EIS 845

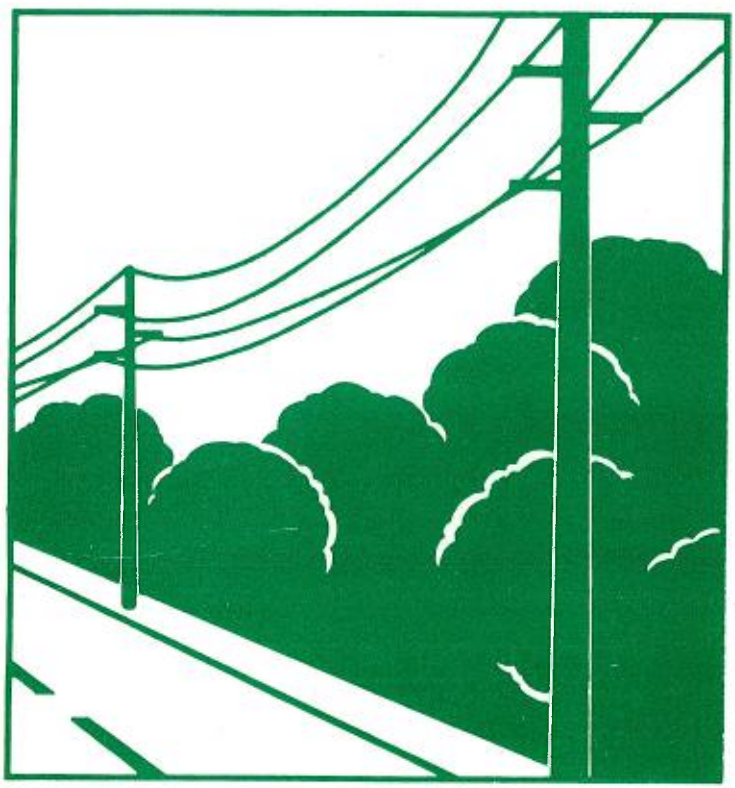
AB019540

66kV electricity transmission line, Springwood - Winmalee - Warrimoo : environmental impact statement

PROSPECT ELECTRICITY

66 kV ELECTRICITY TRANSMISSION LINE SPRINGWOOD – WINMALEE – WARRIMOO

Environmental Impact Statement



KINHILL

PROSPECT ELECTRICITY

66 KV ELECTRICITY TRANSMISSION LINE

SPRINGWOOD – WINMALEE – WARRIMOO

ENVIRONMENTAL IMPACT STATEMENT

Prepared for:

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August 1990
S89089

ELECTRICITY TRANSMISSION LINES

SPRINGWOOD – WINMALEE – WARRIMOO

ENVIRONMENTAL IMPACT STATEMENT

Clause 59 Certification

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

M. T Wade

M.T. Wade
Kinhill Engineers Pty Ltd
August 1990

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SUMMARY

The proposal is to construct a 66 kV transmission line to provide a connection from the existing Springwood zone substation to the proposed zone substation at Winmalee, with a further connect to the bulk supply point at Warrimoo. Prospect Electricity is both the proponent and determining authority for the proposed transmission line.

STRUCTURE OF THE ENVIRONMENTAL IMPACT STATEMENT

This environmental impact statement has been divided into seven chapters. Chapter One provides relevant background information on the need for the proposal, previous studies and the implications of deferring or not proceeding with the proposal. The proposed line is needed to overcome existing capacity problems and to meet the forecast demand for electricity in the area.

Chapter Two examines the range of options which could be adopted as a means of overcoming the existing and future supply problems outlined in Chapter 1. Apart from the construction of a new 66 kV transmission line to connect with the new zone substation, other transmission options examined included the upgrading of the Springwood zone substation, and the implementation of demand management methods.

Chapters Three and Four describe the route assessment process. As part of this process, Chapter Three provides details on the constraints maps which were prepared for the study area. These maps describe such route selection factors as aboriginal archaeology; vegetation; wildlife; soil erosion; landscape and visual quality; heritage; planning controls; and bushfire hazard. Chapter Four identifies and assesses the impact of a range of transmission line route options in relation to the physical constraints described in Chapter Three.

Chapter Five provides a complete description of the proposed transmission line and associated works. It includes a description of the route alignment, transmission structures and easements, the proposed substation and aspects of construction.

Chapter Six summarizes the results of consultation with relevant authorities and the community.

Chapter Seven assesses the impact of the proposal on the environment. With the exception of one private property, the proposed transmission line would be primarily located within road reserves or Crown land. The extent to which the proposal impacts on visual and landscape quality and soil erosion would be largely dependent on the implementation of proposed mitigation measures. The impact on vegetation and wildlife

would be minimized by the use of existing roads and clearings and the use of large spans for valley crossings. The impact of the proposal in relation to bushfire hazard, planning controls, heritage, and electromagnetic fields would be minimized by proposed mitigation measures.

Chapter One

REQUIREMENT FOR THE TRANSMISSION LINE

This chapter provides justification for the proposal. It includes details on the need for the project, the role of the proponent and the implications of the project not proceeding.

1.1 THE PROPOSAL

The proposal is to construct 66 kV transmission lines in the lower Blue Mountains area, west of Sydney. The proposed lines would provide a connection from the existing Springwood zone substation to the proposed zone substation at Winmalee; and from the proposed Winmalee zone substation to the existing bulk supply point at Warrimoo. The proposed lines would connect with the existing transmission line system and would initially operate as 11 kV lines.

The proposed transmission lines would form connecting links within the existing power supply network, as shown in Figure 1.1. These connections would provide a back up supply in the event of a breakdown along one of the linkages within the supply loop. The supply loop is designed in accordance with Prospect Electricity's policy to reduce the risk of loss of supply resulting from maintenance works, or line insulation failure which may be due to a number of causes, including bushfires.

The systems planning branch of Prospect Electricity prepared a report in January 1988 which provided details on the need for the proposed extension to the existing electricity transmission network (The Prospect County Council, 1988). Section 1.4 provides relevant information from this report.

1.1.2 RESPONSIBILITIES AND OBJECTIVES OF PROSPECT ELECTRICITY

The Prospect County Council, generally referred to as Prospect Electricity, was established on January 1, 1957, as the electricity distribution authority for western Sydney. Its powers are outlined under the Local Government Act 1919 and the Electricity Act 1945 as amended. Prospect Electricity is the second largest distribution authority in New South Wales, providing power to more than 1.2 million people within an area of 16,115 square kilometres. Prospect Electricity's constituent councils include the cities of Blacktown, Blue Mountains, Campbelltown, Fairfield, Hawkesbury, Lithgow, Liverpool, Parramatta and Penrith; municipalities of Camden and Holroyd; shires of Baulkham Hills, Rylstone and Wollondilly.

The broad purpose of Prospect Electricity's operation is to provide the community with a reliable and adequate supply of electricity at the lowest possible cost, as defined in the

operating and development plan to 1993/94. In order to achieve its purpose, Prospect Electricity purchases bulk electricity from the Electricity Commission of New South Wales. This electricity supply is reduced to 11,000 volts through Prospect's 90 zone substations and further reduced in voltage to 415 and 240 volts through 14,638 substations for distribution to suit customer needs.

1.2 ROUTE ASSESSMENT STUDY

In late 1988 Prospect Electricity commissioned Kinhill Engineers Pty Ltd to undertake a route assessment study to determine a suitable alignment for the proposed 66 kV transmission line. The specific study objectives were to:

- undertake a study to identify and evaluate line route options based on detailed constraints mapping of the study area.
- select the most appropriate route based on environmental, engineering and economic aspects of the alternatives;
- undertake an environmental assessment in accordance with Clause 56 of the Environmental Planning and Assessment (EPA) Regulation, 1980;
- make recommendations on the need for an Environmental Impact Statement.

The route selection study was completed in September 1989, and made available for public comment. Based on the findings of this report and further consultation with Blue Mountains City Council and the Department of Planning, Prospect Electricity has determined that an Environmental Statement should be prepared for the proposal. The result of the route assessment study are incorporated into Section 3 of the EIS.

1.3 STATUTORY CONSIDERATIONS

The Environmental Impact Statement has been prepared under the provisions of Part V of the Environmental Planning and Assessment Act, 1979, as amended. The Department of Planning has advised of its requirements for the preparation of the EIS which are given in Appendix A. The formal advice of Blue Mountains City Council (Appendix B) confirms the appropriateness of assessing the proposal under Part V of the EPA Act.

1.4 NEED FOR THE PROPOSAL

The Winmalee area is currently supplied from the 66 kV/11 kV Springwood zone substation. Supply from the substation is carried along a single 11 kV feeder to the Winmalee area. A second 66 kV/11 kV zone substation at Blaxland supplies the remainder of the lower Blue Mountains area.

PROPOSED
WINMALEE ZONE
SUBSTATION

SPRINGWOOD ZONE
SUBSTATION

WARRIMOO
BULK SUPPLY
POINT

Backup supply to Springwood

Normal supply to Winmalee

Existing subtransmission line

SPRINGWOOD

VALLEY HEIGHTS

WARRIMOO

YELLOW ROCK

MOUNT RIVERVIEW

BLAXLAND

PARK RIDGE

EPEAN RIVER

North

0

500m

Figure 1.1
NEED FOR THE PROJECT

- Extent of Study area
- Existing subtransmission linkage
- Proposed lines

1.4.1 THE PRESENT ELECTRICITY SUPPLY SYSTEM

Electricity supply from the bulk supply points at Warrimoo and Lawson is delivered to the zone substations by a system of lines referred to as the subtransmission system.

The existing subtransmission system supplies large quantities of power and services a significant number of customers. For these reasons it is important that the design of the system allow for supply to be maintained to all zone substations, in the event that supply to one transmission circuit is disrupted. This design criterion can be met by providing each zone substation with a minimum of two incoming feeders and with each feeder being capable of supplying the zone substation at full load. This design criterion is known as first emergency conditions.

1.4.2 CURRENT LOADS

The 11kV feeder supplying Winmalee from the Springwood substation regularly reaches unacceptable loads. For example, the main Frazer Road Feeder, which has a nominal operating capacity of 240 amps, recorded a peak load of 390 amps in the winter months of 1989. This load represents the maximum emergency current which this feeder can sustain. Furthermore, there is no reserve capacity to provide standby supply to the Winmalee area in the event of a failure of any of the 11 kV feeders, and the system is very close to completely failing during the winter peak period.

The poor voltage conditions currently being experienced in the area have caused pump failures at the Winmalee sewerage pumping station (Water Board. July, 1989). Unless an alternative energy source, such as diesel, is utilized for the operation of the pump motors, poor voltage conditions could contribute to surcharge of sewage. This could pose an unacceptable risk to the environment.

The Springwood zone substation which supplies the 11 kV feeders in the Springwood and Winmalee areas recorded a peak of 23 MV.A (megavolt amperes) during the winter of 1989. This is in excess of its nominal 20 MV.A rating and is equal to its maximum emergency capacity.

1.4.3 PROJECTED LOADS

The lower Blue Mountains area has experienced significant growth over the last ten years. During this period the demand for electricity has approximately doubled. The population of the area is growing at an average of five percent per annum and is expected to continue to grow for the next ten years. (Prospect County Council, 1988.)

