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Sandy Hollow-Ulan railway proposal : environmental impact statement, April 1980

SANDY HOLLOW — ULAN

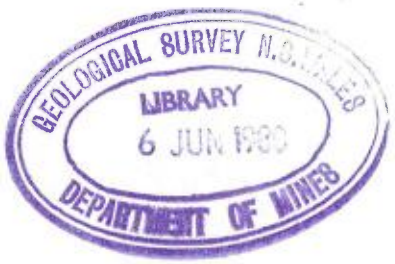
RAILWAY PROPOSAL

ENVIRONMENTAL IMPACT STATEMENT

APRIL 1980.

LM LONGWORTH & McKENZIE PTY. LIMITED.

ULAN COAL MINES LIMITED



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APRIL 1980.
NNT 268.
E.T.C.J.

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ACKNOWLEDGEMENTS

This environmental impact study and preparation of the Environmental Impact Statement for the Sandy Hollow-Ulan railway proposal has been undertaken by a team from Longworth & McKenzie Pty. Limited and their associated Consultants.

The study has been undertaken by a team to ensure a balanced and wide ranging study of the proposal. The various specialists have collaborated to prepare different parts of the report.

The main members of the study team were:

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The study team wish to acknowledge the extensive and most helpful assistance given by various officers of Ulan Coal Mines Limited and the Public Transport Commission and representatives from a number of Government organisations as set out in Section 9.

SUMMARY OF ENVIRONMENTAL IMPACT

1.1 Outline of Study

This Environmental Impact Statement was prepared by Longworth & McKenzie Pty. Ltd. and associated Consultants for its Client Ulan Coal Mines Limited.

The Statement examines the environmental impact which would arise from construction activity during completion of the railway between Sandy Hollow and Ulan on the existing incomplete formation.

The Statement also examines the environmental impact associated with the operation of the railway for transport of coal.

This Section provides details about the railway proposal, its importance to the community and government, its environmental impacts and also presents a conclusion and several recommendations.

Section 2 provides a general background to the proposal by Ulan Coal Mines Limited to complete construction of the railway at the Company's expense.

The development of the proposal concept is discussed in detail in the next Section with particular emphasis being placed on the importance of coal in the context of future markets, the various alternative transport options for Ulan coals and reasons for adoption of the proposal.

Section 4 deals with the future utilisation of the railway in particular examining the potential for coal and other commodity transportation and identifying operational constraints.

The next Section examines the construction, operational and maintenance details of the proposed railway and its associated facilities.

Section 6 discusses the characteristics and present state of the study area with particular attention being paid to landform and aesthetic quality, noise, ecology, archaeological protection with specific examination of the construction camps and quarry sites.

The last Section of the Statement, Section 8, provides a detailed assessment of the environmental impact and the interaction of the proposed railway on the study area.

1.2 The Company's Objectives

Ulan Coal Mines Limited's objectives are to complete the railway for transport of 4.0 million tonnes of high quality steaming coal annually by rail from Ulan via Sandy Hollow and Muswellbrook to Newcastle for export purposes. This coal is required predominantly for export through the Port of Newcastle.

1.3 Synopsis of the Railway Proposal

1.3.1 Construction

The construction of the railway between Sandy Hollow and Ulan involves mainly rehabilitation, formation upgrading, ballast emplacement and tracklaying on the substantially complete existing railway formation. However there are also some major construction activities at a number of specific localities notably the Bylong tunnel completion, remedial works for formation washouts by the Goulburn River and construction of a rail loading loop at Ulan.

The railway will be constructed under the scrutiny of the Public Transport Commission generally to its Class 1-XC Standard comprising continuously welded 60 kg rail on concrete sleepers with 300 mm ballast. These works will cost approximately $45 million involving an estimated 13,350 man weeks construction activity before intended completion in mid-1982.

1.3.2 Railway operation

Upon completion of construction, railway operations and maintenance become the Public Transport Commission of N.S.W. responsibility. The completed railway will have more than adequate capacity to transport 4.0 million tonnes of coal annually from Ulan to Newcastle. It is proposed that mining operations, which are subject to a separate environmental impact statement, will be programmed to initially reach a 1.5 million tonnes production rate shortly after railway completion with progressive upgrading of operations to 4.0 million tonnes within a further two years.

Ultimately coal trains will comprise 42 C.H.S. waggons of 76 tonne nett capacity hauled by three 3000 horsepower locomotives although shorter trains will be used initially. A daily average of four coal trains will transport coal as scheduled by the Public Transport Commission. Occasionally peaks of up to eight trains may occur. In the long term electrification of the line could be undertaken with minimal difficulty.

1.4 Importance of Proposal

The construction of the railway to provide transport for coal from the proposed expanded Ulan mining operations will provide substantial economic benefits and employment prospects in a region which has high unemployment. The Ulan deposits could not be developed as currently proposed if this railway is not completed because no viable alternative transport option is available. This option conforms with the Government's policy to maximise coal transport by rail.

The export of Ulan won coal will, both directly and indirectly, provide substantial State and Federal public revenues. At present values, the annual earnings associated with the development of Ulan deposits would be in the order of $ 104 million providing valuable export earnings for Australia. The additional tonnage of coal hauled over the rail network will increase revenue to the Public Transport Commission.

1.5 Summary of Environmental Impact

The detailed assessment of the proposed railway's environmental impact, both during construction and subsequent operation, is presented in Section 7.

This Section provides a broad summary of environmental impact as follows:

- construction and railway operation will have little detrimental effect on the pleasant rural and undeveloped nature of the sparsely populated region;
- all vegetation outside the existing railway easement will be left undisturbed except where arrangements have been made with landowners to establish borrow pits which will eventually be left as dams for landowners;
- cleared vegetation will be control burned in accordance with bushfire regulations;
- the Public Transport Commission will maintain the easement substantially free of vegetation;
- construction activities will actually improve the present status of minor soil erosion on the incomplete formation;
- water quality will not be affected to any degree by construction or railway operation;
- water usage will not interfere with water users' riparian rights. Additional boreholes will be available after construction completion for landholders' usage;

Is this form of rehab. realistic/acceptable?

- neither construction nor railway operation will cause any significant adverse effects to the region's normally excellent air quality status;

- construction noise will be temporary only and will cause no major impacts;

- railway operation will introduce an additional noise source to the region which is predominantly rural in nature. With the exception of a number of houses built close to the original railway where noise disturbance will be unavoidable, noise will only be distant and transient. This is expected to cause minimal disturbance. Animal and native fauna activity will not be adversely affected.

- both construction and railway operation pose no additional bushfire risk to the region;

- all construction works and railway operation will have minimal impact on the region's ecology particularly those zones designated as ecologically sensitive. Existing corridors between natural areas on the northern and southern sides of the Goulburn River valley system will be maintained. During construction ecological protection will be achieved by restriction of construction to the easement; construction plant cleansing; and intended restrictions on worker's recreational activity by not allowing firearms, animal trapping, pets or trail bikes;

- archaeological investigations did not indicate archaeological relics at any area of proposed construction activity. If any aboriginal relics are discovered during the course of construction, the National Parks and Wildlife Service will be notified.

- railway construction and operation will not materially affect existing land use within the study area except where proven coal deposits at Ulan are developed. The Company intends to completely fence the railway to normal standards;

- although the railway easement passes across land in the vicinity of Wollar, which is currently being explored for coal mining potential, investigations are not yet advanced enough to establish whether commercially viable coal deposits would be alienated by the existing railway route;

- construction work is estimated at approximately $45 million. It will also provide approximately 13,350 man weeks of work creating temporary employment and supportive service prospects in an area of the State which has depressed rural activity and high unemployment. Permanent employment and service prospects will be generated by the proposed Ulan Colliery expansion;

- both construction and railway operation will cause minimal social disturbance;

- construction traffic will not cause any significant adverse environmental impact;

- both during and after construction public traffic will be forced to use the designated existing public road over Cox's Gap rather than utilising the present alternative route through the Public Transport Commission's tunnel and adjacent approaches on the formation. The public road will require upgrading to service the present daily traffic flow of about 100 vehicles. This diversion of traffic will cause minor impact within these ecologically sensitive zones. However such an impact could be short-lived if the Kerrabee Dam proposal is undertaken because a length of public road will be submerged. It is suggested that by upgrading the poor road linking Merriwa to Wollara station, an alternative safer and faster traffic route would become available to through traffic travelling to or from Sandy Hollow to the Mudgee/Gulgong district.

- the railway construction and operation will not affect the natural areas bordering the northern side of the Goulburn River Valley; and,

- although the Kerrabee Dam proposal will undoubtedly be of regional importance, it will have far more significant environmental impact than the railway construction or operation because substantial areas of lowland and sections of public road will be submerged. It will be of special importance to significant ecological corridors.

1.6 Conclusion

From the work undertaken during the course of this study, it is concluded that there are no significant adverse environmental or sociological impacts associated either with the railway construction or operation.

The completion of the single track railway between Sandy Hollow and Ulan presents itself as the most favourable and rational transport option having due regard to economic, geographical and operational factors. It will enable the extensive Ulan coal deposits to be developed thus providing significant economic and societal benefits to a generally depressed region of N.S.W. and providing substantial income for both State and Federal public revenues. It will also not prejudice the possible establishment of other non-coal freight services.

2.0 INTRODUCTION

2.1 General Background

In 1975 White Industries purchased the Ulan Coal Mine, which had been operated on a small scale for eighteen years selling coal to adjacent local industries.

As a consequence of an exploration programme undertaken in 1976, extensive coal reserves were proven. In 1978 Mitsubishi Development Pty. Ltd. purchased a 40% equity in the Ulan Coal Mines and the operating name of the Coal Mine Company was changed to Ulan Coal Mines Limited.

Associated with the further development of the coal mining activities to meet existing and potential export contracts, means of transporting the high quality steaming coal to an export coal loader were investigated. The completion of the railway from Sandy Hollow to Ulan using the substantially complete formation and associated engineering works presented itself as the most favourable and rational transport option having due regard to economic, geographical and operational factors.

2.2 The Company's Proposal

By agreement with the N.S.W. State Government, Ulan Coal Mines Limited propose to finance and complete construction of the uncompleted section of railway between Sandy Hollow and Ulan.

It is intended that all works be constructed to the Public Transport Commission's Class I-XC Standard. The works will also comply with other statutory or regulatory body requirements.

Upon completion of the railway, operation and maintenance will become the Public Transport Commission's responsibility. The Company will eventually recoup monies expended during construction by means of future freight concessions allowed by the Public Transport Commission

2.3 The Company's Objectives

The Company's objectives are to complete the railway to facilitate the annual transport of the 4.0 million tonnes of high quality steaming coal by rail from Ulan via Sandy Hollow and Muswellbrook to Newcastle. Most of this coal will be exported through the Port of Newcastle.

2.4 Scope of Statement

Longworth & McKenzie Pty. Limited were commissioned by Ulan Coal Mines Ltd. to prepare an environmental impact statement for the section of railway between Sandy Hollow and Ulan.

Consistent with this commission, the statement does not assess the environmental impacts for the section of existing railway between Sandy Hollow and Muswellbrook. Along this 43 km section of railway the existing sleepers, track and ballast will be replaced to upgrade the line to the Public Transport Commission's Class 1-XC Standard. This work would not be expected to cause any significant environmental problems and could be scheduled to avoid any conflict with grain transport problems. When operational, temporary noise will be generated by the additional coal trains in areas in close proximity to the railway route. No other significant environmental impacts should be generated by the railway's operation.

Although there is considerable potential for the development of other coal mines and ventures along this route, the statement is also essentially restricted to the intention of transporting 4.0 million tonnes of coal annually from Ulan via the railway to Newcastle for export purposes.

The proposed development of the coal mining activities at Ulan is the subject of a separate environmental impact statement by Longworth & McKenzie Pty. Limited.

Mining ventures by other companies, such as by Energy Recycling Australia in the Wollar Creek area are not considered further in this impact statement because planning and investigations are still tentative. It is understood that the possible relocation of the railway easement may be required if deposits are to be fully exploited but no approach has been made to the Public Transport Commission by the above Company (Ref: D5).

Any such deviation and its environmental, financial and operational ramifications must be assessed in relation to the alternative option of retaining the existing railway easement as has occurred elsewhere in the Hunter Valley for open-cut mining operations.

i.e. "not our responsibility to establish the best route to avoid sterilizing coal resources"
sterilizing graffiti is more fun!

3.0 DEVELOPMENT OF PROPOSAL CONCEPT

3.1 Historical Background

Before this proposal is evaluated it is essential to appreciate that the railway has a long historical background. The Bureau of Transport Economics study (Ref: 3), which is discussed in Section 3.2, provides in its Appendix 1 an excellent treatise of the fortunes of the railway since it was first considered in 1911 by a Royal Commission (Ref: 16).

Construction of the railway began in 1936 following a long period of public lobbying and parliamentary debate. Although most major engineering works were completed, construction ceased before 1951 mainly because of finance and steel shortages which began with the advent of World War II. If these delays had not occurred, the line would be operating today but with a low standard track requiring repeated maintenance. probably not true, since the GWR over the Blue Mountains was electrified in 1956-7 in lieu of completion of the S/H-M Rly

A number of proposals to complete the railway were considered by both Commonwealth and New South Wales Governments which led to an economic appraisal (Ref: 6) by the State Development Corporation in 1970. The corporation concluded that the railway construction could not be economically justified. However, the report noted that this conclusion "could be very materially altered by the development of mineral resources, particularly coal, within the area of influence".

This position remained uncontested from an economic viewpoint until large reserves of high grade steaming coal were proven at Ulan in 1976. In December 1978, Ulan Coal Mines Limited announced its intention of providing the funds for completion of the railway to Ulan subject to State Government approval with Ulan Coal Mines Limited being ultimately recompensed by means of future freight discounts.

3.2 Economic Feasibility Study

In July 1979, the Bureau of Transport Economics completed an economic evaluation (Ref: 3) of the railway for the two separate stages from Sandy Hollow to Gulgong with subsequent extension to Maryvale. This study noted that the main benefits of the first stage would 'arise from the induced extraction and export of coal from Ulan'. From considerations resulting from an economic sensitivity analysis, the Bureau of Transport Economics also recommended that the railway be constructed as early as possible.

The main conclusion of the report was that 'completion of both stages of the Sandy Hollow - Maryvale railway is warranted under a wide range of plausible conditions'. However, as noted earlier in Section 2.4, construction of the railway past Ulan to Gulgong and further to Maryvale is beyond the scope of this proposal.

A detailed examination of economic feasibility is not within the scope of this Environmental Impact Statement. It is considered that the economic justification of the above Study requires updating to account for reassessed construction costs and future known and probable freight volumes. Such further work would undoubtedly support the original findings.

3.3 The Importance of Coal

The economic viability of the railway is dependent on projected transport of known reserves of coal. Development of additional coal reserves would further improve this position generating significant income for the Public Transport Commission. Other significant income to public revenues for both State and Federal Governments will also be generated.

The production of coal is an important and expanding industry in Australia, particularly in New South Wales. Coal is produced for both domestic and overseas markets, both of which are likely to expand in the future. The export of coal is particularly likely to undergo significant and rapid expansion playing an increasingly important role in Australia's export earning ability. Based on the present price of approximately $ 26 per tonne, annual export earnings of Ulan won coal are expected to be in the order of $104 million.

Apart from the economic advantages of coal development, the industry provides a relatively cheap indigenous source of energy for other major and minor industries within Australia.

It also provides substantial employment and secondary opportunities by way of service and support industries. In a region which is economically depressed with one of Australia's highest unemployment rates (Ref:21), the development of the Ulan deposits will provide a much needed stimulus to local employment and community development.

3.4 Future Demands and Markets for the Export of Coal in New South Wales.

The latter part of the 1970's has seen a rapid increase in coal's contribution to Australia's export earnings. As a percentage of the total value of all exports from Australia it grew from 4.9 percent in 1972-1973 to 12.5 percent in 1977-78. Figure 5 shows the relative proportion of coal exports to other commodities within this time period. As well as the direct contribution to exports, the coal industry also indirectly contributes via other essential industries such as iron and steel production and refined aluminium production.

The export coal industry makes substantial contributions to public revenues. Contributions are made by taxes on the industry and its employees and from charges for goods and services provided to it by public authorities.

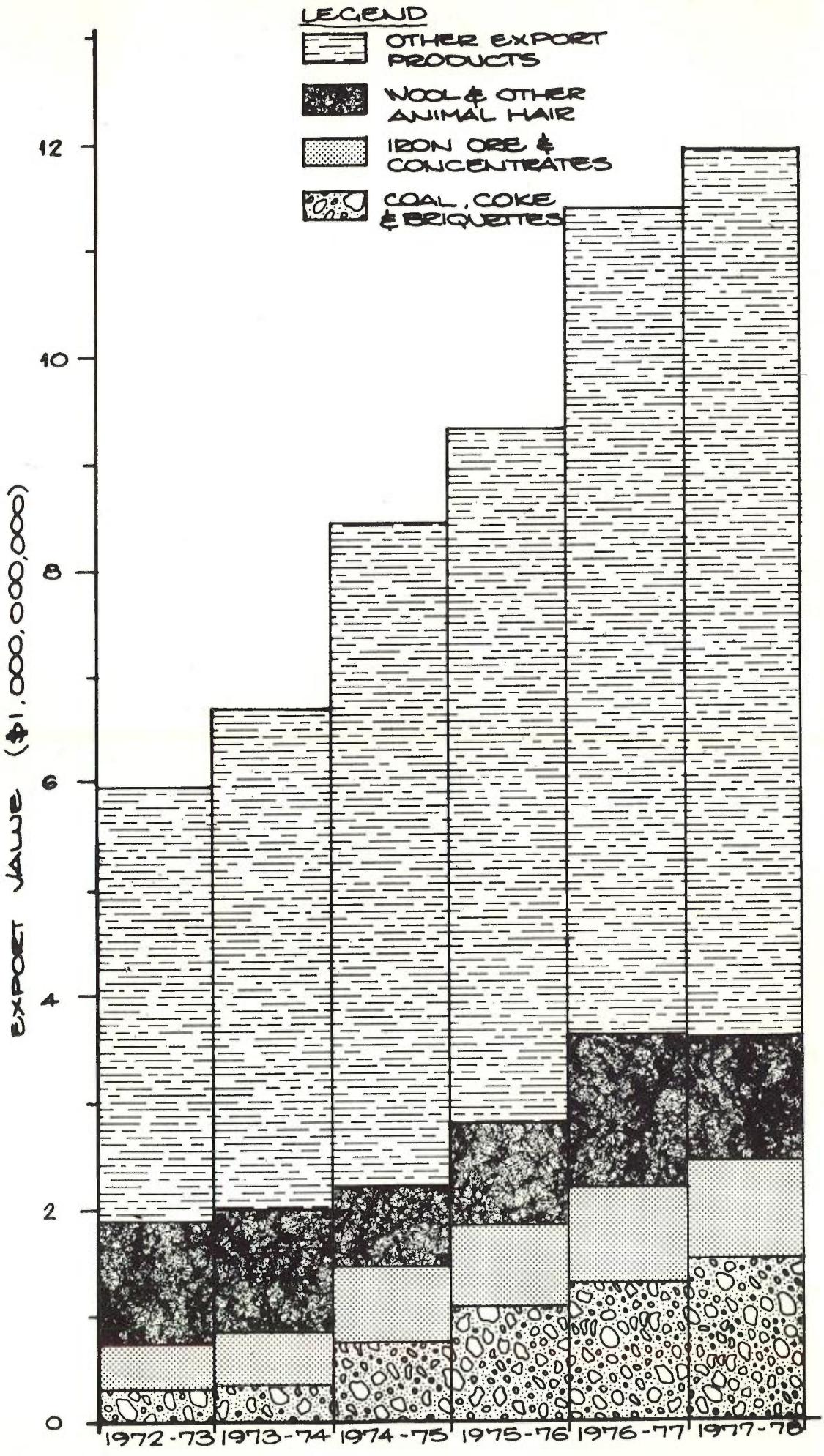

FIGURE 5 EXPORTS OF COAL AND OTHER COMMODITIES

It also has significant secondary effects via revenues flowing from suppliers to the industry and the supporting service framework for its employees.

