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Hunter Valley No. 2 mine, Warkworth N.S.W. : environmental impact statement

COAL & ALLIED OPERATIONS PTY. LIMITED

HUNTER VALLEY NO.2 MINE

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1

PREPARED BY
CROFT & ASSOCIATES

COAL & ALLIED OPERATIONS PTY. LIMITED

HUNTER VALLEY NO.2 MINE
WARKWORTH N.S.W.

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 1

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AMENDMENTS

Plates 1 & 2: Coal storage bins have been relocated to Company owned land to the east as shown in Figure 15.

Figure 2: Small triangular portion of privately owned lot in south-eastern corner (coloured green) of Authorisation has been removed from the proposal.

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1.1 THE PROPOSAL

Coal & Allied Operations Pty. Limited propose to establish and operate an opencut coal mine and associated facilities on Authorisation 13 in the Warkworth/Lemington area in the Shire of Singleton, New South Wales. The mine to be known as the Hunter Valley No. 2 Mine will be developed to a raw coal production rate of approximately 4.5 Mtpa. The location of the mine is shown in Figure 1 and the proposed layout of the major components in Plate 1.

The land required for the mine and a buffer zone separating the project from neighbouring farming properties has been purchased by the Company or is subject to current negotiations. Figure 2 shows the land owned by the Company.

The Company currently operates the Hunter Valley No. 1 Mine, Liddell Colliery and Liddell Coal Preparation Plant on Durham North Colliery Holding together with Hunter Valley Coal Preparation Plant and Hunter Valley Loading Point on Hunter Valley Extended Colliery Holding. When Hunter Valley No. 2 Mine is established, the three mines, two preparation plants and loading facilities will be operated as an integrated coal extraction, preparation and handling complex servicing export markets for coking and steaming coal types.

An Authority to Prospect in Authorisation 13 was granted to the Company in 1974. Detailed exploratory drilling proved a coal resource of approximately 380 Mt and mine planning, economic and environmental studies indicated that a viable opencut mining operation can be conducted on the site. The proposal detailed in this Environmental Impact Statement is for the first 21 years of operation of a mining project with a life expectancy on the site of over 50 years.

The Statement details the Company's proposal and the design and operational safeguards to minimise the impact of the project on the physical and natural environment, local residents and the community at large. The safeguards

proposed incorporate the Company's experience in opencut coal mining at the Hunter Valley No. 1 Mine. Integration of the proposal with the mines now in operation will maximise the efficient use of coal preparation, handling, storage and transportation facilities and the effective application of environmental controls within the complex.

This Statement is submitted as a basis for assessment of the project by the community, Singleton Shire Council, government authorities and departments, and for determination by the Minister for Planning & Environment. The Statement has been prepared in accordance with the requirements of the Environmental Planning & Assessment Act, 1979, & Regulation 1980.

1.2 APPROVALS SOUGHT

The land to be developed in the project is owned by the Company. The areas proposed for development in relationship to the Company's Upper Hunter Valley mining complex are shown in Figure 3.

The components of the project which are the subject of the application are:-

* The establishment of an opencut mine in two stages on Authorisation 13 for a period of not less than 21 years.
* Temporary surface facilities known as "Birnamwood" in the central eastern portion of Authorisation 13.
* Relocations of the Jerrys Plains Road.
* Surface and coal handling facilities on the northern boundary of Authorisation 13 at a site known as "Hunter View".
* Construction and use of a private sealed road from Authorisation 13 to Hunter Valley Coal Preparation Plant, on the Hunter Valley Extended Colliery Holding.
* Construction and operation of an overland conveyor from Hunter View to Hunter Valley Coal Preparation Plant.
* Augmentation of Hunter Valley Coal Preparation Plant and associated coal stockpiles.

Infrastructure components of the Company's existing Upper Hunter Valley mining complex which will be utilised by this project include:-

* The overland conveyor linking the Hunter Valley Coal Preparation Plant to Liddell Coal Preparation Plant and Hunter Valley Loading Point in the north.

* Liddell Coal Preparation Plant where coal will be beneficiated to a coking product.

* Liddell Loading Point where coking coal will be loaded onto trains.

* Hunter Valley Loading Point where steaming coal will be loaded onto trains.

The following reports have been prepared during the development of the Company's Upper Hunter Valley mining complex.

* "Environmental Impact Statement for a Coal Haulage Road Between Liddell Colliery and the Proposed Warkworth Colliery" prepared by James B. Croft & Associates, May 1977.

* "Warkworth Colliery Environmental Standards and Alternatives Report" prepared by James B. Croft & Associates, July 1977.

* "Development Application for Office, Bath House, Vehicle Parking and Maintenance Area, Water Supply and Access Road for Hunter Valley No. 1 Colliery" prepared by James B. Croft & Associates, August 1977.

* "Environmental Impact Statement for Hunter Valley No. 1 Mine" prepared by James B. Croft & Associates, December 1978.

* "Hunter Valley No. 1 Mine, Supplementary Information to the Environmental Impact Statement. Information supporting Applications:- Clean Waters Act, Clean Air Act, Noise Control Act" prepared by James B. Croft & Associates, February 1979.

* "Hunter Valley No. 1 Mine, Environmental Impact Statement for the Proposal to Construct Coal Preparation and Handling Facilities and to Expand Mine Production to an Average of 4 MTPY" prepared by James B. Croft & Associates, August 1979.

* "Environmental Impact Statement for the Hunter Valley Loading Point of Coal & Allied Operations Pty. Limited" prepared by Longworth & McKenzie Pty. Limited, December 1980.

1.3 SCOPE

1.3.1 Outline

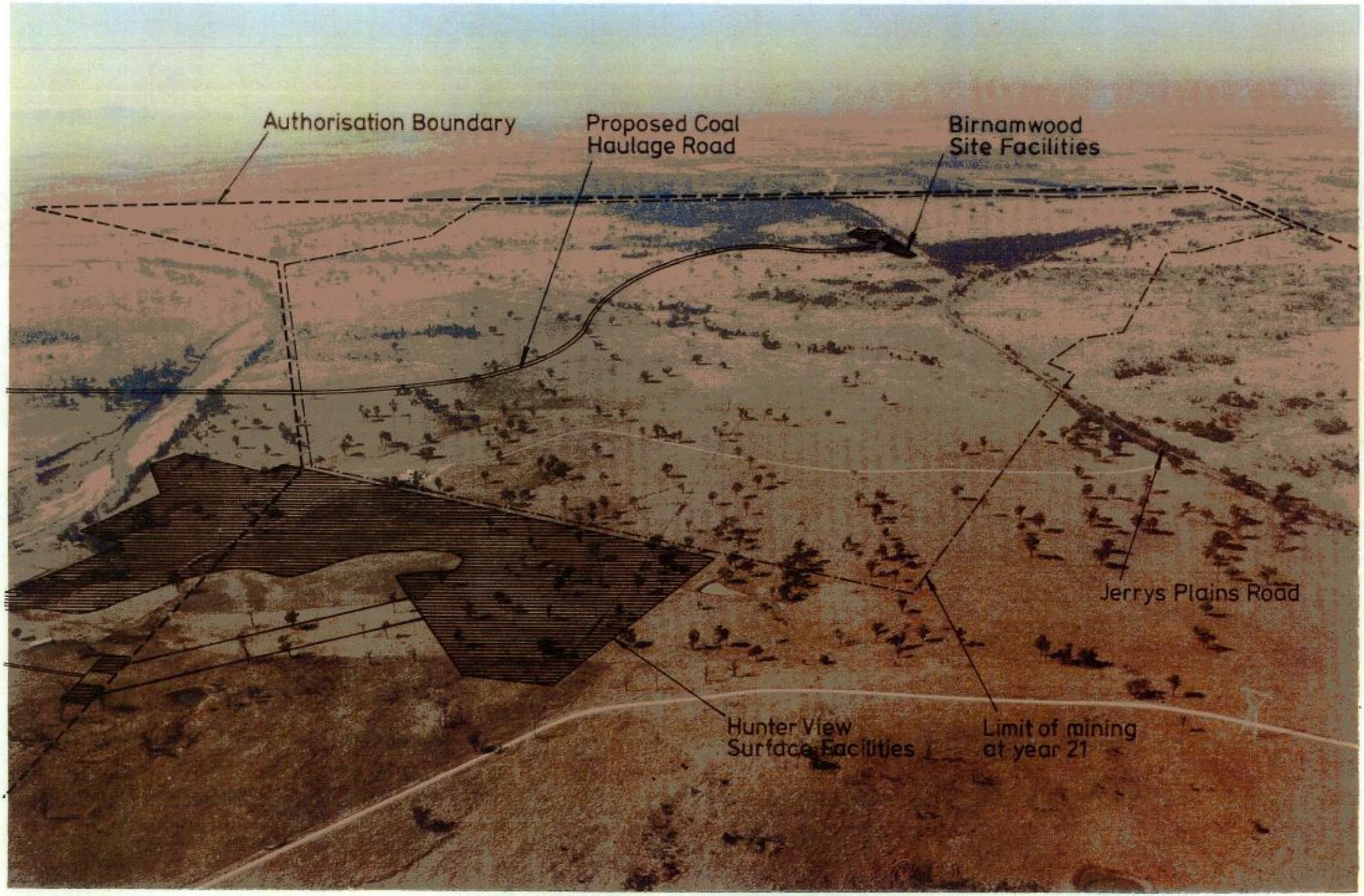
Hunter Valley No. 2 Mine is to be developed in two stages. Stage 1 will involve the establishment of mining operations to be known as Redbank Pit, a small operation in Redbank North Pit and Birnamwood Surface Facilities on the eastern portion of the Authorisation. These operations will last for about 7 years and will produce approximately 1.0 Mt of raw coal per year. The major opencut operation for the project will be in Hobden Pit which will be developed in Stage 2 to produce approximately 4.5 Mt of raw coal per year. The Hunter View Surface Facilities will be constructed to service these operations. The relationship of the mine to the surface facilities is shown in Plate 2.

The proposal will also provide for private road and conveyor haulage of coal to the Hunter Valley Coal Preparation Plant which is to be augmented to handle the range of coal types produced from the Hunter Valley No.1 and No. 2 mines. Other existing coal handling and transportation facilities at the Hunter Valley and Liddell preparation plants and rail loading facilities at the Liddell and Hunter Valley loading points will be utilised for the project.

Initial development and construction in Stage 1 is proposed to be undertaken over approximately 15 months, seven days per week during daylight hours and where necessary for periods at night. Construction for Stage 2 will commence in Year 5.

The Company's existing construction village located beside the Hunter Valley No. 1 Mine will be used to accommodate construction employees.

Mining operations are to be undertaken 24 hours per day, seven days per week.


Authorisation Boundary
Proposed Coal Haulage Road
Birnamwood Site Facilities
Jerrys Plains Road
Hunter View Surface Facilities
Limit of mining at year 21

The Hunter Valley No. 2 project is to be scheduled to receive employees from the Hunter Valley No. 1 Mine as the coal resources at that site are depleted by mining. Average employment during the Stage 1 and Stage 2 operations will be approximately 132 and 539 persons respectively. The project is expected to create approximately 168 new positions. Discussions are being held with Singleton Shire Council and the Premier's Department regarding the provision of accommodation to meet the requirements of new employees seeking assistance.

1.3.2 Mining Operations

Opencut methods using shovel, truck and loader combinations and a small dragline are to be employed for overburden removal and coal extraction. The locations and designs for the open pits are based upon geological, economic and environmental criteria. The basic objective in pit location and plant selection has been to maximise the economic recovery of the coal resource.

Redbank Pit will be developed in Stage 1 to produce run-of-mine (ROM) coal at an approximate rate of 1 Mtpa primarily from the Woodlands Hill Seam. The Redbank North Pit will be established to mine 1 Mt of ROM coal during the final year of Stage 1 operations. The development of Hobden Pit will commence in Year 5 and attain the production target of approximately 4.5 Mtpa of ROM coal in Year 10. All coal seams down to the Vaux Seam will be extracted in this pit, which will extend ultimately to a depth of approximately 260 m. Plate 3 is an artist's impression of the mine at approximately Year 21 when the maximum depth has been reached.

The proposed mining operations will require approximately 100 million cubic metres of in situ overburden to be placed out-of-pit. The area selected for the emplacement is shown in Figure 15 to be located on the eastern side of the Authorisation between Redbank and Hobden Pits.

The open pits are to be backfilled with spoil and rehabilitated progressively in conjunction with the overburden emplacement. Mining operations on the site will result in the construction of a new landform compatible with the topography on adjoining areas and with the landscape of the subregion.

1.3.3 Coal Preparation, Handling and Transport

Stage 1 ROM coal will be crushed at Hunter Valley Coal Preparation Plant prior to washing. During Stage 2 operations ROM coal will be crushed on Authorisation 13 and transported to either Hunter Valley or Liddell Coal Preparation Plants for washing. These two coal preparation facilities will generally produce steaming and coking product coal respectively.

Transport to Hunter Valley Coal Preparation Plant will be by private coal haul road in Stage 1 and by overland conveyor during Stage 2. Transport to Liddell Coal Preparation Plant and Hunter Valley Loading Point will be by existing overland conveyor.

The capacities of the overland conveyor, Liddell Coal Preparation Plant and Hunter Valley Loading Point are sufficient to accommodate the output of the proposal.

Two further modules are to be added to Hunter Valley Coal Preparation Plant to provide operational flexibility in producing a range of coals from the two mines to satisfy the many specifications for different types. This augmentation will provide average and maximum capacities of 1350 and 1500 tph respectively.

Extension of the raw and product coal stockpiles and conveyors at Hunter Valley Coal Preparation Plant will also be required.

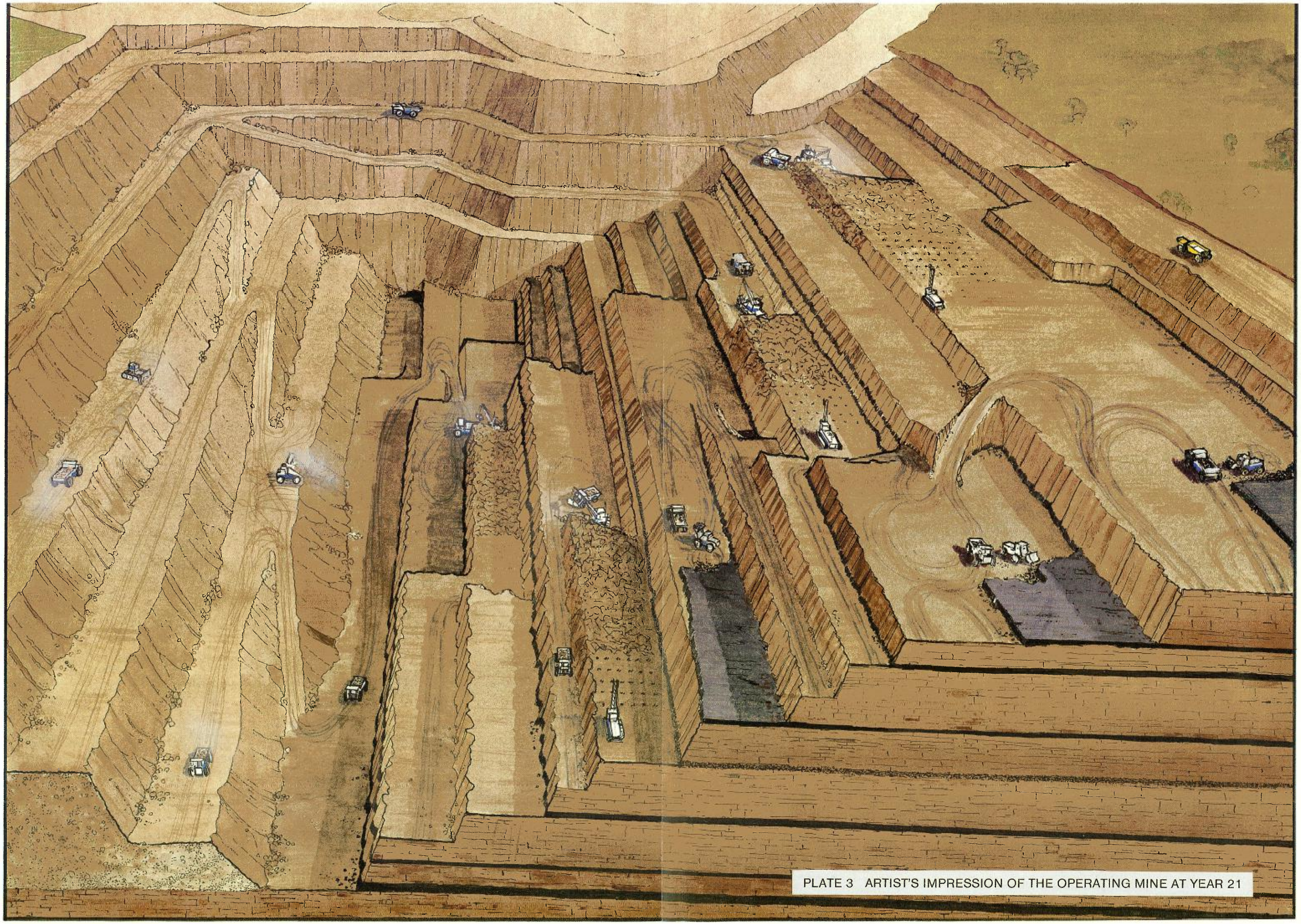


PLATE 3 ARTIST'S IMPRESSION OF THE OPERATING MINE AT YEAR 21

1.3.4 Rejects Disposal

Coarse and fine rejects from Hunter Valley Coal Preparation Plant are currently disposed of in backfilling operations or tailings ponds at Hunter Valley No. 1 Mine. It is proposed that rejects generated by the project will be similarly incorporated in areas allocated for this purpose within the final rehabilitated landform at Hunter Valley No. 1 Mine.

Rejects from Liddell Coal Preparation Plant are currently disposed of in worked out opencut and underground mine areas. It is proposed that rejects generated by this project be disposed of safely in a similar manner.

1.3.5 Surface Facilities

Surface facilities will be established to service Stages 1 and 2 of the project.

The Birnamwood facilities for Stage 1 are to be located in the central eastern section of the Authorisation. The site will be developed with demountable buildings including an office, bath house, workshop and provisions for fuel storage, water treatment and storage, and a sewage treatment plant. The area will be fenced and landscaped. These facilities will be removed in Year 13 to allow for mining.

The Hunter View facilities will be constructed for Stage 2. Buildings and structures on the site will include an administration building, bath house, workshop, fuel storage bay, sewage treatment plant, water treatment and storage facilities, coal dump hoppers, breaker station, conveyors and coal storage bins. The site will be well designed and landscaped.

1.3.6 Services

Access to the site for the Birnamwood Surface Facilities will be from Jerrys Plains Road via the existing Maison Dieu Road easement. Access to Hunter View Surface Facilities will be via a sealed road from Jerrys Plains Road.

The proposal will require two relocations of Jerrys Plains Road and the closure of the section of Maison Dieu Road on Authorisation 13. The two relocations of Jerrys Plains Road are proposed to occur in the initial period of development and by Year 20 respectively.

Access to the Barry property (No. 35 in Figure 14) via Maison Dieu Road will be maintained prior to development at Hobden Pit, after which an alternative route will be established and the Maison Dieu Road closed. Access is proposed from Jerrys Plains Road via the site access road and will then follow a route to the north of Hobden Pit.

Application will be made by the Company to Singleton Shire Council and the Department of Lands for the closure of the section of the Mitchell Line passing through the Authorisation.

Two 66/11 kV transmission lines will also require relocation. The line entering the Authorisation from the east will be placed underground where the route crosses the Warkworth landing ground.

1.4 FURTHER DEVELOPMENTS ON THE SITE

Mine planning for the project will continue throughout its operation. In the light of operational experience and the demand for coals, applications will be prepared for the extraction of the coal resources beyond Year 21.

A pre-requisite for the design of the Hobden Pit was that the development of the mine did not prejudice continued efficient extraction at the completion of 21 years of operations. To this end the Company examined a range of mining concepts to maximise the removal of the remaining coal by extending operations in Hobden Pit. One concept which appears practicable at this time, and is the most favoured both economically and environmentally, is to advance the pit to the limit of economic mining in the southwest and backfill the void with spoil generated in the excavation of a smaller pit opened to extract the coal from the northwestern corner of the Authorisation. This procedure would result in a new post-mining landform which is compatible with the regional topography and drains freely to the north to the Hunter River or to the final void adjacent to the river. It is possible that a void could be utilised as a water storage for future agricultural activities in the areas adjacent to the river.

As it will be over 50 years before the operations are completed on the site, forward planning is only at the conceptual stage, but the options which have been examined indicate that final rehabilitation plans can be developed to leave the site in an environmentally acceptable condition. This Statement addresses these long term plans to the extent of the Company's knowledge and ability at this time.

An area of coal adjacent to the southeastern corner of the Authorisation is constrained from opencut extraction by economic and geological factors. As with the opencut proposals beyond Year 21, the potential for further mining of the lower seams has to be the subject of future detailed investigation. The objective to maximise the economic extraction of coal from the site will remain as a guiding principle.

1.5 SAFEGUARDS AND CONTROLS

The project has been planned with design and operational safeguards aimed at minimising the potential for impact off the site. Specific attention has been given to the location of surface facilities, development of mining and rehabilitation procedures, selection of mining equipment and the application of environmental controls.

An environmental officer employed by the Company will manage the pollution control, rehabilitation and environmental control programmes.

1.5.1 Control of Water Pollution

The guiding principles of the water management programme developed for the project were to eliminate the need for the discharge of saline water and to minimise abstraction from the Hunter River by conservation and re-use of waters generated on the site. The experience in water management at the Hunter Valley No. 1 Mine has been used in designing the facilities and controls for the Hunter Valley No. 2 project.

All minewater generated on-site will be disposed of by in-pit spraying on roads or by use as makeup in the Hunter Valley Coal Preparation Plant. There will be no discharge of minewater from the site.

Runoff from undisturbed areas will, where practicable, be collected in dams for onsite use. Where runoff cannot be contained, diversion channels will direct drainage to natural watercourses without contamination.

Disturbed surface runoff will be collected by table drains and diversion channels and directed to sedimentation dams for settling of suspended solids. Clarified runoff will be used for dust suppression or displaced into natural watercourses

during storms.

Wastewater from vehicle washdown will be treated by an oil and grit arrestor prior to settling in sedimentation dams. Process wastewaters will be passed via oil and grit arrestors to the sewage treatment plant. Treated sewage effluent will be disposed of by spray irrigation in controlled areas.

Collection and re-use of site generated runoff and minewater will minimise the requirement for water to be drawn fom the Hunter River.

Augmentation of Hunter Valley Coal Preparation Plant will require expansion of drainage controls around the proposed stockpile extensions. The existing system of settling dams has been designed to receive the additional flows from the expanded facilities.

Existing controls at Hunter Valley and Liddell Loading Points will be maintained.

1.5.2 Air Quality Controls

Attention is to be given to controlling all dust generating sources to minimise the entrainment of dust from the site. Coal and overburden haulage roads, equipment manoeuvring areas and active overburden dumping areas will be regularly watered to reduce dust emissions.

Disturbed surface areas will be kept to a minimum by limiting pre-stripping ahead of mining and the progressive rehabilitation of areas following overburden emplacement and backfilling. Coal handling facilities, including dump hoppers, conveyors and transfer points will be screened or partially enclosed to minimise dust emissions. Water sprays will be provided at the dump hoppers.

Overburden and coal drilling equipment are to be fitted with dust collection

equipment. Push/pull scrapers will be used to minimise dust generation during pre-stripping.

Existing air quality controls at Hunter Valley Coal Preparation Plant will be applied to the extended facilities. These controls include the sheeting of raw coal conveyors, installation of trays to collect spillage, enclosure and provision of mist sprays at transfer points and the addition of agglomerating agents to raw and washed coal.

Additional controls applied in the facilities' operation include minimising fall height from stackers and the provision of mist sprays on the reclaimers.

1.5.3 Noise and Vibration Controls

Noise levels will be minimised by the fitting of all mobile equipment with exhaust silencers and acoustic panels if required. Blasting practices proposed will limit peak impulsive noise levels to 118 dB(L) and peak particle velocity to less than 7 mm/s at the nearest non-mining company owned residence.

Overburden dumping at night will be limited to selected areas at lower levels or in shielded areas. Dump hoppers, storage bins and the rotary breaker station have been sited to maximise the effects of topographical shielding. Sheeting of transfer points and of the conveyor will limit noise propagation from these sources.

1.5.4 Rehabilitation

The Company will draw on its experience at the Hunter Valley No. 1 Mine to plan the rehabilitation programme. Progressive rehabilitation will be incorporated into the mining operations to provide a stable post-mining landform for the areas completed by Year 21. The final landform configuration will reproduce the

topographical features of adjoining areas and be compatible with the subregional landscape. Landform slopes will range from 4 to 8 degrees with a minimum grade of 1.3 degrees.

The drainage network proposed for the rehabilitated areas will control runoff and minimise erosion potential by replacing or increasing existing drainage densities, limiting overland flow and by minimising channel bed slopes.

Topsoil removed during pre-stripping will be spread over the new shaped and contoured surfaces. Maximum conservation of topsoil will be practiced. Grass species will be planted to establish a rapid cover and shade trees will be introduced at the appropriate time.

Natural vegetation in undisturbed areas will be retained. Revegetation of disturbed areas will aim at providing a density and species diversity of trees superior to the present situation where areas of the site are affected by soil erosion caused by the reduction of vegetation cover.

1.5.5 Landscaping and Visual Safeguards

The sites for surface facilities will be landscaped to minimise visual prominence. Provision of vegetative screens and a forward tree planting programme will further limit visual impact from nearby vantage points. The conveyor and road routes to Hunter Valley Coal Preparation Plant will also be landscaped to reduce their visual intrusion.

Progressive rehabilitation of the overburden emplacement and backfilled pit areas will serve to reduce as far as is practicable the visual impact of the operations. The Company is prepared to discuss with owners the provision of additional tree and shrub plantings at private residences to further minimise any visual impacts of the proposal.

1.5.6 Socio-Economic Provisions

The Company participates in Singleton Shire Council's Land Pre-purchase Scheme to satisfy the requirement for the provision of housing land. Discussions are being held with the Council and the State Government regarding contributions in accordance with the State Government Infrastructure Contribution Policy.

1.5.7 Monitoring

Monitoring of air, water, noise and visual safeguards will be undertaken during operations to ensure their effectiveness. Results will be used in the development of effective and practical environmental controls as well as assessing the effectiveness of these controls.

1.6 THE POTENTIAL IMPACT OF THE PROPOSAL

The environmental investigations were integrated with the mine planning and financial analyses for the project. The impacts identified have been systematically minimised by the incorporation of design and operational safeguards. The potential impact of the proposal is analysed in Section 5 of this Statement and reviewed in Section 6 in terms of the alternatives available to the Company to reduce the effects further. The benefits and residual impacts of the proposal have been assessed to be as follows.

Topography

The project will change the topography of Authorisation 13 by creating a new central ridgeline elevating the surface to a maximum RL of about 155 m, some 80 m above the existing surface. By Year 21, the eastern aspects of the new landform will be completed and rehabilitated whilst mining operations will still occupy

the central section. The rehabilitated areas will represent the slope and proportions of the new landform at the end of mining on the site.

The new landform has been designed to be compatible with the topography in the surrounding areas and the subregional landscape and be functionally suitable for grazing as a post-mining use. The change in the topography will not result in an impact detrimental to the continued effective use of the site.

Drainage

The drainage system proposed for the new landform has been designed to link with existing watercourses and flow patterns off the site. Runoff will flow to the Hunter River and Wollombi Brook in similar proportions to the present. Only minor variations in the runoff to subcatchments of these streams will occur. Controls will be incorporated to combat soil erosion on the rehabilitated areas and there will be no related deposition or erosion in the surrounding drainage network.

Soils

Pre-stripping, stockpiling and application of topsoil to rehabilitated areas will conserve the soil resource of the Authorisation.

Approximately 90 per cent of the soil requirements of the project will be fulfilled by this procedure. Future investigations will be directed at using selected overburden spoils as a topdressing to satisfy any deficit. Trials conducted at Hunter Valley No. 1 Mine have shown this method to be feasible.

Water Resources

Maximum practical conservation of surface waters will be practised.

Site water balance predictions indicate a maximum reduction of average and median flows in the Hunter River of 0.18 and 0.9 per cent respectively. These changes will not be significant and the project will have minimal impact on the water supply available to downstream users.

Changes to the groundwater regime during mining will have no adverse impact on users in the area.

Water Quality

The use of minewaters as a dust suppressant in the pits or as makeup for coal preparation will result in no saline waters being discharged from the site. All process waters and disturbed surface runoff will be treated by on-site sedimentation dams prior to discharge. Process waters will be first treated by grit and oil arrestors where appropriate.

The project will have no prejudicial impact on water quality in terms of suspended solids or salinity.

Air Quality

Dust emitted from the project under average wind conditions will not contribute to significant reductions in air quality during Stage 1 and only to minor levels of impact well below accepted standards in Stage 2. There will be a potential for limited and temporary reductions in air quality at neighbouring residences as a consequence of episodic high wind events in Stage 2.

Cumulative dust deposition predictions from all existing and possible mining operations in the subregion indicate that no additional dust will be deposited in areas to the northwest of the site by mines other than Hunter Valley No. 2. Increases in cumulative deposition levels in areas to the north and southeast

including Warkworth village will largely result from the operations of other closer mines, the contribution due to this project being negligible.

Noise Climate

Based upon current guidelines for the assessment of acceptable noise amenity, it has been predicted that nuisance noise levels may occur at three residences not owned by mining companies. The Company is currently negotiating the purchase or relocation of two of these residences. Should the negotiations prove unsuccessful the Company is prepared to provide alternative safeguards at these residences to reduce the extent of noise impacts. The remaining residence is likely to receive noise levels originating at other adjacent mining operations prior to and in excess of those predicted for the Hunter Valley No. 2 proposal.

Visual Impact

There will be an unavoidable visual impact during the mining operations. Approximately 12 residences or groups of residences will have the potential to view the operations. Of these, 11 residences will have prominent views.

The lighting of the operations and facilities, the lights from haulage vehicles on site roads and glows in the sky at night will also be visible at many residences.

Distant filtered views to the site will be available from vantage points on the eastern and southeastern extremities of Wollemi National Park.

Progressive rehabilitation of the disturbed areas will reduce the extent of the impact, particularly from the eastern approaches, but the scale of the project and its elevation will preclude an effective reduction in the visual impact from many vantage points. The Company is prepared to discuss the provision of

vegetative screens at residences.

It is expected that the visual impact of the rehabilitated landform after the completion of mining will be minor as the new feature, although visually prominent, will conform with the surrounding landscape.

Flora and Fauna

There will be an unavoidable impact on the flora and fauna of the Authorisation due to the stripping of vegetation and the loss of wildlife habitat. The impact is partly mitigated by the relatively limited areas of ecological value to be lost and the close proximity of the more extensive and valuable areas to be protected and retained in the south and west.

Proposals to re-establish tree stands in rehabilitated areas will be effective in returning habitat suitable for some avian species in the longer term.

Land Use

It is currently the intention to return the site to its existing grazing use after mining. Grazing and cropping activities on extensive farming areas to the north, northwest and northeast of the Authorisation will not be affected by the project.

Although the proposal has the potential to contribute to increased levels of dust concentration in the atmosphere and deposition levels due to episodic high wind events it is considered that such levels will not necessarily result in sediment contamination of milk at adjacent dairies. Milk contamination occurs frequently without mining and a number of factors are recognised as contributing causes.

Noise or vibrations due to blasting will be kept to levels permitted at the Hunter Valley No. 1 Mine and should not affect land use activities.

The area of mining in the southeastern corner of the Authorisation will be limited, as will the levels to which overburden is placed, to eliminate conflict with the current commercial and recreational operations of the Warkworth Landing Ground.

Agreement has been reached with the Pastures Protection Board regarding the exchange of land to compensate for the existing travelling stock reserve being required for mining operations. An area of land in the central western portion of the Authorisation adjacent to Jerrys Plains Road is proposed to replace the existing facility.

Residents

The potential exists for a temporary loss of residential amenity and convenience at some residences as a result of predicted increases in dust deposition during high wind episodes. No significant permanent impacts on amenity are likely to occur due to increased dust levels for most of the time under average conditions.

Residential amenity may also be reduced at three residences due to increases in noise levels. As detailed previously the willingness of the Company to purchase, relocate or provide safeguards at two of these residences is expected to result in these impacts being satisfactorily resolved. As the remaining residence is predicted to receive significantly greater impacts due to other mining operations it is anticipated the significance of the levels contributed by this proposal will be minor.

Some residents may be affected by the visual intrusion of the project. This impact will be unavoidable, however the Company will discuss planting vegetation

screens at the residences of concerned persons.

Predicted increases in noise and dust levels due to the cumulative effects of a number of mining operations are likely to result in an impact on residential amenity in Warkworth village. The contribution of the Hunter Valley No. 2 project to dust impacts is expected to be negligible.

Economic Impacts

The proposal will have important implications for the economic and social structure of the subregion.

Capital expenditure of about $200M will occur during the development of the project. Annual operating expenditure during Stage 2 (excluding wages and salaries) will amount to $46M. These expenditures will result in further significant indirect and induced growth in regional output value.

Annual wages and salaries payments of $19.4M will be generated by Stage 2 of the proposal. A further $13.8M in annual indirect and induced income payments is estimated to be generated by the proposal.

Public sector revenues of approximately $50M annually may accrue to all levels of government at maximum production levels.

Employment and Population

An average of 539 employment positions will be provided during Stage 2 operations. These positions will result in an increase in the number of employment opportunities available in the subregion and will also provide alternative employment for existing Company employees at Hunter Valley No. 1 Mine who could otherwise become progressively redundant from 1990 as coal reserves are

exhausted.

The provision of alternative employment for Hunter Valley No. 1 employees is estimated to preserve approximately 517 indirect and induced positions.

The population growth resulting from the project will be limited due to the proposal to plan the development of the new mine with the availability of employees from the Hunter Valley No. 1 operation. Total growth is estimated to be 224 persons. About 80 per cent of these will elect to reside in Singleton Shire.

The proposal will contribute to the stability of the existing population by providing alternative employment for 380 employees. Approximately 1250 residents are estimated to be directly dependent upon these positions with a further 1720 residents dependent on the indirect and induced employment positions.

Accommodation and Housing

Construction employee accommodation will be provided at the existing facilities established adjacent to the Hunter Valley No. 1 Mine site.

Adequate levels of accommodation and housing for operational employees will be provided through the Company's participation in Singleton Shire Council's land pre-purchase scheme. The proposal is not considered likely to result in significant pressure on the availability and cost of accommodation.

Community Services

Limited growth in demand for community services will result from the proposal. Discussions are being held with the State Government and Singleton Shire Council

regarding the maintenance of appropriate services.

1.7 CONCLUSION

This Environmental Impact Statement has been prepared to assess the impact of the proposal to establish the Hunter Valley No. 2 Mine.

The investigations have identified the potential for an impact on some residents living in proximity to the project due to increases in dust deposition at times of high wind events. The impact could result in limited and temporary reductions in amenity and inconvenience.

A visual impact due to the project will be unavoidable.

Residents will not be affected by reductions in the quantity and quality of ground or surface waters.

The effect of noise will be minor due to the proposed relocation of one house and the significantly greater impact from other mining operations on another potentially affected residence. An offer to purchase the third has been made and if unsuccessful the Company will provide additional safeguards at this residence.

The village of Warkworth is located adjacent to a number of existing and proposed mines. As a consequence cumulative noise and dust increases are inevitable.

The expansions proposed at the Hunter Valley Coal Preparation Plant, as a consequence of the Hunter Valley No. 2 proposal, will have no significant impact on air, water and noise pollution levels and hence on neighbouring residents. The changes on the Hunter Valley No. 1 site will not be viewed, with the exception

of the rehabilitated landform in the mining area which will be improved in shape and slope by the incorporation of rejects as additional fill.

The project will be beneficial for employment in the Singleton Shire and ensure the contoration of rejects as additional fill.

The project will be beneficial for employment in the Singleton Shire and ensure the contnor implications for local services and facilities. The potential for any socio-economic problems will be avoided by discussions among the Company, Singleton Shire Council and the relevant State Government departments.

A review of alternatives for the project indicated that the constraints imposed by the subsurface geology and the extent of the coal resource were best accommodated by the mining methods and surface layouts proposed in this Statement. The potential for environmental impact was not reduced by changes from the details proposed.

In view of the fact that the proposal will maximise recovery of coal from a valuable resource with a minimal impact, the Company believes that it is justified in seeking approval for its proposal.

INTRODUCTION

SECTION 2

2.1 THE COMPANY'S PROPOSAL

This Environmental Impact Statement has been prepared for Coal & Allied Operations Pty. Limited by Croft & Associates Pty. Limited to determine the effects on the environment of establishing an opencut coal mine in Warkworth in the Upper Hunter Valley in New South Wales as shown in Figure 1. The mine is to be known as the Hunter Valley No. 2 Mine.

The Statement has been prepared in accordance with the requirements of the Environmental Planning & Assessment Act 1979 and Regulation 1980. Section 101 of the Act provides for the project to be determined by the Minister for Planning & Environment.

The Company and its consultants are satisfied to the best of their knowledge that the Statement is a factual representation of the proposal and the environment which it affects. On the basis of the low level of potential impact which has been identified, the Company now respectfully requests the Minister to assess its proposal for approval.

Applications are submitted concurrently with this Statement to the Department of Mineral Resources for a Mining Lease, to Singleton Shire Council for Development Consent, to the State Pollution Control Commission for approvals under the Air, Water and Noise Control Acts and to other State and Commonwealth Authorities for approvals within the areas of their responsibilities.

The proposed mine is to be established on Authorisation 13 which was awarded to the Company to explore and prove the coal resources for extraction. Geological, mine planning, economic feasibility and environmental studies have shown a viable project can be conducted to produce coals to satisfy specifications for a wide range of markets.

The proposal seeks approval to develop the mine to a production rate of the order of 4.5 Mtpa over 21 years. This statement details the design and operational safeguards proposed for the protection of the environment during that period. The coal reserves of about 380 Mt proved on the Authorisation will be of sufficient magnitude to enable mining to extend to about 50 years. Because of the uncertainties in the long term, mine planning and its environmental implications have been considered in concept only for the period beyond 21 years.

Coal from the proposed Hunter Valley No. 2 Mine is to be handled with the production from the Company's existing Hunter Valley No. 1 Mine and Liddell Colliery to the north. The three mining operations and their associated surface coal handling and transportation facilities have been planned with maximum flexibility and will operate as an integrated coal producing and handling complex. The existing arrangement for rail haulage will be used to move product coal to the Port of Newcastle for shipment to destinations overseas.

