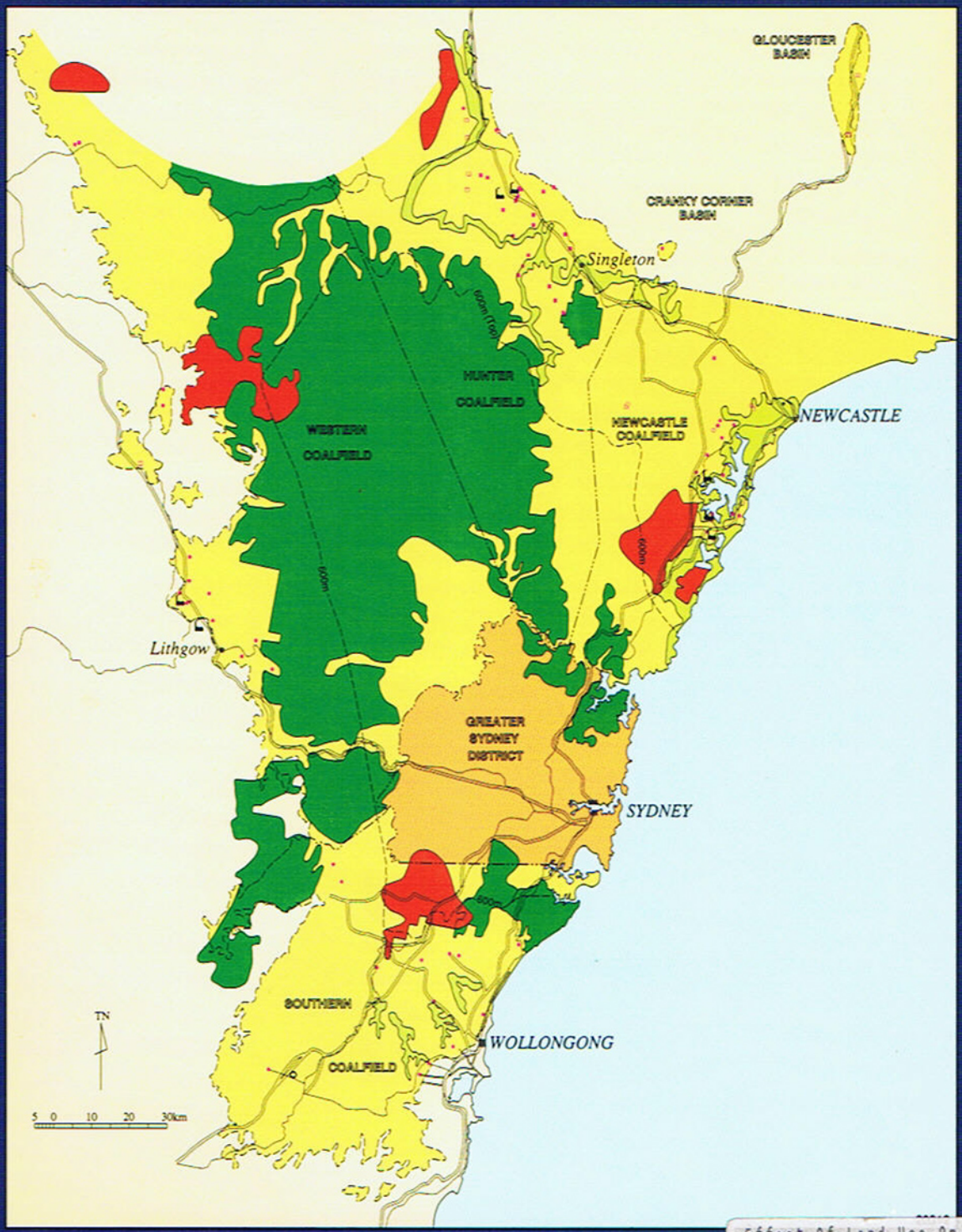
EFFECTS OF LAND USE ON COAL RESOURCES

REPORT PREPARED BY THE COAL RESOURCES DEVELOPMENT COMMITTEE



Effects on Land Use on Coal Resources - NSW 1994 - cover.jpg

MAJOR FINDINGS

It is a commonly held view that New South Wales has sufficient coal resources to meet any longterm demand. This study undertaken by the Coal Resources Development Committee has found that New South Wales is likely to face a serious shortage of economically mineable coal in the future.

The coal industry makes a vital contribution to the standard of living of the people of New South Wales, by the revenue it has generated, the associated employment opportunities and its use in power generation and steel production. Forecasts predict that demand for New South Wales coal will increase by about 40 per cent, and then remain at about that level for at least a further ten years. To meet such demands, the coal industry will require access to economic high quality coal resources.

This study found that, although New South Wales has very large resources of coal, about half of the coal is already affected by other land uses, particularly National Parks and prime agricultural land. Furthermore, much of the remaining coal resource is of less than economic quality. Coal prices have been declining in real terms for at least 15 years. It is most unlikely that there will be a sustained real increase in price in the medium term. Therefore, coal resources which are clearly uneconomic at present are likely to remain so, even in the medium to long term.

The study found that if no new constraints were placed on mining of coal resources, production in each of the coalfields would follow these trends over the next 30 years:

Newcastle Coalfield down to half of current levels;
Hunter/Gunnedah Coalfields to almost double current levels;
Southern and Western Coalfields similar to present production.

There are at least ten new coal projects at advanced stages of planning or under construction. Most of these are in the Hunter Coalfield. These projects, in combination with expansions of existing mines, will provide the bulk of the forecast increase in production to about 2010.

However these projects are not sufficient to maintain production at the forecast levels beyond 2010. New mines will need to be developed on the high quality resources which are not currently held under title by mining companies (see enclosure 1). Importantly, most of these are under threat from some other form of land use or could attract strong community opposition if mining were proposed. Action is required to ensure that these high value coal resources will be available to meet the future needs of the coal industry, community and State.

