EIS 991

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Upper Blue Mountains electricity supply strategy :

environmental impact statement

PROSPECT ELECTRICITY

Upper Blue Mountains

Electricity Supply Strategy

ENVIRONMENTAL IMPACT STATEMENT

EDAW

Upper Blue Mountains Electricity Supply Strategy
Environmental Impact Statement

PROSPECT ELECTRICITY

UPPER BLUE MOUNTAINS

ELECTRICITY SUPPLY STRATEGY

ENVIRONMENTAL IMPACT STATEMENT

EDAW (Aust.) Pty Ltd
551 Pacific Highway
St Leonards NSW 2065

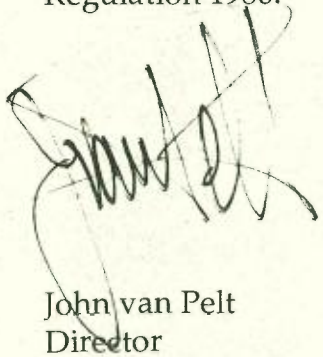
July 1994

UPPER BLUE MOUNTAINS ELECTRICITY SUPPLY STRATEGY

ENVIRONMENTAL IMPACT STATEMENT

Clause 59 Certificate

This is to certify that this Environmental Impact Statement has been prepared in accordance with Clauses 57 and 58 of the Environmental Planning and Assessment Regulation 1980.



John van Pelt
Director
EDAW (Aust) Pty Ltd

July 1994

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ACKNOWLEDGEMENTS

The input of the many members of the community who participated in the preparation of this strategy is greatly appreciated by Prospect Electricity and EDAW. Particular thanks is due to the members of the Project Consultative Committee and the EC/DSM subcommittee who contributed considerable time and effort to ensure that community views played an important part in the shaping of the strategy.

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Allen and Carmel Blackburn	Katoomba Chamber of Commerce
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GLOSSARY OF TERMS AND ABBREVIATIONS

Conductor
A wire or cable used for carrying electricity from one place to another.

Demand
The amount of electricity used by customers. See also *Load*

Determining Authority
A Minister or Public Authority whose approval is required for an activity to be carried out.

Distribution Line
A low voltage power line used to carry electricity to homes and workplaces.

Electric Field
A field resulting from the strength (or voltage) of an electric charge. The intensity of an electric field is measured in kilovolts per metre (kV/m)

EMFs
Collective abbreviation of Electric Fields and Magnetic Fields

Load
The amount of power passing through a system component or used by the customers from the system.

Magnetic Field
Magnetic fields are produced by the current or motion of a charge. The magnetic field of an appliance will increase with higher power settings. Magnetic fields are usually measured in Milligauss (mG).

Power Line
General term used to describe both transmission and distribution lines.

Quaternary
The current geological age. Dating from 1.8 million years ago to the present.

Route Corridor
A broad area from which a number of transmission line routes could potentially be identified.

Substation
A facility containing one or more transformers which enable electrical voltages to be reduced.

Transmission Line
A high voltage power line used to carry electricity from a power station to a substation or between two substations.

Voltage
Can be thought of as the pressure of an electrical energy supply. Higher voltages are often expressed as kilovolts (1 kilovolt = 1000 volts) and low voltages in volts (eg 240 volts for most domestic appliances.

BMCC
Blue Mountains City Council

EC/DSM
Energy Conservation/Demand Side Management

NPWS
National Parks and Wildlife Service

SUMMARY

SUMMARY

THE PROPOSAL

Prospect Electricity propose to improve the electricity supply to the Upper Blue Mountains. This would be achieved through an integrated strategy of constructing new infrastructure and establishing a programme which would change the way in which electricity is used in the area. The Upper Blue Mountains Electricity Supply Strategy consists of:

- The construction of a new 132/66kV transmission substation at North Katoomba.
- The construction of one 132kV concrete pole transmission line to supply the substation.
- The construction of two 66kV concrete pole transmission lines to supply Prospect Electricity zone substations from the proposed substation.
- The establishment of an Energy Conservation/Demand Side Management Programme, aimed at managing electricity use in such a way as to minimise the need for future electrical infrastructure.

Under the Environmental Planning and Assessment Act 1979 (EPAA), the transmission line component of the development is required to be determined jointly by Prospect Electricity and the National Parks and Wildlife Service, while the substation requires a Development Application to be submitted to Blue Mountains City Council. While only the transmission lines require the preparation of an Environmental Impact Statement (EIS) under the EPAA, this EIS assesses the proposal as a whole and will be used to support the substation Development Application.

The Katoomba North transmission substation is proposed to be located on private land immediately to the south of the Katoomba Airfield. The substation would comprise an 80m x 50m rectangular fenced compound which would house a single 132/66kV transformer and the associated switchgear. A control building constructed of grey blockwork with a green Colorbond roof, would be located on the northern boundary of the substation compound, with a rainwater tank collecting runoff from the control building roof.

Although the substation would use only a small proportion of the allotment on which it would be located, Prospect Electricity propose to purchase the entire property and return the unused portion (approximately 70ha) to public ownership. As this land contains significant bushland and a section of the historic *Bruce's Walk*, it is intended that it be incorporated into Blue Mountains National Park or be managed as a nature reserve by Blue Mountains City Council.

The three transmission lines will consist of steel reinforced concrete poles, 16-20m above ground height. The poles would be spaced at approximately 100m intervals. Each pole would incorporate three polymer insulators, each supporting one transmission line conductor (wire).

Two transmission lines would run east of the substation through private property, the Katoomba Airfield and Blue Mountains National Park. One of these would terminate at a point on the existing Wallerawang to Lawson 132kV transmission line, while the other (66kV) transmission line would continue across the Katoomba Creek Gully before connecting with the existing Lawson to Katoomba 66kV transmission line.

A single 66kV transmission line would run west from the substation along the park side of the

boundary between Blue Mountains National Park and Katoomba Airfield. This line would connect with the existing Katoomba to Blackheath 66kV transmission line.

As well as the construction of the substation and associated transmission lines Prospect Electricity propose to establish an Energy Conservation/Demand Side Management (EC/DSM) Programme in the Upper Blue Mountains. This programme will be aimed at minimising the need for future electrical infrastructure by changing the ways in which electricity is used in the area. The EC/DSM programme consists of an integrated strategy of monitoring of the electricity supply; provision of auditing services to customers; education in energy conservation; financial incentives to purchase energy efficient appliances; and the encouragement of energy efficient building codes.

COMMUNITY PARTICIPATION

An extremely comprehensive programme of community participation was undertaken in the planning phase of this proposal. While the participation of the community was initially aimed at the selection of a substation site in the North Katoomba area, it ultimately broadened the scope of the proposal from an infrastructure planning project to a total energy management strategy for the Upper Blue Mountains.

The community participation programme began with the holding of two public meetings and an public exhibition at various locations around Katoomba. A Project Consultative Committee (PCC) was formed from the public meetings to provide community representation in the planning for the proposed electricity supply improvements. The PCC consisted of representatives of Blue Mountains City Council, local environmental, business and community groups, National Parks and Wildlife Service, State Rail Authority, Prospect Electricity and EDAW.

The PCC identified early in the process, the need for greater community awareness of electricity supply issues in the Upper Blue Mountains. Three community workshops were subsequently held, addressing various aspects of electricity supply.

A survey of community values in relation to electricity supply issues was subsequently undertaken by the University of Western Sydney - Hawkesbury. This research involved a survey of 506 Upper Blue Mountains residents as well as selected media research and inquiries to business and environmental groups in the area.

Following the presentation of this research to the PCC, it was decided to form a subcommittee of the PCC to develop an Energy Conservation/ Demand Side Management strategy for the Upper Blue Mountains. A broad strategy was ultimately presented to the PCC in July 1993.

The PCC then continued to investigate alternative substation sites, with a site adjacent to the Katoomba Airfield ultimately being selected as the preferred site.

THE NEED FOR THE PROPOSAL

Ageing equipment and continuing growth in electricity demand have highlighted the inability of the existing Lawson transmission substation to deliver a reliable supply of electricity to the Upper Blue Mountains. The 66kV transmission line from Lawson transmission substation is also of limited capacity and contributes to the

unreliability of the electricity supply to the area.

The Lawson transmission substation was established in 1953 with largely second hand equipment. The original equipment, some of which dates back to the 1920s, is still in use. The reliability of this equipment is decreasing with time and when breakdowns occur, spare parts are often difficult to obtain.

In addition to the problem of equipment age at the Lawson transmission substation, is the design capacity of the equipment. The capacity of the two transformers is such that if the entire Upper Blue Mountains load is placed on one transformer due to a breakdown, it may exceed the capacity of that transformer resulting in major electricity supply interruptions. The backup supply to the SRA electric train system is also extremely limited because of the inadequacy of the Lawson transmission substation.

The 66kV transmission line running north from the Lawson transmission substation carries the majority of the Upper Blue Mountains Electricity load. This transmission line is of limited capacity, particularly in summer when the effect of heat diminishes the efficiency of transmission lines. There is an urgent need for the load on this transmission line to be reduced.

ALTERNATIVES

A number of alternative strategies were considered to meet the electricity needs of the Upper Blue Mountains. These included:

- An improved Lawson transmission substation
- A new Blackheath substation
- A new Katoomba North transmission substation
- Increased energy efficiency through Energy Conservation and Demand Side Management (EC/DSM)
- Do nothing

It was decided relatively early in the planning/community participation process for this proposal that a new substation at Katoomba North was the optimum solution. This was due to both environmental (avoiding transmission lines through residential areas) and logistical grounds (Katoomba North is near the centre of the Upper Blue Mountains Supply area and is therefore the most efficient location for a substation.

It was also determined that although EC/DSM was not an answer to the electricity supply needs in itself, it should form part of the overall Upper Blue Mountains Electricity Supply Strategy. An EC/DSM strategy would minimise the need for the provision of future electrical infrastructure.

Five potential sites in the Katoomba North area were evaluated on the impacts of the substation itself and those of the associated transmission lines. A site on private land immediately to the south of Katoomba Airfield was ultimately chosen primarily on the basis that it was isolated from residents and would have a relatively low impact on Blue Mountains National Park.

EXISTING ENVIRONMENT

The study area largely consists of bushland, although there is a degree of disturbance due to existing transmission lines, the Katoomba Airfield and a network of roads and tracks. The

substation site is situated on the north western corner of an undeveloped block of private land. The site is bordered to the west by Blue Mountains National Park and to the north by Katoomba Airfield, which is privately leased from the department of Conservation and Land Management.

Significant bushland occurs at various locations in the study area, both in National Park and on private land. Of particular importance is the sedgeland or hanging swamp occurring to the south of the substation site.

The nearest urban areas are Medlow Bath, to the west and North Katoomba to the South. The site would be accessed by travelling through Medlow Bath and along Grand Canyon Road.

IMPACTS

The substation site and transmission line routes have been developed in such a way that will minimise the environmental impacts of the proposed activities. Some clearing of bushland would however be necessary to provide for the construction of the substation and for access to the transmission lines, although existing cleared areas, such as access tracks and existing transmission line easements would be used wherever possible. None of the vegetation of particular significance in the study area would be affected.

All of the transmission lines would traverse a portion of Blue Mountains National Park, however the routes were selected in such a way that where National Park was traversed, it would nearly always be adjacent to the park boundary or within an existing disturbed area. The values of Blue Mountains National Park would potentially be enhanced by the proposed returning of the 70ha of unused land purchased by Prospect Electricity for the substation, to public and probably NPWS ownership.

The transmission lines and substation would have a low to moderate visual impact. The areas of moderate visual impact would be those where clearing is required and alteration of the landscape is perceivable. Where no clearing is required, the transmission lines are generally adjacent to existing transmission line easements and would result in a low visual impact. No component of the proposal is deemed to have high visual impact, primarily because the visibility of the transmission lines and substation is extremely limited by the existing vegetation and landform patterns.

RECOMMENDATIONS

A number of measures additional to those incorporated in the design of the proposal are recommended to be instituted to minimise the environmental impact of the proposal. These include the control of soil erosion during construction and operational phases; minimisation of tree clearing; continuing community consultation; and the revegetation of temporary access tracks.

1

INTRODUCTION

1
INTRODUCTION

1.1 BACKGROUND

This Environmental Impact Statement (EIS) addresses electricity supply improvements proposed for the Upper Blue Mountains, an area between Lawson and Blackheath, by Prospect Electricity (Figure 1.1). The proposal comprises a new 132/66kV transmission substation at North Katoomba, one 132kV transmission line supplying the substation and two 66kV transmission lines connecting the substation to existing 66kV transmission lines. Associated with the proposed substation and transmission lines is the establishment of an Energy Conservation/Demand Side Management (EC/DSM) Programme designed to minimise the need for future infrastructure construction in the Upper Blue Mountains.

The Upper Blue Mountains is an area of rugged topography and a cool temperate climate. The pattern of urban settlement forms a series of linear towns and villages attached by one major through road, the Great Western Highway, and the Main Western Railway. The expansion of these towns and villages is confined by the steep escarpments and rugged terrain which occur both to the north and south of this narrow undulating ridge.

The combination of the rugged topography and the cool temperate climate has a direct influence on the supply of electricity to the area. Steep terrain, much of which is National Park, creates numerous difficulties for the reliable supply of electricity to the area. The cold winter conditions in turn emphasises the need for reliable electricity especially for those who rely on electricity for household heating.

Prospect Electricity assumed responsibility for the supply of electricity to the Blue Mountains area in 1980 from the Blue Mountains City Council (BMCC). Prospect Electricity initially purchased the bulk supply from Pacific Power (the Electricity Commission of NSW) at 132,000 volts (132kV) and 66,000 volts (66kV).

Pacific Power identified the need for the improvements to the Upper Blue Mountains electricity supply in 1986. In 1989 Pacific Power prepared a draft Development Application (DA) to be submitted to BMCC. The DA proposed the use of a site on Mini-ha-ha Road at North Katoomba for the development of a new transmission substation.

The Minni-Ha-Ha Road site was not supported by either BMCC or the National Parks and Wildlife Service (NPWS) because of significant environmental impacts. BMCC and NPWS indicated a preference for another site (identified as an alternative in the DA) at a disused quarry to the south of the site initially proposed. Pacific Power subsequently resubmitted the DA proposing the *Quarry Site*.

In 1990, the 132kV transmission lines in the Blue Mountains were transferred from Pacific Power's responsibility to Prospect Electricity. With the transfer of the 132kV assets, Prospect Electricity became the authority now responsible for Upper Blue Mountains electricity supply improvements.

After community opposition to the Quarry Site, Prospect Electricity withdrew the DA and decided to reassess the available alternatives. EDAW (Aust) Pty Ltd were subsequently engaged by Prospect Electricity as consultants to manage the project and prepare the necessary documentation to assess the proposal, particularly in terms of the available alternatives. The programme of tasks to complete this project included comprehensive community participation

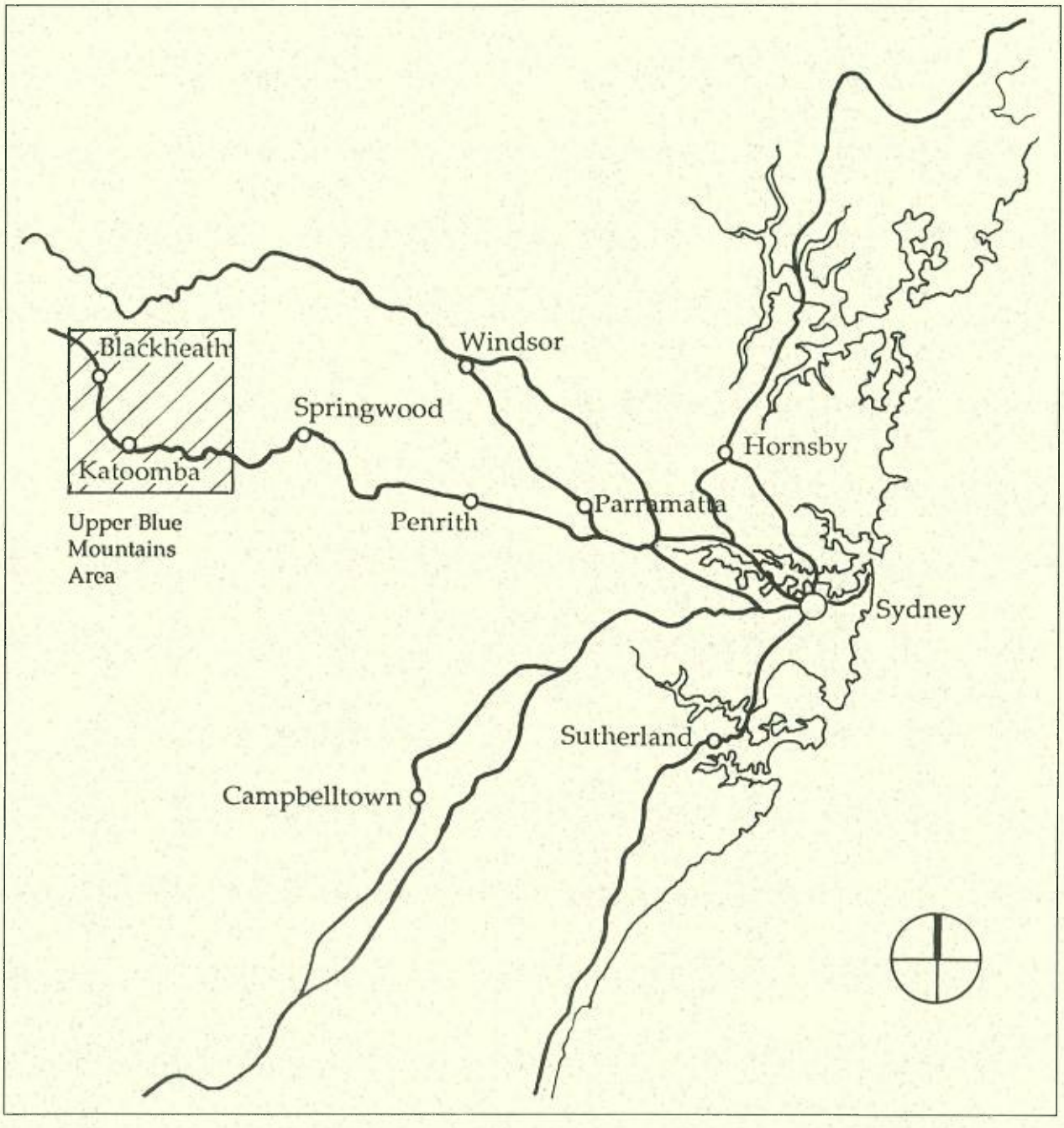

Figure 1.1
LOCATION

in the identification of issues, objectives, options and preferred solutions.

The community participation component, which formed the central focus of the project's activities, substantially influenced the process and products of the overall project. To illustrate the extent of the community's contribution, both the preferred site for the substation and the need for an Energy Conservation and Demand Side Management Program were identified by the community based Project Consultative Committee (PCC) formed at the outset of the project.

The Committee was instrumental in the organisation and running of a series of public workshops which addressed key issues of concern. In response to the desire for a detailed profile of the Upper Blue Mountains community, Prospect engaged the University of Western Sydney - Hawkesbury (UWS-H) to undertake a survey of community values relating to conservation and electricity.

This EIS documents the process and the products of the extensive programme undertaken to develop a strategy for the Electricity Supply Improvements for the Upper Blue Mountains. The EIS will provide the basis for members of the community, interest groups and government authorities to consider the proposals presented and make comment on any aspect of interest or concern.

1.2 STUDY AREA

The study area for this EIS was determined on the basis of the location of the physical components of the proposal and the likely geographical extent of the interactions between the proposal and the environment. Because the extent of these interactions differs between the various aspects of the biophysical and cultural environments, precise study area boundaries are not defined. Primary and secondary study areas are identified on the basis of the likely magnitude and geographical extent of impacts.

The primary study area represents the focus of the likely interactions of greatest magnitude. This is approximately defined by the substation site and the associated transmission lines (Figure 1.2).

The nearest towns of Medlow Bath, Blackheath and Katoomba are located within the secondary study area, as they would not be subject to the major interactions between the proposal and the environment. The extent of the secondary study area is defined by the area likely to be supplied electricity by the proposed Katoomba North substation. This is the Upper Blue Mountains as described in Section 1.1 and shown in Figure 1.1. Within the secondary study area, some of the more minor and indirect interactions between the proposal and the environment would occur.

1.3 STATUTORY REQUIREMENTS

Environmental Assessment in New South Wales is undertaken in accordance with the Environmental Planning and Assessment Act 1979 (EPAA). Activities which require Development Consent from Council are assessed under Part IV of the EPAA, while activities determined by public authorities which do not require Development Consent are assessed under Part V.

Under Part IV of the EPAA, activities which fall into the category of *Designated Development* as defined within Schedule 3 of the Act, require an EIS to accompany the Development Application. Part V of the act on the other hand, does not

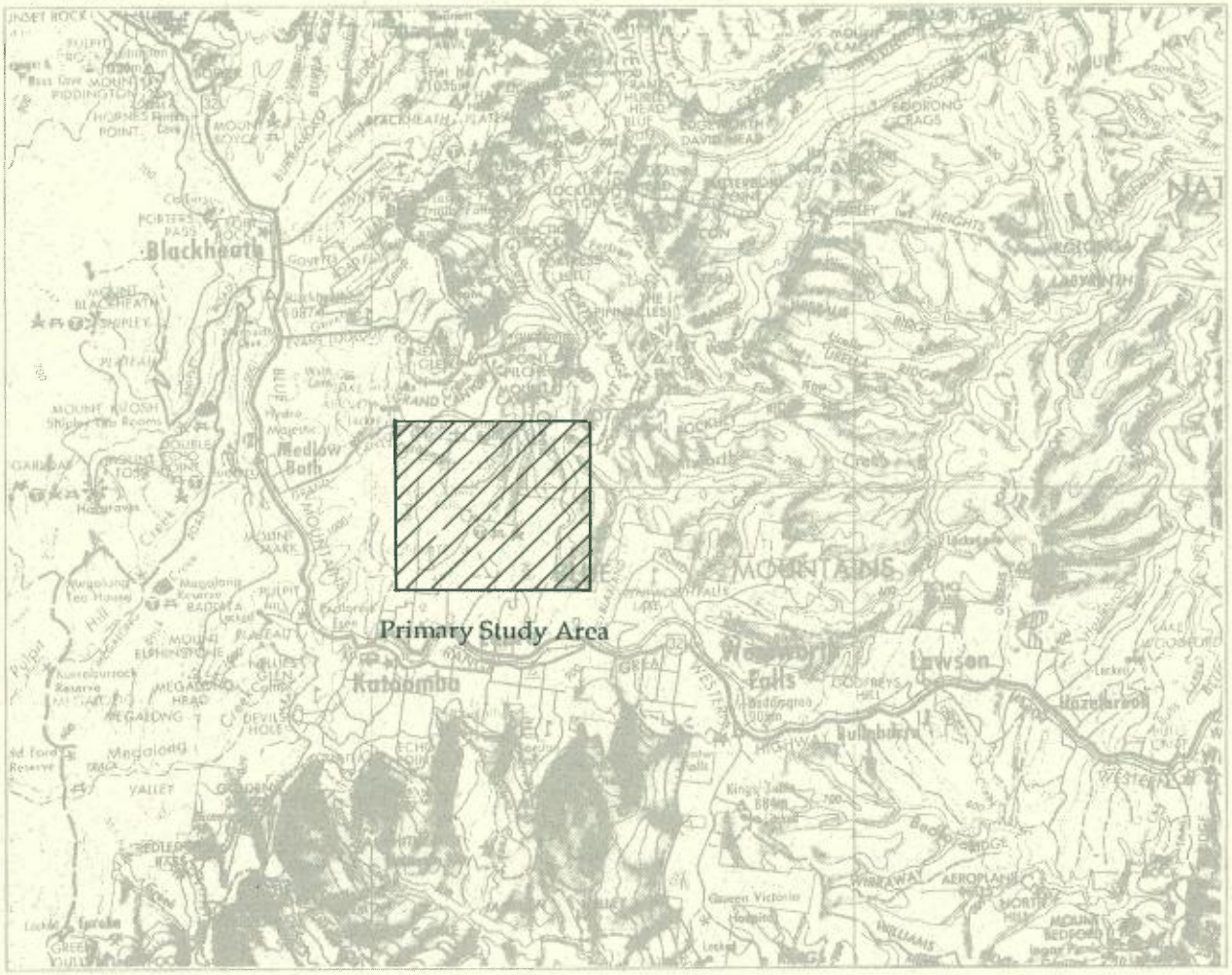

Figure 1.2
PRIMARY STUDY AREA LOCATION

specifically define the types of development which require an EIS, rather the determining authority decides upon the necessity for an EIS on the basis of the likely significance of the Environmental Impacts.

Both Parts IV and V of the EPAA apply to this proposal. The *substation* requires a Development Application under the Blue Mountains City Council Local Environmental Plan. As electrical substations are not classified as Designated Development, the substation does not require an EIS under Part IV of the Act. The associated *transmission lines* however, do not require Development Consent and are assessed under Part V of the EPAA. Because two of the proposed transmission lines traverse a portion of Blue Mountains National Park, the NPWS is an additional determining authority to Prospect Electricity.

Prospect Electricity has determined that the likely impacts of the transmission lines are significant and have therefore decided that an EIS will be necessary. It has also been determined that it is practical to assess the proposal as a whole, rather than the transmission lines in isolation. The EIS therefore incorporates an assessment of the substation and will accompany the necessary Development Application. Figure 1.3 shows the environmental assessment process being undertaken for this proposal.

The requirements of the Director of the Department of Planning are required to be taken into account in the preparation of an EIS. The Director's requirements are included as Appendix A. The Director's requirements also included a list of additional public authorities who should be consulted for comment on the scope and content of the EIS. The comments of these and a number of additional authorities consulted are included as Appendix B.

An agreement has been reached between the two transmission line determining authorities and the Minister for Planning for Prospect Electricity to be the *Nominated Determining Authority*. This means that Prospect Electricity is responsible for the administrative procedures associated with the EIS preparation and exhibition, while the NPWS retains an equal responsibility for approval of the proposal.

Once the EIS is completed, it is required to be placed on public exhibition for thirty days, during which the public is invited to make written submissions on the proposal. At the end of the exhibition period, a *Clause 64 Report* is prepared which outlines the determination of the proposal, taking into account the environmental impacts and public comments. The determination of the transmission line component of the proposal will be undertaken jointly by Prospect Electricity and the NPWS.

The EIS exhibition will also comprise the substation DA exhibition. BMCC will make a determination on the substation component of the proposal after considering public submissions to the DA.

The proposal must also take into account the requirements of the National Parks and Wildlife Act 1974. This requires an *Activity Application* (additional to the consent requirements under the EPAA) to be submitted to the NPWS for the parts of the transmission lines traversing Blue Mountains National Park. The EIS will also comprise the supporting documentation for this aspect of the approvals process.

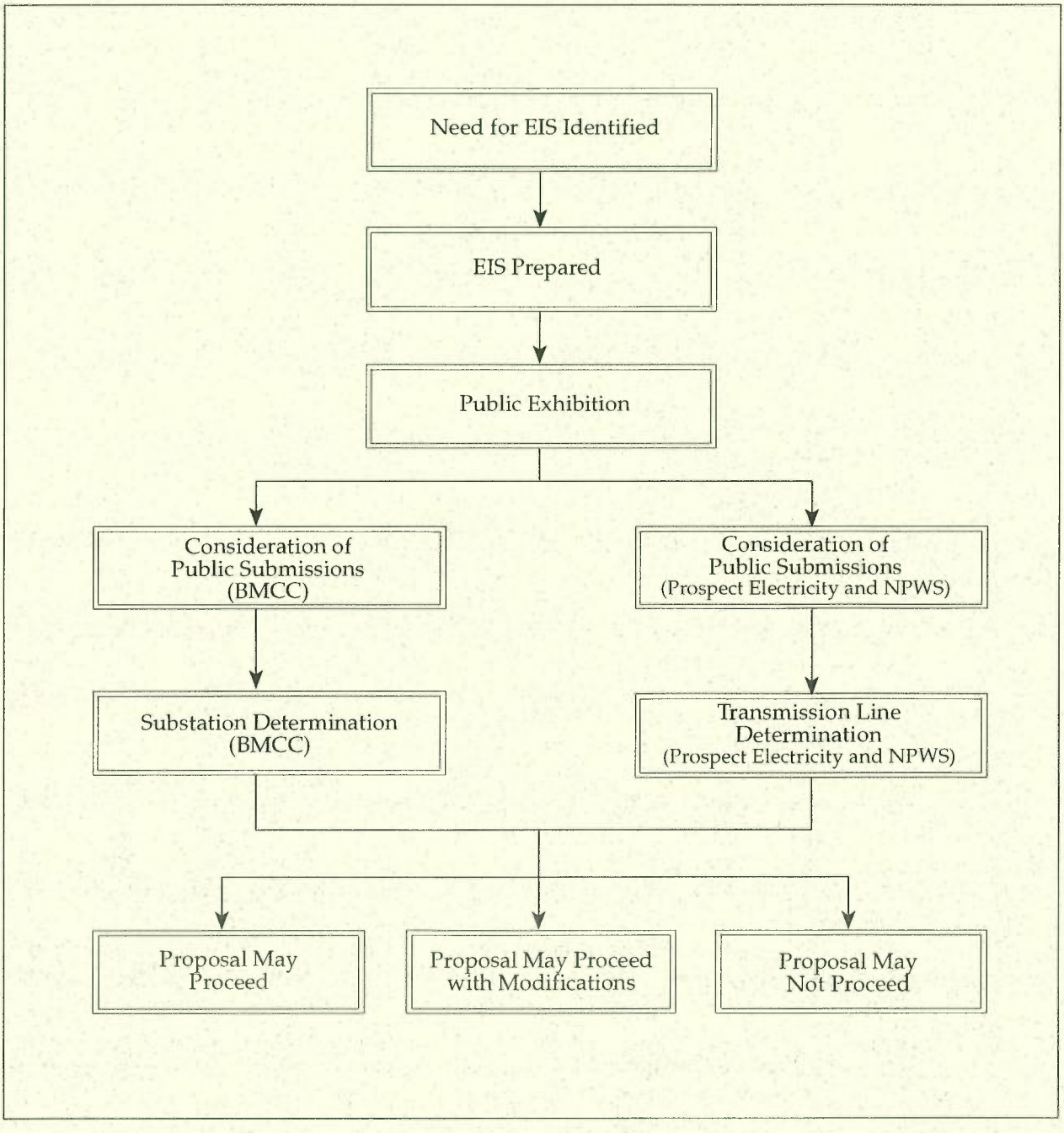

Figure 1.3
ENVIRONMENTAL ASSESSMENT PROCESS FOR THIS PROPOSAL

1.4 STUDY OBJECTIVES

The objectives of the EIS are as follows:

- to outline the background to the development of the Upper Blue Mountains Electricity Supply Strategy
- to describe the development of the community's participation in the preparation of the overall strategy
- to describe the links between the EIS, the Energy Conservation/Demand Side Management Programme and the UWS-H Community Values Survey
- to describe the need for the proposed activities
- to describe the substation site and transmission line route selection process and the assessment of the feasible alternatives
- to describe in detail, the proposed activities associated with the construction and operation of the proposed substation and transmission lines
- to describe the physical and cultural aspects of the study area, taking into account changes which might occur in the future
- to evaluate the interactions between the existing environment and the proposed activities in order to assess the nature and magnitude of the environmental impacts
- to identify the range of measures and techniques to be implemented to mitigate the identified environmental impacts
- to encourage public review and comment on the full proposal and the site and route selection process
- to describe the approvals process which involves three determining authorities
- to facilitate the approvals process with a comprehensive body of material which enables Prospect Electricity and NPWS to make an informed determination on the transmission lines and Blue Mountains City Council to make an informed determination on the substation.

2

COMMUNITY PARTICIPATION

2
COMMUNITY PARTICIPATION

2.1 BACKGROUND

The proposal to improve the electricity supply to the Upper Blue Mountains has developed against a backdrop of growing community concern about the appropriateness of constructing more lines and other electrical infrastructure both through urban areas and across scenic areas of bushland and National Park. The effect of this concern is manifest in the final form of the proposal for the electricity supply strategy for the Upper Blue Mountains.

The participation of the community in the formulation of this proposal has broadened the scope from an infrastructure planning project to a total energy management strategy for the area. The community's input into the siting of the substation also broadened the range of alternatives considered and ultimately resulted in the selection of a site which both satisfied the electrical engineering requirements and produced some additional benefits to the whole community.

2.2 DEVELOPMENT OF COMMUNITY PARTICIPATION

Prospect Electricity's activities in the Blue Mountains have been under close scrutiny in recent years following the presentation of proposals to construct new infrastructure and alter the operation of some facilities in the area. The construction of a new zone substation in Hazelbrook, the closure of the Springwood sub-depot and the proposed transmission lines in the Springwood to Winmalee area have all contributed to the increased community awareness of the range of environmental and social effects which result from these activities.

Despite the sound planning and engineering reasons for these decisions, the fact that Prospect Electricity had fulfilled their legal and technical obligations and in some cases received recognition for these projects (the Hazelbrook zone substation received recognition from the Royal Australian Institute of Architects), Prospect Electricity considered it necessary to undertake a more proactive and flexible approach to community consultations in the Blue Mountains.

The project to improve the Upper Blue Mountains electricity supply was initiated in the mid 1980s by the then Electricity Commission of NSW. The ELCOM team negotiated with the relevant authorities, mainly Prospect Electricity, NPWS and BMCC, to identify a suitable site for a new Katoomba North substation and the associated transmission lines. These discussions led to the identification of the *Quarry Site* for the substation by the NPWS.

At the time that BMCC was assessing the DA for the Quarry site, the responsibility for the project transferred to Prospect Electricity. To this point in time, little to no community participation in the project had occurred.

After some community opposition to the Quarry Site, Prospect Electricity withdrew the DA. In September 1991, a programme of community participation was initiated by Prospect Electricity as part of the investigation of additional alternative sites for the proposed substation. The community participation was to involve a briefing of the local politicians, a public meeting to establish community awareness of the proposal, and to form a Project Consultative Committee (PCC) comprising representatives of the community, to assist in the planning of the proposal.

The programme subsequently expanded in response to the community's desire for wider terms of reference for the PCC. The programme eventually involved two public meetings, a public exhibition in three locations, numerous advertisements, press releases and brochure drops, three public workshops addressing specific issues and 16 PCC meetings, including an all day site visit of the construction options. Appendix C details the full number of meetings, exhibitions, workshops and brochure drops undertaken throughout the whole programme and the participants who attended the PCC meetings.

2.3 PUBLIC MEETINGS AND EXHIBITION

To announce the community participation programme, advertisements and a brochure were distributed, notifying the community of the forthcoming public meeting. Both the politicians briefing and the first public meeting, held in the BMCC building in September 1991, highlighted the degree of sensitivity in the community to issues pertaining to such projects in the Mountains. Following the failure of the public meeting to attract the anticipated numbers (15 people attended), a second public meeting was scheduled, to be preceded by a display of the proposal at three locations in the Mountains.

Additional material was prepared for the second public meeting and display to broaden the level of information. This material was displayed at the Lawson Community Centre, the lobby of the Katoomba K Mart and the Blackheath Area Neighbourhood Centre for a period of two weeks prior to the meeting. The meeting, in early November 1991, was attended by 35 people. From this meeting, a PCC was formed which met three weeks later.

2.4 PROJECT CONSULTATIVE COMMITTEE

The PCC was formed as an informal group of people representing a wide range of interest groups. Participation in the committee was open to anyone interested in the project. The numbers attending PCC meetings mostly ranged from 10 to 30 people.

The meetings were independently chaired in order to facilitate discussion and monitor progress of each meeting. Minutes were taken at each meeting and these were circulated to all participants.

The PCC included representatives of:

- Blue Mountains City Council (councillors and staff)
- Upper Blue Mountains residents
- Local environmental and business groups
- National Parks and Wildlife Service
- State Rail Authority
- Prospect Electricity
- EDAW and other consultants to Prospect Electricity.

The initial PCC meetings discussed a range of issues, including the need for the project, representation of the community on the PCC and alternatives to the proposal (eg energy conservation).

The PCC specifically identified a need for greater community awareness of electricity supply issues within the Upper Blue Mountains. In response to this, three community workshops were initiated by the PCC.

2.4.1 Public Workshops

The three public workshops held in February, March and May of 1992, were designed to increase the community's awareness of a range of key issues and to explore the full range of available options for the area's energy needs. Each workshop was widely publicised in the Upper Blue Mountains in order to attract interest from a broad cross-section of the community. The workshops were held on weekends in the Blue Mountains City Council Chambers and were well attended by residents from the Blue Mountains.

The first workshop focused on the four identified *construction options* and sought to explain the positive and negative aspects of each option. The options were presented with an assessment of the likely impacts and this was followed by discussion and questions from the floor.