New South Wales produces a wide range of coals which are suited to most markets. These vary from steaming coals through soft coking and blending coals to hard coking coals.

The world demand for steaming coal is expected to expand strongly over the next decade. Many countries represent large markets for steaming coal especially with the trend away from nuclear and oil fired electricity generating stations. Countries likely to require increased imports of steaming coal include Japan, West Germany, Israel, South Korea, Taiwan and South America. As an example of the possible increased demand the OECD predicts that Japan will increase its imports of steaming coal from 0.5 million tonnes in 1975 to 16 million tonnes in 1985 and on to 40 million tonnes in 1990 (Ref: 4)

To meet the growing export demand the coal-loaders at Port Kembla and Balmain are being upgraded and the harbour at Newcastle is being deepened to provide for larger vessels. Further expansion at the Newcastle coal loader is also planned.

Table 3a shows the present and estimated future capacities of these ports.

TABLE 3a

ANNUAL COAL SHIPPING CAPACITIES (MILLION TONNES)

(ADAPTED FROM REF: 4)

LOCATION	CAPACITY	
	PRESENT	FUTURE
NEWCASTLE:		
CARRINGTON BASIN AND STEELWORKS CHANNEL	15	25*
SYDNEY:		
BALMAIN	2.5	4.5
BALLS HEAD	1.0	1.0
PORT KEMBLA	7.0	15

* Subject to current environmental assessment and review.

Coal exports from the various mining areas have traditionally been associated with particular ports. Western coal, including Ulan, at present mainly uses Port Kembla and Balmain. Any substantial development of the steaming coal reserves at Ulan would severely test the capacity of these loading facilites because of concurrent expansion of coal mining activity in other Fields and because of the Government's policy to decommission the Balmain facility. It would also severely strain the existing rail network with consequent severe dislocation.

Consequently the large scale development of the Ulan deposit would require that the coal be exported through Newcastle in turn requiring that the transport infrastructure be suitably expanded.

The port of Newcastle has the potential to handle increased volumes of coal via both upgrading of the existing loaders and the possible siting of a new loader at Kooragang Island (Ref: 4).

3.5 Key Issues Regarding Transport Options

At the present scale of operations, Ulan mined coal is transported by road to Gulgong where it is transfered to rail to be directed via the Main Western line through Sydney to Balmain and also via the Illawarra line to Port Kembla. On occasions coal has been transferred north via Werris Creek to be directed to Newcastle on the Main Northern Line.

Currently the coal deposits on the South Coast, in the Lithgow area and the Hunter Valley are all being developed to meet future local and export coal markets. As explained in the previous section this development will severely test the capacity of the coal loading facilities at Balmain and Port Kembla and the development of the Ulan coal deposits will further strain the system.

Therefore the coal from Ulan should be directed to Newcastle and not through the greater metropolitan areas of Sydney and Wollongong.

The transport of coal to Newcastle from Ulan via the Sandy Hollow railway is the most suitable option as demonstrated in Table 3b. This conforms to Government policy to maximise coal transport by rail, where this is practicable.

The development of this railway will provide the most direct geographical route to Newcastle and avoids disruption of existing rail routes which are utilised heavily for other purposes.
The Ulan deposits could not be developed, as currently proposed, if this railway is not completed.

The railway will connect more directly geographically to Newcastle than is the case for other options. This is important because Newcastle has the potential to expand its loader capacity to handle increased volumes of coal in contrast to Balmain and Port Kembla which will be constrained by South Coast and Western Districts coal mine expansion and Government policy to eventually decommission the Balmain Loader.

The construction of the railway and expanded Colliery operations will provide employment opportunities and economic benefits in a region which is currently depressed with high unemployment.

Although the Public Transport Commission will allow freight concessions to enable the Company to recoup construction costs, the railway's operation will still generate substantial income for the Public Transport Commission. This will assist in defraying costs from other uneconomic but essential railway operations.

The export of coal will, both directly and indirectly, provide substantial contributions to public revenue which would otherwise not be available.

4.0 FUTURE UTILISATION OF PROPOSED RAILWAY

4.1 Transport of Ulan Coal Mines Limited Coal

It is proposed that 4.0 million tonnes of coal be transported annually by rail from Ulan via Sandy Hollow and Muswellbrook to Newcastle for export purposes.

4.2 Potential for Transport of Other Companies' Coal

The Bureau of Transport Economics Report (Ref: 3) noted that the Joint Coal Board of New South Wales placed a moratorium on further development of proven deposits adjacent to the current Ulan lease until such time as adequate transport infrastructure could be provided. It is estimated that ultimately 8.0 million tonnes per annum could be produced from the Ulan deposits.

In addition to these proven deposits, it is highly probable that much of the railway route and surrounds contain large coal deposits similar to that at Ulan. A comprehensive geological survey would be required to establish whether this is the case.

Current investigations near Wollar by Energy Recycling Australia are not sufficiently advanced to establish whether commercially viable coals are present.

Consequently reliable estimates of potential coal production within the study area cannot be made at this juncture. As noted in Section 3.4 the prospective export demand for steaming coal is expected to increase dramatically in both the short and long term futures.

Thus, if other areas along the railway route are proven and developed, the potential volume of coal transported could be considerably in excess of the volume currently proposed.

4.3 Other Uses

Because this proposal involves termination of the railway at Ulan, there would be limited opportunity to utilise the railway for other purposes such as the transport of grain, livestock, metalliferous concentrates and other freight. No provision for the transport of such commodities is intended by the Public Transport Commission. Any such arrangements will be subject to the Public Transport Commission's discretion (Ref: D5).

Consequently, realistic estimates of other potential freight have not been prepared for this case where the railway will be terminated at Ulan. It would be expected that the present volume of goods would be relatively insignificant in comparison to coal volumes even if additional loading facilities were established.

A Hunter Valley Research Foundation Report (Ref: 10) indicated potentially important projects which could generate significant traffic using the proposed railway. These include the mining of Molybdenum by Colonial Sugar Refining Company Pty. Ltd. in the Mudgee area and the development of kerosene shale deposits at Wollar by Industrial Minerals Aust. Pty. Ltd. Estimates for possible traffic volumes are not currently available.

4.4 Capacity of Railway

The completed railway will have an immediate potential to transport volumes of coal and other commodities in generous excess of the estimated Ulan tonnages.

The future capacity of the single-track railway could be increased by the provision of minor ancillary construction such as additional loops and passing sidings. On the basis of similar operational situations in Australia and overseas, advice from Public Transport Commission officials (Ref: D5) suggests a possible potential annual throughput of 20 to 25 million tonnes for the Ulan to Sandy Hollow section of single tracked railway, with due allowance being made for operational factors and efficiencies.

4.5 Identification of Constraints

As previously discussed this proposal advocates completion of the railway to Ulan to provide transport of coal to Newcastle. Although other commodities might be transported, subject to arrangement with the Public Transport Commission, this traffic would be insignificant in comparison to coal movements.

Any additional services, such as grain loading facilities or extension of the railway to Gulgong or beyond, are largely matters for Government decision. The proposed construction completion would not prejudice these options.

Figure 6. Typical bridge on existing railway formation.

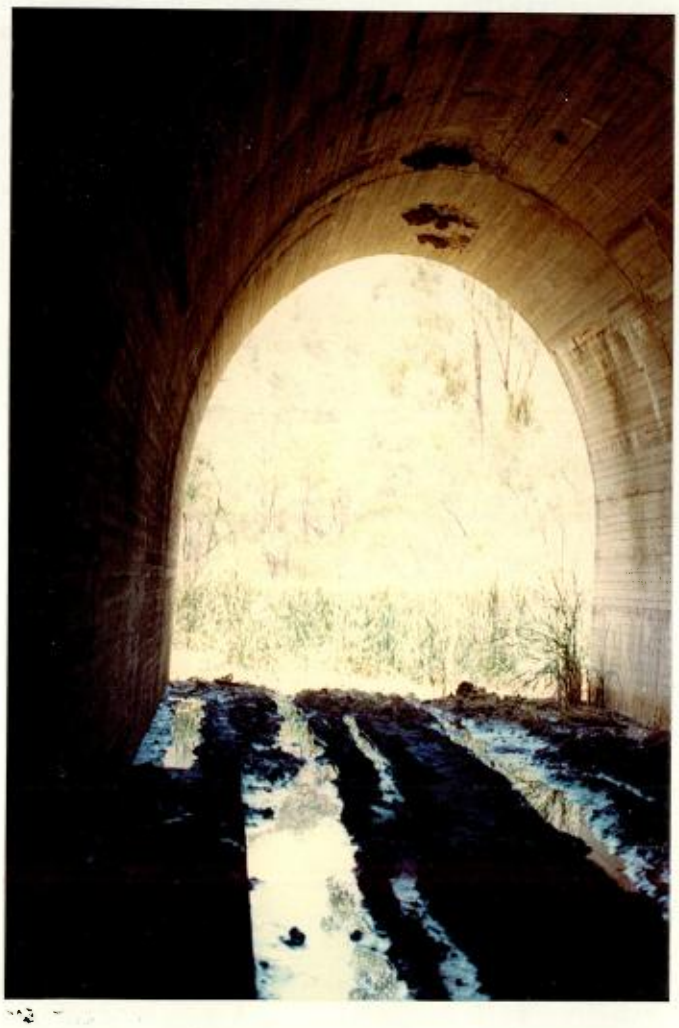

Figure 7.
View from inside
completed tunnel.

In page 52 :- Bull! you build the track in front of you as you go so that you can transport materials by rail!

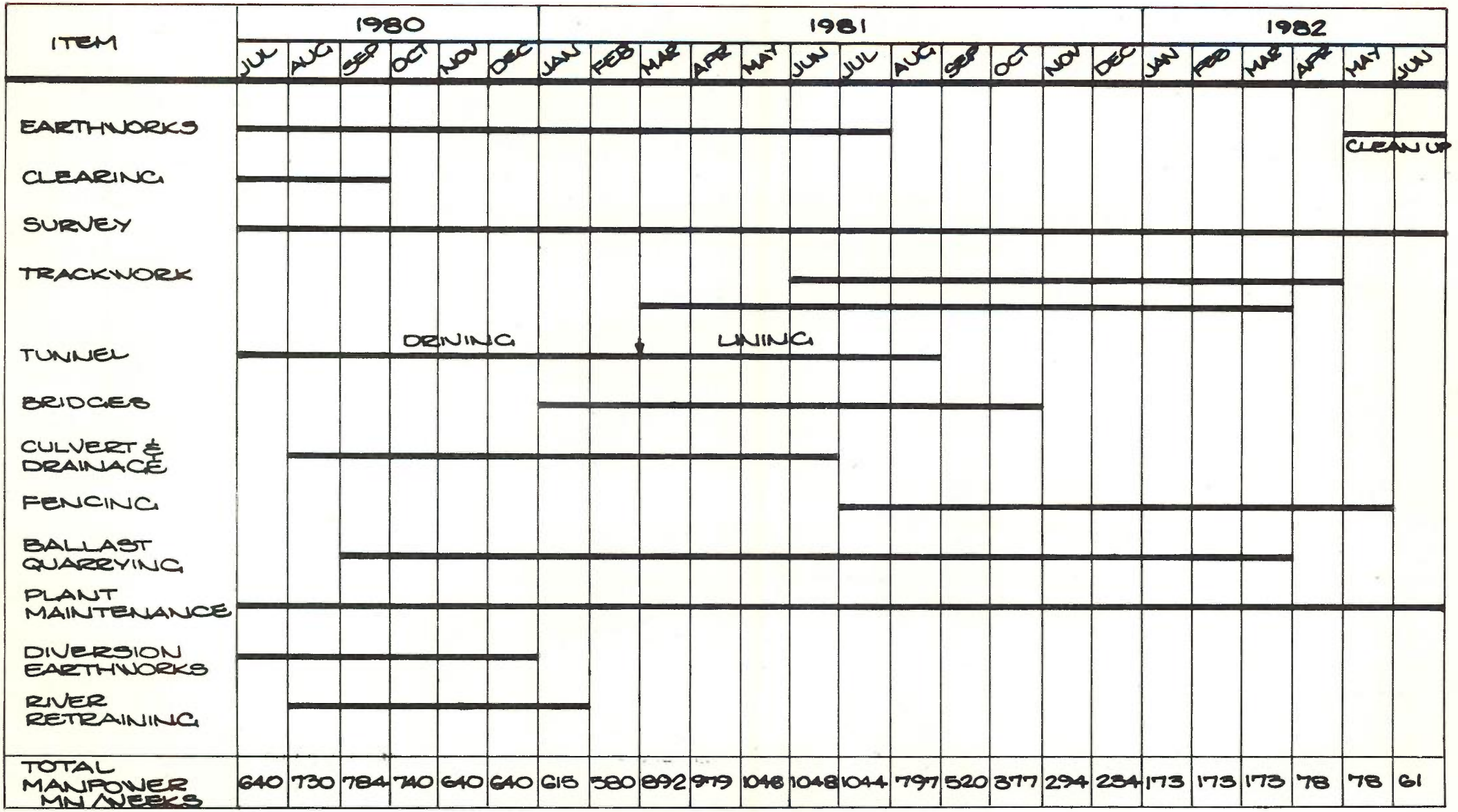

FIGURE 8 SEQUENCE OF CONSTRUCTION ACTIVITY AND MANPOWER REQUIREMENTS

5.0 DETAILED DESCRIPTION OF PROPOSED RAILWAY AND ASSOCIATED FACILITIES

5.1 Outline Description

The railway route and the location of the most important proposed construction activities to complete the Sandy Hollow to Ulan railway are shown on Figure 20.

As indicated previously in Section 2.1 most major engineering works were completed before 1951 when construction was suspended. The works completed may be summarised as follows:

- embankments 95% complete;
- drainage structures 95% complete;
- piers and abutments of the three major bridges over the Goulburn River completed;
- construction of a number of minor bridges complete with some steelwork;
- three completed and lined tunnels ranging in length from 261 to 462 metres;
- part completion of the major Bylong tunnel with 990 metres remaining to be driven and lined; and,
- all gates and wire fences substantially complete.

A comprehensive description of the proposed route is given in Appendix A. Apart from other construction activities, considerable rehabilitation works are necessary because no maintenance has been undertaken since 1951. The various construction activities required to complete the proposed railway are summarised in Appendix B. These works are estimated to be approximately $45 million in total cost.

5.2 General Sequence of Construction

The general sequence of construction is shown on Figure 8 with operations concluding in mid 1982. Construction will be centred from the two main construction camps at Sandy Hollow and Bylong with possibly two minor camps as also shown on Figure 8.This time frame which is the shortest practicable arrangement for the required construction activities located on a long route. Any extension of time will escalate construction costs.

The various activities have been scheduled to ensure that continuity of operations is maintained both in time and in location. Conflict between various activities will be avoided by appropriate scheduling, management and supervision.

Appropriate arrangements have been made with landholders for the establishment of these camps. As indicated on Figure 8, the labour force varies between a peak of 260 men to a minimum of 15 men with an average of 140 men.

Both major camps will each provide accommodation for a peak of 150 workers depending on proximity and sequencing of construction activity. Work levels will be typically much lower than these levels.

Because the railway formation is substantially complete, work will generally proceed along the route with little need to remain for long periods at any particular location in environmentally sensitive areas such as those near Mount Kerrabee.

However, at specific locations where major construction or remedial works are to be undertaken, this cannot be avoided. These locations include Bylong tunnel completion, repair of the washouts in the formation near Baerami and Thunderbolt's Galley and relocation of the railway at the existing washout south-west of Sandy Hollow.

5.3 Construction Standards, Methods and Operations

As indicated in the previous section, the various construction activities have been scheduled to ensure that continuity of operations is maintained in both time and location.

Although it is necessary for some blasting and excavation associated with major construction or remedial works, all spoil will be used along the formation. Otherwise most work is associated with general rehabilitation, formation upgrading and track laying on a formation which is substantially complete, as noted in Appendix A.

All works will be subject to stringent supervision by the employed project manager and by Public Transport Commission representatives to ensure compliance with desired track standards and various statutory requirements including environmental safeguards, which are discussed in Section 7.

5.4 Construction Plant, Labour and Temporary Works

The labour force and supervisory staff will be provided with accommodation and facilities at two main construction camps and also at two possible minor camps.

Plant and fuel will be stored generally at these camps although some temporary compounds will be necessary at convenient locations along the route for safety and security reasons and also as a means of preventing unnecessary plant movements.

Putrescible wastes will be collected regularly from the camps for disposal by arrangement at Council tips. Other waste materials of a non-degradable nature will be disposed of within the formation subject to meeting engineering standards.

Sewage and ablution disposal at camps will be arranged with the Local Councils and Health Commission; septic tanks and absorption trenches are proposed as used for Bylong Hall.

Following completion of the project, all campsites will be dismantled and cleared of all debris with planting of selected, suitable grasses. Boreholes installed for water supply will be left for future possible use by landholders.

5.5 Associatd Quarrying Proposals

The completion of the railway requires in part the provision of suitable ballast material. This material will be won mainly from quarries near Muswellbrook and at Stony Pinch. The quarry at Stony Pinch is shown on Figure 20. These sites have been investigated as part of this study.

The Muswellbrook quarry is located in an agricultural district on a parcel of land which is currently under notice by the Electricity Commission of N.S.W. for proposed resumption for establishment of a power station and associated mining development. It is proposed that the quarry be left ultimately in a fit state commensurate with the Electricity Commission's intentions.

The Stony Pinch quarry, which has been worked previously, is located within an enclosed valley formation. The quarry is located approximately 3 km east of 'Marapana' and 'Bylong Station' and 5 km west of 'Murrumbo'. It is proposed that the site be fenced and worked up the valley away from the road but behind a buffer zone for safety and noise control reasons. It is proposed that the quarry be left ultimately as a permanent water pool for stock. No other rehabilitation is proposed but the natural topography will shield the quarry from sight.

The Muswellbrook quarry will be the first quarry operation in keeping with general construction commencing at Sandy Hollow. Upon its completion, the Stony Pinch operation will follow.

Both operations will be conducted during normal construction working hours for six days a week to provide an estimated 200 tonnes of ballast per hour. Blasting operations will be necessary to extract this material. From each site approximately 250,000 tonnes of sized usable ballast will be extracted.

Where?

why not? Is a "dam" a realistic proposal?

Therefore disposal of say 25% unsuitable product will require dumping of ≈ 65,000 tons, unless it is used as an additive for road surfacing

Where are there? probably not day labour!

The ballast material will possibly be transported by 35 tonne capacity scraper to the railway formation at the nearest convenient access from public roads. The public roads will be maintained by the Contractor whilst in use for this purpose.

5.6 Utilities and Services

Electricity at the construction camps will be obtained by arrangement from Shortland County Council supply for Sandy Hollow and Prospect County Council supply for Bylong. Where suitable arrangments cannot be made for power, diesel generators will be used.

Waste disposal operations will also be made by arrangement with local Councils. Other services such as food supplies will be provided by appropriate arrangement with local agents.

5.7 Permanent Access and Maintenance Facilities

Because the railway route is located in close proximity to the adjacent road along most of the valley, there are many convenient locations for permanent access at road and railway crossings.

Maintenance facilities will be provided for the Public Transport Commission at convenient locations such as at Sandy Hollow and Ulan. Along the formation, level areas and track machine take-off facilities will be provided as required by the Public Transport Commission

If additional access and maintenance facilities are required these will be negotiated by private arrangement by the Public Transport Commission.

5.8 Track Design Standards

The railway will be constructed generally to Class 1-XC Standard which bascially comprises 60 kg continuous welded rail on concrete sleepers. A ruling grade of 1 in 80 will apply for the Ulan to Newcastle route.