The Company's proposals for environmental protection for Hunter Valley No. 2 Mine incorporate safeguards of a similar high standard to those that have been found effective at the Hunter Valley No. 1 opencut operation. The experience gained under operating conditions on that site has been utilised fully in developing the environmental management programme proposed in this Statement. The Company is confident that the new mine can be operated with the low level of impact predicted.

Coal & Allied Operations Pty. Limited will be pleased to discuss the project with all authorities and interested persons.

2.2 THE COMPANY

Coal & Allied Industries Limited is one of Australia's largest producers and

exporters of black coal. The Company is incorporated in the Australian Capital Territory with an authorised capital of $100 million and an issued capital of $32.5 million.

The Group is almost wholly Australian owned and its diversified interests include coal mining, coal preparation, engineering, shipping, and road and rail transport. The major shareholder, Howard Smith Limited owns 50 per cent of the shares in Coal & Allied Industries Limited.

The Company mines and markets a wide variety of coals for steel production, power generation, cement manufacture and gas making for Australian industries and utilities and for export markets throughout the world.

Coal production and marketing functions are carried out by a wholly owned subsidiary, Coal & Allied Operations Pty. Limited. This Company operates seven underground mines within an approximate radius of 100 km of Newcastle. These are Aberdare North, Chain Valley, Liddell, Moonee, Stockrington No. 2, Wallarah and West Wallsend No. 2. A large modern opencut operation has been conducted at Hunter Valley No. 1 in the Lemington area since June 1979.
Coal preparation plants are operated at Wallarah, Hexham, Neath, Liddell and Lemington (Hunter Valley Coal Preparation Plant).

The Company owns and operates stockpile and unit train loading facilities at Hexham near Newcastle and at Liddell (Liddell and Hunter Valley Loading Points). Company owned shiploading facilities are operated at Balls Head, Sydney, Catherine Hill Bay south of Newcastle and at Hexham. In addition, Coal & Allied holds a 12.5 per cent interest in the Port Waratah Coal Services Ltd. coal stockpiling and shiploading facility. Howard Smith Limited holds a 12.5 per cent interest in the recently commissioned Kooragang coal handling facilities.

2.3 LAND INVOLVED IN THE PROPOSAL

Authorisation 13 is shown in Figure 2. The area lies to the south of the Hunter River and its floodplain and occupies approximately 1590 ha.

The various property owners are shown on the figure. The Company has freehold ownership of all of the Authorisation except for some 90 ha in the northwestern corner owned by the Skinner family, 80 ha in the northeast, 50 ha of which is owned by the Barry family and the remainder by Buchanan Borehole Collieries, and approximately 10 ha in the southeastern corner owned by Buchanan Borehole Collieries.

Offers to purchase have been made to the Barry family and to the Skinner family for part of their land. The Barry family have declined to sell at the present time and the Company's offer will remain current.

Components of the project not on the Authorisation will be established on Company owned land. The coal haulage road and overland conveyor will traverse rural lands and the Hunter Valley No. 1 Mine Lease area.

2.4 BACKGROUND TO THE PROPOSAL

In 1974, following State and Commonwealth Governmental decisions to intensify the development of the Singleton Coal Measures, the Company was granted an Authority to Prospect in Authorisation 13 in the Warkworth Area. The results of the exploration showed the principal economic coal seams to extend to the north of the Hunter River and in 1976 the exploration area was extended by Authorisation 75.

The Company conducted a detailed exploratory drilling programme and proved the

coal resources to be continuous and extensive under both Authorisations, including the floodplain of the Hunter River.

In late 1977 and early 1978, the New South Wales Government considered arrangements for the allocation of mining areas to the Company and resolved to award the two separate areas to the north and south of the River respectively shown in Figure 3.

The names granted to the two areas were Hunter Valley No. 1 and Hunter Valley No. 2 respectively.

Hunter Valley No. 1 site was the first to be developed. In June 1979 coal mining commenced at the rate of 1.5 Million ROM tpa and has increased to the current level of about 3.75 Million ROM tpa with approvals for a maximum of 6 Million ROM tpa.

Investigations continued at the Hunter Valley No. 2 site to determine the extent of recoverable resources and mine planning studies culminated in the proposal presented in this Statement.

2.5 EXISTING OPERATIONS

Figure 3 shows the components of the Company's Upper Hunter Valley mining complex in operation at the present time.

Hunter Valley No. 1 Mine

The Company has mined coal at the Hunter Valley No. 1 Mine in a hydraulic shovel and truck operation since 1979. Figure 4 shows the layout of the site. Aerial views of the mine looking west and south are presented in Plates 4 and 5 respectively.

The mine was initially developed to produce 1.5 Million ROM tpa and is currently operating at 3.75 Million ROM tpa. Coal is extracted from the Mount Arthur, Piercefield and Vaux Seams by front-end loaders and transported by bottom dump haulers to the Hunter Valley Coal Preparation Plant north of the site. The coal is either washed at the preparation plant or transported via the overland conveyor to Liddell Coal Preparation Plant. Steaming coal is generally produced at the Hunter Valley Coal Preparation Plant and coking coal at Liddell.

Hunter Valley Coal Preparation Plant

The Hunter Valley Coal Preparation Plant is located on the Hunter Valley Extended Colliery Holding as shown in Figure 4. The plant and associates stockpile layout is shown in Plate 6.

Run-of-mine coal is received and stacked in raw coal stockpiles prior to beneficiation or transfer to Liddell Coal Preparation Plant. Two 80,000 tonne raw coal stockpiles and one 73,000 tonne capacity washed coal stockpile are provided. A minimum of five days production is stored to maintain plant feed.

A single boom portal scraper reclaimer of 1250 tph capacity is used on each of the three major stockpiles.

The preparation plant contains four identical modules, each consisting of dense medium cyclones and water washing cyclones. Each module has a nominal capacity of 225 tph raw coal, providing a total capacity of 900 tph.

Washed coal from the plant is conveyed directly by the overland conveyor to Hunter Valley Loading Point, or alternatively, if the conveyor is being used for the transfer of raw coal, the washed product is stacked out onto the clean coal stockpile.

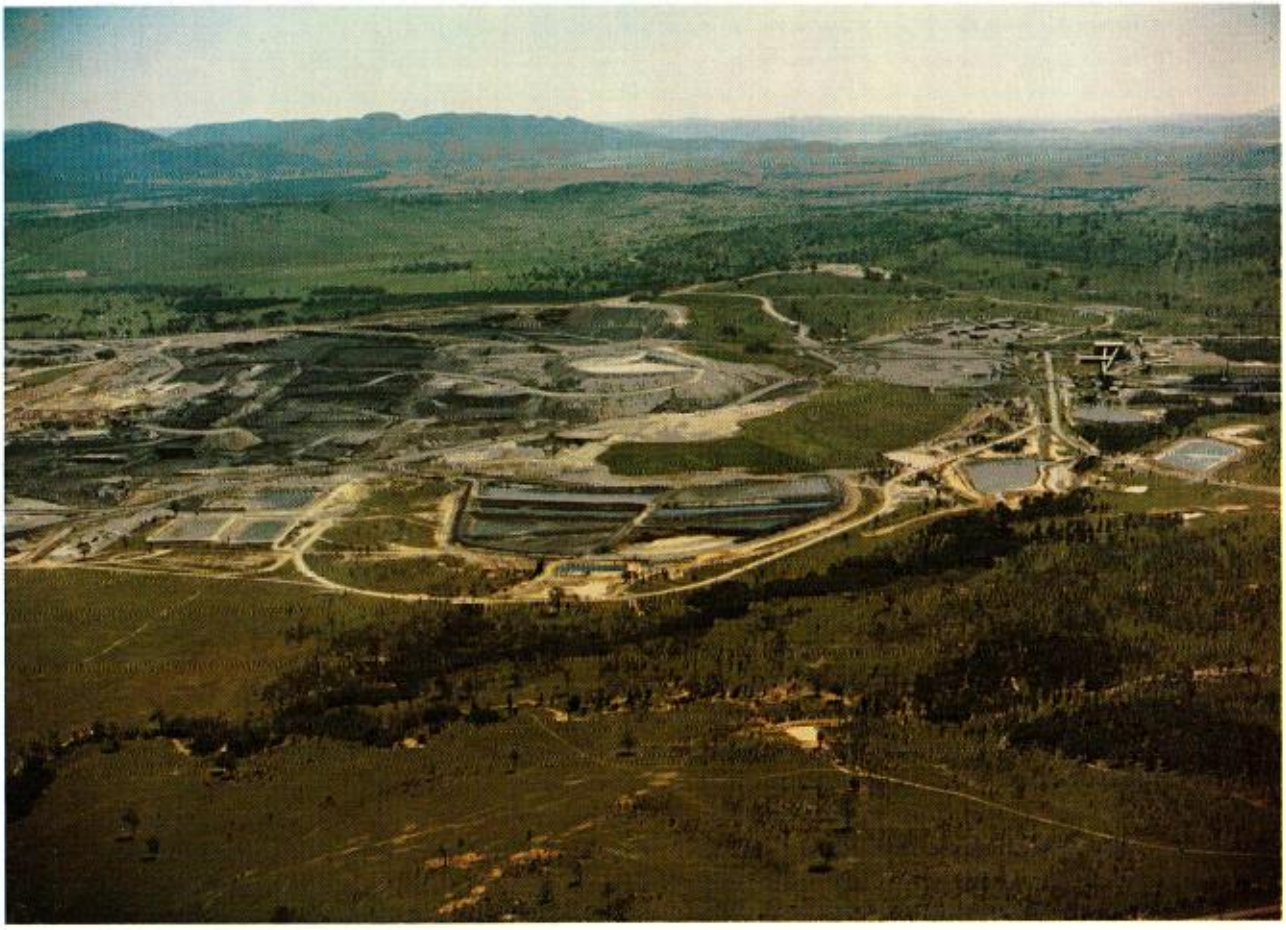


PLATE 4 HUNTER VALLEY NO. 1 MINE AND
HUNTER VALLEY COAL PREPARATION LOOKING WEST

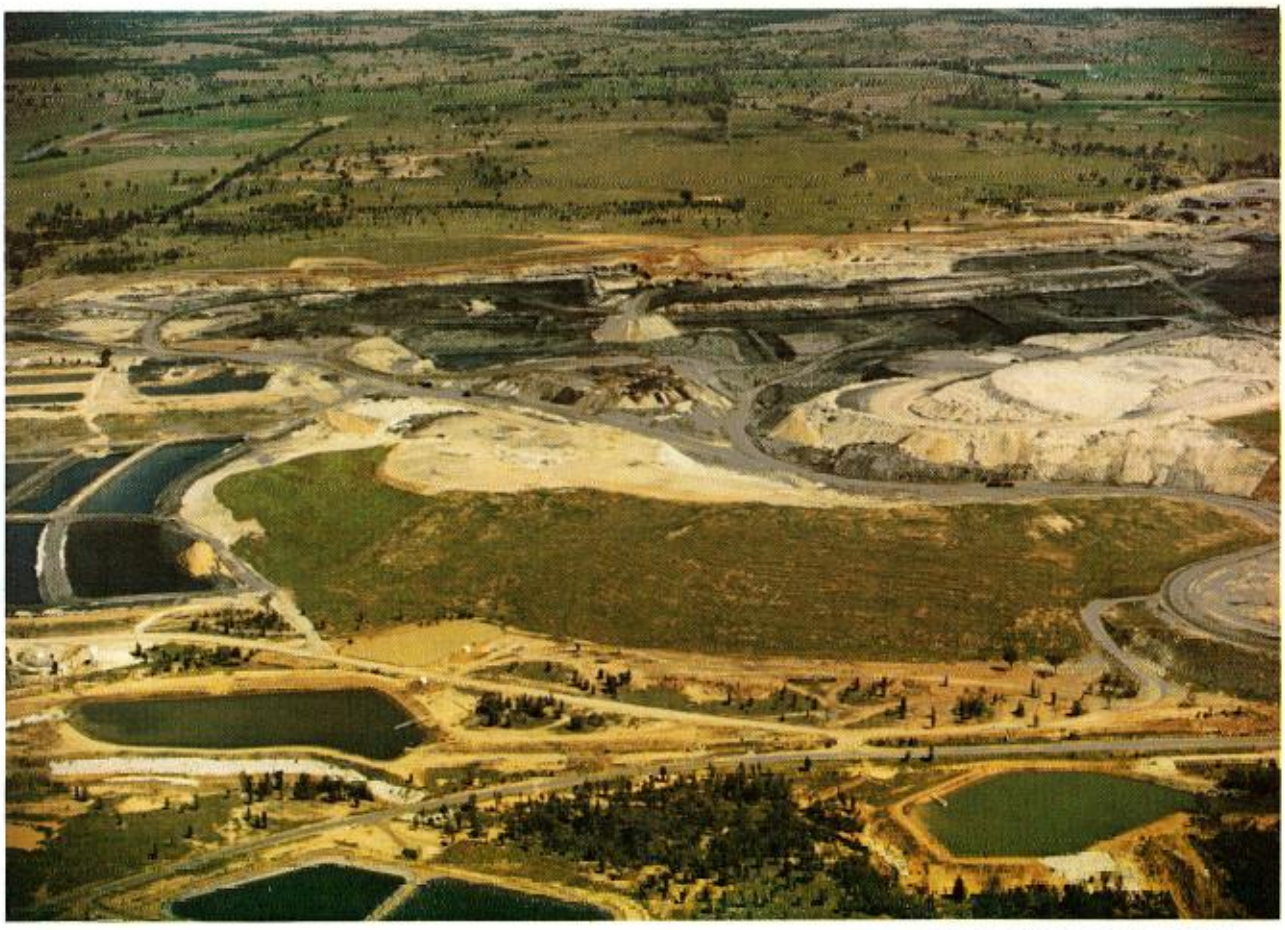


PLATE 5 HUNTER VALLEY NO. 1 MINE LOOKING SOUTH

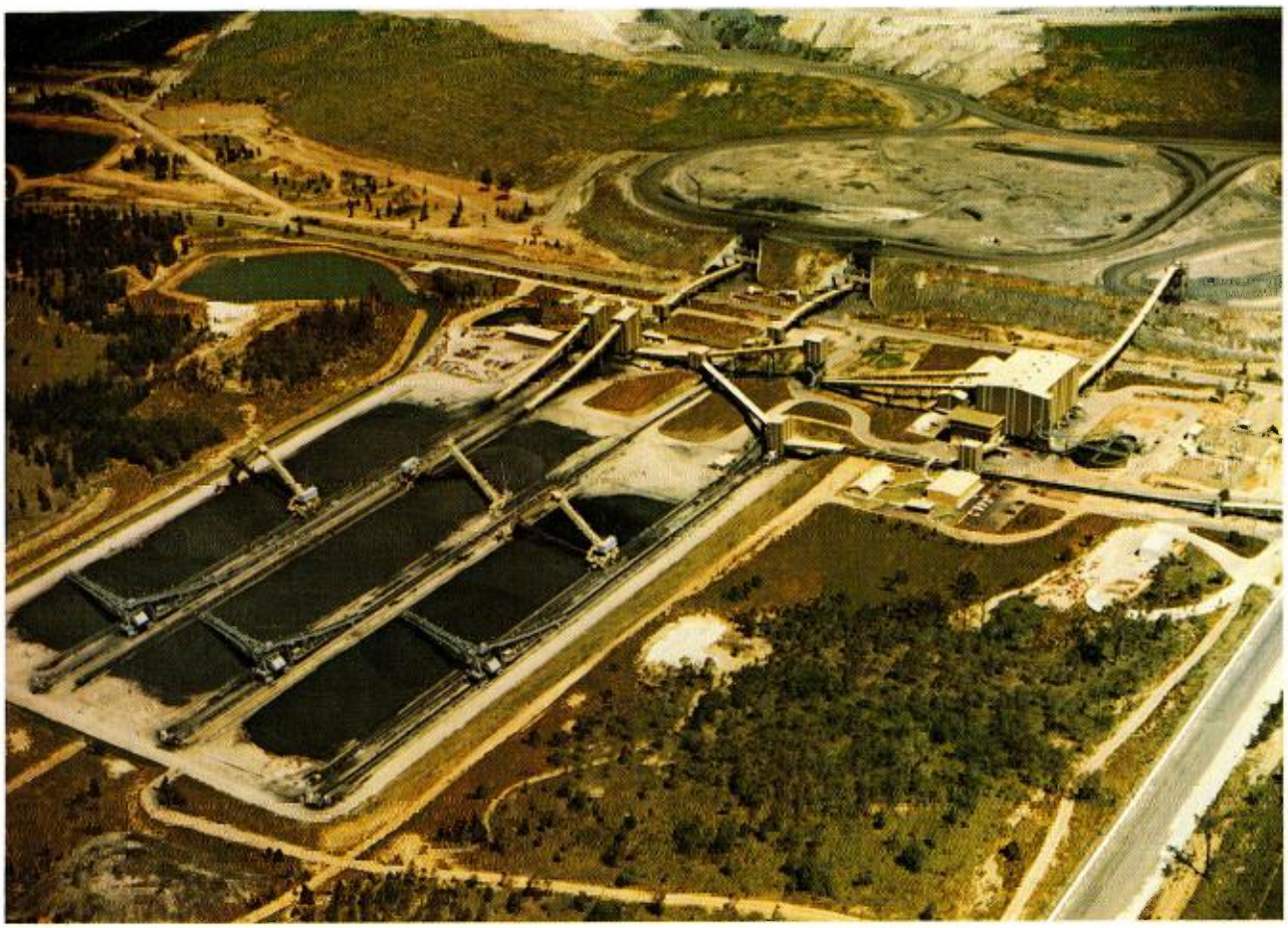


PLATE 6 HUNTER VALLEY COAL PREPARATION PLANT

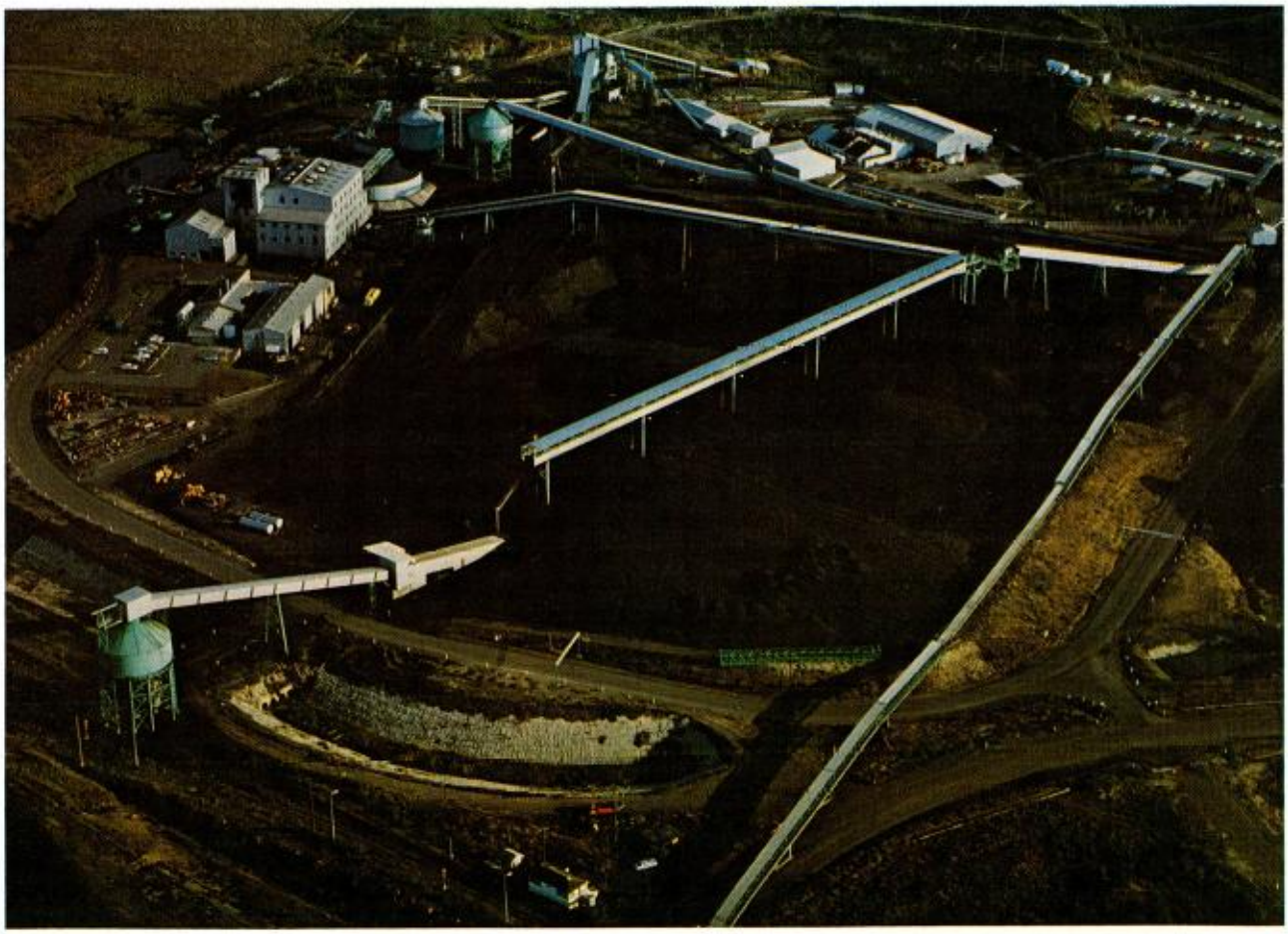


PLATE 7 LIDDELL COAL PREPARATION PLANT

Coarse reject from the washing plant is conveyed to a 500 tonne bin where it can be loaded into rear dump trucks for placement with the overburden at Hunter Valley No. 1 Mine. Tailings from the plant are pumped to settling ponds from which reclaimed water is returned to the plant.

Overland Conveyor

A 7.4 km, 2000 tph overland conveyor commencing at Hunter Valley Coal Preparation Plant is used to transport raw coking coal to Liddell Coal Preparation Plant and washed steaming product to Hunter Valley Loading Point.

The conveyor which is a cable belt design terminates at a 500t bin where samples are taken prior to feeding to Hunter Valley Loading Point. Raw coal can be diverted to Liddell Coal Preparation Plant just prior to the bin.

Liddell Colliery

The Company has operated this underground mine at Liddell since 1958. Coal is produced by continuous miner units working on four shifts daily. Approximately 1,300,000 ROM tonne of coking grade coal are produced annually and conveyed to the Liddell Coal Preparation Plant adjacent to the site.

Liddell Coal Preparation Plant

The Liddell Coal Preparation Plant is shown in Figure 5 and Plate 7. The plant has the capacity to wash approximately 10,000 tonne of ROM coal daily. It handles the output from Liddell Colliery as well as production from the Hunter Valley No. 1 Mine.

The plant is equipped with a dense medium drum, two dense medium cyclones and froth flotation facilities. Washed product is stacked out using an overhead

conveyor to a 1750t rail loading bin, or to a product stockpile.

Currently coarse rejects are being disposed of at the Company's worked out Durham North opencut. Fine refuse is pumped as a slurry into depillared sections of the Liddell Colliery workings, or into dams constructed from coarse reject within the Durham North Open Cut.

Liddell Loading Point

A rail loop adjacent to the Liddell Coal Preparation Plant and connecting with the Main Northern Railway is provided for product transport. Coal from Liddell Coal Preparation Plant is loaded into unit trains via a 1750t rail loading bin.

Hunter Valley Loading Point

The Hunter Valley Loading Point is located on a spur of the Main Northern Railway servicing the Liddell Balloon loop as shown in Figure 6. The facility handles coal products from Hunter Valley Coal Preparation Plant.

The site incorporates two stockpiles and a train load out facility. Each stockpile has a capacity of 200,000 t fed by a single stacker. Two twin boom portal scraper reclaimers with a nominal capacity of 2000 tph are used to recover coal from the two stockpiles.

An 800 tonne capacity rail load out bin is situated over the rail lines. This bin has twin outlets and can load trains either entering or leaving the rail loop.

2.6 OBJECTIVES OF THE PROPOSAL

The proposals for the Hunter Valley No. 2 Mine represent the latest stage in the

development of the Company's integrated coal mining complex.

The project is to be conducted in two stages. Stage 1 will develop two small opencuts known as the Redbank and Redbank North Pits to produce approximately 1 Mtpa ROM coal production over 7 years. Stage 2 will commence in Year 7 with coal extraction from the main opencut, called Hobden Pit. Production will be expanded progressively to about 4.5 Mtpa. The first opencuts will be phased out in about 7 years, the main pit will continue until the end of the life of the mining operations on the site.

It is proposed that the raw coal will be initially transported to the north by road and subsequently by overland conveyor on Company owned land to receival and storage areas adjacent to the Hunter Valley Coal Preparation Plant.

Coal will be prepared at the Hunter Valley Coal Preparation Plant, which is to be expanded to treat coals from the Hunter Valley No. 2 site, and at the existing coal preparation facilities at Liddell.

The existing conveyor will be used to move raw coal to Liddell for preparation and then transfer to rail, and product coal to the Hunter Valley Loading Point. The existing rail loading facilities have adequate capacity to accommodate all coal production. The ongoing growth in port capacity, coupled with the programme to provide additional railway rolling stock will ensure output from Hunter Valley No. 2 Mine will be moved efficiently to export markets.

The Company's proposal is to increase production from the Hunter Valley No. 2 Mine as mining at Hunter Valley No. 1 exhausts the coal resource. The staging of the project will enable this objective to be achieved.

2.7 CURRENT LICENCES AND APPROVALS

The existing facilities have been developed in accordance with various consents and are operating under the conditions imposed in licences and approvals.

Hunter Valley No. 1 Mine, Hunter Valley Coal Preparation Plant and Overland Conveyor

Under the conditions of the Licence issued under the Clean Waters Act (1970), the Company is required to:-

* Limit effluent discharge to 2 Ml/d and to ensure that effluent contains no more than 50 mg/l non-filterable residue.
* Discharge only when the total filterable residue (TFR) in the Hunter River at Farrells Creek does not exceed 500 mg/l.
* Ensure that discharges do not raise the TFR in the Hunter River to greater than 500 mg/l nor cause the river TFR to increase by more than 25 mg/l.
* Ensure effluent pH must not be less than 6.5 nor more than 8.5.
* Monitor all discharges for both volume and quality.

These conditions relate primarily to effluent from minewater treatment dams and aim to control increases in salt and suspended solids levels in the Hunter River.

A Licence was issued under the Clean Air Act (1961). The conditions of the Licence are:-

* That unsealed roads and unvegetated areas shall be maintained damp to prevent wind blown dust.
* That all dust control equipment be maintained in good condition.
* That dust collected from drill rig emission control equipment be disposed of in the opencut.
* That stripping of vegetation and topsoil shall precede mining operations by not more than 200 m.
* That sealed areas be maintained in a clean condition.
* That dust fallout levels be monitored.

Conditions relating to dust control were also imposed on the expansion of the mine and the construction of the Hunter Valley Coal Preparation Plant. These include sheeting of conveyors, enclosure of transfer points and bins, mist sprays on bins and breakers and that a dust suppression system be included on all stockpiles.

Approval was granted under the Noise Control Act (1975) subject to the following conditions:-

* That blasting may only be carried out between 7 a.m. and 7 p.m. Monday to Friday.
* Noise from blasting shall not exceed a sound pressure level of 85 dB(A) or 118 dB(L) nor generate ground vibration levels exceeding 7 mm/s in or on any residential premises not under the Company's ownership.
* A sound pressure level of 80 dB(A) shall not be exceeded at any point more than 20 m from the coal preparation plant.

Hunter Valley Loading Point

This facility has approval under the Clean Waters Act (1970) but as there is no discharge of wastewaters a Licence was not required.

Conditions of the Licence issued under the Clean Air Act (1961) are that:

* Any coal spillages will be cleaned up daily or more frequently if required.
* That the coal stockpile surface be wet before coal is reclaimed from the area.
* The stacker be operated in a manner to minimise the free fall height of coal.
* That mobile vehicles not be permitted to operate on coal stockpile areas without consent of the SPCC.
* That control equipment be well maintained.

Approvals under the Noise Control Act specify noise levels for equipment so that noise levels 5 m beyond the property do not exceed 55 dB(A). In addition noise shall be substantially free of tonal, impulsive or other annoying

characteristics.

Liddell Coal Preparation Plant and Liddell Colliery

The plant is subject to conditions similar to those imposed on Hunter Valley No. 1 Mine and Hunter Valley Coal Preparation Plant.

The Company is operating its facilities in accordance with the various approval and licence conditions and to the satisfaction of the relevant authorities.

2.8 NEIGHBOURING COAL PROPERTIES

Existing and proposed coal mining development in the Upper Hunter Valley including the operations close to Authorisation 13 are shown in Figure 7.

2.9 ORGANISATION OF THE IMPACT STATEMENT

The Environmental Impact Statement for the Hunter Valley No. 2 project is presented in three volumes:

VOLUME 1 - This volume presents a description of the Company's proposal and its environmental implications. The sections in the volume are:

Section 1 : Summary and Overview

Section 2 : Introduction
The scope and objectives of the proposal and an introduction to Coal & Allied Industries Pty. Limited are presented.

Section 3 : Existing Environment
This section draws on studies detailed in Volume 2 and presents summaries of the important features of the

environment potentially affecting the development and operation of the project.

Section 4 : Description of the Proposal
This section presents a detailed description of the Company's project. Summaries are provided of the design and operational safeguards to minimise pollution and management programmes to protect the environment; the details of these provisions are supplied in the studies in Volume 2.

Section 5 : Impact Assessment
An analysis is presented of the residual impact of the fully safeguarded proposal and leads to the conclusions presented in the Summary and Overview at the beginning of the Statement.

Section 6 : Alternatives Considered by the Proponent
This section summarises the options and alternatives considered in the development of the project.

VOLUME 2 - The volume contains the following 16 detailed studies which are the principal references for Volume 1.

Study 1 : Geology and Exploration, Drainage and Climate.

Study 2 : Properties of Soils and Overburden.

Study 3 : Botany, Wildlife and Ecological Studies.

Study 4 : Archaeological Investigations.

Study 5 : Expansion of Facilities at Hunter Valley Coal Preparation Plant.

Study 6 : Rejects Disposal at the Hunter Valley No. 1 Mine.

Study 7 : Proposed Changes to the Rehabilitation Programme at Hunter Valley No. 1 Mine.

Study 8 : Water Management.

Study 9 : Dust Controls and Dispersion.

Study 10 : Noise Climate.

Study 11 : Study of the Visual Aspects, Landscaping and Rehabilitation.

Study 12 : Results of Pollution Monitoring.

Study 13 : Land Use and Settlement Patterns.

Study 14 : Economic, Sociological and Planning Implications for the Region.

Study 15 : Transportation Study

Study 16 : Energy Statement.

VOLUME 3 - Presents the figures issued to illustrate the text in Volumes 1 and 2.

In preparing the Statement, the objective has been to avoid repetition and to contain the length of Volume 1 by providing details and supporting information in Volume 2.

2.10 AUTHORITIES AND INDIVIDUALS CONSULTED

The Company has consulted with the following authorities during its investigations and in the course of the preparation of the Environmental Impact Statement:-

Singleton Shire Council

Council has been kept informed of the Company's proposal. The general implications of the project have been discussed with elected representatives and council officers.

Specific discussions relating to the relocation of roads in relation to the

proposal and to infrastructure requirements are being held.

The Development Application for the project will be lodged with Council.

Department of Mineral Resources

The Company has maintained discussions with the Department on matters relating to the processes of award of a Mining Lease, and have agreement on the geological interpretations and mine planning.

Department of Environment & Planning

The Department has been consulted in accordance with the requirements of the Environmental Planning & Assessment Act (1979) and Regulation (1980) and the Draft EIS reviewed and commented upon.

State Pollution Control Commission

The requirements of the Commission have been sought in relation to air, water and noise pollution investigations and the design of safeguards.

Soil Conservation Service

The Service's advice has been sought on the aspects of land capability, land management and rehabilitation.

Shortland County Council/Electricity Commission

The Company has advised the Council of its plans and discussed provisions for power supply to the mine and relocation of transmission lines. Significant monies have been paid towards capital costs of future power supply.

Denman and Singleton Pastures Protection Board

The relocation of the travelling stock route on the mining area has been finalised.

Department of Main Roads

Discussions relating to the relocation of roads crossing Authorisation 13 have been held.

In addition discussions have been held with representatives of the Department of Agriculture, Water Resources Commission and the Department of Aviation.

Local Residents

Local residents and land users in proximity to the proposed development have been acquainted with the Company's proposals.

2.11 STUDY TEAM

The members of the study team for the project were:-

Croft & Associates Pty. Limited -

J.B. Croft, B.E., Ph.D. (N.S.W.)	Principal-in-Charge and Project Co-ordinator.
P. Ray, B.E.(Swin.Vic.),MIE Aust.	Co-ordinator Engineering Studies.
J. Wiggers, B.A. (Ncle), Dip.Ed.	Socio-economic and planning aspects.
A. Martin, B.Sc. (U.N.E.)	Flora and Fauna Aspects, Land use.
K.W. Perry, B.Sc.(N.S.W.), B.Arch. (Hons.) (W.A.)	Rehabilitation and overburden studies
A. Sands, B.Appl.Sc., Grad.Dip.Res. Man.	Visual aspects and rehabilitation.
M. Morris, B.Nat.Res. (U.N.E.)	Air quality.
G. Matthews, B.E.(Ncle)	Noise studies.
A. Kontopoulos,B.E. (S.A.),M.Sc.	Noise studies.
D. Gibbs, B.Sc.(Hons.Ag.Ec.)(London)	Socio-economic and Planning Aspects.
W. Giblin, B.Sc.,(U.N.E.), Dip.Ed.	Archaeological aspects.

Coal & Allied Operations Pty. Limited -

Dr. B. White, B.Sc. (Hons) Ph.D. C.Eng., MIE Aust., M.Aus.IMM	Superintendent Planning & Development.
R.C. Thatcher, Dip.C.E.(Swin.Vic.), Dip.M.E.(R.M.I.T.),M.Aus.IMM	Project Manager.
D. Mackie, B.E. (U.N.S.W.)	Chief Mechanical Engineer
G. Gilfillan, B.App.Sc.(S.A.I.T.), M.AUS.IMM.	Senior Mining Engineer.
B.E. Boyle, B.E., MIE Aust.	Senior Engineer - Planning & Environment.
R. Gordon, B.Nat.Res.(UNE)	Environmental Officer, H.V.No.1.
R. Davis, B.Sc. (Ncle)	Senior Mining Geologist.
P. White, B.E. (U.N.S.W.)	Coal Preparation Engineer.
B. Watson, Elec.Eng.Cert(NTC), Elec.Eng.Cert.of Competency (Dept. of Mines)	Electrical Engineer

Runge & Associates Pty. Limited -

I.C. Runge, B.E.(Univ.Q),AM.Aus.IMM	Mining Engineering Consultant.

Fluor Australia Pty. Limited

R. Shenfield, Dip.C.E. (C.I.T.) MIE Aust.	Senior Manager Projects
N. Pratt	Supervising Designer.

Crooks Michell Peacock Stewart

R.J. Jackson, B.E.(Syd.),FIE Aust.	Director.
A.S. Reid, APTC., MIE Aust.	Divisional Manager.
K. Dynan, B.E.(Syd), MIE Aust.	Civil Structural Engineer.

EXISTING ENVIRONMENT

SECTION 3

3.1 BIOPHYSICAL FEATURES

3.1.1 Physiography

Figure 8 shows that the topography of the Authorisation is dominated by a ridge system of rounded hills rising southward from the Hunter River floodplain. The major ridge crests occur along the western and southern boundaries and range in height from RL 100 m to 160 m. A further prominent ridge rises from the Hunter River floodplain to the northeast and runs parallel to the eastern boundary at a height of between RL 100 m and 120 m.

The ridgeline within the southern boundary divides the watershed of the Hunter River and its tributary Wollombi Brook. Redbank Creek is the major stream draining east to Wollombi Brook while Hobden Gully flows north through the Authorisation to the Hunter River. All water courses on the site are intermittent.

Much of the Authorisation is undulating lowlands drained by Hobden Gully. The valleys are broad and shallow with flanking slopes less than 5 degrees. The valley floors have large areas with slopes less than 2 degrees. Slopes in excess of 10 degrees occur near the crests of the prominent ridges.

Duplex soils are the principal soil types. The site is characterised by extensive clearing of native vegetation and a history of overgrazing. Consequently high runoff volumes are generated with high velocities causing sheet and gully erosion. Drainage lines are typically eroded incised channels. Details of drainage patterns and catchments are presented in Figure S1.3, Section S1.2 in Study 1.

Flooding has occurred on the Hunter River floodplain and associated areas of Hobden Gully. Approximately 48 ha of the site in Hobden Gully was inundated

during the 1955 flood.

3.1.2 Geology

The regional geology and detail of geology of the coal resources on Authorisation 13 are described in Study 1.

The rock strata outcropping on the site belong to the Singleton Super Group of Permian geological age. The principal rock types forming the overburden and interburden to the coal seams are sandstones, shales, mudstones and conglomerates. Beds range from thin to massive and lithology varies horizontally due to facies changes. Regional dip of the strata is to the southwest.

Figure 9 shows the subcrop of the main coal seams. The seams vary in thickness in vertical and horizontal direction and split and join. Irregularities in the depositional patterns of the seams intrusions, and subsequent structural changes have imposed physical and economic constraints on mining operations. Geological factors affecting the locations of boxcuts for the development of opencuts, out-of-pit overburden emplacements and surface facilities are summarised in Section 4.2.1.

The total in-situ coal reserves have been estimated to be 383 Mt as described in Section S1.1.5.

3.1.3 Soils and Properties of Overburden

Study 2 describes the soil surveys undertaken on the Authorisation and the results of the chemical and physical investigations of the various soil types. The red and brown duplex soils typical of the undulating lowlands of the Hunter Valley are the predominant soils. The topsoils from the profiles achieve depths

averaging 50 mm and will be suitable after appropriate treatment for use in rehabilitation. The alluvial sands and river gravels from an old river meander were found to be unsuitable for topdressing. Figure 10 shows the distribution of topsoil depths and Figure S2.1 the soil types. It is estimated that approximately 730,000 m^3 of topsoil will be available from the whole site.

Investigations were also conducted to assess the physical and chemical properties of the overburden and their suitability for use as a topdressing for rehabilitation where deficiencies in natural topsoils occur.

Most of the rock types on the site are prone to weathering and deteriorate physically on exposure to form sandy to silty clays of low to medium plasticity. Shales, mudstones and sandstones all break down in time with cycles of wetting and drying and only certain horizons containing fine grained silicified siltstones are resistant.

The chemical analyses of the overburden showed the ground rocks to be strongly to very strongly alkaline and of low salinity status. Sulphate was generally the dominant anion, except for the highly alkaline rocks when bicarbonate was dominant. The rocks have high SAR values which indicates that the products of physical breakdown will be prone to surface crusting and dispersion after wetting and drying.