The second workshop explored the *health and safety issues* relating to the supply of electricity. The focus of the workshop became the issue of Electric and Magnetic Fields (EMFs). This workshop attracted a large audience who watched two overseas videos on EMFs and participated in intense discussion with a panel of experts. The panel represented a range of organisations and professions including the Environment Protection Authority (EPA), the medical profession (epidemiological research), the Total Environment Centre and the Electricity Supply Association of Australia (ESAA).

The third workshop on *alternative energy and conservation* was the most popular of the three workshops. It commenced in the morning with a comprehensive display of alternative energy technologies and conservation measures for both the domestic and the commercial markets. This was followed by a seminar in the afternoon which examined and discussed the range of alternative energy options currently available, energy conservation and Demand Side Management (DSM) techniques and the results of recent research. The presenters at this seminar included representatives from the University of New South Wales, CSIRO, BP Solar, NSW Earth Exchange and a DSM expert from Florida Power and Light.

The three workshops were both informative and constructive in focusing attention on the central electricity supply issues and facilitated the process of refining the range of options which were most appropriate to resolve the needs of the Upper Blue Mountains. They were a stimulating forum for the exchange of ideas and information.

As well as the valuable exchange of information, the workshops enabled increased cooperation beyond those of the Upper Blue Mountains electricity supply, such as the contribution by Prospect Electricity to the University of New South Wales' research into the Vanadium Battery. This cooperation illustrates the willingness of Prospect Electricity to embrace new technologies traditionally outside the scope of their operations.

2.4.2 Survey of Community Values

Following the three successful workshops, the PCC sought to implement some of the outcomes of these meetings. The potential for energy conservation and Demand Side Management to influence the outcome of the project was apparent. However the effectiveness of these strategies relied heavily on the willingness of residents in the Upper Blue Mountains to embrace these concepts and implement them in their homes and places of work.

In order to determine the community's attitudes on this issue the PCC encouraged Prospect Electricity to conduct a survey of the residents, business operators and institutions in the Upper

Blue Mountains.

In July 1992, Prospect Electricity commissioned the University of Western Sydney - Hawkesbury (UWS-H) to conduct research in the Upper Blue Mountains to determine community opinion on the issues of the electricity supply and conservation. The research involved three main tasks:

- attendance at PCC meetings
- a community opinion survey of 506 randomly selected Upper Blue Mountains residents and business people
- selected media research and additional inquiries to selected business and environmental groups outside the Upper Blue Mountains.

The findings of this research are summarized below, while the full report has been released with the EIS as *Working Paper 1*.

Summary of Findings

Other than the Consultative Committee members, the Upper Blue Mountains community had virtually no knowledge or even awareness of the local electricity supply and conservation issues.

With a small number of serious exceptions, the community has little experience of interruptions to business or domestic electricity supply and, in the pleasing mountains environment, there are few if any daily reminders of the need for conservation. These factors bear on people's receptiveness to the issues.

The community supports conservation in principle and on a broader than local scale, but consumer's choice of energy and appliances is based on performance and convenience first, cost second, and conservation third.

There appears to be no single, dramatic Demand Side Management (DSM) or broader conservation opportunity, but worthwhile gains should be possible from a coordinated strategy that addresses all of the opportunities revealed by this research.

In the absence of any demonstrable supply or conservation problem at local level, any DSM/conservation strategy would need to be supported by a perceptive, credible, and sensitive social marketing program - to minimise any possibility of resistance. Hard sell *might best be avoided, in favour of an education based programme with appropriately intensive use of persuasion.*

The existing, successful community consultative process would provide a good foundation for such social marketing which should, ideally, be a co-operative program between Prospect Electricity, conservation interests, local government, the local media, and community members.

This approach is in keeping with community opinion, and it has been successful with other social issues. Notwithstanding any present indifference to the issues, the community would be receptive to a carefully packaged DSM and broader conservation strategy and message.

In a different vein: From its high standing in the community as revealed by the survey, Prospect Electricity would be well placed to make a valuable contribution to a strategy of total energy management *that is specific to the district. Local government regulation aimed at energy-efficient dwellings would also be well received.*

In September 1992, these findings were presented to the PCC and following discussions, a subcommittee was formed to develop an Energy Conservation/Demand Side Management Strategy (EC/DSM) for the Upper Blue Mountains.

2.4.3 The EC/DSM Subcommittee

Over the six months following its formation, the EC/DSM Subcommittee formulated a broad strategy for the implementation of both Energy Conservation and Demand Side Management measures in the Upper Blue Mountains.

The report prepared by the Subcommittee has been released with this EIS as *Working Paper 2* and the summary of its findings is presented in Section 5.6.

At a PCC meeting in July 1993, the EC/DSM Subcommittee presented its report to the group. The report received the strong approval of the PCC and at the following PCC meeting, a brief presentation from the newly appointed EC/DSM consultant to Prospect Electricity was given. This presentation initiated the next stage of the programme for the implementation of EC/DSM measures in the Upper Blue Mountains.

2.4.4 Selection of the Preferred Substation Site

Whilst the research was being conducted by UWS-H, the PCC focused its attention on the selection of the most appropriate site for a substation to replace the Lawson transmission substation. It was accepted that the Lawson transmission substation would need to be replaced, due to the antiquated condition of its components, and its remoteness from the major load centre, Katoomba.

The benefits of lower environmental impacts, both locally and regionally, narrowed the selection to the North Katoomba area. Detailed discussion of the selection of a preferred site from the range of alternatives is presented in Section 4, *Alternatives for Addressing the Electricity Supply Needs*.

The preferred site for the substation was selected following a number of meetings, one of which included a full day site visit of each of the alternative sites. The site which was ultimately selected as the preferred site, adjacent to the southern boundary of Katoomba Airfield, was identified by local community members of the PCC.

The PCC considered that this site had a number of advantages including a remoteness from urban and popular scenic/bushwalking areas, whilst being close to the existing lines into which the substation would be connected. The benefit of shorter lines from the substation to these existing lines also resulted in lesser impacts on the adjacent Blue Mountains National Park. The choice of this site which requires the purchase of some undeveloped private property, created the added benefit of enabling the balance of this land, not required for the substation and lines, to be transferred to public ownership for inclusion in Blue Mountains National Park or the BMCC's Minnihaha Reserve.

It was agreed that the proposed substation form a part of an overall strategy which would include an EC/DSM Program to be implemented in the Upper Blue Mountains to minimise the need for further construction of electrical infrastructure in the area.

Upon the identification of the substation site adjacent to Katoomba Airfield, the local community at Medlow Bath were contacted directly by letter, advising them of the proposal. Comments received from residents were followed up with letters and a meeting in June 1993, with members of the Medlow Bath Residents Association in Medlow Bath.

The issues raised during these discussions were addressed at subsequent PCC meetings which were attended by representatives of the Medlow Bath community. These issues included arrangements for the use of Grand Canyon Road and the potential for future expansion of the substation and the associated lines.

The final meeting of the PCC on August 6 1993 agreed that the integrated strategy of a single transformer substation at the Airfield site, and an Energy Conservation / Demand Side Management Programme be addressed in the EIS as the preferred alternative for achieving the necessary electricity supply improvements for the Upper Blue Mountains.

3

THE NEED FOR ELECTRICITY SUPPLY IMPROVEMENTS

3
THE NEED FOR ELECTRICITY SUPPLY IMPROVEMENTS

3.1 THE ELECTRICITY SUPPLY SYSTEM

3.1.1 General

Electric power is produced by generating plants and supplied to homes, businesses and factories by a system of transmission lines and distribution lines, with the voltages of the lines being progressively stepped down by a series of substations.

Substations range from major transmission substations which receive very high voltage transmission lines directly from generating plants (330-500kV) and reduce voltages to 132 or 66kV, through to small pole mounted substations which make the final voltage step down to 415 or 240V before connections are made with homes and commercial facilities.

Transmission lines carry electricity at high voltages over long distances.

Distribution lines are the lowest voltage lines and carry electricity directly to consumers from substations.

The major parts of the supply system require an alternative or backup supply in case of failure of the normal system. A backup supply also enables maintenance to be carried out without major blackouts and ensures a reliable supply of electricity at all times. This normally takes the form of a second transmission line supplying a substation.

In New South Wales the authority responsible for generating electricity is Pacific Power (the Electricity Commission of New South Wales). Pacific Power transmits electricity to various major substations, or bulk supply points throughout the state, from where electricity distribution authorities purchase the electricity and carry it to their own distribution network. Prospect Electricity is the electricity distribution authority for fourteen local government areas between Parramatta in western Sydney and Lithgow on the western side of the Blue Mountains. The electricity supply system is illustrated in Figure 3.1.

3.1.2 The Upper Blue Mountains System

Prospect Electricity's Lawson transmission substation supplies electricity to smaller zone substations at Hazelbrook, Lawson, Wentworth Falls, Katoomba, and Blackheath. From these zone substations, electricity is distributed to consumers in the Upper Blue Mountains (Figure 3.2).

Lawson transmission substation is supplied by two 132kV transmission lines running from Pacific Power's Bulk Supply Points at Sydney West (Eastern Creek) and at Wallerawang near Lithgow.

The State Rail Authority (SRA) operates a transmission system in the Upper Blue Mountains to power its electric train service between Sydney and Lithgow. The SRA also draws power from the Lawson transmission substation, but has separate 66kV transmission lines carrying electricity to its own substations at various points on the railway line. A switch between the Prospect Electricity and SRA system north of Blackheath enables limited backup to be provided by one authority to the other, depending on need at a given time.

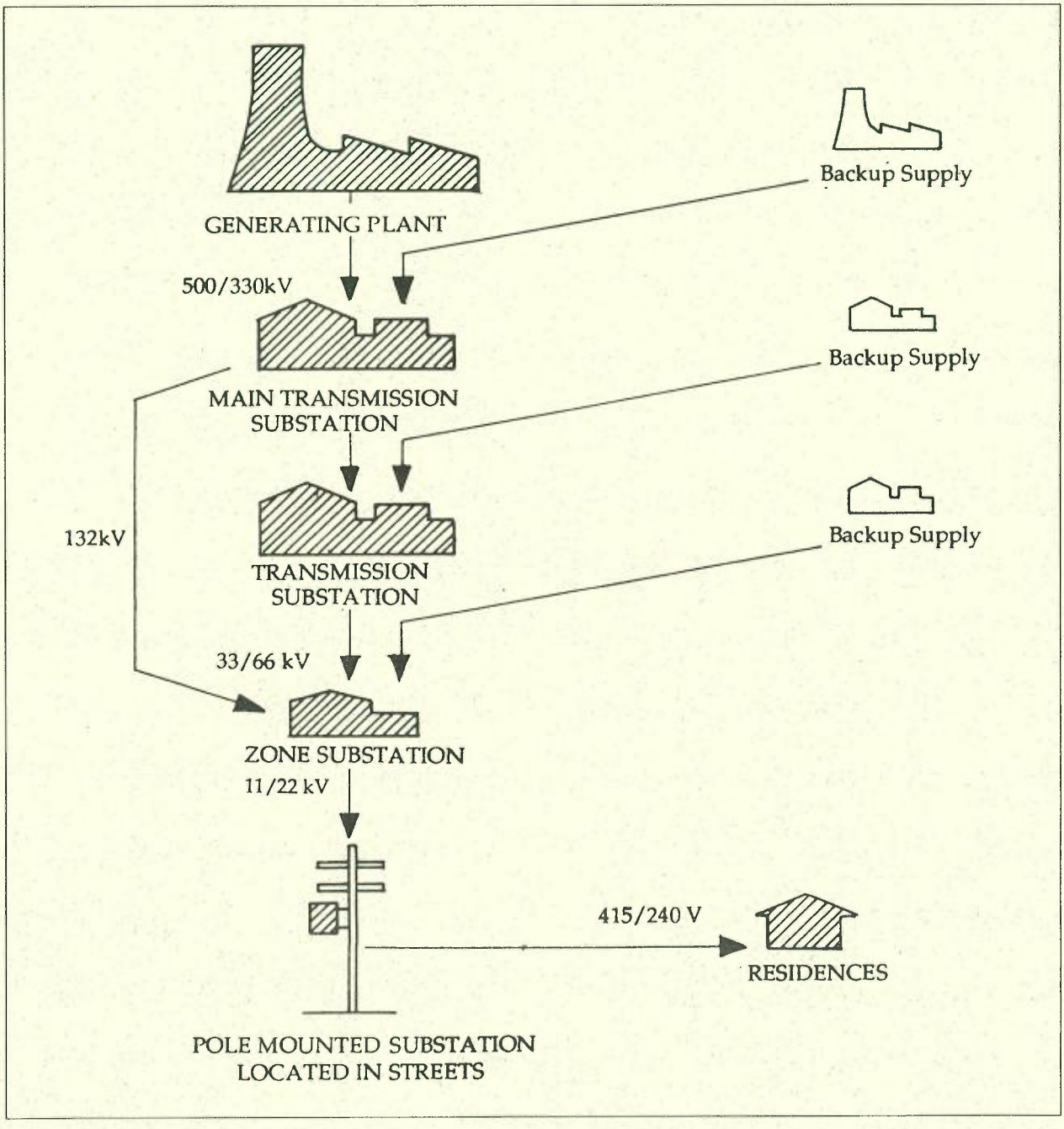

Figure 3.1
ELECTRICITY SUPPLY SYSTEM

Figure 3.2
UPPER BLUE MOUNTAINS SYSTEM

3.2 DEMAND FOR ELECTRICITY IN THE UPPER BLUE MOUNTAINS

3.2.1 General

The demand for electricity depends on the size of the various sectors (residential, commercial, industrial and public) within a community and the way in which these sectors use electricity. Electricity usage in the Upper Blue Mountains is dominated by the residential and commercial sectors, with a corresponding low number of industrial consumers.

Residential electricity use comprises 76.4% of total electricity use in the Upper Blue Mountains. Of the remaining 23.6%, the great majority is commercial use.

Assessment of future electricity demand in the Upper Blue Mountains can logically be based on the future needs of Upper Blue Mountains residents (in terms of nature of use and population growth) and the commercial sector of the area. Commercial needs in turn will largely be linked to tourism, which is the major economic activity in the Upper Blue Mountains.

Prospect Electricity's largest individual customers in the area include the major resorts. The opening of further large resorts would be expected to have a significant effect on the Upper Blue Mountains electricity load.

3.2.2 Population Growth

The Upper Blue Mountains is experiencing steady population growth. Although the land available for new housing development is limited by the local topography and the presence of Blue Mountains National Park, some developable land remains and urban consolidation through dual occupancy development is expected to occur in the area. Population growth, while difficult to precisely quantify, is therefore anticipated to remain steady beyond the turn of the century. Table 3.1 shows population growth in the various towns of the Upper Blue Mountains over the ten years to 1991.

3.2.3 Tourism Growth

Tourism is a major economic activity in the upper Blue Mountains, contributing directly and indirectly to the demand for electricity. The Blue Mountains (within which the Upper Blue Mountains contains the majority of tourist attractions) was rated eighth in a 1991 survey of top Australian destinations for both domestic and international tourists.

International tourists in 1991 numbered 340,000, compared with 313,600 in 1989 (Blue Mountains Tourism Authority 1992). Increases in international tourism to the Upper Blue Mountains could be expected to be largely a function of the increase in the number of overseas tourists entering Australia. However the relative position of the Blue Mountains as a tourist destination appears to be improving.

Domestic tourism contributes considerably more to the local economy than international tourism. Day visitors are estimated at 3,000,000 per annum (Blue Mountains Tourism Authority 1992), while Table 3.2 shows the number of visits (one or more nights) and visitor nights within the Blue Mountains Local Government Area. Table 3.2 also provides an estimate of expenditure by both day visitors and overnight domestic tourist.

While Table 3.2 shows considerable fluctuation in domestic tourism from year to year, a general upward trend can be observed over the last three

Table 3.1

POPULATION GROWTH IN THE UPPER BLUE MOUNTAINS (1981-1991)

TOWN	1981	1986	1991	% Growth
Hazelbrook	2,660	3,570	4,126	55
Lawson	1,840	2,080	2,209	20
Bullaburra	700	870	949	35
Wentworth Falls	3,540	4,450	4,974	40
Leura	3,080	3,370	3,836	25
Katoomba	7,320	7,810	8,091	11
Medlow Bath	270	340	365	35
Blackheath	3,030	3,600	3,758	24
TOTAL	**22,440**	**26,090**	**28,308**	**26**

Table 3.2

DOMESTIC TOURISM IN THE BLUE MOUNTAINS (1987/88 - 1991/92)

	1987/88	1988/89	1989/90	1990/91	1991/92
VISITS	636	551	362	380	551
VISITOR NIGHTS ('000)	1,904	2,000	1,102	1,190	1,592
TOURIST EXPENDITURE ($M)	111	126	71	84	116

years. The state of the national economy appears to be an important influence in both tourism numbers and in the ratio of visits to visitor nights.

3.2.4 Electricity Demand Growth

Prospect Electricity utilises a computer model to predict future demand for electricity in a given area. The calculations are based on past trends in the growth of electricity demand as well as the likely future growth of the major sectors of electricity consumers such as those discussed above.

Demand for electricity in the Upper Blue Mountains as calculated by this model would increase by approximately 25% by 2002 (Prospect Electricity 1992). It should be noted however, that these calculations assume that the way in which electricity is used will remain the same. An Energy Conservation/Demand Side Management programme aimed at reducing and modifying patterns of demand for electricity by both domestic and commercial consumers in the Upper Blue Mountains is described in Section 5. The forecast demand increase is shown in Figure 3.3.

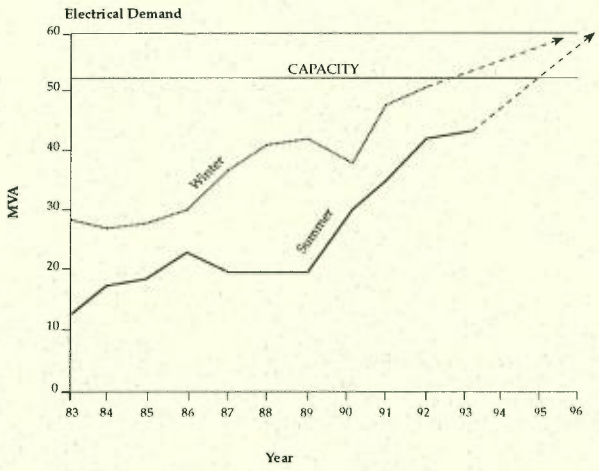

Figure 3.3
LAWSON TRANSMISSION SUBSTATION LOAD GROWTH

3.3 INADEQUACIES IN THE EXISTING ELECTRICITY SUPPLY SYSTEM

Ageing equipment and growth in the demand for electricity have highlighted the inability of the Lawson transmission substation to deliver a reliable supply of electricity to the Upper Blue Mountains. The 66kV transmission line from Lawson transmission substation supplying the zone substations to the north is also of limited capacity and contributes to the unreliability of the electricity supply in the area.

The Lawson transmission substation was established in 1953 with largely second hand equipment. The original equipment, some of which dates back to the 1920s, is still in use. The reliability of this equipment is decreasing with time and when breakdowns do occur, spare parts are often difficult to obtain. This is illustrated by a transformer fault in May 1992 which required a Prospect Electricity employee to drive to Yass to secure the necessary replacement part from a disused transformer. The electricity supply to much of the Upper Blue Mountains was left without any backup for several hours due to this fault.

In addition to the problem of equipment age at the Lawson transmission substation, is the design capacity of the equipment. The capacity of each of the two transformers at Lawson is 52MV.A (Megavolt Amperes). The substation generally operates using one transformer with the other on standby. If a transformer failure occurs, the system automatically changes to the standby transformer. The current Lawson load is close to 52MV.A and is forecast to exceed this figure in

the near future. This means that if the entire load is placed on one transformer due to the other one being out of service, the Upper Blue Mountains may lose its electricity supply.

A successful EC/DSM Programme may see the peak load being kept below the substation capacity in the short term, however it is anticipated that the Lawson load will exceed capacity within the next two to three years with or without an EC/DSM programme. It should be noted that the proposed EC/DSM programme is primarily aimed at minimising the need for infrastructure additional to what is proposed here (see Section 5 - *Description of Proposed Activities*).

The Wentworth Falls, Katoomba and Blackheath zone substations are supplied from the Lawson transmission substation by a single 66kV transmission line. This line is ageing and of limited capacity.

When the 66kV transmission line is out of service, the backup supply from the SRA is used. The capacity of the backup supply is however, only able to, at best, meet the equivalent of the Blackheath zone substation peak load. If a fault on the original 66kV line occurs at a point where more than one of the zone substations lose supply, the SRA backup is unlikely to be sufficient and sections of the Upper Blue Mountains will lose supply until the Prospect Electricity transmission line is back in service. This situation does not meet the normal operating standards of Prospect Electricity, which require a reliable backup supply to be in place for all major parts of the electricity supply system.

In times of high load on the SRA transmission system in the Upper Blue Mountains, no backup supply at all may be available to Prospect Electricity. If Prospect Electricity's system fails, the SRA must make a decision as to whether providing backup to Prospect Electricity will endanger the operation of its own system and there are often situations where it is unable to allow the backup system to operate.

Similarly the backup available to the SRA from the Prospect Electricity 66kV transmission line is limited. As the Prospect Electricity system is consistently running close to capacity, the SRA transmission line can only be effectively backed up in times of low load.

The Lawson transmission substation is located in the south eastern corner of the Upper Blue Mountains Supply Area. This is not an optimum location from an operational point of view as the electricity has to be carried over relatively long distances to the zone substations. Because transmission line conductors are not 100% efficient, some electrical energy is lost as heat, reducing the voltage of the current. This occurrence increases with transmission line length and means that system components are required to work harder to maintain adequate voltage levels.

A more suitable location would be closer to the centre of the area being supplied electricity (the load centre). A substation located close to the load centre minimises the distance which electricity has to be carried to the zone substations. This in turn minimises the drops in voltages which increase with longer transmission line lengths.

The electricity system in the Upper Blue Mountains has suffered serious inadequacies for several years. These inadequacies can reasonably be expected to become more severe with time unless remedial action is taken. The problems associated with the lack of capacity of the existing system will be magnified as the anticipated

increases in electricity demand are realised. The relative ability of the SRA transmission line to provide a backup facility will decrease, as will the likelihood of the Lawson transmission substation being able to operate with one transformer being inoperable. In addition, the equipment at Lawson will become more prone to breakdown as age increases. The above factors also apply to the 66kV transmission line from Lawson transmission substation.

The basic needs for the electricity supply system in the Upper Blue Mountains are:

- A transmission system which can meet both the existing and projected levels of demand in the upper Blue Mountains.
- A substation with modern and reliable equipment, preferably located close to the Upper Blue Mountains Load Centre.
- A reliable backup supply to all of the zone substations in the area.
- A reliable backup supply to the SRA.

4

ALTERNATIVES FOR ADDRESSING THE ELECTRICITY SUPPLY NEEDS

4
ALTERNATIVES FOR ADDRESSING THE ELECTRICITY SUPPLY NEEDS

4.1 BACKGROUND

Throughout the development of this project, a broad range of alternatives have been considered. These alternatives have ranged from rebuilding the existing infrastructure at Lawson to offsetting the need for new infrastructure through Energy Conservation and Demand Side Management.

The alternatives which were evaluated, are discussed in the following section and include :

1. *An Improved Transmission Substation at Lawson*

   a) Rebuild on the Existing Site
   b) Build on a New Site in Lawson

2. *A New Blackheath Transmission Substation*

3. *A New Katoomba North Transmission Substation*

   a) Mount Hay Road Site
   b) Minni-Ha-Ha Road Site
   c) Quarry Site
   d) Airfield Site

4. *Increased Energy Efficiency Through Energy Conservation and Demand Side Management*

5. *Do Nothing*

The locations of Alternatives 1, 2 and 3 are illustrated in Figure 4.1. The locations of Alternatives 3 a, b, c and d are illustrated in Figure 4.2.

4.2 AN IMPROVED TRANSMISSION SUBSTATION AT LAWSON

The Lawson 132/66kV transmission substation which was commissioned in 1954 has a non-standard multi-level layout and contains some components which date back to 1926. A transmission substation located at Lawson which meets the immediate and future needs of the Upper Blue Mountains, would require the replacement of the existing 52MV.A transformers with two 120MV.A transformers. In addition, Prospect Electricity would need to construct a new 66kV backup transmission line to Katoomba or Blackheath. It would also be necessary to reconstruct the existing 66kV transmission line as the existing conductors are not large enough to accommodate future peak loads.

4.2.1 Substation Alternatives

Prospect Electricity have undertaken a detailed investigation of upgrading the Lawson transmission substation and have identified two options:

1. *Augment/Refurbish the Existing Lawson Transmission Substation*

The substation could be augmented by replacing both of the transformers and associated equipment only, at a cost of approximately $4.1 million.

2. *Build a New Lawson Transmission Substation*

Prospect Electricity owns vacant land immediately to the north of the existing substation site. A new transmission substation could be constructed on this site at a cost of approximately $6.2 million.

4

ALTERNATIVES FOR ADDRESSING THE ELECTRICITY SUPPLY NEEDS

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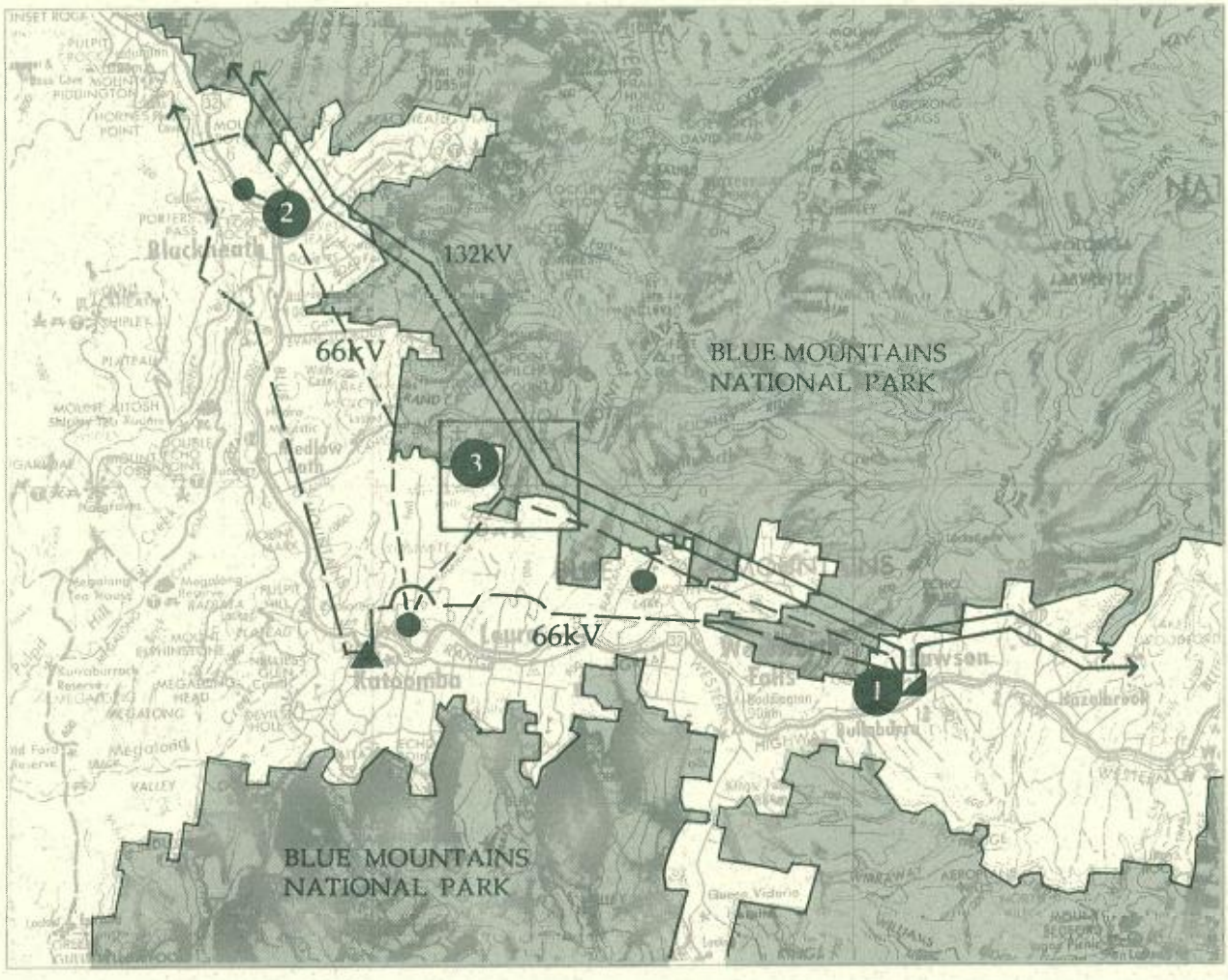


1 Lawson

2 Blackheath

3 Katoomba North (see Figure 4.2)

Figure 4.1
ALTERNATIVE SUBSTATION SITES

4.2.2 Transmission Line Alternatives

The options available for the associated transmission line work would be the same for each option. Two possible schemes have been identified:

1. *New Back Up Line*

Build a new 66kV transmission line for SRA purposes along the railway line from Lawson transmission substation to the SRA substation at Katoomba. The existing SRA 66kV transmission line between Lawson and Katoomba would then become the property of Prospect Electricity. The cost of this proposal would be approximately $5.2 million.

2. *Rebuild Existing Lines*

Replace the conductors on both the existing Prospect Electricity and SRA transmission lines running to the respective Katoomba substations at a cost of approximately $2.75 million.

Evaluation

- Major disruptions to supply would occur during the construction of the substation on the existing site.
- Less disruptions to supply would occur during construction of the substation on the new site although this site is physically constrained due to its size, slope and existing structures.
- The reconstruction of the existing 66kV line or the construction of a new 66kV line (12.5km) would affect urban areas, bushland and National Park.
- The existing 132kV line would supply the substation and therefore no new 132kV lines would be required.
- Construction of the new 66kV line would still require the rebuilding of the existing two lines resulting in high capital cost and high local impacts.
- Rebuilding the existing 66kV line without the construction of the additional 66kV line, would require Prospect Electricity and the SRA to continue sharing the back up supply, resulting in reduced reliability.
- The substation is remote from the centre of demand (or load centre) at Katoomba, causing high levels of voltage drop with losses estimated at $265,000 p.a.
- High capital cost for the substation and lines ranging from $6.85m to $11.4, depending on which combination of alternatives were chosen.

4.3 A NEW BLACKHEATH TRANSMISSION SUBSTATION

The Blackheath alternative would involve the construction of a new transmission substation, initially with a single 60MV.A capacity transformer, on a site adjacent to the existing zone substation. Like Lawson, Blackheath is remote from the Upper Blue Mountains load centre at Katoomba and would also incur significant losses due to voltage drop along the length of transmission line required to supply the zone substations.

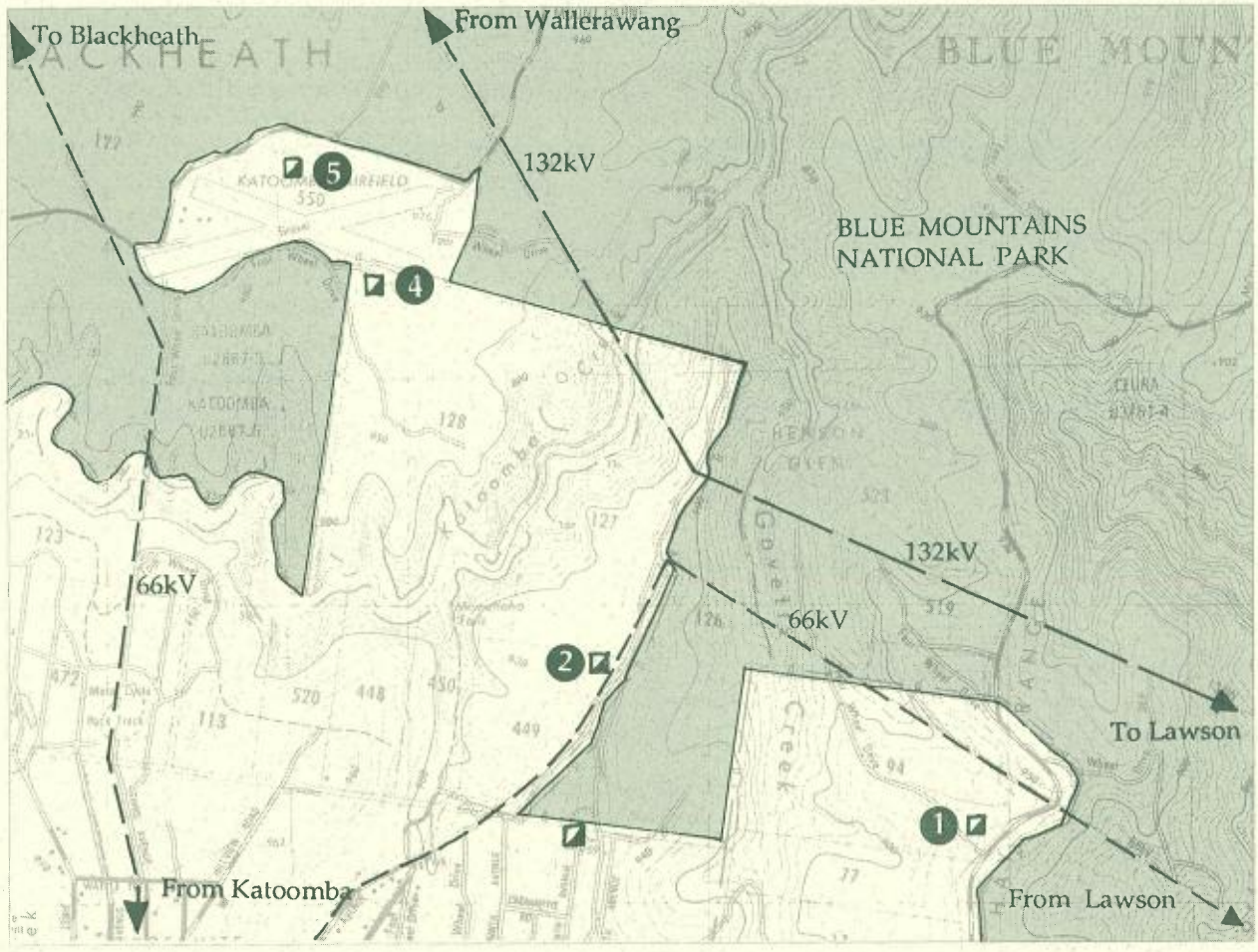


Figure 4.2
KATOOMBA NORTH SUBSTATION SITES

A new 132kV transmission line is required to feed the substation from the existing 132kV line to the north of the site. One additional 66kV transmission line would be required between Blackheath and Katoomba to backup the existing transmission line.

Evaluation

- The construction of a new 132kV line (1.25km) from the substation to the 132kV line is required through bushland.
- A new 66kV line (8.5km) is required affecting urban areas, bushland and National Park.
- The site is remote from the load centre with a resulting voltage drop producing estimated losses of $70,000 p.a.
- The substation site is located adjacent to the existing site containing electrical infrastructure.
- The site is visually exposed to existing urban areas.
- An estimated capital cost of $2.8m for both the substation and the additional lines would be required.

4.4 A NEW KATOOMBA NORTH TRANSMISSION SUBSTATION

North Katoomba was identified as a possible location for a transmission substation as it is close to the load centre of the Upper Blue Mountains electricity supply system. A North Katoomba substation would be constructed at the same capacity (one 60MV.A transformer) as a Blackheath substation.

Four locations in the North Katoomba area were identified as potential sites for a transmission substation:

- Mount Hay Road Site
- Minni-Ha-Ha Road Site
- Quarry Site
- Airfield Site

Each of the site options require a 132kV transmission line to supply electricity to the substation and two 66kV transmission lines to connect with the zone substation network. The options are discussed below.

4.4.1 Mount Hay Road Site

This site is located on privately owned land on the western side of Mount Hay Road. The site is currently vegetated and is adjacent to the Blue Mountains National Park.

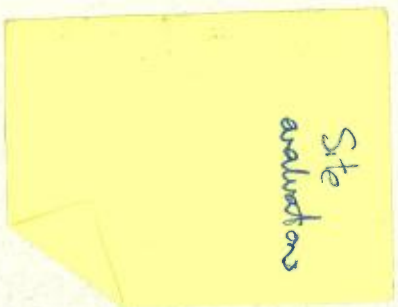
The 132kV transmission line into the substation would be from the north, running through Blue Mountains National Park and private property for approximately 850m.

A new 66kV transmission line would need to be constructed from the substation to the existing Katoomba to Blackheath 66kV transmission line. This would be approximately 3.85km in length, crossing a section of National Park and the Minnihaha Reserve.

