IN SEARCH OF MINERAL WEALTH: THE SOUTH AUSTRALIAN GEOLOGICAL SURVEY AND DEPARTMENT OF MINES AND ENERGY TO 1944.

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A thesis submitted in fulfilment of the requirements for the Master of Arts degree in the Department of History at the University of Adelaide, March 1983.
This thesis does not contain any material which has been accepted for the award of any other degree or diploma in any university and, to the best of my knowledge and belief, this thesis does not contain any material previously published or written by another person, except when due reference is made in the text.

B.J. O'NEIL
Abstract

The initial resistance to Government involvement in the mining industry in South Australia was facilitated by the accidental discovery, and subsequent development, of several large copper deposits, the financial restrictions upon the Government and the limited number of officials to enforce its rights, and the non-assertion of the Crown prerogative over minerals.

There was, however, a trend towards strong, centralised government in South Australia and many colonists accepted the notion of the positive role that the state could adopt in developing society. Indeed, at times during the nineteenth century, they even encouraged and welcomed state participation in, and regulation of, their affairs. But such participation, although a form of state socialism in practical terms, lacked a sound theoretical basis: it was pragmatic. Thus a set of circumstances in the latter part of that century (drought, economic depression, recession in the mining industry, the assertion of the Crown's prerogative over minerals and the emerging idea of public before private wealth) led private enterprise to transfer control for the exploration and exploitation of minerals to the Government. The state's role was generally seen to be one of assisting rather than replacing private enterprise initiatives.

Once formed, the Geological Survey and Department of Mines maintained their own momentum. Their duties (to search for minerals and water, to regulate the industry, and to initiate developments) affected the evolution and
development of the organisation. These duties strengthened the role of the Survey and Department in the industry, and by the twentieth century, few doubted that the involvement of the state in mining was not one of its 'legitimate' responsibilities. Thus there were steps towards state ownership of mining activities prior to World War I and during World War II.

Despite the importance attached by contemporaries to mining as a saviour of South Australia and the continuing faith of the administrators, Government and private enterprise in a resources boom, the Department of Mines remained a minor instrumentality of Government. The Department emerges, historically, as limited in its efficiency because of constant Government restrictions on its finance, powers and staffing. Intermittently, the Department was held to be the scapegoat for the lack of mining in South Australia by those who had urged the formation of the Department and, in particular, by the industry which looked to it for assistance.
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Abbreviations

a) Archival
SAA South Australian Archives.
BRG Business Record Group.
GRG Government Record Group.
PRG Private Record Group.
SRG Society Record Group.

b) Department of Mines
AR Annual Report on the Department of Mines by the Director of Mines and Government Geologist.
DM Department of Mines.

c) Parliamentary
SAPD South Australian Parliamentary Debates.
SAPP South Australian Parliamentary Papers.
HA House of Assembly.
MHA Member of the House of Assembly.
LC Legislative Council.
MLC Member of the Legislative Council.

d) Other
BHP Broken Hill Proprietary Company.
E&WS Engineering and Water Supply Department.
ICI Imperial Chemical Industries Company.
FGS Fellow of Geological Society.
Conversion

The material covered in this thesis pre-dates 1944 and hence all measurements have been given in Imperial form. Also, it has been considered an unnecessary and misleading exercise to adjust the currency from the pre-decimal pound (£), shilling (s) and pence (d). Today the value of £1 would be vastly different to its decimal equivalent of $2.

Note on Grammar

The syntax, spelling and capitalisation of the original sources have been retained throughout. The use of 'sic' has been restricted to those cases where the grammatical errors in the original sources are repeated or the intended meaning is unclear. In most cases, however, the modern usage of the names of towns and places has been adopted.

Terminology

The terminology of the mineral industry is varied, therefore generalised definitions have been adopted throughout. Mining is thus interpreted broadly as the excavation of minerals, ores and rocks from the earth by a variety of methods including dredging and quarrying. A topic of major importance in the Department's activities has been that of underground water resources and this aspect is also examined throughout the thesis. Where necessary, specialist definitions have been provided but this has been kept to a minimum.

The term Geological Survey did not come into official use until 1912. However, in order to maintain the distinction between the Department of Mines and the Geological Survey, the latter term will be used instead of the earlier variants Geological Department or Office.
Locality Map, South Australia.
Locality Map, Northern Territory.
Rocks and minerals were used in South Australia many thousands of years before European settlement. Some of the first manufactured items in South Australia were undoubtedly of mineral origin. Chalcedony, flint, slate and other rocks and minerals were fashioned into tools and weapons in the open-air 'factories' of the Aborigines who, as hunters and collectors of food, depended on such implements for survival. Although Aboriginal legends indicate an awareness of the existence of deposits such as coal and gold, the nature, complexity and demands of Aboriginal cultural mores did not require the extensive working of such minerals.\(^1\)

Other minerals were used during tribal rituals and religious ceremonies and some of these were also economically important. The noted ethnologist, Charles Pearcy Mountford, recorded that ochre from Parachilna was distributed widely throughout eastern Australia and that this region of the Flinders Ranges could be proclaimed one of "the oldest international trade routes in the world".\(^2\) The significance of an assorted array of minerals to Aboriginal life and culture has generally been underestimated.

The most extensive use of minerals has been made, however, since the European occupation of South Australia.

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The process of mining ores precedes the manufacturing of materials and mining has played an integral part of many societies' economic, social and cultural activities. It has become fundamental to the modern way of life because of the dependence on industrialisation in many societies since the Industrial Revolution in the eighteenth century.

This is not a history of the mines of South Australia; a comprehensive, contemporary account of that subject may yet be added to the list of South Australian historiography. This thesis draws on the set of circumstances relating to the South Australian Parliament assuming control over minerals in the nineteenth century and the subsequent history of Government administration of the mining industry, and places these events in the context of South Australia's political, economic and social life. The thesis investigates and describes the origin and development of the Government Geological Survey and Department of Mines through to the Jubilee of the Department in 1944. The historical review highlights the nature of the relationship between the state and private enterprise in the evolution of this organisation.

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The Colony of South Australia, which was founded under the influence of the ideas and principles of Edward Gibbon Wakefield's theories, was an idealistic attempt at systematic colonisation. Incorporated in Wakefield's theories was the maintenance of formalised relations between the state and the people. The colonists, even if they
perceived themselves as coming to a 'paradise of dissent', retained or adopted British administrative and political processes. The system of administration was gradually adapted to meet local needs and circumstances.

Although the British Government had been intricately linked with the planning, implementation and administration of the Colony, the administrators had not formulated a policy for the location and development of mineral resources. This activity was initially left to the private sector and there was a degree of resistance to the idea that the Government should be closely involved with the mining industry. The relationship which existed in South Australia between the state and private enterprise was based on the assumption that society and personal wealth could best be advanced by relying on a simple type of laissez-faire economy. Competitive capitalism fulfilled the needs of economic development in the Colony until the accumulation of wealth under the primitive laissez-faire approach failed.

Two events in Australia in the 1850s resulted in significant changes to the colonial administration. Firstly, the discovery of gold in New South Wales and Victoria led to an expansion of state interests (to enforce and safeguard Crown rights) and activity (in the search for minerals for which private enterprise asked assistance). Secondly, several Colonies (including South Australia) were granted responsible, representative forms of government which necessitated an extension of the administrative organs of the state. For example, the colonial administrations now had control of, and responsibility for, their actions, Ministers with new powers and responsibilities were
appointed, and boards became Ministerial offices or departments. Such changes highlighted the adaptability of the state and, at the same time, its concern with the order and stability of society.

Despite the acknowledged traits of independence and self-reliance, the colonists generally accepted the positive role of the state and came to depend on the administration to act on behalf of individuals. There were currents of egalitarianism in the Colony but, as Keith Hancock noted, it was an Australia-wide characteristic for colonists to look to the state to service their rights. The colonists expected and wanted the authorities to act for them and they agitated for Government action in the expectation of creating new opportunities. This development was pragmatic and took place in the absence of systematic theories or explicit philosophies: the administration operated in response to circumstances.

Hancock's classic observations on the role of the state in Australia explain the widespread acceptance of state involvement on the grounds that the state did not replace private enterprise initiatives but, rather in the manner of a benevolent institution, assisted the forces of capitalism and supplemented the activities of the private sector. The traditional analysis is sufficient to explain the key element in the formation of the Geological Survey and Department of Mines in South Australia.

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3. Hancock, W.K., Australia p.72.
4. ibid. p.69.
The search for water and minerals, and mining activity were modified by the characteristics of the South Australian environment. Locating deposits was one thing; utilising them another. There were several factors which affected the economic management of mining operations. The geographical location of a mine was particularly important; potential areas of mineral wealth might be ignored because of the climate, terrain, distance from the main settlement and the high cost of transport. The characteristics of each mine affected the choice of mining methods; the quality of the ore determined the treatment needed; the extent and nature of the deposit indicated its permanence or otherwise and secured investment to ensure its development; the state of the local economy and society affected demand and supply, while export overseas was dependent on the situation of the world market and other sources of supply. Vital necessities for the mining, mineral processing and manufacturing industries were assured supplies of water and fuel, and the requisite technology in mining methods and metallurgical practices. Finally, a mine had to be under the control of capable managers and sensible businessmen who were alert to the need to invest wisely and to develop it efficiently.

However, sections of the mining industry often ignored these basic common-sense requirements. Many mining ventures failed because of the reckless and greedy behaviour of enthusiastic investors and speculators. South Australia's mining history is full of ill-considered and over-optimistic attempts to develop very limited deposits. Some mines were undercapitalised and were abandoned soon after a limited amount of developmental work and before being fully
tested. After the outlay of initial expenditure, shareholders might refrain from fully paying up on the calls for additional finance. The impatience for profits and desire for speculation led to substantial mining on the Stock Exchange rather than in the field. The success of the copper mines at Kapunda, Burra, Moonta and Wallaroo and the continual lure of gold fever no doubt stimulated these speculative practices.

The mines themselves were often poorly situated in remote areas of the Colony where access was difficult, transport expensive and water scarce. In such situations, the miners' and managers' lack of technical expertise compounded the problems of inadequate machinery and imperfect means of extraction and treatment of the ores. The larger and more spectacular mines had relied on experienced miners, managers and directors. The same did not always apply to many of the smaller or less successful mines where a single error might nullify the prospects. Many promising mines failed to match the investors' expectations and this highlighted the need to examine systematically and scientifically the deposits before attempting to develop them.

By the 1880s, private enterprise was no longer prepared to accept the sole responsibility for developing the mineral resources of South Australia and resorted instead to investment and speculation within and outside the Colony as the principal form of economic activity in the mining industry. Even in times of drought and depression, private enterprise had been, for the most part, content to rely upon accidental discoveries as the means of locating deposits of
water and minerals for its own benefit. This attitude altered appreciably as it became obvious that more deposits would not be easily found or developed. When private enterprise was generally unsuccessful in its attempts to locate and exploit the mineral wealth of the Colony, the colonists were prepared to transfer control of the exploration for resources to the Government. The Government indicated it was prepared to involve itself in direct activity to sustain the industry. In a time of need, private enterprise was willing to accept the assistance of the Government.

There was an expectation that a geological survey of the Colony would help to overcome the downturn in the mining industry. A geological survey could undertake purely scientific investigations independently of the mining industry. A survey might establish the possibility of sources of water for the benefit of pastoralists and agriculturalists. It could also delineate the likely localities for minerals which private enterprise could then develop for wealth. The world-wide expansion of geological thought in the nineteenth century was part of the climate of scientific thought directed towards the examination of nature and the world in search of clues about the evolution and social development of man. The Geological Survey of Great Britain, for example, had been established in 1835, and the Secretary of State for the Colonies in London had, on occasion, made temporary appointments to other colonies. The value of the study of geology to the mining industry was not widely recognised for a long time in the Australian Colonies and South Australia was no exception.
The intervention of the Government in the mining industry was facilitated by the continued growth of the civil service which had, by the 1880s, established the basis for strong central government and future state administration and regulation in South Australia. The state had become involved in many diverse fields including post and telegraph, poor relief, education, health, railways, and a programme of expanding public works. As John Hirst has suggested, the reasonable performance of the state in such undertakings encouraged the transfer of responsibility from the private to the public sector.5

The creation of the Warden of Goldfields Office (1868) and the Geological Survey (1882), the assumption of control of the exploration for resources, and the provision of support facilities for the mining industry were significant in themselves but they do not fully account for the formation of the Department of Mines in 1894. Geoffrey Blainey has stated that "South Australia was surprisingly late in creating a strong geological survey and mines department".6 This was not surprising, however, given the earlier predisposition of Parliament and capitalists towards private initiatives and endeavours. Only at times when mineral wealth declined and the industry suffered a downturn in the value of production and the discovery of new deposits, did private enterprise look for Government assistance. Throughout the 1880s and 1890s, drought and

depression adversely affected the mining industry, overseas investment in South Australian mining activities declined, and local investors turned their attention elsewhere.

Equally as important in the formation of the Department as the acquiescence of the private-enterprise sector were the trends towards state rights and the democratisation of society: "[s]tate policies and interventions at any point in time are the result of broader social and political power struggles and reflect changing influences and priorities". These trends were evidenced in the assertion of Crown rights to minerals on behalf of the public in 1886 and 1888, and the emerging notion of sharing colonial wealth which properly belonged to the whole community. The acquisition of control of the mining industry by Parliament and the effort to stimulate the private sector was another example of the trend towards state socialism in Australian, not just South Australian, society without the adoption of theories to this end. The expansion of the civil service and the increasing role undertaken by Governments to be active in all matters affecting society can be clearly seen in a review of the legislation of this period. However, despite the influence of writers and speakers on the subject of state socialism, this tendency fell short of that philosophy which required public ownership of the means of production, distribution and control on the exchange of commodities.

8. De Garis, B.K., in Crowley, F.K. (ed.), A New History of Australia p.243. His comments on the period 1890-1900 were made in the context of an Australia-wide review but they do hold for the South Australian situation.
Direct Government participation in the mining industry gradually led to the formation of an explicit policy for the development of the colonial mineral resources. Governments had previously been involved implicitly through legislation, rewards for discoveries, and by providing some supportive facilities for the industry. However, the implementation of a formal policy did not occur until after the merger of the Geological Survey and the Department of Mines in 1912. Before this, the Government did increase its interest in the mining industry and adopted measures to stimulate private enterprise. The Survey and Department operated independently in their efforts to promote mining. By the time of the merger into a consolidated body, the administration of the industry was widely considered to be one of the responsibilities of Government.

Governments in the twentieth century attempted to promote the mineral resources of South Australia for the benefit of the industry, investors and the public. During this time, there was a shift in thinking about the development of mineral resources and their role in the South Australian economy and this added a new dimension to the colonial capitalism of the nineteenth century. The elaboration of policies for the development of the resources was generally left to the public servants rather than the politicians. The public servants combined talents with several leading business figures:
it was the South Australian government[sic] that went furtherest[sic] in designing a whole system of state support for manufacturing... it was in clear contrast with the earlier tentative moves towards state-based industrialisation in New South Wales, using state power not to form capital directly, but to create local conditions that would attract manufacturing investment from outside companies by - in effect - guaranteeing profitability.9

The trends for state assistance that were evident in the nineteenth century continued into the twentieth century. More than ever before, Governments were relied on to assist in the economic development of society.

The powers of the public service increased substantially in this period although the political parties, cabinets and Governments maintained their influence over the political decisions for the implementation of some policies. Before World War II, economic considerations were more important than political needs and motives for the adoption of plans and policies. However, the distinction between the initiation of a particular policy or plan of action and its administration was becoming less apparent: objective planning had begun to supersede the pragmatic measures and ad hoc regulations.

Although there have been various arguments for and against the necessity, desirability, amount and type of state intervention in private enterprise, there has been a strong tendency since European settlement for centralised forms of government and administration. The derivative system of administration expanded and was refined to meet South Australian requirements. The assertion of state

rights was particularly emphasised and the administration expanded to service these public rights. South Australians generally looked to Governments for assistance and, in the case of the mining industry, steadfast opposition to such aid declined over time. Government participation in, and direction of, the mining industry - to search, regulate and initiate - was accepted as a state responsibility.
Chapter One: 1836-1856 Touching the Surface

The need for water and the possibility of mineral wealth had not been ignored by the organisers of the venture to establish the Colony of South Australia. When the formation of a South Australian Mining Association was proposed in 1841, the prospectus of the company noted that:

"The attention of English capitalists has long been turned to South Australia, as offering a most encouraging field for mining operations, and so long back as 1835, a public Company with a very large capital was nearly completed [in London], for the purpose of exploring the colony for the rich mineral treasures it was thought to contain."

Both the South Australian Company and the Colonial Office instructed their officers to undertake mineralogical searches in the Colony. The Board of Colonisation Commissioners also became involved in the quest. But the onerous task of locating water and minerals was conducted in a haphazard fashion and most discoveries were of an accidental nature. The colonists naturally brought their cultural heritage and mores to South Australia and, in the case of mining pursuits, they retained the techniques and practices that had been utilised in the mother country. This was clearly reflected in the adoption of the common law precedent to allow the settlers sole possession of 'all above and below the surface' without reference to the Crown of any land purchased, and to ignore Crown rights to gold and silver deposits. The administrators of the Colony acquiesced in this matter. Their interests concerned the stability of the settlement rather than undertaking searches

1. *Southern Australian* 30.3.1841.
for minerals or regulating private initiative other than to control the leases and licences for which limited finance and few officials were needed.

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The name of the capital city, Adelaide, had been accepted before the actual site for the city had been chosen. The Board of Colonisation Commissioners entrusted the responsibility for selecting a suitable site to Colonel William Light, the first Surveyor-General. Light reached South Australian waters on board the brig Rapid during August 1836. By November, he had examined some of the more likely spots for settlement and on 21 November he navigated the entrance of the Port Adelaide River. Although he had barely begun the investigation of 1,500 miles of coastline as instructed, he was certain that he had now found the best site for the capital. Part of his instructions had emphasised the need for a fresh water supply and a satisfactory harbour; the city should also be located near a supply of coal. Given the daunting magnitude of his task to find the best site for the city, one could hardly criticise Light if he had not located Adelaide in the vicinity of a readily usable coal seam!

3. ibid.
5. ibid.
7. Dutton, G., Founder of a City p.162. He had also been told to include a mineralogist in his party but it appears that no-one fulfilled this role (p.160).
Light concentrated his attention on the settlement of Adelaide and the survey of the surrounding land. He had little time to devote to the search for minerals, not even those suitable for building and construction. Nevertheless, these matters were not overlooked by private interests which had retained control of mining rights and were prepared to undertake mining operations. The South Australian Company, a private-business concern, had sent the remarkable scientist, Johannes Menge, to the Colony. Although he was an investigator and not a developer of resources, Menge was the earliest and most notable figure directly involved in the examination of minerals and water in the Colony.

Menge was born at Steinau in Germany on 20 January 1788. He apparently received very little formal education in his early years: he is reputed to have read only four books - the Bible, a hymn book, the Heidelberg Catechism and *The Pilgrim's Progress* - when he left his parent's home in 1806. During his extensive travels throughout Europe, he acquired a practical and theoretical knowledge of several languages, geology, mineralogy, religion, philosophy, and medicine. In fact, his talents and abilities were so widely recognised, that in 1821 he was awarded the honorary degree of Professor of Mineralogy at the University of Lubeck in Germany.

Menge settled in England in the early part of the 1830s and undertook various linguistic pursuits. He taught Hebrew and Chinese in a private academy and also prepared a Chinese

8. Manuscript - 'Sketch of the life of Johannes Menge' - by Marjorie Haughton in author's possession.
dictionary.\textsuperscript{9} He was involved in the work of the British and Foreign Bible Society and it was probably through this organisation that Menge became associated with George Fife Angas, the Christian philanthropist, who controlled the South Australian Company. The answer as to why he accepted the Company's offer to join the venture to South Australia may not lie solely with Menge's personality, his desire for a life without restrictions, or the nomadic lifestyle he had led until then. Perhaps the appeal and tenacity of Angas were contributing factors: "The list of those persuaded to emigrate by George Fife Angas could be continued indefinitely, for his baits and devices were legion and he never took No for an answer".\textsuperscript{10} One can only ponder whether Angas had played upon Menge's philanthropic notions, his religious convictions, his long-standing interest in minerals or a combination of these.

The Company appointed Menge to the post of 'Mine and Quarry Agent and Geologist' on 1 July 1836.\textsuperscript{11} He was instructed to

\begin{quote}
explore the natural productions of the Colony above & below ground and to superintend the working of Quarries of Stone and slate, the boring for water, metal, lead, coal and other Mines at a Salary of £150 per annum for one year and for as much longer as the Company require your services not however exceeding five years.\textsuperscript{12}
\end{quote}

Menge was also entitled to a bonus in addition to his basic salary for any minerals that he discovered. Menge accepted the offer from the Company and agreed to abide by the

\textsuperscript{9} ibid.
\textsuperscript{10} Pike, op.cit. p.137.
\textsuperscript{11} SAA 986/2 G.F. Angas to Menge 16.8.1836
\textsuperscript{12} ibid.
instructions given to him by Angas on 12 July and 16 August 1836. The Company had also engaged four German miners to assist Menge and to "work the quarries of stone and lime and procure additional supplies of water from artesian wells". Menge's party left England on board the Coromandel from the port of Deal on 9 September 1836. The vessel reached the Company's settlement at Kingscote, Kangaroo Island, on 12 January 1837. Unlike many of the early settlers, Menge was impressed with the new environment and he quickly adapted himself to the harsh conditions:

I tell you that I find myself extremely happy on the spot where I willingly bear heat, insects, wilderness, etc. if I do not meet with the annoyance of men. Soil, climate, situation, materials, etc. are excellent and the latter [sic] is heaped up in great stones viz. clay, lime, iron, etc... Cements are everywhere under your feet...

At this stage he was not concerned with mining but with the problems of developing an adequate water supply, arranging

13. SAA 986/3 Menge to Angas 18.8.1836. The earlier instructions had directed him to select land suitable for working quarries and then to engage a foreman to superintend the work while he proceeded to search for water. He was also told to "pursue the discovery of all kinds of mines, lead, Copper, Gold, Silver etc etc - objects of natural history to ship to London".

14. SAA Research Note 11: Early German Immigration. The miners were H. Meyer, F. Stachelroth, H. Sekerdik and H. Sander.


17. ibid.
materials for the settlers' building needs and with fulfilling his interests in agricultural, horticultural and viticultural matters.18

Menge's obligation to the Company required him to remain on the Island although he could make short visits to the mainland. Soon after his arrival, he had formulated a plan to investigate mineral deposits elsewhere: "I shall stay here in this place and ask the company for as much ground I need [sic] and make from this point different excursions in Australia".19 But he had no great desire to make a permanent move to the mainland. When the site for the capital city had finally been decided upon, Menge commented that the country "is spoken of as a fine valley with fruitful soil. I am in no hurry to go there as flat country has as little attraction for me as flat souls".20 He had now decided to recommence his geological ramblings as he had done through the European country-side: "The geologists of this day will have much to digest for the limestone here contains a number of fossils which I shall

18. ibid. "I cannot wish for metals and gems before the land is cultivated and Kingscote has a shape of a human dwelling place".
19. ibid. In other correspondence Menge also refers to 'Australia' but this would appear to be a juxtaposition of terminology for South Australia.
20. Menge correspondence in author's possession: to Dr Pauli, a lawyer in Lubeck, 16.5.1837. Written "under the canopy of heaven, Nepean Bay".
collect and arrange". He was, however, upset and frustrated in his efforts to attend to mining matters on the Island because the Company still did not control the land: "What we now have is only usurped".

Johannes Menge resided on Kangaroo Island until the latter part of 1838. He lost his early enthusiasm for the settlement not so much through a lack of success with his geology and mineralogy but because he disliked many settlers' attitudes. Unfortunately, the settlers could not comprehend Menge's ways nor appreciate his talents and his potential value was often overlooked. David McLaren, the Company's Manager, was often exasperated by Menge who he thought was a particularly obnoxious character.

The issue that aggravated McLaren's hostility towards Menge concerned the water supply on the Island. In contrast to the method for selecting the best site for the capital of the Colony, the South Australian Company had determined, before leaving England, that its settlement was to be founded on Kangaroo Island. The Company's officers were required to make strenuous efforts to fit their concept of a settlement to a place where it did not belong. They were unwilling to adapt their concepts to the new environment. Thus during the 1836-37 summer when the artesian wells were constantly filled with salt water, the Company's officers were unable to comprehend the nature of the problem or to

21. ibid.
22. ibid.
23. Pike, op. cit. pp.133, 209. It must be noted that McLaren had little time for any of the German settlers but he and Menge were in constant disagreement.
24. ibid. p.197.
find possible solutions to their dilemma. In contrast, within three weeks of his arrival Menge had stated that conventional artesian wells were inappropriate. He suggested that some experimentation was required to develop new forms of wells in which the water could be stored without being contaminated by salt. But "neither he nor his theories were ever taken very seriously, and... he was regarded as something of a joke - erudite, but for practical purposes, useless". Even the four miners and labourers sent to assist him were unimpressed by his novel efforts to solve the problem. They continued to dig conventional wells for the Company and Menge was left to pine for one of his brothers and his own sons "for I am alone and whatever must be done I must do it myself".

As the 1837-38 summer drew closer, McLaren insisted that Menge proceed to bore for water, in the immediate vicinity of Kingscote, that we may either obtain a supply, of that invaluable necessary of Life (Fresh Water) Or shall ascertain decidedly that it is not to be had.

McLaren ignored both Menge's previous efforts and his advice that the problem could not be solved if they relied on the conventional methods. Not surprisingly, the attempt failed as did Menge's effort to construct a catchment area

27. ibid, p.139.
28. SAA PRG 174 op. cit.
29. SAA BRG 42/1157 McLaren to Menge 6.11.1837.
near Point Marsden in the first half of 1838. Yet Menge maintained a belief that the problems associated with the water supply on the Island could be remedied. In fact, he proposed that the adoption of a method of irrigation based upon a suitable system of artesian wells would eventually enable Kangaroo Island to support a population of one million people!

Menge's official services were terminated from 30 June 1838 when the Company dismissed him. The main factor contributing to his dismissal was the conflict with McLaren. When Menge returned to the Island after a visit to Adelaide in 1838, he wrote to McLaren:

I cannot allow you to interfere with my duties, as you are ignorant of Geology and unable to converse with scientific men and with Christian Characters. You cannot frighten me with your having the purse of public money; I recollect with horror the Apostle Judas Iscariot as often as I see you with the bag.

Despite Menge's reports and discoveries the Company had not commenced mining operations, nor was it likely to while the settlement at Kingscote struggled for survival. Menge did not remain on the Island but travelled to the mainland where he concentrated on searching for minerals instead of water.

31. ibid.
32. SAA 986/9: 17.10.1838.
33. SAA 986/8 Menge to the Directors of the South Australian Company 15.10.1838.
34. SAA 986/7 Menge to McLaren 15.10.1838.
35. Auhl, I. and Marfleet, D., Australia's Earliest Mining Era p.23. See also SAA 986/5: 2.5.1838, 'Report by J. Menge on the soil, rocks, timber and water supply of various parts of the island'; and SAA 986/10: 27.10.1838, 'Report by J. Menge on the rocks of the island'.
Although it was unbeknown to him, William Light had placed Adelaide near a coal seam. But it was the assortment of minerals in the hills nearby which attracted attention. Menge, while wandering on the mainland, collected rock samples and mineral specimens in these foothills of the Mount Lofty Ranges. The first reported traces of copper were located on a patch of land held by Osmond Gilles, the Colonial Treasurer. Although the discovery attracted some attention from the colonists, Menge was the person most interested in this region before the Cornish miners arrived in the Colony. Francis Dutton, one of the discoverers of copper at Kapunda in 1842, recorded in 1846 that "the existence of the valuable metals was unsuspected by anyone, excepting the geologist, Mr Menge, who always foretold that the hills were metalliferous". The activities of mineral seekers, in particular the Cornish miners, during the next decade were to fulfil Menge's predictions. The Wheal Gawler Mine at Glen Osmond, which is cited as the earliest Australian metal mine, was first worked for its deposits of silver and lead in April 1841.

37. SA Gazette and Colonial Register 25.8.1838. This particular deposit was not mined until 1846.
38. Wells, op.cit. p.47. He suggests that Menge's accounts of the area were responsible for attracting some Cornish miners to South Australia.
40. For a history of subsequent mining activities in the Adelaide Hills see Wells, op.cit.
On 29 June 1839, a new Deputy Surveyor-General for the Colony had been appointed by the Colonisation Commissioners in England. Thomas Burr arrived at Port Adelaide on board the Cleveland on 18 December 1839. He commenced his duties on 1 January 1840, and drew a salary of £400 a year. Burr was scientifically minded and in addition to his surveying duties he examined the geology and mineralogy of the Colony whenever possible. The renowned explorer and former Surveyor-General, Charles Sturt, had also shown interest in geology and mineralogy while in the Survey Department and had made valuable observations during his explorations.

Despite the appointment of Burr, Menge remained prominent as the geological and mineralogical expert in the Colony. Even George Fife Angas, who had apparently reconciled his desire for personal wealth with his Christian

41. SAA Research Note 77: Thomas Burr.
42. ibid.
43. South Australian Statistical Year Book 1840.
45. Johns, R.K. (ed.), History and Role of Government Geological Surveys in Australia has noted two observations by Sturt. In 1838 he felt that "the colony shows promise of future wealth in the ores and minerals of the ranges" and in 1840 he commented that "the mountain ranges contain, without doubt, a great proportion of slate, and that of the finest description; and I have always entertained an opinion that some of the richer ores will be found in them" (p.64). E.C. Andrews recalled that Sturt had "urged the need of scientific prospecting for valuable minerals; indeed, during the whole of his great exploring trip of 1844-1846 to find the centre of the continent he sought assiduously to discover minerals of commercial value" ("The Heroic Period of Geological Work in Australia" in Proceedings of the Royal Society of New South Wales 76:II 1942 p.109). One biographer of Sturt suggests that during this great trip, he became the first explorer to stand on the site of Broken Hill from where he sent specimens to Adelaide! (Price, op.cit. p.51). The Adelaide Observer on 9.10.1858 reported Sturt's account of the geology of that area indicated the existence of a goldfield in the nearby Barrier Ranges.
and philanthropic ideals, had retained his services on a
personal basis although the South Australian Company had
ceased to employ Menge.46 Menge's behaviour may not have
appealed to the purists but he did generate an interest in
mining and minerals.47 When the Adelaide Observer published
one of his letters dealing with minerals north of Spencer
Gulf, the editor noted in his leader that:

We insert Mr Menge's letter, almost
verbatim et literatim, from the
persuasion that although the style is
somewhat enthusiastic, the avowed
impressions are perfectly sincere, and
the opinions entitled to great respect
from the known talents and experience of
the writer.48

Openly manifesting boundless reserves of energy, Menge had
examined much of the area between Cape Jervis and the
Flinders Ranges.

The colonial press often published the information that
he provided. In June 1840, the Register printed a list of
100 mineral specimens that he was able to supply to the
colonists.49 By September 1840, he claimed that his
collection of 200 mineral specimens was only an introduction
to South Australia's mineral wealth because he could do no

46. Adelaide Chronicle 21.4.1840. (Report of Mr Menge,
Geologist, on the Barossa Range, addressed to a South
Australian Proprietor resident in England, 29.4.1839).
See Pike, op.cit. pp.209-210 for the story of
Flaxman's Special Surveys by Menge for Angas. For other
examples, see Linn, R., 'George Fife Angas: On Mining
Operations' in Journal of the Historical Society of
South Australia, 6: 1979, pp.55-64.
47. Kerr, op.cit., p.17; Reynolds, J., Men and Mines
pp.13-18; Gibbs, R., A History of South Australia
pp.95-96; Wells, op.cit.
49. South Australian Register 27.6.1840.
more than touch the surface! In 1841, Menge's small booklet *The Mineral Kingdom of South Australia* was printed. The *South Australian Almanac of 1841* contained one of his lists of minerals of the Colony, and the *Register* published his series of ten papers on the geology of South Australia. On a different note, the *Observer* in 1844, printed ten extracts which were an autobiography of some of his 'Voyages and Travels'. Menge's letters (not all of which dealt with mineral matters) contained novel suggestions. He promoted the idea of a South Australian Mining Association to collect specimens and to search for minerals. He proposed the establishment of mining schools, colleges and associations to encourage the study of geology and mineralogy. He predicted, from his own experiences, that gold would be found and that South Australia would have the greatest copper mines in the world. Menge thought there was a need for regular investigations from Cape Jervis to the northern boundary of the Colony and to publish the results in a geological

52. *Observer* 24.2.1844-25.5.1844.
53. *Register* 30.5.1840.
54. *Adelaide Chronicle* 23.9.1840; *Observer* 20.1.1844.
55. *Ibid.*
journal of South Australia. However, the depression of the early 1840s and the subsequent financial stringency of Governor Grey's administration did not facilitate the adoption of these ideas.

It has often been noted that Menge was not responsible for the commencement of any mining operations in the Colony. This was due partly to his preference for rambling in the bush and collecting specimens; he considered himself a geologist and mineralogist, not a miner. It was also because a request he had made to Governor Grey in 1841 for land to commence a gold mine had been refused. This had upset Menge:

Of course I did not know that the Parliament had legislated so as to hinder the progress of mining, but on receiving this intimation [the Governor's reply] I concluded that it was useless to think of mining operations until I had the pleasure of meeting Captain Bagot.

Menge's association with Bagot was of short duration, and is best remembered for his role in officially opening the Kapunda Copper Mine in January 1844. But his primary concern was with the location and delineation of mineral deposits rather than the process of actually mining.

56. ibid.
57. Loyau, G.E., The Representative Men of South Australia p.174, quotes a contemporary source who suggested that Menge refused to teach the Governor and his wife Hebrew because Grey would not establish a school of mining!
58. Gibbs, op.cit., p.96. On the strength of Menge's reports, George Fife Angas did send out a large party of miners in 1846 to work for the Barossa Range Mining Company but this was a short-lived operation (Register 24.10.1846,4.11.1846). There is also an unproved assertion that he may have assisted in the discovery of the Kapunda and Burra Mines (Cawthorne, W.A., Menge, The Mineralogist).
59. SAA A284 B3 Menge to Grey, 7.7.1841 (request); SAA GRG 24/4/El1841/42 (refusal); Observer 3.2.1844
60. Observer 3.2.1844.
minerals. In fact, he often cautioned the colonists against rushing into mining enterprises without first proving the nature of the deposits. The combination of his roles as an investigator and adviser was very similar to that which would later be adopted by the Government-employed officials.

The decade of the 1840s was one of substantial mining activity which assisted the Colony's recovery from the economic depression after Governor Gawler's period in office. Yet the Colonial Office and the local administration were slow to display any intention to direct the discovery and development of the mineral resources. In 1846, Francis Dutton suggested that the Government could have done more in this area:

> It is not too much to expect that the necessary [geological] explorations should be conducted by the Government themselves; and I may be allowed to express a hope that this important subject may meet with some attention on their part.

The opportunity to create an official post had arisen when Menge offered his services to Governor Grey in 1844:

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62. For example, silver-lead at Glen Osmond (1841), copper at Kapunda (1842), the Montacute Mine in the Mount Lofty Ranges (1843-44) and at Burra (1845). The importance of the mineral discoveries to the colonial economy can be seen from the figures for the value of exports - by the end of 1849, minerals amounted to two-thirds of the colonial exports.

I would beg to make application that it might please Your Excellency to confer upon me the appointment of Colonial Geologist, in which capacity, I believe, I should have it in my power to make myself very useful to this Colony, which has been my chief concern for several years past.64

Menge suggested that an appropriate salary, which was in Grey's capacity to decide upon, could be augmented by a bonus system based on the sale of all land containing minerals that he found for the Government.65 The Surveyor-General, Edward Charles Frome, was aware of Menge's ability and of his potential value to the Colony:

I do not suppose there is any person in the Province so fitted for the situation should Your Excellency think fit to consider the Creation of such an Office.66

But Frome did not think that anyone should receive a large salary for their "occasional services" or that the Colony could afford to encourage speculation about mining.67 Grey, who was also conscious of Menge's efforts in the discovery of minerals, refused the offer because he did not believe it was within his power to make such an appointment.68 More likely, however, is that the refusal stemmed from Grey's notion of "cheap administration, [which was] well enough

64. SAA GRG 24/6/1844/268 Menge to Grey 22.2.1844. The creation of this position had been mentioned to Grey by Menge when he asked for land to mine - see SAA A284 B3 op.cit. Menge to Grey 7.7.1841: "I had wished to be appointed as Colonial geologist, and to have obtained a salary suitable to the expences; [sic] which the opening of such places where useful materials or valuable minerals occur require; but it continually happened that other circumstances turned the attention from this important scientific object".

65. ibid.
66. ibid. Frome to Grey 8.3.1844.
67. ibid.
68. SAA GRG 24/4/7G/318 Mundy to Menge 13.3.1844. Pike, op.cit. p.36, suggests that it would have been within Grey's prerogative.
adapted to a bankrupt colony but ill suited to coppermania". 69

From this point on, Menge was less conspicuous in the arena of mineral development in South Australia. According to his letters, Menge had now strengthened his attitudes towards God, mining and man. For example, he wrote to Dr Pauli in Lubeck, Germany:

Should the creator of all send some sensible people here who would use the treasures of Australia to the Honour of God and the benefit of their fellow man, then I would also look at the mineral wealth again. 70

On another occasion, he predicted with accuracy and foresight that share-broking would cause a downfall in mining in the Colony: "As long as this system lasts any body may contrive a puff, enhance shares, and leave the consequence to the shareholders". 71 In his last known communication with the Government of South Australia, he wrote to the recently arrived Governor Young and offered his services in promoting geology, mineralogy and the study of languages. 72 His suggested grammar and mining schools were not established. Menge eventually travelled to Victoria in the 1850s and he died on the goldfield at Forest Creek near Castlemaine in late October 1852.

Menge's exploits were important in the early mining activity in the Colony although his search for minerals and examination of the Colony's geology were independent of the accidental discoveries of mineral wealth. Menge's inability

69. Pike, op.cit. p.399.
70. Menge correspondence in author's possession: to Dr Pauli 3.2.1846.
71. South Australian Mining Journal 11.11.1848.
72. SAA GRG 24/6/1848/1266 Menge to Young 15.8.1848.
to uncover the vast deposits of worthwhile minerals may have been considered a further example of his eccentricities. On the one hand, some colonists argued that the dependence on so-called experts and scientists would not lead to valuable discoveries. They considered that competitive private enterprise and initiative which relied on 'miners' luck' for accidental finds would eventually create a vigorous mining industry. On the other hand, these colonists were the same ones who would later maintain that the best way to improve colonial wealth was to search actively for minerals. Hence, after the attempts to work gold deposits in the Adelaide Hills during 1846 at the Victoria Gold Mine near Montacute and in 1849 at Balhannah, and in response to the gold rush in California in 1849, Governor Young attempted to initiate a geological survey of South Australia. The Gold Rush to eastern Australia in the 1850s encouraged the colonists to request a survey of the Colony in order to indicate the best possible sites for the discovery of gold. Thus the value of a survey to determine the mineral wealth of the Colony was accepted or questioned depending on the economic circumstances facing the colonists.

A strongly maintained belief of many early colonists had been that an increase in mineral discoveries and mining activity would harm the colonial economy. It was, however, the expansion of the copper mining industry which proved to be of great assistance to the economy. But the spread of settlement and the sale of land in special surveys

73. For example, SAA GRG 24/6/1843/1434 Burr to Frome 7.12.1843: "the low state of the labour market cannot support mining at a beneficial level; if more land is opened to the public, the colonists will be injured."
of 20,000 acres at such localities as Mount Remarkable and Burra prompted Governor Grey to suggest to the Imperial Government that all minerals should be reserved to the Crown and a royalty imposed. Until this time, land containing minerals had been sold at the same price as land for agricultural and pastoral purposes and the public revenue had not benefited to any extent. Grey's insistence in 1844 and 1845 that the rights over all minerals should be reserved to the Crown was a factor which influenced his appointment to New Zealand by the Colonial Office.

Frederick Robe, who arrived in October 1845 to replace Grey, did not renege at first on the issues of reservation and royalties. The Government proclaimed regulations on 5 March 1846 which distinguished between land thought or known to contain minerals and other land. Provision was made for the leasehold tenure of mineral-bearing lands for a 21-year term. More importantly, the administration had now begun to view the mines and mineral resources as a source of public revenue and not just objects for vested interests to exploit. Thus the regulations also stipulated that a royalty of one-fifteenth of the value of production of metalliferous ores upon Crown land sold after 5 March was payable to the Crown.

The lack of authority for the Colonial Government to raise revenue from the expansion of mining activity had been an important element in the reluctance of the Government to assume responsibility for directing the search for minerals. By now the Colonial Land and Emigration

74. Pike, op.cit. p.401.
75. ibid. p.398.
76. SA Government Gazette 5.3.1846.
Commission, which had replaced the Board of Colonisation Commissioners in 1840, had ordered "that land thought to contain minerals was to be withheld from sale until inspected by a government geologist and mine surveyor".  

According to Pike, Robe appointed a mineral surveyor in May 1846.  

It is almost certain that the Deputy Surveyor-General undertook this function: Frome reported that most of Burr's time in 1846 was spent on a geological examination of land applied to be put up for sale, and other areas supposed to contain valuable minerals.  

The introduction of the mining royalty was accompanied by a downturn of new mining operations. In order to ascertain the effect of the royalty, Robe instructed the Commissioner of Crown Lands, James MacDonald, to report  

upon the present state of the lands in the mining districts which have been sold since the 3rd March last, with reservation of Royalties to the Crown.  

MacDonald commenced his tour on 15 January 1847 and visited several mines in the Adelaide Hills, Burra and Barossa Valley regions. He found that all of the newly-opened mines required more capital to be invested before they would become productive and, until then, it would not be worthwhile for the Government to appoint officers to superintend the different mines or to collect the royalties.  

77. Pike, op.cit. p.305.  
78. ibid. p.402.  
79. SAA GRG 24/6/1847/402/2 Progress Report (for 1846) - Survey Department compiled by E.C. Frome, April 1847.  
80. SAA GRG 24/4/17N/677 Mundy to MacDonald 5.1.1847.  
81. ibid.  
82. SAA GRG 24/6/1847/317 'Report Upon the Mining Districts by J.W. MacDonald 13.3.1847'.
MacDonald suggested that the collection of royalties would be made easier if the Legislative Council passed an Act with provisions to invoke large penalties for non-compliance and to appoint an officer to administer the Act. However, Robe had already been rebuffed by the Council in September and October of 1846 when he attempted to legislate for the collection of the royalty. Robe found himself left with a regulation which was unpalatable to many sections of the public. The community was generally opposed to the royalty and to the administration intervening in the mining industry even though the public stood to gain by such action. He pressed on with efforts to collect the royalty under the regulation although the cost and difficulty of enforcing the collection of royalties was unlikely to outweigh the revenue to be gained.

Another problem arose for Robe when Burr decided to resign from the Survey Office. Burr tendered his resignation on 12 October 1847 and accepted a position as General Superintendent of the Burra Burra Mine. He had been tempted by the offer of a salary at nearly double the rate that the Government had been paying him. Robe accepted his resignation with regret for he had found Burr to be "a most upright, intelligent, and valuable public

83. Pike, op.cit. pp.402-03.
84. SAA GRG 24/6/1847/317 op.cit.
85. SAA Research Note 77: op.cit.
servant, and one in whom he had the utmost confidence". Robe would have induced Burr to remain with the Government by increasing his salary if he had held the power to do so. This would not have altered Burr's decision which had been taken not only for financial reasons, but also because he could see no immediate opportunity for promotion and advancement with the Government.

Thomas Burr can be credited not only with producing the first official Government geological report, Remarks on the Geology and Mineralogy of South Australia in 1846, but this was also the first book on geology to be published in Australia. A classified list of mineral specimens and their localities was appended to this booklet. Burr had not been employed originally to investigate the geology of the Colony and he relied on observations made while surveying. However, there were occasions, other than his period as mineral surveyor, when he was specifically directed to make geological observations. He visited the South-East with Governor Grey's expedition in 1844 during which he searched for signs of coal. Late in 1846, Frome directed him to examine geologically an area near Mount Remarkable and also one near the Burra Creek Copper Mine:

87. SAA GRG 24/4/19 0/1605 Mundy to Frome 20.10.1847.
88. ibid.
89. SAA GRG 24/6/1847/1287 op.cit.
90. SAA GRG 24/4/17W/677 Mundy to Burr 3.5.1847. Some copies of the 32 page booklet were sent to the Colonial Office and distributed to various Museums and Societies; Vallance, T.G., 'Origins of Australian Geology' in Proceedings of the Linnean Society of New South Wales 100:441 p.21.
91. SAA A650 Cl. It is entitled 'Classified List of Minerals discovered in the Province of South Australia to the close of the year 1844: showing the Class, Family, and species to which each specimen belongs with its description and locality. To which is subjoined a Summary of the Geology of the Located districts'. 
The principal object... was a more correct knowledge of the Geological structure of the Country in those Latitudes for the purpose of ascertaining if there was any formation to be met with in the Northern portions of the Province which offered a probability of the discovery of Coal.92

Such opportunities for a detailed geological analysis of an area were not common. When he resigned, Burr indicated that he would try to assist the Government by forwarding sketches showing the geological structure and mineral possibilities of the country that he passed through.93

The problems of reserving land, and assessing and collecting royalties under the regulation of March 1846 after the loss of Burr from the mineralogical section of the Survey Office were quickly attended to by Governor Robe. On 3 November 1847, James Trewartha was appointed 'Mine Surveyor and Toller of Crown Lands'.94 Little was known about this man who had recently arrived in the Colony:

Mr Trewartha has been ... in charge of mines in South America and elsewhere, and is well acquainted with the nature and value of metallic minerals, as well as with mine surveying.95

Later comments indicated that he had experience of mines in Germany, England, Mexico, Peru and Chile.96

92. SAA GRG 24/6/1847/402 1/2 op. cit.
93. SAA GRG 24/6/1847/1287 op. cit.
94. SAA GRG 24/4/19 0/1710 Mundy to Trewartha 3.11.1847. His salary was £250 p.a. with a forage allowance of 1s 6d per day for his horse. The appointment was confirmed in a despatch from the Secretary of State on 29.6.1848 (See SAA GRG 24/4/21P/1779 Mundy to Trewartha 5.12.1848).
95. SAA GRG 24/4/19 0/1711 Mundy to the Commissioners of Crown Lands 3.11.1847.
96. SAA GRG 24/6/1848/65 MacDonald 19.1.1848.
He was placed under the control of the two Commissioners of Crown Lands: James MacDonald was to administer mineral reservations and Charles Bonney was responsible for depasturing and timber licences. The Surveyor-General was directed to refer all applications for land relating to minerals to the Commissioners. Trewartha was to collect and maintain records of all royalties, sample ores, examine any land which was about to be sold or alienated, and prevent miners from occupying land that was not alienated from the Crown. The Commissioners could instruct him to report on any mineral district, and he was required to prepare diagrams of all lands examined or sold when royalties were involved. The Commissioners, the Surveyor-General and Trewartha were all informed that he was expressly forbidden to undertake anything other than service to the public while employed by the Government.

Trewartha's first task was to become acquainted with the mining areas of South Australia. To this end, he was instructed to accompany MacDonald on a tour of inspection of the mining operations undertaken on Crown land since 3 March 1846. The investigation commenced on 18 November and covered the same territory that MacDonald had visited during

97. SAA GRG 24/4/19 0/1711 op.cit. The Commissioners had equal power and could assist each other in any matter pertaining to land.
98. SAA GRG 24/4/19 0/1712 Mundy to Frome 3.11.1847.
99. SAA GRG 24/4/19 0/1710 op.cit.
100. ibid.
101. ibid.
his inspection in January 1847. MacDonald again concluded that the royalty would be difficult to collect, and that the existing system enabled miners and owners to defraud the Government at ease. Trewartha and MacDonald concurred that it would be preferable for the Government to let the mineral lands of the Crown on a lease basis and collect a rental instead of alienating the land. They suggested that this would facilitate the collection of revenue, encourage practical miners to develop resources, and stimulate an interest in discoveries. MacDonald was not optimistic about the value of organised mineral searches: he could not think "of any manner of quickening the discovery of minerals beyond the ordinary operation of inartificial causes".

Trewartha ceased his duties as Toller of Crown Lands in August 1848 when the unpopular royalty on metals and metallic ores mined on Crown lands was removed by the incoming Governor, Henry E. F. Young. The people had won the battle with the Government. The problems of royalties and reservations were later dealt with in the 1849 South Australian Land Titles Act; all grants containing reservations of royalty on metalliferous ores were to be construed as if no reservations had been made. The private ownership of minerals had been asserted and was to remain for many years. Trewartha was transferred to the Survey Office and he remained as Mine Surveyor for another two

102. SAA GRG 24/6/1847/317 op.cit. SAA GRG 24/6/1848/65 'Report of visit to the Mining Districts by J.W. MacDonald 19.1.1848'.
103. ibid.
104. SA Government Gazette 17.8.1848.
years. The change in administrative masters was not a happy experience for Trewartha and his incompatibility with Freeling, the new Surveyor-General, eventually led to his resignation. His services were terminated on 10 December 1850 although he had offered to remain with the Government until the end of that month.

Trewartha examined many areas as the land was opened up or developed and his comments on the prospects for mineral discoveries were reported in the Government Gazette. On one occasion he wrote a general letter on mining practices and the theory of geology. Trewartha constantly warned the public of the activities of mining speculators and swindlers. For example, in the 1848 'Report on the Mining Districts', he drew attention to those people who concealed their discoveries, especially in the region north of Burra, in the hope of future gain. Another time when he found yellow sulphuret of copper ore near Port Lincoln, he concluded that it had been "placed there for some purpose by someone who [carried it] over from this side of the Gulf". These fraudulent practices may have been more prevalent than was usually thought. According to Pike, Trewartha alleged that:

106. SAA GRG 24/6/1850/2473 Trewartha to Sturt 11.11.1850.
109. SAA GRG 24/6/1848/65 op.cit.
whole outcrops were covered with earth or carted away or even painted to delude the inspector. One over-sanguine individual transplanted native bushes in the height of summer in the hope of hiding his find.\textsuperscript{111}

But the speculators and investors generally remained unperturbed by such devious acts.

In August 1850, Trewartha was asked by Governor Young to examine and report on the possibility of coal being found near a sandstone formation which Governor Robe had previously located at the head of Spencer Gulf.\textsuperscript{112} Trewartha required a horse, cart, tent, and two assistants, and he tried to dispel the notion that it would be an easy task: "it is by no means sufficient to come at this information by merely riding over the country".\textsuperscript{113} In the same month, the Legislative Council considered a suggestion from a Samuel Stocks that a bonus or reward be offered by the Government for the discovery of coal.\textsuperscript{114} Again there was opposition to the notion of Government interference and the Council resolved "that His Excellency be advised to leave the Discovery of Coal to Private Enterprise".\textsuperscript{115} However, Young went ahead with his plan for the Mine Surveyor to conduct his examination. Trewartha resigned before the survey could be undertaken but Young's initial enthusiasm for the venture indicated his keenness to develop the mineral resources of the Colony.

\textsuperscript{111} Pike, op.cit. p.305.
\textsuperscript{112} SAA GRG 24/4/23R/1362 Sturt to Freeling 12.8.1850.
\textsuperscript{113} SAA GRG 24/6/1850/1771 Trewartha to Freeling 14.8.1850.
\textsuperscript{114} SAA GRG 24/6/1850/1770 Stocks to Sturt 16.8.1850.
\textsuperscript{115} ibid.
In January 1851, Young wrote to the Secretary of State, Earl Grey, asking him to arrange for someone to visit South Australia for the purposes of a geological and mineralogical survey.\textsuperscript{116} Young's principal observation was quite realistic: "The value of a scientific survey, exploration, and description of the geological stratification of this province cannot be overestimated".\textsuperscript{117}

Young was determined to have a competent survey completed and he was no doubt aware of the possible economic benefits which might accrue from such a purely scientifically oriented survey. Perhaps his decision not to tolerate half measures any longer had been influenced by the closure of the earlier working for gold near Montacute in 1846, the subsequent discovery of gold at Balhannah and the visible success of the Californian gold rushes in 1849. For example, a colonist, George Francis, applied to join the Rawnsley expedition as an assistant under the same terms that Trewartha had been employed.\textsuperscript{118} This party was expanding the trigonometrical survey in the north and Francis felt that "a good opportunity offers of making at the same time a Geological and Mineral survey of the ground which might prove of value to the Government in the future

\textsuperscript{116} SAA 1362/6 'Biographical sketch of Benjamin Herschel Babbage'. SAA PRG 138 'Diaries believed to be written by B.H. Babbage 1843-77: Notes by G.W. Symes'.

\textsuperscript{117} SAA PRG 138, ibid. Symes quoted from Young's request but did not provide a source.

\textsuperscript{118} SAA GRG 24/6/1851/382 Francis to Sturt 8.2.1851.
sale of lands in that district.\textsuperscript{119} The offer was declined because there had not been a substantial demand for land in the area north of Mount Remarkable, and because Young had "no knowledge of his qualifications as a geologist.\textsuperscript{120} Young indicated to Grey that a sum of £2,000 would be sufficient to cover the cost of the entire project over the two years that the examination would take.\textsuperscript{121} The survey that Young envisaged:

not only require[d] a scientific man of zeal and ambition, but also one of much already high established professional reputation and disinterestedness [sic] as would impart to his reports the stamp of a conclusive authority.\textsuperscript{122}

Grey's favourable response was not sent until August. In the meantime, members of the unit of Royal Sappers and Miners attached to the Survey Office were employed in the inspection and sampling of possible mineral deposits.\textsuperscript{123}

The colonists' opposition to Government involvement in mining matters decreased during 1851 following the large gold discoveries in New South Wales and Victoria. The Gold Rush precipitated a dramatic exodus of people from South Australia and the Colony entered a period of marked economic decline. The local mining industry, in particular, was severely incapacitated by the loss of labour and capital. In contrast to preceding years, the public sought official intervention in the form of rewards for, or assistance with, discoveries. But when immediate success was not forthcoming

\textsuperscript{119} ibid.
\textsuperscript{120} ibid. In 1850, Francis wanted to produce a geological map of the Colony based on his geological research and the work of the Trigonometrical Survey (SAA GRG 24/6/1850/1067).
\textsuperscript{121} SAA GRG 138 op. cit.
\textsuperscript{122} ibid.
\textsuperscript{123} SA Government Gazette 13.2.1851.
from these initiatives which the Government adopted, public attention was turned to the need for scientifically directed surveys to locate minerals. The public, however, was really only interested in gold. This was due, no doubt, to gold being in a special category; it could be mined by individuals who retained the accompanying personal wealth. Nevertheless, the proposals for surveys created the possibility of direct Government action to encourage the mining industry.

In August 1851, the South Australian Mining Journal lamented that little was known about the geology of the Colony. A survey was now an important consideration rather than relying upon accidental discoveries:

We have, time after time, pressed upon the attention of Government the propriety of a Geological Survey of South Australia, by some Geologist about whose competency for the duty there could be no doubt.124

The colonists were not aware that the Colonial Office had acceded, in part, to Young's request of January 1851.

Earl Grey had been unable to find a geologist, with the qualifications that Young desired, who was willing to visit South Australia at the proposed salary. However, a young engineer named Benjamin Herschel Babbage, who was emigrating to the Colony with his wife and three children in August 1851, was recommended to Grey by Henry de la Beche, the noted English geologist and Director of the Geological Survey of Great Britain.125 Grey appointed Babbage to the position for one year and the South Australian Government was permitted to terminate or continue the arrangement after

that period. Babbage and his family sailed on the Hydaspes which reached South Australia on 27 November 1851.

Babbage's appointment as Geological and Mineralogical Surveyor with a salary of £500 a year dated from 27 November 1851. The Geological and Mineralogical Department was constituted under the Land Fund but it was to have its own identity and not to be tied to the Survey and Land Department or Crown Lands Department. This would have accorded it greater status and prominence than if it had been a branch of another large department. Several weeks passed before the colonists were informed that a new department had been constituted. When George Waterhouse presented to the Legislative Council a petition from Robert Lyon Milne requesting that the Government consider a geological examination of the Colony to discover gold, the Register commented that in this matter "both the Imperial and Local Governments have shown characteristic supineness". The editor could only repeat hearsay evidence at this stage: "we understand a gentleman whose name is eminent in the records of science has just arrived from England for the express purpose of making a geological survey of the province".

Milne's petition was debated in the Council on 12 December. The Council resolved to ask the Governor to follow the example of other colonies and appoint a

126. SAA PRG 138 op. cit.; see also Grey to Young 11.8.1851, despatch No. 60.
127. SAA PRG 138 ibid.
128. SA Statistical Yearbook 1852.
130. Register 12.12.1851.
131. Ibid.
commission to examine the Colony geologically in an effort to find gold, and to offer a reward of £1,000 for the discovery of a productive goldfield.  

Boyle Travers Finniss, the Registrar-General, noted "that a gentleman skilled in geology had been sent out from England" and the Governor might consider appointing him to a commission. Young approved of the proposal to reward the discoverers of gold, and he therefore thought that a commission was not warranted. He now officially announced that Babbage had been appointed to survey the Colony. This also precluded the need for a commission to search for gold. Likewise a petition to bring Edward Hargraves or Reverend W.B. Clarke to the Colony was not proceeded with. Young did appoint two "commissioners for regulating the issue of Licences for searching and digging for gold, and other matters appertaining to Gold"

133. Ibid.  
See also SA Government Gazette 18.12.1851 for details of the reward. The Government offered £1,000 for the discovery of a payable goldfield. To be considered eligible for the reward, the claimant had to show that within the first two months of a field being proclaimed, licences to the value of at least £1,000 had been taken out by the miners (each licence then cost 30s) and that £10,000 worth of gold had been uncovered.  
135. SAA GRG 24/6/1851/3768 J.B. Montefiore to Sturt 16.12.1851; SAA GRG 24/4/1851/24S/2765 Sturt to Montefiore 18.12.1851. The petition from fifty-eight 'Bankers, Merchants and Traders of Adelaide' requested a geological survey of the Colony with an emphasis on locating gold to reverse the trend of labour moving to eastern Colonies. Hargraves had been rewarded by the New South Wales Government for his discovery of gold in that Colony; Clark has commonly been called 'The Father of Australian Geology'.
The Crown also attempted to enforce its prerogative over gold. The first regulations for gold mining were issued on 23 December 1851 and dealt with the issue of licences and leases regarding Crown lands only. Young was later told by the Imperial Government to adopt the measures used in New South Wales and Victoria for gold mining on private property, but the Legislative Council rejected his proposed Bill in 1852 and reasserted the rights of individual ownership of the minerals of the Colony.

The Gold Commissioners who took office on 17 December 1851 were Charles Bonney, the Colonial Treasurer and Commissioner of Crown Lands, and Babbage. This appointment had important consequences for Babbage and the Colony because it proved to be the thin end of the wedge in diverting him from the Geological and Mineralogical Department. Babbage's first task in the survey was to investigate the boring for water on the artesian principle and he was instructed to experiment at the Adelaide Gaol where he could use the prisoners as labourers. He proposed to undertake the preliminary investigations as his duties as Gold Commissioner permitted. The report was not completed because Governor Young ordered the Gold Commissioners to visit the supposed gold discoveries at Sixth Creek and Mitchell's Flat near the Onkaparinga

137. Ibid. 23.12.1851.
138. Lloyd, L.W., 'Sources and Development of Australian Mining Law', PhD. ANU 1966 pp.306-07. The instructions to Young were dated 15.7.1852.
139. SA Government Gazette 3.1.1852.
River. Babbage was then asked to proceed to any locality on Crown land where gold might be found and to spend up to a month searching the area with two miners who had experience of the Victorian goldfields. Almost immediately, Babbage received counter-orders to visit the goldfields of Victoria and New South Wales. The Governor again changed his mind while Babbage was organising this trip! Young asked Babbage on 29 January if he could prepare to receive and assay gold. In February 1852, an Assay Office was established and Babbage was appointed the Government Assayer. He drew his full salary as Geological and Mineralogical Surveyor until 4 February. From then until 1 June, one-half of his original salary was allotted to his new post and after this date the former office was held in abeyance.

The Geological and Mineralogical Department was neither formally terminated nor replaced. In his time in office, the Geological and Mineralogical Surveyor submitted only one report to the Government. This 'Report on the Select Committee of the Legislative Council on the Water Works Bill' had been compiled after a hasty visit to the Brownhill Creek area with George E. Hamilton who had been Inspector of Iron

142. SA Government Gazette 1.1.1852, and 8.1.1852.
146. SAA GRG 24/4/1852/25T/730 Finniss to Auditor-General 25.2.1852.
147. SA Statistical Year Book 1852.
148. SAA GRG 24/6/1852/1809 Babbage to Finniss 14.5.1852.
Ore. Babbage studied the report and the evidence presented to the Committee and suggested that a reservoir be built in the Brownhill Creek region and not on the River Torrens. He also recommended that a sewerage system be constructed for Adelaide.

Although fully occupied with the work of the Assay Office, Babbage was eager to commence the surveys for which he had been appointed. By June he had the Assay Office operating efficiently and had made internal arrangements so that he did not have to supervise the Office daily. He proposed to spend up to three days a week on the survey of areas near Adelaide. He suggested that the Government appoint Hamilton as his assistant to prepare tracings and drawings. Governor Young replied that Babbage had to confine himself to his duties in the Assay Office. He would not appoint an 'Assistant Geological Surveyor' in the absence of the report and estimate of the mode and expense of conducting the Geological Survey, for which application was made to you some time ago, but which your engrossing duties in the Assay Office have naturally delayed.

He indicated it was unlikely that Babbage would himself have the opportunity to undertake surveys in the twelve months for which he had been retained.

150. SAA GRG 24/6/1852/1784 Babbage to Finniss 19.6.1852.
151. ibid. Hamilton was employed in the Chemical Department of the Assay Office.
153. ibid.
Babbage presented his plan for an effective Geological Survey to the Governor in July 1852. He estimated that a survey of the known and settled parts of the Colony could be conducted over two years at a cost of £1,438 2s 6d a year. The method of surveying would be to divide the Colony into sections of approximately twenty square miles. The Survey would move from one section to another until enough information had been collected to enable plans and maps to be compiled in its Adelaide Office. In places which the Survey Office had not mapped, Babbage intended "to make an eye Survey, assisted by astronomical and trigonometrical observations". The standards of Greenough's geological survey of England - five miles to the inch - would be used to compile a map of South Australia which "would cover a sheet of paper about ten feet by twelve".

Governor Young was not enthused by Babbage's estimate. Young had not suggested to Earl Grey that an 'Assistant Geologist' be appointed and Grey had not proposed one; "nor was it intended that any expense should be incurred for the first twelve months, beyond your own salary of £500". A Geological Survey at the proposed cost would not be formed. Although he had the power to retain Babbage for an additional year when the Assay Office closed, Young did not think he would do so because of the fall in revenue.

154. SAA GRG 24/6/1852/1942 Babbage to Finniss 8.7.1852.
155. ibid. This annual sum was composed of: Mineralogical and Geological Surveyor £500; Assistant Geological Surveyor £250; two Guides (to be tent and horse-keepers also) @ £80 = £160; five horses @ £45 12s 6d each = £228 2s.6d; Travelling expenses £300.
156. ibid.
157. ibid.
from land sales. However, Young asked Babbage to forward any geological observations he made while in South Australia. In contrast to his attitude in June, Young now allowed him to use some of his time at the Assay Office to make brief geological observations. Consequently, Babbage resigned his post as a Gold Commissioner on 31 August, in order to spend more time on geological pursuits. However, when he approached Young for approval to commence a collection of 'Mineralian, Mineralogical and Geological Specimens' in the Assay Office, he was again reprimanded and told to give his undivided attention to the Assay Office. No doubt Babbage was relieved when he left the service of the Government after the Assay Office closed on 17 February 1853. The inconsistent attitudes displayed by Young throughout Babbage's appointment might be considered to be an example of obstructionism in the upper echelons of the Government but it simply reflected the state of confusion that the Colony was thrown into by the gold discoveries in the eastern Colonies.

About the same time that Babbage resigned his post as Gold Commissioner, a claim for the reward for the discovery of a payable goldfield was made to the Government. Messrs Chapman senior and Hampton presented seven ounces of gold at the Treasury on 23 August 1852. The next day they escorted approximately sixty horse-riders led by the

159. ibid.
162. SAA 1362/6 op. cit.; SA Statistical Year Book 1853.
Colonial Secretary, Boyle Travers Finniss, and some policemen to Chapman's Gully near Echunga where Chapman's son had found gold. Finniss observed the younger Chapman who, despite a few anxious moments, managed to pan a small amount of alluvial gold. When he returned to Adelaide, Finniss announced that the discovery was genuine. The proclamation of the Echunga Goldfield temporarily halted the exodus of colonists to the Victorian fields. But the field did not prove to be a new Ballarat or Bendigo. In fact, the success of the field was such that the Government did not feel obliged to pay the full reward to the prospectors. Eventually the discoverers of the field received £500 from the Government.

The failure to locate rich deposits of gold in the Colony again led to a re-evaluation of the role of the state in locating and developing mineral resources. Late in 1854, the Colonial Secretary's Office rearranged its duties so that applications for mineral leases were to be forwarded, in the first instance, from the Surveyor-General and the Colonial Secretary to the Commissioner of Crown Lands. Finniss, the Colonial Secretary, was concerned that his office was too involved in matters that properly belonged to the Crown Lands Office. But there was no suggestion that a survey staff would be formed in the Crown Lands Department: the Surveyor-General's Office was instructed to survey, on behalf of the Crown Lands Office, all mineral lands for which leases had been requested.

165. SAA GRG 24/6/1854/3109 Bonney to Finniss 21.10.1854.
The need for a trained geologist and mineralogist remained even though many of the miners and prospectors had left the Colony in the rush for gold. Neither Freeling, the Surveyor-General, nor Bonney, the Commissioner of Crown Lands, was capable of making the geological judgements now being demanded of them. Freeling hinted that Babbage's services could well be utilised again. The Observer commented at length on this issue:

When are we to begin a systematic and scientific examination of the geological structure of the country we are inhabiting, and the resources of which it is our interest to develop? When are we to have a Government geologist?

There are few ways in which a little bit of the public revenue could be more advantageously spent. The advantage which it is presumable would follow from the appointment of a Government geologist is not less than it has ever been, nor has the importance of a thorough knowledge of the geological structure of the colony in any way diminished.

The editor wanted to know why Babbage had not been replaced because many people could be expected to apply for a post such as 'Colonial Geologist'. The editor noted that mining had 'saved' the Colony before and that it probably would in the future, but he warned that scientific endeavour should not be neglected for reasons of economy. He thought that a systematic programme of research would enable South Australia to develop its mineral resources. But the reconsideration of the role of the state did not produce a

166. SAA GRG 24/6/1855/320 G.R. Thompson to Finniss c.8.1.1855.
167. Ibid. The Government had retained an ear for Babbage's word, for example, SAA GRG 24/6/1854/3609 Babbage to Finniss 8.11.1854 re a proposed reward for coal discoveries. See also Register 8.5.1856, Legislative Council Debates.
168. Observer 13,1,1855.
significant change in Government policy. The Government still limited its involvement to offering rewards for the discovery of coal or gold.