The general conclusion is that the rocks are similar in composition and behaviour to the duplex soils. The deficiency in nitrogen and phosphorus will need to be corrected by fertilisers for the breakdown products to be suitable as a topdressing to support pasture growth. The conclusions are based upon laboratory studies and experience gained at Hunter Valley No. 1 Mine and are subject to the qualifications and limitations discussed in Section S2.2 in Study 2.

3.1.4 Climate

The climate of the area is detailed in Section S1.3 of Study 1. The distance of the site from the coast is sufficient to modify maritime air masses and hence climate is influenced by continental effects. Annual wind direction is dominated by the northwest/southeast axis with 60 per cent of wind direction observations lying on this axis. The east/west axis claims a further 25 per cent of wind direction occurrences. The predominance of these axis varies only slightly between seasons. In winter the dominant direction is northwest with 50 per cent of winds in this quadrant. During summer, the southeast direction prevails. Autumn and spring are transitional periods between these extremes.

Inversions in the area occur on 70 per cent of the nights during a year. Those occurring can be extremely complex involving up to six distinct layers extending to a height of 700 m, with 350 m being the most common. During winter the inversions can persist until late morning.

Annual average rainfall is 636 mm at Jerrys Plains. Although the number of rain days per month is relatively consistent, approximately 35 per cent of the annual total occurs during summer. The remainder is spread reasonably evenly throughout the other seasons.

Monthly average pan evaporation values total 1600 mm annually with maximum values occurring during summer. Values steadily decrease as winter approaches and then begin to increase to the summer peak.

Temperatures in the area range from a mean daily maximum of 31.8^{o}C in summer to a mean daily minimum of 3.6^{o}C in winter. The mean monthly range over the year is 14.8^{o}C with the highest occurring in November and the lowest in February.

3.1.5 Ecology

Flora and Fauna

Study 3 details the flora and fauna studies conducted on the Authorisation and the adjoining areas. The vegetation communities are shown in Figure 12. A large proportion of the area has been cleared for grazing and only scattered stands of trees and recent regrowth remain.

The remnants of the original dry sclerophyll forest cover are dominated by Eucalyptus species with Casuarina species also prominent in parts. The understorey is variable and consists predominantly of grasses and dense shrubs up to 10 m in height. The small number of species reflect a low plant diversity. The grass (POACEAE) and wattle (MIMOSACEAE) families are the best represented numerically although eucalypts (MYRTACEAE) are the visually dominant plants.

A total of 79 bird species were observed on the Authorisation and a further 50 species were recorded nearby. Only three of the birds identified are introduced. The majority of species are passerines. Species numbers and individual numbers were generally low except at a few sites where large groups of birds were passing through the area.

The most common fauna species observed in the area were the Eastern Grey Kangaroo, the Common Brushtail and the Red-necked Wallaby. The Common Wombat is also relatively common but restricted in distribution to the low lying alluvial areas. The overall wildlife populations were relatively low due to the disturbed and cleared nature of the area.

Ecological Status

No rare or endangered species of plants or fauna have been identified within the

site.

The important aspects of the ecology of the site are:-

i. The area of vegetation in the southwestern corner forms an interconnecting system which is close to, although not directly connected with, the existing Wollemi National Park. The area of vegetation is very small when considered in isolation and is probably not of a viable size for existing populations in the longer term.

ii. The area still supports a moderately diverse population of fauna species native to the area although the numbers of individuals are not high.

iii. There is a range of habitats available to fauna species.

iv. The significant degree of disturbance to all of the natural areas has contributed to their decline as flora and fauna habitat.

The conclusion to the ecological study is that the area of the Authorisation proposed for mining is of low significance. The small southwestern sector is well wooded and is of value to the existing wildlife populations.

3.1.6 Water Quality

Water quality has been monitored on the Authorisation since October 1979, with up to 12 samples tested on a monthly basis. These investigations are discussed in Section S12.3 in Study 12.

A review of the results to October 1982 indicated that sufficient data was available to characterise water quality on the Authorisation. Subsequently a reduced number of key variables were monitored at four sites. A summary of the results at these sites are presented in Tables 3.1 to 3.3 while all data are represented in Tables S12.4 to S12.15. The location of all sampling sites is indicated in Figure 11.

TABLE 3.1

pH

October 1979 - July 1983

Site	Number of Samples	Log-Normal Distribution Assumed	
		Mean	Std.Dev.
5	46	8.63	1.13
11	48	7.15	1.10
15	35	6.96	1.16
16	44	7.23	1.11

TABLE 3.2

CONDUCTIVITY at 25^{o}C (uS/cm)
October 1979 - July 1983

Site	Number of Samples	Log-Normal Distribution Assumed	
		Mean	Std.Dev.
5	44	938.55	1.71
11	27	248.38	2.22
15	34	220.76	2.08
16	42	208.60	2.02

TABLE 3.3

SUSPENDED SOLIDS (mg/l)
October 1979 - July 1983

Site	Number of Samples	Log-Normal Distribution Assumed	
		Mean	Std.Dev.
5	44	25.51	4.20
11	27	116.30	3.89
15	34	123.15	3.33
16	44	84.79	3.84

A number of groundwater samples were drawn on a one off basis with the depth of sampling corresponding to the three major coal seam aquifers. An additional sample was drawn from the partly consolidated gravels and silts in Hobden Gully. The sample points are shown in Figure 11 and the analyses of quality are presented in Table 3.4.

TABLE 3.4

RESULTS OF GROUNDWATER CHEMICAL ANALYSIS

Sample Location	Partly Consolidated Gravel and Silt	Mt. Arthur Seam		Piercefield Seam		Vaux Seam	
Borehole	AN48	AB52	AQ59	AB52	AQ57	AE55	AP56
pH	6.95	6.85	7.05	6.80	6.60	7.00	7.40
Conductivity (mS/cm [25^{o}C])	15.60	8.00	3.60	7.60	6.70	5.40	5.30
TSS mg/l	9984	5120	2304	4864	4288	3456	3392
Total Hardness (mg/l $CaCO_3$)	4540	1045	471	1293	1400	838	218
Chloride (mg/l)	5926	2164	738	2218	1964	1436	291
Sulphate (mg/l)	674	276	41	263	54	97	56

The water quality analyses indicate that the surface waters of the Authorisation are generally of acceptable quality for agricultural, domestic and industrial uses. In most cases the waters are suitable for use on all soil and on sensitive crops. Soil permeability should be unaffected by its use.

Groundwaters are saline and unsuitable for dairying, stock watering and irrigation on the poorly drained duplex soils of the Authorisation.

Water quality monitoring in the vicinity of Hunter Valley No. 1 Mine is detailed in Section S12.1 in Study 12. The Hunter River and Farrells Creek which are the two watercourses in proximity have mean pH levels during the period of mining within the neutral range of 7.5 to 8.5. Mean conductivities in Farrells Creek range from 400 to 1200 mg/l which is substantially greater than those of 650 to 750

mg/l for the Hunter River. Suspended solids in Farrells Creek are also substantially higher ranging from 15 to 110 mg/l compared to a range of 2 to 21 mg/l for the Hunter River.

These results indicate that mining has had no detectable effect on water quality downstream of the operations.

3.1.7 Air Quality

Ambient dust deposition has been monitored on the Authorisation on a monthly basis since October 1979.

Nine dust stations were monitored over the period October 1979 to October 1982. The stations, marked 1 to 9, are indicated in Figure 11. A review of results undertaken in October 1982 indicated that a rationalisation of stations was possible and a further site (number 18) was established to the north of the Authorisation and monitoring stations 1, 2, 3, 6 and 8 were discontinued.

In order to assess the ambient dust levels the seasonal values of total dust deposition and residual dust deposition over the entire period of record were plotted for Stations 4, 5, 7 and 9. Table 3.5 summarises these results for the Authorisation as a whole together with the range of values recorded at individual sites. These values are shown in Figure S12.2 together with rainfall recorded at Hunter Valley No. 1 Mine during the same period. Several features are apparent from these plots. These include:-

i. There is a similar pattern of temporal variation in both total and residual dust deposition rates at individual stations throughout the measurement period.

ii. The distribution of residual dust deposition rates shows less variability than the distribution of total dust deposition rates. Varying vegetation cover in the vicinity of each gauge is the probable cause of this increased variability.

iii. Total dust deposition rates peak in summer and autumn with marked decreases in levels in winter. The range of individual results is large, from 0.34 g/m^2.mth to 5.84 g/m^2.mth.

iv. Residual dust deposition rates show a similar pattern, with one exception. No peak occurred during summer and autumn 1981/82. It is suggested that high rainfall totals for the year ending in Autumn 1982 account for this. The range of residual dust deposition rates is from 0.14 g/m^2.mth to 3.73 g/m^2.mth.

v. There appears to be some relationship between the inter-station variation in total dust deposition rates and the preceeding years rainfall. In 1983, following high rainfall in 1981 and 1982, less variable dust deposition levels were observed than in years following low rainfall years. This relationship is not as obvious when considering residual rates.

TABLE 3.5

TOTAL DUST DEPOSITION RATES

(g/m^2.mth)

Averaging Period	Authorisation as a Whole Geometric Mean			Range of Mean Values Recorded at Individual Sites
	Minimum	Mean	Maximum	
Annual	1.3	*1.4	1.5	1.0 - 1.6
Seasonal	0.7	*2.2	2.3	0.5 - 3.4
Period of record	0.5	0.9	2.8	0.3 - 5.8
Summer	1.6	1.9	2.3	1.0 - 3.4
Autumn	1.4	1.7	2.1	1.0 - 2.5
Winter	0.7	*0.9	1.2	0.5 - 1.3
Spring	1.3	1.4	1.6	0.9 - 1.9

* Background values adopted for impact assessment.

Dust deposition rates recorded on the Authorisation reflect considerable variation between individual monitoring stations for a particular month as well as on seasonal and annual bases. This variability is attributed to differences in land use practices within the area and in meteorological conditions.

Dust deposition monitoring data in the vicinity of Hunter Valley No. 1 Mine since the commencement of operations is presented in Table S12.3 in Study 12. The data

indicate a wide range of values at any particular site. Absolute values range from 0.2 to 10.98 g/m^2.mth. During 1983 geometric mean deposition levels ranged from 0.98 to 2.97 g/m^2.mth.

The results indicate that at distances of 1 km or more from the mine total dust deposition levels are below those which affect amenity or health.

3.1.8 Noise Levels

Sound pressure levels were measured at a series of locations to establish the acoustic climate of the area surrounding Authorisation 13. Readings were taken on three occasions during the day and night. The monitoring sites are shown in Figure 11 while a summary of the results is presented in Table 3.6. The table indicates that ambient sound pressure levels are typically dependent on site location. Existing background sound pressure levels for the area including the area in proximity to Hunter Valley No. 1 Mine were adopted as L_{90} of 35 dB(A) for daytime and L_{90} of 30 dB(A) for night time.

TABLE 3.6

AMBIENT SOUND PRESSURE LEVELS

Position	Measured Ambient Mean Sound Level dB(A)					
	Day			Night		
	Leq	L_{10}	L_{90}	Leq	L_{10}	L_{90}
1	35	37	32	31	34	28
2	40	43	35	30	32	27
3	39	41	35	32	33	30
4	37	40	32	38	40	35
5	40	41	35	33	35	31
6	42	45	37	40	43	36
7	40	44	37	30	35	27
8	40	43	34	31	34	26
9	46	48	42	32	34	29
10	40	41	38	32	33	29
11	44	47	41	35	38	31

3.2 SOCIO-ECONOMIC ENVIRONMENT

3.2.1 Archaeology and History

Archaeological investigations of Authorisation 13 and the proposed road and conveyor routes have been undertaken in compliance with requirements of the National Parks & Wildlife Service, and are reported in Study 4. The study area is shown in Figure S4.1. These studies have indicated the past use of the sites by aborigines. Previous archaeological studies in adjacent areas have identified sites located primarily in eroded areas adjacent to watercourses, however, investigations on Authorisation 13 revealed a wider dispersal of artefacts in areas away from the watercourses. This has suggested that the site may have been utilised by greater numbers of people relative to the adjacent areas.

Recording and salvage of artefacts have been carried out at those sites considered to be of significance.

European settlement in the area which is discussed in Section S13.1 of Study 13 commenced with the discovery of the area by John Howe in 1819 and 1820. The growth of agriculture and the location of Jerrys Plains and Warkworth on major stock routes resulted in the development of the area. No items of European heritage are located on Authorisation 13.

Agriculture has been the dominant activity until the 1970's. Since that time extensive development of coal mining has occurred in the Warkworth/Lemington area.

3.2.2 Socio-Economic Base

The combined area of the Singleton, Muswellbrook and Cessnock local government areas has been taken to represent the subregion for the purposes of assessing the

socio-economic impact of this proposal. This aspect is detailed in Section S14.2.1 of Study 14.

Analysis of economic indicators shows a diverse range of industrial activities are undertaken in the subregion. The Cessnock area is characterised by coal mining, manufacturing wine products and tourist industries whilst the Upper Hunter Valley, incorporating Singleton and Muswellbrook, exhibits a mix of coal mining/power generation and agricultural enterprises. Within the Upper Hunter the significance of coal mining is expanding whilst agricultural activity continues to decline. The mining industry provides the greatest proportion of employment opportunities in the subregion. The subregion produced approximately 37 per cent of the total saleable coal output of New South Wales in 1983-84.

Growth of tertiary industry has accompanied the expansion of the areas industrial base.

3.2.3 Labour Supply

Analyis of unemployment data detailed in S14.2.2 indicates a subregional and regional concentration in the junior female clerical/administrative and adult male semi and unskilled categories. Projections of regional labour demand indicate that high unemployment levels in most skill categories will continue until the late 1980's and that given an upsurge in development, unemployment levels may be reduced (Perkins, 1983).

Surveys of labour mobility patterns within the mining industry have revealed that between 60 and 80 per cent of new employees are obtained from subregional sources.

3.2.4 Population

Significant increases in the rate of population growth have occurred in the subregion in the 1976-1981 period as detailed in S14.2.3. Alterations in the distribution of population have also occurred with a reversal of a previous declining trend in rural population.

Further significant population growth has been predicted for the subregion in the period 1981-1986. However, it is considered that due to the deferral of development projects such growth will not occur until renewal of development activity, possibly in the 1986-1991 period.

Surveys of the demographic implications of rapid population growth have revealed that growth is characterised by a high proportion of married adults less than 35 years of age and a high proportion of children.

3.2.5 Community Services

Investigations into the availability and adequacy of community services as detailed in S14.2.4 have revealed significant increases in demand for and supply of these facilities. Additional educational and child care facilities have and are planned to be provided to satisfy the increased demand. Availability of sporting facilities is considered to be adequate whilst a shortage of general entertainment/recreational facilities exists.

3.2.6 Accommodation and Housing

The demand and cost of housing and housing land increased rapidly in the subregion in the period 1980-82. There has been a marked decrease in demand since 1982 which has resulted in significant reduction in the cost of land and housing. Figure S14.3 indicates the change in price between 1976-1983.

Land reserves currently available in Singleton, Muswellbrook and Cessnock have the capacity to meet expected requirements for growth.

3.2.7 Land Use

A mix of agricultural and coal mining operations characterise the general pattern of land use surrounding Authorisation 13 as discussed in S13.6 and S13.7 in Study 13. The agricultural and non-agricultural land uses are shown in Figures 13 and 14 respectively. Dairy farming on the alluvial flats of the Hunter River and beef cattle grazing on the less fertile land away from the river are the predominant agricultural land use activities. Coal mining is undertaken to the north, east and south of the site. Further mining development is proposed for areas to the south and west.

Agricultural Landuse

As indicated in Figure 13, 16 operating dairies are located in proximity to Authorisation 13. The value of milk production from these farms is estimated to be $1.36M (ABS, 1981-82). Five of the farms are owned and operated by mining companies. Approximately 74 local residents are dependent upon the operation of dairy farms for their livelihood.

Eight properties are involved in beef cattle grazing as the principal activity or in conjunction with dairy farming, sheep grazing or horse breeding. Total value of production from grazing is estimated to be $0.38M. Approximately 28 local residents are dependent upon beef grazing for their livelihood.

A further two properties in the area undertake horse breeding and sheep grazing activities. Estimates of the value of production of these activities cannot be made.

Cultivation and irrigation of fodder crops is carried out on all properties in the local area. Approximately 1400 ha of land are utilised for these purposes, with lucerne and other pastures being the most common crops produced. Although generally used as farm fodder, a number of farms cultivate these crops on a commercial basis.

Figure 13 indicates that the majority of the Authorisation is devoted to non-intensive cattle grazing. Two areas of land located along the western boundary and northeastern corner of the Authorisation form part of dairy farming properties. These two areas are used principally for grazing of dry dairy cattle.

The remainder of the Authorisation is used on a leasehold basis, for beef and/or dry dairy cattle grazing and for grazing of stock on agistment. Utilisation of the Authorisation for these purposes is generally undertaken in conjunction with farming activities on properties adjacent to the Authorisation. Maximum carrying capacity of the land varies between 1 and 2 beasts per hectare.

The practice of non-intensive cattle grazing on the Authorisation is supported by an assessment of the Authorisation's land capability based upon procedures developed by the Soil Conservation Service of N.S.W.

As shown in Figure 13, a Travelling Stock Reserve is located adjacent to the Jerrys Plains Road on the southern boundary of the Authorisation. The Company has reached agreement with the Pastures Protection Board for the exchange of this area of land with another situated to the north of the Jerrys Plains Road on the Authorisation's western boundary.

One privately owned farming residence is located on the Authorisation in the northeastern corner.

Residential Land Use

Residential development in the study area is restricted to the villages of Warkworth and Jerrys Plains, 3 km and 7 km from the Authorisation respectively, and to individual farm residences. Approximately 55 individual residences are located in the area, 23 of which are owned by mining companies. Details of the location of individual residences in relation to the proposal are shown in Figure 14.

As shown on the figure the major concentration of non-mining Company owned residences is located to the northwest of the Authorisation with a limited number located to the northeast. Only one privately owned residence is located on the Authorisation.

A survey of neighbouring residents indicated that 64 per cent of adults were employed as farmers with 20 per cent employed in the mining industry. A high proportion (67 per cent) of residents was found to occupy rented accommodation. This finding can be explained by the presence of a large number of mining-Company owned residences and multiple residences on properties for farm employees.

The village of Warkworth consists of approximately nine households, a primary school, general store and service station, caravan park, church, hall and sports facilities. Limited growth has occurred in Warkworth over the past nine years. However, due to the constraints of existing and proposed mining the ability of the village to develop further is restricted.

To limit the potential for conflicts between residents of Warkworth and mining, Singleton Shire Council has proposed to restrict the extent of further residential development in the village.

Extractive Industries

Authorisation 13 is located in an area of extensive coal mining activity as shown in Figure 14. Existing opencut and underground mining operations are undertaken to the north, east and south of the Authorisation. Further proposals for mining have been made for areas abutting the Authorisation to the west and south. There are also long term proposals for increasing production at existing collieries.

Commercial/Industrial/Recreational Land Use

Non-agricultural commercial and industrial activity is limited to the service station and caravan park at Warkworth and the commuter airline operations at the Warkworth landing ground.

Singleton Air Services operates a 56 flights per week commuter airline service from the landing ground to Sydney, Cessnock and Scone. The operation is undertaken according to Supplementary Airline Operational Standards issued by the Department of Aviation. The Department of Aviation is currently reviewing a proposal by Singleton Council to develop a new airstrip to the east of Singleton urban area.

Warkworth landing ground is owned and operated as a recreational facility by the Hunter Valley Gliding Club Co-operative Ltd. consisting of 60 members. The landing ground constitutes the Club's only gliding facility, and is used every weekend and infrequently on weekdays. Approximately 120 aircraft movements occur each weekend. Facilities provided at the ground include a hangar with storage for up to six gliders and a clubhouse. Plans for the site include the provision of an additional hangar.

Roads

Two public roads, Jerrys Plains and Maison Dieu Roads currently intersect on Authorisation 13. Jerrys Plains Road provides a route for vehicles travelling north and west of Mount Thorley via Warkworth, Jerrys Plains and Denman.

Maison Dieu Road intersects Jerrys Plains Road on the Authorisation and provides a means of access to residences in the northeastern corner of the Authorisation and north of the Buchanan Lemington Colliery. Proposals to close the section of Maison Dieu Road to the east of the Authorisation have been put to Singleton Shire Council by Buchanan Borehole Collieries Pty. Ltd. with alternative access via the rerouted Comleroi Road shown in Figure 14. This would retain a means of access to Jerrys Plains Road for local residents.

Transmission Lines

Figure 14 details the location of electricity transmission lines relative to the Authorisation. Two 66/11 kV lines intersect in the southeast corner of the Authorisation with one line running across the Authorisation and crossing its northern boundary. The Liddell to Newcastle No. 1 330 kV transmission line crosses the southwestern portion of the Authorisation.

3.2.8 Statutory Planning

Statutory planning controls relevant to the proposal as applied under the Singleton Planning Scheme Ordinance 1961 are detailed in Figure 14. The majority of the Authorisation is zoned Non-Urban A, except for 500 m either side of Jerrys Plains Road which is zoned Non-Urban B. Both zonings permit agricultural and forestry developments to be undertaken without consent and mining developments to be undertaken with consent of the relevant authority.

3.2.9 Planning Policies

Various studies of the implications of rapid population and industrial growth on the Upper Hunter Valley have highlighted concerns regarding the capacity of rural villages to cater for population growth and the potential for land use conflicts between mining, agriculture and residential developments. (Hunter Regional Environmental Plan No. 1, 1982; Upper Hunter Sub-Regional Study, 1981.) In addition, such studies have also indicated the importance of coal resources to the overall development of the region and sub-region.

In accordance with Strategy 57 of the Hunter Regional Environmental Plan No. 1, Singleton Council has prepared a Draft Local Environmental Plan (1983) aimed at limiting the extent of urban development at Warkworth which is potentially affected by mining. This plan, together with others drafted for the villages of Ravensworth and Camberwell will also serve to limit the need for additional infrastructure provision in these villages and to minimise the extent to which coal reserves are sterilised by urban development.

With regard to the potential for conflicts between agriculture and mining, the Hunter Regional Environmental Plan No. 1 recommended that where opencut mining was proposed on valuable agricultural land, particular consideration should be given to the potential for restoration of mine areas, the effects on ground and surface water flows and quality, the effects on agricultural land in adjacent areas and the social effects of the proposal. The requirements have been met in this Statement.

DESCRIPTION OF THE PROPOSAL

SECTION 4

4.1 SCOPE

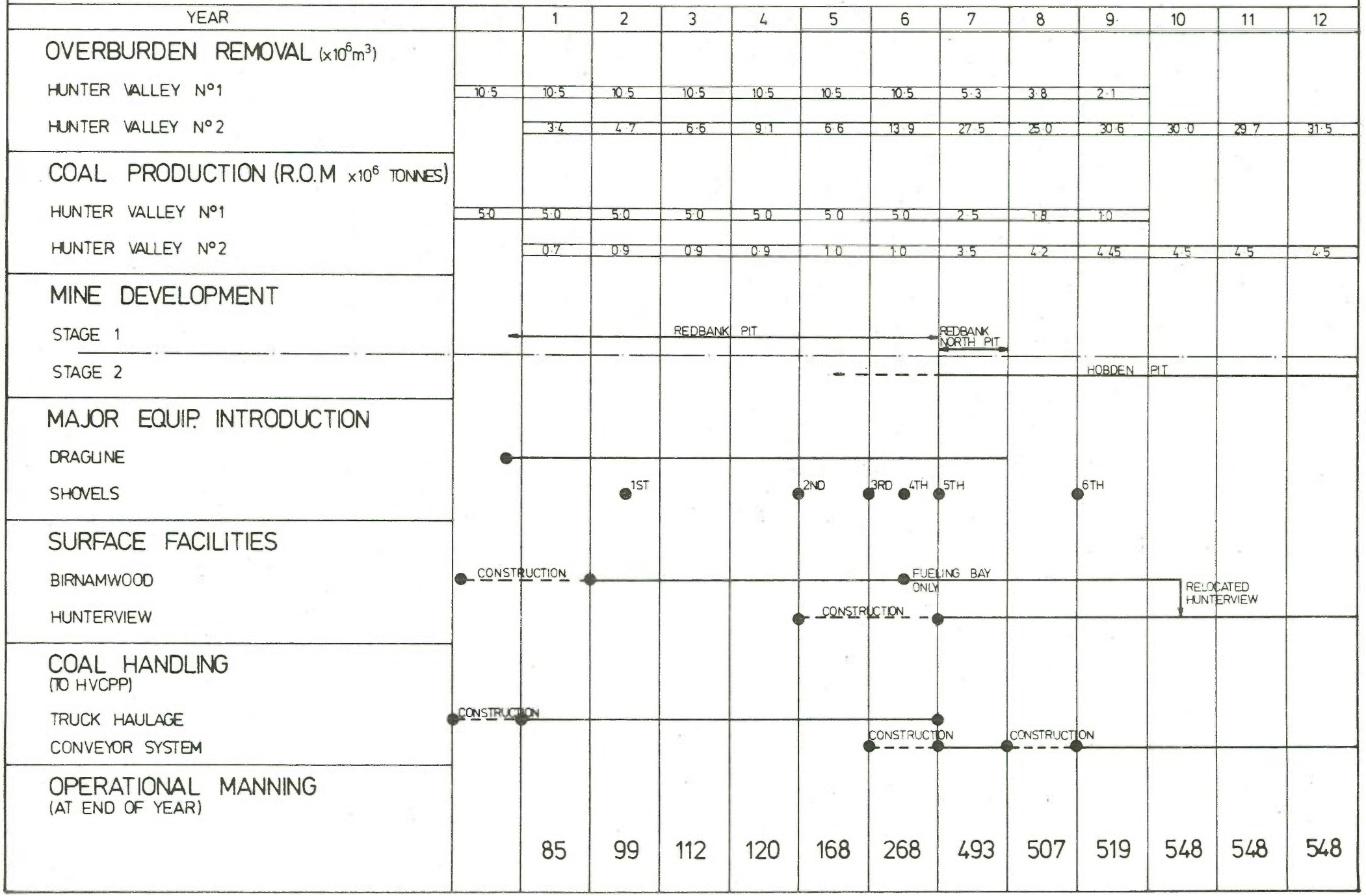
The Company's proposals for Authorisation 13 are shown in Figure 15. It is planned to develop an opencut mine to produce run-of-mine (ROM) coal at a rate of about 4.5 Million ROM tonne annually. Table 4.1 shows that the maximum rate will be achieved in Year 10 after a staged production build-up.

The proposed operations on the site will involve the development of two major pits and a minor pit and supporting facilities to administer and maintain the project, service the workforce and transfer coal for beneficiation at the Company's coal preparation plants. In Stage 1 of the project two shallow pits to be known as Redbank and Redbank North are to be worked. These pits will have the short lives of six years and one year respectively and will produce ROM coal at 1 Mtpa. Stage 2 represents the long term mining operation in which a single pit will be ultimately developed to a depth of 260 m. This pit, to be known as Hobden Pit will continue beyond the 21 years covered by this Statement to a life of the order of 50 years.

An out-of-pit disposal area with a capacity for approximately 100 million bank cubic metres (bcm) of overburden is required to permit the development to proceed in the manner proposed. The area selected is between the Redbank and Hobden Pits. The emplacement will be rehabilitated progressively as it is constructed and integrated into the final post mining landform.

Run-of-mine coal is to be processed at existing Company facilities. The Hunter Valley Coal Preparation Plant will be used to produce predominantly steaming grade coal while coking grade will be washed at Liddell Coal Preparation Plant. Hunter Valley Coal Preparation Plant will be augmented to acommodate this increased production. All coal will be transported to the Hunter Valley Coal Preparation Plant from where coal bound for the Liddell Coal Preparation Plant will be transferred to the existing overland conveyor. During Stage 1, coal

TABLE 4.1
HUNTER VALLEY N°. 2 MINE PROJECT SCHEDULE



transport to Hunter Valley Coal Preparation Plant will involve trucking along a private haul road. In Stage 2 the road will be replaced by an overland conveyor and the road maintained for mine access.

The complete development of the site will require the relocation of Jerrys Plains Road. Figure 15 shows the routes proposed in the short term and after about 18 years. The Maison Dieu Road is also to be closed and an alternative access provided along Comleroi Road to the east of the site.

The Birnamwood surface facilities are to be constructed for Stage 1 of the project. Construction will last for approximately 15 months and will employ an average of 25 persons. The Hunter View surface facilities for Stage 2 will be constructed in two stages. The first, commencing in Year 5, will include the buildings for administration, maintenance and amenities coal storage and handling and will last for 24 months and employ an average workforce of 85. The second stage of coal storage and handling facilities will be constructed in Year 8 and will require an average of 24 persons.

The permanent workforce will progressively increase until a peak of 548 is reached in Year 10. Only the initial 168 employees will be new Company personnel as it is proposed that the remaining workforce will comprise personnel progressively transferred from the Company's Hunter Valley No. 1 Mine. Operations of this latter mine are scheduled to reduce from 1990.
Site power requirements will be drawn from the existing 66 kV line crossing the Authorisation. Potable water needs will be drawn from the Hunter River as will any shortfall in raw water requirements.

4.2 DEVELOPMENT OF THE PROJECT

4.2.1 Site Constraints

Boundaries

The majority of Authorisation 13, as shown in Figure 2, is owned by the Company. The exceptions to this are the Skinner property in the northwestern corner, the Barry property in the northeastern corner and sections along the eastern boundary owned by Buchanan Borehole Collieries Pty. Ltd. The Skinner property is beyond the limit of mining for the period covered by this proposal, however the Company has discussed the purchase of the part of their land on the Authorisation. The Company has been unable to purchase the Barry property as the owners have been unwilling to sell.

The inability to purchase the Barry property will prevent 19 million ROM tonne at low overburden to coal ratio being mined. The Company has been able to negotiate a 20 year lease agreement for the southern paddock of the property to enable mining to be successfully undertaken on Company land.

The Company recognises that significant quantities of coal exist along sections of both the eastern and southern boundaries in the barriers between opencut mining operations to be conducted by both neighbouring companies. Much of this coal may be available for later extraction. At an appropriate time, the Company will enter into detailed negotiations with both United Collieries and Buchanan Borehole Collieries such that, with the approval of the appropriate Authorities, the maximum economic extraction of the resource may be achieved.

Geology

The geology of the coal deposition on Authorisation 13 is considered in Study 1.

The deposit contains a number of relatively thin and banded seams, most of which occur at a linear overburden to coal ratio of less than 10:1. Four areas on the Authorisation with ratios in excess of this limit are:-

i. The central eastern portion of the site where the ratio between the Piercefield and Vaux seams is excessively high due to a thick sedimentary wedge which has also caused major splitting of the bottom seams.

ii. The southeastern corner of the Authorisation and a small area in the southwestern corner where the ratio is excessively high for seams underlying the Woodlands Hill Seam.

iii. The northwestern section of the site where a wedge of interburden between the Vaux and Piercefield seams results in the ratio being exceeded beneath the Piercefield.

These areas with little opencut potential will be used in the project for surface developments. The small area in the southeastern corner of the Authorisation may have future potential for underground mining.

Services

Roads and power transmission lines crossing the Authorisation will need to be relocated to enable coal recovery to be maximised. These relocations can be effected without significant disadvantage to users and will only be temporary constraints to mine development.

Flooding

Portions of the site lower than R.L. 70 m, adjacent to the Hunter River have been subject to backwater flooding during large floods. As it is proposed to construct a levee to protect the mining operations without detriment to flood flows, flooding will not pose a permanent constraint to mining. The levee which will be located in Hobden Gully as shown in Figure 15 has been approved by the Water Resources Commission.

4.2.2 Evolution of Options

Approach

The Company has conducted extensive investigations to determine the most appropriate mining method to maximise the recovery of coal from the Authorisation.

Extraction by opencut methods has been favoured because of the practical difficulties in using underground techniques successfully for winning coal from the many thin and banded seams in the deposit. Underground methods will still be considered in the future for areas where opencut mining is uneconomic and seams can be worked by this method.

The following factors were taken into account in the design of the proposed opencut mining operations.

Mining Block Orientation

Studies indicated that efficient operations throughout the life of the mine and maximum mining rates would be best achieved by minimising changes to the orientation of the mining benches. The layout developed to achieve this aim involves the orientation of mining blocks and benches parallel to the general strike of the major coal seams. This basic design will allow the simple pre-development of the mining benches while maintaining consistent overburden to coal ratios. Better flexibility of access and scheduling of equipment will be possible. The adopted bench layout will also provide substantial scope for blending coal between seams to satisfy coking or steaming coal requirements.

Resource Recovery Options

The results of the detailed geological investigations of the coal seams were used to reduce the options for coal extraction to the following cases.

Base Case in which all seams to the Vaux would be mined over the Authorisation with the exception of the areas described in Section 4.2.1 and in the northwestern corner of the site where extraction would be to the Piercefield Seam. This option requires approximately 100 million bcm of overburden to be placed out-of-pit.

Minimum Ratio Case in which all coal on the site with an overburden to ROM coal ratio of less than $7m^3$:1t is extracted. Generally, this case involves all seams to the base of the Woodlands Hill Seam plus the extraction of coal from the Warkworth to Vaux Seams in selected areas.

Maximum Ratio Case in which all of the seams would be extracted.

Barry Case which is a special case involving mining the reserves in the northeastern corner in the Authorisation on the property currently owned by the Barry Family.

The Base Case option was selected for the following reasons:

i. The maximum ratio case would constitute an uneconomical mining operation.

ii. The Barry property is currently unavailable and so cannot be considered at this time.

iii. The difference in ratio between the minimum ratio case and the base case is relatively insignificant from an economic viewpoint, yet adoption of the base case would result in an increase in mineable reserves of approximately 55 per cent.

iv. Adequate site area is available within the Authorisation for the out-of-pit overburden emplacement requirements.

Criteria for Pit Design

The following criteria were adopted for the design of the mining pits:-

i. A sufficient number of benches would be required to allow all the equipment to work unimpeded.

ii. Sufficient pit length and bench width must be provided to ensure that 'dead-heading' and manoeuvring time associated with large

equipment were minimised.

iii. Where possible development would commence in the shallowest areas to minimise the initial amount of overburden to be placed out-of-pit.

Other factors taken into account relate specifically to the geology and geometry of the coal seams on the Authorisation.

iv. The mining methods selected need to be flexible enough to allow coal to be won from a large number of mining faces at any one time and still ensure the maximum recovery of coal.

v. A large amount of pit room would be essential for the careful extraction of coal from the thin partings and seams at the production rates required.

The substantial variability in the thickness of the overburden exclude inflexible methods based upon continuous extraction.

Equipment Selection

Feasibility studies demonstrated the sensitivity of the project to the efficient removal of overburden. The volume of overburden to be stripped is of the order of six times the volume of coal. Consequently plant selection studies concentrated on comparing the performance capabilities of a range of major overburden extraction units.

Draglines: The variable geometry of the deposit demanded a flexibility not readily achievable with large capacity draglines at the proposed mining rates. Other factors opposing the selection of these units included the reduced economies of mining resulting from the need to rehandle spoil and the length of time before spoil heaps could be graded and rehabilitated.

Further investigations showed that the disadvantages in the use of the larger units on the project could be overcome with the smaller capacity modular construction draglines recently introduced into the market. These units have been found more economical than rope shovels in areas of few seams and overburden thickness to 30 m as they eliminate the need to haul spoil in trucks. This situation will occur in the Redbank and Redbank North Pits where the Woodlands Hill Seam is overlain by 15-25 m of overburden ideally suited to removal by a smaller dragline fitted with a bucket of 13 m3 capacity.

The modular construction will also enable the unit to be readily dismantled for transport.

Bucket Wheel Excavators: The units were considered unsuitable for use in the project as experience at the Hunter Valley No. 1 Mine has indicated that the overburden will be too hard for efficient operations. Scheduling difficulties arising from pit slope and overburden production volume requirements would result in poor utilisation and uneconomic productivity.

Electric Rope Shovels: These units provide the flexibility needed to extract the variable thickness of broken overburden concurrently from over the many complex seams of the deposit and will be used extensively on the project.

Overburden Haulage Trucks: The project will utilise 154t haul trucks which are the largest units with proven reliability that can operate in combination with shovels. The reliability of larger trucks was considered questionable and their relatively poor turning circles would result in low utilisation on the site.

Front-end Loaders: These units were considered most suitable for handling the thin parting bands difficult for larger plant. They will find wide application on the project as approximately 15 to 20 per cent of the overburden/interburden will occur in this form. The units will work in combination with 77t rear dump trucks.

The extraction of coal from a large number of seams concurrently will require excavating units with small capacity and high mobility. Rubber-tyred front-end loaders equipped with large buckets were selected as being the most appropriate for the flexibility demanded.

Mine planning and equipment selection have been based upon the concept that most of the overburden in the large operation in the Hobden Pit will be drilled and blasted and the spoil loaded into 154t rear dump trucks using electric rope shovels.

In areas of lower overburden to coal ratio, such as in the Redbank Pit, a small capacity modular dragline will allow for the most efficient operation. The plant favoured for the removal of coal is a combination of front-end loaders with up to 15 m^3 buckets and 25t and 77t rear dump trucks.

Overburden Disposal

In adopting the Base Case mining option it was recognised that an area would need to be found for an emplacement to hold approximately 100 million bcm of overburden. Disposal out-of-pit was essential to enable the mine to be developed with sufficient space for working.

Initial investigations were directed at locating an area off the Authorisation so as not to prejudice the future extraction of the coal by opencut methods. A potential site was identified in reasonable proximity to the mine on the Coal Development Area 4 to the west as shown in Figure 7. The site was evaluated in terms of the options for the transport of overburden and environmental constraints.

The first transport method involving the use of haulage trucks on an internal road was found to be less attractive economically than an alternative based upon the installation of in-pit crushing and an overland conveyor and stackout system for the crushed spoil. Whilst the second approach would be feasible and improve the compaction characteristics of the spoil for placement, it introduced problems for dust suppression during handling. The stackout system would create dump faces up to 60 m in height which would require substantial grading to achieve final slopes. The addition of the large volumes of water needed to control dust from the crushed spoil would have created problems for working on the emplacement.

In addition to the practical difficulties in the construction of the emplacement, the site selected is of value because of the high diversity of the flora and fauna habitat. Safeguards to protect adjoining areas not needed for overburden disposal and to re-establish vegetation and relocate fauna were investigated, and although found to be practical, were not without complications. Other potential problems related to the visual impact of the proposal and the

requirements to handle runoff and leachate with either high contents of solids in suspension or in solution.

The Company's preliminary mining studies of the proposed emplacement site off the Authorisation indicated that its potential for coal extraction was limited to underground methods.