A second 66kV transmission line would traverse 300m to the north to link with the Lawson to Katoomba 66kV transmission line.

Evaluation

- The construction of a new 132kV line (850m) from the substation to the existing 132kV line is required, affecting bushland and National Park.



- Two new 66kV lines (4.35km) is required affecting bushland (including Minnihaha Reserve) and urban fringe areas.
- The site requires the removal of bushland to enable the construction of the substation.
- The site is isolated from urban areas although it is located close to the centre of demand.
- Cost for the substation and lines is estimated to be $2.6m.

4.4.2 Minni-Ha-Ha Road Site

This substation site is located in privately owned bushland adjacent to Minni-Ha-Ha Road.

The 132kV transmission line connection to the substation would be from the north, approximately 750m in length and running in bushland west of Minni-Ha-Ha Road.

A 1.9km, 66kV transmission line would connect with the existing Katoomba to Blackheath 66kV transmission line. This would run initially down Minni-Ha-Ha Road and then in a westerly direction, crossing a section of the Minnihaha Reserve.

As the existing Lawson to Katoomba 66kV transmission line runs along Minni-Ha-Ha Road adjacent to this site, the connection to this line from the substation would require less than 50m of new 66kV line.

Evaluation

- The construction of a new 132kV line (750m) from the substation to the existing 132kV line is required affecting bushland.
- New 66kV lines (2.0km) are required affecting both bushland (including Minnihaha Reserve) and urban fringe areas.
- The site requires the removal of bushland to enable the construction of the substation.
- The site is isolated from urban areas although it is located close to the centre of demand.
- Cost for the substation and lines is estimated to be $2.7m.

4.4.3 Quarry Site

A disused quarry located on the perimeter of Blue Mountains National Park was investigated as a possible substation site on the request of the NPWS and BMCC.

The substation compound would be located on an area that has been previously cleared for the quarry activities.

Approximately 1.3km of new 132kV transmission line would be required. This would run from the north, largely along Minni-Ha-Ha Road and then cross approximately 300m of National Park.

A 1.5km, 66kV transmission line would connect with the existing Katoomba to Blackheath 66kV transmission line. This would run in a westerly direction, primarily through bushland along the northern perimeter of North Katoomba.

A short connection would be made with the existing Lawson to Katoomba 66kV transmission line to the north of the substation site. This would traverse approximately 300m of National Park.

Evaluation

- The construction of a new 132kV line (1.25km) from the substation to the existing 132kV line is required affecting bushland along Minni-Ha-Ha Road and a section of National Park.
- New 66kV lines (2.25km) are required affecting National Park, bushland (including Minnihaha Reserve) and urban fringe areas.
- Part of the substation site and a small section of line occur in National Park.
- Sensitive hanging swamps exist adjacent to the substation site.
- The substation site utilises a disused quarry which would be rehabilitated.
- The site is closer to urban areas than the other North Katoomba sites although it is the closest to the centre of demand.
- The site is visible from the urban and bushland areas.
- Cost for the substation and lines is estimated to be $3.8m.

4.4.4 Airfield Site

The final alternative substation site adjacent to the Katoomba Airfield, was identified by members of the PCC. Two sites in this area were assessed, one (Airfield South) is situated on privately owned bushland near the southern boundary of the airfield, and the other (Airfield North) is located within the airfield boundary in an open area north of the runways.

Airfield South

The substation site is located on a level site adjacent to the airfield boundary. It would be supplied electricity by a 132kV line running from the existing Wallerawang to Lawson 132kV transmission line to the east of the site, a distance of approximately 700m.

A 66kV transmission line out of the substation would share the easement containing the 132kV line and would then cross the Katoomba Creek gully parallel to the Wallerawang to Lawson line, from where it would connect with the Lawson to Katoomba 66kV transmission line. The total length of this line would be around 2.2km.

A second 66kV transmission line would run west of the substation along the proposed entrance road, for approximately 900m adjacent to the southern boundary of the airfield to connect with the existing Katoomba to Blackheath 66kV transmission line.

Evaluation

- The construction of a new 132kV line (700m) from the substation to the existing 132kV line is required, approximately 400m occurring in National Park.
- New 66kV lines (3.0km) are required affecting bushland and National Park.
- The site is isolated from urban areas and popular bushwalking areas.
- The access road to the substation site occurs along the edge of National Park.
- Up to 70 ha of the total 75 ha site would be offered for inclusion in either the National Park or the Minnihaha Reserve.
- The substation site is located in disturbed bushland which is secluded from urban areas.

- The site is close to the centre of demand.
- Cost for the substation and lines is estimated to be $3.7m

Airfield North
The substation site is located in an open area north of the runways inside the airfield boundary. Electricity would be supplied to the substation by a 132kV line running from the existing Wallerawang to Lawson 132kV transmission line to the east of the site, a distance of approximately 900m.

A 66kV transmission line out of the substation would share the easement containing the 132kV line and would then cross the Katoomba Creek gully parallel to the Wallerawang to Lawson line, from where it would connect with the Lawson to Katoomba 66kV transmission line. The total length of this line would be around 2.5km.

A second 66kV transmission line would run west from the substation for approximately 700m along the northern boundary of the airfield to connect with the existing Katoomba to Blackheath 66kV transmission line.

Evaluation
- The construction of a new 132kV line (900m) from the substation to the existing 132kV line is required, most of which affects National Park.
- New 66kV lines (3.2km) are required affecting bushland and National Park.
- The 132kV and 66kV lines would be exposed to Point Pilcher Road and Evans Lookout.
- The site is isolated from urban areas but potentially visible from Evans Lookout and National Park access roads.
- Most of the access road to the substation site occurs in National Park.
- The site requires subdivision and is adjacent to an area identified in the LEP as an *Environmental Constraint Area.*
- The site is close to the Upper Blue Mountains Load Centre
- Cost for the substation and lines is estimated to be $3.75m

4.5 INCREASED ENERGY EFFICIENCY THROUGH ENERGY CONSERVATION AND DEMAND SIDE MANAGEMENT

Prospect Electricity in association with the PCC Subcommittee for Energy Conservation and Demand Side Management (EC/DSM), prepared an EC/DSM Strategy for the Upper Blue Mountains. The concept of EC/DSM is described in detail in the *EC/DSM Programme* (Working Paper 2) however the definition of EC/DSM as they apply to this proposal is as follows:

Energy Conservation: The use of features in an energy efficient design of buildings and appliances to make a unit of energy go further.

Demand Side Management : Changing the volume, timing and geographic distribution of energy consumption, satisfying customers' needs for energy services and influencing customer use of energy to reduce demand during peak times.

The outline of the EC/DSM Strategy from this report is provided in Section 5.6.

The implementation of an EC/DSM Strategy would offer the following benefits:

- reduce peak demand growth in the system
- reduce environmental impact
- improve overall energy efficiency
- reduce capital cost of construction of additional infrastructure
- reduce maintenance costs on the additional infrastructure
- promote energy conservation
- enhance Prospect Electricity's financial performance in the Upper Blue Mountains
- reduce customers' electricity bills

Analysis of the EC/DSM alternative revealed that it would not in itself, adequately address the needs of the Upper Blue Mountains Electricity Supply. There are two main reasons for this:

- The problems of lack of backup supply and ageing equipment would not be solved.
- If the potential impact on peak demand was reached, it would be unlikely to be sufficient to achieve an actual decrease in demand from current levels, rather it would reduce the rate of increase. The capacity of the system would therefore still be exceeded and the problem of antiquated equipment at the Lawson transmission substation would remain.

4.6 DO NOTHING

The condition of the existing electrical supply system for the Upper Blue Mountains, as described in Section 3 *The Need for Electricity Supply Improvements*, illustrates the shortcomings of the system.

The inadequacies of the existing system relate to both the Lawson substation and the 66kV transmission line from Lawson through to Blackheath.

The Lawson substation has an operating capacity which is inadequate to meet the growing demand for electricity in the Upper Blue Mountains. In addition to having reached its maximum operating capacity, the Lawson substation's electrical components are approaching the end of their reliable operating life. The ageing of these components is accelerated by operating the substation at its maximum capacity.

The 66kV transmission line from Lawson to Blackheath is the only Prospect Electricity supply line feeding the Lawson, Wentworth Falls, Katoomba and Blackheath zone substations. If this line goes out of service, only limited backup supplies of electricity are available from the SRA System at Blackheath. The Prospect Electricity line also has limited capacity to accommodate the growing demand for electricity in the Upper Blue Mountains.

These existing conditions in the substation and transmission line system are considered to be unacceptable to Prospect Electricity as they fail to meet the fundamental objective of a reliable supply and it is inadequate to meet the growing demand for electricity in the area.

The alternative of *Do Nothing* would produce a number of outcomes:

- avoid the environmental impacts of the proposal
- savings on the initial capital cost of construction
- savings on maintenance of the new substation and transmission line
- reduce the reliability of electricity supply to the area
- increase the incidence of blackouts in the area
- increase the levels of maintenance required on the substation and the transmission line
- severely restrict the connection of new customers and the expansion of existing customers levels of electricity usage
- potential losses of economic and employment growth in the area

4.7 SELECTION OF PREFERRED ALTERNATIVES

The selection of the preferred alternative was undertaken on a broad evaluation of a set of environmental criteria which are set out below :

- the environmental sensitivity of the substation site
- the environmental sensitivity of the associated transmission lines as determined by :
  - the length of lines in urban areas
  - the length of lines in bushland
  - the length of lines in Blue Mountains National Park
- the cost of each alternative
- the distance of alternative substation sites from the Upper Blue Mountains Load Centre
- the potential of each alternative to forego future infrastructure development in the Upper Blue Mountains.

The selection process involved the evaluation of broad environmental criteria for each alternative. The final transmission line routes were not determined, however the substation sites were accurately defined.

Whilst the accurate locations of the substation sites enabled a precise identification of the environmental impacts on each site, the line routes were evaluated on relative distances traversed through various land use areas.

A summarised comparison of the preferred alternatives described in this section is presented in Tables 4.1 and 4.2.

The preferred alternative combined two alternatives in order to maximise the number of overall benefits. The *Airfield South* substation site was selected in conjunction with the implementation of the EC/DSM Strategy. The reasons for this selection is as follows:

Airfield South -Substation Site

- Low environmental impacts on a disturbed and level substation site

- Site is adjacent to a land use (airfield) with low visual sensitivity levels and well buffered from ecologically sensitive areas such as the National Park and hanging swamps
- The site is close to the Katoomba Load Centre
- It is an isolated site with low visual impact on the adjacent National Park and Minnihaha Reserve
- Existing access track leads directly to the site
- Balance of the land purchased for the substation would be placed into public ownership.

Airfield South -Transmission Lines

- Relatively short sections of line (800m) through National Park, 200m traverse the edge of the National Park along the Airfield boundary
- Existing lines and associated maintenance tracks already occur within this area of National Park
- Low environmental impacts on disturbed lands in private ownership and on Crown land
- Line routes isolated from urban areas and popular National Park and bushland areas
- Access tracks exist on or adjacent to the proposed line routes
- Low levels of voltage drop will occur due to short lengths of line

The Energy Conservation/Demand Side Management Strategy

- Reduce peak demand growth in the system
- Reduce environmental impacts, both at the local and national scales
- Improve overall energy efficiency in the Upper Blue Mountains
- Minimise the need for construction of additional infrastructure
- Reduce maintenance costs on the additional infrastructure
- Promote energy conservation
- Enhance Prospect Electricity's financial performance in the Upper Blue Mountains
- Reduce customers' electricity bills

The details of the combined proposed development and the EC/DSM Programme is described in Section 5, *Description of the Proposed Activities.*

Table 4.1

ALTERNATIVE ELECTRICITY IMPROVEMENT STRATEGIES
(Excluding a North Katoomba Substation)

SYSTEM ELEMENTS	ALTERNATIVES			
	LAWSON	BLACKHEATH	ENERGY CONSERVATION & DEMAND SIDE MANAGEMENT	DO NOTHING
New Substation	Required	Required	Nil	Nil
New Substation Site	Available on disturbed site adjacent to substation	Extend existing site into disturbed area	Nil	Nil
Approximate length of Transmission Line Corridor through TOWN AREAS	2.6 km (20.5%)	2.0 km (20.5%)	Nil	Nil
Approximate length of Transmission Line Corridor through BUSHLAND AREAS, *not in National Park*	5.4 km (43.5%)	5.25 km (54%)	Nil	Nil
Approximate length of Transmission Line Corridor through NATIONAL PARK	4.5 km (36%)	2.5 km (25.5%)	Nil	Nil
Total length of Transmission Line Corridor	12.5 km	9.75 km	Nil	Nil
Distance to Load Centre (Katoomba) and resultant voltage drop	15.5 km Very high voltage drop	10.75 km High voltage drop	Nil	Nil
Cost	$6.85 m to $11.4m	$2.8m	• low capital costs • low maintenance cost on additional infrastructure	• no capital costs • high ongoing maintenance costs
General Comments	• High construction costs • Construction could disrupt supply • Long transmission lines have high impacts on town areas, bushland and National Park • High running costs due to voltage drop	• New lines have significant impacts on Blackheath streets, National Park and bushland • Moderate to high running costs due to distance from load centre	• Does not resolve lack of back up supply or ageing Lawson Substation • Will not decrease demand from current levels • Reduce peak demand growth • Increased energy efficiency • Reduce environmental impacts • Reduce costs to customers	• No additional environmental impacts in the Blue Mountains • Savings on initial capital costs • Reduced reliability and possible increase in blackouts • High levels of maintenance required • Restrictions on new customers connections & expansion of existing connections

Table 4.2

ALTERNATIVE NORTH KATOOMBA SUBSTATION SITES

SYSTEM ELEMENTS	ALTERNATIVES				
	MOUNT HAY ROAD SITE	MINNI-HA-HA ROAD SITE	QUARRY SITE	AIRFIELD SOUTH	AIRFIELD NORTH
New Substation	Required	Required	Required	Required	Required
New Substation Site	Site located in bushland	Site located in bushland	Site located in disused quarry	Site located in disturbed bushland	Site located on disturbed land
Approximate length of Transmission Line Corridor through TOWN AREAS	0 km	0 km	0 km	0 km	0 km
Approximate length of Transmission Line Corridor through BUSHLAND AREAS, *not in National Park*	4.0 km (77%)	2.75 km (100%)	2.25 km (64%)	0.7 km (19%)	0.6 km (14%)
Approximate length of Transmission Line Corridor through NATIONAL PARK	1.2 km (23%)	0 km	1.25 km (36%)	3.0 km (81%)	3.5 km (85%)
Total length of Transmission Line Corridor	5.2 km	2.75 km	3.5 km	3.7 km	4.1 km
Distance to Load Centre (Katoomba) and resultant voltage drop	6.25 km Moderate voltage drop	4.5 km Low voltage drop	4.25 km Low voltage drop	6.0 km	6.5 km
Cost	$2.6 m	$2.7 m	$3.8 m	$3.7 m	$3.75 m
General Comments	• Low construction costs • Substation located in undisturbed bushland • Transmission lines traverse bushland and National Park only • Lines impact on Minni-ha-ha Reserve • Substation close to load centre	• Low construction costs • Substation located in undisturbed bushland • Transmission lines in bushland only • Line impact on Minna-ha-ha Reserve • Substation close to load centre	• Moderate construction costs • Disused quarry rehabilitated around substation • Limited impact on National Park • Lines impact on Minni-ha-ha Reserve • Substation close to load centre	• Substation located in disturbed bushland • Lines mostly affect National Park • Site isolated from walking tracks and access to National Park • Up to 70 ha. of site to be offered to National Park • Substation close to load centre	• Substation site on disturbed land • Line mostly affect National Park • Site & lines potentially visible from Evans Lookout and access road to National Park • Substation close to load centre

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5

DESCRIPTION OF THE PROPOSED ACTIVITIES

5
DESCRIPTION OF THE PROPOSED ACTIVITIES

5.1 INTRODUCTION

The objective of the proposal is to create an integrated electricity supply system in the Upper Blue Mountains. The strategy to create this system consists of two components. These are:

- A new 132/66kV transmission substation close to the Upper Blue Mountains load centre at North Katoomba, to provide a reliable electricity supply. This will include three new transmission lines to connect the substation with Prospect Electricity's existing supply network.
- An energy conservation/demand side (EC/DSM) management programme to minimise the demand for electricity and to reduce the need for further infrastructure in the Upper Blue Mountains.

The substation is intended to reduce the load on the existing Lawson transmission substation by constructing an additional transmission substation at North Katoomba, and to provide a reliable backup supply to the Upper Blue Mountains. The North Katoomba transmission substation would subsequently supply electricity to Wentworth Falls, Katoomba and Blackheath zone substations.

Electricity would be supplied to the North Katoomba transmission substation via a 132kV transmission line which connects with the existing 132kV line currently supplying Lawson transmission substation. Two 66kV transmission lines would run out of the substation to connect with existing transmission lines supplying the three zone substations listed above (Figure 5.1).

The design of both the substation and transmission lines described below is conceptual. Assuming the proposal gains the necessary approvals, detailed design will be carried out taking into account the comments of BMCC, NPWS and the local community.

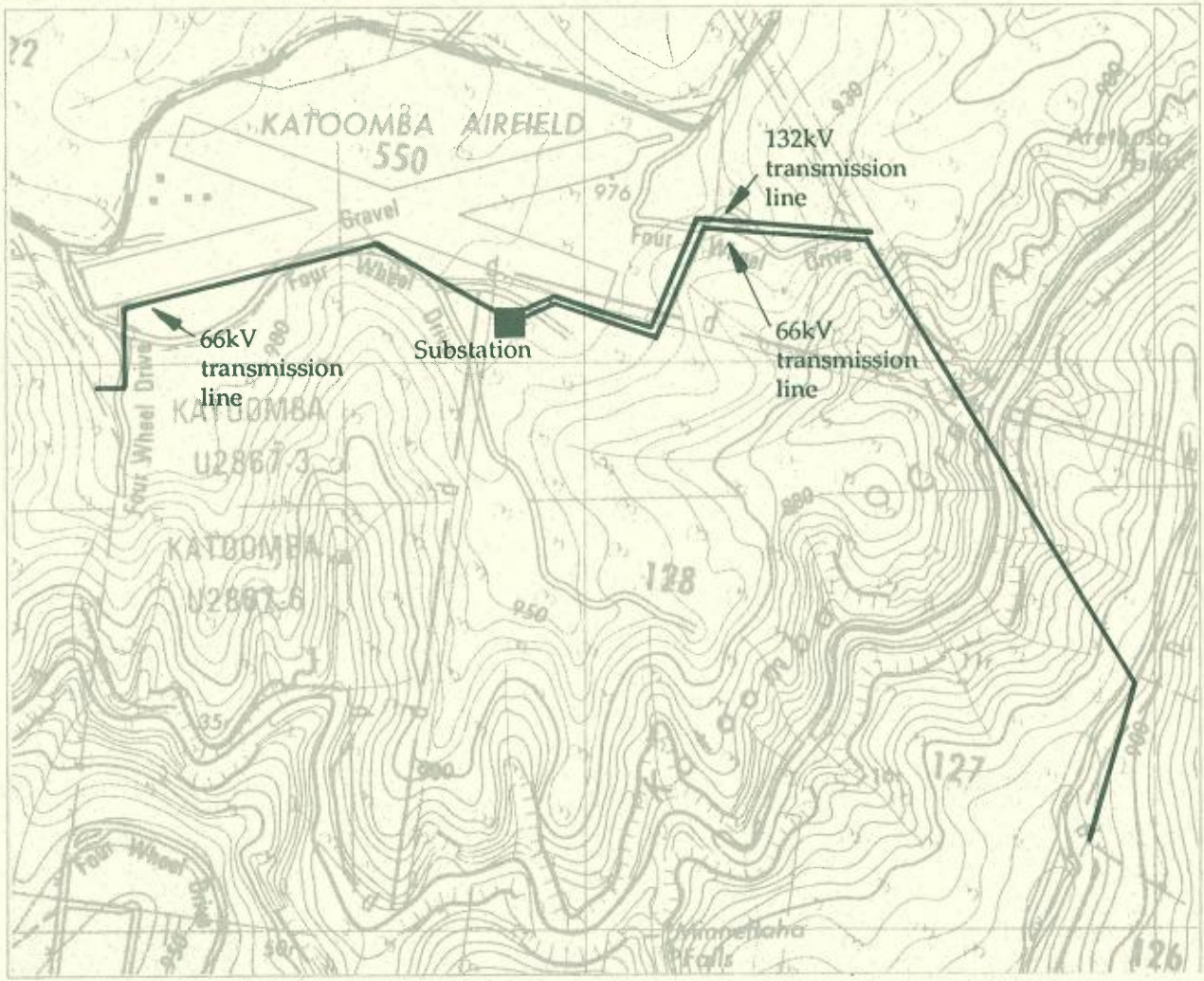
It is proposed that the Lawson transmission substation would continue to remain operative under this scheme, however it would only supply the SRA and the Hazelbrook and Lawson zone substations and act as a backup to the proposed Katoomba North transmission substation.

The Lawson transmission substation will ultimately need to be modernised due to the antiquated nature of the substation equipment. Future works at Lawson however, fall outside the scope of this EIS other than their consideration as an alternative to the construction of a Katoomba North transmission substation (see Section 4 - *Alternatives for Addressing the Electricity Supply Needs*)

The Energy Conservation/Demand Side Management (EC/DSM) Programme developed by the EC/DSM subcommittee (see Section 2.4.3) is proposed to be implemented as part of the Upper Blue Mountains Electricity Supply Strategy. This programme is aimed at changing patterns of electricity usage (including reducing the amount of electricity used), so that the need for future infrastructure is minimised.

The EC/DSM programme will include educational programmes to inform people of ways of achieving energy reduction. It will be complemented by an auditing programme to enable people to understand their use of electricity and ways to improve it. The whole programme will be monitored to determine its effectiveness, with a view to establishing similar programmes elsewhere.

Base Map reproduced with the permission of the Central Mapping Authority



Note: The EC / DSM Component of the Proposal Activities will include the whole of the Upper Blue Mountains Area.

0 100 200 300 400 500m

Figure 5.1
LOCATION OF PROPOSED ACTIVITIES

5.2 THE SUBSTATION

5.2.1 Physical Components

The substation would be situated within an approximately 80m x 40m rectangular area and would consist of a single 132/66kV, 60MV.A capacity transformer, associated switchgear and a control building, all of which would be surrounded by a black PVC coated security wire fence approximately 2.5m high. The substation layout is shown in Figure 5.2.

The transformer would be located in the centre of the substation compound. It would be mounted on concrete foundations and would be surrounded by a bund wall to contain any oil leaks should they occur. The remainder of the compound would be covered with a surface of blue metal gravel.

The 132kV transmission line entering the substation would connect to the transformer via a concrete pole landing span, approximately 13m high.

The 66kV transmission lines exiting the substation would also require a landing span, approximately 13m in height. The landing span for these lines would be of steel lattice or concrete construction.

One lightning protector mast and one communication mast (up to 20m in height) would be erected within the substation compound.

A bushfire buffer would be maintained in an approximately 20m wide margin around the substation compound. This would mean the clearing of the majority of undergrowth in this area, however much of the existing tree cover would be retained.

Some minor site works within the buffer area on the southern side of the substation would be required for the installations of earth rods and their connecting cables. These would be completely underground.

The control building would be on the northern boundary of the substation compound. It would be used to contain equipment for the various functions associated with the substation operation, as well as providing amenities for maintenance staff.

The control building is proposed to be constructed of grey blockwork with a green *Colorbond* roof. A two car capacity parking area for maintenance vehicles would be located at the entrance to the control building.

Human wastes from the building would be treated on site with a septic tank system, while a rainwater tank would provide a water supply, collecting rain from the southern half of the control building roof. Runoff from the northern half of the roof would run into a stone surfaced swale, and infiltrate to the ground.

5.2.2 Land Acquisition

The parcel of land on which the substation site is proposed (Portion 128 DP 751627) is currently privately owned. The allotment consists of 74.87ha of bushland bounded by the Blue Mountains National Park, the Katoomba Airfield and Katoomba Creek.

Although the substation would use less than 2ha of the northern edge of this land, Prospect Electricity proposes to acquire the entire property and return what is not used for the substation and transmission lines to public ownership. This is intended to guarantee the long term survival of the ecologically significant bushland which occurs on the property. This is intended to offset

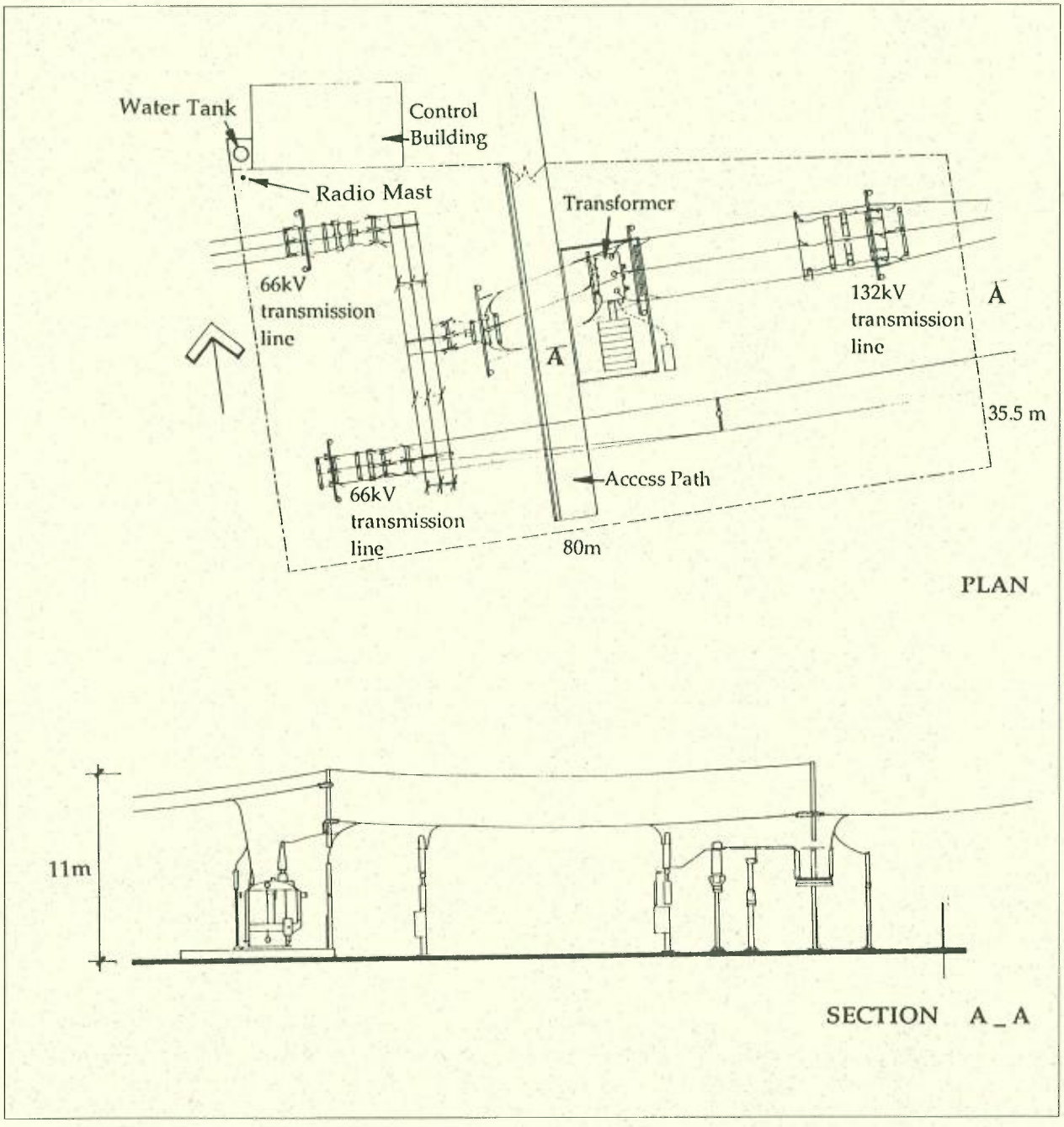


Figure 5.2
PROPOSED SUBSTATION

the negative environmental effects of the proposal. The public ownership of this land would also serve to provide public access to the historic Bruce's Walk, which runs along a disused SRA easement within this property (see Section 7.3.1).

5.3 TRANSMISSION LINES

5.3.1 Alignments

The three transmission lines associated with the proposed substation would be located within two easements.

One 66kV transmission line would run west of the substation, along the southern boundary of Katoomba airfield, before turning south and west to connect with the existing Blackheath to Katoomba 66kV transmission line.

The other 66kV transmission line from the substation and the 132kV line entering the substation would run parallel within a single easement to the east. The lines would span a small gully at the eastern end of the Katoomba Airfield, before turning east and intersecting with the 132kV Wallerawang to Lawson transmission line. The 132kV line would terminate at a point on this existing transmission line, while the 66kV line would continue along the Wallerawang to Lawson corridor to the south eastern side of the Katoomba Creek gully. A connection along Minni-Ha-Ha Road would then be made with the existing Lawson to Katoomba 66kV transmission line to the south.

5.3.2 Poles

The poles would be of a low maintenance type being from 16m to 20m above the ground (depending on the insulator arrangement) and constructed of steel reinforced concrete. The diameter of the poles at the base and the top would be approximately 61cm and 21cm respectively. Two main types of poles would be used, intermediate and termination poles (Figure 5.3).

Intermediate poles are the most common type of pole, and are designed to carry the weight of the conductors (wires) plus the forces imposed by wind pressure both directly on the poles and on the conductors. They are used for relatively straight sections of line and consist of a single pole with horizontal line post insulators to support the conductors.

Termination poles are designed to support the additional loads in a sideways direction created by turning points and end points on the transmission line conductors. The extra load is supported by stay poles (normally one or two).

Where a major gully span is required, the poles would carry a single conductor each, rather than the normal three conductor arrangement. When a large gully span is required, three gully span poles are placed on each side of the gully, after which the line reverts to the standard single pole formation. This arrangement (which would be used for the crossing of the Katoomba Creek Gully) is necessary to provide adequate separation of conductors, as the danger of conductors touching increases with the length of the span.

5.3.3 Conductors and Insulators

The main current carrying conductors would be of aluminium, approximately 21mm in diameter. There would be three single phase conductors on each line, arranged to provide a standard three phase electricity circuit. A smaller conductor would be strung from the top of the poles to act as an earth wire for protection against lightning strikes.

Insulators would be arranged in either a delta or a single sided formation. In a delta formation,

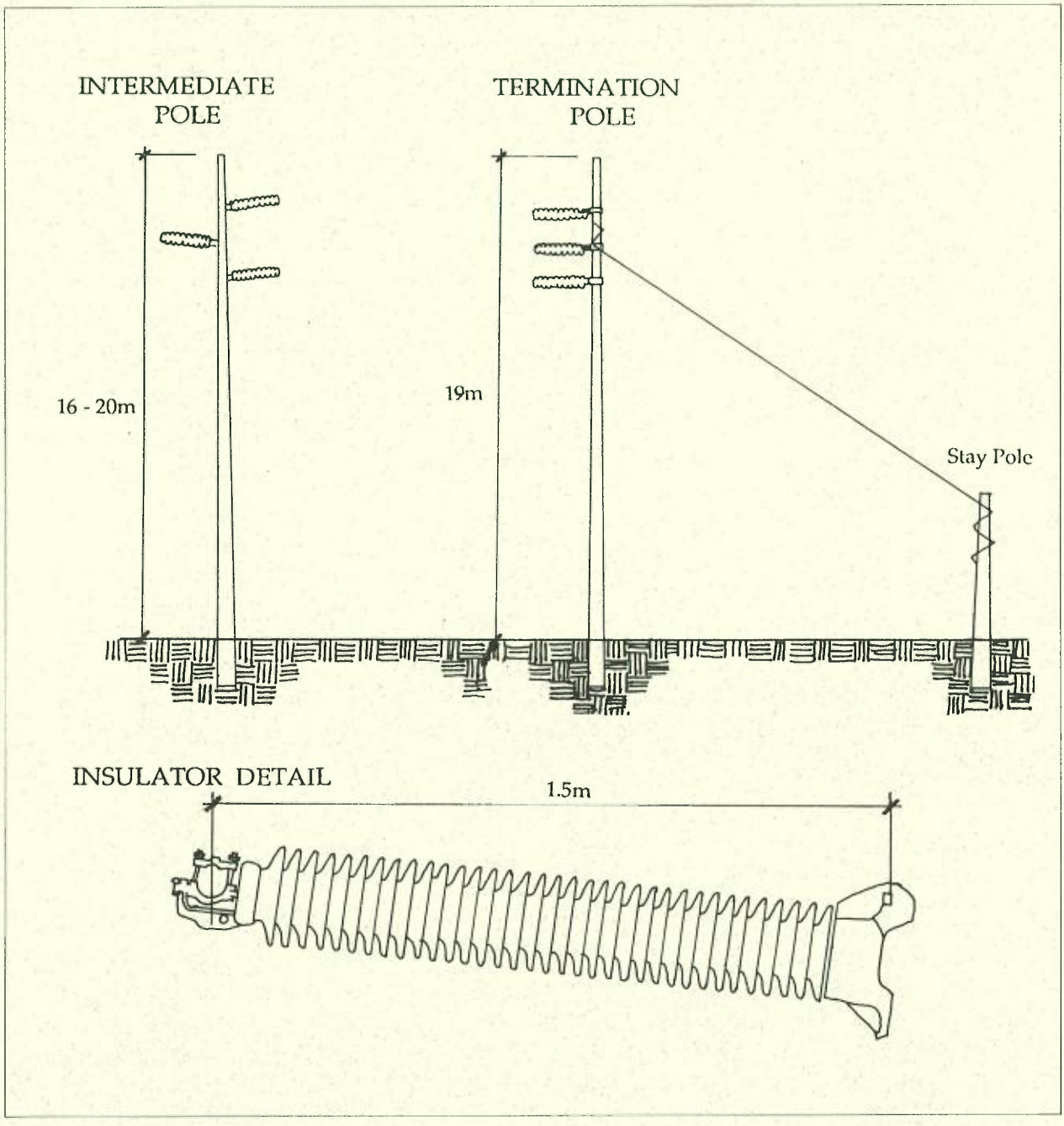


Figure 5.3
PROPOSED TRANSMISSION LINE POLES

two insulators are located on one side of the pole, while the other is located on the opposite side at a height between the first two insulators. A single sided formation on the other hand, has all three insulators located on one side of the pole. This formation is used to minimise tree clearance on either side of the line, but requires slightly taller poles to be used (up to 20m above ground). The insulators would be approximately 1.6m long and constructed of a lightweight polymer compound with an alloy clamp at the outer extremity, to hold the conductor in place (Figure 5.3).

5.3.4 Easement Requirements

Where Prospect Electricity locates power lines away from public roads, the acquisition of an easement from the property owner is generally required. This gives Prospect Electricity the right to construct, operate and maintain a line, ensuring 24 hour access for its entire length.

The two transmission lines west of the substation would be located in a single easement 41.5m wide. The single 66kV transmission line running west from the substation would require an 18m wide easement. It should be noted that although the easement for the western transmission line corridor would be 41.5m, an approximately 20m wide cleared margin would be required, leaving the remainder of the easement in its present state.

As outlined above, Prospect Electricity is negotiating for the purchase of Lot 128 DP751627. Within this property therefore, no easement arrangements would be necessary for the transmission lines east of the substation.

Approximately 250m of easement east of the substation would be necessary within Katoomba Airfield. The Airfield is owned by the Department of Conservation and Land Management and privately leased. While the easement would be purchased from the Department, the approval of the airfield lessee would also be sought.

Beyond the Airfield, a 200m long easement through Blue Mountains National Park would be required, before connecting with the existing easement for the Wallerawang to Lawson 132kV transmission line. This easement would be widened by 15m to accommodate the new 66kV transmission line which would span the Katoomba Creek gully, before a separate 18m wide easement approximately 200m long would be required through Blue Mountains National Park to connect with the easement for the existing 66kV Lawson to Katoomba transmission line.

The proposed 66kV transmission line to the west of the substation is likely to require an easement for its entire length (650m). This easement would be within Blue Mountains National Park.

5.4 ACCESS TRACKS

Permanent access would be required for operational, maintenance and repair vehicles to the substation and to each transmission line pole position. A number of existing unformed tracks provide access to the majority of the locations, however some additional lengths of track and some upgrading would be necessary.

An existing dirt track running approximately parallel to the southern boundary of the Katoomba Airfield extends to the substation site. This track is in poor condition however and would not provide adequate access to the substation. Rather than undertaking an extensive upgrade, it is proposed to realign the track, so that it runs adjacent to the airfield boundary. The existing alignment would then be encouraged to revegetate. The realigned track would

remain unsealed but would be maintained to provide a 5m all weather access to the substation and to the western 66kV transmission line.

East of the substation, along the southern boundary of the airfield, a new track would be required. This would be built to the same standards as the substation access track.