There was a flurry of activity in the Colony in mid-1856 when a campaign to search for gold was begun with a new emphasis. The Register was prominent in putting forward the view that prospecting parties should be dispatched to search systematically the mid-northern areas of the Colony:

In such a movement as the one contemplated we would unite the geologist and the miner; not making the exploration a pure expedition, nor making it a simple game of chance.¹⁶⁹

Few doubted the existence of gold in the Colony and it was felt that working parties and Government rewards would prove, once and for all, that the deposits were payable. Even the spectre of Menge was raised in this matter:

if Mr Menge had been allowed the assistance it is proposed to give now, I for one have no doubt we should have had a veritable gold field in this colony long before California, Sydney, or the far-famed Victoria.¹⁷⁰

On 13 June 1856, the Legislative Council accepted a petition from '325 bankers, merchants, traders and others' and asked the Governor to place £1,000 on the Supplementary Estimates to fund the search for gold which would be administered by a commission.¹⁷¹ The petitioners wanted the Government to have some control over the funds and thus a 5-man committee was proposed. The Governor, Richard MacDonnell, accepted the Council's motion. On 17 June he informed the Council that he had nominated the Surveyor-

¹⁶⁹. Register 12.6.1856.
¹⁷⁰. ibid. 13.6.1856 Letter from 'Pro Bono Republico'.
General (Freeling), the Commissioner of Crown Lands (Bonney) and George Strickland Kingston MLC as the three Government members of the Gold Commission. The Gold Research Committee, a private organisation, nominated Babbage and John Bentham Neales MLC as its two representatives. A meeting of the Commission was held on 26 June and an extensive exploration costing between £600 and £700 was planned. The trip was to be of 3-months duration, and the two leaders, Babbage and Bonney, were to be accompanied by three practical miners. However, the colonists' desires were unfulfilled. The expedition travelled to the area north of Mount Serle between October and November but failed to uncover extensive or profitable deposits of gold. Despite yet another failure, the colonists retained hopes that worthwhile gold deposits might one day be found.

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Government involvement in geological and mining activities during 1836 to 1856 was haphazard and indecisive. Opportunities to survey the Colony had not been pursued and Parliament had generally been wary of interfering in the development of the Colony's resources by private enterprise. At times the colonists asked for the Government to conduct surveys on their behalf, but they always maintained that it was the right of private

172. ibid. 17.6.1856.
173. Register 20.6.1856.
174. Ibid. 27.6.1856.
175. SAA 1362/6 op. cit.
enterprise to develop the Colony's wealth. With the advent of self-government in 1857, the responsibility for the control and development of colonial wealth lay firmly with the colonists. Prior to responsible Government, the colonists generally resisted the efforts of officials to increase direct Government control of the industry. Parliament itself was more worried about the restrictions to the existing mining developments than with encouraging mineral searches and development. Although there was opposition to Government involvement in the mining industry, there was not a similar feeling in regard to the search for, and development of, water resources.

176. For example, F.S. Dutton, op.cit. p.313 (see footnote 63) in contrast to his p.68 re mineral resources, "an important branch of colonial industry, which can only flourish when unfettered by Government interference".
Chapter Two: 1857-1882 Fits and Starts

The change from representative to responsible Government in 1857 required the colonial Legislature to assume control for the affairs of South Australia. The Colony was now in a position to determine its own destiny and this period after 1857 saw the emergence of an important philosophy - that the wealth and resources of the Colony belonged to all colonists.

One area which became a public issue involved the use and control of the land and thereby the mineral and water resources of the Colony. After responsible Government, the revenue from the sale of lands, leases, licences, any royalties imposed and so on, formed part of the general revenue to be used by the Government as it thought best. Undoubtedly, this would have strengthened the case for increasing Government intervention in a whole range of activities. In regards to the mineral and water resources, this in turn would necessitate the appointment of an officer to regulate and control the industry and the formation of a department with the geological expertise to ensure the use of the land in the most appropriate manner.

The fledgling Parliament, however, did not immediately involve itself with the systematic categorisation of the nature and location of the Colony's resources. Nor did it really attempt to control the mining industry with a specific regulatory body. But the responsibility for appointing the appropriate officials now lay with the colonial Legislature. The ad hoc growth of the Civil Service accompanied the fluctuating fortunes of the Colony. There were calls for Government involvement in the
mining industry but these early requests were for geological surveys of the Colony and not for a mining department to oversee the industry. Consequently, Parliament gradually organised some geological surveys of the Colony. Private enterprise had not previously been in favour of surveys and preferred to rely on accidental discoveries of minerals. While the minerals were found easily, the colonists saw little need for geological surveys to determine the most likely areas for mineral deposits. Thus the few initial surveys were haphazard and restricted in their nature and purpose. When deposits of water and minerals were becoming harder to find, the need for an official geological survey of the Colony was emphasised.

With a great deal of foresight, William Light had selected a site for the capital city of the Colony in accordance with most of the criteria issued to him. Light's choice was especially justified with regard to a water supply and a harbour. The discovery of coal in the parklands of Adelaide eventually fulfilled another of the instructions. In 1857, a Mr Thompson found coal at North Adelaide but he was unable to continue the investigation because of the cost of boring. A motion in the House of Assembly for the Government to spend £1,000 on boring and searching for coal in the Colony had not been accepted because the Government refused to speculate on proving deposits; it thought capitalists should develop any which
might exist. However, the House later passed a motion to pay a reward of £2,000 to the discoverer of a commercially usable coalfield on the Colony's waste lands.

It is fitting that a statue of Light was resited on Montefiore Hill in the vicinity of an early discovery of coal. At the base of this hill, Thompson recovered samples of lignite at a depth of seventy-two feet while boring on behalf of Francis Dutton, the Commissioner of Crown Lands and Immigration. Dutton sent the samples to the London School of Mines but the tests indicated that the deposit was not economic; the value of the nearby land for speculative purposes represented a better investment. The Observer noted that other objections to locating and developing coal deposits in South Australia included the readily available and accessible fuel supplies in the form of wood and trees and the fact that the cost of colonial labour would raise the price of local coal to that imported from England.

The editor of the Observer pointed out that the geological indications of deposits were varied and that the existence of 'carboniferous rocks' in South Australia had not been disproved. He hoped that the Adelaide

1. SAPD:HA 23.10.1857.
2. Ibid. 26.11.1857.
3. Earlier discoveries of coal, such as those at Myrtle Bank in September 1845 and near the Murray River above Wellington in April 1846, had been too small to develop at that time. See Wells, R., 'Early Mining in the Adelaide Hills' in Journal of the Historical Society of South Australia 21:1976 p.54. Later discoveries on the city golf links and at the brewery in Hindley Street suggests Light placed the city near one or more coal seams.
4. Register 29.5.1858; London Mining Journal 17.7.1858. The Montefiore Hill Coal Mining Company was formed in 1858 to work a deposit at the base of the hill.
5. Observer 24.7.1858 Supplement.
Philosophical Society would investigate the matter because the signs of coal at North Adelaide were encouraging:

Proper steps should be taken to determine the exact amount of usefulness pertaining to the material which has been found, and especially to continue the exploration through the subjacent strata. The addition to our knowledge of the geological character of the land we live in would be worth all the cost of obtaining it, and in these days of scientific research no enlightened community would hesitate to undertake such enterprises when the matter was fairly put before them. But in addition to the certainty of a scientific reward, we have in this undertaking two chances of pecuniary return. There is at least a possibility that coal may be found, and there is more than a possibility that a permanent spring of water may be reached by the borer.6

The colonists turned to the Government for assistance in surveying the geology of South Australia for water, coal and other mineral deposits.

Marshall MacDermott initiated the first move in the new Parliament for an organised survey of the Colony. On 31 August 1858, he gave notice of his intention to move

that a sufficient sum ... be placed on the Estimates to secure the services of a Geological Surveyor, with special reference to his knowledge and experience in boring for water on the Artesian principle; and that an efficient party may be organized to be permanently employed in boring in such localities as he may indicate, as offering a reasonable prospect of success...7

The motion was discussed at length, and was passed by the House of Assembly on 8 September after MacDermott accepted two amendments.8

6. ibid.
7. SAPD:HA 31.8.1858 MacDermott.
8. Ibid. 8.9.1858.
The Assembly appreciated MacDermott's objective to locate water in the northern areas and to utilise the subterranean water that went to waste. Some Members stressed the benefits that would accrue to the pastoralists through an increased water supply. John Hart felt that such a move would demonstrate to the sheep farmers that their taxes were not being wasted. George Hawker noted that many sheep farmers had spent a good deal of money in looking for water and even the squatters might now offer to help pay part of the costs for an investigation, regardless of success or failure. Both MacDermott and Hawker saw that a survey would be of value to the Colony in general and not just to particular individuals. They also realised that a survey for artesian water was potentially more valuable if other interests were also catered for.

In order to strengthen his call for a survey, MacDermott linked the proposed search for water with the suggestion that a survey might also locate minerals:

in a great mineral country such as this, [the Assembly] might reasonably hope to combine with their primary object, a scientific mineralogical and geological survey of the province.\(^9\)

MacDermott felt that the probable value of a survey for water and minerals would eventually outweigh the initial costs.

There was opposition to the organisation of a survey because the anticipated cost was between £2,000 and £3,000 annually. Henry Mildred suggested that the Parliament make further use of Herschel Babbage's services in preference to

\(^9\) ibid. MacDermott.
employing a surveyor. John Barrow questioned the need for any one to be employed at all:

the Surveyor General could see quite as far below the surface as the Geological Surveyor, and, without depreciating geological science, he [Barrow] would venture to suggest that the experience of many in the colony would enable them to determine where to bore with the greatest probability of success.

John Bagot moved an amendment that a Geological Surveyor be placed under the charge of the Surveyor-General instead of creating a new department. Hawker had previously amended the motion by deleting the term 'permanently employed'. The motion passed the House in its amended form but it was not put into effect. MacDermott inquired about the resolution in December. He was then told by the Commissioner of Crown Lands that Freeling, Babbage, and 'another gentleman with valuable advice' had decided:

that it was not desirable to incur great expense in sinking for water upon the artesian principle, without a geological survey of those portions of the country where it was most likely that the artesian system could be usefully and successfully applied.

Dutton did not ignore the problem and he moved adroitly outside the Parliament. Dutton wrote to William Lawrence in Adelaide and asked him to approach, confidentially, Alfred Selwyn, the Victorian Government Geologist, with a view to examining the Colony. Lawrence then wrote to a Mr Bland who was a friend of Selwyn in Victoria. Bland spoke to Selwyn and found he was prepared to visit South Australia if

10. Babbage had been a Member for the Encounter Bay district from 9.3.1857 to 17.12.1857.
11. SAPD:HA 8.9.1858 Barrow.
14. Ibid.
Dutton could arrange for his leave of absence with the Victorian Chief Secretary. Dutton then asked Members of the South Australian House of Assembly to examine and approve of the project. With Cabinet's approval, William Younghusband MLC, the Chief Secretary, wrote to his Victorian counterpart requesting Selwyn's services on a temporary basis. The Victorian Government granted Selwyn two months leave of absence and the South Australian Government paid him a salary of £100 a month.

Selwyn arrived in the Colony on 1 May 1859. His task was to collect evidence as to the possibility of a permanent supply of artesian water in the northern areas, a workable coalfield, and any gold-bearing rocks. While waiting for George Goyder, the Deputy Surveyor-General, Selwyn visited the gold-bearing region at Echunga. He also went to the Inman Valley where he found evidence of glaciation at a point now known as 'Selwyn's Rock'. He left Adelaide with Goyder for the trip north on 20 May and returned on 30 June. The inspection was only cursory but Selwyn concluded from his observations that there were no indications of coal or gold in the area passed over. He advised the construction of reservoirs to retain the surface water rather than boring for artesian springs. Selwyn voiced

15. ibid. Bland to Lawrence 11.1.1859.
16. ibid. Dutton to Members 4.2.1859.
17. SAA GRG 24/4/32/242 Younghusband to Chief Secretary, Victoria 16.3.1859.
18. SAA GRG 24/6/1859/738 Dutton to Younghusband 9.5.1859. Salary approved in Cabinet; a report had to be presented. In comparison, his Victorian salary was £1,400 p.a. plus allowances.
19. SAPP20:1860 'Geological Notes of a Journey in South Australia from Cape Jervis to Mount Serle' by A.R.C. Selwyn. A preliminary report was issued on 1.7.1859: SAPP119:1859. The following paragraph is based on this report.
regret at the pessimistic tone of the report which, he said, had to be considered in terms of the nature of his inspection. It could not be taken as the final verdict on the area.

Unlike Selwyn, Goyder believed in the artesian principle and strongly advocated the use of artesian wells. While he and Selwyn were visiting northern areas, Parliament passed a motion to place £1,000 on the Estimates for the purpose of sinking wells. Dutton's motion was designed to assist the development of the pastoral runs and the internal lines of communication. On this occasion, Dutton did not consider the need for a geological survey to locate the sites for boring:

the Surveyor-General, whose officers were constantly about the country, and sending reports to the head of the department, was the most suitable person to fix the spot where the money could be most beneficially employed.

David Shannon nominated Goyder as the most suitable person under the control of the Surveyor-General to oversee the expenditure of money on boring for water. Goyder's concern with developing the Colony's water supply was such that he constantly looked for possible sites for boring and he was usually accompanied on his travels by well-sinkers.

Francis Dutton, a man with substantial pastoral and mining interests and considerable influence in the Colony, introduced another significant motion in May 1860. He asked Parliament to appoint a Select Committee "to consider the

20. SAA 1487m 'Biographical notes on George Woodroffe Goyder'. He had become vitally interested in efforts to bore for water during a trip to Binchewater in 1857.
22. Ibid. Dutton.
23. SAA 1487m op.cit.
best means for effectually encouraging the development of the mineral discoveries in the northern districts".24 Dutton wanted Parliament to investigate and improve the method of leasing land so that it offered better opportunities for mining, to consider the means of transport and communication for the mines, and to discover the mineral value of the north. John Bagot, then Commissioner of Crown Lands, said the Government was aware of the problems and "fully recognised the great importance of developing the resources of the northern district, and of examining into as quickly as possible the mineral resources of that country".25 However, he objected to any interference in the activities of private enterprise:

He did not think it was the duty of the Government to examine for mines, or that a mine having been discovered they should take steps to obtain a report in reference to its riches or poverty. That was not a matter for the Government, but should be left to private enterprise.26

Bagot saw the role of the Government solely as providing the support facilities to enable the private companies to exploit the wealth of the north.

Philip Santo agreed with Bagot. He thought a Committee was an unnecessary and unwarranted expense in an area where the Government should not even be involved:

it would be very wise, both on the part of that House and the Government, to have as little to do as possible with developing, or attempting to develop [sic], the mineral resources of the north.27

24. SAPD:HA 29.5.1860.
26. Ibid.
27. Ibid. Santo.
However, other Members of the Assembly disagreed with this. The motion was carried and a 7-man committee formed; its optimistic report was subsequently presented to the House by Dutton on 24 July. But other than recommending assistance by sinking wells and improving transport, the Committee reiterated the arguments of Bagot and suggested that Government involvement in the area be kept to a minimum and that further development of the discoveries and the country should be undertaken by private enterprise.

When the Surveyor-General, Freeling, tendered his resignation in November 1860, Bagot sought Cabinet approval to rearrange the departments under his Ministerial control in an effort to economise on time and labour. Bagot nominated Goyder as the new Surveyor-General with W.H. Christie as his Deputy. He also pointed out that it would be advantageous to appoint them Inspectors of Mines because they would both travel extensively throughout South Australia. Cabinet approved of his suggestion. Goyder was gazetted to the post of Chief Inspector of Mines, and Christie to that of Sub-Inspector of Mines on 19 January 1861. Christie resigned from his posts on 25 April and he

28. ibid. 24.7.1860. The report was printed as SAPP76: 1860 'Report on Mineral Development of the North'.
30. ibid.
31. SA Government Gazette 7.2.1861. However, the SA Statistical Year Books for 1861-63 state that the appointments were made on 29.1.1861. Goyder and Christie were presumably appointed Inspectors before they were promoted.
was not replaced as Sub-Inspector of Mines. Goyder presented his first report, in which he was wary of describing any geological features, a month later.

In July 1861, Dutton asked Parliament to consider implementing a Bill to consolidate the regulations for the leasing of the Waste Lands of the Colony for mineral purposes. He acknowledged that an increase in the Legislature's control over the mining interests would not be a radical departure from other precedents established by the Parliament:

Even the canine race was specially legislated for, and... that considering the vast importance of the mining interest that had sprung up in the colony, some special enactments should be passed for its protection.

Boyle Travers Finniss hoped that by passing such a Bill to provide a degree of stability to the regulations governing the mining industry, the Government would encourage the investment of capital and the development of the colonial resources. He felt that the existing system was disadvantageous to investors and speculators because they feared that the continual changes of Government would result in frequent alterations to the regulations. An Act would remove some of this doubt and inconvenience because a Government required the authority of Parliament to alter legislation whereas it could change the regulations as it desired.

32. SA Government Gazette 25.4.1861.
34. SAPP:HA 31.7.1861.
35. Ibid.
Dutton's motive reflected the emergence in the colonial society of an important philosophical belief that the wealth to be obtained from mineral resources properly belonged to all citizens. In Dutton's opinion,

it was not unreasonable to expect that the public property of the colony should be made use of to pay off the existing [colonial] debt, and to enable the Government to borrow more money for useful purposes and reproductive works. Whilst, on the one hand, he would give every encouragement to the discoverer of the natural riches of the land, on the other hand he would be desirous that the public interests should not be lost sight of, or disregarded by reason of the pressure of the numerous and influential class who were engaged in mining pursuits. 36

However, Henry Strangways, the Commissioner of Crown Lands, told the House that the Government would not interfere in the legitimate development of the colonial resources by private enterprise. But, he said, the Government would at some future date, consider legislation to consolidate the regulations regarding mineral leases.

The Members of the House generally acknowledged that the Colony would benefit from the revenue earned through the mining industry. When Strangways presented a motion designed to allow the Great Northern Mining Company to assume control of the leases of Messrs Chambers and Finke under the 1851 regulations and thereby save about £30,000, he was rebuffed by the House. 37 Dutton did not think that Strangway's attempt to foster the private-enterprise sector of the Colony was fair or equitable. He again expressed to the House his attitude that

36. ibid.
37. ibid. 5.9.1861.
the public had a right to look to the mineral discoveries as a source for the future supply of funds to enable them to pay off the large public debt they had already incurred for public improvements - (hear, hear) - to enable them, if necessary, to borrow more money for future public works - (hear) - and to enable them to supply the pressing wants of all the districts of the colony for roads and other necessary improvements. (Hear, hear). 38

Several Members of the House supported Dutton and Strangways' motion was negatived. The House anticipated that the revenue to be gained from the mining industry would be used in a general fashion: it was not envisaged that a branch or department would be formed to administer and regulate mining activity in the Colony.

Two months later, during the discussion on a Drainage from Mines Bill, in November 1861, the Chief Secretary, George Waterhouse, stated that the mines at Wallaroo would not be properly developed unless adequate drainage facilities were provided to cater for the flow of excess water from the mines. 39 He noted that private enterprise would not undertake the task because it would not prove very profitable. He felt that the Inspector of Mines could regulate the drainage operations. Henry Ayers commented that the establishment of a Mining Board or Commission would have been a better measure - it could then empower others to do the work on behalf of the Government. When the Bill was debated in the Assembly, Dutton recommended the appointment of an Inspector of Mines for the Wallaroo area and a Bill to

38. ibid.
regulate the working of mines. However, after the Bill passed through Parliament, it merely stipulated that the Inspector of Mines had to report on all land in any district where the construction of drains by private enterprise had been proclaimed as necessary in the public interest.

Goyder retained the post of Inspector of Mines until his retirement from the Civil Service in 1894. During this time, he issued several reports, investigated many claims and leases and theoretically controlled mining activity in the Colony although the position was one with limited powers and influence. In much the same way that Freeling had relied on the Royal Sappers and Miners to make observations while in the field, Goyder was dependent upon his surveyors and other officers to report mineral occurrences and collect specimens. However, the reports were usually kept in confidence from the public.

Early in 1862, Goyder visited mines in the north of the Colony but the Government refused to publish his report. Strangways told the House that this was because

a report embodying only the opinions of an individual, and written for official purposes alone, ought not to be allowed to affect the value of important properties - as such a report must do if published, without some very strong reason.

40. SAPD:HA 27.11.1861. Strangways had noted in the House on 31 July that a recent development in England had been to regulate for the working of mines in a safe and efficient manner.
42. SAPD:HA 29.4.1862.
George Kingston moved that this report be published but the House refused to support him. Several Members questioned Goyder's competency to investigate mining developments and there were mixed fears that the publication of the report might either foster or discourage mining speculation. Only Kingston alluded to the likelihood of the Parliament's intention being misunderstood: "ill-natured people might say the Ministry themselves availed themselves of their knowledge to speculate on the share market". This was a distinct possibility given the nature of nineteenth-century politics when Parliamentarians were often involved in various activities associated with the mining industry.

The significance of Goyder's appointment as Inspector of Mines was that an official position with some influence over mining matters had again been created. A 'Report on the present Mineral Laws' was presented to Parliament in late 1862, and the Committee indicated that the powers of the Inspector were limited:

full and proper powers should be conferred on the Inspector of Mines, to enable him effectually to carry out his duties; and that it should be a portion of those duties to see that the mines are worked in such a manner as not to endanger human life... all mineral lands held under lease from the Crown should be periodically inspected; and that, if necessary, a person should be appointed to assist the Surveyor-General and Inspector of Mines in the discharge of these duties.

43. ibid. 14.5.1862.
44. ibid.
But no additional appointment was made at this stage nor did the Government contemplate doing so in the future; Goyder's prime concern lay with his duties as Surveyor-General.

Following this report on the mining laws of the Colony, a Mineral Leases Act along the lines suggested by Dutton in 1861 was passed by Parliament in October 1862. The Committee had recommended the adoption of legislation over the mineral regulations rather than leaving this subject to the frequently changing Ministries. Land leased for mining minerals other than gold was restricted to a maximum of 320 acres for a maximum term of fourteen years. The rent for each acre was set at ten shillings a year and was payable in advance. A well-known Mine Agent and Broker and the Adelaide correspondent for the _London Mining Journal_, J.B. Austin, objected to the principle of having to pay a fee solely for the right to search. In preference to this method, he felt the Government could strengthen its position by implementing either of two alternative plans:

The first is a Royalty, but that has its objections, and was strongly opposed when hinted at some years since; the better plan would perhaps be an export duty on all Ores or Metals, this would be more easily collected than a Royalty, and in many respects preferable.

But no moves were made in this direction by the Parliament, and the mining industry appeared to consider that the new regulations were an improvement on the old ones.

47. Austin, J.B., _The Mines of South Australia_ pp.103-04.
Although the Government collected the rent from the mining leases and licence fees, it gave little thought to actively participating in the search for, or development of, mineral deposits. This was especially the case after more significant copper discoveries had been stumbled upon at Wallaroo in 1860 and Moonta in 1861 and a less valuable deposit at Blinman in 1862.\textsuperscript{48} The value of these discoveries once again set back the need for a geological survey of the Colony. Parliament again passed motions to reward the discoverers of usable deposits of coal or gold on Crown land.\textsuperscript{49} Several Parliamentarians, including the 4-man Cabinet of George Waterhouse's Ministry, were also subscribers to a tour of the Colony by Austin which took four months and covered an estimated 1,800 miles.\textsuperscript{50} In March 1863, Austin published \textit{The Mines of South Australia} in which he recorded the history and some of his observations of more than seventy mines. This valuable publication was the first attempt to publish a detailed account of the Colony's mines since F.S. Dutton's \textit{South Australia and Its Mines} in 1846. Although Austin hoped that similar volumes would be published more frequently, another record of the mines was not to be produced for twenty-four years!

\textsuperscript{48} A House of Assembly Select Committee on Mineral Regulations (\textit{SAPPL90:1866-67}) subsequently reported that, despite the increasing wealth accruing from the mining industry, "for the true means of national gain, from this source we must look to the additional Customs Revenue, the enhanced consumption of pastoral and agricultural produce of the Colony, and extended trade in imported articles, such as machinery, &c., rather than to any direct charges on the mines".

\textsuperscript{49} \textit{SAPD:HA 11.3.1863}.

\textsuperscript{50} Austin, \textit{op.cit.}
In July 1863, the Commissioner of Crown Lands, Lavington Glyde, announced that Edward Hargraves in response to a Crown Lands Office request, had offered to examine the auriferous deposits of the Colony. The conditions demanded by Hargraves were for the Government to provide him with the means of conducting the exploration and the payment of £100 for a report. Hargraves commenced his search for a workable goldfield on 11 November and visited several sites between Cape Jervis in the south and Blanchewater 535 miles north of Adelaide. He concentrated his attention on the Adelaide Hills and Barossa Valley regions. He did not think it likely that a goldfield would be found in the north. Hargraves expressed disappointment at his failure to find one but he consoled himself with the thought that although the community wanted it, gold did not exist in payable quantities in the Colony. However, his conclusions drawn from this cursory inspection were incorrect and some valuable discoveries were made during the next twenty-five years.

Goyder visited the Echunga Goldfield on 22 July 1867. He reported that the gold deposit was being worked by industrious men but it was proving a difficult operation. A major problem, apart from the technical

51. SAPD:HA 28.7.1863. Hargraves who is incorrectly referred to as the discoverer of gold in Australia had been approached before by the Parliament (see V&P 8.9.1852 and Chapter I p.44) to search for goldfields. Governor Young had withdrawn the request because the colony lacked the population to develop the known fields. (SAA GRG 24/4/1852/25T/2845 Finniss to Hargraves 4.11.1852).
52. SAPD:HA 28.7.1863 Strangways.
53. SAPP96:1864 'Report and Journal of E.H. Hargraves'.
difficulties, concerned the non-compliance with the
regulations by the miners. This had led to many disputed
claims. Goyder recommended the appointment of an officer to
assist in the enforcement of the regulations and the
settlement of disputes. Following the gold discoveries at
Jupiter Creek (Echunga) and Spike Gully (Barossa Goldfield)
in September 1868, the Government intervened and appointed a
regulatory authority. The office of Warden of Goldfields
was created on 15 October 1868 with William John Peterswald
as the first Warden.\(^5\)

The question of a geological survey was again raised
within a few days of this appointment. Charles Gould, who
had been the Geological Surveyor in Tasmania from 1859,
offered his services to the Government.\(^6\) The renewed
interest in mining activities in the Colony during the 1860s
led him to suggest that a scientific survey of the mineral
deposits would be advantageous to South Australia. On
October 26 Henry Ayers, the Chief Secretary, forwarded
Gould's letter to the Commissioner of Crown Lands, Lavington
Glyde, who returned it to Ayers two days later.\(^7\) A new
Ministry took office on 3 November but the reply to Gould

55. SAPP2:1871 'Blue Book for 1870'. SAPP5:1868
 'Estimates for 1869' proposed £500 for management of
Gold Fields'. SAPP5:1870-71 'Estimates for 1870'
provided the following breakdown: Warden £300,
Campkeeper £65, one forage allowance £52, Contingencies
(railway fares, travelling expenses, sundries, rent of
offices, etc.) £283. Total £700.
56. SAA GRG 24/6/1868/1331 Gould to Ayers 19.10.1868. He
wrote from Hobart where the Tasmanian Survey had been
discontinued.
57. ibid. Docket notes by Ayers and Glyde.
remained the same: his application would "be duly considered in the event of the services of a Geologist being required". 58

Parliament remained opposed to the concept of establishing an office for a geologist or mineralogist. William Lewis had moved for the commencement of a museum and mining school with a mineralogist and practical miner as the lecturer. 59 Wentworth Cavenagh, the Commissioner of Crown Lands, acknowledged that this would possibly be useful but the Government would not support it - they were yet to appoint an analytical chemist to examine wheat diseases! Cavenagh also downplayed the ability of science to uncover new deposits: "when Mr Selwyn was here he went over the ground which was afterwards proved rich in minerals and had not found any (Hear, hear)". 60 The Treasurer, Henry Hughes, thought the object was desirable if the Colony could afford it; otherwise, a school could become a part of the Institute and Museum. However, many Members pointed out that the Museum, which did collect minerals, did not have the space to display the specimens or the time to arrange a complete collection. Lewis would not withdraw his motion as it was of great importance in connection with the future of the colony that there should be a Government Mineralogist, thoroughly acquainted, theoretically and practically, with his duties, to appeal to. 61

58. ibid. Bagot was to send the "usual acknowledgement". SAA GRG 24/4/42/1007 of 68 Boothby to Gould 5.11.1868.
60. Ibid. Cavenagh.
61. Ibid. Lewis.
The motion was easily defeated when put to a vote because the Strangways' Ministry was unwilling to appoint additional staff or to create a new department.

The Government was favourably inclined towards temporary arrangements or the 'tacking-on' of additional duties to an existing function. When Peterswald was forced, for reasons of economy, to rotate his visits to the goldfields an arrangement was made for the Police Force to assist him.62 Peterswald suggested that the police officers stationed at, or near, the Barossa, Jupiter Creek, and South Rhine Goldfields could issue licences, receive applications, and generally assist in the orderly operation of the fields when he was not there.63 George Hamilton, the Commissioner of Police, agreed to the proposal as long as the arrangement did not interfere with the normal duties of the police officers.64

In November 1870, John Barrow MLC moved that the Warden of Goldfields be instructed to maintain quarterly returns of the gold mining statistics.65 Barrow was prepared to go further and he wanted general mining returns compiled also:

If the Constitution Act was amended, and a Minister of Mines and Agriculture created, a machinery might be called into existence by which the returns suggested might be easy of collection.66

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62. SAA GRG 24/6/1870/29 J. Blackmore, Secretary to Commissioner of Crown Lands, to Under Secretary, Chief Secretary's Office. 6.1.1870.
63. ibid. Docket note by Peterswald 11.1.1870.
64. ibid. Docket note by Hamilton 27.1.1870.
65. SAPD:LC 22.11.1870.
66. Ibid. Barrow.
His motion was successful but the latter proposal was not adopted. Peterswald issued his first report on the goldfields on 13 January 1871. He relied on the assistance of gold buyers and other interested persons "in the absence of any recognized means of obtaining information". The Gold Mining Laws Amendment Act of 1870-71, which had been passed by Parliament at this time, did not contain any provision to assist the Warden in the compilation of statistics. But it did define more clearly the powers and duties of a Warden and it enabled the Governor to appoint more than one Warden if he desired.

At this time, gold was discovered south of Palmerston (now Darwin) by members of the Overland Telegraph Party in the Northern Territory. South Australia, which had acquired responsibility for the Territory in 1863, was now forced to make temporary arrangements for the administration of the new goldfields. According to Peter Donovan, some of the Government officials in the Territory accepted the new duties to collect licence fees and exercised a little control over the small numbers of miners on the field while other officials left their posts and joined the miners. But the mining legislation was difficult to enforce and proved to be ineffective for the conditions in the Territory. Donovan continued:

68. Ibid. p.106.
69. Act assented to 13 January 1871.
The confused nature of the regulations becomes evident when it is appreciated that, by mid-1873, only two years after the goldfields were proclaimed in the Territory, various claims were held under the provisions of one or other of two acts and three sets of regulations. According to the directions given to Douglas [Government Resident] in July 1871, claims were to be held under the regulations of the Gold Mining Act then applying in South Australia. In response to suggestions made by Warden Peterswald, new regulations, applicable to the Northern Territory goldfields only, were issued on 20 December 1871.71

In 1872, a new Northern Territory Land Act was passed and more regulations were invoked under this Act on 24 December 1872. These were superseded and replaced by the Northern Territory Gold Mining Act of 1873. A Warden of Goldfields for the Northern Territory was appointed in 1872 and this position was raised to Chief Warden in 1873 when an additional Warden was appointed. From this point on, control over mining in the Territory and in South Australia was administered by separate branches of the Civil Service.

Following the 1849 Land Titles Act, the situation regarding land and minerals in South Australia had reverted to the days before Governor Grey suggested imposing royalties and reservations. However, the Waste Lands Alienation Act of 1872 introduced an important new provision which for the first time, enabled the Government to refuse to alienate mineral-bearing lands, in the Colony. The Act allowed the Commissioner of Crown Lands to "decline to accede to any application for selection of any waste lands known or supposed to contain gold, copper, or any other

mineral".72 There had previously been only one method for the reservation of known mineral-bearing lands from alienation and that was by the refusal to survey the land. This was because 'waste land' of the Crown could not be alienated until the land had been surveyed and charted on the official maps of the Colony.

The Parliament continued its policy of making temporary arrangements for a survey when it invited George Ulrich "to prepare a scientific report of the mineral wealth of the country north of Port Augusta, to the extent of 250 miles".73 Ulrich attempted to examine many different types of mines and he visited twenty-one mines and ore localities. He considered that the prospects of many mines were unfavourable although there were signs of auriferous deposits in the north. He did not describe the physical characteristics of the area north of Burra because Goyder and Selwyn had already done so. Ulrich agreed with Selwyn's geological analysis of the area that they both traversed. He was not optimistic about the possibility of uncovering any coal seams and he felt this would prevent the proper development of the iron ore in the area. He adopted a very cautious attitude in his report because his visit was of a short duration, was hastily conducted, and the inspection was only cursory.

73. SAPP65:1872 'Mineral Resources North of Port Augusta by George H.F. Ulrich. 6.4.1872'. Ulrich had been Senior Field Geologist in the Victorian Geological Survey. He was now acting as a Consulting Mining Geologist and Engineer. He later became a Professor at Otago University in Dunedin, New Zealand.
William Peterswald was succeeded by J. Hesketh Biggs on 27 August 1873. The Goldfields Establishment was still allocated £700 per year but this now included £100 for prospecting on the fields. John Richards MHA attempted to alter this arrangement by an amalgamation of offices in 1875:

it is desirable for the better carrying out of the mining laws of the colony and development of the mining interests that the office of Inspector of Mines and Warden of Gold-fields be combined, and an officer with practical and scientific knowledge of mining be appointed to the duties connected with those offices.

Richards pointed out that Goyder could not devote sufficient attention to the inspection of mines and associated matters. For example, regulations under the Mineral Leases Act of 1867 required the Inspector of Mines to visit mines and leases at least twice a year. Goyder later admitted that licences and leases were renewed without inspection. He told a House of Assembly Select Committee that "in granting renewals, it would be perfectly impossible for the Department to visit and inspect every locality". Richards, one of the Members for Wallaroo, was vitally interested in the mining industry and he saw that an appropriate Inspector could reduce accidents, report on new discoveries, and advise the miners and investors. The Commissioner of Crown Lands, James Boucaut, thought that it would be unfair to have one man doing both jobs as an

74. SAPP2:1874 'Blue Book for 1873'.
75. SAPP7:1874 'Estimates for 1874-5'. Warden £350, Sundries £250, Goldfields prospecting £100. Total £700.
76. SAPD:HA 25.8.1875.
77. Ibid.
78. SAPP112:1876 'Report of Select Committee of the House Of Assembly appointed to inquire into the issue of certain mineral Licences'. Evidence by G.W. Goyder.
inspector and a judge. He asked Richards to withdraw the motion and allow the Government to examine the matter. Richards would not do so but the motion was not carried and the Government did not pursue the subject.

However, in the following year, Richards successfully moved a motion that "the mining laws of the province urgently require reform, so as to give more encouragement to the development of our mineral wealth". Although Richards' motion was passed, the legislation was not altered significantly until 1877. In that year, Parliament passed a Crown Lands Consolidation Act which retained the proviso of the 1872 Act to refuse the alienation of known mineral-bearing lands. The Act also empowered the Governor, acting on behalf of the public, to create mineral reserves, or reserves for gold-mining purposes from Crown lands. A more important Act, No. 88 of 1877, was passed after the Privy Council upon hearing an appeal by the Victorian Government had decided that the person who held land freehold did not retain control of the precious metals. The South Australian Parliament promptly passed the Act in order to preserve the status quo and to refuse the Crown's claim to the prerogative over minerals. The rights of the individual, not of the public, were emphasised in this Act. The owners of land alienated from the Crown retained control of the minerals in the Colony:

79. SAPD:HA 23.8.1876.
80. AR:1918. See Lloyd, L.W., 'Sources and Development of Australian Mining Law'. PhD. ANU 1966. pp.305-06. Act 88 of 1877, An Act for declaring that all Grants in Fee Simple of Land in the Province of South Australia heretofore made or hereafter to be made shall be construed to include all Minerals and Metals, including Gold and Silver, on or under such lands. Assent 21.12.1877.
The grant in fee simple of any land ... heretofore granted or hereafter to be granted shall be construed to include and to convey to the owner in fee simple for the time being of such land the absolute property in all mines and minerals, including gold and silver (commonly termed Royal Metals), nothing whatever above or below the surface of the land being reserved by the Crown. 81

This reservation of the rights to minerals by the South Australian Parliament, acting on behalf of colonists with vested interests in land and minerals, clearly resisted the efforts of the Crown to assert control over minerals.

In the same year, a positive effort to involve the Government in a geological survey of the Colony was made by the Adelaide Philosophical Society. The Society had been formed in 1853 but its influence had declined until the foundation of the University of Adelaide and the arrival of Professor Ralph Tate gave it a new lease of life. 82 At the Society's 210th meeting on 30 January 1877, the members unanimously passed two motions proposed by Tate who stressed the scientific value of a survey:

That this Society urges upon the Government the great importance of commencing at once a systematic geological survey of the province, and also of providing ample space in the new Museum building for a Department of Technology; and That this Society urges upon the Council of the University the great importance of providing special training for students in mining engineering. 83

81. Act 88 of 1877, Section 1.
82. Howchin, W. in The Centenary History of South Australia, p.317.
83. SAA SRG 10/1/Volume 5, p.361 - Records of the Royal Society of SA.
The Honorary Secretary of the Society, W.C.M. Finniss, forwarded a copy of each motion to the Chief Secretary and the Registrar of the University.84

For the benefit of the Government, Finniss also enclosed a transcript of the discussion on Tate's paper regarding a survey. Tate highlighted the value of a geologist in indicating areas where prospectors might search for minerals and farmers could select the best land. The information delineated on a geological map would display the nature of the soil, the areas where minerals could occur, and the location of subterranean waters: "a survey of this kind to be thorough would involve a work of several years, while those which had been made had only occupied a few weeks".85 The issue of an artesian water supply was a geological question that only a skilled geologist or hydraulic engineer could pass judgement upon. He did not have to elaborate on the benefits that would accrue from a suitable system of wells.

Tate also noted that the Governments of other countries had spent money on surveys which had proved to be beneficial: "all civilized nations recognised the importance of geological surveys".86 "Even the Japanese", Tate added, "had a survey and a large geological department, consisting of several Americans and a number of specially

84. SAA GRG 24/6/1877/327 Finniss to Ayers 20.2.1877. Also SAA SRG 10/1/5 p.364. A letter from the Registrar of the University was read at the 212th meeting of the Society on 27.3.1877. He stated that steps had been taken to see if the object of the resolution could be adopted.
85. SAA GRG 24/6/1877/327 ibid.
86. ibid.
trained Japanese". Yet only the Colonies of Western Australia and South Australia remained without surveys in Australia. He wanted the Government to rectify this and to establish a School or Department of Mines as well.

The Society's resolution was discussed in Cabinet on 8 March and then referred to George Goyder. The Surveyor-General presented three options of varying estimated costs. Firstly, all information on the Colony's geology could be assimilated and reproduced for a small amount of money. Secondly, a comprehensive survey could be made at a cost of approximately £5,000 a year in its initial stages. This amount would be sufficient to cover the cost of a geologist, several assistants, a draughtsman, clerk, camp equipment, transport, and sundry expenses. His third proposal was to appoint a competent geologist and mineralogist, and a chemical analyst who could carry out their duties for several years at a cost of £1,000 a year. He considered that this would represent

an important step in advance...[T]he surveys and experience thus gained would form a satisfactory basis upon which both a Geological and Mining Depart... might be formed.

Although inclined towards the third proposal, Goyder was not eager for another Government department to be formed at this time:

87. ibid.
88. ibid. Ayers to Carr 8.3.1877.
89. ibid. Goyder to Carr 26.3.1877.
I quite concur with Mr Tate as to the importance of a Geological Survey & Department of Mines but the time has scarcely arrived for such a work - our farmers will not be guided any more than our miners by scientific reports - and wells are being avoided in favor of surface reservoirs. 90

Goyder misunderstood and was not enthusiastic about the Society's proposal for a Department of Technology. He suggested that the Museum be left to exhibit the works of science and art.

Henry Ayers received Goyder's report and then wrote to John Carr, the Commissioner of Crown Lands, indicating that the survey would have to wait "for consideration at another time". 91 The Council of the Philosophical Society was informed of this at a meeting on 12 July. 92 Shortly afterwards the Assembly accepted the motions of John Williams that the Government start boring for water west of Port Augusta, and that of John Bosworth for a bonus of £10,000 for the discovery by private enterprise of a payable coal-field. 93 An important part of Bosworth's motion was "that the Government should secure the services of the best available geological surveyor to report on the most likely localities for a search". 94 The Commissioner of Public Works, John Colton, said his Ministry supported the motion. He considered Tate to be the best qualified person

90. ibid.
91. ibid. Ayers to Carr 17.5.1877.
92. SAA SRG 10/2/Volume 1.
93. SAPD:HA 18.7.1877.
94. ibid.
to conduct the search and, in fact, the Government was considering employing Tate to report on the strata of the Colony.95

The Society was not content with the inaction of the Government. At the same Council meeting a letter from R. Brough Smyth, Secretary for Mines in Victoria, was acknowledged.96 Smyth's letter formed the basis of a renewed approach - this time through the Register - after it was read at the 214th meeting of the Society on 31 July.97 Finniss wrote to the Register on 10 September and pointed out that the amounts to be expended on the objects of the latest proposals would be sufficient to occupy a geological survey for at least five years.98 Finniss repeated the Society's resolution and a portion of Tate's paper. He criticised the Government for being indefinite and the public for being apathetic in this matter. The chances of discovering valuable wells and minerals would be greater if the Government undertook a systematic survey: private enterprise could not be relied upon to conduct one efficiently and impartially.

Finniss forwarded the information from Smyth about the organisation of the Victorian Geological Survey. Smyth had also indicated how a survey of South Australia could be conducted at a cost of between £1,100 and £1,200 a year: "it would be necessary for the Government to select and appoint a Superintendent of Surveys, who would undertake the entire control of the branch, and there should be at least

95. ibid.
96. SAA SRG 10/2/Volume 1.
97. SAA SRG 10/1/Volume 5 p.368.
98. Register 17.9.1877.
one field geologist". The Victorian Government Analyst, and Palaeontologist could carry out some work on a temporary basis, and the formation of a School of Mines could be delayed. Finniss noted that the New Zealand Geological Survey had cost only £2,710 for the year to 30 June 1876. He insisted that a Survey and School of Mines be established: "there is no doubt that the colony will in the future have to depend greatly on her splendid mineral resources".

The editor of the Register commented favourably upon the two resolutions recently passed by Parliament but he felt the objectives might be achieved by accident. He was more impressed by the letter from Finniss and he realised the value to the Colony of systematic research. The editor postulated three reasons for not having had a survey already: the cost had been exaggerated, the work did not lead to immediate profits, and a large staff would be needed to examine the Colony over a long period. Smyth's suggested arrangement and estimated cost now made a survey feasible. It might uncover artesian water supplies and coal deposits. If it did not, then the information gained would be indirectly useful. Other resources might be located and the public protected from dishonest mining speculators. The editor agreed with Finniss that the Government should undertake the task:

99. ibid.
100. ibid.
101. ibid.: editorial.
We should not be disposed to advocate the prosecution by the State of work which could be as well or better accomplished by private enterprise; but the geological survey now suggested is a work fairly coming within the scope of duties of the Government, and one which we believe would in a very short time be both directly and indirectly remunerative.\textsuperscript{102}

He wanted definite action to be taken by the Parliament in the current session.

This campaign elicited a positive response in Parliament. David Nock MHA, who had been alerted to the problem by the letter and editorial, moved that "the Government ought to take early steps for making a thorough geological survey of the province".\textsuperscript{103} He repeated the claims made by the editor and Finniss that coal would not be found by private enterprise which would not undertake a systematic search when so many people believed that it did not exist. A geological survey would assist in this and in the development of an artesian water supply. John Carr, Commissioner of Crown Lands, said the Government would support the motion but they:

\textit{were quite aware that a good deal of money might easily be wasted on so-called geological surveys unless they were conducted in a thoroughly efficient and scientific manner.}\textsuperscript{104}

Hence, the Government had contacted Tate and Goyder to determine what could be done: the Government was not in a hurry and it claimed to want the investigations to be carried out efficiently.

\textsuperscript{102} ibid.  
\textsuperscript{103} SAPD:HA 3.10.1877.  
\textsuperscript{104} Ibid.
The motion was carried in October 1877 but, yet again, little came of it. Thomas Playford, the new Commissioner of Crown Lands, told the House in June 1878 that he believed a thorough geological survey of the Colony would cost £5,000 a year. The Boucaut Ministry was not inclined towards establishing another department at such a cost when "it was problematical whether any practical good would result from such a survey". The Government continued to rely on temporary arrangements. The office of Warden of Goldfields was amalgamated with that of Inspecting Crown Lands Ranger on 1 July 1878 when Bedford Hack replaced J. Hesketh Biggs as Warden. Goyder delegated some of the responsibility for the development of the water supply to James William Jones, the Deputy Surveyor-General who, in 1884, was appointed Conservator of Water. Professor Tate was also called upon to examine possible sites for artesian water. It was Tate who again brought the subject of an official survey under scrutiny.

At the Annual Meeting of the Royal Society of South Australia on 4 October 1881, Tate presented an 'Anniversary Address' in the absence of a Presidential Address by Chief Justice Way. As the Colony encountered drought conditions and was entering a period of deep economic recession, he lamented the lost opportunities "in which the

105. SAPD:HA 27.6.1878.
106. SAPP2:1879 'Blue Book for 1878'.
107. SAA 1487m op.cit.; SAA 137 'Miscellaneous Papers collected by James William Jones'.
108. Tate, R., 'Geology in its relation to mining and subterranean water supply in South Australia' in Transactions of the Royal Society of South Australia 4:1881, p.134.
services of a geologist would have been of inestimable benefit to the country". In the following month, Parliament was presented with yet another motion for a survey of the Colony. Martin Basedow's motion was worded almost identically to that of David Nock in 1877. Basedow was disappointed that nothing had been done to determine the extent of the Colony's mineral wealth. The Government had bought diamond drills for the search for water and it had allocated the sum of £5,000 in the Loan Estimates for trigonometrical and geological investigations. He suggested, therefore, that the Government could test the country and it could arrange for a competent person to organise a geological department, if a department was considered necessary. John Bray's Ministry refused to support the motion because it had been introduced late in the session. In any case, they were taking steps at the present time in the direction indicated by the motion, because what were these inspections of the interior, in view of providing water supplies, but something like a geological survey? It was a practical testing, which was better than a theoretical opinion. (Laughter).

110. Tate, op.cit. p.114.
111. SAPD:HA 17.11.1881.
112. Ibid.
113. Ibid. J.M. Downer.
The Attorney-General, John Downer, stressed that a survey might be necessary but it was not the time to discuss it at the end of a session. It was defeated - thirteen votes to ten.  

Interest in a Government geological or mineralogical survey was not neglected while the Parliament was in recess. Although Tate was absent in the Northern Territory on the first specific geological examination of the area, the Royal Society maintained the campaign for Government action. The Society urged the Government to appoint an official Analyst to examine minerals for the public. Henry Marshall, a mineralogist from Angaston, had asked the Society if such a post existed. He also stressed the need for an extensive mining museum, and a mineralogical survey of the Colony.

114. Basedow maintained that the motion failed because Downer had opposed it under a misapprehension and John Bray, the Chief Secretary, who had promised to support it, had been absent from the House when the vote was taken (Advertiser 16.1.1882). He neglected to mention that another twenty-two members were absent from the House!

115. SAPP63:1882 'Professor Tate's Report on the Northern Territory' 13.5.1882. See also Sowden, W.J., The Northern Territory As It Is - A Narrative of the South Australian Parliamentary Party's Trip and full descriptions of the Northern Territory, its Settlements and Industries. With an appendix containing reports on the General resources of the Territory by R. Tate.

116. SAA SRG 10/1/Volume 6 7.2.1882.

117. SAA SRG 10/6/1882 Marshall to Society 14.3.1882. He had previously made a lengthy submission to Governor Daly in December 1862 to stress the need for a Mining Museum and the organisation of systematic records of mines and collections of specimens which he thought might be of limited value at the time but which would eventually enable accurate deductions about the Colony to be made. The Government had promised to keep the matter under consideration (SAA GRG 24/6/1863/32 Marshall to Daly 2.12.1862).

Once again there was some support from the newspapers which now emphasised the probable financial benefits of a proper survey.119 The _Register_ printed several leader articles on the value of geological surveys.120 The Reverend Walter Howchin, a recent arrival from England and of later importance to the study of South Australian geology, was the author of these 'editorials'.121 He argued for the formation of a survey because of its economic and scientific importance:

> so little is known about the mineralogical features of the country that speculators and capitalists are working in the dark. This is no drawback to the former, but it is a grievous disadvantage to the genuine investor".122

When caves containing the red ochre used in Aboriginal ceremonies were revealed to Mr T.A. Masey, a director of the Corporation of South Australian Copper Mines Limited, the _Observer_ stressed the usefulness of a survey:

119. _Observer_ 20.5.1882, 27.5.1882.
120. _Register_ 17.3.1882, 5.5.1882, 17.5.1882, 19.6.1882.
121. SAA GRG 30/2/1883/1 Howchin to Brown 16.12.1882
122. _Register_ 17.5.1882.
Although at present it would be difficult to determine the value and importance of this discovery to those interested, it clearly shows the absolute necessity that a Government geological survey of the colony should be made without further delay.\footnote{123}

The Government was apparently working behind the scenes again but, unfortunately, this cannot be accurately deduced from the extant evidence. Henry Yorke Lyell Brown, a geologist in the New South Wales Geological Survey, wrote to Surveyor-General Goyder:

Having been informed that it is the intention of your Government to appoint a Geological Surveyor, for the Colony; I have the honor to make application for the post, should the terms be such as would compensate for the giving up of my present appointment...I have had an interview with Mr Deering who has been kind enough to transmit you two of my reports.\footnote{124}

Brown had telegraphed to Goyder on 27 July stating that he had sent his application.\footnote{125} It would appear that Brown was approached to survey the Colony in much the same manner that Selwyn had been asked. Brown later claimed that he had been offered the position while working in New South Wales.\footnote{126}

\footnote{123} ibid. 17.6.1882. The caves were situated between the Parachilna Gorge and Aroona and had been visited by Ulrich in 1872. According to Mincham, Masey was one of the few whites to see the deposits: "Interested in the commercial possibilities of the ochre, he found the aborigines very reluctant to show him where the deposits were to be found. In the end, however, he bribed two renegades (who, according to one story, were executed afterwards by older tribesmen for having allowed an uninitiated person to visit the sacred sites) to show him the way to Bookartoo, as the aborigines called the spot near Parachilna Gorge where the most highly prized ochre was to be found". Mincham, H., The Story of the Flinders Ranges p.227.

\footnote{124} Surveyor-General's Office: Docket 3984/1882 Brown to Goyder 26.7.1882. In personal possession of Mr R.K. Johns, the present Deputy Director-General of Mines and Energy.

\footnote{125} ibid.

\footnote{126} Advertiser 12.1.1912.
The important difference on this occasion was that Brown's services were to be engaged for a lengthy period.

Brown's application came before the Cabinet on 14 August, but a decision on the appointment was postponed four days later. 127 John Bray, the Chief Secretary, presented a memo to the Cabinet on 19 August in which he referred to a suggestion made by the Chief Justice, Samuel James Way, Henry Ayers and "other gentlemen connected with the University", that Ralph Tate be employed to conduct the survey. 128 The proposal assumed that Tate's duties at the University would occupy him for only four months each year and that he could survey the Colony in the other months. Bray asked the Cabinet "to consider whether this might not firstly be tried as a commencement". 129 He went on to say that, if this method was considered to be undesirable, it could be discontinued "without any serious inconvenience". 130 However, Cabinet did not sanction this suggestion and on 4 October, Brown's appointment was approved by the Cabinet. 131 A telegram was sent on 6 October to inform him of this. On 26 October, the Surveyor-General was instructed to complete the organisation of the new position and ensure that Brown would arrive in South Australia.

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129. ibid.
130. ibid.
After all of the motions before Parliament and several ill-conceived and hastily-conducted surveys, South Australia was finally prepared to organise an official geological survey. The emphasis had so far been on the formation or undertaking of a survey. The community was united in its demands for the Survey to locate water supplies and mineral deposits but not in its expectations of the Survey's priorities. The Royal Society and Professor Tate urged the formation of a Geological Survey principally for its presumed scientific attainments, while private enterprise expected that the work of the Survey would create further opportunities for speculation and investment. The practical and economic aspects of the Survey's work won out over the scientific interests.

Although positions with regulatory authority had been created in the form of an Inspector of Mines and Warden of Goldfields, there was little involvement, other than by legislation, and the accompanying regulations, and Parliamentary select committees, of the state in mining activity itself. The capitalist, miner, speculator and the public were generally given a free rein in the development of mines and mineral resources. An administrative structure to oversee the locating and development of resources did not fully evolve until after the Geological Survey of South Australia had been established.
Chapter Three: 1882–1894 Survey to Department

The Geological Survey was intended to assist the mining, pastoral and agricultural industries by opening new areas for investment and development by private enterprise. It was formed in response to the perceived needs of a colony that was suffering from drought and economic recession in the 1880s and where private enterprise had failed to locate new deposits of water and minerals. Once appointed, the Geological Survey developed its own momentum. Despite the occasional attacks on the nature and value of its work, the Survey became indispensable. Given the conditions under which the services of the Government Geologist were employed, the Survey operated as an efficient organisation. This enhanced the arguments of those colonists who claimed that it was acceptable for the Government to be involved in the mining industry.

The trend of the period from 1882 to 1894 was for Parliament to act in response to demands, pressures and circumstances rather than to set the pace for change and development. But following the implementation of a Survey, changing circumstances again led Parliament to reconsider its attitude towards intervening in the mining industry. As the location and development of the mineral deposits became more difficult, mining subsided and was in a condition of pronounced deterioration during the depressions later in the century. Eventually Parliament was requested by the private sector to assist in stimulating and developing the industry. Parliament was prepared to undertake this role with a view to securing benefits for the Colony as a whole
rather than for a narrow sectional interest group. Subsequent measures and policies culminated in the formation of a Department of Mines. The formation of the Department of Mines was not the logical progression from, or the natural corollary of, the establishment of a Geological Survey. However, the role of the Survey in this early period established its predominance over the Department.

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The proposed geological survey of the Colony was allocated £2,500 in the 1882-83 Loan Estimates under the Surveyor-General's Department.¹ Three-fifths of this amount was to be spent on salaries (Geologist £800, Assistant Geologist £400, and the Clerk and Accountant £300) and the remaining £1,000 was for general expenditure. The Geological Survey was established as a separate department under the Ministerial control of the Commissioner of Crown Lands and H.Y.L. Brown FGS was appointed Government Geologist on 1 December 1882.

Henry Yorke Lyell Brown, the son of Mr R. Brown FGS who was at one time the general manager of the Mining Association of London, was born at Sydney, Nova Scotia on 23 August 1844.² Brown was educated at King's College, Windsor, Nova Scotia, and then entered the Royal School of Mines in London where he studied under Professors Huxley and

1. SAPp11:1882 'Loan Estimates 1882-83'.
2. The following biographical notes have been compiled from 'Obituary Notices - H.Y.L. Brown' by L.K. Ward in Transactions and Proceedings of the Royal Society of South Australia 52: 1928; Advertiser 24.1.1928; and Australian Dictionary of Biography.
Tyndall. He arrived in Melbourne on 13 June 1865 and joined the Victorian Geological Survey in July as a field geologist under A.R.C. Selwyn. Upon the termination of this Survey for reasons of financial stringency in 1869, Brown made his way to New Zealand where he acted as Goldfields Surveyor on the Coromandel diggings. In 1870, he became the Government Geologist of Western Australia and conducted the Survey on his own for two years, before it was also closed down through Government attempts to economise. Brown then engaged in various mining pursuits in Victoria and New Zealand for the following two years. He ventured to Canada in 1874 where he was employed for eighteen months as a geological surveyor under Selwyn who was then the Director of the Geological Survey of Canada. However, because he disliked the colder climate, he migrated back to Australia whereupon he undertook mining activities in Victoria and New South Wales. In May 1881, he became a geologist in the New South Wales Geological Survey from which he resigned before moving to South Australia in late 1882. His varied experiences as a geologist and miner stood him in good stead during his years as Government Geologist in South Australia.

Brown was assisted in the Survey by George F. Hallett who was promoted from the Education Department on 1 January 1883 to be the Clerk and Accountant on a salary of £220 a
year. The choice of an Assistant Geologist was left to Brown. The only applicant from within the Australian Colonies appears to have been Walter Howchin of Adelaide, who wanted the job for altruistic reasons or, as he put it, "purely to indulge a passionate liking for the work of "the hammer". However, Brown was looking further afield and he informed Howchin that the Assistant Geologist would be obtained from England. The position was offered in March 1883 to a Mr Reid of the Geological Survey of Great Britain who indicated that he would accept the post if a minimum term of three years and his passage to and from England was approved. Brown recommended his appointment under these conditions at the salary of £400 a year but Reid was not engaged. Harry Page Woodward was then recommended in his place by Professor Archibald Geikie and Mr C.B. Brown. Woodward's nomination was accepted and his appointment on the same conditions as those offered to Reid commenced from 24 May 1883 although he did not arrive in the Colony until July.

3. SAPP2:1884 'Blue Book for 1883'.
4. SAA GRG 30/2/1883/1 Howchin to Brown 16.12.1882. Goyder had told Howchin that this would be the case, and Jones, the Deputy Surveyor-General, had offered to introduce Howchin to Brown.
5. ibid.
9. ibid.; SAPP2: 1884 op.cit.
The 'Report of the Government Geologist' for the period from 2 December 1882 to 31 December 1883 summarised his work during that time. The following list provides an indication of the substantial demands made upon Brown and his efforts to fulfil the tasks:


January 3 - inspected Woodside Gold Mine.

January 18 - north to Beetaloo Springs to examine sites for a bore.

January 31 - to Callington to report on water for a stock route.

February 6 - examined wells, report on water supply by boring at Dublin.

February 14 - examined Barunga Gap for prospects of a water supply.

February 23 - to South Hummocks via Dublin, then to Kadina, Wallaroo and Moonta.

March 10 - report on site for boring for water at Wallaroo.

10. SAPP35:1884 ibid. Another report was not published until 1894, although a summary of the Survey's activities for 1885 was published in the Register 29.1.1886.

11. This was his first task directly related to mining.

12. Wilmington was the nearby town and this was his first inspection for water supplies.
March 21 - to Beltana, Waukaringa, Innamincka, Diamentina River, Coopers Creek and back to Adelaide on 10 July.13

October 10 - to Mount Nor-West, Farina, Mount Serle, Mount Lyndhurst with Woodward. Survey not completed when forced to return on 27 November.

December 13 - to Wellington and across the Ninety Mile Desert to Bordertown and the Victorian border, to report on the water supply for the railway route.

Brown also made various tours of inspection over one or two days around the Adelaide area in association with his office duties.

The main characteristic of the Survey in this early period was the manner in which it was conducted. From the outset, Brown was deployed at random. This happened so frequently and haphazardly that Henry Marshall presented a petition to Parliament in June 1883 requesting that a proper and complete geological survey be undertaken to determine the location and extent of mineral formations in the Colony.14 After he arrived in July, Woodward was also kept busy in a similar fashion. He spent some time mapping parts of the Mount Lofty Ranges and the gold-bearing areas of Kuitpo and Noarlunga. He travelled north with Brown in October and November, and in December accompanied the party

13. See SAPPL46:1883 'Report of Government Geologist on trip to Beltana.'
of Mr Poeppel which left to survey the South Australian and Queensland border north of latitude 26°. The piecemeal examination of the geology of the Colony continued for many years.

One of Brown's first proposals had been to form a Geological and Mining Museum. On 16 January 1883 he asked Catt for a room to house a collection of specimens.\textsuperscript{15} He then wrote to R. Logan Jack, Reginald Murray and Charles Wilkinson (the Government Geologists of Queensland, Victoria and New South Wales respectively), Professor George Ulrich (at the University of Otago, Dunedin) and Cosmo Newbery (of the Technological Museum, Melbourne) soliciting an exchange of mineral and rock specimens.\textsuperscript{16} They responded favourably to the idea. Marshall's petition in June 1883 also requested the formation of a mining museum for the collection of mineral specimens and general information on mining operations in the Colony. Brown again asked for an extra room and Catt forwarded the request to the Minister of Education, John Parsons, who asked Robert Kay, Secretary of the South Australian Institute, to find a suitable room.\textsuperscript{17} Thus the Survey obtained the use of a room at the Institute where its specimens were stored with the intention of arranging a display.\textsuperscript{18}

The presentation of mineral specimens to the public, however, remained a perennial problem for the Survey. Brown organised the collection of specimens with the assistance of

\textsuperscript{15} DM Letter Book 2 p.2 Brown to Catt 16.1.1883.
\textsuperscript{16} ibid. pp.10-12. 13.2.1883.
\textsuperscript{17} SAA GRG 30/2/1883/24 Kay to Brown 29.8.1883.
\textsuperscript{18} SAPP35:1884 op.cit.
mining companies and other geologists. But the dissemination of the knowledge thus obtained was limited because of the difficulties with the storage and display of the minerals. The Survey provided collections for various Exhibitions - in 1886, the Indian and Colonial Exhibition (London); in 1887, the London Exhibition (London), the Queen Victoria and Adelaide Jubilee Exhibitions (Adelaide); and in 1888, the Centennial Exhibition in Melbourne. Brown also initiated the exchange of publications with other organisations in order to acquire more information to assist him in determining the geology of the Colony, and to spread knowledge about the resources and geology of the Colony to interested individuals.

Both Woodward and Brown were aware of the possibilities to develop further mining activities in the Adelaide Hills. Woodward had commenced a detailed geological map of the Echunga Goldfield which had not been completed before he went north with Poeppel. Brown also wanted to have a topographical survey made of the Echunga area before his own

19. For example, SAA GRG 30/2/1884/8 Brown to R.L. Jack; ibid./10-14 correspondence with companies at Moonta, Wallaroo.
20. Register 22.1.1886; Advertiser 12.5.1886.
21. SAA GRG 30/2/1885/62 re London; Register 29.1.1886 re Indian and Colonial Exhibition; SAA GRG 35/2/1888-assorted files re Adelaide and Melbourne.
22. Requests and exchanges were cited in DM correspondence in the SAA.
23. For example, when Norman Taylor, a former member of the Victorian Geological Survey, visited South Australia he was invited to inspect the Woodside Goldfield with Brown and J.C.F. Johnson MHA. The Commissioner of Crown Lands, Jenkin Coles, had been alerted to this possibility by Rowland Rees - SAPD:HA 18.9.1884. SAPP 156:1884 'Report on Woodside Goldfield' by Taylor.
geological survey was carried out. Consequently, he requested the Commissioner of Crown Lands, Alfred Catt, to attach a young surveyor or a student of surveying to the Survey. The appointment of Frank E. Goyder, a son of the Surveyor-General, in February 1884 led to the formation of a Topographical Survey within the Geological Survey. After Goyder submitted his resignation in 1885, Brown sought and was granted a replacement. W.H. Wadham, who had worked in the Surveyor-General's Office for seven years, joined Walter Kingsmill as the second Assistant. Financial considerations, however, led to the demise of the Topographical Survey at the end of May 1886. Once again the Government adopted a measure of economy which severely affected the operations of the Survey.

Brown had been compelled to rely on such temporary arrangements for clerical and field assistance. The position of Clerk and Accountant was struck off the Estimates for 1884-85. Brown complained about the inconvenience this would cause and recommended, unsuccessfully, that Hallett be retained. From the latter part of 1884, Brown and Woodward carried out the clerical

25. ibid.
27. SAA GRG 30/35/Vol 1/p.48 Hallett to Goyder 18.2.1884.
29. SAA GRG 30/2/1885/99 Wadham to Brown 9.12.1885 - application. Kingsmill had been appointed during 1885, no date found. See DM Letter Book 1 pp.121-22 Brown 2.9.1885 - 'Rules and Regulations to be observed by the Topographical Assistants.'
31. SAPP2:1885 'Blue Book for 1884'. No record of the date when Hallett left the department was located.
and administrative duties. The various Governments were not concerned about this problem. Alfred Catt suggested that some clerical assistance would help reduce expenses but nothing of a permanent nature was implemented. For example, Herbert Evans was employed as a temporary clerk during the first half of 1886. Brown sought to retain his services after 30 June:

otherwise during my absences from Town
the office must be closed, and there will be no-one to receive specimens and messages, or write letters and attend to the public, who frequently call to ask for information.

Brown's request was not acceded to despite an obvious need for assistance: in May and June, seventy-five persons visited the office and 116 letters were written. When Woodward completed his three years of service in 1886 he was not retained because of the state of the economy. But such stringent constraints proved to be measures of false economy. The lack of assistance for Brown was not compensated for by the amounts saved in salaries. His capabilities were being used inefficiently by diverting him from scientific investigations to perform routine clerical work.

33. SAPD:HA Catt 18.11.1885.
35. ibid. Evans salary was £3 3s per week.
Woodward's contract expired on 24 May 1886 but Brown wanted to retain his services for an additional period. He could not complete the progress report of the Survey's activities for 1884 and 1885 without the Assistant Geologist. He also wanted Woodward to finalise the topographical maps of the Para Wirra and Uoolooloo Gold Reserves before handing them to the printer. The Government accepted Brown's advice and retained Woodward's services until early June. Brown was also compiling a geological and mining map of the Colony at a scale of eight miles to an inch. The map was sent to the 1886 Indian and Colonial Exhibition in London with the collection of rocks and fossils for display. He also revised the 1883 geological map of the Colony according to his researches since then and in 1887 this was published at a scale of forty miles to the inch.

The decision not to renew the agreement or to employ another Assistant was made for reasons of economy. In the debate on Supply in the House of Assembly, Robert Homburg noted that "the retrenchment party last year [1885] were not only in favor of the abolition of the office of assistant geologist, but also of the geologist's salary being reduced". James Howe, the Commissioner of Crown Lands, said that the Geological Department had not been abolished in 1885 because an assurance had been given to the

37. The date of termination could not be located but DM Letter Book 2 contains a letter from Woodward to Brown 2.6.1886 p.300.
38. Scott, H.J. (Compiler), South Australia in 1887 p.49.
Parliament that the Assistant Geologist's post would cease to be funded. There were suggestions not only for the retention of Woodward's services in South Australia or for conducting a survey of the Northern Territory, but also for an increase in the size of the Survey. But the limited opposition in Parliament and the press to the decision was ineffective. In its efforts to economise, the Government viewed the immediate needs of the Colony as more important than any possible future benefits from a fully organised survey. Consequently, Woodward left the Civil Service and returned to England on 17 June 1886 under the terms of the arrangement. The loss of Woodward completed a phase of the Geological Survey's activities: Brown struggled with the survey of the Colony without assistance for many more years.