Much of the lower Blue Mountains' growth is in the Winmalee area. The load forecast for Springwood, Blaxland and Winmalee is shown in Table 1.1 The recorded load at the Springwood zone substation in 1987 represented approximately 91% of the substation capacity (Prospect Electricity, 1988). Load forecasts undertaken by Prospect Electricity estimate that Springwood zone substation would reach its capacity in 1993 with the possibility that severe overloading may result in lengthy outages.

Table 1.1 **Zone Substation Load Forecast**

Winter Loads												
						Year						
Zone		*89*	90	91	92	93	94	95	95	97	98	99
Substation	Rating	Forecast Maximum (MV.A)										
Blaxland	35.0	24.60	23	24	28*	29	30	30	31	29*	30	31
Springwood	20.0	23.10	22	22	20*	20	21	21	22	13*	14	14
Winmalee	0.0	0.00	0	0	0	0	0	0	0	11*	12	12
Summer Loads												
Blaxland	35.0	14.50	14	14	16*	17	17	18	18	17*	17	18
Springwood	20.0	13.20	12	13	11*	11	12	12	12	7*	8	8
Winmalee	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7*	6.8	7.0

*Notes: *89* is the recorded maximum demand for summer 88/89 and Winter 89*

** Indicates transfer or system rearrangement*

The load forecast for the Springwood zone substation has been based on the expected growth in demand from the existing development area and future growth areas as identified in the Blue Mountains Environmental Management Plan (1986). It was estimated that the ultimate load on the Springwood zone substation would exceed the capacity by 50%. This forecast was confirmed by Prospect Electricity in response to the recently exhibited draft Local Environmental Plan (EMP 1) which identified areas of future urban development.

The Winmalee zone substation and the proposed transmission lines would be required to overcome existing capacity problems and to accommodate the load forecast for the Winmalee area. This would be achieved by the development of a subtransmission system which provides a direct connection from the bulk supply point and a back-up connection from the Springwood zone substation.

The proposal is also required to meet the additional power supply needs associated with the proposed upgrading of the Winmalee Sewerage treatment works. The Water Board has advised that it will gradually upgrade the existing treastment works which would result in additional electrical loading of 40 kVA by the end of 1990 and 45.4 kVA by the end of 1992. The existing electricity supply system is only sufficient for the total load up to the end of 1990 (Water Board. March, 1989). The proposal is therefore needed by 1991 to accomodate the proposed upgrading of the treatment works.

1.4.4 SUBTRANSMISSION SYSTEM

The problems associated with the subtransmission system are documented in Technical Report No. 90 (The Prospect County Council, 1988). This report concluded that the

subtransmission system would have inadequate capacity (under first level emergency and summer conditions) by the year 1997. The following measures were recommended to overcome the inadequacies of the subtransmission system:

- Construction of a new zone substation at Winmalee by autumn 1996, to off-load the Springwood zone substation. This would avoid the need to augment the Springwood zone substation which has limitations on expansion.

- Undertaking of subtransmission development which would include the construction of two 66 kV feeders, to be used initially at 11 kV.

The existing transmission lines supplying the Springwood zone substation have a rating of 22 MVA (mega volt amps) in summer. Springwood zone substation has a limited capacity of 20 MVA. The present loading is 23 MVA with an expected load growth to 30 MVA. Of the existing load, 8 MVA is generated in the Winmalee area, with an estimated ultimate increase to 12 MVA. Construction of an additional zone substation at Winmalee would allow sufficient capacity at Springwood for the foreseeable future and would increase the efficiency and reliability of the system.

1.4.5 PROPOSED NETWORK EXPANSION

Expansion of the electricity network in the Winmalee area is required to maintain supply to existing customers and to provide additional capacity for new connections. Development of the 11 kV system is required to alleviate 11 kV technical problems and to off-load Springwood zone substation in the early 1990s. For loading and voltage regulations reasons both sections of the proposed line (Springwood to Winmalee and Winmalee to Warrimoo) would need to be constructed by 1990/91.

Construction of the proposed transmission line operating at 11kV would satisfy projected load growth in the short term and defer construction of the substation. The existing 11kV system from Springwood zone substation to the Winmalee area is currently being extended and reinforced to satisfy load growth. However, it is expected that immediate load growth would exceed Springwood capacity requiring the proposed 66 kV transmission lines and substation to be constructed in the long term.

1.5 CONSEQUENCES OF DEFERRAL OR NO ACTION

Development of the proposed transmission lines is required by the early 1990s to permit the connection of additional electrical load resulting from expected new urban development. Without the proposed transmission lines, the quality of supply (voltage regulation) to existing users in the Winmalee area would be below acceptable limits. This is already apparent during peak load periods or periods of routine and emergency maintenance, at which time the normal supply voltage is reduced or cannot be sustained. Reduced supply voltage results in loss of efficiency in electrical equipment such as refrigerators, air conditioners and lights. An increase in the frequency and duration of electrical disruptions could be expected in the Winmalee area during periods of routine maintenance and bushfires, which are the most critical emergencies in the Blue Mountains

area. Deferral of the proposal could also have serious implications for the continued safe operation of the Winmalee sewerage treatment plant.

Chapter Two

ALTERNATIVE TRANSMISSION OPTIONS AND THE PREFERRED PLAN

This chapter describes the alternative transmission options for addressing the current and future supply problems. The alternative route alignments for the proposed transmission line are discussed in detail in Chapter Four.

2.1 OBJECTIVES

The need for the proposal is outlined in Chapter One. The specific objectives of the proposal are to:

- overcome the capacity and associated overloading problems of the 11kV feeder system and the Springwood zone substation.
- to accommodate the current demand and load forecast for electricity generated by existing and future urban development in the Winmalee area
- to provide a back up electricity supply in the event of a breakdown within the subtransmission system

In addition to meeting these objectives, alternative transmission options should:

- be compatible with the existing subtransmission system
- utilize existing transmission lines, to avoid proliferation
- be compatible with the long-term augmentation of the Blue Mountains electricity supply network

2.2 SPRINGWOOD SUBSTATION UPGRADING

The first alternative transmission option is to upgrade the existing Springwood zone substation, located as shown in Figure 1.1, and the construction of additional 11 kV feeders from the upgraded zone substation to Winmalee.

This is not a favoured option because of the extreme difficulty in obtaining additional 11 kV feeder routes from Springwood to Winmalee. The topography of the area precludes a ring feed system and the extent of gully crossing and easement requirements would have attendant environmental impacts.

The existing Springwood zone substation is twenty-four years old. It would be difficult to undertake reconstruction while maintaining electricity supply to the Springwood and Winmalee areas. Upgrading of the substation would only provide enough capacity to satisfy short-term demand. Further major works would still be required to satisfy long-term demand.

2.3 DEMAND MANAGEMENT OPTION

The demand management option involves making changes to customer supply with the aim of reducing the load on the existing supply system. In response to the current high loads on the existing system, Prospect Electricity has implemented reduced off peak electricity hours in an attempt to reduce the load by 12 to 20 percent. This measure is designed to prevent a partial break down of the existing supply system during times of peak load which generally occur in the winter months.

Implementation of demand management is not considered a feasible option for overcoming existing and future loading capacity problems. With the expected increase in demand generated by future growth of the Winmalee area, even this reduction would not be sufficient to prevent overloading of the present supply system.

2.4 CONSTRUCTION OF A NEW SUBSTATION

The construction of a new zone substation at Winmalee was assessed as the most suitable transmission option given the deficiencies of the options described in sections 2.2 and 2.3. The construction of a new zone substation is consistent with a long term strategy to ensure future electricity supply to growth areas in the lower Blue Mountains.

2.4.1 ALTERNATIVE SITES FOR THE PROPOSED ZONE SUBSTATION

Prospect Electricity, in consultation with the Blue Mountains City Council, considered four alternative sites for the proposed Winmalee zone substation. These alternative sites were selected to meet the following criteria:

- Ease of access for subtransmission feeders (a site that provided the shortest distance and avoided traversing populated areas)
- Ease of development of 11 kV distribution feeder (in order to minimize overhead conductors and the cost to the community)
- Absence of earthing difficulties, for example soil resistivity and proximity to Telecom facilities

- Centre of load for substation position (the more suitable site is closer to the centre of load)

All sites were required to be at least 0.6 km from the District Telephone Exchange in Singles Ridge Road to ensure that under fault conditions, the induced currents did not cause damage to the Telecom installations.

The following alternative zone substation sites were considered:

- Site 1 is located on the corner of Roslyn and Halcyon Avenues being part of St Columbus College property. This site was dismissed as a suitable option due to its possible future residential use.

- Site 2 is located on the corner of Roslyn and Halcyon Avenues on lots 4 and 5, DP 20760 and Part B MPS (RP) 42445. This site was dismissed as a suitable option due to its residential zoning.

- Site 3 is located on the corner of Arunta Avenue and Singles Ridge Road. It is known as lot 79 and is privately owned. This site is subject to Local Environment Plan No. 36 (gazetted 23 May 1986) and Development Control Plan adopted by Blue Mountains Council 1 September 1987 which requires a twenty metre building set-back from Singles Ridge Road. This requirement would place unreasonable restrictions on the siting and operation of a proposed zone substation.

- Site 4 is located on the corner of Vendetta Road and Singles Ridge Road. It is Crown land described as Part Portion 83. The site was assessed as the most suitable site for the proposed zone substation as it met the previously described criteria.

2.5 THE PREFERRED TRANSMISSION OPTION

The selected site of the proposed Winmalee zone substation influences the location and staging of the proposed transmission lines. The proposal would involve:

- construction of a 66 kV transmission line from Warrimoo to Winmalee. In the short term, supply would be obtained from the existing zone sub-station at Blaxland with the line operating as 11 kV.

- construction of a 66 kV transmission line from Springwood zone substation to Winmalee to be used as an 11 kV line in the short term to meet immediate demand

- in conjunction with the above measures, rearranging the existing feeder network to equalize loads

- construction of the Winmalee zone substation in 1995-1996

- conversion of new lines to 66 kV by re-energizing, following construction of the Winmalee zone substation

Chapter Three

MAPPING OF ROUTE SELECTION FACTORS

This section provides a summary of the route assessment study undertaken to determine the most suitable route for the proposed transmission line. It includes a description of the route selection methodology and the results of detailed constraints mapping undertaken for the study area.

3.1 DEFINITION OF THE STUDY AREA

The main factors considered in defining the extent of the study included:

- the location of the origin and destination point of the transmission lines which included the Springwood zone substation, the Warrimoo bulk supply point and the proposed Winmalee zone substation;
- the need to minimize the length of the proposed transmission lines;
- the location of physical constraints such as gulleys, creeks and steep slopes.

Based on these factors, the study area boundaries were determined by:

- Hawkesbury Road and Singles Ridge Road in the north;
- the residential areas of Blaxland and Mount Riverview in the east and south-east;
- the natural creek and escarpment boundary in the west and south-west which generally run parallel to the Great Western Highway.

3.2 ROUTE SELECTION METHODOLOGY

The route selection methodology involved mapping of the following constraints for the purpose of determining alternative route options and the associated environmental impact. Further details on the assessment of route options is given in Chapter Four. The following route selection factors have been mapped as part of this process:

- Aboriginal heritage and archaeology
- Vegetation
- Wildlife habitats

- Landscape and visual quality
- Soil erosion hazard
- Agricultural capability
- Land ownership
- European and natural heritage
- Planning controls
- Bushfire hazard.