Based upon the results of the foregoing analyses together with studies undertaken by the Department of Mineral Resources and a review of the environmental problems, the proposed site on the Coal Development Area 4 was rejected.

Reconsideration of the mine plans for Authorisation 13 resulted in the area shown in Figure 15 close to the eastern boundary being selected as the only site on the Authorisation with sufficient capacity for the required emplacement. As the site is close to the subcrops of the coal seams where mining will commence, haulage distances can be minimised. The location also has the advantages of containing the disturbance to the one site and of enabling the emplacement to be integrated with the backfilled mining areas to form a single landform compatible with the adjoining topography after rehabilitation.

Support Facilities

The permanent support facilities required for the project will include equipment maintenance areas, offices, amenities for employees and coal handling facilities. To achieve maximum economies these facilities will be located close to the mining operations and off areas of opencut mining potential. Sites which are within a single drainage catchment, in already disturbed areas and are screened from view were considered desirable from an environmental viewpoint. Two sites on the Authorisation meeting these criteria are in the central eastern section and in the northwestern corner overlooking the Hunter River. As the former area was selected for the out-of-pit overburden emplacement, the Hunter

View site was chosen for the permanent surface facilities.

The Hunter View site is in the area of highest overburden to coal ratio and the coal is of poor quality due to cindering and a dyke traversing the area as shown in Figure 9. The site lies at the head of a small catchment draining directly to the Hunter River and is on land previously cleared for grazing.

Coal Preparation and Handling

Section S15.1 in Study 15 considers in detail the transportation strategies and routes to move coal from the Hunter Valley No. 2 Mine to railhead facilities for transportation to the Port of Newcastle. Of the two basic strategies to move coal eastwards to the Mount Thorley rail loop or northwards to the Company's facilities at Hunter Valley Coal Preparation Plant and at Liddell, the latter has been favoured and investigations were directed at maximising the flexibility of the existing infrastructure to prepare, handle and transport the coal produced from each of the mines in the Company's Upper Hunter mining complex.

Factors influencing the decision were:-

i. It was more economical to construct and use a conveyor to haul coal from the Hunter Valley No. 2 Mine to the existing Hunter Valley Coal Preparation plant than to bring a rail spur from Mount Thorley to Hunter Valley No. 2 site or to the Wollombi Brook and from there a conveyor to the site. The latter option would also require a coal preparation plant to be constructed at Hunter Valley No. 2.

ii. Combined preparation and transport facilities for Hunter Valley No. 1 Mine and the proposed No. 2 Mine would provide increased economies of scale, and at a capital expenditure lower than building separate facilities at Hunter Valley No. 2.

iii. Operational advantages and maximum operational independence for the Company would be gained by centralising all product coal loadout at Liddell.

iv. More effective application of environmental safeguards would be achieved by locating the major coal handling, storage and

preparation facilities at two rather than three sites.

Considering these arguments the planning for the Hunter Valley No. 2 project was based upon the transportation of the raw coal to the Hunter Valley Coal Preparation Plant. Generally a steaming coal product is to be prepared at this plant and coking coal is to be moved by the existing overland conveyor for preparation at the Liddell Coal Preparation Plant. The Hunter Valley Coal Preparation Plant is to be augmented to handle the wider range of coal types. Figure 16 shows the flow of coal proposed for the project.

Rail load out of steaming and coking coal will be undertaken at Hunter Valley Loading Point and Liddell Loading Point respectively. The existing facilities have adequate capacity to cater for the output of the project.

4.2.3 Site Layout

The proposed layout in Figure 15 incorporates the favoured development options for the project. The four main components are:-

Mine Area: Mining operations will be commenced initially in the southeastern corner in Redbank pit and later in Hobden Pit in the northeastern portion of the site. Stage 1 will involve extraction of coal from the Woodlands Hill Seam in the two shallow pits and Stage 2 the extraction of all seams to the base of the Vaux Seam in a deep open-pit operation.

Out-of-Pit Overburden Disposal Area: The area between the proposed pits on the eastern side of the Authorisation has been selected for the emplacement.

Surface Facilities: Temporary surface facilities required in Stage 1 will be located adjacent to the Redbank pits at the Birnamwood site. The permanent Hunter View facilities will be established in the northwestern corner of the Authorisation.

Coal Handling and Preparation: In Stage 1, the coal will be loaded directly into highway type trucks and hauled on a private sealed road to the Hunter Valley Coal Preparation Plant.

A system of combined trucking and conveyor transport is to be

implemented in Stage 2 to move the increased coal production to the Hunter Valley Coal Preparation Plant. Coal from the pit will be trucked to a receival and crushing facility adjacent to the Hunter View facilities. It will be stored temporarily in surge bins at this site and then conveyed to the preparation plant via the overland conveyor constructed for the purpose.

4.3 MINING

4.3.1 Pit Development

Figures 17 to 22 show the progressive development of Redbank, Redbank North and Hobden pits. The development of the Redbank Pit will commence towards the southeastern corner at the subcrop of the Woodlands Hill Seam. The extraction of the seams below the Woodlands Hill Seam is not planned for this area as the thickness of the interburden and the poorer quality of the coal results in strip ratios in excess of the requirements for economic opencut mining. The maximum depth of mining to the Woodlands Hill Seam will be 80 m in the southwestern corner of the pit.

Redbank Pit is to be located in the shallowest coal which will permit a rapid build up of production to about 1 Mtpa. This production level will be maintained for six years until coal extraction commences from Hobden Pit.

Redbank North Pit will be developed during Year 7 to mine the Woodlands Hill Seam in an area to the northwest of Redbank Pit. The low strip ratio at this location will enable this small pit to produce 1 Mt of coal in a 12 month period to assist in offsetting the large expenditure involved in the establishment of Hobden Pit.

The development of Hobden Pit will commence in Year 5 in the northeastern corner of the site and proceed in a southwesterly direction. Overburden will be removed for approximately 18 months before coal is produced in Year 7. The initial box cut will need to be developed to a maximum depth of 115 m on the eastern boundary

over a four year period before a mining face is available for continuous coal production at the rate of approximately 4.5 Mtpa.

Hobden Pit will progress to the southwest with the system of benches aligned generally parallel to the crop zones of the upper coal seams.

4.3.2 Pit Operations

Overburden removal will commence in Redbank Pit with a dragline equipped with a $13m^3$ bucket, excavating a box cut along the subcrop of the Woodlands Hill Seam. A $10m^3$ capacity front-end loader and two 154t rear dump trucks will be employed to construct access ramps and establish pre-strip benches in advance of the dragline. Overburden from the box cut will be sidecast onto the out-of-pit disposal area with subsequent dragline excavated overburden being used to backfill the previous strip. Spoil excavated by the front-end loader will be hauled to either the disposal site or used to fill voids between the heaps of spoil sidecast by the dragline.

As the front-end loader will not be fully utilised in the overburden removal operations it will also be used to load broken coal into trucks. Coal extraction will start approximately one month after the commencement of overburden removal. At the beginning of Year 2, a $6m^3$ capacity front-end loader will be introduced and used exclusively for coal loading while the $10m^3$ capacity front-end loader will continue as previously detailed. Coal haulage will be in 25t highway type trucks which will haul the coal to the Hunter Valley Coal Preparation Plant via the sealed haulage road constructed on Company owned land.

After 18 months a $26m^3$ capacity rope shovel will be introduced to commence pre-stripping in advance of the dragline. The front-end loader will continue to construct ramps and establish dragline benches. Initially these units will work in conjunction with three 154t rear dump trucks but by Year 4 this number will have

increased to eight due to longer haul distances.

All of this equipment will operate until Year 6 when only a small amount of pre-strip will remain in Redbank Pit. The rope shovel will then be transferred to Hobden Pit and by the end of Year 6 mining in Redbank Pit will be completed. During Year 7, the dragline will be used to uncover coal in Redbank North Pit in conjunction with a small amount of pre-stripping by front-end loader.

Figure 19 shows that a void of approximately 46.5 Mm^3 will remain at the end of the mining operations in Redbank Pit. This void will be filled to create a free draining surface using pre-strip material from Redbank North Pit and overburden from Hobden Pit to permit future mining some 20 years hence. Sidecast material from Redbank North will be recontoured, grassed and the final strip retained for water storage.

The main mine development will commence in Hobden Pit in the latter half of Year 5 by ramping down to the base of the Vaux Seam and excavating to form the box cut shown in Figure 20. The location for the box cut was selected in the shallowest area of coal on Company owned property with the lowest overburden to coal ratio. The development of the box cut to its maximum depth of 115 m will take approximately 2.5 years.

A single shovel will be used to excavate the box cut in the first five months, after which a second shovel will then be transferred from Redbank Pit. Hobden Pit will be further developed in Year 6 to provide sufficient face length for two further shovels. A fifth shovel will be introduced in Year 7 and with the final shovel in Year 9 the target production of 4.5 Mtpa will be achieved in Year 10.

Overburden from Hobden box cut will be incorporated initially in the refill for Redbank Pit and then in the out-of-pit emplacement. The box cut will be completed at the end of Year 7 and then about 70 per cent of the overburden will be

recycled. The remaining 30 per cent will be taken to the emplacement area until Year 15 by which time all the overburden will be recycled within Hobden Pit. Approximately 30 M bcm per year of overburden will be removed when coal production reaches about 4.5 Mtpa after Year 9.

During Stage 2 a 225 kW track dozer will be used to rip and heap coal within the pit. Three 10 m^3 capacity front-end loaders will be used to load broken coal into 77t capacity rear dump trucks which will haul to the Hunter View Receival Area.

The maximum equipment numbers proposed during each stage of the project are listed in Table 4.2.

4.3.3 Component Operations

Site Preparation

Trees and large shrubs within the areas proposed for mining, overburden emplacement and surface facilities will be cleared, stacked and burnt at times permitted by Fire Control Regulations.

Topsoil Handling

Figure 10 shows the availability and depths of topsoil on the site. Topsoil depth is variable and generally limited to 50 mm except for areas adjacent to watercourses where the thickness may increase to 300 mm. Areas which have been affected by erosion are devoid of topsoil.

Experience at the Hunter Valley No. 1 Mine has indicated that nominally 100 mm of topsoil is required for effective rehabilitation and the surveys conducted on Authorisation 13 have shown that there will be a deficit of topsoil in the later

TABLE 4.2

MINING PLANT LIST

Task	Plant Description	Capacity	Maximum Number in Operation Stage 1	Maximum Number in Operation Stage 2	Maximum Sound Power Level dB(A)
Topsoil Stripping and Placing	Push Pull Scraper	340/190kW	2	3	115
Overburden Removal: Excavating and Placing	Dragline	13m^3	1	-	114
Benches >8m:					
Drilling	250mm diameter Rotary Blast Hole Drill	35m/hr	3	6	115
Loading	Electric Rope Shovel	26m^3	4	6	113
Haulage	Rear Dump Truck	154t	15	40	120
Benches <8m:					
Drilling	150mm diameter Rotary Blast Hole Drill	40m/hr	1	5	115
Loading	Rubber-tyred Front-end loader	10m^3	1	3	118
Haulage	Rear Dump Truck	77t	-	17	115
Ripping, Ramp Clean Up, Trimming	Wheel Dozer	280kW	3	4	115
Ripping, Ramp	Track Dozer	340kW	2	6	118
Construction	Track Dozer	520kW	1	1	118
Coaling:					
Drilling	150mm diameter Rotary Blast Hole Drill	40m/hr	1	2	115
Loading	Front-end Loader	6m^3	1	-	115
	Front-end Loader	15m^3	-	3	115
	Track Dozer	225kW	-	1	115
Haulage	Rear Dump Truck	77t	-	18	115
	Haulage Trucks (contract)	25t	25	-	106
Road Maintenance:	Grader	190kW	-	4	102
	Grader	135kW	1	1	102
	Water Tanker	50,000L	2	4	115
	Water Tanker	20,000L	1	1	108
	Compactor	280kW	-	1	106

years of mining. However, during the initial 21 years of the project only approximately 60 per cent of the site will be rehabilitated, as the remainder will be occupied by the pit, and 90 per cent of the topsoil requirements will be fulfilled.

Laboratory investigations of the suitability of rock types in the overburden for use as a topdressing material have shown that some horizons may contain rocks suitable for this purpose. Further investigations and field trials will be conducted to identify the most suitable rocks, and any chemical and fertilizer requirements, and the results will be employed to prepare topdressings to remedy the deficits.

Topsoils to be stockpiled, will be grassed to maintain some seed stock and soil organisms prior to respreading.

Drilling and Blasting of Overburden

Based upon the current technology, available explosives and experience at Hunter Valley No. 1 Mine, it is envisaged the blasting practice for the project will employ the following techniques:

Explosives: Dry blastholes will be loaded with ammonium nitrate/fuel oil (ANFO) supplied by a contractor. The explosive will be discharged into the holes from a 12 to 15 t capacity mixing truck with an auger-pneumatic delivery system at approximately 450 kg/min. Wet blastholes which are expected to comprise less than 10 per cent of the volume charged will be charged with bulk or cartridged slurries.

Initiation System: Downhole initiation will be performed by cast pentolite primers at determined intervals on approximately 10 g/m detonating cord downlines. Decking of the blastholes may be required to ensure efficient blasting of the various material types. Downlines will be connected to trunkline networks of 5 g/m. Detonating relays will be placed in a network to give delays between the rows of blastholes as required by the blast design. This initiation is considered to be the safest available.

The drilling patterns for blasting overburden will be determined by bench heights. It is proposed that holes will be drilled at 150 mm in diameter on a 4.0 m x 4.5 m staggered 'V' pattern when bench heights of up to 8 m are used and at 250 mm diameter on a 7.5 m x 8.5 m pattern for benches greater than 8 m.

Ground vibrations and overbreak will be controlled by the use of detonating relay connectors with different delay periods.

Stemming lengths will be as long as practicable to prevent premature venting of explosive gases which would reduce the effectiveness of the blast in fragmenting the rock and lead to an increase in noise, airblast and flyrock.

Overburden Removal and Haulage

A modular dragline with an approximate bucket capacity of 13 m^3 will be used to remove blasted overburden in Redbank and Redbank North Pits. Operating bench widths will be approximately 40 m with an operating height up to 25 m.

Large electric rope shovels with 26m^3 capacity buckets will work against faces between 8 m and 15 m high. Operating bench widths will be approximately 50 m and 80 m in Hobden and Redbank Pits respectively. Where the depth of excavation exceeds 15 m, two or more benches will be formed.

The shovels will load blasted rock into 154t off-highway rear dump trucks. These will haul the material from Redbank Pit to the particular construction areas during the initial development of the site and thence to the overburden emplacement or in-pit dump horizons.

Approximately 15 per cent of the overburden faces will be less than 8 m in height and will be loaded by 10m^3 capacity front-end loaders into 77t rear dump trucks.

Overburden Emplacement

Table 4.3 shows the proposals for the movement of overburden during the first 21 years of mining on the Authorisation.

TABLE 4.3

OVERBURDEN MOVEMENT
($x10^6$ bcm)

Year	Redbank Pits			Hobden Pit
	Dragline	Shovel/Front-end Loader	Total	
1	2.95 (a)	0.41 (b)	3.36	-
2	3.27	1.44	4.71	-
3	3.01	3.56	6.57	-
4	2.88	3.73	6.61	-
5	3.05	3.12	6.17	2.91 (c)
6	3.36	0.78	4.14	9.73
7	3.58*	1.10	4.68	22.81
8				24.95 (d)
9				30.56
10				30.02
11				29.66
12				31.47
13				29.53
14				30.55
15				29.53
16				29.53 (e)
17				30.67
18				29.55
19				30.77
20				29.57
21				32.98

Key: (a) Redbank Pit refill.
(b) Overburden disposal area and Redbank Pit Refill.
(c) Placed in overburden disposal area and Redbank Pit Refill.
(d) 30% to overburden disposal area and Redbank Pit. 70% to Hobden Refill until Year 15.
(e) Hobden Pit Refill.
* Redbank North Pit.

Approximately 100 million bcm of overburden will be disposed of in the out-of-pit emplacement at the location shown in Figure 15.

Disposal of overburden will commence close to the eastern boundary of the site and

advance to the west and north. Emplacement will be predominantly by end-dumping over an advancing face by rear dump trucks although sidecasting by the dragline will occur during excavation of the first strip of Redbank Pit. Face heights of 30 m to 60 m maximum are proposed. The outside faces will be trimmed after all overburden has been placed in a particular area to form an average slope of between 4 and 8 degrees. Rehabilitation of these faces will be undertaken approximately one year behind the emplacement operations.

Backfilling in the open pits will commence when it is practical after the box cuts are completed. The majority of the overburden mined in Redbank Pits will be recycled. About 2.5 years will be required to develop the box cut in Hobden Pit before some backfilling is possible. For the next seven years, 70 per cent will be recycled and all the overburden will be returned as backfill to the pit after Year 15.

The volume occupied by the broken overburden in the out-of-pit emplacement and in the backfilled areas will be greater than it was in-situ and the surplus will be surcharged on the filled areas above the level of the original surface. Estimates of the degree of swell based upon current opencut operations in the Hunter Valley indicate that the swell factor will be between 1.20 and 1.30 and a factor of 1.25 was adopted for the Hunter Valley No. 2 project. Using this swell, the elevation of the surcharged spoil will reach a maximum elevation of RL 155 m, which will be approximately 80 m above the existing surface. The out-of-pit emplacement will be graded into the surcharged spoil during rehabilitation to form the final contoured surfaces shown in Figure 22 for Year 21 of the project.

Coal Extraction and Haulage

All coal in seams down to 500 mm in thickness will be mined. Coal seams less than 2 m in thickness, which comprise approximately 60 per cent of the coal, will be ripped and pushed into heaps by large bulldozers. The thicker coal seams will be

drilled and blasted.

Broken coal will be loaded by front-end loader into 25t capacity highway type trucks during Stage 1 of the project and into 77t rear dump trucks during Stage 2.

During Stage 1 coal will be hauled by road directly to the Hunter Valley No. 1 coal receival area, while road haulage will be to the Hunter View dump hoppers during Stage 2. From the Hunter View facilities coal will be transported by overland conveyor to either the Hunter Valley or Liddell Coal Preparation Plants. The coal production rates proposed for the two pits are shown in Table 4.4. Production of about 4.5 Mtpa will be maintained after Year 11.

TABLE 4.4

RUN-OF-MINE COAL PRODUCTION
($\times 10^6$ tonnes)

Year	Redbank Pits	Hobden Pit	Total
1	0.7		0.7
2	0.9		0.9
3	0.9		0.9
4	0.9		0.9
5	1.0		1.0
6	1.0		1.0
7	1.24	2.26	3.5
8		4.2	4.2
9		4.45	4.45
10		4.5	4.5
11		4.5	4.5

4.3.4 Water Quality Controls

Objectives

Pollution control and water management studies were conducted to examine the possible impact of the proposal on the site and surrounding areas. The major findings of these studies which are detailed in Section S8.2.3 in Study 8 in

Volume 2 are:-

i. The major watersheds are to the Hunter River and Wollombi Brook. Approximately 89 percent of the Authorisation drains to the Hunter River, primarily via Hobden Gully.

ii. Surface waters are of adequate quality for domestic, agricultural and industrial applications.

iii. A general groundwater gradient exists from southwest to northeast. Groundwater is recharged in the hills and discharges into the Hunter River.

iv. Groundwater salinity levels were found to vary from 500 to 3600 mg/l.

v. Groundwater flows into Hobden Pit from the coal measures are estimated to be in the range of 300 m^3/d to 4000 m^3/d. The range is wide due to the uncertain distance to recharge sources, lack of detailed knowledge of faults and aquifers and the influence of drainage to other mines in the vicinity. The inflow to the pit is estimated at 1000 m^3/d.

vi. Groundwater inflows to Redbank Pit were estimated at 15 m^3/d at RL 60 m. These flows are expected for the first two years and then reduce because of the limited sources of recharge.

vii. Seepage from the Hunter River to Hobden Pit through the coal measures was estimated at less than 300 m3/d and through the alluvium at less than 10 m3/d.

Based on these findings and the Company's experience at Hunter Valley No. 1 Mine, the objectives for water management at Hunter Valley No. 2 Mine were identified as:-

i. To minimise the need to draw on the Hunter River supply by maximising the re-use and site storage of water. Where practical, water generated on the site will be stored for use during periods of low generation when the requirements by other consumers of alternative sources are at a peak.

ii. To use poorest quality water first by assigning priorities in water use.

iii. To discharge treated excess water into watercourses when the receiving waters are best able to assimilate the releases.

iv. To segregate the various water types generated on site to minimise the volume of contaminated water to be treated.

These objectives were employed in an assessment of available options detailed in Section S8.3.1 in Study 8. From the analysis the water management programme

summarised in Figure 38 was developed for the mining operations. The safeguards proposed to achieve these management aims are shown in Figures 17 to 22 and are detailed below. The volumes of the various treatment facilities are shown in Table S8.5 (Volume 2).

Runoff from Undisturbed Areas

Only runoff water generated on the site will need to be controlled as there are no upstream catchments beyond the boundary of the Authorisation.

Where practicable, runoff from catchments upstream of the areas being mined will be collected in semi-permanent storage dams constructed to retain water for on-site use. Three dams will be provided for this function. The first shown as Dam 2 with 30 Ml capacity will be sited in the central region of the site on Hobden Gully which receives the majority of site runoff. In Year 5 when Hobden Pit development commences, the subcatchment in the central eastern portion of the site will be isolated from Hobden Gully and Dam 3 of 28 Ml capacity will be required to prevent runoff entering the pit. It is estimated that by using water from Dam 3 before the water from Hobden Gully, Dam 2, there will be no overflow into the pit under normal conditions. During Year 5, Dam 4 of 20 Ml capacity will be established in Hobden Gully in conjunction with the construction of the haul road to the Hunter View facilities. After Year 15 when the Hobden Gully catchment has been substantially reduced by mining, this dam will be the only permanent storage for clean runoff.

Diversion channels will be provided as shown on the mine plans to intercept clean runoff prior to any of the mining developments and maximise the volumes directed to the dams. These channels will be sized to handle the flows from a time of concentration storm of 1 in 10 year return period. This storm will generate the maximum instantaneous flow rate during this return period. Runoff from areas downstream of Dam 2 and later Dam 4, will be directed to temporary storage dams

constructed adjacent to the Hobden Pit highwall to prevent flow into the pit and subsequent contamination. These storages will be re-established in advance of stripping operations and will be sized to handle average runoff volumes. The dams will be kept empty by draw-off for use, transfer to the permanent storages or by discharge if these facilities are full.

All dams will be provided with overflow spillways capable of discharging flows from 1 in 20 year storms. In the case of Dam 2 a channel will also be provided to permit overflow to gravitate to the Hunter River.

Where runoff cannot readily be contained, or the catchments are too small to provide a usable quantity of runoff, diversion channels will be provided around the open pits. These channels will direct runoff to natural watercourses.

All diversion channels will be wide, shallow and grassed. Where practical bed slopes will be maintained at a minimum to reduce erosion potential of the channel.

Minewater

It was not considered practical to segregate groundwater inflows from runoff from direct rainfall within the pit. The resulting minewater mix is expected to have concentrations of dissolved salts and suspended solids which would render it unsuitable for direct discharge to watercourses under current Clean Waters Act requirements.

Use of this water will be confined to on-site uses. Apart from the initial development period in the Redbank Pit an excess will remain after pit demands are satisfied. Therefore, additional disposal methods will be required. Until Year 7 of the project, it is estimated that as only small volumes of runoff will be generated due to the small pit area,minewater excesses can be disposed of by using the evaporative potential of the pit. This will be achieved by watering non-

active roads in addition to normal dust suppression of active haul roads on occasions when excesses occur. Following Stage 1 a pipeline will be constructed along the overland conveyor to Hunter Valley Coal Preparation Plant and all excess minewater will be pumped to the plant to supplement requirements. This system of minewater control will ensure that there are no discharges of saline groundwater from the mining sites.

The in-pit collection and storage system will consist of a series of sumps located in the low points of benches. Water will either be pumped from these sumps directly into tankers for in-pit dust suppression or transferred to surface storages for settling prior to re-use. For Stage 1 of the project, the storage will consist of two cells each of 30 Ml capacity located adjacent to Redbank Pit as shown in Figure 17. For Stage 2, the final strip of Redbank North Pit will not be backfilled so that in excess of 100 Ml can be stored in the void.

During periods of high rainfall, if minewater storages are filled, the pit will be used as a sump to store the water temporarily so that a discharge will not be necessary. Estimates of storm flows indicate that the flows from 1 in 100 year storms would only result in the flooding of the bottom coal seam in the pits. For the Redbank Pit operations the volume of water is relatively small and can be disposed of in a short time while the slow rate of advance of the Hobden Pit will ensure that the loss of access to the bottom seam, even for a number of months, will not substantially hinder the mining operations including backfilling and rehabilitation.

Runoff from Disturbed Areas

Runoff from the out-of-pit haul roads will be collected in table drains and directed to sedimentation dams as shown in Figures 17 to 22. Following settling of suspended solids washed from the roads, the clarified runoff will be used for dust suppression or displaced from the dams and discharged into natural streams

during storms.

Runoff from the overburden emplacement and backfilled surfaces will be collected by a series of short contour banks constructed every 40-60 m to prevent the formation of erosion channels. These banks will discharge into sedimentation dams with a capacity of approximately 2500 m^3 sited within the flow lines created in the refilled landform. A number of small dams rather than only large perimeter storages are proposed to eliminate large flow concentrations which may create substantial erosion and also to provide stock watering points necessary for the post mining land use of grazing.

All drains and diversion banks will be sized to handle flows from a time of concentration storm of 1 in 10 year return period. This storm will generate the maximum instantaneous flow rate during this return period.

The function of the sedimentation dams will be to provide primary sedimentation for runoff.

The dams have been designed on a flow-through basis with a minimum detention of one hour for the 1 in 20 year storm flows. Spillways based on 1 in 100 year flows will be built to discharge clarified overflow safely. The retention period was chosen following an analysis of soil particle size and settling times. The results showed that all material 0.1 mm in diameter or greater can be settled in the sedimentation dams proposed in one hour. This will result in all material except fine silt and clay being settled. To achieve improved removal efficiency using sedimentation would require impractically larger storage times and hence dam volumes. For example to settle the fine silts would require approximately 7.5 days and clay approximately one year.

The principle of primary settling to remove coarse material followed by displacement to streams if rainfall persists will result in discharges at times

when streams are in flow and hence the potential for impact on downstream users will be minimised.

4.3.5 Air Quality Controls

Construction

Dust generation will be minimised during construction. Water tankers will be maintained on site when clearing and stripping construction areas. Water added to the soil to assist in compaction will reduce dust emissions from embankment and road construction operations. Revegetation and landscaping of disturbed areas will be carried out as soon as construction is complete.

Mining Operations

Topsoil Stripping: Topsoil stripping operations will be undertaken by push/pull scrapers. This approach is likely to be most effective with stripping for the Hobden Pit because of the flexibility provided in the slow advance of the pit. Scraper haulage routes from stripping areas will be watered similarly to the coal and overburden haulage roads.

Blasthole Drilling: Overburden and coal drills will be fitted with dust collection equipment to minimise dust emissions during drilling.

Blasting: The minimisation of dust will be considered in the design and execution of blasts. Practices such as the adoption of stemming lengths as long as practicable to prevent the premature venting of gases will aid in reducing dust emission as well as providing more efficient blasts.

Where practical blasting will not be conducted during periods of excessively high winds.

Dragline Operations: Care will be taken to minimise the dump height of the spoil while maintaining efficient dragline operations.

Overburden and Coal Haulage: All regularly trafficked unsealed areas will be watered using water tankers fitted with a spray bar and side sprays. The tanker fleet will contain one 20,000 l and two 50,000 l units and will be able to apply water on active haul roads at

the rate of 1.5 $l/m^2.h$.

Overburden emplacement: The areas associated with overburden dumping and shaping for rehabilitation are susceptible to wind erosion. To minimise the entrainment of dust the area of active overburden dumping will be kept at a minimum and the final surfaces will be shaped and sown as soon as practical. Active dumping locations will be regularly watered at the same rate as the haul roads.

4.3.6 Noise and Vibration Controls

Table 4.2 lists the major units of plant required for the project and their operating noise levels when equipped with silencing devices. Sound power levels presented in Table 4.2 will be achieved either by equipment as supplied or by the addition of noise suppression equipment in the form of high performance silencers and/or acoustic panels.

The penetrative effect of the pure tone emitted by the reversing alarms on mobile equipment is to be reduced by modification to achieve a 5 to 10 dB reduction from standard operating levels.

Overburden dumping at the top levels of the out-of-pit emplacement and surcharge areas will be conducted during daylight hours where noise impacts are of concern and only in selected locations at lower levels behind shielding at night.

The major excavating units will operate on benches below the existing ground surface in the open pits for most of the mine life. Residents in neighbouring properties will be shielded from the noise levels generated by this equipment except for the short periods when the operations are at the surface, and at these times, partial shielding will be provided by topographic features and overburden emplacements.

The blasting practice proposed for the operation will be designed to limit ground

vibrations and air blast to levels which do not cause discomfort to nearby residents. Initial blasting will be designed on the basis of parameters determined from the monitoring of production blasts at the Company's Hunter Valley No. 1 Mine. Peak impulsive noise levels will not exceed 118 dB(L) and peak particle velocities will be less than 7 mm/s at the nearest non-Company owned residences.

4.3.7 Visual Controls

Study 11 considers the visual implications of the project and the landscaping and tree planting programmes proposed to screen various components from residences, roads and vantage points.

Total screening of the operations and overburden emplacement will be impractical because of the size of the area proposed for disturbance and the increasing elevation of the working places as the mine develops. Figures 17 to 22 indicate that a visual impact will become apparent early in the project and increase in magnitude to Year 21 when the height of the emplacement will reach about RL 155 m, approximately 80 m above the existing surface. At this time the new feature will be prominent and visible from many locations. Impressions of the mine at Year 21 looking south from Lemington Road and looking northeast from the realigned Jerrys Plains Road are shown in Plates 8 and 9 respectively. The rehabilitation programme will assist in reducing the impact as the sections along the eastern side of the Authorisation are revegetated and the tree planting proposals indicated in Figure 25 are commenced in these areas.

The Company has discussed the visual impact of the project with residents living at vantage points with views to the operations and is prepared to plant tree screens at strategic locations adjacent to residences to minimise the visual effects.

4.3.8 Rehabilitation

Objectives

Section S11.4 in study 11 details the Company's experience in rehabilitation at the Hunter Valley No. 1 Mine and the proposals for the Hunter Valley No. 2 project. Plate 10 shows progressive rehabilitation of the out-of-pit overburden emplacement at Hunter Valley No. 1 Mine. Plate 11 presents a close up view of the grass cover established on the emplacement. The basic objective of the programme will be to create an environmentally acceptable and productive landscape suitable for the favoured post mining land use of grazing and to be visually compatible with the landforms in the subregion. The main stages in the programme will be to:-

i. Minimise erosion by revegetation and establishment of a suitable drainage network.

ii. Establish a viable productive pasture.

iii. Establish tree stands within the pasture.

Due to the close proximity and similar overburden types it is proposed to use the experience gained at the Hunter Valley No. 1 Mine and the results of ongoing research on that site as the basis for rehabilitation planning for the Hunter Valley No. 2 project.

The approach intended is to evaluate the success of differing surface treatments, seed and fertiliser requirements under operating conditions on the Hunter Valley No. 1 site and extrapolate results to Hunter Valley No. 2 where the soil types and climate are basically the same.