Access tracks exist along the remainder of the transmission line routes. Some minor realignment and/or upgrading may however be necessary in order that all poles can be accessed in any weather conditions.

5.5 CONSTRUCTION

5.5.1 Survey

A survey of the transmission line routes and the substation site would be carried out to accurately determine ground levels, existing pole positions and other factors relevant to transmission line detailed design and construction. Where line of site is blocked by vegetation, limited clearing may be necessary.

5.5.2 Site Access

After the survey has been completed, access to the substation site and transmission line routes would be established to allow the efficient access of vehicles and equipment. In most cases the access established for construction purposes would become permanent access for maintenance and monitoring purposes.

Access tracks used solely for construction would normally be 4m wide (6m wide on curves). These would be revegetated on completion of construction.

The largest vehicle requiring access would be the low loader delivering the transformer to the substation. This would access the substation site across the airfield, with a temporary track 40m long and 6m wide being constructed between the airfield and the substation site. Use of the airfield would avoid the need for significant upgrading (for a one-off event) of the existing access track running along the south of the airfield.

Construction access to the transmission lines east of the substation would ultimately form the permanent access. As discussed in Section 5.3, existing tracks could be utilised for the much of the eastern transmission line route. These access tracks would therefore be constructed to permanent access standards from the outset.

Access for construction of the western 66kV transmission line would be achieved by the construction of the substation access track. Temporary construction access may be required where the transmission line route turns south from the existing access track alignment to connect with the Katoomba to Blackheath 66kV transmission line.

5.5.3 Pole Delivery

Poles would be constructed off-site and delivered by truck as near as possible to the position for erection. Where site conditions are limiting, the poles would be placed into position by another vehicle.

5.5.4 Pole Foundations

Holes would be excavated by a truck mounted drilling machine. Where rock is present, excavation would be carried out with a pneumatic hand drill. The excess excavation material would be spread or removed, depending on the ecological

sensitivity of the particular location. Excavations would be covered with timber drum ends until the poles are erected to prevent injury to the public and wildlife.

5.5.5. Pole Erection

Poles would be fitted with insulators on-site and erected by mobile crane.

5.5.6 Stringing of Conductors

Ropes would be run along the ground from trailer mounted cable drums and raised into position on the poles in preparation for conductor pulling. Using the position of the ropes as a guide, final tree trimming would be carried out at this stage. The conductors would then be pulled through a section of the route using a trailer mounted winch.

The stringing of conductors for the large gully span over Katoomba Creek would be carried out by helicopter. Using the Katoomba Airfield, the helicopter would carry each of the three conductors across the gully, where a ground crew would attach them to the gully span poles.

5.5.7 Substation Construction

The substation control building would be constructed initially, in conjunction with the establishment of the switchyard structure.

The substation equipment would then be installed. This would include the transformer, switchgear, radio and lightning masts as well as the electronic equipment for the control building (batteries, chargers etc.).

5.5.8 Interruption to Supply

There would be no interruption to supply during the construction and commissioning of the proposed 132kV transmission line as the backup system would operate during the connection process. The connection would be carried out during a period of low load to ensure that the backup is adequate to maintain supply to the Upper Blue Mountains.

There may however be interruptions to some areas during the construction and commissioning of the two 66kV transmission lines. These interruptions (which may be up to 2-3 hours) would be publicised in the local media.

5.5.9 Construction Programme and Cost

The construction of the entire proposal is expected to take approximately 17 months from the gaining of planning approvals. The likely programme is shown in Figure 5.4

The estimated cost of the substation is $2.3m, while the transmission line component of the proposal is anticipated to cost $0.35m.

5.6 MAINTENANCE AND MONITORING

5.6.1 Routine Transmission Line Patrols

A biannual patrol along each transmission line would be undertaken by a two man team on foot and/or vehicle, to assess the condition of the line and access tracks, as well as ensuring that adequate vegetation clearances are maintained. Patrols would also be carried out during, or immediately after severe storms or bushfire to identify any damage.

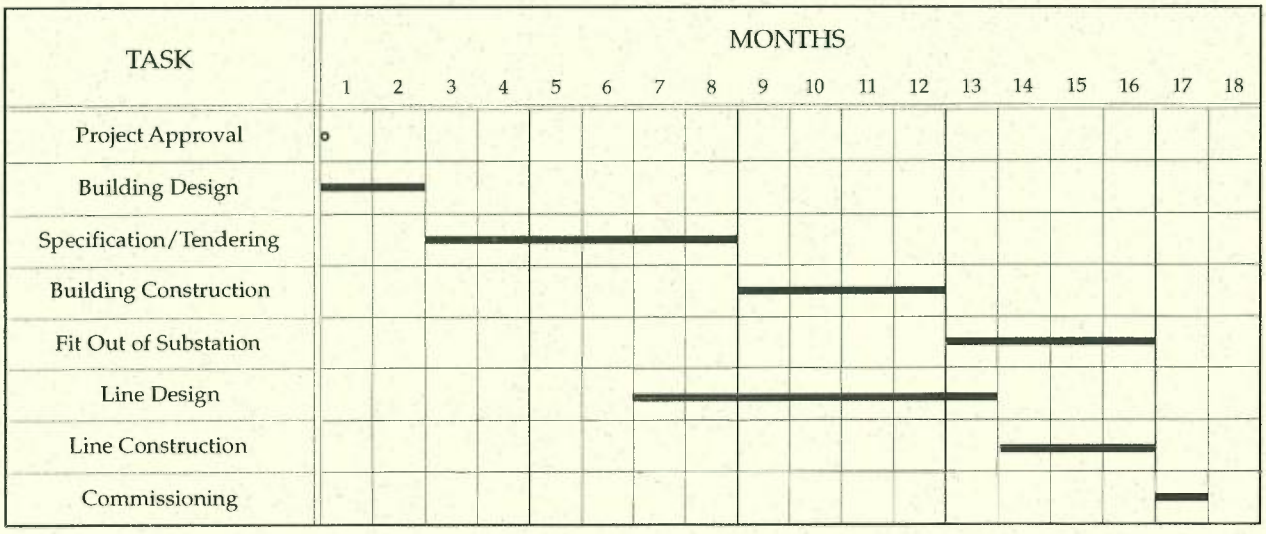


Figure 5.4
CONSTRUCTION PROGRAMME

5.6.2 Electronic Monitoring

Prospect Electricity operates a System Control and Data Acquisition (SCADA) radio network which transmits data on system performance and identifies and locates major faults immediately. An electricity supply disruption caused by a fault in one of the proposed transmission lines or the substation would be detected by the SCADA network and relayed to a central control point almost instantaneously. Remedial action would then be taken as soon as possible.

5.6.3 Tree Trimming

Tree trimming would normally be undertaken by a five man team with two to three vehicles. Tree trimming is carried out to maintain safe clearances to the conductors, which in turn reduces the chance of line malfunctions and the possibility of bushfire.

5.6.4 Substation Maintenance and Monitoring

Substation maintenance and monitoring is anticipated to consist of:

- Routine inspection by a two man crew every ten weeks.
- Battery check by a two man crew every ten weeks.
- Minor maintenance visit by a four man crew every three years (3-4 day visit).
- Major maintenance visit by a four man crew every six years (1 week visit).

5.7 ENERGY CONSERVATION/ DEMAND SIDE MANAGEMENT PROGRAMME

5.7.1 Overview

Prospect Electricity proposes to implement the extensive EC/DSM programme developed by the community based Project Consultative Committee as part of the planning for the proposed Katoomba North substation. The programme would be implemented across the Upper Blue Mountains and it is designed to modify patterns of electricity usage so that the supply system operates as efficiently as possible.

Prospect Electricity has recognised that the sensitivity of the Blue Mountains environment is such that priority should be given to the minimisation of future electricity supply infrastructure projects. Detailed studies currently being undertaken will quantify the increases in energy efficiency and provide an accurate picture on when and if future electricity supply improvements are necessary.

There are two main methods of increasing the efficiency in patterns of electricity usage. The first is *load shifting*, in which the use of electricity is transferred from peak times to low volume use times. The second method is *load reduction*, where the amount of electricity used is reduced. Both of these methods are proposed as part of this programme.

A shopfront would be established, initially at Prospect Electricity's existing Customer Centre at Katoomba, which could be renamed the *Energy Advisory Centre*. This would serve as an information point for the local community, while the programme would be administered from Prospect Electricity's Head Office. A full time staff member would implement the programme from this shopfront with backing from the resources of the Prospect Electricity head office. The various components of the programme are outlined below, while the full proposal report of the EC/DSM subcommittee has been produced as *Working Paper 2*.

The EC/DSM programme is the first of its kind in Australia so it is being proposed by Prospect as a pilot for future programmes. The development of the programme would be monitored by Prospect Electricity working with an Energy Conservation Advisory Group which would include interested members of the community. The programme will be managed by an Energy Conservation Officer working from Prospect Electricity's marketing officer in Katoomba.

5.7.2 Education

The main requirements that have been identified for an education programme are that it is well focused, appropriately intense and consistent.

The education programme would include:

- Regular exposure, through a newsletter to accompany electricity bills and shopfront displays in the Energy Advisory Centre.
- Periodic exposure, such as forums on aspects of energy efficiency; advertising in the local media; and displays at local schools and community events.
- A library on energy efficiency established at the Energy Advisory Centre.
- Liaison/joint research with government departments, particularly those which are major users of electricity in the Upper Blue Mountains.

5.7.3 Auditing

An auditing service would be offered to both domestic and commercial customers, providing advice on increasing energy efficiency. Free advice would be provided at the Energy Advisory Centre, however a nominal charge would be necessary for visits to homes and commercial premises.

5.7.4 Monitoring

Prospect Electricity would periodically perform statistical analyses to compare differences in energy usage between randomly selected programme participants and matched groups of non-participants homes in the upper Blue Mountains.

A similar programme would be applied for the commercial/industrial sector by Prospect Electricity's marketing group. Using internal audit trails, the differences in actual versus projected results may be compared and the programme evaluated and modified where necessary.

5.7.5 Incentive Schemes

Prospect Electricity would offer discounts on energy efficient devices and would actively promote and market these devices.

A three phase differential rating scheme is also proposed, involving:

- Preparation of a professional paper on the potential energy conservation benefits and the way in which it would work within the context of Prospect Electricity's area. This would be prepared with the input of the community.
- Use of the above paper as a basis for discussion with Prospect Electricity, the community and politicians to support the need to accept such an approach in relation to environmental conservation.
- When the timing is considered appropriate in terms of achieving success, prepare a submission to the Government Pricing Tribunal in relation to the application of differential rating for the domestic sector.

5.7.6 Other Initiatives

A number of additional initiatives would be necessary to ensure the effectiveness of the energy efficiency programme. These would include:

- Registration of tradespeople through TAFE, as being capable of performing energy efficiency upgrade work.
- The assistance to BMCC in the development of an energy efficient building code.

6

BIOPHYSICAL ENVIRONMENT AND INTERACTIONS

6
BIOPHYSICAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

6.1 CLIMATE

6.1.1 Existing Environment

Katoomba experiences colder temperatures and greater rainfall than coastal Sydney. Climate is strongly related to Katoomba's altitude at approximately 1,000mAHD.

Average daily maximum temperatures in January are 23°C, decreasing to 9°C in July, while average daily minimum temperatures are 13°C in January and 2 to 3°C in July. Temperatures as low as -3°C have been recorded.

The mean average rainfall is 1,416mm, with the maximum rainfall occurring from November to June and the highest rainfall month being February. The lowest rainfall is between July and October. Rain occurs on an average of 126 days per annum with thunderstorms being most prevalent in the summer months.

Records indicate that winds from the west and north west predominate all year, with significant easterly and north-easterly winds during summer. Fog days occur frequently at Katoomba, with approximately 55 fog days per year and 35 frost days per year, mostly between April and November. Snow falls an average of three days per year.

6.1.2 Interactions with the Proposal

The major potential interaction between the proposal and climate is the possibility of lightning strikes.

The substation would be constructed with a lightning protection mast which would minimise the chance of lightning striking parts of the substation.

Lightning strikes on transmission lines are unavoidable and could be expected to occur from time to time on all three of the proposed transmission lines. In the event of a lightning strike, the transmission line insulators are generally damaged and the line put out of service.

6.2 TOPOGRAPHY

6.2.1 Existing Environment

The study area is primarily situated on the southern edge of an east west oriented plateau at an elevation of approximately 980mAHD. The gully through which Katoomba Creek flows is situated immediately to the south and falls to approximately 830mAHD 1km south of the site. To the north is the gully created by Greaves Creek which is known as the Grand Canyon. This falls to around 800mAHD, 1.25km north of the site.

6.2.2 Interactions with the Proposal

The substation site slopes gently to the south. The control building would require a small amount of cut to level the ground, while existing ground levels could be maintained within the substation compound, except for small amounts of fill being required for the transformer platform and switchgear foundations.

The transmission lines would not require ground level changes. The poles would be sunk into the ground to a depth of approximately 3m, with the hole being filled to its original level once the pole is in place.

The crossing of the Katoomba Creek Gully by the eastern 66kV transmission line would minimise the requirement for clearing for this transmission line.

6.3 GEOLOGY AND SOILS

6.3.1 Existing Environment

The geology of the area consists of the Narrabeen Group, which was deposited during the Triassic period approximately 300 million years ago. This unit is generally composed of lithic sandstone, sedimentary breccia, claystone and conglomerate.

Soils are duplex types, generally described as sandy yellow earths. These soils are usually shallow, particularly along the ridges. Residual nodules and stones including quartz pebbles and fragments are common. Soils derived from the Narrabeen geology are usually poorly aggregated, infertile and have a reasonably high erosion risk.

6.3.2 Interactions with the Proposal

The risk of soil erosion would be greatest during the construction phase of the proposal. Although design and construction would take place in accordance with requirements laid down by the NPWS and the Department of Conservation and Land Management, a small degree of soil erosion is likely.

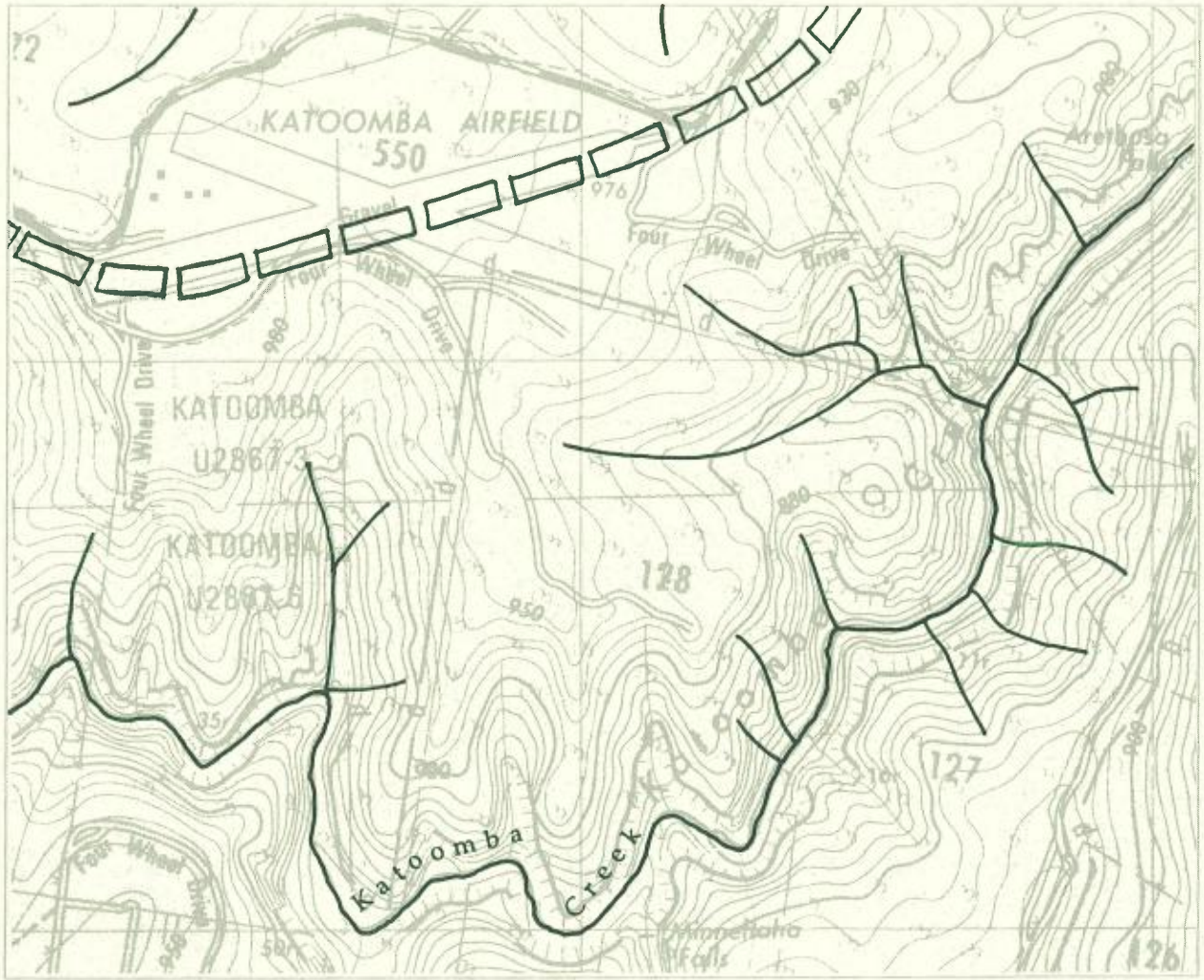
The substation site is relatively flat and would require little excavation. The vegetation on the site would however be cleared and there would be regular heavy vehicle traffic over the construction phase which would disturb the topsoil. The level of disturbance would be largely dependent on the amount of rain occurring during this time, however adequate haybaling would ensure that any soil moving beyond the site boundaries is insignificant.

Upon completion of construction, the substation compound would have a gravel surface which would serve to stabilise the soil underneath. Water falling on the roof of the control building would be contained in a tank which would provide the water supply to the building or would fall onto the gravel swale on the north and west of the building.

The soil erosion risk associated with the transmission lines would primarily be related to the construction and ongoing condition of the access tracks. The existing network of access tracks would enable the construction of new tracks to be minimised, with the only major lengths of new track being immediately to the east and west of the substation.

The new access tracks are located on the flat area adjacent to the substation site. Erosion risks with appropriate track design would therefore be expected to be low, despite the removal of some vegetation.

The upgrading of existing tracks would result in some initial soil disturbance during construction, with the greatest risk being on the steeply sloping access track between the north side of the airfield gully span and the 132kV transmission line termination point. Surface gravelling would be used for tracks with a slope of over 12% in accordance with NPWS road construction guidelines, and may be used on all access tracks. Once surface gravel is in place the risk of soil erosion would diminish, however regular inspections and periodic maintenance by Prospect Electricity would occur.



Katoomba Creek/Greaves Creek catchment boundary

Drainage line

0 100 200 300 400 500m

Figure 6.1
DRAINAGE

6.4 DRAINAGE

6.4.1 Existing Environment

A small unnamed watercourse immediately to the south drains the substation site in an easterly direction to Katoomba Creek. The eastern transmission line corridor drains to the same watercourse, while the western transmission line corridor drains to a southerly flowing stream which joins Katoomba Creek further upstream (to the west).

Katoomba Creek joins Govetts Creek, which in turn flows into the Grose River to the north. The Grose River is the major drainage feature in the Blue Mountains and flows in an easterly direction to meet with the Nepean River at the foot of the mountains approximately half way between Penrith and Windsor.

The substation site is not located close to any permanent watercourses. There is however, a small creek flowing into Katoomba Creek immediately below the proposed connection point between the western 66kV transmission line and the existing Katoomba to Blackheath 66kV transmission line. There is also a drainage line crossing the existing access track immediately to the west of the substation which ultimately runs into Katoomba Creek.

6.4.2 Interactions with the Proposal

As the proposed substation is located on a flat area away from drainage lines and creeks, it would have a minimal effect on surface water flows. Water falling onto the roof of the substation would be held in a water storage tank which would overflow onto the gravel surfaced substation compound. Rain falling within the compound would infiltrate through the gravel directly to the ground.

The concrete foundations of the control building and substation equipment would provide a minor impediment to groundwater, which flows towards Katoomba Creek. The porous nature of the soil would allow this groundwater to flow beneath the foundations. Human waste from the substation would be contained in an underground tank and periodically pumped out and transported off-site.

The construction of new access tracks and the upgrading of existing ones would lead to a minor modifications in the surface water drainage patterns along the transmission line routes. The tracks would be designed to effectively channel runoff to the edge of the track surface in order that it can be discharged with minimal erosional effects.

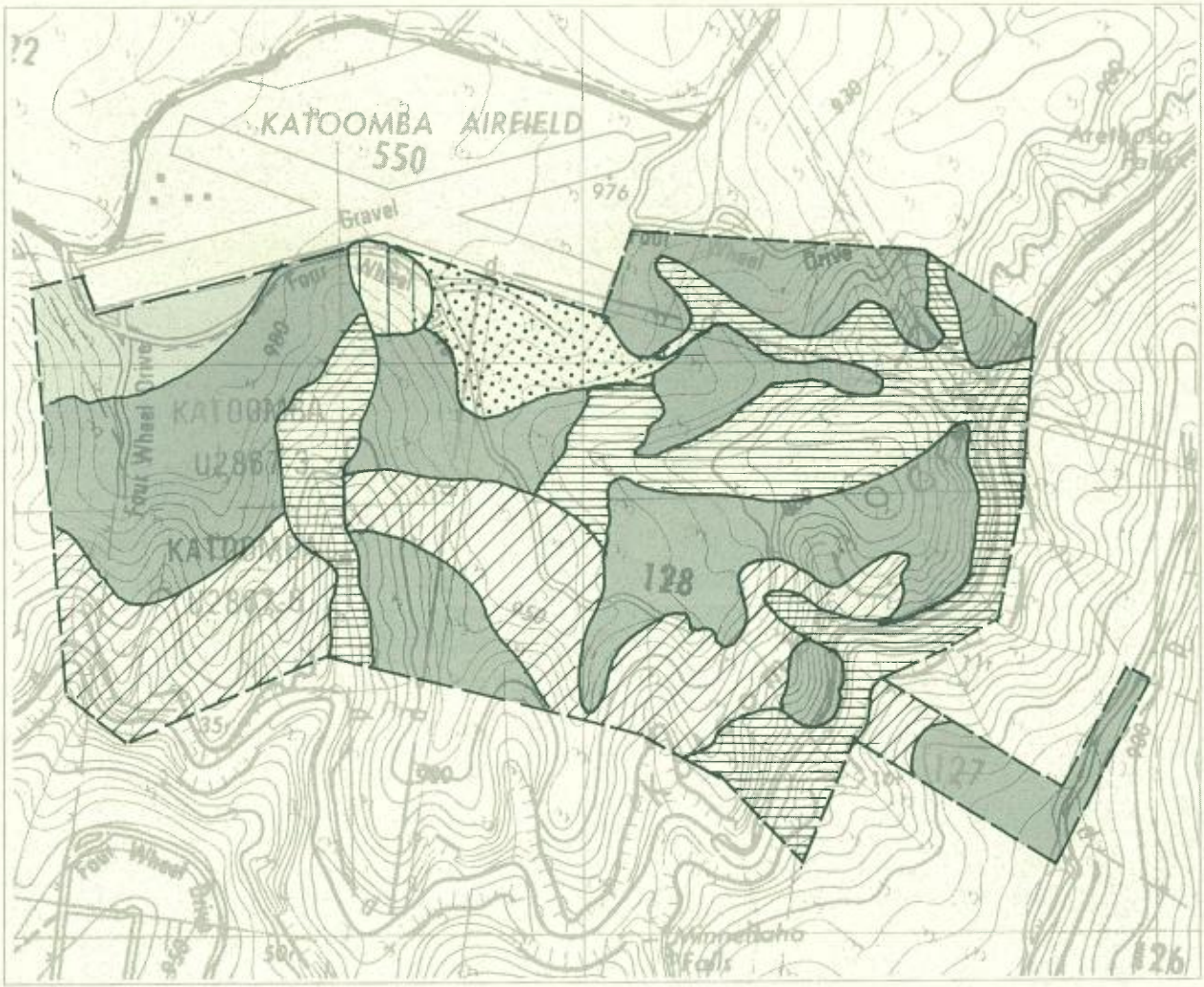
6.5 VEGETATION

6.5.1 Existing Environment

A vegetation survey of the proposed substation site and transmission line corridors was carried out by Quality Environmental Management Pty Limited on 14 and 15 October 1992. Five plant communities were identified according to Specht (1981) and McDonald et al (1990). These are described below, while a list of plant species identified in the study area is included in Appendix D.

1. Open Woodland/Silvertop Ash

Structure
Low branching, broad spreading trees to approximately 15m. The understorey is variable, with fire history possibly being one influencing factor. The last major fire which occurred in 1983



Open woodland/Silvertop Ash

Open woodland/Scribbly Gum, Sydney Peppermint (regen.)

Open woodland/Scribbly Gum, Sydney Peppermint (mature)

Open forest/Blue Mountains Ash

Open scrub/Blue Mountains Mallee

Sedgeland/heathland

0 100 200 300 400 500m

Figure 6.2
VEGETATION

completely burned out some sections of the study area and partially affected other sections (M. Eades pers. comm.).

Occurrence
This plant community occurs on the higher, flatter parts of the study area on sandy, well drained soils.

Floristics
Dominant trees are Silvertop Ash (*Eucalyptus sieberi*) and Yertchuk (*E. consideniana*). The ground cover species *Grevillea laurifolia* and *Persoonia chamaepitys* form dense mats along some sections of the access track.

2a. Open Woodland/Scribbly Gum, Sydney Peppermint (regenerating)

Structure
Low branching, broad spreading trees to approximately 15m, but usually not exceeding 8m. Spacing between trees varies from around 3-10m. Understorey shrubs are generally sparse and low.

Occurrence
This plant community covers a major part of the study area, generally merging with Community 1, but becoming dominant on sloping topography, especially where the soil surface contains lateritic material.

Floristics
The dominant tree is the Sydney Peppermint (*Eucalyptus piperita*). The incidence of other Eucalypts varies according to several factors, particularly aspect and topography . In exposed locations of the main study area, Scribbly Gum (*Eucalyptus sclerophylla*) dominates, whereas alongside Bruces Walk, both Scribbly Gum and Narrow Leaved Stringy Bark (*Eucalyptus oblonga*) are common. In more sheltered locations, Narrow Leaved Peppermint (*Eucalyptus radiata* subsp. *radiata*) occasionally occurs and in some poorly drained areas scattered small specimens of Brittle Gum (*Eucalyptus mannifera*) were found.

2b. Open Woodland/Scribbly Gum, Sydney Peppermint (mature)

Structure
Trees to approximately 24m, usually with tall straight trunks. Spacing between trees is usually greater than 8m and for this reason this community has been described as Woodland rather than Open Forest. The understorey is not as dense as in Community 2a and grasses are more common.

Occurrence
One section of this plant community occupies a relatively flat area adjacent to the intersection of the Airfield's two runways. The last major bushfire occurred in this area in 1983. It would appear that this section of the study area was not as extensively burned as the slopes further to the west, not only during the last major fire event but also during previous fires. As a result there is a greater concentration of mature trees in this area, compared to the rest of the study area. The lack of sawn stumps in areas occupied by Plant Community 2a would discount the possibility that the lack of mature trees is the result of clearing.

Floristics
Species composition is similar to that in Community 2a, although two specimens of Brown Stringybark (*Eucalyptus blaxlandii*) growing near the remains of a stone house are of interest as this species is not common in this plant community. The most commonly occurring grass species are *Entolasia stricta* and *Chinochloa pallida*.

3. Open Forest/Blue Mountains Ash

Structure
Straight trunked, high branched trees 15-25m in height depending on age. The understorey is generally sparse and does not exceed about 2m in height.

Occurrence
This community occurs immediately to the west of Community 2b and extends from the airstrip boundary, where several mature trees occur, down a steep south facing slope.

Floristics
The tree canopy consists of a monotypic stand of Blue Mountains Ash (*Eucalyptus oreades*), with an understorey similar to that of Community 2b but also including species favouring wetter conditions such as Black Wattle (*Callicoma serratifolia*) and Elderberry Panax (*Polyscias sambucifolia*).

4. Open Scrub/Blue Mountains Mallee

Structure
Mallee and shrubs to about 4m, but often less than 2m in exposed areas. Understorey is dense, varying from low shrubs to herbaceous groundcovers.

Occurrence
This community occurs as a series of narrow bands along the edges of cliffs and rock outcrops.

Floristics
Although stunted specimens of Silvertop Ash and Sydney Peppermint occur on the margins of this community, Blue Mountains Mallee (*Eucalyptus stricta*) is the dominant Eucalypt species. Specimens of *Eucalyptus moorei* and intergrades between the two mallee species occur close to cliff edges. Understorey shrubs include *Banksia*, *Acacia* and *Boronia* species, as well as Curly Sedge (*Caustis flexuosa*), Scale Rush (*Lepyrodia scariosa*) and Saw Sedge (*Lepidosperma laterale*).

5. Sedgeland/Open Heathland

Structure
This community is described by Keith and Benson (1988) as *Blue Mountains Sedge Swamp* although in the study area the ecotone surrounding this community usually includes sections of open heath. This vegetation type approximates that described by Smith and Smith (1991) as *Gymnoscoenus sphaerocephalus-Leptospermum juniperum* Swamp.

Occurrence
Patches of this community occupy south and south east facing slopes below the main plateau. These areas not only collect water but usually occupy basins formed on poorly drained sandstone strata.

Floristics
Species of the Cyperaceae, Juncaceae, and Xyridaceae families dominate the wetter sedge vegetation, while members of the Epacridaceae and Myrtaceae families dominate the surrounding heath vegetation. Two specimens of *Almaleea incurvata* (syn *Pultanaea incurvata*) and one specimen of *Lissanthe sapida* were recorded growing in a section of this community, close to the base of a rock outcrop. Both specimens are listed by Briggs and Leigh (1988) as endemic and rare.

Conservation Significance
All plant communities recorded in the study area, except Community 3, are well represented

in the Blue Mountains National Park. Community 3 (Open Forest/Blue Mountains Ash) is not listed as a community dominant elsewhere in the Blue Mountains by Keith and Benson (1988). *Eucalyptus oreades* (Blue Mountains Ash) normally appears as a habitat specific associate species in communities dominated by other Eucalypts. The occurrence of *E. oreades* in the study area complies with the recorded occurrence of this species by Keith and Benson (1988) in "more sheltered situations" within sections of Blue Mountains Sandstone Plateau Forest.

Although the communities found in the study area are well conserved in Blue Mountains National Park, they are generally subject to relatively low levels of disturbance and are representative of the pre-European vegetation pattern. They are also part of a wider network of indigenous vegetation which incorporates Blue Mountains National Park.

The following species listed as rare or endangered by Briggs and Leigh (1988) and/or Benson (1988) were recorded in the study area.

Lissanthe sapida
This species is coded as 3RCa in Briggs and Leigh (1988) indicating it is considered rare but has a range of over 100km and is considered to be adequately conserved. One specimen was recorded in the study area, growing near the base of a rock outcrop to the south of the eastern access track.

Almaleea incurvata
This species is coded as 2RC-t in Briggs and Leigh (1988) indicating it has a maximum range of less than 100km. It is conserved in the Blue Mountains National Park although the actual number of individual specimens is not known. Two specimens were recorded in the study area, growing in a stand of sedgeland/open heathland.

Epacris muelleri
Several specimens of *Epacris muelleri* were recorded at the base of a rock outcrop close to the eastern access track. This species is coded as 3RC in Briggs and Leigh (1988) indicating it has a range exceeding 100km and occurs in the Blue Mountains and Wollemi National Parks.

Pseudanthus divaricatissimus
Several specimens of *Pseudanthus divaricatissimus* were recorded in the understorey within Community 4. This species is coded 3RCa in Briggs and Leigh (1988) and is considered to be adequately conserved in the Blue Mountains and Kanangra Boyd National Parks, as well as other reserves in New South Wales and Victoria.

6.5.2 Interactions with the Proposal

Substation
The construction of the substation would involve the clearing of approximately 1.2ha of bushland. This is classified as vegetation type 2b, Open Woodland/Scribbly Gum, Sydney Peppermint.

This association is well represented in Blue Mountains National Park and contains no rare plant species in this location. The woodland on the substation site, while not pristine has been subject to a relatively low level of disturbance with a large number of mature trees being present and few weeds in the understorey. It must therefore be regarded as having some conservation value.

The clearing would take place at the edge of the woodland, adjacent to land cleared for the Katoomba airfield. This would restrict the impact of the substation in terms of the effect on the continuity of the vegetation within the area, as well as enabling the building of new access tracks through bushland to be minimised.

Uncleared woodland adjacent to the substation would be unlikely to be significantly affected by the clearing. As no cut or fill, or major concrete slabs are required, normal groundwater flows would be unlikely to be altered, resulting in no change to the soil conditions. The clearing of trees would increase the vulnerability of the adjacent woodland to weed intrusion through windborne seeds. The existing understorey is well established however, and similar vegetation on the perimeter of the association has successfully resisted significant weed intrusion, with potential sources of seed being limited.

Western Transmission Line Corridor

The western transmission line corridor alignment passes along the margin of three vegetation associations: Open Forest/Blue Mountains Ash; Open Woodland/Scribbly Gum, Sydney Peppermint (mature and regenerating); and Open Woodland/Silvertop Ash.

The corridor (including one 66kV transmission line and the substation access track) has been located as close as possible to the southern boundary of the Katoomba airfield. The proposed realignment of the existing access track would avoid the severance of the bushland which is currently occurring. The disused section of track would be left to regenerate and over the longer term would be expected to become structurally similar to the bushland immediately to the south of the track.

The initial section of the corridor from the substation would follow an already established track. Upgrading of this track would necessitate some tree removal on the margins of the Open Woodland/Scribbly Gum, Sydney Peppermint and Open Forest/Blue Mountains Ash communities, as well as some trimming to allow safe operation of the transmission line.

A partially cleared margin exists along the airfield boundary, however this would need to be widened to accommodate the realigned access track. A number of trees, primarily immature *E. oreades* 8-12m high, would need to be removed in this section of the corridor.

The final section of the western 66kV transmission line, connecting with the existing Katoomba to Blackheath transmission line would diverge from the substation access track. Two of the three poles between the substation access track and the existing transmission line would be located on other existing tracks requiring tree trimming and some tree removal for the necessary line clearances. The third pole would require a short access track approximately 20m in length to be constructed through the Open Woodland/Silvertop Ash Community.

Eastern Transmission Line Corridor

The eastern transmission line corridor (incorporating one 132kV and one 66kV transmission line) would initially run east from the substation along the southern boundary of the airfield. This area is a continuation of the Open Woodland/Scribbly Gum, Sydney Peppermint community found on the substation site. The transmission line corridor would be located on the margin of this community which has already been disturbed from the adjacent airfield development. The relatively wide easement required for the two transmission lines would however necessitate a small amount of tree removal and ongoing tree trimming. Access to these poles would also result in the clearing of a narrow band (approximately 4m) of shrubs.

A small gully span parallel to the eastern boundary of the airfield would require the removal of several mature trees within the Open Woodland/Scribbly Gum, Sydney Peppermint community on either side of the gully. The gully

span would traverse an area of Sedgeland/ Heathland (Hanging Swamp) but would have no impact.

From the northern point of the airfield gully span, the corridor east to the existing 132kV Wallerawang to Lawson transmission line. The transmission lines would continue through the same vegetation community for approximately 300m. Although there is an existing access track in this area, it is likely to require some realignment and therefore some tree removal.

A widening of the existing 132kV transmission easement by 15m would be necessary to incorporate the new 66kV transmission line for the gully span across Katoomba Creek. Previous clearing has avoided the need for significant tree removal within this existing easement. Some periodic tree trimming may however be required.

The connection to the existing Lawson to Katoomba 66kV transmission line would pass through an association described by Smith and Smith (1991) as *Eucalyptus piperita/E. radiata* Open Forest. While it is proposed to follow the general alignment of the Minni-Ha-Ha Road, some divergence through the existing vegetation may be necessary due to excessive bending in the road.

6.6 WILDLIFE

6.6.1 Existing Environment

A wildlife survey was carried out in conjunction with the vegetation survey by Quality Environmental Management Pty Limited on 14-15 October 1992.

Each of the habitat types occurring in the study area were examined during the day and night. Survey during the day involved direct observation, lifting of likely objects under where animals may be sheltering and the identification of calls, scratchings diggings and scats. Spotlighting was carried out at night.

Three habitat types were identified on the basis of the vegetation survey:

- Open Woodland (Plant Communities 1, 2a, 2b)
- Open Forest (Plant Community 3)
- Open Shrubland (Plant Community 4)

Five mammal, ten reptile and amphibian and thirty five bird species were identified in the study area and are listed in Appendix D. All the species observed were quite numerous in the study area and none are presently listed as endangered on the revised Schedule 12 of the National Parks and Wildlife Act.