The year 1886 was also significant for it heralded an expansion of activity in the Goldfields Office as a result of the depression and the changes to the legislation regarding Crown land. The need to alter the mining laws and the policy of non-alienation of minerals was clearly seen by many colonists as a means of reducing the severity of the depression. Sidney Clark espoused this view in a letter to the editor of the Observer:

41. ibid. J. Howe.
42. For example, ibid.—Coglin, Bagot, Rees; Advertiser 12.5.1886, 20.5.1886, 8.6.1886 SAPD: HA 9.6.1886.
43. Advertiser 17.6.1886. He was later the Government Geologist in Western Australia, 1887-95, 1901, and 1905-17.
It is of the highest importance, especially at this time, when so many of our people are in want of remunerative employment, that our mineral laws and regulations should be so framed as to encourage as far as possible the genuine explorers and discoverers, taking care at the same time to facilitate the active working of the discoveries when made. 44

Parliament was also keen to stimulate gold mining. Joseph Johnson MHA had noted that:

Owing to the depression the country had awakened to the importance of fostering by all means in our power our mineral wealth, and the opinion was gaining ground that after all it was to the mines and minerals ... that the colony would have to depend for her future prosperity. Unquestionably nothing would make the country go ahead with leaps and bounds like payable gold mining. 45

Parliament subsequently passed the Crown Lands Consolidation Act in 1886 which, in part, repealed Act 88 of 1877 and allowed the future reservation of gold above and below ground to the Crown.

The belief in the capability of gold to alleviate a depression was widely maintained throughout the colonial society. The discovery of gold at Mannahill was officially reported on 2 December 1885 by the Warden of Goldfields, Bedford Hack, and the hopes of the colonists were raised again. 46 Albert Landseer MHA had previously suggested that the Echungu Goldfield be prospected along the lines of Brown's report for the successful development of the field would assist in alleviating the depression in the

44. Observer 20.2.1886.
45. SAPD:HA 29.10.1885.
Colony. His motion was carried and John Downer's Government subsequently appropriated £200 for prospecting at Echunga. A Government Prospecting Party was formed to examine the area and Godfrey Mellor was later appointed mining manager of the Party. The Government's attention was also focussed on areas other than Echunga. The Surveyor-General instructed Bedford Hack to employ about 100 unemployed men, with a preference for married men, in Adelaide to form a large prospecting party. Hack engaged ninety-six men at the Labour Bureau on 5 April 1886 and sent them to the Hundred of Para Wirra. He visited the area with Woodward and split the group into two parties - one of forty-five men was placed under Thomas Hutchinson, an experienced miner, and left at the Mount Crawford waterhole, while the other fifty-one remained at Bonney Flat under John William Wilson. They proceeded to work the sites where Woodward thought gold might be found.

47. SAPD:HA 23.9.1885.
48. ibid. 9.12.1885; SAPP4:1886 '4th Annual Report of the Commissioners of Audit' - Excess Warrant for 1885-86 approved by Executive Council 3.3.1886. Of the £200, £189 17s 5d was spent.
50. SAPP4:1886 op.cit. Executive Council approved £1,200 on 21.4.1886 as 'aid to gold prospectors'. Of this amount £1,152 6s 5d was spent by the end of June. The '5th Annual Report of the Commissioners of Audit' (SAPP 4:1887) showed for the financial year 1886-87 £140 10s. 6d. was spent on 'mineral prospecting in western districts', £721 8s on 'prospecting Echunga Goldfield', £1,489 4s 1d on 'aid to gold prospectors' and £670 6s 8d out of £2,000 on 'aid to gold mining companies'.
The level of unemployment and the demand for work were such that within a week of forming the prospecting parties for Para Wirra, Hack was able to provide the Surveyor-General with a list of the names of another fifty men who had applied for employment as gold prospectors.\textsuperscript{52} The Government had provided prospectors with tents, tools and twelve shillings a week as a means of relief for the unemployed.\textsuperscript{53} The lure of gold was an additional incentive for these prospectors and the scheme was successful in providing employment although very little gold was uncovered. However, the desire for a significant discovery was foremost in the mind of James Howe, the Commissioner of Crown Lands, who "had great hopes that before long we should discover something of great benefit to the country".\textsuperscript{54} He went on to say that the Crown Lands Office

\begin{quote}
    had several hundred men prospecting for minerals in various parts of the colony, and considering that on both the east and west of our frontier there are found valuable deposits of minerals, it was very unlikely that we are left out in the cold in this respect.\textsuperscript{55}
\end{quote}

Following reports about gold discoveries by prospectors near Peake, Brown visited the area in September to organise prospecting parties in the Neales River country.\textsuperscript{56} For this

\begin{itemize}
  \item \textsuperscript{52} SAA GRG 30/3/1886/192 Hack to Goyder 13.4.1886.
  \item \textsuperscript{53} ibid. The tents, tools and other facilities remained Government property. The prospectors were eligible to partake in the discovery of gold via rewards and leases.
  \item \textsuperscript{54} SAPD:HA J. Howe 8.6.1886.
  \item \textsuperscript{55} ibid. "No record of the "Several hundred men" was located.
  \item \textsuperscript{56} ibid.; SAA GRG 30/2/1886/406 Biddle to Brown 2.9.1886.
\end{itemize}
purpose, he took with him Mr R.H. Biddle who subsequently discovered gold there on 8 October.\(^57\) However, the venture did not lead to greater success.

The opportune strike which did occur came as a result of the reward offered by the Government for the discovery of a payable goldfield rather than through the agency of a prospecting party. Thomas Brady and Thomas Smith located a deposit of gold at Teetulpa on 6 October 1886 and they were subsequently granted £1,000 by the Government when the field proved to be a payable one.\(^58\) A rush to the site of the discovery occurred as many people saw it as a means of escape from the gloom and despair of the depression.\(^59\) Howe sent Brown to report on its prospects and the possibility of a water supply.\(^60\) Brown spoke highly of the field, and from the results of the fossicking, felt it to be payable. Such was the public interest in this discovery that as soon as it became available, Brown's main report on the field was published in a special edition of the _Express_.\(^61\) He visited the field on several occasions and, as always, he took great care not to excite the public unduly.\(^62\) Brown's expectations of the value of the discovery were confirmed by

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57. SAA GRG 30/2/1886/465 Biddle 8.10.1886; Register 26.10.1886.
58. Brown, op.cit. p.315. Brady and Smith received twice the amount they were entitled to - see SAPP4:1887 op.cit. pp. ix-x.
60. Evening Journal 15.10.1886.
62. For example, when he arrived at Teetulpa on 12 November, the then Assistant Warden of Goldfields, F.T.D. Clindening, noted his cautious manner and that "he doesn't want it known in Town that he is there". In SAA 574, L.C.E. Gee: Diary kept as a mining official on the Teetulpa Gold Field.
Reginald Murray, the Victorian Government Geologist, when he inspected Teetulpa with Brown and the Commissioner of Public Works, Luke Furner, on 23 December.63

The rush to Teetulpa encouraged many prospectors to continue the search for other gold and mineral deposits.64 The Government found it necessary to strengthen the staff of the Goldfields Office so that it could cope with the additional responsibility of overseeing the development of the field, the administration of regulations, the grants of financial assistance to prospectors and companies, and the control of the search for gold. Lionel Gee and F.T.D. Clindening had been appointed Assistant Wardens of Goldfields as from 27 October but the necessity of having an officer with full authority on the field as well as one in Adelaide led to their promotion to Wardens on 18 November.65 The expansion of this Office to satisfy the renewed demands of the miners, prospectors and companies, and to control the increased revenue was an important stage in the evolution of the Department of Mines.66

The publication of Brown's Record of the Mines of South Australia in May 1887 followed the discovery of the Teetulpa Goldfield. In order to compile the record, Brown arranged for Mr E. Davenport Cleland to assist him.67 Cleland had been the correspondent to the Register at Teetulpa where he

63. ibid.; Observer 27.12.1886.
64. Advertiser 20.5.1887.
65. SAPP2:1887 'Blue Book for 1886'. Clindening was a Draughtsman in the Survey Department. SA Government Gazette 28.10.1886.
66. SAPP32:1890. 'Mining Commission'. L.C.E. Gee in evidence to the Commission, 25.11.1889, said that the Teetulpa diggings brought about a rise in the fees paid to the Warden of about £2,500 in one year.
became acquainted with the Geologist. Brown employed him on a temporary basis at £5 a week for this work. Although Brown had personally visited many mines, he relied for most of his information on the observations made by Woodward, J.B. Austin in *The Mines of South Australia*, Professor Ulrich's Parliamentary Paper of 1872, and mine managers and others interested in mining. The handbook was well received in the press which accurately predicted its value to prospectors and miners.68 Given the nature and magnitude of the task, it was to Brown's credit that he was able to produce such an important book - by 1908 it had been revised and reprinted for a fourth edition.

Apart from listing the mines, their workings and development or decline, Brown commented on the conduct of mining enterprises and the enforcement of the regulations.69 He criticised the public for indulging in speculative enterprises before the mines and deposits being floated on the Stock Exchange had been fully examined, prospected and scientifically proven: "mining need not be such a risky business, and, if proper measures were taken, the proportion of unsuccessful mines might be greatly reduced".70 Brown attributed the majority of failures in mining enterprises to the inexperience of investors, miners and managers. Too many mines were undercapitalised while,

68. Register 20.5.1887; Advertiser 20.5.1887, 27.5.1887; Melbourne Age 30.5.1887. Brown was indebted to Austin's publication to the extent that he adopted the same format. Austin had suggested in 1863 that a publication similar to his own should be issued on a frequent basis but twenty-four years had elapsed since then!

69. Brown op.cit. (1st ed.).

70. ibid. p.ix. Similar complaints about the conduct of the industry were made throughout the 1880s and 1890s. For example, Observer 6.10.1888
in some cases, dividends were paid to investors instead of providing more capital to determine the mines' potential. Some mines failed because they lacked adequate machinery, others through the fraudulent promises of prospectors. Brown argued for changes in the thinking of the industry to keep pace with the technological developments:

The present age demands a more intelligent class of mine captains, engineers, and miners, and the establishment of schools of mines becomes every year more necessary. The time has passed for mines to be managed by rule of thumb. 71

Another necessary step for the Colony to take was for the formation of a Department of Mines similar to that in Victoria: "the establishment of one would be of great service both to miners and the general public". 72 Although he acknowledged that some colonists might think the mineral resources had not been developed to the point of requiring a department to regulate the industry, Brown felt this was not so and alluded the copper industry to support his view.

Cleland was also retained for the preparation of the mineral display at the Queen Victoria Jubilee Exhibition in Adelaide in 1887. 73 Both the Register and the Advertiser praised the display of the gold specimens at the Exhibition which had been organised by Cleland and Bedford Hack. 74 Cleland's services were dispensed with on 11 July when the funds for his employment had been exhausted. 75 With the loss of Cleland and the absence of Brown through injury, the

71. ibid.
72. ibid. p.v.
74. Register,Advertiser 7.7.1887.
75. DM Letter Book 1 p.435 op.cit.
colonists found themselves with a Geological Survey in name only for several months in 1887. During a visit to Victoria, Brown had been badly injured in a railway accident on the Brighton line near Windsor on 11 May 1887. The Herald reported that Brown was among the seriously injured with severe scalp wounds and an injury between the back and shoulders. He was unable to leave Victoria until early in July and upon his return to South Australia, he requested a year's leave of absence without pay on the basis that he would be allowed to resume if his health permitted him to do so. This was acceptable to the Government which did not attempt to replace him with a temporary appointment. Jenkin Coles, the Commissioner of Crown Lands, reported to the House of Assembly on 11 October that Brown was about to return to office. However, he still had not done so when the Estimates were debated in the House in November. It is unclear when Brown resumed his duties: no entries were made in the Survey's letter book from 19 July where his application for leave was filed, to 27 April 1888 when he

76. It is quite likely that Brown was visiting his old friend, Cosmo Newbery, on official business. For example, Newbery had invited Brown to Melbourne on other occasions (cf. SAA GRG 30/2/1886/466 Newbery to Brown 12.10.1886 - come and watch the treatment of ores). Newbery, who was also injured in the accident, was Superintendent of the Melbourne Industries and Technological Museum and Analyst to the Victorian Department of Mines.

77. Melbourne Herald 12.5.1887. He later received £1,000 compensation from the Victorian Railways Department (Register 30.6.1911, Advertiser 24.1.1928).


79. Register 23.7.1887.

80. SAPD:HA 11.10.1887.
reported on the silver-lead discoveries in the north. In the meantime, the Government made no effort to appoint a temporary replacement or to maintain the operations of the Survey.

The renewed interest in mining activities following the discovery at Teetulpa and the reservation of gold to the Crown under the Crown Lands Consolidation Act of 1886 led to calls for a School of Mines or a Department of Mines. Brown had already pointed to the necessity of establishing both organisations. The *Melbourne Age* suggested why South Australia had been backward in this matter:

> it has to be remembered that the Government have refused to establish a department of Mines, mining in South Australia not having attained yet to the importance which the industry assumes in Victoria.

The editor of the *Advertiser* saw the situation in a different light and said that the basis had been laid down:

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82. Prior to this there had been little demand in Parliament for an administrative body to oversee the development of mining in the Colony. In the House of Assembly on 1 October 1884, Arthur Fox commented that South Australia needed a similar institution to the Mines Department of New South Wales or the School of Mines in Victoria. Joseph Johnson commented that the basis for a School of Mines already existed here. During debate on the Mining on Private Property Bill on 8 June 1886, James Howe said that a deputation which saw him about the Bill had also suggested that a separate department be set up to deal with water conservation, mining and forestry.
84. *Melbourne Age* 30.5.1887.
The impetus that would be given to mining by the establishment of a special department would no doubt be great...

Still, notwithstanding that we have a public geologist and a public assayer with an efficient staff to overlook the work on alluvial goldfields and to carry out the mining regulations, something more is wanted. There is a lack of organisation.85

In October 1887, Luke Furner asked Parliament to set aside £20,000 for the assistance of the mining industry because he felt that it had been the mining interests which had saved South Australia during previous depressions.86 He emphasised that the expansion of the mineral resources of the Colony was of paramount importance:

As long as we confined our attention to wheat and woolgrowing we should remain a one-horse colony, but a vigorous mining policy would do more to advance South Australia speedily than anything else.87

He suggested that the Geologist could examine mines and advise the Government on the systematic distribution and spending of funds in association with a practical and experienced miner who could be appointed a mining inspector. During the debate, John Jenkins suggested that the best way to supervise the money spent on mining would be to have a School of Mines under a practical miner who could conduct assays, receive applications from the mines, send out inspectors before allocating grants, and generally assist the industry.88 The Minister of Education, Joseph Johnson, stated that he had already corresponded with the Technical Education Board to inquire into the best method of establishing a School of Mines: the Board was in favour of

85. Advertiser 27.5.87.
86. SAPD:HA 19.10.1887.
87. Ibid.
88. Ibid. 2.11.1887.
creating such an institution. However, he preferred the formation of a mining department to ensure that any funds would be properly distributed. He proposed a department along the lines of those in other colonies with a mining board, some inspectors, an expert on boring and some supporting staff. Although there had been a long discussion on the subject, nothing eventuated other than reviving some of the old arguments for a department. Only one Minister, Joseph Johnson, indicated that he was enthusiastic about the concept of a department and Furner's motion was not carried.

The push for, and development of, a Department of Mines and a School of Mines were interconnected at a time when the industry was in a state of decline and there was a need for new and improved technological methods and sophisticated techniques to assist in maximising the chances of success in the mines. The formation of a department was also related to the alterations to the land and mining legislation. The Crown Lands Act of 1888 extended the principles relating to the reservation of gold to the Crown which had been reasserted in 1886, to all minerals upon land thereafter granted in fee simple, with a perpetual lease or a lease with right of purchase. The public theoretically owned the gold of the Colony through the rights which had been vested in the Crown. Lewis Lloyd has argued that the reversal of the common-law principle which gave the colonists rights to 'all above and below the surface' was the natural

89. ibid.
90. ibid. 30.11.1887.
consequence of reasserting Crown rights over gold.\(^9\)\(^1\)
Parliamentarians, as a whole, had come to regard the public ownership of minerals as the best policy in the interests of the community. However, a problem remained with that land containing minerals which had been alienated prior to 1888, or 1886 in the case of gold. Parliament tried to overcome this obstacle by passing a Mining on Private Property Act in 1888, although its provisions were initially confined to the one mineral - gold. Lloyd has noted that

> having upheld the Crown's rights to gold in private lands, the colonial Governments were virtually committed to make provision for mining and, in fact, to compel mining where landowners were either unable or unwilling to mine their land.\(^9\)\(^2\)

The legislation was designed to open up private land for the genuine prospectors and miners while preserving the rights of land-owners in all other areas, and making provision for royalties to be paid to the land-owners. The Act required the Commissioner of Crown Lands to appoint an inspector to survey the land for minerals before the prospectors could proceed with their applications for entry.

When the Mining on Private Property Bill was being debated in July 1888, Johann Scherk argued for the establishment of a School of Mines to be staffed with mining inspectors who were well-versed in both the theories and practices of mining techniques and who had some knowledge of geology and mineralogy so that they could investigate and

\(^9\)\(^1\) Lloyd, L.W., 'Sources and Development of Australian Mining Law'. PhD. ANU 1966 p.xii.
\(^9\)\(^2\) ibid. p.xi.
evaluate discoveries. He also urged the appointment of a Minister of Mines. John Castine was opposed to the Bill because, he claimed, it would lead to the creation of a new department to conduct all mining business. However, members of the Government acknowledged that the Colony lacked a competent expert on mines and that Brown was doing the work of a mining inspector. Governments had attempted to make the most of Brown's widely-recognised abilities. But in addition to his duties as a geologist, he was inappropriately employed examining mines. His visits to private mines at Government expense were made after the individuals or companies had applied for his services through the Commissioner of Crown Lands. The money that was allocated to the Survey was not well spent in employing Brown, a highly paid and competent geologist, simply to report on mines. Brown himself urged the necessity of having the mines inspected in a manner similar to that in Victoria.

In 1889, the Playford Government moved to alter the system and appointed an Inspector of Mines and inaugurated a School of Mines under a board of management but distinct from the Inspector. Brown was pleased with these decisions:

93. SAPD:HA 26.7.1888.
94. Ibid. 7.8.1888.
95. Ibid. 29.9.1888.
96. Ibid. and 2.10.1888. For examples of requests, see the Observer of 15.9.1888, 24.11.1888.
97. Register 10.9.1886.
98. SAPD:HA 2.10.1888.
99. Ibid. The formation of a School of Mines was recommended in 1888 by the Technical Education Board. It first opened for students on 31.3.1889 and was officially opened on 8 June. Its full title was the South Australian School of Mines and Industries and Technological Museum.
in the successful establishment of a School of Mines there is warrant for the expectation that in the future... mining will be conducted with greater attention to method, and on a more scientific basis than has been possible heretofore. Since the appointment of an Inspector of Mines... a great deal of work has been done which should make the eventual organisation of a mining department a natural sequence. 100

He also praised Parliament for legislating to liberalise the industry and promote legitimate mining.

The Government called for applications from outside of the Civil Service and the highly qualified David Davey Rosewarne, a native of Cornwall, was chosen from about seventy candidates in January 1889. 101 Rosewarne's commission as Inspector of Mines and Inspector under the Mining on Private Property Act commenced on 18 February 1889. On 18 November 1889, he replaced Gee as the Warden of Goldfields. For these duties he received a salary of £400 a year. 102 No reference was made to the position of Surveyor-General Goyder who, until he retired on 30 June 1894, appeared to remain nominally an Inspector of Mines. Apart from inspecting the mines, the Inspector was to supervise the allocation of subsidies in order to prevent the wasteful

101. London Mining Journal 14.6.1890; Observer 7.2.1891. In evidence to the Public Service Commission, Rosewarne said he had been associated with mining since the age of fifteen. He had been the Manager of Umberumberka Mine, and also the Assayer there for two years, and had been the mining reporter for the Silver Age in Broken Hill. When examined by the Mining Commission, he said he began mining in 1870 in the iron mines of Pennsylvania. He had later worked in Nevada, Utah, California, Arizona, North Mexico, New Zealand and NSW.
102. SAPP2:1890 'Blue Book for 1889'. He was also, "Ex Officio", the lecturer on mining at the School of Mines.
expenditure which had previously occurred. Thus he immediately left Adelaide for Angaston to examine the silver-lead deposits and workings at the Keyneton and Shannon Mines which had applied for Government subsidies. The pattern of Rosewarne's work was clearly established from the day he undertook the appointment, as had happened with Brown. In his first nine months of duty, he inspected and reported on 190 separate mines although he visited several of these many times.

In the fourteen months of his work before he turned his attention to the London Mining and Metallurgy Exhibition of 1890, Rosewarne reported on 250 mines and claims covering an area from Cape Jervis to Mount Lyndhurst. Although the Government doubted that Rosewarne could be replaced, even temporarily, he was appointed South Australia's Executive Commissioner to the Exhibition. The Great International Exhibition of Mining and Metallurgy was organised by the London Mining Journal and was held in London from mid-July to mid-October 1890. The South Australian Government received an invitation to the hastily-convened Exhibition in January of that year. Brown and Rosewarne were immediately instructed to prepare a collection of exhibits for the Exhibition. A deputation from the mining community asked the Government to send the recently appointed Inspector as the Colony's representative. The company director and mine promoter, T.A. Masey FGS, suggested that Rosewarne be

103. SAPD:HA J. Coles 2.10.1888.
104. Observer 23.2.1889.
105. SAPP32:1890 'Mining Commission'. Evidence 18.11.1889.
106. Observer 7.2.1891.
108. Advertiser 17.3.1890.
instructed to investigate the latest technological developments in mining and processing in Europe. The Government saw the wisdom of his advice and Rosewarne was asked to carry out this additional study.

Masey also told the Government that the publication and distribution of geological maps, handbooks of resources and a catalogue of exhibits would be an advantageous method of promoting the Colony. Consequently, a special edition of Brown's Record of the Mines was compiled by Edwin H. Derrington, a journalist and former Commissioner of Crown Lands in the Ayers Ministry of early 1872. Ten thousand copies of the book were published for free distribution at the Exhibition, principally, and thereafter in the colonies. Brown hoped this would

convey information to English capitalists and others financially interested in our mines, and also afford an opportunity for the general public to acquire some knowledge of the extent to which this country may claim to be regarded as having a great mining future before it.

Incorporated in this book was a copy of the 1886 geological map of the Colony which had been printed in 1887.

A catalogue of exhibits was also prepared for distribution. Although the Government received short notice of the Exhibition, Brown and Rosewarne were still able to arrange the preparation of over 500 individual mineral specimens from mining companies, private collections and the School of Mines for the display. Rosewarne was not able to take as many specimens with him as he desired because

109. ibid.
110. Brown, op.cit. (2nd edn)
111. ibid.
the Museum Committee of the School of Mines in Adelaide compelled me to unpack and leave behind the cases of specimens belonging to that institution which I had packed in Adelaide in readiness to take to London and the application I made to the Board of Governors of the Public Museum for specimens met with a refusal.\footnote{112}

However, when he left for London, Rosewarne managed to take sixty-six tons of specimens from South Australia and the Northern Territory.\footnote{113}

The response and enthusiasm of the contributors overwhelmed the organisers of the Exhibition. The South Australian display covered between 5,000 and 6,000 square feet of the Crystal Palace and this was only exceeded by the effort of the New South Wales Government in providing a collection which occupied over 15,000 square feet of floor space.\footnote{114} Many of the South Australian specimens did not return to the Colony because Rosewarne had been instructed to dispense with them in what he saw as the best interests of the Colony. Thus he exchanged specimens with other colonies and countries and he also sold some and then purchased equipment to bring back to South Australia.\footnote{115}

The South Australian exhibits had received more diplomas and awards than any other exhibitors' display.\footnote{116} This was due not only to the quality of the specimens but

\footnote{112}Observer 3.10.1891.
\footnote{113} Ibid. 26.4.1890. This excluded the extensive personal collection made by Brown on his travels between Cape Jervis and Neales River. An additional twelve tons were to be forwarded in time for the Exhibition. The Northern Territory exhibits had been collected by Mr J.G. Knight, the Acting Government Resident in the Territory. (London Mining Journal 16.8.1890.)
\footnote{114}London Mining Journal 21.6.1890, 27.9.1890.
\footnote{115}Observer 3.1.1891.
\footnote{116} Ibid., and 7.2.1891.
also to the efforts of Rosewarne who, as Joy Chilman has recorded, was a popular figure at the Exhibition:

Genial, enthusiastic, hard-working, co-operative and courteous to Exhibition visitors, journalists and investors alike, he achieved much towards repairing the damage done by the recent doubtful promotions and restored at least some confidence in South Australia as a field for investment. 117

However, he was not as popular in some quarters in South Australia because of his commercially-oriented activities in London. But the Observer later dismissed the criticisms of his decision to sell the specimens because "in every instance they emanate from disappointed candidates for the position of Inspector of Mines and unsuccessful applicants to the Exhibition". 118

On 14 April 1890, James Villiers Parkes had been appointed Acting Inspector and Acting Warden for the duration of Rosewarne's absence. 119 While in London, Rosewarne notified the Government of his intention to leave the Civil Service upon his return. 120 He had received two offers of employment at more than twice his existing salary. He had declined the first offer from the Imperial Government in the expectation that the South Australian Government would increase his salary. 121 Playford's successor, John Cockburn, had once promised Rosewarne a rise

117. Chilman, J.K., Silver and a Trace of Gold p.86.
118. Observer 3.1.1891.
119. SAPPT:1891 'Blue Book for 1890'.
120. SAPD:HA T. Playford 16.10.1890.
121. Public Service Journal and Railway Review 3:30 June 1891.
of £200. But when this did not eventuate he accepted an engagement as manager of the Aclare Mine, near Callington in South Australia, for three years at £1,000 a year. When Rosewarne resigned from the Civil Service at the end of February 1891, Parkes was promoted and became the Inspector on a permanent basis.

Rosewarne had been restricted in his investigations because the Inspector's power to enforce the mining legislation was limited. There were no rules, regulations or legislation dealing with safety in mining although this was ostensibly the primary task of the Inspector. The Public Service Commissioners examined the Mining Department of the Crown Lands Office as part of an investigation into the Public Service in 1890. The Commissioners found that Rosewarne had not been used for the purposes for which he was originally employed: "it was primarily intended that his inspection should more particularly have reference to the appliances employed being in such an efficient state as to afford reasonable safety to life". He did not have the power to enter mineral properties, other than gold mines, for inspection or to enforce proper and safe working conditions on the properties. He could examine the properties only with the owners' permission and could do no more than make recommendations for the more efficient operation of a mine or for the safety and health of the

122. Observer 3.1.1891. It had long been recognised that a salary of £400 would not be sufficient to retain a suitably qualified Inspector. See Observer 15.12.1888; SAPD:HA A.McDonald 19.11.1889.
123. ibid. 23.2.1889.
124. SAPP30A:1890 'Sixth Progress Report of the Public Service Commissioners' p.xii.
The Playford Government moved, unsuccessfully, to legislate in this area. Rosewarne was concerned about the number of accidents and deaths in the mines which he attributed partly to bad management. He subsequently drafted a Bill on the lines of the Victorian Inspection and Regulation of Mines Act. This was considered in 1890 by the Royal Commission on Mining which recommended that the powers of the Inspector be strengthened and that his duties should include:

a) The proper inspection of mines so far as the safety and health of the miners are concerned;
b) Special authority to condemn any faulty machinery or improper mining;
c) Supervision of storage of explosives;
d) Supervision of any Government plant.

The Public Service Commissioners reached a similar conclusion: the Inspector needed authority to enter all mines to deal with aspects of safety. The legislation to protect miners was slow to evolve despite the precedents set in England during the 1860s.

The reports of the Mining Commission and Public Service Commissioners were presented to the Government in 1890. Both reports were important influences in the consolidation of the various Government offices associated with mining activities. Although the reports concluded that the establishment of a Department of Mines was a necessity, the two sets of Commissioners differed as to the manner of its formation but, owing to the changes of Government, no firm or immediate action was taken to implement this initiative.

125. Observer 23.2.1889.
126. Ibid. end 7.2.1891.
127. SAA GRC 30/1/1890/64 Rosewarne to Burgoyne (CCL) 6.2.1890.
The Sixth Progress Report of the Public Service Commissioners had included advice from Rosewarne and Brown about the Mining and Geological Departments. The Public Service Commissioners suggested a merger between these sections: "the duties of the two sub-departments are in many ways so nearly allied that we are convinced that it would be more economical and efficient to work them together". Brown had commented that an amalgamation would be a convenient arrangement and although there might be a clash of duties, a single department would generally be an advantage to the public. It would not be necessary, he said, to have the one person holding the positions of Geologist and Inspector. Rosewarne was not asked for his opinion about the possibility of a merger.

Following the Public Service Commissioners' Report, John Cockburn acknowledged that the establishment of a Department of Mines under the control of the Commissioner of Crown Lands was a necessary step to assist the development of mining ventures in the Colony. The editor of the Broken Hill Silver Age expressed satisfaction with this aspect of Cockburn's election policy and he noted that a department was already partly organised:

129. SAPP30A:1890 op.cit. The members were H.E. Bright MHA, D. Bevs MHA, D. Bower MHA, R. Homburg MHA, W. Longbottom, T. Harry, Secretary and D. Glyce, Chairman.
130. ibid. p.xii.
131. ibid. p.44.
132. The Silver Age 22.3.1890 editorial.
With the Government Geologist - a gentleman known here and beyond the seas as a most able scientist - as its executive head, the affairs of the department would be thoroughly well conducted.133

There was also support from members of the Public Service:

The promised establishment of a Mining Department, with a Minister of Mines, is a sign that ministers and public begin to see and know that we are not for ever to slumber on our corn-heaps and wool-packs while one of our richest inheritances lies hidden beneath us.134

However, the matter was held in abeyance while the elections were conducted and no action was contemplated until after the 'Report of the Mining Commission' was presented.

The 'Report of the Mining Commission' was forwarded to Governor Thomond on 21 November 1890.135 The Commission had been established on 11 September 1889:

> to inquire into and report upon the working of the "Mining on Private Property Act, 1888", the desirability of the establishment of a Department of Mines, and generally upon all other matters in connection with the mining industry...136

The detailed and extensive evidence touched upon many important areas of mining activity in the Colony such as mining on alienated land, subsidies to companies, rewards to individuals, boring, prospecting, the School of Mines, the system of inspection, and Government batteries. As for a

133. ibid.
135. SAPP32:1890 op.cit. The members were A. Campbell MLC, J.H. Gordon MLC, and five MLA's - L.L. Furner, A.D. Handyside, J. Moule, J.C.F. Johnson and S. Solomon. H.A. Grainger replaced Solomon after the election of 1890.
136. ibid. p.v.
Department of Mines, the Commissioners recommended amalgamating of the branches of the Public Service which influenced mining matters:

Department of Mines - Your Commissioners think that the time has now arrived when a sub-department under the Commissioner of Crown Lands should be formed to control and supervise the mining industry of the colony. As regards the local administration of this department, they are of opinion that the services of various Government officers now stationed throughout the country should be utilised wherever practicable in the establishment of local offices.\(^{137}\)

The Commissioners did not specify that the Geological Department should be part of a Department of Mines. This was implied neither in their recommendations nor in any of the evidence presented to the Commission.

It is of interest to note that Brown had very little to do with the Mining Commission; his evidence totalled only six pages out of the 190 pages that were taken during the sittings and he was not asked to pass judgement on the formation of a department. Rosewarne was guarded in his favourable response to the idea.\(^{138}\) He pointed out that the interests of the Crown Lands Office and mining were not antagonistic. But he wanted to ensure that there would not be a clash between the Lands Department and a mining department if it were established. There was no opposition to the formation of a department from those who gave evidence on this subject. In fact, those Government officers who were connected with mining or the Lands

137. ibid.
138. ibid. p.25.
Department were keen on the concept. However, a change of Government and dissatisfaction with the proposed Mining Bills delayed the passing of legislation for three years.

When he opened the second session of the thirteenth Parliament on 4 June 1891, Governor Thomond announced that a Bill 'for the Better Protection of those engaged in Mining' would be introduced in that session. The notion of 'protection' could be widely interpreted as it was intended to apply to matters of safety in mining, the safeguarding of Crown rights, preservation of public interests as defined by Parliament, and the fostering of the mining industry particularly by attempting to control speculative practices. Thomas Playford told Henry Grainger who had been a member of the Mining Commission, that the Government had instructed the Parliamentary draftsmen on 10 November 1890 to prepare a Mining Bill. But the Government did not implement the proposed Bill because it failed to satisfy all members of the Mining Commission. According to the Attorney-General, Robert Homburg, the Inspector of Mines and Warden of Goldfields also demanded amendments and "it was impossible to give effect to them without recasting the

139. For example, L.C.E. Gee, Warden of Goldfields; W.S. Crabb, Clerk in Land Office; G.S. Wright, Secretary to Commissioner of Crown Lands; M. Doswell, Second Clerk, Land Office; B. Hack who was Warden of Goldfields until July 1889.
140. SAPD:LC 4.6.1891.
141. Ibid. HA 22.7.1891. He had also been instructed to prepare Bills to amend the Mining Companies Act (31.3.1891) and the Mining on Private Property Act (20.6.1891).
Bill".  However, Homburg presented the Bill on 19 December so that it could be read and discussed by the Members of Parliament during the recess.

The introduction of a new Bill was delayed in 1892 because of the problems in drafting the legislation. South Australia now looked to other colonies for advice and examples of Mining Acts and regulations to use in conjunction with the 'Report of the Mining Commission' as the basis of its own legislation. During the second reading of a new Bill in October 1892, the Commissioner of Public Works, Andrew Handyside, drew attention to the fact that only a few mines were being worked in the Colony although much land had been acquired for mining purposes. Further delays to the passage of this Bill were caused by the fall of the Holder Ministry on 15 October after 116 days in office. The Bill was returned to the draftsmen by the incoming Ministry of John Downer but this Ministry also collapsed before a Bill was re-introduced in Parliament.

It was not until December 1893 that a Bill based on the 'Report of the Mining Commission' was accepted by Parliament. Charles Cameron Kingston, introduced the Mining Bill into the House of Assembly on 12 September 1893 and discussion about the Bill commenced in earnest after the second reading on 5 October. Kingston stressed that his Government considered it important to be "doing what they

142. ibid. 16.12.1891.
144. SAA GRG 30/1/1892/Correspondence with Goldfields Office from Victoria (317), Queensland (318), Tasmania (321), New South Wales (322), Western Australia (343) and New Zealand (344).
145. SAPD:HA 6.10.1892.
could for the purpose of encouraging those who were prepared to develop our mineral resources". The Government was not prepared to develop the colonial resources. Instead, said Kingston, the Government desired to do everything that they could to induce people to exploit our resources and to secure to themselves the benefits of the discoveries that they might make, and in any considerable mineral find in South Australia it was to these benefits that the State should look.

The Government wanted to encourage legitimate mining by preventing speculative enterprises and the shepherding of leases, and to provide the facilities to assist miners and prospectors. Consequently the Bill proposed the formation of a Department of Mines, with the Commissioner of Crown Lands acting as Minister of Mines, to regulate and control the industry.

There was some opposition to the creation of a new department because of the anticipated high cost. Richard Chaffey Baker MLC who, like many nineteenth-century Parliamentarians, was personally involved in the mining industry through shares and directorships, argued that mining would become more expensive and difficult to undertake than had previously been the case because of the extension of the bureaucracy. John J. Duncan MLC suggested that the cost of mining operations would increase because of the system of inspection and regulation which he felt was absurd given the extent of mining operations in the

146. ibid. 5.10.1893.
147. ibid.
Colony. Kingston had already expressed the hope that little extra expenditure would be involved because the Bill provided for all the work of the proposed department to be carried out by the staff of the Crown Lands Office. But if additional expenditure was necessary, said Kingston, the Government was satisfied "that it could only result from the development of our resources and by more than corresponding benefit".

Some authors have assumed that a department was formed because of "the growing importance of the mineral industry to the economic welfare of the State". Most Members of Parliament who spoke on the Bill recognised that the value of the mining industry had declined in South Australia and that a revival of the industry was required. The financial instability and the climate of economic uncertainty in South Australia during the droughts and depressions of the 1880s and 1890s had seriously undermined the confidence and activities of the mining community. The speculators and investors had even turned their attention away from the Colony's resources and now looked to the significant discoveries at Broken Hill and in Western Australia as

149. ibid.
150. ibid.HA 5.10.1893.
151. ibid.
fields for investment. South Australia's progress had been aided through the earlier activities of the mining industry and many people thought that her future prosperity would be ensured by returning the industry to its former position of importance. Thus a department was created during a time when there was a need for development to overcome the widespread depression affecting the Colony.

Some Members of Parliament expected that the development of the mineral resources would be best achieved through the co-operation of the Government and private enterprise. Vaiben Solomon, Member for the Northern Territory, did not want the Government to consider the development of the mineral resources solely from a revenue-earning viewpoint and he opposed the notion of state-ownership of the Colony's resources. Solomon feared that this Bill would be the thin end of the wedge of State-owned everything... However much they might approve of the State owning the post-offices, telegraphs and railways and controlling the military forces and education, and he agreed that the system was right, it was not expedient for the State to take control of so speculative a thing as mining.

153. For example, J.B. Austin recorded in the London Mining Journal of 22 September 1888 that the Broken Hill operations affected many people in Adelaide: "nearly half the shares in the Broken Hill Mine are held in Adelaide, while its geographical position secures to South Australia the larger proportion of the business connected with it". See also Gibbs, R., 'The Real Poseidon: South Australians and the Golden Mile in the 1890's' in Journal of the Historical Society of South Australia 4:1978; and Gibbs, R., A History of South Australia p.109.
154. For example, SAPD:LC D.M. Charleston 20.12.1893.
155. ibid.HA 16.11.1893.
156. ibid. 23.11.1893.
Other Members also pointed out that Government control of services such as railways, post and telegraph differed to Government involvement in mining because of the risks associated with speculative activities and because it would be going beyond its priorities and powers.

Not all Members agreed that the Government should not be involved. Edward Hawker wanted the Government to provide limited financial assistance to the industry rather than to attempt to prop it up. 157 John McPherson argued that "if private enterprise were not prepared to develop our mining industry the State should step in". 158 But, he indicated, a major obstacle was that "many of the heads of the Government departments were not in sympathy with the movement which had for its object giving a greater amount of State control of our industries". 159 However, Parliament accepted the view that it should be involved in the mining industry in order to secure benefits for a broad range of people instead of a narrow sectional interest.

The Mining Bill passed through Parliament in December and received the Governor's assent on 23 December 1893. The Mining Act was proclaimed in a Government Gazette 'Extraordinary' on 27 February 1894 and came into effect on the next day. It was from this date that the Department of Mines was formally established under the control of the Minister of Mines to administer the legislation and regulations in South Australia, but not for the Northern

158. ibid. 23.11.1893.
159. ibid.
The Act stipulated the role and function of the Inspector of Mines, and the Wardens but it only made a passing reference to the position of the Geologist: the Act provided for the allocation of Government subsidies to assist mining developments but "no such subsidy shall be granted unless the same be recommended by the Government Geologist or Inspector of Mines". Although there was the provision for the Governor to appoint officers to the Department, no records have been located which might indicate that Brown was appointed to the Department.

The Act did not specify the structure of the Department or its administration:

The work of the department shall be performed by the staff of the department of the Commissioner of Crown Lands and Immigration, and by such wardens, registrars, inspectors, and other officers as may be necessary and shall be appointed by the Governor.

No provision was made, initially, for the appointment of a permanent head or Secretary for the Department and no hierarchical structure was formulated. Thus the relationship between the various bodies remained unclear for some time. However, it appears that the intention had been to place the Department under the control of the Geologist and from 1894 to 1898 the Department was known as the 'Geological, Mines and Goldfields Department'.

161. ibid. Section 90.
162. ibid. Section 12.
163. SAPP2:1895 'Blue Book for 1894'. The title Geological Survey did not come into use until 1912, but in order to distinguish between the Department of Mines and the Geological Survey, the latter term is used instead of Geological Office or Department.
The role of the Geological Survey in the Department of Mines was probably much greater in South Australia than in the departments of the other Australian Colonies. Brown was the only professional officer in an inadequately staffed Department and, until the appointment of Rosewarne, he had been closely associated with the administration of mining in the Colony:

Having since the appointment of the Inspector of Mines been relieved in a great measure of reporting on mines I have been enabled to make progress with the work of constructing geological maps of the various mineral bearing portions of the colony.164

The Department's responsibilities included not only its regulatory and supervisory functions, but also the locating of mineral deposits. The Survey had survived a rocky road since its inception but it was to become the focal point of the new Department.

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Prior to the 1880s, the development of mineral deposits occurred through private-enterprise activity. Apart from a period during the Gold Rush of the 1850s, the mining industry was sustained by the impetus which it generated. While the colonists retained the prerogative over minerals and the large discoveries were beyond Crown Land or on private land, many colonists staunchly resisted any attempts by the Government to intervene in the industry. But in times of stagnation, the same colonists were not averse to calling on the Government to undertake surveys or offer rewards to encourage private enterprise. Thus the mining,

pastoral and agricultural interests had similar motives in calling for the formation of a Geological Survey in the drought and depression of the early 1800s.

Precedents for Government involvement in areas formerly considered the sole preserve of private-enterprise activity had been established from 1836. But in the period after the granting of responsible Government in 1857, two notions gradually gained wider appeal among South Australians. Firstly, many colonists concluded that the benefits which might accrue to the Colony from its resources should be shared by all colonists. Secondly, the Government now considered that it could legitimately increase the revenue of the Colony by asserting Crown rights to the mineral wealth being exploited by private enterprise.

By the late nineteenth century, most colonists accepted that Governments could be involved in a wide range of activities - in aspects of communication, in matters of transportation, ports and harbours, control of land, and in mining through assaying, rents, leases, licences and legislation like the Drainage from Mines Act of 1861 and other specific legislative enactments. When the Crown prerogative over minerals was asserted on behalf of the colonists, it became necessary for Parliament to create a body to administer these rights. Thus a bureaucratic organisation was formed to regulate and control the mining industry and to collect all monies due to the Colony.

The Government had now become involved in efforts to locate water and minerals, and to control and regulate the industry for the benefit of the people. Drought and depression not only accelerated the creation of a Survey and
a Department, but also facilitated a greater acceptance of the notion of community responsibility to its members. The inauguration of both the Survey and the Department occurred when the boom era of mining in the Colony had well and truly subsided. The attempts to regenerate enthusiasm in the potential of South Australia to sustain a mining industry certainly proved to be a case of 'too little, too late'.
The introduction of the Mining Act of 1893 on 28 February 1894 established the bureaucratic entity of the Department of Mines. The Department was a combination of those sections which had preceded it but the relationship between these sections was not clarified. The Act did not specify any particular structure other than that the work of the Department be undertaken by the staff of the Crown Lands Office. The roles of the Inspector of Mines and Warden of Goldfields were clearly stated in the Act. In theory, however, the Geological Survey could not be considered a part of the Department of Mines. The Public Service Commission in 1890 had recommended that the Geologist be appointed head of a Department of Mines but this was not implemented during Brown's period in office. The Act had not outlined the role of the Government Geologist or the relationship of the Survey to the Department although the Department was sometimes referred to as the 'Geological, Mines, and Goldfields Department'. In practice, Brown did not consider himself to be head of the Department of Mines and he regarded the Geological Survey as being a separate entity altogether.

By the time of the formation of a Department of Mines, activities relating to investment and speculation in the mining industry had become more prominent than the undertaking of mining operations. The practice of 'mining on the Stock Exchange', or 'mining on King William Street', had been apparent throughout the history of mining in the Colony. During the economic depression of the 1880s and
1890s, enthusiasm for local ventures declined because accidental discoveries were not being made in South Australia. The major discoveries of silver-lead at Broken Hill in 1883 and gold in Western Australia in 1893 attracted vast amounts of capital from Adelaide. Yet the belief that mining enterprises would 'save' South Australia was still earnestly maintained.

The increasing involvement of the Government in the local mining industry was, in part, a response to the demands of private enterprise for official intervention to stimulate the industry. The Survey was a focal point in this activity because its duties included the location of mineral deposits which private enterprise could develop. The general public, however, also desired Government intervention in order to control and regulate the industry on behalf of the community. Despite the optimism of investors and the enthusiasm of many colonists, mining in South Australia did not move ahead with leaps and bounds. But the responsibility for the failure of mining enterprises to 'save' South Australia cannot lie with a Department which was understaffed and ill-equipped to meet the challenges and demands of the period.

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The inauguration of the Department of Mines did not attract significant attention from the public or press because it merely formalised the existing functions and activities of several branches of the Public Service.1 The Geological Survey, however, found itself under attack again

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1. The only change in staffing was the transfer of William Crabb from the Lands Department to be Chief Clerk and Registrar in the Department of Mines.
in August 1894. An amateur geologist, Dr Charles Chewings, submitted a lengthy criticism of the Survey to the Register which published the critique on 21 August. In his article, Chewings commented on the failure of the Survey to collect specimens, publish maps, issue quality reports, or to provide information to assist the development of mineral deposits. He requested the reorganisation of the Department of Mines and the creation of a new Department to superintend the Geological Survey, Inspector of Mines, School of Mines, Government Assayer and Water Conservation Department. The editor acknowledged that South Australian mining interests urgently required a comprehensive geological survey and a reference map. In order to achieve this, Brown needed a fully organised department to manage routine matters while he conducted the survey: "there is a need for a Mining and Geological Department, either separate from other branches or, as we suggested some months ago, associated with the Department of Agriculture, under a responsible Minister of Industries".² He agreed with many of Chewings' comments but the blame for this unsatisfactory state of affairs, he pointed out, lay not with Brown but with his masters.³ The editor was subsequently supported in his comments by several other writers.⁴

². Register 21.8.1894.
³. Ibid.
⁴. Ibid. Letters to editor from E.H. Derrington 22.8.1894; J.B. Austin 27.8.1894; H. Knutsen 1.9.1894. Also the Australian Mining Standard 25.8.1894. Both Derrington and Austin had worked with Brown.
The critique by Chewings was not entirely unconnected to other moves in the Colony to have the north examined. After Brown had returned from an unsuccessful search for gold deposits in the north of the Colony in March 1894, the Public Service Review expressed the hope that the MacDonnell Ranges would prove to be valuable if rich deposits were found across the Western Australian border. In the House of Assembly on 22 August, Robert Caldwell moved a motion for the examination of the northwest of South Australia from the Musgrave Ranges to the Western Australian border. He saw mineral development as the most spectacular method for the dispersal to the country of the urban population, especially the many unemployed, and for utilising surplus capital and labour. He felt that the manner in which Brown's surveys were conducted caused them to be of little value and therefore proposed that a more systematic examination be made of the area. The Treasurer concurred with Caldwell that many previous discoveries had been accidents and he urged the formation of parties of practical prospectors: "a geological investigation of the country was not necessarily that which was most likely to bring about the discovery of

5. Chewings made similar requests on other occasions. For example, he had written from Germany on 12 July 1893 to Charles Kingston asking if a geological survey of the MacDonnell Ranges could be organised by the Government with Chewings as leader. Brown remained unimpressed with Chewings' proposal and advised the Government against the venture: "Should the Government at any time decide to provide money for the purpose of making a thorough Geological Survey of the MacDonnell Ranges or the rest of South Australia, I shall be only too pleased to engage a staff of Geological Surveyors and undertake the work". (SAA GRG 24/6/1893/986 Brown to Kingston 25.8.1893).

minerals". Holder trusted Brown's judgement but he felt that systematic prospecting would be of more value than a geological chart because most discoveries had not been made by geologists. He pointed out that while the Government wanted a geological map of South Australia compiled, Brown would not live long enough to complete it without a large staff to support him. Joseph Johnson asserted that more staff should have been provided for Brown and the Survey. Johnson placed his hopes in mineral discoveries as the means to alleviate the economic distress in South Australia.

Although Caldwell's motion was not passed by the House of Assembly, an identical motion, moved by David Charleston on 9 September, was accepted by the Legislative Council. Charleston urged a further examination of the northwest in an effort to develop the Colony's resources, to increase the rural population by unlocking more land, to provide more opportunities for pastoralists and agriculturalists, to alleviate unemployment, and to expand the network of railways. The successful development of the northwest area would also be an added incentive towards the development of Leigh Creek where all Government and private activity had virtually stopped. This development could only be undertaken by the State, said Charleston, because private enterprise was not attracted to far away places that appeared to be, or were, inaccessible or which would be expensive to develop.

8. Ibid. LC 3.10.1894.
John Gordon, the Chief Secretary, told the Council on 3 October that the Government would accept the motion if it was amended so that the Government Geologist would conduct the investigation because the Colony could not afford to furnish a survey party. Brown had advised the Government that a complete geological survey of the MacDonnell Ranges and the rest of South Australia would take a long time, would prove expensive, and need a staff of trained geological surveyors. 9 John Duncan "agreed with the Chief Secretary that mineral discoveries were much more likely to be made accidentally than by systematic exploration of the colony", and he amended the motion to limit the amount to be spent to £5,000. 10 Duncan noted that the proposed examination would take place in the same latitude as the gold discoveries in Western Australia and the eastern Colonies. The notion, based on a crude interpretation of geological formations, that because the Colonies on either side of South Australia had significant deposits of valuable minerals then South Australia would have them also, had been prevalent in the Colony since the Gold Rush. Duncan now predicted that a gold deposit would be found in that region of South Australia, and he stated with a tinge of optimism, that the discovery of rich mineral fields always came in time of need as if by an act of God. The amended motion was passed by the Council on 3 October. However, a surveying

10. ibid.
expedition under Brown was not immediately dispatched to the area because he had previously been instructed by the Minister controlling the Northern Territory to examine parts of the Territory.  

Brown left Adelaide for Port Darwin by steamer on 7 July 1894. This was his first visit to the far north, and after his arrival on 29 July he commenced geological investigations in numerous localities. He ventured towards the Western Australian border; he examined the Daly River Copper Mine, tin near Bynoe Harbour, gold deposits, water supplies and an assortment of mines and mineral occurrences. His movements were influenced by the weather but despite the hurried nature of the trip, which concluded in December, he acquired a general knowledge of the geology of the Territory. He was impressed by the prospects of gold and coal in several regions but the indications required testing by drilling before he would commit himself as to their potential. Brown suggested that further exploration of the area west of the overland telegraph to the Western Australian border would increase knowledge of the geography and geology of the Territory as well as uncovering any likely gold-bearing sites. After the six months in the

11. SAPP82:1895 'Government Geologist's Report on Explorations in the Northern Territory'. Instructions issued to Brown on 26 June 1894. Brown's salary for the period of the expedition was drawn from the Goldfields and Mining Branch of the Northern Territory administration. See SAPP9:1894 'Estimates for 1894-5' and ibid.13:1894 'Details of estimated revenue and expenditure for the Northern Territory'.  
12. ibid. Full details contained therein.
north of the Territory, he commenced his return journey to Adelaide which took four months of travel overland via the telegraph route.13

Some members of the public expected Brown to return to Adelaide after a 10-month absence with his report in hand, but the editor of the Australian Mining Standard asked for a display of common-sense: "it is far better to allow a trustworthy officer reasonable time [to prepare a full and reliable report], than to risk having an incomplete report by hurrying the matter".14 When the report appeared five months after the trip was completed, Brown was praised for the amount of information he had compiled and the encouragement he gave to the industry.15 However, the editor of the Register thought Brown should not spend too long in Central Australia because there was an urgent need to find minerals in South Australia. At the same time, he said it was unfortunate that Brown had not spent more time near the Fitzmaurice River because he could have then helped to solve the puzzle as to whether the goldfields of Western Australia crossed the South Australian border and linked up with those of the Northern Territory.

Brown's report and the possibility of tracing gold across the border from Western Australia encouraged John Moule MHA and Mr J.C. Lovely to acquire land in the Northern

13. Register 14.5.1895.
15. Register 21.10.1895. Brown's evidence to the Royal Commission on the Northern Territory (SAPP19:1895) was more optimistic and encouraging than his normal cautious tones. But as usual, he pointed out that he had not been there long enough for a thorough examination.
Territory for prospecting purposes. Moule obtained land at Fossil Head near Treachery Bay where Brown had located carboniferous rocks which he thought might indicate workable coal seams. Moule proposed to use a diamond drill as Brown had recommended:

knowing that Mr Brown is not only an exceedingly competent authority, but an extremely cautious one, when he recommended the expenditure of money in boring for coal we thought we could not have a sounder venture.17

The editor of the Register pointed to motives of an Imperial nature in the search for coal. Firstly, coal discoveries would offer opportunities to improve British trading links with the Far East and secondly, the Royal Navy might consider establishing a coaling station and perhaps a defence base in the Territory. Moule and Lovely also held a large area in the south-west of the Territory. They intended to prospect for gold in this area in the hope that the Western Australian gold deposits were associated with those of the Territory. If this were not the case, then the pair had contingency plans to use the land for pastoral purposes.

Such was the hope that the gold deposits of the west might extend across the imposed colonial boundary that in 1895 the Government felt compelled to send Brown over the border.18 The purpose of Brown's visit was to examine the country near the Western Australian goldfields and to compare it with the nature of the terrain in South Australia and other Australian Colonies where gold, in workable

16. Register 25.3.1896.
17. Ibid.
quantities, had been uncovered.19 He left Adelaide on 9 October 1895 and returned on 18 December after having visited the area near Coolgardie. His report was hastily compiled on 2 April 1896 only a day before he left for another inspection in Central Australia.20 The delay in the preparation of the report was caused by the belated delivery of his rock specimens from the goldfields to Adelaide. It is worth quoting at length from this report which displayed all of Brown's customary caution mixed with a modicum of optimism. In regard to the possible continuation of the gold-bearing deposits into South Australian territory, Brown wrote:

The country along the western border of this province, from the northern border of the Nullarbor Plains northward, where not covered by newer deposits, is of the same geological formation as that on the Western Australian side of the border, and is a continuation of it. It presents all the essential conditions necessary to the occurrence of gold. Up to the present time it has not been prospected, except very slightly and perfunctorily, and much of it has been only partially explored. There is, therefore, every reason to expect that gold exists, and will be found when the vast area it comprises is thoroughly explored. Much of it, doubtless, consists of plains occupied by newer and non-auriferous formations, but the outcrops of bedrocks are also extensive, and include the continuation westward of the MacDonnell Ranges (where gold is now being obtained) and the Musgrave and other ranges to the south.21

The hopes of Brown, the Government, prospectors, investors, and the mining industry in general, were not fulfilled at this time or on any subsequent occasion.

19. SAPP26:1896 'Report upon the Nature of the Auriferous deposits of Western Australia by H.Y.L. Brown'.
20. ibid.
21. ibid.
Although an extension of the the gold-bearing lodes of Western Australia into South Australian territory was not located, the Western Australian goldfields themselves proved to be a major attraction for South Australian investors and mining personnel.22 James Parkes, Inspector and Warden from 1890, announced his resignation in October 1895 because of his appointment as Mine Manager with the Australian Mining Company on the Western Australian goldfields.23 A lack of support and finance had continually frustrated Brown's efforts. Similar problems dogged the Inspector of Mines and Parkes ostensibly left the Public Service because of the heavy demands being placed upon him, and because the Government would not pay him a higher salary.24 The Register highlighted the anomaly that a private company was prepared to pay him more to manage a single venture than the Government could pay him to oversee the whole of the Colony! On 31 October, Mr W.H. Beaglehole, who chaired the proceedings at a farewell presentation for Parkes, expressed a common feeling when he stated that the Government should have offered Parkes a higher salary.25

At the same function, comments were made about the general development of mining in South Australia. It was recorded, once again, that most of the mining was simply speculation on the Stock Exchange.26 Alexander Poynton MHA called for a greater show of patriotism by South Australians to invest in their own Colony to make the mines payable. A

23. Register 5.10.1895, 1.11.1895.
24. Ibid. 1.11.1895.
26. Ibid.
Mr G. Laughton argued for more capital to be invested from England. Earlier in the year, Parkes had stated his own views as to the failure of mining, and gold mining in particular, in the Colony.27 He suggested that not enough attention was given by capitalists and prospectors to the possibility of mineral development and that much of the capital that had been spent did not produce significant results because it was misdirected. A problem in the Adelaide Hills was that most of the land and minerals had been alienated from the Crown prior to 1888: further into the country areas, the lack of timber and water proved to be a hindrance.28 The Register opined that a lack of capital, and incapable managers and directors were two major concerns.29

The resignation of Parkes saw Kingston's Government continue the ad hoc procedures of the years before Rosewarne's appointment in 1889. At one stage, it was suggested that the Chief Clerk, William Crabb, be appointed Inspector but the position was not offered to him.30 The Register reported a more commonly accepted suggestion:

it is thought that in these times of stringent economy the Government may entertain a proposal to amalgamate the offices of Government Geologist and Inspector of Mines, and get Mr Brown to carry out the joint duties.31

27. Register 23.1.1895.
28. Advertiser 29.1.1895.
29. Register 1.11.1895.
30. The Public Service Review 6:5 December 1897 p.35 reporting the unexpected death of Crabb.
31. Register 1.11.1895.
The Minister of Mines, Peter Paul Gillen, announced this would be the case when Parliament debated the Estimates in December. There was no opposition to this cost-saving measure and consequently Brown retained the duties of the Inspector of Mines which he had maintained since Parkes' resignation. However, this was not gazetted as an official appointment. Lionel Gee, whose previous appointment as Warden of Goldfields had been cancelled on 18 November 1889 after Rosewarne's appointment, was reinstated as Warden and also entrusted with the duties of Inspector under the Mining on Private Property Act of 1888 as from 29 January 1896.

The appointment of the Secretary to the Commissioner of Crown Lands, Thomas Duffield, as Secretary to the Minister of Mines on 26 February 1896 did not alter the relationship or method of communication between the Survey and the Department. He became the first permanent clerical head of the Department and some Public Service lists later named him the Secretary for the Mines and Geological Departments. This cosmetic change - his duties were primarily concerned with the Crown Lands Office - in combination with Brown's frequent absences as Geologist and Inspector meant that the Department lacked continuous leadership and functioned haphazardly as a result. This led to various complaints about the Department. J.J. Rendle, the Australian representative of the London Mining Journal, and G. Thureau, ex-Government Geologist of Tasmania, complained about the

33. An extensive examination of the SA Government Gazette revealed no evidence to indicate Brown's appointment in an official capacity.
34. SAPP2:1897 'Blue Book for 1896' et al.
35. Ibid.
short-sightedness of the Department in not providing free rail passes and rate-free cartage of specimens on the railways during their tour of inspection.\textsuperscript{36} They considered such 'improper treatment' from a Government department as a major explanation for the lack of mining in the Colony. The need for a stronger and more efficient Department had already been highlighted in a letter to the \textit{Advertiser} from Mr O. Lake of Moonta who suggested placing a Department of Mines under a seventh Ministry separate from the Commissioner of Crown Lands.\textsuperscript{37} This was not to be. Brown was employed in the Survey, and Duffield, Gee, and two clerks, William Crabb and George Gill, and a junior clerk, R.H.A. Smart, operated the Mines Department. With the exception of Duffield, these officers worked separately from the Crown Lands Office.

Fifteen months after David Charleston's motion of September 1894 for an investigation of the north-west of the Colony was passed in the Council, Brown was still unable to decide when he would have time to visit the MacDonnell Ranges.\textsuperscript{38} However, the Minister controlling the Northern Territory instructed him on 31 March 1896 to visit the Central Australia region.\textsuperscript{39} Thus he left Adelaide on Good Friday, 3 April, for Alice Springs where he commenced his explorations. He visited the gold-mining operations at Arltunga and reported favourably on the possibility of

\textsuperscript{36} Register 6.11.1896.  
\textsuperscript{37} Advertiser 15.10.1896.  
\textsuperscript{38} Register 18.1.1896.  
\textsuperscript{39} SAPP127:1896 'Reports on Arltunga Gold Field and Hart's Range Mica Field and explorations north-east of Hart's Range, north-west of Alice Springs, and of the Frew River country &c by H.Y.L. Brown; notes by R. Etheridge junior'. 
erecting a public battery and cyanide plant there. Brown spent some time at the mica fields at Hart's Range and then examined the areas northwest of Alice Springs and northeast of Barrow Creek. He returned to Adelaide from Barrow Creek on 13 August. The report on his expedition impressed Robert Caldwell who had originally moved the same motion as Charleston in the House of Assembly. No doubt it also pleased the investors and speculators who were looking for new ventures to float and promote.

A significant change for the Department occurred when Laurence O'Loughlin replaced the recently deceased Peter Paul Gillen in the Kingston Ministry on 28 September 1896. Critics of the Department often claimed that it did not really assist mining in the Colony but the Southern Cross came to the defence of the Department of Mines early in 1897 in an article entitled the "Mining Industry: What are the Government doing?" It pointed out that the difficulties facing the mining industry in the Colony were not a result of lethargy on the part of the Department or a reflection on the performance of O'Loughlin as Minister. The interest in the mines in Western Australia had revived interest in several South Australian mining ventures but the drought of 1896-97 and depression had hindered any development in the Colony. The paper reprinted an interview with Gee and O'Loughlin who both highlighted the lack of water in the northern areas where many mineral deposits lay and the lack of capital because investors turned their attention elsewhere. The Government had renewed its assistance to the

40. Register 12.4.1897.
41. Southern Cross 12.2.1897.
industry by offering rebates on the ore carried by rail, by providing subsidies to finders of new and payable fields, and by seeking investment from England.\footnote{42} Two other practical methods of encouraging the industry were the establishment of cyanide works and the formation of prospecting parties; the latter in response to numerous requests from unemployed men during the drought and depression.\footnote{43}

O'Loughlin began to organise prospecting parties in May 1897 for the many men out of work. He arranged for Alfred Hall, an experienced prospector with the Department, and P. Boyle to travel to Kangaroo Island and form a party with four other men to search for gold in the country-side which Gee thought was gold-bearing.\footnote{44} On the mainland, O'Loughlin employed temporarily over 100 men to prospect inland while the farmers and pastoralists were moving their stock to deposits of water following heavy rain in March.\footnote{45} Some gold had already been found by the farmers from agricultural areas who had moved their stock north for feeding

\footnote{42. SAPP4:1900 '18th Annual Report of the Audit Commissioners' p.xx. The annual expenditure under the vote for 'gold prospecting - encouragement of Mining and Cyanide Works' had fallen from £5,357 8s 7d in 1895-96, to £1,067 9s 9d in 1896-97. Under O'Loughlin, the amount rose to £9,995 19s 9d in 1897-98.}
\footnote{43. SAA GRG 30/11/2-1897}
\footnote{44. Register 14.5.1897, 15.5.1897, 27.5.1897. The party were given 10s per week and were allowed to keep all gold found.}
\footnote{45. ibid. 21.5.1897; Advertiser 16.5.1897.}
The Department refused the applications from men in the city area because O'Loughlin gave preference to those in the northern areas in order to prevent them moving to the city.47

In 1893, Parkes had investigated the possibility of the Government establishing a cyanide plant in the Adelaide Hills.48 A private crushing battery and cyanide plant for the treatment of alluvial gold was subsequently purchased from the Mount Torrens Gold Mining Company by the Government at Mount Torrens in 1894. At a later stage, the Government entered negotiations for the sale of the facilities back to a private company but the plan did not eventuate.49 A second public crushing works was opened at Petersburg (later Peterborough) in August 1897. The Government had decided upon this site in August of 1896 following Brown's advice that it was preferable to a plant at Terowie.50 There had been a 6-month delay between the selection of the site and the commencement of construction but, under O'Loughlin's direction, the works were completed and began operating.

46. Register ibid.
47. Ibid. 29.5.1897, 29.6.1897. Unlike previous occasions, the Government did not provide tools, tents, explosives or transport. The prospectors were required to take out miners' rights and they received 2s per day for six days a week when full time.
49. SAPP4:1896 '14th Audit Commissioners Report.' The transfer was to have taken place on 1 January 1886.
within five months.\textsuperscript{51} Frederick Holder, the Treasurer, told the guests at a banquet to celebrate the opening of the works, that the Government had done all it could to foster the industry.\textsuperscript{52} Holder argued that the Government could compete with private capital in such matters because they were not interfering with the operations of the industry, but were undertaking work that was essential for its development.

The need for Government involvement was succinctly expressed in an address by Mr H.R. Taylor of Wadnaminga to an Australian Natives Association meeting the following month:

It was evident... that unless the State came to the rescue of the mining industry it would always be stagnant in South Australia, for there appeared to have grown up a rooted opinion that mines in South Australia are no good.\textsuperscript{53}

According to the report in the Register, Taylor also praised O'Loughlin for his part in attempting to stimulate the industry:

The necessity of State assistance had already been recognised, and although the gentleman at present occupying the position of Minister of Mines was a comparative novice, the lecturer credited him with having done more to assist the mining industry in his short term of office than had been done during the previous ten years.\textsuperscript{54}

\textsuperscript{51} Register 25.2.1897; Advertiser 9.8.1897. O'Loughlin's electorate included the district of Petersburg. He had visited the Mount Torrens Battery with Brown and Gee in January 1897 and subsequently made several visits to the site of the Petersburg Battery. (Register 25.1.1897.)

\textsuperscript{52} Advertiser 9.8.1897.

\textsuperscript{53} ibid. 14.9.1897 re State Mining Policy.

\textsuperscript{54} Register 14.9.1897.
This attitude was in sharp contrast to some expressions of discontent earlier in the year. For example, 'Pick' had written to the editor of the Advertiser to ask for a good practical mining inspector, and a Minister of Mines:

What are the Government or the Minister of Mines - has anyone ever seen that gentleman in the flesh or heard him publicly speak or lecture on the subject - doing to encourage the opening up or development of this country?33

O'Loughlin's desire to improve the prospects for mining during 1897 was reflected in his preparedness to be involved directly and personally in encouraging the industry. For example, he adopted a new method of issuing Brown's reports as pamphlets in order to disseminate more information about South Australian mines.56 The Department had as its Minister a man who displayed as much interest in the Mines portfolio as he did in his role as Commissioner of Crown Lands.

The rise and fall of particular mines in South Australia was accompanied by varying moods of pessimism and optimism among the general public and the industry; such an instance involved the Menzies' Barossa Gold Mine. A company under the directorship of Leslie Robert Menzies, an experienced gold-miner from Western Australia, had obtained some success with their holding near the South Para River in the Hundred of Barossa. An assay of fifteen ounces one pennyweight and fourteen grains of gold from a parcel of twenty-three tons fourteen hundredweight of ore, which was treated in March 1897 at the Mount Torrens Cyanide Works, induced the Company to install a 40-head battery and to

55. Advertiser 17.4.1897.
56. Register 2.11.1897.
undertake further extensive developments to the workings. At the invitation of the Company, Brown, Gee, Duffield and O'Loughlin inspected the property in October. There was an air of optimism, much greater than normal, about the probable success of this field. The Advertiser reported that even Brown was a little enthusiastic about the mine:

The habitually reticent Government Geologist seemed especially impressed, and for once gave expression to an opinion. "This", said he, "is the first genuine attempt at scientific mining conducted on a proper basis that we have had in South Australia".

However, this optimism diminished in the early part of 1898 as it became apparent that a lot of luck and hard work would be needed to ensure success. The first results of the crushing on Menzies' battery dealt a blow to the Company from which it never recovered - thirty ounces of gold were salvaged from 1,500 tons of ore. There were fears that the collapse of the Company, in the light of its then modern approach to mining, would prove fatal to the mining industry because many South Australians had invested in the Company on account of Menzies' reputation. The directors arranged for Brown to report on the property but he, too, was wise after the event. He concluded that the lodes were too poor to be payable and that the battery could not be permanently operated:

58. Register, Advertiser 2.10.1897.
59. Advertiser ibid.
60. Register 25.4.1898.
61. Ibid.
a great error [was] made in erecting a
large crushing plant, and sinking a main
shaft, before the lodes had been
thoroughly prospected and their value
ascertained.62

As had happened before, insufficient work on a sound
scientific basis had been done to confirm the nature of the
deposits. Perhaps more collaboration with Brown would have
enhanced the Company's chances of success or, at least,
prevented its humiliating failure.