Planning

The components of the existing local and subregional topography were used in the

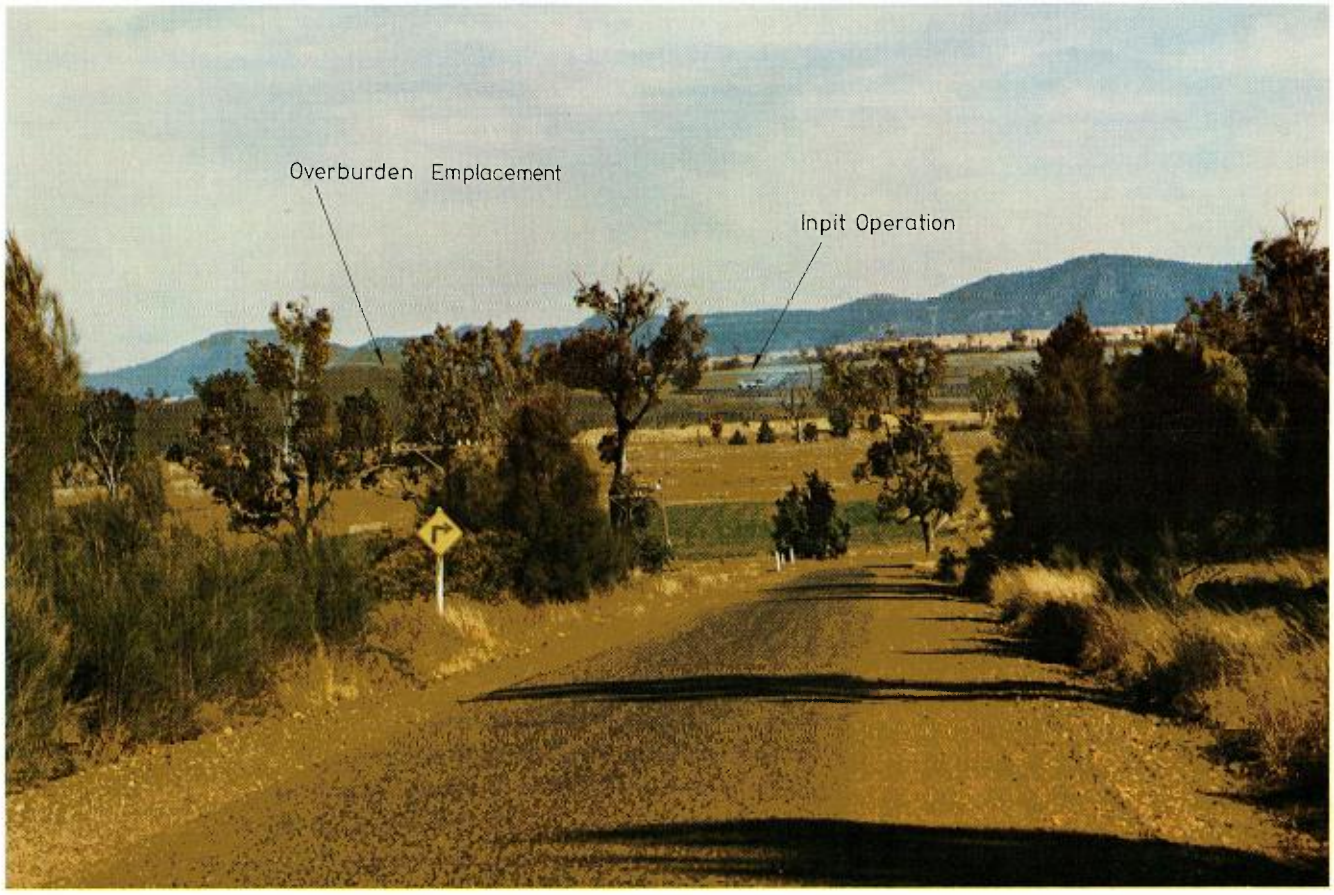


PLATE 8 IMPRESSION OF THE MINE AT YEAR 21 LOOKING SOUTH FROM LEMINGTON ROAD

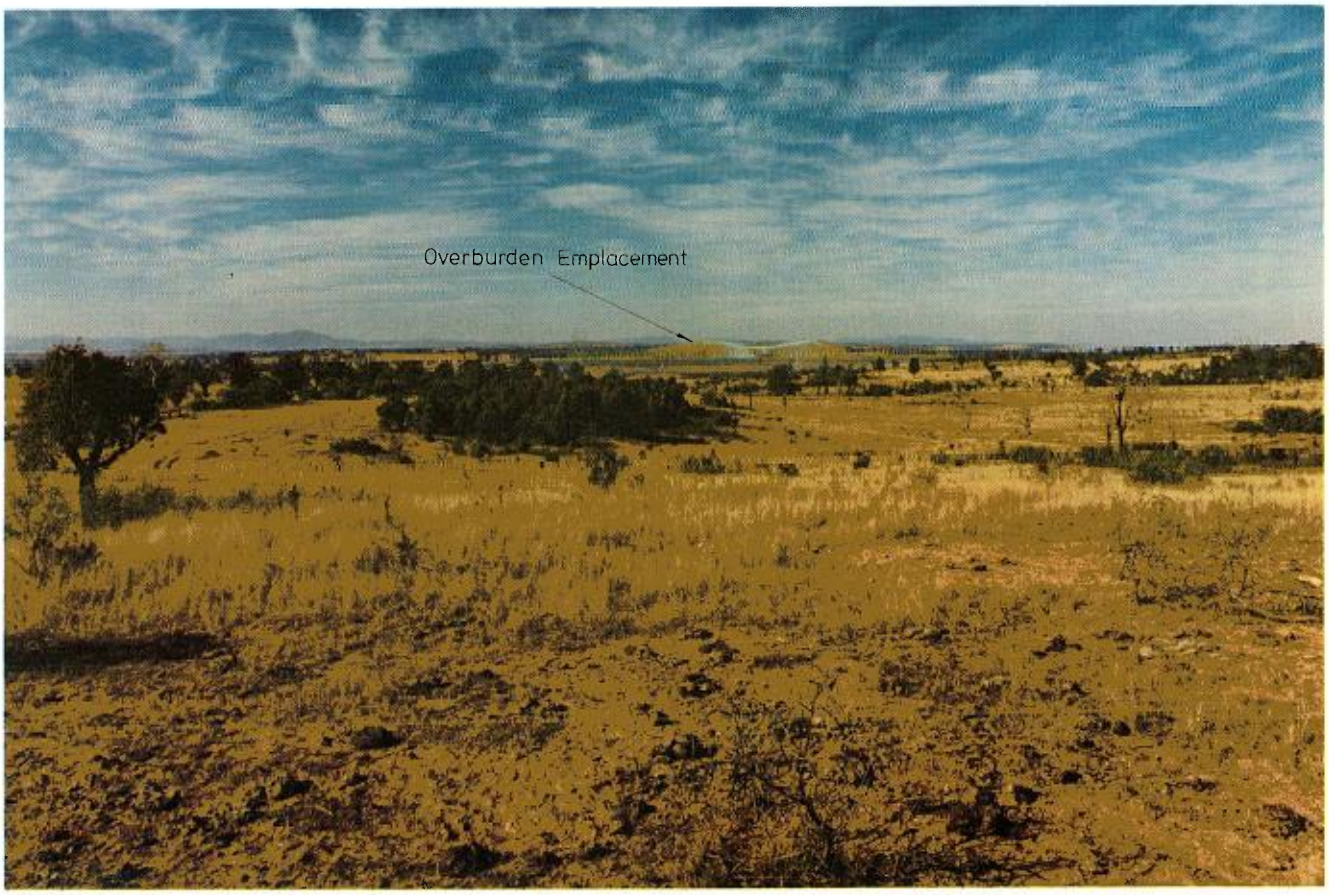


PLATE 9 IMPRESSION OF THE MINE AT YEAR 21 LOOKING NORTH-EAST FROM JERRY'S PLAINS ROAD REALIGNMENT

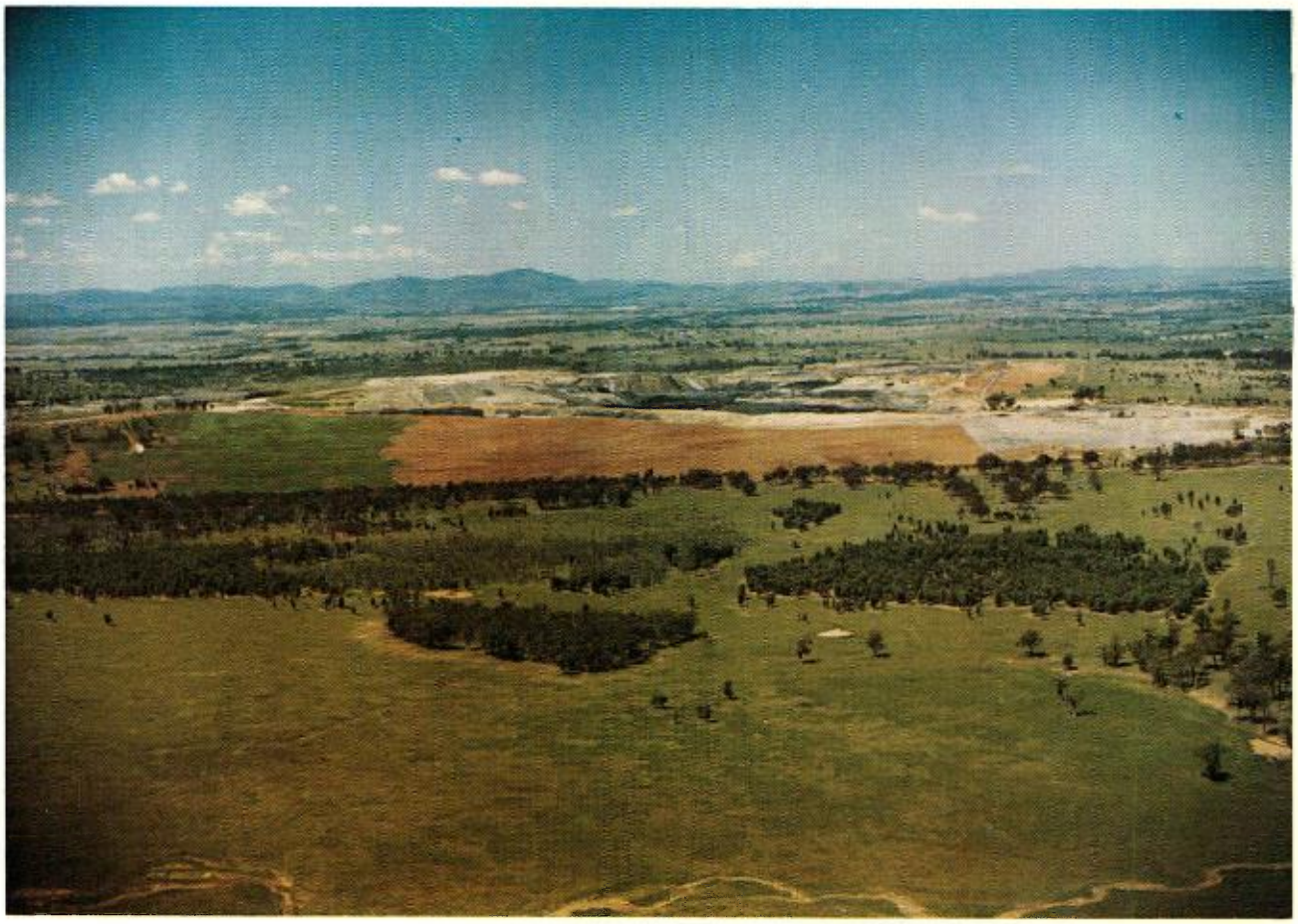


PLATE 10 PROGRESSIVE REHABILITATION OF THE OUT-OF-PIT OVERBURDEN EMPLACEMENT AT HUNTER VALLEY NO. 1 MINE

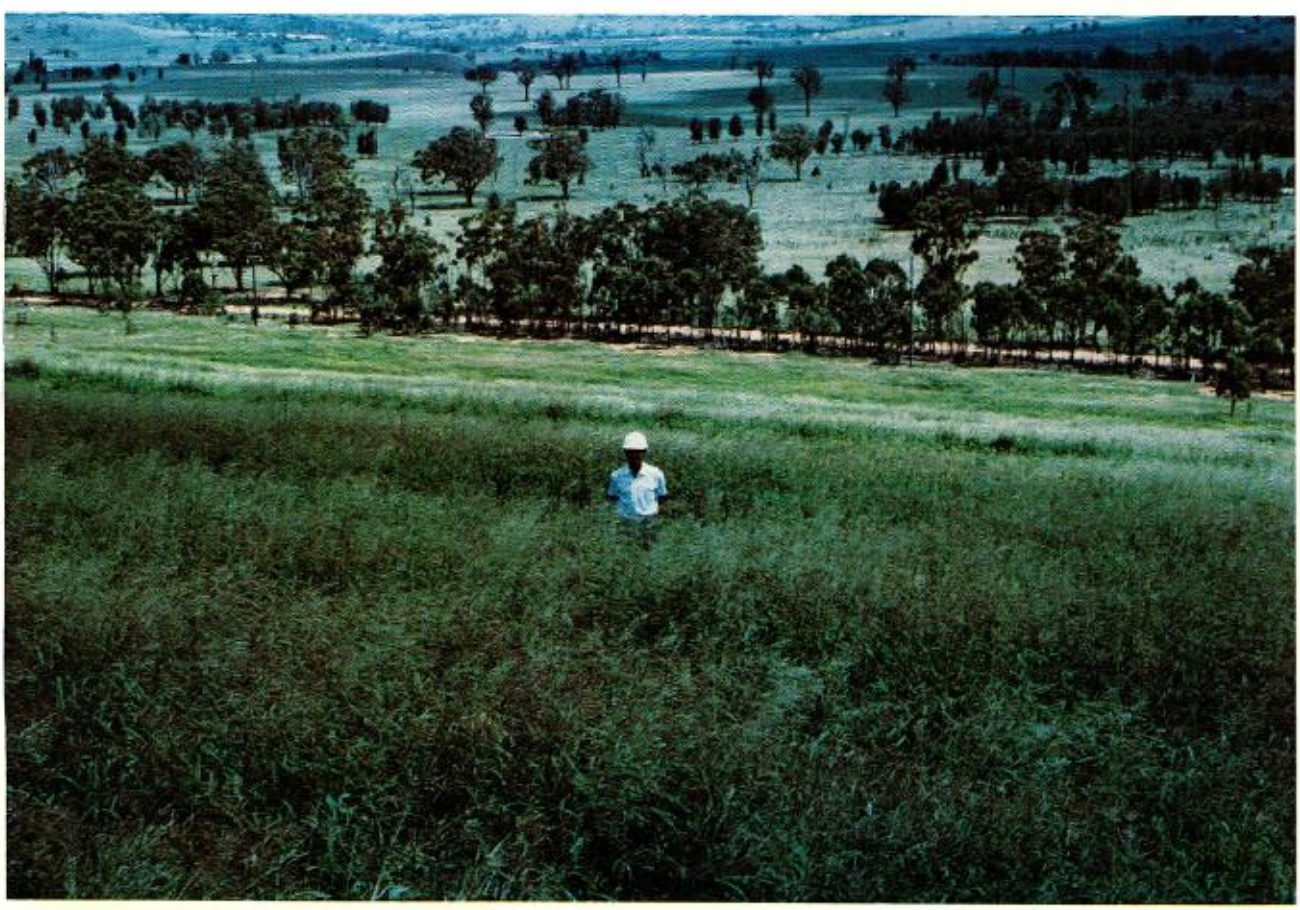


PLATE 11 REHABILITATED SECTION OF THE OUT-OF-PIT OVERBURDEN EMPLACEMENT AT HUNTER VALLEY NO. 1 MINE

design of the post-mining landforms. The new topography will reproduce the features characteristic of the adjoining undulating and hilly land. The skyline is to be designed with small peaks so as to appear as a logical extension of the rugged topography to the southwest of the Authorisation. Slopes will satisfy the requirements of the Soil Conservation Service and range from about 4 to 8 degrees with a minimum grade of 1.3 degrees. Local areas may be increased to 14 degrees.

A new drainage network will be constructed to control runoff and erosion from the new surfaces. Numerous lined dams will be located in the flow lines to provide for runoff settling and stock watering points for grazing. The design details for the new surfaces and flow lines will be finalised prior to each successive overburden emplacement lift. Surveys will be conducted to ensure accuracy. Figures 17 to 22 present the proposed plans for the mining operations after Years 2, 4, 6, 7, 13 and 21. Detailed planning has not extended beyond the 21 years of the project for which approval is sought. Conceptual mine planning for the longer term is considered in Section 4.9.

The operations will commence in Redbank Pit. Initially the spoil will be sidecast and then disposed of in the out-of-pit emplacement to the east. With the further development of the pit the spoil will be returned to the mined-out sections. Figure 20 shows that at the end of Year 7 about 60 ha of the final surface will have been shaped and about 40 ha will have been revegetated.

At about Year 7 Redbank Pit will be largely filled. The western refill benches which will be above the surrounding natural surface will remain until the Hobden Pit is developed into this area at a later stage.

The Hobden Pit is due for commencement in about Year 5. The pit will move progressively to the southwest and be backfilled from the northeastern section. Figure 22 shows the situation by the end of Year 21 when about 45 ha of the pit will

be filled to the level of the final surface. Ridge and valley systems constructed on the backfilled Redbank Pit area will be extended onto the Hobden backfill.

The proposed final landform shown in Figure 25 is to be constructed progressively from the beginning of the project. Possible changes in the designs or practice after Year 21 are likely to reflect improvements resulting from the experience with mining and rehabilitation to that date.

Procedures

The techniques for rehabilitation at Hunter Valley No. 2 Mine are being developed by the Company in consultation with the Soil Conservation Service. A summary of the procedures proposed are as follows, futher details are given in Study 11:-

Placement of Overburden: The new surfaces will be graded and contoured according to design criteria. Contour banks and small sedimentation dams will be provided to control erosion and topsoil will be spread to a nominal depth of 100 mm.

Surface Preparation: The surface will be cultivated to blend the topsoil with the overburden. Contour guidelines will be provided, banks and batters will be graded, topsoiled and grassed.

Fertilizer Application and Seeding: Seed and fertilizer will be broadcast after cultivation.

Tree Planting: Extensive areas of native trees are to be planted in stands on the new landforms in a manner consistent with the final land use proposed.

Maintenance and Management: An officer employed by the Company will be responsible for maintenance and management. Rehabilitation will be monitored to assess the progress and effectiveness of the various techniques.

Grazing: Stocking rates will be carefully managed when grazing is commenced.

4.3.9 Geotechnical Stability of Overburden Emplacement

A preliminary assessment of the potential geotechnical stability of the overburden spoil in the backfill was conducted by Golder Associates Pty. Limited (1981). The study concluded that the proposed refill in the Hobden Pit with an average slope of 23 to 25 degrees should be stable provided that the angle of friction at the floor of the pit exceeded 11.5 degrees. Actual floor friction angles are typically 10 to 20 degrees. In areas approaching the limit it is also recommended that the refilling operations should ensure that coarse sized, strong rock is placed on a clean floor at the base of the excavation to maximise frictional interlock at the floor. Weak materials such as clay or silt should be placed in the upper levels of the refill.

Investigations for a similar proposal are presented in an Environmental Impact Statement for Glendell Colliery (1982). The results of these investigations support the findings of Golder's preliminary assessment. It is also relevant to note that stability problems have not generally been encountered at other operating mines in the area with slopes greater than those proposed for the Hunter Valley No. 2 project. The stability of the backfill and out-of-pit emplacement will be reviewed continually as the mine is developed.

4.4 SUPPORT FACILITIES AND COAL HANDLING

4.4.1 Surface Facilities

It is proposed to establish surface facilities for the project at two locations corresponding with the two stages of development. This approach will enable the facilities to be located close to the mining operations and the capital expenditure to be staged in proportion to the growth in coal production.

Stage 1

Figure 15 shows the location of the Birnamwood Surface Facilities for Stage 1. A plan and cross-section for the site are shown in Figures 26 and 27, and for the workshop in Figure 28. The main buildings will be a site office, a bath house to cater for 145 men and a workshop. The buildings will incorporate an amenities room, field crew workshop, fuel and lubrication bay and a tyre change bay.

The existing project office established at Hunter View will continue to accommodate senior mining personnel and support staff.

Transportable buildings will be used for the site office, crib room and bath house and the workshop will be a conventional portal frame steel clad building.

Other facilities to be provided on the site will include a bulk fuel and oil storage area, washdown bay for mining equipment, hardstand area with 30 truck capacity, 1 Ml fuel storage tank, oil and grit arrestor, sewage treatment plant, water treatment plant, two 100,000 litre water storage tanks, site runoff treatment facilities and vehicle parking areas.

Access to the facilities will be from Jerrys Plains Road via the existing Maison Dieu Road easement.

At the completion of Stage 1, the facilities will be converted to a refuelling bay and a base for the field maintenance crew. Other activities will be transferred to the Stage 2 Hunter View site. The facilities will be dismantled at the end of Year 13 to make way for the advance of the Hobden Pit.

Stage 2

Figure 29 shows the layout and buildings proposed for the Hunter View Surface

Facilities for Stage 2 of the project. Figure 30 is a cross-section through the facilities.

The administration building shown in Figure 31 will be a single storey building located on a reinforced concrete slab with the dimensions of approximately 40m x 30m. The external walls will be hardiplank and plasterboard sheeting will be used internally. The roof will be framed in timber and sheeted with 'colorbond' roof sheeting or tiles. External walls and the roof will be insulated.

The bath house shown in Figure 32 will be built in two sections linked by a covered way. One section will be the main bath house and the other will be the office of the pit overseer. A covered verandah will provide access to both the clean and dirty entrances to the bath house. Both sections will be single storey with concrete slab floors, brick walls and 'colorbond' type sheeted roofs.

The workshop/warehouse complex shown in Figure 33 will consist of a central area approximately 60m x 50m which will house the warehouse, offices and amenities. Workshop bays 15 m wide will flank this area on two sides. One set of bays will be 150 m long and the other set 100 m in length. The building will be steel framed, clad in 'colorbond' type sheeting and will have reinforced concrete floors. The workshop height will permit 154t rear dump trucks to be housed with trays raised.

Other facilities and structures to be constructed on the site will include a vehicle washdown pad for mining equipment, coal dump hoppers and a breaker station, a fuel storage area, sewage treatment plant, raw water storage, oil and grit arrestor, runoff treatment and storage facilities and a sealed vehicle hardstand and parking area. Access to the facilities will be from Jerrys Plains Road along a sealed road to be constructed on the site.

4.4.2 Services

Power Supply

Electric power for Stage 1 will be provided by the construction of a transmission line from the Hunter Valley No. 1/Hunter Valley Coal Preparation Plant Substation to Hunter Valley No. 2 at a supply voltage of 11 kV.

Electric power for Stage 2 of the project will be obtained from the existing 66 kV line traversing the Authorisation. A switching station will be located adjacent to the Hunter View Surface Facilities. A 66 kV ring main system will provide reticulated power for mining equipment in the open pits and the Birnamwood facilities; power will be transformed to 11 kV, 6.6 kV, 415 V, 240V and other voltages as required for use on the site.

The existing 330 kV line shown on Figure 14 will not require relocation before the end of Year 21. It may be necessary to relocate this line after Year 30.

Water

Potable water requirements will be obtained from the Hunter River. Non-potable water for surface facilities and mining will be supplied from runoff collected in a dam in Hobden Gully. Figure 15 shows the location of a pump station to be established in the Hunter River near the Hunter View site. Raw water will be pumped to two 9 Ml storage cells (Dam 1) on the hillside to the west of the Hunter View site. From here it will be pumped to the 100,000 litre storage tanks at Birnamwood to be used to supplement the supply from the Hobden Gully Dam.

Potable water for Birnamwood will be provided from a treatment plant with a capacity of 30,000 l/d. Treated water will be stored in two 40,000 litre tanks which will feed the bath house and crib room. Demineralised water for use in the

workshop is to be stored in a 10,000 litre tank.

When the Hunter View Surface Facilities are constructed, the pump station will be upgraded. The two 9 ML storage cells will supply the 100,000 litre water treatment plant and also supplement the supply to the truck washing station, workshop and fire hydrant ring main. Treated water will be stored in two 100,000 litre tanks for daily domestic use.

Ancillary Services

Fuel Storage: In Stage 1, distillate is to be stored on the site in a bunded storage area which will be progressively increased to a capacity of 1 Ml. Provision has been made to permit up to 20,000 litres of oil to be stored in drums adjacent to the Birnamwood workshop. It is estimated that four to six 1500 kg bulk grease containers will be held on site at any time.

Waste oil will be stored in a 5000 litre tank and disposed of on-site in an approved manner or removed by a contractor. Petrol will be obtained initially from local service stations.

The following additional stores for Stage 2 will be located adjacent to the Hunter View facilities:-

Distillate	- 2 Ml bunded storage.
Petrol	- 15,000 litre underground tank adjacent to 2 Ml bunded storage
Oils	- 40,000 litre in oil store area at workshop
Grease	- 1500 kg bulk containers, additional four on site.
Waste Oil	- 11,000 litre waste oil tank.

Firefighting Facilities: Hose reels, hand held extinguishers and break glass alarms will be provided as required by regulations of the New South Wales Fire Brigade.

First Aid: Ambulance rooms will be located in the bath house buildings and qualified first aid men will be available on each shift to treat any injured personnel.

Eating Facilities: A lunch room will be provided within the work complexes. Field facilities will be provided for mining personnel.

Public address systems will be installed in the workshop complexes.

A VHF/FM radio communication system will be provided with a base station in the administration building.

Garbage Disposal: Both domestic and industrial wastes will be collected by a commercial waste collector operating in the Hunter Valley.

4.4.3 Coal Handling and Transport

Stage 1

The ROM coal will be loaded into 25t capacity highway type dump trucks in the Redbank Pit, operating five days per week between the hours of 6 am and 10 pm. Figures 16 and 34 show the proposed route for the haulage road to the Hunter Valley Coal Preparation Plant.

The road will be bitumen sealed to minimise dust generation. A low level crossing approved in principle by the Water Resources Commission will be constructed over the Hunter River. Lemington Road will be crossed at grade. Stop signs and speed humps will be erected on the haul road for traffic travelling in both directions. Tarpaulins will be used to cover coal on all loaded trucks.

Stage 2 - Coal Handling

The coal handling facilities for Stage 2 are shown in Figures 16 and 34. The ROM coal will be loaded into 77t capacity rear dump trucks in the Hobden Pit and hauled to the dump hoppers at the Hunter View facilities. Haulage will be along the 20 m wide haul road shown in Figure 20.

Twin ROM dump hoppers are designed to operate simultaneously. Each hopper will have a capacity of 400 t and be provided with a 900 mm grizzly frame cover.

An emergency ROM stockpile of approximately 30,000 t capacity will be located adjacent to the dump hoppers. Stockpiled coal will be reclaimed by mobile equipment and loaded into the hoppers. Minus 900 mm ROM coal from the hoppers will be fed by electromagnetic feeder grizzlies to 800 mm wide breaker feed conveyors. Material from the conveyors will discharge to fixed bar type grizzly chutes feeding 3.7m diameter x 6.7m long rotary breakers which will reduce the coal to minus 100 mm. Coal less than 100 mm will bypass the breakers and discharge directly to the storage bin feed conveyors. Reject material from the breakers will be discharged to 900 mm wide conveyors and transferred to stockpiles of approximately 250 t capacity. The rejects will be loaded by front-end loaders into rear dump trucks and hauled to the overburden emplacements areas on approximately every second coal loading shift.

Stage 2 - Coal Storage

Coal from the breakers will be transported by 1200 mm wide conveyors to two 8,000 t capacity storage bins. Each conveyor will be fitted with a tramp metal magnet and belt weight scale.

Figure 35 shows the details of the coal storage bins. They will be located approximately 250 m north of the dump hoppers and stand 40 m high. Crossover conveyors will allow coal to be fed to either bin and enable different coal types to be handled simultaneously and stored separately. Draw-off from the bins will be via 2,000 tph vibrating feeders to a ground level conveyor located beneath the bins.

Stage 2 - Coal Transport

Coal will be transported from the storage bins to the Hunter Valley Coal Preparation Plant by overland conveyor along the route shown in Figure 34.

The proposed system will provide for coal to be fed from either storage bin to a 1200 mm wide, 2000 tph conveyor for transport over approximately 5.75 km across the Hunter River and floodplain to a transfer station near the northwestern corner of the Hunter Valley No. 1 Mine Lease boundary. A belt weight scale will be installed near the tail of the conveyor and a full sampling station at the transfer point.

For 900 m across the river and floodplain, the conveyor will be housed in a fully enclosed and bottom sealed gantry structure supported on steel trestles. For the remainder of its length it will be supported on the low level gantry structures shown in Section A-A in Figure 34. Both the superstructure of the gantry and the causeway will be above the maximum recorded flood level of RL 73.2 m (1955 flood). The supporting structures are shown in Figure 36.

The superstructure and substructure of the gantry have been designed to withstand the effects of all self weights, live load and material carried together with the effects of wind forces and forces due to stream flood flow, including log and debris impact.

The conveyor will be elevated over Lemington Road. From the transfer station adjacent to the Hunter Valley No. 1 Mine lease boundary, another 1200 mm wide, 2000 tph conveyor will transport the coal to a further transfer station above the overland cable belt conveyor which is connected to Hunter Valley Loading Point and Liddell Coal Preparation Plant. At this point it will be possible to divert coal to either the overland belt conveyor feeding the Hunter Valley Loading Point and the Liddell Coal Preparation Plant, or to a conveyor which will feed a 1500 t capacity surge bin within the area of the Hunter Valley Coal Preparation Plant.

The drive station for all conveyors will be at the head end and conveyor belting will be of steel cord construction. A fully enclosed belt tension station will

be provided for each conveyor to prevent breakage and spillage, and rip detectors will be provided at the transfer points. Emergency stop pull wires will be provided for the full length of the conveyors.

4.4.4 Water Quality Controls

Drainage Network

Drainage controls for the areas of the surface facilities are based on the 1 in 10 year design standard for runoff from disturbed areas detailed in Section 4.3.4.

Birnamwood: Figure 26 shows the area of drainage control for the Birnamwood facilities. Runoff from undisturbed grassed areas upslope of the facilities will be directed to Hobden Gully by diversion channels. Stormwater from building roofs, hardstand areas, car parks and adjacent areas will be collected by a series of dish drains and concrete pipes which will discharge to settlement Dam 5 in the northeastern corner of the site. Settled water will be used in dust suppression or will overflow via the spillway to Hobden Gully during storms.

Hunter View: Figure 29 shows the diversion channels proposed to direct runoff from undisturbed areas upslope of the facilities around the site to the Hunter River.

Stormwater from roofs, hardstand areas, car parks and grassed areas will be collected by a system of dish drains and concrete pipes and directed to Dam 6 in the northwestern corner of the site for settlement and storage. The dam will be a source of water supply and will have a capacity of 85 Ml.

Runoff from the coal receival area containing fine coal will pass through a grit arrestor prior to discharge to Dam 6 for settling and storage.

Process Wastewater

Birnamwood: Wastewater from the workshop and fuelling bay will be collected by a reticulation system and directed to an oil and grit arrestor adjacent to the northern edge of the hardstand area. The oil will be collected and stored for disposal. The effluent will be pumped to the sewage treatment plant. Wastewater from the washdown pad will be passed via an oil and grit arrestor to a 0.4 Ml retention pond for seven days settling and then will be discharged to Dam 5.

Hunter View: Washings from vehicle maintenance, lubrication and

refuelling areas and the workshop will be diverted via graded concrete floors, box gutters and a concrete pipe reticulation system to an oil and grit arrestor. The oil will be collected in inground tanks for periodic extraction and removal offsite. The effluent will be passed to the sewage treatment plant.

Wastewater from the washdown pad will be passed via an oil and grit arrestor to retention ponds for seven days settling and then discharge to Dam 6.

Sewage Treatment

Package type sewage treatment plants will be provided at the Birnamwood and Hunter View facilities with capacities of 32,500 l/d and 100,000 l/d, respectively. These capacities are based on daily wastewater allowances of 170 litres per production employee and 120 litres per office employee plus an allowance for truck washdown.

The effluent from the plants will be polished in maturation ponds. There will be two ponds at both sites each providing ten days retention. The ponds will have treated clay seals, and the exposed areas of the embankments will be grassed. A two-pond system will be employed to facilitate cleaning of sediment and to allow for maintenance without shutting the system down.

Effluent from the maturation ponds will be disposed of by spray irrigation in defined areas so as not to mix with other site water.

4.4.5 Air Quality Controls

The coal haulage road from Hobden Pit to the Hunter View facilities will be watered regularly to minimise dust generation. Application rates will be up to 2.5 $l/m^2.h$ according to conditions.

Sealed trafficked areas including the coal haul road for Stage 1 will be swept as required to remove spilled coal and material likely to generate dust.

The dump hoppers at the Hunter View Surface Facilities will be provided with protective screening 4 m high, along the rear and on one side, to minimise the spread of dust from coal dumped by haulage trucks from the pit. Mist sprays will be located at the top of the sheeting and immediately below the rim of the dump hopper. The sprays will be activated automatically on truck arrival and continue until dumping is completed.

Coal conveyors will be totally enclosed, or sheeted on top and the windward side. Transfer points will be fully sheeted. Scrapers will be fitted to belts to remove loose coal. The details of the enclosures to minimise dust generation on the overland conveyor are shown in Figure 36.

4.4.6 Noise Controls

The sound power levels generated by the 77t coal trucks will be limited to a maximum of 115 dB(A).

The site selected for the dump hoppers and rotary breaker is protected by the local topography and the propagation of noise from these sources will be reduced by the natural features.

The overland conveyor will be sheeted and electrically powered and will not be audible at the residences closest to the route. Coal transfer conveyors from dump hoppers to the storage bins will be fully enclosed to provide attenuation when they are above the ground.

4.4.7 Landscaping

Landscaping details are provided in Section S11.3.5, Study 11.

The landscape treatment proposed for the Stage 1 facilities at Birnamwood has

been designed to provide maximum benefit in the short term, as the site will be abandoned after approximately 13 years. Planting to provide screening from Jerrys Plains and Maison Dieu Roads has not been a major consideration because of their imminent realignment or closure. Conceptual landscape design for the site is shown in Figure 26. Trees and shrubs will be planted to provide shade and reduce exposure to winds. The area will be fenced before construction to protect mature and regenerating trees outside the site which will form a natural buffer for the facilities. All banks, batters and areas disturbed by construction will be grassed to minimise erosion.

Figure 29 shows the landscaping proposed for the Hunter View Surface Facilities. Extensive tree and shrub planting, including a forward tree planting programme, will be introduced to improve the appearance of the site, screen views from vantage points and control erosion and dust generation.

Figure 34 shows the tree planting programmes proposed for the routes of the coal haulage road and overland conveyor to the Hunter Valley Coal Preparation Plant. The objectives of the programme will be to reduce the stark and linear forms of the corridors and filter views from residences and vantage points.

4.5 COAL PREPARATION AND PRODUCT HANDLING

4.5.1 Steaming Coal

The Hunter Valley Coal Preparation Plant is to be augmented to provide greater flexibility in preparing the steaming coal production from the Hunter Valley No. 1 and No. 2 Mines. Details of the proposal are presented in Study 5 and in Figures S5.1 to S5.6.

Raw Coal Handling & Storage

During Stage 1 of the project, ROM coal delivered by road from Redbank Pit will be dumped into either of the two receival hoppers at Hunter Valley Coal Preparation Plant from where it will pass through a rotary breaker for crushing to minus 100 mm and then conveyed to raw coal stockpiles.

With the commencement of Stage 2, the coal from Hobden Pit will discharge from the conveyors into a 1500 t capacity surge bin at the southern end of the raw coal stockpile area. Surge capacity will be sufficient to allow the overland conveyor to continue running when stackers are being repositioned, during delays at the plant and for the conveyors to be unloaded if stacker mechanical failure occurs.

The existing raw coal stockpile capacity will be increased from 160,000 t to 320,000 t by doubling the length of each of the two stockpiles. The raw coal stacking conveyors will be extended approximately 270 m to permit stacking to the new stockpile areas and each will have capacity upgraded to 2000 tph.

The reclaiming conveyors will also be extended by 270 m as will the trackwork and ancillary equipment for the existing reclaimers and stackers. The existing raw coal luffing stackers will be upgraded from 1200 tph to 2000 tph.

Additional flexibility will be provided by installing 1250 tph conveyors to transfer Hunter Valley No. 1 coal from either dump hopper to either of the raw coal stockpiles.

Further handling facilities will enable coal from Hunter Valley No. 2 to be fed onto either of the raw coal stockpiles. Three 2000 tph vibrating feeders located beneath the surge bin will discharge simultaneously to the following conveyors:-

Middle Feeder: To existing stacking conveyor.

Western Feeder: To the existing reclaim conveyor at 1250 tph, or bypass to a new transfer conveyor at 2000 tph which feeds a stacking conveyor.

Eastern Feeder: To the existing reclaim conveyor at 1250 tph, or bypass to a new transfer conveyor at 2000 tph which will feed to a new eastern stockpile stacking conveyor. This conveyor will deliver coal to a new 2000 tph slewing and luffing stacker.

Reclaiming from the coal stockpiles will be carried out using the existing portal scraper reclaimers of 1250 tph capacity. Raw coal will be reclaimed and fed to the coal preparation plant as required.

Coal Preparation

The proposed expansion of the Hunter Valley Coal Preparation Plant will involve increasing the number of plant modules from 4 to 6. This will allow an average overall capacity of 1350 tph with an upper sustainable production level estimated at 1500 tph. An additional tailings thickener will be added to the west of the plant as shown in Figure S5.1. The thickener will be similar to the existing installation which is 22.5 m in diameter and has a capacity of approximately 2900 m^3/h.

The coal preparation plant will be extended by approximately 20 m to the south to accommodate the additional modules. The pad on which the existing plant is constructed has sufficient area for the expansion.

Product Handling and Transport

Product coal will be transported directly by overland conveyor to the Hunter Valley Loading Point or will be stored at the Hunter Valley Coal Preparation Plant.

The existing product coal stockpile will be increased from 73,000 t to 150,000 t by extending its length. The product coal stacking conveyor will be extended by 270 m as will the trackwork and ancillary equipment for the existing reclaimers and stackers. The existing 1800 tph luffing stacker and 1250 tph portal reclaimer will continue to be used for stockpile initiation and retrieval respectively. Retrieved coal will be directed to the overland conveyor for transfer to the Hunter Valley Loading Point.

Coal is stockpiled and reclaimed at the Hunter Valley Loading Point using procedures and plant similar to those at the preparation plant. Reclaimed coal is fed to an 800 t capacity outloading bin situated over the rail lines for discharge to unit trains for transport to the Port of Newcastle.

Disposal of Rejects

Section S6.3 in study 6 details the methods proposed for the disposal of rejects from Hunter Valley No. 2 on the Hunter Valley No. 1 site. The existing procedures were reviewed in the light of experience and improved mine planning and the need to dispose of the rejects from the Hunter Valley No. 2 operations.

Rejects from the Hunter Valley Coal Preparation Plant are currently disposed of on the Hunter Valley No. 1 Mine site. Coarse rejects are combined with the overburden being recycled within the open pit and tailings are pumped to ponds.

To accommodate reject disposal from Hunter Valley No. 2 once mining on the Hunter Valley No. 1 site has ceased, it is proposed to provide areas in the refilled landform at Hunter Valley No. 1 Mine for the establishment of coarse rejects emplacements and tailings ponds. These areas will be rehabilitated to integrate with the ultimate landform.

Study 7 details the investigations and revisions to the rehabilitation plans at

Hunter Valley No. 1 Mine to accommodate the reject disposal proposals.

Pollution Control Safeguards

The environmental safeguards currently provided for the Hunter Valley Coal Preparation Plant and associated coal handling facilities are to be extended for the proposed expansion. The Company is satisfied as to the effectiveness of the current safeguards.

Water Controls: Drainage works will be undertaken to extend control over the area of the stockpile extensions. Prior to the earthworks being commenced the 'V' section diversion bank along the western side of the stockpiles will be extended. The bank which will have side slopes of 1V:4H and a depth of 1 m will collect and channel runoff from the grassed area between the coal haulage road and the stockpiles to Farrells Creek north of the stockpiles. Perimeter catch drains around the stockpile areas will also be extended at this time to collect runoff during the construction period. Open drains and agricultural pipes between the stockpiles, and installed under the conveyors to collect runoff from stockpiled coal will be extended during the construction of the earthworks.

The drainage network in other areas of the site will not require expansion to accommodate the building and conveyor extensions. The extended drainage controls will be capable of handling flows generated by 1 in 50 year return period storms. The existing drainage network, which is designed on the same basis, will be capable of handling the additional flows.

Following the expansion, all contaminated runoff from the coal preparation and handling facilities will gravitate via the system of pipes and drains to the existing primary settling dam to the southeast of the facilities. Settled overflow will pass via a baffled overflow to a secondary settling dam for further treatment and storage prior to being pumped to the coal preparation plant to reduce make-up requirements. These dams are designed to handle flows from the expanded preparation plant and stockpiled areas. Both dams may overflow to Farrells Creek in times of extended rainfall.

Air Quality Controls: Safeguards are proposed for raw coal handling and the stockpiles. The low level raw coal conveyors will be sheeted on the top and on the windward side. Wind shields will be installed on the western or southern sides where this is not possible because of the stacker and reclaimer. Trays will be provided under conveyor belts at road crossings to prevent the spillage of coal. Conveyor transfer points will be fully enclosed to minimise dust emissions. Mist sprays will be installed at transfer points should these be found necessary. Chemical agglomerating agents will be added to raw and washed coal at various points throughout the handling operations.

Luffing and slewing stackers will continue to be used in stockpile

formation. The free falling height of coal will be minimised to reduce the generation of dust.

The water spray system provides nozzles mounted one on each side of the apex of the portal, about 8 m above ground level, and one at the top of the portal. The nozzles are directed so that the patterns of the two side mounted sprays overlap the top mounted spray and are not shaded by the reclaimer boom. The top mounted spray is arranged to operate over 180 degrees so that its spray is not shaded by the reclaimer boom. The sprays operate intermittently to provide dust control in accordance with the current licence under the Clean Air Act. The system can deliver up to 2.5 $l/m^2.h$ when required during adverse weather conditions.

The precautions currently taken in the Hunter Valley Coal Preparation Plant to minimise dust will be extended to include the new modules. Similarly, the existing safeguards for dust control for clean coal handling, the product stockpiles and the overland conveyor to the Hunter Valley Loading Point will be adequate for the Hunter Valley No. 2 project.

Noise Controls: The following safeguards employed in the existing coal preparation plant will be installed in the proposed expansion.

Screens - All screens will be mounted on air bags to minimise noise and vibration. The screens are located on a thick concrete floor to further reduce those effects.

Centrifuges - Centrifuges will be fitted with anti-vibrational pads and casings will be rubber lined.

Electric Motors - All motors above 37 kW will be fitted with fans and cast iron cowlings to meet noise control standards.

Chutes - Chutes will be rubber lined where practical.

Cladding - The preparation plant building will be provided with a concrete floor and suitable cladding on the walls and roof to ensure that the sound pressure level does not exceed 80 dB(A) at any point greater than 20 m from the plant.

The proposed extensions to the coal handling will include a raw coal bin, additional raw coal and clean coal conveyor belts, an additional raw coal stacker and the lengthening of the existing raw and clean coal conveyors. The conveyors and raw coal stacker will be electrically powered and will produce low noise levels. The raw coal bin will be fully enclosed and under normal operations coal will fall onto coal within the bins.

4.5.2 Coking Coal

Operations

Liddell Coal Preparation Plant prepares essentially coking coals from raw coals produced at Liddell Colliery and Hunter Valley No. 1 Mine. Originally the plant handled the total production from Hunter Valley No. 1 but after the establishment of the Hunter Valley Coal Preparation Plant to prepare steaming products, surplus washing capacity became available.

The underutilised washing capacity is to be taken up in the project. It is proposed that approximately 25 per cent of the ROM coal from the Hunter Valley No. 2 Mine will be prepared for the coking market at the Liddell plant. The existing overland conveyor from the Hunter Valley Coal Preparation Plant has the capacity to transport these tonnages.

Figure 5 shows the layout of the facilities at the Liddell site.

Raw coal is diverted from the overland conveyor to an elevated 1500 t surge bin which feeds the preparation plant. Emergency stockpiling is available adjacent to the bin. The plant has an average design capacity of 500 tph. One dense medium drum, two dense medium cyclones and froth flotation cells are used for the preparation of the coal.

Coal leaving the preparation plant will be handled by the existing equipment. Product coal is stacked out on a stockpile area adjacent to the plant using a 500 tph tripper conveyor. Recovery from the stockpile is via an underground reclaim system which supplies coal to a 1750t outloading bin situated over the rail lines for loading unit trains.

Rejects Disposal

The worked out Durham North Opencut is currently being used for disposal of coarse and fine refuse. In addition fine refuse is pumped as slurry through boreholes into depillared sections of the underground workings. It is proposed to continue this method of disposal.

Pollution Controls

Water: Runoff from areas such as grassed surfaces, car parks and the access road is channeled to Bayswater Creek. Runoff from the precincts in the preparation plant and stockpile areas is reticulated to an inground concrete primary separation of 224 m^3 capacity. Settled water is discharged to a 2500 m^3 capacity recycle water pond. Water is drawn from this pond for re-use in the coal preparation plant. In the event of sustained rainfall that exceeds the capacity of the pond and separator, runoff overflows to Bayswater Creek via an emergency weir located near the inlet of the primary separator.

Air Quality: Controls are licenced under the Clean Air Act. Coal stockpiles are maintained damp to prevent wind blown dust at all times. The surfaces are wet to a depth of 100 mm prior to reclaiming by rubber- tyred vehicles.

All sealed access roads are kept clean and any spillages from conveyor belts or transfer points are regularly collected. Unsealed access roads are watered regularly to prevent dust generation.