No attempt was made to survey bats although several were seen during the spotlighting and not identified.

Species listed in Schedule 12 which may occur in the Upper Blue Mountains are listed in Table 6.1.

There were only a few areas of rock outcrop in the study area and these were not considered to be extensive enough to provide habitat for either *Aprasia parapuchella* (Granite Worm Lizard), *Morelia spilota* (Diamond Python) or *Hoplocephalus bungaroides* (Broad Headed Snake).

No suitable habitat exists in the study area for the bird species listed in Table 3.1. These species favour either moist open forest or Casuarina woodland.

The Open Woodland and Open Forest habitats in the study area were considered unsuitable for

Table 6.1 **SPECIES OF ENDANGERED FAUNA WHICH MAY OCCUR IN THE UPPER BLUE MOUNTAINS**

SCIENTIFIC NAME	COMMON NAME	HABITAT
AMPHIBIANS		
Litoria aurea	Green and Golden Bell Frog	Ponds and swamps
REPTILES		
Eulampris leuraensis	Blue Mountains Skink	Heath and grass tussock areas fringed by open forest or woodland
Aprasia parapuchella	Granite Worm-Lizard	Rocky outcrops in open woodland, grassland or shrubland
Hoplocephalus bungaroides	Broad-headed Snake	Ridges and escarpments where sandstone outcropping is prominent
Morelia spilota	Diamond Python	Rainforest through to open woodland where there are rocky ravines or outcrops
BIRDS		
Calyptorhynchus lathami	Glossy Black Cockatoo	Casuarina woodland
Ninox strenua	Powerful Owl	Moist open forest
Tyto tenebricosa	Sooty Owl	Moist open forest
MAMMALS		
Petaurus australis	Yellow Bellied Glider	Moist open forest
Petaurus norfolcencis	Squirrel Glider	Open woodland and forest
Dasyurus maculatus	Tiger Quoll	Rainforest and open forest
Phascolartus cinereus	Koala	Open woodland and forest
Saccolaimus flaviventrus	Sheathtail Bat	Rainforest to woodland
Falsistrellus tasmaniensis	Great Pipistrelle	Open forest
Miniopterus schreibersii	Common Bent-Wing Bat	Wet and dry open forest
Myotis adversus	Large-Footed Bat	Open forest
Scoteanax ruepellii	Greater Broad-Nosed Bat	Rainforest and open forest

Koalas because of the absence of food trees (Lee and Martin 1988).

Dasyurus maculatus (Tiger Quoll) apparently occurs in the Katoomba area (Smith and Smith 1991). It tends to prefer moist gully areas and may occur in the Katoomba Creek gully.

Five bat species listed in Schedule 12 may occur in the Katoomba area. Two of these, *Saccolaimus flaviventrus* (Sheathtail Bat) and *Falsistrellus tasmaniensis* (Great Pipistrelle) utilise tree hollows for roosting (Strahan 1983) and may occur in the study area, however the number of tree hollows is limited and may not be adequate to support viable populations.

The two species of Glider listed in Table 6.1 may occur in the more mature forested sections of the study area, however as discussed above, there are relatively few tree hollows available to provide habitat.

6.6.2 Interactions with the Proposal

The areas which would be affected by the proposed development do not appear to contain any species of endangered fauna. The species which may be affected are relatively common. Although hollow-bearing trees may be removed during construction of the substation and transmission lines they are not considered a limiting resource in the region. The only arboreal marsupial recorded in the area was the Ringtail Possum (*Pseudocheirus peregrinus*) which is common and does not depend on hollows for a daytime retreat. Sugar Gliders (*Petaurus breviceps*) were not detected during this survey but are expected in the area. Other species of arboreal marsupial are unlikely to use the area due to a lack of suitable habitat.

Small bat species are highly mobile and can travel large distances from their roost areas (Lunney et al 1985, 1988). Two of the endangered bat species which might occur in the area would require tree hollows, the Great Pipistrelle (*Falsistrellus tasmaniensis*) and the Greater Broad Nosed Bat (*Scoteanax ruepellii*). The location of the works on the margins of habitats would not reduce access to adjacent areas with tree hollows.

The location of the transmission lines adjacent to existing disturbed areas would serve to limit the severence of existing habitats and wildlife corridors. The relocation of the substation access track and revegetation of the existing alignment would marginally increase the available habitat to ground dwelling small mammal species which would not cross a cleared area such as a track.

Some habitat loss to birds would occur as a result of clearing. In the context of available alternative habitat however, this is not considered significant.

6.7 BUSHFIRE

6.7.1 Existing Environment

Fire is a significant factor in the Upper Blue Mountains. The extensive bushland within and adjacent to Blue Mountains National Park provide extensive fuel for bushfires as well as continuous potential bushfire corridors.

Most of the fires in the local area are influenced by the hot, dry westerly winds of spring and summer. The combined effect of these winds, high summer temperatures and flammable sclerophyllous vegetation produce a fire prone environment.

Within the study area, the bushfire risk is greatest on steep north facing slopes, while the flatter areas on the plateau experience a lower bushfire risk. The presence of the cleared airfield area also reduces the bushfire risk on the plateau.

6.7.2 Interactions with the Proposal

The substation site is located at the top of a south facing slope and as such is not in one of the high bushfire risk areas. The continuous vegetation to the south, east and north of the substation site, does however present some level of risk. A 20m wide partially cleared area would be constructed around the substation to act as a buffer against any fires that do occur.

The transmission lines are also generally located away from high risk bushfire areas. The section of the proposed eastern 66kV transmission line on the southern side of the Katoomba Creek gully is however located in a relatively high risk area.

Transmission lines are likely to be significantly damaged by a bushfire if it is of high intensity and located in the tree crowns. The poles would be constructed of concrete, while the proposed insulators and conductors have extremely high melting points.

There is a slight chance that the transmission lines may cause a bushfire to start. In 1991, 1.67% of recorded bushfires in New South Wales were attributed to power lines (Department of Bushfire Services 1992). Fires caused by power lines (including transmission lines) normally occur if there is contact between two conductors and vegetation. The vegetation clearance requirements imposed by Prospect Electricity for the transmission lines as well as design measures to prevent conductor contact would make this event extremely unlikely.

The Emergency Services Coordinator of BMCC has raised no objection to the proposal on bushfire grounds, provided the transmission line poles are concrete and fire protection facilities are incorporated into the substation (Appendix B).

7

CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

7
CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

7.1 VISUAL CHARACTER

7.1.1 Existing Environment

Background

The assessment of the visual impact of the proposed development on the landscape of North Katoomba requires the analysis of a number of factors. These factors include:

- Visual Character of the Study Area
- Visual Character of the Proposed Development
- Visual Effect
- Visual Catchment
- Visual Use Areas
- Visual Sensitivity

These factors are combined to identify the level of visual impact of the proposed development would have on the existing landscape (Figure 7.1). Each of the factors and the sequence of combination are described below.

The *Visual Character of the Study Area* is defined in terms of the relationship between the landform, creek and drainage system, the vegetation and the types of land use occurring in the area.

The *Visual Character of the Proposed Development* is defined in terms of the physical form of the components of the proposed development.

The *Visual Character of the Study Area* is combined with the assessment of the *Visual Character of the Proposed Development* to produce a level of *Visual Effect*, which is the measure to which the proposed development would affect the visual character of the area.

The *Visual Catchment* of the study area, which is the area of landscape visible from any location, is defined by the relationship between landforms, creek and drainage systems, and vegetation.

The locations from which the study area is visible or the *Visual Use Areas*, are identified and defined in terms of the frequency of use as indicated by the number of people using the area. The type of the activities people undertake within the *Visual Use Areas* will vary in terms of their sensitivity to change. The sensitivity of activities occurring in the area is combined with the numbers of potential viewers to produce a level of *Visual Sensitivity* to change.

The Visual Impact is then measured by the combined effect of the *Visual Sensitivity* of the area and the *Visual Effect* of the proposed activities on the existing landscape character. Visual Impact is expressed in terms of high, moderate and low levels of impact.

The Visual Character of the Study Area is described below whilst the Visual Impact assessment components are described in section 7.1.2 Interactions with the Proposal.

Visual Character of the Study Area

The existing visual character of the study area comprises a combination of natural elements which includes hydrology, landform and vegetation, and various land use features. The visual environment or study area affected by the proposed activities is defined by a visual catchment which is determined by both landform and vegetation.

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CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

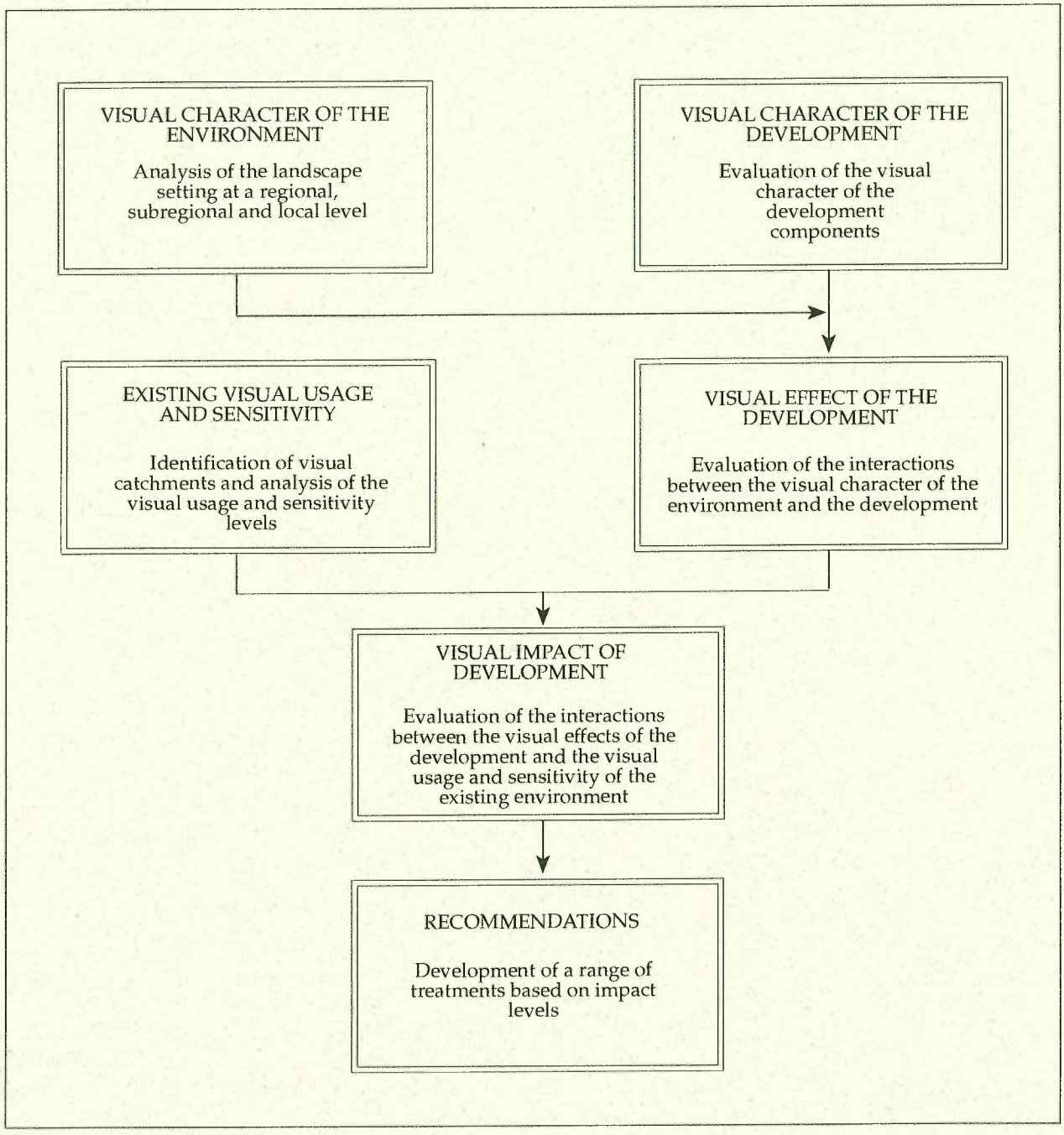

Figure 7.1
VISUAL ASSESSMENT METHOD

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CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

Hydrology
The visual character of the study area is primarily influenced by the two major creek systems which flow through the study area. Katoomba and Greaves Creeks run in a generally parallel and easterly direction before joining Govetts Creek which flows in a northerly direction. These creeks have dissected the plateau between Katoomba and Blackheath and have created two deep gorges with a narrow peninsula between them.

Landform
This peninsula forms a spur off the main ridge known as the Blue Mountains Range, originating at Medlow Bath and runs in an easterly direction to the escarpment at Carne Wall. Grand Canyon Road generally follows the ridgeline from Medlow Bath to Point Pilcher.

The visual character of the area can therefore be described as a deeply dissected plateau with sheer escarpments and rock outcrops increasing towards the east. The plateau is comparatively flat along the ridgeline whilst the side slopes which fall into the Creeks are steep and in some places sheer. The rugged character of the area is illustrated by the fact that the Creeks are up to 200m below the ridgeline and range in distance of only 300 to 1500m from the centreline of the ridge.

Vegetation
Vegetation patterns which are largely a result of the land use patterns, also influence the visual landscape character of the area. The vegetation patterns of the area are predominantly comprised of natural systems except in those areas where land use activities such as residential areas, roads, transmission lines and the Airfield, have changed the native vegetation patterns.

Land Use
The land use characteristics of the study area range from residential uses to nature conservation. The majority of the study area is retained in a natural state due largely to the steep and precipitous landforms and the presence of Blue Mountains National Park. The residential areas occur primarily around the northern, western and southern perimeters of the study area.

A large proportion of the area adjacent to the proposed substation site and line routes forms part of the Blue Mountains National Park. The remaining areas of natural bushland are either Crown land or privately owned. These natural bushland areas support a number of ancillary land uses such as roads and tracks which access lookouts, bushwalking trails, water storage facilities and the two transmission lines which traverse the area.

A prominent land use in the centre of the study area is the Katoomba Airfield which occupies the ridge adjacent to the substation site.

Landscape Character Types
The landform, vegetation and land use patterns form four broad visual landscape character types which are described below and illustrated in Figure 7.2 and Photos 1 to 4 are as follows:

- woodland
- sedgeland
- residential areas
- disturbed areas.

The *woodland* character type occupies the majority of the study area, occurring on the ridges, the slopes and the valley floors. This character type generally consists of an open woodland where the tree spacings and scattered shrub layer exclude all but the immediate foreground views

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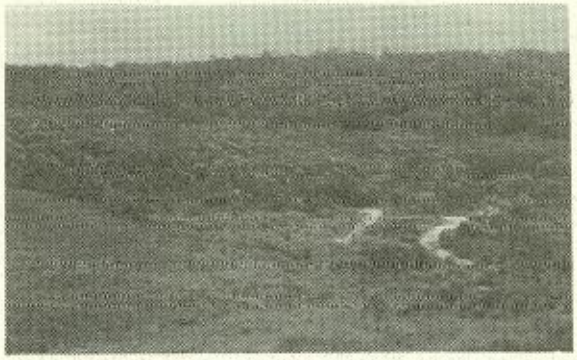
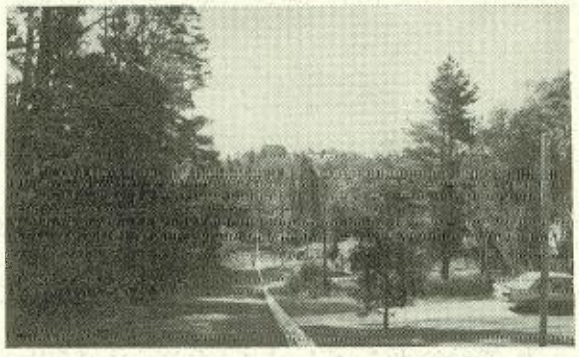
CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

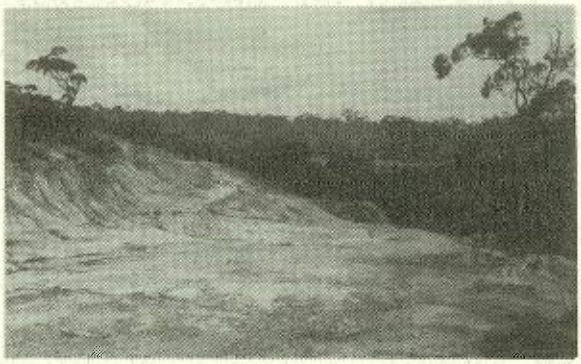
1. WOODLAND
Woodland, which occupies most of the study area, limits views to the immediate foreground due to the combined screening effect of mature trees, true seedling regrowth and shrubs.



2. SEDGELAND
Sedgeland areas occur in isolated pockets with the low vegetation providing unrestricted foreground, middleground and background views of the adjoining landscape



3. RESIDENTIAL AREAS
Residential areas occur around the perimeter of the study area and provide unrestricted foreground and restricted middleground and background views, usually along straight streets.



4. DISTURBED AREAS
Disutrbed areas occur throughout the study area in a range of forms including Katoomba Airfield, the quarry, roads and transmission line easements, all of which provide unrestricted foreground, middleground and backgorund views.

Photographs 1-4
LANDSCAPE CHARACTER TYPES

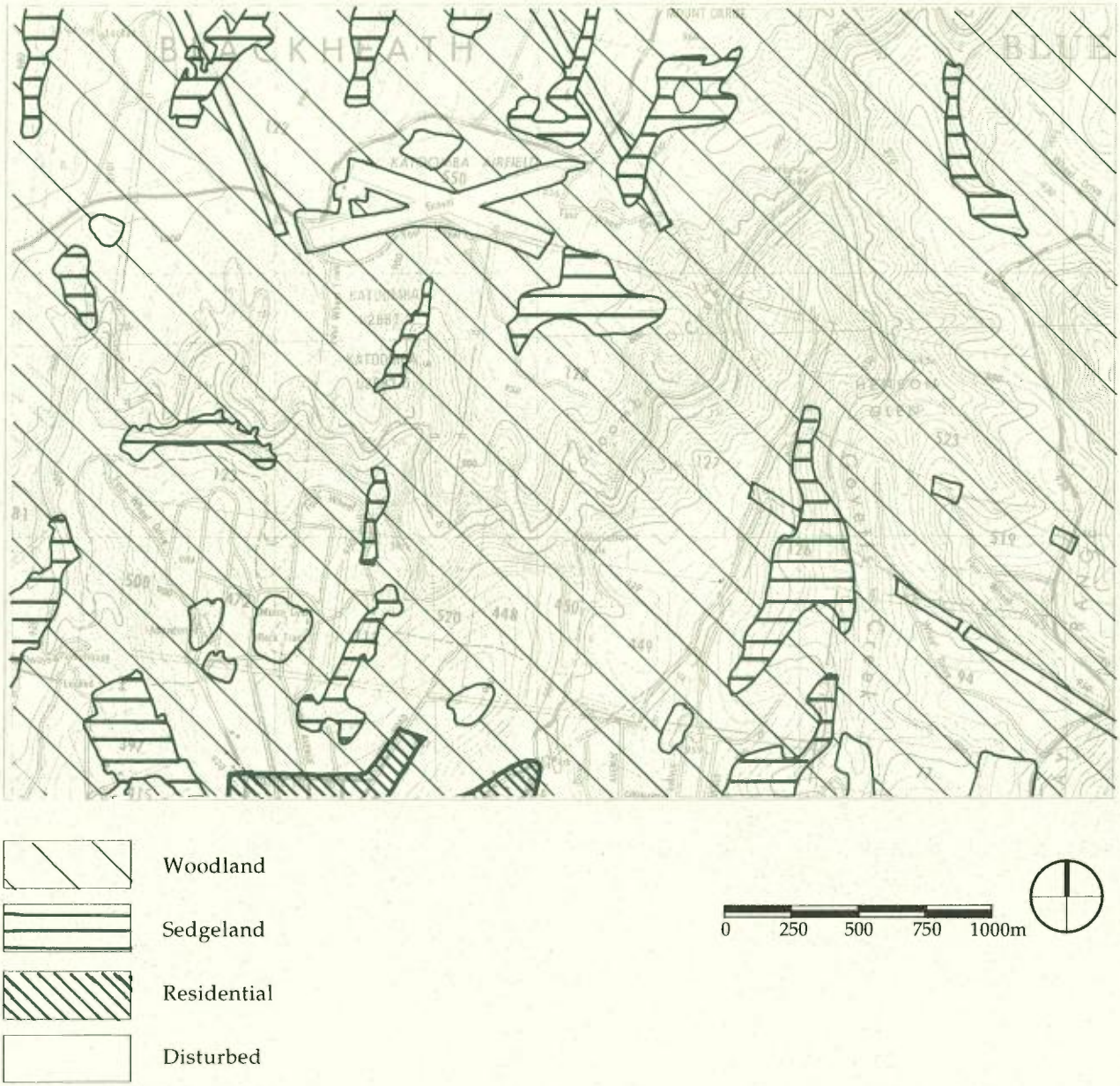


Figure 7.2
VISUAL CHARACTER

The *sedgeland* character type occurs in isolated pockets throughout the study area in the wet gully floors and the surrounding slopes. The low shrub vegetation in this character type provides views of the surrounding areas ranging from foreground to background.

The *residential areas* are located around the perimeter of the study area at distances of greater than 2km from the substation site These residential areas provide unrestricted foreground views and restricted middleground and background views, mostly along streets, of the surrounding areas.

The *disturbed areas* occur mostly on the ridgelines and some of the adjoining spurs. The largest area of disturbance in the vicinity of the substation site is the Airfield which is located on the ridgeline. The other disturbed areas include the various roads and tracks which are mostly located along ridges and spurs, and the two transmission lines which cross the ridge in a generally north-south direction. The open character of these disturbed areas provide opportunities for a range of foreground, middleground and background views depending on the degree of disturbance and the elevation.

7.1.2 Interactions with the Proposal

Visual Character of the Proposed Development

The two components of the proposed activities which have potential to produce a visual impact in the existing environment are the substation and the transmission lines.

The Substation

The substation which is described in detail in Section 5.2, would be sited within an 80m x 40m rectangular area, in a fenced compound. The wire mesh fence which would be 2.5m high, would be a black coated PVC material to reduce its visibility.

The switchyard structures would be constructed from galvanised steel which on ageing would have a low reflectivity level. The transformer would be painted grey, also having low reflectivity. The 132kV landing span (13m), lightning protector mast and the communication tower (both up to 20m) would be the tallest structures within the substation.

The control building would be located on the northern perimeter of the switchyard. The building walls would be constructed of split concrete blocks with a *Colorbond* galvanised iron roof. The wall and roof colours would be subtle earth tones with non-reflective surfaces.

The surface of the switchyard would be a layer of blue metal gravel, whilst the carpark and access road would be a crushed gravel sourced from a local quarry where possible, to achieve colour compatibility between the road surface and the existing soil colour.

Site clearing would be minimised to retain the screening effects of the existing vegetation.

The Transmission Lines

The three transmission lines associated with the proposed substation would be located within two easements.

One 66kV transmission line would run west of the substation, along the southern boundary of Katoomba Airfield, before turning south and west again to connect with the existing Blackheath to Katoomba 66kV transmission line.

The other 66kV transmission line from the substation and the 132kV line entering the substation would run parallel within a corridor to the

east. The lines would span a small gully at the eastern end of the Katoomba Airfield, before turning east and intersecting with the Wallerawang to Lawson 132kV transmission line. The 132kV line would terminate at a point on this existing transmission line, while the 66kV line would continue along the Lawson to Wallerawang corridor to the south eastern side of the Katoomba Creek gully. A connection would then be made with the existing Lawson to Katoomba 66kV transmission line to the south.

The poles would be constructed of steel reinforced concrete and range in height from 16m to 20m above the ground. The diameter of the poles at the base and the top would be approximately 61cm and 21cm respectively.

Visual Effect

The visual effect would be influenced by landform and vegetation within the areas adjacent to the substation and transmission lines. The visual effect is also assessed in terms of the extent of change resulting from the proposed activities which includes vegetation clearing and the various structures themselves.

The viewing angle in relation to transmission lines will influence the level of visual effect. For instance a right angle view of a line will mostly be screened and backdropped by the trees, however a view in line with the easement will produce a higher level of visual effect.

The elevation of the viewer will also influence the level of visual effect. Landform and vegetation would potentially screen structures if the viewing point is at an elevation lower than the structure, whereas at an elevation higher than the structure, the visual effect would potentially be greater.

The study area was assessed for visual effect based on the four Landscape Character Types described above. These types were ranked and scored according to their ability to screen or backdrop the proposed activity. The potential visual effect throughout the study area is depicted in Figure 7.3.

Woodland

The Woodland was ranked as moderate visual effect due to its ability to most effectively screen the substation and lines. When viewed from a distance, the open spacing of trees generally creates an uneven texture and a varied colour which has the potential to absorb structures without disturbing the overall landscape pattern.

Sedgeland

The lack of screen or backdrop vegetation in the sedgeland areas produces a high visual effect. The combination of the open character and the location of the these sedgelands in open gullies and the adjoining slopes creates a high level of exposure of any structures in these areas. The even texture and colour patterns which are common to these areas would contrast strongly with the new structures.

Residential Areas

Whilst residential areas generally have an open character, the combination of buildings, service infrastructure and trees in gardens create a diverse landscape. This diverse combination of natural and cultural elements enables electrical structures to be placed in these areas with moderate visual effects.

Disturbed Areas

The open nature of these disturbed areas produces a moderate visual effect. The irregular shapes of these areas combine with a variation of colours to create the potential for structures to have less contrast.

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CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

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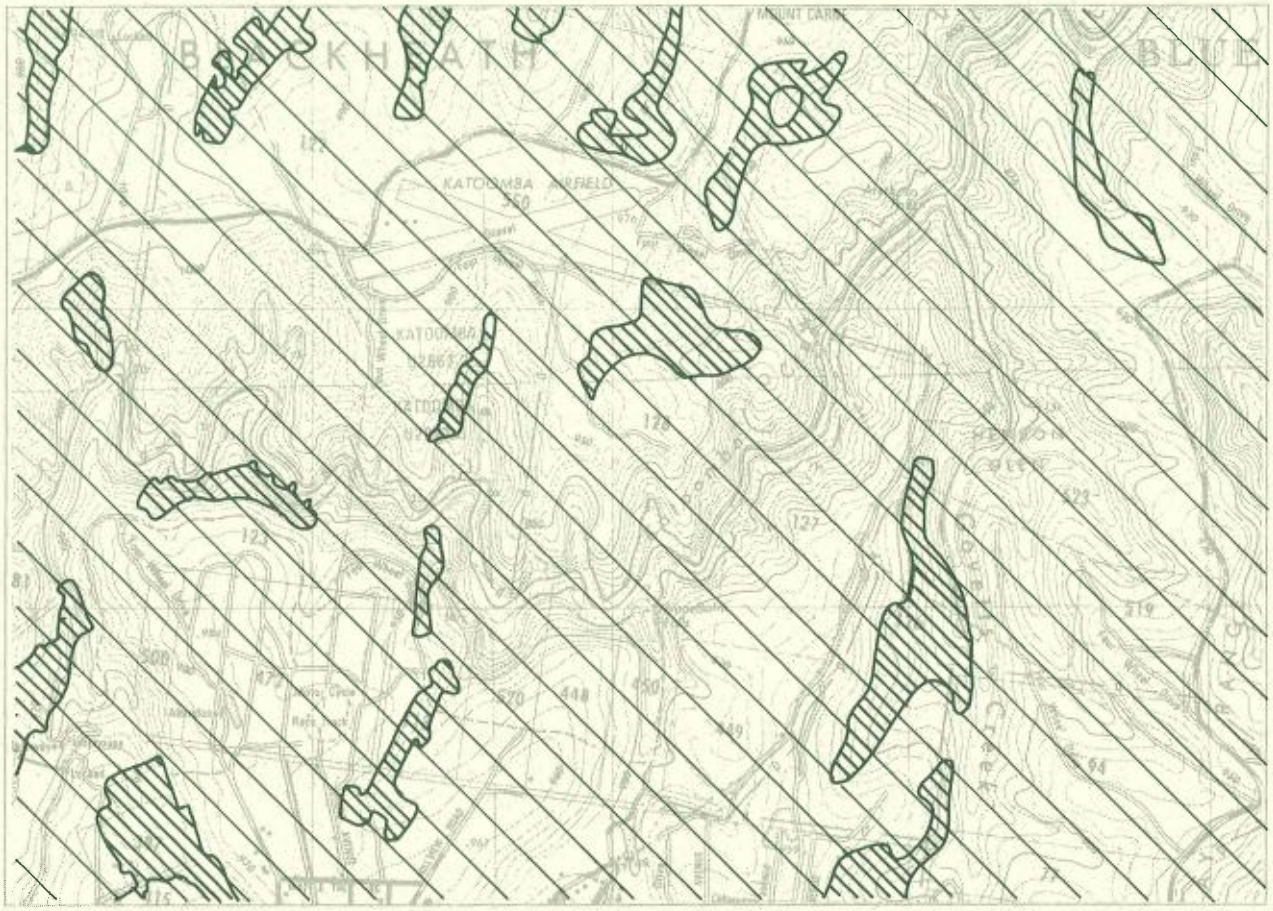
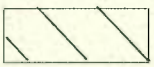
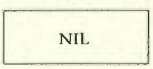


High



Moderate



Low

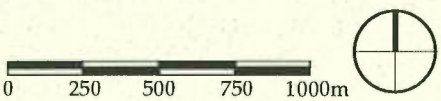


Figure 7.3
VISUAL EFFECT

Visual Catchment

The *Visual Catchment* of the study area, which is the area of the landscape visible from any location, is defined by the relationship between landforms, creek and drainage systems, and vegetation. The visual catchment of the study area can be divided into two levels: the regional catchment and the local catchment (Figure 7.4).

Regional Catchment

The regional catchment of the study area is formed by the ridge of the Blue Mountains Range, which is generally indicated by the Great Western Highway. Views of the area immediately adjacent to the proposed substation site and transmission routes are possible from locations north and east of this regional catchment boundary.

Local Catchment

A number of local catchments have been defined along the secondary ridgelines and spurs which originate from the Blue Mountains Range. These ridges define discrete areas from which views are often contained. Views of the area immediately adjacent to the proposed substation site and line routes are possible only from some of the ridges and higher slopes within these local catchments.

The extent to which the substation site and line routes are visible is dependent upon the presence of intervening landforms and vegetation. The substation site is not visible from locations within the regional and local catchment areas other than those immediately adjacent to the site, due primarily to intervening vegetation and to some extent, intervening landform.

The transmission lines would however be visible from a number of locations within the regional and local catchments. The lines and pole structures would be visible from foreground and middleground locations however from a background position only the vegetation clearing would be evident.

Visual Use Areas and Visual Sensitivity

Visual Use Areas are defined in terms of the extent and type of use which is likely to occur within these catchment areas. These visual use areas are illustrated in Figure 7.4. Visual Use Areas are defined in terms of primary, secondary and tertiary areas. Primary Use Areas have the highest levels of visual sensitivity, whilst Secondary Use Areas have moderate levels of sensitivity and Tertiary Use Areas have low levels of sensitivity.

Primary use areas are frequently used and include areas used by tourists such as town and village centres and main roads, the National Park walking trails and lookouts. As a result of the frequency and type of use, primary use areas are the most sensitive to any change in the visual character of the area.

Secondary use areas are either less frequently used or are less sensitive than primary use areas and include residential areas, local roads, parks and reserves. The lower levels of use and the type of activities in these secondary use areas makes these areas moderately sensitive to change in the visual character of the area.

Tertiary use areas are the least frequently used and comprise the balance of the land which is largely undeveloped Crown and private land.

The three visual sensitivity areas are illustrated in Figure 7.5.

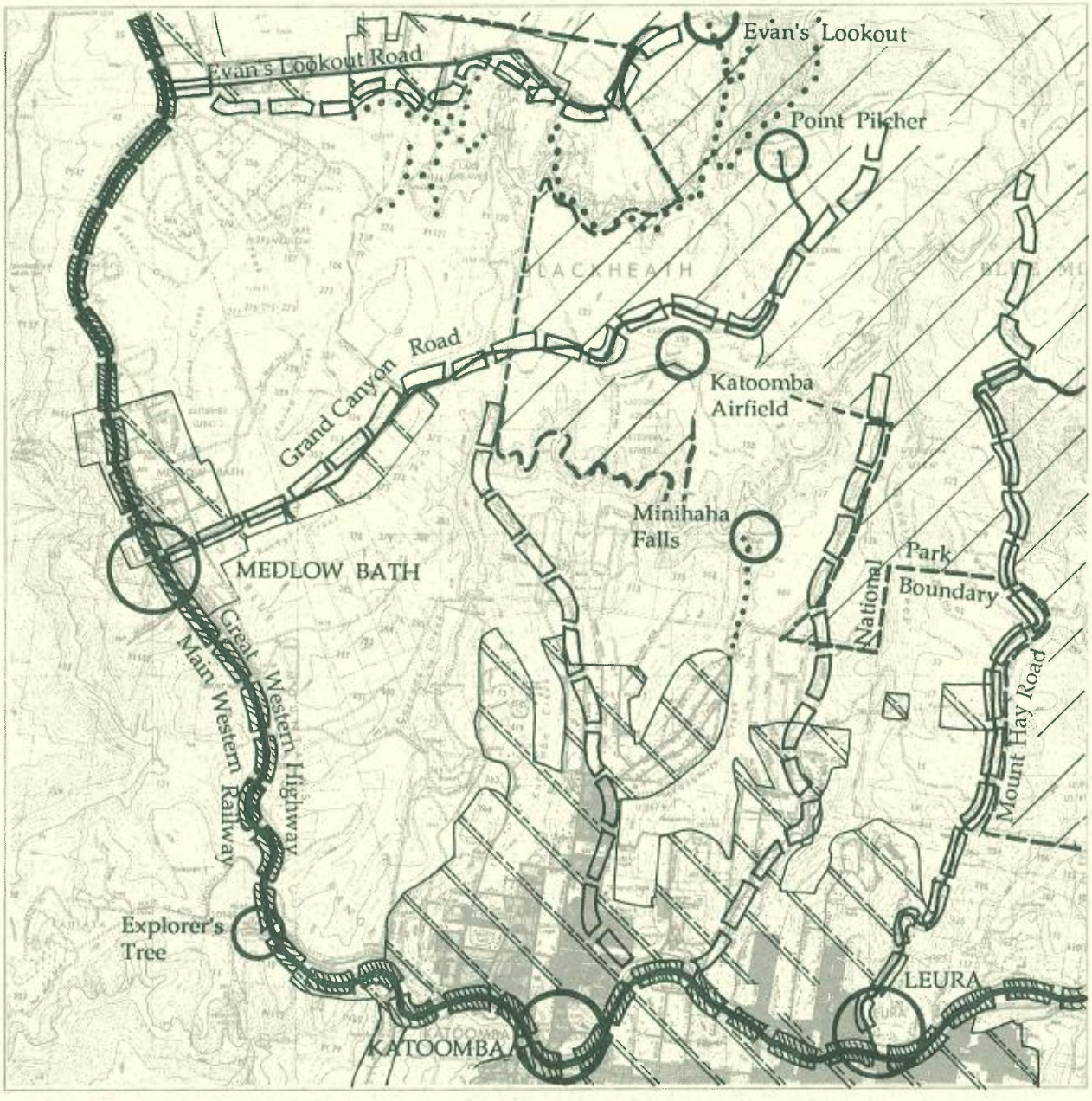


Figure 7.4
VISUAL CATCHMENTS AND USE AREAS

EDAW

7
CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

Figure 7.5
VISUAL SENSITIVITY

Visual Impact

Visual Impact is measured by combining the visual sensitivity and the visual effect and is expressed in terms of High, Moderate and Low Visual Impact.

A detailed description of the visual impacts of the proposed substation and transmission lines is presented below. The proposed substation site, access road and transmission line routes have been divided into six Evaluation Zones which are illustrated Figure 7.6 and in the following photographs (Photos 5 to 12).

Zone 1 Substation Site

The substation site is located in partially cleared woodland adjacent to the southern boundary of the Airfield, in the north eastern corner of a privately owned property.

Visual Effect

The visual effect of the substation would be moderate due to the presence of the surrounding woodland which would screen the components from all viewpoints except for the immediate foreground. From the foreground, the control building, fence and the electrical equipment such as the transformer, would form a dominant visual element in the immediate area.

Visual Sensitivity

The substation site is located in a Tertiary Use Area, a parcel of undeveloped privately owned land. The areas from which the site is visible include the edge of the Airfield to the north, the edge of the National Park to the west and the adjoining areas of the property to be purchased by Prospect Electricity, to the south and east.