For the most part, the embankment will be narrower than the new standard 8.5 m width other than where new works are undertaken. Excavation and borrow pit material will be used to widen the formation. This construction is satisfactory to the Public Transport Commission (Ref: D5) because the line will be essentially maintenance-free with concrete sleepers and there are no safety or performance factors which dictate the need for additional works involving extensive excavation.

The formation will be capped with approved material consolidated to acceptable design depths. 300 mm ballast will be supplied under sleepers provided with resilient fasteners.

5.9 Description of Trains

At present the Public Transport Commission use up to 36 waggon trains for the transport of coal on existing railway systems as typically shown on Figure 3.

Having due regard for various operational factors on the Ulan to Newcastle route, the Public Transport Commission envisage initially similar sized train units (Ref: D5). However, ultimately train units comprising 42 CHS type 76 nett tonne waggons hauled by three 3000 horsepower diesel locomotives are envisaged.

A daily average of 4 train units each way hauling approximately 3200 tonnes would be required to transport the projected 4 million tonnes of coal per annum.

5.10 Electrification

Although railway electrification is not proposed in the near future, it may become more attractive in the long-term than retention of diesel power. This will occur because of a number of reasons including:

- expected continued spiralling costs of oil relative to electrical power;
- accelerated development of Hunter Valley coal resources with possible establishment of additional coal-fired power stations;
- probable electrification of the present Newcastle-Muswellbrook-Werris Creek northern line; and
- generally improved train performance with electrification particularly for critical sections thus facilitating shorter round trip times and additional track capacity.

The decision to electrify remains the perogative of the Public Transport Commission which is presently unable to forecast whether this might occur. However, it is noted that the route could be electrified without any major modification.

5.11 Train Control Measures

The traffic control measures have not been finalised; however, the Public Transport Commission have included in cost estimates a sum of $1.5 million which will adequately provide a reliable system of train control. A telephone service will facilitate train control similar to other sections of the Public Transport Commission network.

It was noted earlier in Section 4.4 that the railway's potential capacity is well in excess of the proposed quantity of coal to be transported. An average speed of 40 Kmh is envisaged over the Ulan to Newcastle route with existing Public Transport Commission train control measures applying along the Sandy Hollow to Newcastle railway section.

5.12 Funding Arrangements

Subject to other Government approvals, a commitment between the Company and the Government has tentatively been entered into requiring a guarantee of works completion by 1983.

Because Ulan Coal Mines Limited will finance construction and because these monies will be recompensed by means of a future freight concession by the Public Transport Commission, both the Government and Ulan Coal Mines Limited will have an incentive to complete the works in the shortest practicable time to avoid unnecessary escalation in construction costs caused by delays.

6.0 CHARACTERISTICS AND PRESENT STATE OF THE STUDY AREA

6.1 Location of Study Area

The study area lies between approximately 170 and 220 kilometres north north west of Sydney and entirely within the western part of the Hunter River Valley catchment. It extends from Ulan in the west to Sandy Hollow in the east over a rail distance of 105 kilometres. Figure 1 shows the location of the proposed rail link in relation to the major cities and towns of eastern New South Wales, to the existing rail and road network and to coal mines and coal loaders.

6.2 Landform and Aesthetic Quality

The study area's landform varies considerably as shown on Figure 9 and described in detail in Appendix E. The land systems vary between alluvial and colluvial deposits, lowland flats, gently undulating hills to rugged and steep slopes.

The valley formation varies in width along most of the railway's route which is flanked by natural undisturbed hills on both the northern and southern sides. These gentle to rugged formations provide a marked contrast to the lowlands which have been developed for agriculture. At a distance, the formations promote an aura of pleasantness as shown on Figures 10 and 11 while at closer proximity they can be imposing and spectacular formations of high visual quality as shown typically on Figures 12, 13 and 21.

The existing land use, which is predominantly rural in nature, is in harmony with its natural surrounds. This promotes a feeling of peace and tranquility.

6.3 Geology

The study area is located close to the north west limit of the Sydney Basin. In general, the railway route passes eastward from Ulan along valley floors primarily comprising Singleton Coal Measures. After passing through tunnels in these and under the Narrabeen Group Sandstones, the railway follows the generally alluvial deposits within the Goulburn River from Kerrabee to Sandy Hollow.

Appendix C provides a more detailed description of the study area's geology.

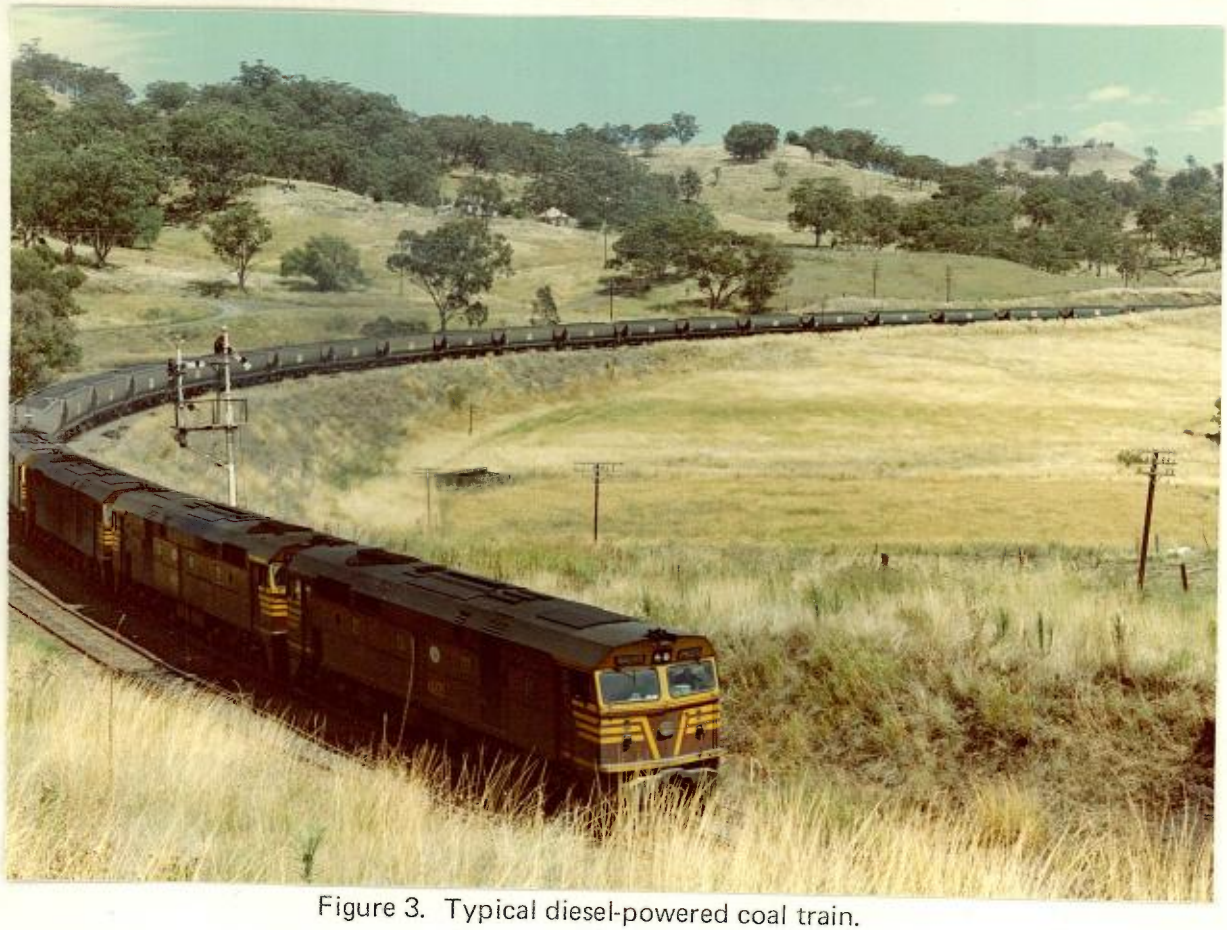

Figure 3. Typical diesel-powered coal train.

Figure 4. View along substantially complete railway formation.

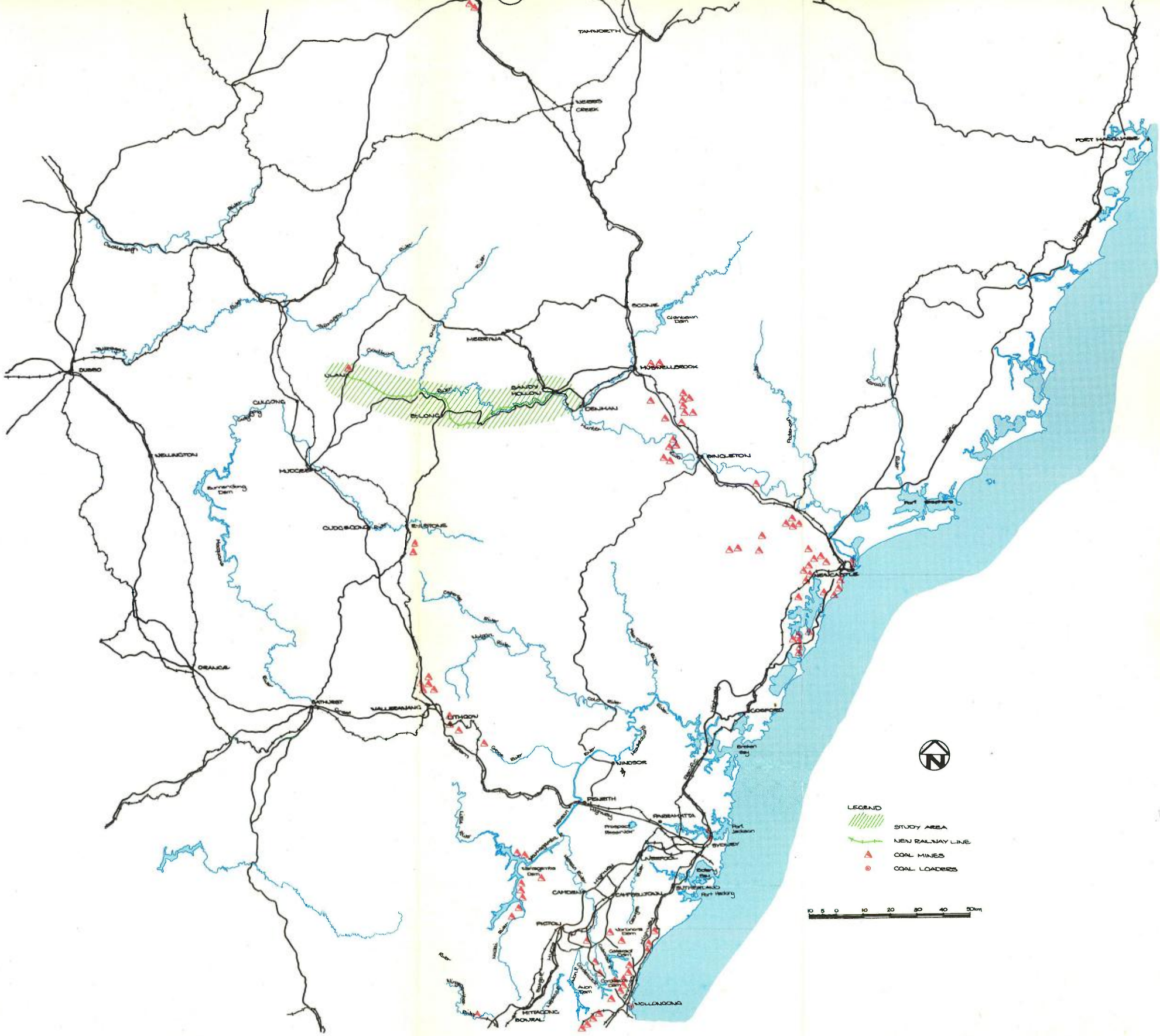

FIGURE 1 LOCATION MAP

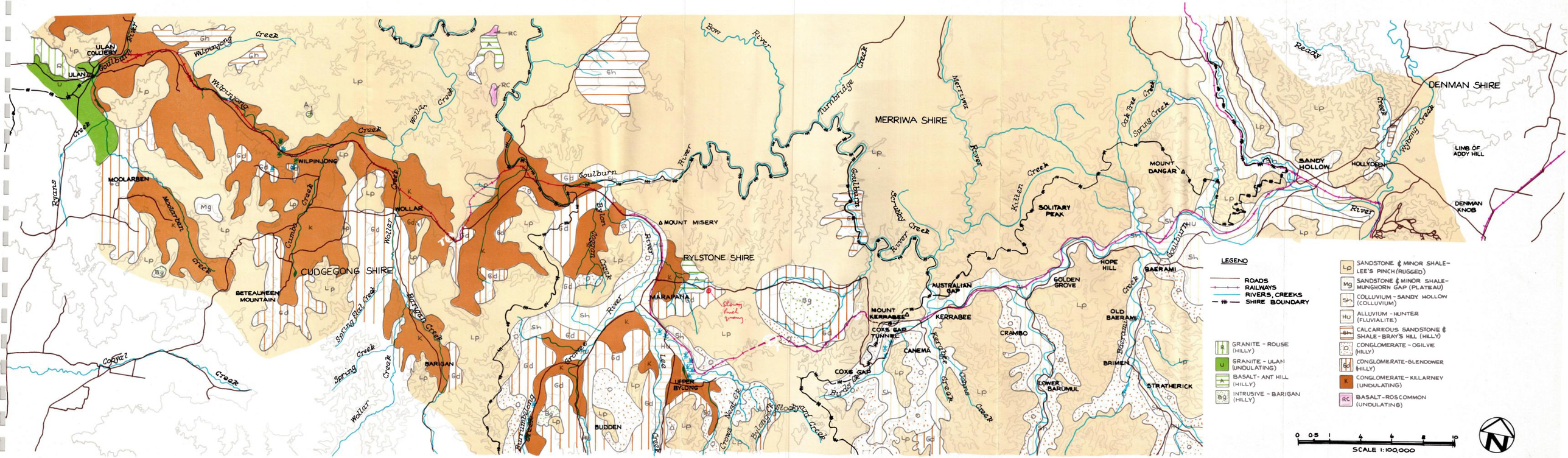

FIGURE 9 LAND SYSTEMS IN STUDY AREA

Figure 10. View to south-west from Sandy Hollow station.

Figure 11. Typical countryside near 'Wollara'.

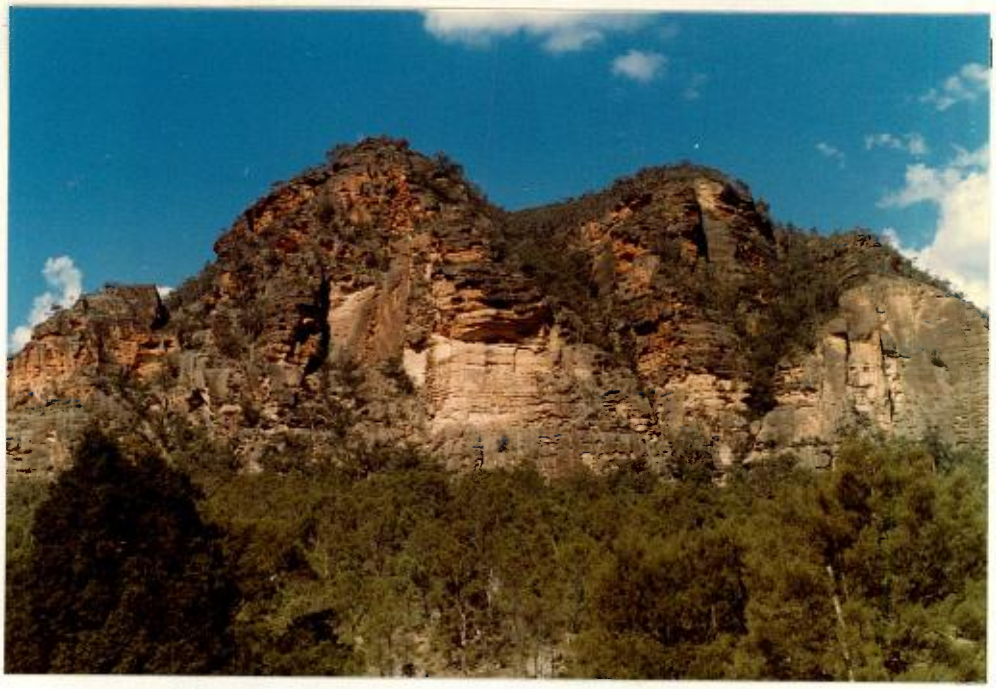

Figure 12. View of typical imposing bluff formation.

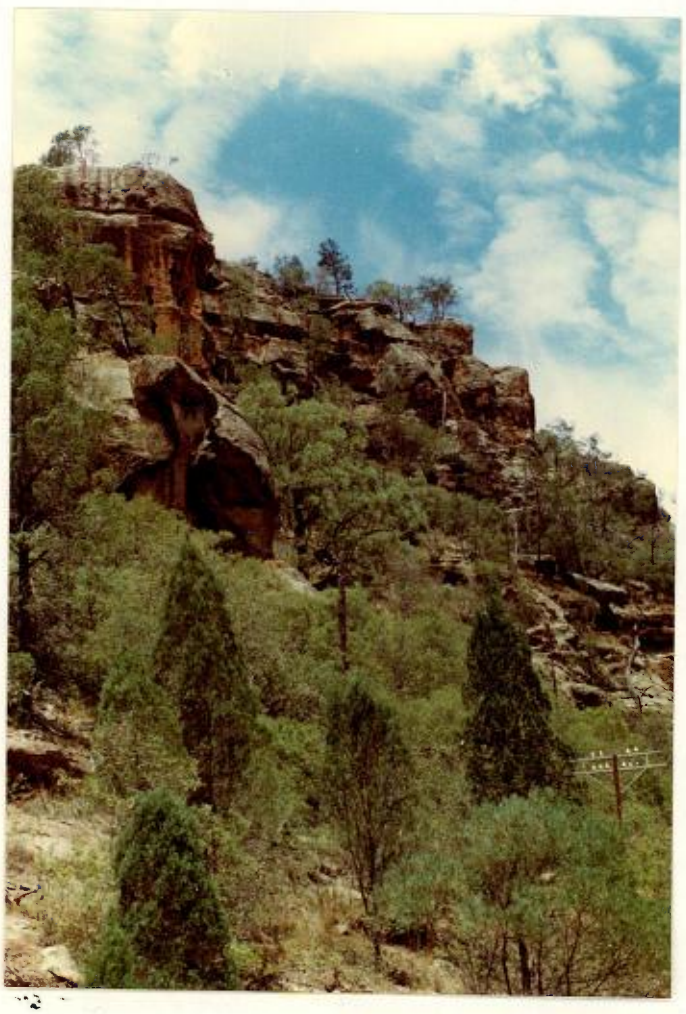

Figure 13.
View near Widden
Cutting.

Figure 14. Historic church at Wollar.