The key issues in each coalfield are:-

Newcastle - *urban development and the need to protect lake foreshores and flood-prone land from the effects of subsidence;*

Hunter - *community concerns over the intensity of mine developments close to population centres like Muswellbrook; prime agricultural land overlying coal resources;*

Gunnedah - *prime agricultural land;*

Southern - *considerable coal resources occur under stored waters, while urban expansion in the Camden-Campbelltown area might compete with development of premium hard coking coal resources;*

Western - *75 per cent of the resources in this coalfield occur within existing National Parks, and an additional proposed National Park would seriously affect the life of existing collieries, as well as the exploitation of hitherto undeveloped resources.*

The CRDC concluded that the greatest problems in protecting areas for future coal development would come from declaration of new conservation areas and from the expanding surface utilization (land subdivision and urban development) of Eastern New South Wales. However, it also concluded that mining in areas where it has traditionally been excluded could take place without detriment to other land uses e.g. under railway lines or stored bodies of water.

KEY STRATEGIES

The CRDC recommended that a number of strategies be implemented to facilitate conflict resolution and allow the best use of the State's resources, including coal.

The key strategies identified were:-

- ***protection of strategically important coal resources;***
- ***proposals for Conservation Areas be required to include a Resource Impact Statement incorporating an assessment of all resources in the area;***
- ***development of a multiple land use strategy for Conservation Areas;***
- ***increased liaison and information exchange between the coal industry and the community;***
- ***preparation by the Department of Mineral Resources of a Strategic Coal Development Plan, which would include an assessment of the State's coal resources.***

Foreword by the Hon Ian Causley, MP
New South Wales Minister
for Agriculture and Fisheries
and Minister for Mines

As Minister for Mines I am naturally fully aware of the importance of the coal industry to New South Wales - for its contribution to export earnings, as the supplier of an essential ingredient to the power and steel industries of the state, and for the employment which it generates.

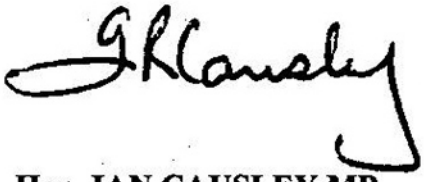
I also know that the coal industry can remain one of the key elements of this State's growth for many decades into the future. However, to do so the industry must be assured of access to the State's coal resources to meet the demands of export and domestic markets.

This report makes a valuable and timely contribution to the debate over the merits of the different forms of land use in the coal-bearing areas of New South Wales. It highlights the fact that we do not have infinite resources of high quality coal. Further, much of the coal is not available for mining or is under threat because of the effect of other land uses.

The recommendations made in this report need to be carefully considered by all those with an interest in the various land uses which might be proposed for areas containing significant coal resources.

I believe that it will be possible, with good will and full cooperation between the various parties, for the needs of the coal industry to be met, while at the same time arriving at satisfactory outcomes for proponents of other land uses.

I commend the Coal Resources Development Committee for this report and would particularly note that the diagrams included provide an excellent snapshot of the problems which face the coal industry as far as access to resources is concerned.



Hon. IAN CAUSLEY MP
MINISTER FOR AGRICULTURE AND FISHERIES
MINISTER FOR MINES

FEBRUARY 1994

1. INTRODUCTION

This report has been prepared by a working party appointed by the Coal Resources Development Committee (CRDC). The CRDC consists of representatives of New South Wales Government agencies, coal mining companies, local government and unions associated with coal mining.

One of the stated priorities for the CRDC is "the preparation of a strategy for long term planning of coal industry development, with particular reference to coal resources assessment and utilisation, transport, infrastructure and regional issues. Initially emphasis should be given to assessment of land use conflicts between coal developments and other land uses, with particular reference to avoiding unnecessary sterilisation of resources". The present study was undertaken to implement this priority of CRDC.

A major factor in the economic development of New South Wales has been the ready availability of coal for the major industrial and urban centres of Sydney, Newcastle and Wollongong. Historically, the presence of high quality coal near these areas has acted as a catalyst to urban and industrial growth.

However, the expansion of some of these centres, the growth of satellite centres and the demands of the population for infrastructure and recreational areas is now threatening long term access to the very coal resources that were a key ingredient in the development of the east coast of NSW. For example, urban development in the Newcastle Coalfield has severely constrained access to export quality thermal coal. Restrictions on extraction under more recent urban development around Lake Macquarie are seriously affecting the economics of coal mining in this district, to the extent that some mines have closed. In the Western Coalfield, the major part of the coal resource is now covered by National Parks, leaving only a few areas that are still unallocated and available for development.

Nevertheless, the easy access to low cost coal resources for such a long period has given rise to a commonly held belief that New South Wales contains vast coal resources sufficient to meet any foreseeable demand. Earlier studies by the NSW Coal Association in 1980 and the Department of Mineral Resources in 1986 showed that most of the State's coal resources were unable to be mined because of other land uses.

The CRDC therefore considered it appropriate to quantify the coal resource already affected or likely to be subject to competing land use in the foreseeable future. More importantly, it wished to identify and develop strategies that could reduce the impact of other land uses, particularly on economically

attractive coal resources. The CRDC appointed a working party in December 1991 to investigate the effects of different forms of land use on coal resources.

In its deliberations, the Working Party was conscious of the fact that coal is a low priced commodity. Therefore, profit margins are such that very small increases in the cost of producing coal impact adversely on the profitability of mining operations. Profitable mining requires that deposits have access to railheads, short transport distances to ports, suitable geological conditions and commercially acceptable coal quality.

1.1 Terms of Reference

The Terms of Reference were:-

1. To identify the types of land uses that affect the availability of coal resources including coal which has potential for methane production.

2. To assess the impacts of land uses on coal resources.

3. Assess the effects and implication of land uses on the availability of coal resources on a statewide and coalfield basis with particular emphasis on economically attractive deposits.

4. Broadly identify future pressures and developments that have the potential to affect the availability of coal resources.

5. Recommend strategies that could reduce conflicts between major land uses and the availability of coal resources having regard to compatibility of land uses, resource priorities, timing and other relevant critical issues.

1.2 Working Party Composition

Mr B Mullard, Chief Geologist - Coal and Petroleum, Department of Mineral Resources (DMR), was nominated Chairman. Mr D Casey, Executive Officer Coal DMR was appointed Secretary of the Working Party. Other members of the Working Party and their affiliations were as follows:-

Department of Planning	- Mr K Sullivan
Mine Subsidence Board	- Mr G Hartley
NSW Coal Association	- Mr J Hannan/Mr F Topham
Pacific Power	- Mr C Weber

4. INTERRELATION OF COAL MINING AND OTHER LAND USES

4.1 Effects of Mining on Other Land Uses

Land subsidence is commonly an unavoidable consequence of underground mining if mining is to be carried out economically. Restrictions on subsidence levels to protect natural or manmade structures can severely affect the economic viability of a coal deposit by limiting the percentage of coal recovered. Therefore, underground coal resources may have to be left unmined to protect surface structures. The entire coal resource, a significant part, only a limited part, or none of the coal resource may be affected, depending on the amount of subsidence that can be tolerated by the surface features.