A further attempt to boost Government participation in
mining operations was made in August 1898 by Richard Hooper,
a Member for Wallaroo. The editor of the Register supported
his motion for the Government to spend £500 to erect a
smelter in the north of South Australia to treat low grade
ores and thereby to encourage the mining industry in the
interior of the Colony.63 The success of such a proposal
depended upon the availability of coal from Leigh Creek but,
in the meantime, the Government had quite rightly allowed
Brown to recommend a suitable site. The Register indicated
that the only impetus to the mining industry at this stage
would be due to the reports of Brown who, as usual, urged
cautions.64 Robert Caldwell MHA suggested through the paper
that South Australia should develop its iron and copper
deposits which were easily accessible and close to the
sea.65 The lack of suitable coal deposits and the limited
demand for unmanufactured iron in the Australian Colonies
were disabilities to be overcome. He argued that federation

63. Register 4.8.1898. The idea for a smelter at Port
Augusta had been mooted by a private company ten years
earlier. (London Mining Journal 22.9.1888.)
64. ibid. 5.9.1898.
65. ibid. 1.10.1898.
of the Colonies would facilitate the transportation of ore for treatment in New South Wales, or the importation of New South Wales coal to be used in the smelters which he hoped would be built in South Australia. However, Brown's report indicated that the state of mineral development did not justify the erection of a smelter at Leigh Creek. He recommended Port Augusta as the best site for a smelter if other discoveries made it worthwhile to build one.

Brown's discretion, as one might expect, did not appeal to everyone. Following the report on his inspection of Kangaroo Island from 31 October to 22 November in search of gold, silver-lead, manganese and quartz, Brown came under attack for not encouraging the industry. 'A Miner' complained that the Government assisted the industry on the advice of the Geologist but, he said, Brown was not even a mineralogist:

I am not aware of any advantage the colony has derived from the geologist, but believe he has been the means, more than anything else, of so little interest being taken in our gold mines.

These isolated attacks on Brown's ability were relatively uncommon in comparison to the amount of praise he received.

Brown preferred to record information on the geology of the Colony in map form, but a geological map of the Colony for the benefit of the mining industry was a long time in coming. Two editions of a geological map were prepared in 1883 and 1886 but these were produced in the early stages of the Survey's work and, at forty miles to the inch, they were

67. SAPP36-1898 'Report by Government Geologist on Kangaroo Island'.
of limited value. Robert Caldwell had often called for a geological map to be compiled as a substitute for a proper geological survey of the Colony which Brown could not undertake without assistance. It was to Brown's credit that despite the conditions under which he was employed, he was able to produce significant maps. He struggled to prepare a geological map of the Northern Territory at a scale of twenty miles to an inch and this was published in 1898. At the same time, Brown was preparing a geological map of South Australia and this finally became available in August 1899.

Brown had maintained that a geological map was of great value to prospectors and companies alike, but the conditions under which his services had been utilised had prevented the completion of the map at an earlier date. The painstaking attention to detail, reproduced at a scale of sixteen miles to an inch, was accurately predicted by the Register to be the basis for all future geological work in South Australia. Brown's successor later noted that the map was

69. SAPD: HA 15.12.1896; Register 13.3.1897.
70. Register 29.11.1898.
71. Ibid. 15.8.1899 editorial.
72. Ibid. The broad parameters laid down by Brown have not been challenged in the years since the map was published. Naturally they have been modified and more clearly defined but geologists, both within and outside the Department, have verified, often with amazement, the startling accuracy of Brown's great work.
a splendid monument to his untiring zeal and his excellent judgement must remain the foundation for all future work in South Australia. To later generations is left the task of putting in the detail on the background that has been painted with the sure touch of a master hand. /3

Not surprisingly, the map had some blank spaces indicating those areas that had not been personally explored by Brown. In some instances, Brown relied on the observations of other explorers.

The demand to complete these maps and to issue a third edition of the Record of the Mines in May 1899 (compiled with the assistance of Derrington and Gee), took their toll on Brown and he requested twelve months leave of absence in order to recuperate physically, mentally and emotionally. /4 His exertions on behalf of the Colony were appreciated by the general public and his ceaseless efforts to produce the monumental map swayed the Government's decision to accede to his request. During his leave, Brown planned to visit England, Europe, Halifax and his birthplace, Nova Scotia. /5 The Executive Council appointed Brown as an Honorary Commissioner to represent the Colony at the London Mining and Metallurgical and Machinery Exhibition of 1899 and "to enquire into and report on any mining or geological question and upon any new mining machinery that

74. DM Letter Book I p.925 Brown to O'Loughlin 17.12.1898. He applied for leave from 31.3.1899, but he did not commence his leave until 1.5.1899. After four weeks annual leave, he officially took his leave of absence from 1.6.1899. He was entitled to half of his normal salary for this 12-month period - see SAA GRG 35/1/1911/1243, note by P. Whittington, Commissioner of Audit, 26.7.1911.
75. Register 29.4.1899.
he might consider of interest to the colony". Prior to his departure, a social evening took place on 1 May, and as testimony to the high regard that was held for Brown, all sections of the Public Service were represented as well as many persons connected with the mining industry. Two significant comments were made amid the general praise from all of the well-wishers. John Gordon MLC stressed that the future citizens of South Australia would benefit from Brown's genuine, scientific work. O'Loughlin commented on the improved prospects of mining because of Brown's services to the Colony. The editor of the Register extolled the virtues of the taciturn man whose abilities were obvious to all in the industry. He had prevented rash speculation by passing many accurate judgements which often forced those who criticised him 'to eat their words'. Brown's integrity, sincerity and popularity were of the highest order and the failures of the mining industry could not be attributed to the masterly geologist.

In his original application for leave, Brown suggested the appointment of an Acting Government Geologist to carry out his duties and to inspect mines. He recommended Harry Page Woodward, the former Assistant Government Geologist who had later been the Government Geologist in Western Australia, as "the only man ... who combines the necessary

76. ibid. 21.4.1899. The Government frequently issued Honorary Mining Commissions to enable interested persons to obtain the latest information overseas or interstate.
77. ibid. 2.5.1899.
78. ibid.
79. Advertiser 2.5.1899.
80. Register 2.5.1899.
81. DM Letter Book 1 p.925 op.cit.
knowledge with Australian experience". This request was not adopted and Brown subsequently urged the appointment of an Inspector of Mines and Supervisor of Boring so that the public would not be inconvenienced by his absence. The Government agreed and advertised for a man with practical experience to fill the position. In the short period of eleven days during which the applications were received, forty-one people applied for the post. The proposed salary of £400 a year which had not been sufficient to retain Rosewarne or Parkes was obviously an inducement to many candidates. William Henry Matthews, an experienced mine manager and a man familiar with the mineral areas of the Colony, was chosen to be the Inspector of Mines and Supervisor of Boring during Brown's absence. As with all previous appointments to the Department, there was to be no 'teething' period for Matthews. On his first day of duty he was dispatched to Mount Fitton, Yudnamutana and other mines northeast of Leigh Creek.

The Government would have been short-sighted not to have made such an appointment. The Department of Mines had suffered as a result of Brown holding dual positions, and Brown himself was fatigued from over-work. The Government

82. ibid.
83. ibid. p.989 Brown to O'Loughlin 24.4.1899. No records were located to indicate that Brown held either of these positions as official appointments.
84. Advertiser 9.5.1899.
85. Register 24.5.1899.
86. ibid. 8.6.1899. Some of his qualifications included: four years as President of the Mine Managers Association of Australasia at Broken Hill, a year as President of the Central Mine Managers Association at Ballarat, manager at Port Darwin (tin) and Round Hill (silver), and of the Gold Eagle Mine at Castlemaine (gold), and had undertaken boring operations in Victoria and NSW.
was attempting to attract overseas investment and it was absolutely necessary to have an expert compiling complete official reports for those investing their capital.\textsuperscript{88} A rise in the price of copper had caused a flurry of activity in the industry and a spate of applications for claims, leases and miners' rights, and general enquiries had to be met by the Department.\textsuperscript{89} The Government, and O'Loughlin in particular, continued to encourage the industry in many ways. The Department was boring with a diamond drill on the Ediacara silver fields, a boring plant for copper was on loan at Burra, plans for a smelter in the north had not been permanently shelved, and the various subsidies and rebates were still being offered.\textsuperscript{90} Upon Brown's recommendation, a cyanide plant had been installed at Arltunga in the Northern Territory in February 1898. Mr F.J. Gillen SM, who started the machine operating, praised the Government for its "courageous, wise, and legitimate effort... to develop the resources of the interior".\textsuperscript{91} The Department actively encouraged mining activities and the industry would have declined even further if the Government had ceased to provide assistance, or if it had refused to replace Brown with a temporary appointment. Matthews was employed on a temporary basis as Inspector during Brown's absence. This became a permanent position when Brown returned and the functions relating to geological surveys and administration of mining matters were again placed under the control of the relevant officers.

\textsuperscript{88} Register 9.6.1899.  
\textsuperscript{89} Ibid. 10.2.1899.  
\textsuperscript{90} SAPD:HA O'Loughlin 1.3.1899.  
\textsuperscript{91} Register 12.2.1898.
By the turn of the century, the colonial society had generally accepted Government intervention to promote the mining industry. The method of assistance initially offered had included financial subsidies, allowances and rebates, the maintenance of supportive facilities and the appointment of officials to search for possible mineral-bearing areas and to ensure that the proper development of the mines was being undertaken.

However, the formation of a Geological Survey and, later, a Department of Mines had not immediately alleviated the problems facing the industry. Although there were some critics of Government involvement, further requests for Government assistance were voiced in Parliament, the press, by the mining community and by the public. Mining had remained at a low ebb in South Australia. The search for water supplies and sources of energy, and the regulation of the industry were still important. But the Department and the Survey began to turn their attention to a broader range of interests and this resulted in a strengthening of their relationship during the time Brown remained as Government Geologist. This in turn meant that the Department, in order to be more effective, attempted to gain greater control in directing the activities of the mining industry.

The months following Brown's departure in May 1899 were hectic ones for the Department. A discovery of gold at Worturpa in July 1899 did not spark off a great rush. This led the Register to ask if South Australians were only fine-
weather gold seekers. But the other aspects of the field’s lifespan conformed to the usual pattern of development of South Australian mines. The mention of gold exhilarated the community and a few companies were immediately formed. Several samples of ore from Worturpa were displayed in the office of the Minister of Mines and when it was discovered that the best two specimens had been stolen, the public were urged to invest with care in case an attempt was made to use the specimens to float a company. Warden Gee was sent to Worturpa to select the site of a town because it was thought the field had developed to an extent that justified one. The town did not eventuate when it became apparent that the gold had petered out. Work came to a sudden halt and the companies were terminated.

Some Parliamentarians thought the Government was not doing enough for the industry. Alexander Poynton, whose electorate of Flinders included the mining districts of Eyre Peninsula, placed before the House of Assembly a motion:

That, viewing the immense magnitude of our mineral fields, together with the testimony of our greatest geological and mineral experts of its possibilities, and the enormous difficulties of development, in the opinion of this House there should be voted a sum sufficient to materially assist in developing and exploiting the mineral wealth of this province.

Poynton acknowledged the valuable contribution of O’Loughlin but he felt the Government should be doing more than they were. Frederick Holder, the Treasurer, told the House that

1. Register 8.7.1899.
3. Register 14.7.1899.
4. Advertiser 29.7.1899.
5. Brown, op.cit.
the Government's policy had not changed; it would assist any person who wanted to develop the mineral resources. Robert Caldwell, an old hand in the campaign to develop the mining industry, supported Poynton and called for an increase in the work of boring and prospecting. The motion was carried with an amendment by Richard Hooper to restrict the amount to £50,000, exclusive of the annual vote, for a maximum period of five years. Hooper desired a more careful approach to the location of mineral deposits and he decried the dependence of the industry upon luck and accidental discoveries.

The issue of a Government copper ore smelting works at Port Augusta was raised again in August 1899. Richard Foster MHA, a member of a deputation which asked Laurence O'Loughlin to have a smelter built, lamented the absence of Brown who he was confident would have urged its immediate erection. The editor of the Register agreed that Port Augusta was the best site for a smelter to assist in developing the north. He criticised the Government for retaining funds as if it were an extravagance to spend money instead of stimulating private enterprise. O'Loughlin was reported as saying that the Government had not received sufficient requests for assistance and therefore could not justify using all of the funds. Despite his desire to see a smelter built, the editor criticised the Government for

7. ibid. 24.8.1899.
8. ibid. 22.11.1899.
9. Register 18.8.1899. Several private smelting works had operated in the Colony over the years and a smelter at Port Augusta had been mooted for a considerable time. (See London Mining Journal 22.9.1888).
10. ibid. editorial. This maintained his policy of the previous year.
attempting to prove that state-directed enterprises would be successful in developing mineral resources. However, the decision not to build a smelter remained unchanged; the Government was only prepared to purchase copper ore at the assay value until a large quantity of ore could be delivered at Port Augusta.\textsuperscript{11}

Despite the criticism of state-directed enterprises, the Kingston Government maintained that the best method of encouraging the industry was to provide water, freight rebates, and machinery such as batteries, concentrators and smelters to treat the ore at minimum cost.\textsuperscript{12} O'Loughlin believed that the future development of the Colony lay in mining pursuits. Many colonists had not been faithful to South Australia but, he argued, it was not likely that the Colony would be left out of the mineral boom - the surrounding Colonies contained valuable minerals and so did South Australia. O'Loughlin disclaimed any special knowledge of mining but his vigorous pursuit of active policies belied this claim. His efforts to promote mining activities were widely appreciated in the industry. Vinrace Lawrance, a well-known business figure, wrote that:

\textsuperscript{11} SAPD:HA O'Loughlin 15.8.1899.
\textsuperscript{12} Register 12.9.1899. Lecture given by O'Loughlin on 'The Mining Institute of South Australia'. 
Our present Commissioner of Crown Lands is undoubtedly the most far-seeing and energetic Commissioner among all who have held that portfolio, his constant aim being to assist in and push on the mineral development of this colony... He has evinced phenomenal enthusiasm in this direction, and evidently has succeeded in infusing with his earnestness his colleagues, his warden, the Government Geologist, and staff and officers of the Mines Department, as is evidenced by their courtesy when applied to on matters "mineral", and their willingness and even voluntary attention and help to all seekers of information, in remarkable contrast to the apathy shown in the past. 13

Lawrance had expressed the views of many investors, managers and company secretaries.

It was also acknowledged in Parliament that O'Loughlin was an effective Minister, although he and the Department were overworked and the Department was still understaffed. 14 The problem of too much work and too few to do it had never been satisfactorily resolved and Alexander Poynton's affirmation that the mining interests of the Colony were not as well looked after as those of the agriculturalists and pastoralists could not be disputed. 15

Another example of O'Loughlin's efforts to establish a wider mining base for the Colony was his acceptance of an offer to distribute displays of mineral specimens throughout the Colony. 16 The Public Libraries Board, the School of Mines, and the Board of School Inspectors had approached the Government with the proposal to disseminate knowledge of 'economic mineralogy'. After comparing a list of Public

15. ibid.
Institutes with Brown's geological map, Professor Ralph Tate recommended that fifty-three of the 161 Institutes be given cabinets of minerals and that all should have the geological map of the Colony. The Public Libraries Board were to advise the Institutes to procure a copy of a first-class book on mineralogy. Three copies of the Government Assayer's 'prospectors' manual' were to be included in each case. The work was to be done at the School of Mines under the supervision of Tate, and all expenses paid from the mining vote incorporated in the Governments Budgetary Estimates. However, there was a lengthy delay between the initiation of this idea and its final implementation in 1902!

In South Australia, the reality of new discoveries rarely matched the high ideals and expectations of the eager investors and miners as the recent experiences at Worturpa had highlighted. With each new discovery such as that at Tarcoola in 1900 when prospectors located fresh deposits of gold, the public was warned not to rush in blind haste.17 The Western and South Australian Border Prospecting Association, a party of nine prospectors, had been organised by Andrew Tennant MLC and Mr C.H. Hakendorf in 1899.18 The men found surface and reef gold in the Tarcoola district during February and April of 1900. When Warden Gee was sent to Tarcoola, he stressed that a field could not yet be

17. Register 3.5.1900 editorial.
18. Brown, op.cit. p.285. Brown, who had previously named the area after the winner of the 1893 Melbourne Cup, said "the specimens were of remarkable beauty and value".
proclaimed as it was only a good surface show. In addition, the declaration of Tarcoola as a field would have limited prospectors to claims of 100 by 600 feet instead of the 20-acre lots they were then able to work. Gee was prepared to enforce strict labour conditions to prevent unfair monopolies of large areas but, in the initial stages, the reefs could only be worked by individuals or companies with substantial financial backing. The Register advised that Tarcoola's future would best be secured at the field rather than working the Stock Exchange. However, several companies were formed and one in particular, the Tarcoola Blocks Company which held ten 20-acre blocks around the prospectors' recent discovery, met with considerable success over the next few years.

The use of Gee, Warden of Goldfields and Inspector under the Mining on Private Property Act of 1888, to report on the mining activities at Tarcoola demonstrated the problems facing the understaffed Department in coping with the vast territory. The practice, which arose in earlier days, to utilise the facilities of Government officers stationed throughout the Colony and of private individuals had been continued for reasons of practicality, efficiency and economy but it was not always the most appropriate means of ensuring confidentiality and accuracy in

19. Register 3.5.1900 editorial. Perhaps he had learnt from his own experiences at Worturpa the previous year.
20. Advertiser 3.5.1900.
21. Register 3.5.1900.
administration. It was suggested by Mr T.J. Barnes that the Department employ two or three more workers to relieve the Inspector of some of his duties. No such move was entertained by the Government but the pressure on the Department was alleviated somewhat by the return of Brown to the Colony. Brown arrived at Port Adelaide on board the Himalaya on 12 May, and was met by Thomas Duffield. After a brief visit to Adelaide, he continued on board the ship to Melbourne. Upon the completion of his private business, Brown returned to Adelaide on 25 May and thenceforth to Tarcoola with O'Loughlin three days later; he was not due to resume his official duties until 1 June.

Brown's preliminary report on the development of the area induced the Minister to implement the conditions for working leases as under the Mining Act. It also produced a significant exchange of shares on the Stock Exchange.

The Tarcoola Blocks Company decided to invest heavily in its property by installing its own battery, albeit in an

23. For example, SAA GRG 30/4/1894/557 W.R. Anderson to Warden 4.7.1894. He was going to Western Australia and he asked for a reference. He had worked on behalf of the Departments of Mines, Stock, Customs, Crown Lands and the Central Board of Health in association with his duties as a policeman. At Teetulpa he had been a Crown Lands Ranger, Registrar of Dogs, Inspector under the Vermin Act, an Acting Warden of Goldfields and had issued miners' rights. A store-keeper at Leigh Creek, Mr Duck, was responsible for issuing miners' rights for the Worturpa field. (Register 8.7.1899.)

24. Advertiser 9.5.1900 T.J. Barnes to editor. See also letters from 'Worturpa' and others on previous days.

25. Register 14.5.1900.


27. Register 3.7.1900. A full report was not available until January 1901.

unfavourable position, to treat the ore. Not all companies working on the Tarcoola field were able to erect batteries and Alexander Poynton asked Parliament to authorise the construction of a public battery and cyanide plant. Brown had already advised the Jenkins' Government to do so and the motion was readily accepted by the Assembly on 17 October. Edward Grundy, Manager of the Mount Torrens Battery was then transferred to be Manager of the Tarcoola Battery from 1 August 1901. Brown had also selected the site for a Government well to be sunk and the supply of 1,000 gallons of good quality water a day ensured the Tarcoola field of a vital necessity for success. The field was not another Ballarat or Kalgoorlie but it did sustain a lot of activity by industrious miners for several years.

Agitation for a smelting works had continued from the residents of Port Augusta and the probable success at Tarcoola was a further boost to their request. O'Loughlin proceeded cautiously in this matter and he sent the Engineer-in-Chief, Alexander Bain Moncrieff, and John Bice MLC to New South Wales to inspect the smelters there. Moncrieff recommended engaging an expert in Sydney to draw

29. ibid. 5.11.1901. See also Brown, op.cit. pp.291-92: "From the starting of the Tarcoola Blocks Company's battery, May 16th, 1901, to June 30th, 1907, 26,719 tons of ore, yielding 34,435 ozs. 15 dwts. 16 grs.-1,772 ozs. 18 dwts. 11 grs. had been obtained from the cyanide plant - making a total of 36,208 ozs. 14 dwts. 3 grs., valued at £112,355; the stone being worth (by battery treatment only) 78s. per ton".
31. SAPP2:1902, 1903, 'Blue Books 1901 and 1902'.
32. Advertiser 25.1.1901. Brown had chosen the site, named Geologist's Well in his honour, in a memo of 17.9.1900.
33. ibid. 5.5.1900.
up plans before calling for tenders. Arthur Addison MLC, on behalf of Bice, told O'Loughlin that the smelters should be built without delay.\textsuperscript{34} The Government could erect a small plant in South Australia for about £1,000 although O'Loughlin preferred the construction of a large plant in Sydney for £5,000. However, it was decided that experimentation with a small plant might be the deciding factor in ordering a large plant. The Government then moved to purchase copper ore at Port Augusta with 60 per cent of the present value of ore to be paid as a deposit and any balance due upon completion of the smelting process.\textsuperscript{35}

The newspapers played an important role in encouraging or down-playing the mining interests of South Australia and during 1901 the \textit{Register} criticised the Government for its failure to act in the matter of mineral specimen displays:

\begin{quote}
Surely it is not too much to ask that in a democratic community the Government departments, which are paid for promoting the development of the mineral wealth of the State, shall rouse themselves from lethargy and make an effort to supplement the work done by the Press in disseminating useful information regarding minerals and how they are to be found and recognised.\textsuperscript{36}
\end{quote}

The paper had continued to receive enquiries from the Institutes who were awaiting the cabinets of minerals and the publicity it gave to the issue caused the Government to fulfil its original promise.\textsuperscript{37} However, the displays were not distributed until July of 1902 and, by then, the proposal had been drastically curtailed: only thirty cases

\begin{flushright}
\textsuperscript{34}. ibid. 7.5.1900. \\
\textsuperscript{35}. SA Government Gazette 20.9.1900. \\
\textsuperscript{36}. Register 25.7.1901. \\
\textsuperscript{37}. Ibid. 1.8.1901.
\end{flushright}
were sent to various country areas. Part of the explanation for this was related to the exercising of economy by the School of Mines. The same philosophy also resulted in the termination of the services of the Government Assayer, G.A. Goyder. The project was completed in December and in this time the Department received no adverse criticism about the specimens from the Institutes.

The retarded development of Tarcoola once again reflected the penchant of South Australians for indulging in speculative, rather than mining, activities. Although many shares changed hands on the Stock Exchange, the companies were under-capitalised. The Register suggested changing the laws to ensure money was spent on actual work and not on speculation:

substantial encouragement to legitimate mining should form one of the most prominent features of the Government policy... One of the difficulties in the way consists in the lack of a sensible lead by Government and Parliament. Another is due to the unreasonable and unreasoning haste to be rich which is betrayed by so many people who buy shares in the hope that the mine concerned in the scrip will be worked sensationallly on the Stock Exchange, so that they may "get out with a profit" as soon as possible.

The Department promoted Tarcoola as a going concern by seeking artesian water supplies, erecting the battery and cyanide works, and having Brown continually report on the developments and possibilities. In fact, it had turned its

38. ibid. 31.7.1902. Those Institutes which received specimens included Angaston, Clare, Kadina, Mount Gambier and Wilmington. Some major centres were not allocated specimens; for example, Moonta, Gawler, Wallaroo, Mount Torrens and Kapunda.
40. SAA GRG 30/4/1902/743.
41. Register 12.6.1901 editorial.
42. Ibid.
attention almost single-mindedly towards Tarcoola and this upset some miners in other areas such as Mount Torrens from where the Manager of the Battery, Edward Grundy, had been transferred. However, there were others in the industry who felt that the Government was not doing enough for the Tarcoola district.

Charles Chewings offered his services to search for minerals and to geologically map east and southeast of the Musgrave Ranges. Earlier in the year, Richard Maurice had equipped an expedition to travel from Ooldea and fill in the gaps between the expeditions of Giles and Elder. He undertook this expedition with William Murray, a graduate from the School of Mines, who was on loan from the Department of Mines. Chewings also sought the assistance of a competent surveyor and bushman from the Department but this request was not granted. The proposed expedition was forestalled by the motion of Robert Caldwell in the House of Assembly on 27 November for an examination of the country between Tarcoola, the Musgrave Ranges and the northwest of the Colony. This amateur geologist thought it was obvious that Tarcoola and other spots west of Lake Gairdner were part of the mineral deposits that covered a large part of Western Australia, especially near the border. It was therefore probable that rich minerals would be found on this side of the border; a geological fault was unlikely to have terminated the deposits at the borderline. Caldwell aimed to encourage prospectors by having the area systematically

43. ibid. Letters to editor 22.10.1901 (Kellaway); 23.10.1901 (Aird).
44. SAA GRG 35/1/1901/2022 Chewings to O'Loughlin 5.8.1901.
45. Advertiser 11.4.1901.
tested under the Department's control and Brown's supervision. He wanted the staff of the Geological Survey enlarged in order to maintain geological examinations and the development of mineral resources. Brown was also aware of this and he noted in a memo to O'Loughlin that "to carry out a continuous geological survey of this province a staff of field surveyors is required, and the appointment of Mr Wells [to lead a party of prospectors north] would be a step in that direction". There was no doubt in Caldwell's mind that the Government had to open up the outback on behalf of private enterprise, and the House was similarly inclined for it passed the motion on 20 December. However, the resolution was not immediately put into effect.

Instead of an expedition to the vicinity of the Musgrave Ranges, Brown was sent by the Minister for the Northern Territory, John Jenkins, to Central Australia. He left Adelaide on 11 April 1902 and travelled via Alice Springs to Arltunga where he inspected the gold mines from 8 to 31 May. Brown returned to Alice Springs and on June 18 he left for Bonney Well, sixty-five miles south of the Tennant's Creek Telegraph Station, on Bonney Creek. He examined the country in the Davenport and Murchison Ranges,

46. SAPD:HA 27.11.1901.
47. SAPP150:1901 'Mineralogical Examination of Musgrave, Mann etc. Ranges' Memo to O'Loughlin 18.12.1901. Mr L. Wells, who was a Valuator of Pastoral Improvements in the Survey Department, had previously been associated with the Department. For example, he was sent to the Wilgena Goldfield to arrange a water supply, to locate and survey a town-site and to report on the field's prospects. (Advertiser 5.9.1899; Register 12.9.1899.)
48. Register 22.3.1902 editorial.
along the Frew River and east of Tennant Creek without uncovering significant deposits of minerals. He returned to Adelaide on 15 October. Brown was on loan from the Survey during this expedition, and the Goldfields and Mining Branch of the Northern Territory was responsible for his salary.50

Chewings corresponded with the Government on two more occasions about his proposed investigation of the north-west of South Australia, but it was clear that his plans were not acceptable.51 The Government was prepared to conduct the fieldwork itself: "in regard to the Geological Department undertaking the work, I would respectfully suggest the question be submitted to the Govt. Geologist it being his department".52 But it was undecided as to when the party would be organised and not until December 1902 was Brown's recommendation for a party to visit the Musgrave, Mann and Tomkinson Ranges adopted.53 The prospecting party included Wells, Herbert Basedow and Frank George who was "generally

50. SAPP13:1902 'Estimates for the Northern Territory 1902-3'.
51. SAA GRG 35/1/1902/665 Chewings to Minister of Mines 10.3.1902. SAA GRG 24/6/1902/514 Chewings to Premier/Chief Secretary 28.4.1902.
52. SAA GRG 24/6/1902/514 ibid. Docket note by Matthews, Inspector of Mines, 27.5.1902. The Minister for the Northern Territory, Frederick Holder, had previously told Vaiben Solomon and Walter Griffiths, Members for the Northern Territory, that Brown or Matthews would be sent to investigate the mineral deposits in Central Australia, especially White Range and the MacDonnell Ranges, and the mines at Arltunga. (Advertiser 19.1.1900.)
known as the understudy to the Government Geologist". The party's visit to the area was not successful because it uncovered little conclusive evidence of valuable minerals. However, in submitting the report, Brown doubted the efficacy of the evidence and the results. His own explorations and the nature of the geology of the area led him to believe that gold and other mineral discoveries would be made in the region.

In the meantime, problems had developed with the Government-operated smelters at Port Augusta and subsequently in the Northern Territory. The copper smelters closed at Port Augusta after a few months which showed, according to the Register, that encouraging mining through socialistic projects would inevitably produce losses. The Manager of the Smelting Works, Frederick Bice, was transferred to Port Darwin where a reverberatory furnace had

54. Advertiser 30.3.1903. George had joined the Department as a surveyor on 16.2.1897. He had worked in many areas such as the Mount Fitton district where he compiled a geological and topographical map of the area and selected sites for wells. (Advertiser 21.6.1899.) He travelled north with Brown in February, 1901 and Brown had requested that George be made a permanent officer in the Department with the title of 'Mining and Geological Surveyor'. This would prevent further offers for him to rejoin the Survey Department. (DM Letter Book 3 p.39 Brown to O'Loughlin 16.1.1901.)


56. ibid. Brown to O'Loughlin 10.2.1904.

57. Register 22.1.1902. SAPP4:1904 '22nd Annual Report of the Audit Commissioners' showed a loss on erecting and working the smelter of £14,500.
been erected. This had been sanctioned by Parliament although Brown had advised against building a smelter there because the quantity and quality of the ore did not justify it at that stage. Nearly £2,500 was spent on the smelter which was available to treat ores from the public after 27 August 1902. But the venture failed, as Donovan noted, owing to the distance from the mines, the fluctuating copper prices, and because "little ore, less than a hundred tonnes, was forthcoming for processing". The plant was relocated at the Daly River Copper Mine in 1903 but it did not recommence operating until the following year because of problems with the weather and labour supply. Even then it did not operate efficiently and was constantly being repaired until it ceased operating in 1909.

The opposition to the State conducting mining enterprises had become a hallmark of the Register and the newspaper maintained this line for many years although it did not suggest the alteration of the Department's role to oversee the industry:

58. SAPP2:1903 'Blue Book for 1902'. The Manager of the Port Augusta Smelting Works, Frederick W. Bice, was appointed on 24.6.1901 and transferred to the Port Darwin Smelters on 1.5.1902; the Assayer, Edwin T.C. Fitzgerald who had previously been an Assistant at the Peterborough Battery, was appointed on 28.9.1901 and retrenched 1.5.1902; Stanley G. Threadgold, Clerk, was appointed on 21.8.1901 and transferred as a junior clerk to the Department on 1.3.1902.


60. SAPP4:1903 '21st Annual Report of the Audit Commissioner'.


62. ibid.

63. SAPP45:1910 'Government Resident's Report on the Northern Territory'.
it would be unfair to measure the results of the state mining department by the direct returns from it; but, if ever a Government spent 40 [shillings] worth of gold money to earn a doubtful sovereign, this has been done in connection with the officially directed mining affairs of South Australia. And this remark involves no reflection upon the officials, who simply had to act as administrators of a socialistic policy.64

That private enterprise concerns had more frequently incurred heavier losses and had been subject to more failures than those undertaken by Parliament, which in comparison was involved in a more limited degree and which was very careful about the nature of its involvement, seems to have escaped the notice of the Register.

The Advertiser was more to the point and argued that prosperity through mining would not eventuate until there was a change of attitudes in South Australia.65 South Australian capital was frequently involved in the formative stages of new mines but the capitalists generally lacked staying power; all that was needed to correct this lack of confidence would be new and rich fields for private enterprise to exploit. If private enterprise would not do so then Parliament could legitimately become involved to ensure that the work was done. This would require a more effective Department of Mines than that which existed, said one writer to the paper:

64. Register 3.11.1903 following the release of the Audit Commissioners' report for 1902-03 which showed another loss of money on the cyanide works and the cessation of the Port Augusta Smelters. The Jenkins' Ministry was a Liberal and Liberal-Conservative grouping.
65. Advertiser 22.3.1902.
The Mines Department of South Australia - a kind of inconsequential and non-consequential appendage of the Lands Department - is put utterly to shame when its work is compared with that of the other States in the way of circulating reliable scientific and practical information, and so promoting the mining industry.66

Chambers asked for a stronger department and for the State to undertake policies of industrial development so that it would be 'saved'. Expressions of dissatisfaction with O'Loughlin as Minister, and the amount of negative publicity that the Department received because of delays with the North-West Prospecting Party, the losses on the cyanide plants and smelter operations, and the delay over the specimen displays could not have created favourable impressions in the public mind. Neither did the turmoil at Tarcoola.

William Frayne, who had prospected for gold at Tarcoola, complained that it was the administration of the mining laws rather than the laws themselves which prevented payable gold mining.67 Frayne had applied in August 1901 to take up land to prospect for alluvial gold at Tarcoola.68 He stated that the owners were not working some claims but he was unable to secure the immediate forfeiture of company leases in the area. He had thus left the area in November before the Department had cancelled the company leases that he had asked for.69 Further letters to the papers indicated that dissatisfaction with the Department was widespread at Tarcoola. 'A Prospector' complimented the Department on its

66. ibid. 29.3.1902 Letter to editor from Trant Chambers.
67. ibid. 4.1.1902 Letter to editor.
68. ibid. 28.1.1902 Letter to editor.
69. ibid. 18.1.1902 Letter to editor from Thomas Duffield.
efforts to find artesian water and to erect a battery but he felt that the people of Tarcoola generally lacked confidence in the Department's administration of the field: "under the present regime the resident officer does not appear to be in authority even to clearly explain the working of our far from workable Mining Act". Mulga Wire' noted that companies were being granted exemptions from the Act and this allowed them to retain the leases without working them. Prospectors were thus prevented from working the claims and he found this unacceptable:

...what have we to put up with? A spineless Government, or, shall I say, Minister of Mines, who has neither the will nor the inclination to enforce the mining laws as they should be enforced.

Robert Bruce came to the defence of O'Loughlin who he considered was still trying to promote the industry. In this case, O'Loughlin had allowed exemptions beyond the strict limit because any move to enforce the labour conditions of the Act would result in the downfall of many companies and correspondingly wreck the hopes of investors.

Whilst O'Loughlin's actions may have been necessary to preserve the hopes of the capitalists and the potential of the field, they were not understood or appreciated by the workers and prospectors at Tarcoola. The assistant secretary of the Tarcoola Miners' Benefit Association, Mr F.H. Davies, complained to the Trades and Labour Council: "the abuse of [O'Loughlin's] power to do these things [exemptions beyond limit] has been monstrous in the

70. Register 31.1.1902 Letter to editor from 'A Prospector'.
71. Advertiser 12.2.1902.
72. Ibid.
73. Ibid. 24.2.1902.
These complaints fell on deaf ears as the Department maintained that the interests of the companies came first; otherwise the field would collapse. Brown's report in February 1902 highlighted the slow pace of development because of the difficulties of access, the trying conditions, and the expense of working the field. These could be overcome by companies working systematically over a large area rather than by individual prospectors and miners scratching on small surface shows.

Some of the public criticism may have influenced O'Loughlin's decision to resign as Commissioner of Crown Lands and to attempt to enter Federal Parliament. He was replaced by Richard Butler, a member of the Liberal-Conservative group in the Jenkins' Ministry, who became Commissioner in addition to his portfolio as Treasurer. At the same time, the Department of Mines was amalgamated with the Roads Department and the Lands Department to form the Department of Lands, Mines, and Roads. This arrangement was born out of convenience rather than necessity and, in practice, there were no changes to the previous operations of the Departments. Thomas Duffield became the Secretary of the new Department, whereas he had previously been the Secretary of the Department of Mines and the Crown Lands Department only. He remained Secretary to the Minister of

74. ibid. 19.2.1902 Davies to F.S. Wallis, Secretary of the Council.
75. Register 28.2.1902.
76. O'Loughlin resigned on 31.3.1902 under the terms of the Constitution Act Amendment Act 1902 which prohibited politicians holding a seat in both State and Federal Parliaments (SAPP2:1903 'Blue Book for 1902'). The following information has been gleaned from the relevant Blue Books, Estimates, and Statistical Record of the Legislatures.
Mines as well as being Secretary for the new Department. The Departments were separated in 1907 and regained their individual titles although each had operated as a separate entity during this period.

The Minister for the Northern Territory, Premier Jenkins, again arranged for Brown to visit to the Territory in 1903 following the highly optimistic reports made by Charles Chewings about a new gold find. He inspected the gold discovery at Winnecke's Depot in March and then proceeded to the gold mines at White Range and Arltunga. The preliminary report on Winnecke's Depot provided little consolation for the investors. The general opinion was that he had said no more than usual but some investors found cause for optimism in his cautious tones. His return to Adelaide on 16 May was met with anticipation from investors and "his detailed report on the Arltunga Goldfields [was] anxiously awaited by mining investors in this and other States". However, many investors now followed Brown's advice and were wary of the field's potential for he again downplayed the value of a new find. It was left to the Government to allocate funds for boring to prove the viability of deposits. Boring was undertaken in the Pine Creek district on Brown's advice, and the possibility of using a drill to test for coal in the Victoria River area was also considered.

77. Quiz and the Lantern 10.4.1903; SAPP59:1903 'Report by the Government Geologist on Gold Discoveries near Winnecke's Depot etc.' 30.6.1903.
78. Register 7.4.1903; Quiz and the Lantern ibid.
80. SAPD:BA Jenkins 30.10.1903.
Premier Jenkins transferred Lionel Gee to Arltunga because the Warden of Goldfields stationed at Alice Springs, Johannes Mueller, was not as familiar with the gold-mining laws as Gee.\textsuperscript{81} Gee was the Warden at Arltunga from 16 March 1903 until he returned to the Department of Mines on 1 February 1904.\textsuperscript{82} Edward Grundy went to Arltunga with Gee to manage the Cyanide Works. He returned with Gee and was appointed the Manager of the Mount Torrens, Peterborough and Tarcoola Batteries with the responsibility of supervising a single Assistant at Tarcoola.\textsuperscript{83}

In addition to the responsibilities over the new discoveries in the Territory, the Department acquired further duties in South Australia where public interest in the possible occurrence of oil had increased. The chance of South Australia being an oil-bearing territory had long been recognised, particularly by some of the earlier settlers on Kangaroo Island. In 1875, J.B. Austin had told readers of the London Mining Journal of

> the existence in the south-eastern part of this colony, near the "Coorong", of a remarkable deposit on the surface of the ground... this deposit is supposed to be petroleum, hardened by some means into a substance resembling india rubber...\textsuperscript{84}

The Boucaut Ministry had responded to the requests of speculators and granted a lease of fifteen years over 10,000 acres of land in the South-East "to certain gentlemen to work the land for petroleum, and [who] intended to form a

\textsuperscript{81} Register 4.3.1903.
\textsuperscript{82} He was temporarily employed on his return as a clerk before being permanently appointed Clerk on July 1. Information from file of employees in possession of Mr R.K. Johns, the present Deputy Director-General of Mines and Energy.
\textsuperscript{83} SAPP2:1906 'Blue Book for 1905'.
\textsuperscript{84} London Mining Journal 2.10.1875.
company to prosecute the search by boring &c". In fact, the drilling of the first major bore in search of petroleum in Australia was undertaken near the Coorong by the Salt Creek Petroleum Oil Prospecting Company between 1881 and 1883. However, drilling to a depth of over 660 feet indicated no more than the existence of saline water and some indications of coal and the venture ceased. Subsequent attempts to test deposits of petroleum in the Colony also failed but the importance of oil, especially as a potential source of energy, was not neglected.

The revival of interest in the prospects for oil on the Coorong and around Mannum had, by the end of July 1903, resulted in the Department issuing 295 search licences for 913 square miles of land in that area. The Department's revenue was increased by the £913 paid in fees and the £73 15s for the 295 miners' rights. Mr K.R. Moure and a Mr G.C.

85. ibid. "Amongst the promoters and lessees are two gentlemen whose names are not unknown in London - Sir John Morphett and Mr T.U. Scrutton, son of the late Alexander Scrutton, of the Stock Exchange". On 13 February 1874, Scrutton had read a paper on the existence of petroleum or coal in South Australia to the local Chamber of Manufacturers. (Advertiser n.d. February 1874).

86. Blainey, G., The Rush That Never Ended p.342; according to Blainey, the site was 'on the Coorong near the port of Kingston'. Details of the boring operations were reported in Adelaide at the time. For example, see the Observer 26.2.1881, 25.6.1881 (a second bore was being drilled), 15.4.1882 (the bore had penetrated coal at 625 feet), 29.4.1882, 3.6.1882 (the bore had reached 660 feet), 2.6.1883 (proposed wind-up of the Company). This Company, however, was not the only group drilling for oil. Among others were the Para Para Petroleum Prospecting Company and the Para Oil and Coal Prospecting Company. Some individuals also sought petroleum. For example, Mr W. Malcolm of Gawler in November 1881 sent 'boring apparatus' to Nuriootpa (Observer 26.11.1881) and subsequently the drilling passed 140 feet with promising results (Observer 29.4.1882).


88. Register 30.7.1903.
Fair of Canada had visited the Coorong in June 1903 and were impressed by the evidence for oil that they saw. The Department's Clerk and Draughtsman, William Murray, investigated the reported finds around Mannum. Brown and Matthews later reported on oil in the Meningie area, and the Government subsequently adopted Brown’s recommendations to bore to a maximum depth of 100 feet for signs of oil. Although there were no startling oil discoveries at this time, the Department showed that it was prepared to expand its range of operations and diversify its interests and sphere of control when faced with new problems, and a different set of circumstances and external pressures.

The mining industry had remained at a low ebb in South Australia despite the formation of the Department. Once again attention was focussed on the Adelaide Hills and Inspector Matthews reviewed the possibilities of further developments there. He reported optimistically and he felt that many deposits would require only prudent investment and efficient management by private enterprise to make them successful. A failing in the past had been the lack of capital to pursue developmental work. The lack of persistence and faith among South Australians as well as a lack of capital, and mismanagement were also criticised by Mr F.J. Congreve. The usual complaint of too much mining

89. Advertiser 22.6.1903.
90. Register 30.7.1903.
91. Ibid. 28.9.1903.
92. SAPD:HA 15.10.1903 Butler to Tucker.
93. Register 22.10.1903, 29.10.1903; Advertiser 5.11.1903; Australian Mining Standard 29.10.1903.
94. SAA GRC 30/4/1903/1420 Matthews to Butler 17.8.1903.
95. Australian Mining Standard op. cit.
on the Stock Exchange was again voiced. The Department was also accused of not doing enough to assist the industry or to alleviate unemployment. Butler naturally defended the Department and the Government's efforts to provide facilities to encourage mining. A portion of his press statement was omitted from the final printed version and it is in this that an explanation for the lack of mining in the Hills can be found:

The difficulty about having a thorough search made for gold in the Adelaide hills is the fact that most of the land is in private hands, the minerals not being reserved to the Crown when these lands were sold. The owners are mostly conservative and do not wish their lands disturbed or they ask excessive rates for the mining rights over their land.

Both the Geologist and Inspector of Mines were prepared to advise land-owners and miners on possible sites, and drilling was to be conducted at selected localities to stimulate interest.

The public debate over the conduct, purpose and functions of the Department of Mines continued throughout the early months of 1904. The Register elaborated upon the history and functions of the Department in a major article:

The operations of the Department of Mines are generally little understood by the people of the state, notwithstanding their important character and the momentous bearing they may have upon the commercial future of South Australia.

96. Register Letters to editor 22.10.1903, 31.10.1903.
97. Ibid. 22.10.1903; Advertiser 5.11.1903.
98. Register 6.11.1903.
100. Register Parkes had noted this in 1895.
101. Register 3.2.1904.
This outline, derived from Departmental sources, provided a detailed and accurate account of its obligations and responsibilities to the public and investor. Comments were made about the roles of several individual members of the Department. However, some of the public were still not satisfied because the Department did not live up to their expectations of what a department should do as compared to what could realistically be done. On the one hand, Mr J. Hancock wanted a vigorous department free of pessimism with Brown taking an active role to induce investment in mining. 101 'Metalliferous' had proposed a radically different organisation: "the sooner the department is placed under the control of a board of management composed of experienced mining and business men, the sooner we shall see the industry advancing with leaps and bounds". 102 On the other hand, the Minister was given credit from practical miners for his efforts to expand the industry. 103 The Government could open up the industry but it was left to those with capital to develop the resources. When Brown was about to go north to Lake Phillipson on a new prospecting and mapping expedition, Hancock asked if Brown could be kept within speaking distance rather than let him run away! 104 The function of the Geologist to plot and trace mineral resources in preparation for their subsequent development was mistaken but this was not new - Brown's abilities had been inappropriately utilised since his appointment.

101. ibid. 12.3.1904 Letter to editor.
102. ibid. 19.2.1904 Letter to editor. Also ibid. 21.3.1904.
103. ibid. 16.3.1904 Letter to editor from 'Welshman'.
104. ibid. 22.3.1904 Letter to editor.
Hancock's complaint that the Department ran away too often without justification was incorrect but it did seem to be the case in 1904 when both Brown and George were absent from Adelaide for extended periods. Brown, accompanied by two white assistants and seven camels, left Adelaide on 27 April and spent four months examining areas 100 to 200 miles west of Marree and north to Charlotte Waters. He successfully plotted the point where the artesian water basin entered South Australia and traced its course. The Australian Mining Standard overlooked the possible benefits of this exercise when it criticised the Government prospecting parties as being nothing more than good explorers: "The socialistic tendency of the times having so entirely destroyed the old self-helpfulness and independence of the people, it is too much now to expect that much will be done in the matter of private prospecting". This was also in reference to Frank George who had left Adelaide on 20 June to prospect north of Fowlers Bay on the west coast. The expedition, which concluded on 28 October, did not uncover a new gold or mineral field.

The explorers and prospectors often considered themselves endangered by the Aborigines, but they also relied on them a great deal for assistance and it was the usual practice for each expedition to be accompanied by at least one 'blackboy' as a guide or interpreter. But the scientists, explorers and prospectors did not actively seek to establish broad contact with the Aborigines. This was

105. Register 22.8.1904.
107. SAPP60:1905 'Report of Mr F.R. George on his Prospecting Expedition North of Nullarbor Plains'.
surprising because one would expect these adventurers to have an interest in the people around them, especially when it was apparent that the Aborigines could exist on a land which the European found hostile. Lionel Gee later placed on record his appreciation of his friendships with several Aborigines who assisted him during his days in the field. In his Bush Tracks and Gold Fields: Reminiscences of Australia's "Back of Beyond", Gee praised his 'blackfellow mates'. The early work of the Geological Survey and the Department of Mines would have been hindered further without the assistance of the Aborigines. But the Department had no specific interest in the affairs of the Aborigines; it simply wanted to survey and then use the land in the 'best' possible manner. However, a rare and interesting episode unfolded in 1904-05 when the Department did reserve land solely for the Aborigines to use as they wished.

Rod Matheson of Wilpena drew the attention of the Protector of Aborigines, Mr E.L. Hamilton, to a deposit of ochre at Red Ochre Hill in the Brachina Gorge near Parachilna which had been used by the Aborigines for many years:

_Lately the king of the tribe came to me saying he had heard that the whites were going to work these claims, and asking me to try and get the locality reserved for them. I think this would be just and right as the black man will be gone before long and the white man [will] have full opportunity._

Hamilton asked the Minister of Education, Robert Homburg, to arrange access for the Aborigines to the deposit which

108. SAA GRG 52/1/1904/265 Matheson to Hamilton 8.8.1904. This was the same deposit as that mentioned in Chapter 3.
Inspector Matthews had noted was on a claim registered as 'The Sacred Land'. The Survey Department did not object to granting the right of access because only a small quantity of ochre was used and some Aborigines travelled hundreds of miles to reach the deposit. Subsequent correspondence on this issue reveals an underlying motive, the avoidance of frontier violence, as an additional reason:

I have spoken to the recognized King of the local tribes (a native who speaks excellent English) & he considers if the rights of the hill be denied them by the Government issuing a mineral lease to whites there will be a native feud waged, which will possibly extend to a reprisal on the White Population in our far Northern centres.

The significance of the ochre deposit was not disputed by any of the parties involved: for example, Dr P. Shanahan said that

the main issue of the event [a corroboree to be held at Parachilna] seems centred in the possession of an ochre hill, the contents of which appear to be (to the aborigines) of as much import as the bible is to Christians.

But there were differences in the concessions that the Government could make. Whereas Dr Shanahan and E.L. Hamilton wanted "a preserve in perpetuity to the Aborigines", the Department of Mines refused to withdraw the area from the ambit of the Mining Act until the claim was abandoned. Frank George visited the site in January

111. ibid.  
112. ibid. Perpetuity was the equivalent of 'when they died out'.  
113. SAA GRG 35/2/1904/7318 Matthews 25.11.1904.
and found the claim abandoned. Upon his recommendation, the claim was cancelled and twenty acres were withdrawn from the operations of the Mining Act and reserved for the Aborigines.

Much of the criticism to which the Department had been subjected over the years had arisen as the Department diversified its interests, extended its operations and became more involved in the whole range of mining activity. The expansion of responsibilities after the turn of the century was not accompanied by an increase in the staff of the Department. The Department undertook more work without additional staff or facilities to meet these extra demands. The continual shortage of staff inhibited the operations of the Department and Survey in regards to both the type and amount of work which could be undertaken, and the attention which could be devoted to its investigations but the Governments did not attempt to provide more Public Servants for the Department.

The Department placed greater emphasis on minerals other than the normally sought after metallic minerals and ores. The depressed economy of the 1890s, and the associated drought and dry seasons had frustrated or destroyed the hopes of many agriculturalists who then pressured the Government for assistance. The Department attempted to help the farming community by locating phosphate deposits to alleviate the problems caused by soil deficiencies. When Brown doubted the possibility of

115. ibid. See also SAA GRG 52/1/1905/40.
116. See Williams, M., The Making of the South Australian Landscape Chapter 7 - 'Changing The Soil'.
phosphate deposits existing under the salt pans on Yorke Peninsula, the Central Agricultural Bureau asked the Minister of Agriculture to arrange for Brown to report on other deposits which might be useful.\textsuperscript{117} William Copley of the Yorke Peninsula Electoral District, successfully asked Parliament to stimulate private enterprise to search for phosphates to assist the farmers.\textsuperscript{118} The £500 reward for the locating and working of phosphates on Crown land proved to be a sufficient amount to attract interest but many of the specimens were of a low grade and the reward had not been paid when the offer expired.\textsuperscript{119} The Department examined other promising localities, including in February 1904, that at Kapunda. There was an increasing awareness in the community of the need to diversify interests in order to develop properly South Australia's resources. Consequently, Brown recommended that the Minister of Agriculture arrange for experiments to be conducted on a scientific basis with the low-grade phosphate ores.\textsuperscript{120} The Department was now more alert to the possibility of assisting the broad range of economic activities in the State. Up until this time, its functions had been occupied primarily with opening the land to mining operations for wealth, and through the development of water resources to sustain life and, if possible, rural industries in the interior.

Government regulation of the mining industry increased as activities diversified. The Mining Act of 1893 had become out-dated but the Department was able to recommend

\textsuperscript{117} Advertiser 7.9.1897.
\textsuperscript{118} SAPD:HA 30.8.1899.
\textsuperscript{119} Advertiser 26.1.1900, 27.7.1901.
\textsuperscript{120} SKA GRG 30/4/1905/232 Brown to Butler 16.2.1905.
amendments to the Act. In 1900, the Act was altered to specify more clearly the requirements to search for 'precious stones, phosphates, oil and rare metals, minerals, and earths'. Other weaknesses of the principal Act were also removed and, in 1904, the Act was extended to apply to all quarries. This alteration had become necessary because quarries had not been legislated for in the original Act. There had been several accidents and deaths in quarries during 1904 and Matthews had been highly critical of the unsafe nature of the operations in some quarries he investigated.121 It was later discovered that another amendment was required in 1919 because the 1904 Amendment Act only extended the provisions of the 1893 Act and not the regulations under the Act to quarries.122

Further legislation in 1905 enabled the Department to grant leases for gold dredging. Companies prepared to conduct dredging and sluice mining operations had applied to the Department but Matthews had previously been forced to refuse their requests for such leases.123 With the introduction of the Act, several companies including the Echunga Proprietary Hydraulic Gold Sluicing Company commenced operations.124 Brown visited Victoria to inspect hydraulic sluicing plants and bucket dredging.125 The Gold Dredging Act, unlike the amendments to the principal Act

122. AR:1919.
123. SAPD:LC A.A. Kirkpatrick 10.10.1905.
124. Advertiser 27.3.1906. See Brown, op.cit. p.236.
125. Ibid. 9.3.1906.
which further regulated the industry, did stimulate the industry and there were high hopes for a revival of mining in the State. 126

A revival of mining in the Northern Territory was also anticipated after Brown spent seven months there in 1905 with Gee and Herbert Basedow. 127 The party left Adelaide on 13 April 1905 and reached Port Darwin on 3 May. Investigations included into tin and gold at Bynoe Harbour and Pine Creek, the Daly River Copper Mine where the Government smelter was under the control of Basedow's brother, Erwin, the Melville and Bathurst Islands and tin at Mount Todd. 128 Brown had intended to examine all of the coastline between Queensland and Western Australia but the Government Resident could not procure a suitable steam launch. The second keeper of the Point Charles Lighthouse, Mr F.J. Williamson, was hired as the master of the pearling lugger Venture which the party used along the coast and on the rivers. However, Williamson borrowed one of the revolvers while the party was in Darwin preparing for a sailing trip on 20 July and shot himself in the head for no apparent reason. This did not prove to be as great an inconvenience to the expedition as the malaria and ague which Brown succumbed to in October. From then until the return to Adelaide in December, he was unable to do any more than examine the cores from bores which were brought to him

126. ibid. 28.3.1906 editorial.
127. SAPP55:1906 'Northern Territory of South Australia, North-Western District. Reports (Geological and General) resulting from the explorations made by the Government Geologist and staff during 1905' 30.6.1906. See also SAA 579 L.C.E. Gee: personal diaries of the expedition.
128. Register 4.1.1906.
in Darwin; much of the geological exploration was left to Basedow. Brown reported that the trip was satisfactory because fresh indications of deposits of gold and coal had been uncovered. Further boring and deep mining were required to make the development of the minerals of the north a feasible proposition.

Matthews, like Brown, was under constant pressure in the performance of his duties but he also visited the Territory in 1905. Butler had instructed him to investigate the MacDonnell Ranges locality and he left Adelaide on 5 June. He reported on the working of gold at Arltunga and Winnecke's Depot, and mica at Hart's Range. Although he made no major discoveries, he found evidence to suggest the area had great potential for development if the difficulties of working the deposits - lack of water, expense, inefficient machinery, high cost of transportation - could be overcome. However, Matthews recommended against boring with a diamond drill before more exploratory work was done and deeper shafts sunk.

Under the amended legislation of 1904, the already overworked Inspector had been given the additional responsibility of inspecting all quarries in the State. His other duties included the inspection of mining operations or properties; supervision of the boring for minerals, and work at the Government Batteries; inspection of gold-bearing land; reporting on applications for subsidies; recommendations for mining in general; and acting as a

Warden. In keeping with the conditions of the times, he had not been allowed his annual leave since April of 1903, when he had taken two years conjointly:

owing to it being inconvenient for me to absent myself from my official duties on the starting of the Diamond Drill, and the inspection of Mining properties, which could not at the time be delayed.

Before Matthews went on leave in April 1906, the Department suffered a blow with the death of Frank George on 4 April.

Frank George, the Geological and Mining Surveyor, and second-in-charge to Brown in the Survey, was in Central Australia on a prospecting trip. The party had left Adelaide on 11 September 1905 to prospect near the Petermann Ranges and in the southwest corner of the Northern Territory. George had been taking one of the party members - Tom Hall, who had been injured on 6 December when the party was attacked by Aborigines - to Alice Springs for treatment. In attempting to cure the dysentery he had contracted, George took overdoses of medicine; he died at the age of 32. At his own request, the Clerk and Draughtsman, William Murray, replaced George as leader of the party. Murray joined the party at Alice Springs on 22 April and took the expedition to the Buxton and Davenport Ranges before returning to Adelaide via Oodnadatta in

130. SAPD:HA R. Butler 12.7.1904.
131. SAA GRG 30/4/1906/406 Matthews to O'Loughlin 28.3.1906. Application for six weeks leave from 17.4.1906 was approved in Cabinet.
132. SAPP50:1907 'Northern Territory of South Australia (with plans) of the Government Prospecting Expedition to the south-western portions of the Northern Territory by F.R. George; and to the Buxton and Davenport Ranges by W.R. Murray'.
133. Register 29.10.1906.
134. Ibid. 16.2.1907.
October. No appointment was made to fill the vacant position in the Survey and Brown again found himself without any form of permanent assistance.

George had been on the Wells expedition of 1903 with Herbert Basedow who had occasionally assisted Brown in a temporary capacity. On the day of George's death, the Registrar of the School of Mines wrote to O'Loughlin asking if Basedow could be employed to classify the mineral specimens in the School of Mines' Museum. Basedow was appointed on 1 May 1906 and he completed the classification and arrangement of the 2,500 specimens by November. The collections made by Professor Tate and Mr East in 1891 and 1899 had totalled only 675 specimens, but Basedow's compilation which included a complete record of the Leigh Creek coal-boring operations to date, highlighted a greater variety of specimens and indicated the expansion of interest in assorted minerals. Basedow noted that many of the gold specimens had disappeared but he found many valuable specimens... among a neglected mass of material heaped in the old Exhibition Buildings; some bore labels with a date as far back as 1881 and included a valuable series of copper ores from South Africa presented by His Excellency Sir George Grey.

Basedow compiled a catalogue of the minerals and this was issued by the Government Printer in 1907. Until authorisation was obtained to use his services in the

136. SAA GRG 30/4/1906/408 L. Laybourne-Smith to O'Loughlin 4.4.1906. Note: it appears that O'Loughlin did not enter Federal politics after all and he returned to State politics. He joined the Price Ministry as Commissioner of Crown Lands and Immigration and other portfolios in July 1905.
137. Advertiser 8.10.1906.
138. SAA GRG 30/4/1906/408 op.cit.
Department of Mines, Basedow made collections of specimens for the Institutes in the country.

The volume and variety of the Department's work increased without a corresponding increase in staff and the Department continued to rely on temporary measures. Walter Howchin and Douglas Mawson were two members of the University of Adelaide staff who were assisted in their fieldwork by the Department. In return they provided the Department with sundry reports and their work contributed greatly to the general geological knowledge of the State. However, there were clashes of opinion and the staff of the Survey and the academics did not always see eye to eye.

139. SAA GRG 30/4/1905/1462 Howchin to O'Loughlin 13.12.1905 reporting on his fieldwork in the previous year. The Department had issued him with a railway concession ticket to enable the work to be done. He was granted another annual pass. The origins of this scheme are unclear but it may be connected to the comments made by Thureau and Kendle during their visit in 1896 - see Chapter 4.

140. For example, SAA GRG 30/4/1906/199 Mawson to O'Loughlin 13.2.1906 'Report on the geological features of Bimbowie District'. SAA GRG 30/4/1906/300 Mawson to O'Loughlin 1.3.1906 'Geological report on Beltana District and Ajax Mine'.
In May 1906, Brown informed O'Loughlin that specimens of ore sent in by Mr A.J. Smith from his lease in the Olary district were carnotite and contained uranium oxide. Walter Chapman, a graduate of, and the new Analyst at the School of Mines, and Professor Bragg at the University found the specimens to be significantly radioactive. Additional tests were also conducted by Drs Rennie and Cooke at the University. Samples sent to the Agent General for South Australia in London were submitted to the Imperial Institute for a report on their commercial potential. Professor Dunstan, Director of the Institute, told the Government that the samples contained uranium and vanadium but in too small a quantity to be of economic value although they brought high prices on the world market. Two English manufacturing firms had agreed with Dunstan, and further tests at the Rare Metals Company in London, and Madame Marie Curie's laboratory in Paris were not encouraging. However, the major significance of Smith's discovery was that the oxide

141. SAA GRG 30/4/1906/521 Brown to O'Loughlin 1.5.1906. J.B. Austin had previously hinted at the probability of uranium in the Colony when he reported that pitchblende containing uranium had been found in a silver-lead mine in Cornwall. See the Mount Barker Courier 8.11.1889: "It has often occurred to me that scarcely sufficient attention is given to the collection of a variety of minerals in the colony. South Australia is so rich in all common minerals of commerce that anything not belonging to that category and not appearing to the uneducated eye to be of special value, is apt to be passed by as worthless. Why may there not be uranium in the colony?". The first reported occurrence of uranium was in 1890. Captain Stevens of the Mount Rhine Silver Mining Company uncovered a small deposit of chromium which contained uranium (Observer 26.6.1890, 5.7.1890, 12.7.1890).

142. SAA PRG 323 Papers of W.S. Chapman.
of uranium, pitchblende, provided radium which attracted more attention for its commercial or special value than uranium did at this time.

Public interest was aroused by the discovery because Brown had immediately left Adelaide for Olary when he had been informed of the find. Laurence O'Loughlin told the press that Brown would never get excited and rush off in a hurry unless he was impressed by the importance of a discovery. Brown, a paragon of caution, downplayed the discovery and recommended thorough prospecting of the area by shafts and drives before reaching conclusions: "I am unable to give any opinion as to persistency of the ore in depth, as Uranium ores being very rare have not previously come within my experience". The disclaimer of any knowledge of uranium was inaccurate. In 1898-99, the Government had arranged for Bentley Greenwood to prospect in the Umberatana district and he sent specimens, including rocks from the Mount Painter area, to Brown. According to Greenwood these specimens were thrown out without being examined while Brown was absent on leave in 1899. In 1903, Brown had noted that radium existed in pitchblende in a ratio of one grain to a ton and he advised a prospector to

143. Register, Advertiser 4.5.1906.
144. SAA GRG 3074/1906/549 Brown; information for reporters 4.5.1906.
145. Register 23.7.1898. He had been used by the Department on other occasions; see for example, Register 29.6.1897. According to Gee, Greenwood was "a top notch prospector, who, from his intimate knowledge of geology, was affectionately known throughout the north as "Dolomite Bill"." In Gee, L.C.E., Bush Tracks and Gold Fields p.2.
146. Ibid. 30.11.1910. Letter to editor from Greenwood.
"not waste time searching for it". Greenwood did, however, persuade Brown to visit the area in 1906 and investigate the deposit of corundum near Mount Pitt.

The news of Smith's discovery again raised hopes for a commercial field and it led to a flurry of activity on the Stock Exchange. Some speculators had even taken a train to Gawler on a Thursday evening in order to speak to people returning from Olary by train on the Friday morning. Smith later sought a reward of £1,000 from the Government for being the discoverer of the Radium Hill Mine but this was not recommended by Matthews. Smith was informed that Parliament had not appropriated money for this payment and, in any case, the conditions for a reward had not been met under regulation 252 of the Mining Act.

A similar substance had been discovered by Mr S. Radcliffe, Assistant Chemist for the Wallaroo and Moonta Mining Company, prior to the announcement of Smith's find. This had been kept secret until tests were completed. Mawson, who claimed to be the first person to discover radium in Australia, pointed out the low-grade quality and small, non-commercial quantity of the ore at Moonta. But he did give cause for optimism by suggesting that the copper lodes of South Australia might contain

149. Advertiser 5.5.1906.
150. SAA GRG 30/4/1912/186 Smith to Butler 28.2.1912.
151. ibid. Matthews to Butler 13.3.1912.
152. Register 5.5.1906. Mawson said in this article that the discovery took place three months beforehand. In SAA GRG 30/4/1906/638 Mawson to O'Loughlin 15.5.1906, he says it occurred in October 1905. See also Radcliffe, S., 'Radium at Moonta Mines' in Transactions of the Royal Society of South Australia 30:1906 pp.199-204.
varying quantities of uranium ore. News of this discovery had been printed in the newspapers ten days before Mawson wrote to O'Loughlin to report the discovery and to mention that the Company did not want any publicity.153 The breach in confidentiality upset Brown and he told O'Loughlin:

[Mawson's reports] are of little use to the Department, and I see no necessity for their continuance. They will doubtless be of value to the University, to the staff of which Mr Mawson is attached.154

Brown's discontent with Mawson was not restricted to this single incident but was related to a similar episode that began earlier in the year.

Mawson had inspected and reported on the Elder's Rock Nitrates Development Company's deposit of phosphate, nitrate and ammonia at Elder Rock, nine miles from the Paratoo Railway Station. In submitting a report, which had been printed by the Company, to O'Loughlin, he acknowledged that "as suitable for their purposes, a very optimistic view has been taken of the quantity of material present".155 He appended several comments to the report to show that it would be difficult to make the field payable and the Company would collapse if it tried to work the field on a larger scale than a one-man show. Brown asked O'Loughlin to seek an explanation from Mawson about his statement that indicated he had assisted the Company to float shares.156 Mawson replied that the report was never meant to be published and that he had told the Company that he had given them the most optimistic report possible solely for their

154. ibid. Brown to O'Loughlin 23.5.1906.
155. SAA GRG 30/4/1906/578 Mawson to O'Loughlin 7.4.1906.
156. ibid. Brown 10.5.1906.
own satisfaction. Brown considered Mawson's explanation "to be the reverse of satisfactory". The Minister consequently withdrew the privilege of a free rail pass from Mawson who, however, continued to associate with the Department on a professional basis. The granting of rail passes to selected individuals continued but permission in the future was subject to an explicit understanding "that such ticket be used for purposes of research only. [not] for the purpose of making professional visits or issuing mining reports".

The Advertiser of 7 November 1906 reported on the meeting of the Royal Society held the previous night. At the meeting, Howchin had read three papers by Mawson and Dr W.T. Cooke of the Adelaide University. In the second paper, he alleged that no geological reports of many parts of the country, especially Eyre Peninsula, had been published. Brown, commenting on this inaccuracy, pointed out that the official records of the mines contained a great deal of information. Duffield wrote to Dr J.C. Verco, the President of the Royal Society, and pointed out the inaccuracy. The Minister of Mines had asked him to inform the Society that it was unhelpful to the mining industry to publish misleading statements to the public.

157. ibid. 18.5.1906.
158. For example, Matthews, Mawson and Gee visited Williams-town and searched for a gem drift. (Advertiser 9.7.1909.) Menge once claimed he had found gems in the same area.
161. ibid. Duffield to Verco 15.11.1906.
Such incidents added another unsavoury flavour to the already sour relations between some leading members of the geological profession.

The increased pressure of work in the first half of 1906 eventually led to the appointment of a junior clerk. Matthews had complained to O'Loughlin that it was impossible to keep up with all of the business even though he had all of his officers working overtime which, under the Public Service regulations of the time, was unpaid. The rise in the prices of some minerals had given mining a fresh impetus and a few old copper mines were revived. The Department, even with the junior clerk, struggled to keep pace with the developments in the industry as the Register reported:

Owing to the continued activity in the copper market the Mines Office staff has been working during the past six months at high pressure, in order to cope with the enormous increase in applications for registration of mineral claims and subsequent conversion into mineral leases.