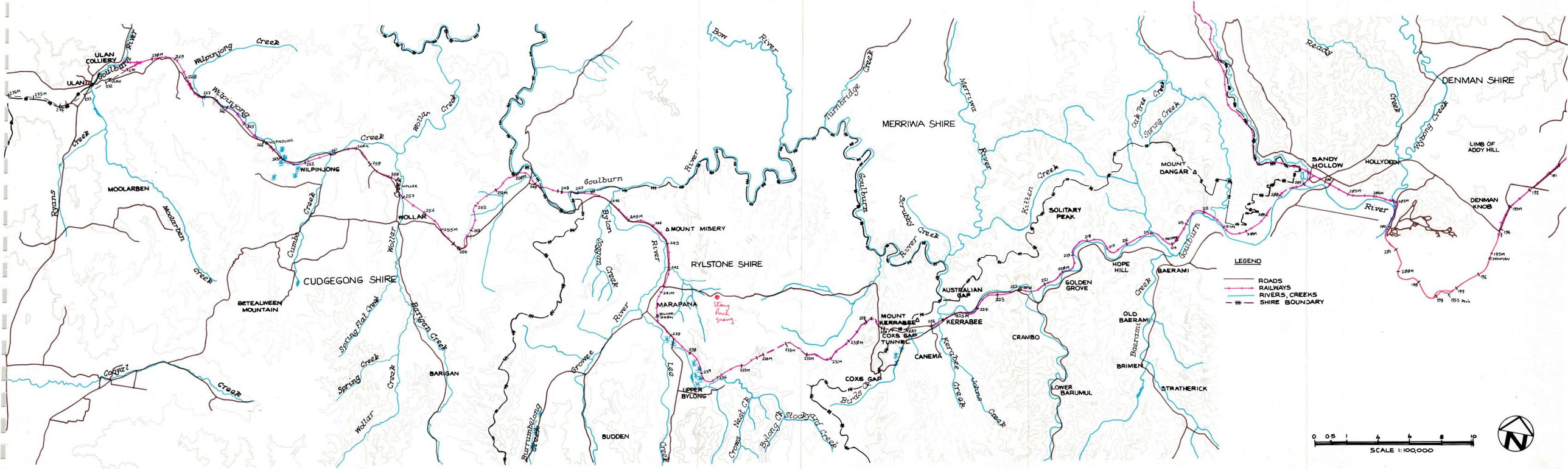

FIGURE 2 THE STUDY AREA

JANUARY

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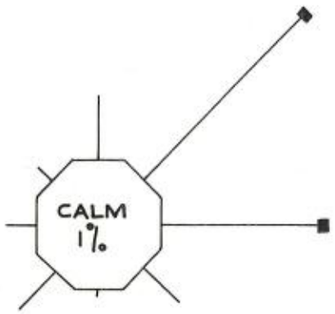

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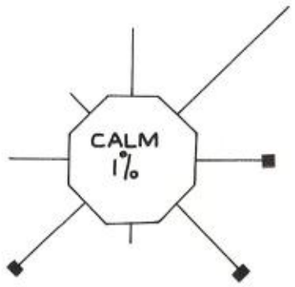

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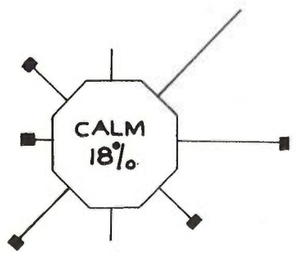

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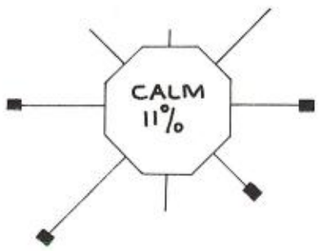

JULY

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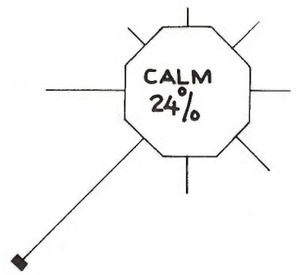

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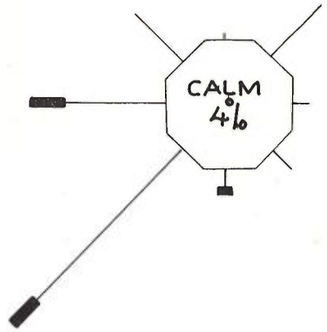

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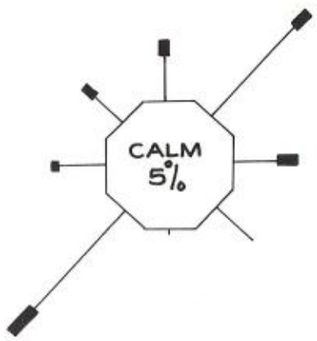

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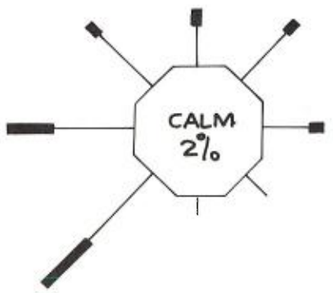

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PERCENTAGE OCCURRENCE OF WINDS IN 8 DIRECTION CLASSES

KEY

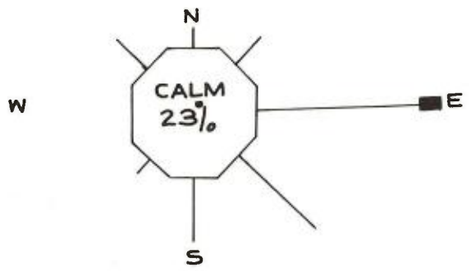
WINDS UP TO 10 KNOTS

WINDS OVER 10 KNOTS (STRONG WINDS)

FIGURE 15
REPRESENTATIVE WIND ROSES FOR GULGONG

JANUARY

9·00 am



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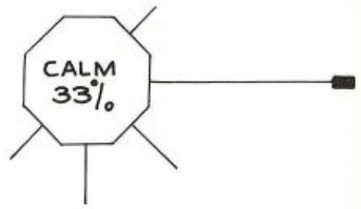

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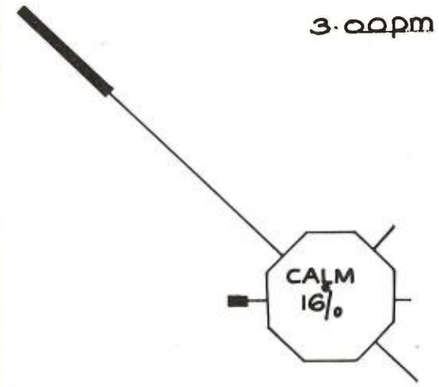

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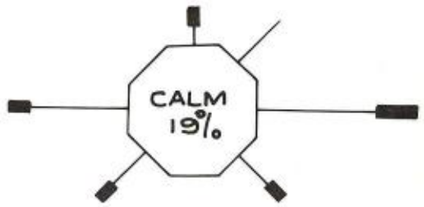

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PERCENTAGE OCCURRENCE OF WINDS IN 8 DIRECTION CLASSES

KEY

WINDS UP TO 10 KNOTS

WINDS OVER 10 KNOTS (STRONG WINDS)

FIGURE 16
REPRESENTATIVE WIND ROSES FOR SANDY HOLLOW

6.4 Climate

Weather conditions in the study area are determined by the pressure patterns and resultant movement of air masses which generally occur over eastern Australia. The strong relief in the area means that topography and aspect also influence these general climatic patterns.

The study area experiences a wide range of climatic conditions. The annual average rainfall varies little within the area with intense storms occurring in western regions which also tend to be drier because of a characteristic rapid runoff. Temperatures vary considerably from extremely high in summer to cool in winter. A more detailed discussion of these matters is given in Appendix D.

Winds also vary considerably within the study area as shown on Figures 15 and 16 which depict representative wind roses for Gulgong and Sandy Hollow. Generally it appears that at Gulgong the winds tend to be less calm than at Sandy Hollow, but the directional wind spread is more even with a preference for easterlies in summer and south westerlies in winter. At Sandy Hollow, by contrast, the strongest and most dominant winds are the north westerlies in winter with easterlies and south westerlies predominating in summer and autumn respectively. This is a local phenomenon caused by the landform of the area.

6.5 Air Quality

Air quality is characteristically excellent throughout the study area largely because of topographical features which align the Goulburn River Valley in a generally easterly direction. The undeveloped natural areas bordering the northern and southern sides of this valley, coupled with a general restriction of agricultural development within the valley and towards the extremes of the Mudgee and Sandy Hollow areas, maintain this excellent air quality.

This condition would be disturbed only temporarily during periods of high wind activity when dust would be entrained and by vehicles utilising unsealed roads in the study area. Observations suggest that this disturbance is of minor local consequence having negligible effects on overall air quality.

6.6 Water Quality

Water quality within the study area would be expected to relate primarily to natural system influences. Runoff from tilled agricultural areas and the unsealed roads in the region would contribute to turbidity levels particularly during the more intense storms. At lower flows agricultural runoff affects nutrient levels through the introduction of fertiliser and animal residues.

Figure 17. Dry creek bed at Stony Pinch, upper catchment area.

Figure 18. View of typical low flows along alluvial deposits.

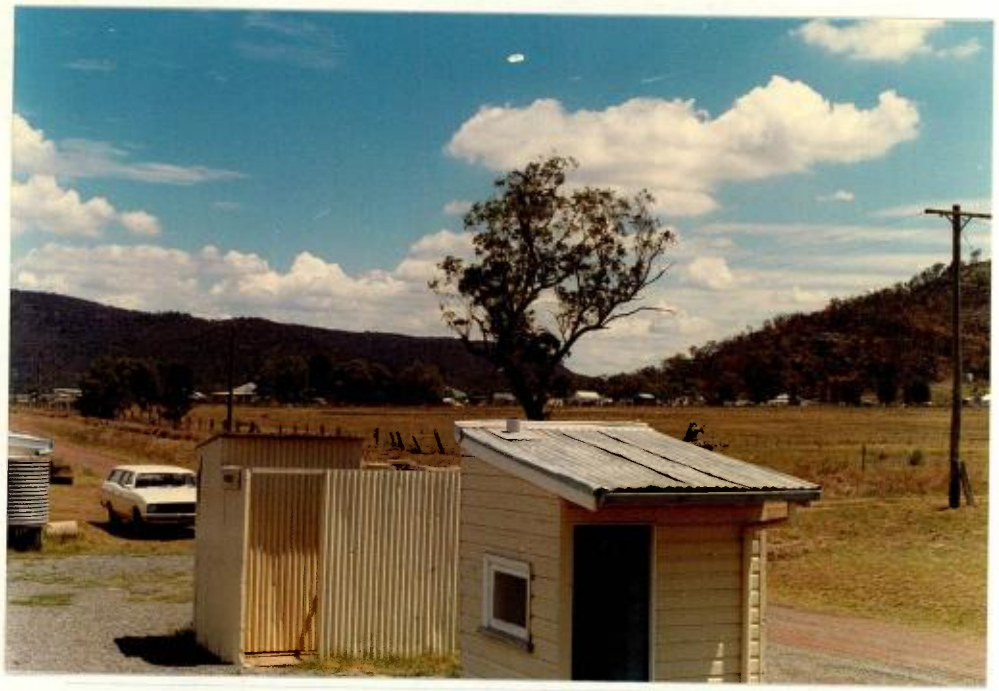


Figure 19. View of Sandy Hollow township from Sandy Hollow railway station.

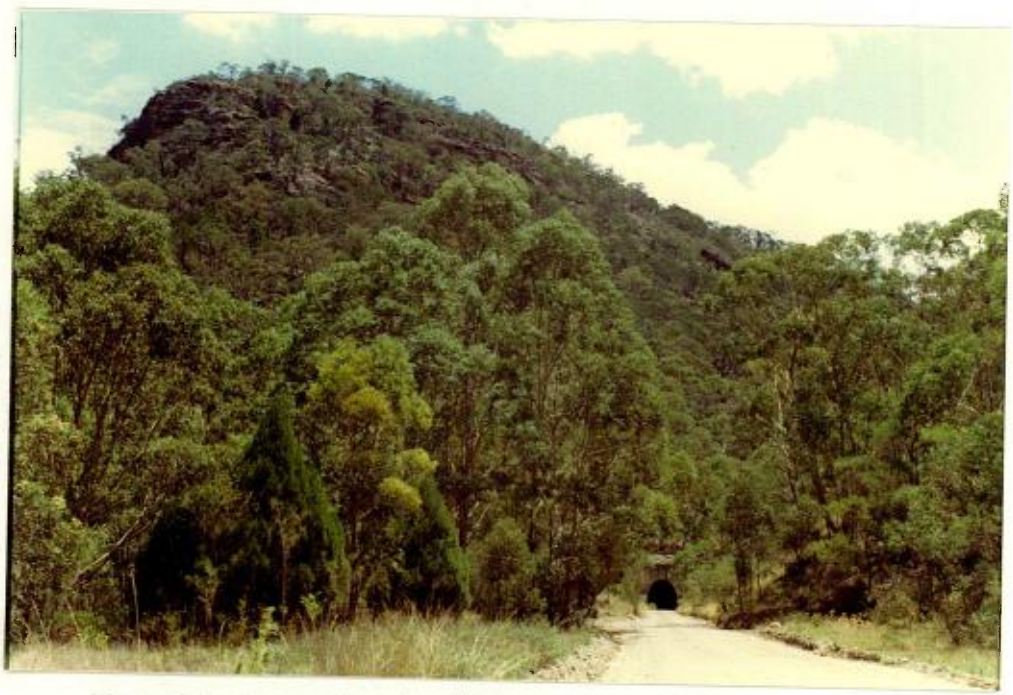


Figure 21. Approach to Cox Gap tunnel on existing rail formation indicating surrounding dense vegetation and rugged topography.

The quantity of river or tributary flow would relate closely to water quality. Turbid conditions would be characteristic of higher flows while higher salinities and nutrient values would be characteristic of lower flows.

A Water Resources Commission Report (Ref:20) observes that flows in this region exhibit a high degree of variability, citing the flows at Coggan on the Goulburn River as a marked example which exhibits a variation in annual flows from about 1000% to 3% of the long term average annual flow. It also observes that generally the waters of the Goulburn River have higher salinities than other main Hunter River tributaries during low flow periods.

Agricultural activities depend on availability of water. Generally poorer rural properties exist higher in the catchment to the west where runoff tends to be more rapid because rainstorms tend to be of a more intense nature and because infiltration is limited by generally thin soil cover. However along the Goulburn and Bylong River valleys, particularly downstream of the Bylong area, agricultural activities improve because of longer duration river flows supplemented extensively by water obtained from wells located along alluvial deposits. Observations made during field inspections confirmed this system behaviour.

6.7 Noise

With only small centres of population, no secondary industry and little road traffic, present background noise levels in the study area are very low, the only expection being in the immediate vicinity of the present Ulan colliery and truck-loading yard. Coal trucks carry coal from the Ulan mine westwards to Gulgong and pass through Ulan township during both day and night. They do not use the roads east of Ulan. Roads in other parts of the study area are used by heavy vehicles mainly for the transportation of farm products, livestock and equipment.

Typical daytime background sound levels at points such as Stony Pinch near the proposed quarry and just north of Bylong are about 34 dBA. These typical background levels do not include sound from wind or traffic. In Bylong Village, levels are approximatley 38 dBA but are often around 50-55 dBA with vehicle and garage noise. Although not measured, noise from fodder cropping and other regular agricultural ativities would increase these ambient levels. Night-time background levels were generally found to be slightly lower.

At Ulan significant noise occurs close to the colliery workings but at a distance of 1 kilometre these levels are greatly reduced and beyond 2 kilometres the sound can barely be heard. Whilst noise levels on the road adjacent to the mine are 66 dBA, as they typically are, those at a distance of just under 1

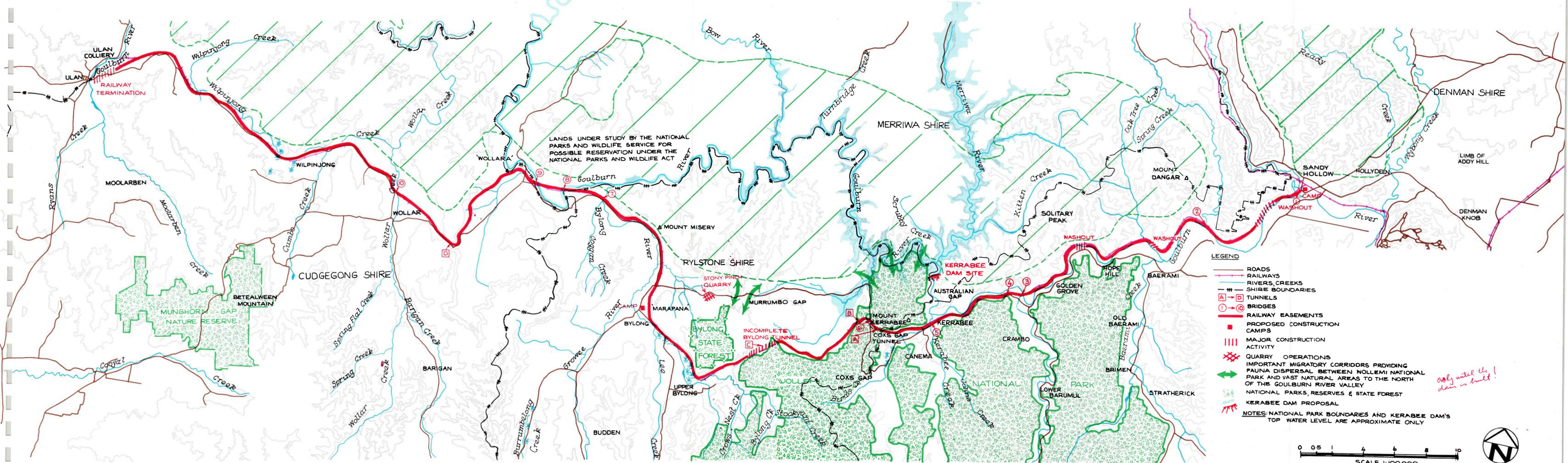


FIGURE 20
CONSTRUCTION ACTIVITIES AND AREAS OF ECOLOGICAL SIGNIFICANCE

kilometre south across open country on the Wollar road (where the intended rail loop will be constructed) are about 36 dBA.

In the centre of Ulan township, typical daytime levels of background noise are about 38 dBA (without traffic noise). In all cases, night-time sound levels are slightly less than these figures.

6.8 Vegetation

Extensive clearing of land for agricultural and grazing purposes has occurred in the valleys and lowlands within the study area. This land use has drastically altered the original structural formation exemplified by scattered isolated areas.

Utilising Specht's classification (Ref. 21) these areas now consist of very sparse Open Woodland and associated Closed Herbland. R. Story in the C.S.I.R.O. land report (Ref. 22) indicates that subdivision into vegetational regions is not practicable.

Tree species mainly comprise the box E. moluccana, the gum E. tereticornis and broad-leafed ironbarks in the east, with a gradual transition westerly to the boxes E. albens and E. melliodora, the gum E. blakelyi and narrow-leafed ironbarks. The Closed Herbland mainly comprises the grasses Paspalum, Dichanthium, and Themeda spp. which provide good grazing except for Aristida spp. which stock largely avoid. Trifolium and Medicago spp. provide the best fodder producers among the non-grasses.

The above vegetation formations are located on the following land systems: Glendower, Hunter, Killarney, Ogilvie, Rouse, Sandy Hollow and Ulan. Appendix E describes in greater detail these and other land systems and associated vegetation within the Study area.

In the more rugged upland areas surrounding the valley lowlands, relatively little clearing has occurred. These steeper hillslopes and ridge-tops support a Closed-Forest comprising ironbarks E. crebra, E. panda, E. sideroxylon and E. fibrosa mostly intermingled with other eucalypts such as the gums E. punctata with communities of E. mannifera and E. rossi, stringybarks E. laevopinea, E. oblonga and E. agglomerata in moister regions, and a few bloodwoods E. eximia in the east and E. trachyphloia further inland. The absence of boxes indicates sandy soils poor in plant nutrients.