Public perceptions of the risk of damage to property, particularly where longwall mining systems are proposed, have created pressure for increasingly stringent restrictions to be imposed on mining operations. Over the past 15-20 years, mine subsidence engineering in New South Wales has been developed to the point where accurate predictions can generally be made of potential mine subsidence; mining patterns can be designed to provide close control of subsidence. Some recent subsidence-induced damage in the Newcastle area was related to older mining practices.

The main issues of public concern with open cut mines are their effect on air quality, noise levels, aesthetics and the concern that the land may not be restored to a suitable condition. The development consent required by the mining proponents imposes conditions to address these issues. Rehabilitation is monitored by the Department of Mineral Resources and is of world class standard for coal mines in New South Wales.

4.2 Role of the Mine Subsidence Board

The role of the Mine Subsidence Board is important in determining the type of structures that can be built in areas likely to be affected by subsidence.

The Mine Subsidence Board's Charter is set out in the Mine Subsidence Compensation Act. It is designed to provide a scheme for the payment of compensation where improvements on the surface are damaged by subsidence following the extraction of coal or shale anywhere in New South Wales. Under the Act, the Board is subject to the control and direction of the Minister for Mines, reporting through the Minister to the New South Wales Parliament.

It also provides expert advice to property owners, government departments and authorities, local councils, community organisations and industries within 19 "Mine Subsidence Districts" and throughout New South Wales. This advice aims to provide compatibility between surface development and underground coal mining. To this end, the Board controls building and other surface development in Mine Subsidence Districts, setting building and construction requirements that provide protection from subsidence damage. These requirements cover the nature and class of improvements, including height, type of building materials used and the method of construction.

Mine Subsidence Districts are established in areas where potential incompatibility between surface development and coal mining operations needs to be controlled by the Board. The Mine Subsidence Districts are not restricted to areas of residential development. The Department of Mineral Resources administers "subsidence matters" outside Mine Subsidence Districts.

An important role of the Mine Subsidence Board is the elimination of public and private danger caused by mine subsidence.

Previously, research to reconcile the needs of coal mining with those of urban development concentrated on mine design and mining techniques developed to minimise the surface effects of subsidence following the extraction of underground coal in urban areas. However, if buildings can be made more resistant to subsidence, this will increase the level of extraction that can occur beneath the buildings.

An extensive research program, now completed, has been carried out into this issue, using funds provided by the National Energy Research, Development and Demonstration Council (NERDDC), the Mine Subsidence Board and the NSW Coal Association. The NERDDC grant was made to Elcom Collieries Pty Ltd and the NSW Coal Association. Australian Coal Industry Research Laboratories coordinated the project, with input from the coal industry, local government and the Department of Mineral Resources. The total cost of the project was $1.5 million. Some very promising results have emerged from the project and these should lead to the design and construction of houses able to withstand considerable levels of subsidence.

4.3 Land Uses Affecting Coal Mining

The close association of present day coal mining with the urban developments of Newcastle, Sydney and Wollongong will result in some land uses being affected by coal mining. In non-urban areas natural features may also be affected by subsidence. Open cut mines can affect some land uses and natural features.

In addition to these considerations which may limit coal mining, legislative constraints may give priority to some land uses over others.

The Working Party has compiled a list of land uses and environmental constraints that have, or could have, a significant impact on the development of coal resources in New South Wales.

Land Uses affecting Coal Extraction:-

Conservation Areas
Urban Development
Infrastructure
Stored Bodies of Water
Prime Agricultural Land
Commonwealth Land

Environmental Constraints:-

Natural Features
- Foreshores
- Escarpments
- Flood-prone Land
- Lakes

Heritage Sites
- Aboriginal Heritage
- European Heritage

Groundwater Resources

The effect that these land uses and constraints have on coal mining is explained below. However, it should be noted that a particular area could be affected by more than one category. For example National Parks might contain escarpments under which coal could not be fully extracted, even if mining was not prohibited by the location of the coal in a National Park.

4.3.1 Conservation Areas

Mining and private exploration ventures cannot be authorised in National Parks, Nature Reserves, Historic Sites or Aboriginal Areas after their dedication, except by specific Act of Parliament. It is possible for any reserve under the National Parks and Wildlife Act 1974 to be proclaimed to a limited depth e.g. Nattai National Park 60 m. In theory there would be no direct constraints to exploration and mining beneath any such reserve. However, in practice mining would be virtually impossible without access to the surface for

many years has given valuable information on the design of stable pillar layouts.

South Bulli Colliery in the Southern Coalfield proposed some years ago to mine coal resources under the Cataract Dam storage area, but not under the dam structure itself. In respect to such an application, the Dams Safety Committee has certain statutory functions concerning coal mining operations that affect prescribed dams and their storage. The colliery carried out a thorough research program and demonstrated to the satisfaction of the Chief Inspector of Coal Mines and the Dams Safety Committee that partial extraction by longwall mining under the storage area could be safely undertaken. Approval has been given for mining under the water storage area of Cataract Dam.

When the mining at South Bulli commences, it will be comprehensively monitored. If the mining layout then proves to be conservative, the level of extraction can be increased. In the unlikely event that there is leakage from the dam, the mine workings can be effectively sealed to limit the water loss.

4.3.5 Prime Agricultural Land

Significant coal resources underlie prime agricultural land in the Hunter and Gunnedah Coalfields.

In the Hunter Valley restrictions have historically been applied to prevent coal mining beneath alluvial lands or within the floodplain defined by the 1955 Hunter River Flood. In a report on an Authorisation held by Coal and Allied Industries Ltd over an alluvial area near the Hunter Valley Mine, Mitchell McCotter and Associates Pty Ltd (consultants) noted that these restrictions have been derived from the *perceptions* that mining had the potential to cause the following:

- "disruption to agricultural production and a potential loss of high quality farm land;
- potential hydraulic impacts upon Hunter River flows, that is alterations to flooding characteristics;
- potential effects upon groundwater resources (loss of resource and quality deterioration); and
- effects on the quality of Hunter River waters".