Whilst the Airfield is used for scenic flights, the site is located adjacent to the secondary runway beyond a band of screening vegetation. Although partially screened by this existing vegetation, the cleared substation site would be visible to scenic flights as they approached the Airfield. At the time of writing, scenic flights were not occurring on a regular basis.

The nearest walking track within the National Park follows the old SRA transmission line route (Bruce's Walk) which traverses private property to cross Katoomba Creek to the south. This track is used on an irregular basis and is screened from the site by vegetation. The private property is undeveloped and has correspondingly low levels of use. The very low levels of usage of these areas produces a low visual sensitivity.

Visual Impact

The combination of moderate visual effect and low visual sensitivity of the uses in the area results in the substation having a low visual impact.

Visual Effect : Moderate
Visual Sensitivity : Low
VISUAL IMPACT : LOW

Zone 2 Two Transmission Lines East of Substation

The 132kV and 66kV transmission lines follow the Airfield boundary fence east of the substation and cross a section of National Park to connect into the existing 132kV transmission line easement. The route traverses partially cleared bush adjacent to the Airfield boundary and subsequently follows an access track through the National Park to the 132kV easement.

Visual Effect

The visual effect of the transmission lines through this Zone would be moderate due to the woodland which would screen the cleared easement and the transmission lines from most angles of

ZONE 1 SUBSTATION SITE
The substation site which is located in partially cleared woodland would be effectively screened by the adjoining woodland.

ZONE 2 TWO TRANSMISSION LINES EAST OF THE SUBSTATION
The 132kV and one 66kV transmission lines would follow the partially cleared airfield boundary in a south easterly direction to the existing 132kV tower line.

ZONE 2 TWO TRANSMISSION LINES EAST OF THE SUBSTATION
The 132kV and 66kV transmission lines traverse the National Park between the airfield and the existing 132kV transmssion line. The 132kV line connects to the nearest tower in the photograph whilst the 66kV line turns south adjacent to the 132kV easement.

ZONE 3 SINGLE TRANSMISSION LINE OVER KATOOMBA CREEK
The eastern 66kV transmission line crosses Katoomba Creek in a gully span parallel to the 132kV line, on the left side of the photograph.

Photographs 5-8
VISUAL EVALUATION ZONES

ZONE 4 TRANSMISSION LINE EAST OF KATOOMBA CREEK
The eastern 66kV transmission line follows the approximate alignment of the existing track to connect into the existing 66kV transmission line.

ZONE 5 TRANSMISSION LINE WEST OF THE SUBSTATION TO BLACKHEATH
The 66kV transmission line route to Blackheath follows the airfield and the National Park boundary along the existing cleared fenceline.

ZONE 6 ACCESS ROAD TO THE SUBSTATION
Grand Canyon Road provides access to Katoomba Airfield, Point Pilcher and the access track to the substation site.

ZONE 6 ACCESS TRACK TO THE SUBSTATION
The existing access track to the substation site would be realigned along the boundary between the airfield and the National Park to minimise effects on the Park.

Photographs 9-12
VISUAL EVALUATION ZONES

7
CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

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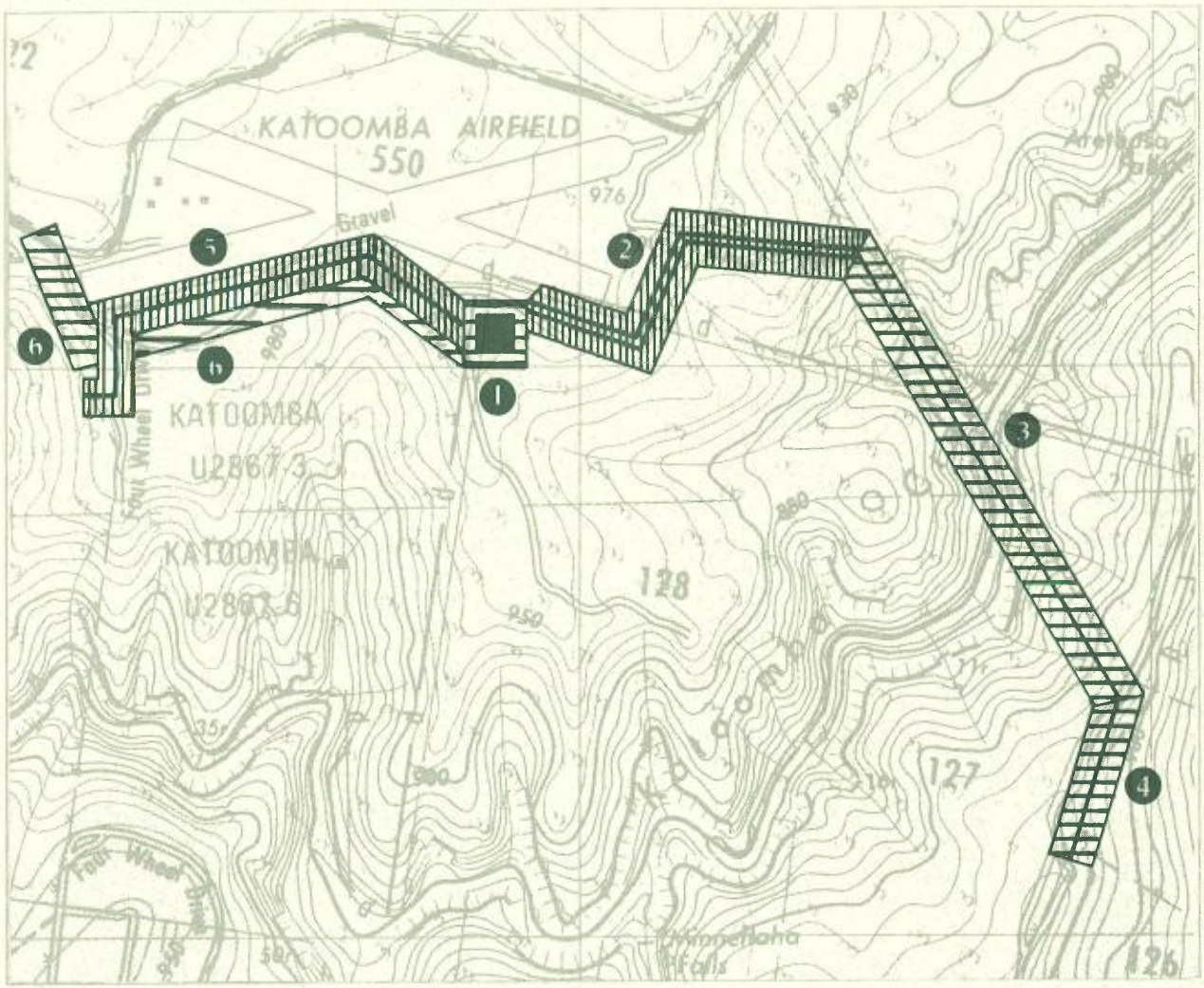

NIL — High

Moderate

Low

0 100 200 300 400 500m

Figure 7.6
VISUAL IMPACT

view. Views along the easement however, would create the greatest effect, particularly where it crosses the ridge at the eastern edge of the Airfield. Potentially, the clearing of vegetation for the lines would have the greatest visual effect, particularly from middleground and background view points, however the lines would have an equally dominant visual effect from foreground viewpoints.

Visual Sensitivity
The line route is located in both Primary and Tertiary Use Areas, being undeveloped private land, Crown land within the Airfield and the National Park. The line route would potentially be visible from the Airfield, elevated parts of North Katoomba and Mount Hay Road.

The lines would potentially be visible from the part of the Airfield, particularly at the end of the secondary runway where a gully span crosses up to the ridge on the eastern boundary. Although partially screened by existing vegetation, the cleared easement would be visible to scenic flights as they approach the Airfield.

The clearing for the easement where it crosses the ridge, may be visible from elevated parts of North Katoomba such as the hill near the corner of Barton and Oxley Streets and the ridge at Woodlands Road near the Cemetery. These viewpoints are at distances of greater than 3km from the proposed line route.

The line route through the National Park may be visible from a section of Mount Hay Road which is due east of the Airfield, at a point where the road curves sharply to the east on the summit of a small hill. The line route is 1.2km from the road and the existing vegetation would affect the visibility of the line from this viewpoint.

Despite the distances separating many of these viewpoints from the line route, visual sensitivity along this section of the line route would be moderate due to the elevated ridge position of part of the line route.

Visual Impact
The combination of a moderate visual effect and moderate visual sensitivity results in the two transmission lines having a moderate visual impact on the area.

Visual Effect :	**Moderate**
Visual Sensitivity :	**Moderate**
VISUAL IMPACT :	**MODERATE**

Zone 3 Single Transmission Line Over Katoomba Creek

The 66kV transmission line parallels the existing 132kV transmission line in a long gully span over Katoomba Creek.

Visual Effect
The gully span across Katoomba Creek would produce a low visual effect resulting from the placement of three poles at each end of the gully span between the woodland and the existing 132kV easement. Clearing of woodland would be required to widen the easement. The conductors which would be strung across the valley would parallel the existing 132kV conductors.

Potentially, the clearing of vegetation for the lines would have the greatest visual effect, particularly from foreground and middleground view points, however the poles and conductors would have a less dominant visual effect. The presence of the existing 132kV tower line adjacent to the proposed line, would moderate the visual effect of the line which would have a greater effect if it traversed undisturbed woodland.

Visual Sensitivity
The line route is located in a Primary Use Area, being National Park. The line route would potentially be visible from a section of Mount Hay Road, the track to Point Pilcher and walking tracks at the end of Minni-Ha-Ha Road.

The line route may be visible from sections of Mount Hay Road. The line route is between 0.9km and 1.2km from the road and the existing vegetation would affect the visibility of the line from these potential viewpoints. A view along the existing 132kV easement from Mount Hay Road, northwest towards Katoomba Creek, would potentially provide a view of the three poles, which would be approximately 1.2km distant.

The line would be visible from the track to Point Pilcher where the lines connect into the existing 132kV easement, at a distance of approximately 400m. The clearing for the line would potentially be the most visible effect from this relatively low use track, although the three poles may be clearly visible.

A number of tracks at the end of Minni-Ha-Ha Road provide access for bushwalkers following the disused SRA easement (Bruce's Walk). This area has relatively low usage however the poles and potentially the conductors may be visible from some viewpoints.

The cleared easement and the three poles at each end of the gully span would potentially be visible to scenic flights as they pass over the area on approach to the Airfield.

The relatively low levels of use, the presence of the existing 132kV gully span and the distances separating many of these viewpoints from the line route results in moderate visual sensitivity along this section of the line route.

Visual Impact
The combination of a low visual effect and moderate visual sensitivity results in the transmission line having a low visual impact on the area.

Visual Effect : **Low**
Visual Sensitivity : **Moderate**
VISUAL IMPACT : **LOW**

Zone 4 Transmission Line East of Katoomba Creek

The 66kV transmission line follows approximately the alignment of an existing access track between the existing 132kV line and the existing 66kV line near the end of Minni-Ha-Ha Road. The route is located just outside the National Park boundary. The route traverses partially cleared bush adjacent to the track and intact bushland where the track deviates from the straight line.

Visual Effect
The visual effect of the transmission line through this Zone would be moderate due to the woodland which would screen the cleared easement and the transmission line from most angles of view. Views directly along the easement however, would create the greatest effect, particularly when viewed along the track. The clearing of vegetation for the lines would have the greatest visual effect, particularly from middleground and background view points, however the lines would have an equally dominant visual effect from foreground viewpoints.

Visual Sensitivity
The line route is located in Tertiary Use Areas, being undeveloped private and Crown land although it is adjacent to a Primary Use Area, the National Park. The line route would potentially be visible from foreground views only, as the route follows the spur in a southeasterly direction. Vegetation and landform would screen the route from most viewpoints in the area.

The lines would be visible from the track which continues from the end of Minni-Ha-Ha Road which is used occasionally by bushwalkers to access Bruce's Walk and potentially other tracks in the vicinity.

Although partially screened by existing vegetation, the cleared easement would be visible to scenic flights as they pass over the area on approach to the Airfield.

The visual sensitivity along this section of the line route would be low due to the low numbers of potential viewers who would see the line and the few viewpoints from which it could be seen.

Visual Impact
The combination of a moderate visual effect and low visual sensitivity results in the transmission line having a low visual impact on the area.

Visual Effect : **Moderate**
Visual Sensitivity : **Low**
VISUAL IMPACT : **LOW**

Zone 5 Transmission Line West of Substation

The 66kV transmission line follows the Airfield boundary fence west of the substation crossing a section of National Park to connect into the existing 66kV transmission line. The route traverses partially cleared bush adjacent to the Airfield boundary and subsequently crosses an access track through the National Park to reach the 66kV easement.

Visual Effect
The visual effect of the transmission lines through this Zone would be moderate due to the woodland which would screen the cleared easement and the transmission lines from most angles of view. Views along the easement however, would create the greatest effect, particularly where it crosses the edge of the ridge near the western edge of the Airfield, where it connects into the existing line. Potentially, the clearing of vegetation for the lines would have the greatest visual effect, particularly from middleground and background view points, however the lines would have an equally dominant visual effect from foreground viewpoints.

Visual Sensitivity
The line route is located in both Primary and Tertiary Use Areas, being the National Park and undeveloped private land at the edge of the substation. The line route would potentially be visible from the Airfield and elevated parts of Katoomba and the Great Western Highway.

The lines would be partially visible from the western end of the main runway through existing trees inside the Airfield boundary. Although partially screened by existing vegetation, the cleared easement would be visible to scenic flights as they approach the Airfield.

The clearing for the easement where it crosses the ridge near the existing 66kV line, may be visible from elevated parts of Katoomba such as the hill near the centre of the town. This viewpoint is at a distance of greater than 4.5km from the proposed line route. Views from elevated parts of the Great Western Highway would be possible, such as from the area around the Explorer's Tree where the viewer would look down the Cascade Creek valley across to the Airfield ridge. These viewpoints range from 3.5 to 4.5km from the proposed alignment.

The line route through the National Park would be visible from the tracks which provide access to the existing line and Bruce's Walk. The realignment of the track along the proposed line route would expose walkers to this section of the line before the track turns south towards Katoomba Creek.

Despite the distances separating many of these viewpoints from the line route, visual sensitivity along this section of the line route would be moderate due to the elevated ridge position of part of the line route and its exposure to any bushwalkers following Bruce's Walk.

Visual Impact
The combination of a moderate visual effect and moderate visual sensitivity results in the transmission line having a moderate visual impact on the area.

Visual Effect : **Moderate**
Visual Sensitivity : **Moderate**
VISUAL IMPACT : **MODERATE**

Zone 6 Access Road to the Substation

Access to the substation would follow the existing access track along the Airfield western boundary fence from Grand Canyon Road. The road would then follow the proposed 66kV line route along the southern boundary of the Airfield to the substation. The route traverses partially cleared bush adjacent to the Airfield boundary through the National Park to the substation.

Visual Effect
The visual effect of the access road through this Zone would be low due to the presence of the existing track and the woodland which would screen the new section of the alignment from most angles of view, except for immediate foreground views.

Visual Sensitivity
The access road is located in both Primary and Tertiary Use Areas, being the National Park and undeveloped private land at the substation. The road would be visible from the areas of National Park adjacent to the road, the Airfield, the intersection with Grand Canyon Road and potentially elevated parts of Katoomba and the Great Western Highway.

The road through the National Park would be visible from a range of immediate foreground positions adjacent to the road, although existing vegetation would obscure much of the road from greater distances.

The lines would potentially be visible from the part of the Airfield, particularly at the western end of the main runway along the western boundary. Although partially screened by existing vegetation, the road would be visible to scenic flights as they approach the Airfield.

The upgraded section of the existing track where it follows the western edge of the Airfield, would be visible from the intersection with Grand Canyon Road, however existing roadside vegetation would screen much of the road from view.

The upgraded section of the existing track where it crosses the ridge at the western edge of the Airfield, may be visible from elevated parts of Katoomba and the Great Western Highway, however the distances of greater than 3.5km from the road.

The visual sensitivity of the access road would be low due to the relatively low numbers of viewers and the presence of the existing track and screening vegetation.

Visual Impact
The combination of a low visual effect and moderate visual sensitivity results in the upgraded access road having a low visual impact on the area.

Visual Effect : **Low**
Visual Sensitivity : **Moderate**
VISUAL IMPACT : **LOW**

Visual Impact Summary

The construction of the substation, transmission lines and access road in the woodland setting has the potential to create moderate to high levels of visual effect, however the screening effects of the adjoining areas of woodland reduced the overall visual effect to moderate and low levels, depending on the location of the structures and the viewer.

The low numbers of potential viewers of the proposed activities, and in some cases the distance of these viewers, results in a generally low level of sensitivity. However the high sensitivity of National Park users, albeit in relatively small numbers, raised the visual sensitivity to moderate levels in those areas.

Due to the generally remote location of the substation and the associated transmission lines and the presence of extensive woodland areas adjacent to these locations, the overall visual impact of the proposed activities would be moderate to low.

7.2 ABORIGINAL SIGNIFICANCE

7.2.1 Existing Environment

A reconnaissance survey for Aboriginal sites was undertaken by archaeologists Helen Brayshaw and Josephine McDonald with the assistance of Tony Condek from the Dharuk Aboriginal Land Council on 26 October 1992.

Context

The National Parks and Wildlife Service site register indicates that no archaeological sites are known in the vicinity of the study area. Previous surveys by Macintyre (1989) and Steel (1991) of alternative substation sites and transmission line routes both resulted in no archaeological sites being found.

A similar result was obtained by an investigation of an area in Greaves Creek, only 1km north of the Katoomba Airfield (Brayshaw 1990). However, upstream on Greaves Creek is Walls Cave (NPWS site #45-4-7), a shelter site with archaeological deposit. This excavated shelter site on Greaves Creek and another at Lyrebird Dell near Leura have provided evidence by radiocarbon dating that the eastern Blue Mountains were occupied over 12,000 years ago (Stockton 1970, Stockton and Holland 1974). Later occupation appears to have been discontinuous until a more intensive phase about 3,000 years ago (Bowdler 1983).

Archaeological site density in this area of the Blue Mountains is low. Many other surveys have been carried out, most with negative results. Site types encountered in the region include open occupation sites, rock engravings, axe grinding grooves, shelter sites with rock art and stone arrangements, and there is also a natural site with mythological significance. A recent survey (by Attenbrow) of Catalina Park, Katoomba in a broad valley with outcropping sandstone, revealed an open campsite, an isolated

find, an axe grinding groove and a small shelter with deposit. These are sites which have not yet been added to the NPWS site register (Sullivan 1992).

According to Mcintyre's (1990) model of occupation in the Blue Mountains, access to the major valleys would have been via the headwaters of broad valleys, gullies and cliffs. The ridge on which the substation is proposed does not provide access to plateau areas further west nor to areas below the cliff line. There would therefore have been very little reason for occupation of side ridges, and the expectation of sites occurring in the study area is low.

Field Survey
No evidence of Aboriginal occupation was encountered. Along the proposed transmission line routes visibility was sufficient, either on the routes themselves or on existing tracks which weave across them, to indicate that the absence of cultural material was real. Within the substation area visibility was generally low, however there was no focus for occupation in the area and exposures in the vicinity were all culturally sterile. Isolated stone artefacts can occur anywhere, but it was concluded that there was very little likelihood of significant Aboriginal cultural material being present in the area.

However, the Yosemite Gully and Minnihaha Falls adjacent to the site area is of considerable significance to the Aboriginal community. Information provided by Tony Condek noted that the area is known to the Aboriginal people as a women's area and is archaeologically sensitive.

7.2.2 Interactions with the Proposal

As no artefacts of Aboriginal significance have been identified on the substation site or proposed transmission line routes, it is unlikely that the proposal will impact upon the Aboriginal culture of the area. Neither the substation or transmission lines would be visible from Minnihaha Falls, which have been identified as an important Aboriginal women's area.

Construction staff would be briefed on identification of Aboriginal artefacts. If any are found during construction, the NPWS would be immediately advised.

7.3 EUROPEAN HERITAGE

7.3.1 Existing Environment

The Blue Mountains National Park is listed by the Australian Heritage Commission on the National Estate Register.

No sites as listed by the Heritage Council of NSW or BMCC occur on or within close proximity to the site. Two unclassified items of potential European heritage value do occur in the study area.

The first is a section of Bruce's Walk, which was a bushwalk between Blackheath and Lawson established along a now disused SRA transmission line easement in the 1920s. The section within the study area runs in a straight line between the western boundary of the Airfield and Minnihaha Falls. The walk has become largely overgrown since the SRA transmission line was removed some years ago.

The second item is the ruin of a stone and mud brick cottage approximately 30m to the east of the substation site.

7.3.2 Interactions with the Proposal

The original alignment of Bruce's Walk is located away from the proposal and would not be affected. Opportunities exist however for the walk to be re-established along the realigned and improved substation and transmission line access tracks.

The ruins near the substation site would not be affected by the proposal.

The impacts on the values of Blue Mountains National Park are discussed in Section 7.4.2.

7.4 LAND USE AND ZONING

7.4.1 Existing Environment

The substation site although on private land, is located within bushland and not used for any commercial purpose. The eastern transmission line corridor crosses both private land and Blue Mountains National Park, while the western transmission line corridor is almost entirely within the Park except for the final few metres to the substation. Land ownership is shown in Figure 7.7 and current zonings in Figure 7.8.

Katoomba Airfield is situated immediately to the north of the substation site and transmission line corridors. This airfield is privately leased from the Department of Conservation and Land Management and is primarily used for scenic flights. Regular scenic flights have temporarily ceased, however until recently two scenic flight companies operate from the airfield, one using fixed wing aircraft and one using a helicopter. Fixed wing aircraft movements were between 75 and 100 per month, while helicopter movements were approximately 90 per month. It is uncertain at the time of writing as to whether this amount of aircraft traffic will resume at the airfield.

The nearest urban development is Medlow Bath which is located 3km to the west of the substation site, while Katoomba is immediately to the south and Blackheath is located 5km to the north west.

Service infrastructure in the immediate vicinity of the substation site and proposed transmission line corridors primarily consists of existing Prospect Electricity transmission lines. A double circuit, steel tower 132kV transmission line runs to the east of the substation in a north west to south easterly direction; while a 66kV wood pole transmission line located immediately to the west of the airfield runs south to north.

Under the Blue Mountains Local Environment Plan 1991, the proposed substation site is zoned *Bushland Conservation*. The eastern transmission line corridor traverses Bushland Conservation, Environmental Protection and National Park zonings; while the western transmission line corridor is almost entirely within the National Park zoning which corresponds with the boundaries of Blue Mountains National Park. The objectives of each of the zones are listed below.

Bushland Conservation

(a) to conserve the natural bushland character of the landscape surrounding the existing urban areas of the city and minimise the visual impact of the development on the landscape, particularly when viewed from the Blue Mountains National Park.

7
CULTURAL ENVIRONMENT AND INTERACTIONS WITH THE PROPOSAL

Base Map reproduced with the permission of the Central Mapping Authority

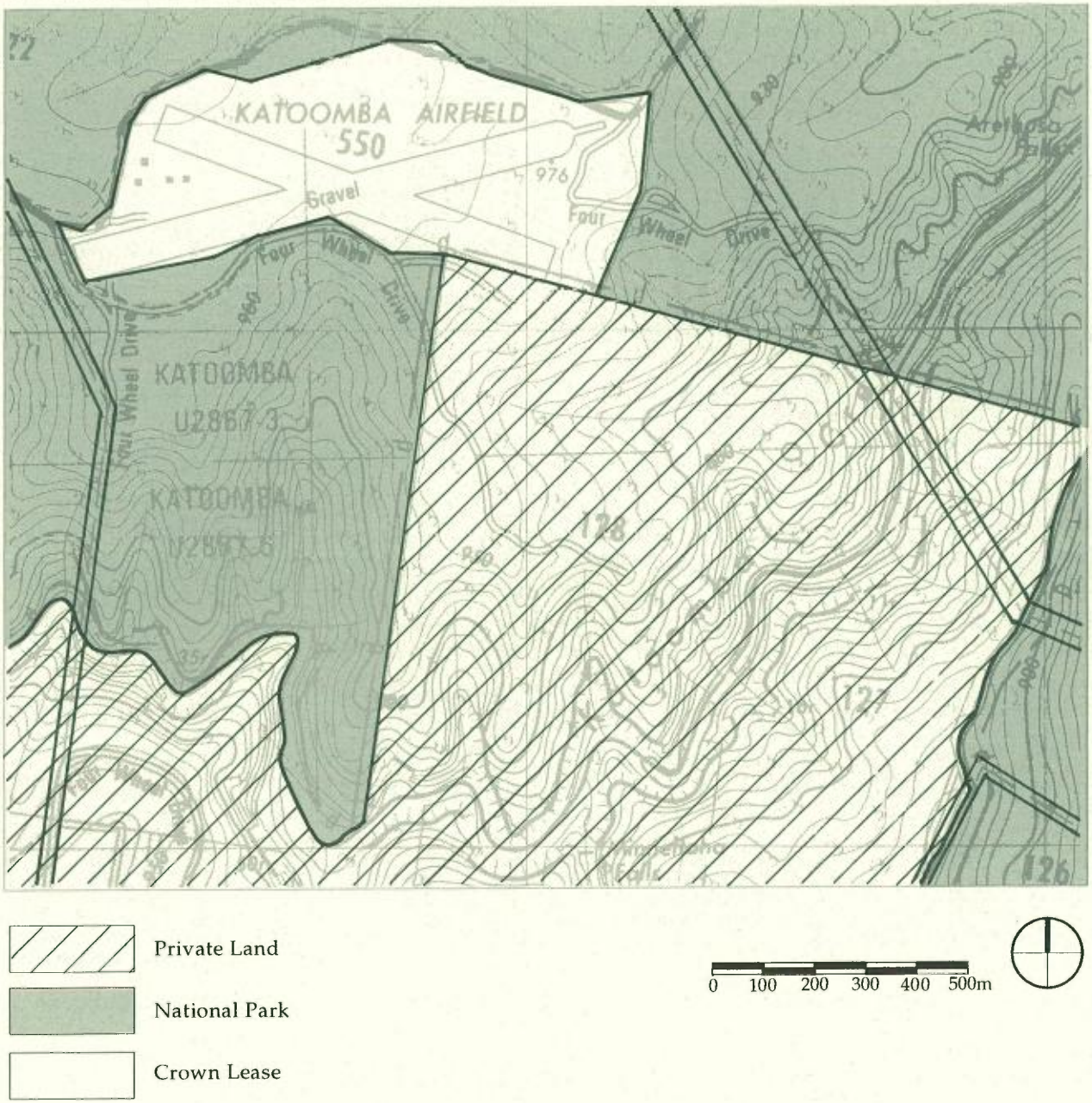

Figure 7.7
LAND OWNERSHIP

Base Map reproduced with the permission of the Central Mapping Authority

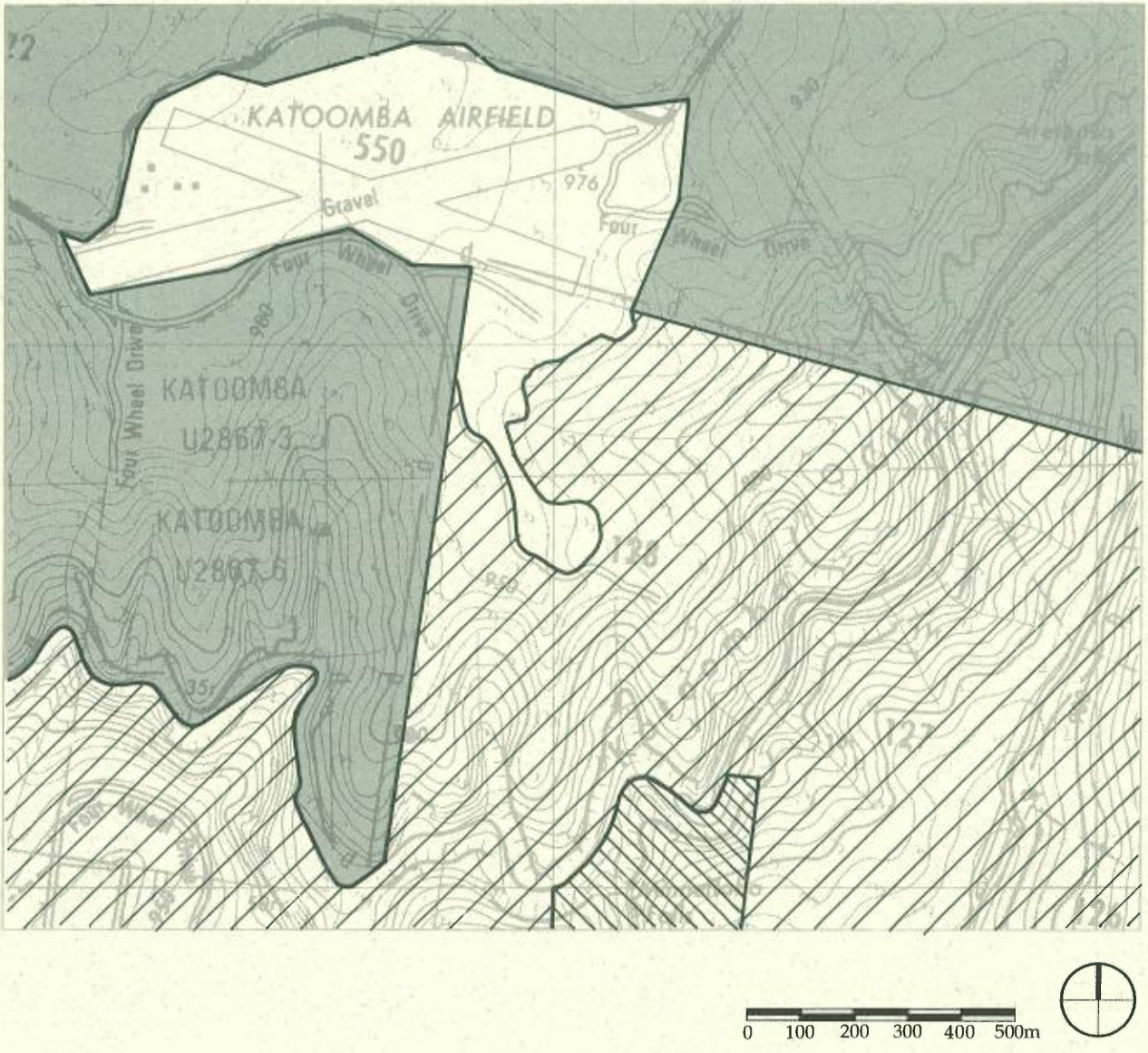

Figure 7.8
ZONING

(b) To protect the natural bushland buffer zones between towns, to avoid ribbon development and to conserve and enhance the views and vistas of natural bushland obtained from the Great Western Highway and the Great Western Railway, public places, lookouts and areas within the Blue Mountains National Park.

(c) To ensure that the form and siting of buildings, colours, landscaping and building materials are appropriate for, and harmonise with, the bushland character of the areas.

(d) To provide only for development that utilises and retains the natural bushland on the site as an important feature of the development.

(e) To ensure that development in bushfire prone areas is carried out so that effective bushfire management can be implemented within the property boundaries with appropriate environmental controls.

(f) To encourage landscaping and regeneration of natural bushland areas with sparse tree cover.

Environmental Protection

(a) To protect environmentally sensitive land and areas of high scenic value in the city from development.

(b) To provide a buffer around areas of natural ecological significance.

(c) To restrict development on land that is inappropriate by reason of physical characteristics or high bushfire hazard.

(d) To encourage the restoration of disturbed bushland areas.

National Park

(a) To maintain the spectacular natural environment of the Blue Mountains.

(b) To facilitate the management of the Blue Mountains National Park in accordance with the National Parks and Wildlife Act 1974 and the Blue Mountains National Park Plan of Management.

The substation component of the development requires a Development Application be submitted to Blue Mountains City Council. Transmission lines on the other hand, are exempt from the requirement for Development Consent under State Environmental Planning Policy (SEPP) 4, provided they are not *Prohibited Development* and are therefore not directly affected by the Local Environment Plan.

7.4.2 Interactions with the Proposal

The substation site and transmission line routes would not be subject to land use impacts given that no human uses presently occur on this land.

The purchase of the entire allotment of Portion 128 DP 751627 by Prospect Electricity and the return of the unused part of this land to either the NPWS or BMCC would enable the recreational use of this land to be extended.

The ecological significance and sensitivity of parts of the land (particularly the Hanging Swamp or Sedgeland areas) would require careful management, however there are a number of opportunities for low intensity recreational use, such as bushwalking. The section of Bruce's Walk within the property may be re-established

and connected with other existing tracks running through the property. Alternatively it may be deemed appropriate by the managing authority to establish additional walking tracks.

The use of the adjacent Katoomba Airfield would not change as a result of the proposal. Two of the proposed transmission lines would run perpendicular to the airfield's secondary runway, however the height of the poles and conductors would be well beneath standard Civil Aviation Authority requirements, as well as being below the existing tree line. The secondary runway is in relatively poor condition and is rarely used.

Impact on Blue Mountains National Park

Priority has been given in the planning of this proposal to the minimisation of impacts on Blue Mountains National Park. The preferred substation site, as identified by the community based Project Consultative Committee was arrived at after the consideration of a number of alternatives (all of which impacted upon the Park) and was seen as the one which best met the objective of minimising environmental impacts.

The proposed transmission lines would however require the following easements through Blue Mountains National Park. The easement lengths are approximate, pending detailed design.

- 650m of 18m wide easement for the 66kV transmission line west of the substation
- 500m of 41.5m easement for the 66kV and 132kV transmission lines east of the substation
- Widening of the existing Wallerawang to Lawson 132kV transmission line easement by 15m to accommodate the proposed eastern 66kV transmission line.
- 200m of 18m wide easement adjacent to Minni-Ha-Ha Road for the eastern 66kV transmission line.

Transmission lines are regarded by the NPWS as being *Alien Tenure*, that is an activity that does not necessarily meet or support the primary management objectives of the NPWS and is for the purpose of facilitating other interests.

Under Section 153 of the National Parks and Wildlife Act 1974, the Minister is empowered to grant an easement for the *erection of standards, posts, wires and appliances for the conveyance and transmission of electricity*. An easement may be granted under any condition deemed fit. NPWS policy states that transmission lines are not an appropriate use in National Parks but acknowledges that in some cases there may be an overwhelming case in favour of such developments.

The inadequacies of the Upper Blue Mountains Electricity Supply (as detailed in Section 3) have been apparent for some years and many alternatives have been considered. The process for the selection of the preferred substation site has been extremely proactive, with the community, BMCC and NPWS participating (see Sections 2 and 4).

It was established at an early stage that a new transmission substation in the North Katoomba area was the best solution to the electricity needs of the Upper Blue Mountains. All the sites considered in the area involved the traversing of Blue Mountains National Park by transmission lines.

The preferred site for the substation is one that would minimise the length of transmission line running through the Park and ensuring that the sections of transmission line that did run through the Park were either along the Park boundary, or

within disturbed areas (such as parallel to the existing Wallerawang to Lawson 132kV transmission line).

The eastern transmission corridor runs within what is proposed to be Prospect Electricity owned land, then within the Katoomba Airfield property, before entering Blue Mountains National Park. From this point it largely follows an existing track to the existing 132kV tower line (although this track would need to be realigned). On the southern side of the Katoomba Creek Gully the transmission line would, as far as possible follow the alignment of Minni-Ha-Ha Road, before terminating.

The western transmission line corridor runs along the Park's boundary with Katoomba Airfield for the majority of its length, before approximately following existing tracks to the termination point. It is proposed to realign the existing access track (revegetating the old alignment) to be adjacent to the airfield boundary in order that the impacts on the Park may be further minimised.

While it is acknowledged that the construction of a transmission line is not necessarily consistent with the dedication of Blue Mountains National Park, the proposed transmission line route have been developed in such a way that impacts on either the ecological or cultural values of the Park are minimal. It should also be noted that opportunities exist for Park values to be enhanced, particularly in relation to Prospect Electricity's willingness to improve and maintain access tracks. As well as improving the condition of the tracks themselves this may include the construction of gates in the area to prevent unwanted vehicles.

7.5 ACCESS AND TRAFFIC

7.5.1 Existing Environment

The substation site is accessed from Katoomba via the Great Western Highway to Medlow Bath, from where Rutland and Grand Canyon Roads run to the airfield. A dirt track borders the southern boundary of the airfield and runs along the proposed western transmission line corridor to the substation site. There is currently no access to the eastern transmission line corridor beyond the substation site.

Rutland and Grand Canyon Roads experience relatively low traffic volumes. The traffic which does occur is primarily derived from the small number of local residences along the area and traffic to and from the Airfield and the Water Board's Greaves Creek facility.