The only common large non-eucalypt tree is the apple Angophora floribunda but many smaller trees and shrubs such as Acacia, Bursaria, Dodonaea, Myoporum, Callitris, Boronia exist in

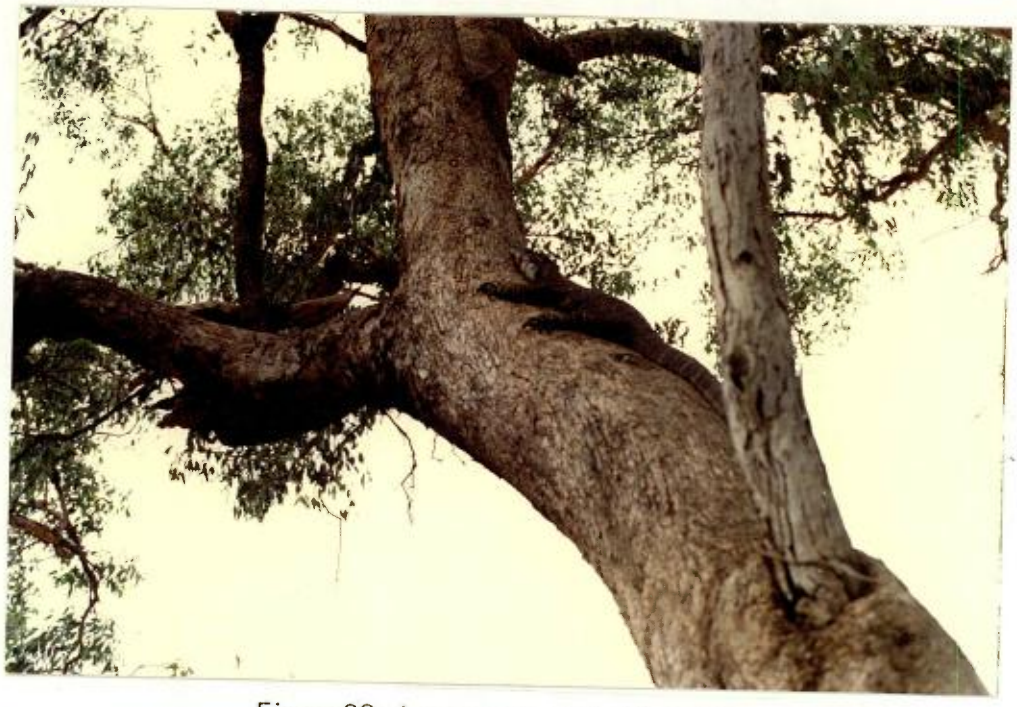


Figure 22. Large goanna climbing tree.

Figure 23. Cattle grazing on existing railway formation.

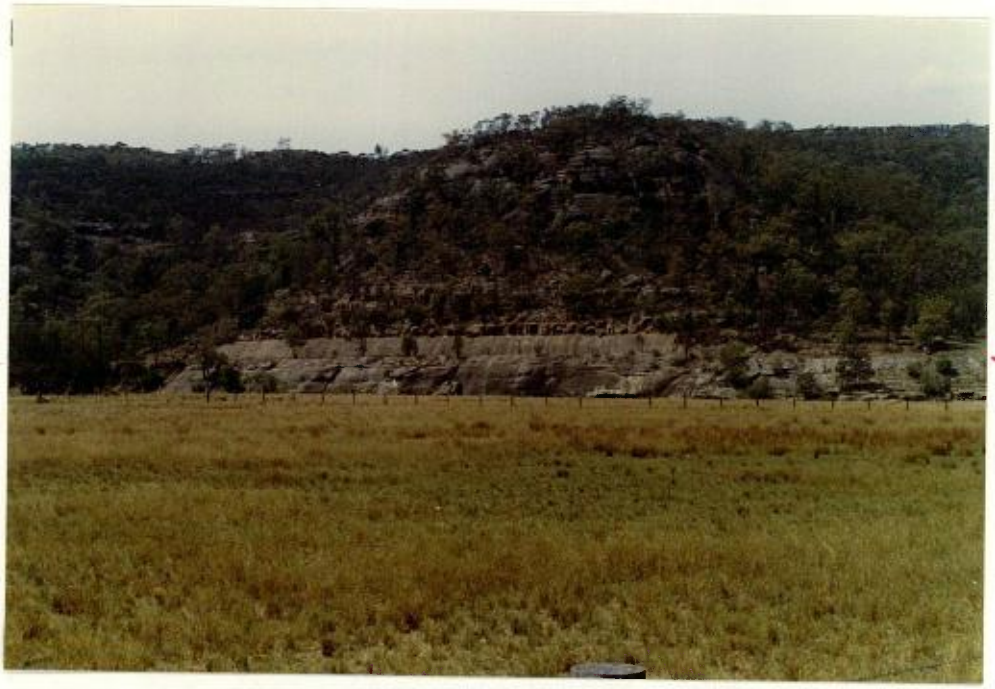


Figure 24. View of railway cutting adjacent to Goulburn River near Diamond Point.

profusion and great variety. The ground vegetation is sparse and scattered with grasses such as Aristida and Eragrostis spp. and Themeda australis being the most frequent and other herbs such as Patersonia and Primelea.

The above natural areas are largely not adequately protected with accessible parts being grazed and other areas occasionally subject to violent bushfires such as recently occurred within the Manobalai Nature Reserve where extensive vegetation damage resulted.

The later vegetation formations are located on land systems principally designated as Lee's Pinch which tends to be rugged topography. It is this formation which also affords natural isolation from surrounding lands as evidenced in the Cox's Gap area, a region of considerable ecological importance.

6.9 Ecology

The railway easement comprises a substantially completed formation which passes through mostly cleared agricultural lands including those used for grazing purposes, horse studs and fodder crops. These areas typically represented by Figures 4 and 11, are a marked departure from their former natural state.

The easement also generally follows the Goulburn River skirting around the base of surrounding hills which for the most part are undeveloped as shown typically on Figures 13 and 24. These natural areas are viewed as having important ecological value. The National Parks and Wildlife Service has recently gazetted the Wollemi National Park (Ref: 8) which borders the southern side of the east-west valley at a number of locations as indicated on Figure 20. This figure also approximately indicates those natural areas which are being studied by the National Parks and Wildlife Service for possible reservation under their Act.

The railway passes through tunnels under two areas of ecological significance which provide the last remaining natural corridors for dispersal between the large natural areas to the north and those generally south of the railway line. These areas are:

- The corridor of timbered country generally to the east of the Bylong State Forest in the vicinity of Murrumbo Gap which is north of the incomplete Bylong Tunnel; and,

- The corridor to the east in the vicinity of Cox's Gap under which two completed railway tunnels already exist.

6.10 Archaeology

Because the railway formation is substantially complete any sites of archaeological significance within the easement would have been disturbed during prior construction activity. Investigations along the route indicated no evidence of such sites.

However aboriginal archaeological sites are known to exist in areas in close proximity to the railway - notably at Sandy Hollow, Narrow Arm, Wilpinjong Creek and Wollar (Ref: 14).

The area of the existing basalt quarry at Stony Pinch, which is planned for re-opening, was investigated and no evidence of aboriginal relics was found. However, at a distance of over 1 kilometre south of the road along the valley of Dry Creek, waterholes and evidence of aboriginal stone chippings were found suggesting an area of occupation. This is some distance beyond the proposed limits of the quarry.

6.11 Land Use and Constraints

Most of the railway route easement passes through cleared agricultural land with remaining sections located generally at the base of higher areas with natural bushland cover.

Rural land use comprises four main agricultural activities - notably viticulture, cattle grazing, fodder and some cereal production and livestock stud farming. Viticultural activities have been established recently in the Sandy Hollow region and appear to be successful enterprises.

Cattle grazing is undertaken along the route particularly near alluvial flats where water is available. Some sheep grazing is also carried out in foothill areas. Advice from specialists in the Department of Agriculture (Ref: D1) indicates there is potential for pasture improvement. Along some sections of the railway formation fences have been removed to allow cattle to graze on vegetation on the formation.

Cattle and horse studs, some having a history of renowned racehorse stock, are well established principally in the Bylong district. However, some farms in this area have been poorly maintained with resultant encroachment by nuisance weeds.

Crops grown in the study area are mainly lucerne, but include some barley and oats. Advice from specialists in the Department of Agriculture (Ref: D1) suggest that there is a potential for alternative mulching agents such as lupin.

In the more western regions of the area agricultural activities are marginal because of the generally poor soil cover with a low phosphorous content. Advice from specialists in the Soil Conservation Service (Ref: D6) confirms this observation with the comment that sheet soil erosion occurs to a minor degree because of overclearing. In adjacent well timbered areas there are no erosion problems although grazing among poor and scanty fodder plants leads to isolated denudation (Ref. 22).

As commented elsewhere, access to the railway formation for construction purposes has been arranged with private landholders where this is necessary.

A rare constraint on railway operation could be the reported inundation by floodwaters of the railway formation as reported in the Hunter Valley Research Foundation Report (Ref: 10). Areas affected might include sections of railway between Sandy Hollow and Kerrabee and near Coggan.

However advice from the Water Resources Commission (Ref: 20) suggests that such inundation would only occur during major floods of the 1955 flood magnitude. In such circumstances major flooding would occur elsewhere in the Hunter Valley causing major disruption of normal services because of the state of general emergency which would result.

10 year frequency

6.12 Regional Planning Context

Statutory permissible land use adjacent to the railway is 'non-urban', however, there are two possible major planning developments which are of regional significance.

The first possibility is the designation of areas bounding the northern side of the Goulburn River valley formation as being of ecological significance. These natural bushlands, which are currently of statutory interest to the National Parks and Wildlife Service, are likely to become dedicated as a national park. Discussions with the National Parks and Wildlife planning personnel (Ref: D3) indicated that precise boundaries for such a park are yet to be finalised.

As noted in Section 6.9, if this area of ecological significance is retained as natural bushland, the largely undisturbed area around Cox's Gap will maintain its importance as a natural corridor providing migratory dispersal of fauna with the Wollemi National Park which generally bounds the southern side of the valley.

The other major possible planning development is Kerrabee Dam, which is shown in position on Figure 20, and described in a Water Resources Commission document (Ref: 20). Advice from Commission planners (Ref: D7) indicates that planning for the

dam is only in the preliminary stages. Detailed hydrological investigations are still required to determine potential yields and designate a final top water level in the dam. Figure 20 indicates the approximate extent of the most likely inundation for a dam with a top water level of approximately 230 m. An earlier proposal considered a much higher dam crest level but this is not currently considered a likely development (Ref: D7).

It is intended that the dam will provide assured water supplies downstream of Kerrabee improving the river's water quality particularly during periods of low natural flow, thus improving the long-term viability of agricultural practices. The dam will also provide a major regional water-based recreational facility.

Apart from these benefits, the dam will sever the forementioned migratory ecological corridors and submerge considerable upstream areas of agricultural land and will also submerge stretches of the existing road system, particularly part of the road from Cox's Gap to Sandy Hollow.

At this stage of planning, it appears from discussions between Water Resources Commission and Public Transport Commission officials that the railway will not be inundated.

Other potential major developments within this region are additional mining activities. As noted earlier in Sections 2.2 and 2.3 no other projects are expected to be developed in the medium and short term futures other than the currently unproven Wollar coal deposits which is beyond the scope of this Impact Statement.

why beyond?
see p. 10.

7.0 ENVIRONMENTAL SAFEGUARDS

7.1 Access

7.1.1 Construction

Access during construction is available at public road crossings and at locations where the public road is adjacent to or has utilised part of the railway formation. The railway formation and easement will be used for construction crews and equipment to gain access to progressive work sites. Access through or on private lands has been made by arrangement - the rights of landowners being respected at all times. Any accidental damage caused during construction will be remedied.

7.1.2 Railway operation

Where permanent access to the railway system through private lands is necessary, appropriate arrangements will be made.

7.2 Traffic

Apart from utilising the railway easement and traversing designated access routes across private lands, construction traffic will use public roads. All construction vehicles using public roads will have to comply with traffic regulations. Construction workers will not be allowed to partake in trail-biking during recreational periods.

7.3 Site Clearing

7.3.1 Construction

As indicated typically on Figures 4 and 23 vegetation has established itself on the existing formation which has not been maintained since at least 1951, and even a lot earlier, for considerable formation lengths. All vegetation within the easement will be stripped and removed for disposal by controlled burning. All vegetation outside the easement will be left undisturbed.

7.3.2 Railway operation

The easement will be maintained substantially free of vegetation by the Public Transport Commission using established control procedures utilised elsewhere in the State rail network.

7.4 Landscaping

No landscaping is intended either during or after construction because construction activity will be largely confined to the existing railway easement which is flanked by lands which will

not be disturbed. Where practicable excavation cuttings will be stabilised by spray seeding with native grass species.

7.5 Erosion Control

The restoration and completion of excess surface water and drainage structures and embankment upgrading works will improve erosion control. Although some minor erosion will occur for a short duration after clearing the existing formation of vegetation, the critical construction phase timing will ensure rapid completion of earthworks. Where practicable earth batters will be stabilised with natural grass mixtures.

7.6 Disposal of Surplus Material

All surplus material removed during excavation for general widening, regrading and completion of the Bylong tunnel will be placed as highly compacted thin layers of fill on the upgraded rail formation.

7.7 Water Quality

Water for construction purposes will be obtained mainly from existing and future boreholes as have been already been arranged with landholders. Approval from the Water Resources Commission will be obtained as a matter of routine. The riparian rights of landowners will be maintained with river flows not being materially affected.

7.8 Air Quality

7.8.1 Construction

Generally construction vehicles will be restricted to utilising the railway formation. Potential localised dust nuisance generated by vehicular movement on unsealed roads will be suppressed by regular watering from water carts.

7.8.2 Railway Operation

Coal from Ulan will be loaded at a minimum 8 % moisture level as currently practised on other rail routes.

In the interests of fuel conservation and environmental protection, the Public Transport Commission regularly services their diesel locomotives thus minimising the potential for polluted diesel exhausts.

7.9 Noise

During building of the railway various construction and associated activities will create increased noise levels in the

immediate vicinity of the line but only on a temporary basis. In addition to restoring and levelling the formation and laying the track, this will include the building of bridges and completion of the Bylong tunnel which is not foreseen to involve blasting. In addition, road traffic (particularly heavy vehicles) associated with the construction will cause increased noise levels in the area along the main road and railway access roads. Work on the rail link will be carried out on the basis of one shift per day and a six-day week. The exception to this will be the tunnelling programme which will involve 2 shifts per day, in order to streamline the operation and shorten the period required for construction.

Construction camps will be established for varying durations of time at the locations shown in Figure 20. These locations have been selected in order to minimize the impact on residential areas and ecologically sensitive zones. The use of trailbikes and firearms by construction personnel will be prohibited.

Following completion of the line only the coal trains themselves will cause increased noise levels in the study area. The trackwork will be constructed using concrete sleepers and continuous welded rails for the full length of the new route which should reduce noise in comparison to conventional tracks.

7.10 Bushfire Prevention

7.10.1 Construction

All cleared vegetation will be control burnt in accordance with Bush Fire Control Regulations.

At job locations and at construction camps power,cooking and heating requirements will be met by portable gas, diesel or connection to the local electricity distribution network. No open fires will be allowed.

7.10.2 Railway operation

Diesel-powered locomotives, which are proposed by the Public Transport Commission, are fitted with efficient spark arrestors. The railway easement will also be maintained substantially clear of vegetation. These measures, which are the normal practices throughout N.S.W., should reduce the risk of bush fires arising from railways operations. except for 421's in the Yass area!

7.11 Ecological Protection

All construction will be confined to the railway easement except in areas of major construction activity as shown on Figure 20 which also shows areas of ecological significance.

Within the more important ecological zones little construction activity will occur because areas such as Cox's Gap and Murrumbo Gap will be traversed mainly in existing tunnels.

The proposed re-opening of the existing quarry at Stony Pinch which is contained in a locally enclosed geological formation will also exert minimal influence on surrounding areas.

It is essential that care be taken to prevent the introduction of exotic (non-native) species of either plants or animals to these natural regions or destruction of the natural habitat. To this end it will be standard practice to clean equipment prior to bringing it into the area, and use concrete instead of standard timber sleepers. In addition, it is intended to control worker's recreational activities by disallowal of:

- Firearms or animal traps;
- Cats or dogs at camp sites or construction locations; and
- Trail-biking.

7.12 Archaeological Protection

As previously discussed in Section 6.10 a number of aboriginal archaeological sites are known to exist in close proximity to the railway. A further condition of contract and employment will be the stipulation that workers shall not visit such sites because of the possible risk of damage to relics.

If any aboriginal relics are discovered during the course of construction, the National Parks and Wildlife Service will be notified.

8.0 ASSESSMENT OF ENVIRONMENTAL IMPACT AND INTERACTION OF PROPOSED RAILWAY WITH THE ENVIRONMENT

8.1 Landform and Aesthetics

With the exception of a few major construction activities, most construction works are concerned with restoration, upgrading and the laying of track. These activities will be largely confined to the substantially completed formation within the railway easement as typically shown by Figure 4.

Consequently the landform will basically remain unaltered except that sections of the railway formation which have become overgrown will once again become visible.

The operation of the railway, which will involve an average traffic of 4 coal trains in each direction daily, will temporarily disturb the pleasant rural and undeveloped nature of the sparsely populated region.

8.2 Vegetation

All vegetation within the railway will be stripped and disposed of by controlled burning. All vegetation outside the easement will be left undisturbed during construction, except for borrow pits which have been arranged with land owners. These will be left as dams upon completion of works.

The completed formation will be maintained by the Public Transport Commission substantially free of vegetation by utilising established control procedures utilised elsewhere in the State.

8.3 Erosion

Advice from Soil Conservation Service Representatives (Ref: D6) indicates that there are no known erosion problems on the existing formation except at the washout by the Goulburn River south west of Sandy Hollow and where other minor bank erosion occurs.

Minor erosion will occur during construction but would be of short duration and would be overshadowed by other study area erosion. After vegetation stripping, the construction operations will quickly restore and upgrade the formation surface with compacted fill and ballast emplacement. In addition, concurrent restoration and completion of side drains and other surface drainage works will be undertaken where practicable, with earth batters being stabilised with natural grass mixtures where practicable.

The restoration and completion of the surface water control and drainage structures, and upgrading of the formation, will ensure that soil erosion potential will be minimal. These measures will improve the present status of the incomplete formation.

8.4 Water Quality and Supply

Construction activities will involve the use of water for soil compaction and other construction purposes. Water for these purposes will be obtained from existing boreholes and several proposed new boreholes with Water Resources Commission's and landholder's approval. These practices will not have any observable effect on riparian rights of other water users.

Water quality within the valley will not be affected to any degree by construction activity. Minor increases in turbidity in localised situations could be expected during short storm periods whilst the formation is being upgraded.

The restoration and completion of the railway formation will actually result in improved localised water quality through better erosion control.

As demonstrated in adjacent Hunter Valley rural situations involving coal transport by train, there is no reason to expect any change in water quality from railway operations.

8.5 Air Quality

As with all present traffic, construction vehicular movements on unsealed roads will cause temporary minor local dust nuisance. This potential impact will be mitigated by the use of water carts where nuisance might result to a landowner. More importantly construction traffic will be restricted to using the easement wherever practicable.

Tunnel excavations are not anticipated to require any blasting. Blasting operations are planned for the re-opened Stony Pinch quarry which is contained in a minor ridge-locked valley. These operations will have minimal impact on air quality.

These operations will not generate as much entrained dust as presently originates from tilled, over-cleared or over-grazed agricultural properties in the region when strong winds occur.

Strong winds could also entrain smaller particles of coal from coal waggons, but providing the proposed moisture levels are maintained during loading operations at Ulan this will not be a problem, as demonstrated on other coal-rail transport systems within this State. The Public Transport Commission do not propose to cover the coal waggons which have high sides and a

restricted exposed surface area relative to the volume of coal carried. Additionally, care will be exercised by the Commission in preventing overloading because otherwise potential freight charges could be lost.

Consequently, neither construction nor railway operation are expected to cause adverse effects to the valley's normally excellent air quality status.

8.6 Noise

Fortunately the proposed railway route does not pass through any centres of population and at both Sandy Hollow and Ulan the line comes no closer than 0.5 kilometre from town centres. The villages of Bylong and Wollar are both located about 1 kilometre from the line itself thereby ensuring that noise impacts on these settlements from both construction activities and coal-train operation will be minimal.