3.3 ABORIGINAL HERITAGE AND ARCHAEOLOGY

The assessment of archaeological sensitivity given in Figure 3.1 is based on landscape features within the study area and the distribution of recorded sites within similar landscape types. Archaeological investigations within the study area aimed to:

- describe and locate known sites and items of significance;
- identify areas which may potentially contain sites or items of heritage significance;
- identify areas of low, moderate and high sensitivity to transmission line construction, based on assessment of known sites and potential sites;
- provide details on the type, number and significance of known sites.

3.3.1 RECORDED ARCHAEOLOGICAL SITES

There are seven recorded sites with the study area as shown in Figure 3.1 (pers com. B. Conyers, National Parks and Wildlife Service, 1989). The maps of these recorded sites have been inspected, and the environments of the sites compared with the latest available aerial photographs. The recorded sites are representative of the kinds of archaeological sites found in the Blue Mountains and are divided as follows:

- Three sites located at Valley Heights and near Valley Heights Creek;
- Three sites located adjacent to Cripple Creek between Blaxland and Mount Riverview;
- A single open site overlooking a tributary of Fitzgeralds Creek near the end of Singles Ridge Road.

3.3.2 AREAS OF POTENTIAL SIGNIFICANCE

Based on the locational characteristics of known sites and previous research, the largest number of potential sites are expected to be located along and adjacent to the ridgetops, particularly where a creek is in close proximity. Archaeological sites tend to be found near areas of settlement. As the main settlement across the Blue Mountains follows the ridge lines along which the Great Western Highway passes, it is to be expected that the majority of sites would be found in proximity to the Highway.

Figure 3.1

ABORIGINAL HERITAGE AND ARCHAEOLOGICAL SENSITIVITY

- Recorded sites
- High sensitivity
- Moderate sensitivity
- Low sensitivity

Source: J Kohen, 1989

3.3.3 ARCHAEOLOGICAL SENSITIVITY

Although prehistoric Aboriginal sites have been found in virtually all environments in the Blue Mountains with the possible exception of the steep gorges, sites are unlikely to occur away from the ridgetops and away from sources of water.

Since the recorded sites do cluster together, it seems likely that additional undiscovered sites are more likely to exist adjacent to those already located. As a consequence, those areas which are distant from ridges, creeks and known sites will have the lowest potential for additional undiscovered sites.

Figure 3.1 shows areas of high, moderate and low archaeological sensitivity. These areas have been determined as follows:

- Areas of greatest significance and high sensitivity - these include recorded sites and the immediate environments of those sites;

- Areas of moderate sensitivity - these include regions where no sites have been recorded, but where the environment is such that there is a likelihood that undiscovered sites may be located because of the nature of the terrain which includes ridgetops and areas adjacent to water supplies;

- Areas of low sensitivity - these include areas where there are no known sites and which are not likely to contain sites. This does not mean that sites do not exist in these regions but there is little potential for sites to be found.

3.4 VEGETATION

Figure 3.2 identifies vegetation types and areas of ecological significance within the study area. Information on vegetation of the study area was obtained from the National Herbarium of New South Wales, the National Parks and Wildlife Service, aerial photography and field inspections.

3.4.1 VEGETATION TYPES AND SIGNIFICANCE

The vegetation units shown in Figure 3.2 include:

- Tall forests (average tree height greater than 25 metres and including rainforest)
- Forest (average tree height less than 25 metres)
- Cleared land

Blue Mountains City Council has prepared maps at 1:10,000 scale which identify vegetation communities of conservation significance within the study area. Significant vegetation types identified include hanging swamps, rainforest, alluvial forests, alluvial bench woodlands and heath.

Of particular significance are tall forest remnants on Wianamatta shale and the Cabbage Gums (Eucalyptus amplifolia) forests on the volcanic diatreme of the Sun Valley area.

PROPOSED WINMALEE ZONE SUBSTATION

SPRINGWOOD

VALLEY HEIGHTS

YELLOW ROCK

WARRIMOO

MOUNT RIVERVIEW

PARK RIDGE

Figure 3.2

VEGETATION TYPES AND ECOLOGICAL SENSITIVITY

SENSITIVITY	VEGETATION TYPES
Very high	1 Tall forest
High	2 Forest
Moderate	3 Cleared land
Low	

Source: Mt King Ecological Surveys, 1989.

North

0 500m

These vegetation types are considered to be of high significance due to their restricted distribution within the study area. A full species list is included as Appendix C.

Tall forest communities in the deep gullies are also of significance. The extent of rainforest within these tall forest areas appears to be related primarily to fire history. The deep gully communities provide habitat for some rare and endangered plant species.

3.4.2 RARE AND ENDANGERED SPECIES

A list of rare and endangered species was provided in the Route assessment study and in Appendix C. The habitats where rare and endangered species exist are most likely to include tall forests along creeklines; remnant forests on shale; and drier forests of the eastern escarpment. Several rare or endangered plants have either been recorded in the study area or nearby.

3.4.3 ECOLOGICAL SENSITIVITY

Plant species diversity, conservation status of vegetation types and the presence or likely existence of rare plant species were used to identify the following four values of ecological sensitivity as shown in Figure 3.2:

- very high - rare or unusual plant communities
- high - tall forests, rainforests, and/or high likelihood of rare plants being present
- moderate - other forest communities, some likelihood of rare plants being present
- low - cleared land

3.5 WILDLIFE HABITATS

The four wildlife habitats identified within the study area include wetlands, escarpment, timbered and grassland habitats as shown in Figure 3.3.

The wetlands habitat includes any alluvial land associated with the creeks such as Fitzgeralds, Long Angle, and Frazers Creeks, as well as lentic (standing) and lotic (flowing) water bodies. This habitat covers the water body together with the aquatic and littoral vegetation. The thin line of riverine vegetation is too small to be mapped as a separate vegetation type and is included within the tall forest and forest category as identified in Section 3.4.

The escarpment habitat covers those areas of land dissected by watercourses and forming steep-sided valley walls. The steep-sided hills, cliff-faces and rocky overhangs of the escarpment are important habitats for a group of specialized animals such as bats and brush-tailed rock-wallabies. This habitat also provides shelter to other more generalized species.

The timbered habitat includes the vegetation types identified as tall forest and forest and covers the majority of the study area. Although some animal species may prefer one

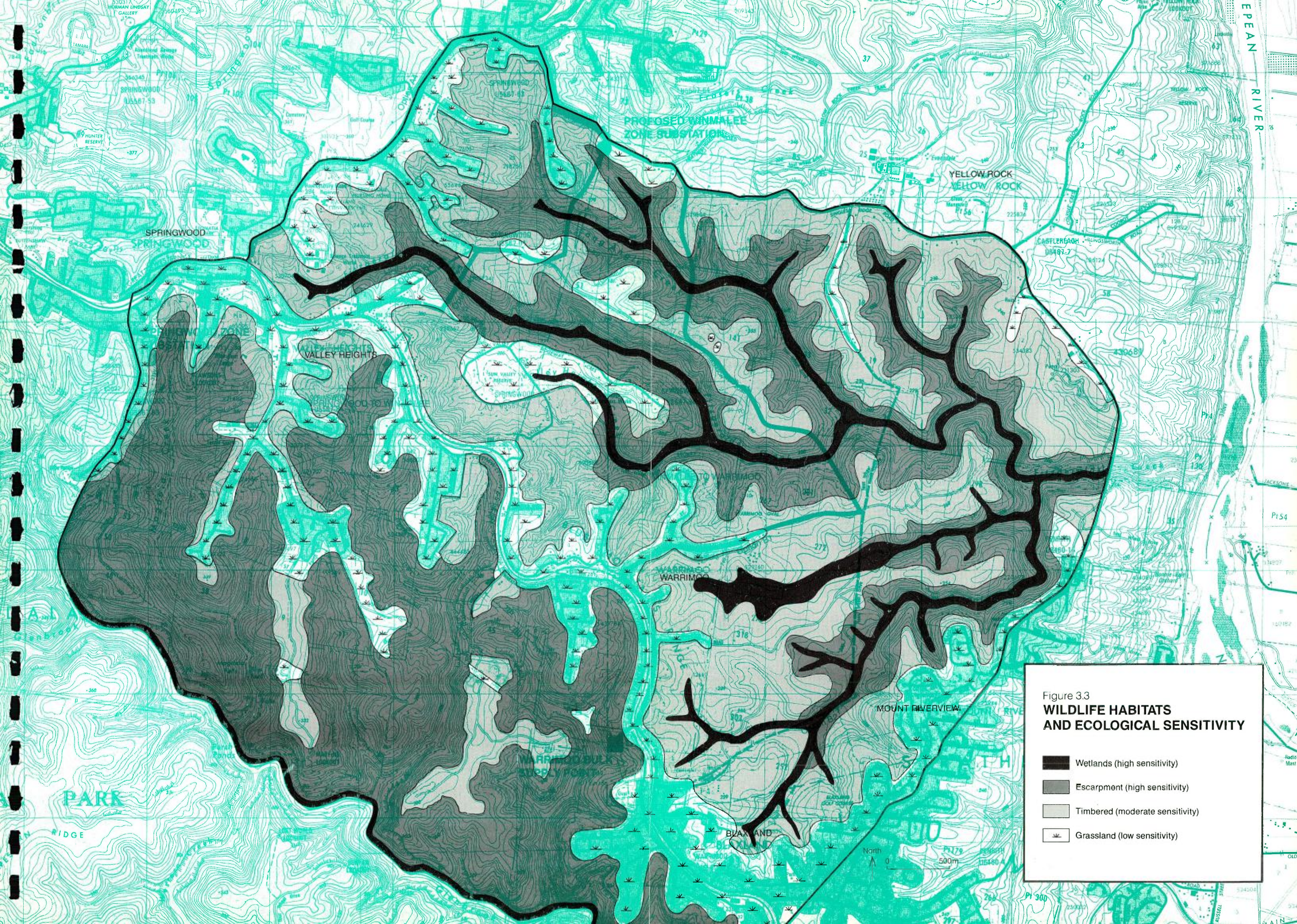


Figure 3.3
WILDLIFE HABITATS AND ECOLOGICAL SENSITIVITY

- Wetlands (high sensitivity)
- Escarpment (high sensitivity)
- Timbered (moderate sensitivity)
- Grassland (low sensitivity)

vegetation type to another, such as tall trees for perching and nesting, there is little difference in the faunal use to warrant an extra habitat category. The grassland habitat is similar to that described in Section 3.4 as cleared land. It includes all areas of induced and natural grassland.

3.5.1 FAUNAL USE OF HABITATS

A large proportion of the native fauna known or expected within the study area is associated with the timbered habitat. Most of the species located within this habitat cannot be considered as specialists and are generally found throughout a range of habitats. For instance, the macropods are not only found in the timber habitat but also in grassland. The wallaroo and the common wombat are associated with timbered, grassland and escarpment habitats, while the short-beaked echidna ranges over a wide variety of habitats.

Small mammals such as the antechinus and the native rats are found in several habitats but usually have a preference for timbered habitats with a dense understorey. The swamp rat is usually associated with wetlands, but can be found in drier habitats. There are three species of possum and five species of glider known from the region in which the study area is located. These would be associated with the timbered habitat. Although bats range widely in search of food, they roost in either the escarpment or timber habitat.