The demands of the industry also affected the Department's work in the field. It had been impossible for Matthews to do all of his duties and following several accidents which occurred because the proper precautions were not taken in the mines and quarries, an Assistant Inspector of Mines was appointed. Henry Jones commenced duty on 17 July 1907 under Matthews who became Chief Inspector of Mines and Boring. Jones, who had local experience at the Mount Grainger Gold Mine and as General Manager of the Tarcoola

162. SAA GRG 30/4/1906/974 Matthews to O'Loughlin 5.7.1906.
164. Register 8.1.1907.
165. Advertiser 28.3.1907.
Blocks Mine, was delegated to supervise matters of safety and health in all mines and underground workings.  

In the meantime, Brown had lost the assistance of Basedow who went to Europe to further his studies. The Executive Council appointed Basedow as an Honorary Commissioner to enquire into aspects of the mineral industry and the economic geology of Great Britain, Europe and America. Basedow did not disappear from the story of the Department and he resumed his association with it on his return to South Australia in 1910.

Brown now returned to the Northern Territory to complete the work of his previous expedition in 1905. He sailed east from Darwin on 30 July 1907 in the Government steamer Federal. James Condon, his assistant from other trips accompanied Brown as did Dr Strangman, the Protector of Aborigines in the Territory who took advantage of the opportunity to investigate the Aborigines' plight, and Mr A.E. Martin, who was examining possibilities for pastoral development. The party spent two months in the northern coastal areas of the Territory before returning to Darwin on 20 September. Brown was again impressed by the potential for the development of mineral resources. He prospected for gold and metallic minerals around Melville and Caledon Bays, the Alligator and Roper Rivers, and at McArthur River where copper, silver-lead and zinc were uncovered. He also recommended boring for coal at places along the coastline such as Mallison Island, the entrance to Arnheim Bay and

166. Register 25.7.1907.
Borroloola. But little mining was attempted because the investors and speculators were now alert to the difficulties of conducting viable mining enterprises in the Territory. It is ironic that the Government's efforts to stimulate mining in the region foundered after all the years of urging the mining industry to be cautious in undertaking new projects. Despite Brown's encouraging remarks about the possibilities of several localities, the mining industry was less favourably inclined towards the Territory than to other distant mining fields.

Not only did the Department of Mines undergo changes during the early part of this century, but the political life in South Australia also altered appreciably and this had an affect on the Department. The transformation from alliances of small factions and individuals to the now-familiar system of party politics had been consolidated by the turn of the century. One of the unusual combinations during the growth of party politics was the Price Ministry, a Labor-Liberal coalition, from 26 July 1905 to 5 June 1909. There were originally two Ministers from each Party - the number rose to three each when the size of the Ministry was increased to six on 30 December 1908. The Department under O'Loughlin, a Liberal Minister, became involved in an interesting attempt to offset the lack of suitable coal deposits in South Australia and the difficulty of ensuring supplies from the eastern States.

The Government had decided that a solution to these problems would be for South Australia to purchase its own coal mine. Thus Brown was instructed to visit Sydney to
investigate coal deposits in New South Wales. He renewed his acquaintance with Edward Fisher Pittman, the Government Geologist and Under Secretary for Mines, and inspected several sites. Of the properties visited, Brown was able to recommend that of Alexander Shedden at Maitland. Matthews inspected and recommended this site, and although the scientist and practical man agreed, the Government followed Matthews' advice to prove the existence of the seam. The New South Wales Mines Department was engaged to carry out the boring operations on the property on behalf of the South Australian Government.

The project appeared to be feasible and it progressed smoothly until it became necessary to pass legislation to enable the Government to purchase the site. Premier Thomas Price (Labor) told the Assembly that the Government Coal Mine Bill was essential: Leigh Creek coal had been experimented with and though some departments were attracted by its potential, South Australia simply did not have a usable coal seam. Andrew Kirkpatrick (Liberal), Chief Secretary, stressed this point to the Legislative Council when it considered the Bill. Some Members of the Council accepted the Bill because of Brown's favourable advice about the site; some were attracted by the possible savings of

169. DM Letter Book 3 pp.503-09 Brown to O'Loughlin 6.4.1908.
171. Advertiser 30.6.1908. The Government supplied fuel and water. Two shifts (four men to a shift) were run daily and sixty feet per week bored. The estimated cost of the exercise was £1,000.
172. SAPD:HA 19.11.1908.
173. TBTd. LC 2.12.1908.
£30,000 a year. However, most Members of the conservative Council opposed the Bill on the principle that the Government should not be actively involved in the conduct of mining operations. The Bill was negatived at its second reading in the Council on 17 December 1908.

The issue of a Government coal mine remained prominent in the following year and several other potentially valuable mines in New South Wales were offered to the Government but these offers were not entertained. At first Shedden argued that the Government was committed to purchasing his site because the extensive boring had revealed coal. When it became apparent that it could not be bought immediately, Shedden gave the Government a final opportunity before he signed with a mining company: "I would rather see a Govt. with whose policy I sympathize get it than a private firm who will not work it for the benefit of anybody but themselves". Duffield informed Shedden that O'Loughlin would reintroduce the Bill if the property was placed under offer to the Government until 30 September. The Labor Members of Parliament urged the Government to proceed with the purchase but the opposition of the Legislative Council could not be overcome. O'Loughlin attempted to win the Council over to the Government's side, and on 26 April he invited the Councillors to select two or three members to

175. SAA GRG 30/4/1909/43 C. Capp to O'Loughlin 12.1.1909; ibid./668 R. Wyndham to E.H. Coombe 17.6.1909; ibid./688 H. Sparks to Coombe 2.7.1909; ibid./1133 E. Llewelyn to Coombe 8.11.1909.
176. SAA GRG 30/4/1909/102 Shedden to O'Loughlin 3.2.1909.
177. SAA GRG 30/4/1909/147 Shedden to Duffield 10.2.1909.
178. ibid. Duffield to Shedden 8.4.1909.
179. Register 2.4.1909.
visit the coal mines. John Duncan acknowledged O'Loughlin's request but none of the Councillors he spoke to were interested in going to New South Wales:

the Bill to authorize the purchase of the mine was rejected on the grounds of principle against the Government undertaking coal mining particularly in another state.

A Government coal mine was a lost cause with such entrenched opposition in the Council.

The issue was finally shelved when the coalition Government collapsed following the death of Thomas Price on 31 May 1909. The Treasurer, Archibald Peake (Liberal), was asked by the Governor to form a new Ministry. The Labor Party Caucus naturally desired a Labor Member to replace the deceased Premier. Peake, however, formed a Liberal Ministry with the support of the Leader of the Opposition, Richard Butler. O'Loughlin's official association with the Department of Mines - he had been Minister from 28 September 1896 until 5 June 1909 except for two periods when Alexander Poynton, 1 to 8 December 1899, and Richard Butler, 1 April 1902 to 26 July 1905, were the Commissioners of Crown Lands - came to an end when Peake appointed him Commissioner of Public Works and Minister Controlling the Northern Territory. Although there had been complaints made against him over the years, O'Loughlin was generally a popular and efficient Minister. His degree of personal interest and length of office had provided some stability and direction to the work of the Geological Survey and the Department of

181. ibid.
Mines. Brown now ceased to be sent all over the countryside in a haphazard fashion to appease the whims of Parliament. Having completed much of the groundwork in this desultory manner, Brown was now allowed to be more systematic in his approach. O'Loughlin's genuine attempts to comprehend geological and mineralogical matters, to assist the industry and individuals, and his frequent visits to mining areas and associated industries were widely appreciated in the mining community.

At the time of the change of Government and Ministerial reshuffle, Brown was again visiting the Northern Territory. He had returned there in June 1908 to report on the discoveries in the Pine Creek district of copper at Mount Davis, tin and gold.¹⁸³ He investigated the possibility of boring to test the West Arm tin deposits at depth and he reported on the progress of boring for coal at Cliff Head, Anson Bay. This short trip had been completed by the end of July 1908. Soon after he returned to Adelaide, Brown was instructed by O'Loughlin, in his capacity as Minister Controlling the Northern Territory, to visit the Tanami Goldfield. But Brown did not leave until March 1909 after the wet season in the tropics.¹⁸⁴ By now, Brown had crossed over much of the Territory but he was keen to explore the geology of the Tanami region. Gold had been discovered in August 1900 by Allan A. Davidson, a prospector who only scratched the surface before leaving. The region had been visited briefly by Richard Maurice in 1902 and thereafter by

¹⁸⁴. Advertiser 30.3.1909.
some small private prospecting parties between 1904 and 1908.185

William Murray, who had been on the Maurice expedition, went with Brown. His purpose was to locate accurately the position of the field, its relationship to the South and Western Australian border - presumably in case the deposit stretched across the borderlines - and the general geographical features of the region. Brown went to inspect the gold discovery, to investigate nearby areas which might favourably indicate gold, and to continue his work on the geology of the Northern Territory.

The party travelled by horse from Port Darwin to the Victoria Downs Station on the Wickham River where L.A. Wells, who had been surveying land in the area, had left some Government camels. Brown was not accompanied on this trip by Shoergool, his favourite camel-driver.186 Instead, James Condon of the Survey Department took charge of the horses and camels.187 Shoergool, called 'George' by the children of Wright Street where he lived, had died of typhoid fever in the Adelaide Hospital. He was known as a first-class camel driver with a reputation for being a good cook, general hand in camp, and an intriguing story-teller around camp fires, as well as for ensuring that his camels remained in sound condition while on the trips. Brown was fortunate in having such a capable and companionable assistant for the trips were always lonely and the success

185. SAPP31:1911 'General Report on Tanami Goldfield and District (North-Western Central Australia) by Lionel C.E. Gee' 12.4.1911.
187. Register 8.3.1909.
or failure of the hazardous expeditions often depended on the animals' ability to travel long distances without the need for water.\textsuperscript{188}

During Brown's absence, Lionel Gee, now Recorder and General Clerk, was placed in charge of Brown's office work and was also instructed to visit any discoveries of rock phosphates.\textsuperscript{189} Brown spent two months at the Tanami Goldfield which he left on 16 June and upon his arrival at Pine Creek on 24 July, he telegraphed O'Loughlin to report that the gold find was important. Brown took nearly two months to prepare his report back in Adelaide: the preparation was delayed by the amount of work outstanding.\textsuperscript{190} He encouraged the development of the locality and urged the adoption of efficient mining procedures and wise investment.\textsuperscript{191} Later in the year, Gee himself was approached by O'Loughlin who suggested that he could be posted, temporarily, to the Tanami Goldfield to act as Warden, Magistrate and Clerk.\textsuperscript{192} Gee, with the approval of the new Minister of Mines, Ephraim Henry Coombe, accepted the proposal and he transferred to the Northern Territory Department on 1 October 1909. He departed from Adelaide in September but did not arrive at the field until 19 December because of delays in Port Darwin. He remained at Tanami until November 1910 and then returned to Adelaide where he

\textsuperscript{188} For example, on a trip to the northwest of Fowlers Bay in 1897, the camels were forced on two occasions to travel without water for thirteen days at a time. SAPP46: 1898-99 'Government Geologist's Report on Explorations in the Western Part of South Australia'.

\textsuperscript{189} SAA GRG 30/4/1909/222 Brown to O'Loughlin 6.3.1909.

\textsuperscript{190} SAPD:HA O'Loughlin 27.10.1909.

\textsuperscript{191} SAPP105:1909 'Government Geologists's Report on the Tanami Gold Country'.

\textsuperscript{192} SAA GRG/30/4/1909/806 Gee to Coombe 11.8.1909.
compiled his report on the field. Like Brown, he was enthusiastic for its development and confident of eventual success.

The Peake Ministry survived a censure motion in the House in August 1909, and after the merger of the Liberals and Conservatives into the Liberal Union, the Ministry was reconstructed. Peake remained the Premier and took over the portfolio of Commissioner of Crown Lands on 22 December 1909. The level of mining activity in the State had fallen again and Peake met with the usual complaints from the public. Some argued that the Government did not properly assist the prospectors. Others said the depression in the mining industry was a result of Government apathy. Some suggested that not enough attention had been given to the State's mineral resources and that South Australians would not invest in their local mines. All demanded that the Government provide greater assistance to the industry.

At the time of this debate, another opportunity arose for the Government to involve itself in the actual conduct of mining operations. On 13 January 1910, a deputation from the residents of Woodside asked the Peake Government to purchase the Bird-in-Hand Gold Mine. Both Friedrich Pflaum MHA and Mr A.H. Scarfe, the Secretary of the Company, suggested it would be advantageous for South Australia and the School of Mines to have a mine for practical training. Pflaum also thought the State might turn the Mine into a

193. Advertiser 8.1.1910 Letter to editor from "Prospector".
195. ibid. 17.1.1910 Letter to editor from J. Havers.
profitable venture by injecting capital and providing efficient management. Scarfe told the familiar story of the Mine being originally undercapitalised and the early profits being distributed as dividends instead of being spent on developing the Mine. Peake did not think it was a good idea for the Government to be involved: "to purchase worthless mines would be bad and to get a good mine would want a lot of money and would be the most expensively worked mine in the State". The School of Mines was asked for an opinion and its Council decided in favour of the principle without specifying any particular mine. Nevertheless, the Government refused to be involved in such an enterprise.

In the campaign for the election in April 1910, the Labor Party displayed a substantially different policy to that of the Liberal Union. John Verran, Leader of the Labor Party and a Member for Wallaroo announced Labor's policy at Wallaroo on March 2. The Labor Party was prepared to nationalise all of the mines in the belief that 'God had put the wealth in the earth for everyone and not just for a few people'. As Verran pointed out, Parliament already controlled railways, waterworks, sewerage and so on, and there was no reason why it could not similarly control a coal mine or any other type of mine. He also promised that a Labor Government would stir up action within the Department of Mines and, in an attempt to reverse the unsatisfactory state of mining, it would increase the mining vote to £50,000 to encourage development.

197. ibid.
198. Advertiser 2.3.1910.
The election in April saw the Labor Party victorious, and the new Premier, Verran, appointed Crawford Vaughan to be the Treasurer and Commissioner of Crown Lands. But Verran did not turn the Department of Mines upside down as some people had feared. The Department continued as before although the new Government introduced a different perspective on several issues and this produced some interesting episodes during Labor's twenty months in office. For example, within five weeks of taking office, the Government was offered the Poona and Matta Copper Mines near Yelta in accordance with the Party policy to nationalise the mines. ¹⁹⁹

Matthews, who had taken only one week's leave since April 1906, applied at this time for all leave owing to him. The numerous duties he performed, and his involvement with the attempt to purchase the coal mine had prevented him taking his leave at the normal time. ²⁰⁰ He arranged to take his leave at times to suit the Department which was still inadequately staffed. In an attempt to secure some assistance for the Geological Survey, H.Y.L. Brown played upon the Government's policies:

¹⁹⁹. SAA GRG 30/4/1910/561 W.J.L. Polmear to Vaughan 6.7.1910. Matthews noted on 22.7.1910 that the idea could not be entertained at the proposed price of £4,000.
At a time when the policy of the Government is to bring to the front and advertise the natural products of the State it is advisable that attention should be paid to its economic Geology (such as building stones, iron ores, phosphate and clay deposits etc.) in addition to the more valuable metallic minerals the exploitation of which receives particular encouragement.

He suggested the appointment of an Assistant Government Geologist to manage this branch of the Department's affairs and to this end he recommended Herbert Basedow who had recently returned from his studies overseas. His scientific and medical training - BSc. (Adelaide), PhD. (Breslau), MD. and ChD. (Gottingen) - and practical experience in South Australia and overseas certainly qualified him for the post.

Brown's proposal that Basedow report on a wide range of economic minerals, maintain the display at the School of Mines, and assist him on general duties was approved by the Government. Basedow accepted the position and he commenced duties on 10 August 1910 at a salary of £400 a year which was the same amount that Woodward had received twenty-seven years previously! This appointment was welcomed by many people especially in the Public Service. For example, James W. Jones, the Chairman of the Supply and Tender Board and Secretary to the Commissioner of Public Works, in writing to congratulate Basedow commented:

Your Office too is one which should have been created long ago both for my Friend Mr Brown's sake & for the State. Our expectations for the future are now sanguine and confident; and I hope personally to often meet you.203

The depressed market for minerals at the time and the continuing trend for diversity in the Department's activities heightened the long overdue necessity of appointing an Assistant Government Geologist.

In the meantime, the new Government was forced to deal with the on-going problems associated with energy supplies for the State. The lack of readily usable coal seams in South Australia, and the unreliability of supplies from the eastern States, highlighted by the strikes on the Newcastle fields, turned the Verrian Ministry's attention to the possibility of developing Leigh Creek. The Leigh Creek Coal Mining Company had closed the colliery in 1897 and only a little work was carried out during the next few years.204

In 1901, the editor of the Register had suggested that the increasing use of electricity in mining operations might be of value in the development of the State's resources because it was cheaper to carry power to the ore deposits rather than carry the ore to the sites of the power generating plants: "The coal at Leigh Creek, for example, might be made available for the generation of power at a central station in the midst of a highly mineralized region of the Far North".205 The Government had carried out drilling in the

203. SAA PRG 324/1 p.100 Jones to Basedow c.12.8.1910.
205. Register 26.4.1901.
area and Brown, though impressed with the samples, could only suggest that the coal would be suitable for the State's railway engines.\textsuperscript{206}

The lease for the Leigh Creek area had been acquired by a director of the Broken Hill Proprietary Company, John Darling, on 13 January 1906.\textsuperscript{207} On 6 July, this lease was transferred to the Tasmanian Copper Company Limited.\textsuperscript{208} Gibbs, Bright and Company, agents for the new lease-holder, asked the Government to assist the Company by reducing the fees payable for the cartage of coal from Leigh Creek to Parachilna to a "purely nominal rate".\textsuperscript{209} The Labor-Liberal coalition under Price did not grant this concession to the Company. At the same time, the Department refused to extend the term of the lease which was due to expire in 1908 for another ten years as the Company requested.\textsuperscript{210}

The Company raised 12,455 tons of coal and experiments were conducted using the coal in domestic situations in Adelaide and some country towns, and on the Government and Company steam engines in conjunction with Newcastle coal, and by itself.\textsuperscript{211} The results were not encouraging and when the lease expired after the 15-year term was completed on 30 June 1908, it was not renewed by the Company. Private enterprise activity at Leigh Creek ceased; the Price

\textsuperscript{206} SAA GRG 30/4/1905/155 Brown to Butler 30.1.1905.
\textsuperscript{207} Dickinson, S.B., 'The Search For Coal at Leigh Creek' in Geological Survey Bulletin 24.
\textsuperscript{208} ibid.
\textsuperscript{209} SAA GRG 30/4/1906/1014 H.W. Waterhouse to O'Loughlin 12.7.1906.
\textsuperscript{210} SAA GRG 30/4/1906/1013 H.W. Waterhouse to O'Loughlin 12.7.1906.
\textsuperscript{211} Dickinson, op.cit.
Government subsequently reserved the coalfield under the provisions of the Mining Act by issuing a proclamation to this effect on 27 August 1908.

The Department did not commence any new activity at the coalfield until 1910. Gibbs, Bright and Company asked the Verran Government in July 1910 to purchase some of the machinery which the Tasmanian Copper Company had left at the old mining sites. The offer was held over until the field had been visited by several Parliamentarians including Verran, Vaughan and William Denny, the Attorney-General, in September 1910. Henry Jones, the Inspector of Mines, dressed ten volunteers from this party in miners' suits and took them down 300 feet of ladderways and into the former Company mine then being examined. Vaughan later announced the Government's intention to develop the mine, and £5,000 was allocated in the Estimates for this purpose.

Matthews visited the area with Brown who selected the site for a third bore to test for coal at a deeper level. The Government now purchased the machinery that had been offered for sale. Another bore was sunk the following year although the details of this operation have been lost: "It was bored probably in 1911, immediately following the completion of the No. 3 bore and abandoned owing to an accident which involved the loss of the boring tools in the

hole".\textsuperscript{217} The renewed work did not herald immediate success and the development of the Leigh Creek deposits required many more years of extensive testing before the coal could be utilised.

As well as the search for a source of energy, the Department continued to investigate the problems of the subterranean waters of the State. For example, Brown had first reported on underground water in the Ninety-Mile Desert in 1883 and some boring in the area had subsequently been undertaken by the Water Conservation Department. Vaughan sent him back to the area in 1910 to report on any developments or fresh possibilities.\textsuperscript{218} Brown also spent time examining the poor drainage of water from the Mount Gambier region.\textsuperscript{219} After visiting the locality, he suggested a revolutionary, more efficient, and less expensive approach to the problem than the proposed method of surface drainage.\textsuperscript{220} His suggestion of using bores and shafts to drain the surface water underground and out to sea from the Dismal Swamp area was eventually adopted. One request for advice came from an unusual industry. The South Australian Ostrich Company, which had tried for thirty years to establish an ostrich farm near Port Augusta, had found the venture to be unprofitable because the rainfall in the

\textsuperscript{217} Dickinson, op.cit.
\textsuperscript{218} SAPP90:1910 'Report on the Geology of the Country South and East of the Murray River with Special reference to the Subterranean Water Supply in Wells and Bores along the Pinaroo and Bordertown Railways'.
\textsuperscript{220}Advertiser 21.9.1910.
area was not sufficient for growing feed for the birds.221 Hence, Brown was asked to assist the Company in its efforts to locate underground supplies of water. However, his report to Vaughan was not encouraging and the farming enterprise faded away.

The topic of radium was raised again in 1910 when Bentley Greenwood at Mount Painter sent further specimens of corundum-bearing rock to be analysed at the School of Mines.222 Brown and Basedow did not investigate the discovery when asked by Greenwood in July and an earlier visit in April had been terminated by Brown.223 However, Brown issued his normal cautious remarks:

\[
\text{this discovery is the direct outcome of the action of the Government in the exploitation of this district. Although this discovery is of great scientific interest, it remains to be proved whether any commercial advantage can be derived from it.} \quad 224
\]

Douglas Mawson, who had offered his assistance to Greenwood, had been more optimistic in his analysis of the potential value of the discovery.225 Mawson's examination of the outcrop from which Greenwood had obtained his samples was encouraging to investors and the Radium Extraction Company of South Australia was formed with nominal capital of £5,000 and incorporated on 28 November 1910.226 Other companies formed at this time were the Mount Painter

221. SAA GRG 30/4/1910/513 W.L. Ware, Secretary to Vaughan 29.6.1910.
222. Register 28.11.1910.
223. Ibid. 30.11.1910 Letter to editor from Greenwood.
224. Ibid. 28.11.1910.
Proprietary Company Limited and the Mount Painter East Prospecting Syndicate.

The Government provided assistance to the companies by sinking wells for water and, in 1911, Brown visited the locality. His report on the field was contained in the 12-page booklet, *The occurrence of uranium (radio-active) ores and other rare metals and minerals in South Australia*. This compilation by Gee generated considerable interest in radium. Indeed, so great was this interest that the Public Library organised the distribution of an additional sixty copies within and outside of Australia.227 Though developmental work was continued by the private companies, the Government was only involved intermittently over the next few years and substantial success in the region was not forthcoming until after 1944.

The Labor Party had acknowledged that a greater effort was needed in examining the geology of the State and in developing its mineral resources than was being achieved.228 In an attempt to fulfil this need, the Commissioner of Public Works, Premier John Verran, took over the portfolio of Minister of Mines on 13 October 1910.229 However, the Ministerial supervision of the Department of Mines and the Geological Survey is not distinct. The 'Blue Book for 1911' shows that Vaughan was not the Minister of Mines but the Department, including the Survey, came within his portfolio as Commissioner of Crown Lands and

227. SAA GRG 30/4/1911/1079 General Secretary of the Public Library, Museum and Art Gallery of South Australia to P.C. Ward 23.11.1911.
229. Ibid. "Also SAPP2:1913 'Blue Book for 1912'."
Immigration. The 'Blue Book for 1912' lists Verran as the Minister and the Department and Survey were now part of the Commissioner of Public Works portfolio. The Department and Survey were allocated funds under the Estimates for the Commissioner of Crown Lands.

Nevertheless, a distinction appears to have been made for Brown and Basedow continued to send their correspondence to the Commissioner of Crown Lands, while Matthews occasionally corresponded with Vaughan but more usually with Duffield, the Secretary to the Minister, who invariably directed all matters to Verran. In mid-1911, Vaughan commented that the 'Departments' had at one time been under the same head, but he could offer no reason for their separation. The Government then decided to reorganise the Department of Mines and Geological Survey and merge them into the one body.

230. SAPP2:1912.
231. SAPP2:1913.
232. SAPP2:1910, 1911-12. In 1913 the allocation was made to the Minister of Mines and not to either Commissioner.
233. SAA GRG 35/1/1911/1142 Brown to Vaughan 1.6.1911. Vaughan's comments 17.7.1911.
Chapter Six: 1911-1912 Trouble in the Mines

The year 1911, which proved to be a tumultuous one for the Department, commenced with signs that the times had indeed changed. The Northern Territory was transferred to the Federal Government as from 1 January. The Department had assisted in locating mineral deposits in the Territory although the Governments' efforts to encourage the mining industry had been relatively unsuccessful. The Survey was active in the Territory after 1889: "A survey of geological exploration during the period of South Australian administration shows that few areas in the Territory were neglected, although of necessity some surveys were sketchy". From 1889 until 1911, Brown issued fourteen comprehensive reports on the mineral-bearing areas of the Territory and, in 1898, the first major geological map. The Territory was no longer a State responsibility but the State's officers were to be seconded by the Commonwealth to visit there on occasions.

Brown, who had seen himself as simply a geologist in the Survey and not as a part of the Department of Mines, elaborated upon the specific functions of his position for inclusion in the 1911 edition of the Commonwealth Guide Book. They were

to determine the geological features of
the State, Firstly in a large and general
way, and Secondly in detail where
required at particular localities. To
examine and report on new mineral
districts and discoveries, advising and
directing those in search of metals and
minerals of Economic value. Advising and
selecting sites for bores and shafts for
water, artesian and other, coal and
minerals in Government undertakings and
also those of the general public. Detail
investigation of the deposits of
phosphatic rock existing in the State.
Investigation and suggestions in
connection with subterranean drainage in
particular districts. Generally dealing
with all geological and mineralogical
matters and acting as consulting
specialist to the Government and the
public in connection therewith and also
acting for the Federal Government in an
honorary capacity as consulting Geologist
in connection with Government boring
operations in the Northern Territory.3

As indicated, the role of the Government Geologist had
clearly changed in detail from Brown's original brief to
survey the geology of the Colony for mineral and water
deposits. He was now being subjected to greater demands and
a more complex sphere of investigations. During 1911, the
Government Geologist's position was to be given greater
prominence in the Department.

The implementation of new methods to assist in the
locating, testing and utilisation of resources had been
important. Technological innovations were also made within
the Department. The offices of the Secretary, Geologist and

Book 19.5.1911.
Chief Inspector of Mines had been connected by telephone in 1906. Now Brown urged the introduction of motorised transport:

In order that the transport arrangements of this department may be carried on more satisfactorily and expeditiously and on up-to-date lines I would respectfully suggest your approval for the purchase of a motor-car for the sole use of the Assistant Geologist and myself.

Eventually, all officers in the Department who were required to travel to fulfil their duties, were able to use either the Department's vehicles or be reimbursed for the use of their private cars.

However, such changes and the whole range of operations of the Department were overshadowed by several resignations and the subsequent controversy generated by the appointment of a new Government Geologist.

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Herbert Basedow resigned on 4 May to enter the Federal Public Service as the Protector of Aborigines for the Northern Territory. During his nine months as Assistant Geologist he had located valuable marble and phosphate

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4. SAA GRG 30/4/1906/160 Duffield Memo 6.2.1906. Brown rarely corresponded directly with the Minister of Mines, the Secretary to the Minister, the Inspector of Mines, or the Warden. An examination of the files relating to the Department of Mines revealed very few cases of such correspondence. Brown usually wrote to the Commissioner of Crown Lands, who was also the Minister of Mines, from the Government Geologist's Office or Department. Similarly, the Inspector, Warden and staff of the Department of Mines corresponded directly with the Minister of Mines and his Secretary, and with Brown through the Minister of Mines in his capacity as Commissioner of Crown Lands.

5. DM Letter Book 4 p.121 Brown to Vaughan 7.2.1911. He even used a car when inspecting sites for bores on the west coast (Advertiser 7.2.1911).
At the time of his application for the Federal post, he had proposed to the Commissioner of Crown Lands that the State concentrate on developing the deposits of phosphate and clay, and mineral springs. Brown appears to have been dismayed at Basedow's decision:

I would like to inform you that I regret extremely that there is a prospect of your retiring from your position... I had hoped that you would have been able to remain here to carry on the work we had planned out, and eventually to succeed me as Government Geologist. As however the post you are applying for is a very important one, in which besides your necessary duties, you will have a good opportunity of continuing the study of the geology, natural history etc. of Northern Australia, in which work we have previously been engaged, & for which I know you to be well qualified, I will not offer any opposition although against my own interests and the hopes I have entertained.

At a farewell for Basedow, the reticent Brown took the chair and among his few words, he said that Basedow's departure was a loss to the State but at least he was not leaving Australia. Few people, if any, appear to have known that, even at this stage, Brown was planning to retire three years before the official retiring age of seventy. The Chief Secretary, Frederick S. Wallis, later claimed that "it was common knowledge that Mr Brown contemplated an early retirement" but the contemporary evidence does not indicate this.

7. DM Letter Book 4 pp.158-59 Basedow to Vaughan 31.3.1911. His interest in mineral springs was an extension of his medical background - he saw mineral water as a valuable table and medicinal object.
8. SAA PRG 324/2 p.8 Brown to Basedow 28.3.1911.
9. Register 2.5.1911.
Brown informed Vaughan on 1 June of his resignation which he wanted to take effect from 30 November, the completion of his twenty-ninth year of duty. He had given notice to the Government well in advance so that a suitable replacement could be obtained. In the meantime, he would complete any special tasks. The Register noted his resignation on 30 June and the Public Service Review expressed regret at the news: "the work achieved by this officer on behalf of the State has been exceedingly valuable in quality and enormous in quantity".

Edward Lucas, a strong supporter of Basedow, told the Legislative Council on 6 December that Brown had not mentioned his resignation to Basedow: "What took place between the Government and Mr Brown that led to his resignation Parliament had not been informed". Wallis gave Lucas a vague reply that Brown had resigned for private family reasons. Brown had himself written to the newspapers to emphasise the personal and private motives for his resignation - he had married Hannah M. Thompson in 1911. However, he was also at pains to point out that he had maintained good relations with the Labor Ministry and that Verran and Vaughan had been kind and courteous to him. It was not unusual that he felt compelled to quash the rumours about his resignation, but his uncharacteristic desire for publicity to ensure this was done was surprising. In a rare interview before going away

11. SAA GRG 35/1/1911/1142 Brown to Vaughan 1.6.1911.
15. Ibid. 22.12.1911. His wife and a daughter, Margaret, survived Brown who died in 1928. (Register 24.1.1928).
for his leave in 1912, Brown stressed that he was well
treated by everyone, and that he had no qualms about anyone
and was at peace with all.16

The Government decided to advertise for a Geologist and
an Assistant Geologist following the representations of
several University lecturers. Professors Stirling, Rennie
and Chapman, and Walter Howchin had been invited by Vaughan
to discuss with him the restructuring of the Department
after Brown's retirement.17 The University deputation
sought the appointment of an efficient staff and the
amalgamation of the Geological Survey and Department of
Mines:

They did not wish to reflect on Mr
Brown's ability in any way, as they all
recognised him to be a geologist of very
high standing indeed, but on account of
his being the only geologist in the
Service he could not confine his
attention enough to scientific matters.
His time was too much taken up by matters
which were wholly commercial. There was
no up to date geological map of the
State, and they suggested that a thorough
scientific survey of geology be made of
the whole State. They pointed out that
South Australia was the only State that
did not have an up to date geological
map, and the only State that did not
issue an annual geological map.18

Howchin stressed that the Department was understaffed in
comparison to the other States' Departments and should be
reorganised. He argued for the appointment of at least
three geologists including a highly scientific man with
extensive Australian experience and he nominated Mawson for
this position. Vaughan pointed to the appointment of
Basedow as evidence of the Government's willingness to

17. Register 18.7.1911.
18. SAA GRG 35/1/1911/1142 op.cit. 17.7.1911.
assist the Department. He did not know why the Survey and Department had been separate but he told the deputation that the Government intended to reorganise the 'Departments' and would amalgamate them if necessary.

Basedow had been replaced on 1 July 1911 by a Geological Probationer, Ralph Williams, a son of the Director of Education and who was also one of Mawson's students at the University and School of Mines. Brown recommended to Verran and Vaughan that the Geological Survey be augmented further by the appointment of Gee, who had returned from the Northern Territory, to the position of Secretary to the Geological Department. Brown asked for a Secretary

who is possessed of a knowledge of the working of the Department and is apt at compiling information and preparing it for publication... the absence of such assistance during the greater portion of the time I have been in office has been a great drawback.20

The demand for a Secretary exclusively for the Geological Survey was in response to the increasing pressure on Thomas Duffield which hindered his control of the Department and the Survey. Two new appointments were made in order to cope with the additional work. Louis Bronner, who had joined the Department as a Junior Clerk on 1 June 1900, had acted as Clerk and Receiver of Revenue from 1906 until 1 July 1911 when he was promoted to be Clerk and Accountant (the first such position in the Department). James Wainwright was appointed a Clerk on 1 September. This was of some assistance, but Duffield's workload in the Crown Lands and

20. ibid.
Immigration Office compelled him to ask Verran to relieve him of his duties as Secretary to the Minister of Mines, although it appears that he remained the Secretary for the Geological Survey. 21 He subsequently recommended that his former duties as Secretary to the 'Mines and Geological Departments' be taken over by Frederick Ward for the Department of Mines and Lionel Gee for the Geological Survey to ensure that the work of the two Departments continued satisfactorily. 22 Ward had been transferred from the Audit Office to the position of Chief Clerk and Registrar of Mines on 17 January 1898 following the death of William Crabb. In the same period, another vacancy arose when the Clerk and Draughtsman, William Richard Murray, transferred to the Woods and Forests Department on 1 October. 23 No replacements were made until the Department was reorganised after Brown's retirement.

Meanwhile, the anticipated revival of the mining industry had not eventuated despite Premier Verran, a former practical miner, being the Minister of Mines and the Labor Government having given greater attention to a wide range of minerals. The tests on the coal at Leigh Creek were not encouraging as its quality had not improved as expected when the deeper bores were sunk. The analyses of the coal showed that it was not good enough for steaming purposes and Brown recommended against the sinking of more bores. 24 Matthews also concluded that it was not worth spending more money when other samples of coal had been similar. The Port

21. ibid. Duffield to Verran 7.9.1911; see also SAA GRG 30/4/1912/21 Verran 5.1.1912.
22. SAA GRG 30/4/1911/42 16.10.1911.
Augusta Despatch suggested it would be a waste of money not to continue the tests after so much work had been carried out.\textsuperscript{25} Rather prophetically, the Despatch was afraid that it would be another twenty years before anything would be attempted again at Leigh Creek if the boring plant was removed.

In order to stimulate the industry, Verran implemented the Labor Party policy of nationalisation by acquiring the copper mines of Wandilta at Kadina, and Parramatta and Yelta at Moonta.\textsuperscript{26} Whereas previous Governments had encouraged private enterprise by erecting, and thereby controlling, cyanide works and smelters, and by substantial subsidies which were not usually recovered, the Labor Government became engaged in the competitive market. Private enterprise had demanded and willingly accepted Government hand-outs but it could not tolerate a Government-owned mine for the benefit of all in a business already regulated by the State. In fact, the apparent radical nature of Labor's actions was not far removed from previous Governments' involvement in mining activities or from other accepted State-controlled enterprises such as water resources and railways. That the Government did not propose to take over the coal at Leigh Creek, an unproven deposit, or more successful mines indicates that its policy was not to be effected as broadly as some thought.

\textsuperscript{25} Port Augusta Despatch 14.7.1911.
\textsuperscript{26} SAA GRG 30/4/1910/1042 Theodore Bruce & Company per Parramatta and Yelta Mining Company 23.11.1910, accepting the verbal offer of Verran for the Government to buy the mine at £6,000 including all leases (approximately 1,300 acres), plant and machinery.
During the debate on Estimates, the former Minister of Mines, Laurence O'Loughlin, said that mining was too risky a venture for the Government to undertake. Thomas Smeaton, however, said that private enterprise had failed to develop the mine at Yelta and he hoped that the Government would be able to do so. Archibald Peake preferred to question whether the Government had undertaken mining speculation without Parliamentary approval rather than discuss if the mines might be payable. Verran justified Labor's action because the Party had been elected on a policy which included the nationalisation of mines. The House did not alter the proposed allocation of £14,500 for the Parramatta and Yelta Mines.

The attention of the House also focussed on the problems of the Survey. Richard Butler complained, as he had the previous year, that the Government was multiplying too many positions by having an allocation for a Geologist, Assistant Geologist and now, a Geological Probationer. Verran and Vaughan commented that there was enough work for all the officers and that South Australia had lagged behind the level of other State's geological work because it had been impossible for Brown to do everything: "when the geological department was fully equipped it would be of great value to the State". Vaughan commented that the Geologist was still under the control of the Commissioner of Crown Lands but the Government would alter the existing

27. SAPD:HA 28.11.1911.
arrangement and place the Survey under the control of the Minister of Mines. Vaughan also revealed the name of the new Geologist: Leonard Keith Ward.29

The appointment of the relatively unknown Ward from interstate ahead of the most likely South Australian candidate, Herbert Basedow, was a controversial issue in Parliament and the press. The ramifications of appointing an appropriate candidate to such an important position transcended personalities and parochial interests. The Government was prepared to reorganise the Department and the opportunity was there for the new Geologist to make his mark, as Brown had done, on the State's development.

Basedow had left the State Public Service on 4 May 1911. Not only did he become the Chief Protector of Aborigines in the Northern Territory, but he was also appointed the Chief Medical Inspector, and Federal Geological Adviser. There was some confusion over his duties for the Federal Government. He had been told in Darwin that he was to operate under the South Australian Aborigines Act of 1911 but he was responsible to the Federal Minister for External Affairs.30 He was instructed to remain in Darwin and not to travel throughout the Territory to look after the Aborigines, and this also prevented him from doing worthwhile geological investigations. There were too many teething problems with his new job and Basedow resigned at the end of August.

29. ibid. Vaughan to Ryan.
Basedow returned to South Australia where in a personal interview with Verran, he was reassured that his resignation from the Northern Territory position would not disadvantage him in his application for the Government Geologist's position. However, when he was referred to Vaughan, he was told, in confidence, not to submit an application because he might be humiliated by being an unsuccessful candidate. This naturally surprised Basedow and his supporters for Vaughan had usually spoken highly of him. When he announced the Government's intention to advertise for the Geologist, Vaughan had said:

If a suitable man could be obtained in Australia he would be engaged. The general opinion was that a capable successor to Mr H.Y.L. Brown...would be hard to find...Had Dr Basedow not secured the appointment...in the Northern Territory the difficulty might easily be got over, but as it was, the Government were faced with a knotty problem.

Three months later, Vaughan told the Parliament that he was not altogether guided so much by Dr Basedow's vacillation in connection with his Federal appointment, but also by the fact that while Assistant Government Geologist he did not prove to be altogether satisfactory to the department.

The press sought an explanation of these contradictory statements, but Vaughan did not attempt to clarify the inconsistency, although he later suggested that the criticism about the appointment came from people likely to

31. ibid.
32. ibid. Wallis on behalf of Vaughan 4.10.1911.
33. ibid. Lucas citing Vaughan's statement of 6.7.1911.
34. ibid. Wallis.
be disappointed. Wallis, who spoke on Vaughan's behalf in the Legislative Council, said Basedow had not been considered good enough to be head of the Department because of an alleged unsatisfactory manner of conducting business and his general disposition such as his behaviour in resigning both the State and Federal appointments soon after commencing duty. In any case, the Government maintained that Basedow's previous appointment as Assistant Geologist could only be regarded as a stepping stone towards, but not a guarantee of, replacing the Geologist.

The most contentious issue of the whole affair had been the Government's unexplained decision to allow the University to advise it on the talents of the respective candidates. Several letters to the papers argued strongly that Brown should have had a greater say in the selection of his successor. 'The Tattler' suggested that the Government had abrogated its responsibility and allowed Vaughan to hide behind the fact that the University had, in effect, made the appointment. According to Basedow, 'The Tattler' and other writers of the time, this was simply a ploy by Vaughan which ensured that Basedow, who was involved in a scientific dispute with the geological staff of the University, would not be selected. This dispute, the 'Glacial controversy', had been conducted principally

35. *ibid.* HA Vaughan 9.11.1911; *Register* 11.10.1911; *Critic* 25.10.1911.
37. For example, *Register* 30.10.1911, 2.11.1911, 4.11.1911; *Critic* 1.11.1911.
38. *Critic ibid.* 'Round the town' by 'The Tattler'.


between Howchin and Basedow at various times in the preceding ten years and was to continue for at least another ten years.

Basedow's mentor, Professor Ralph Tate, had long been in dispute with Walter Howchin and "there can be no doubt that he and Tate were antipathetic towards each other and invariably took opposite sides in matters of controversy". Their dislike for each other extended beyond the bounds of scientific disagreements as the late Arthur Alderman recalled:

It is related that Tate's field excursion for students left the university in a horse-drawn "drag" with a keg of beer lashed on at the back! The Rev. Walter Howchin would certainly not have approved of this.

One major dispute concerned the subject of glaciation in South Australia which had aroused Tate's interest after he found evidence of glaciation near Hallett Cove in 1877.

At the completion of his undergraduate studies, Basedow had assisted Tate with the presentation of his classes and lectures while Tate was ill during 1900-01. Basedow recalled in 1911 that he had visited Tate several times a day to discuss geological matters while Tate was on his death bed. When Tate died, another of his pupils J.D. Iliffe, and Basedow had examined the area of Tate's study, the Sturt Valley, and compared Tate's lecture notes with his marginal comments in the Textbook of Geology by Professor Archibald Geikie and concurred with Tate that the formations

40. Ibid.
41. Register 19.9.1911 Letter to editor from Basedow.
were of the Pleistocene age. After corresponding with the Geological Survey of Great Britain, they concluded that Howchin's interpretation of the glacial deposits of the Cambrian age in South Australia was inaccurate. In April 1905, Basedow and Iliffe read a paper to a meeting of the Royal Society of South Australia.\(^{42}\) In this they discussed the formation of glacial beds and their disagreement with Howchin who, they claimed, had ignored the work of the Department of Mines, Brown and H.P. Woodward. Basedow alleged that Howchin had quoted freely from this paper and severely criticised it but, as editor of the _Transactions of the Royal Society_, he suppressed its publication.\(^{43}\)

The question of Cambrian glaciation was revived at the 1907 Australasian Association for the Advancement of Science Congress in Adelaide from 7 to 14 January.\(^{44}\) Several prominent figures in the field of Australian geology attended the conference: A. Gibb-Maitland (Government Geologist of Western Australia), Bernard Woodward (curator of the Perth Museum), L. Keith Ward (Lecturer at the Kalgoorlie School of Mines), Professor David and Dr Woolnough (Sydney University), Howchin, Mawson, Basedow and Matthews from Adelaide. The glacial issue was discussed and there were field trips to the various localities under question. Different opinions were expressed "and a temperature was now and then developed that could hardly be considered glacial".\(^{45}\) Howchin was supported by the University geologists while the views of the official

\(^{42}\) ibid. 5.4.1905.  
\(^{43}\) ibid. 19.9.1911.  
\(^{44}\) ibid. 15.2.1907.  
\(^{45}\) ibid.
geologists opposed his theory. The simmering controversy lost heat when Basedow went to Europe but it was regenerated after his return from Federal Public Service in the Northern Territory.

The Register for the period from September to November 1911 contained extensive correspondence on the glacial question. The principal correspondents were Basedow, Howchin and a pro-Howchin supporter, Dr Fritz Noetling who had lived in Tasmania for the previous six years. The introduction of Noetling into the controversy again raises the element of a conspiracy to prevent Basedow being appointed Geologist. Professor Hermann Klaatsch, one of Basedow's lecturers in Germany, suggested the possibility that not only was Noetling involved but also that the Chief Justice and Chancellor of the University, Samuel Way, and Howchin had collaborated with others to attack Basedow. Yet Basedow had his supporters, especially in the Public Service, and he was defended by men like Charles Edward Owen-Smyth, the Superintendent of Works and Buildings, who wrote encouraging Basedow to "keep it up...get matters settled about the Brown succession as soon as possible. People's opinion of Howchin does not amount to much". The 'Glacial controversy' continued into 1912 and it resurfaced intermittently thereafter, for example, in 1921, although

46. SAA PRG 324/2 pp.49-50 Klaatsch to Basedow 21.12.1911. Noetling was involved in a dispute with Basedow on another issue - the interpretation of fossil imprints in sandstone at Warrnambool, Victoria. (Register 19.9.1911.)
47. ibid.pp.51-52 Owen-Smyth to Basedow 19.9.1911.
Howchin's work was later found to be accurate in its interpretation of the glacial beds being covered by an overlay of Tertiary limestones.48

In a criticism of the method of appointing the Geologist, the Register highlighted the fact that the appointments to the geological staff at the University since Tate's death - Drs D. Mawson and W.G. Woolnough, Mr Benson and Mr Mahoney - had all been students at Sydney University.49 The only exception was Howchin who had been made a Lecturer in Geology and Palaeontology through the efforts of Samuel Way. Basedow had even heard in Sydney that a student of Professor David would be appointed ahead of him.50 A good deal of concern was expressed about the role of the University in making this appointment. It was widely known that members of the University staff wanted to appoint an Acting Government Geologist until Mawson returned from Antarctica and took up the position.51 'The Tattler' reminded the public of Mawson's errors of judgement in his report on the Elder Rock nitrate deposit when Brown had to warn the public after Mawson had unwisely encouraged people to invest money.52 The appointment was discussed by the University professors and lecturers, the Faculty of Science and University Council before being referred to Brown, Verran and Vaughan.53

48. Alderman, op.cit.
49. Register 30.10.1911.
51. Register 30.10.1911
52. Critic 1.11.1911.
53. SAPD:LC 6.12.1911. Interestingly, the School of Mines was not asked for its advice on either the new Geologist or the reorganisation of the Department.
The sudden, surprise resignation of Brown, the bias against Basedow, the role of the University and the unsatisfactory proceedings in the whole affair were thought to be important issues to resolve and led to calls in the press for an enquiry.\textsuperscript{54} The Register wanted a Parliamentary Select Committee to investigate the operations of the Department of Mines. Although no moves were made in this direction, the Legislative Council did pass the motion of Edward Lucas to give South Australians the prior right to appointments in the State Public Service if they were suitably qualified.\textsuperscript{55} The case of Basedow had been cited as the foremost instance of a qualified, knowledgeable, local man being beaten by an outsider.

The decision of Cabinet on 27 November to recommend the appointment of L. Keith Ward confirmed the suspicion that a Sydney graduate would become the Geologist. Not only was the Geologist from interstate, but the new Assistant Government Geologist, Robert Lockhart Jack, was also from interstate. This paralleled the original appointments of Brown and Woodward! Ward, the son of F.W. Ward, the editor of the \textit{Sydney Daily Telegraph}, was the then Assistant Government Geologist and Inspector of Mines in Tasmania. He had studied at the Sydney University under Professor David and he was a contemporary of Mawson and Woolnough.\textsuperscript{56} The appointment of Ward was more than just a case of providing a 'job for one of the boys'. He had been schooled in the same principles as the geologists at Adelaide University. Cooperation between the Survey and the University was likely to

\textsuperscript{54} Register 30.10.1911; Critic 1.11.1911.
\textsuperscript{55} SAPD/LC 13.12.1911.
\textsuperscript{56} Daily Herald 28.11.1911.
be facilitated if the geologists were trained in the same rather than conflicting schools of thought. Brown was a professional officer without the accompanying professional qualifications; he had been educated at the Royal School of Mines in London, but he was not a university trained geologist. An added factor in Ward's favour was that his duties in Tasmania included those of Inspector of Mines. This was to be important in the reorganisation of the Survey and Department.

Brown's original proposal to resign as from 30 November was extended to 31 December when he was due to commence six months leave of absence on full salary. However, he remained as Geologist until Ward's arrival on 10 January and he continued his relationship with the Geological Survey and Department of Mines, in the form of an 'Honorary Consulting Geologist', until his death on 22 January 1928. The termination of his employment did not elicit as much response as his departure on one year's leave in 1899. This could be attributed to the controversy over the appointment of his successor which distracted the public attention away from the loss of his services to the State. A small, private farewell dinner was arranged by Lionel Gee who had met Brown on his arrival in 1882 and who had continued to work closely with him. At this dinner, the Government presented him with a bound volume of all his official reports and casket containing his geological maps of the

57. SAA GRG 35/1/1911/1142 op. cit.; SAA GRG 35/1/1911/1243 3.7.1911; SAPP2:1912 'Blue Book for 1911'.
State and Territory. Both Vaughan and O'Loughlin were generous in the praise they heaped on Brown at this dinner on 8 December. He had worked under great difficulties but always with the State's interests in mind and his many successful achievements were to be his long-lasting monument.

Of course, not all were sorry to see him resign and no doubt many speculators were content with his departure. The editor of the Balaklava newspaper wrote:

The retirement of Mr H.Y.L. Brown... cannot but be hailed with satisfaction. His over caution has led the investor and prospector oftentimes into a labynynth of despair, and without unduly disparaging the wealth of technical knowledge possessed by Mr Brown, one can fearlessly say there was a lack of decision, and an entire absence of that forceful attitude calculated to inspire those of zealous and generous temperaments. He may have been reflective, he may have been classic, but scarcely any report I have read from his pen would create in one the slightest enthusiasm or induce one to invest a penny.60

But his withdrawn and cautious nature were among his greatest assets, for the role of a Governor official was to be fair, accurate, reliable, dependable and trustworthy. Brown was all of these and more. Judging by the reactions of the speculators to his few expressions of optimism, it was a good thing that he constantly warned against unwise investment. South Australia did not have glamorous mineral deposits, apart from copper, to sustain a rash of speculative investment and his characteristic and constant

59. The Public Service Review 18 January 1912.
60. Wooroora Producer 7.12.1911.
disparagement of 'shows', while often disappointing, was reliable and correct. The editor of the Advertiser in 1902 had summarised his capabilities:

The chief feature of Mr Brown's official character is his extreme caution. It may be wrong to describe him as a pessimist, but it is indubitable that he has never been known to exaggerate the promise of any property on which he has been called to express a judgement. He possesses a keen sense of responsibility, and while always conscientious, and never inaccurate, he has always striven to be calmly and dispassionately scientific, rather than to permit himself to be betrayed into the employment of tones or phrases calculated to create a baseless enthusiasm. His desire has been always to warn people from rash speculation, and during his long connection with the Mining Department no-one can truthfully say that he has ever allured investors into enterprises which have resulted in financial loss.61

Brown was an inveterate traveller and his pioneering explorations throughout South Australia and the Northern Territory should be considered of as much importance as those of the more commonly lauded, earlier explorers:

61. Advertiser 28.2.1902.
No single geologist has made such extensive personal contributions to the growth of our knowledge of Australian geology... His was the heroic age of geological exploration in a great part of the continent, and his were the first geological observations placed on record with regard to many of the remote regions of the interior.  

He traversed a great deal of land on camel and by foot on his lonely and hazardous trips in the company of an Afghan camel-driver, an Aboriginal guide or, occasionally, one or two white companions. The resourcefulness and courage of Brown were renowned and his preference for working in the field rather than behind a desk in the office afforded him ample opportunities to demonstrate these capabilities. The field trips and constantly changing Ministries provided Brown with a degree of security of tenure. In undertaking all responsibilities entrusted to him, Brown ensured that the Survey would be maintained. Politicians and private enterprise demanded prompt action but complete scientific reports could not be compiled without lengthy, detailed investigations and Brown refused to sacrifice accuracy for expediency. Consequently, South Australia has been in debt

62. Ward, L.K., 'Obituary Notice - H.Y.L. Brown' in Transactions and Proceedings of the Royal Society of South Australia 52:1928. Despite Brown's modesty, it is surprising that he has not been honoured in the same way as many other explorers. No monuments have been erected in recognition of his efforts and the geographical features of the State and the Territory bear little evidence of his numerous expeditions. One landmark - Mount Lyell Brown in the Ehrenberg Range (formerly the Magarey Ranges) between Lake MacDonnell and the MacDonnell Ranges in the Northern Territory - was accorded his name by William Henry Tietkens on 28.5.1889. (SAPP111:1889 'Journal of Mr W.H. Tietkens' Central Australian Exploring Expedition'.)
to this unpretentious man; the most significant testimony to his abilities is that his fieldwork has proved to be the basis of much of the subsequent geological work in the State and the Territory.
Chapter Seven: 1912-1944 A Consolidated Enterprise.

During the period of H.Y.L. Brown's service, the Geological Survey had been hindered in its operations by a lack of staff and facilities, and financial constraints. The Department of Mines had been similarly affected. After Brown's retirement, the Survey and Department were officially merged and a coherent hierarchy implemented. This, however, did not alleviate the problems which prevented the bureaucracy from operating more efficiently.

The Verran Government from 1910 to 1912 provided fresh leadership for the Department of Mines and encouraged the trend towards diversity in its operations and routine functions. The Labor Party stressed the value of a viable mining industry to the State's economy and emphasised the work of the Survey. The new Geologist, Keith Ward, indicated that he would maintain the scientific and practical aspects of Brown's work. The editor of the Advertiser saw the wisdom of this approach:

Mr Ward proposes to continue the geological surveys, partly with a view to a solution of "definite economic problems" related to mining, pastoral, and agricultural industries. It is to this practical work of the department particularly that Parliament will look for guidance in their endeavors [sic] to develop the resources of the State.

Keith Ward was more explicit than Brown had been as to the functions of the Survey and thereby related the Survey's operations more closely to the needs of the State. In March 1912, he presented the incoming Minister of Mines, Richard Butler, with the following list of the Survey's objectives:

1. The scientific and systematic examination of the geology of the State in general and of certain areas of special importance in particular.
2. The investigation of definite economic problems, undertaken with the object of affording assistance to the mining, pastoral or agricultural industries.
3. The guidance of the efforts of those who are endeavouring to develop the natural resources of the State.
4. The publication from time to time of the results of investigations, with such maps and illustrations as may assist to elucidate these reports.
5. The gathering, arrangement and maintenance of the type collections necessary for reference by the officers of the survey and general public.²

To ensure that the extension of geological knowledge was continuous, Ward suggested "that examinations of defined areas rather than of special individual localities should be regarded as the proper work of the geological survey".³ The conclusions reached by the Geologists would be drawn from as wide an area as possible given the limits of finance and staff numbers. He intended to enhance the geological knowledge of the State by examining the mining fields, investigating the underground water supplies, and by disseminating the information thus obtained.

Ward acknowledged that the thrust of the Survey's work would be directed towards the solution of economic problems in order to satisfy public demand. But he did not lose sight of the need for scientific investigations:

2. SAA GRG 24/90/7/1912/19 Ward to Butler 18.3.1912.
3. ARGSS:1912 p.3.
At the same time the economic discussions are to be based upon a sound scientific examination sufficiently complete for the immediate purposes for which it is undertaken and for purposes of correlation when circumstances may demand the investigation of neighbouring areas.\(^4\)

Ward realistically recognised that a complete, scientific survey of the geology of the State was beyond the scope and ability of the existing Survey.

The evolution of the Survey and Department had highlighted their functions as surveying and regulatory bodies respectively. Now, the official merger of the two enhanced the role and status of the Survey as Ward noted:

> With regard to the relationship between the mining and geological activities of the Department I would submit the opinion that these are, in the present state of development of the State, to be considered as portions of a composite whole rather than viewed separately as distinct branches. While the staff of geologists is so small it is inevitable that much of the geological work will be carried out in the direct interests of the mining industry.\(^5\)

The activities of the Geologists came under greater notice than those of the other officers of the Department because their duties appeared to be relatively more glamorous and essential to the development of the State.

* * * * * * * * * * *

Leonard Keith Ward and Robert Lockhart Jack were officially appointed to the positions of Government Geologist and Assistant Government Geologist on 1 January 1912. Jack, son of the former Queensland Government Geologist, Robert Logan Jack, had been employed by the Golden Horseshoe Estates Company at Kalgoorlie until 14

4. SAA GRG 24/90/7/1912/19 op.cit.
December 1911. He had also spent time in western China, Korea and the Transvaal. Ward, born in Sydney on 17 February 1879, had been educated at the Sydney and Brisbane Grammar Schools from 1890 to 1896 and was Assistant Government Geologist and Inspector of Mines in Tasmania from 1907. Prior to this, he had worked for the Broken Hill Proprietary Company at Broken Hill in 1903 following his graduation from Sydney University with an Arts degree in 1900 and an Engineering degree (in the field of mining and metallurgy) in 1903. He had been a lecturer in geology, mineralogy, petrology, and mining geology at the Western Australian School of Mines in Kalgoorlie from October 1903 until August 1907. In Tasmania, he had conducted investigations on the silver-lead, tin, and copper fields and also geologically surveyed the proposed railway route from Hobart to Mount Lyell from the view of the mining, agricultural and forestry interests. Both Ward and Jack were competent, professional geologists and their previous experiences provided the basis for the success of their appointments in South Australia. In particular, Ward's administrative skills were important in uniting the Survey and Department into the one organisation.

At the same time as the appointments of Ward and Jack, Lionel Gee was made the Chief Registrar of Mines and Recorder to replace Frederick Ward who became the Chief Clerk and Acting Secretary of the Survey and Department. From 5 January 1912, the Geological Survey was officially

6. SAA GRG 24/90/7/1912/5.
7. Register 17.6.1914.
placed under the Ministerial control of the Minister of Mines and Frederick Ward took over responsibility for the affairs of the Survey from Duffield, the Secretary to the Commissioner of Crown Lands. In addition, a Draughtsman and Mining Surveyor, Stephen Quintrell, was appointed on 9 January to replace William Richard Murray who had transferred to the Woods and Forests Department on 1 October 1911. The Verran Government was now implementing the promised reorganisation of the Department. Said the Premier in his official statement to the press:

For a long while the Mining Department has been in what I consider to be a disorganised state. Knowing that Mr Brown was going to leave the service of the State at the end of the year, I did not take any steps before, as Mr Brown was under the Commissioner of Crown Lands, and I thought it was not wise to disturb the arrangements during his term of office; but I was preparing to make fresh arrangements to bring the department under one head.

Verran, the Minister of Mines, recognised that the Survey had never officially been a part of the Department of Mines and that Brown had not been responsible to, or for, its administration. This had become more apparent when he had assumed the portfolio on 13 October 1910; from then, the Minister of Mines was classed as a separate portfolio to that of the Commissioner of Crown Lands who controlled the Survey.

10. Register 6.1.1912; SAPP2: 1913 'Blue Book for 1912'.
The Labor Government undertook the reorganisation in the expectation of pushing on a forward movement as regards the discovery and exploitation of the mineral resources of South Australia. We intend to bring this department to a high state of efficiency, thus following the lead of the other States.\(^\text{12}\)

This had also been the Government's intention in 1910 when it had appointed Basedow. The Survey and Department were understaffed and the augmentation of staff was a necessity in view of the Government's policy to promote and develop the mining industry. To this end, Keith Ward approached Verran with a request for a Geological Draughtsman to be appointed.\(^\text{13}\) The anticipated increase in the work of the Survey made it necessary to have such an officer continuously attached to the Survey rather than using Quintrell as both a Mining and a Geological Draughtsman. Ward sought a competent man with specific experience of geological maps, the use of colour schemes, and the photolithographic methods required for the reproduction of maps, drawings, and plans. From the three applicants, Ward chose Werner Walter Weidenbach, a temporary Draughtsman in the Survey Department. He commenced duty on 1 April.

Although additional staff was needed, the Labor Government's reorganisation took the form of a consolidation of roles rather than an actual increase in the number of officers in the bureaucracy. In fact, the changes to the organisation of the Department were not as far-reaching as the Government's political pronouncements had suggested. In overall terms, the number of permanent and salaried officers

\(^{12}\) Daily Herald 9.1.1912.
\(^{13}\) SAA GRG 24/90/7/1912/3 L.K. Ward to Verran 17.1.1912.
in the Department fell from fourteen throughout 1911 to twelve at the end of 1912.  

For example, Edward Grundy, who had been the Manager of the Mount Torrens and Peterborough Batteries since 1 February 1904 became the General Manager of the State Batteries and Cyanide Works on 18 January 1913. This position had been created in 1912 following the death of Gerald Tolmer, the Manager of the Tarcoola and Glenloth Batteries since 1 October 1907. The Geological Probationer appointed on 1 July 1911, Ralph Williams, was transferred to the Yelta Mine on 29 May to act as the Storekeeper there. He had completed his work in the Survey and Keith Ward saw no immediate prospects of providing him with additional work: the requests for assistance required the attention of senior staff only.

The Labor Party policy of reorganisation was part of its genuine attempt to assist the mining industry. The Government attended to the needs of the mining sector and the alterations to the structure and functions of the Department of Mines improved the Department's status and rank in the Public Service and, for a while, in the eyes of the public. Not only was the Government concerned with being seen to be doing something positive, but it also actually attempted to stimulate the industry. This became apparent by Premier Verran's assumption of the Minister of Mines portfolio, and the purchase of the Government Mines.

14. SAPP2:1912, 1913 'Blue Books for 1911, 1912'.  
15. File of employees in personal possession of Mr R.K. Johns, Deputy Director-General of Mines and Energy.  
16. SAA GRG 30/4/1912/446 Butler 29.5.1912.  
The Labor Government had been faced with a Legislative Council which was hostile to it throughout its time in office. In December 1911, the Council, in opposition to the supposed socialistic tendencies of the Government, refused to pass the Appropriation Bill. The issue of Government-controlled mines was barely mentioned in the debates on the Bill although the principles involved were an aspect of the Council's objections to Labor Party policy. The Council objected not so much to State monopolies but to competition between the State and private enterprise in matters such as the provision of cheaper housing. As a result of the Council's refusal to pass the Bill without amendments, Verran appealed to the British Government to assist him in the battle against the Council. This was refused and a dissolution of the House of Assembly took place on 16 January 1912. An election for the House and half of the Council was held on 10 February. The Labor Party lost office and was replaced by the Liberal Ministry of Archibald Peake. A former Commissioner of Crown Lands, Richard Butler, was appointed to the portfolio of Minister of Mines on 17 February.

There were few changes to the personnel of the Department from 1912 to 1919 and it remained understaffed and overworked. The activities at the Government Mines during 1912 necessitated the appointment of many temporary and daily-paid staff but few of these men were retained after the closure of the mining operations. Frederick Ward was officially promoted to be the Secretary to the Minister

of Mines on 29 May 1913. In the same year on 14 August, Quintrell, the Draughtsman and Mining Surveyor died and was replaced by Frank O'Brien on 11 December. Ward was forced to neglect aspects of economic geology because of the new Government's policy of economy. Once again, it proved to be a measure of false economy as the need for field investigations and clerical work was increasing. Ward continually appealed in the Annual Reports of the Geological Survey (ARGS) until 1916 and then subsequently in the Annual Reports on the Mines Department (AR) for additional field and office staff. Successive Governments generally paid little attention to Ward's requests and the Survey and the Department were left to make do. Not even the onset of World War I affected the number of staff in the Department although the amount and variety of work increased.

The Peake Government fell at the election in March 1915 and was replaced by a Labor Ministry under Crawford Vaughan. Reginald Blundell, who became the new Minister of Mines, proved to be a welcome change for the Department. He took an active interest in the Department's affairs and not only undertook various tours of inspection, but also sought the opinions of miners, prospectors and companies. The Register praised Blundell for bringing life to the Minister's position and for renewing the enthusiasm of the Department. When the Government increased the Department's finances in its first Budget, the preceding

19. SAA GRG 24/90/7/1912/29 F.C. Ward had asked Butler to confirm his temporary position as a permanent one on 17.6.1912.
21. Ibid. 13.4.1915, 2.7.1915; Register 15.6.1915; Advertiser 8.11.1916.
Minister, Richard Butler, criticised the move and said there was no reason for the increase.\textsuperscript{23} Blundell argued that the Department needed a more active policy after being starved of funds for the previous three years.

Ward had approached Blundell shortly after he took office with a proposal to create a new post in the Department.\textsuperscript{24} Ward's suggestion for the appointment of a Government Metallurgist arose from his observations during a geological inspection at Yudnamutana in the Flinders Ranges. Some copper mines, although continuing to be worked, were restricted in their operations by distance, high transport costs and the varying quality of ore. The normal practice in mining enterprises had been to mine the high-grade ore before exploiting the low-grade reserves. Often mines were abandoned instead of being thoroughly worked because technology had not advanced to the stage whereby low-grade ores could be treated profitably. Ward wanted a specialist to experiment, using hydro-metallurgical techniques, with the reserves of copper ore, in order to prevent future failures at these mines. He considered this the only option for a revival of mining operations in the far north.

Ward recommended that a metallurgist be appointed for two years and the advice of the University be sought for suitable candidates.\textsuperscript{25} He preferred this to the appointment of a specialist from overseas, or the transfer of Jack from "the normal work of a Department which is already

\textsuperscript{23} SAPD:HA 11.11.1915.
\textsuperscript{24} DM Letter Book 5 p.49 L.K. Ward to Blundell 11.5.1915.
\textsuperscript{25} ibid. p.55 24.5.1915.
undermanned". On this occasion, his appeals were successful, and Blundell accepted the University's nomination of Julian Dove Connor, a graduate of the Science Faculty, who commenced duty on 19 July. He was temporarily attached to the Survey, pending a further reorganisation of the Department. There were no complaints aired in the press about the role of the University in this appointment. Before going to the United States on 31 August 1915 to study the latest hydro-metallurgical plants operating there, Connor inspected some of the larger copper mines in the north of the State. He returned to Adelaide on 17 January 1916 and subsequently established a small experimental plant on Frome Road for his investigations into methods of treatment.

Some of the Department's operations were rearranged in 1915 because of the ill-health of the Chief Inspector of Mines, William Matthews. Ward and Jack were appointed as Inspectors under the Mining on Private Property Act on 8 July, and L.K. Ward, F.C. Ward and E.L. Grundy were made Wardens under the Mining Act in December. Matthews, who had reached the retirement age of seventy on 21 September 1915, had been allowed to remain in the Department for an extra year. But his slow recovery from illness forced him to resign on 29 February 1916.

26. ibid.
29. Register 4.3.1916, 8.3.1916; Advertiser 3.3.1916, 4.3.1916.
The possibility of promoting Henry Jones, the Inspector of Mines, did not arise. The Government advertised throughout Australia for another Chief Inspector to carry out the following duties:

a) The inspection of all mine workings and quarries... and the responsibility of seeing that the Regulations under the Mining Act are observed.
b) The supervision and guidance of work carried out with Government assistance... under the prospecting vote.
c) The examination of mines and the preparation of reports.
d) The registration and checking of plans of the working of mines.
e) The preparation of an annual report.
f) The performance of any other work which the Minister of Mines may instruct him to carry out.

Louis Winton was chosen from the many highly qualified applicants and he commenced on 26 May. Winton, who had been born in Sydney in 1877, was a graduate of Sydney University with a Bachelor of Engineering (Mining Engineering) degree. He had received practical training and extensive experience at Broken Hill and Cobar in New South Wales.