Construction of the entire rail link will take a maximum of 2 years but activity will be focussed at specific locations for much shorter periods sometimes of intermittent duration. Figure 8 indicates the projected sequence of construction. Construction will be carried out during daytime only with the exception of the tunnelling operation as discussed in Section 7.9.

Noise from increased construction traffic will also be essentially a daytime phenomenon and will not be a major factor as it is planned to lay the track westwards from Sandy Hollow and transport sleepers and rail along the completed section as it is laid. In addition, vehicular traffic will use the railway easement rather than public roads wherever practicable.

Some construction work noise will undoubtedly affect native fauna in areas of natural bushland but these effects should not be lasting. It is obvserved that areas of sensitive ecological importance are largely traversed in tunnels. The Company will make every effort during construction to minimise any potential noise nuisance.

Some rock blasting will be necessary particularly at quarry operations. The nearest habitation to Stony Pinch quarry is at approximately 3 km distance,, and at Muswellbrook several kilometres distance. These operations will be restricted to daylight construction hours.

The incomplete Bylong tunnel, in which no blasting will occur, is approximately 1.6 km from the nearest habitation. The topography adjacent to both adits will provide general relief from noise originating at tunnel operations.

TABLE 8a

-RESIDENCES IN PROXIMITY TO RAILWAY
BETWEEN ULAN AND SANDY HOLLOW

Distance from Track	Named	Unnamed	Total
to 50 m	Hillside, Old Kerrabee	2	4
between 50 m and 100 m	Coggan Creek, Marydee, Worondi Park	2	5
between 100 m and 250 m	Springvale, Wollana, Baringa, Sylvania Lodge, Marapana, Tinka Tong, Thornvale, Belmont, Dunroven	4	13
between 250 m and 500 m	Myown, Yawarina, Tralee, Heatherbrae Lynwood, Bylong Station, Sunnyside, Golden Grove, River View, Araluen.	11	21
between 500 m and 1000 m	Debtrees, Hillview, Small Heath, Monaville, Tawarri, Yarrawonga, Tarwin Park, Helvetia, Mountain View, Belmont, Mount Dangar.	17	28

TABLE 8b

RESIDENCES IN PROXIMITY TO RAILWAY
BETWEEN SANDY HOLLOW AND MUSWELLBROOK

Distance from Track	Named	Unnamed	Total
to 50 m	The Glen, Craigend, Redcliffe	3	6
bewteen 50 m and 100 m	Thornbro	10	11
between 100 m and 250 m	Primrose, Waroon, Glen Ayr, Aluinn Rosemount, Trig Hill, Lindisfarne, Runnymede, Lazy Acres, Lumeah, Glen-dor, Wontana, Bengalla, Overton, Karoda, Oak Farm.	17	33
between 250 m and 500 m	Helden Farm, Maraluinn, Park Lane Leonora Lodge, The Double J Ranch, Coldon Stud	16	22
between 500 m and 1000 m	Richmond Grove, Dalama, Pickering Bell, Pickering Farm, Bells Line, Lochana, Crinda Vale, Carrington Park, Alkoomie,Leahurst, Blowering, Killara, Overdene, Lincoln Park, Texas.	18	33

NOTE: The above estimates do not include residences within Muswellbrook town area and Denman east of the railways. Parish and other available maps do not adequately define residences in these areas. Best estimates for residences not included in the above table are:-

Denman	-	within 100 m	30
		100 m - 500 m	70
Muswellbrook (to junction with main Northern Line)	-	within 100 m	-
		100 m - 500 m	90

TABLE 8c (after Ref: 13)

NOISE LEVELS IN PROXIMITY
TO COAL TRAIN OPERATION

Distance from Track	NOISE LEVELS (dBA)	
	Peaks	Equivalent Continuous Sound Level
25 m	85	76-78 for 60 secs.
50 m	79	70-72 for 70 secs.
100 m	73	64-66 for 90 secs.
250 m	67*	-
500 m	62*	-
1000 m	56*	-

* Estimated peak noise levels.

Construction camps will not cause major noise problems as they will be sited in areas where very little nuisance to others will be caused (see Figure 20). As an additional precaution firearms and trail-bikes will be prohibited.

Noise impacts will be experienced at a number of residences located in close proximity to the line. Table 8a provides a listing of residences within various distance ranges from the railway. Noise disturbance during construction cannot be averted, although every effort will be made by the Company to reduce its nuisance.

The coal trains which use the completed railway will cause noise and possibly minor vibration problems to those houses situated very close to the line. These houses, which are are not all permanently occupied, have been mostly constructed since the original formation was constructed. It is not proposed that any additional noise abatement measures be adopted. Some houses in the vicinity of the proposed Ulan coal mine have already been acquired by the company.

It is anticipated that on average 4 trains will operate each day (in each direction) with no restrictions being intended by the Public Transport Commission on the hours of operation. Table 8b provides estimated noise levels for various distances from the railway.

It is not anticipated that coal trains will cause any substantial noise problems to farm animals and the disturbance to horses, cattle and sheep should not affect their health or production. It is expected that fodder harvesting along the valley regularly affects normal background noise levels.

Some minor noise impacts would temporarily affect native animal activity in the areas of natural bushland near Murrumbo Gap and Cox's Gap but these effects would not be lasting. Also, fortunately in these regions, the railway line is largely contained in the tunnels thereby minimising the effects on these faunal corridors. However, it is likely that whistles will be blown as a safety measure as trains approach the tunnels along the route.

Although it is expected that the noise created by coal trains in this predominantly quiet natural and rural countryside will be the major permanent environmental impact associated with this project, it is considered that noise impact resulting from railway operation will only have temporary effects along the greater length of the route except for specific locations where houses are located close to the original railway formation.

8.7 Bushfire Potential

The controlled burning of cleared vegetation in accordance with Bush Fire Regulations during construction and subsequent railway operational measures involving maintenance of a substantially cleared railway easement and the use of efficient spark arrestors to diesel powered locomotives should minimise the risk of bush fires.

8.8 Ecology

The proposed construction activities should cause minimal impact on the study area's ecology because operations will be restricted to the existing railway easement areas with minor diversions at washout locations and at the Stony Pinch quarry.

Particular care will be taken in ecologically sensitive areas such as at Cox's Gap and near Murrumbo Gap, which provide important corridors affording fauna and flora dispersal between the Wollemi National Park and the largely undisturbed natural areas to the north of the Goulburn River Valley. Because the railway formation is largely in tunnels within these areas activity will be of minor consequence in these areas.

Any reconstruction of the road over Cox's Gap should be subject to particular attention from the relevant authorities to minimise alteration to the present habitat. Only minor upgrading is required to service current traffic levels of approximately 100 daily vehicles. However, the long-term future of this road is questionable because of the proposed Kerrabee Dam and the suggested possible improvement of the Merriwa to Wollar road as an alternative route as discussed in Sections 8.12 and 8.13.

The ecology within the study area will be further protected by construction equipment cleaning requirements and by restrictions on workers which will not allow firearms, animal trapping, pets or trail-bikes.

8.9 Archaeology

The proposed construction activities should cause no impact on the study area's archaeological sites because operations will be largely restricted to the existing railway easement areas. No archaeological sites occur within the easement because they would have been covered or disturbed during previous construction work which also deviated from the easement to surrounding areas for the purposes of winning fill, disposal of surplus material and supply of timber.

The quarry site at Muswellbrook has no aboriginal relics. The site at Stony Pinch also had no relics, although an area suggestive of aboriginal occupation was discovered at some distance south of the proposed limits of the quarry. If any aboriginal relics are discovered within or adjacent to any construction activity, the National Parks and Wildlife Service will be notified and, if necessary, restrictions placed on construction operations.

The archaeology within the study area will be further protected by restrictions on workers visiting aboriginal relics.

8.10 Land Use

Construction activity will be confined essentially to the railway easement except where it is necessary to complete drainage structures to water courses or the like or to gain access for construction purposes.
In such cases appropriate arrangements have been made with private landowners.

If any damage to existing fences during construction occurs restoration will be undertaken. It is noted that a number of fences have been removed from the easement border by landowners. Under the Sandy Hollow Railway Act, the Public Transport Commission is not obliged to maintain fences. However, the Company intends to completely fence the railway to normal stock-proof standards which do not impede native faunal movements.

8.11 Social Disturbance and Benefits

When works on the existing railway formation were initiated in 1936 it was still a period of great hardship in the latter Great Depression years. This relief programme imposed extremely harsh conditions on workers fortunate to get a job as reflected in Duke Tritton's bitter folk song (Ref: 7) about the Sandy Hollow Line.

The completion of this railway from Sandy Hollow to Ulan will be conducted under somewhat different circumstances. Workers will enjoy comfortable accommodation and substantial employment benefits. During the project it is estimated by Ulan Coal Mines Limited that approximately 13,350 man weeks of work will be required. Local employment will be used wherever possible with work usually being undertaken over six days a week.

It is estimated that the gross weekly pay of construction workers on the project will be about $365 per week, which includes various hardship and living away from home allowances, overtime and other penalty payments. These workers would be expected to spend considerable monies on goods, services and

recreational activities both within the study area and at further locations such as Merriwa, Mudgee or Muswellbrook. These pay rates compare with a typical gross pay of $170 to $200 per week for general construction workers already employed in the area.

Employment prospects, mainly as labourers, will arise both within the study area and in bordering areas of depressed rural activity and high unemployment levels. Although this employment would be temporary it should be noted that the expanded Ulan Coal Mine operations will afford more permanent prospects.

The construction of the railway through mostly sparsely populated country is not expected to result in any serious social disturbance or inconvenience.

Recreational facilities, particularly those at Sandy Hollow, would be expected to be heavily patronised but this should cause little inconvenience to the established local community which experiences seasonal influxes of workers for grape-picking.

Also of considerable economic and employment importance, the servicing and supportive services associated with materials, fuels and food supply will provide a stimulus to this region of New South Wales.

8.12 Traffic

During construction of the railway, works traffic will use the existing railway easement wherever practicable and also certain designated access routes as already arranged with landowners. Otherwise construction traffic will utilise public roads and comply with all traffic regulations.

Certain sections of the main road currently use the railway formation at the Cox's Gap tunnel and approaches to the tunnel and a section near Kerrabee where the road itself was washed out by the river. Under the terms of Rail Lease Agreement No. 13481, the Department of Main Roads and Rylstone and Muswellbrook Shires have permission from the Public Transport Commission to use the Cox's Gap tunnel on a yearly tenure basis with provision for six months advance notice of a requirement to abandon this arrangement. Alternative routes will be used in future. This is the responsibility of local Shire Councils.

This impact could be further ameliorated by the diversion of a large amount of traffic through Merriwa by the upgrading of the road which runs northwards from the main road near Wollara station. Although in bad condition, near Lees Pinch, this road is currently being improved and would require a new bridge over the Goulburn River at the ford near Wollara station. Upgrading

this road would provide a faster and safer alternative through traffic movement option. On a cost benefit basis it would appear preferable to further upgrade and seal this road than to spend monies on the existing road over Cox's Gap.

The two tunnels in the Cox's Gap area contain no provision for fire-fighting or air conditioning as are required in tunnels currently constructed for road traffic. Cox's Gap tunnel has a 4.25 m vertical clearance and a 3.5 m horizontal clearance. It is thought that at present various petrol tankers use this route and tunnel in violation of current road traffic regulations.

14' × 11½' impossible, since all SRA locos have a max ht of 14'

A longer existing road passes over Cox's Gap and discussion with Department of Main Roads officers (Ref:D2) indicate that the road can be upgraded with minor construction improvements - notably the removal of four hair-pin bends and road stabilisation on the western side of the Gap. The Department of Main Roads estimate that the Annual Average Daily Traffic using this road is approximately 100 vehicles. It is expected that with reasonable growth this figure may ultimately treble.

An alternative to road improvements here is the construction of a separate road tunnel through Cox's Gap but this would cost over 20 million dollars, an expense that is hardly warranted under the circumstances.

It is important to appreciate that these discussions concerning the impact on traffic caused by the railway development will be relatively insignificant compared with the possible consequences of the Kerrabee Dam which would inundate considerable areas of land and a section of road upstream of the dam. This matter is discussed further in the next Section.

The road washout and necessary diversion near Kerrabee is being examined by the Department of Main Roads and Public Transport Commission but a solution has not yet been proposed. Upon completion of the rail link, public road traffic will not be able to use sections of the railway formation which it has had the privilege of doing for many years.

8.13 Planning Context and Regional Constraints

This Impact Statement for the proposed completion of the Sandy Hollow railway line arises from a State Government decision, at Cabinet level, that such a statement would be required. This decision superseded earlier recommendations in December 1979 by the Planning and Environment Commission that an Environmental Impact Statement would not be necessary.

The railway formation is substantially complete, and for the most part, only minor rehabilitation works and embankment upgrading will be required before laying ballast and track.

However, some major construction works will be required including completion of the tunnel near Bylong and restoration and diversion works where washouts have occurred.

The railway route passes mainly through land used for agricultural purposes. However, there are sections of the route which pass through or under (in tunnels) undeveloped land of rugged topography.

These natural bushland areas have zones of considerable ecological sensitivity providing important corridors between the Wollemi National Park and vast areas of bushland on the northern side of the Goulburn River. These later areas are likely to be set aside for a National Parks purpose. The environmental significance of the corridor zones was assessed earlier in Section 8.8. Of much greater regional significance than the railway construction or operation is the proposed Kerrabee Dam which is still being planned. Details on this proposal should be reasonably conclusive by early 1981 with completion of investigation later in the year.

The dam proposal presently has no effect on the railway. Nevertheless discussions will continue between the Water Resources Commission and the Public Transport Commission.

However the Kerrabee dam proposal (shown in possible extent on Figure 20) will have more far reaching effects to this region because vast valley upstream areas ~~which~~ will be inundated. This will submerge a length of public road and sever the existing ecological corridors near Cox's Gap and Murrumbo Gap. However, the dam will provide augmented water supplies to agricultural activities downstream and provide a potential regional recreational complex.

Advice from Water Resources Commission planners (Ref: D7) indicates that an environmental impact statement will be prepared for the Kerrabee dam proposal.

8.14 Project Guarantees

As shown on Figure 8 construction is proposed to be completed over approximately a two year period. To meet the potential increases in coal production associated with Ulan Colliery operations the railway will be required for service as soon as possible.

This production and transport requirement, coupled with Ulan Coal Mine Limited's desire to commence recouping monies from its investment, will ensure that the project will be managed efficiently. Contractors will be obliged to complete their work under the threat of severe penalties for failure to comply.

Funding arrangements by the Company will guarantee completion of works as discussed in Section 5.12.

The completed railway will operate at approximately 20% of its possible single-track capacity. The Public Transport Commission's incentive to operate the railway as proposed is a guarantee of income from imposed freight charges although concessions will be allowed for to allow Ulan Coal Mines Limited to recoup construction costs.

The State and Federal Governments also have a vested interest in the railway's efficient operation because of public revenue accruements resulting from Company taxes and export tariffs.

9. AUTHORITIES CONSULTED

Most helpful discussion and consultation with the following Government Departments and instrumentalities is gratefully acknowledged.

D1 Department of Agriculture
(Messrs. B. Vaine, M. Nott)

D2 Department of Main Roads
(Mr. D. Watson)

D3 National Parks and Wildlife Service
(Messrs. M. Williams, P. Hitchcock and Mrs. L. Giles)

D4 Planning and Environment Commission
(Messrs. J. Bosward, C. Wright, G. Holt and G. Yeates).

D5 Public Transport Commission

D6 Soil Conservation Commission
(Mr. B. Piesley)

D7 Water Resources Commission
(Messrs. D. Rankine, M. Shaw, E. Hatfield, G. Lewis)

Not of Dept of Mineral Resources — re coal sterilization

10. REFERENCES

1. Australian Coal Industries Research Laboratories,
   Report on Analysis of Ulan No. 1 Underground Mine Water Overflow
   September 1975

A.R.H.S. Bulletin #238, 6/1957, The S/H - M/V Rly, R. Wright

2. Bureau of Meteorology
   Climatological Data Records

3. Bureau of Transport Economics,
   Sandy Hollow - Maryvale Railway:
   Economic Evaluation of Proposed Completion
   Australian Government Publishing Service,
   Canberra, 1979

4. Coal Export Strategy Task Force (N.S.W.)
   Coal Export Strategy Study
   Report, March, 1979

5. Coal Testing Laboratories Pty. Ltd.,
   Report on Analysis of Ulan No. 1 Underground Mine Water Overflow
   Report CTL-427,
   March 1978

6. Development Corporation of N.S.W.
   Report on the Sandy Hollow - Maryvale Railway Proposal
   Sydney, 1970.

7. Duke Tritton
   The Sandy Hollow Line
   (folk song)

Pity it wasn't put in as an appendix.

8. Government Gazette
   Wollemi National Park
   Government Gazette 36
   November 1979

9. Gulgong, Maryvale, Sandy Hollow Railway Committee
   An Appraisal of the Uncompleted Sandy Hollow - Maryvale (near Dubbo) Railway Links
   Newcastle, Sept. 1967.

10. Hunter Valley Research Foundation,
    A Study of the Economic and Social Impacts of the Dubbo-Newcastle Rail Link
    Report for Dubbo-Newcastle Rail Link Committee,
    October, 1979

11. Joint Coal Board,
Black Coal in Australia
1977 - 78 A Statistical Year Book
Sydney, June 1979

12. Joint Coal Board,
New South Wales Coal - Prospective Markets to the Year 2000
July 1977.

13. Longworth and McKenzie Pty. Ltd.
Heavy Vehicle Transport for Port Kembla - Environmental Inventory for Alternative Road Proposal
November 1979

14. National Parks and Wildlife Service,
Aboriginal Archaeological Sites Register

Singleton 1:250,000 S156-1 Map
Nartrow Arm 337.994 (D. Moore)
Sandy Hollow 3529.0003 (D. Moore)
Dubbo 1:250,000 S155-4 Map
Wilpinjong Creek 289.0035 (McCarthy)
Wollar 2923.9984 (McCarthy)

15. Public Transport Commission of N.S.W.
Proposed Construction of Railway between Ulan and Sandy Hollow
Unpublished Report,
April 1978

16. Royal Commission as to Decentralisation in Railway Transit,
Report, p. xxi in N.S.W. Legislative Assembly,
Parliamentary Papers,
1911, Vol. 2, p. 31

17. S.G.S. Australia Pty. Ltd.
Report on Creek Water Samples
Report La-7425
August 1979

18. Tweedie, A.D.
Chapter on Climate
C.S.I.R.O. Land Research Series No. 8.

19. Ulan Coal Mines Limited
Ulan Mine Development - Water Resources Study
Inception Report
December 1979

20. Water Resources Commission of N.S.W.
Preliminary Plan for Development of Water Resources in the Hunter River Basin
January 1979

21. Specht, R.L. et al,
Supplementary Series No. 7,
Aust. Journ. Botany
July, 1974

22. Commonwealth Scientific and Industrial Research Organisation,
Land Research Series No. 8
General Report on the Lands of the Hunter Valley,
Melbourne, 1963.

APPENDIX A

ROUTE DESCRIPTION OF PROPOSED RAILWAY

The location of the proposed railway, which is approximately 105 km in length, is shown in location on Figure 20 commencing at Sandy Hollow Railway station which is located on the existing Muswellbrook-Merriwa Railway. The railway's longitudinal section is shown on Figure 25. From here the proposed line branches to Ulan. Just past Sandy Hollow the line crosses a bridge over the junction of Halls, Giants and Melon Creeks. The piers and abutments are in good condition, however, there is no decking. The approaches need upgrading.