7.5.2 Interactions with the Proposal

The major traffic impacts would occur during the construction phase of the proposal, with construction traffic passing through Medlow Bath. The volume of construction traffic however, is considered to be akin to that required for the construction of a house, although the duration of construction would be approximately 12 months. Contractors and Prospect Electricity staff would be instructed to minimise speeds through the Medlow Bath township, while the unsealed section of Grand Canyon Road would be graded and watered at regular intervals during construction. Likely construction traffic is shown in Table 7.1.

Traffic during the operational phase of the proposal would be minimal, consisting of routine maintenance and monitoring vehicles (see Section 5.5), except when there is a fault in the substation or one of the transmission lines.

Table 7.1
CONSTRUCTION TRAFFIC

TYPE OF VEHICLE	FREQUENCY
SUBSTATION BUILDING PHASE (4 months)	
Builders Utes	2 return trips per day
Excavator	1 return trip (parked on site during construction period)
Concrete Trucks	up to 20 return trips
Brick Trucks	3 return trips
SUBSTATION FIT OUT (4 months)	
Supply Trucks (carrying crew)	1-2 return trips daily
Excavator	1 return trip (parked on site)
Transformer delivery/ installation vehicles	3 return trips (large lowloader, crane, car)
Switchgear delivery vehicles	2 return trips daily (car and crane)
LINE WORKS (4 months)	
Trucks (for crew and equipment)	2 return trips daily
Pole Jinker	3 to 4 return trips
Dozer/Scraper	1 return trip (parked on site)
Crane	up to 12 return trips

7.6 ELECTROMAGNETIC ENVIRONMENT

7.6.1 Existing Environment

The electric charges associated with electric power create two kinds of fields: *electric fields* which result from the strength of the charge and *magnetic fields* which result from the motion of the charge. These two fields are collectively abbreviated as EMFs. *Electric fields* are measured in Kilovolts per metre (kV/m) and *magnetic fields* in Milligauss (mG).

EMFs are produced by anything which carries or uses electricity, including:

- ordinary street power lines
- underground electric cables
- home and workplace wiring
- any household electrical appliance.

A number of factors affect the strength of EMFs. The voltage of the object creating an electric field has a direct effect on the strength of that field. For example a high voltage power line creates a stronger electric field than a low voltage power line. Current does not have to be flowing for an electric field to exist. A toaster that is plugged in, but not switched on, may still produce an electric field.

Currents produce *magnetic fields*. The higher the current, the stronger the field. The magnetic field generated by a hair dryer will therefore increase when the power setting is moved from low to high. Appliances which are plugged in, but turned off do not produce magnetic fields.

The remoteness of the study area from the urban areas of Katoomba and Medlow Bath, limits the existing levels of EMFs to what may be termed base background levels. The exceptions to this are the corridors for the existing 132kV and 66kV transmission lines in the east and west of the area, however elevated EMF levels due to these transmission lines would not extend significantly beyond the easement boundaries.

7.6.2 Interactions with the Proposal

Although there has been no causal link established between EMFs and human illness, Gibbs (1991) recommends a policy of *Prudent Avoidance* in the location of transmission lines, given the degree of uncertainty in relation to EMFs and human health. The policy of Prudent Avoidance has been an important factor in the planning for this proposal, that is priority has been given to the location of the substation and transmission lines away from residential areas. No residences are located within the area which would be subject to a detectable rise in EMF levels.

Interference to Electronic Equipment

Television and radio reception in the primary service area of transmitting stations is normally unaffected by transmission lines.

Both transmission lines and television signals produce electric fields. Tests have been carried out by both Prospect County Council (1984) and Sydney County Council (1984). The tests indicated that the strength of the electric field from a transmission line is unlikely to be strong enough to affect television and radio reception. Given the distance of houses from the proposed substation and transmission lines, there is no realistic possibility of any impact in the study area.

Some momentary fading of radio reception is occasionally experienced by a car driving underneath a transmission line. The proposed transmission lines do not however, cross any public roads.

8

RECOMMENDATIONS

8
RECOMMENDATIONS

The description of the proposal in Section 5 outlines a conceptual design for the Upper Blue Mountains Electricity Supply Strategy. The conceptual design and siting of the proposal have been oriented towards the minimisation of environmental impacts. There are however opportunities for additional measures to be incorporated in the detailed design and the construction and operational procedures, which would serve to further reduce impacts on both the biophysical and cultural environments of the area. Some of these measures are recommended below.

- An erosion and sediment control plan should be formulated as part of the detailed design, in consultation with the Department of Conservation and Land Management and NPWS. This should include controls for the construction and operational phases of the proposal and be oriented towards both the substation and the transmission line access tracks.
- Where new access track construction is required, it should be designed in accordance with the NPWS Road Design Manual. A gravel surface should be used wherever there are significant slopes.
- Gates should be placed on access tracks in accordance with NPWS requirements.
- Tree clearing for the substation site should be kept to a minimum. Although a bushfire buffer would be necessary around the substation, there remains opportunities to leave some of the mature woodland trees standing. The retention of as many trees as possible on the north side of the substation would serve to screen views of the substation from the airfield.
- Consultation with the PCC and the onwers and users of the Airfield should be maintained during the construction of the proposal. Medlow Bath residents should be advised (possibly by letterbox drop) of the timing of construction activities and provided with a contact person within Prospect Electricity with whom they can receive information or outline any problems associated with the construction of the substation and transmission lines.
- Open lines of communication should also be maintained with NPWS and BMCC throughout the design and construction process, as well as during the operational phase of the proposal.
- The installation of interpretive signs should be considered, advising of the location and history of Bruce's Walk
- Hours of construction activities should conform to standard EPA and BMCC requirements
- Drivers of construction vehicles should be fully briefed and required to mantain low speeds when travelling through the Medlow Bath township area. This may be a condition of construction contracts.
- The final location of the transmission lines should follow the existing access track alignments where possible to minimise the clearing of vegetation. Where realignment of access tracks is necessary, the original alignment should be treated in accordance with the erosion and sediment control plan and revegetated as quickly as possible.
- Revegetation of cleared areas including access tracks used only for construction, should be aimed at regenerating the local bushland. Indigenous species should always be used, with local gene stock being used where possible.

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REFERENCES

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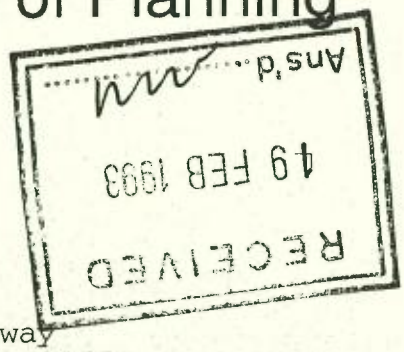
Appendix A

DEPARTMENT OF PLANNING CONSULTATION

New South Wales Government

Department of Planning



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Mr M Wright
Project Manager
EDAW
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Contact : J. Croft

Our reference : P91/01152/001

Your reference :

Dear Sir,

Re: Proposed Katoomba North Substation and Connecting Transmission Lines

Thank you for your letter of 19 January '93 of 9 December, 1992, indicating that you are consulting with the Director with regard to the preparation of an environmental impact statement (EIS) for the above development.

2. An EIS is required to be prepared where the proposal is an activity referred to in Section 112(1) of the Environmental Planning and Assessment Act, 1979. The EIS shall bear a certificate required by clause 59 of the Regulation (see Attachment No 1).

3. Pursuant to clause 58 of the regulation, the Director requires that the following matters be specifically addressed in the EIS:

- justification of the proposal;
- evaluation of alternatives, including the "do nothing" option, and alternative routes that do not pass through the National Park or Environmental Protection zones;
- the risk of bushfire on the proposal and an assessment of any increased risk of bushfire related to the proposal. Measures to minimise risk need to be considered.
- visual impact of the proposed powerline;
- description of the existing natural environment including a detailed survey of flora and fauna which should also identify any rare or endangered species;
- An assessment of any impacts on the natural environment during the construction and operation of the proposal including the clearing of vegetation for any proposed access routes. Measures proposed to mitigate impact, including

wildlife corridors, should be assessed for their adequacy and effectiveness. Measures proposed for the ongoing management of the natural environment and prevention of the introduction of pests and weeds should also be considered;

- heritage issues, including Aboriginal archaeology, European heritage and landscape character;

- assessment of measures proposed to prevent erosion and siltation during both construction and operation of the powerline;

- access routes to the transmission lines, the number of access roads that will need to be created and a description of maintenance techniques to ensure erosion and siltation is mitigated. Management of access routes to ensure the spread of weeds and feral species into the national park is minimised;

- Measures proposed for site rehabilitation including revegetation and landscaping should also be assessed;

- electro magnetic radiation. The EIS should consider this issue and identify any implications for the proposed development;

- likely impact on adjacent Katoomba airfield (if operational);

- results of consultation with the local community;

- results of consultation with:-

  - National Parks and Wildlife Services
  - Bushfire Council
  - Environment Protection Authority
  - Department of Conservation and Land Management (Soil Conservation Division)
  - Blue Mountains City Council.

4. The determining authority should also note that section 113 of the Environmental Planning and Assessments Act, 1979, and clause 61 of the associated Regulation, requires that the EIS be made available for inspection at the same time in the offices of the determining authority and the Department as well as any other agencies nominated by them. To ensure that simultaneous exhibition occurs, EDAW should forward the necessary documents to the Department prior to the commencement of the public display period. This will enable concurrent exhibition in the Department's head office and the relevant regional office where appropriate.

Yours faithfully

16.2.93

B. Adams
Manager
Assessments and Major Hazards Branch
As Delegate for the Director

DEPARTMENT OF PLANNING
ATTACHMENT NO. 1

STATUTORY REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENTS.

In accordance with Part V of the Environmental Planning and Assessment Act, 1979, an environmental impact statement (EIS) must meet the following requirements.

Pursuant to clause 57 of the Environmental Planning and Assessment Regulation, 1980, as amended:

(1) An environmental impact statement referred to in section 112 (1) of the Act shall be prepared in written form and shall be signed by the person who has prepared it.

(2) The contents on an environmental impact statement referred to in subclause (1) shall include the following matters:-

(a) a full description of the proposed activity;

(b) statement of the objectives of the proposed activity;

(c) a full description of the existing environment likely to be affected by the proposed activity, if carried out;

(d) identification and analysis of the likely environmental interactions between the proposed activity and the environment;

(e) analysis of the likely environmental impacts or consequences of carrying out the proposed activity (including implications for use and conservation of energy);

(f) justification of the proposed activity in terms of environmental, economic and social considerations;

(g) measures to be taken in conjunction with the proposed activity to protect the environment and an assessment of the likely effectiveness of those measures;

(g1) details of energy requirements of the proposed development and measures to be taken to conserve energy;

(h) any feasible alternatives to the carrying out of the proposed activity and the reasons for choosing the latter;

(i) consequences of not carrying out the proposed activity.

The EIS must also take into account any matters required by the Director of Planning pursuant to clause 58 of the Regulation, which may be included in the attached letter.

The EIS must bear a certificate as required by clause 59 of the Regulation.

DEPARTMENT OF PLANNING
ATTACHMENT NO 2

ADVICE ON THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR A TRANSMISSION LINE.

It is the responsibility of the determining authority to decide whether an EIS is required (unless the proposal is a prescribed activity).

Pursuant to S112 of the Environmental Planning and Assessment Act, 1979, where a proposal is a prescribed activity or where a proposal is likely to significantly affect the environment, a determining authority must, before deciding whether to proceed with the proposal, consider an EIS prepared in respect of the proposal.

In general transmission lines have the potential to create problems for local residents and landholders due to acquisition of easements, loss of access, severence effects on agricultural activities. Other impacts may include sterilisation of minerals, impacts on landscape, conservation areas, flora and fauna, and visual amenity. Location of the transmission line also requires consideration of the health, safety and amenity of the local community.

The purpose of this paper is to outline various issues relevant to the preparation and consideration of an EIS for transmission lines. It is the applicant's responsibility to identify and address, as fully as possible, the matters relevant to the specific development proposal in complying with the statutory requirements for EIS preparation (see Attachment No 1).

The matters nominated in this paper are not intended as a comprehensive identification of all issues which may arise in respect of transmission lines. Some of the issues nominated may not be relevant to a specific proposal. On the other hand, there may be other issues, not included, that are appropriate for consideration in the EIS.

Information provided should be clear, succinct and objective and, where appropriate, be supported by maps, plans, diagrams or other descriptive detail. The purpose of the EIS is to enable members of the public, the determining authority and the Department of Planning to properly understand the environmental consequences of the proposed development.

1. Description of the proposal.

The description of the proposal should provide general background information on the location of the proposed transmission line.

- Details of the form and physical dimensions of structures, lines and conductors and any associated facilities that may be required;

- Proposed management and scheduling of construction including staging of works, source and transport and assembly of plant and materials, employment details, construction camps, access arrangements, temporary and permanent earthworks, hours of operation for construction works,.

- Description of existing easements and possible new easement requirements including procedures for the creation of such easements.

- Rehabilitation and maintenance proposals on completion.

2. The objectives of construction of the proposed transmission line should be described as well as its compatability with the existing regional transmission line network, including any provisions for rationalization with existing lines to avoid proliferation and any proposals for longer term augmentation of that network.

3. Description of the Environment.

This should provide details of the environment in the vicinity of the development area and also of aspects of the environment likely to be affected by any facet of the proposal. In this regard, physical, natural, social and economic aspect of the environment should be described to the extent necessary for assessment of the environmental impact of the proposed development. In particular:

- Topography, geology and geotechnical data, ecology, meteorology, hydrology etc.
- Noise and air quality where appropriate for impact consideration.
- Aesthetics.
- Areas of visual significance and/or with potential for visual impact from the constructed line, eg skylines, treelines, river crossings, etc.
- Flora and fauna with particular regard for sensitive environments such as wetlands.
- Agricultural and mining activities that may be affected by the proposed works.
- Utilities and communications.
- Buildings and/or sites having architectural/ archeological/heritage/conservation significance.
- Socio economic aspects including local agricultural/ commercial activities, recreation, employment etc.

4. Analysis of Environmental Impacts.

Environmental Impacts usually associated with transmission lines are listed below. Where relevant to the specific proposal, these should be addressed in the EIS:

- Impact on areas likely to be subject to urban growth or other land use change (eg conservation proposals).
- Impact on management or development of agricultural lands, commercial forests or other established or proposed urban uses.
- Cumulative impact taking into consideration existing linear developments including transmission lines, service corridors, roads and railways.
- Visual impact in relation to skyline, topography etc.
- Impacts on features or areas of local or community concern eg in respect of recreation or conservation etc.
- Impact on historic or archeologically significant sites and/or buildings.
- Impact on natural or conservation areas which may have wildlife or habitat or aesthetic conservation value.
- Impact on health or safety or amenity.

Proposed safeguards in respect of those matters relevant to the proposal should be clearly described and the EIS should provide an objective assessment of their efficacy, both during construction and on completion of the project, as well as proposals for monitoring environmental safeguards where applicable.

5. Assessment of Feasible Alternatives.

the EIS should include a detailed assessment of the feasible alternatives considered for the proposal including the key physical and engineering constraints as well as pertinent environmental and economic factors including clear reasons for rejecting such alternatives in favour of the recommended proposal.

6. Contact with relevant Government Authorities.

In preparing the EIS, it is suggested that authorities, such as those listed below, should be consulted and their comments taken into account in the EIS.

- The relevant local council(s) and regional planning authorities.
- The Environment Protection Authority in regard to air, water and noise impacts and relevant pollution control legislation requirements.
- The Department of Conservation and Land Management with regard to erosion control.
- The Department of Agriculture with regard to impact on agricultural activities.
- The Department of Mineral Resources with regard to mineral sterilisation and subsidence.
- The Heritage Council of NSW if the proposal is likely to affect any place or building having heritage significance for the State.
- Any servicing authorities which may be required to supply water, power, etc.
- Any other authority that may have an interest and/or administrative responsibility in the area affected.

It is the responsibility of the person preparing the EIS to determine those Departments relevant to the proposed development.

7. Supporting Information.

The EIS should refer by suitable appendices to all relevant studies/investigations that may have been carried out in support of the proposal. This supporting documentation should be made available during the period of public display of the EIS.

New South Wales Government

Department of Planning

Remington Centre
175 Liverpool Street, Sydney 2000
Box 3927 G.P.O. Sydney 2001
DX . 15 Sydney

Telephone : (02) 391 2000 Ext: 2071
Fax No : (02) 391 2111

Contact : J. Croft

Our reference : P91/01152/001

Your reference :

Mr M Wright
EDAW (Aust) Pty Limited
551 Pacific Highway
ST LEONARDS NSW 2065

c.c. Prospect Electricity

Dear Mr. Wright,

NOMINATED DETERMINING AUTHORITY; KATOOMBA NORTH SUBSTATION AND ASSOCIATED TRANSMISSION LINES

This letter if to inform you that on 12 October, 1993, the Minister for Planning and Minister for Housing, the Hon. Robert Webster, MLC, in pursuance of Section 110A of the Environmental Planning and Assessment Act, 1979 (EP&A Act) nominated Prospect Electricity to be the nominated determining authority in relation to any activity within the meaning of Part V of the EP&A Act, for the purpose of the proposed transmission lines associated with the construction of a substation at North Katoomba, Blue Mountains.

Yours sincerely,

29/10/93

B. Adams
Manager
Assessments and Major Hazards Branch

RECEIVED
04 NOV 1993
Ans'd

		SIGN/DATE
MW		

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979

ORDER UNDER SECTION 110A

I, the Minister for Planning, in pursuance of Section 110A of the Environmental Planning and Assessment Act, 1979, nominate Prospect Electricity to be the nominated determining authority in relation to any activity, within the meaning of Part 5 of the Environmental Planning and Assessment Act, 1979, for the purpose of the proposed transmission lines associated with the construction of a substation at North Katoomba, Blue Mountains.

Signed at Sydney this 12 day of OCT. 1993.

Robert Webster MLC
Minister for Planning
and Minister for Housing

Appendix B

PUBLIC AUTHORITY CONSULTATION

6 July 1993

NSW NATIONAL PARKS AND WILDLIFE SERVICE

Attn; Mr M. Wright

Edaw (Aust.) Pty Ltd,
551 Pacific Hwy,
St Leonards NSW 2065

RECEIVED
16 JUL 1993
Ans'd m.w

Our reference:
Your reference: CR/1259

	WHO	ACTION	SIGN/DATE
	PM		
JOB NO:		FILE:	

Dear Mr Wright

**PROPOSED KATOOMBA NORTH SUBSTATION-
ENVIRONMENTAL IMPACT STATEMENT**

In reply to your letter 8th March seeking our formal comments on the scope and content of the EIS, the Service advises the following:

1. * The seven point test of significance for a fauna impact statement should be undertaken to determine whether a fauna impact statement is required. Information on the format and content of this procedure can be obtained from the National Parks & Wildlife Service's Endangered Species Unit, Hurstville, telephone (02) 585 6444.

* The Environmental Impact Statement should detail both positive and negative impacts of the proposed powerline on native flora and fauna.

* Aboriginal sites should be surveyed along the bandwidth of the proposed line. Any new sites that are located during this survey should be referred to the Blue Mountains District office so that their conservation status and future management actions can be considered.

* Mapping of environmental constraints, using overlay and/or computer techniques should be undertaken to indicate the best possible route for the powerline.

Central Region
Level 1
10 Valentine Avenue
Parramatta
PO Box 95
Parramatta 2124
Fax: (02) 895 7414
Tel: (02) 895 7420

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 585 6555
Tel: (02) 585 6444

* The design of the powerline and associated access trail system should aim to:-

  - minimise the easement widths and associated works

  - minimise the number of maintenance trails; and detail the long term maintenance standards of the access system.

  - provide for rationalization and rehabilitation of trails.

  - provide a maintenance schedule for on-going ground works in areas of easements within National Parks or bushland areas.

2. * The draft Plan of Management and E.M.P.1 prohibit development other than in accordance with the area's dedication. There is therefore a need to justify development on National Park estate as being consistent with the purpose of reservation. The E.I.S. will need to resolve these issues if an activity application is to be determined favourably for the proposal (see letter 29/06/88).

  To this end significant discussion and justification on the need to undertake works is required. It may be useful to get specific advice on this matter from the Service's Legal Branch.

* The NPWS is required eventually to create formal agreements for all powerlines in areas under the Service's control. Towards this end, it is expected that an easement agreement will be formalized for the powerline and any related structures associated with this proposal.

3.0 Having regard to the Services inputs to this project since 1986, I reconfirm matters previously raised in writing for consideration.

* possible future additions to National Park.

* requirement to submit an Activity Application to the Service.

* current requirement for ministerial consent.

* current proposals would require amendment to L.E.P. 4 and E.M.P. 1.

* need for E.I.S.

* E.I.S. should clearly identify legal aspects roles and responsibilities for each agency to show the whole process.

* need to propose the whole and ultimate project not just stage 1, eg. include SRA needs.

* evaluation of regional alternatives.

* discussion on design aspects and constraints to pole arrangements with regard to easement widths, clearing vegetation, cost, safety etc.

* use of endemic propagation material.

* need to enter licence easement/agreement.

* access gating.

* supervision of site works to comply with design (special item of importance).

4.0 In regard to the matter referring to Section 110A of the E.P.A. Act, the National Parks and Wildlife Service agrees that Prospect Electricity be declared the **NOMINATED DETERMINING AUTHORITY** under Section 110A of the Act. It would be appreciated if copies of any submissions could be forwarded to the Service as soon as practicable after the exhibition period for its consideration and determination. It should be noted that upon the determination of the E.I.S., Ministerial approval to the granting of an easement and Prospect Electricity's endorsement of the easement licence conditions is required prior to any work proceeding on National Parks and Wildlife Service lands.

Thank you for the opportunity to comment on this proposal. Any queries concerning this letter should be directed to Gregor Manson, District Manager, Blue Mountains District on (047) 87 8877. District's reference for future correspondence is BM/0940 Part II.

Yours faithfully,

M. J. Mortimer,
Regional Manager,
Central Region.

c.c. Prospect Electricity.
Attn:- D. Morgan.

1.11 Developments by Public Authorities on Service Areas

Introduction

1.11.1 The general topic of development on Service areas is dealt with in Service Memo 88/10 and reference should be made to that document for information on external legislative controls and the procedure for approvals. So far as utility installations by public authorities are concerned, several special considerations arise and these are set out in this statement.

1.11.2 The Director of National Parks and Wildlife is responsible for the care control and management of lands reserved or dedicated under the National Parks and Wildlife Act as national park, historic site, nature reserve, Aboriginal area or State game reserve.

1.11.3 Consistent with these statutory responsibilities the Minister and the Director are generally precluded from approving licenses, leases, easements rights of way or other interests where there is no nexus with the purpose for which the land has been reserved or dedicated.

Policy

1.11.4 The construction of transmission lines, pipelines, roads, television towers, dams and other public utilities within land dedicated under the Act constitute a threat to the natural condition and the special features of such areas. They are not considered to be an appropriate use.

1.11.5 The Service acknowledges that there may in some cases be an overwhelming case in favour of such developments.

1.11.6 In regard to 1.11.5, the Minister, on the recommendation of the Service, may grant a license or easement to the authority concerned to carry out the necessary work:

* on the grant of the license or easement the authority shall be required to complete a full scale Environmental Impact Statement to the satisfaction of the Service;

* the license or easement shall contain conditions essential to protect the natural and cultural features of the area and to minimise impact on or displacement of uses recognised as appropriate;

* a schedule of all such structures and occupancies will be maintained;

* the Service will ensure the compliance of the authority with the conditions laid down;

* the operation of the license or easement will be periodically reviewed to ensure conformity.

1.11.7 Apart from 1.11.6, when considering whether a proposed development is permissible the Service will have regard to:

* whether the development can be sanctioned or permitted under the Act in accordance or compatible with the particular purposes for which the land has been reserved or dedicated under the Act;

* whether the activity is permitted by the relevant environmental planning instruments.

HO
3 - Central

New South Wales Government

ational Parks and Wildlife Service

BLUE MOUNTAINS DISTRICT

Includes:

Blue Mountains National Park
Kanangra Boyd National Park
Wollemi National Park
Hartley Historic Site

Blue Mountains Heritage Centre
Govetts Leap Road
P.O. Box 43
Blackheath, N.S.W. 2785

Our reference: AJ; BM/0940

Your reference: 55975 T/P/TL/LY

Telephone: (047) 87 8877

Secretary
The Electricity Commission of N.S.W
G.P.O. Box 5257
Sydney N.S.W. 2001

Attention: Mr H.L. Yin

29 June, 1988

PROPOSED 132 KV TRANSMISSTION LINE CONNECTION TO KATOOMBA NORTH SUBSTATION

Thank you for your letter of 12 May 1988 requesting comments on the above proposal.

The NPWS offers the following comments on the matters raised in your letter:

1. Lands affected

Whilst the Elcom works associated with this proposal do not include NPWS areas, the related Prospect County Council and State Rail Authority powerline proposals do include sections of Blue Mountains National Park. This aspect will be raised with Prospect County Council. However, this aspect is also an important consideration in the final determination for the sub-station site.

2. Difficulties which may arise in relation to management and future use

(a) *Fire prevention and fire control operations*

Consideration needs to be given to the impact of the proposed powerline and sub-station on fire management requirements, both on site and in adjoining lands, including Blue Mountains National Park:

* fire prevention techniques e.g. slashing, frequent burning, chemical treatment

* fire control operations e.g. aerial incendiary burning, aerial water bombing, back burning

In particular, the installation of additional powerlines in the bushland areas away from existing corridors - roads, tracks, existing powerlines etc., will create an additional problem for fire management, especially aerial operations and as a possible source of fire ignition.

(b) *Addition of Crown Lands to Blue Mountains National Park*

It is possible that in the future, some of the crown lands associated with the Minihaha Reserve could be added to Blue Mountains National Park as part of the park boundary rationalisation process. However, this would depend on a thorough assessment of the natural and cultural values of the area.

Nevertheless, management of powerline easements needs to consider minimising the number and extent of cleared corridors which create barriers to wildlife movement and attract illegal use.

(c) *Recreational opportunities*

Consideration should be given to the impact of the proposal on recreational opportunities and aesthetic values in the area, both within the park and the recreational reserve.

3. Rare, threatened and endemic plants and animals

A number of rare, threatened and endangered plant and animals species occur in the upper Blue Mountains. The swamp, heath and mallee habitats are the main vegetation types in which these species are present.

Details of rare, threatened and endemic plants on the Katoomba 1:100,000 map sheet are given in:

D.A. Keith and D.H. Benson "The Natural Vegetation of the Katoomba 1:100,000 map sheet". In press Cunninghamia 2(1) 1988.

Rare, threatened and endemic fauna likely to occur in the area include:

Sphenomorphus leurensis a water skink
Hoplocephalos bungaroides the Broad-headed snake
Morelia spilotes the carpet/diamond python
Stipiturus malachurus the Southern emu wren
Acrobates pygmaeus the Feathertail Glider
Cercaetus nanus the Eastern Pygmy Possum

Other aspects of the proposal which warrant further investigation

(a) *Archaeological survey*

An archaeological survey of any relatively undisturbed bushland likely to be affected by the proposal is required.

(b) *Proposed siting of the powerline*

The proposed siting of the powerline, whilst minimising the visual impact, will add an additional barrier to wildlife movement, could compromise aerial fire control operations, and could create additional management problems such as the illegal use of the powerline corridor by trail bikes.

It is therefore recommended that consideration be given to siting the powerline alongside the existing road giving a straight line from the existing 132kV line to the proposed sub-station.

(c) *Planning Instruments*

The Draft Plan of Management for Blue Mountains National Park states that :

"new works, facilities or operations proposed by any organisation or individual will not be permitted unless they are consistent with the purpose of reservation of the park".

The Blue Mountains Local Environmental Plan No.4 prohibits development within National Parks other than that in accordance with the area's dedication.

Yours faithfully,

G Manson 29/6/93

G. Manson
A/Superintendent
for Director

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

RECEIVED
09 FEB 1993
Ans'd

1 February 1993.

Edaw (Aust) Pty Limited
551 Pacific Highway
ST LEONARDS NSW 2065

Our reference: CR/1259
Your reference:

ATTENTION MR MICHAEL WRIGHT

Dear Sir

ARCHAEOLOGICAL SURVEY - KATOOMBA NORTH SUBSTATION AND ASSOCIATION TRANSMISSION LINE ROUTE OPTIONS

Three copies of the above report by Dr Helen Brayshaw dated December 1992 have been received and reviewed by the Service.

The recommendations contained in the report are endorsed by the Service. In accordance with the concerns expressed by the Daruk Local Aboriginal Land Council, the Service particularly endorses the recommendation that the existing easement to the north-west of the substation be utilised and is the preferred option, upon archaeological grounds.

If you have any queries or require clarification of the above please do not hesitate to contact the Service's Acting Cultural Resources Coordinator, Ms Jillian Comber on 8957440.

Yours faithfully,

C J Burrell
for Director

Central Region
Level 1
10 Valentine Avenue
Parramatta
PO Box 95
Parramatta 2124
Fax: (02) 895 7414
Tel: (02) 895 7420

Head Office
43 Bridge Street
Hurstville NSW
Australia
PO Box 1967
Hurstville 2220
Fax: (02) 585 6555
Tel: (02) 585 6444

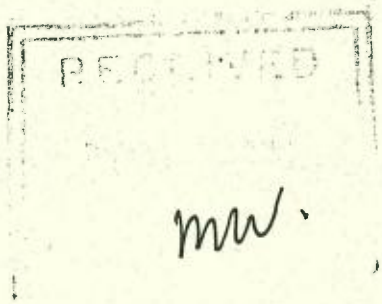
City of Blue Mountains

Please quote file
D08-00070
KM:GA

If telephoning or calling regarding this matter, please contact:

25 March 1993

Mr M Wright
Project Manager
EDAW (Aust) Pty Ltd
551 Pacific Highway
ST LEONARDS NSW 2065



Dear Mr Wright

Reference is made to your letter dated 4 March 1993 regarding the proposed Katoomba North Substation for Prospect Electricity.

As the tenure of the land affected is private and National Park, the Bush Fire Service is not going to pose any objections to the proposal, other than to suggest that the lines should be on concrete poles due to the fire history of the area.

With regard to the actual Substation building, it is assumed that normal fire protection facilities will be incorporated during construction.

Should you have any further concerns, please contact Council's Emergency Services Manager, Mr K McKellar on (047) 82-0613.

Yours faithfully

K R McKELLAR
on behalf of
G C COLLINS
Town Clerk

Address communications to:
Town Clerk/City Manager, Blue Mountains City Council, P.O. Box 189, Katoomba. 2780
Telephone: (047) 82-0777, DX: 8305 Katoomba, Fax: (047) 82-0506.

City of Blue Mountains

The City within a National Park

6 May 1993

Please quote file
D08/00070

If telephoning or calling regarding this matter, please contact:

EDAW (Aust) Pty Ltd
551 Pacific Highway
St Leonards NSW 2065

Subject: Proposed North Katoomba Substation and Associated Lines Environmental Impact Statement

Dear Sir,

Receipt is acknowledged of your letter dated 23/3/93 regarding procedures for the above proposal.

The requirements for an EIS are set out in Part V, Environmental Planning and Assessment Act, 1979 and Part VII, Environmental Planning and Assessment Regulation, 1980.

The Department of Planning should be consulted in the first instance, to confirm procedure and scope of the EIS, and confirm the nominated determing authority.

No objections are raised to the process suggested in your letter, provided that the public report prepared under Clause 64 makes clear the requirement for development approval under Part IV of the Act. Your attention is also drawn to the relevant sections of Blue Mountains LEP 1991 (copy enclosed for your information), and other relevant legislation.

Yours faithfully

M. Broderick
on behalf of
G.C.COLLINS
Town Clerk

Address communications to:
Town Clerk/City Manager, City of Blue Mountains, P.O. Box 189, Katoomba. 2780
Telephone: (047) 82-0777, DX: 8305 Katoomba, Fax (047) 82-0506.

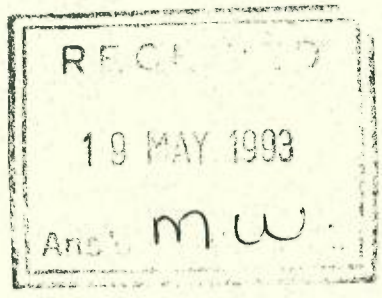
RAIL ESTATE
THE PROPERTY GROUP OF STATE RAIL

Regional Property Manager
North West
Level 7, 87 Marsden Street
PARRAMATTA NSW 2150

Telephone: (02) 682 2718
Facsimile: (02) 682 2750

Our Ref: MN:354:DL

12 May, 1993



Edaw (Aust.) Pty Ltd
551 Pacific Highway
ST LEONARDS NSW 2065

Attn : Mr M. Wright

Dear Mr Wright,

KATOOMBA NORTH - E.I.S. BY EDAW BY PROPOSED CONSTRUCTION OF SUBSTATION

With reference to your letter of 11 February 1993, no Authority services would be affected by the proposed construction of a new substation at Katoomba North and no special requirements on the scope or content of the EIS to be carried by your Company are required by this Authority.

Yours faithfully,

Eric Mann
Regional Property Manager
RAIL ESTATE

WATER BOARD
SYDNEY – ILLAWARRA – BLUE MOUNTAINS

Contact: Justin Taylor
Telephone: (02) 831 0447

Our Ref: 339090F3

17th March, 1993

Michael Wright
EDAW (Aust) Pty Limited
551 Pacific Highway
St Leonards NSW 2065

Dear Mr Wright

EIS for Proposed Katoomba North Substation

Thank you for your letter dated 11th February, 1993 inviting comment from the Water Board regarding the preparation of an Environmental Impact Statement (EIS) for the above proposal. The Board has reviewed the proposal and formulated the following comments for consideration.

As outlined in the Water Board Act, 1987, the Board's objectives encompass planning and land use matters in terms of their impacts on catchment management, natural resource conservation, pollution control and prevention, efficient use of resources, the public interest and community needs.

The proposed development is located in the catchment of the Nepean/Hawkesbury River system. The Board has a major role in the protection and improvement of water quality in the river system and is currently working on a Total Catchment Management Plan in co-operation with state and local government bodies, environmental organisations and community groups. In accordance with Sydney Regional Environmental Plan No. 20, the Board aims to ensure that any development and associated activities, including the subject proposal, does not contribute to further degradation of the Nepean/Hawkesbury River system.

As such, the Board believes the following issues should be addressed in the EIS for the subject proposal.

ENVIRONMENTAL CONSIDERATIONS

The Board's main area of concern with the proposed substation focuses on potential water quality impacts on Katoomba Creek and ultimately the Hawkesbury/Nepean River system. The nature of the soils, topography and rainfall

North Western Regional Office, 22 Main Street, Blacktown, NSW 2148
Telephone: (02) 831 0407, Facsimilie: (02) 831 2049, DX 8133

CityRail

North West Region
Level 7, 87 Marsden Street
Parramatta NSW 2150

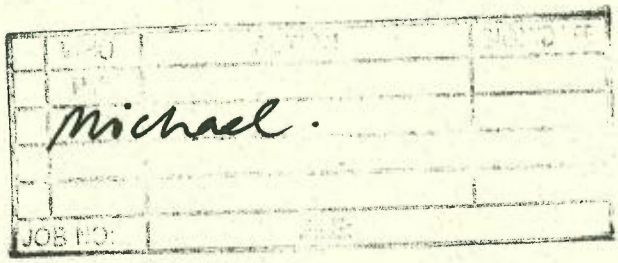
P.O. Box 1079
Parramatta NSW 2124

Telephone: (02) 682 2777
Facsimile: (02) 682 2750

Our Ref: RD:KH:262

June 28, 1993

Edaw (Australia) Pty Ltd
551 Pacific Highway
ST LEONARDS NSW 2065



Attn: Mr M Wright

Dear Mr Wright,

KATOOMBA NORTH - E.I.S. BY EDAW BY PROPOSED CONSTRUCTION OF SUBSTATION

Further to the letter from Rail Estate dated 12 May, 1993, it is advised that the State Rail Authority High Voltage & Traction Power Supply system in the Blue Mountains is currently supplied from Prospect Electricity Bulk Supply Point assets at Lawson.

In addition, State Rail Authority 66kV assets in the blue Mountains are utilised by Prospect Electricity at Blackheath in a back-up capacity (as well as a number of other locations).

The State Rail Authority must therefore be consulted and informed re any aspect of the proposed Katoomba North Substation which may impact on the State Rail Authority's assets and interests.

A State Rail Authority representative has attended meetings of the Upper Blue Mountains Community Consultative Committee but, to date, Prospect's intentions re, for example, Lawson Substation have not been discussed at this forum and it is suggested that this forum is not and has not been the forum for such consultation between Prospect and the State Rail Authority due to the Technical nature of the possible issues concerned.

It is requested that Prospect advise this authority of any aspect of the proposed Katoomba North Substation which may impact on the State Rail Authority's assets and interests and arrange for relevant staff from Prospect and State Rail to liaise re the aspects concerned.