Matthews' resignation provided the opportunity for the Survey to consolidate its position of influence in the Department. Keith Ward took over Matthews' role as Supervisor of Boring Operations, and he was also appointed Director of Mines in order to supervise all of the Department's technical operations. The delineation of responsibilities was more clearly defined and five distinct branches - Geological Survey, Inspection of Mines and

32. AR:1916. This was the first annual report issued by the Department. All previous reports dealt with the Geological Survey. Ward's appointment dates from 9 March 1916 - book of employees in possession of Mr R.K. Johns, Deputy Director-General of Mines and Energy.
Quarries, Metallurgical Laboratory, Government Batteries and Cyanide Works, and Diamond Drilling Operations - made up the Department. But an expansion of the Department's operations and the ability to carry out its duties were still hampered by financial constraints. During this year, the offices of the Department were relocated on the fourth floor of the Education Department Building in Flinders Street. The previous offices in the Treasury Building were overcrowded. Ward had urged subsequent Governments to allocate more suitable accommodation to the Department.

The Department advertised for an additional Geological Surveyor in 1917 to assist Weidenbach and to enquire into sources of materials for road-making.33 A suitable candidate did not apply although the position was advertised a second time at a higher salary and the work on road construction was not completed.34 On 14 June 1917, Keith Ward was appointed the official head of the Department although he had adopted this role since he joined the Survey.35 Despite his additional duties, Ward received the same salary - £800 a year - as Brown had before him.36 The Metallurgist's position was brought under a Professional Division Classification and made a permanent post on 20 July. On 1 August, the Clerk since 1911, James William

33. ibid.:1917.
34. Advertiser 5.5.1917 at salary of £300 p.a.; ibid. 23.6.1917 at £400 p.a.
36. This was raised to £825 on 1.9.1920 after a change in Public Service Classifications. Further increases were granted on 1.7.1923 (£850), 1.7.1925 (£900), 1.11.1926 (£950). But by 30.6.1934 his salary had been reduced to £800 due to Government policy in the Depression. His salary increased as the State gradually recovered from the worst of the Depression and by 30.6.1938, Ward was receiving £1,071 7s 3d p.a.
Wainwright was transferred from the Department. Another change of note occurred on 8 August when the first female, Dorothea Alice Jacobs, commenced duty as a stenographer and typist at twenty-five shillings a week. This temporary appointment was made permanent on 1 October 1922 at a salary of £132 a year; she remained with the Department until 1933. Strictly speaking, she was not the first female to work for the Department since Mrs Elizabeth Martin had replaced her husband as Caretaker at the Sliding Rock Mine on 1 May 1914. This temporary arrangement which carried a wage of ten shillings a week was continued until 31 October 1926.

In the meantime, the Labor Party had divided over the issue of conscription for war service and the Government was replaced in July by a Liberal-National Labor coalition under Peake. John George Bice, a Liberal Member of the Legislative Council, was Minister of Mines from 14 July 1917 to 19 December 1918 when William H. Harvey, a National Labor Party MLC, replaced him. The new Government deferred appointing extra officials. When the highly regarded Draughtsman, Werner Weidenbach, resigned on 28 February 1918 to enter private practice, Ward was unable to convince the Cabinet to appoint a successor for this most important position. Although he approached the Minister on several occasions in 1918 and 1919, and was supported by the Public Service Commissioner, Ward was continually refused

37. SAA GRG 30/4/1918/103 Weidenbach resignation.
permission to replace Weidenbach. The Department was forced
to use the valuable time of its senior officers to undertake
draughting.38

The arrival of the new year in 1919 heralded several
more administrative changes for the Department. Alfred
Matthews and Charles Duffield who had been the Foremen of
the Department's Boring Plants since November 1904 and
November 1906 respectively, were placed on the salaried
staff of the Department from 1 January 1919.39 They had
originally been appointed on a temporary basis but Ward
suggested that because they did some clerical work and had
been with the Department for so long, the Government should
create the positions of 'Engineer for Boring' and transfer
them to the permanent staff.

The Peake Ministry's policy to 'hang on and carry on',
as one writer described it, was confirmed when it refused to
replace Frederick Ward who retired as Secretary on 30 June
1919 at the age of seventy.40 The Government hoped that his
duties would be transferred to the other officers without
any loss of efficiency.41 Thus the Executive Council
approved the allocation of Ward's duties as Secretary to the
Minister to Keith Ward, Chief Clerk to Louis Bronner, and
Warden to Louis Winton.42 Robert Jack became the Deputy
Government Geologist, Deputy Director of Mines, and Deputy
Supervisor of Boring Operations at the same time. Frederick
Ward criticised the Government's policy of restricting the

38. AR:1918.
40. Register 30.6.1919; for criticism of policy, see letter
to editor from C.L. Gray, Kadina in Daily Herald
19.10.1918.
41. Register 5.7.1919.
42. Ibid. 30.6.1919.
amounts spent on the mining industry: he urged the appointment of another two geological field surveyors as a means to assist the Department.43

The inadequate staffing arrangements hindered the efficient and economic operation of the Department and the consequences were to be felt throughout Ward's period as Director of Mines and Government Geologist. The level of staffing did not fluctuate to any great extent during Ward's time. For the most part, less than fifteen permanent officers constituted the Department. There were slight increases in 1935 and 1937 when the employment of additional clerical staff raised the level to eighteen. The separation of existing duties and the provision for additional officers had raised the staffing level to twenty by the time of Ward's retirement in 1944. But retirements, resignations, promotions, and a delay in filling the vacancies meant that by the middle of that year only twelve of the positions were manned.44

Ward continued to voice his concern at Government refusals to provide additional staff. In his responses to two surveys on efficiency in the State Public Service, Ward stressed that there were no superfluous officers in the Department and that much of the investigative work was not

43. Advertiser 10.7.1919.
44. AR:1944.
completed because of the lack of staff.45 When Julian Connor resigned on 31 January 1922, the Barwell Government did not attempt to fill the vacancy because the general attitude of the industry towards the Metallurgical Laboratory had been unenthusiastic.46 Fortunately, not all positions were considered to be dispensible and the Government advertised for a new Inspector of Mines and Quarries immediately after the retirement of Henry Jones on 31 December 1923. Jones had been due to retire in January 1921 but the Government had extended his term of service in the Public Service several times. Although Jones gained the respect of the mining community during his sixteen years with the Department, he did not attract the attention of the general public in the way Ward, Jack, Matthews, and Winton had. The new Inspector, John Pearson, commenced his appointment on six-months probation, on 5 March 1924. Pearson was a knowledgeable mine manager with varied experience of different localities and techniques, and his expertise was to be of considerable value to the Department.

45. DM Letter Book 7 Ward to Premier Barwell 7.10.1920; ibid. 8 p.93 Ward, 18.8.1921. In the 1920 report Ward suggested several procedural changes such as allowing an officer of the Department to control some matters of administration instead of referring them all to the Minister, and allowing the Inspectors to visit other States to investigate the operations elsewhere. Another aid to efficiency involved a simple remedy: "The conduct of ordinary departmental routine might be assisted, in my opinion, by issue of a brief set of regulations dealing with matters of attendance, discipline. I would also suggest that stringent rules be enforced to prevent the waste of time by itinerant vendors of sweets, soap, pictures, stationery, tickets for entertainments, etc. It is customary in other States to exclude such persons from the public offices altogether".

46. AR:1921.
The Department lost the services of two other long-serving officers in 1924. Lionel Gee retired from the Public Service after fifty-four years of duty. He had joined the Department in 1896 and had reached the position of Chief Registrar and Recorder when he retired on 30 June. Gee had been associated with the development of mining in South Australia and the Northern Territory for so long that he had come to be regarded as an institution. When he had announced his retirement, the Register commented with mock disbelief that: "somehow or other we seem to have drifted into the idea that Mr Gee, having become such an identity of the service, would never resign". 47 Certainly no one else was as familiar with the legislation and regulations for the control of the industry. Louis Winton incorporated Gee's duties as Recorder into his role as Chief Inspector. Louis Bronner, another long-term employee, took on the functions of Chief Registrar as well as his duties as Chief Clerk and Accountant. 48 On 31 August, two months after Gee's retirement, Malcolm Trowbridge the Deputy Registrar and Clerk, resigned. Trowbridge had been in the Department for thirteen years and he also was not an easy man to replace. The temporary Deputy Registrar and Recorder, Lionel Campbell, was considered unsuitable for the position and so Vincent Geraghty, a Junior Clerk in the Department, was promoted to the position on 1 June 1925; Charles Stanley Inns replaced Geraghty.

47. Register 30.3.1923.
During 1925, Ward and Jack went to Melbourne for the Interstate Geological Conference which discussed proposals to standardise scales, and colours on maps, methods of research and so on throughout Australia. The Conference also compared the structure of the State Geological Surveys, and concluded that the South Australian Survey needed to be strengthened because of the nature and amount of geological surveying to be carried out. The Government ignored the recommendations of Ward and the Conference on the usual grounds of exercising financial restraint. Ward again approached the Minister of Mines in the following year to request additional staff for the Department. Ward stressed that the health and safety of the miners were at stake if left in the control of the management at the mines particularly in the quarrying industry which had undergone a rapid expansion. Ward was supported in his application by John William Wainwright, the Inspecting Officer for the Public Service Commissioner. The Minister on this occasion, Andrew Kirkpatrick, approved of Ward's request and Horace Cornelius joined the Department on 20 September 1926.

In the subsequent four years, during which South Australia plunged into the world-wide depression, the only changes in personnel or positions were the death of Brown, the Honorary Consulting Geologist, and the re-appointment of Werner Weidenbach as a temporary draughtsman. Brown passed away on 22 January 1928, and his death was mourned by the State and his scientific colleagues. South Australia, and

indeed Australia, owed a large debt to Brown whose heroic excursions into the interior had laid the groundwork for geological knowledge of the State. All geologists since Brown have depended on the information he gathered and reproduced during his years as Government Geologist. His influence as a consultant to the Department was less pronounced, but he had already laid the foundations upon which Ward built. Brown's lasting achievement, the geological map of 1899, was revised shortly before his death by Weidenbach, who was temporarily employed by the Department for this express purpose. There was a backlog of draughting work because Weidenbach had not been replaced after his resignation in 1918. He was able to chart a great deal of information about the geology and underground water of the State which had been constantly sought by the Government, other departments and the public. The Geologists had not been able to devote sufficient time to the preparation of this material. So Ward retained his services until 1932, when he retired because of ill-health; this time he was replaced.

A major change took place at Easter in 1931 when Robert Lockhart Jack resigned to join the BHP Company. Jack's main work on coal, iron ore, and underground water supplies - he had written thirteen of the fifteen Bulletins of the Geological Survey issued by the Department during his eighteen years as Assistant Geologist - had made him well known to agriculturalists, pastoralists and the mining community.52 His wide-spread travelling through the State had given him an extensive knowledge of the State's

52. Advertiser 28.3.1931.
resources and he was often consulted for advice on the economic development of deposits. Louis Winton became the Deputy Director of Mines, and Ralph Segnit, an Assistant Mechanical and Electrical Engineer in the Architect-in-Chief's Department, was appointed to the recreated post of Assistant Government Geologist. Segnit, a returned soldier, had studied at the local School of Mines as well as at Oxford University; he had graduated with degrees as a Master of Arts, and a Bachelor of Science for which he had specialised in geological research. Ward had been previously acquainted with his work; for example, Segnit's paper on 'Geological Notes on the Flinders Ranges' had been read at a meeting of the Royal Society over which Ward presided in 1929. Though not criticised at first, the appointment of Segnit later led to another controversy between the University geologists and the Department but Ward generally seems to have remained aloof from this.

The Department's concern with the water supplies of the State was emphasised when it acquired control of the water-boring plants from the Public Works Department. The Engineer-in-Chief, John Henry Eaton, rearranged the boring operations undertaken for the Engineering and Water Supply Department (E&WS) and the Department of Mines in 1931. Eaton urged the Commissioner of Public Works to transfer the equipment:

53. ibid. 25.3.1931.
54. ibid. 30.4.1931.
55. ibid. 12.4.1929.
At the present time there is very little boring done, or contemplated, so far as this Department is concerned, and as the Director of Mines has a qualified boring staff, I think it would be an advantage to place our portion of the work under him also.56

The transfer of these duties did not substantially affect the Department's structure, or the conduct of its boring operations. Duffield became the Chief Engineer for Boring in 1933 after his position in the Public Service was reclassified, but Ward remained the Supervisor of Boring Operations.57 However, the additional workload for the administration required the provision for extra clerical assistance and Joseph Wright was transferred to the Department from the E&WS in September 1931.

The Depression of the 1930s, which had actually commenced in South Australia by 1927, renewed interest in the mining industry. Particular attention was paid to prospecting, the development of gold deposits, and the attempted revival of the copper industry. The increased activities in these areas placed further demands on the Department. For example, many parcels of ore were now being sent to the Cyanide Works and the General Manager of the State Batteries, Edward Grundy, could not cope with the demand.58 Ward pointed out that Grundy was due to retire in five years and that this was sufficient time in which to train a replacement for him. The Government saw the sense of Ward's suggestion and an Assayer and Assistant Manager, W.L. Tucker, was employed from 1931 until he resigned in

56. SAA GRG 23/1/1930/64 Eaton to J.McInnes (CPW) 24.11.1930.
57. AR:1933.
1934. Mr Ross Love was then appointed temporary Assayer for the Mount Torrens Battery only. When Grundy retired in October 1936, Winton officiated as the General Manager.

John Pearson also retired in October 1936 although he had reached the age for retirement in August the previous year. His replacement, Mr Albert Thomas Armstrong, had a wide range of practical experience in mining in New South Wales, New Caledonia, and Victoria where he had gained a mine manager's certificate of competency for alluvial and lode mining. Three years later, after the death of Louis Winton on 3 October 1939, Armstrong was promoted to the position of Chief Inspector of Mines and General Manager of the State Batteries, but not Deputy Director of Mines. Another Inspector of Mines and Quarries was not employed to fill the position vacated through Armstrong's promotion. Several junior officers were promoted at this time, but there was not a general redistribution of duties.

The health problems associated with the industry were emphasised throughout 1939 when the Department found itself undermanned because of ill-health. The Minister of Mines, George Ritchie, had fractured his thigh in May, Albert Blesing, the Acting Minister had a severe bout of influenza, and Ward underwent two major operations for a long-term illness while Winton had been in hospital. Ritchie resigned from the Ministry on 8 August, and Lyell McEwin became the Chief Secretary, Minister of Health and Minister

59. AR:1936.
60. News 15.6.1939.
of Mines on the eve of World War II. The Engineer for Boring, Alfred Matthews, was forced to resign in September because of ill-health.

The difficulties facing the Department had not gone unnoticed and Arthur Christian asked Premier Thomas Playford "for a report as to the adequacy or otherwise of the present staff... with a view to the possibility of augmenting the staff by training further geologists". Ward promptly reported to Blesing and recommended that an additional geologist be appointed and that "the position be advertised throughout Australia since... a suitable and properly qualified man will [not] be obtainable in this State". However, the Government was slow to respond and Robert Richards raised the matter again in Parliament. Playford then obtained the advice of the Public Service Commissioner who recommended that an Assistant Geologist be appointed to alleviate the increasing burdens on Ward and Segnit. He also advised that the position should be advertised throughout Australia, and that the candidates be considered in relation to the future requirements of the Department for Ward was due to retire within five years.

The position was advertised in September and nineteen applications were received. Ward and the Public Service Commissioner chose David Evan Thomas, a Field Geologist in the Victorian Department of Mines, and his appointment was

62. AR:1939.
63. SAPD:HA 19.7.1939.
64. SAA GRG 24/6/1939/975 Ward to Blesing 24.7.1939.
65. SAPD:HA 3.8.1939.
gazetted on 19 October. But Thomas declined the opportunity after the Director of the Geological Survey in Victoria, W. Baragwanath, intervened on his behalf and his salary there was raised to £507 a year. Fresh applications were not called for and Norman Henry Fisher, Government Geologist in New Guinea, was chosen as the next best candidate to Thomas. However, Fisher also declined the appointment because he had commenced a major project after being informed that he had not been accepted on his original application. The position was readvertised in February 1940 and the selected candidate, Samuel Benson Dickinson, accepted the Government's offer and commenced duty on 27 May 1940.

The appointment of Dickinson did not please the idiosyncratic Segnit who "studiously avoided him and... had not spoken a word to him in [his first] six or seven months... in the Departmen". In 1942, Dickinson was promoted to the position of Deputy Government Geologist and Deputy Director of Mines and this further soured relations between them. The young graduate had been given status over and above Segnit and was now in line to replace Ward. Segnit unsuccessfully appealed to the Classification and Efficiency Board against the promotion. According to Playford and McEwin, Segnit was considered an excellent

67. ibid. 6.10.1939.
68. DM 1978/562 J.L. Knight to C.D. Branch 1.7.1981. However, he did reapply for the position in 1956 when the Director resigned.
69. SAA GRG 24/6/1939/975 op.cit. 3.1.1940.
70. ibid. Fisher to Hunkin 20.1.1940.
71. ibid. Hunkin to McEwin 10.4.1940.
73. SAPD:HA T. Playford 29.9.1942.
practical man but unsuited to the top position in the Department because he lacked the necessary professional qualifications.74 Although Segnit had faith in his geological knowledge, his expertise was often questioned by the geologists, particularly Mawson, at the University.75 Ward, who had entrusted Segnit with very important work such as the mapping of the State's iron ore deposits, later expressed a want of confidence in the work of Segnit.76 However, the Public Service Commissioner had previously reported that Ward, Winton and Segnit were "of the standard of education and training necessary for the effective administration of the department and the performance of the more important technical work".77 It is likely that in addition to the discontent over the quality of his work, Segnit's dour personality, unfriendly disposition and anachronistic mannerisms were considered unsuitable for such a position of responsibility.78 The antipathy towards Segnit paralleled the treatment of Basedow thirty years earlier. The similarities included the role played by the University, the appointment of a non-South Australian, the personality of the individuals, and the conflict over matters of geological theories and practice. As a result of this affair, Segnit transferred to the E&WS Department in 1942 but he was involved in numerous disputes for several more years with the Department of Mines. In 1947, this culminated in a major controversy during which Dickinson

78. Interview with Johns op.cit.
submitted his resignation to the Government. He subsequently withdrew his resignation and remained as Director of Mines.

The Department of Mines employed a temporary Assistant Geologist, Ted Broadhurst, from April 1943 to maintain the schedule of investigative work. Segnit's work in the E&WS dealt with geological aspects and problems of the water supply in the State, but this did not mean that these duties were no longer part of the function of the Department of Mines. Ward and the Engineer-in-Chief, Hugh Angwin, had made a verbal agreement in 1942 to restrict the nature of Segnit's duties, to exchange information and to avoid overlapping the work of each Department. However, the agreement was not strictly enforced and this led to dual control of this important aspect of the State's geological work.

The onset of World War II in September 1939 did not have a detrimental effect on the Department's personnel or activities because most of its work directly or indirectly contributed to the war effort. Only a few junior officers enlisted in the armed forces and the Department maintained its staff level, albeit too low for so many years, throughout most of the war years. But the Department declined to a low ebb in its jubilee year when Keith Ward retired after reaching the statutory retiring age of sixty-five years in 1944. The final stages of Ward's thirty-two years of service were concentrated almost solely on office

81. DM Letter Book 18 p.171 Ward to Hunkin 18.12.1941. 'Man-power survey of the Department of Mines'.
work because his fieldwork had been severely restricted by a debilitating illness. Before commencing his retirement, Ward took his long service leave on 17 February—eleven days short of the fiftieth anniversary of the Department.82 Dickinson was promoted in March to replace Ward as Director of Mines, Government Geologist, Supervisor of Boring Operations, Warden, and Secretary to the Minister. Dickinson, who had completed a mining engineering degree at Melbourne University, had been an Assistant Geologist to the Commonwealth Government for the three years from 1936 to 1938.83 His practical work had included a period of service with the Commonwealth geophysical survey team.84 The promotion of the young, energetic and highly-qualified Dickinson heralded a new and exciting phase in which the Department of Mines finally achieved the important status it had desired for so long.

In August 1944, Ward was appointed a Consulting Geologist to the Department and he retained this position until his death on 30 September 1964. As an experienced and capable geologist, Ward had acquired the respect and confidence of his political masters, fellow scientists, the mining industry, and the community at large. Premier Thomas Playford once tried to trick Ward by claiming that he had found gold on his own property at Norton Summit in the Adelaide Hills.85 But Ward told Playford that this was unlikely because he not only recognised the specimen as one from Kalgoorlie, but he also could tell him in detail which

82. Advertiser 16.2.1944.
83. Ibid. 23.3.1944.
84. Ibid. 21.2.1936.
85. Interview with Playford op cit.
shaft and level it had come from! He was renowned as a congenial and humorous personality who enjoyed retelling amusing stories whenever the opportunity arose. In this respect he differed greatly from H.Y.L. Brown as a correspondent of the Register once noted:

as I scribble this record I hear the cheery laugh of... Dr Keith Ward and I recall the tremendous contrast in personality between him as one of the wittiest members of the congress, and always the circle [sic] of a group of chatting friends, and his predecessor, dear old H.Y.L. Brown, who was so sparing of his words as to have carried the title of "Millionaire of Reticence", just as Keith Ward has become known as a "Croesus of Cordiality".

Though he was more verbose than Brown, Ward shared his modesty and desire for anonymity. When a reporter of the Advertiser interviewed Ward about the State's water resources in 1913, he recorded that Ward had a 'naturally retiring disposition' and was an unassuming and honest man. The State Archivist, G.H. Pitt, attempted to compile a biographical register of the heads of Departments in the 1930s, and he found the same qualities were exhibited by Ward who stubbornly resisted Pitt's request. Eventually Ward submitted a photograph of himself and a brief list of personal details which he wanted "buried so deeply in the archives that they will never be found and brought to light... [because] personalities are not agreeable to one whose training has been such as to place stress on the

86. Interviews with Playford, McEwin, Johns op.cit.
88. Advertiser 25.10.1913.
impersonal as against the personal". Naturally there were serious traits in his personality: "he was a man to whom pretence was anathema, he took quiet delight in cutting the self-important down to size, and in bringing to light the true facts of any situation".

Ward supervised a diverse and expanding range of operations and interests during his thirty-two years in office. The following brief list of his professional achievements is testimony to the volume and quality of his work, and the high regard which was held for his ability as a geologist. He was responsible for the revision of Brown's geological map of the State in 1914 and 1928; from 1925 to 1931 he was Geological Adviser to the Federal Government on water supplies in the Northern Territory and Central Australia; from 1927 to 1930 he was Consultant Geologist to the Federal Government on mining in the Northern Territory; he was awarded a Doctorate of Science from the Adelaide University in 1926 for his thesis on the geological history and science of Central Australia; from 1928 to 1931 he was one of the State representatives on the Executive Committee of the Imperial Geophysical Experimental Survey; a member of the Federal Government's Royal Commission on the Coal Industry 1929 and 1930 and the Commonwealth Oil Advisory Committee from 1936 to 1940. Among his special visits to the north were trips with Professor T.G.B. Osborn and a

89. SAA B6081 op.cit. Ward to General Secretary, Public Library, Museum and Art Gallery 22.6.1932.
visiting explorer, Vilhjalmur Stefansson, in 1924\textsuperscript{92}, the
Victorian Railways Commissioner in 1927\textsuperscript{93}, a 2-month
inspection of railways, roads, stock routes, and water
supplies by an official Commonwealth party in 1928\textsuperscript{94}, and a
journey to report on the establishment of an ore-treatment
plant at the Tennant Creek Goldfield in 1937.\textsuperscript{95}

Ward was willing to be a consultant to the Commonwealth
Government. He was conscious of national needs and he
stressed the value of having a Federal Geological Survey, in
addition to the State Surveys, to cover the whole country.
The suggestion for the establishment of a Federal Survey had
been made at the 1925 Interstate Geological Conference and
was reaffirmed at subsequent meetings.\textsuperscript{96} Some might
consider that "Ward's support of the proposal was largely
due to the fact that South Australia had little to lose by
the plundering of its mineral resources".\textsuperscript{97} Or the
eagerness to assist the Commonwealth could be interpreted as
confirming a belief in some local circles that the South
Australian Government and Department of Mines were not
interested in developing South Australian mines and
minerals. But South Australia had much to gain by having a
Federal Survey because its own Survey was understaffed and

\textsuperscript{92} Advertiser 17.7.1924; Register 21.7.1924.
\textsuperscript{93} AR:1927.
\textsuperscript{94} Register 13.6.1928.
\textsuperscript{95} SAA GRG 24/6/1937/211 Prime Minister Lyons to Premier
Butler 8.3.1937.
\textsuperscript{96} SAA GRG 24/6/1932/1006 Ward 16.9.1932.
\textsuperscript{97} Alderman, A.R. 'The Development of Geology in South
Australia: A Personal View' in Records of the Australian
Academy of Science 1:2 1967 p.38.
could not undertake the purely scientific pursuits. The proposal reflected the growing trend for the Federal Government to promote a centralised and national bureaucracy.

Ward was associated with numerous societies and had long-standing memberships of the Australian National Research Council, Australasian Institute of Mining and Metallurgy, Royal Society of South Australia (on Council 1924-27, 1933-35, Vice-President 1927-28, President 1929-30), Royal Geographical Society of Australasia-South Australian Branch President 1931, the Board of the Faculty of Science at the University, and the Council of the School of Mines and Industries from 1920. He attended most of the Interstate Artesian Water Conferences (Chairman, Sydney 1928), Interstate Geological Conferences, and the Pan-Pacific Science Conferences. He was a regular participant at the meetings of the Australasian Association for the Advancement of Science and was President of the Geology and Mineralogy Section of the sixteenth meeting held in Wellington, New Zealand, in 1923. Given his commitments to South Australia and Australia, it is not surprising that he was less involved with the international scene; he was a Fellow of the Geological Society of America, and the Society of Economic Geologists of America.

The Royal Society of New South Wales awarded him the W.B. Clarke Memorial Medal in 1930 in recognition of his geological research, particularly on the mining geology of Tasmania and South Australia, and his reports on artesian water problems and the underground water supply in South,
Central and North Australia. He received an Imperial Service Order in 1942. The Royal Society of South Australia recognised his services to geology in 1955 by awarding him the Verco Medal and electing him an Honorary Fellow of the Society.

The societies and committees were an ideal forum for an exchange of ideas and information on all aspects of science and development on a regular and broad basis. Ward was influenced by, and was an influence on, the meetings and the professional relationships and friendships formed through the societies. His experiences of the development of mineral industries in other States enabled him to recognise the dilemma facing South Australia. The State was deficient in significant industrial developments and did not have a substantial or highly productive mining industry. Thus Ward was prepared to forego the purely scientific research of the Survey in favour of investigations based on economic considerations for the development of the State because "the contribution of the mineral industry towards every part of the fabric of modern civilisation is intimate and essential".

Ward's philosophy on the relationship of the State, economic development and the mining industry was expounded on several occasions. He firmly maintained his beliefs and the following extract from one of his earlier reports in 1918 characterises his position:

98. Advertiser 23.5.1930.
It may be stated without fear of contradiction that the modern attitude of the State towards its mineral resources is to regard them as the raw materials of industry rather than as a direct source of Revenue by taxation. It is considered that minerals are public property and as such must be used and regulated in such a manner as to best serve the interests of the community... the development of mineral resources leads to industrial and national prosperity... All that can be done to increase the development of our domestic mineral resources will foster the development of our native industries. These will provide occupation for an increased population. The growth of the population will be accompanied by a still greater production of minerals and the indirect benefits to the State will result here as in other countries which have passed through this stage in their national growth.

Ward elaborated upon his ideas in Departmental reports on matters of general policy and on particular problems facing the industry and its advancement. Ward's notions indicated a change in perception about the development of resources and their role in the South Australian economy. He emphasised that mining alone could not 'save' the State and that there was a need to attract industries which could use the mineral resources.

World War I provided opportunities to promote the notion of industrialisation and development for the State's benefit. For example, Ward was head of the Mineral Industry Committee which was one of five committees set up by the Advisory Council of Science and Industry of South Australia in 1918. The interruptions to the traditional trading ventures on the international market placed importance on expanding or creating domestic markets and local industries either to supplement or to replace the overseas sources of

100. DM Letter Book 6 p.95 3.5.1918.
supplies. The example of Germany's successful economic, industrial and military expansion impressed Ward and Blundell who emphasised that this had occurred through her attitude towards the industrial sciences. Ward stressed that the Australian States had to develop the mineral deposits to their maximum potential to assist the progress of industrial independence and he recommended further geological mapping to provide more knowledge of the resources of the State.

Ward also proposed that the Department conduct a census through the Chamber of Manufactures to gain an overview of the demand for minerals, particularly those of the non-metallic group. This project was enlarged to consider all possible details about raw minerals including local and imported supplies. Blundell arranged a meeting in September 1915 with Ward, Dr W.A. Hargreaves, the Government Analyst, and representatives of the Chamber of Manufactures, A.H. Dobbie, J.W. McGregor and H.E. Winterbottom, when the need for a department to control industrial chemical research was outlined and accepted. A Department of Chemistry was subsequently established under Hargreaves to conduct systematic research into the development of South Australia's natural resources. Ward noted that the industry had continually sought highly valued minerals, but now the State had to look at other less profitable minerals for the

101. ibid. 7 p.243 14.10.1920 'Notes on Development in the Mining Industry during and after the War' by Ward.
103. ARGS:1915.
104. Ibid.
106. Register 20.9.1915.
benefit of local industries. Investors were now reluctant to speculate on new interests although the development of non-metallic resources would provide stability for the industry.

The University of Adelaide conducted a series of six lectures in 1917 on the development of the State by the efficient application of science to industry. Ward presented a lecture on 11 September entitled 'Geology in the University and in the service of the State' in which he continued to push the view that industrial growth could be achieved through South Australia's own natural resources. He argued for educative programmes to persuade the community to depend on expert knowledge and he suggested that the State inculcate its citizens with sensible, scientific attitudes towards development. This was in keeping with the emergent intellectualism in South Australian society and the accompanying efforts to educate more sections of the community. Ward's approach was to continue the trend towards the diversity in mineral interests which had been apparent since the turn of the century:

as far as the mining industry is concerned the industrial developments that have arisen out of the conditions imposed by the war have been chiefly in the expansion of those branches of the industry that had been previously in existence.

107. ARG:1915.
108. Advertiser 11.10.1918.
109. Register 31.5.1917.
110. AR:1917.
But the decline in traditional mining pursuits in South Australia and the impact of World War I ensured that Ward's policies for development dominated the subsequent activity of the Department which was directed towards industrial expansion.

Ward lectured to the South Australian Chamber of Manufactures on 7 August 1922 and stressed the need for wise investment, the prevention of wasteful expenditure and a closer working relationship between the manufacturer and the mining industry.

In 1926, Ward and Charles Duffield presented evidence on coal deposits to the State Royal Commission on Manufacturing and Secondary Industries.

The Commission recognised that the State would not develop a strong industrial base until a dependable, cheap and plentiful fuel supply could be established in South Australia. In the same year, Ward was one of three representatives appointed to the State Committee of the Council for Scientific and Industrial Research and he held this position until his retirement in 1944. This position proved to be of practical value in the 1930s when Ward was able to secure the establishment of the Imperial Chemical Industries (ICI) alkali-processing plant at Port Adelaide.

During the peak of the Depression and throughout the remaining years of the 1930s, a policy of industrialisation was adopted by the Government, with the support of the Opposition, and the Public Service. As Burton has recorded:

113. AR:1922 op.cit.
115. SAA GRG 24/6/1926/520 Premier Gunn to Prime Minister S.M. Bruce 15.7.1926.
it became obvious to leading politicians, senior public servants, industrialists and other interested persons of the State that the solution to South Australia's current economic problems and its long term economic development lay in the growth of secondary industry rather than the traditional economic underpinning, primary production.\textsuperscript{116}

Other factors in support of this policy included the cooperation of the Chamber of Manufactures, industrialists, the trade union movement, and the "anti-Federal tradition in politics [and a] widespread antagonism towards the centralization of economic wealth in the Eastern States".\textsuperscript{117}

The findings of the Royal Commission on Manufacturing and Secondary Industries had not been followed up at that time by the Ministry of Richard Butler. In 1933, when he again became Premier, a policy was initiated Butler, who, when he again became Premier, had been impressed by the industrial developments in Great Britain and Germany during his overseas visit in 1935, did not dominate the adoption of industrialisation policies as Playford later would. The protagonist was John William Wainwright, who became Auditor-General in 1934. Wainwright's enthusiasm for the policy often led him beyond the bounds of his normal responsibilities: "because of his keenness and competence and the shortage of trained senior, civil servants, governments allowed him to range over fields normally outside the province of the Audit Office".\textsuperscript{118} Thus he was a regular visitor to Trades Hall where he discussed industrial

\textsuperscript{116} Burton, R.R., 'The Industrial Urbanization of Whyalla 1937-61'. BA Honours Adelaide University 1971 p.11.
\textsuperscript{117} Mitchell, T.J., 'Industrialisation of South Australia 1935-40'. BA Honours Adelaide University 1957 p.1.
policies with leading figures in the union movement.\footnote{Mitchell, op.cit. p.20.} The vigour with which Wainwright pursued this economic policy was a reflection on the growing desire for industrial development. Ward would have been associated with Wainwright through Ward's activities outside of the Department, such as his chairmanship of the Mining Committee of the Employment Promotion Council in 1934.\footnote{AR:1934.}

In 1932, the Development Branch of the Prime Minister's Department, the Council for Scientific and Industrial Research, and Ward investigated a proposal to establish an alkali manufacturing plant near Port Adelaide.\footnote{SAA GRG 30/4/1932/1029 Memo to Senator A.J. McLachlan, October 1932: 'The Proposed Establishment in Australia of a Works for the Manufacture of Alkali by the Ammonia-Soda Process' by A.C.D. Rivett, Chief Executive Officer CSIR, S. Fowler, Prime Minister's Department, and L.K. Ward.} No decision was made at this time by the Federal Government, but the committee strongly favoured the ICI Company if the proposed works were established. Ward wanted to attract the Company to South Australia and he submitted his own report to the State Government in 1934.\footnote{ibid. Ward 25.6.1934: 'Confidential Report on the Proposal to Establish Alkali works at Port Adelaide.'} The Company negotiated with the Government and after a meeting between Ward, Winton, J.H. McNamara (the Surveyor-General), Edwin Allen Farquhar and Hugh Angwin representing the Harbours Board, and Messrs Smith and Newton of the Company, it was announced that ICI would establish the industry.\footnote{ibid. Ward to Director of Lands 10.1.1935.} The Government granted ICI mining rights to 409 acres on St. Vincent Gulf
and sixty acres at Osborne as the site for a factory.124

Although the acquisition of this industry was a significant achievement, it was the imminent departure of the motor-body building company of E.W. Holden to Victoria which precipitated the adoption by the Government of the policy to further industrialise the State. The Holden Company, which employed nearly 4,000 men, threatened to leave the State in May 1935 because of the high levels of company tax and wharfage dues on exports.125 The Government was being held to ransom in this time of high unemployment and was forced to make concessions. The Chamber of Manufactures established an Industries Committee to study the needs of secondary industries in Australia.126 The Government appointed Wainwright to the Committee and it eventually offered tax concessions and reduced export tariffs which persuaded Holden's to remain in South Australia.127

Further agitation for the expansion of industrial interests led to the formation of the South Australian Housing Trust, the Industries Assistance Corporation and the controversial Cellulose Australia Limited. Several important operations - ICI in 1935, British Tube Mills in 1938, and Stewarts and Lloyds in 1939 - were also attracted to the State through the availability of cheap industrial sites, particularly at Port Adelaide, assistance in the building of plants, the provision of cheap facilities such

124. Smith, op.cit. p.163.
125. Advertiser 8.5.1935.
126. Smith, op.cit. p.154. The Committee consisted of J.A. Rinder (President of the Chamber), H.E. Winterbottom (Secretary of the Chamber), A.E. Clarkson, E.S. Clark and E.W. Holden.
as water and power, and general advice from acknowledged experts like Ward and Wainwright.

A major feature of this policy of expansion was that in its desire to attract industries, the Government was often prepared to fulfil many of the demands made by companies. In regards to establishing a steelworks in the State, BHP was virtually allowed to set its own terms as Premier Butler indicated to Essington Lewis, Managing Director of the Company:

Believing that the establishment of such [steel] work or works would not only be an impetus to other industries to do likewise, but would be of material benefit to the people of this State, my Government would like to know if there is anything we can do to remove any obstacle that may stand in the way, or if we can assist in any direction. 128

Lewis took advantage of this offer and the Company secured tenure of the iron ore reserves near Whyalla for fifty years with the right of renewal for another twenty-one years. The BHP Indenture Act of 1937 also increased the royalty payable on iron ore from threepence a ton to sixpence a ton on ore raised after the end of 1939. A blast furnace had to be built at Whyalla, within three years of the passing of the Act, to enable the treatment of iron ore before being sent to New South Wales. The ships taking the iron ore east would return with supplies of coke and coal as ballast. Ward had based this idea on the methods used on the Great Lakes in the United States and Canada. 129 The Butler Government gave BHP rights over the limestone deposits at Rapid Bay and granted special privileges for the buildings,

wharves and jetties at the blast furnace. Although the Government was obliged under the indenture to supply Whyalla with water, the conditions granted to BHP in 1937 were extremely generous.

Ward's positive encouragement of the mining and manufacturing industries began to pay dividends by the late 1930s although the days of major discoveries of valuable minerals had passed and the era of rapid industrial expansion was still to come. The Department had urged the development of deposits which would provide the State with a variety of economically useful minerals. While this may not have pleased the investors and speculators who criticised the Department for not locating large deposits of easily exploited minerals, it did establish a sound base from which industrial activity in the State could expand. The Department's basic function - to investigate for water and minerals, and to oversee the industry - did not change under Ward. The position and value of the Geological Survey was asserted more strongly and the structure and policies of the Department were consolidated. A feature of the Department's existence was that the appointment of Ward as Director of Mines and Government Geologist enabled it to function more independently of the Parliament. Gone were the days when the Survey and Department operated at the whim of Parliament. The Department's functions were still subjected to scrutiny by the politicians but its activities were directed less by the Parliament than by the perceived needs of the industry and State as determined by the Department. This was obviously related to the decline in self interested factions and the personally-motivated desires of individual
politicians and the rise of party politics and the growth of political stability. It was also part of a trend whereby the interests and abilities of the bureaucrats determined the direction that the State would take.
Chapter Eight: The Establishment At Work.

The attention of the Survey was focussed on specific problems, minerals, and localities in order to increase knowledge about the State and to assist in solving the economic difficulties facing South Australia:

The ultimate aim of the Geological Survey is the detailed mapping of the geological features of every portion of South Australia, but the order in which the various areas are to be investigated may well be made to depend upon economic requirements.¹

The Survey was primarily concerned with the State's mineral resources and water supplies and it therefore undertook much of the Department's work in connection with the economic development of the State. However, this was overlooked by a substantial number of people who neither understood nor appreciated the functions and duties of the Survey and Department.

The Government Geologist was also the Director of Mines and was responsible for supervising the Department's other activities particularly as a regulatory and controlling authority.² Most of the work of the Department was of a routine nature and concerned the inspection of mines and quarries, the assaying and analysis of mineral specimens, particularly gold, and the drilling and boring operations carried out to determine the possibility and extent of deposits. An important part of the Department's duties concerned the administration of the legislation, the permanent recording of information, and the distribution of maps and publications. The nature or emphasis of the

1. ARGS:1914 p.3.
Department's work naturally did not please everyone and there were some severe criticisms made; of special note were the numerous calls for Royal Commissions into the Department or on the mining industry in South Australia. But the Department was hindered in its operations by the magnitude of the task and through the policies of successive Governments which limited the financing and staffing of the organisation.

* * * * * * * * *

Inspectors of Mines and Quarries

The nature of the Inspector of Mines' investigations and regulatory role had not changed greatly from Rosewarne's time, but the range of duties and responsibilities had increased as had the number of officers. Reports about the mines that were inspected were prepared and plans of the mines were submitted to the Mining Review. The Inspectors reported on all accidents in mines and quarries, and they were empowered to enforce conditions for the safe working of the mines. Rosewarne had complained to the Public Service Commissioners in 1890 that he lacked this power but the provision had been legislated for under the 1893 Act (Section 72). The Inspectors revisited mines to ascertain that their directions to improve safety conditions for the miners had been complied with: in most cases the instructions were adopted. Special legislation was enacted in 1920 - the Mines and Works Inspection Act - to provide greater protection for those working in the industry and for the Inspectors appointed to enforce the regulations.

3. AR:1916-44.
The Department paid special attention in the 1920s to health problems associated with working in quarries where building stone, slate and road-making materials were obtained, and in brickworks and clay pits. Many accidents occurred in the quarries; for example, in 1924 there were four fatalities. But the major problem was that of the dust produced during the crushing and milling processes, and caused by poorly designed, inefficient machinery, and an inadequate supply of water to suppress the particles. In 1919, Winton examined all quarries and stone-crushing plants to inspect conditions likely to injure workmen through the creation of a dust hazard. Frequent checks on the operations of the quarries under the Mines and Works Inspection Act of 1920 had led to some improvements in treating this problem by 1925. The Inspectors were successful in their efforts to have several plants upgrade their operations, particularly by using more efficient water sprays and improving the working conditions for the quarrymen. However, not all managements responded favourably to the Department's requests and some stone-crushing plants continued to operate without effective dust suppression units.

5. AR:1924.
6. Ibid.1919.
7. Ibid.1925.
8. Ibid.
Another problem associated with the quarrying industry was the scarring of the Adelaide Hills. Ward acknowledged this but his reports on the quarrying did not produce satisfactory solutions. According to the Attorney-General, William Denny, the Government was aware of the problem but felt that it could not be easily overcome because of the difficulties associated with the private ownership of land in the Hills. The issue continued to be raised at various times by Ward and some concerned citizens, but no legislation was enacted or regulations proclaimed to alleviate the situation. A few citizens were forthright in their opposition to this 'sign of progress'. In 1927, Stephen Parsons told the editor of the Advertiser that those "responsible for these ugly gaping quarries [were] committing a crime against posterity". Despite other efforts to remedy the problem since the 1920s, the legacy still remains obvious today.

Ward was continually concerned about the health and safety of the workers, and the reluctance of some quarry owners to adopt satisfactory precautions although the Department lacked the staff to devote sufficient attention to these problems. He observed in 1926, that the least satisfactory aspect of the industry was its failure to adhere to the regulations concerning the suppression of dust. Consequently, another Inspector of Mines and Quarries, Horace Stanley Cornelius, was appointed to join Winton and Pearson whose other duties had prevented them

9. ibid.
10. Register 17.9.1925.
13. AR:1926.
from devoting much of their time to the issue of quarry
dust.\textsuperscript{14} Although there was not a rapid solution to the
problem, Cornelius' appointment did assist in alleviating
the nuisance.\textsuperscript{15} Other factors which led to a reduction of
dust-related health problems in the 1930s were the
willingness of the miners to adopt preventive measures such
as using respirators, and the downturn in the building and
construction industry as a result of the Depression, which
caued significant unemployment in mining and quarrying
activities.\textsuperscript{16}

Not only did the Department lack the staff to
investigate the matters of industrial health and hygiene,
but it was also restricted in its powers in these areas.
Ward had previously urged the need for an Act, separate from
the principal mining legislation, to deal with the aspects
of health and safety. Although Parliament passed the Mines
and Works Inspection Act in 1920, the Department was limited
as to the extent to which it could intervene in the mining
operations of companies. The Department was thus
reactionary rather than being an initiator of many measures
of safety. One example of this occurred in 1925 when
Inspector Pearson was appointed a member of the Royal
Commission into Plumbism.\textsuperscript{17}

The rise in the number of cases of plumbism, or lead
poisoning, at the Port Pirie works of the Broken Hill
Associated Smelters had caused concern in the Department and
among the public, and led to calls for the

\textsuperscript{15} ibid. 12 p.49 op.cit.
\textsuperscript{16} AR:1930.
\textsuperscript{17} SA Government Gazette 19.3.1925.
investigation. The Royal Commission recommended alterations and additions to the works in order to reduce the hazards of dust and fumes, and when these were adopted, the number of cases of plumbism subsequently declined: there had been 234 in 1924, 178 in 1925, ninety-eight in 1926, eighty-three in 1927, ninety-one in 1928, fifty in 1929, twenty-three in 1930, and seven in 1931. Pearson attributed the decrease to five factors: the adoption of the Commission's suggested preventive measures, the reconstruction of the treatment sections of the plant, the formation of an Industrial Hygiene Department by the Company, the co-operation of the inspectors appointed by the workmen, and the Department of Mines inspections. Pearson inspected the smelters for five days in each month. The Inspectors also regularly visited the zinc roasting and the sulphuric acid plants at the fertiliser works of the Wallaroo-Mount Lyell Fertilisers Company at Birkenhead and Wallaroo where the inspections relating to lead poisoning had commenced in 1925.

The Inspectors generally adopted an advanced approach to mining matters and this was often reflected in their suggested alterations to the legislation and regulations. For example, a set of regulations was compiled in 1926 and 1927 to control the safe use of electricity which was commonly used in mining operations by this time. These regulations were successful in reducing the number of cases.

18. Register 28.10.1924.
20. Ibid.1931.
22. SAA GRG 30/42/1 J. Pearson Report for 1929.
23. AR:1926.
accidents caused by electrical means. The regulations to prevent extensive undercutting of quarry faces were revised by the Inspectors with a similar effect. Winton usually found that the regulations were adhered to, although some owners and managers were not as responsible as he would have liked them to be and this was reflected in cases of carelessness by employees. He voiced his concern at such irresponsible transgressions of the regulations as when four men died in an explosion after using iron implements to charge a hole for blasting with explosives.

The Inspectors fulfilled a vital role in the operations of the Department. They assisted in the administration of the Acts and the formation and enforcement of the regulations. They saw that the conditions attached to leases were adhered to, and that applications for subsidies or rewards were thoroughly considered. All Inspectors focussed their attention on safety in mining and quarrying operations to ensure the maintenance of the health and safety of the miners.

**Drilling and Boring**

The Inspectors of Mines were also associated with the Department's drilling operations. William Matthews had been Supervisor of Boring Operations but the work had generally been left in the hands of the Foremen of the Boring Plants, Charles Duffield and Albert Matthews. William Matthews had acted in a supervisory and advisory capacity and Keith Ward, then Jack, continued this function when they were subsequently appointed to the post. The Department

24. ibid.1928.
25. ibid.1929.
26. ibid.
conducted exploratory boring with a variety of drills, the
diamond drill in particular, and arranged for the drill to
be hired by persons who wanted boring carried out on their
own properties. The valuable contributions of the Foremen
were acknowledged by Ward in 1918; Duffield and Matthews
were transferred to the salaried staff as Engineers for
Boring on 1 January 1919.

The boring plants often ran for two shifts daily and
were operated by temporary and daily-paid staff. The drill
under Matthews' control was principally used in the Moonta-
Wallaroo region, while Duffield was responsible for much of
the investigative boring for coal. When Duffield completed
a drilling exercise without success at Leigh Creek in 1919,
he undertook an examination of silver-lead deposits with the
Number 2 Diamond Drill at Wheal Ellen near Strathalbyn in
1920. He was then sent to Victoria to inquire into the
latest techniques of drilling for lignite.27 This was in
preparation for a systematic search for coal by the
Department in South Australia. Acting on his advice, the
Government purchased a modern Victoria percussive and rotary
plant which was more mobile and cheaper to operate than the
diamond drill when searching for coal. This drill was
employed at Clinton and Moorlands from 1921 to 1923 and
during this time Duffield designed another calyx drill for
the Department. He constructed an efficient, portable plant
suitable for shallow boring, and for taking samples of the

27. ibid.1920.
materials pierced. Cabinet later gave its approval for him to accept royalties from companies for this coal-sampling device. The special double-tube core-barrel, which was patented by Duffield, "received world-wide recognition in connexion with diamond drilling".

Boring for lignite was suspended in 1923 and the drills transferred to the Murray River area to test the sites for piers for new railway bridges to be built at Murray Bridge and Paringa. The Department also continued the search for coal in the vicinity of the River and holes were drilled at Mannum, Morgan, Mallala, Tailem Bend, Monteith, and Swan Reach in the hope of uncovering shallow deposits suitable for open-cut mining. During 1925 and 1926 Duffield drilled fourteen holes, with a total depth of 1,692 feet, at Waikerie for the Irrigation Commission to carry excess water to the porous limestone 130 feet below the ground surface. The drills were also called upon for many other projects including the testing of a graphite deposit southwest of Port Lincoln, the soil foundations at the Adelaide Railway Station, at Port Pirie where the Railways Commission wanted to erect a coal gantry, and at Port Augusta for a proposed bridge across Spencer Gulf. The Department also tested the foundations of the Ocean Steamers

28. ibid. 1922. The work was undertaken at the Departmental workshop at Mile End where the boring plants were repaired and maintained.
29. SAA GRG 30/4/1922/372 n.d.
30. Mining Review 91 for half-year to December 1949 p.31.
31. AR: 1923.
33. AR: 1925, 1926.
34. DM Letter Book 10 p.165 op.cit.
Wharf at Port Adelaide, and investigated sites near Osborne on the Port River with a calyx drill at the request of the Harbours Board.35

The diamond drill being used at Kadina failed to uncover any rich copper ores during 1924 and 1925 and in 1926 it was moved to Moonta. A programme of boring was maintained in the vicinity of Moonta for several years. The diamond drill was occasionally used by the Imperial Geophysical Experimental Survey in 1929 and 1930 to test the sites selected by the geophysical method of prospecting. Further drilling under the Moonta Mining Scheme during the Depression proved to be as unrewarding as most of the previous drilling programmes undertaken in the area and the Scheme ceased in 1938. Two diamond drills were later used to test the copper lodes at the Karkarilla Mine at Moonta but the results did not justify renewing the Scheme.36

Drilling operations to locate water supplies were an important aspect of the Department's work. This function increased after the Department took over control of the water-boring operations from the Engineer-in-Chief in 1931. The public could hire the boring appliances or arrange for the Department to do the drilling at a cheaper rate than that charged by private contractors.37 Much of this work was concerned with the Adelaide metropolitan region and the Eyre Peninsula where Segnit supervised many of the investigations. In 1936, forty-seven holes were drilled for water by percussion drills and thirty-seven of

35. AR:1928.
these were on Eyre Peninsula; in 1937, thirty-six of the fifty-nine holes were drilled there, in 1938, fifty-seven of the sixty-two holes, but in 1939 only nineteen of the sixty-one holes put down were on Eyre Peninsula.38

In some cases, owners of properties were not subsidised by the Government and they paid for the whole cost of the drilling by the Department. Rotary drills were used to test the overburden of an argillaceous sandstone deposit being worked by the South Australian Silicates Company for its glass sand and clay.39 The South Australian Portland Cement Company paid for the cores recovered from its limestone deposit at Reynella; ICI paid for the boring at a marble deposit near Angaston; and BHP were charged for the drilling on the Whyalla foreshore for the ship-building works being constructed there.40

World War II provided a new range of activities for the boring plants. Ward reported to Leslie Hunkin in 1941 that the drilling programmes were

concerned practically wholly with work
directly connected with the war effort,
including the prospecting for minerals
that [could not] now be imported into
Australia, or with the search for
domestic sources of fuel.41

The renewed investigations into a domestic supply of coal at Leigh Creek were particularly important and the Department again conducted large-scale boring operations there.

40. ibid.
41. DM Letter Book 18 p.171 op.cit.
Another special drilling programme during the war years was that undertaken for the investigation of the Mount Painter uranium deposits.42

The successful boring operations at Leigh Creek and Mount Painter in the war years should not be allowed to overshadow the extensive and efficient work of the earlier drilling crews. The expertise and knowledge of Charles Duffield and Albert Matthews facilitated this good work. The crews carried out a large amount of boring while often working in remote or sparsely populated areas and always under trying conditions. Although not always of immediate success in terms of deposits delineated or water supplies located, the planned drilling programmes and other boring operations were of valuable assistance to the mining industry and also enhanced the study of the geology of the State.

**Government Batteries and Cyanide Works**

The Batteries and Cyanide Works were managed by Edward Grundy until his retirement in October 1936, when Louis Winton took over the position. The Department maintained five plants at Peterborough, Mount Torrens, Tarcoola, Glenloth and Mongolata. The Battery at Mongolata had been established through Commonwealth funds after the discovery of gold there in 1930; the Glenloth Battery which had been purchased from the Glenloth Mining Battery and Options Company (NL) in 1907 was also situated on a goldfield, and was operated by the staff of the Tarcoola plant when

42. AR:1944.
necessary. Grundy travelled between each plant to conduct smelting and assaying as required, and foremen were given the responsibility of maintaining the plants. The foremen engaged temporary staff when the prospectors or companies could supply sufficient ore in expectation of profitable returns. An Assayer and Assistant Manager, W.L. Tucker, was employed from 1931 until 1934. A temporary Assayer, Mr Ross Love, was then stationed at the Mount Torrens Battery and in May 1944, he became the Assayer and Assistant Battery Manager to Armstrong, the then Chief Inspector of Mines and Manager of the Government Batteries and Cyanide Works.

The Government restricted the operations of the Batteries in the Depression by curtailing funds for the Department. Ward complained against the prosecution of such a policy at a time when there had been a revival of interest in prospecting for gold. There were requests from prospectors and companies to have the Batteries operating for longer periods. For example, the miners at Tarcoola suggested that the Battery there be operated for twelve instead of eight hours each day. Similar requests had been made at Mount Torrens. Ward arranged with the gold producers to send more ore in each parcel but to send fewer parcels overall so as to reduce the time required for

43. For details of purchase, see SAA GRG 30/4/1906/2008 and SAA GRG 30/4/1907/586. Glenloth, a goldfield near Tarcoola, had been named by H.Y.L. Brown after the horse which had won the 1892 Melbourne Cup.


45. AR:1944.


47. ibid, P,A, McBride to Ritchie 25.9.1933.
cleaning the plant after each parcel was treated. The Minister of Mines, George Ritchie, approved Ward's recommendation for returning to 12-hour crushing operations. Ward was also able to arrange through the Commonwealth Assistance for Metalliferous Mining Fund for repairs and renovations of the older Batteries at Mount Torrens, Peterborough and Tarcoola.

By the beginning of World War II, privately-owned batteries had closed down and the Government Batteries were the only ones assisting in gold production. The fluctuating fortunes of the gold-mining industry did not necessitate the uninterrupted operation of all Batteries and Cyanide Works at the one time. In any case, they continued to run at a loss throughout this period. The Government was prepared to carry this loss in an attempt to stimulate the industry. Prospectors were encouraged to search for gold and companies were able to mine the low-grade ores. The Government allowed a rebate of a third of the cost of rail freight for South Australian ore forwarded to the Batteries. Parcels of gold ore of less than a hundredweight were treated free of charge, and there were reductions in the charges for those opening new deposits or mining low-grade ore. Various tests, assays and experiments in milling were also conducted for the prospectors.

50. DM Letter Book 18 p.171 op.cit.
51. See AR and SAPP4 Audit Commissioners Report for each year.
52. See footnote 43.
Technical Laboratories

All of the Department's chemical and assaying work was conducted at the School of Mines to which the Department's Assaying Laboratory had been transferred in 1891. The chemist made free public assays on behalf of the Department for prospectors and carried out other analytical duties for the Department. This arrangement was maintained until after World War II. The work was of a different nature to that undertaken by Julian Connor in the Metallurgical Laboratory, which had been established in 1915 with a view to improving techniques for the treatment of individual minerals and deposits.

Ward's suggestion for the appointment of a Government Metallurgist had been made after his inspection of some northern copper deposits. Thus Connor spent a lot of time during World War I investigating methods of treatment of low-grade copper ores. Connor tested samples free of charge and advised individuals and companies on the best means of treating the ores. He also experimented with other minerals such as phosphatic rocks in 1918 and graphite in 1919. To test the samples of graphite, he designed a winnowing machine which proved to be very effective. Connor visited the silver-lead deposits at the Eukaby Field with Jack in 1920 to report on developments and the application for a concentration plant there.

The world-wide depression in the mining industry after World War I led to less frequent calls in South Australia for Connor's services. On some occasions, he was able to

54. AR: 1920.
conduct experiments outside of the Public Service. For example, the Minister of Mines, William Harvey, gave him permission in 1919 to act as a consultant metallurgist at the Burra Burra Mine. He also conducted experiments on specimens from beyond the South Australian borders. Ward was surprised at the downturn in the local demand for Connor's expertise because he thought that the decline in the industry should have stimulated interest in experimentation. The situation did not improve in 1921 and the Laboratory was again not fully utilised. Consequently, Connor left the Public Service on 31 January 1922 and entered private employment.

Connor was not replaced and the Government merged the experimental work of the Laboratory with the Metallurgical Laboratory at the School of Mines. This had been built from funds provided by Langdon Bonython and the Government. The Lecturer in Mining Engineering at the University, Mr H.W. Gartrell, was appointed to supervise the work of the new Laboratory but the Department retained the right to use the equipment whenever it was required. Apart from a request by Robert Richards MHA for the establishment of a research laboratory in the Department in 1928, there were no complaints about this arrangement which proved to be a satisfactory one throughout Ward's time.

55. ibid. 1919.
56. ibid. 1920.
57. ibid. 1921.
59. ibid. p. 165 op. cit.
60. News 19.5.1928; see also SAPD: HA 7.8.1928.
The Bonython Laboratory collaborated with the Department on a wide range of problems including the treatment of gold ores, copper, barytes, clay and rutile. The Department relied on the Laboratory for advice on all matters involving State expenditure. Ward also stressed that scientific analyses were required before investors should be persuaded to part with their money:

this procedure is conducive to the betterment of mining generally... the investing public are being educated thereby to a wiser attitude towards problems of development.

Dickinson later reported favourably on the valuable nature of the Laboratory's research "in the determination of properties and characteristics of a particular material and methods of fostering its economic use".

Legislation

By the turn of the century, South Australia had clearly followed many other parts of the world in adopting legislation which maintained public ownership of all minerals for the development and regulation on the community's behalf. The Department which had been formed in 1894 after the passing of the first specific Act dealing with mining generally, was responsible for the administration of the legislation and regulation of the industry. Much of the work was of a routine nature and was superintended by the clerks of the Department. Advice was given to enquirers as to the procedure under the Acts; leases, claims and licences were registered and issued; and

61. SAA GRG 24/6/1940/1578 op.cit.
63. AR:1944 Appendix.
64. DM Letter Book 10 p.199 op.cit.
plans constructed to show titles over minerals. Statistics of mineral production were gathered for each half-yearly period, and general correspondence was dealt with. The Accountant maintained records of revenue and expenditure, and arranged the collection of rents and royalties. Applications for suspension or forfeiture of agreements were forwarded to Ward, who was the officer primarily responsible for conducting the Warden's Court to resolve disputes within the mining industry, or between miners, prospectors, or companies and the Department. Under Ward's direction in 1913, Lionel Gee compiled *A General Synopsis of the Mining Laws of the State and an Index to the Mining Acts and Regulations Thereunder* and this proved to be a useful reference compendium for the industry. It was subsequently published in new editions in 1918 and 1924.

The Department was receptive to complaints from the industry about the legislation and regulations covering mining operations although the Government occasionally refused to accede to the Department's or the industry's wishes. Part of Ward's policy of positive encouragement for the development of the State involved improvement in the legislation and the suggested alterations were proposed by the Department in an effort to assist the industry.

In 1912, Ward promptly reported on the complaints of holders of miscellaneous leases in the metalliferous areas of the Adelaide Hills who desired an improved form of tenure and security.65 A new *Mining on Private Property Act* in 1916 enabled these lease-holders and prospectors to enter private properties and protected them from losing the

65. ARGS:1912.
benefit of their efforts to the land-owners. Previous Mining on Private Property Acts (1888, 1895, 1899, 1901, 1909) had inhibited the search for, and development of, minerals because the land-owner could take possession of the minerals even if that person had no prior interest in the deposits. The Department had urged the Government to define 'private land' more succinctly and to allow mining operations within 100 yards of private buildings instead of the distance of 200 yards. As with the previous Acts, this Act proved to be unworkable. In this instance, the problem was caused by the time-consuming and costly process for the prospector to obtain the right to mine the land. Ward reported that

unless legal advice was available to the prospector at almost every stage of the procedure, it was inevitable that there would be some omission [in the application process] which would prevent the issue of a compulsory mining lease. The alienation of a large portion of readily accessible and potentially metalliferous areas prior to the Act of 1888 continued to present a problem for the Department and the industry in that it restricted the amount of prospecting and mining in the region of the Adelaide Hills.

In February 1916, the Government amended regulations under the Mining Act to permit the concentration of labour on salt and gypsum leases between January and April in those cases where a Departmental officer reported that the land could not be continuously worked because of flood

67. AR:1933 Appendix 'Some Aspects of Mineral Ownership'.
waters.\textsuperscript{68} In the following year the regulations were extended to provide protection to the holders of mineral claims during droughts or if they were engaged on work of a public or national interest.\textsuperscript{69} The Mining Act Further Amendment Act of 1918 extended the range of provisions over minerals and, as a result of the opal discovery at Stuart Range, a proviso was included to place 'precious stones' next in priority to gold and before mineral claims such as salt, gypsum, coal, oil and guano. The Act also reduced the term of leases for mineral lands from forty-two to twenty-one years.

Ward's growing concern with matters of industrial safety and the health of miners resulted in the Department revising the general regulations for the working of mines in 1920. The Department proposed a Mines and Works Inspection Bill which was based on the development of legislation in the mining industry in other parts of the world.\textsuperscript{70} Parliament accepted the Bill and the health and safety aspects of the industry were separated from the principal mining legislation. An important feature incorporated in this Act by Parliament was the provision for the inspection of mines by representatives of the workmen. Ward did not feel that such a provision was necessary because the principal Mining Act enabled workers to direct complaints to the Department's Inspectors and not to the mine-owners.\textsuperscript{71}

He foresaw a clash between the activities of the workmen's inspectors and the responsibilities of the Inspectors of

\textsuperscript{68. AR:1916.} \\
\textsuperscript{69. \textit{SA Government Gazette} 25.1.1917.} \\
\textsuperscript{70. AR:1920.} \\
\textsuperscript{71. DM Letter Book 7 p.255 Ward 'The Check Inspection of Mines by Workmen', n.d. 1920.}
Mines. This did not eventuate and the system worked quite satisfactorily. However, an additional regulation was gazetted in 1926 to ensure that the appointment of the miners' inspectors was formally approved by an authorised Government official; there had been some instances where the inspector had announced his appointment and then applied for Ministerial approval.72 This regulation standardised the practice in South Australia with that elsewhere in Australia.

Several significant regulations to provide greater protection for the workmen in the mining industry were gradually introduced in response to particular problems. In 1925, new regulations to prevent lead and gas poisoning were implemented on the lines proposed by the Royal Commission into Plumbism.73 The Inspector of Mines, John Pearson, had strongly urged the Government to adopt the Royal Commission's recommendations. In 1926, the Department prepared a draft code of regulations for the use of electricity in the mines, works and quarries and this came into effect in 1927, but several cases involving degrees of negligence were recorded by the Inspectors.74 The Inspectors often pointed out the importance of the health factor, such as the damage caused by dust, but the mine-owners were reluctant to change their ways. In another case, the method of obtaining clay by undercutting the overburden was considered to be unsafe by the Inspectors

72. ibid. 10 p.165 op.cit.; Advertiser 4.2.1926.
73. AR:1925.
74. Ibid.1927.
whose advice was usually ignored.\textsuperscript{75} It was only when the Department issued a special regulation to prevent this practice that the owners and managers complied with the instructions not to undercut at the pit face.

The regulations and legislation covered a diverse number of areas. In 1928, the Parliament passed specific legislation designed to foster the search for oil. The Mining (Prospecting for Oil) Act increased the amount of land available at any one time for prospecting for oil to a maximum of twenty-five square miles for each person holding a miner's right. The holder of a permit was required to conduct boring operations of at least 1,000 feet, or to spend a minimum of £1,000 each year in the search for oil. The provisions of the Act were intended to enable more companies to undertake investigations in greater detail. However, the search for oil in the State remained an unproductive affair.

The mining legislation of South Australia was occasionally amended to keep pace with developments interstate and overseas. Early in 1929, Ward visited Canberra where a conference attended by several State representatives discussed mining legislation.\textsuperscript{76} The Mining Act in South Australia was altered as a result of these discussions. The amendments to the principal Act brought the legislation concerning gold leases into accord with that relating to mineral leases. Provision was also made for the granting of special mining leases on the line of those contained in the New South Wales Mining Act of 1906.

\textsuperscript{75} ibid.
\textsuperscript{76} DM Letter Book 12 p.49 op.cit.
Special mining leases could be issued for periods up to two years upon the Minister’s recommendation if there were particular problems associated with the prospecting or development of the land. Shortly after the Bill was assented to by the Governor, two mining companies were granted special leases over deposits at Ediacara and Moorlands.77

The principal Act, the Mining Act of 1893, was revised in 1930. It had become outdated because of the changes in mining techniques and procedures. The Crown Law Department prepared a consolidating Bill to remove anomalies and to upgrade the mining legislation.78 A draft of the revised Bill was examined and approved by the Department and it was subsequently passed by the Parliament. The mining industry generally welcomed the legislation for it removed the ambiguities and confusion which had arisen over the years.79

The problems associated with mining on mineral-bearing land which had been alienated from the Crown prior to 1888 were still to be satisfactorily resolved and the Act of 1930 did not attempt to provide a solution. A special, temporary measure, the Mining Act Amendment Act of 1931, was introduced because of the difficulty in enforcing the Mining on Private Property Acts of 1909 and 1916.80 These Acts were repealed until 30 June 1936 when the Amendment Act was to expire although Ward strongly urged that the Act be retained after this date.81 Ward issued an appendix to the 1933 Annual Report because many of the land-owners

77. ibid.
78. ibid.
79. AR:1930.
80. Ibid.1931.
81. ibid.1933.
misunderstood both the operation and intention of the Amendment Act. In the Report, he criticised their reluctance to consider the State's interest before their own personal desires.

The Mining Act Amendment Act of 1931 was intended to enable genuine prospectors to enter private land and test the mineral deposits under the same conditions as those imposed where minerals were reserved to the Crown.\(^8\) Private ownership of the minerals was ensured under the Act and the owner's right to work the minerals himself or to make a private agreement with prospectors was not altered. The original owners had in some circumstances sold the surface rights and retained control of the minerals, although the land-owner was generally the owner of the minerals. However, in all cases the payment of royalties was made to the owner of the minerals after the Minister of Mines had deducted one-tenth of the amount due on behalf of the Crown. The Department took great care in the administration of this sensitive issue but land-owners remained fearful that their land might be transferred over wholesale to mining operations. The legislation lapsed in 1936 because of the continuing differences between some prospectors and the interests of the land-holders.\(^9\) Ward hoped that the legislation would be re-enacted and he pointed to the successful operation of similar legislation in New South Wales as evidence that the Act was feasible.

\(^8\) ibid. Appendix 'Some Aspects of Mineral Ownership'.
Although Ward reported on proposals to amend the Mining on Private Property Act and the Mining Act on several occasions, no other legislative arrangements were made during the 1930s. Towards the end of the decade, Ward was asked by the Federal Government to report on the legislation dealing with titles over the possible oil-bearing areas of South Australia. The Commonwealth proposed to revise the legislation over oil-bearing land in order to obtain uniformity between the States. Ward considered that the remote possibility of discovering oil in South Australia lay in the South-East only. But he felt it was important to improve the legislation, and to standardise it throughout Australia, despite the slim prospects in the State:

It has [he wrote] been made perfectly clear by the larger oil interests, to whom we must look for financing the future search for oil in Australia on a scale that will constitute an adequate test of the country's possibilities, that they will not consider the question of entering the Australian field unless legislation is modernized....The modernization of South Australian legislation would, therefore, not only bring this State within the scope of such large-scale operations as a powerful and wealthy company might undertake, but would also help to attract the introduction of capital by providing an enactment in line with modern requirements.