A similar situation occurs for the avifauna. Most birds are associated with the timbered habitat, but also use other habitats. Most parrots use the timber and the grassland habitats, whilst raptors are generally found in the timber, grassland and escarpment habitats. Water birds such as ducks, egrets and herons are closely associated with wetland habitat. Aerial birds such as swallows and fairy martins are usually located in the wetland habitat, but are also found over other habitats. The origma or rock warbler nests within rocky overhangs of the escarpment and is restricted to this habitat.

Most of the 90 species of reptiles known from the region are found in all habitats of the study area, whilst the 30 species of amphibians are mostly associated with the wetland habitats. However, there are several species of frog which are found away from open water and can be considered as associated with grassland, timber and even escarpment habitat. These include the red crowned toadlet and the giant burrowing frog. The broadheaded snake is only found within sandstone escarpment habitat.

3.5.2 ECOLOGICAL VALUE OF HABITATS

Assignment of a value to the wildlife habitats was based on the diversity of fauna within the habitat, the proportion of species of conservation importance expected and the amount of each habitat within the study area. Habitats which have a limited distribution and which support unique flora and fauna are considered to be most important. These include the wetlands and escarpment habitats. Some wetlands have the additional value of providing wildlife corridors between natural areas as a result of the vegetation which fringes water courses.

Although the timbered habitat supports the highest animal diversity, this habitat is widely distributed throughout Eastern Australia and does not contain as high a proportion of

important species as the other habitats. The grassland habitat contains the least number of animal species, is widely distributed throughout Australia and supports few species of conservation importance.

3.6 LANDSCAPE AND VISUAL QUALITY

The visual sensitivity of the study area shown in Figure 3.4 is based on information derived from topographic data, aerial photography and field inspections. This figure was produced using a series of overlay maps to determine areas of high, medium or low visual sensitivity.

3.6.1 FACTORS AFFECTING VISUAL SENSITIVITY

The main factors affecting the visual sensitivity of an area to transmission line construction include terrain, land use, proximity and existing corridors. Each of these factors, observed below, was separately mapped and overlaid to produce Figure 3.4.

Terrain

Terrain influences visual sensitivity in a number of ways. Landform may focus or screen views, whilst sequences of ridges and valleys present a constantly changing relationship between observer, skyline background and viewed object. Three visually significant terrain units were identified within the study area:

- *Ridgelines:* The area has been dissected into a series of elongated ridges which are of high visual sensitivity due to their elevation and the manner in which they contain views by forming the horizon line.

- *Slopes:* These comprise the most extensive terrain unit within the study area, and are of medium visual sensitivity. This assessment combines the high sensitivity of slopes viewed in elevation with the low sensitivity of those which are located directly below potential viewpoints.

- *Creek lines:* Creeks within the study area are deeply incised, and their immediate vicinity is of low visual sensitivity due to enclosure by valley slopes.

Land use

Visual sensitivity is influenced by land use in two respects: firstly, it affects the number of potential observers—for example, residential areas contain more observers than bushland; and secondly, it determines the ability of the landscape to accommodate visual change. Clearing within undisturbed bushland will have a greater impact than clearing in rural residential areas. Three categories of land use identified include:

- *Bushland:* These areas of dense, largely continuous tree cover are of high visual sensitivity due to the visual impact that clearing would have. This factor was considered to outweigh the low levels of visibility which are encountered due to the screening effect of vegetation.

Figure 3.4
VISUAL SENSITIVITY

High

Medium

Low

- *Clearings:* These areas are of medium visual sensitivity. They include cleared areas used for access, grazing, rural residences, farming and recreation. This assessment was based on the trade-off between a substantial number of potential observers, variable levels of visibility, the presence of existing man-made intrusions and impact on remnant tree cover.

- *Housing:* These urban and suburban residential areas are of high visual sensitivity due to the number and proximity of potential observers. This factor was considered to outweigh the significance of existing man-made intrusions, chiefly buildings.

Proximity

The distance between a transmission line and potential observers is crucial to its perceived impact. Within the study area the principal viewpoints were considered to be public roads and the housing areas. Three proximity zones were mapped:

- 0-0.25 km: This includes most foreground and ridgetop views and is of high visual sensitivity.

- 0.25-0.5 km: This comprises middleground views, usually within the slopes terrain unit, and is of medium visual sensitivity

- Over 0.5 km: This comprises background and long-distance views, often across a series of valleys and ridges, and is of low visual sensitivity.

Corridors

The study area is crossed by a number of existing transport and service corridors, which were assessed as follows:

- *Railway:* This comprises a section of the main line between Blaxland and Springwood, and is of medium visual sensitivity due to the trade-off between a high level of visibility, a substantial number of observers and the impact of existing stanchions and overhead lines.

- *Public roads:* These comprise both residential streets and major routes such as the Great Western Highway, and are of high visual sensitivity due to the combination of high levels of visibility with large numbers of potential observers such as residents, drivers, and tourists. These factors were considered to outweigh the presence of man-made intrusions, including existing power lines.

- *Power lines:* These comprise existing cross-country routes (as opposed to roadside lines), and are of low visual sensitivity due to the presence of structures and cleared easements.

- *Other routes:* These comprise rural tracks and service easements such as the water main east of Warrimoo, and are of medium visual sensitivity due to the presence of clearing.

3.6.2 VISUAL SENSITIVITY

Figure 3.4 shows areas of high, medium and low visual sensitivity. This map was produced by overlaying the terrain, land use, proximity and corridor maps as described in Section 3.6.1. The most visually sensitive areas comprise broad zones centred along the developed ridgelines. Four of these zones may be identified:

- Springwood-Blaxland
- Springwood-Winmalee
- Winmalee-Yellow Rock
- Blaxland-Mount Riverview

The principal constraints in these areas are elevation, proximity to potential observers and the combination of road corridors and urban development.

The least visually sensitive areas comprise the valleys which lie between the ridgeline zones. These areas offer screening by surrounding slopes and ridges, and distance from potential observers. Two valley systems may be identified:

- Glenbrook Creek valley, located south-west of Springwood-Blaxland;
- Fitzgeralds Creek valley, located north-east of Warrimoo.

3.7 SOIL EROSION HAZARD

The soil erosion hazard within the study area is mapped in Figure 3.5. This map shows four categories of erosion hazard ranging from low to very high. These categories are based on the soil landscapes map produced by the Soil Conservation Service of New South Wales. Table 3.2 provides details on landscape characteristics, limitations and soil erosion hazard associated with the soil landscape categories identified in Figure 3.5.

Erosion hazard is described by the Soil Conservation Service as the susceptibility of land to prevailing erosion. This definition includes a number of factors such as terrain, soil and climate. The soil erosion hazard map of the study area generally shows the ridgelines and flatter areas to have a lower erosion hazard. Areas with steep slopes generally have a high to very high erosion hazard.

Prospect Electricity would normally use existing tracks and fire trails for transmission line access wherever possible. Although some tracks are located in moderate and high soil erosion hazard areas, Prospect Electricity would generally use these rather than construct new access tracks.

Figure 3.5
SOIL EROSION HAZARD

- Very high
- High
- Moderate
- Low

Source: Soil Conservation Service, 1989.

Table 3.2 **Soil landscapes**

Description	Limitations	Erosion hazard
Rugged, rolling to very steep hills on Hawkesbury sandstone	Mass movement (rock fall), Steep slopes, highly permeable soil, rock outcrop	Very high
Narrow convex crests and ridges, steep colluvial side slopes	Mass movement hazard, rock fall, steep slopes	High
Undulating to rolling rises and low hills on Hawkesbury sandstone	Rock outcrop, localized steep slopes, shallow highly permeable soil, very low fertility soil	High
Gently inclined valley floors surrounded by steep colluvial slopes formed on volcanics	Highly plastic, reactive shrink - swell subsoils with low wet strength	High
Gently undulating crests and ridges on plateau surfaces of Mittagong Formation	Stony soil, low soil fertility, low available water capacity	Moderate
Gently undulating rises on Wianamatta group shales	Poor soil drainage, low soil fertility, moderately reactive highly plastic subsoil	Moderate
Level to gently undulating crests and ridges on plateau	Highly permeable soil, rock outcrop, very low soil fertility	Low

Source: Soil Conservation Service

3.8 AGRICULTURAL SUITABILITY

The agricultural suitability classifications of the Department of Agriculture are shown in Figure 3.6. These suitability classes incorporate the land capability classes produced by the Soil Conservation Service, in addition to a number of other factors such as terrain, vegetation, topography and climate. The purpose of the agricultural suitability maps is to identify agricultural land which should be retained for agricultural purposes.

The study area is covered by classes 4 and 5 lands as defined by the Department of Agriculture. These classes of land are generally considered to be marginal lands which are not suitable for cultivation and with low to very low productivity for grazing. Based on this system of classification, agricultural suitability does not represent a constraint on the future location of transmission lines in any location within the study area.

3.9 LAND OWNERSHIP

The broad pattern of private and public ownership of land within the study area is shown in Figure 3.7. This information was taken from colour coded parish maps held at the Blacktown regional office of the Department of Lands. These maps do not appear to