4.6 RELOCATION OF SERVICES

4.6.1 Road Network

The project will require Jerrys Plains Road to be relocated and Maison Dieu Road to be closed. Application will be made by the Company for the closure of the dedicated easement of the Mitchell Line of Road crossing the Authorisation.

The relocation and final realignment proposed for Jerrys Plains Road are shown in Figure 15. The short term relocation will commence where Jerrys Plains Road

currently enters the Authorisation on the southern boundary. The new route will follow the southern boundary on Authorisation 239 for approximately 1 km and then deviate northwest to link with the existing alignment to the west of the Birnamwood Surface Facilities. The Company has negotiated an agreement with the holders of Authorisation 239 to site the road on this property. The length of new road will be approximately 3 km and construction will be undertaken during the initial two years of mining.

Jerrys Plains Road will be realigned a second time to allow mining to continue beyond Year 20. This alignment will be constructed along the southern boundary of the Authorisation for approximately 2 km and then veer northwest to meet the alignment inside the western boundary.

The closure of a section of the Maison Dieu Road east of the Authorisation and the provision of an alternative route has been proposed as a consequence of mining operations at the adjacent Buchanan Lemington Colliery. The remaining section of Maison Dieu Road running through Authorisation 13 is also to be closed for the Hunter Valley No. 2 project. Initially the Maison Dieu Road will be maintained for the Barry family to gain access to their property until mining in Hobden Pit requires an alternative route to be established.

Power Supply

Figure 14 shows the locations of the major electricity transmission lines in the vicinity of Authorisation 13. The proposal will require the 66/11 kV line to be relocated as shown in the figure. The proposed route will intersect the existing southern line south of the Authorisation boundary, follow the relocated Jerrys Plains Road for approximately 2 km and then veer north to join the existing 66/11 kV transmission line south of the Hunter River.

A 66/11 kV line entering Authorisation 13 from the east will also require

relocation. In the area where this route crosses the Newcastle Gliding Club runway approximately 100 m of the line will be placed underground.

The existing 330 kV line shown on the figure will not require relocation before the end of Year 21. It may be necessary to relocate this line after Year 30.

4.7 WATER MANAGEMENT

The various safeguards for the mining operations and the areas of the surface facilities have been detailed in this section. A site water balance was prepared to determine the likely effectiveness of the controls to achieve maximum water conservation and utilisation of the supplies generated on the site. The water balance was based on a mathematical model developed to simulate site consumption and generation under various climatic conditions. Details of the modelling are presented in Section S8.4 in Study 8. Figure 39 presents the water balance for the site for Year 13 based on average monthly rainfall conditions. This year was selected as it is representative of the largescale mining operations when generation and demands volumes will be greatest.

The model demonstrated that for approximately 30 per cent of the time during average rainfall conditions the only make up water required will be for potable needs. During the remainder of the time the runoff volumes will not be adequate to satisfy site needs and a supplementary supply will be required. If all site water was available for use this deficit would be approximately 75 Ml/y. However, as the proposed sedimentation dams will be of small volume and scattered over the site it will be impractical to collect water from these facilities. In addition runoff from some undisturbed areas cannot be retained on site. It is expected that the total site make up will average 300 Ml/y over the life of the project. This requirement will be satisfied from the Hunter River.

No dry weather discharge will occur. Following rainfall treated effluent from disturbed areas of the site and from clean water storages may be displaced to watercourses.

Minewater will be disposed of by dust suppression in the pit and as makeup for the coal preparation plant and no discharge will be required. In the event of prolonged wet weather or extreme storm events when surface storages may be filled, the pit will serve adequately as a sump to store the excess runoff.

The proposed management scheme will be regularly reviewed during the project and if appropriate modified in accordance with developments in water treatment methods.

4.8 PRODUCTION AND USE OF ENERGY

The proposed Hunter Valley No. 2 Mine will produce energy in the form of steaming and coking coals and consume energy in the form of petroleum products and electricity. Details of the energy statement are contained in Study 16.

During Stage 1 of the operations approximately 390 x 10^{12}J/y will be consumed in the form of petroleum products and electricity for mining and transport activities. In Stage 2, 1282 x 10^{12}J/y will be consumed by these activities. Based on 85 per cent efficiency in petroleum refining and 35 per cent efficiency of electricity generation and transmission, the energy requirements represent primary energy inputs of 551 x 10^{12}J and 1902 x 10^{12}J for Stage 1 and Stage 2 respectively.

The energy output from the mining operations will be approximately 19950 x 10^{12}J/y in Stage 1 and 96360 x 10^{12}J/y in Stage 2. This output is based on an opencut recovery of 86 per cent, a dilution of 8 per cent by interburden and a

yield of 75 per cent from the coal preparation plant. Approximately 75 per cent of the coal produced will be sold for steaming use and the balance will be marketed as coking coal.

The overall efficiency of energy extraction will be 51 per cent of the total in situ reserves and 65 per cent of the total mineable reserves.

The project will be a nett energy producer with a nett annual output of 19.40 x 10^{15}J and 94.46 x 10^{15}J for Stage 1 and Stage 2 respectively. An Energy Statement is presented in Study 16.

4.9 CONSTRUCTION

4.9.1 Schedule

The construction schedule for the project outlined in Table 4.5 shows that construction will be undertaken in three phases during the initial eight years.

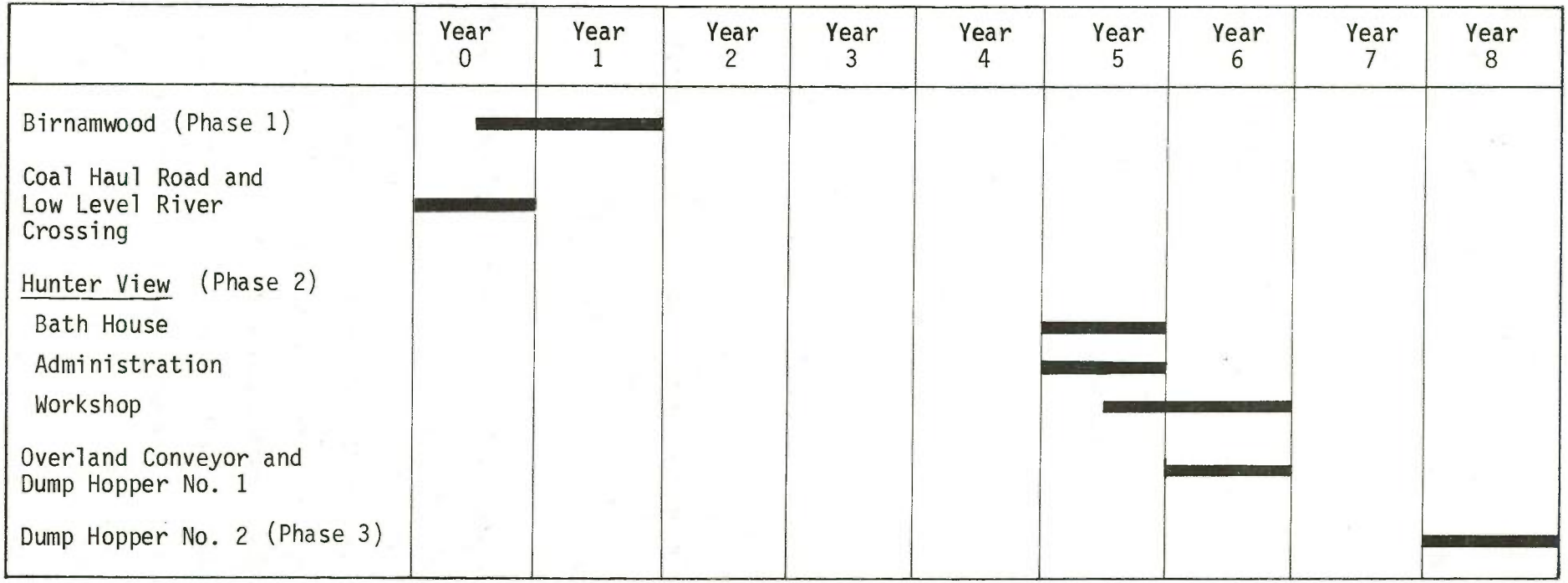
4.9.2 Manning and Accommodation

The mine will be developed in two stages. The employees required during each phase are shown in Table 4.6.

An average of 25 persons will be employed in the construction of the Birnamwood facilities and the coal haulage road for Stage 1 during the pre-development year and Year 1. During Years 5 and 6 an average of 85 persons will be required for the construction of the Hunter View surface facilities and the overland conveyor. An average of 24 persons will be engaged in Year 8 to complete the construction of the coal handling facilities.

TABLE 4.5

SURFACE FACILITIES CONSTRUCTION SCHEDULE



The construction workers will be accommodated in the existing construction village provided for the construction of Hunter Valley Coal Preparation Plant. The village will be adequate to house the workforce.

4.9.3 Construction Safeguards

Drainage Controls

Drainage works will be constructed to divert clean runoff around areas of development and contain contaminated runoff as the first stage of the project.

Noise Controls

Construction plant will generate similar noise levels as the mining operations. Other sources of construction noise will include the small plant items used for building construction and plant assembly. Contractors will be directed to give preference to the selection of modern plant and equipment fitted with efficient silencers. Construction will generally be conducted during daylight hours.

Air Quality Controls

Water tankers will make frequent passes of the areas to minimise dust generation during clearing and the construction of earthworks. Water added to soil to aid compaction will assist in reducing dust emissions during the preparation of foundations and the building of embankments. All areas of surface disturbance will be shaped, spread with topsoil and planted as soon as is practicable to reduce the source of dust.

TABLE 4.6

WORKFORCE BY YEAR OF OPERATION

Classification	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Construction	45	30				88	83		24													
Operational																						
Staff	27	28	30	33	33	45	79	87	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Production	38	45	54	62	68	96	142	304	294	309	330	330	330	330	330	330	330	330	330	330	330	330
Maintenance	10	12	15	17	19	27	47	102	116	118	126	126	126	126	126	126	126	126	126	126	126	126
Total	75	85	99	112	120	168	268	493	507	519	548	548	548	548	548	548	548	548	548	548	548	548

Note: Construction workers in Year 0 are an average for six months only and in Year 1 an average for nine months only.

4.10 PERMANENT WORKFORCE

Table 4.6 shows the permanent workforce requirements for the life of the project. The workforce will be increased progressively during Stage 1 from 85 to 268 and to a maximum of 548 from Year 10 onwards. The average workforce in Stage 2 will be 539.

It is intended that 380 of the positions to be created at the new mine will be filled by persons transferred from the Company's Hunter Valley No. 1 Mine. Production at the existing operation is scheduled to reduce from 1990-91, which corresponds to Year 7 of the Hunter Valley No. 2 project. Over the four year period commencing from this date, all new employees at Hunter Valley No. 2 will come from Hunter Valley No. 1.

The proposals for rationalising the workforce between the two mines as the Hunter Valley No. 1 project winds down will result in approximately 380 employees being assured of continuity of employment and the creation of 168 new positions.

Company participation in Singleton Shire Council's Land Pre-purchase Scheme will ensure sufficient housing land will be made available to accommodate the needs of the proposal.

The Company will hold discussions with Singleton Shire Council and the State Government regarding the provision of additional community services and facilities.

4.11 MINE DEVELOPMENT YEAR 21 AND BEYOND

4.11.1 Planning

The proposal detailed in this Statement is for a mining project of 21 years

duration. The exploration on the Authorisation has established that the coal resources are well in excess of those that can be mined in this period and it is the Company's intention to continue mine planning to recover all of the available coal. At this time it is expected that the total life of the operation will be approximately 50 years.

Long term planning has been advanced to the stage where it could be demonstrated that the mine designs proposed for the first 21 years can be logically extended without prejudicing continued maximum extraction.

It is envisaged in conceptual planning that mining in Hobden Pit will advance in a southwesterly direction until the limit of economic mining is reached in the steep country in the corner of the Authorisation. At that time the pit will terminate in a void of approximately 100 Mm^3 capacity and a small area of coal in the northwestern corner will remain unmined. It is envisaged that by establishing a small pit to extract coal to the Piercefied Seam in this latter area, sufficient spoil would be generated to fill the Hobden Pit and create a free draining surface towards the Hunter River. A final void of about 86 Mm^3 would remain in the northwestern corner. Figure 25 shows the final rehabilitated landforms incorporating these concepts for the longer term mining. However, a final agreement has yet to be made with the owner of the property in the northwestern corner to accommodate this plan. Negotiations will continue to enable the Company to purchase this area to allow this proposal to be instituted.

4.11.2 Cessation of Mining at Year 21

If the Company was not granted consent to mine beyond 21 years the operations would cease at the pit configuration shown in Figure 22. The mining and refill benches within Hobden Pit would be retained while areas of refill where final levels had been reached would be rehabilitated. The landform created by the cessation of operations at Year 21 is shown in Figure 24.

This proposal is favoured as it would permit opencut mining to be continued from this point without the development normally required before operations commence. Options involving the refilling of the excavation are not considered appropriate. In excess of 200 Mm^3 of overburden would have to be rehandled from rehabilitated areas of the site to restore the pre-mining levels and such filling would preclude any future economic mining to the Vaux Seam by opencut methods. The objective of maximising coal extraction would not be achieved if refilling occurred.

4.11.3 Options for the Hobden Pit

The proposed concept for a final lanform and void satisfies the objective of maximising coal extraction. It is the alternative currently favoured from among a number of options aimed at minimising the size of a final void and maximising the free draining areas on the site.

The method selected for filling the void in Hobden Pit will need to be scheduled into mine planning from about Year 25 to ensure continuity of coal production. From this time on the overall mining ratios are similar for mining to the base of both the Woodlands Hill and Vaux Seams. Intermediate ratios also suggested that excavations to the bases of these coal seams were the only practical options to consider for mining beyond Year 25. The mining concepts to be evaluated are:-

i. To continue mining to the Vaux Seam to the end of the pit.

ii. To mine down to the Woodlands Hill AE Seam only to the end of the pit.

iii. To mine down to the Vaux Seam until approximately Year 30 and then continue mining down to the Woodlands Hill AE Seam only to the end of the pit. This position in the pit has been suggested as an intermediate face because there is a marked reduction of excavation face length relative to refill face length at this strip.

Associated with these three options there are the alternatives to mine to either

the Woodlands Hill Seam (Option 4) or the Piercefield Seam (Option 5) in a final pit in the northwestern corner of the Authorisation to reduce the size of the void when Hobden Pit nears completion.

Features of the mining operations and of the voids created by these various options are:-

Option 1 : The volume of swelled overburden produced by this option from Year 25 onwards is approximately 56 Mm^3 less than that required to provide a free draining surface. However to achieve this landform many millions of cubic metres of surcharge material must be rehandled. This is because the coal in the Vaux Seam in the final mine strip is more than 250 m below natural surface and the 1 km long strip with 1V:1H batters on the highwall and a low wall angle of 18 degrees will represent a volume of approximately 100 Mm^3.

Option 2 : This option would generate sufficient overburden to create a free draining surface from Year 25 onwards. However, the void extending to the base of the Vaux Seam at Year 25 would only be partially refilled leaving a void of approximately 100 Mm^3. This void would be of the same order of magnitude as that in Option 1 but the 55.8 Mt of coal below the Woodlands Hill Seam would not be mined.

Option 3 : This option was investigated as it was believed that the coal losses with Option 2 could be reduced as well as reducing the size of the voids with Options 1 and 2. The option would mine 39.3 Mt less than Option 1 and result in a reduction of approximately 20 Mm^3 in the volume of the void.

Option 4 : The excavation of a pit down to the Woodlands Hill Seam in the northwestern corner of the Authorisation would increase the coal recovered by opencut methods by only 4.0 M tonnes. However, 44 Mm3 of swelled overburden is produced and only 16 Mm^3 would be required to refill to the level of the final landform surface. This means that 28 Mm3 of overburden would be available for placement into Hobden Pit void.

Option 5 : A further option would be to mine down to the Piercefield Seam in the northwestern corner of the Authorisation. The higher linear ratio from the Piercefield Seam to the Vaux Seam precludes mining down to the lower seam. Compared with Option 4, a further 9.3 M tonnes of coal would be mined, giving a total of 13.3 M tonnes of coal produced in this option. About 108 Mm^3 of swelled overburden would be excavated in this option. After allowing 75 Mm^3 for refill in the pit, 33 Mm^3 would be available to refill Hobden Pit.

Only Option 1 for mining to the base of the Vaux Seam in the Hobden Pit will maximise the extraction of coal. The adoption of this option would result in

50.3 Mt more coal being mined than with Option 2, 34.3 Mt more than with Option 3 and the creation of a final void of 100 Mm^3.

Option 2 is not attractive because the size of the final void would be similar to that in Option 1 and 50.3 Mt less coal would be mined. The adoption of Option 3 would be a compromise between the first two options. The major disadvantage with each of the three options would be the need to rehandle large volumes of overburden to achieve a free draining surface.

The development of a pit in the northwestern corner of the Authorisation would result in the first three options becoming more attractive. The volume of a final void would be reduced and coal extraction would be maximised. In practice the void in the Hobden Pit would be filled and a void of 86 Mm3 would remain in the northwestern corner. At the time of writing the proposed long term mining method is a combination of Options 1 and 5. A final decision will be determined by the experience gained in mining before Year 25 and the prevailing economic conditions.

4.11.4 Post-Mining Landform

On the assumption that long term mining will be based upon these concepts and options, the final post rehabilitation landform will be a major ridgeline reaching a height of about 80 m above the existing surface with a maximum elevation of about RL 155 m. Slopes will range from 4 to 8 degrees with a minimum grade of 1.3 degrees. Minor ridge and valley systems will radiate from a relatively flat topped hill and merge with the surrounding topography. The new feature will be designed to integrate visually and functionally with the subregional landscape. Figures 25, 37 and 38 show the scale of the proposed landform and its relationship to the subregional topography.

The northwestern aspects of the landform will be designed as a free draining

surface towards the final void. The void will be connected to the Hunter River by a channel and water will enter the void during periods of high flow in the river. The channel will be protected from scouring and flood damage.

4.11.5 Options for the Final Void

The final void in the northwestern corner of the Authorisation would not be created until after 50 years of mining on the site. It is also dependent upon the implementation of long term mine designs based upon the concepts described and resolution of land purchase. Possible uses for the void should it be established could be:-

Water Storage: The void could be utilised as a water storage to supplement supplies from the Hunter River at times of low flows. The storage would be useful for stock watering or irrigation on the adjoining areas.

Rejects Disposal: Mining on the adjoining area to the west will be largely by underground methods and coarse rejects could be disposed of in the void rather than in emplacements on the site.

Mine Access: Future investigations could show the void to be of value as an access for undergound mining on the property to the west.

4.11.6 Post Mining Land Use

Section S11.4.4 in Study 11 examines the post mining land use options of grazing, forestry and a wildlife reserve. Although the adoption of the final use is many years away, it is proposed to construct and rehabilitate the new landform on the overburden disposal and backfilled areas with grazing as the preferred option. Rehabilitation is to be conducted progressively as mining is completed and stock will be admitted to the new areas in a carefully managed programme when the pasture is considered stable. Stock water will be provided from the various dams constructed for erosion control and shade will be available from the tree stands to be planted in the landscaping and rehabilitation programmes.

The post mining land use of grazing is in accord with the current land capability assessment for the existing site by the Soil Conservation Service.

4.12 ENVIRONMENTAL MANAGEMENT

Programme

The operational safeguards proposed for this project are based on current data relating to the existing environment and the predicted effectiveness of the controls as experienced at the Hunter Valley No. 1 Mine. The Company proposes to monitor the efficiency of the controls and the resulting effects on the environment as an integral component of the operation. The proposals will be discussed with the State Pollution Control Commission prior to their initiation.

Water Quality Controls

All dams constructed on the site and watercourses which receive site flows will be monitored regularly to determine the effect of the mining operation. The results will be recorded and analysed to assess the effectiveness of the monitoring programme.

Air Quality Controls

A network of dust fallout gauges will be established in the vicinity of adjacent residences and concentrated on the predominant wind axes. The results of analyses will be used to control the levels of the dust fallout and the potential impact on adjoining properties.

Noise and Vibration Levels

Noise and vibration levels associated with the blasting will be recorded at the commencement of mining to assist in the development of an acceptable blasting practice for the project.

Rehabilitation

The Company will undertake research and field trials to establish the effectiveness of the various rehabilitation procedures proposed for the site. These investigations will be conducted in association with trials and operational practice at the Company's Hunter Valley No. 1 Mine.

Management of Safeguards

The programmes of investigation and the safeguards proposed for the protection of the environment will be under the control of a permanent Environmental Officer reporting to the Mine Manager.

The Officer will be responsible for the effective operation of safeguards, adherence to the conditions of approval and licences and for close liaison with all relevant authorities.

IMPACT ASSESSMENT

SECTION 5

5.1 IMPACT ON TOPOGRAPHY

5.1.1 Authorisation 13

This Statement assesses the impact of the proposal to extract coal from Authorisation 13 for the first 21 years of a mining operation expected to last for about 50 years. The changes to the site at the completion of 21 years of mining is considered to represent an interim stage in the total extraction of the coal resource and the creation of a new topographic feature for the area.

The changes proposed for the site will be evident by the end of the 21 years. The undulating terrain and the valley of Hobden Gully on the eastern half of the site will be replaced by newly elevated slopes and by the extensive excavations of the Hobden Pit and the out-of-pit spoil emplacement.

The rehabilitation completed along the eastern boundary at Year 21 will demonstrate the shape of the new landforms proposed for the mined-out sections as the operations proceed in a southwesterly direction. Figure 38 shows how the new sloping surfaces will grade into the contours on the adjoining land and how the emerging landform will be compatible with the existing and subregional topography.

It is also possible to envisage the likely shape of the ultimate landform at the completion of mining. Although detailed mine planning has not advanced beyond Year 21, the possible scale and form of the final topography after about 50 years have been considered from a range of excavation/refill concepts. Figure 25 shows the new feature as a central ridge reaching a maximum elevation of about RL 155 m. The ridge will be approximately 80 m higher than the existing ground surface, but will be lower than other prominent hills in the subregion. The starkness of the ridge will be broken by smaller hills, ridges and valleys similar in detail to the adjoining high ground to the west.

It is probable that the long term mining on the site will result in the creation of a final void. The favoured mining concept, considered to be practical at present, envisages the retention of a void in the northwestern corner of the Authorisation as a large water storage. The location of this feature close to the Hunter River would not be topographically incongruous.

In the longer term, the favoured post-mining landform will form part of the landscape and will not result in a detrimental impact. The main source of impact will involve the visual prominence of the mining operations prior to the final landform being rehabilitated. Safeguards proposed for the project will contain the effects of the operations to the site and the adjoining topography on the areas will not be affected.

5.1.2 Hunter Valley No. 1 Mine

The proposal to dispose of rejects generated by the preparation of Hunter Valley No. 2 coal in the backfilled sections of the Hunter Valley No. 1 Mine prompted a review of the proposed post-mining landforms for that site.

Experience gained in the rehabilitation of the first cut at the Hunter Valley No. 1 Mine has tended to confirm predictions that the final rehabilitated surfaces at the middle and on the southern end of the mining path will be at lower elevations than at present. This will come about because of the low overburden to coal ratios being mined. The addition of rejects generated by Hunter Valley Coal Preparation Plant to the Year 2004 will result in a more undulating final landform in the southern areas than originally proposed.

Study 7 details the changes to the landform on Hunter Valley No. 1 Mine which will result from the incorporation of coarse rejects with the backfill and the location of slurry ponds in selected locations of the mined-out sections of the opencut.

The study also indicates that there will be sufficient capacity at Hunter Valley No. 1 Mine to incorporate rejects for periods beyond 2004 should this be desired.

The proposed changes to rehabilitation at Hunter Valley No. 1 will result in an improved final landform and are regarded as beneficial.

5.2 SOILS

All topsoil which is practical to recover and suitable for use as a topdressing material will be removed from the mining path and incorporated into the rehabilitation programme. Maximum conservation of topsoil is to be practised. It is expected that there will be shortfalls in topsoil due to the elevation of the new land surface above the existing levels. When and where the deficits emerge suitable overburden will be applied as surface dressing material. Appropriate chemicals and fertilisers will be added to ensure the composition and properties of the materials are suitable to support pasture growth.

All site drainage works and the rehabilitation programme will incorporate safeguards in the form of earth structures to combat soil erosion. There will be no loss of soils from the site to contribute to sedimentation of watercourses or deposition on adjoining properties.

The Company's experience at the Hunter Valley No. 1 Mine and the results of tests and ongoing research on that site and elsewhere in the Hunter Valley will be employed to manage the soil conservation programme and ensure that the soils are re-used efficiently.

5.3 IMPACT ON FLORA AND FAUNA

5.3.1 Flora

Approximately 795 ha in the eastern half of the Authorisation will be disturbed by mining during the first 21 year period. This area excludes the Barry property in the northeastern corner. The southwestern corner of the site with the most valuable vegetation assemblages will not be affected by mining until towards the end of the operations on the Authorisation, and at that time coal extraction will depend on the economics of removing the large thickness of overburden.

The vegetation to be removed during the project will include approximately 25 ha of Red Box woodland and 125 ha of regenerating Bull Oak woodland. The remainder of the areas to be cleared consist of pasture land with scattered and regenerating Narrow-leaved Ironbark communities. Because of the disturbance to these areas in the past, the loss of vegetation caused by mining will not be significant.

In the longer term the impact will be compensated by the tree planting programme proposed for the site. The new tree stands to be established on the rehabilitated surfaces will replace the density and species diversity of trees which are lost and provide shade trees for stock.

5.3.2 Fauna

The clearing of vegetation will result unavoidably in the loss of faunal habitat and in the probable depletion of species numbers and diversity. The habitats to be cleared will be in the Red Box, Ironbark and Bull Oak vegetation communities which have been rated as less significant than the wooded areas on the southwestern corner of the Authorisation. Species likely to be displaced will include the Eastern Grey Kangaroo, Common Brushtail and Red-necked Wallaby, as well as avian species and individuals. The planned revegetation programme will

re-establish the potential of parts of the site as a habitat for native fauna and assist in minimising any impact.

The extent of clearing required for the proposal, and hence the loss of vegetative communities and fauna habitats, is minimal relative to the wooded areas available within the subregion as a whole. However, as the number of mines in the subregion increase, the potential exists for a significant cumulative impact on the natural environment.

5.4 WATER RESOURCES

5.4.1 Drainage Pattern

The project will have no significant impact on the drainage pattern of the areas adjoining the site. Water will be shed from the eastern flanks of the new landform in similar directions to the present and flow either to Wollombi Brook via Redbank Creek and other minor watercourses to the south , or northwards to the Hunter River along a small unnamed watercourse. The new landform has been designed so that the distribution of runoff to the Hunter River and Wollombi Brook is similar to the present.

Catchment areas of the creeks draining these areas will however be modified. With respect to Wollombi Brook the sub-catchments affected are Redbank Creek, which will be reduced by approximately 4 per cent and an unnamed creek in the southeastern corner which will be increase by approximately 12 per cent.

The proposed sedimentation dams and drainage network will ensure that changes in catchment areas will not cause accelerated erosion of the beds and banks of creeks.

Concepts for the ultimate landform include the provision of free draining slopes directing runoff northwards from the central watershed to the Hunter River or to the void in the northwestern corner of the Authorisation should it be established and used as a water storage at that location.

5.4.2 Groundwaters

Groundwater studies in Section S8.2.3 in Study 8 suggested that recharge areas were in the highlands in the south of the site and that flows were towards the Hunter River. Redbank Pit is expected to be little affected by groundwaters with maximum flows of 15 m^3/d at RL 60 m being predicted for the first two years only. Flows into the Hobden Pit were estimated to range between 300 m^3/d and 4000 m^3/d; an average inflow of 1000 m^3/d was adopted for water balance estimates.

The development of Redbank Pit will have little impact on the groundwater table in the eastern areas of the site as the levels appear to be low and possibly influenced by pumping in local underground mines.

In the longer term in Stage 2 of the project the development of the deeper Hobden Pit will intercept groundwater flows to the Hunter River. If it is assumed that all discharges from the site cease, it is estimated that the loss would represent a reduction of flow in the river of approximately 0.03 per cent of average daily flow which would be negligible. As the groundwaters have a saline content varying between 500 and 3600 mg/l, the total salt load in the river would be reduced.

Currently there is one licensed bore to the north of the Authorisation on the Barry property. Water is extracted from a well in the alluvium on the river flats and not from the deeper bedrock aquifers. Similarly, there are other licensed bores on the alluvial areas to the northwest of the Authorisation which draw on the better quality water seeping from the river rather than the deeper saline

sources. None of these bores are likely to be affected by the mining operations which would only influence the flows in the bedrocks. Other bores over 2 km to the west of the Authorisation in alluvium would not be affected. Bores penetrating bedrock would still receive flows from the higher recharge areas to the south.

In the longer term after mining it is likely that the groundwater regime will be re-established on the site. Recharge would still be in the highlands to the south and flows would move through the backfilled opencuts towards the river. Localised aquifers may form in the deeper sections of the pits. However, the salinity concentrations could be similar to the present high levels and water users will probably prefer the river as a source.

The groundwater studies have also indicated that there will be no significant seepage from the Hunter River through the alluvium in Hobden Gully into Hobden Pit. The alluvium represents old gravel and clay deposits associated with former channels and higher levels of the Hunter River and is too compacted, indurated and lenticular to permit the passage of water.

5.4.3 Water Management

Procedures

Water management proposals for the project depend upon maximum conservation of waters from all sources on the site. The programme outlined in Section 4 for the unit operations and detailed in Section S8.5 in Study 8 has been developed to minimise abstraction from the Hunter River. This is to be achieved by maximising the re-use of site generated water with preference being given to the use of water with the poorest quality first. Control of contaminated waters, other than minewater is to be achieved by discharging surplus water of acceptable quality when the receiving waters are best able to assimilate the release.

Management and disposal strategies have been developed for the four main types of water on the site, sewage effluent, process wastewaters from areas of surface facilities and activities other than mining, stormwater runoff and minewaters including groundwaters.

Sewage effluent will be disposed of by spray-irrigation on selected areas of the site.

All process waters and surface runoff from disturbed areas will be treated by sedimentation dams prior to re-use or discharge. Oils and grease will be recovered.

Clean runoff from undisturbed areas will be diverted around operations and activities and stored or discharged according to the practicabilities of recovery.

The programme provides for all minewaters generated during the mining operations to be disposed of by in-pit dust suppression or as makeup in the washery circuit at the Hunter Valley Coal Preparation Plant. There will be no discharge of saline minewater from the site.

The existing primary and secondary pond system for runoff treatment and storage at the Hunter Valley Coal Preparation Plant has been designed and constructed with sufficient capacity to handle the additional runoff generated by the expanded facilities. The existing emergency overflow spillway also has adequate capacity to allow safe discharge of settled runoff. The proposed expansion will have no detrimental impact on water quality downstream of the Hunter Valley No. 1 site.

Water Balances

Water balances have been investigated for various stages in the 21 years of the proposal. Figure 39 shows the sources, generation and usage of water in Year 13, which is representative of maximum mine development.

The external makeup requirements for the project are estimated to be 300 Ml/y under average conditions. This draw on the Hunter River will represent approximately 0.03 per cent of the average daily flow at Singleton. The average daily flow in the river will also be reduced by the loss of surface and groundwater yields from the Authorisation. Total reductions due to these losses plus site makeup requirements are estimated to be approximately 0.16 per cent of average daily flow. A further reduction of 0.02 per cent may be required to satisfy the maximum make-up requirements of the Hunter Valley Coal Preparation Plant after Year 11.

The mining and coal preparation proposals will reduce the average Hunter River flows at Singleton by a maximum of 0.18 per cent and by a maximum of 0.9 per cent of the flow occurring 50 per cent of the time. At these reductions there will be minimal impact on the volume of water in the river.

Water Quality

Data on conductivity and soluble salts in Study 12 indicate that the salinity levels of the runoff from Authorisation 13 are lower than those in the Hunter River. This result is confirmed by the results of monitoring at the Hunter Valley No. 1 Mine where the drainage and leachates from disturbed and undisturbed areas have remained low in soluble salts and the water quality in the Hunter River has shown no detectable change over four years of mining.

Results of the overburden leaching tests in Section S2.2.6 in Study 2 suggest that

leachates from overburden rocks may be of low to moderate salinity. Note has been taken of this observation and control dams are to be located to allow sedimentation of flows from all disturbed areas and to detect saline concentrations should they occur. However, in the light of the experience at Hunter Valley No. 1 Mine, and of the quantities expected leachates will be able to be controlled by disposal on site.

Any saline 'patches' that occur in areas of local ponding or due to impeded drainage on the rehabilitated slopes will be repaired. Any saline sludge in dams will be removed and buried so as not to enter the drainage system.

As there are to be no discharges of saline minewaters, it is improbable that the project will contribute to increased saline concentrations or loads in the Hunter River.

Water monitoring data for Authorisation 13 indicates that the suspended solids content of the existing runoff is higher than that of the Hunter River.

The high suspended solids in the existing runoff from the site is attributed to the dispersive nature of the soils and inadequate erosion control measures in certain areas. The proposed rehabilitation programme will limit all slope angles and incorporate earth structures to combat erosion on regrassed surfaces. It is also intended to rehabilitate backfilled areas and overburden emplacements as soon as it is practicable. These safeguards together with the rapid repair of damaged areas and controls over all runoff on slopes and in watercourses will minimise the solids in suspension in any discharges to the Hunter River.

Conclusion

The objective of the water management programme for the project will be to maximise the re-use of waters generated on the site. Minimal demands to be made

on the Hunter River will only reduce flows under average conditions by approximately 0.18 per cent. All discharges will be controlled and it is expected that there will be no detectable changes in the saline content of the Hunter River resulting from the project. Maximum safeguards have been incorporated to minimise solids in suspension.

5.4.4 Flooding

Flooding within the Authorisation has been confined to the low-lying areas adjacent to the Hunter River and Hobden Gully.

Mining is not proposed for the floodplain and the only areas affected will be at the road and conveyor crossings. The Company has discussed the design of these structures with the Water Resources Commission and is proposing to build a low level causeway crossing for the road and to support the elevated conveyor on trestles and columns to minimise impacts from all flows up to and including a 100 year return period flood.

The possibility of floodwaters at the lower end of the Hobden Gully impeding mining in the Hobden Pit is to be prevented by the construction of a flood levee adjacent to the northwestern corner of the pit. This precaution will also ensure that the river waters are not contaminated by saline groundwaters from the boxcut.

5.5 IMPACT ON AIR QUALITY

5.5.1 Methods

The safeguards proposed for the various components of the project to minimise the emission of dust are outlined in Section 4 and Section S9.3 in Study 9. The

principal sources of dust will be topsoil stripping, blasthole drilling, blasting, truck loading, dragline operations, overburden and coal haulage, overburden dumping, surface shaping and rehabilitation, wind erosion from bare areas at the mining site and coal handling and storage at the Hunter Valley Coal Preparation Plant.

Dust will be produced over the life of the project, but at the end of mining after about 50 years the conditions on the site will be the same as in all rural and open space areas with effective land management determining the generation of emissions.

The prediction of the potential impact of the proposal on air quality required data on pre-mining dust levels including their temporal and spacial variability. A mathematical procedure was used to calculate the increments of dust emitted by the different controlled sources during the various stages of the operation.

The predictions presented for the Hunter Valley No. 2 project are based upon estimates of deposited dust and total suspended particles (TSP) under average annual, summer and winter conditions, during episodic events and when combined with the estimated emissions from existing and proposed neighbouring mines.

The continuous meteorological records from the Hunter Valley No. 1 Mine were found to be the most suitable for use in the dust dispersion model.

Details of the modelling procedures are presented in Section S9.4 in Study 9. Isopleths for dust deposition and concentration levels in the areas around the mine site are presented for Years 4 and 21 of the project in Figures 40 to 55. These two years were selected as being representative of the most extreme conditions for impacts at the nearest groups of residences to the southeast and northwest of the site respectively and also of Stages 1 and 2 of the project.

The limitations of mathematical procedures for estimating the dispersion of dust in areas around the site were well recognised and the predictions from the model were compared with measured levels of dust deposited downwind under similar conditions at four operating mines in the Upper Hunter Valley. Reasonable agreement was obtained between predicted and measured levels, except perhaps that the model may overestimate the distance of dust travel from generating sources. The Company's consultants are satisfied that the model provides a fair and reliable prediction of dust dispersion for impact assessment purposes. However, because of the extreme variability of the many spacial and temporal factors known to be affecting dust dispersion and deposition and the limitations of the generalised model, the modelling approach is not yet believed to be appropriate for regulatory purposes.

5.5.2 Background Conditions

Section S9.2 in Study 9 discusses the difficulties in assigning background dust depositional levels prior to adding the increases predicted due to mining. It has been found better to deduce a number of levels from available data than to assign one single level arbitrarily, thereby avoiding the risk of errors affecting the prediction of total dust deposition.

Table 5.1 shows the background dust levels used for predicting impacts at residences around the proposed mine.

TABLE 5.1

ESTIMATES OF BACKGROUND DUST DEPOSITIONAL RATES
($g/m^2.mth$)

	Mean of All Years of Monitoring	Range of Means
Annual Average	1.4	1.3 - 1.5
Summer Average	2.2	1.6 - 3.2
Winter Average	0.9	0.8 - 1.3

The values were obtained from dust deposition monitoring results for Authorisation 13, and comparison with background data from a range of areas with different land uses, affected and unaffected by mining in the Upper Hunter Valley. Section S12.2 presents an anlysis of the monitoring source data.

5.5.3 Predicted Dust Deposition and Concentration Levels

Isopleth maps for predicted increases in dust deposition rates and atmospheric concentrations due to the proposal are shown in Figures 40 to 45 for Year 4 of the project. The increases are presented as annual, winter (July) and summer (January) averages.

The results reflect the seasonal dominance of southeasterly and northwesterly winds.

Table 5.2 presents the predicted total dust levels (background plus increment due to the proposal) at privately owned residences at Year 4 when Redbank Pit is in operation.

In Year 4 under annual average wind conditions, residences 4a, 4b, 5, 6, 12a, 12b, 25a and 25b will experience total fallout levels of 1.5 g/m^2.mth. The increase of 0.1 g/m^2.mth above background will not be detectable. Corresponding TSP concentrations also represent negligible increases. There will be no measurable increases at other residences in proximity.

The dominant southeasterly winds in summer will result in very minor increases in dust deposition and concentrations at residences 4a, 4b, 5, 6, 11, 14, 12a, 12b, 13a, 13b, 20, 21a, 21b, 25a and 25b. While in winter the northwesterlies will transport the dust into areas to the southwest of the mine where the privately owned residence 54 and caravan park near Warkworth Village will experience a minor increase. None of the increases during summer and winter will be

detectable above background.