Mining of "Agricultural Land", defined in the Mining Act 1992, has to be approved by the Director-General of the Department of Agriculture.

Experience of mining prime agricultural land in the mid and western USA is relevant to New South Wales, as the mining areas have similar climates, land use patterns and topography. Passage of the Surface Mining Control and Reclamation Act of 1977 imposed strict minimum standards for soil reconstruction and revegetation that apply throughout the USA. These performance standards are used as criteria for the release of reclamation bonds. The Act stimulated extensive research by the coal industry.

The avoidance of compaction of topsoil is one of the main technical requirements in overseas rehabilitation of prime agricultural land. This can be achieved by the employment of deep tillage machinery e.g. vibrating rippers which loosen replaced soils to depths of 90-120 cm. Recompaction can be minimised or eliminated through careful management practices and the injection of low-density soil additives into the voids created by deep tillage.

Technical and engineering expertise is available from dam construction and gravel extraction projects to provide design solutions to minimise the impact of mine construction on upstream and downstream land uses during flooding.

4.3.6 Commonwealth Land

Mining leases are not granted over Commonwealth land because it is outside the jurisdiction of the State to do so. However, the Working Party is not aware of any approach being made to the Commonwealth for permission to grant a mining lease over its areas. At Holsworthy in the Southern Coalfield, the Commonwealth owns the land to a depth of 30 metres, with the State Government having title over depths greater than 30 metres. Therefore, it would be possible for a lease to be granted for underground mining at depths greater than 30 metres.

Commonwealth land in the Singleton area containing significant coal resources has been used as a firing range. Before open cut mining or the installation of surface facilities for an underground mine could occur, the area would need to be rendered safe. If use of the area as a firing range were to cease, technology exists to locate unexploded ordnance and render the area safe for exploration and mining.

4.3.7 Natural Features

Only partial extraction of coal resources is permitted under some natural features, in order to protect them from damage due to subsidence e.g.

Significant archaeological areas containing Aboriginal relics are declared with the consent of the owner or occupier of the land on which they occur. These sites may require some protection similar to European heritage sites. These areas are administered by the National Parks and Wildlife Service.

4.3.9 Groundwater Resources

Intake beds for groundwater resources could also be affected by subsidence e.g. north of Newcastle. Perched groundwater resources in alluvial lands along the Hunter River could be subject to loss or disturbance from subsidence but generally only an insignificant quantity of coal is affected by groundwater resources.

The tonnages in the table represent about 42% of the total coal resources of the Hunter Coalfield, which were assessed as 61 100 Mt. This figure was derived by revising the 1986 study of the coal resources of New South Wales with the figures determined for the National Parks, Urban Development and Prime Agricultural Land categories in this report. Generally, the resources west of Scone, Muswellbrook and Denman have only been subjected to limited exploration.

The Wollemi and Yengo National Parks overlie the western boundary of the Hunter Coalfield and contain the bulk of the coal currently affected by other land uses.

Prime agricultural land associated with the Hunter River floodplain, and the protection of associated groundwater resources within the alluvial deposits of the floodplain, affects a significant percentage of the coal resource. Some coal that would be affected by natural features is already constrained by National Parks.

Part of the Commonwealth land associated with the Singleton Army Base is used as an artillery firing range. All of the coal resource is located in that part of the Commonwealth land used for the firing range (see figure 8).

6.4 Gunnedah Coalfield

The parameters used to define coal resources for this study are minimum seam thickness 1.5 metres, raw coal ash less than 35% and depth of cover less than 600 metres.

The following table lists the quantity of coal currently affected by other land uses, as determined by the Department of Mineral Resources. Coal resources have been categorised as prime (ie suitable for export) and domestic quality to reflect the variability in quality of individual coal seams in the Gunnedah basin rather than dividing coal into major and minor seams.

Coal Affected by Other Land Uses - Gunnedah

Land Use	Prime Quality (Mt)	Domestic Quality (Mt)
National Parks	1 000 +	1 000 +
Prime Agricultural Land	7 500 +	8 500 +
Total	**8 500 +**	**9 500 +**

There is less data coal resources in this area than, say, for the Hunter. This has led to more uncertainty in calculations of the tonnages affected by the land uses listed above. Total resources in the Gunnedah Basin are about 38 000 Mt, with almost 50% affected by other land uses.

The Gunnedah Coalfield is 320 km from the port of Newcastle, compared with Singleton which is much closer at 90 km. This adds a cost to the rail freight of coal to the port that in turn requires high quality and/or lower cost mining conditions to compensate. In the past, the Gunnedah Coalfield was seen as having great potential for large open cut coal mines that could be cost competitive with mines closer to the coast. However, drilling by the Department of Mineral Resources virtually eliminated these potential resources because of thick alluvial cover in the zone of prime agricultural land, diminution of quality because of igneous intrusions, or indeed absence of the coal seams. It must be questioned whether much of the underground coal resource of the Gunnedah Coalfield will ever be mined (see figure 9).

6.5 Southern Coalfield

Premium quality coking coal is obtained from the Bulli and Wongawilli Seams that supply both export markets and the domestic steel industry. Export quality thermal coal is also obtained from both of these seams, which would be classified as major seams.

Two other seams, the Tongarra and Balgownie Seams, have been mined in the past but are not currently mined (minor seams). All four seams have been considered as a coal resource in the Southern Coalfield.

Coal in the Southern Coalfield has been considered as a resource if there is a minimum seam working section thickness of 1.5 metres and a maximum 35% ash content for raw coal. No limits were placed on the depth of coal, because mining is likely to occur over the next decade at depths of greater than 550 m.

7. STRATEGIC COAL DEVELOPMENT PLAN

7.1 Introduction

This report has demonstrated that competing land uses already affect significant areas of known coal potential. The scale of this effect is only poorly understood outside the coal industry. Most people would assume that mining is by far the most significant reason for the depletion of coal resources in New South Wales. However, since coal mining commenced in NSW in the late 1700s less than 5 thousand million tonnes or only about 3% of the State's total coal resource has been depleted due to mining. This compares to about 74 thousand million tonnes, or 50% currently affected by land uses perceived as incompatible. Most of this impact has occurred in the last 40 years. Continued access to economic coal resources in New South Wales will require commitment to a range of strategies aimed at minimising the impact of competing land uses on coal resources.