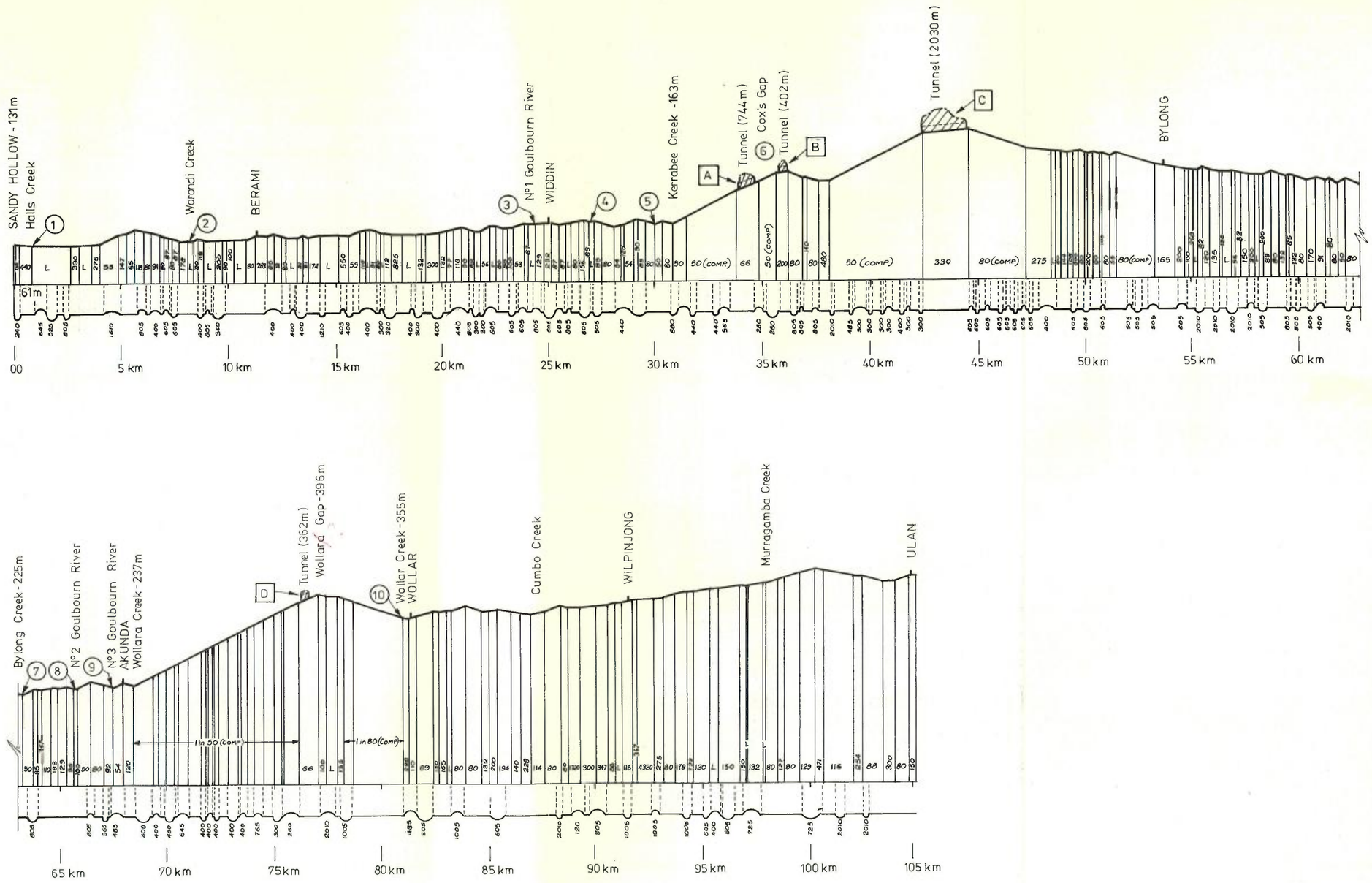
The line then passes on towards Baerami. Approximately four kilometres from Sandy Hollow there is a small washout. The line then enters a long straight where the Goulburn River has eroded a large section of approximately four hundred metres of formation. This will require remedy and the favoured engineering alternative would be to relocate the line between an existing farmhouse and the hills. The line then continues to Worondi Rivulet bridge crossing. The bridge is in good condition with decking in place. However, the approaches to the abutments will need upgrading as with many of the other bridges.

The line follows the Goulburn River entering a long straight opposite the village of Baerami. The formation on this section is sandy and has been ploughed in sections for a total of three hundred metres to eradicate rabbits.

Leaving the long straight the line continues to follow the river reaching an area where the fill in the formation has been undermined by the river causing a slump. This extends for one hundred metres and will require remedial works. These repairs would involve additional works. These works would involve additional rock extraction providing a wider cutting and more appropriate batter with concurrent refilling of the slumped section.

Past this point there is a crossing over Eckfords Creek with the line continuing to follow the river and hills around Diamond Point. At Thunderbolt's Gully another small washout will require remedial works.

At Widden Cutting there is a basalt quarry which was considered as a source of ballast material. Only a small amount of rock has been excavated from the quarry and access to the quarry is by sealed road to Widden. However, reserves of this quarry are too small to be worth developing.



NOTES:

1. INFORMATION OBTAINED FROM PUBLIC TRANSPORT COMMISSION RECORDS.
2. TUNNELS AND BRIDGES IDENTIFIED AS REFERENCED IN REPORT.

FIGURE 25
SANDY HOLLOW TO ULAN RAILWAY
– LONGITUDINAL SECTION

Just past Widden Cutting the line crosses the Goulburn River. There are four piers and two abutments which at close inspection all appear in good condition. There are no spans on the bridge and the approaches to the abutments need upgrading. The line continues to Kerrabee although just before reaching Kerrabee it crosses over the road. At Kerrabee the line crosses a bridge which spans Kerrabee Creek. Steel work is missing on one span of this bridge.

Further on the public road utilises the alternative route of the railway formation which continues through Cox's Gap Tunnel. The designated public road, which preceded railway construction passes over the Gap. This is used for high load traffic. This route does not make use of the formation or tunnel, but is approximately five kilometres further to travel, the tunnel being a shorter and more direct route.

There is no agreement between the Public Transport Commission and Department of Main Roads which would prevent the railways using the formation and tunnel. With construction of the railway all road traffic would be required to use the existing road which crosses under the line just past the western portal of the tunnel

The line continues a short distance to another tunnel near Honeysuckle Creek. The line then continues along behind the property of Murrumbo reaching the uncompleted Bylong tunnel. The line then passes Upper Bylong and it reaches a siding near Bylong.

Leaving Bylong the line continues through the property "Marapana" crossing the Kerrabee - Bylong - Wollar road intersection at the boundary of this property. It then continues on through open country reaching Mead's Crossing on Coogan Creek. This is a 4 span bridge approximately thirty metres in length. It requires abutments and piers for completion.

A short distance from Mead's crossing the route crosses the Goulburn River. The two abutments and three piers for this bridge are in position and appear in good condition. There are no spans on the bridge and approaches to the abutments require upgrading of earthworks.

Approximately two kilometres further towards Wollar the route again crosses the Goulburn River. The two piers and two abutments on this crossing appear to be in good condition. However, there are no spans on the bridge and approaches to the abutments require upgrading.

After this crossing the line continues through open country reaching the fourth tunnel, the Wollar Gap tunnel, at Razorback

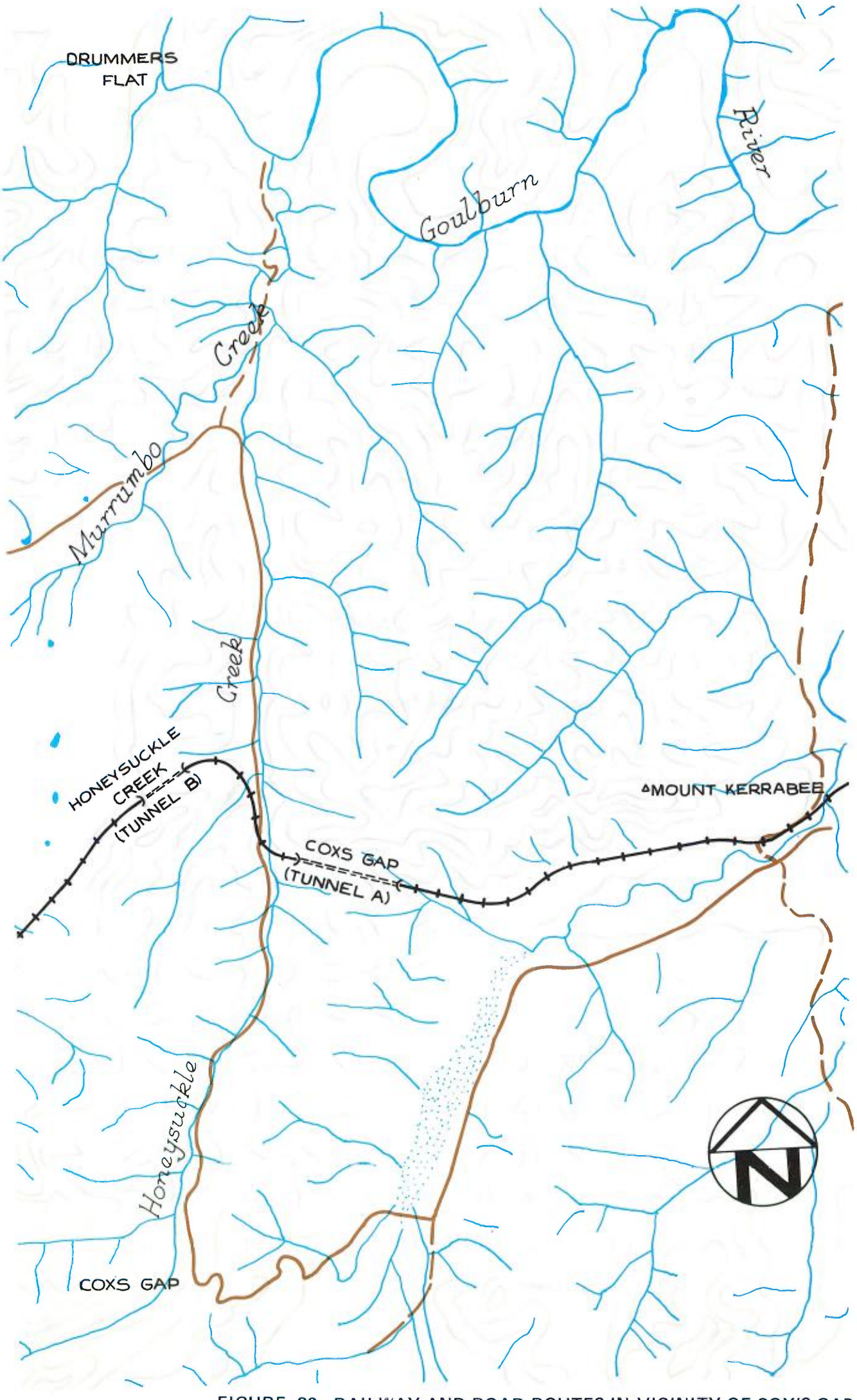


FIGURE 26 RAILWAY AND ROAD ROUTES IN VICINITY OF COX'S GAP

Ridge. There is a tight curve of two hundred metres radius entering this tunnel.

Leaving the tunnel the line continues in open country bypassing Wollar. Near Wollar the line crosses over Wollar Creek the bridge being in good condition with steelwork in place.

The line then continues across open country with no major creek crossings but several culverts, some large, all in good condition.

The line then reaches the Ulan - Wollar road opposite the Ulan mine site where a loop would be constructed. It would not be necessary to cross the Ulan- Wollar road at this point as the branch for the loop would commence before reaching the road.

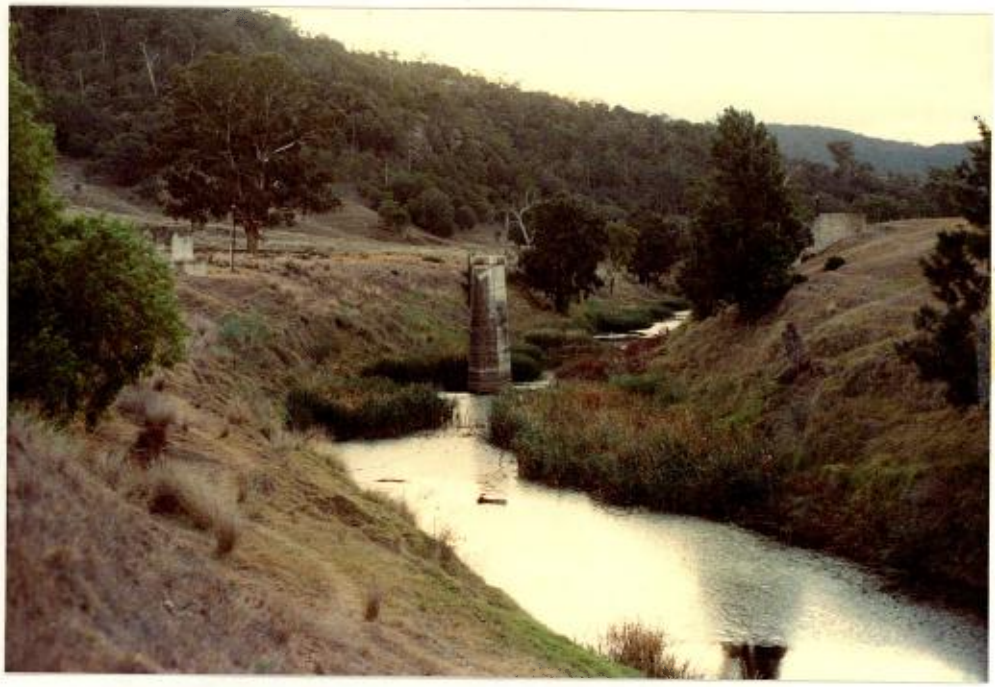


Figure 27(1) Halls Creek Bridge (Bridge No. 1)

Figure 27(2) Worondi Rivulet Bridge (Bridge No. 2)

Figure 27(3) No. 1 Goulburn River Crossing (Bridge No. 3)

Figure 27(4) Kerrabee Road Crossing (Bridge No. 4)

EXAMPLES OF EXTENT OF INCOMPLETE STEELWORKS INDICATED IN RED.

Bike riders will have to duck ! No, there will be a wire at each side to cater for cyclists!

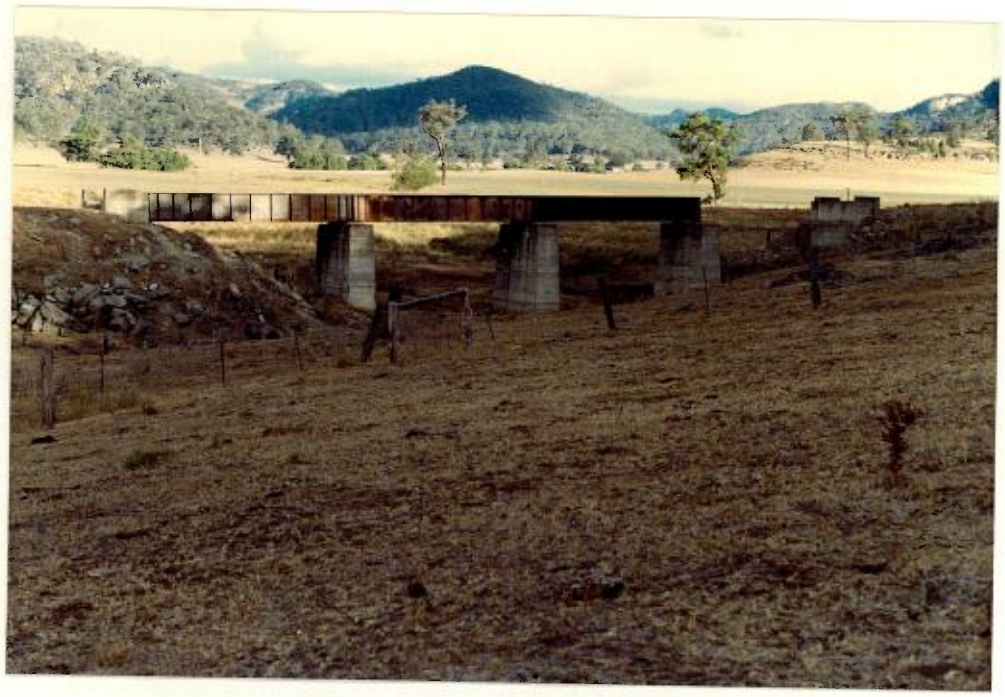


Figure 27(5) Kerrabee Creek Crossing (Bridge No. 5)

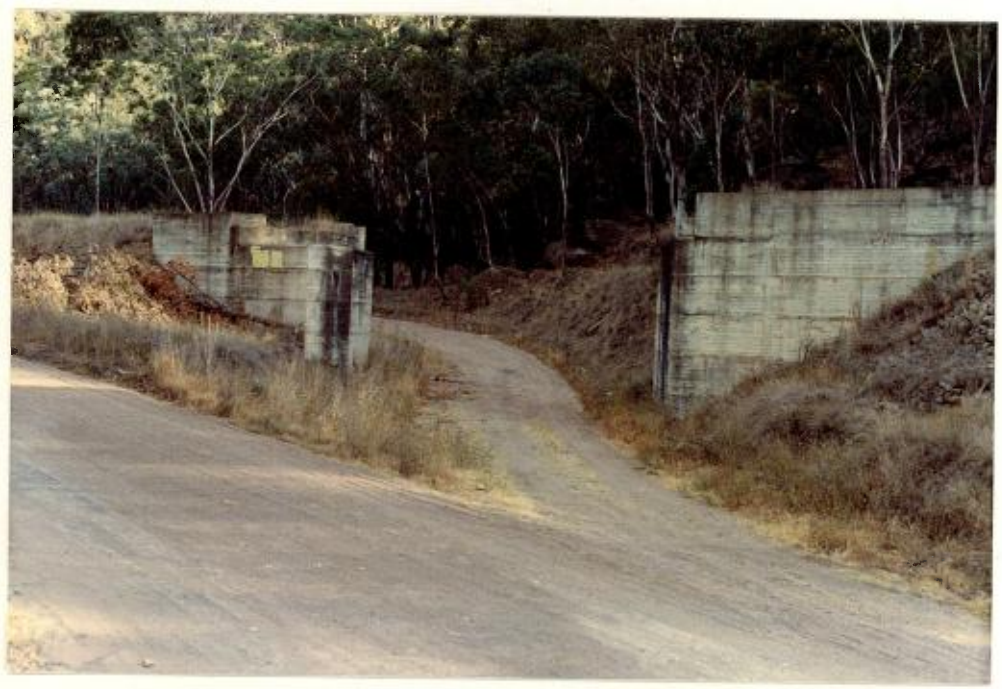


Figure 27(6) Cox's Gap Road Crossing (Bridge No. 6)

Figure 27(7) Mead's Crossing (Bridge No. 7)

Figure 27(8) No. 2 Goulburn River Crossing (Bridge No. 8)