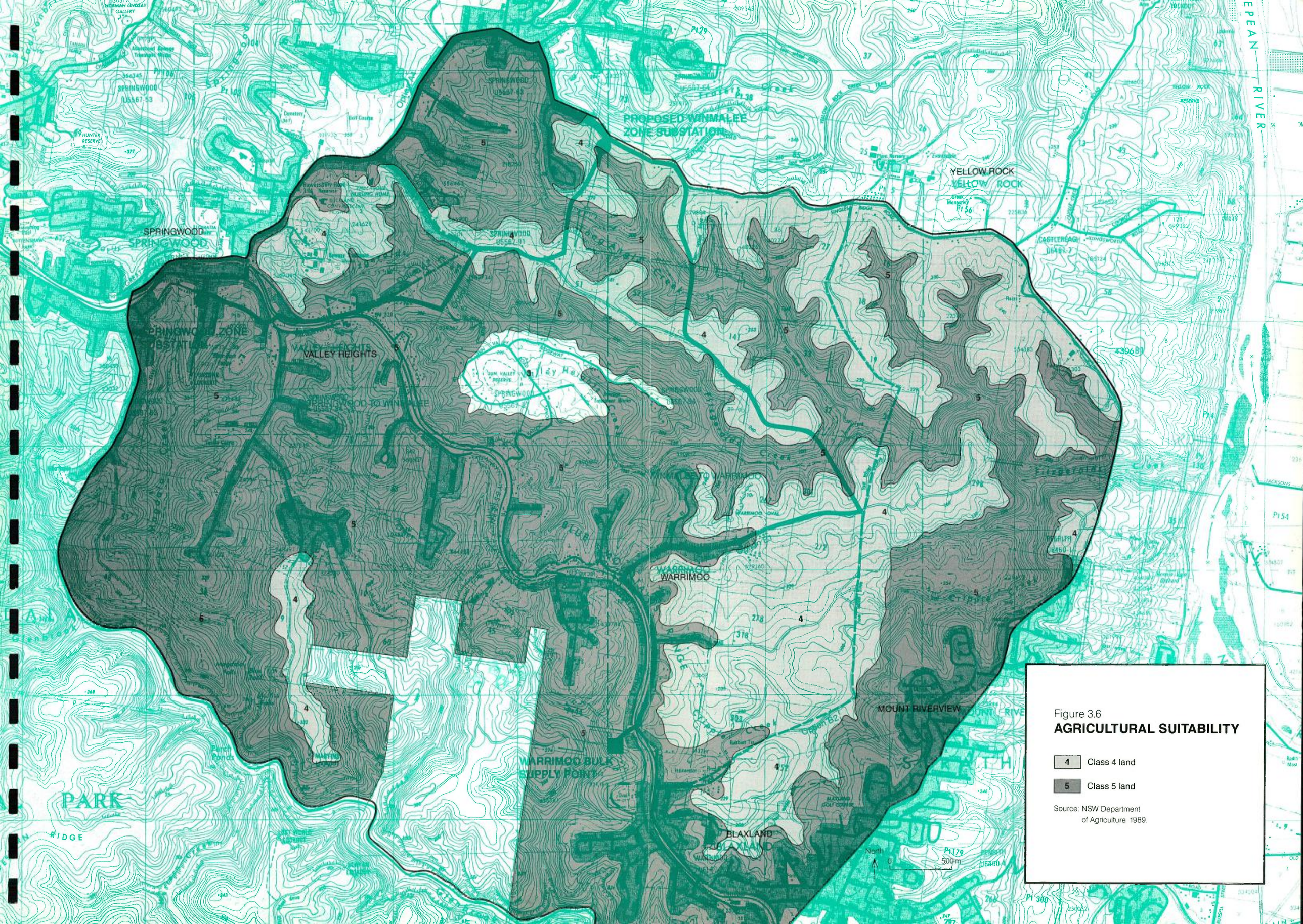


Figure 3.6
AGRICULTURAL SUITABILITY

4 Class 4 land

5 Class 5 land

Source: NSW Department of Agriculture, 1989.

PROPOSED WINMALEE ZONE SUBSTATION

SPRINGWOOD

VALLEY HEIGHTS

YELLOW ROCK

WARRIMOO

WARRIMOO BULK SUPPLY POINT

BLAXLAND

MOUNT RIVERVIEW

Figure 3.7
LAND OWNERSHIP

Private ownership

Public Ownership

Source: Department of lands
Parish maps

North

0 500m

include some of the smaller areas of land owned by Blue Mountains City Council for such uses as open space reserves and local infrastructure facilities.

Land ownership was selected as a relevant route selection factor in response to Prospect Electricity's general requirement to locate transmission lines within publicly owned land. It is generally considered more acceptable to obtain easements within publicly owned land, rather than privately owned land.

Figure 3.7 shows that privately owned land covers a substantial proportion of the study area. It generally extends outwards following ridgelines and transport routes. The large area of publicly owned land in the south-western corner of the study area includes the steeper areas consisting of vacant Crown land, Crown reserves and national parks. East of the Great Western Highway, most of the publicly owned land consists of vacant Crown land.

3.10 EUROPEAN AND NATURAL HERITAGE

The locations of buildings and trees of heritage significance are given in Figure 3.8. This information was obtained from a listing provided by the National Trust, the Blue Mountains Heritage Study (Croft and Associates Pty Limited in association with Meredith Walker) and the Significant Trees Register (Appendix E). The majority of heritage buildings and significant trees are concentrated in urban areas of Springwood. This represents the most recent data available at time of preparing the route assessment study.

3.11 PLANNING CONTROLS

The existing planning controls covering the study area are contained within Blue Mountains LEP No. 4, gazetted in December 1982. The proposed planning controls are contained within the draft local environmental plan (EMP 1), which was placed on public exhibition in May and June 1989. This draft local environment plan was the subject of a report prepared by the Commissioners of Inquiry for Environment and Planning. A revised draft LEP is expected to be placed on exhibition in late 1990.

3.11.1 EXISTING PLANNING CONTROLS

Blue Mountains LEP No. 4 generally reflects the existing land use pattern in the Blue Mountains. Under this LEP, provisions relating to existing urban areas will not be superseded by the provisions of the draft LEP (EMP 1). Under the current planning controls transmission line proposals fall within Part V of the *Environmental Planning and Assessment Act, 1979*. The main land use zones contained within LEP No. 4 include:

- *Vacant Crown land:* This covers the majority of the study area outside existing developed areas.

- *Residential:* This generally reflects the existing residential development pattern.

Figure 3.8

BUILDINGS AND NATURAL FEATURES OF HERITAGE SIGNIFICANCE

- Buildings and sites of Heritage significance
- Trees included in significant trees register

North

0 500m

- *Special uses:* This covers uses or sites set aside for railways, schools and local infrastructure facilities.

- *Industrial:* This covers the existing industrial areas located in the Lawson Road area at Springwood and along Attunga Road at Warrimoo.

- *Open space:* This includes both existing and proposed areas of open space.

- *Business:* This mainly relates to the existing commercial centre of Springwood.

3.11.2 PROPOSED PLANNING CONTROLS

The generalized zone boundaries of the draft local environmental plan (EMP 1) are shown in Figure 3.9. This plan was placed on public exhibition in April, May and June 1989 and applies to rural and environmentally sensitive areas. The draft local environmental plan was the subject of a public hearing which was held in February 1990 and conducted by the Commissioners of Inquiry for Environment and Planning. The inquiry's recommendation endorsed Prospect Electricity's requirement to be permitted to undertake work in all zones in accordance with the terms of State Environmental Planning Policy No. 4 and the model provisions.

The draft local environmental plan is based on the description and assessment of the Blue Mountains environment as contained in the environmental management plan of the area. The relevant principles taken from this plan are to:

- raise public awareness of the unique character of the Blue Mountains;
- maintain the unique landscape and heritage of the Blue Mountains;
- ensure environmentally sensitive design;
- improve the social environment;
- achieve appropriate economic development;
- improve the attraction of towns and villages;
- achieve effective management of development.

Blue Mountains City Council is currently amending the draft local environmental plan in response to recommendations contained in the report prepared by the Commissioners of Inquiry. This revised draft local environmental plan is expected to be placed on public exhibition in late 1990, during which time submissions will be received. Following review of these submissions, the revised draft local environmental plan will be submitted to the Department of Planning. The plan is expected to be gazetted in early 1991.

Blue Mountains City Council has advised that the revised draft local environmental plan will involve only minor amendments to the zone boundaries shown in Figure 3.9 (Wood-Bradley pers. comm. 1990). Under the provisions of the revised plan, transmission lines would be a permissible use in all affected zones, endorsing the recommendations of the Commissioners of Inquiry regarding the undertaking of transmission line proposals.

PROPOSED WINMALEE ZONE SUBSTATION

SPRINGWOOD

VALLEY HEIGHTS

YELLOW ROCK

WARRIMOO

WARRIMOO BULK SUPPLY POINT

BLAXLAND

MOUNT RIVERVIEW

Figure 3.9

PROPOSED PLANNING CONTROLS DRAFT LOCAL ENVIRONMENTAL PLAN (EMP 1)

- Environmental Protection 7(e)
- Bushland conservation (B-C)
- Residential bushland conservation (R-B-C)
- Residential bushland conservation (Urban release area)
- Rural conservation (R-C)

North

0 500m

3.12 BUSHFIRE HAZARD

Figure 3.10 identifies areas of low to moderate, high and extreme bushfire hazard. This information was taken from the maps included in the draft Blue Mountains environmental management plan. Factors considered in the mapping of bushfire risk included: slope, aspect, vegetation type, area of the adjoining bushland and bushfire history. Information obtained from Blue Mountains City Council bushfire control section, the National Parks and Wildlife Service and the Department of Planning was also used in the formulation of these maps.

Generally the bushfire hazard is considered to be high within the Blue Mountains area. Figure 3.10 shows areas of low to moderate hazard following the pattern of existing urban development. The largest part of the study area is within the high bushfire hazard category. Areas of extreme fire hazard correlate with the steeply sloped areas.

PROPOSED WINMALEE ZONE SUBSTATION

SPRINGWOOD

VALLEY HEIGHTS

YELLOW ROCK

CASTLEREAGH

WARRIMOO

WARRIMOO BULK SUPPLY POINT

BLAXLAND

MOUNT RIVERVIEW

PARK RIDGE

Figure 3.10
BUSHFIRE HAZARD

- Low – moderate
- High
- Extreme

Source: Blue Mountains City Council.

North

0 500m

Chapter Four

ASSESSMENT OF ALTERNATIVE ROUTE OPTIONS

This section describes and assesses route options for the proposed transmission line. It also details the process undertaken in the identification of alternative route options and determination of the preferred route of the transmission line. A detailed description of the preferred route alignment is given in Chapter Five.

4.1 IDENTIFICATION OF A RANGE OF ALTERNATIVE ROUTE OPTIONS

The first step in the route selection process was to identify a comprehensive range of route alignment options that would provide a connection from the existing Springwood zone sub-station and a further connection to the bulk supply plant at Warrimoo. In the initial stages of the route selection process, the criteria for determining route options aimed to:

- use existing roads, access tracks or existing transmission line easements to minimize disturbance to the surrounding environment and the need for obtaining easements on private property;
- provide a direct connection to origin and destination points to minimize the length of the line and associated construction cost;
- traverse areas that permit reasonable ease of construction.

The use of the Great Western Highway as a route option was not available for a number of reasons. The construction a new transmission line was considered incompatible with existing State Rail Authority lines and major road widening proposals.

A range of route options were first identified and assessed in the Winmalee transmission line route assessment discussion paper prepared by Kinhill Engineers in April 1989. This discussion paper identified two main route options for the Springwood to Winmalee section of the proposed line. Both of these options traversed natural areas, and included crossings of Fitzgeralds and Long Angle Creek. The use of Hawkesbury Road as a route option was not considered in the initial route selection process due to perceived importance of this road as a tourist road. Two route options were also identified in this discussion paper for the Winmalee to Warrimoo section of the proposed transmission. These routes utilized existing roads or access trails where available.

The impacts of the main route options were assessed in detail against each of the route selection factors described in Chapter Three. The impact of the line was assessed as low, moderate or high for each of the route selection factors by calculating the proportion of the route within areas of low, moderate or high sensitivity. As a result of this detailed assessment it became clear that the two route options for the Springwood to Winmalee section of the line would have moderate to high environmental impacts particularly in relation to the vegetation, wildlife, visual effects, soil erosion and bushfire hazard. It was concluded that other route options should be considered which would reduce the impact of this section of the line. The use of the existing Hawkesbury Road corridor therefore arose as an additional route option.

4.2 OPERATIONAL AND CONSTRUCTION FEASIBILITY

Before undertaking further refinement of the route options described in Section 4.1, Prospect Electricity undertook a detailed onsite assessment of possible route options. The purpose of this site survey was to determine the feasibility of constructing and operating the given route options. In response to the site survey and the assessment of impacts given in the discussion paper, it was considered necessary to partly alter the alignment of the Winmalee to Warrimoo line options. It was also considered necessary to further assess the impact of using the Hawkesbury Road corridor for the Springwood to Winmalee section of the proposed line.

4.3 DESCRIPTION AND ASSESSMENT OF FINAL ROUTE OPTIONS

Figure 4.1 identifies the final route options resulting from the processes described in Section 4.2. Tables 4.1 and 4.2 provide a summary of the impacts of these route options against each of the route selection factors described in Chapter Three. The final route options are also shown in Figures 3.1 to 3.10.