To address these issues this report proposes a **Strategic Coal Development Plan** that presents strategies for addressing coal resources in:

- **Existing mines**
- **Project areas**
- **Areas that will form the resource base for new coal mine development.**
- **Other areas**

It is vitally important to preserve access to key coal resource areas. Demand studies indicate that there is a need for new mine development to ensure that New South Wales is in a position to meet domestic coal demand for power generation and the steel industry, as well as being able to supply the growing export demand for New South Wales coal. Coal's position as a fundamental commodity, underwriting much of the State's economic development, demands that careful consideration be given to future coal supply and that action be taken to secure strategic resource areas.

The previous chapter catalogued the effect on coal resources of various land uses which are already in existence. This chapter attempts to document some impacts which future development may have in each coalfield, particularly in respect of high value coal resources.

Most of the land use categories cover areas which are well defined e.g. natural features, water storage, prime agricultural land, Commonwealth land and large infrastructure elements. However, two categories can expand as planning decisions are made - National Parks and urban development. Both land uses have the potential to affect high value coal resources. The only major infrastructure development proposed in recent years that could have affected large tonnages of coal resources is the Very Fast Train project, but this is now dormant, if not abandoned.

As stated previously the growth of Newcastle, Sydney and Wollongong as major industrial centres can be attributed in a large part to the presence of coal. The coal industry has also benefited by easy access to ports through well developed transport infrastructure, a skilled workforce and sophisticated engineering support.

However, as these urban centres grow and tend to coalesce with their surrounding satellite centres, there is an ever increasing pressure on the accessibility and availability of coal resources in these areas.

Also, requirements of the expanding populations for recreation areas have led to an expansion in conservation areas around the cities that can also affect coal resources. The declaration of the Nattai National Park in the Southern Coalfield is a recent example.

Some very significant studies on plans for urban development are now being undertaken which will have major implications for the coal industry. The Department of Planning is updating its Metropolitan Strategy that was published in 1988. A discussion paper entitled Sydney's Future has recently been released by the Department of Planning. This paper acknowledges the significance of coal and methane resources in the area. At the same time an Integrated Transport Study is being prepared by the Department of Transport. The area covered by these studies extends from the Lower Hunter and Newcastle, south to the Northern Illawarra. The Macarthur South Study covering south-western Sydney and the draft Hunter Coastal Urban Settlement Strategy will be considered as part of the larger Metropolitan Strategy. Substantial coal resources occur in the area covered by the Metropolitan Strategy, a fact that is an important part of the Department of Planning's deliberations.

Proposals for new conservation areas or extensions to existing conservation areas have been made which have not been implemented. As these areas presumably have qualities to warrant their being proposed as conservation areas, it is possible that they may be proposed again in the future. Some assessment has also been made of coal resources contained in such areas.

Possible land use changes for each coalfield have been considered and particularly their effect on high quality coal resources. A map (enclosure 1) has been prepared showing those deposits that are considered to have high potential to be developed as stand-alone mining developments in the future.

7.2 Newcastle Coalfield

Existing Mines

In 1992-93 production from the Newcastle Coalfield amounted to 16.9 Mt. Of this total, 8.2 Mt was delivered to power stations in the district, 7.9 Mt was exported and 1.0 Mt was supplied to the steel industry. The balance was incorporated into stock piles. The closures of Pelton and Newvale No 1 have occurred recently; Awaba is likely to close and production from Wallarah and Moonee has been curtailed. These decisions have led to reduced production from the Newcastle Coalfield.

The Ulan mine near Mudgee was awarded a contract to supply Eraring Power Station from January 1993, which has required the construction of a rail unloading facility. This rail unloader will increase the competitiveness of mines outside the Newcastle area with the potential for further loss of domestic markets by local mines.

High levels of population growth have been maintained along the New South Wales coast over the past few decades. There is a strong trend toward increasing settlement in the coastal areas of Lake Macquarie and Wyong local government areas. In particular, development on the western side of Lake Macquarie is of most concern in respect to the possible impact on coal resources (see figure 7).

In most cases urban development on the western side of Lake Macquarie is affecting existing mines. The direct impact on existing mines is to limit planning options by constraining longwall mining layouts, thereby reducing productivity by restricting the amount of coal that can be recovered. Each constraint imposed on a mining operation increases the cost of that operation. The mines in the Newcastle area are particularly vulnerable because of their age (many have operated for over 50 years) and dwindling resources of high quality coal. Many mines have substantial resources of poorer quality coal in lower seams (Fassifern Seam in particular). However, the economics of extracting this coal in the face of increased constraints being imposed by surface development are doubtful.

The recent closures and cutbacks at several mines are in part a reflection of the increased costs associated with mining in the Newcastle coalfield.

Project Areas

Project proposals are limited to Bellbird near Cessnock and Lachlan on the western side of Lake Macquarie. These projects could be expected to be developed in the medium to longer term. However, production from these projects would be insufficient to make up for lost production from mine closures in the Newcastle Coalfield.

Future Coal Development Areas

The options for new mine developments in the Newcastle Coalfield are limited.

The Mandalong area north west of Wyong (figure 7) contains high quality steaming coal that at one time was reserved for a power station. This area contains probably the **last significant, high quality thermal coal resource in the Newcastle area**. The resource of 450 Mt is thought to be sufficient for two underground mining developments. However, the area is under increasing threat from rural residential development. In particular Wyong Council has strenuously opposed restrictions on development in the area, particularly where the coal measures deepen south of the 400 m depth of cover line, which is in the southern part of the area indicated on figure 7.

The Department of Planning prepared a discussion paper on the draft Hunter Coastal Urban Development Strategy early in 1992. This report included a map showing areas for potential urban development. However, the report noted that the sterilisation of productive coal resources needs to be avoided. The resources in these areas have been calculated at about 140 Mt in the major seams. These resources would be exploited from existing collieries. However, mining in the largest of these areas (Edgeworth) should be completed in five years. As full development of the area is likely to be spread over 30 years, coal mining and urban development should be able to be coordinated to allow both land uses to occur.