TABLE 5.2

PREDICTED TOTAL DUST LEVELS AT
NON-MINING COMPANY OWNED RESIDENCES IN YEAR 4

	TSP CONCENTRATION (ug/m^3)			TOTAL DEPOSITION ($g/m^2.mth$)		
	Annual Average	January Average	July Average	Annual Average	January Average	July Average
4a	43	44	41	1.5	2.3	0.9
4b	43	44	41	1.5	2.3	0.9
5, 6	42	43	41	1.5	2.3	0.9
7a, 7b, 8, 10	41	42	40	1.4	2.2	0.9
11, 14	42	43	41	1.4	2.3	0.9
12a, 12b	42	43	41	1.5	2.3	0.9
13a, 13b	42	43	41	1.4	2.3	0.9
15	41	42	40	1.4	2.2	0.9
16	41	42	41	1.4	2.2	0.9
17a, 17b, 17c	41	42	41	1.4	2.2	0.9
18a, 18b, 19	41	42	41	1.4	2.2	0.9
20, 21a, 21b	41	42	41	1.4	2.3	0.9
25a, 25b	43	45	41	1.5	2.3	0.9
32	41	41	42	1.4	2.2	0.9
35	41	40	41	1.4	2.2	0.9
36a, 36b	40	40	41	1.4	2.2	0.9
38a, 38b, 38c	40	40	41	1.4	2.2	0.9
39a, 39b, 39c	40	40	40	1.4	2.2	0.9
54/Warkworth	41	41	45	1.4	2.2	1.0
Assumed Existing Background		40		1.4	2.2	0.9

Increases and total dust deposition and concentrations for Year 21 are presented in Figures 46 to 51 and Table 5.3 respectively. The increases in dust levels are predicted to be higher than in Stage 1 because the scale of mining will have increased and the operations will be closer to residences to the north and west of the site.

The table indicates that in Year 21 under annual average wind conditions most residences will experience increases in dust deposition rates of between 1.5 and 0.1 $g/m^2.mth$ and in concentrations of between 54 and 1.0 ug/m^3 above background levels. Similarly in summer most residences will be subjected to higher levels

fallout with the largest increases in deposition and concentrations being at residences 25a, 25b, 4a and 4b to the northwest of the site. In the winter all residences close to the mine will experience small increases.

TABLE 5.3

PREDICTED TOTAL DUST LEVELS AT
NON-MINING COMPANY OWNED RESIDENCES IN YEAR 21

	TSP CONCENTRATION (ug/m^3)			TOTAL DEPOSITION ($g/m^2.mth$)		
	Annual Average	January Average	July Average	Annual Average	January Average	July Average
4a	78	96	53	2.3	3.8	1.2
4b	72	84	49	2.2	3.4	1.1
5, 6	50	50	43	1.6	2.4	1.0
7a, 7b, 8, 10	45	44	41	1.5	2.3	0.9
11, 14	63	75	49	1.9	3.0	1.1
12a, 12b	66	79	49	2.0	3.2	1.1
13a, 13b	64	77	49	1.9	3.1	1.1
15	47	57	43	1.6	2.5	1.0
16	54	62	45	1.7	2.6	1.0
17a, 17b, 17c	50	56	44	1.6	2.5	1.0
18a, 18b, 19	51	58	45	1.6	2.6	1.0
20, 21a, 21b	53	57	47	1.6	2.5	1.0
25a, 25b	94	121	60	2.9	4.7	1.4
32	46	44	52	1.6	2.3	1.2
35	44	43	47	1.5	2.3	1.0
36a, 36b	42	41	44	1.4	2.2	1.0
38a, 38b, 38c	42	42	43	1.4	2.2	1.0
39a, 39b, 39c	41	41	42	1.4	2.2	0.9
54/Warkworth	44	43	53	1.5	2.3	1.1
Assumed existing background		40		1.4	2.2	0.9

Figures 40 to 51 also show that the predicted increases in dust levels due to the expansion of the Hunter Valley Coal Preparation Plant including stockpiles will not exceed 0.1 $g/m^2.mth$ on land not owned by coal mining companies. The largest increase will be 10 $g/m^2.mth$ on the property to the northwest of the site owned by Clutha Development Pty. Limited. No residences occur within this area of deposition.

5.5.4 Dust Deposition Episodes

Estimates of episodic dust deposition rates were calculated as a basis for predicting the impact at residences of short duration, high wind events. The methods of estimation are presented in Section S9.8.1 in Study 9.

It is believed that for the assessment of the potential impacts from high wind events the most appropriate parameter is the TSP concentration. However, as extensive data on dust concentrations during high wind episodes for both mining, and more importantly, pre-mining conditions is not available, it was considered impractical to attempt a determination of impacts with little or no data base. It was therefore decided to use the large amount of dust depositional information collected to provide an indication of the potential for impact at surrounding properties at times of high winds.

Table 5.4 presents the predicted increase in dust deposition levels ($mg/m^2.h$) and the probability of occurrence of one hour episodes of winds 40 km/h or greater during Years 4 and 21 of the project. The table also presents ratios of the dust deposited in the one hour episode to the deposition in one hour at the annual average rate.

The following limitations of this analysis need to be appreciated when interpreting the results in terms of impacts.

i. The hourly episodic predictions are extrapolated from data collected on a monthly basis and theoretical considerations of particle lift-off in high wind events.

ii. High ratios of dust deposition in the hourly event to the deposition in one hour under annual average conditions does not necessarily mean that a large mass of dust will be deposited.

iii. High frequencies of one hour events are equivalent to a very small percentage of the total time.

Because of the limitations in the episodic analyses the predictions have been

regarded as being only indicative of the potential for an impact. In practice the one hour episodes can be related to short duration high wind gusts.

TABLE 5.4

ESTIMATED ONE HOUR EPISODIC DUST LEVELS
AT NON-MINING COMPANY RESIDENCES

	Year 4			Year 21		
	Events per Year	Deposition during Episode ($mg/m^2.h$)	Ratio of Episodic to Annual Average Deposition Rate	Events per Year	Deposition during Episode ($mg/m^2.h$)	Ratio of Episodic to Annual Average Deposition Rate
4a	12	1.0	7.3	12	14.1	10.3
4b	12	1.0	7.3	2	24.3	21.0
5, 6	2	1.8	13.2	<1	24.5	89.7
7a, 7b, 8, 10	2	0.8	>5.9	<1	6.8	49.8
11, 14	10	0.6	>4.4	12	7.3	10.7
12a, 12b	12	0.7	5.1	12	8.6	10.5
13a, 13b	10	0.6	>4.4	12	7.9	9.6
15	2	0.3	>2.2	2	3.3	12.1
16	12	0.4	>2.9	12	4.0	9.8
17a, 17b, 17c	10	0.3	>2.2	12	2.7	9.9
18a, 18b, 19	10	0.3	>2.2	10	2.8	10.2
20, 21a, 21b	11	0.4	>2.9	11	3.7	13.5
25a, 25b	12	1.1	8.1	12	22.7	11.1
32	<1	1.6	>11.7	<1	51.5	188.5
35	<1	1.9	>13.9	2	20.2	147.9
36a, 36b	<1	1.0	>7.3	<1	10.4	>76.1
38a, 38b, 38c	<1	1.5	>11.0	2	7.0	>51.2
39a, 39b, 39c	<1	1.0	>7.3	2	4.9	>35.9
54/Warkworth	7	2.2	>16.1	7	3.6	26.4

*The episodic deposition is calculated as 1/k x (deposition during episode)/(annual average deposition)

where: k is the conversion factor from $g/m^2.mth$ to $mg/m^2.h$ [=1000/(24x30.5)]

The greatest potential for episodic impacts during Year 4 are predicted to occur at residences 5, 6, 32, 35, 38a,b and c, and 54 at hourly deposition rates between 11 and 16 times those of annual average conditions. These levels would be in addition to the background levels for the corresponding high wind events which

would be at least equal to the hourly rate equivalent to 5.84 $g/m^2.mth$, the highest rate recorded in a single month on Authorisation 13 (Table S12.27).

The frequency of occurrence for such events has been estimated at less than one event per year at residences 32 and 35, 38 a, b and c to seven events per year at residence 54. Other residences have the potential to receive hourly episodes of deposition 2 to 8 times the annual average at frequencies between 1 and 8 per year.

It is expected that the magnitude of the dust deposition episodes would be greater once the Hobden Pit comes into production. Table 5.4 shows the hourly deposition episodes to be greater in Year 21 than in Year 4. All residences have the potential to receive increases in hourly deposition rates 10 times or greater than those of average conditions. The frequency of episodes would vary between less than once per year to 12 times per year.

5.5.5 Cumulative Dust Impacts

Study 9 details the assumptions used for predicting the cumulative dust deposition rates from the Hunter Valley No. 2 Mine and other existing and possible mining operations on neighbouring properties. The conclusions from the study are intended to be indicative and valid only for generalised impact assessment purposes.

Figures 52 and 53, and 54 and 55 indicate the estimates of cumulative dust levels, with and without the operations of the Hunter Valley No. 2 project in Years 4 and 21 respectively.

Table 5.5 summarises the predicted cumulative increases (annual average basis) in the general areas containing residences to the north and south of Authorisation 13. The increases cannot be assessed for precise locations because of the broad approximations adopted in estimating dust emission rates and

in locating emission points on the surrounding mine sites.

The table shows that the cumulative effects of mining operations in both Years 4 and 21 in the absence of the Hunter Valley No. 2 proposal may cause dust deposition increases above background of between 0.1 and 0.5 g/m^2.mth in the areas to the northwest of Authorisation 13. In general, the dust level increases above background to the northeast and southeast will be relatively higher due to the closer proximity of those areas to other mining operations.

TABLE 5.5

PREDICTED CUMULATIVE INCREASES IN DUST DEPOSITION (g/m^2.mth)

	Areas to the Northwest	Areas to the Northeast	Areas to the Southeast
Without Hunter Valley No. 2 Mine			
- Year 4	0.1 - 0.5	0.5 - 10.0	0.1 - 0.5
- Year 21	.05 - 0.1	.05 - 0.1	to 5.0
With Hunter Valley No. 2 Mine			
- Year 4	0.1 - 0.5	0.5 - 10.0	to 0.5
- Year 21	0.1 - 2.0	.05 - 0.5	to 5.0

The introduction of Stage 1 of the Hunter Valley No. 2 project will have little significant effect on the subregional dust deposition as the contributions to the cumulative total will be very small. The interaction may be stronger in Stage 2 if the locations assumed for the various mining operations are proved to be reliable. By this time, the 2 g/m^2.mth isopleth could envelope the operations on Authorisation 13 and the mines to the south and southeast. However, the proposal will not increase the level of impact appreciably because of the distances between the proposed mine and these areas. Land lying between the projects is also owned by the various mining companies.

The proposed Hunter Valley No. 2 Mine will make its greatest contribution to the

cumulative dust levels in the areas to the northwest where maximum levels of increase of the order of 2.0 g/m^2.mth are predicted.

5.5.6 Summary

This section has examined the potential impact of the proposal on air quality. The impacts of changes in air quality on land use and residents are considered in Sections 5.9 and 5.10 respectively.

All predictions are for Years 4 and 21 of the project which correspond to the most extreme conditions predicted for Stages 1 and 2 respectively.

Maximum annual average increases in dust deposition and concentration predicted for Year 4 were 0.1 g/m^2.mth and 3.4 ug/m^3 respectively. The corresponding total dust levels allowing for background values were 1.5 g/m^2.mth and 43 ug/m^3. The levels represent negligible increases which would be impractical to detect above background.

After allowing for background, the maximum annual average deposition and concentration in Year 21 were predicted to be 2.9 g/m^2.mth and 94 ug/m^3 at residences 25a and 25b. These levels represent an approximate doubling of background but are still within acceptable limits. A number of additional residences will experience average total dust depositional levels of between 1.4 and 2.3 g/m^2.mth.

Episodic dust deposition increases in Years 4 and 21 have the potential to exceed equivalent annual average hourly deposition rates at varying frequencies according to the relative locations of residences to the mining operations. The ratios of the increases in hourly deposition to the hourly rates under annual average conditions vary between about 2 and 16 times on between less than one and twelve occasions in Year 4 to greater than about 10 times at similar frequencies

in Year 21.

Predictions of cumulative dust deposition rates for all existing and possible mining operations indicated that the contribution of the proposed mine will be negligible in the areas to the northeast and southeast of Authorisation 13. The largest contribution will be in the order of an increase of 2.0 g/m^2.mth in the areas to the northwest in Stage 2 of the project.

5.6 NOISE CLIMATE

5.6.1 Scope

Study 10 provides a detailed analysis of the acoustic environment of the proposed Hunter Valley No. 2 Mine.

The predictions of the sound pressure levels generated by the proposal have been based on published and measured data on noise emission levels generated by the various components of the project and the extent of the attenuation likely to result from meteorological, atmospheric, topographical and ground effects. The various safeguards described in Section 4 have been incorporated in the selection of equipment, operating procedures and in the design of the facility to minimise the potential for noise impacts. The levels adopted for emitting sources have taken account of the proposed controls.

The noise emitting sources on the site were arranged into shielded and unshielded groups according to the degree of protection afforded by the mine high wall, the overburden emplacement and existing natural contours.

The operations on the surface (unshielded components) include construction activities, stripping overburden and blasting on the surface, haulage and

emplacement of overburden and final rehabilitation.

The operations in the Redbank and Hobden Pits and the road haulage of coal to the Hunter View receival area (shielded components) will be shielded by the highwall and refill faces of the pits.

The procedures described in Section S10.3 in Study 10 were used in the prediction of the noise climate for the project during Stages 1 and 2 and the Hunter Valley Coal Preparation Plant in Figures 56 to 58.

Table 5.6 predicts the maximum noise levels likely to be experienced at residences not owned by the Company. The impacts will result from the surface operations under neutral and adverse meteorological conditions. The probability of occurrence of temperature inversions and sound focusing effects contributing to the adverse meteorological conditions is assessed in Table S10.6 in Study 10.

Measurements of sound pressure levels on Authorisation 13 indicated the existing background conditions (L_{90}) to be 35 dB(A) and 30 dB(A) for day and night respectively. These levels are comparable to those for similar environments in the Upper Hunter Valley.

5.6.2 Predicted Noise Levels

Table 5.6 indicates that the unshielded operations will only result in increased daytime noise levels at residence 35. The increase is likely to be 6 dB(A) for residence 50 and 5 dB(A) at residence 35 in Stage 2. Meteorological conditions may enhance this increase for about 2 to 4 per cent of the time.

A total of about 13 residences or groups of residences are expected to receive night time noise levels in excess of 5 dB(A) above night time background at some

TABLE 5.6

RESIDENCES ESTIMATED TO EXPERIENCE
NOISE IMPACTS [dB(A)]

Building Number	Ownership	Background Levels		Impacts Due to Unshielded Operations				Impacts Due to Unshielded Operations Under Adverse Meteorological Conditions				Likelihood of Occurrence of Adverse Meteorological Conditions
				Stage 1		Stage 2		Stage 1		Stage 2		
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	% of Time in One Year
32	Private	35	30	-	-	-	+10	-	-	+3-7	+14-18	4
35	Private	35	30	-	+5	+5	+9-16	-	+11	+11	+15-22	2 - 4
36a,b	Private	35	30	-	+3	-	+3	-	+9	-	+9	2 - 4
37a,b	B.B.C.*	35	30	-	+5	+1	+8-12	-	+11	+3-7	+14-18	2 - 4
38a,b,c,d	Private	35	30	-	+3	-	+5- 9	-	+9	+4	+11-15	2 - 4
39a,b,c	Private	35	30	-	+1	-	+2	-	+7	-	+8	2 - 4
41	B.B.C.	35	30	-	+8	-	+5- 8	+3	+14	+3	+11-14	25
42	B.B.C.	35	30	-	+8	-	+5- 8	+3	+14	+3	+11-14	25
43	B.B.C.	35	30	-	+8	-	+5- 8	+3	+14	+3	+11-14	25
44	B.B.C.	35	30	-	+8	-	+5- 8	+3	+14	+3	+11-14	25
45	B.B.C.	35	30	-	+8	-	+5- 8	+1	+15	+3	+11-14	25
46	B.B.C.	35	30	-	+9	-	+5- 8	+1	+15	+3	+11-14	25
47	B.B.C.	35	30	-	+10	-	+5- 8	+3	+16	+3	+11-14	25
50	United**	35	30	-	+3	+6	+9-12	+4	+10	+12	+16-19	2 - 4
53	B.B.C.	35	30	-	+6	-	+5- 8	+1	+12	+1	+12	25
54	Private	40	30	-	+3	-	+3	+3	+9	+3	+6- 9	4 -25
Warkworth	Private	35	30	-	+1	-	+1	+1	+7	+1	+7	4 -25

* Buchanan Borehole Collieries Pty. Limited
**United Collieries Pty. Limited

Notes: 1. There will be no impacts for in-pit and coal receival operations (shielded) in Stages 1 and 2.
2. All residences omitted from the table are predicted to experience no increase in sound level due to the proposal.
3. Background levels are expressed as L_{90}.

time during the life of the proposal. Of these, residences 32, 35 and 38 are not owned by mining companies.

The operations in Stage 1 are predicted to result in night time increases above background of 5 dB(A) at residence 35 under normal meteorological conditions.

In Stage 2 of the operations, residences 32 and 38 are expected to receive increases above night time background of between 5 and 10 dB(A). Meteorological effects may enhance the increases for certain percentages of the time in the year. Residence 35 is estimated to experience increases in noise levels of up to 16 dB(A) in neutral atmospheric conditions and appreciably higher levels under adverse conditions.

The distance to the majority of residences from the proposed coal haulage road and conveyor to the Coal Preparation Plant minimises the occurrence of noise impacts. Noise levels estimated for the haulage road are 37 dB(A) at 1000 m and 23 and 35 dB(A) for the enclosed and open sides of the conveyor respectively at a distance of 500 m. There will be no impact at residences 25a and 25b which are the closest residences not owned by the Company, nor any other residence.

The predicted noise levels resulting from the expansion of the Hunter Valley Coal Preparation Plant will attenuate to 30 dB(A) at a distance of about 1700 m from the facility. No privately owned residences will be affected.

5.6.3 Impact of Blasting and Vibration

Preliminary blast design practices have been developed for the proposed Hunter Valley No. 2 project based upon monitoring results from the Hunter Valley No. 1 Mine. These practices will provide effective fracturing of overburden whilst limiting peak particle velocities and overpressure to acceptable levels at nearby residences.

The scale of blasts required during the first six years of mining will result in overpressure levels of less than 118 dB(L) and peak particle velocities of less than 7 mm/s at the nearest residence. These levels are below those expected to cause complaint. In the Years 7 to 21 the volumes of overburden to be broken will increase and a safe and effective drilling and blasting practice will be based upon the experience gained during Stage 1 to meet the above criteria at nearby residences.

5.6.4 Cumulative Noise Emissions from Hunter Valley No. 2 Mine and Other Neighbouring Mines

The cumulative noise emissions for the Hunter Valley No. 2 proposal and existing and possible future mines on neighbouring properties were estimated for Years 4 and 21, i.e, Stages 1 and 2 of the project. The assumptions for production rates, the locations of components on the mining sites and the limitations of analyses were the same as for cumulative dust deposition in Section 5.5.5.

Figures 61 and 62 show the positions of the 35 and 40 dB(A) cumulative noise contours.

The contours for Year 4 indicate that most of the land within the 40 dB(A) contour is owned by mining companies and proposed for mining development. The exceptions are Warkworth village and residences 35, 36, 38, 39 and 54. The increment due to the proposed Hunter Valley No. 2 Mine will not contribute to levels in excess of current standards at any privately owned residence.

The proposal is not expected to contribute to the noise levels between 35 and 40 dB(A) predicted for the privately owned residences 2, 4a, 4b, 5, 6, 13, 14, 20, 25a, and 25b.

Residence 54 and Warkworth village will also experience noise levels of 40 dB(A) or greater at Year 21 but the project will not be a contributor to these levels.

Residences not owned by mining companies and expected to experience cumulative noise levels of between 35 and 40 dB(A) are 5, 6, 25a, 25b, 32 and 35, and of these the proposal is predicted to be a contributor to the noise impact at only residences 32 and 35.

5.6.5 Conclusion

The potential for noise impacts from the Hunter Valley No. 2 project will be minimised by the small number of houses not owned by Mining Companies in close proximity to the mine. Protection is afforded to other residences by intervening topography.

Increases in noise levels of more than 5 dB(A) above night time background levels during neutral meteorological conditions have been predicted to occur at only three groups of residences not owned by mining companies. Negotiations are proceeding concerning the purchase and relocation of residences 35 and 32 respectively. The Company is prepared to consider the provision of alternative safeguards should these negotiations prove unsuccessful. The remaining residence 38 is predicted to receive significantly greater increase in noise levels due to other mining operations prior to Stage 2 operations of this proposal. As such the extent of impact and the requirement for safeguards cannot accurately be assessed.

The adoption of blast designs estimated to result in overpressure levels and peak particle velocities within the acceptable levels of 118 dB(L) and 7 mm/s respectively will ensure that the potential for impacts is minimised. Monitoring of blasting results during Stage 1 will be used to develop an efficient and acceptable practice for Stage 2 of the project.

5.7 VISUAL IMPACT

5.7.1 Scope

Study 11 details the visual implications of the project. Section 4 outlines the landscaping and rehabilitation proposals designed to improve the appearance of the surface facilities, to filter and screen views from vantage points, to establish a rehabilitated new landform on the backfilled areas of the mine and overburden emplacements, and to design a landform which is visually compatible with the subregional landscape and which is functionally suitable for grazing as a post-mining land use.

The visual impact of the proposal has been assessed in terms of:

i. The changes to the topography and landscape of the subregion and Authorisation during the life of the project and in subsequent years according to concepts for advanced mining on the site.

ii. The visual prominence of the various surface facilities and the road and conveyor to the Hunter Valley Coal Preparation Plant.

iii. The view potential of mining operations on the site from roads and residences in proximity.

5.7.2 Impact on Authorisation 13

The Authorisation is visually prominent due to the open rolling topography, the generally cleared state of the site, the number of residences in the vicinity and the presence of roads which cross the area. Much of the site is visible from Jerrys Plains Road which is an important traffic link in the Upper Hunter Valley.

The Authorisation is not visible from Jerrys Plains township. Limited views to the southern areas of the site can be obtained from Warkworth village.

Development of the site will commence in Stage 1 with the establishment of Redbank

Pit and the construction of the out-of-pit overburden emplacement in the southeastern areas. The initial areas will be visible from roads, residences and vantage points, but they will not appear significant in the subregional landscape until the area of disturbance expands and the out-of-pit emplacement increases in elevation. The progressive rehabilitation of the graded and contoured slopes adjoining the eastern boundary will assist in reducing the visual impact.

The activities on the site will become more prominent as Hobden Pit develops and the elevation of the backfilled areas and emplacements gradually increase to about RL 150 m. By the end of the project in Year 21, the transformation of the site will be considerable. The central areas will be dominated by the large opencut with the approximate dimensions of 2 km x 1.4 km and a depth of 120 m, and the exposed faces of the backfill awaiting shaping and contouring. Large areas of rehabilitation and tree planting along the eastern side of the site will improve the appearance of the operation when viewed from the east, but views from other directions will see the extensive earthworks in progress. At this time the visual impact on the subregional landscape will be considerable.

Continued mining beyond Year 21 will involve the advance of Hobden Pit in a southwesterly direction.

Planning for the advanced operations in the mine is still in the conceptual stage but an option which appears possible and practical and is favoured at this time involves the extension of the Hobden Pit to its southwesterly limit, and the filling of the excavation with spoil from a small new pit to be excavated in the northwestern corner of the Authorisation. The ultimate landform at the end of about 50 years of mining based upon this concept is shown in Figure 25. The centre of the site would be occupied by a ridgeline with an elevation of approximately RL 155 m, grading into the topography on the adjoining properties. The new surfaces on the western side would drain freely to the final void in the

northwestern corner. The void could be retained as a water storage and linked to the Hunter River by a channel. A final void at that location would not be visually prominent as it would be at a low elevation beside the Hunter River and screened from view by high ground, hills and ridges.

Should future mining decisions favour the creation of this final landform, the site would be returned to a topography compatible within the surrounding undulating country. The new central ridgeline would still be lower in elevation than other more prominent natural features to the west. Detailed design of the ridge and its flanks will incorporate landscape features typical of the area. The new landform would not detract from the scenic quality of the subregion.

Irrespective of the shape and location of the final landform, future mine planning will be directed at the creation of new topographic features similar to those considered in concept and visually acceptable in the landscape.

5.7.3 Hunter Valley No. 1 Mine

The establishment of the project requires the increased disposal of rejects and tailings from Hunter Valley Coal Preparation Plant in emplacements and ponds in backfill areas of the Hunter Valley No. 1 Mine. These operations will elevate the final rehabilitated surface slightly to provide an improved landform conforming with the surrounding gently undulating slopes. The final feature will not appear incongruous in the subregional landscape.

5.7.4 Impact of Surface Facilities

Birnamwood Facilities

The construction of the Birnamwood Surface Facilities will result in a minor visual impact for viewers using Jerrys Plains Road. The existing natural tree

screens and the proposed landscaping will assist in minimising the impact. The vegetative screening will also reduce any views from Maison Dieu Road. Any impact will be limited and temporary as the road is scheduled for closure and will only be retained as an access for the occupants of residence 35. The minor visual impact of the Birnamwood site will also be temporary in that the surface facilities will be dismantled in Year 13 to allow the advance of the Hobden Pit.

Hunter View Facilities

The impact of Hunter View Surface Facilities will be minor as the site will only be overlooked by a relatively small number of viewers at long viewing distances from vantage points to the north. The tall structures such as the dump hoppers, transfer towers and workshop will be the focal points.

The visual impact of the facilities will be reduced further as the trees in the forward tree planting and landscaping programmes become effective. The plantings will have the effect of filtering views and reducing the scale of the facilities in the landscape. The selection of building profiles and the designs and colour of the claddings selected will also assist in minimising the prominence of buildings.

Coal Haulage Road

The visual impact of the coal haulage road will be low due to the few viewing points and the screening and filtering effects of existing and proposed tree stands. The proposed crossing of the Hunter River will present a minor impact as the location selected for the crossing is inconspicuous. Vehicle movements may tend to focus attention on the road and vehicle lights may draw attention to its location at night. The impact of vehicle lights will not occur after 10 p.m. which is the time coal haulage will cease.

Overland Conveyor

The proposed overland conveyor will be viewed as a prominent structure from a number of vantage points, particularly from along the route of the Lemington Road. Tree planting to be undertaken along the conveyor route and on the floodplain will assist in minimising visual prominence. The plantings are to be located so as to reduce the perceived linear character of the conveyor and to screen the floodplain and river crossings.

Realigned Roads

The operations for the realignment of Jerrys Plains Road will be visually prominent during construction. Long term impacts will be insignificant as the road will become an integral component of the landscape.

Hunter Valley Coal Preparation Plant

The Hunter Valley Coal Preparation Plant and associated handling facilities are located 2.5 km from Lemington Road and the nearest residence. The dense belt of trees along Farrells Creek, the surrounding ridgeline to the north and east and landscaping along the coal haulage road to the west combined with the landscaping of the site and along Lemington Road will result in no significant visual impact due to the proposed expansion.

Lighting

The sites of the Hunter View and Birnamwood surface facilities will be prominent at night. Lighting from these areas will be seen from a wide area within the subregion. Similarly, general illumination associated with the sites will create a glow which will be readily seen against the skyline. The proposed tree planting programme will serve to filter the direct views to the lights and

minimise the impact.

Additional lighting impacts will result from the continuous operation of overburden haulage and the construction of the emplacement. These activities will be prominent at night.

5.7.5 Prominence from Vantage Points

Travellers on the Jerrys Plains Road will view the operations and the emerging landform.

Distant and filtered views of the proposal will be obtained from the eastern extremities of Wollemi National Park.

The prominent central ridgeline will be the focus of views from Comleroi Road. Views of the existing ridges to the northwest will be eliminated by the height of the new feature. Similarly, views of the ridges to the south of the Authorisation from Lemington Road will be lost due to the prominence of the central landform.

The impacts will be progressively minimised by the proposed rehabilitation programme as the project proceeds, however, an unavoidable visual impact will remain for the life of the project.

5.7.6 Prominence for Residences

Computer estimations of the views to the mining operations and the emerging landform from residences around Authorisation 13 are presented in Figures 63, 64 and 65. Details of the potential visual impacts at residences are presented in Study 11 and summarised in Table 5.7.

TABLE 5.7

PREDICTED VIEWS OF THE PROPOSED MINING OPERATIONS
AND FINAL LANDFORM FROM RESIDENCES

Residence No.	View Description
25(a)&(b)	The western aspect of the proposed landform will be visually prominent and will screen background views to the eastern boundary. Viewing distances will range from 1.5 km to approximately 4.1 km. Portions of the Hunter View facilities will be visible as will the conveyor route. Proposed planting of vegetative screens at these sites and adjacent to the residences will minimise the extent of these impacts. In the long term when rehabilitation is complete and the tree stands are mature the ridgeline will be perceived as an extension of the hills and spurs to the southwest of the Authorisation.
4(a)&(b)	Residents will not view the Birnamwood surface facilities but will see the conveyor leading from Hunter View surface facilities across the floodplain toward Hunter Valley No. 1 Coal Preparation Plant to the north. Views will also include the northwestern aspect of the overburden placement operation and the ridges further to the southwest.
5 & 6	This vantage point will provide extensive views to the western aspect and the ridgeline of the new landform. Mining operations will be visible at viewing distances between 1.5 and 2 km. Rehabilitation of the new feature will ensure its compatibility with the subregional landscape.
16,17(a)&(b)	Birnamwood surface facilities will be visible, but at the viewing distance of 6.25 km the impact will be negligible. The northern and western aspects of the proposed landform will be visually prominent. The overland conveyor will be viewed at distances of 4 km to 6 km from this vantage point. This distance, coupled with the proposed revegetation programme will result in minimal visual impact.
20,21(a)&(b)	Sections of the Hunter View surface facilities will be visible but the impact will not be significant due to the viewing distance of 3.75 km and the screening provided by the forward tree planting. Views to the mining and overburden placement operations will be obtained for much of the mine life. The impact of the final landform will be minimal due to the viewing distances which range from 4 to 6 km, and the likelihood that the ridgeline will appear as an extension of the hills and ridges near the southwestern corner of the site.
35	The northern face of the overburden emplacement will be visually prominent from about Year 4 onwards. Viewing distances will range from 1 to 4 km. The proposed new landform will probably screen and filter views to the ranges further to the south. Filtered views to the Hunter View surface facilities will also be obtained by the forward tree planting programme although the 3.6 km viewing distance will limit this impact.
38(a)to(c)	The final landform will be visually prominent and will represent a change from existing views to the southwest.
39(a)to(c)	Residents will have extensive views of the operations and the proposed ridgeline. The new landform will also screen some background views to the southwest. The project's visual impact will be progressively reduced as rehabilitation progresses.
36(a)&(b)	The views of the site are extensive. Viewing distances range from 2 to 7.5 km. The proposed new landform will modify the view catchment and screen background views to the ranges and the southern portion of the Authorisation. Both the surface facility sites will be visible but due to the retention of existing trees, forward tree plantings and the viewing distance, they will present a minor visual impact.
15	Only a small area in the southwestern portion of the Authorisation will be seen from this vantage point. Mining will not present a visual impact as the final area will be lower than existing levels.
18(a)&(b)	Mining operations from Year 7 onwards will be visually prominent from this vantage point, as will be the final landform. Background views to the southeast will be restricted by the elevation of the new feature.
11to14	Residents at these vantage points will not see the Authorisation.
54	The proposed overburden emplacement area will be visible from Warkworth for the duration of the project. Progressive rehabilitation during will serve to limit the area of operations. The village will have extensive views of the final landforms eastern aspect. The design of the landform and its revegetation will serve to ensure its compatibility with the surrounding landscape.

The proposed project will become increasingly prominent at a number of residences from Year 7 onwards. The potential for visual impacts will be reduced in the early years to some extent by the limited area of disturbance, variable viewing distances of up to 7 km, the filtering and screening effects of existing trees, tree planting and landscaping, especially for the surface facilities, and by the progressive rehabilitation of the backfilled areas of the mine and overburden emplacements.

The scale of the operations will increase after Year 7 when the magnitude of the project will reduce the effectiveness of visual controls on the site. By about Year 21 the new landform will have reached its final height and from then onwards the ridgeline will be extended in a southwesterly direction. This prominent central feature will be visible from up to 12 residences and groups of residences for most of the mine's life. The impact will be reduced by rehabilitation and tree planting, but a significant residual impact will remain, unavoidably, until the site is completely rehabilitated.

The Company recognises the visual implications of the project and is prepared to discuss the provision of tree and shrub screening at residences on private properties.

5.7.7 Cumulative Impacts

The Hunter Valley No. 2 project will contribute in conjunction with mining operations on neighbouring sites to the increasing visual prominence of coal mining in the local area and the Upper Hunter Valley in general. The contribution of this project will be significant due to its individual visual prominence.

The regional landscape will be changed markedly whilst operations are in progress and the effective re-establishment of an undulating terrain similar to the

present will depend upon the attention given to future landscape design on the various mining properties.

Coal & Allied Operations Pty. Limited is approaching the rehabilitation task at its adjoining Hunter Valley No. 1 Mine in a responsible fashion and the progress made is indicative of the satisfactory standards that can be achieved. With the experience gained on the Hunter Valley No. 1 site and the detailed planning proposed for the Hunter Valley No. 2 project, the Company is confident that a new landscape compatible with the present will be returned to the sites of both mines.

5.7.8 Conclusion

The landscape character of Authorisation 13 and the subregion will be altered significantly during the mining operations.

Twelve residences or groups of residences will experience prominent views of the site during and following mining operations. Some residences will lose their views to the escarpment to the south and west. The proposed project will be most conspicuous in the period between Years 7 and 21 when effective screening on the site is impractical. Progressive rehabilitation will help to reduce the impact and ultimately re-establish an acceptable landform compatible with the surrounding landscape at the end of mining on the site.

The surface facilities and structures will not be conspicuous or visually prominent for most travellers on the local roads or at many residences. Forward tree planting and landscaping proposals will assist in screening or filtering the distant views. The prominence of the overland conveyor will be reduced by the tree planting programmes.

Lighting at surface facilities, mining and overburden emplacement sites and along haulage roads will be visually conspicuous at night.

5.8 EMPLOYMENT AND ECONOMIC IMPLICATIONS OF THE PROPOSAL

5.8.1 Scope

The economic, sociological and planning implications of the Hunter Valley No. 2 project for the Upper Hunter Valley and the Region as a whole are detailed with background data in Study 14 and summarised in Section 3.

The proposal to establish the Hunter Valley No. 2 Mine will preserve the continuity of employment for 380 employees at the Hunter Valley No. 1 Mine and create approximately 168 new positions when the mine is in full production.

Direct economic benefits will flow to the community during the construction and operational phases of the project. The support of suppliers of goods and services will create indirect benefits and induced effects will result from the increased consumption expenditure flowing from the higher income generated by the direct and indirect effects.

The magnitude of the direct, indirect and induced effects has been assessed by the use of a regional input-output model and derived multipliers.

5.8.2 Impact on Employment

The impact of the project on employment in the region is detailed in Table 5.8.

Construction

The average employment for each of the three phases of construction namely the Birnamwood, the Hunter View and the coal receival and transport facilities, and additional coal handling facilities is estimated to be 25, 85 and 24 persons respectively.

TABLE 5.8

IMPACT ON EMPLOYMENT

Project Component	Employment Growth A	B	C	Total	Employment Maintenance A	B	C	Total	Total Employment A	B	C	Total
Construction												
Phase 1	25	16	-	41	-	-	-	-	25	16	-	41
Phase 2	85	56	94	235	-	-	-	-	85	56	94	235
Phase 3	24	15	-	39	-	-	-	-	24	15	-	39
Operations	168	75	154	397	380	169	348	897	548	244	502	1294

Key: A = Direct employment
B = Indirect employment
C = Induced employment.

Labour supply patterns for previous major development projects in the Upper Hunter have indicated that approximately one third of the construction labour is obtained from local sources. The proposal is therefore estimated to provide between 8 and 29 construction employment positions for subregional residents.

Indirect impacts of construction are estimated to provide a further 15 to 56 employment positions in the region. Approximately 94 induced employment positions may be created in the region during the second construction phase. Five hundred and fifty persons were registered as unemployed in the Singleton area in March 1984 (CES). Up to 80 per cent of the unemployed are registered in the clerical, administrative service, unskilled and semi-skilled occupations. As approximately 60 per cent of the indirect and induced positions occur in these occupational categories all indirect and induced employment positions are capable of being filled by local persons seeking employment.

Operations

Employment growth resulting from the operation of the project will be based upon the creation of approximately 168 new positions by Year 5. Approximately 100

positions out of this total are expected to be filled by local residents. This estimate is based upon the current labour supply patterns which indicate that between 60 and 80 per cent of mining labour is obtained in the subregion (Wiggers & Gibbs, ANZAAS 1982, R.W. Miller & Co. Pty. Ltd. Public Enquiry, 1982).

A total of 229 additional employment positions may be created as a consequence of the indirect and induced effects of the proposal. As most if not all of these positions have the potential to be filled by the regional unemployed no in-migration of labour is anticipated at the regional or subregional level.

The proposal to transfer 380 employees from Hunter Valley No. 1 Mine to Hunter Valley No. 2 Mine will ensure the maintenance of existing levels of employment in the subregion.

The application of employment multipliers to the existing Hunter Valley No. 1 operations indicates that approximately 169 and 348 indirect and induced employment positions respectively are likely to be dependent on these current operations.

5.8.3 Impact on Income

Table 5.9 summarises the effect of the project on sub-regional income levels.

Construction

Approximately $7.7M will be paid as wages and salaries to the construction workforces during the three construction phases. Indirect stimulus to regional income levels may generate a further $7.4M over the three phases. Induced income effects generated by the second phase may generate a further $2.0M.

TABLE 5.9

INCOME TO THE SUB-REGION DUE TO THE PROJECT
($M/y)

Project Component	Income Growth				Income Maintenance				Total Income			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
Construction (average)												
Phase 1	0.60	0.26	na	0.86	-	-	-	-	0.60	0.26	na	0.86
Phase 2	3.26	1.40	2.04	6.70	-	-	-	-	3.26	1.40	2.04	6.70
Phase 3	0.46	0.19	na	0.65	-	-	-	-	0.46	0.19	na	0.65
Operation	6.06	1.83	3.41	11.30	13.44	4.06	7.57	25.07	19.50	5.89	10.98	36.37

Key: A = Direct income
B = Indirect income
C = Induced income.

Operations

Wages and salaries payments to the 168 additional employees created by the proposal are estimated to result in an increase in income levels for the sub-region of approximately $6.1M per annum.