Table 4.1 **Preliminary assessment of alternative routes–Springwood to Winmalee**

Route selection factor	Option A1	Option A2	Option A3	Option A4
Aboriginal archaeology	**	*	*	*
Native vegetation	**	**	*	*
Wildlife habitats	**	**	**	*
Landscape and visual	***	***	***	***
Soil erosion hazard	**	**	**	*
Agriculture suitability	*	*	*	*
Land ownership	**	**	*	*
Heritage	**	*	*	*
Planning controls	***	***	***	*
Bushfire hazard	**	**	*	*

* *low sensitivity*

** *moderate sensitivity*

*** *high sensitivity*

SPRINGWOOD ZONE SUBSTATION

PROPOSED WINMALEE ZONE SUBSTATION

WARRIMOO BULK SUPPLY POINT

SPRINGWOOD TO WINMALEE

WINMALEE TO WARRIMOO

Option A1

Option A2

Option A3

Option A4

Option B1

Option B2

SPRINGWOOD

VALLEY HEIGHTS

WARRIMOO

BLAXLAND

YELLOW ROCK

MOUNT RIVERVIEW

CASTLEREAGH

PARK RIDGE

HUNTER RESERVE

Hawkesbury River

Figure 4.1

ALTERNATIVE ROUTE OPTIONS

SPRINGWOOD TO WINMALEE

- Option A1
- Option A2
- Option A3
- Option A4

WINMALEE TO WARRIMOO

- Option B1
- Option B2

North

0 500m

4.3.1 SPRINGWOOD TO WINMALEE

Option A1

This option takes an easterly alignment from Springwood zone substation crossing the main western railway and the Great Western Highway at the northern end of De Chair Avenue. It follows the Great Western Highway, diverting eastward along Peninsula Road. A gully crossing of Fitzgeralds Creek would intersect with Paterson Road. This option follows Paterson Road crossing Long Angle Creek and its tributary in a direct line to the proposed substation.

Due to the extent of gully crossings, this line traverses substantial areas of high sensitivity, particularly in relation to vegetation, wildlife habitats, visual quality, erosion and bushfire hazard. It also traverses substantial areas of private property. The environmental sensitivity of much of the area traversed by this option coincides with the 7 (e) environmental protection zone identified under Blue Mountains draft local environmental Plan (EMP1).

Option A2

This option differs from option A1, south west of its juncture with Paterson Road. It traverses the railway and highway directly to the Avenue, following Taylor Road and the western end of Peninsula Road before taking a north-easterly direction across the Fitzgerald Creek valley to Paterson Road.

The nature and extent of the impacts associated with this option are similar to those described for Option A1. Option A2 traverses substantial areas of high environmental sensitivity in relation to soil erosion, wildlife habitats, bushfire hazard and vegetation. Approximately thirty per cent of the length of this option traverses privately owned land.

Option A3

This option takes a northward direction from Springwood, crossing the highway and the railway line at the railway overbridge. It remains within the Hawkesbury Road reserve until it reaches the intersection of Paterson Road which it follows in a south easterly direction before heading north across Long Angle Creek to the site of the proposed substation.

The potential impacts of this option are concentrated in the section of the line leading from Paterson Road to the site of the proposed substation. The crossing of Long Angle Creek traverses areas of high sensitivity particularly in relation to vegetation, wildlife habitat and bushfire hazard.

Option A4

This line option would leave the Springwood zone substation in a northward direction as described for Option A3. It follows the alignment of Hawkesbury Road and Singles Ridge Road to the site of the proposed substation.

This line option was assessed as having the least environmental impacts when examined against each of the route selection factors. Underground construction of this line option within the township area of Springwood would overcome any impacts associated with the proximity of the line to features of heritage significance. This line option is located with an area of high visual sensitivity which is also a feature of the other three line options.

Table 4.2 **Preliminary assessment of alternative routes–Winmalee to Warrimoo**

Factor	Option B1	Option B2
Aboriginal archaeology	*	***
Native vegetation	**	**
Wildlife habitats	**	***
Visual sensitivity	***	**
Soil erosion hazard	**	***
Agriculture suitability	*	*
Land ownership	*	**
Heritage	*	*
Planning controls	***	***
Bushfire hazard	***	**

* *low sensitivity*

** *moderate sensitivity*

*** *high sensitivity*

4.3.2 WINMALEE TO WARRIMOO

Option B1

This option follows Singles Ridge Road and Long Angle Road and crosses Long Angle Road. It crosses Long Angle Creek and follows the alignment of Paterson Road to its eastern end. At the end of the road it traverses the Fitzgerald Creek gully in a south easterly direction. The line takes another sharp turn to the south-west at the intersection of several existing four wheel drive tracks. This south westerly route connects with and follows the existing alignment of Rickard Road. At the intersection of Rickard Road and Railway Parade, the line follows the alignment of Railway Parade in a southwards direction, crossing the railway line to connect with the bulk supply point at Warrimoo.

This option utilizes existing roads, access tracks and easements wherever possible. The areas of high environmental sensitivity are in the vicinity of Long Angle Creek valley and the Fitzgerald Creek valley. These areas are sensitive in relation to vegetation, wildlife habitats, bushfire hazard and erosion hazard. The extent of these areas of high sensitivity is small when compared with the overall length of the line.

Option B2

From the site of the proposed substation, option B2 follows the alignment of Singles Ridge Road westward to its intersection with Purvines Road. It follows the alignment of Purvines Road and an existing unsealed track, making a crossing of Fitzgerald Creek

valley. The line generally follows the north-south alignment of the existing Water Board easement and associated four wheel drive track. It connects with an unsealed section of track which extends to Attunga Road. The line follows Attunga Road to its intersection with Railway Parade. At this point it follows Railway Parade northwards with a crossing of the railway and highway to connect with the bulk supply point at Warrimoo.

4.4 PREFERRED OPTION

As a result of the detailed assessment of route options described in the earlier part of this chapter, a preferred option was identified for the two sections of the proposed transmission line. Option A4 was assessed as the preferred option for the Springwood to Winmalee section and Option B1 was selected as the preferred route for the Winmalee to Warrimoo section. The construction, operation and design details of the proposed lines are described in Chapter Five. A detailed assessment of the impact of the preferred route alignment is given in Chapter Seven.

Chapter Five

DESCRIPTION OF THE PROPOSED TRANSMISSION LINE

This chapter describes the route alignment, structural features and easement requirements of the proposal, and outlines the construction process and subsequent maintenance requirements. It also describes the process of connecting the proposed transmission lines to the existing network.

5.1 ROUTE ALIGNMENT

A description of the proposed transmission route alignment is given in Figure 5.1 to 5.3. These figures show the location of above ground structures; joint use line; valley crossings; and underground sections. The length of valley crossings as shown in these figures is only indicative and would be determined during detailed design.

5.1.1 SPRINGWOOD TO WINMALEE

The route alignment originates at the Springwood zone substation. It would be located underground within the road reserve and would cross the Great Western Highway and the main western railway on the undercarriage of the Hawkesbury Road overbridge. The line would resurface on Hawkesbury Road near Silva Road. For a short distance, the line would be located on the western side of Hawkesbury in joint use with the existing line. Joint use involves erection of the new 66 kV line as an additional circuit on an existing line (Section 5.2.1).

It would cross Hawkesbury Road as shown in Figure 5.1, where it would remain in joint use along the eastern side of Hawkesbury Road to the intersection with Singles Ridge Road. This section of the line would be located within the existing road reserve or road widening reserve which has already been acquired by the Roads and Traffic Authority.

The line would be constructed in joint use along the western and southern side of Singles Ridge Road. Underground cable tails are proposed for line connections to the Winmalee zone substation. These would have a maximum length of 100 m on each side of Vendetta Road.

5.1.2 WINMALEE TO WARRIMOO

Figure 5.2 provides a description of the proposed line from the site of Winmalee Zone substation to Paterson Road. A cable tail of 100 m would leave the Winmalee Zone substation, emerging above-ground on the southern side of Singles Ridge Road. The line