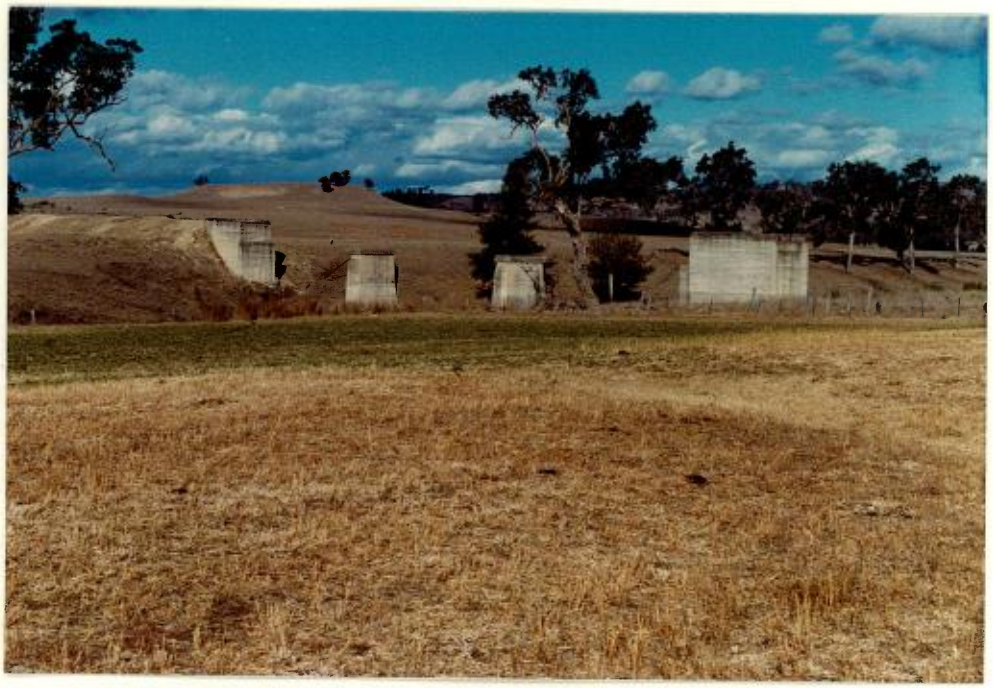


Figure 27(9) No. 3 Goulburn River Crossing (Bridge No. 9)

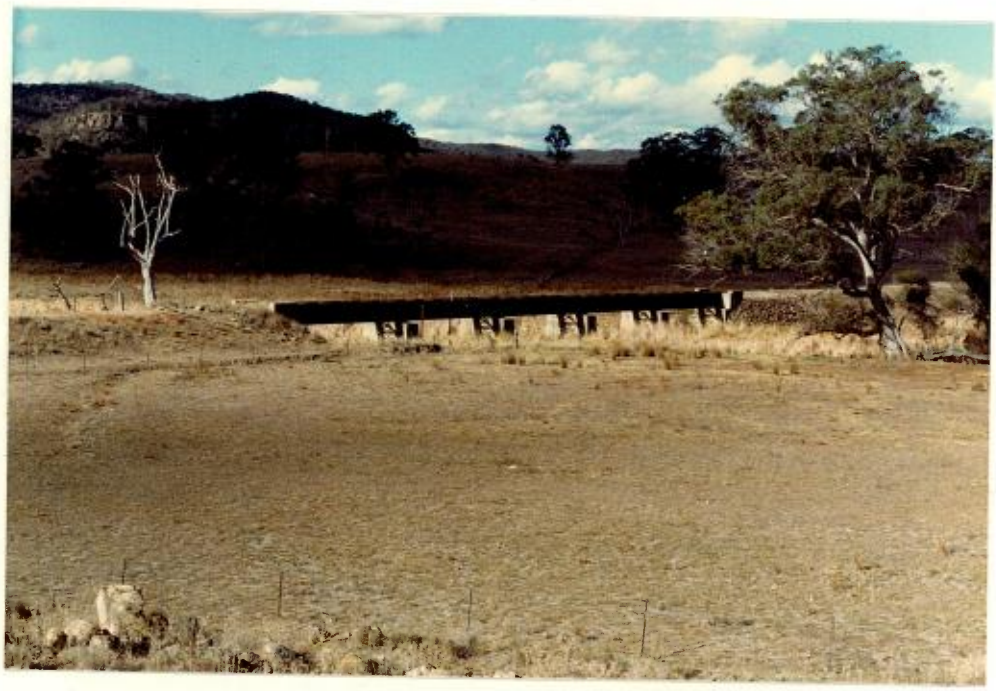


Figure 27(10) Wollar Creek Bridge (Bridge No. 10)

APPENDIX B

SUMMARY OF CONSTRUCTION ACTIVIITES

The various construction activities, including extensive restoration works which are necessary to complete the proposed railway, from Sandy Hollow to Ulan, may be summarised as follows:

- design and engineering by Public Transport Commission officials and others specialising in planning, design, construction, survey, geotechnical services and environmental assessment;
- establishment of camp, workshop, office, tunnel compounds and transportation facilities;
- clearing of railway easement and disposal of vegetation;
- formation surface restoration and upgrading;
- general earthworks involving compacted fill over entire length of formation excluding tunnels;
- specific earthworks associated with remedies to the formation washout by the Goulburn River approximately 5 km from Sandy Hollow and minor washouts at Thunderbolt's Gully and west of Baerami;
- restoration and completion of side drains and other surface drainage works for entire length of line;
- restoration and completion of steelwork on ten bridges (see Table B1);
- cleaning out 805 culverts, cutting channels and general restoration of headwalls and cattle stops;
- minor restoration works for the Cox's Gap (Tunnel 'A'), Honeysuckle Creek (Tunnel 'B') and Wollara Gap (Tunnel 'D') tunnels;
- completion of Bylong tnnnel (Tunnel 'C');
- final trimming and preparation for track laying;
- replacement and restoration of fencing;
- laying of 105 km trackwork and ballast to Class 1-XC standards;
- provision of 246 private and 29 public road crossings (including surveyed roads not constructed);
- provision of 3 passing loops (location not yet determined);
- provision of signals and telegraph; and,
- construction of a balloon loading loop at Ulan mine.

ITEM		DESCRIPTION	CONSTRUCTION REQUIREMENTS*
Bridges			
1.	Halls Creek Bridge	2 x 24.4 m span	Steel supply
2.	Warondai Rivulet Bridge	3 x 12.2 m span	Restoration steel, repair abutment approaches
3.	No. 1 Goulburn River Crossing	5 x 24.4 m span	Steel supply
4.	Kerrabee Road Crossing	1 span (approx. 6 m)	Steel supply
5.	Kerrabee Creek Crossing	4 x 12.2 m span	Steel supply, steel restoration, abutment completion
6.	Cox's Gap Road Crossing	1 span (approx. 6 m)	Steel supply
7.	Meads Crossing	2 x 2.75 m Armco Pipes 20 m length	Armco pipes, headwalls, compacted fill
8.	No. 2 Goulburn River Crossing	4 x 24.4 m span	Steel supply
9.	No. 3 Goulburn River Crossing	3 x 24.4 m span	Steel supply
10.	Wollar Creek Bridge	5 x 12.2 m span	Steel restoration, repair abutment approaches

cont'd

TABLE B 1 cont'd

ITEM		DESCRIPTION	CONSTRUCTION REQUIREMENTS*
Tunnels			
A.	Cox's Gap (completed)	465 m	Minor repairs and work cleanout
B.	Honeysuckle Creek (completed)	383 m	Minor repairs and work cleanout
C.	Bylong (incomplete)	1950 m (960 m complete) 6396' 2132 yds 1-212 m = 1M. 16·91 chns.	Excavation middle 990 m with concrete lining; minor repairs and work in completed sections
D.	Wollara Gap (complete)	323 m	Minor repairs and work cleanout

* Construction requirements include laying of trackwork

TABLE B1

CONSTRUCTION REQUIREMENTS FOR COMPLETION OF BRIDGES AND TUNNELS

APPENDIX C

GEOLOGY WITHIN THE STUDY AREA

The study area lies within the broad structure known as the Sydney Basin which extends along the New South Wales coast from near Batemans Bay in the south to Port Stephens in the north. The railway route is located very close to the north-western limit of the Basin and Ulan itself is situated on the very edge of the Basin adjacent to the granitic rocks which form part of the older complex to the west.

The sedimentary rock strata forming the Sydney Basin are of Permian and Triassic age. In addition, much smaller areas of younger Tertiary volcanic rocks occur in some areas as well as alluvial deposits of Tertiary and Quaternary age. The study area includes rock types from each of these categories. The stratigraphic succession table,Table C1, refers to the geological formations present in the area.

The dominant rock unit in this area is the massive quartz sandstone of the Narrabeen Group and it is this unit which forms the extensive dissected plateau surfaces, the sheer cliffs and the steep exposed hillsides. It is more lithologically consistent and of greater thickness in the east, whereas west of Bylong the Triassic rocks become thinner, less extensive and characteristically contain a basal conglomerate layer.

The Permian rocks of the Illawarra Coal Measures and Shoalhaven Group are generally less resistant to erosion than those of Triassic age and consequently form more gently-sloping valley sides and lowlands. The Illawarra Coal Measures are typically made up of an interbedded sequence of sandstone, shale, conglomerate and tuff layers and coal seams ranging from 1 to 15 metres in thickness. The shale, conglomerate and sandstone of the older Shoalhaven Group outcrops only along the floors of the north-south trending valleys in the western part of the area and is of much smaller areal extent.

The small patches of Tertiary olivine basalt which occur mainly in the central part of the area are the youngest rocks represented. These are usually small hill-top remnants of extrusive basalt which overlie the Narrabeen Group sandstones and which once covered much larger areas. However, the larger area of basalt immediately to the east of Bylong State Forest is an exposed intrusive dome.

GEOLOGICAL PERIOD	UNIT	MAX THICKNESS	LITHOLOGICAL DESCRIPTION	OCCURRENCE
QUATERNARY			GRAVEL, SAND SILT, CLAY	ALONG RIVER VALLEYS ALLUVIAL ORIGIN
TERTIARY		160 M	OLIVINE BASALT	HIGH DOMES AND PLATEAU-TOP REMNANTS
TRIASSIC	NARRABEEN GROUP	300 M	MASSIVE QUARTZ SANDSTONE; MINOR SHALE; CONGLOMERATE	FORMS SHEER CLIFF FACES, EXTENSIVE PLATEAU SURFACES
PERMIAN	ILLAWARRA COAL MEASURES	200 M	SANDSTONE, SHALE, COAL CONGLOMERATE (EXTENSIVELY INTERBEDDED)	OUTCROPS ALONG VALLEYS AT BASE OF NARRABEEN GROUP
PERMIAN	SHOALHAVEN GROUP	100 M	SHALE, CONGLOMERATE SANDSTONE	OUTCROPS ALONG THE BASE OF SOME VALLEYS

TABLE C1

GEOLOGICAL FORMATIONS WITHIN STUDY AREA

APPENDIX D

CLIMATOLOGY IN THE STUDY AREA

A general description of the climate within the study area is given in Section 6.4. This Appendix provides further information.

Average annual rainfall is in the order of 600 mm (about half Sydney's average) and varies only slightly across the area. Throughout the area the normal pattern is one of summer rainfall maximums with January the wettest month. However winters are not dry and at almost all stations the driest month (usually April, May, August or September) receives at least 35 mm. The variation between winter and summer rainfalls is greater in the central and eastern parts while at stations such as Ulan and Gulgong to the west the seasonal variation is less marked. Monthly rainfall averages and annual totals for stations in the area are shown in Table D1.

Temperature records are available for Sandy Hollow and Jerrys Plains to the east and for Gulgong to the west. In winter, cool to cold temperatures are characteristic throughout the area while in summer high daytime temperatures prevail and are influenced by factors such as cooler southerly air masses of oceanic origin or strong hot winds of tropical continental origin which produce heatwave conditions. In general, daily maximum temperatures are slightly higher throughout the year at Jerrys Plains and Sandy Hollow in the east than at Gulgong in the west. Daily minimum temperatures are also higher in the east as shown on Table D2.

Severe frosts are a feature of the winters in the area and Jerrys Plains expects 18.5 days per year of severe frosts with temperatures below 0°C and this figure is known to increase with distance inland from the sea. The period of severe frost risk extend from May until late August. (Ref: 18).

TABLE D1 : MEAN MONTHLY AND ANNUAL RAINFAILL (mm) FOR THE STUDY AREA

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
JERRYS PLAINS	78	67	56	45	39	49	46	38	40	51	57	69	635
DENMAN	72	63	52	40	35	43	39	36	38	47	52	63	580
SANDY HOLLOW*	93	67	49	31	38	32	26	44	40	49	51	84	604
KERRABEE*	98	64	52	38	43	33	26	52	39	67	51	77	631
WOLLAR	67	63	50	37	33	45	40	44	36	48	53	55	573
ULAN	71	61	45	41	42	48	43	49	39	49	49	66	600
GULGONG	69	61	52	45	43	53	46	48	45	56	59	65	642

*not considered truly representative
as records taken over only 7 and 13 years respectively.

TABLE D2 : MEAN DAILY MAXIMUM AND MINIMUM

TEMPERATURES (°C) FOR THE STUDY AREA

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
JERRYS PLAINS	MAX	30.0	29.4	28.1	25.1	20.5	17.8	16.8	18.4	21.5	25.0	27.9	29.3	24.2
	MIN	17.2	17.3	15.2	11.4	7.5	5.6	3.8	5.2	7.0	10.8	13.4	15.8	10.9
SANDY HOLLOW*	MAX	33.1	29.1	28.6	25.2	21.9	18.1	17.6	20.0	25.8	25.1	26.2	32.5	25.3
	MIN	18.0	17.5	14.1	8.8	7.8	3.0	0.4	3.7	6.7	11.5	12.3	15.8	10.0
GULGONG	MAX	29.0	26.6	26.5	23.1	18.3	15.8	14.8	15.6	19.2	22.7	24.5	28.6	22.1
	MIN	15.8	16.0	13.0	8.7	5.7	2.6	1.7	3.5	5.8	9.5	10.7	14.9	9.0

*Records taken over only a limited number of years.

APPENDIX E

DESCRIPTION OF LAND SYSTEMS IN THE STUDY AREA

Figure 8 illustrates the various land systems existing within the study area. This Appendix provides a brief description of the associated geology, topography, soils and vegetation which are generally associated with these land systems. The following table is based on work undertaken by R. Story et.al. (Ref: 18) of the C.S.I.R.O. Division of Land Research and Regional Survey.

TABLE E1

DESCRIPTION OF LAND SYSTEMS IN STUDY AREA

LAND SYSTEM	GEOLOGY	TOPOGRAPHY	SOILS	VEGETATION
ROUSE	PALAEOZOIC GRANITE	ROLLING TO RUGGED HILLS-GRADIENTS 10-35%	SKELETAL SOILS BARE ROCK OUT-CROPPING OVER HALF THE AREA	SAVANNAH WOODLAND OF BOX,GUM & IRONBARK,SOME THINNED OR CLEARED
ULAN	PALAEOZOIC GRANITE	SMOOTH GENTLY UNDULATING SLOPES, 3-7%,WIDE ALLUVIAL BELT UP TO 1/4 MILE WIDE IN VALLEY BOTTOMS	PALE BROWN SANDY & GRITTY EARTHS WITH MAINLY SOLONETZIC SOILS IN VALLEYS	SAVANNAH WOODLAND OF BOX,GUM & IRONBARK,MOSTLY THINNED OR CLEARED. VALLEY BOTTOM,CLEARED & UNDER PIONEER GRASSES
BARIGAN	TERTIARY BASIC INTRUSIVES	VARIED-EXTREMELY STEEP DOME SHAPED HILLS SLOPES UP TO 90%,ROCKY HILLS SLOPES 10-30% & GENTLE LOWER SLOPES	VARIED ACCORDING TO LANDFORM-BARE ROCK,LOAMY SKELETAL SOILS, & SHALLOW STONY RED EARTHS	VARIED ACCORDING TO LANDFORM, HILLS MAINLY BARE ROCK, OR ANOMALOUS WOODLAND OF WHITE BOX OVER DENSE SHRUBS.WIRY PIONEER GRASSES OR CULTIVATION OR LOWER SLOPES

Table E1 cont'd

OGILVIE	PERMIAN CONGLOMERATE SANDSTONE, & SHALE	STEEP HILLS & ESCARPMENTS WITH SOME CLIFFS & BENCHES. SHEET EROSION ACTIVE, ESPECIALLY WHERE CLEARED	SKELETAL SOILS OF VARIOUS TEXTURES; SOME SHALLOW EARTHS, SOLONETZIC SOILS & DEGRADED BLACK EARTHS. SOME WETTER AREAS	SAVANNAH WOODLAND DENSER THAN USUAL, BOX, GUM & IRONBARK IN THE WEST. WET OR DRY SCLEROPHYLL FOREST WITH DENSE GROUND COVER IN THE EAST
GLENDOWER	PERMIAN SHALE, SANDSTONE, & CONGLOMERATE	MODERATELY STEEP HILLS, SLOPES 10-25%, SOME ROUNDED, SOME TABULAR. UNDULATING AREAS IN MAJOR VALLEYS	WIDE RANGE OF SOILS SOLONETZIC & PODZOLIC SOILS, EARTHS, SKELTETAL SOILS, SOME CRACKING CLAYS & DEGRADED BLACK EARTHS	SAVANNAH WOODLAND OF BOX, GUM & IRONBARK, MOSTLY THINNED OR CLEARED. SOME AREAS UNDER CULTIVATION OR PIONEER GRASSES IN VALLEY BOTTOMS
KILLARNEY	PERMIAN SHALE, SANDSTONE & CONGLOMERATE	UNDULATING LOWLANDS SLOPES LESS THAN 10% WITH GENERALLY SHALLOW VALLEYS	SOILS VERY VARIABLE MOSTLY PODZOLIC & SOLONETZIC SOILS, SMALL PATCHES OF SHALLOW EARTHS, SKELETAL SOILS, CRACKING CLAYS, & DEGRADED BLACK EARTHS	SAVANNAH WOODLAND OF BOX, GUM & IRONBARK, MOSTLY THINNED OR CLEARED. SOME AREAS CLEARED & UNDER CULTIVATION OR PIONEER GRASSES IN VALLEY BOTTOMS.

Table E1 cont'd

LEE'S PUNCH	TRIASSIC SANDSTONE & MINOR SHALE	RUGGED HILLY AREA WITH SOME SANDSTONE CLIFFS 50-500 FT. HIGH.NARROW VALLEYS & GORGES UP TO 2500 FT DEEP	BARE ROCK & SANDY GRITTY OR GRAVELLY SKELETAL SOILS,MINOR AREAS WITH PODZOLIC SOILS & EARTHS.	SHRUB WOODLAND OF IRONBARK & GUM
MUNGHORN GAP	TRIASSIC SANDSTONE WITH MINOR SHALE	GENTLY UNDULATING TO LEVEL PLATEAUX UP TO 2 MILES WIDE.SLOPES 0-5%	SOIL COVER UNIFORM FAIRLY DEEP SANDY BROWN EARTHS & SOME SKELETAL SOILS	DRY SCLEROPHYLL FOREST OR SHRUB WOODLAND OF IRONBARK & GUM
GREENHILLS	TRIASSIC & JURASSIC SANDSTONE & SHALE	GENERALLY UNDULATING SOME ROCKY SANDSTONE KNOLLS,HILLS & OUTCROPS	SHALLOW BROWN OR YELLOW EARTHS, SKELETAL SOILS, & SOME SOLONETZIC SOILS	GENERALLY SAVANNAH WOODLAND OF BOX,GUM & IRONBARK,MOSTLY CLEARED.SOME SHRUB WOODLAND OF IRONBARK & GUM
ANT HILL	TERTIARY BASALT	GENERALLY BASALT HILLS & LOWER MOUNTAIN SLOPES, SLOPES 5-35% SOME UNDULATING VALLEY FLOORS SLOPES 7-15%	DARK,MAINLY SHALLOW BUT ALSO COMMONLY DEEP,STONY CRACKING CLAYS	SAVANNAH WOODLAND OF BOX & GUM,MOSTLY THINNED OR CLEARED. SOME EUCALYPT TREE SAVANNAH

Table E1 cont'd

SANDY HOLLOW	QUATERNARY COLLUVIUM	UNDULATING WITH SMOOTH SLOPES LESS THAN 10%,OCCASSIONAL OUTCROPS OF SANDSTONE	UPPER SLOPES MAINLY DEEP COARSE-TEXTURED BROWN & RED EARTHS, LOWER SLOPES USUALLY WITH SOLONETIZIC SOILS SOME ALLUVIUM IN VALLEYS	SAVANNAH WOODLAND OF BOX,GUM & IRONBARK,MOSTLY CLEARED. SOME AREAS UNDER CULTIVATION OR PIONEER GRASSES IN VALLEYS

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