7.3 Hunter and Gunnedah Coalfields

Existing Mines

In 1992-93 production from this area amounted to 39.1 Mt and has been growing for the last decade. It has been the fastest growing area of coal production in the State over this period. Of this production, 29 Mt were exported and 10 Mt was sold to power stations.

There has been a great expansion of mining operations, particularly open cut, in the Singleton-Muswellbrook area in the last decade. As discussed in chapter 2, residents of this district were initially concerned at the effect which large scale mining developments would have on their lifestyle.

The Hunter/Gunnedah area does not contain significant areas of urban development. However, the major regional centres, particularly Singleton and Muswellbrook and the surrounding smaller settlements, do have a significant impact on potential coal development in the region. Residents of these centres commonly express concern over open-cut mining developments. Major issues of concern include dust, noise, water quality, visual impacts and general loss of amenity.

Project Areas

Several major coal projects are now in various stages of development near Muswellbrook e.g. Dartbrook, Bengalla, Mount Arthur North and Mount Pleasant. For these projects to proceed it is essential that proponents of projects in the Muswellbrook district demonstrate that they can mine in an environmentally sensitive manner and can resolve concerns held by local communities.

Several consultative processes have evolved over the last 15 years to allow residents' concerns to be addressed. For example an Environmental Impact Statement (EIS) has to be put on display to inform residents of the details of proposed developments. A Commission of Inquiry is held if there are objections, which allows residents an opportunity to explain why they oppose mining. Conditions can be imposed by the Commissioner on the development to meet these objections. An Environment Monitoring Committee, which has community representation, was established for the Rixs Creek mine near Singleton.

The Working Party expects that production from the Hunter region, resulting from the development of existing project areas, in the year 2000 will have grown by about 17 Mt. While some existing mines may close, it is expected that this loss of production will be more than offset by up to 9 mines opening in the same period. It is likely that production will continue to grow through to 2010 to about 69 Mt with a further 5-6 mines opening and a small number of closures.

There are also two large open cut mining proposals in the Gunnedah district, Maules Creek and Boggabri. However, these projects will require major improvements to rail capacity between Gunnedah and Muswellbrook, particularly the rail link over the Liverpool Range, before these projects could

be developed to their full potential. The development of new export mines in the Gunnedah region will require efficiencies of scale to justify the increased transport costs e.g. production of 5-10 Mtpa to offset the greater distance to port, 300 km compared with 125 km from Muswellbrook.

Future Coal Development Areas

Significant coal resources of high quality coal are contained in Authorisation 102 (figure 8) held by the Department of Mineral Resources west and north of Muswellbrook. Some disquiet has been expressed by residents that their lifestyle will be adversely affected if all the coal resources in this area are developed. It is estimated that sufficient resources exist in this area for a further 2 or 3 mines. While there is some potential for limited open-cut mining, it is expected that these developments will principally be underground mines.

These resources represent the bulk of the Hunter Coalfield undeveloped coal resources. The strategic importance of these resources for the future of the New South Wales coal industry increases as options for new mine development diminish in other coalfields.

Previously it had been believed that the Gunnedah Basin would eventually replace the Hunter as the State's coal mining centre. However, the high costs of transport due to the distance of the area from the ports and the limited transport infrastructure, meant that it was essential that low cost open cut coal resources be identified. Recent exploration by the Department of Mineral Resources has shown that open cut coal resources in the Gunnedah Basin are very limited. Although substantial underground resources are known to exist, the current evidence suggests that many areas contain significant igneous intrusions that are likely to adversely affect the economics of underground mining in the area. In addition there is a potential for concern over the effects of subsidence on alluvial areas that are subject to flooding.

In summary, with dwindling options in the other coalfields for the development of new coal mines, it is essential that the remaining high quality coal resources in the Hunter Valley be available for mining. The perception by some members of the community that mining in the Hunter Valley is already too intensive will need to be addressed.

7.4 Southern Coalfield

Existing Mines

The Southern Coalfield contains the State's only known resources of hard coking coal.

Coal Development Areas

Most of the available coal resources in the Western Coalfield have already been incorporated into National Parks.

The remaining coal resources that would be available for mining exist as isolated blocks or are confined to relatively small areas along the fringes of the National Parks. In this regard areas around Rylstone are considered to have the most potential.

Numerous proposals have been made to extend the Wollemi National Park, including one by the Colong Committee, the Colo Committee and the Federation of Bushwalking Clubs in 1985. This extension of 38 300 ha would join the Wollemi National Park to Pantoneys Crown and would include the Mt Airly/Genowlan mesas. Coal resources amounting to 970 Mt are located within this area that would cover several operating collieries. The National Park and Wildlife Service has advised the Department of Mineral Resources that there are no plans to revive the issue of the area being added to the Wollemi National Park.

A Private Member's Bill has been introduced by Dr P McDonald MP, which includes consideration of a comparable area to that proposed in 1985 in a National Park. It would similarly affect several operating collieries. For example, Baal Bone Colliery's life could be reduced from 15 - 20 years to two years because 40 Mt of mineable coal would not be accessible.

7.6 Summary

The Hunter region will be a major centre for new coal mine development over the next decade. Production from the Hunter Coalfield will therefore increase significantly as the many projects already in the planning stages commence production. Community concerns regarding the scale of these developments, particularly in areas around Muswellbrook, will need to be addressed.

In the other coalfields it is expected that, in the short term, new mine development and expansions of current operations will balance the loss of production from mines that cease to operate due to the exhaustion of economically mineable reserves. However, in the medium to long term, it is apparent that New South Wales has limited resources which would be suitable to sustain future new mine development. It is therefore important that the necessity of preserving these key resource areas be recognised.

8. COAL SEAM METHANE

Coal seam methane exploration is still at an early stage so that it is not possible to precisely forecast the effects of existing land uses or possible developments on methane gas exploration and exploitation if commercial discoveries are made. Therefore, no maps have been prepared which identify highly prospective areas as enclosure 1 does for coal resources. Nevertheless, some general comments can be made on the relationship between coal seam methane resources and other land uses that might affect its exploitation.

Bituminous coals typically contain gas consisting of over 95 per cent methane, with smaller quantities of carbon dioxide and higher hydrocarbons (although localised concentrations of carbon dioxide can vary over short distances).

Naturally occurring methane gas in coal seams has been a significant hazard to the coal mining industry throughout its history.