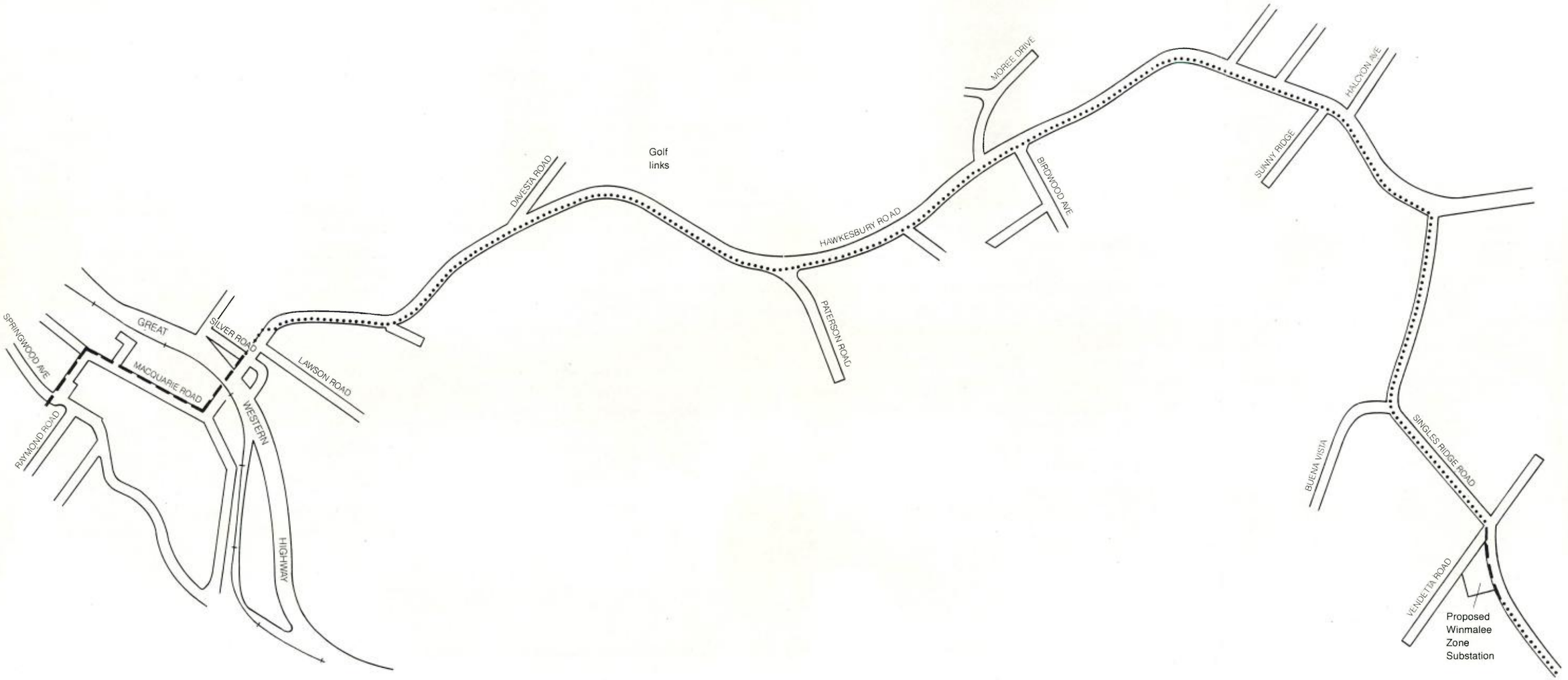


Figure 5.1
ROUTE DESCRIPTION
SPRINGWOOD TO WINMALEE

— — Underground

····· Joint use

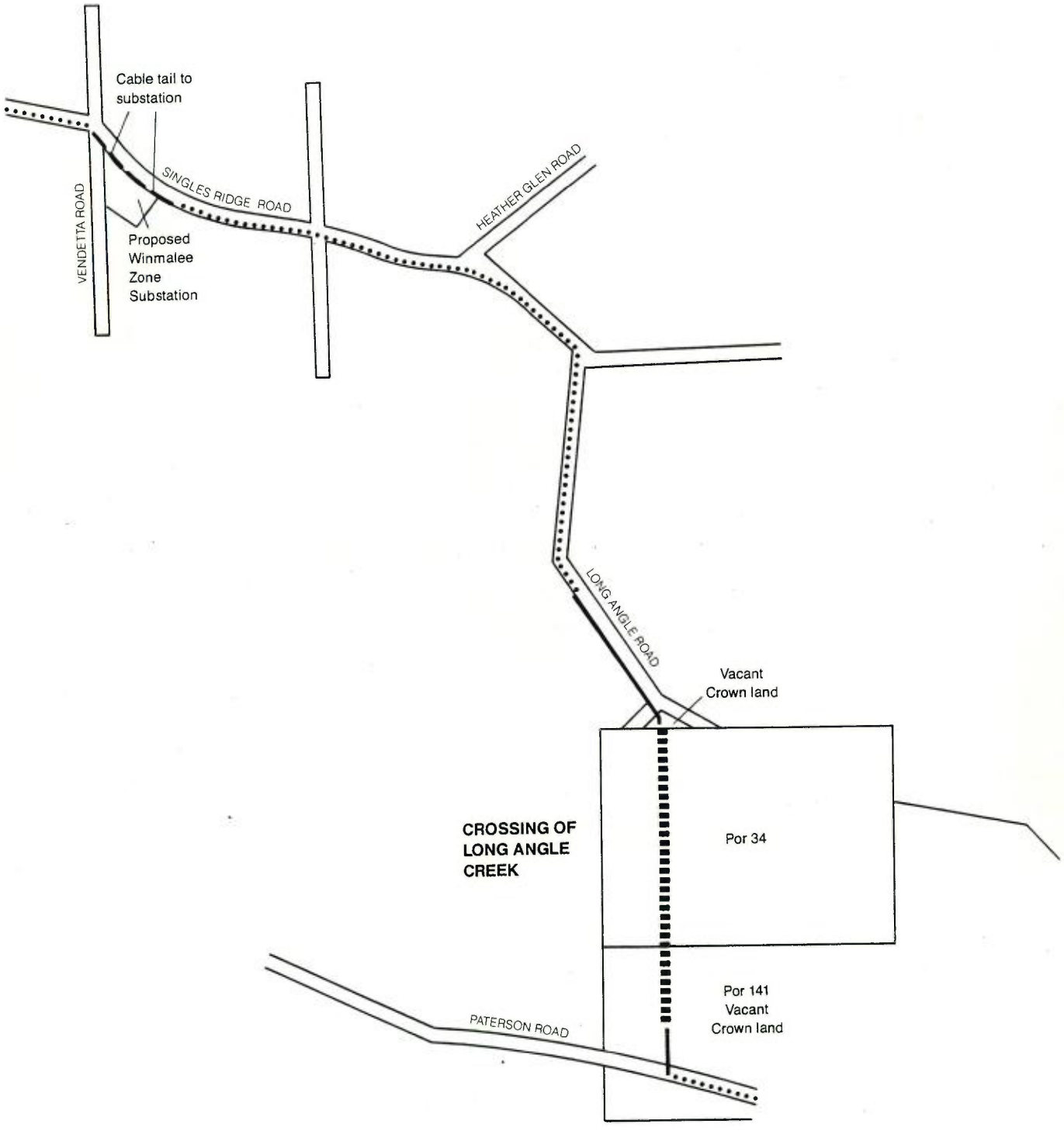


Figure 5.2
ROUTE DESCRIPTION WINMALEE TO PATERSON ROAD

would be located within the existing road reserve on the southern side of Singles Ridge Road to its intersection with Long Angle Road.

From the intersection of Singles Ridge Road and Long Angle Road, the line would be located within the existing road reserve on the western side of Long Angle Road. It would be constructed in joint use to the extent of the existing line. Beyond this point, a new above-ground line would be constructed along the western side of Long Angle Road adjoining the support structure on northern side of Long Angle Creek valley.

The valley span of Long Angle Creek would be supported by a three pole structure to be located on each side of the Valley. The length of the valley span and the location of the supporting pole structure would be determined during the detailed design. Poles would be sited to minimize the visual impact and to maintain a landscape buffer in relation to major viewing points. The valley span of Long Angle Creek is not expected to exceed 500 m. Figure 5.4 provides a cross-section of a typical valley crossing. A short above-ground section of line would provide a connection to Paterson Road.

Figure 5.3 provides a description of the proposed line from Paterson Road to Warrimoo. The line would be constructed in joint use within the road reserve on the southern side of Paterson Road. It would follow the eastern extension of Paterson Road which currently functions as an access road and Water Board easement. A gully crossing would be required at the eastern end of Paterson Road to traverse Fitzgeralds Creek. This crossing would span 400 m with pole structures being located on both sides of the valley. An above-ground line would be constructed from the Fitzgerald's Creek valley crossing to the eastern extension of Government Road. It would follow the cleared track and Government Road for a distance of approximately 900 m. The line would be constructed in joint use along the southern side of Rickard Road and the eastern side of Railway Parade.

The final section of the route would pass underneath the Great Western Highway and the Main Western Highway providing a connection to the Warrimoo bulk supply point on the northern fringes of Blaxland.

5.2 STRUCTURES AND EASEMENTS

5.2.1 TRANSMISSION LINE STRUCTURES

The above ground section of the proposed transmission line would consist of 20 m high reinforced concrete poles carrying conductors and earthwires. The poles would be spaced at maximum intervals of 85 metres requiring an easement of approximately 15 m wide where necessary. Intermediate and termination poles are the two types of structures to be used. Valley crossings would require three pole support structures.