Yours faithfully

R. Davies

R. DAVIES
REGIONAL ELECTRICAL ENGINEER, WEST

All communications to be addressed to:
The Director-General
Locked Mail Bag 17
GRANVILLE NSW 2142

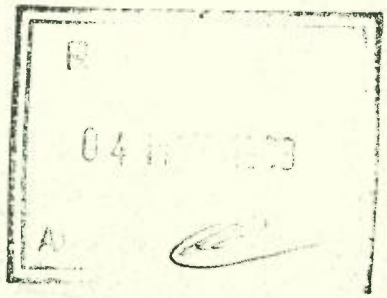
Our Reference: Your Reference:

DEPARTMENT OF BUSH FIRE SERVICES

Unit 3,
175-179 James Ruse Drive
Rosehill 2142

Phone: (02) 684 4411
Facsimile: (02) 638 7956
Telex: AA71438

Mr Michael Wright
Project Manager
EDAW (Aust) Pty Limited
551 Pacific Highway
ST LEONARDS NSW 2065



26 February 1993

Dear Sir,

Re: Proposed Katoomba North Substation

I refer to you letter of 19 February 1993 inviting the Department of Bush Fire Services to raise any issues relevant to the above mentioned proposal for consideration during preparation of an EIS.

We consider that the proposal does not raise any bush fire related issues of state or regional significance that should be considered during the preparation of the EIS.

However there may be bush fire related issues of significance at the local level. Therefore we recommend that you consult with the Blue Mountains District Fire Committee.

The Blue Mountains District Fire Committee was constituted under the Bush Fires Act 1949 (as amended), and consist of the major bush firefighting and land management authorities and identified support authorities such as the Police and NSW Ambulance Service within each Shire. The District Fire Committee provides the main forum for discussion of bush fire management issues within the district, and has the local expertise necessary to identify any bush fire issues relevant to the EIS.

The contact details for the Executive Officer of the Blue Mountains District Fire Committee is as follows.

Keith McKellar
Fire Control Officer
Blue Mountains City Council
P.O. Box 189
Katoomba NSW 2780

We will also forward your letter to the above mentioned Executive Officer for comment. Should any further information be required, please contact the undersigned on 684-4411.

Yours Faithfully

Debbie Pinfold

Debbie Pinfold
Planning Officer
for
Director-General

EPA

Environment
Protection
Authority
New South Wales

Citadel Tower B 799 Pacific Highway
PO Box 1135 Chatswood NSW 2057
Tel .02. 795 5000 Fax .02. 325 5678

The Director
EDAW (Australia) Pty Ltd
551 Pacific Highway
ST LEONARDS NSW 2065

Our Reference: GP:711345

Your Reference:

Contact: Graham Pinkerton

-7 APR 1993

ATTENTION: Mr Michael Wright - Project manager

PROPOSED KATOOMBA NORTH 132 / 66 kV SUBSTATION AND ASSOCIATED TRANSMISSION LINES

I refer to your letter of 10 February 1993 seeking the EPA's comments on the preferred site option for inclusion in the forthcoming Environmental Impact Statement (EIS).

The EPA has considered the proposal and in accordance with our responsibilities to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development, reduce the risks to human health and prevent the degradation of the environment, is pleased to offer the following comments.

AIR POLLUTION

Our interests in this issue would concern the open burning of cleared vegetation or construction wastes and any emissions from motor vehicles used in the construction, particularly those that are diesel powered.
All vehicles used in the construction must comply with the New South Wales Clean Air Regulations and be fitted with properly maintained emission controls relevant to their date of manufacture.
Vehicles must not emit visible air impurities for a continuous period in excess of ten seconds.

/2

WATER POLLUTION

The subject land includes portions of the Blue Mountains National Park and forms a watershed for the Grose River. The catchment of this river system must be protected from the deleterious effects of development.

Sewage and other contaminated water from the construction sites should preferably be disposed of to the Water Board's sewer system. Where sewer is not available, wastes should be directed to a collection tank. The collected wastes should then be removed by a liquid waste tanker and disposed of in a manner which does not pollute waters.

To prevent erosion from disturbed areas and the subsequent siltation and turbidity in receiving waters, we suggest that the proponent install soil erosion and silt control measures in accordance with the recommendations of the New South Wales Soil Conservation Service.

The former State Pollution Control Commission's publication, "Pollution Control Manual for Urban Stormwater" also offers guidelines for the control of sediments.
Access roads necessary for the long term maintenance of power lines or associated structures should be aligned and provided with drainage systems designed to reduce erosion and the subsequent harmful effects on watercourses.

It is recommended that Prospect Electricity or its contractors discuss any proposal to install pollution control structures at the preliminary design stage with EPA officers as approval under Section 17 of the Pollution Control Act is required for sediment control basins on drainage lines from disturbed areas.

Only uncontaminated waters should be discharged from construction sites and access roads.

NOISE POLLUTION

The proponent should refer to the former SPCC Environmental Noise Control Manual for noise criteria and control methods applicable to construction site equipment and activities.
A noise impact statement should detail any likely adverse effects on the amenity of residents and address hours of construction, particularly when the works are in close proximity to residential premises.

Exhaust noise from vehicles and equipment would be subject to the requirements of the New South Wales Noise Control Act.

Construction equipment, material stockpiles and temporary offices should be located so as to have minimum impact on the amenity of residents.

VISUAL IMPACT

The EPA attaches considerable importance to the need for preserving the visual beauty of the environment. It encourages attention to visual factors as an important element in the process of environmental impact assessment.
The EPA therefore considers that a much higher emphasis should be placed by the determining authority on the real need for visually offensive structures likely to be placed in sensitive areas. Best available technology, rather than best practicable means should be employed to achieve the least visual effect on the environment. The placement of the power line underground could be the favoured option in sensitive areas.

Bushland should not be regarded as vacant land awaiting a use. It is a resource which should not be undervalued. Bushland is not a limitless resource and cannot be replaced once destroyed. Areas of bushland continue to shrink despite environmental protection policies designed to protect it.
Some of the pressures which will continue to threaten bushland and are likely to occur during and after the construction process are;

. The construction and widening of roads.
. The channelling of watercourses.
. Disturbance created by power and service corridors.

The EPA would expect that important natural features of the landscape are preserved and aesthetic treatment given to disturbed areas and structures.

The developer, in this case, Prospect Electricity, who are also the determining authority, has the responsibility of ensuring that before approving any proposal for development they are satisfied that adequate safeguards to prevent pollution of the environment are incorporated in the proposal, including any pertinent standards that are laid down by the EPA or by any other statutory body with a responsibility for ensuring that the environment is protected.

Thank you for the opportunity to offer comments prior to the preparation of the proposed EIS. Should you have any enquiries regarding this letter, please do not hesitate to contact Graham Pinkerton on (02) 325 5646.

Yours faithfully

WARREN HICKS
Regional Manager-Outer Sydney
for
Director General

create favourable conditions for erosional processes in the locality of the proposed development. The EIS should detail measures to minimise impacts on vegetation communities, land and other physical resources to ensure minimal erosion and degradation of soils and subsequent sedimentation of surrounding waterways, bushland and adjacent properties.

Erosion and Sediment Control Plan

Prior to development approval, the proponent should prepare an erosion and sediment control plan, so that potential water quality impacts are minimised. The plan should be prepared to the satisfaction of the Soil Conservation Service (within the Department of Conservation and Land Management) and include:

- Details on the construction, operation and rehabilitation stages of the project to ensure development is undertaken in orderly and responsible manner
- Site drainage details including runoff and groundwater conditions
- Details on erosion and sediment control structures including location, size, capacity and structural integrity

Vegetation Clearing

Removal of vegetation should be by acceptable methods (eg spraying, slashing, mulching) to minimise soil erosion and water quality impacts.

Storage Areas

The EIS should contain details on methods to avoid water quality contamination from stored petroleum products, chemicals, oils, construction materials and other materials used for maintenance of construction and plant equipment. Contaminants should be located in a bunded area to mitigate potential water quality impacts on Katoomba Creek and ultimately the Nepean/Hawkesbury River system.

ADDITIONAL INFORMATION

If you require further information on the Board's comments, please contact Justin Taylor, telephone (02) 831 0447.

Yours faithfully

for IL Smith
Customer Manager
Western-Blue Mountains Region

Facsimile 21 4871 Area Code (047)

Reference

Telecom Australia

Consumer Business
Sydney Metropolitan Region
2nd Floor Borec House
Cnr Henry & Station Streets, Penrith NSW 2750
(P.O. Box 331, Penrith, NSW 2751)

Manager
EDAW (Aust)Pty Limited
551 Pacific Highway
St Leonards, MS.

Attention: Mr. Michael Wright.

Subject: Proposed Katoomba North Sub-Station.

Dear Sir,

With reference to your correspondence dated on 10/2/93 forwarded to Mr.Len Favier, in regard to the proposed Katoomba North Zone Sub-Station, I would like to advise you that Telecom has an aerial distribution cable parallel to the proposed 132 and 66 KV power lines along the Grand Canyon Rd.

Telecom main concerns are as follows:-
* Low frequency induced voltages "LFI" in Telecom cables.
* Earth potential rise "EPR" at the proposed Katoomba North Zone Sub-Station.
* Earth potential rise around each pole should concrete type poles be used.
* Final route selection.

To enable us to pursue with a detailed study on the impact of the proposed sub-station and its associated transmission lines, a detailed LFI/EPR studies will be carried out by Telecom, the Power Co-ordination Section.

Please advise Fares Hanna of the Power Co-ordination Section, Ph 752 1836, with the relevant information of the maximum fault current level, shielding factor and the category of the power system as well as the final route selection.

If Telecom requires to take any special measures to safeguard its plant as a result of Prospect proposed works, then the costs of such measures will need to be met by the power authority.

Should you have any further queries, please do not hesitate to contact either Fares Hanna or myself on 047 21 9896.

Yours faithfully,
N.N. Mitry 2/3/93
Nagy Mitry
Engineer

copies to: Fares Hanna Senior Engineer.
File.

The Project Manager
EDAW (Aust) Pty Limited
551 Pacific Highway
ST LEONARDS NSW 2065

DEPARTMENT OF
CONSERVATION AND
LAND MANAGEMENT
Neale Court
311 High St
Penrith NSW 2750
PO Box 651
Penrith NSW 2751
Phone (047) 21 0188
Fax (047) 21 0181

Contact: Neville Pavan

Our Ref: 20: P19 (N\EISKATOO.4)

Attention: Mr Michael Wright

Dear Sir,

RE: ENVIRONMENTAL IMPACT STATEMENT
PROPOSED KATOOMBA NORTH 132/66kV SUBSTATION
AND ASSOCIATED TRANSMISSION LINES

I refer to your letter of 10th February, 1993 seeking comment on matters relevant to the Department of Conservation and Land Management, which should be considered during the preparation of an Environmental Impact Statement for the subject proposal.

Following are general requirements, which should be addressed during the environmental evaluation process. Also enclosed for your information are Guidelines to assist the evaluation on the above development.

A) **Relevant NSW Legislation:**

i) The Soil Conservation Act, 1938 and amendments, makes provision for the conservation of soil and farm water resources and for the mitigation of erosion within New South Wales. Any activity which disturbs the natural ground surface or the protective vegetation cover can constitute an erosion hazard. It is therefore necessary to adopt adequate control measures to minimise environmental degradation. When adequate control measures have not been carried out and advice has been ignored the Commissioner has specific powers under Section 15A of the Soil Conservation Act, 1938, where an erosion hazard exists or has the potential to develop.

ii) Areas within the vicinity of the proposal may be classified as Protected Land under the Soil Conservation Act, 1938. In this context, the Act requires all owners, occupiers and holders or grantees of timber rights, to apply for an authority before destroying or injuring all trees on land mapped as Protected Land. This provision applies to the construction of new power lines. Maps showing Protected land are available for inspection at the Department's office at Penrith.

iii) The NSW Government is actively promoting the concept of Total Catchment Management (TCM). This concept involves the coordinated use and management of land, water, vegetation and other natural resources on a catchment basis. A TCM committee exists for the Blue Mountains comprising of State government authorities and landholders. The Committee at this stage is in its formative stages with working parties collecting data and formulating recommendations.

A) **Existing Use and Potential Limitations:**

i) The sensitive nature of the Narrabeen Geology is highlighted. The soil is regarded as poorly aggregated, infertile and a high erosion risk when the existing vegetation is removed.

This Department is currently mapping the soil landscapes of the area.

Erosion and sediment control is an important environmental consideration prior to and during any activity and/or development. It is essential to minimise on-site erosion, and offsite sedimentation of adjacent properties, streams, waterbodies and the like.

A progressive erosion and sediment control program should be implemented from the initial operation stage until the proposal has been completed and the site fully stabilised and/or landscaped.

Such a program should consider:

1. control of surface drainage (especially in main watercourses)

2. early revegetation of completed development areas (i.e., access tracks and substation site)

3. the construction of Sediment Trapping Structures (e.g., sediment basins, haybale and geo-textile fences).

This program is usually presented in the form of an Erosion and Sediment Control Plan (ESCP).

I enclose for your information:

i) *Soil Conservation Guidelines for Urban Developments* - outlining the components of an Erosion and Sediment Control Plan.

This Department would welcome the opportunity to discuss erosion and sediment control, as with the previous proposals, in more detail. For further information or advice, please do not hesitate to contact me at the Department's Penrith Office on (047) 21 0188 which handles all enquiries within the Blue Mountains City Council area.

Yours faithfully,

Neville Pavan.

NEVILLE PAVAN
District Manager
PENRITH

22/2/93
(Encl. 1)

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

SOIL CONSERVATION GUIDELINES FOR URBAN DEVELOPMENTS

INTRODUCTION

These notes provide additional guidelines and specifications to those given in the Services' Technical Handbook Number 2, "Urban Erosion and Sediment Control" and should be read in conjunction with that publication.

The Handbook is currently being updated to provide more comprehensive guidelines and specifications for the mitigation of land degradation, soil erosion and sediment pollution in urban and peri urban areas.

GUIDELINES

* Development should be staged to minimise the area exposed to erosion damage at any one time.

* Topsoil should be stripped from each area disturbed and stockpiled for later respreading to aid revegetation.

* Temporary erosion and sediment control measures should be incorporated during all stages of development.

* Stormwater runoff from disturbed areas should be filtered through sediment trapping structures. Where practical, runoff from undisturbed areas should be controlled separately.

* Permanent drainage and sediment control works should be installed as a first step, or soon as practical in land development. They should be immediately revegetated/stabilised against erosion damage.

* Disturbed areas should be progressively stabilised and revegetated so that no areas remain exposed to erosion damage for more than 30 days after earthworks cease.

* All erosion and sediment control measures should be maintained in a functional condition.

EROSION AND SEDIMENT CONTROL PLANS

Erosion and sediment control plans should be prepared for all development where:-

* there is a high hazard of sediment pollution to downslope lands;

or.. * the area to be disturbed is greater than one hectare.

The goals of any erosion and sediment control plan involve:-

* control of water from the top of the site through to and beyond the bottom of the site;

* minimisation of the area disturbed;

* maintenance of a protective groudcover wherever possible;

* prevention/minimisation of sediment leaving the site.

Erosion and sediment control plans should be prepared at the development design stage and may be individual plans, or included on the engineering drawings. The plans should contain the following information as applicable to the site:-

* existing contours;

* location of existing vegetation (eg; grass, trees, shrubs etc),

* location of critical natural areas, eg; drainage lines, water bodies, unstable slopes, floodplains and seasonally wet areas;

* nature and extent of proposed earthworks, including areas of cut and fill;

* location of roads and other impervious areas;

* location and design criteria of erosion and sediment control structures such as diversion banks, perimeter banks, sediment basins and sediment traps;

* location and capacity of proposed stormwater drainage facilities and methods of discharging stormwater from the site;

* site rehabilitation and maintenance program;

* details regarding scheduling of works.

STRUCTURAL SOIL CONSERVATION WORKS

All structural soil conservation works shall be designed in accordance with the Services' Technical Handbooks:-

No 2 - "Urban Erosion and Sediment Control"
and
No 5 - "Design Manual for Soil Conservation Works"

The information below supplements that found in these handbooks.

Sediment Basins

Basins should be designed so as to have sufficient capacity to ensure settlement of most sand sized particles.

The actual capacity of the sediment basin will depend on the erosion hazard of the soil and the volume of water and sediment likely to enter the structure in a large storm event.

The following table simplifies the determination of sediment basin capacity based on the erosion hazard inferred at the site, and is based on the assumption that all runoff from undisturbed areas within the catchment of the basin is diverted to an approved stable outlet.

Erosion Hazard	Capacity (m^3/ha of disturbed catchment)
Low	150
Moderate	300
High	450

Where runoff from undisturbed areas cannot be diverted, additional capacity equivalent to 50 per cent of the above nominated figures should be applied for each additional hectare of contributing undisturbed catchment.

Storage surface area is a critical design feature and should be maximised within the site constraints. The distance between the inlet and outlet of the structure should also be the maximum practical.

The emergency spillway of the basin should have a minimum capacity to safely discharge the peak flow from the 20 year frequency storm.

Earth Batter

Earth batters should be formed to a stable slope determined after investigations into topography, soil type and the presence of rock and should generally have a maximum gradient of:

i) 2(H):1(V) on soils with a low erosion hazard;

ii) 3(H):1(V) on soils with a high erosion hazard;

iii) 4(H):1(V) on soils with an extreme erosion hazard.

Geotechnical advice should be sought for batters steeper than those described above.

GENERAL

Further information and technical expertise on this subject is available by contacting the local office of the Soil Conservation Service of NSW.

Civil Aviation Authority
AUSTRALIA

SYDNEY DISTRICT OFFICE
Safety Regulation & Standards Division
Cnr Robey St & Qantas Drive
PO Box 409, Mascot 2020
Telephone: (02) 556 6836 Fax (02) 556 6840

Ref. 92/1070

19 February 1993

Project Manager
EDAW Aust. Pty. Ltd.
551 Pacific Hwy.
ST. LEONARDS NSW 2065

Dear Sir,

PROPOSED KATOOMBA NORTH SUBSTATION

I refer to your letter dated 11 February 1993, seeking comment on the above proposal.

The Civil Aviation Authority has no objection to the proposal, but wishes the following points to be taken into consideration.

a) The owners of the adjacent Katoomba Landing Area should be consulted as they may have an interest in protecting the airspace around their facility.

b) Civil Aviation Regulation 89Y requires that any structure (including cables), which will be 110 metres or more above ground level, must be brought to the attention of this Authority for assessment as a hazard to aircraft.

Should you have any further enquiries regarding this matter, please contact me on 556 6817.

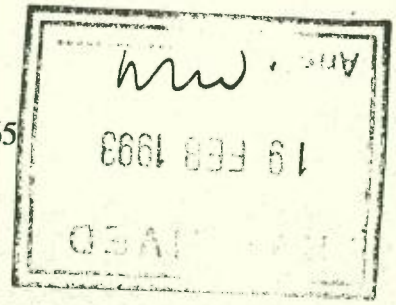
Yours faithfully

Richard Allen
Regional Airport Inspector
Safety Regulation and Standards
South East Region

New South Wales Government

Water Resources

EDAW (Aust) Pty Limited
551 Pacific Highway
ST LEONARDS NSW 2065



Telex: 121188
Facsimile: (02) 895 7281
Telephone: (02) 895 6211
Ext: 7441
Contact Name: John Ross
Our Reference: 0070753 [AKW1303#]

16-2-93

Attention: Mr Michael Wright

Dear Sir/Madam,

Re: E I S Requirements for Proposed Katoomba North Substation

Thank you for your letter of 10 February 1993 seeking this Department's comments and requirements for the above E I S.

Enclosed for your information and retention are the following Departmental documents:

a) "Amendments to the NSW Rivers and Foreshores Improvement Act";

b) "The 7-Step Method of controlling Bank Erosion and Sediment Build-up"; and

c) a revised "General Requirements for Environmental Impact Statements". (This is essentially a checklist of water resources matters to be addressed in the assessment of environmental impacts).

The Department would appreciate being sent a draft copy of the subject E I S for review. It would be worth noting that if multiple copies of the draft document can be made available (even on a loan basis) this helps significantly to expedite the review process.

I trust the above and enclosed information will prove useful.

Yours sincerely,

John A. Ross
for J.F. Clarke, Manager
Sydney-South Coast Region

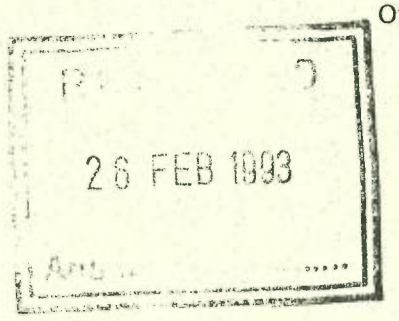
DEPARTMENT OF MINERAL RESOURCES

NEW SOUTH WALES GOVERNMENT

MINERALS AND ENERGY HOUSE
29-57 CHRISTIE STREET
CORRESPONDENCE PO BOX 536
ST LEONARDS NSW 2065
DX 3324 ST LEONARDS
TELEPHONE (02) 901 8888
FACSIMILE (02) 901 8777

Mr Michael Wright
Project Manager
EDAW (Aust) Pty Ltd
551 Pacific Highway
ST LEONARDS NSW 2065

Our ref: L91/0336



Dear Sir

re: PROPOSED KATOOMBA NORTH SUBSTATION.

I refer to your letter dated 10th February, 1993, concerning any issues this Department might wish to address in the EIS.

The proposal is not affected by any applications and/or titles administered by this Department.

Technical officers have examined the proposal and, as a result, this Department has no objections and no issues to address in regard to the subject proposal.

If any further information is required, please phone the undersigned on (02) 901 8257.

Yours faithfully,

Brian Theobald,
for DIRECTOR-GENERAL.

19th February, 1993.

Appendix C

COMMUNITY PARTICIPATION PROGRAMME

SUMMARY OF UPPER BLUE MOUNTAINS COMMUNITY CONSULTATION

1991

September	15	Brochure drop (North Katoomba)
	18	Advertisement
	25	Advertisement
	28	*Public Meeting No. 1* • Agreement to broaden the coverage of the community
October to November	28 to 11	*Public Exhibition*
October	30	Advertisement
November	30 to 3	Brochure Drop (Blackheath, Katoomba, Wentworth Falls and Lawson)
November	6	Advertisement
	9	*Public Meeting No. 2* • Agreement to include Energy Saving Techniques
	28	*Project Consultative Committee (PCC) No. 1* • General overview of the Project Options
December	4	Media Release and Advertisement
	12	*PCC Meeting No. 2* • The needs of the PCC identified • DSM discussed

1992

January	16	*PCC meeting No. 3* • review of the project in detail • explanation of the need for the project discussed • type of publicity to be used for the project discussed • generation of alternatives
February	8	*Workshop No. 1* • general discussion of construction alternatives • identifying major issues to be discussed in further workshops
	13	*PCC Meeting No. 4* • criteria established by the community on high voltage line location, etc • Construction options discussed
March	7	*Site Visit / PCC Meeting No. 5* • Construction Option Sites presented

March	21	*Workshop No. 2* • Health and Safety Issues discussed, eg. EMF • presentation by a range of experts
	22	*PCC Meeting NO. 6* • review EMF Workshop • review site visit • discuss option update
April	2	*PCC Meeting NO. 7* • schedule for the Energy Display discussed • Construction options update presented
May	2	Energy Conservation Display
	2	*Workshop No. 3* • Alternative Energy Options discussed • Energy Conservation Options discussed • Demand Side Management discussed
	3	*PCC Meeting No. 8* • discussed proposed attitudinal study • review the level of publicity used for the project • discuss the need for electricity in the Upper Blue Mountains
	11	*PCC Meeting No. 9* • discussions of responses to the draft questionnaire survey
	18	*PCC Meeting NO. 10* • review of survey objectives • review of follow up of Energy Conservation Workshop • need for project site discussed • airport site update presented • legislative reform in PE considered
June	11	*PCC Meeting No. 11* • DSM Presentation • publicity of the EIS discussed
September	19	*PCC Meeting No. 12* • copies of residents proposal circulated • project update presented • presented preliminary findings of attitudinal survey
	23	*PCC Meeting No. 13* • residents proposal and PE's response discussed • plans to implement EC / DSM program in the Blue Mountains discussed
October 15		*PCC Meeting No. 14* • sub-committee formed to develop an Energy Conservation / Demand Side Management Programme (EC / DSM)
December	15	Letters and comment sheets sent out to the Medlow Bath community

1993

June	11	*EC / DSM Sub-Committee Meeting* • discussed components of EC / DSM Strategy
July	16	*PCC Meeting No. 15* • EC / DSM Programme presented to the PCC • Final report of the University of Western Sydney, "Community Values : Conservation and Electricity presented • substation and transmission design details discussed
August	6	*PCC Meeting No. 16* • to report on meeting with SRA requirements • EC / DSM report comments • EC / DSM presentation by Energetics

Appendix D

VEGETATION AND WILDLIFE SPECIES OBSERVED IN THE STUDY AREA

Table 1: Amphibian and reptile species identified around the site of the proposed Katoomba North Substation

SCIENTIFIC NAME	COMMON NAME	HABITAT
Amphibians		
Crinia signifera	common froglet	OS
Reptiles		
Egernia saxitilis	black rock skink	OS
Egernia whitii	White's skink	OS
Eulampris tympanum	montane water skink	OW, OF
Lampropholis delicata	garden skink	OW, OF
Lampropholis guichenoti	garden skink	OS
Lampropholis mustelina	weasel skink	OW
Leiolopisma platynotum	red-throated skink	OS
Tiliqua nigrolutea	blotched blue-tongue	OS
Tympanocryptis diemensis	mountain dragon	OS, OW

OW = open woodland
OF = open forest
OS = open scrub

Table 2: Mammal species identified around the site of the proposed Katoomba North Substation

SCIENTIFIC NAME	COMMON NAME	HABITAT
Vulpes vulpes	red fox (s)	OS, OW, OF
Macropus giganteus	eastern grey kangaroo (s)	OW, OF
Wallabia bicolur	swamp wallabby (s)	OW, OF
Perameles nasuta	long-nosed bandicoot (d)	OW, OF
Psuedocheirus peregrinus	common ringtail possum	OW, OF

OW = open woodland
OF = open forest
OS = open scrub
(d) = digging
(s) = scats

Table 3: Bird species identified around the site of the proposed Katoomba North Substation

SCIENTIFIC NAME	COMMON NAME	HABITAT
Birds		
Anthochaera carunculata	red wattlebird	OW, OF
Acanthorhynchus tenuirostris	eastern spinebill	OS, OW, OF
Phylidonyris novaehollandiae	newholland honeyeater	OS, OW, OF
Lichenostomus chrysops	yellow-faced honeyeater	OS, OW, OF
Lichenostomus leucotis	white-eared honeyeater	OW, OF
Melithreptus brevirostris	Brown-headed honeyeater	OW, OF
Melithreptus lunatus	white-naped honeyeater	OW, OF
Pachycephala rufiventris	rufous whistler	OW, OF
Phaps elegans	common bronzewing	OS
Strepera graculina	pied currawong	OW, OF
Strepera versicolor	grey currawong	OW, OF
Gymnorhina tibicen	Australian magpie	OW
Platycercus elegans	crimson rosella	OW, OF
Rhipidura fuliginosa	grey fantail	OW, OF
Zosterops lateralis	silvereye	OW, OF
Pardalotus punctatus	spotted pardalote	OW, OF
Merops ornatus	rainbow bee-eater (c)	heard, not seen
Malurus cyaneus	superb blue wren	OS
Acanthiza lineata	striated thornbill	OW, OF
Petroica phoenica	flame robin	OW, OF
Eopsaltria australis	yellow robin	OW, OF
Psophodews olivaceus	eastern whipbird	OW, OF
Menura novaehollandiae	superb lyrebird	OW, OF
Dacelo gigas	laughing kookaburra	OW, OF
Colluricincla harmonica	grey shrike-thrush	OW, OF

OW = open woodland
OF = open forest
OS = open scrub
(c) = calls

Table 3: Bird species identified around the site of the proposed Katoomba North Substation

SCIENTIFIC NAME	COMMON NAME	HABITAT
Birds		
Cuculus pyrrhophanus	fan-tailed cuckoo	OW, OF
Hirundo neoxena	welcome swallow	OS
Climacteris leucophaea	white-throated treecreeper	OW, OF
Coracina novaehollandiae	black-faced cuckoo-shrike unidentified quail species	OW, OF
Cinclosoma punctatum	spotted quailthrush	OW
Ninox novaeseelandiae	boobook owl (c)	OF
Aegotheles cristatus	owlet nightjar (c)	OW
Podargus strigoides	tawny frogmouth	OF
Vanellus miles	spurwinged plover	?

OW = open woodland
OF = open forest
OS = open scrub
(c) = calls

KEY	
n	not previously recorded
*	introduced species
u	uncommon
f	frequently occurring

FAMILY	SPECIES	PLANT COMMUNITY					
		1	2a	2b	3	4	5
Dilleniaceae	*Hibbertia acicularis*					u	
	Hibbertia cisitiflora					u	f
	Hibbertia monogyna		u	u	f		
	Hibbertia obtusifolia	f				u	
Droserraceae	*Drosera spathulata*						u
Epacridaceae	*Brachyloma daphnoides*		u				
	Dracophyllum secundum						u
	Epacis longiflora						u
	Epacris microphylla	u					
	Epacris muelleri						u
	Epacris obtusifolia				u		u
	Epacris paludosa						u
	Epacris pulchella	u				f	u
	Epacris reclinata						u
	Leucopogon lanceoulatus var lanceolatus			u	f		
	Lissanthe sapida					u	
	Monotoca scoparia			u			
	Sprengelia incarnata						u
	Woollsia pungens						u

KEY	
n	not previously recorded
*	introduced species
u	uncommon
f	frequently occurring

FAMILY	SPECIES	PLANT COMMUNITY					
		1	2a	2b	3	4	5
Euphorbiaceae	*Amperea xiphoclada*	f	f	u		u	
	Pranthea corymbosa			u			
	Poranthera ericifolia	u	u			f	
	Poranthera microphylla	u	u				
	Pseudanthus divaricatissimus					u	
Fabaceae: Faboideae	*Almaleea incurvata*						u
	Bossiaea ensata	f	u	u			u
	Bossiaea heteophylla	u	u				
	Daviesia ulicifolia	f	f	f		u	
	Dillwynia sercea		u				
	Dillwynia retorta species complex		u				
	Gompholobuim glabratum	u				u	
	Gompholobium huegelii		u				
	Gompholobium latifolium	u	u			u	
	Mirbelia platyloboides					u	
	Mirbelia rubiifolia	u	u	u		u	
	Phyllota phylicoides		u	u			
	Phyllota squarrosa			u			
	Platylobium formosum	f	f	f			

KEY	
n	not previously recorded
*	introduced species
u	uncommon
f	frequently occurring

FAMILY	SPECIES	PLANT COMMUNITY					
		1	2a	2b	3	4	5
Fabaceae: Faboideae cont....	*Pultenaea brunioides*		u				
	Pultenaea divaricata	u					
	Pultenaea retusa			u			
	Genista monspessulana *	u	u				
Fabaceae: Mimiosoideae	*Acacia dorothea*		u				
	Acacia echinula	u					
	Acacia elata				u		
	Acacia lonifolia		u				
	Acacia obtusifolia	f	f	f		u	
	Acacia suaveolens	u					
	Acacia terminalis	f	f	f		u	
	Acacia ulicifolia					f	
Goodeniaceae	*Dampiera stricta*	f	f	f		u	f
	Goodenia bellidifolia	u	u	u			
Haloragaceae	*Gonocarpus teyragynus*			u		f	
Loganiaceae	*Miitrasacme polymorpha*					u	
Loranthaceae	*Amyema pendulum subsp pendulum*		u				
Myrtaceae	*Baeckia linifolia*						u
	Callistemon citrinus						u

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FAMILY	SPECIES	PLANT COMMUNITY					
		1	2a	2b	3	4	5
Myrtaceae cont...	*Eucalyptus blaxlandii*			u			
	Eucalyptus consideniana	f					
	Eucalyptus mannifera		u				
	Eucalyptus moorei					u	
	Eucalyptus oblonga		u				
	Eucalyptus oreades				f		
	Eucalyptus piperita	u	f	f			
	Eucalyptus radiata subsp radiata		u	u			
	Eucalyptus sclerophylla	u	f			u	
	Eucalyptus sieberi	f	u	u		u	
	Eucalyptus stricta	u				f	
	Leptospermum arachnoides					u	
	Leptospermum juniperinum	u	u			u	
	Leptospermum polygalifolium			f		u	
	Leptospermum squarrosum					u	u
	Leptosperum trinervium	f	f	f		u	u
Olacaceae	*Olax stricta*	u					
Pittosporaceae	*Billardiera procumbens*					u	
Polygalaceae	*Comesperma ericinum*	f	f	f		u	

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Proteaceae	*Banksia conferta var penicillata*					u	
	Banksia ericfolia					f	
	Banksia marginata		f				
	Banksia oblongifolia		u				
	Banksia serrata	u	u			u	
	Banksia spinulosa var cunnighamii	u	u				
	Banksia spinulosa var spinulosa	u				u	
	Conospermum taxifolium	u	u				
	Conospermum tenuifolium	f	f	u		u	
	Grevillea acanthifolia			u			
	Grevillea laurifolia	f	f			u	
	Hakea dactyloides	u	u			u	
	hakea teretifolia	u	u			u	f
	Isopogon anemonifolius	f	f			u	
	Lambertia formosa	f	f	f		u	
	Lomatia silaifolia	f	f	u		u	
	Lomatia silaifolia	u	u	u		u	
	Persoonia chamaepitys	f	f			u	
	Persoonia lanceolata		u				

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Proteaceae cont...	*Persoonia levis*			u	u		
	Persoonia mollis			u			
	Persoonia myrtilloides		f	u			
	Petrophile pulchella	f	f	u		u	
	Symphionema montanum					u	
	Symhionema paludosum					u	
	Telopea speciosissima	f	f	f			
Rhamnaceae	*Cryptandra amara var amara*					u	
	Pomaderris andromedifolia			f			
	Pomaderris ledifolia			u			
Rubiaceae	*Galium propinquum*	u					
	Opercularia aspera				u		
	Pomax umbellata	u	u				
Rutaceae	*Boronia microphylla*		u	u		f	
	Boronia pinnata			u			
	Boronia rigens					u	
	Phebalium squalosum subsp ozothamnoides				u		
Santalaceae	*Choretrum candollei*		u	u	u		
	Choretrum pauciflorum				u		

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Santalaceae cont...	*Leptomeria acida*			u		u	
Solanaceae	*Solanum pungetium*			u			
Stylidiaceae	*Stylidium lineare*					f	
	Stylidium productum		u			f	
Thymelaeceae	*Pimelea linifolia subsp linoides*			u			
Tremandraceae	*Tetratheca rubiodes*		f				
	Tetratheca rupicola		u			u	
Violaceae	*Hybanthus monopetalus*	u	u	u		u	
MAGNOLIOPSIDA - MONOCOTYLEDONS							
Cyperaceae	*Caustis flexuosa*	u	u			f	u
	Gahnia melanocarpa						u
	Gahnia microstachya				u		u
	Gahnia sieberiana				f		f
	Gymnoschoenus sphaerocephalus						f
	Lepidosperma laterale		u			f	u
	Lepidosperma limicola					u	f
	Ptilanthelium deustum				u		f
	Schenus imberbis		u			u	

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Cyperaceae cont...	*Schoenus melanostachys*		u			u	
	Schoenus villosus				u		f
Haemodoraceae	*Haemodorum planifolium*	u	u				
Iridaceae	*Patersonia serices var sericea*	f	u				
Iridaceae	*Patersonia glaberata*		u			u	
Juncaceae	*Juncus planifolius*						u
Liliaceae	*Dianella caerulea*		u				
	Sowerbaea juncea	u					
Lomandraceae	*Lomandra filiformus subsp filiformis*		u			u	
	Lomandra longifola subsp longifolia				f	f	
	Lomandra obliqua	u	u	u			
Orchidaceae	*Caladenia catenata*		f	f	f		
	Caladenia angustata		f	f	u		
	Corybas pruinosus				u		
	Thelymitra ixoides			u	u		
Poaceae	*Anisopogon avenaceus*		u	u			
	Chionochloa pallida	u	u		u		u
	Danthonia sp	u	u	u			
	Echinopogon caespitosus	u					

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Poaceae cont.....	*Entolasia sricta*		u			u	
	Stipa sp	f	u				
	Themeda australia	u					
Restionaceae	*Lepyrodia scariosa*			u		f	f
	Restio fastigiatus	u	u	u			
Xanthorrhoeaceae	*Xanthorrhoea media*		u	u		u	
Xyridaceae	*Xyris ustulata*						f