Consequently a Bill to revise the State legislation was drafted in accordance with the provisions in other States and countries. The Minister of Mines, Lyell McEwin, was prepared to push the Bill through Parliament but in 1940,

84. SAA GRG 30/50/1938/5 Ward to H.A. Barrenger, Secretary to Commonwealth Oil Advisory Committee 28.9.1938.
86. SAA GRG 30/50/1939/7 Ward to Ritchie 27.7.1939.
87. SAA GRG 24/6/1940/1578 op.cit.
with the support of each party, it passed both Houses comfortably.\textsuperscript{88} McEwin felt that this was the most revolutionary legislation presented before the Parliament to that date because it made provision for extensive grants of land to companies searching for oil.\textsuperscript{89} The basic aim of the Act was to increase substantially the area available for oil exploration, prospecting and mining and, at the same time, provide a greater degree of security of tenure than the companies had held before. The Mining (Petroleum) Act did not come into operation until 31 July 1941.\textsuperscript{90} However, its effectiveness was not apparent until after World War II when it became possible to attract large companies to the State.

The final piece of legislation which concerned the Department at this time was the Leigh Creek Coal Act of 1942. The Act vested control over the coal deposits in the Minister of Mines but the Parliamentary Draftsman had included a proviso whereby the Governor could appoint any Minister to manage the field.\textsuperscript{91} In the initial stages, the field was opened up by officers of the Mines and E&WS Departments. The E&WS subsequently took over the field because it was better equipped than the Department of Mines to oversee the development of the deposits.\textsuperscript{92} Thus the administrative control of the Leigh Creek Coalfield was transferred to the Minister of Works, Malcolm McIntosh.

\textsuperscript{88} Interview with McEwin 11.7.1980.  
\textsuperscript{89} ibid.  
\textsuperscript{90} Advertiser 1.8.1941.  
\textsuperscript{91} SAPD:HA T. Playford 30.9.1942.  
\textsuperscript{92} Interviews with Playford 26.6.1980; McEwin op.cit.
Displays and Publications

The Geological Survey attempted to initiate the collection, storage and display of mineral specimens as Brown had previously urged. Ward proposed to organise a comprehensive and systematic display of minerals for the 1912 Royal Agricultural and Horticultural Society Show which could be retained and maintained by the Survey.93 This collection was begun anew because the Survey no longer had any specimens to display to the public or the officers of the Department. Later that year, the Director of the Imperial Institute in London submitted a report to the South Australian Government and indicated that the State's exhibits in London needed to be improved.94 The Under Treasurer asked the Department for assistance but Ward could not offer to remedy the situation although the Director's criticisms of the Government's display were justified according to Ward.95

Ward asked Butler to consider the needs of the State before sending specimens overseas - other States had mineral collections and South Australia needed one also. Agitation in this matter had not been vigorously pursued by Brown, though Basedow's arrangement of specimens at the School of Mines had been a valuable contribution. But Ward considered, quite rightly, that the Department should have its own reference collection in order to assist the public and the Departmental officers in the performance of their

93. SAA GRG 30/4/1912/570 L.K. Ward to Butler 31.5.1912.
94. SAA GRG 24/90/7/1912/43 Under Treasurer to F.C. Ward 30.11.1912.
95. ibid. L.K. Ward to Butler 6.12.1912. The displays were arranged for 'Manufacturers Week' organised by the South Australian Chamber of Manufactures.
duties. When the Royal Commission of enquiry into the minerals, water and people of the Dominions visited Adelaide in 1913, it was again noted that South Australia did not have a representative display in London. Ward told the Commission that the Government would not allocate space for a display in Adelaide so he did not envisage that much could be done about the exhibits in London.

The officers of the Department continued to collect samples while in the field but several years passed before a State Mineral Collection for the promotion of the mining industry was organised. The Department was forced to rely on temporary, make-shift displays of specimens. In April 1915, samples of minerals, metals, precious stones and building materials were arranged in the windows of the premises of Messrs Duhst and Bivens, and Messrs Farmer and Devonshire in King William Street. In November 1916, opal from the new field at Stuart Range was displayed in the window of the Tourist Bureau in King William Street. Ward had considered the problems of storage and display of minerals to be so vital that he had recommended the transfer of the Department from the Treasury Building:

> For my part, I would willingly sacrifice the advantages of a site in King William Street in order to obtain space for the carrying out of work which I feel confident will be for the benefit of the Mining Industry, and which should in my opinion be carried out by the Department of Mines.

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96. Register 21.5.1913.
97. Advertiser 22.4.1915.
98. Ibid. 13.11.1916.
The problems were temporarily resolved after the Department was transferred to the Education Department Building in Flinders Street in 1916. Ward was pleased to be able to display a representative collection of economic minerals and he reported that the collection was in constant use.\(^{100}\)

The small museum was used to display minerals of economic potential. Purely scientific specimens, especially fossils, were usually distributed to outside organisations such as the Museum, University and School of Mines because the Department did not have a palaeontologist to investigate or arrange these specimens.\(^{101}\) As additional specimens of economic minerals were acquired, the Department was able to distribute small sets to attract overseas investment; for example, the Commissioner for Australia in the United States was presented with a collection.\(^{102}\) Ward spent some time in 1923 preparing a display of mineral exhibits for the British Empire Exhibition at Wembley.\(^{103}\) On other occasions he forwarded samples of minerals on request to interested persons. In 1926, the Commonwealth Government sought information and samples on the mining industry for Rhodesia and in 1927 for the Minister of Agriculture and Mines in Newfoundland.\(^{104}\) Another large-scale overseas exhibition of mineral resources involving the Department took place in 1931. For this display of the Empire's mineral resources,

100. AR:1917.
102. AR:1919.
103. Ibid.1923.
the Department provided a variety of specimens including iron ore from Iron Knob, radio-active ores from Mount Painter, barytes from Willunga, graphite from Port Lincoln and manganese from Pernatty Lagoon. However, the London correspondent for the Advertiser was critical of the Department for not sending worthwhile specimens of copper, but this simply highlighted the decline in prominence of this mineral.

During the 1930s the Department appears to have made little effort to maintain the displays of specimens. Two old problems arose - nobody was employed to maintain and upgrade the collection, and there was insufficient room for it to be displayed. The records of the operations of the Department for this period do not mention what happened to the displays but it is clear that at a time when the mineral specimens should have been prominent, the collection was neglected. In 1936, the Inspectors of Mines were required to devote a good deal of effort to arranging exhibits for the State's Centenary Exhibition. One can only ponder how much more representative that display would have been had the suggestions of Menge, Babbage, Marshall, Lewis, Tate and others to arrange displays of South Australian minerals been adopted. In any case, the work of all geologists and mining enthusiasts would have been more accurately reflected on this occasion had a State Mineral Collection been properly maintained after Basedow had organised the specimens at the School of Mines in 1907.

105. Advertiser 24.4.1931.
107. AR:1936.
Public displays of the State's resources were an important aspect of Ward's plan to increase community awareness of the potential value of a broad range of minerals. The Geological Survey issued Bulletins and Reports as official publications in a similar fashion to the release of Brown's findings in the individual Record of the Mines and the compendium volumes. The Parliamentary Papers which had been Brown's main outlet for publishing information before O'Loughlin became Minister, were now rarely used to distribute information. The Review of Mining Operations which was issued in 1904 for the preceding year and subsequently on a half-yearly basis, was continued in the Department under Gee's direction. This comprehensive publication was, according to the Minister of Mines, "much appreciated by the mining public, despite a certain small carping criticism, cunningly engineered, probably by a disappointed applicant for a position in the department".108 This appears to have been a veiled reference to Basedow and the criticism of the Review by the Australian Mining Standard since 1913.109 The publications were distributed widely by the Department, and Ward regarded them "primarily as a means of spreading authentic data concerning the resources of the State, and also as a means of education".110 The Department's exchange mailing list contained 800 separate names and addresses including South Australian papers, the principal daily and weekly publications interstate, the Mechanics Institutes of South Australia, public libraries, scientific bodies, universities

110. ibid. 6 p.85 op.cit.
and mining institutions throughout the world, Members of Parliament, interstate Departments and Surveys and the Agent-General in London who received 100 copies of each publication.\textsuperscript{111} The public could obtain copies on application to the Department. The Department received publications on exchange by subscription or they were purchased. Although there was a lack of space to arrange the material, there was no need to employ a librarian while the staff numbers remained low.\textsuperscript{112}

The Department maintained publication of the \textit{Mining Review} throughout Ward's time. The information contained in the Review concerned details of production, results of boring and drilling activities, reports on mining and prospecting and news of a general nature relating to the industry. Special bulletins concerning specific aspects of the industry were published as the occasion warranted.\textsuperscript{113} The regular publication of information relating to the mining industry in newspapers had ceased in the nineteenth century but in 1935 Ward arranged for the \textit{Advertiser} to publish a monthly summary of mining news.\textsuperscript{114} This followed the request by Victor Newland in the House of Assembly for the Department to publish official reports as soon as possible because of the inconvenience caused to investors and miners alike by withholding the reports for publication in the half-yearly \textit{Review}.\textsuperscript{115} After the beginning of World War II, the Department withheld the publication of mineral production figures in accordance with the Commonwealth

\textsuperscript{111} ibid.; Daily Herald 25.7.1916.
\textsuperscript{112} DM Letter Book 21 p.293 op.cit.
\textsuperscript{113} DM Letter Book 10 p.199 op.cit.
\textsuperscript{114} AR:1935.
\textsuperscript{115} SAPD:HA 27.2.1935.
Government censorship laws, but these regulations had been relaxed by 1944 and the Department was able to resume publication of such information.  

Ward considered the dissemination of information by the Department to be an important process and reports and comments were provided for other Government departments and various external organisations. In 1912, he reported to the Commonwealth Statistician on mineral springs in the State. He submitted a bulletin on the State's coal and iron resources for the International Geological Congress meeting at Toronto, Canada, in August 1913. The Annual Report for 1914 contained a complete catalogue of all official publications and reports on the State's geology and mineral resources. During that year, Ward compiled information on the State's resources for the Handbook of South Australia for the Australasian Association for the Advancement of Science Congress.

The Standing Committee on Railways in 1917 sought Ward's advice on the mines in the northern Flinders Ranges in relation to the proposed railway links with Queensland. Reports for other Government departments dealt mainly with the problems of water supply and storage, excavations and tunnelling, boring, and the use of land for agricultural purposes. The British and Federal Governments both arranged for special reports from Ward. In response to a request from the Secretary of State to the Colonies for an increase

117. ARGS:1912.
118. Ibid,1914. He also contributed to later publications of the Association such as the 1924 handbook.
in the supply of minerals to assist the war effort\textsuperscript{119}, he submitted a detailed report on South Australian mineral resources and maps of the main deposits to the Imperial Mineral Resources Bureau in England.\textsuperscript{120} At the same time, he reported on mineral deposits for the Commonwealth Board of Trade and the Department of Repatriation. Ward composed similar reports for various publications including a chapter on mineral resources written for the Handbook of Information which was issued by the South Australian Intelligence and Tourist Bureau in 1919.\textsuperscript{121} He subsequently submitted papers on the mining industry, and the State's resources for the revised editions of the handbook in 1921 and 1925.

The Department received many requests for information about the value of, and markets for, South Australian mineral products. Ward always maintained his efforts to publicise the State's mineral potential. He provided detailed information on minerals and tables of statistics relating to the industry for Premier Henry Barwell to use on his visit to Britain in 1922.\textsuperscript{122} In addition to this normal departmental work, Ward compiled special reports such as a chapter on South Australian mineral resources and economic geology for publication in Professor Edgeworth David's work on The Geology of the Commonwealth; an article on the mining industry for the centenary issue of the London Mining Journal in 1934 was prepared at the request of the Agent-

\textsuperscript{119} SAA GRG 30/4/1918/329 Circular to the Empire 26.2.1918. The British Ministry of Munitions sought supplies of mica, tungsten, chrome ore, vanadium, manganese, graphite and French chalk in particular. Another circular on 26.6.1918 asked the colonies to assist with Britain's post-war needs.

\textsuperscript{120} AR:1919.

\textsuperscript{121} Ibid.

\textsuperscript{122} Ibid, 1922.
General in London; and the 1937 Annual Report of the School of Mines contained an article by Ward on the development of mineral resources. Various official and unofficial reports stressing the potential and actual value of South Australian resources were published in this period as Ward attempted to promote the development of minerals to assist in the expansion of industry in the State.

Another important aid to the mining industry was the provision of accurate geological maps. H.Y.L. Brown's detailed map of 1899 remained the basis for the geological charts of the State and the permanent record of the Department's investigations. Ward prepared a small, coloured geological map in 1914 for the Australasian Association for the Advancement of Science handbook. This map, scaled at forty-eight miles to the inch, was based on Brown's map. A contour map, scaled at 128 miles to the inch, was prepared during 1917 and published later that year in the Annual Report for 1916. This map delineated the average annual rainfall in the State and had been compiled by officers in the Surveyor-General's Office, Railways Department, Hydraulic Engineer's Office, Engineer-in-Chief's Office and the Geological Survey. The purpose of the map was to highlight the geological, topographical and climatic factors which influenced the development of the State. The Department of Education distributed copies to schools in the

123. ibid.1933, 1934, 1937.
124. ibid.1916.
State and published explanatory notes in the Education Gazette for the benefit of teachers. The Department also published a small black and white geological map, for easy reference purposes in the same year.

The charts of 1914 and 1917 were compiled by the Draughtsman Werner Weidenbach under Ward's supervision. After Weidenbach resigned in 1918, the amount of drafting and preparation of plans in the Department declined. Weidenbach was re-employed in 1927, on a temporary basis, for the revision and up-dating of Brown's 1899 map. Ward's improvements to this map basically consisted of incorporating all additional information provided by the official and non-Government geologists since 1899. The map was issued in 1928 and it highlighted the extent of the Department's knowledge of the State's resources at that time. However, no systematic mapping on a large-scale had been undertaken before this revision, nor was there any after its publication because the Department primarily concerned itself with problems of economic importance rather than purely scientific pursuits. The mining industry would have benefited from a planned programme of detailed mapping of localities. But the Department was never suitably equipped or staffed to carry out such a proposal.

Criticism, Praise and Summary

The Department attracted some severe criticism in the press, from the public and mining industry during Ward's time but many attacks were unwarranted. For example, the Labor Party newspaper, the Daily Herald, criticised Ward for
not inducing dramatic changes in the operations of the Department in the period following the Party's loss of office in February 1912.\textsuperscript{125}

The altered emphasis in the Department's activities following Ward's appointment, the shift in thinking about resources and their role in the economy, especially in regards to industrial development, and the changing nature of mining operations were not fully accepted by the public and the mining community, who continually looked towards spectacular discoveries and developments which were no longer forthcoming. Consequently, the Department was criticised on many occasions for the lack of mining enterprises in the State. Few contemporaries appear to have been aware of the irony of this situation. In times of depressed economic circumstances in South Australia or, more particularly, in the mining industry itself, the public and the industry looked to the Government for help. The creation of a Geological Survey and the formation of a Department of Mines had both occurred during the depressions of the 1880s and 1890s. Yet many members of the public or sections of the industry were those who later came to blame the Department for each and every slump in the industry.

It was often noted in the press that the Department had not uncovered any mines of long term value.\textsuperscript{126} The editor of the \textit{Advertiser} had commented in 1913:

\begin{quote}
\textit{Advertiser} 7.11.1916 editorial, 9.10.1917.
\end{quote}

\textsuperscript{125} \textit{Daily Herald} 5.11.1913.
\textsuperscript{126} Ibid. 15.10.1917; \textit{Advertiser} 7.11.1916 editorial, 9.10.1917.
Considering that all the great mineral discoveries of the early days of our State's history were accidental finds, and not the outcome of systematic research founded on geological knowledge, it is remarkable that with the more complete [scientific] information now at our disposal so few mineral finds of any importance should have been made of late years.\(^{127}\)

On some occasions a few writers suggested that a return to profitable mining could be achieved through the closure of the Department.\(^{128}\) The *Daily Herald* did not doubt this according to the editor in 1917:

> It is logical to assume that with the abolition of our Mines Department purely local mining matters will return to the same state of prosperity that they were in before this State tried the experiment of employing geologists in its Mines Department.\(^{129}\)

The only remaining major mines, Moonta and Wallaroo, had opened before the inauguration of the Department and when these operations were restricted in 1919, the editor of the *Advertiser* reflected a common sentiment: "we have a fully-equipped Mines Department, which seems somewhat of an anomaly without productive mines to give it a real reason for existence."\(^{130}\) After those particular mines closed in 1923, Robert Stanley Richards, a Member for Wallaroo and later Minister of Mines, claimed that South Australia had a

127. *Advertiser* 8.4.1913 editorial.
130. *Advertiser* 1.5.1919 editorial.
unique record: "we have a Department of Mines, a Director of Mines, two Inspectors of Mines, and a Minister of Mines, but practically no mines."\textsuperscript{131}

South Australia had mineral deposits suitable for development and the Department attempted to encourage all feasible mining operations. However, investors and prospectors were often severely critical of the Department's efforts, although it lacked the staff and time to devote to anything but the most pressing problems. On the one hand, the investors and prospectors claimed they were not encouraged to develop mines because the Department was too pessimistic in its attitudes towards, and reports on, the development of mineral deposits.\textsuperscript{132} On the other hand, the Department criticised speculators and companies for floating companies before lodes were proven, and it tried to prevent unwarranted speculation which damaged public confidence in the industry.\textsuperscript{133} Ward, like Brown, was only prepared to issue praiseworthy reports if the circumstances justified a degree of optimism.

The most trenchant public criticism of the Department occurred in 1916 although dissatisfaction with the Department lingered for several years. The following comments provide an indication of the attacks on the Department in 1916. 'Wolfram' wrote of the Department's apparent inactivity during the crisis of wartime:

\textsuperscript{131} SAPD:HA 19.8.1924.
\textsuperscript{132} Daily Herald 9.1.1915, 25.7.1916, 15.10.1917; Advertiser 7.11.1916, 13.11.1917.
\textsuperscript{133} AK:1916.
It has never within the memory of living man shown any sign of dazzling brilliance in its avowed object of encouraging this State's mineral development, and it is still placidly dozing along.134

When the Annual Report for 1915 was issued at this time, the editor of the Daily Herald queried the emphasis placed by the Department on the question of water supplies:

Of course, prospectors and others interested in mining in this State are quite accustomed to receiving stones when they ask for bread, from the Mines Department, but on this occasion plentiful supplies of water have been handed out with the stones, possibly to help the unfortunate recipients to swallow them.135

Yet two years earlier, in the drought of 1914, the public had called on the Department to find a solution to the depleted supplies in the metropolitan reserves! Ward found it necessary to issue a statement to accompany the Report for 1916 to combat the attacks. He did not object to "genuine disinterested criticism which [aimed] at the betterment of the mining industry"136, but he was upset by the personal bias of the press, particularly the Daily Herald, and the "mischievous misrepresentation of the work of the officers of the department".137 Ward outlined the principles, previously given by Brown, for the conduct of the Departmental officers in the compilation of their reports. The Department had a duty to fulfil to the Government and the public, and the reports had to be accurate even if they were pessimistic. The dilemma of encouraging the industry and issuing factual reports had

135. Ibid. 14.11.1916.
137. Ibid.
been overcome by Brown who strove to maintain his professional integrity; the Department under Ward did likewise.

The dissatisfaction with the Department and its administration led to numerous calls in the press for its reorganisation to improve efficiency.\(^\text{138}\) A frequent suggestion was for Parliament to appoint either a Royal Commission into the Department and industry or for a Royal Mining Commission to supersede the Department.\(^\text{139}\) However, nothing was done in this matter until 1918 when the downturn in mining activity began to affect the mines at Moonta and Wallaroo. Robert Stanley Richards moved a motion in the House of Assembly on 16 October 1918 for the appointment of a Royal Commission on the industry.\(^\text{140}\) He hoped that the information provided to a Royal Commission would be of assistance to the Department and industry. Ward reported to the Minister of Mines, John Bice, that a Royal Commission was not necessary: he preferred to see increased financial backing for all types of mines and the efficient management of mining operations.\(^\text{141}\) The motion was not passed by the House and in the following year, William Harvey presented a new motion "that in the opinion of this House, a Royal Commission should be appointed to inquire into the mining industry, with a view of devising the best means of


139. Register 2.8.1913, 15.8.1913; Advertiser 25.10.1913, 7.11.1916, 12.10.1917; Daily Herald 7.11.1916, 12.4.1917, 20.8.1918.

140. SAPD:HA 16.10.1918.

141. SAA GRG 23/1/1918/559 Ward to Bice n.d.
developing the mineral resources of the State". Harvey looked to the State to ameliorate some of the problems caused by the war such as the general financial difficulties and the repatriation and employment of returned soldiers. Ward sympathised with Harvey but he did not think that the Department needed a Royal Commission to stimulate it to action. Ward argued against the proposition that the State should commit itself to undertake the work of developing the industry although this may have proved to be of benefit during the immediate post-war period when a recession affected the State and the industry. The Government adopted Ward's advice and Harvey's motion was defeated on 15 October 1919.

The critics of the Department ignored its efforts to extend the range of interests of the mining industry. However, the defenders of the Department highlighted these attempts to stimulate mining. The policy of Ward may not have reaped immediate rewards but it was an attempt to broaden the sphere of mining activity in the State. A well-known company promoter and speculator, Mr W.A. Kingsborough, lay the blame on Parliament for not providing the Department with additional funds, and on the public for its ignorance, prejudice and lack of confidence in the State. 'B. Fair' claimed that the lack of successful mines proved that the Departmental officers had not been incorrect in their

142. SAPD:HA 10.9.1919. This was not the same Harvey as the Minister of Mines who sat in the Legislative Council.
144. Daily Herald 15.1.1915, 1.10.1915; Register 6.1.1915; Public Service Review October, 1917.
assertions.\textsuperscript{146} The Register saw this as a 'negative good' in that the Department prevented unwise expenditure and encouraged 'proper' development.\textsuperscript{147} The editor also suggested that it was unreasonable to criticise the Department only; as an example, he pointed to the School of Mines which he felt had trained its students so well that they left the State because there were so few opportunities available.

The calls for an investigation into the Department continued into the 1920s. In 1920, Richards and Harvey both expressed the view in the House of Assembly that the Department did not provide value for the money being spent on it.\textsuperscript{148} Harvey subsequently moved a motion, similar to that of the previous year, for a Royal Commission:

In the interests of this State something ought to be done with our Mines Department. There have been so many adverse reports from that department that they cannot, to save their reputation, give a report that will condemn themselves. We have to go over their heads in order to justify the expense of the Mines Department.\textsuperscript{149}

Richards suggested that the Government and the Department had misinterpreted the motive of Harvey's motions; he did not want to undertake an inquisition in the Department, but simply desired to find the best way to develop the State's resources. William Hague, the Commissioner of Public Works, claimed that the condition of the mining industry was not due to the administration but to the old problems of too much mining on the King William Street Stock Exchange and

\textsuperscript{146} Register 23.10.1917 Letter to editor.
\textsuperscript{147} Ibid. 4.12.1917 editorial.
\textsuperscript{148} SAPD:HA 10.11.1920 Budget debate.
\textsuperscript{149} Ibid. 24.11.1920.
the limited amount of genuine mining being undertaken in the State. The Government was not inclined towards conducting an investigation into one of its departments and the motion was adjourned until 1 December, but Parliament rose on 27 November and the motion was not proceeded with.

Ward again opposed any move for a Commission to investigate or control the industry. However, he did accept Harvey's argument that more money was required for the encouragement of mining. The amount allocated for the prospecting vote for the 1920-21 financial year was only £8,000 which compared unfavourably with the £20,000 allotted in each of the 1912-13 and 1913-14 years. Approval from one of the Geologists or Inspectors was required before State aid, which took many forms, was advanced to the industry. The Department would subsidise approved developmental work, loan machinery at reduced rates, provide free assays for prospectors and hire equipment to them for a nominal charge, pay rebates on ore and machinery carried by rail, treat ores at the Batteries for low rates, and generally assist the industry in every aspect of locating and developing the resources. The Department constantly offered advice and encouragement to the industry and, as Ward often noted, no officer in the Department had reported against any mining development which later proved to be successful.

151. ibid.
152. ibid.
In the following year, Harvey again asked Parliament to consider an investigation into the mining industry of the State, but on this occasion he moved for a Select Committee only. In the discussion on the Budget, he suggested closing the Department of Mines if the Government could do no more to sustain settlers employed in the industry in the outlying areas. Once more Ward urged the Government to be cautious in its approach to the proposal:

If a select committee of expert mining engineers is appointed, a considerable expense will be incurred, and it is, in my opinion, extremely doubtful whether the industry will be in any way assisted. Capital for development will still need to be found, and capital for mining undertakings is not obtainable on the report of a select committee.

Debate on the motion had been adjourned until 9 November, but it was not discussed then or proceeded with.

The issue was raised again the following year when John Fitzgerald presented a motion, on behalf of Robert Richards, for a Royal Commission on the mining industry. Richards wanted to prevent any further decline in the mining industry which, he feared, might kill off the State:

I would not confine the inquiry to that one particular industry or district, but would make it general, so that we may have reliable information upon which to frame a definite policy to be followed in the future by the Mines Department and those engaged in the industry.

154. Ibid.
155. DM Letter Book 8 p.117 'Notes on proposal for a Select Committee on the Mining Industry' by Ward 16.11.1921.
156. SAPD:HA 22.8.1923.
157. Ibid. R.S. Richards.
In a subsequent debate on the motion, Malcolm McIntosh said he would prefer an investigation into the Department's administration rather than the mineral wealth of the State which could not be disputed.\textsuperscript{158}

The motion was defeated in the House on 31 October 1923 and some sections of the press approved of this decision. The editor of the \textit{Register} acknowledged that South Australia's problems were related to the lack of valuable mines and minerals.\textsuperscript{159} The finance for the development of mining was available in the State; this was apparent, said the editor, from the amounts invested in the interstate mines. He argued that the Department could do no more than develop the minerals that existed and the responsibility for the exploitation of the resources lay with private enterprise and capital. This was refuted by John Williams who told the editor that because the mineral wealth belonged to the State, the State should develop it in its own interest.\textsuperscript{160} The Minister of Mines, Thomas Pascoe, also defended the Department and said the attack on the public servants was unwarranted.\textsuperscript{161} He understood that Ward was unpopular with some sections of the industry because of his cautious manner in investigating all deposits with a view to preventing unjustified investment. Those engaged in the campaign to locate oil in the State were among the most discontented with Ward's approach.\textsuperscript{162} Herbert Basedow, in particular, was perplexed by the Government's attitude of waiting to see what developments occurred, and he complained

\begin{itemize}
\item \textsuperscript{158} ibid. 31.10.1923.
\item \textsuperscript{159} Register 1.11.1923.
\item \textsuperscript{160} Ibid. 5.11.1923.
\item \textsuperscript{161} Advertiser 2.11.1923.
\item \textsuperscript{162} News 7.9.1923.
\end{itemize}
that the industry was now moribund. Basedow's dissatisfaction was plainly expressed in his small booklet, *The Collapse of Mining in South Australia: A Tragedy in Geology*, which was published in 1924.

Richards' proposed Royal Commission into the industry consisted of the Director of Mines, a Minister of the House, and a member of the Opposition. After the Gunn Labor Ministry replaced Barwell's Liberal Ministry in April 1924, Ward told the new Minister of Mines, Andrew Kirkpatrick, that he objected to Richards' proposed arrangement. Although the formation of a commission had been part of Labor's pre-election policy, Ward reiterated that, in his view, a mining commission was not required at this time. However, he felt that if an enquiry was organised then it should be conducted by experienced, technical experts from the mining profession:

> The nomination of myself in any such capacity would, I think, be quite wrong in principle and practice. If questions of policy are to be decided, it is surely for the Government and not a committee to formulate them.

The Government did not move to implement the election promise until 1926 when Robert Richards, a sitting Labor Member of Parliament, again presented a motion for the establishment of a Commission of Inquiry into the industry. Richards' motion of 15 September 1926 was intended to re-establish mining in the vicinity of Moonta-Wallaroo, and to develop the wealth of, and to settle people in, other

163. *Industrial Australian and Mining Standard* 1.5.1924.
164. DM Letter Book 9 p.141 Ward to Kirkpatrick 19.5.1924.
165. *ibid.*
districts. On this occasion, Richards suggested that the committee be composed of three experts (a geologist, a metallurgist and a mining engineer) to advise investors on the best means of prospecting and development. He felt that in comparison to the assistance given to the pastoral and agricultural industries in times of trouble, Governments in South Australia had not come to the rescue of the mining community. But, he argued, the impetus for a revival had to come directly from the Government because the Department of Mines could not save the industry. William Harvey still maintained that the Department should be closed if the Government could not support it with sufficient funds to adequately cater for the industry. Harvey thought too much money was being spent on the salaries of the staff and not enough on mining activities: "in my opinion one man should be able to carry out the work of the whole Mines Department at the present time". Only George Cooke agreed with Harvey on this point. On 22 September, the Attorney-General, William Denny, presented a chronicle of the Department's activities which clearly indicated the absurdity of Harvey's suggested reduction in staff.

The Labor Party recognised that South Australia had a long tradition of mining activity and Denny hoped that a technical commission would lead to the creation of new opportunities for investment and employment in the State. The editor of the News welcomed the proposal because "there [had] been no systematic and comprehensive attempt on the part of any government to ascertain and develop the mineral

166. SAPD:HA 15.9.1926.
167. Ibid.
168. Ibid, 22.9.1926.
resources of the State". The mining community appeared to accept Richards' motion; Basedow, in particular, thought it would be useful to have a full investigation of resources. The motion was carried on 29 September after Richards reassured the House that his intention was to have an inquiry into mineral resources, and not for the Government or a Commission to develop them.

Ward now approved of the resolution because of the technical and non-Parliamentary nature of the investigation. He proposed that the Government appoint Messrs H.W. Gartrell, University Lecturer in Mining Engineering, and W.E. Slee, former General Manager of the Wallaroo and Moonta Mining and Smelting Company, to the Commission with Ward himself as Chairman. However, the proposal was not adopted after Richards refused to accept these nominees in preference to the Commissioners he had chosen. Expressions of discontent with the Department were voiced less frequently in Parliament after this. However Herbert Basedow, who had entered Parliament at the 1927 elections, campaigned for more visible signs of activity by the Department. On 25 May 1927, Premier Richard Butler told Basedow he would investigate why the inquiry had not been proceeded with. Basedow did not receive an official reply and the next year, Basedow asked Butler to appoint a Commission to inquire into the State's mineral

170. Ibid. 23.9.1926, 7.10.1926.
172. Ibid. p.199 op.cit.
173. SAPD:HA 25.5.1927.
resources and the administration of the Department. Butler said the Government would consider the suggestion but he was more inclined to leave the Department of Mines in control than to have the Parliament interfere with the industry. No action was taken on Basedow's proposal because the Government did not wish to investigate one of its own departments. This was a typical attitude. By 1929, the Parliament had become less concerned with overseeing the functions of the Department than it had been a decade before. Apart from some probing by Richards and Basedow, the Department's activities were not subject to close scrutiny from Parliament. This remained the case until the late 1930s.

Extra demands had been placed on the Department after 1912 because of the onset of World War I, the diversification of mineral interests, and the failure of the industry to establish large-scale mining operations in the State. Despite its efforts to assist the industry, the Department lacked the staff, funds and equipment to be of greater value to the State. The critics ignored the difficulties facing the Department and each sectional interest group looked for benefits on an individual basis, rather than establishing the mining industry on a broad base as Ward had envisaged. General discontent with Ward was usually focussed on his efforts to prevent unwise investment by the public, and his encouragement of genuine investment and mining activity was all too often overlooked. Beguiled by the transient success in the nineteenth century

174. ibid. 8.8.1928.
175. Advertiser 8.8.1922 Comment by Thomas Pascoe, Minister of Mines.
of the large copper mines and, to a certain extent, the gold discoveries, the industry had misconceived notions of the potential for growth and development in South Australia. When the difficulties facing the industry were further highlighted by Ward's pragmatic approach, the Department was held up to be the scapegoat. But it was with the high hopes of the mining community which had continually over-anticipated success that the fault lay.176

176. For examples of this frequent complaint see Advertiser 17.6.1913, 28.1.1926; Register 30.1.1920.
Chapter Nine: Liquid Gold - Water and Oil

The desire for assured supplies of water had been uppermost in the minds of the European settlers from the early days of the Colony of South Australia. This desire had not diminished over time and the Geological Survey and then the Department of Mines were actively involved in the location and development of additional supplies. In fact, the investigation for water supplies on behalf of the general public and for the benefit of individual agriculturalists and pastoralists was the most important feature of the Survey and the Department's work until 1944. This was despite the involvement of other Government Departments - Hydraulic Engineers, E&WS, and Surveyor-General's Office - in the quest to solve the State's perennial problem. The Department of Mines engaged in a good deal of work on behalf of other Departments including the examination of reservoir sites, reports on leakage from reservoirs, and the sites for bores and wells. The long hot summers and droughts in the urban and rural areas highlighted the need for this type of work; water was truly worth its weight in gold in the dry State.

The early colonists had also been interested in developing sources of energy but this issue was considered to be of less immediate importance than the search for water. However, the timber, coal and other fuel resources were eventually utilised by the colonists. The search for one particular source of energy, oil (or petroleum - naturally occurring liquid hydrocarbons), became more important in the twentieth century. Although water and oil
were sought for different purposes and with differing degrees of success, there was an inter-relationship between these two elements. The problems, technology and methodology involved in the search for water and oil were similar and the Department had limited but efficient equipment and a few capable drilling crews. Thus the Department was able to undertake the search for oil in addition to the numerous investigations by companies and speculators who hoped to discover 'liquid gold'. The Department under Ward, however, disparaged most of the private searches as ill-considered ventures. Consequently, there was little real progress made in this field other than in delineating more clearly the areas which Ward considered were the 'least improbable' localities for oil deposits.

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Water

The investigations by H.Y.L. Brown into water supplies in South Australia were continued by Ward and Jack. One of the first major tasks allocated to Jack was the search for a water supply in the County of Jervois on the eastern coast of Eyre Peninsula. 1 Jack and an assistant spent nine weeks in a region covering 3,900 square miles which, as his preliminary report indicated, was insufficient time for an adequate examination of the area. 2 But he was confident that the geological conditions favoured the locating of fresh underground water to assist the development of agricultural pursuits in the area. Ward concluded from Jack's work that there would be water where the inclination

1. SAA GRG 24/90/7/1912/16 L.K. Ward to Butler 27.2.1912.
of the terrain facilitated its accumulation and where the soil's components, such as sand, enabled the water to sink to a depth sufficient to prevent its loss.\textsuperscript{3} Other fieldwork on the occurrence of water was undertaken at Iron Knob, Farina and the Hundred of Erskine. Ward was enthusiastic about the question of water resources and, unlike Brown who disliked attending conferences, he visited Sydney in May 1912 for an Interstate Conference on Australia's Artesian Water Supply.\textsuperscript{4} This was a preliminary conference to bring together all available information about underground water in the States.

As a result of this Conference, Ward submitted a detailed proposal to the Government on "The Artesian Water Resources of South Australia: Methods of Investigation and the Necessity for State Control".\textsuperscript{5} He had been impressed by the New South Wales scheme for the control and distribution of bore water in the north of that State and he suggested that the Geological Survey undertake investigations of underground water in South Australia for the public benefit. He considered the investigation and control of water resources to be a primary duty of a State Geological Survey. In fact, he felt there was an urgent need for the State to claim all underground waters on behalf of the Crown and to control them because they were too valuable to waste: "among all civilised nations there is arising an increasingly stronger belief in the necessity for the

\textsuperscript{3} ARGs:1912.
\textsuperscript{4} \textit{Advertiser} 22.5.1912.
\textsuperscript{5} ARGs:1912. The appendix was presented at a lecture to the Royal Society and was based on the preliminary report of Ward (SAA GRG 24/90/7/1912/27 21.6.1912) with which the Surveyor-General and Engineer-in-Chief concurred.
effective conservation of natural resources". He criticised South Australians for taking more care with the mineral resources than with water even though the pastoral and agricultural interests, which depended so much on water supplies, had been vital to the economy. Mineral substitutes could always be found but water could not be replaced and needed to be conserved: "the object of any movement to effect conservation is essentially the same, viz., to safeguard future generations from the results of present reckless expenditure and waste". He recommended legislation to establish a board, comprising the Geologist, Surveyor-General, and Engineer-in-Chief, to control the existing and future bores. The Government was also advised to initiate moves to protect South Australian rights in the Great Australian Basin: otherwise, Ward predicted, the State might lose a part of the underground supply in the same way that it had lost the surface water of the Murray River.

In a lantern slide lecture to the twenty-fifth Anniversary Congress of the Agricultural Bureau of South Australia in September 1913, Ward noted that some areas of the State relied on the water which fell outside the State to flow through the underground basins. The Murray River Basin was another area where Ward desired to commence a project to delineate the limits of a useful supply. The Annual Report for 1914 mentioned that Howchin was examining samples taken from the bores sunk by the Mutooroo Pastoral Company near Lilydale Station in the Murray Basin. However,

6. ibid. p.18.
7. ibid.
8. Register 11.9.1913.
Ward's attention had been diverted from this project during a prolonged and severe drought which had commenced in the 1913-14 summer.

Earlier in 1914, Ward had initiated a scheme to collect and file the records of all privately-owned wells and bores in the State.9 This scheme was proposed in his appendix to the 1912 Annual Report. There were no records of the efforts already made to secure water supplies. Hence, Ward hoped to complete a file for every hundred in the State to show the locality, depth, quantity, quality and usefulness of the deposit. This would eventually be of assistance in the sinking of additional bores and in the conservation of existing supplies. The lack of such information prevented the Department from providing reliable advice to the public. The object of Ward's request was to prevent the ruination of the sub-artesian and artesian bores: this was not the same as the proposed legislation to give the State control of the water resources. The campaign was supported by the newspapers as a vital and necessary attempt to develop the State.10 But Ward 'found that the public response was limited and he thought the situation would not improve unless a fully trained official was appointed to compile the record of bores and wells.11

Though public response to this programme was poor, many people were not averse to asking the Department to find a solution to the depleted supplies in the metropolitan reservoirs during the drought of 1914. Ward and the Hydraulic Engineer, Charles Albert Bayer, were then

10. Ibid.; Register 17.4.1914.
11. ARGS:1914.
instructed by the Government to search for subterranean supplies. Ward commented that the main problem associated with this task was the lack of a systematic record of the work already done; the underground water supply of Adelaide had never been properly investigated in any detail and the official reports were of little value to a geologist attempting to locate new supplies.\(^\text{12}\) He also found that the testimony relating to previous bores and wells was often inaccurate and unreliable because so much depended on hearsay and the land-owner's memory.

Water supplies to Adelaide became so limited that the Government was forced to prohibit its use on roads, which were then unsealed, and gardens in the metropolitan area.\(^\text{13}\) Ward continued to search for the elusive artesian flows in and around Adelaide. In the meantime, many metropolitan residents had their own bores sunk privately by boring contractors.\(^\text{14}\) There was also an inflated interest in such faith-demanding devices as divining rods and 'patented water-finding machines'. In fact, Ward was compelled to issue an official report as to the unreliability of these methods which he considered valuable only to the extent of their encouraging people to search for water.\(^\text{15}\)

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Ward submitted his report on the underground water supply for Adelaide to the Government on 12 October 1914. The groundwater supplies were thought to be of insufficient quantity or quality. The underground supplies from Second Valley, the Bird-in-Hand Mine, the Onkaparinga River valley and from the east of Adelaide all presented difficulties. Ward suggested that the only proven supplies of artesian water which could be relied upon were those west of Adelaide. The resources at Croydon, Dry Creek, Seaton, Plympton and Morphettville were potentially useful and he recommended boring in the latter two localities or along the meridian through these areas. The Advertiser welcomed this report and urged the Government not to overlook the necessity of legislating to secure full control of the artesian basins throughout South Australia. However, the Government was more concerned at this stage with increasing the metropolitan supply for urban residents during the approaching summer months.

In 1914, Ward also reported on the site for a bore at Peterborough, the non-scientific approach to sinking bores by some land-owners in the Mount Lofty Ranges, the second Artesian Water Conference in Queensland in July, and the sites for weirs in conjunction with the Hydraulic Engineers Department, particularly at Baroota Creek and in the Hindmarsh River valley. Although the drought continued into 1915, the Government did not respond favourably to Ward's call for additional staff:

16. SAPP97:1914 op.cit.
No radical departure from precedent is suggested, but it is desired to carry on the work of investigation of subterranean water supplies continuously, and it is not possible to arrange for uninterrupted work unless the geological staff is so strengthened that an officer can be detailed for this special branch of geological work.

Such an appointment would have further justified the amounts expended by the Department on the search for water. It would also have been economical in that it would have allowed other work to be completed while reducing the inconvenience to the Department.

Ward continued investigating Adelaide's water supply in the early part of 1915, and he also visited the sites of the proposed Clarendon and Warren Reservoirs, and at Dismal Swamp where the persistent problems of the underground drainage were being examined with Bayer. Jack's report on his expedition to the Musgrave and Everard Ranges in 1914 contained the suggestion that the provisions of the Pastoral Act, which granted the remission of ten years' future rent as a reward for the discovery of a successful artesian well more than ten miles from any other well or permanent natural spring, be extended to encourage the sinking of wells beyond the limits of the Great Australian Artesian Basin. The Annual Report for 1915 disclosed that the question of the water supply was one of the most often asked by the public and Public Service Departments of the Geologists. The report did not please the Department's critics as the editor of the Daily Herald commented:

19. ARGs:1915 p.3.
20. IBIId.
The continuous references to, and reports on, water supplies really causes the reader to wonder whether he is perusing the annual report of the Government Geologist or that of the Waterworks Department.21

Although the editor did not think that locating water supplies ought to be a concern of the Department, the use of scientific methods by the Geologists to delineate water supplies had been generally accepted as a legitimate sphere of interest for the Survey and Department from the time of Brown's appointment.

During 1916, Jack reported on the prospects of water by boring at the Point McLeay Aboriginal Mission Station, and he also supplied a report to the Department of Agriculture on the prospects of a permanent supply at the Mount Remarkable Training Farm near Melrose.22 Ward maintained his association with the Hydraulic Engineers Department and reported on a weir for the River Torrens and, with the assistance of Howchin, he recommended sites for reservoirs at Spring Creek near Wilmington and Mount Remarkable as Bayer had proposed.23 In evidence to the Royal Commission on Water Supply, Ward stated that the Department was always willing to undertake similar investigations even at short notice because it was desirable that geologists be called in to pass on their advice.24

A complication in constructing a reservoir there was that the Spring Creek Copper Mine No Liability Company held a 21-year lease from the Woods and Forests Department. A

22. AR:1916.
23. SAPP49:1918 'Royal Commission on Water Supply - 6th Progress Report - Spring Creek and Mount Remarkable Scheme'.
condition of the lease specified, however, that the land could be reserved by the Crown for any purpose related to water. To resolve whether the Mine or the reservoir would be more valuable to the State, the Commission took evidence from Matthews, who had retired by this time from the position of Chief Inspector of Mines. He did not proffer a solution, but suggested that the Mine be tested before building a reservoir.25 The Chief Inspector of Mines, Louis Winton, inspected the Mine from 13 to 15 September and recommended it be continued as a mining speculation.26 After a 12-month trial by the Company, Jack told the Commission that the value of the Mine had not been proved.27 The Royal Commission subsequently adopted the recommendations of Ward and Howchin to build reservoirs at Spring Creek, and at Mount Creek instead of the Mount Remarkable site which Charles Bayer had originally proposed.

The Department's investigations to establish water supplies had been extended each year. One instance occurred in 1917 when Ward examined an area at Strathalbyn which had been offered to the Government for the settlement of repatriated members of the armed forces. Ward reported on the suitability of water at Pinnaroo for irrigation; on the origin and quality of water in Lakes Leake and Edward from which it was proposed to supply Mount Gambier; and on the construction of a tunnel at Millbrook, where he inspected its effect on the nearby surface waters. He also gave evidence to the Railways Standing Committee on the underground water supply northwest of Port Augusta between

the railway to Oodnadatta, and the transcontinental railway. The Royal Commission on Water Supply continued to call on Ward to give evidence on various localities such as Peterborough where complaints about inadequate supplies were still being raised after twenty-five years. Other bodies, such as the Advisory Council of Science and Industry of South Australia, relied on Ward for advice. To facilitate the work, Ward kept the records of investigations in map form. Although these maps fell far short of his 1914 proposal for a complete record, they were used to advantage by the public and Government departments. Although Jack spent less time than Ward on the water question, he also reported on underground supplies and dealt with some unusual problems such as the weir excavation at Tassie's Creek, and the underflow of the Gilbert River at Manoora where the Railways Department had built a reservoir in the river valley.

The routine work was maintained throughout the 1920s but additional responsibilities were also incorporated into the Department's activities. Ward and Jack began to travel much further afield in their investigations. During 1924, Jack went to the northeast of the State and subsequently prepared Bulletin 11 on 'the current developments in the shallow water' of that area. Ward went across the Nullarbor to Eucla in 1921 to collect information for the Interstate Conference on Artesian Water which was held in Adelaide in

29. DM Letter Book 6 p.171 Ward, evidence given before the Pastoral Committee of the Council, 8.10.1918, 23.10.1918.
30. AR:1918.
31. iBid.1919.
Three years later he went to Perth as the South Australian delegate to the Conference. In 1923, the Federal Government requested Ward's services for a 3-month examination of the overland stock route from Alice Springs to Charlotte Waters and to report on improving the existing water supplies and the possibility of establishing additional supplies en route. It was his first experience of the Central Australian region and his work so impressed the Federal authorities that they subsequently arranged for Ward to be appointed Geological Adviser to the Commonwealth Government on the Northern Territory and Central Australian water supplies. This appointment dated from 1 July 1925 and he was paid £100 a year as a consultant and the State Government was reimbursed for his absence until the agreement was terminated for financial reasons by the Commonwealth on 31 December 1931. His first investigation as Geological Adviser was undertaken for the Commonwealth Department of Works and Railways to find underground water supplies on stock routes and generally in the Territory. The time spent on this expedition, from 2 July to 10 October, was one of Ward's longest periods of continuous fieldwork. Some of the borehole sites selected by Ward

32. ibid.1921.
33. ibid.1923. The Register of 12.4.1923 noted that W. Baldwin Spencer, a noted anthropologist, was also visiting the area to report on the Aborigines and mixed bloods. The opportunity for Spencer's expedition had arisen because of Ward's trip.
34. SAA GRG 24/6/1925/122 Prime Minister S.M. Bruce to Premier J. Gunn 10.5.1926. There was a separate agreement for Ward to be a consultant to the Commonwealth on mining in the Territory under the same terms as the Geological Adviser's consultancy; this post was from 13.9.1927 to 2.10.1930.
36. AR:1925.
proved to be successful.\textsuperscript{37} Earlier in the year, Ward, Jack and the Surveyor-General, T.E. Day, had spent February on a tour of inspection of bores and artesian water localities, and in prospecting for water for pastoralists in the north of the State.\textsuperscript{38}

The Department's investigations for water increased as a result of the dry seasons of 1927 and 1928. Jack reported on a possible dam site at Telowie Gorge, and looked for additional supplies on two visits west of Kimba, and at Andamooka and Roxby Downs Station in 1927.\textsuperscript{39} He also selected sites for bores on behalf of the Commonwealth Railways Department at Depot Springs near Port Augusta and at Brachina. In 1928, he lectured on the occurrence of underground water to the Winter School for Farmers at Roseworthy Agricultural College, and went to Melbourne to discuss geophysical techniques of prospecting to locate underground water.\textsuperscript{40} Federal authorities arranged for Ward to report on water supplies in Central Australia, and to investigate the underground supplies in the southwest of Western Australia, where the Commonwealth Development and Migration Commission wanted to develop wheat farming.\textsuperscript{41} Jack also visited this locality at the request of the Commission and undertook a preliminary survey of the water

\textsuperscript{37} Register 12.8.1926.
\textsuperscript{38} Ibid. 21.1.1925.
\textsuperscript{39} AR;1927.
\textsuperscript{40} Ibid.1928.
\textsuperscript{41} Ibid. The '3,500 farms scheme' which was to be established south of Southern Cross was eventually abandoned. One member of the Commission was John Gunn, a former Labor Premier of South Australia. See G.C. Bolton, \textit{A Fine Country To Starve In.}
supplies. They both submitted reports to the Commission and Jack reported to the Imperial Geophysical Experimental Survey on the possible use of geophysical methods to locate supplies in that area.

The Department maintained records and maps to assist anyone boring for water and Ward was pleased with the increasing number of requests for advice. Thus he willingly accepted the offer of John McInnes, the Commissioner of Public Works, to take over the water boring operations from the Engineer-in-Chief. It was a convenient, economic and efficient arrangement because the Department already had some staff with the expertise to conduct the drilling. It further confirmed Ward's special interest in this sphere:

the whole of the [geological] work has a direct economic application, and there is no prospect of any change of policy. The particular investigations undertaken are those which appear most urgent in the general interest; and, in my considered judgement, questions connected with the development of underground water supplies should take precedence over all others, so far as South Australia is concerned.

This policy had been clearly manifested when Jack resigned in early 1931 and was replaced in the Survey by Segnit who specialised in geological fieldwork relating to underground water resources. One of Jack's last reports, Bulletin 14 on the 'Geological Structure and other Factors in Relation to

42. Advertiser 10.12.1928.
43. AR:1929.
Underground Water Supply in Portions of South Australia', summarised the knowledge regarding water supplies he had acquired while he was Deputy Government Geologist.

Ralph Segnit undertook a variety of investigations while Ward concentrated on the development of the Mount Bold Reservoir. Segnit inspected numerous localities including Thebarton Oval, Kooyonga Golf Course, properties at Cherry Gardens and the camps of unemployed men who were forest clearing at Kersbrook, to advise on the problems of water supply. A dry winter in 1934 again turned the attention of the Geologists to the metropolitan area. Although there were requests for the Department to drill private bores for individuals, Ward and Segnit decided to concentrate upon the mains supply only. Ward knew that most of the city could be supplied through bores and not reservoirs if the restrictions imposed during the drought of 1914 were renewed, but he did not think this necessary in 1934.

Until 1936, the public were only charged for the hire and operation of the water-boring plants. When Segnit applied for an increase in the amount paid to him for the use of his private car on official business, it was noted that his services were provided free of charge to private land-holders. The Government subsequently decided to impose a fee of £2 2s for the Geologist's services when no more than three sites on a small holding were involved. Ward had objected to such a proposal and he referred the

47. AR:1932.
50. SAA GRG 30/4/1936/342 Chairman, Classification and Efficiency Board to Ritchie 6.4.1936.
51. ibid. Ritchie to Ward 18.4.1936.
Minister, George Ritchie, to a previous occasion in 1927 when it had been decided not to impose fees for the advisory services of the Department. But the high cost of Segnit's travelling expenses, about £200 a year, was enough to convince the financially-conscious Minister to introduce the fee. Although there are no comparative statistics to determine whether this was a retrograde step, Ward claimed that the amount of work declined as a result of the fee. Segnit continued to select bore sites for private landowners and in the 1939-40 financial year his geological inspections on thirty-two properties raised £67 3s 9d; in the 1940-41 year he visited forty-seven properties and the charges totalled £98 14s. Ward tried unsuccessfully to persuade the Cabinet to reverse the decision for the public's benefit.

Ward had been doing less fieldwork each year on the water supply because of ill-health. In 1939, however, he compiled reports for an Interstate Artesian Water Conference which Segnit attended, an international conference in America on water supplies, on underground water in upper Eyre Peninsula for the Marginal Lands Committee, and he lectured to the Agricultural Bureau at Nuriootpa on locating and developing deposits for farms. At the same time, the number of interdepartmental enquiries increased and Segnit was frequently called upon to assist other Departments. He reported on the proposed pipeline from the Murray River to

53. SAA GRG 24/6/1939/975 Ward to Blesing 24.7.1939.
54. SAPP4:1940, 1941 Audit Reports: Department of Mines.
56. AR:1939.
Port Augusta and Whyalla and on supplies on the west coast for the E&WS; for the Wirrabara Forest on behalf of the Woods and Forests Department; for the Onkaparinga Racecourse Camp for the Defence Department; at Clare and Angaston for the Soldier Settlers Department; and the underground supply at the Point Pearce Station for the Aborigines Department. Engineer-in-Chief Angwin was impressed with Segnit's work and asked the Public Service Commissioner to arrange for Segnit to be transferred to the E&WS. The request was not entertained at that stage because of the staffing crisis facing the Department of Mines.

Upon joining the Department, Ben Dickinson was sent to the west coast where his first duties were concerned with the investigations into the water supply for the marginal lands of the area. Segnit later transferred to the E&WS after his unsuccessful appeal against Dickinson's appointment as Deputy Government Geologist. Ward and Angwin verbally agreed on the working relationship between the two Departments, but the antipathy between Segnit and Dickinson caused much friction in the ensuing period. The duplication of duties, clash of personalities, and waste of time and money seriously affected operations after Ward's retirement and led to the resignation of Dickinson in 1947. Prior to this, Dickinson maintained the inspections and selection of sites as Segnit had done. Ward and Dickinson investigated the proposed reservoir on the South Para River in 1943 and

57. ibid.
60. SAA GRG 24/6/1947/960 Dickinson to McEwin 23.11.1947 His resignation was withdrawn shortly afterwards and he remained as Director of Mines.
1944.61 Dickinson also spent time on the water supply for the Leigh Creek Coalfield and he selected sites in the vicinity of the old Sliding Rock Mine for the proposed supply to the field.62

The Department attempted to locate water to assist the mining industry in developing mineral resources. But the search for water had a wider significance for the people of the State. The Department assisted the pastoral and agricultural industries by opening up more land and by making the existing supplies of water more assured. As always, however, the Department was hindered by a lack of staff in all categories, equipment and finance. In addition, there were the problems of climate, distance and hazardous field trips to be overcome, and the normal difficulties associated with accurate interpretations from 'reading the terrain'. Despite these restricting factors, the Department achieved valuable results in alleviating the severe problems caused by a lack of water in the regions with a harsh climate and in times of drought.

Oil

Before and during H.Y.L. Brown's appointment, private companies and speculators had expressed interest in the possibilities of oil deposits in the State as a means of developing a source of energy and increasing their own wealth.63 For example, some drilling was undertaken on the Coorong in the 1880s and Brown had inspected a bituminous

61. AR:1943, 1944.
substance along the southeast coast near Mount Gambier in July 1895. But neither the Survey nor the Department paid much attention to the matter until Ward's appointment. When a company was formed to promote the possibilities of oil on Kangaroo Island, the Federal Minister of Defence agreed to have the samples tested for the company. Herbert Basedow was engaged by this company to report on the field and his favourable report recommended boring at selected points. Ward, however, was pessimistic about the prospects of oil on Kangaroo Island which he visited in August of 1912, and about another find on the west of Eyre Peninsula. Ward could not justify the expense of boring operations, and argued that the geology of the areas of the reported finds did not suggest that the substances found on the beaches were of local origin. In the Annual Report for 1912, he postulated that the asphaltum which was found along the southern coast of Australia was probably transported to the coast by unidentified oceanic currents.

Company promoters and prospectors frequently complained that Governments did not take sufficient interest in the search for oil. Some complained about inadequate or inefficient drilling methods while others criticised the lack of financial support. For example, George Meudell, a company promoter, protested to Premier Peake about Ward's condemnatory report on Kangaroo Island. Meudell suggested that the evidence against oil was negative because the drills had not been sunk deep enough. 'Prospector'

64. Register 8.7.1895.
65. Ibid. 13.8.1912.
67. SAA GRG 24/6/1913/520 Meudell to Peake 9.5.1913.
complained that he could not get subsidies to continue the search because Ward had reported against the possibility of oil on Kangaroo Island, the Coorong, and Eyre and Yorke Peninsulas. But when the Government offered to assist by reporting on the prospects of oil, the companies were still not satisfied. Butler interviewed Sebastian George, representative of the Eyre Peninsula Commonwealth Asphaltum and Petroleum Oil Company, and asked for information about the recent discoveries. Butler proposed to send Ward and Brown to investigate the area. Following this suggestion, a meeting was hastily arranged between the representatives of companies, syndicates and persons who held search leases covering 150 square miles of Eyre Peninsula, and a motion was passed asking Butler not to send these geologists to report on Eyre Peninsula because they had already commented unfavourably on the prospects of oil there.

The scientific analyses by Ward and Brown were widely criticised and demands for practical prospecting were made by letter writers such as 'Oil Prospector':

The only true test is a series of bores put down under the supervision of an acknowledged expert, and if this were done I am confident the result would be surprising, and would effectually dispose of the absurd theorising and unnecessarily severe condemnation of those areas by the present Government Geologist and his honorary associate, whose joint practical experience of petroliferous areas and petroleum mining may be summed up in one word, "Nil".

68. Register 19.8.1913.
69. Advertiser 3.10.1913.
70. Ibid. 4.10.1913.
71. Ibid. 15.10.1913 Letter to editor. See also ibid. 20.1.1914 from 'Independent Observer'.
There were also several requests and a deputation to Butler for a report to be obtained from an independent expert.72

However, Butler defended his advisers in whom he had complete confidence:

the more I see of the Government Geologist the more I am impressed with his sterling honesty, his undoubted ability, and his desire never to put his pen to paper unless he has absolutely satisfied himself that he is justified in making his report.73

Ward was naturally upset by these attacks on his person and the questioning of his ability as a geologist and he was moved to submit a lengthy defence to Butler.74 While acknowledging that he lacked personal experience of oil fields, he claimed that he had studied the relevant literature, including Brown's maps, before concluding that boring was not necessary to prove that oil did not exist in the State:

While I am able to appreciate the desire of those who are interested in these ventures to have bores put down for them by the Government, I am unable to so prostitute my intelligence as to admit that any good justification has yet been shown to me in the field.75

He denigrated the old argument that South Australia would have the mineral because the conditions here were similar to those prevailing in other oil-bearing areas. Ward cited other prominent geologists - Brown, Tate, Howchin, Mawson, and two former Government Geologists of Victoria, E.J. Dunn and R.A.F. Murray - in support of his verdict. He did not think that an oil expert was needed to investigate the State

72. ibid. 15.10.1913,17.10.1913,25.10.1913; *Daily Herald* 17.10.1913.
73. *Advertiser* Butler 17.10.1913.
75. ibid.
but suggested, if one were appointed, a geologist with experience of oil fields rather than an oil-drilling specialist. Nevertheless, he proposed that Parliament grant a reward for any company producing the first 1,000 barrels (42,000 gallons) of petroleum in South Australia. The Minister heeded Ward's advice and proposed a reward of £5,000. Parliament accepted the resolution but it raised the level of production necessary to claim the bonus to 100,000 gallons of crude petroleum. 76

Butler also told Parliament that he would not be dictated to by syndicates about who might be appointed by the Government as the expert to examine for oil.77 The State approached the Federal Government and sought the opinions of Dr Arthur Wade whose services were also in demand from the Queensland and Western Australian Governments.78 Early in 1914, an agreement was reached for Wade to visit South Australia after August.79 In the meantime, Ward collated the results of previous investigations which Wade would rely on in addition to his personal examination of the South-East, Kangaroo Island and Eyre Peninsula. When the pessimistic report of Wade's 5-month study was subsequently issued, the Daily Herald commented that it followed too closely Ward, Brown and Howchin's studies and that it was no better than a

76. SAPD:HA Butler 9.12.1913. The reward was offered under the provisions of the Native Industries Encouragement Act of 1872 (Advertiser 23.1.1914).
77. ibid. 21.10.1913.
78. ibid. 26.11.1913.
79. Register 21.2.1914.
compilation of other reports. Although it was not a favourable report, the Department satisfied the Government that it had adopted the correct attitude towards prospecting for oil.

Naturally the presentation of Wade's report did not please the oil-seekers and it was Herbert Basedow who led the critics of Wade's findings. In 1914, Basedow had issued a Report on the Country held under boring options for oil by the South Australian Oil Wells Company. Now, on behalf of the same Company, he reviewed Wade's report and criticised the Government for appointing a stranger to make a hurried visit in search of oil. The main regret was that Wade had based his work on the report on 'The Possibilities of the Discovery of Petroleum on Kangaroo Island and the Western Coast of Eyre's Peninsula' which had been published in January 1913 as the second Geological Survey Bulletin. Basedow, on one of the first occasions when he openly criticised Ward, had previously commented unfavourably on this paper. Basedow's personal disappointment at being overlooked for the Geologist's position may have strengthened his inclinations and professional views towards disagreeing with Ward. Ward's "condemnatory bulletin, which was the real cause of the renewed controversy between the

80. Daily Herald 2.4.1915.
81. Ibid. 26.3.1915.
82. Advertiser 28.5.1915. The Daily Herald published several long criticisms by Basedow of Wade's work - for example, 9.8.1915. See also Basedow, H., The Supposed Oil-Bearing areas of South Australia: Dr. Wade's Report Critically Reviewed.
public and the Government department"\textsuperscript{84}, had been the first to be distributed overseas by the Department, much to the chagrin of the local promoters and speculators.

The Department remained intransigent on the oil question and its subsequent investigations, particularly in the South-East, did not result in any startling discoveries. Ward's report on oil deposits at Carpenters Rocks near Mount Gambier, which he visited with Professor Herbert Gregory of Yale University and the United States Geological Survey, was criticised like so many other reports.\textsuperscript{85} On this occasion, the company promoter, Sebastian George, maintained there was hope for the development of oil fields despite Ward's pessimism:

\begin{quote}
The people of South Australia have cause to remember the errors made by Government Geologists in the past, and cannot forget that Broken Hill, Kalgoorlie, Mount Morgan, and other places were all banned in their turns, but eventually became wonders of the universe.\textsuperscript{86}
\end{quote}

Ward's former teacher, Professor David, later visited the South-East with Ward, but he was not enthusiastic about its prospects either.\textsuperscript{87} Ward's reports were accurate and geologically correct but they disappointed the investors by being too pessimistic to inspire any speculation.

Private enterprise continued to search the State without success and although many companies criticised the Department, they were reluctant to provide any help or evidence which might have changed Ward's opinion. For example, the South Australian Oil Wells Company had refused

\textsuperscript{84} Advertiser 28.5.1915.
\textsuperscript{85} ibid. 3.4.1916.
\textsuperscript{86} ibid. 4.5.1916.
\textsuperscript{87} ibid. 27.6.1921.
an application from the Department for samples from its boring site at Robe, but it eventually provided a confidential record of the strata passed through; the Ocean Oil Wells Company declined to supply the Department with any information. When co-operation between the parties was absent, the Department found it difficult to assist the companies with their investigations. During 1919, the Federal Government was asked by a private company to provide financial assistance towards the cost of boring for petroleum at Tantanoola and Robe. Ward inspected the bores in August with Joseph Carne, the Government Geologist of New South Wales, and concluded that the possibility of a commercial oil supply was remote. The application for assistance was refused; the Federal Government followed the policy adopted by South Australia in January 1914 by offering a bonus for amounts produced instead of subsidising the boring operations.

Although he was frequently criticised for a pessimistic outlook on the possibility of oil deposits, Ward was aware of the need to develop this resource if it were possible. However, this did not appear feasible in terms of the existing geological knowledge. The sinking of numerous 'wild-cat' bores would have been very expensive and most impractical in the absence of the requisite geological data. The State had neither the finance nor the knowledge to undertake such a task. Similarly, private enterprise was ill-equipped for the task and thus made constant demands for the Government to assist in the search. For example,

88. SAPD:HA Blundell to Reidy 3.10.1916.
89. AR:1919.
'Prospector' complained that private enterprise should not be compelled to search for oil without aid from the State or Department. The Department was also criticised on occasions for not providing encouragement and assistance which matched the expectations of private enterprise. The problems associated with the supplies of oil in Australia during World War I suggested to several observers that a solution might be found through a national approach. Ward was inclined to allow the Commonwealth Government to undertake the responsibility of searching for petroleum because he felt some matters of geological interest transcended State boundaries and would be most realistically resolved if the Commonwealth employed a petroleum geologist or formed a Federal Geological Survey. Ward's inclinations were similar to those of the Commonwealth Government which organised several petroleum investigations during and after the 1920s. However, Ward was reluctant for the State to become involved with these Commonwealth surveys because he did not consider there were any commercial deposits of oil in South Australia. He considered there were more important investigations, especially concerning underground water, for the Geologists to undertake:

90. Advertiser 10.10.1917 Letter to editor.  
91. SAA GRG 24/6/1915/88 Ward 28.10.1925 on Dr Wade's report on oil in the South-East.  
If the Federal Government is prepared to set aside part of the funds allotted for prospecting for oil, to be used on this special geological [mapping] and drilling work; and if arrangements can be made for engaging a palaeontologist to work continuously at the problem, we can then enter upon the work without the feeling that we are setting aside the investigations that are of tangible and immediate use to the community for the pursuit of data that may lead us nowhere.93

Throughout the 1920s, Ward and Jack visited several boring operations and supposed oil finds, particularly in the South-East near Kingston and the Glenelg River, but no successful discoveries were reported.

A lack of success did not deter prospectors and companies from taking out search licences to investigate the for oil.94 The Government attempted to further stimulate these searches by increasing the amount of land which could be held at one time to a maximum of twenty-five square miles.95 This was intended to allow the companies to examine each locality thoroughly instead of taking up the small tracts of land which, under the 1893 Mining Act, were limited to 640 acres. Basedow, who had now entered Parliament, said it was not good policy for Ward to administer the Act because he disparaged the prospects of oil.96

The limited involvement of the State Government in the search for oil continued in the 1930s. However, Ward's role with the Commonwealth Government in the search for oil increased during this time. He visited the South-East and

93. SAA GRG 24/6/1915/88 Ward 18.2.1926.
95. Mińing (Prospecting for Oil) Act, 1928. Assented to 1.11.1928.
96. SAPD:HA 25.9.1928.
part of Victoria with the Director of the Geological Survey of Victoria, W. Baragwanath, and another Geological Adviser to the Commonwealth, Dr W.G. Woolnough in 1931.97 He was appointed in 1934 to a Commonwealth committee to investigate the construction of a plant in Australia to produce oil by the hydrogenation of coal.98 The following year, Ward was appointed to the Geological Advisory Committee to assist the geologists of the Anglo-Persian Company who were investigating sites in Australia for the Commonwealth Oil Refineries.99 An aerial survey under the control of Ward and Woolnough was conducted as part of this search programme.100 The most significant appointment was that on 5 May 1936 to the Commonwealth Oil Advisory Committee which

97. AR:1931.
98. Ibid:1934.
100. Advertiser 8.5.1935. Some years earlier, Ward had expressed a disinterest in this modern method of surveying! "The claims made for aerial surveying by Dr Woolnough and others appear to me to be extravagant. Close ground control is necessary, if accuracy is demanded; and I still regard the method as applicable chiefly to the filling in of detail in country in which the relief is pronounced. I should certainly decline to spend a penny on the aerial surveying of an area that has been mapped already by the usual methods". (SAA GRG 24/6/1932/1006 Ward 1.9.1931.)
was trying to locate petroleum in Australia. Woolnough, who was also on the Committee with Arthur Wade, told Ward of the need for confidentiality in their work:

While... I believe the chief motive force behind the present proposal was the personal advantage of a selected few, there is included a modicum of desire to see Australia self-contained in the matter of oil products. Definite statements have reached the Powers that be that U.S.A. is likely to be an importer within ten years. I think, too, that diplomatic information about Japan is by no means reassuring. The situation in connection with shale oil, hydrogenation and power alcohol is not at all encouraging and anxiety is felt in regard to defence supplies. As your hairy covering is not superior to mine keep these suggestions under your hat.  