The majority of New South Wales coal mines mine coal at shallow depths where gas is of little or no consequence. However, in several regions, particularly in areas where mining is progressing into deeper coal resources, management of gas emissions is a significant economic and safety issue. Consequently, a number of mines have adopted in-seam drainage techniques to control gas emissions.

Gas from coal seams has recently been recognised as a potentially important economic resource. As a result, several companies are now undertaking greenfields exploration in New South Wales and Queensland with the aim of identifying economic gas resources within coal seams.

The recovery of coal seam methane using surface technology was first successfully trialled in the United States during the 1970s. Over the past 20 years a coal seam methane drainage industry has developed in the United States based on gas production from vertical wells drilled from the surface. Initially the development of surface production techniques occurred in collaboration with the coal mining industry. However, seam gas production by surface methods has now moved to exploiting greenfields gas resources. The industry now contributes about 10 per cent of the total US gas supply.

In New South Wales both Pacific Power and Amoco are actively assessing the coal seam methane potential of coal seams in the Southern, Newcastle, Hunter and Gunnedah Coalfields as well as the deeper part of the central Sydney Basin.

The dwindling options for coal development in each coalfield due to the loss of coal resources to competing land uses threaten the long-term future of the coal industry.

There are enough projects at an advanced stage to meet projected demand for the short term. Medium term demand can be met if access to several prospects can be assured against competing land use pressures. However, access to resources defined as having high potential in figures 7-11 is required to ensure the future growth of the industry beyond the next 15-20 years. The Working Party acknowledges the difficulties posed by the requirement to preserve access to these poorly defined resources for such a long time, particularly when there are other, more immediate land use pressures.

9.2 General Strategies

This study aims to lead to the achievement of a reasonable balance between coal mining and other land uses through a strategic coal development plan that addresses issues related to coal resources in four categories:-

- Resources within existing mines
- Resources within project areas
- Strategic coal resource areas
- Other coal resources

Strategies addressing these resource categories can be divided into a number of broad headings

- Protection of strategically significant coal resources.
- Implementation of multiple and sequential land use concepts
- Assessment of the impact of alternative land uses on coal resources
- Increased liaison and information exchange between the coal industry and the community

Protection of Strategically Significant Coal Resources

Sensible land use planning cannot occur unless the coal resources have been properly assessed. The Department of Mineral Resources should continue to

assess the coal resources in areas subject to land use planning pressures so that decisions can be based on an appropriate assessment of the significance of the resources present.

The main aim would be to highlight key coal resource areas vital to the future of the New South Wales coal industry in each coalfield. Ideally, once identified, the resources should be given some level of protection, possibly through a planning classification that would exclude land uses that would be incompatible with future mining. These zones should form ideal models for the concepts of multiple and sequential land uses.

Areas that should be considered for some form of protection are shown in enclosure 1.
Such a classification would have several advantages:

- The local community would benefit by having the key resource areas clearly identified. Medium to long term planning could then take into account these future coal developments.

- The coal industry should obtain greater security over the resources needed to meet future coal requirements.

- The process of obtaining approvals for mining developments in these areas should be facilitated, due to the previous identification and forward planning that has taken place.

Multiple/Sequential Land Use

Sometimes, land has been seen as being capable of a single use only e.g. open cut mining or agriculture. However, it is often possible for an area to have more than one land use, which may be multiple and/or sequential. Multiple land use means that more than one land use may be carried on in a designated area e.g. mining under active farming land. Sequential land use refers to changing land use over time, e.g. from agriculture to mining or mining to recreation. Multiple and sequential land use involves optimising the use of the land, compared with an approach that determines what single purpose the land might best be used for. Although the planning system does allow for this concept, the reality is that the community does not always accept the principle of sequential or multiple land use.

South Australia, Western Australia, Northern Territory and Queensland have adopted these concepts as a policy for the achievement of sustainable development. South Australia and Queensland have made specific legislative provision to allow exploration and mining to coexist with conservation in

"regional" or "resource" reserves. However, New South Wales would need to develop its own model to suit its land management systems, rather than copy another state's system.

Resource Impact Statements For Conservation Areas

A formal process needs to be developed for addressing land use conflicts over conservation areas. A key aspect of this is that proposed conservation areas in the coalfields need to be subject to a formal resource assessment process. It is envisaged that such a process could be similar to the process used for Environmental Impact Statements. The aim of a **"Resource Impact Statement"** would be to ensure that all resources are valued and given proper consideration so as to assess whether or not conservation dedication is an appropriate land use for the area.

Sensible land use planning cannot occur unless the coal and petroleum and mineral resources are properly assessed; the Department of Mineral Resources is the appropriate body to carry out this task.

Liaison

Increased consultation between proponents of different land uses will reduce ignorance and misunderstanding of each side's position and hopefully lead to solutions that take into account each side's concerns.

Occasionally fundamental policy differences will mean that disputes cannot be resolved by discussions between the parties. Conflict resolution mechanisms are therefore required to deal with such cases. An example is the Natural Resources Audit Council that has been established by the Government. This Council comprises representatives of the relevant agencies who will make the necessary assessment and provide recommendations to the Government where there are competing land uses.

9.3 Strategies for Specific Land Uses

Besides the broad strategies outlined above several strategies have been developed to address specific land uses that have a major affect on coal resources. These strategies are outlined below.

Conservation Areas

Issues:

Proposals for new conservation areas and access to existing conservation areas give rise to separate issues. There has been a lack of information exchange in the early stages of forward planning of new conservation areas between the National Parks and Wildlife Service and the Department of Mineral Resources.Multiple land use involving mining and conservation has to be considered, in contrast to a widespread belief that the two are incompatible in all circumstances.

In the past, processing of some proposals for National Parks and other conservation areas has been subject to outside pressures, which has not allowed a complete analysis of conservation values or a consideration of other resources contained in the areas. The Department of Mineral Resources developed the "Planning Focus" mechanism to deal with Government organisations' responses to proposals for new coal leases, and acts as coordinator of the "Planning Focus" meetings. These meetings provide the mining company concerned with an opportunity to brief the relevant government authorities on its proposals and to identify all pertinent issues at an early stage.

If the National Parks and Wildlife Service were to organise similar meetings and specify the particular habitats, scenery or other features to be preserved, this would give the opportunity for all the resources of the area to be assessed. The appropriate conservation category and area could then be determined after this consultation. The National Parks and Wildlife Service could then prepare draft conditions before dedication of an area. These plans would take into account land uses that might be appropriate and compatible.