Annual indirect and induced income growth to the sub-region is estimated to amount to $1.8M and $3.41M respectively.

The proposal to transfer employees progressively from the Hunter Valley No. 1 Mine will maintain the source of income for existing subregional employees.

Hunter Valley No. 1 Mine currently contributes approximately $13.4M to regional income levels through wages and salaries payments. This contribution is estimated to generate approximately $4.0M and $7.6M annually in further indirect and induced income effects respectively.

5.8.4 Impact on Output Value

Capital expenditure in the order of $200M during the first 11 years of operations will be effective in stimulating the industry output value of the Hunter Region and Australia. Approximately $26M and $153M of this total expenditure are estimated to be expended in the Region and Australia respectively. The regional expenditure is expected to stimulate regional value of output by up to $60M in the initial 11 year period.

The mine is expected to have an annual expenditure, excluding wages and salaries, of approximately $46M during Stage 2. A further $18.5M and $33.4M in regional output value may be generated by indirect and induced effects.

5.8.5 Impact on Population

Population Growth

Population growth during the construction phases will be limited to construction employees. As detailed previously, 66 per cent of construction labour is anticipated to be obtained by inmigration. Consequently, the three phases of construction are estimated to temporarily increase the subregional population by 17, 56 and 16 persons respectively.

Approximately 40 per cent of the 168 operational employment positions not filled by existing Company labour, are estimated to require inmigration. The population growth due to the operational phase will be in the order of 224 persons, assuming 3.33 persons per family. The estimated distribution of this growth among the local government areas is indicated in Table 5.10.

No population growth should occur as a consequence of indirect and induced employment effects.

TABLE 5.10

ESTIMATED EXTENT AND DISTRIBUTION OF POPULATION GROWTH

Area	Number of Residents
Singleton Shire	179
Muswellbrook Shire	38
City of Greater Cessnock	7
Total	224

Population Maintenance

In addition to providing a stimulus for population growth the project will be effective in maintaining the subregional population by ensuring a continuing source of employment for the 380 existing Company employees. As such the project will ensure stability for the estimated 1250 residents dependent upon these employees.

Similarly, the continuity of employment created by indirect and induced effects will ensure stability for approximately 1720 regional residents dependent on these positions.

5.8.6 Impact on Community Services

The project will result in only minimal population growth and no significant requirement for additions to community facilities, other than to child care and education facilities, is anticipated. Based on Department of Education planning formula as detailed in Section S14.3.7 in Study 14, an additional 34 primary and 17 secondary school places are estimated to be required.

Contributions towards the cost of providing additional community services due to the predicted population growth will be discussed with State and local

governments.

5.8.7 Impact on Availability of Accommodation

Based upon the estimated population growth and the assumption of one housing unit per immigrating employee, 67 additional units will be required for the operational workforce.

Construction accommodation will be provided by the Company at its existing construction village adjacent to the Hunter Valley No. 1 Mine.

The Company proposes to ensure an adequate supply of land to satisfy the needs of employees for the project. The Company has participated in Singleton Shire Council's land pre-purchase scheme in accordance with the State Government Infrastructure Policy.

5.8.8 Impact on Public Sector Revenues

Revenue will accrue to the three levels of government through the application of land rates, royalties, freight rates, transport and shipping charges and taxes. Current estimates are that the mine may generate up to $56M annually during Stage 2 operations. The distribution is expected to be in the proportions: Local Government, 0.15 per cent, State Government, 96.69 per cent, and Commonwealth Government, 3.16 per cent.

5.8.9 Conclusion

The Hunter Valley No. 2 proposal will have a significant impact on the socio-economic environment of the subregion. It will contribute to the maintenance and the expansion of employment opportunities and income and revenue flows. The economic stability of the subregion will be strengthened and only limited

additional demands will be made upon community services, accommodation and urban infrastructure. The Company is negotiating the most appropriate means of satisfying these demands with the relevant authorities.

5.9 IMPACT ON LAND USE

5.9.1 Scope

The establishment of the Hunter Valley No. 2 Mine will result in a change to the traditional agricultural land use practices on Authorisation 13 as detailed in Section S13.6.1 in Study 13. The impact will be significant during the life of mining on the site, but will cease when the rehabilitated topography is finally returned to grazing as a post-mining land use.

Although the project will represent a temporary departure from the current practice, it conforms to the more recent use of coal mining which is planned as the predominant use in the region for the foreseeable future. Figure 7 indicates the lands allocated for coal exploration and mining in the Upper Hunter Valley. The proposal to extract the coal resources from Authorisation 13 represents a further stage in the development of the coal resources in the area.

The Company's policy has been to acquire properties on the Authorisation and on the adjoining areas likely to be affected significantly by mining operations. When account is taken of the land held by other mining companies, the potential for conflict between the proposed project and adjoining non-mining uses is minimal.

5.9.2 Agricultural Land Use

Value of Agriculture

Approximately 795 ha of land on Authorisation 13 will be affected by the proposal. The loss of agricultural value of production if the total area were withdrawn from use at the outset of the project would be of the order of $140,000 per annum. However, it is the Company's intention to allow grazing to proceed for as long as practicable and reductions in income of this magnitude from the property are only likely to occur after Stage 2 is fully operational. Stock will be introduced carefully into the rehabilitated areas at the appropriate time.

Dust Deposition

Dust dispersion studies predict that the maximum increase in annual average deposition over the life of the proposal will be 1.5 $g/m^2.mth$ in a small area not owned by the Company adjacent to the northwestern corner of the Authorisation. The predicted increases in dust levels at other privately owned properties in proximity to the proposal are not expected to exceed 0.5 $g/m^2.mth$ on an average annual basis. When added to predicted background levels of 1.4, 2.2 and 0.2 for average annual, summer and winter conditions respectively, the total deposition will represent a minor impact under the worst conditions due to the operation and a negligible impact at most times.

In the case of the cumulative dust deposition, the dust fallout from other existing and possible mines will have little effect in the rural areas to the northwest of Authorisation 13 where the proposal will be the major contributor. Areas to the northeast and southeast of Authorisation 13 will receive fallout from other mining operations, but negligible dust contributions from the Hunter Valley No. 2 project.

Predictions of episodic events in Section 5.5.4 indicated that there is the potential for the air quality of residences on a number of properties to receive increased dust deposition. Such episodes may be most significant in Stage 2. In practice the events would be represented by short duration wind gusts in excess of 40 km/h.

Table 5.11 indicates the agricultural activities conducted on the various properties likely to be affected by episodes, the estimated dust deposition in the episode and the possible frequency (from Table 5.4).

TABLE 5.11

FARMING ACTIVITIES ON NON-MINING COMPANY PROPERTIES LIKELY TO BE AFFECTED BY DUST DEPOSITION EPISODES

Residence Number	Predominant Land Use Activity	Year 4 Events per Year	Year 4 Deposition during Episode ($mg/m^2.h$)	Year 21 Events per Year	Year 21 Deposition during Episode ($mg/m^2.h$)
4a	Residential, dairy farming	12	1.0	12	14.1
4b		12	1.0	2	24.3
5,6	Beef and dairy cattle grazing, irrigated crop production	2	1.8	<1	24.5
7a,7b,8,10	Dairy farming, beef cattle grazing	2	0.8	<1	6.8
11,14	Thoroughbred horse breeding, beef	10	0.6	12	7.3
12a,12b	cattle grazing and fodder crop	12	0.7	12	8.6
13a,13b	cultivation	10	0.6	12	7.9
15	Dairy	2	0.3	2	3.3
16	(As for 11 to 14)	12	0.4	12	4.0
17a,17b,17c	Beef cattle grazing and fodder crop cultivation	10	0.3	12	2.7
18a,18b,19	Residential, dairy farming, fodder	10	0.3	10	2.8
20,21a,21b	crop cultivation	11	0.4	11	3.7
25a,25b		12	1.1	12	22.7
32	Dairy farming, fodder crop	<1	1.6	<1	51.5
35	cultivation	<1	1.9	2	20.2
36a,36b		<1	1.0	<1	10.4
38a,38b,38c		<1	1.5	2	7.0
39a,39b,39c	Beef cattle grazing, fodder crop cultivation	<1	1.0	2	4.9
54	Service Station, Caravan Park	7	2.2	7	3.6

Crop Cultivation

It would appear that there has been little research on the effects of dust deposition on fodder crops under Australian conditions. It has been generally observed that native species adjoining unsealed roads appear to show high levels of tolerance to dust, as do many cultivated crops and trees. Research undertaken in Europe by Auclair (1977) indicated that photosynthesis was impeded in Poplar leaves when coal dust was applied at an instantaneous deposition rate of 2 g/m^2 under illumination levels of less than 100 W/m^2. These extreme conditions will not be experienced anywhere in the vicinity of Authorisation 13. The predicted dust deposition is well below this high level and under average annual conditions the illumination in the Hunter Valley is double the European illumination, with a lowest recorded value of 120 W/m^2.

In the absence of more precise information on the effects of dust on photosynthesis and in view of the low levels of continuous dust deposition, which will only be marginally above background after allowance is made for the episodes, the dust deposition from the project is not expected to result in a significant impact on cropping and grazing activities.

Milk Quality

The principal means by which coal mining is considered to have the potential to affect milk quality involves contamination of milk due to increased dust levels.

The potential impact of dust deposition levels on milk quality has been assessed in terms of past patterns of milk rejection due to sediment contamination.

Milk produced in the Warkworth/Lemington area for delivery to the Singleton Co-Operative Dairy Co. Ltd. is subject to various quality contol tests which include sight, smell and taste tests at the time of farm pickup and a series of laboratory

tests on receival at Singleton. These latter tests ensure levels of bacteria, sediment and antibiotics comply with standards, in addition to ensuring that the composition of milk in terms of butterfat and solids (non-fat) meet the required standards.

Analysis of sediment levels is undertaken on a weekly basis. Rejection of milk based upon excessive levels of sediment can be attributed to a variety of sources, principally contamination due to cattle health problems such as mastitis and to contamination by dirt in the form of manure, mud and/or dust. Dirt contamination of milk occurs principally during the milking process or during the handling and storage of milk. No analysis of sediment in rejected samples is undertaken to identify the source of contamination.

Analysis of sediment rejection statistics has been undertaken for 14 dairies in the study area. The 14 dairies shown in Figure 13 are divided into two groups, A and B, based upon their physical relationship with existing opencut mines. Group A consists of eight dairies located within 2.5 km of operating mines and on the prevailing northwest-southeast wind axis passing through those mines. Group B consists of six dairies located at distances greater than 2.5 km and to the west and southwest of operating mines.

Annual Incidence of Sediment Rejections

The results of the analysis, presented in Table 5.12 indicate three principal findings:-

i. No significant difference in the annual pattern of rejections is evident between the two groups of dairies.

ii. A direct relationship between variability of annual rainfall and annual milk rejections statistics is apparent.

iii. Significant variability exists in the annual incidence of rejections for individual dairies within each group.

These findings suggest that over the four years surveyed, proximity of mines to dairies in terms of the dominant wind axes had no marked impact on the annual incidence of sediment rejections.

The results also indicate rejection of milk is lower in drier years and greater in years of higher annual rainfall. This finding reflects a reality of dairy farming practice in that during extended periods of rainfall additional care is required to prevent contamination of milk by mud and manure brought into dairies by cattle.

The finding of significant variability in the incidence of rejections between individual dairies indicates that regardless of proximity to mines and of meteorological factors, some dairies were able to avoid rejection of milk whilst others received up to 11 rejections per year.

These results suggests that despite the potential influence of meteorological, mining or other land use factors on the incidence of milk rejection, the realisation of this potential is dependent to a large extent on factors relating to conditions at individual dairies.

TABLE 5.12

ANNUAL INCIDENCE OF SEDIMENT REJECTIONS AND RAINFALL, 1980-1983

	1980		1981		1982		1983		1980-1983
	Mean	Range*	Mean	Range*	Mean	Range*	Mean	Range*	Mean
Group A	1.1	0 to 4	5.1	1 to 11	3.3	0 to 8	2.5	0 to 8	3.0
Group B	2.2	0 to 7	4.3	0 to 10	3.3	0 to 6	3.7	0 to 8	3.4
All Dairies	1.6	-	4.8	-	3.3	-	3.0	-	3.2
Rainfall (mm)	294		662		399		583		

* Range of rejections received at individual dairies within each group.

Source: Singleton Co-Operative Dairy Co. Ltd.

Incidence of Rejections During High Velocity Wind Periods

Results of the preceding analysis indicate that the proximity of coal mines to dairy farms did not contribute significantly to the annual incidence of milk rejections. However, the potential remains for mine generated dust to contribute to rejection of milk during isolated high velocity wind episodes.

Three specific cases of milk rejection due to sediment contamination have been analysed to determine the relationship, if any, between milk rejections and high velocity wind episodes. All three cases of rejection occurred at one dairy located approximately 1.5 km and 3.5 km from opencut mines. The dairy in question is one of eight located

on the prevailing northwest/southeast wind axis passing through adjacent mining operations.

Meteorological conditions recorded during the three cases were:-

Case 1: Northwest winds recorded at a peak of 72 km/h reducing to between 20 and 30 km/h.

Case 2: Northwest winds recorded between 20 and 25 km/h followed by southeast winds at a peak of 40 km/h reducing to approximately 20 km/h.

Case 3: Northwest winds between 10 and 25 km/h followed by southeast winds up to 25 km/h.

Analysis of rejections records for the eight dairies occupying a similar location with respect to mining operations indicates that for all cases no other dairy, other than the one in question had milk rejected on that date despite two other dairies being within 700 and 1500 m of it.

This result suggest that no direct relationship is apparent between wind velocity and direction, proximity to mines and the incidence of milk rejection. This finding supports that of the earlier analysis suggesting that the potential for rejection due to mining and/or meteorological influences is more dependent upon other factors relating to conditions at individual dairies.

All three rejection cases occurred during one month. In this same month the 14 dairies surveyed received a total of 16 rejections compared to a monthly average for the year of 5.2. Meteorological records indicate that during this month the incidence of winds in excess of 18 km/h increased relative to previous months.

The two groups comprising the 14 dairies each received an equal number of rejections in this period. This latter result indicates that as for the annual pattern of rejections, rejections during high velocity wind episodes show no differentiation based on the relative location of mines and dairies. Similarly, both groups of dairies exhibited significant differences in the number of rejections received indicating the importance of factors specific to individual farm conditions.

The preceding analysis of the relationship between milk rejection statistics and location of dairies to mining operations has indicated that for the four year period the incidence of milk rejection was independent of the spatial relationship between dairies and mines. This finding was found to be consistent regardless of variations in rainfall or wind strength and wind direction characteristics.

Variations in rainfall, wind strength and wind direction appear to be related to

the incidence of milk rejection. However the potential for these factors to influence the incidence of milk rejections was found to vary significantly between individual dairies. This variability appears to be a function of factors relating to conditions at individual dairy farms. Based upon these results it is considered that although the proposal has the potential to contribute to increased levels of dust deposition during episodic high wind events such levels may not necessarily have an adverse impact on milk quality at adjacent dairies.

Noise and Vibration

The changes in noise climate due to the project will be minimal and will have no effect on agricultural land use around Authorisation 13.

The proposed blasting programme will be based upon experience at the adjacent Hunter Valley No. 1 Mine, to ensure overpressure levels are limited to 118 dB(L) or less. This level is in accordance with United States Bureau of Mines standards and as such is considered to provide no cause for complaint. Corresponding vibration levels are estimated to be less than 7 mm/s which is the limit imposed at the Hunter Valley No. 1 Mine. No impact is expected due to blasting.

Water Flows and Quality

As the water management programme proposed for the project has been designed to prevent the discharge of saline minewater, untreated runoff and process waters from the site, the quality of the water of downstream users will not be affected. Similarly, as the maximum estimated reduction in the volume of water in the Hunter River is predicted to be 0.18 per cent of the average flow, the impact of the project on the availability of water will be negligible.

5.9.3 Impact on the Landing Ground

The proposed mining and overburden emplacement operations in the southeastern corner of the site will ensure an obstacle free flight path for commuter aircraft.

The Company has also discussed the mining proposal with the Hunter Valley Gliding Club Co-Operative Limited who operate the landing ground for gliding operations. Agreement has been reached that the mining operations will not interfere with gliding activities.

5.9.4 Impact on Local Roads

The proposal will require the relocation of the Jerrys Plains Road and the closure of Maison Dieu Road west of Buchanan Lemington operations. Comleroi Road will link Jerrys Plains Road and Maison Dieu Road. These changes are not expected to be a major cause of disturbance or inconvenience to road users.

Application will be made to Singleton Shire Council and the Department of Lands for the closure of the relevant section of the Mitchell Line.

The Lemington Road will be crossed at grade by the proposed coal haul road. Details of the crossings have been discussed with Singleton Shire Council and the intersection design will include appropriate safety measures.

The Company will co-ordinate the proposed changes to the local road network in consultation with the Singleton Shire Council and the Department of Main Roads.

Continuous access will be provided to local residences to ensure residents are not isolated by the mining operations.

5.9.5 Travelling Stock Reserve

The existing travelling stock reserve will require relocation to enable mining of the southeast corner of the site. An agreement has been reached for the exchange of an area of land in the central western section of the site to be used for these purposes.

5.9.6 Impact on Land Use Options

The potential for land use conflicts between the proposal and the activities on adjoining properties is limited by the extent of the land owned by the Company and proposed for development by other mining companies.

The only potential for impacts on agricultural land use involves the effects of dust deposition episodes. This problem is not seen to be insurmountable and the Company is prepared to co-operate with local farmers in controlling activities to minimise dust emissions. With proper consultation and co-operation, the potential for impacts can be minimised.

The project is not expected to affect cropping or grazing land uses.

5.9.7 Conclusions

When Stage 2 of the project is in operation, 795 ha of grazing land will be removed from production. Stock will be reintroduced to rehabilitated areas as soon as it is practicable.

There will be no impact on agricultural activities due to water or noise pollution. A limited potential exists for an impact on dairying due to episodic dust deposition.

The project is consistent with the trend away from agricultural activity and towards coal mining as the dominant planned land use for the foreseeable future.

5.10 IMPACT ON RESIDENTS

5.10.1 Scope

The preceding sections have assessed the potential impact of the project in terms of predicted changes in water, air and noise qualities, visual character and land use patterns in the areas adjoining Authorisation 13. This section considers the possible implications of the changes for the residents of the area.

5.10.2 Pollution Standards

Dust

Dust deposition is highly unlikely to cause health problems in the vicinity of the project due to the low concentrations of particulates. Most health effects identified with particulates are related to toxic constituents such as lead or to the simultaneous occurrence of gases such as sulphur dioxide. Neither of these phenomena will be present in significant proportions around the project area.

Increased dust levels can affect amenity by reducing water quality in tanks, decreasing visibility, soiling surfaces and by causing inconvenience in various ways. An impact on amenity is largely dependent on the personal perceptions of the recipient which will vary among individuals according to factors which include:-

i. Pre-development dust levels, their variability and frequency and the duration of high dustfall events.

ii. Increases in dust levels and their variability and frequency.

iii. Differences in the nature of particulate fallout prior to and following development, i.e. changes in colour and size.

Criteria and guidelines proposed for dust levels affecting amenity tend to be based upon subjective assessments. Table 5.13 presents a selection of air quality standards for dust concentration that have been adopted or recommended in several countries and states. Most standards are not directly comparable because of variations in land use and different statistical bases, however, several approaches are relevant to the Upper Hunter Valley where there is a known high variability in seasonal background dustfall and where levels at residences close to mining projects vary with meteorological conditions and other factors.

TABLE 5.13

AMBIENT DUST CONCENTRATIONS AIR QUALITY STANDARDS

Country/State	Level (ug/m^3)	Comments
Australia	90	Annual geometric mean
Canada	70	Annual geometric mean
	120	24 hour mean
United States	75	Annual geometric mean
	260	24 hour mean
Colorado, North Dakota	120	3 month average
Delaware	60-125*	Annual geometric mean
	95% <130 to 200*	
Wyoming, Montana, St. Louis	75	Annual geometric mean
	99% <200	
New York	50% <40 to 135*	
	84% <60 to 200*	
Oregon	150 to 250*	Above background
Pennsylvania	100	Air basin, 30 day average
	150	Single point, 30 day average
	500	Single point,24 hour average
SW Ohio-Northern Kentucky	100 to 250*	
	90% <75 to 175*	
Texas	90% <125 to 200*	
Soviet Union	150	
	500	Maximum at any one time
Spain	130	Annual geometric mean
	202	30 day mean
	300	24 hour mean

* Maximum and minimum figures for most restrictive and least restrictive land use classes.

Sources: Stern (1977), McKee (1969), Ferrari & Ross (1983).

Table 5.14 presents similar standards for dust deposition incorporating land use categories, statistical approaches and averaging periods for different dustfall criteria to reflect seasonal and spacial variations.

The standards in Tables 5.13 and 5.14 have been used in considering the possible impact of dust deposition on residents in proximity to the Hunter Valley No. 2 proposal.

TABLE 5.14

AMBIENT DUST DEPOSITION AIR QUALITY STANDARDS

Country/State	Level (g/m^2.mth)	Comments
New South Wales	4	Annual average inconsistent with rural amenity
	10	Annual average unacceptable in rural areas
West Germany	10.5	Mean of 12 monthly means
	19.5	Monthly mean
Poland	19	Annual average, protected areas
	3	Annual average, specially protected areas
	6	Monthly average, specially protected areas
Spain	6	
Hungary, Romania	15	
Hungary	11	Protected areas
North Dakota, Montana, St. Louis, Wyoming	5.25 to 10.5*	3 month average
Oregon	5.25 to 10.5*	Above background
New York	50% <3 to 15*	Monthly average
	84% <3.5 to 22.5*	
Pennsylvania	10	Air basin, 30 day average
	15	Single point, 30 day average
	8	Single point, annual average
S.W. Ohio-Northern Kentucky	90% <3.5 to 12.3*	
Arkansas, Kentucky	5.25	Monthly average
Mississippi	5.25	Above background
Louisiana	7	Monthly average

*Maximum and minimum for most restrictive and least restrictive land use areas.

Sources: Stern (1977), McKee (1969), Ferrari & Ross (1983).

Noise

Noise impacts have been assessed in accordance with guidelines established by the State Pollution Control Commission. Daytime impacts were determined by calculating the difference between existing background L_{90} and L_{10} levels. Night time impacts were based upon the difference between existing L_{90} levels and the peak L_{10} generated by the project.

Increases in sound pressure levels of up to 5 dB(A) may be considered acceptable for continuous mining operations. Similarly, short duration noise level increases of 10-15 dB(A) may be considered acceptable.

5.10.3 Impact on Villages

Jerrys Plains

The village of Jerrys Plains is not predicted to experience increases in water, noise, or air pollution resulting from the project. The operation will not be visible from the village, but a glow from lighting on the site may be apparent at night.

Warkworth

Increases in annual dust deposition equivalent to 0.1 g/m^2.mth or less in Stages 1 and 2 and in dust concentrations of less than 5 ug/m^3 in both stages will be of minimal importance when compared with the potential dustfall levels associated with other operations in closer proximity. The potential exists for high wind episodes to contribute to increased dust fallout.

Predictions of noise emissions indicate that night time increases of up to 6 dB(A) may be experienced in Years 4 to 14. This increase is just in excess of the

maximum acceptable increase of 5 dB(A) and would represent a minor impact. Cumulative noise from other mining operations in the area could exceed the acceptable limit by a larger margin.

The construction of the out-of-pit overburden emplacement and the mining operations close to the eastern boundary of Authorisation 13 will be visible from Warkworth for most of the life of the project. Progressive rehabilitation will minimise the area of disturbance at any time and improve the outlook to the north. The final landform is likely to be perceived as an extension of the slopes leading to the higher ridgeline in the west. Tree planting programmes on the new landform will improve its appearance in the surrounding landscape.

Lighting on the site will be visible at night time.

Warkworth village is located adjacent to a number of existing and proposed open cut mining operations. The village will be prone to reductions in air and noise quality and visual impacts due to the cumulative effects of mining in the area.

5.10.4 Rural Residences

Dust Deposition

The annual average dust depositions and concentrations predicted for Stage 1 of the project are unlikely to approach levels causing reductions in amenity standards for residents.

The maximum level of increase in dust deposition at residences not owned by the Company is estimated to be 1.5 g/m^2.mth at residences 25a and 25b in Stage 2 of the operations. This level is within all acceptable standards in itself and when added to an estimated background level of 1.4 g/m^2.mth.

Episodic dust deposition events have the potential to intermittently reduce the amenity of residents at a number of locations to the northwest of the project. High wind dust episodes are not new to the area as background monitoring results indicate their occurrence in the past. Increased dust deposition during high velocity wind episodes will not constitute a health hazard.

The analysis of annual average cumulative dust levels indicated that at no stage during the proposal will the predicted levels of between 0.5 and 2.0 g/m^2.mth affect the amenity in the area to the northwest of the site. The Hunter Valley No. 2 project will be the major contributor to these deposition levels.

During Stage 1 of the project, the areas to the northeast of the site are predicted to experience cumulative levels of 5 g/m^2.mth, whilst areas to the southeast may experience similar levels in Stage 2. These levels are at the threshold levels for various standards. The contribution of the Hunter Valley No. 2 project to this total cumulative deposition will be negligible at less than 0.1 g/m^2.mth.

The general conclusion from the dust deposition studies is that residents to the northwest of the project will only experience minor impacts from dust for most of the time under average conditions, but there is the potential for short duration dust episodes leading to reduced amenity and inconvenience. In the areas to the southeast and northeast, the average dust deposition levels will be much higher due to the close proximity of other mining operations.

Noise Levels

Three residences shown in Table 5.15 are likely to experience increases in noise levels of 5 dB(A) or greater above background levels.

It is believed likely that residence 38 may experience noise levels in excess of 50 dB(A) from an adjoining mining operation prior to the start of Stage 2 of the

project (Buchanan Borehole Collieries, 1982). It is expected that ameliorative measures will have been taken to limit the potential for such an impact before the predicted increase from the Hunter Valley No. 2 project becomes effective.

TABLE 5.15

PREDICTED NOISE LEVEL INCREASES OF 5 dB(A) OR GREATER AT NON-MINING COMPANY OWNED RESIDENCES

Residence Number	Stage 1 dB(A) Day	Stage 1 dB(A) Night	Stage 2 dB(A) Day	Stage 2 dB(A) Night
32	-	-	-	+1
35	-	+5	+5	+19-16
38	-	-	-	+5-9

A similar situation will exist at residence 54. Predictions of noise levels resulting from the road haulage of coal from the proposed operation to the south of Authorisation 13 indicate that levels of up to 73 dB(A) may occur at this property (United Collieries, 1983). It is assumed that such levels will require the provision of safeguards prior to the occurrence of such impacts predicted for Stage 1 of the Hunter Valley No. 2 project.

A standing offer for purchase by the Company exists for residence 35. To date the owners have expressed the desire to continue residing on this property. The Company is prepared to provide additional safeguards at this residence to reduce the extent of predicted impacts.

The Company is currently negotiating the relocation of the dairy complex at residence 32 to a site adjacent to residences 36a and 36b.

Each of these four residences are affected by circumstances which when resolved will eliminate the potential for an impact due to noise. Residents in other locations will not be affected by noise.

Proposals to control blasting will limit overpressure and vibration levels to limits which are currently acceptable.

Visual Impacts

Twelve residences or groups of residences will have prominent views of the mining operations and out-of-pit overburden emplacement. These residences are 25a, 25b, 4a, 5, 6, 16, 17a, 17b, 20, 21a, 21b, 35, 38a, 38b, 38c, 39a, 39b, 39c, 36a, 36b, 18a, 18b, 11, 54 and Warkworth. The rehabilitation programme will help to reduce the impact, but in general, residents at these locations will overlook the project for most of the life of the operations on the site. Concealment of the operations will not be practicable and the Company is prepared to discuss the planting of vegetative screens at the residences of persons interested in having their views shielded or filtered.

Lighting on the mining site and at surface facilities and glows at night time will be viewed from many residences.

The increase in scale and elevation of the new landform on the site will eliminate views to the south and southwest for residents living to the northeast of the site.

Limited and distant views of the site will be obtained from Wollemi National Park.

Water Quality

The project will not contribute to reduced water quality in streams or rivers and surface and subsurface sources of supply are not expected to be affected at neighbouring residences.

5.10.5 Conclusion

The proposal will result in the potential for an impact on air quality at residences to the northwest of the site due to episodic dust deposition. The impact may involve a reduction in amenity and inconvenience at times of high wind events. Residents living to the northeast and southeast of the site will be mainly affected by mining operations on properties to the east and southeast of Authorisation 13.

There will be an unavoidable visual impact at a number of residences for the life of mining on the site.

Potential impacts at four residences resulting from increased noise levels can be resolved in each case.

5.11 IMPACT ON TRANSPORT FACILITIES

5.11.1 Vehicular Traffic

Impacts of the proposal on the existing road network will be limited to additional traffic volumes primarily on Jerrys Plains Road and Lemington Road due to construction and operational employee movements and to delivery of construction materials. No road haulage of coal on public roads is proposed.

Construction activity is estimated to result in a maximum of 30 additional passenger vehicle round trips per day on Jerrys Plains Road. Operations employees are estimated to generate a maximum of 224 additional vehicle round trips. Approximately 70 per cent of this latter additional volume represents the transfer of existing traffic movements from Hunter Valley No. 1 Mine.

Estimates of the potential for traffic accidents indicate that one accident per year may occur on Jerrys Plains Road as a consequence of the additional Stage 2 traffic volumes. Assessment of the potential contribution of the proposal to road maintenance requirements indicates that the estimated increase in Stage 2 traffic volumes may contribute approximately 0.2 per cent of the daily total of standard axle loads on Jerrys Plains Road. This contribution represents in part the transfer of existing vehicle movements and hence road maintenance requirements from other roads in Singleton Shire.

5.11.2 Rail System

The State Rail Authority has the planned capacity to meet the projected coal tonnages up to the late 1980's. To fulfill this planned capacity the Authority has contracted for the delivery of additional rolling stock and undertaken the construction of passing loops on the Maitland to Muswellbrook line.

Approvals have been obtained from the State Rail Authority permitting 9 Mtpa product to be transported by rail from the Company's Liddell facilities to the Port of Newcastle. This volume will allow all current and projected tonnages from the Company's operations to be transported in this manner.

5.11.3 Port Capacity

The commissioning of Stage 1 of the Kooragang Coal Loader increased coal export capacity for the Port of Newcastle from approximately 28 Mtpa to 40 Mtpa. As future demand levels for coal remain uncertain, a decision regarding the construction of further stages of the Kooragang Coal Loader is dependent upon favourable market conditions.

Export production levels are projected to be 30 Mtpa in 1985 and 45 Mtpa in 1990. This compares with earlier projections of between 40 and 45 Mtpa in 1985 and

between 45 and 75 Mtpa in 1990.

Given these projections, additional capacity over and above that provided by Stage 1 of KCL will be required by 1988. Construction of Stage 2 of KCL will provide sufficient capacity to meet the needs of this proposal within the port until the mid-1990's.

5.12 ENERGY PRODUCTION AND USE

An Energy Statement is provided in Study 16.

Stages 1 and 2 of the proposed Hunter Valley No. 2 opencut mine will produce an average of 0.7 and 3.3 million tonne of saleable coal per annum respectively.

Total saleable product for the two stages will have an energy content of approximately 19.95 x 10^{15}J and 96.36 x 10^{15}J respectively.

Consumption of primary energy required to recover the coal will amount to 551 x 10^{12}J and 1902 x 10^{12}J for Stages 1 and 2.

The project will be a net energy producer with a nett annual output of approximately 19.4 x 10^{15}J and 94.46 x 10^{15}J for Stages 1 and 2 respectively.

The minimisation of energy consumption and the conservation of the least plentiful energy sources was considered in the design of the mining operations.

REVIEW OF ALTERNATIVES

SECTION 6

6.1 SCOPE

Section 1 summarises the conclusions to the analysis of the proposal's impact detailed in Section 5.

The conclusions relate to the significance of the residual impacts after the incorporation of design and operational safeguards to minimise the proposal's contribution to pollution thereby affecting the amenity and economic well-being of residents in proximity and the Region as a whole.

This section reviews the options available to the Company to further reduce the residual impacts and optimise the development for the site in terms of environmental, economic and resource recovery criteria.

6.2 RESIDUAL IMPACTS

The conclusions for the physical environment were that water resources would not be affected in any way so as to prejudice other users. Topography of the site would be changed, but not to the detriment of the subregional landscape in the long term. The impact on air quality will not be significant under average conditions and the increases in noise levels will not be a source of disturbance.

Clearing of vegetation and loss of of wildlife habitat will result in an unavoidable impact on the natural environment. In the longer term tree planting could restore conditions suitable for wildlife in some areas.

The ongoing policy to purchase properties on and adjacent to the area of the development is resulting in the creation of an effective buffer zone between the project and private landholdings. Other adjoining land intended for mining also minimises the potential for an impact on residents and land use.

Residual impacts on residents in proximity relate to reductions in amenity and inconvenience resulting from episodic dust deposition events, the daytime visual impact for many residents for the life of the project and the night time impact of lighting.

The assessment of the impacts on the social and economic environment indicated the potential for significant benefits in terms of increased employment opportunities, provision of alternative employment opportunities, additional revenue flows due to capital and operational expenditure and of limited population growth resulting in only minor increases in the demand for urban and community infrastructure.

The potential for significant social and economic benefits and minor adverse impacts has been maximised by the scheduling of the Hunter Valley No. 2 project to integrate with the planned operations at the Hunter Valley No. 1 Mine.

6.3 ALTERNATIVES FOR THE DESIGN AND OPERATION OF THE PROJECT

6.3.1 Constraints

The basic objective of the project is to maximise the recovery of the coal resource in a financially viable business venture. The exploration of the Authorisation revealed the constraints imposed by the original depositional environment and subsequent structural history of the coal seam assemblages.

The various design and operational alternatives available to the Company were summarised in Section 4.2. The evaluation of mine plan options revealed that the open pit method utilising predominantly shovel and truck combinations offered the best approach to maximise economic coal recovery.

After determining the locations for boxcuts on the basis of the most favourable overburden to coal ratios, the space requirements for development of the open pits and the relative merits of subsequent mining sequences, the available options were restricted to identifying adequate surface areas for the overburden emplacements and the supporting facilities.

Selection of the preferred site for each of these components was based upon technical, economic and environmental suitability. In terms of the latter, site selection objectives included where possible, minimisation of the area of disturbance and the confinement of development to land owned by the Company.

6.3.2 Out-of-Pit Overburden Emplacement

The Authorisation contains only two areas not underlain by coal suitable for opencut extraction. However only one of these has sufficient capacity to accommodate the volume of overburden predicted. This site, was also considered preferable on environmental grounds as it is closest to existing and proposed mining operations and the most isolated from residences and agricultural areas unaffected by mining.

One alternative site within an economically acceptable distance was identified adjacent to the southwestern corner of the Authorisation. Evaluation of this site indicated it was of ecological significance and that its utilisation would require a significant enlargement of the area to be disturbed by the project. Overburden haulage by truck or conveyor to the site was also found to contribute to a significantly greater potential for dust, noise and visual impacts on privately owned land otherwise unaffected by the proposal.

6.3.3 Surface Facilities

The only remaining area on the Authorisation suitable for surface development in

the northwestern corner was selected for the Hunter View facilities.

Alternative sites located off the Authorisation are restricted by coal bearing and floodprone land, and ownership constraints.

6.3.4 Coal Preparation

Options available for the preparation, handling and transport of coal involved the establishment of independent facilities on Authorisation 13 or the utilisation of the Company's existing facilities at the Hunter Valley and Liddell Coal Preparation Plants and Hunter Valley and Liddell Loading Points.

The objectives to avoid coal sterilisation and use of floodprone land precluded the selection of a site on the Authorisation or to its immediate north.

Potential environmental benefits arising from the establishment of a coal preparation complex on or adjacent to Authorisation 13 include the disposal of rejects on the site and the elimination of the need to transport coal over the Hunter River.

The preferred and adopted option of utilising the Company's existing facilities to the north has the advantage of limiting the scale of development and hence disturbance to Authorisation 13. It was also recognised that by maximising the utilisation of existing facilities in less sensitive areas the efficiency of environmental controls could be maximised.

6.3.5 Transport of Coal to Hunter Valley Coal Preparation Plant

Limited options were available for the transport of coal to Hunter Valley Coal Preparation Plant. The routes adopted in the proposal are the most direct and traverse Company owned land for their entire lengths. The proposed arrangements

minimise the potential for impacts upon adjacent landholdings.

6.3.6 Final Void

The large open excavations of Hobden Pit will remain in the centre of the site at the end of the 21 years covered by this proposal. Prior to that time it will be the intention of the Company to complete mine planning and seek approvals for subsequent stages of the operation. Information supporting the applications will contain details of the designs proposed for the ultimate landforms and for the treatment of a final void.

This Statement has provided an indication of the possible final landform and of an option for the location of a final void. These schemes are based upon mining concepts which appear to be practicable at this time but are not intended to commit the Company to a specific course of action for 50 years ahead.

Should a final void be located in the northwestern corner as described in this Statement, it will be treated in a manner which is acceptable to determining authorities at the time. One possible useful application would be a water storage. This Statement has explored this possibility and other options in a general way to advise interested parties that the Company is giving thought at this time to the long term situation.

6.4 THE 'NO DEVELOPMENT' OPTION

The limitations imposed by the nature of the coal resource and the objective to minimise the area potentially affected by the project effectively restrict the Company to the proposal detailed in this Statement. In all cases other options considered result in the loss of coal due to sterilisation or are uneconomic and the inclusion of more properties and residents within the zones of influence of

the project. As a consequence the remaining alternative to achieve further significant reductions in the residual impacts is to adopt the 'no development' option.

A decision not to proceed with the proposal will result in significant negative economic and social repercussions for the local community, Region and State. Such impacts on the local community would include the loss of alternative employment opportunities made available by the proposal for 380 existing employees at Hunter Valley No. 1 Mine. Additional direct employment losses would also occur due to the Hunter Valley Coal Preparation Plant and Hunter Valley Loading Point becoming redundant at the cessation of mining at Hunter Valley No. 1 Mine.

Additional employment losses would also occur in those industries where indirect and induced employment positons have been generated.

Failure to proceed with the proposal will therefore result in a substantial contraction of existing employment opportunities available in the Upper Hunter Valley.

A decision not to proceed with the proposal will also prevent the utilisation of a valuable energy resource and reduce the extent of foreign exchange earnings generated by the export of this resource.

Advantages to be gained by the 'no development' option involve the elimination of the residual impacts predicted to result from the proposed development. In view of the fact that the impacts are 'predicted' and should be able to be minimised by management of the operations, monitoring and control of pollution and liaison between the Company and its neighbours, it is believed that the project should not be refused approval on environmental grounds.

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