Ward served on the Commonwealth Oil Advisory Committee until his resignation on 10 January 1940. The Commonwealth Government usually paid his full salary when he worked on its behalf because he spent a lot of time visiting places outside of South Australia.  

Ward issued a statement on the search for petroleum in South Australia through the Commonwealth Oil Advisory Committee. In this paper he outlined ten reasons which led people to believe that oil deposits existed in the State, but he did not give these theories any credibility as true geological explanations. The so-called evidence included the distribution of asphaltic bitumen on beaches,

101. SAA GRG 30/50/1936/1 Woolnough to Ward n.d. probably 18.5.1936. Woolnough expressed a desire for a harmonious working relationship with Ward although he acknowledged that they both held widely divergent opinions in several areas.
102. SAA GRG 24/6/1936/453 for details of appointment.
103. SAA GRG 30/50/1937/2 H.A. Barrenger, Secretary to Committee to Ward 16.7.1937. Ward visited most States between 1936 and 1940 and in Papua 1938.
104. SAA GRG 30/50/1939-40/8 Ward 8.11.1939.
the source of which, though petroliferous in origin, was unknown; 'coorongite', a rubbery substance formed from vegetable matter which seasonally accumulated on the Coorong; claims of diviners; the extrapolation of the wrong conclusions from normal occurrences of minerals; faulty geological knowledge; and the superficial appearance of the State's coastline which resembled California in parts. He later issued a Bulletin on the 'Search for Oil in South Australia' which contained similar comments on the failings of exploratory searches for oil. Although legislation was passed in 1940 to encourage developers of petroleum deposits, Ward remained pessimistic about the possibilities of success in South Australia. Prospecting for oil had been conducted in similar fashion to prospecting for gold and too many regarded the activities as purely speculative. There was a need for further scientific and technical examinations which were not seriously considered by the Department because of Ward's steadfast theoretical opposition and the lack of sufficient staff to do any more than the most urgent and fundamental research.

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Parliament had assumed control over the supply of water in the nineteenth century for the benefit of all South Australians. The value of water was intrinsic and could not be measured in monetary terms: it was essential to life. Ward's positive attitudes ensured the prominence of his policy towards the development of water resources. This work of the Department was of lasting value to the State for it not only contributed to an improved standard of living.

for the citizens of Adelaide, but also extended the range of pastoral and agricultural interests. But mining operations, particularly in the outlying regions, remained at a low ebb and did not benefit to any great extent from the pursuit of Ward's policy.

Given his general ideas on industrial development, it seems odd that Ward consistently denied the existence of oil. One would have thought that he would be determined to discover supplies of petroleum because of its growing importance to industrial and technological change. But Ward was a scientist and a realist. He always spoke in highly negative and cautious terms about the possibilities of oil in the State - 'the least improbable area', 'the prospects are least unfavourable'. To him there were no geological indications of commercial deposits of petroleum and he was not prepared to waste time and effort on a futile search. Although Ward's critics said it was his fault that no worthwhile oil discoveries were made, the results of the Department's investigations and the private prospectors and company searches justified his verdict at that time.
Chapter Ten: Diverse Mineral Interests.

In contrast to H.Y.L. Brown, who spent most of his time on field excursions, Ward remained in the office for long periods overseeing the administrative and regulatory duties. One of the frequent complaints against the officers of the Department was that they did not spend enough time on fieldwork. For example, Edward Twopenny told Parliament of the "general opinion in the country that there is too much mining work done in the Adelaide office and too little outside of it".¹ The constant demands for reports on a variety of minerals and problems, and the insufficient amount of clerical assistance forced Ward to concentrate on office duties to ensure that the Department was efficiently managed. He was obviously in a difficult predicament because he could be criticised for spending either too little or too much time in the office depending on whatever way he chose to arrange his duties and manage the Department.

Jack was less concerned with administrative responsibilities and more involved with fieldwork than Ward. His most hazardous undertaking was a trip to the far northwest Musgrave Ranges at the end of 1914, a year of severe drought throughout the State. This expedition was not only a geological survey but also an examination for water, minerals and pastoral land. Accompanying Jack were Captain S.A. White (Biologist at the Museum), J.P. Rogers (White's privately-employed assistant and taxidermist), W.H.

¹. SAPD:HA 16.10.1917. Numerous complaints were voiced in the newspapers of 1915-17 when the Department was strongly criticised.
Williams and R. Nicholls (two experienced prospectors), and some Aboriginal youths who were allegedly "very useful for rounding up stray camels, etc.". White travelled only to Todmorden Station, sixty miles northwest of Oodnadatta, where G.F. Dodwell (Government Astronomer) joined the party. Although it was an inappropriate time of the year to venture into the area, Jack completed some useful work. Jack's later report on the desirability of establishing a reserve for the Aborigines in the northwest of the State was based on his 1914 expedition. The Daily Herald had queried the value of commencing a geological survey in this area, and suggested that Ward and Jack, strangers to the State, should first concentrate on the areas closer to Adelaide. Jack's experiences on this expedition vindicated the paper's criticism and most of the subsequent fieldwork was of a less spectacular and more practical nature than Brown's explorations. This was partly because Brown had already established a broad overview of the State's geology. It also suited Ward's preference to examine, in detail, areas of economic potential and his positive encouragement to policies promoting industrial development in the State.

2. Register 17.6.1914.
3. ARG5:1914.
4. SAA GRG 23/1/1917/643 Jack 31.1.1919 'Report on proposed area for reserve': He was unimpressed with the mineral possibilities of the area.
Uranium and radium

The longest northern journey undertaken by Ward in his first year in office was to Mount Painter where he examined the uranium deposits. The following year he visited the radium deposit at Radium Hill in response to a request from the South Australian Radium Hill Proprietary Company for Government assistance to erect a concentrating mill and to develop the field further. Premier Archibald Peake reported to Parliament that the activities of the Company had extended the search for radio-active ores. This provided additional geological knowledge of the area. Ward revisited Mount Painter in May 1914 to follow up the developments. However, the onset of World War I in August of that year eventually terminated Government and private enterprise activity in the area for several years; for example, the Radium Extraction Company of South Australia Limited went into liquidation in 1917.

Four companies resumed operations at Mount Painter in 1924, and in 1926 they merged to form the Australian Radium Corporation NL. Ore was sent from Mount Painter to Dry Creek, near Adelaide, where a treatment plant and refinery had been constructed by the Company. However, Ward did not return to Mount Painter until 1926 when he visited the area with Winton to report on the development of the uranium and

7. ARGIS:1913.
11. ibid.
radium deposits. The Department had established a supply of water for the area, and tenders were called for the construction of another well at Greenwood's Camp on the eastern side of the field. This was intended to supply water for the prospectors working in the mineralised locality. Early in 1929, the British Government cabled the South Australian Government and requested information about sources of radium and their potential for exploitation. The Department considered the Mount Painter field deserved more attention and the lessee for the area, the Australian Radium Corporation, decided to undertake more comprehensive testing of the deposits. The Government refused to issue any of the confidential details of the request or the results of the investigations.

The British Government maintained an interest in the radio-active ores and in 1930 British financiers attempted to arrange a £20,000 subsidy for the prospecting for radium at Minerva Heights. Dr A.C. David Rivett of the Council for Scientific and Industrial Research, who was in England sought information which might satisfy the financiers that the deposits were of sufficient quality to be a commercial venture. Ward reported that £20,000 would enable a

15. Advertiser 19.4.1929. The request from the Dominions Office was probably made on 28 February, and a reply sent from the Government on 15 March according to letter registers for Dominions Office correspondence held in London. Unfortunately the files have been destroyed (personal correspondence, 12 April 1981).
17. SAPD:HA Acting Premier to Basedow 21.5.1929.
18. SAA GRG 24/6/1930/1471 Acting Prime Minister to L.L. Hill 20.11.1930.
comprehensive survey to determine if the ore was payable. But he noted that little work had been done on the deposits since Winton's report in October 1927; the two mineral claims of the Minerva Heights Radium Syndicate NL had since been suspended. He felt that the radium and uranium at Mount Painter looked more promising. However, in 1934, the Australian Radium Corporation abandoned its leases and the fields remained dormant until mid-1944 when the Department investigated the deposits again. World War II was the catalyst to numerous investigations at Mount Painter and Radium Hill on behalf of the British Government. The massive Radium Hill Uranium Project was subsequently developed in the post-war years.

Coal

Although the State seemed poorly endowed with suitable coal deposits, the search for this energy source continued as each year the demand for a local supply of coal increased. The unreliability and expense of the coal from Newcastle induced the Government to pursue the deposits at Leigh Creek but it was not prepared to subsidise heavily the operations there. Limited assistance was also allocated to other potential coalfields such as the Moorlands Coal Mining Company property at Moorlands. When the Paradise Coal Mining Company applied to Butler for assistance with boring on its property near Highbury, the Department agreed to do the work with the Company contributing half of the

20. DM Report Book 40 op. cit. The investigation was from June 1944 to September 1945. The British Government request was made to the Commonwealth Government on 17.5.1944.
22. ARGS:1913.
cost of boring.\textsuperscript{23} Coal and shale were also known to exist at Bower but the Department had not visited the area in an official capacity.\textsuperscript{24}

Another strike on the Newcastle Coalfields in 1916 again focussed attention on South Australian supplies.\textsuperscript{25} On this occasion the Minister of Mines, Reginald Blundell, attempted to find a solution to the problem of the quality of the local coal supplies. The Government appointed a committee to investigate the commercial availability and economic utilisation of the Leigh Creek and other coal deposits. The committee was composed of Ward, Professor R.W. Chapman, Dr W.A. Hargreaves (Director of the Chemistry Department), James McGuire (Acting Railways Commissioner), William G.T. Goodman (General Manager of the Tramways Trust) and J.P. Burnside (Chief Inspector of Factories and Steam Boilers).\textsuperscript{26} The Department maintained a diamond drill on the Leigh Creek Coalfield, the area of which had been reserved from the operations of the Mining Act in 1908 and subsequently extended in accord with Brown's mapping of the potential coal-bearing country.\textsuperscript{27} Jack, Ward and Winton visited the field at various times, and from April to December 1917, Inspector Jones managed the drilling operations on the field.\textsuperscript{28} This activity did not provide the Leigh Creek Coal Committee with evidence to suggest that the field could be successfully developed to alleviate the

\textsuperscript{23} Advertiser 16.6.1914.
\textsuperscript{24} ibid. 5.7.1914.
\textsuperscript{25} Daily Herald 7.12.1916.
\textsuperscript{26} ibid. 5.12.1916.
\textsuperscript{27} Dickinson, S.B., 'The Search for Coal at Leigh Creek' in Poole, G., The Leigh Creek Coalfield p.88.
\textsuperscript{28} AR:1917. The work was usually left under the control of the Foreman of Boring Plant, Charles Duffield.
rising cost of fuel in the State. The coal had been of a constant but poor quality, and the Committee did not anticipate any improvement as the bores were sunk deeper.  

The difficulties with the fuel supplies for the State became more severe after the War, and efforts to solve the problems increased. Although work at Leigh Creek ceased after the sixth bore was sunk in 1919, Ward examined the working of the lignite deposit at Moorlands, and Jack went to Tasmania with Dr Hargreaves to investigate a proposal to supply coal to the Government of South Australia. The inquiries into the purchase of the Dalmayne Coal Mine came to nothing, as had the previous discussions with the New South Wales coal-mine owners. The Government purchased another drill to test the State's coal resources: "all of these deposits will probably be tested since their value has been greatly enhanced by the difficulty and expense of obtaining supplies of the higher grade fuel from New South Wales". The Leigh Creek coal was experimented with on the northern railways.

Henry Barwell's Government also attempted to make South Australia more independent of the interstate supplies. Winton and Jones collected samples from the lignite fields and some were tested by the Chemistry Department, while others were taken overseas by Premier Barwell for analysis in Britain. Ward reported on the supplies of brown coal for British and American interests and to the Director of

29. ibid.1919.
30. ibid.1920.
33. Register 18.1.1922.
the Commonwealth Institute of Science and Industry. He visited the lignite deposits at Morwell in Victoria and inspected more drilling equipment for possible use on South Australian deposits. He then revisited the Moorlands, Clinton and Moarunga sites and reported on the merit of further drilling by the Department. New deposits were also sought and when Robert Wilson, a part European, found traces of brown coal at Point Pearce Station, Ward immediately visited the locality and three bores were sunk and samples collected. In 1924, Jack investigated the supposed discovery of bituminous coal at Burra, and Ward examined bores being sunk near Mannum and Bower for lignite.

The Labor Government under John Gunn arranged an independent report on the coal resources by an expert from outside the State. Dr H. Herman, Engineer-in-Charge of Briquetting and Research with the State Electricity Commission of Victoria, visited South Australia from April to June 1925. Herman reported to Gunn on the immediate and future commercial possibilities of South Australian brown coal, and what might be done to extend the Government and private explorations and laboratory tests. Duffield and Ward took Herman on several tours of inspection of the coal deposits near Adelaide but they did not visit the far distant deposits at Leigh Creek and Lake Phillipson. This led Herman to conclude that the best fields for development were those at Moorlands, Inkerman and Clinton, although the

34. AR:1922.
35. Ibid.
36. Advertiser 28.3.1922.
37. AR:1924.
38. SAP73:1925 'Report on the Brown Coal of South Australia and Prospects of their commercial utilisation'.
coal could not compete economically with the fuels then being used in Adelaide. However, Herman suggested that a power station located on a coalfield might transmit electricity at a reasonable cost. He did not think there was any prospect of successfully utilising the Leigh Creek deposits because of the low quality of the coal, and the disadvantageous location of the deposits. Herman recommended that the Government undertake deep-mining for coal and conduct an energetic boring campaign to uncover seams for cheap open-cut mining.

Ward was also reluctant to suggest Leigh Creek as a suitable coalfield and in his evidence to the Royal Commission on Manufacturing and Secondary Industries he recommended using the deposits at Moorlands, Noarlunga, Clinton and Inkerman in preference to Leigh Creek. The Commission had noted that improvements to the manufacturing and secondary industries would depend on a cheap fuel supply in the State. The Commission dispensed with the objections to the value of brown coal on the grounds of its combustible properties or its heating value, and considered that its economic potential depended solely on the cost of production. In August 1926, the Commission visited Yallourn in Victoria where Herman demonstrated the latest developments in coal mining procedure and he re-emphasized the use of the open-cut method of mining.

The manager of the Adelaide Electric Supply Company, Mr F.W.H. Wheadon, told the Royal Commission that the Company was interested in locating or developing coalfields with the

Department of Mines.\textsuperscript{40} Charles Duffield, however, had said there were difficulties with the exploratory boring programme because the boring plants could not be readily adapted to shallow boring.\textsuperscript{41} At that time, the Department was prospecting for shallow deposits of lignite with three calyx drills which were designed for boring to depths of 1,000 feet.\textsuperscript{42} Duffield felt the problem of locating and developing deposits could be overcome with the procurement of a sufficient number of appropriate machines. But the Commission did no more than recommend that the Government subsidise the bona fide sinking of trial shafts for lignite deposits which private enterprise could then develop.

Before the report of the Royal Commission was released, the Mineral Committee of the Advisory Council of Science and Industry of South Australia reported on the possibilities of using South Australian brown coal.\textsuperscript{43} The Committee had tested forty tons of Moorlands coal at the Adelaide Electric Supply Company's plant and concluded that the coal could be burnt under the right conditions. This provided further incentive for the Department to continue its boring operations in search of shallow deposits which could be mined by open-cut methods.\textsuperscript{44} The drilling east of the Mount Lofty Ranges was used to delineate the brown coal reserves for future exploitation.\textsuperscript{45} But other than these routine boring operations to determine the quality and extent of the

\begin{itemize}
\item \textsuperscript{40}Advertiser 15.9.1926.
\item \textsuperscript{41} \textit{SAPP61}:1927 op.cit. Duffield 25.5.1926.
\item \textsuperscript{42} \textit{DM Letter Book} 10 p.199 op.cit. The drills were at Bower, Moorlands and Sedan.
\item \textsuperscript{43} Register 28.6.1927.
\item \textsuperscript{44} AR:1927.
\item \textsuperscript{45} \textit{DM Letter Book} 12 p.49 Ward to Tassie 14.4.1930. The drills were still used near Bower, Moorlands, and Sedan.
\end{itemize}
brown coal deposits, the Department's interest in developing coal diminished for several years.

Ward's services were requested by the Federal Government in 1929 and he served on an Australian Royal Commission into the Coal Industry from June 1929 to March 1930.\(^{46}\) Drilling was commenced at Myponga in 1930 in a search for black coal and the Department also wanted to bore for coal on the golf links in the north parklands of Adelaide. The Adelaide City Council refused permission for the Department to drill there but the existence of a rich brown coal seam was not denied.\(^{47}\) The lack of success with the development of coal deposits led to a mood of pessimism on the part of Ward. By 1932, he had concluded that because there appeared to be insufficient reserves of coal, open-cut methods were not suited for the deep seams and that mining by conventional tunnels and shafts would have to be adopted on South Australian fields.\(^{48}\) Even so, he did not consider that there was a profitable and practical method of utilising the deposits economically.\(^{49}\)

When the policies of industrialisation were initiated in the mid-1930s, the Department renewed its interest in coal, and Ward then concentrated on the lignite at Moorlands. A geophysical survey of the Moorlands field by a

46. AR:1929.
47. Register 24.6.1930. An old well on the links was rumoured to have indicated coal, and coal had been found when a bore was sunk at the West End Brewery in Hindley Street during the search for water in the 1914 drought. The Montefiore Hill Coal Mining Company had been formed in 1858 to work a deposit at the base of the hill which was near the golf links. In 1890, the Montefiore Hill Coal Venture also conducted some exploratory boring in the same area.

49. SAA GRG 24/6/1932/779 Ward to Premier Hill 27.7.1932.
Commonwealth geophysicist, J.M. Rayner, was undertaken on behalf of the South Australian Government to delineate the extent of the deposits.\textsuperscript{50} However, the report later indicated that the coal at Moorlands could not be economically exploited by the existing techniques.\textsuperscript{51}

In the meantime, the Adelaide Electric Supply Company had commenced negotiations with the Government for a lease of land at Osborne to establish a second generating plant to satisfy the requirements of the expanding secondary industries.\textsuperscript{52} Mr F.W.H. Wheadon approached the Department for the latest information on the question of coal supplies, treatment and the possibility of a Government subsidy to enable South Australian coal to be developed on an equal cost basis to the New South Wales coal.\textsuperscript{53} Ward replied that the coal was of constant quality in several places but it had to be mined by underground methods and that, consequently, the cost of developing any deposits would be too high to compete with the imported coal even with a subsidy.\textsuperscript{54} But the Company was determined to locate a viable local supply and arranged for the former Deputy Government Geologist, Robert Lockhart Jack, and Mr T.L. Barston of the Broken Hill Proprietary Company to visit South Australia and investigate the coalfields.\textsuperscript{55} They visited several fields with Charles Duffield but they too doubted that the fields could be worked economically.\textsuperscript{56}

\textsuperscript{50. News 30.9.1937.}
\textsuperscript{51. Advertiser 14.9.1939.}
\textsuperscript{52. SAA GNG 13/18/1939 Wheadon to DM 10.3.1939.}
\textsuperscript{53. ibid.}
\textsuperscript{54. ibid. Ward to Wheadon 13.3.1939.}
\textsuperscript{55. ibid. Wheadon to Ward 31.3.1939.}
\textsuperscript{56. ibid. Wheadon to Ward and Playford 19.5.1939.}
Once again a war proved to be the catalyst to action in the mining and industrial spheres. World War II placed many difficulties on the supply of New South Wales coal. In addition to the perennial problems of the high cost of the coal and the disruptions caused by strikes in the maritime and coal-mining industries, there were constant demands for coal throughout Australia for industrial purposes and there were fewer ships to transport it. Thus the Adelaide Electric Supply Company met Premier Playford and discussed the possibility of developing the Leigh Creek deposits as a national undertaking. The Company was not prepared to work the coal without Government assistance because it was still considered to be uneconomic to do otherwise. The Government was disturbed, as were many South Australians, by the continued interruptions to the State's coal supplies and it was arranged for the Department to drill at Leigh Creek.

The search for coal was recommenced in August 1941 but Ward adopted a different tactic on this occasion. He examined the results of the previous boring operations and concluded that the main seam of coal would be close to the surface if there were no faults in the geological structure of the locality. Ward's keen observations were accurate and a main seam of coal was struck at sixty-six feet six inches in the borehole 'El' in October 1941. Instead of drilling deep into the basin, the outer limits of the coal seams were

57. SAA GRG 13/18/1941 Wheadon to Ward 17.1.1941.
58. ibid.
60. Dickinson, op.cit. p.92.
tested on a systematic basis to determine if open-cut methods could be used to develop the deposits.61

There was a sense of urgency about the renewed activity at Leigh Creek; for example, a Parliamentary party inspected the drilling operations a month after they commenced62, and Playford regularly visited the field each month.63 Another shaft was sunk near the 'El' bore and between October 1941 and March 1942, 640 tons of coal were raised for the purpose of experimentation.64 From October 1942 to March 1943, an additional 1,000 tons were raised from this shaft.

In October 1942, the E&WS became involved in the project because of its experience with large-scale excavations by mechanical means and the first dragline excavations commenced in January 1943.65 The Leigh Creek Coal Act which vested power over the coal mines in the Minister of Mines, received the Governor's assent on 5 November 1942. The Governor was empowered to create an administrative or advisory authority and, in January 1943, a Leigh Creek Coal Advisory Committee was appointed. Its members were Hugh Angwin (Engineer-in-Chief), J.P. Burnside (Chief Inspector of Factories), and Keith Ward who remained on the Committee after he retired.66 This Committee arranged for the testing of coal in various industrial situations and the Department reported the results in the Mining Reviews.

61. Advertiser 8.8.1941.
62. Ibid. 3.9.1941. The party included Segnit, Angwin, Playford, McEwin and G.F. Jenkins (chairman of the Public Works Committee).
64. Dickinson, op.cit. p.93.
65. SAPP56:1944 'Report on Leigh Creek'.
The Department maintained its drilling operations and geological investigations after control of the project was formally transferred to the E&WS Department on 9 March 1943. Leigh Creek itself had to be diverted because the occasional rainfall in the area sometimes resulted in the Creek overflowing which was likely to fill any open-cut mines and thereby retard development. 67 This diversion of the Creek was completed by August 1943 and the planned open-cut mining could proceed. But it took some years before worthwhile results were obtained because the State, with its limited finance for large-scale projects, was forced to undertake all operations without Federal Government assistance. 68

The Department of Mines continued to work at Leigh Creek on behalf of the E&WS. Dickinson visited the brown coal deposits in Victoria in 1943, and reported to McEwin on the Department's operations at Leigh Creek; Ward also issued a detailed report on the coal. 69 Dickinson carried out valuable work in geologically exploring the northern coal basin at the field and in examining for underground water supplies. He supervised the boring operations which by 30 June 1944 had cost £4,914 and resulted in over 6,500 feet being drilled each year by the percussion and rotary drills. 70 The Department of Mines was never in a position to control and operate the Leigh Creek Coalfield because it

68. SAA GRG 24/6/1943/545 Playford to Prime Minister Curtin 3.9.1943.
69. AR:1943.
70. SAPP56:1944 op.cit.
lacked the expertise and staff.\textsuperscript{71} The E\&WS, however, was equipped to manage large-scale construction projects as that Department's historian, Marianne Liebelt, has noted. She has claimed that the E\&WS takeover was inevitable after the Commonwealth had declared it a protected body under the National Security (Manpower) Regulations.\textsuperscript{72}

**Copper**

The early mainstay of the mineral industry, copper, continued to decline in importance during Ward's time although there were temporary revivals. As one of their first tasks, Ward and Jack had visited the Government Mines in January 1912.\textsuperscript{73} The Geologists had concluded that the region warranted further systematic and extensive prospecting, especially by boring with the diamond drill, to determine the possibilities of the lodes. Jack attempted the first complete survey of the Moonta-Wallaroo region following this visit. After the election in February 1912, the new Minister of Mines, Richard Butler, inspected the Yelta, Parramatta, Wallaroo and Wandilta Extended Mines with Ward and Matthews.\textsuperscript{74} Butler subsequently advised his Ministerial colleagues to move the Government's diamond drill from the Wallaroo Extended Mine to the Yelta Mine. Although Butler said this would not mean the cessation of work at the Wallaroo Extended, it was clearly the first step in terminating the Government's involvement in mining operations. Butler opposed direct Government activity in mining; in his view, legitimate assistance to mining took

\textsuperscript{71} Interviews with Playford and McEwin, op.cit.
\textsuperscript{72} Liebelt, op.cit.
\textsuperscript{73} SAA GRG 24/90/7/1912/11 'Geologists' Report on Yelta and Parramatta' 31.1.1912.
\textsuperscript{74} Advertiser 2.3.1917.
the form of subsidies and developmental work to open up possibilities for private enterprise.75

Despite, or because of, the favourable report of Ward and Jack, the Government arranged for Hartwell Conder of Strahan, Tasmania, to investigate the Government Mines.76 Ward had recommended him as a capable mining engineer and metallurgist.77 His report on the Yelta Mine supplemented the Geologists' report and examined the economic prospects of its successful development.78 In the first instance, the Mine could be operated at a profit but the future results would require close attention and the work abandoned as soon as it became unprofitable. The report on the Wandilta Mine at Kadina grappled with the question of abandoning the work immediately or providing additional funds to prove its prospects.79 Ward concurred with this report but gave precedence to the boring at the Yelta Mine. Matthews also opposed further work at Wandilta, but he suggested that the machinery and plant remain at the Mine in case it reopened if the price of copper rose in the future. The Mayor of Kadina, J. Tonkin, opposed the closure of the Wandilta Mine at that time, because he believed that further boring of only 100 feet was required to reach the lode.80 However, the pumping machinery had broken down and the Mine had

75. ibid.
76. Daily Herald 18.5.1912; Register 2.7.1912.
77. SAA GRG 24/790/7/1912/24 L.R. Ward to Butler 2.4.1912.
78. SAPP36:1912 'Report of Mr Hartwell Conder on the Yelta Mine'.
79. SAPP37:1912 'Report of Mr Hartwell Conder on the Wandilta Mine with remarks of Ward and Matthews'.
filled with water. Rather than undertake costly repairs and drainage when the Mine might prove only marginally profitable, the Government decided to concentrate on the Yelta Mine.

The first attempts to smelt the ore at Yelta failed because the metallurgist, Mr Shearer, lacked the required knowledge of the difficult techniques. While the three unsuccessful efforts to smelt the ore on 27 and 29 May and 6 June did not result in a financial loss to the Government, the anticipated profit was not attained. When Shearer lost his self-confidence and withdrew from the position, another metallurgist, Mr A. Armstrong, was selected by the Department from the thirty-five applicants for the position which carried a salary of £800 a year. He also failed to smelt the ore successfully on three occasions - 28 August, 2 and 4 September. The Wallaroo and Moonta Mining and Smelting Company refused to assist the Government in reaching a solution to this problem. Consequently, Matthews and the Geologists recommended the appointment of a competent and expert metallurgist. The Verran Government had previously arranged for W.H. Trewenack, a brother-in-law to the new Chief Secretary, John Bice, to operate the plant at Yelta and, after the change of Government, he had informed Butler that he was available if his services were still required. After a good deal of procrastination and discussion over the terms of a contract, Trewenack came from

81. Register 24.6.1912.
83. SAPD:HA Butler 28.7.1914.
84. SAA GRG 24/90/7/1912/34 Matthews to Butler 14.9.1912.
85. SAA GRG 24/90/7/1912/21 Trewenack to Butler 16.3.1912.
New South Wales to be the Consulting Engineer and Adviser to the Yelta Mine for six months from 12 October with F.S. Mathews as Assistant Metallurgist.  

Butler told Parliament that the Government would continue the work at the Mine and the smelting of the ore while a profit was obtained. However, the Government decided to cease operating the smelters at Yelta in May 1913 following the advice of Ward, Matthews, Trewenack, and Frank Richards, manager of the Parramatta and Yelta Mines since 11 May 1911. The quantity and quality of the ore deposits had fallen away and were not sufficient to maintain the smelters. The Government was liable for the large financial deficit of at least £31,000 and it worked the Mine until it was clear that the loss would not be reduced. The Labor Party was critical of this decision and Verran urged that more money be spent on the Mine in the interests of the miners and the industry. John Southwood, a Member for Wallaroo, chided Butler for being unsympathetic with mining interests and for taking a purely political stance towards the question of Yelta. Southwood also blamed the Department for not assisting the industry by defending the Mine:

88. Register 23.5.1913.
89. DM Letter Book 4 pp.325-38 n.d. L.K. Ward 'Summary of the History of the Yelta Mine for the period during which it was worked by the Government of South Australia,' This report was printed as SAPP37:1913.
90. SAPD:HA 29.10.1913.
Mining, which should be encouraged in South Australia, had on the contrary been discouraged. The Mines Department was far from being in a good working state; very little information could be obtained from it. The whole department was a reproach and a by-word, and was frequently referred to in disgusted terms by mining men who came here for information.  

Butler did not come to the defence of the Department but he noted that the Government had given the Mine a trial even though it had disagreed with the original purchase. He believed it was outside the Government's 'legitimate sphere' to undertake mining and he refused to spend public money if there was not a reasonable chance of success. The work at Yelta did not cease entirely as it had at Wandilta; varying numbers of men were employed there to work the Mine on tribute and the Government assisted by maintaining a caretaker and storekeeper there. 

The failure of the Government Mines on Yorke Peninsula was due not simply to mismanagement or Government involvement. The falling prices on the world market, the reduction in quality of ore and the difficulty of treating the remaining ores were warning signs for the industry. There was a partial revival in the copper industry during World War I but this was not sustained and the post-war years were difficult ones. Julian Connor, the Government

91. ibid.  
92. DM Letter Book 5 p.195 L.K. Ward to Blundell 26.1.1917, part answer to an extensive 'List of questions covering information required by the Commission on State Mining from the Governments of Great Britain and various British Colonies and Foreign Countries on State Mining'.
Metallurgist who had been appointed in 1915 to assist with the treatment of low grade ores, was utilised less frequently as the smaller workings were abandoned and the large companies employed their own technical staff.

The reduction in the market price of copper early in 1919 finally affected the operations of even the largest companies. When the Wallaroo and Moonta Mining and Smelting Company restricted its operations, the Government called an urgent conference between the Company and the three major unions - Australian Workers Union, Yorke Peninsula Miners' and Smelters' Union, and the Wallaroo sub-branch of the Federated Enginedrivers' and Firemans Association. Following the meeting on 4 April, the Government approached the Federal Government and organised an Interstate Copper Conference. Ward attended this Conference from 14 to 16 July with the Minister, William Harvey. An agreement was reached on a guaranteed minimum price for copper over a fixed period but the Government did not ratify this arrangement when the world price for copper improved.

The Department's interest in copper deposits did not extend much beyond the Moonta-Wallaroo area, although Ward and Jack did visit the new discoveries at Dome Rock in 1922. Late in 1923 Ward and Jack inspected the underground workings at Kadina and Moonta but they were not able to prevent the closure of the previously prosperous mines. The Wallaroo and Moonta Mining and Smelting Company closed its operations, after another fall in prices on the world market, when it was no longer profitable to

93. AR:1919.
94. Ibid.1922.
95. Ibid.1923.
mine the ore and keep the mines free of water. The Department maintained a drilling programme in the area but it failed to uncover any new deposits or to provide evidence to justify reopening the mines.96

In an effort to recommence mining at Moonta-Wallaroo, Ward stressed the idea of geophysical prospecting to the State Advisory Council of Science and Industry which forwarded the request to the Council for Scientific and Industrial Research.97 The Moonta Copper Recovery Company, Moonta Prospecting Syndicate and the liquidators of the Wallaroo and Moonta Mining and Smelting Company all agreed to pay 50 per cent of any profits made from payable lodes uncovered by the survey until all costs were repaid.98 Ward was successful in obtaining the services of A.B. Broughton Edge of the Imperial Geophysical Experimental Survey (IGES) who visited the area with Ward, Jack, Duffield and Pearson in May 1928.99 The investigations continued the following year when officers of the IGES returned on three occasions to Moonta.100 The tests of the IGES suggested that work in the area could be extended and the Government was willing to subsidise the Moonta Prospecting Syndicate if it put down shafts.101 Pearson also submitted reports on the Moonta-Wallaroo region to the Commonwealth Development and

97. AR:1926. Geophysical prospecting was a relatively new technique and involved study by methods such as land and aerial surveys using magnetic and electrical fields and seismic surveys. The principle aim was to delineate the locality, type, amount and potential of ores of economic importance from the variations in the earth's surface.
98. SAA GRG 24/6/1927/770 Ward to companies 3.4.1927, 4.4.1927.
99. Register 29.5.1928.
100. AR:1929.
Migration Commission but the indications for a substantial revival of copper mining were not apparent. However, the Government did commence a programme of mining to alleviate unemployment in the area.

In 1929, Ward arranged for the Department to supply explosives to parties of tribute-miners at Moonta. Subsequent small-scale exploratory work led to a reopening of several old workings and the discovery of some promising lodes. Ward obtained the support of Premier Butler for his application to the Federal Government for financial assistance to continue the work. After lengthy negotiations, the Federal Government agreed to participate in the Moonta Mining Scheme by directly financing part of the operations, and by assisting the Department with investigations into the deposits. The Scheme, which commenced in September 1930 with substantial funding from the Federal Government, was designed to provide employment to out-of-work miners and to work towards re-establishing the copper industry in the area. The State Unemployment Council allocated funds to the project from its Commonwealth grant for the relief of unemployment in May 1932. The Scheme was maintained with a few interruptions until September 1938 and during this time, the Department

102. AR:1929.
103. DM Letter Book 13 p.221 'History of the Moonta Mining Scheme' n.d., but probably early 1933. See also ibid. 12 p.271. Commonwealth Aid to Mining - Draft Letter from Premier to the Prime Minister by Ward, n.d. 1931. ibid. 13 p.207. Notes supplied to R.S. Richards for policy speech 10.2.1932. The system of tribute-mining had been used extensively at Moonta. Miners chose an area of the mine to work for a short term. They received a portion of the value of any ore they mined and a small amount of subsistence money instead of being paid a wage.
controlled the operations on behalf of the leaseholder, Moonta Prospecting Syndicate Limited. Although it was successful in providing some relief to about sixty miners, the Scheme did not result in an expansion of operations in the area. 104 At the closure of the Scheme, the then Minister of Mines, George Ritchie, lamented the unromantic end to the mining of copper at Moonta. 105 But the Department had been forced to recommend against continuing the Scheme because of the declining profits from the tributers' work. 106

World War II led to a renewal of interest in copper because of its value in war munitions and general industries. Proposals were put forward for the reopening of the Moonta and Kapunda Mines by private enterprise. 107 Playford refused to undertake copper mining as a State enterprise. 108 However, the Government was prepared to subsidise operations on a pound-for-pound basis if the Department of Mines recommended such assistance for any worthwhile proposition. 109 Even Burra was re-examined by the Department in preparation for a visit from the Commonwealth Copper and Bauxite Committee. 110 But no new major developmental work was undertaken and the Department

104. ibid. 16 p.189. Evidence prepared for Select Committee on Unemployment by Ward 22.2.1939.
105. Advertiser 8.7.1938.
106. Ibid. 7.7.1938.
107. ibid. 8.2.1940, 29.3.1940.
108. ibid. 30.3.1940.
concentrated on its programmes of exploration and investigations of the old mines.\textsuperscript{111}

**Iron**

Statistics relating to mineral production in the nineteenth century were poorly collected and invariably inaccurate. The statistics can only be considered estimates, but it is clear that South Australia had relied on copper and some gold as the principal elements of its mineral production.\textsuperscript{112} This slowly altered after 1885 and the development of iron ore deposits in the Middleback Ranges by the Broken Hill Proprietary Company proved to be a significant addition to the State's mineral resources. It was not until 1914 that BHP was in a position to increase substantially the process of smelting the ore into steel. But there was a major drawback for the State as Premier Archibald Peake indicated to Parliament:

> The enterprise is welcomed as marking the initiation of an entirely new phase of mining in South Australia, and our great regret is that our lack of suitable coal deposits has necessitated the smelting of the ore in another State.\textsuperscript{113}

The first shipments of large quantities of iron ore to Newcastle for smelting into steel were made in 1915.\textsuperscript{114} Some of this ore returned to the State in the form of rails for the construction of the transcontinental railway.\textsuperscript{115} By 1919, iron ore had replaced copper as the dominant mineral in the State's economy.

\textsuperscript{111} Advertiser 5.11.1941.
\textsuperscript{112} Brown, H.Y.L., Record of the Mines (4 eds); AR: Records of the output of mineral production.
\textsuperscript{113} SAPD:HA 22.10.1914.
\textsuperscript{114} AR:1919.
\textsuperscript{115} DM Letter Book 7 p.243 op.cit.
The Department assisted BHP, the lessee of the Iron Knob and Iron Monarch deposits, with additional surveys and drilling to determine the reserves of ore. Until he joined BHP, Jack was closely involved in the geological surveying of the deposits; he compiled three important reports in 1921, 1927 and 1929 on the estimated reserves of iron ore. In 1928, Winton inspected the Company's operations at Iron Knob which had been converted to electric power to reduce costs and improve production; he considered this to be a successful innovation.116

The Government policy to promote industrial growth in South Australia had ensured the passage of the BHP Indenture Act in 1937. As a result of this legislation, the Company was required to build a blast furnace at Whyalla to use South Australian iron ore. Ward, who had attended the BHP's jubilee celebrations at Newcastle in 1935, regarded this decision:

as the most important that has ever been reached in the mining history of the State... [because] once pig iron is being produced, there will not be a long interval before the conversion of iron into steel is undertaken in the State, and an impetus thus given to the establishment of secondary industries manufacturing various steel products.117

Consequently, the Department commenced a long and detailed study of the iron ore deposits in 1937. Segnit and Ward conducted this research programme over a 3-year period but the work was hampered by Ward's illness.118 However, the extensive fieldwork and mapping carried on from the

116. AR:1928.
foundations laid by Jack's inspections enabled the compilation of a more accurate formulation of the reserves of the area.

The Commonwealth also investigated the nation's iron ore supplies and Ward forwarded a confidential report to the Federal Government on the conservation of iron ore resources in 1938. 119 Although the Federal Government placed an embargo on the export of iron ore from 1 July 1938, South Australia was not compensated for the financial loss incurred by this decision. 120 As part of the Commonwealth investigation, Dr Woolnough temporarily joined Ward and Segnit at Iron Knob, but he found it was not necessary for the Commonwealth to have a separate survey because of the valuable work being done by the Department. 121 As a result of the development at Iron Knob, BHP was able to improve the capacity for manufacturing at Whyalla. Although this was naturally directed towards the war effort, Ward hoped that his pre-war policy of industrial expansion would be renewed. When he reported to the Government on the possible expansion and development of the State in the post-war period, Ward placed special emphasis on the steel-producing industry at Whyalla. 122 The Department, under Dickinson, subsequently devoted considerable attention to this aspect of industrial growth in South Australia.

120. Advertiser 21.5.1938.
121. Ibid. 21.7.1938, 30.7.1938.
122. AR:1943.
The Department's investigations of gold deposits did not lead to any major discoveries but there was increased activity during times of economic recession. A Gold Producers Conference, organised by the Victorian Chamber of Mines, was held in Melbourne in January 1919 to discuss issues affecting the gold mining industry. South Australia was represented by F.C. Ward, and Keith Ward who presented a paper on 'Government assistance to prospecting, with brief notes on the principles involved'. A Gold Producers Association was formed and the Minister, William Harvey, acquired shares on behalf of the Government. The Australia-wide Association attempted to secure the best possible price on the world market for prospectors and companies. The Department obtained gold from prospectors and companies through the Government Batteries and Cyanide Works, and then competed on the world market through the Association.

Ward saw the Association as the best option to assist the prospectors in the State. The State Government would not employ a salaried mining engineer in the Department to assist in the direction and control of prospecting parties. Government assistance still took the form of bonuses and rewards, and the Department continued the practice of arranging mineral assays for prospectors who obtained their samples from Crown lands. The Federal Government had not accepted a proposal drafted at the Conference by Keith Ward and H. Herman, the Director of the Victorian Geological Survey, for it to pay a reward for the
discovery of new goldfields on top of the incentives already offered by the States.

The decade of the 1920s was unexceptional as far as the gold-mining industry in South Australia was concerned. The Department maintained its usual routine operations at the Batteries and Cyanide Works but its interest in gold-mining activities was generally limited. Ward visited Tarcoola with the Minister of Mines to consider forms of assistance to miners prospecting for gold in 1924; Jack investigated gold mining operations in the Hundreds of Talunga and Dutton in 1926. The Department was rarely concerned with gold and its minimal involvement in this area was restricted to the provision of aid for prospectors, the treatment of ore, and the administrative duties related to the Gold Producers Association and the Government's offer of rewards for discovery.

The downturn in the State's economy after 1927 and the increasing financial depression resulted in many unemployed males engaging in, or returning to, prospecting activities and this gave Inspectors Winton, Pearson and Cornelius, more work to supervise. The Department provided prospectors with tools, on loan, and tents were hired out for a shilling a week. On some occasions, petrol and oil were issued, or the horse and spring dray were loaned out. But Ward declined all applications from gold prospectors for explosives. The Department encouraged prospectors to

124. ibid.1924. Some land at Tarcoola had been subdivided in 1922 to cater for small prospecting parties instead of large company operations.
125. ibid.1926.
126. ibid.1930.
127. DM Letter Book 13 p.239 Ward to J.B. Brigden, Director, Bureau of Industry, Queensland 6.4.1933.
investigate all possible sites for development but the flurry of activity did not lead to highly valuable discoveries: the prospectors did not lack energy, but there was little gold to be won in the State. Apart from the opening of new fields at Mongolata near Burra in 1930, and at Gomersal near Tanunda in 1931, the prospectors concentrated on old diggings such as Bird-in-Hand, Balhannah and Wadnaminga Mines. Ward later advised prospectors to re-examine the Adelaide Hills because of the newer techniques for mining, improved methods of treatment and the continued rise in the price of gold on the world market.

The Commonwealth Government assisted the State's efforts to advance this industry in much the same way as it had assisted developments in the copper industry. Herbert Gepp, Consultant to the Commonwealth, visited Mongolata with Ward in 1931 and recommended that a battery be established there. A 10-head battery was erected on the field from funds provided by the Commonwealth Unemployment Relief Council. In addition, the Peterborough and Mount Torrens Batteries were upgraded and the steam-operated plants replaced by crude oil engines, and the Tarcoola plant was partly refurbished. The Commonwealth also provided funds to develop further the New Deloraine Mine at Kersbrook by installing power machinery to assist in unwatering the

128. ibid.
129. DM Letter Book 12 p.249 Ward to Richards n.d. 'Relief of Unemployment in Mining'.
130. Sunday Mail 20.10.1934.
132. ibid. 13 p.207 op.cit.
133. ibid.
Mine and to operate lights and drills. The Deloraine Mine at Kersbrook received State and Commonwealth aid to erect a flotation plant for use instead of the cyanide process in the recovery of gold from copper-bearing tailings. The joint State-Commonwealth aid was administered by the Department from a Commonwealth Assistance for Metalliferous Mining Fund.

The Department continued to drill and test deposits at various gold mines even after World War II began. Drilling had been kept to a minimum because of insufficient Federal assistance for this activity and the high cost of diamonds. Under a Commonwealth Gold Mining Encouragement Act (1940), the Federal Government allocated £1,000 to be distributed among gold producers in South Australia until the fund was exhausted. The terms of the advance were calculated on the basis of the charges payable at the Government Batteries: producers received three shillings a ton for ore crushed at Glenloth, Mongolata and Tarcoola; two shillings a ton for ore crushed at Mount Torrens or Peterborough; one shilling a ton for low-grade ore valued at less than twenty-five shillings a ton which was already eligible for special concessions at the Batteries. However, gold-mining activities were restricted by the War

134. ibid.
135. ibid.
136. SAPP4:1937 'Audit Commissioner's Report'.
137. SAPP4:1942 ibid.
138. Ibid.
because of a loss of manpower\textsuperscript{139}, and less than £740 of this fund were distributed between July 1940 and June 1946.\textsuperscript{140}

The gold mining industry had been stimulated by the Depression but no major developments occurred to justify the industry's hopes. Yet again, it had been made apparent that South Australia did not have the deposits of gold of the type or magnitude from which the other State's benefited.

**Other Minerals**

In keeping with the expansion of interests, the Department investigated many other minerals of potential value to industry and commerce. The following list is representative of the numerous specimens and deposits examined by the Department: alumina, alunite, apatite, arsenopyrites, asbestos, barytes, clay, graphite, limestone, magnesite, manganese, marble, mica, molybdenite, monazite, ochre, opal, phosphate, potash, rock for road-making and house-building, salt, sand, serpentine, silver-lead, talc, tungsten, vanadium, and whiting. Many special reports on deposits were compiled by the Geologists and Inspectors of Mines to advise on the development or treatment of the minerals. To provide an indication of investigations into some of the lesser known minerals which contributed significantly to the State's economy, a few of these reports are outlined. As previously discussed, the World War I gave a boost to Ward's policies for industrialisation and a strengthening of the bond between economic development and progressive scientific research. The interruption to traditional trading markets enabled the expansion of

\textsuperscript{139} AR:1943.
\textsuperscript{140} SAPP4:1946 'Audit Commissioner's Report'.
relatively minor industries in the pre-war years to highly productive ones during and after the war. A similar process occurred as a result of World War II when "all members of the technical staff [were] engaged on work directly concerned with the supply of munitions of war".141

The local gypsum industry developed quite considerably during the war because the mineral could no longer be imported and the Department reported on many large deposits which were conveniently located for development.142 The manufacture of plaster of Paris from gypsum was undertaken at Port Adelaide and on Yorke Peninsula. Gypsum was also exported in its raw form to the eastern States where it was used in plaster factories and in the manufacture of Portland cement.143 Ward hoped that South Australia would eventually have more factories for the manufacture of plaster from gypsum; the extent and nature of the deposits on Yorke Peninsula and near Fowler's Bay justified the State's position as the leading supplier to the rest of the country. However, the State did not engage in the production of plaster and this aspect of the industry remained in the hands of the manufacturers in the eastern States where most of the plaster was sold.144

Deposits of ochre, whiting and barytes were developed during the World War I by manufacturers of paint.145 South Australia became the major producer of barytes for the Australasian region, and between 1913 and 1922, 10,993 tons

143. AR:1922.
144. SAA GRG 24/6/1940/1578 op.cit.
of ore with a value of £34,995 were mined. But Ward warned against the possibility of depleting the high-grade supplies before ensuring the practicality of treating the second-grade material. Fortunately, a treatment plant to bleach the lower grade ore was erected at Port Adelaide and this enabled the reserves to be conserved and the life of the operations to be extended. The Government also encouraged the local production of a white pigment from barytes, zinc and sulphuric acid. This had previously been imported to Australia but the decision of the Electrolytic Zinc Company to establish a plant at Port Pirie for the annual production of 3,000 to 4,000 tons of the pigment increased the export of barytes and associated products from South Australia.

Two minerals of direct importance to the war effort for the manufacture of munitions - manganese ore shipped to Britain and limestone for the smelting of ore at Port Pirie - continued to be of value to the State after World War I. South Australia had large quantities of high grade manganese deposits, particularly at Pernatty Lagoon on the transcontinental railway, although production remained at a low level for much of the time. Most of this ore was suitable for use in the steel industry, and the production of ferro-manganese at the BHP works in Newcastle was made possible by the shipments of South Australian ore from Port Augusta to New South Wales. Ward's interest in limestone extended to its value in the formation of an alkali industry.

146. AR:1922.
147. SAA GRG 24/6/1940/1578 op.cit.
148. ibid.
149. DM Letter Book 7 p.243 op.cit.
150. SAA GRG 24/6/1940/1578 op.cit.
as his report on the limestone quarry at Klein's Point indicated.\textsuperscript{151} Segnit later conducted an examination of possible sources for use in the alkali industry.\textsuperscript{152}

Another important ingredient for the alkali industry was salt obtained through the evaporation of saline water. The South Australian climate made the State ideal for the formation of salt deposits. In fact, South Australian supplies far exceeded the national demands as Ward noted: "it would be possible to obtain vastly more salt than can be consumed at the present time. Many millions of tons of salt are known to be available on the surface of the dry lakes alone".\textsuperscript{153} Ward saw salt as a significant mineral for many industrial purposes, and thought that its future lay in the establishment of the alkali industry. Ward's enthusiasm for the establishment of an alkali manufacturing plant in South Australia was apparent in the Federal Government's investigations of the proposal in 1932. He stressed the suggestion on several occasions, including his evidence to the Public Works Committee in which he proposed using the low-lying areas near St. Kilda as salt fields for the ICI Company.\textsuperscript{154} After the works were established at Osborne, Ward pursued his interest and arranged for the Department to test and drill a quarry of marble at Angaston for carbonic acid which would be used at the ICI plant.\textsuperscript{155}

The occurrence of opal, which was discovered at Stuart's Range near the present town of Coober Pedy in 1915, was examined in some detail. The Department conducted

\textsuperscript{151} AR:1933.
\textsuperscript{152} Ibid.1935.
\textsuperscript{153} ibid.1922.
\textsuperscript{154} ibid.1934.
\textsuperscript{155} ibid.1936; SAA GRG 24/6/1940/1578 op.cit.
boring operations for water on the field to enable it to be permanently occupied.\textsuperscript{156} Ward visited the area in 1921 following the collapse of the world opal market.\textsuperscript{157} This collapse had unfortunately occurred at a time when development on the field was most favourable after several falls of rain. Ward examined proposals for new methods to dispose of opal and Michael Schlank, who visited Europe in 1921, was commissioned in an honorary capacity to investigate the overseas opal markets.\textsuperscript{158} The market for the precious gem was not easily re-established, and the boom era for opal did not occur until after World War II.

Prior to the Government's purchase of a quarry in 1914, Ward investigated various sites with the Engineer of Roads and Bridges, W.M. Stevens.\textsuperscript{159} Following a conference between Ward, Stevens and representatives of the District Councils and the Good Roads Association in 1917, several reports on aspects of road-making were compiled but Ward restricted himself to geological observations about the supply of materials and not the engineering tasks involved.\textsuperscript{160} His studies in this area were extended in 1918 to include inspections of stone supplies along the Murray River which could be used in the construction of locks. Throughout the 1920s, the Department looked at deposits for possible use in broken-stone roads around Adelaide. Ward visited an outcrop of gneissic diorite near Houghton in 1920.

\textsuperscript{156} DM Letter Book 7 p.243 op.cit. \\
\textsuperscript{157} AR:1921. \\
\textsuperscript{158} SAA GRG 24/6/1921/825 Schlank to Chief Secretary Bice 10.8.1921 - report on the sale of opal in Europe and elsewhere. The Government had granted him an Honorary Mining Commission on 15.12.1920. \\
\textsuperscript{159} SAPD:HA F.W. Young 22.7.1914. \\
\textsuperscript{160} Advertiser 28.6.1917, 13.7.1917; AR:1917.
and Jack looked at a source of road metal near Woodside in 1922. But the development of suitable deposits for road construction was left to the Engineer of Roads and Bridges, and the Department was only occasionally called upon for its advice after 1930.

The Department also examined quarries for general purpose constructions such as quarries for brick-making or roofing-slate. In 1914, Ward commented on the flagstone quarries at Mintaro and the prospecting for slate at Spalding.161 Jack frequently inspected deposits of South Australian building stones, particularly the quartzite deposits.162 After the downturn in the building industry in the Depression, Segnit and Ward attempted to locate cheap supplies of stone in order to ameliorate the cost of housing in the State. Segnit was also closely involved in the project to build a new wing of Parliament House. In 1935, he examined granite outcrops at Victor Harbor as an alternative to reopening the West Island quarries for stone to complete building Parliament House.163 The following year, he reported on marble at Koonunga and granite at Port Elliot as potential supplies for the construction of the new wing of the Parliament.164

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As these brief outlines indicate, the Department's activities were wide and varied. So much so, that it is not possible to list its involvement in the many facets of specific industrial developments and construction

161. ARGS:1914.
162. For example, see AR:1922-25.
163. ibid.1935.
164. ibid.1936. He followed up these investigations with two more in 1937 and 1938,
programmes. The interest in a wider range of minerals and deposits clearly reflected the trend towards using the resources of the State as the basis for its economic and industrial expansion. The Department usually carried through its interest from the discovery of minerals, to their exploitation and development, to the manufacturing, industrial or construction phases and finally to the commercial utilisation of the minerals.

Ward's philosophies linked the needs of the State and the mining industry more closely and emphasised that the future development of local industries would depend on the skilful management, conservation and utilisation of resources. He occasionally pleaded for the efficient development and conservation of resources and he had noted at an early stage that

> The harvest of minerals needs more careful control than the agricultural harvest. If the latter fails through unskilful treatment, the matter may be remedied by the adoption of the proper practice. But when attempts to reap the crop of minerals are badly handled the loss may be irreparable. Nothing man can do will restore the wasted asset. The formation of most mineral deposits was effected once and for all in the distant past, and the deposits which we work will not be regenerated.165

But the mining community generally failed to heed his advice and it continued to search solely for profits under the guise of progress.

Conclusion

From the commencement of European settlement in South Australia, several themes have dominated the nature and pattern of the settlers' relationship with the land and their fellow men. Among these have been the recurring search for water, energy and wealth. The primary concern of the first settlers was to establish a foothold in the Colony. Hence the search for water and, to a lesser extent, the search for energy were imperative for survival. The land was seen to be not only a means of ensuring survival, but also as an object to be utilised and exploited. But the opportunity of capitalising on any possibility for acquiring personal wealth, such as those advantages offered in the pursuit of minerals, was not ignored.

The competitiveness of private enterprise fulfilled the mineral needs of the Colony for many years, particularly after the discoveries of copper at Kapunda in 1842 and Burra in 1845, and while both the Government and the community equated the public interest with private profit. The early colonial administrators maintained an interest in the mineral potential of the Colony but the Crown, as in other colonies, did not possess the rights over minerals under common law. By tradition and practice, the rights to 'all above and below the surface' of the land sold were vested in the land-owners. Thus the majority of colonists resisted the efforts of administrators to increase official control over mineral resources, particularly while the wealth from the earth was easily won. In any case, Government involvement in the mining industry was restricted by a lack of economic and administrative resources. Few officials and
little finance were needed to safeguard the interests of the Crown while it only retained the mineral prerogative for the so-called Royal metals, gold and silver. The exploitation of colonial resources under the direct control of the Government could not occur until the prerogative over all minerals was alienated to the Crown.

The colonists were content to rely on private enterprise, but resistance to Government involvement in the mining industry declined when it became more difficult to locate and develop resources. As private enterprise failed to match the expectations of the public, especially during times of adverse economic circumstances, the Government increased its involvement. Greater demands were made by the colonists for the Government to expand its range of activities in developing the Colony. Sporadic requests were made for the Colonial Government and, on at least one occasion, for the Imperial Government to have the Colony geologically surveyed in the expectation of uncovering additional mineral deposits for private enterprise to exploit. But the early moves for geological surveys in South Australia were limited. Some amateur geologists brought their knowledge from Europe and adapted it to their colonial experiences and in many cases tried to fit the local conditions into the rigid concepts applicable to the European environment.

An important step toward implementing an organised survey of the colonial resources came with the appointment in 1875 of Ralph Tate as the Elder Professor of Natural Science at the recently established University of Adelaide. Tate's appointment coincided with the end of a
period of prosperity during which the colonial economy had been sustained by the highly valuable deposits of copper at Moonta-Wallaroo. Copper had been the mainstay of the colonial economy since the discoveries at Kapunda and Burra during the depression of the 1840s. The value of mineral exports in 1868 was still greater than that of wheat and flour, and from 1872 it had averaged £750,000 a year. By the 1880s, mineral exports had fallen drastically.\(^1\) During the ensuing years of drought and depression, the colonists demanded an official geological survey to assist in the location and exploitation of fresh deposits of minerals and water.

Private enterprise had been unwilling to undertake the search for water and minerals because the possibility of success was low in comparison to the risks and costs involved in a systematic examination of the areas of potential deposits. Tate was concerned with the scientific aims of an organised survey rather than with any presumed economic benefits. After he arrived in the Colony in 1882, Walter Howchin supported Tate's efforts, but he was quick to point out that the scientific and economic aspects of a geological survey were not mutually exclusive.

The role of the state in fostering private enterprise had been established in other spheres by the time of the formation of the Geological Survey under H.Y.L. Brown in

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1882. The initial policy of the Survey, in brief, was to assist in the locating of payable deposits, and the development of water and mineral resources. In theory, the Survey would prevent the unnecessary expenditure of money and waste of labour in unworthwhile ventures. More importantly, it was intended to discourage speculation. The Survey was never able to follow the purely scientific interests to which the geologists' inclinations and training might direct them because of the time involved, and the necessity to be seen to be obtaining results of immediate or potential economic value to justify its existence.

At the same time, the community had generally accepted that the wealth of the Colony was the property of the public rather than that of a small, sectional interest group. To ensure that society benefited as a whole from the exploitation of the mineral resources, the public ownership of the rights over minerals had to be asserted. In keeping with developments overseas and in the other Australian Colonies, the South Australian Parliament passed legislation in 1886 and 1888 for the alienation of mineral rights to the Crown. The mining industry, which was at a standstill, accepted the validity of this argument. Subsequent measures of the Legislature resulted in the establishment of another branch of the Civil Service to implement, execute and

2. Cockburn, J.A., 'The Sphere of State Activity in Australia' in Journal of the Society of Arts 50: 2583 23 May 1902 pp.589-93. The former Premier of South Australia pointed to some of the less obvious Government functions such as State banks to encourage farmers, controls in the agricultural industry (especially to combat animal diseases) and the emerging social welfare legislation; Hancock, W.K., Australia; Pember Reeves, W., State Experiments in Australia and New Zealand, Volumes I and II.
maintain Government policy. Following the investigations by, and recommendations of, the Public Service Commissioners during 1889 and 1890, and the Royal Commission on Mining in 1890, the Government established in 1894 a Department of Mines for the purpose of regulating and encouraging the industry.

Increasing Government involvement in the mining industry had been demonstrated earlier by the creation of the Warden of Goldfields Office, a regulatory position, in 1868. But with the formation of the Geological Survey, the Government accepted explicit responsibility for locating mineral and water deposits. The Government undertook control of the mining industry with the formation of the Department of Mines, which was designed primarily as a regulatory body. It was intended to also assist the development of the industry by encouraging individual miners, prospectors, investors, promoters and companies. The allocation of funds to assist prospectors and companies, and the provision of support facilities such as assays, examination, treatment of minerals in cyanide works and even drilling operations to determine the prospects of localities, was a conscious policy of the Government to promote the economic activities of the industry. The industry also received preferential treatment from the Government in the fees charged for these services.

The previous involvement of Parliament had been indirect; for example, in the construction of railways (and reduced rates for the use thereof) and reservoirs, or the offers of rewards and bonuses. As time advanced, Parliament offered more direct assistance because many companies had
been unable, or had neglected, to improve the techniques they employed to mine and treat minerals. Thus many people expected that Governments would expend large amounts over a long term for the implementation of the latest mining and treatment techniques. Private enterprise was limited in the money it could spend because it viewed the industry from too narrow a perspective, while Governments had to be more universal in their efforts to stimulate the industry.

The inability of companies to keep up with the latest techniques was often cited as a principal reason for the decline of mining in South Australia. The push by private enterprise and the Government for a School of Mines and Industries in the late 1880s acknowledged the relationship between the progress of science, growth of technology and the mining industry. By the 1880s, there was a broad scope for technical change in the approach of the Colony towards mining and new technological features were gradually introduced. Such an approach involved the erection of crushing batteries and cyanide works for the treatment and extraction of fine gold particles from large samples of ore in the 1890s. The development and adaption of technology was necessary; some previously unpayable fields became feasible ventures.

The progress of science and technology was of paramount importance. Improvements in, and adaptations of mining techniques, organisation and marketing of minerals, changes in production patterns, prices and sources were dependent on the development of the appropriate technology. But the ability of technological changes to provide solutions to the dilemmas of the industry varied. To establish stability,
private enterprise and the Government needed faith and persistence. Capital had to be invested wisely, scientific means to locate and prove deposits had to be utilised, and economic methods of extraction and treatment adopted. Constant failures and limited successes in the industry slowly drove the message home.

Government activity had been pragmatic and had increased in a piecemeal fashion. There had been forty Ministries in the thirty-seven years from the attainment of self-Government to 1894 but the policies of the Governments had been remarkably consistent despite, or perhaps because of, the lack of recognised political parties.3 Parliamentarians themselves were heavily involved in the mining industry through directorships, shares and owning mines, and this was accepted for most of the nineteenth century.4 This stance represented a conflict of interests as more demands were made by the community for the promotion of wealth as a public policy in preference to the private-enterprise search for profit. But the politicians were able to reconcile their interests with those of the Colony - the expected improvement of the condition of the mining industry through surveys and regulation would naturally enhance their personal positions while the Colony benefited at the same time.

Speculation on the Stock Exchange often hindered rather than helped the mining industry. The popularity of the speculative activities was understandable in view of the quick profits which could be made. Many people had been prepared to gamble and speculate from the early days of the Colony; an example was the large amount of land speculation after 1836. The entrepreneurs and capitalists sought profitable areas of investment with high returns over short periods and after the early 1880s, these were found outside South Australia. Private enterprise felt that there would be a guaranteed return in the Colony if the Government found the minerals and assisted in developing mines on its behalf. Thus the desire for, and expectations of, a Geological Survey and Department of Mines were related to a search for security in the mining industry in the Colony or, more simply, the search for wealth.

Private enterprise looked to the Geological Survey and the Department of Mines to promote investment and speculation but the Government was more concerned with encouraging legitimate mining activities and stimulating the industry. Private enterprise had high expectations that the Government would provide assistance in its search for wealth. The constant demands for the Department to locate minerals and water were all economically motivated. But the Department was criticised when it reported adversely on prospects and localities, although it was acting in the interests of private enterprise and the community. As the Department expanded its operations and interests, complaints
about the nature of the administration, especially from the investors and speculators, increased. The Department of Mines became the scapegoat for a lack of mining in South Australia.

Although Parliament assumed explicit responsibility for overseeing the development of colonial resources, a clear, official policy to achieve this was slow to evolve. Policies for development gradually took shape on an ad hoc and pragmatic basis without regard for the formulation of comprehensive and long-term aims and goals.

The Geological Survey and Department of Mines functioned as separate entities until 1912. The Government Geologist, H.Y.L. Brown, was primarily concerned with undertaking the search for minerals and water, and with compiling accurate scientific data on the geology of South Australia. The Department of Mines maintained efforts to encourage mining but this was always subject to its regulatory, supervisory and administrative responsibilities. The move towards being an organisation to initiate new directions commenced at the close of the nineteenth century. There was little expansion of the mining industry immediately after the formation of the Department, and the public made demands for both the Survey and the Department to focus on a wider range of potentially valuable economic minerals. But this change in emphasis was not fully adopted until the appointment of Keith Ward and the merger of the Survey and the Department in 1912.

The mood of pessimism which had pervaded the local mining industry during the 1880s and 1890s continued into the twentieth century. South Australia had few mines, and
the future looked bleak. Ward imparted fresh enthusiasm and new ideas into the operations of the Survey and the Department. He promoted further the idea of pursuing a diverse range of minerals, and also suggested that South Australia thereby expand the process of industrialisation. He introduced objective planning into the Governments' and Departmental management with respect to the mineral resources. Parliament had initially directed and supervised the operations of the Survey and the Department which had existed for the most part, as servants of the politicians and private enterprise. But the relatively progressive and practical approach of Ward demonstrated the degree of influence which could be exhibited by the public servants rather than by the Government.

The Public Service acquired a greater role in the formation and implementation of Government policy than it had previously held. Personalities in an organisation can mould the shape of the institution. The interests of the Geologists and administrators came to influence Government policy, private enterprise activity, and the approach and work of the Survey and the Department. After the merger in 1912, the investigation of water supplies and the development of a variety of minerals of disparate economic value were emphasised, and a policy directed towards the industrialisation of South Australia eventually began to unfold. This process was assisted by the appointment of Ward to the position of Director of Mines in addition to that of Government Geologist. Under Ward, the Survey came to dominate the activities of the Department and the overall thrust of the Department's work expanded so that it searched
for minerals and water, regulated the industry, and initiated developments. The Department was inadequately staffed throughout the period to 1944 and the dependence on the professional officers to maintain the administrative duties of public servants increased the influence of the Department in Government policy-making processes. The departmental hierarchical structure whereby the Geological Survey and Government Geologist dominated the Department also facilitated this tendency.

The mining industry in the twentieth century was directed towards policies promoting industrialisation and diversity in the economy of South Australia. The Department under Ward was keen to promote industrial growth in South Australia and policies to this end were pursued by the state and private enterprise. The search for minerals, water and energy was maintained but there was a change of emphasis in the motives for mining. Mining activities did not lead directly to an increase of benefits for the state and private enterprise. Interest was diverted to the associated field of industrial expansion, and it was from this avenue that private enterprise expected to acquire wealth while South Australians gained such intangible objects as a higher standard of living and an improved quality of life.

Throughout their existence, the underlying rationale of the Geological Survey and the Department of Mines has been the notion that the role of Government was to promote the resources of South Australia for the personal wealth of the capital investors and the benefit of the public at large. Although mining ventures have been highly unstable and
unpredictable operations, they have on occasions provided a sense of stability to South Australia and its economy. The most notable discoveries were those prior to the formation of the Survey and the Department. Of particular significance were the major copper finds at Kapunda and Burra in the 1840s' depression, and at Moonta-Wallaroo in the early 1860s which produced a climate of economic prosperity in the Colony until approximately 1875. The exploitation of the iron ore deposits on Eyre Peninsula later added to the value of mineral production.

In comparing the attitudes and generalised responses of society towards mining activity since 1836, it is apparent that the mining of minerals has been consistently heralded as the saviour of South Australia. In the 1840s, minerals were of vital importance to the physical survival and well-being of South Australia because their discovery had a significant impact on the colonial economy and society. The opening of numerous mines during the depression in the 1840s and thereafter, stimulated development, expansion and settlement. The discoveries of minerals also underpinned the recovery of the Colony on subsequent occasions and gave rise to the trend to look towards mining pursuits as a saviour in times of economic recession and depression. It was always self-evident to South Australians as Premier Archibald Peake recalled in 1914: "it is a matter of history that in bad times mining has come to the rescue of South Australia; let us hope that history will repeat itself". Keith Ward expressed himself more broadly than Peake during the Great Depression: "it has been found

5. SAPD:HA 22.10.1914.
throughout Australia that hard times turn the attention of the community to mining". 6 Geoffrey Blainey has also noted this to be an Australia-wide trend. 7

During each era or new development, the same phrases and catch-cries have been resurrected to indicate that the saviour is at hand. It has usually been overlooked that the activities of private-enterprise mining companies have proved them to be reluctant saviours. The ability of the mining industry to 'save' the state can only be of a transient nature because it has proved to be no more than a cyclical and temporary solution to the problems of 'progress' and thereby creates a false sense of security. Given the character, structure and development of society, one might expect this consistent response over time. But the basic questions such as whom will mining save, save from what, how will it do so, and will everyone benefit equitably from resources belonging to all have not as yet been fully examined or answered by society.

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