A difficulty in the present system of conservation areas is that there is no category in which multiple land use is widely accepted as being compatible with preservation of conservation features. A Legislation Committee on the National Parks and Wildlife (State Conservation Parks) Amendment Bill 1992 stated "the proposal for State conservation parks should, if implemented, be based on a multiple land use conservation category that includes provision for current and future exploration and mining". Part of the difficulty in such

multiple land use is the public perception that multiple land use and preservation of conservation values are mutually exclusive.

The Working Party recognises that even if there is improved consultation and information exchange, there will still be situations where decisions must be made between mining and conservation areas. Information gathered by the Natural Resources Audit Council referred to above might be able to assist in minimising some of these land use conflicts.

The NSW Coal Association and the Australian Coal Industry Council carried out a survey that dealt with community attitudes to the coal industry. It found that there was community support for the concept that development can be compatible with nature conservation.

Protection of ecosystems that might be affected by coal mining developments should also be considered. This issue would be addressed during consideration of the EIS by the designated authority and conditions imposed at that time. After mining commenced, if the Department of Mineral Resources had concerns that the measures proposed to protect ecosystems were inadequate, it would require the proponent to obtain independent advice that the ecosystems would not be damaged by the predicted subsidence.

Strategies:

- **Before an area is declared a conservation area a formal process needs to be followed which provides for a full assessment of all resources in the area. This will in effect be a Resource Impact Statement for the conservation area.**

- **Development of a multiple land use tenure classification for conservation areas is considered essential.**

Urban Development

Issue:

> ***Both the coal mining industry and urban development will require access to significant areas of additional land in the Newcastle and Southern Coalfields in the future.***

The competing land uses in these coalfields require a continuation of the high degree of ongoing liaison between the Department of Mineral Resources, Department of Planning, Mine Subsidence Board and the local councils in

under key infrastructure. Similarly, engineering solutions have been devised in the design of transmission towers to allow for the effects of subsidence.

Surface subsidence predictions have advanced considerably since the guidelines for mining under stored bodies of water were framed in the 1970s, as has an understanding of subsurface strata behaviour in mines. South Bulli Colliery in the Southern Coalfield carried out a thorough research program before applying to mine under the Cataract Dam storage area; its application was then approved by the relevant authorities after they were satisfied that there was no risk to the dam storage involved.

Research should be considered and carried out where appropriate, on a case by case basis, to reduce the quantity of coal that must be left to protect the infrastructure.

Although overseas experience and research into subsidence have enabled the lifting of many restrictions, clearly the best solution is to avoid siting infrastructure over economic coal resources. The identification of coal resources will help in positioning infrastructure in the optimum location.

Strategy:

- **Identification of the extent of coal resources will allow the optimum siting of roads, pipelines and other infrastructure to minimise the impact on coal extraction.**

- **Continued action to demonstrate that coal mining can safely take place beneath infrastructure.**

Prime Agricultural Land

Issue:

The power of veto by the landowner to exclude open cut mining from Agricultural Land.

The mining of Agricultural Land has been opposed by the farming community because of:

- doubts that the land can be satisfactorily restored to previous levels of productivity

- concerns over the possibility of flooding

- concerns over the effect of mining on water quality.

Most of the State's remaining open-cut coal resources in the Hunter and Gunnedah Coalfields are potentially affected by Agricultural Land. Overseas experience has suggested that many concerns expressed regarding mining of Agricultural Land can be addressed. Technical and engineering solutions are available to restore mined Agricultural Land to its pre-mining productive capacity.

Many of the environmental issues related to mining of Agricultural Land should be addressed through the normal EIS process. It is difficult to identify strong reasons why Agricultural Land should be in the privileged position of having the potential to trigger a veto whereas other potential environmental issues do not and are addressed through the normal EIS process.

Strategy:

- **Demonstration through research projects of the industry's ability to restore Agricultural Land.**

- **Dissemination of overseas experience and the results of local research into restoring Agricultural Land.**

- **Pursue issues concerning the mining of river flats through the normal EIS process, which would provide adequate protection.**

Natural Features

Issue:

> ***Mining under natural features may need to be limited because of the potential for damage if the underlying coal is fully extracted. Mining may also have to be limited under flood-prone land or foreshores to prevent damage to natural features or surface structures.***

The Department of Mineral Resources limits mining of coal under natural features. It has issued clear guidelines for mining under foreshores, so that subsidence will not exceed limits above which damage might occur. Damage that has occurred in the Lake Macquarie area relates to mining predating the current guidelines. In areas where the cause of subsidence in old mines is not known, mining is prohibited. The guidelines were set after consultation with the mining industry and local councils. A similar procedure will be followed in establishing guidelines for mining under flood-prone areas.

The Department of Mineral Resources has placed increasingly tight restrictions on mining under significant escarpments to prevent major cliff falls, as for the Airly Mountain project. The Department has an ongoing research program into the effects of mining on escarpments.

Ongoing Action:

- **Rigorous assessment of plans to mine under natural features should continue to be carried out by the Department to minimise damage to the features.**

- **Guidelines for mining under natural features should be monitored and updated as required in the future to ensure that there is appropriate protection for the features as well as economic coal extraction.**

Commonwealth Land

Issue:

Two areas of Commonwealth land, at Holsworthy and Singleton, are currently excluded from mining; both cover substantial coal resources.

Strategy:

- **Discussions should be held with the Commonwealth Government by the NSW Department of Mineral Resources to determine if there is a possibility of the resources being exploited in the future.**

Coal Seam Methane

Issue:

Two types of conflict could occur in the exploitation of coal seam methane resources:

- ***Potential conflict with existing surface land use, in particular urban development;***

- ***Co-ordination between coal producers and coal seam methane producers over access to the coal.***

Ongoing Action:

- **Coal seam methane explorers should be encouraged, as a matter of urgency, to test areas where urban development is likely to proceed so that access to the resource can be incorporated into planning objectives.**

- **Close liaison is necessary between the explorers, the Department of Mineral Resources and planning authorities to enable potential conflicts to be resolved at an early stage.**

- **Where coal and petroleum titles overlap, the title holders should enter discussions at an early stage to resolve areas of uncertainty, with the Department of Mineral Resources facilitating the process if necessary.**