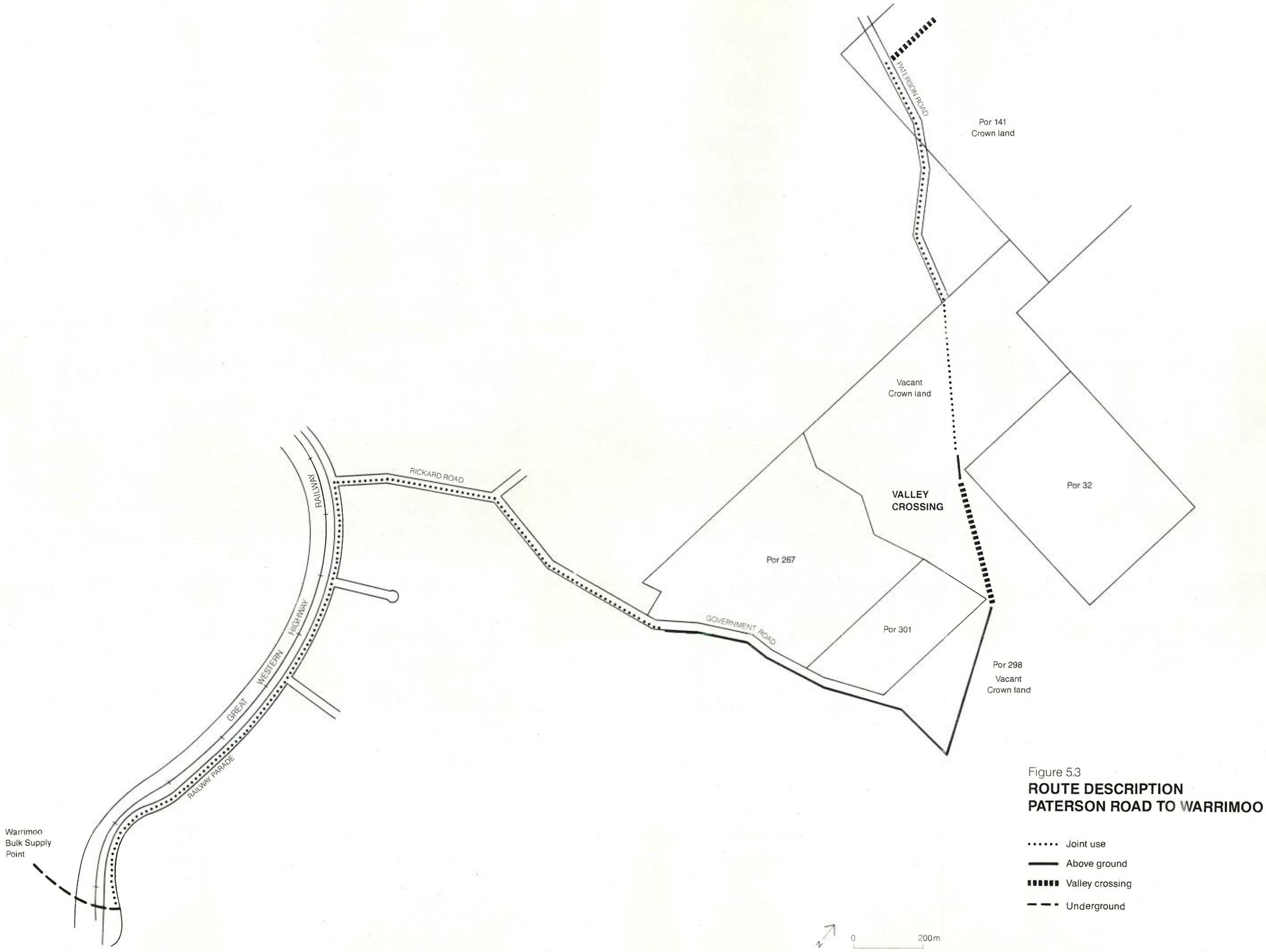


Figure 5.3
ROUTE DESCRIPTION
PATERSON ROAD TO WARRIMOO

- Joint use
- Above ground
- Valley crossing
- Underground

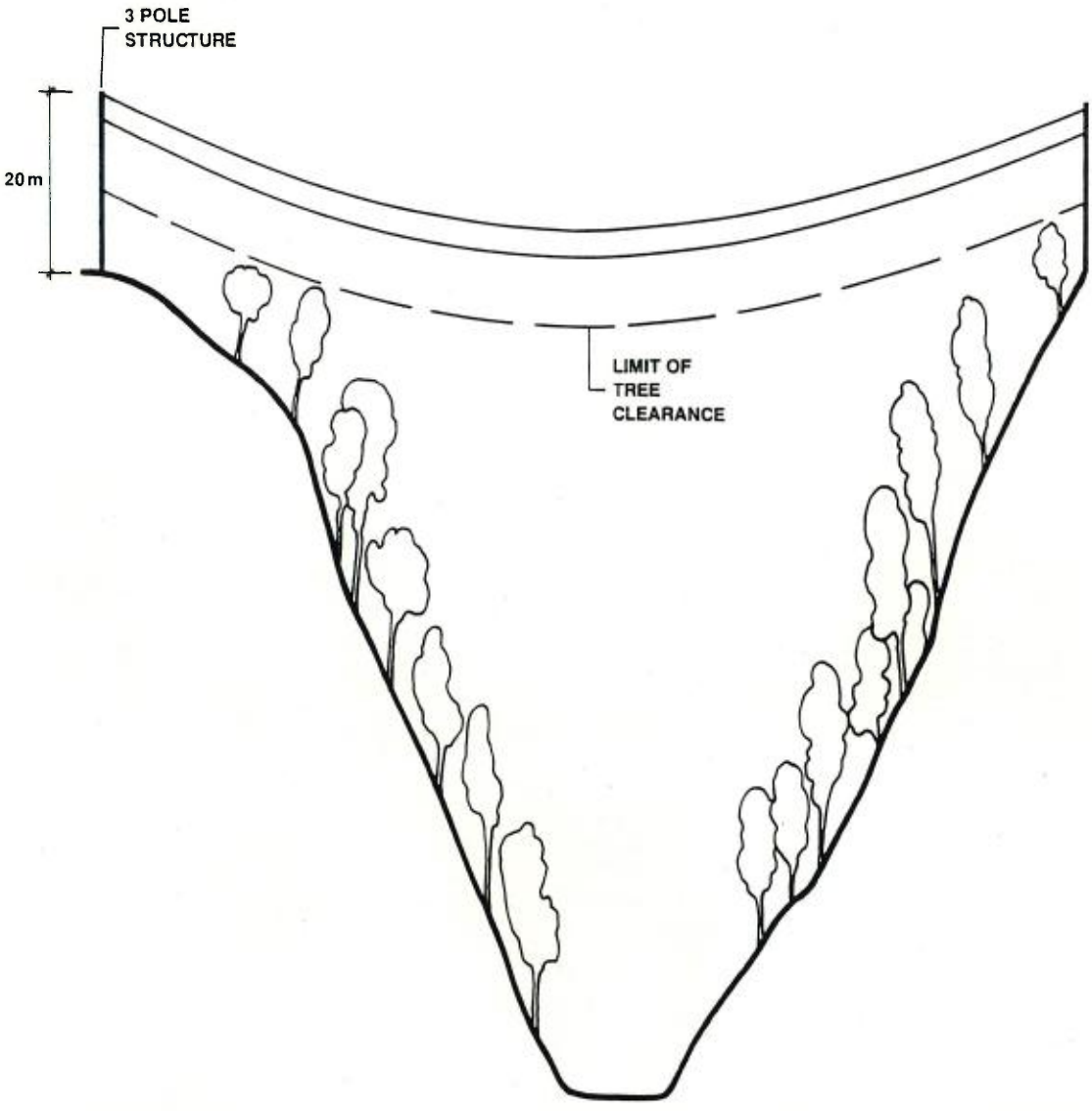


Figure 5.4
TYPICAL VALLEY CROSSING (LONG ANGLE CREEK)

Intermediate Structures

Figure 5.5 shows the design and dimensions of intermediate structures. These structures are designed to carry the weight of the conductors and the forces imposed by wind pressure on both the poles and conductors. Intermediate structures are normally used for relatively straight sections of the transmission line and consist of a single concrete pole with horizontal line post insulators to support the conductors.

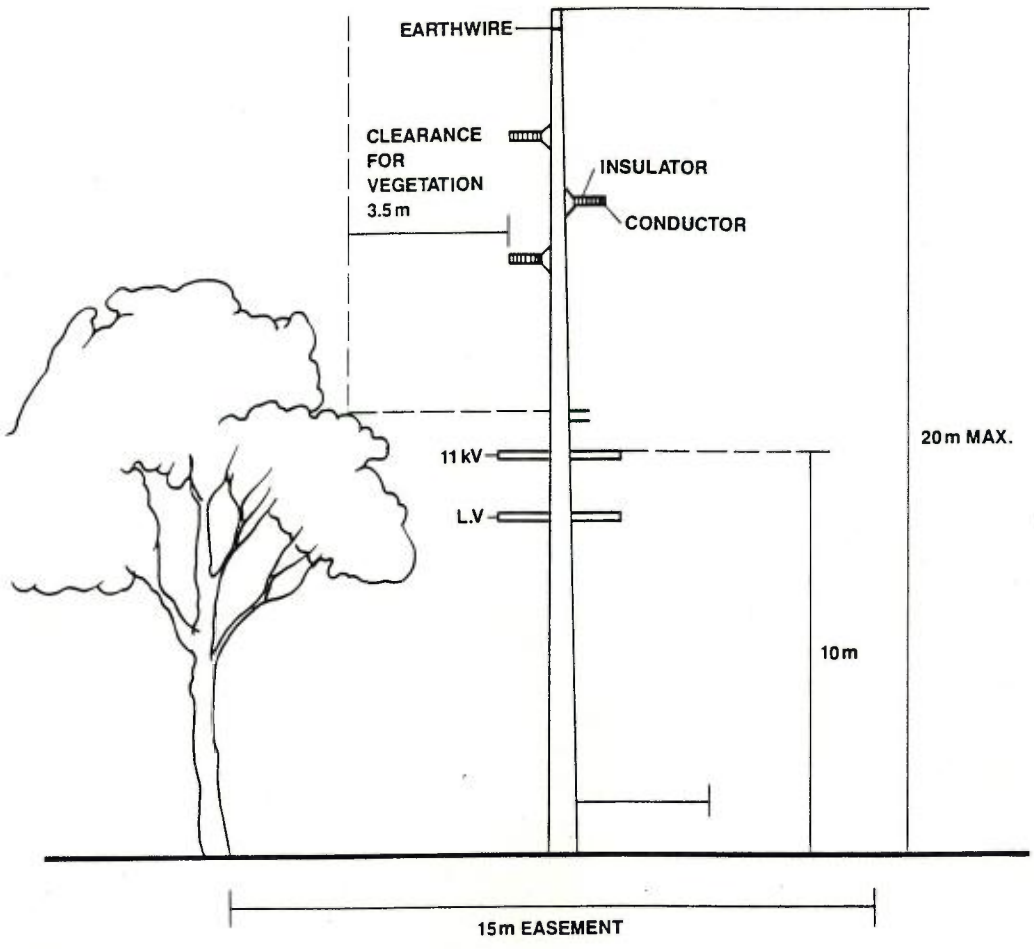


Figure 5.5
INTERMEDIATE STRUCTURES

Termination Structures

Figure 5.6 shows the design and dimensions of termination structures. These are used at turning points and end points in the transmission line, and are designed to support additional loads due to conductor tension. The structures are generally more complex than intermediate structures with additional stabilization requirements, insulating strings and fittings required.

Joint Use Structures

Figures 5.1 to 5.3 show the extent of joint use structures over the length of the proposed line. Joint use construction refers to sections of the transmission line where the overhead lines carry more than one circuit. For much of the proposed route, the existing overhead power lines have two crossarms: the upper supporting high voltage wires (11 kV) to supply transformers for conversion to usable voltage; the lower crossarm supports low voltage wire supplying local users. It is proposed that where such lines exist, larger poles (intermediate or termination structures) would be installed to replace the existing smaller poles and new structures would therefore be in 'joint use'. This type of construction has the benefit of reducing the total number of poles over the length of the line. Figure 5.7 shows a typical cross section which compares existing structures and joint use lines.

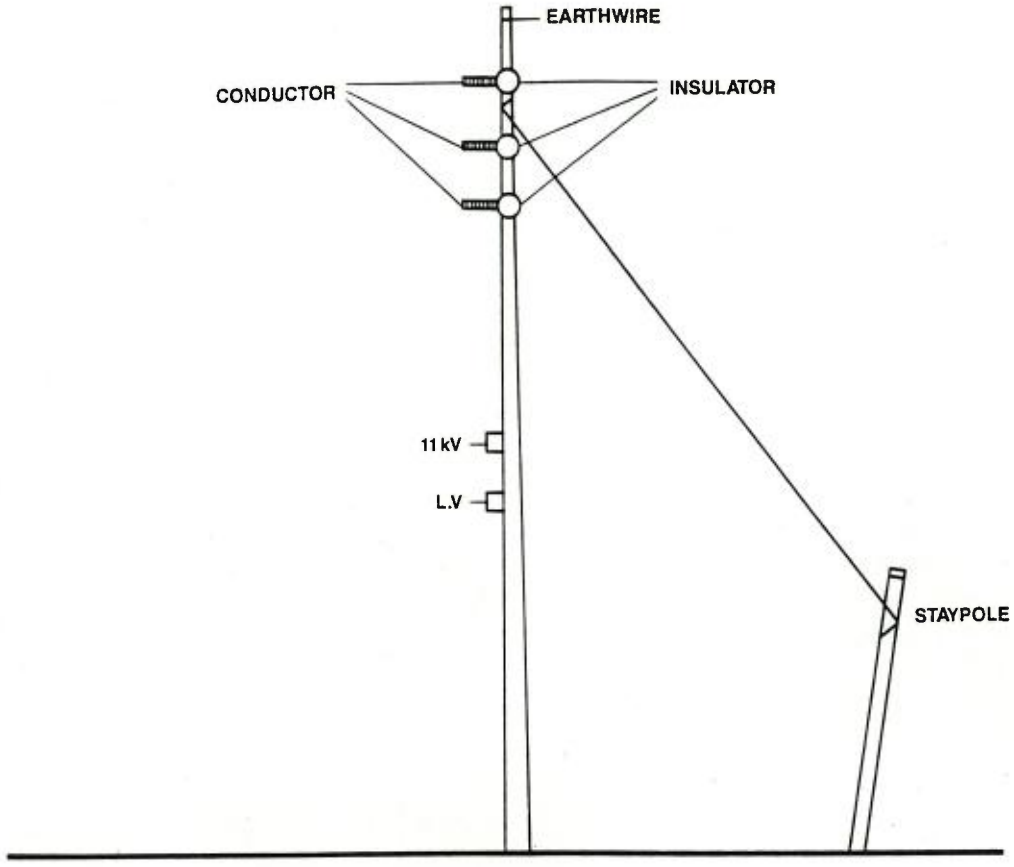


Figure 5.6
TERMINATION STRUCTURES

5.2.2 UNDERGROUNDING

Figures 5.1 to 5.3 show the underground sections of the proposed transmission line. An underground transmission line cable would also be used to connect from overhead lines to the existing substations at Springwood, the proposed Winmalee zone substation and the bulk supply point at Warrimoo.

The underground cable section at Springwood would extend 750 metres through the commercial area to the northern side of the railway bridge on Hawkesbury Road. Underground cables would also extend for a length of 200 m along Singles Ridge Road and for a length of 250 m from Railway Parade to the Warrimoo bulk supply point. Due to the high cost of undergrounding lines of this voltage, this type of construction is normally only used in potentially high impact areas.

5.2.3 CONDUCTORS, INSULATORS AND EARTHWIRES

The main current-carrying conductors would be of aluminium, approximately 24 mm in diameter. Three single conductors would be arranged to provide a three phase power circuit. A smaller conductor would be strung from the top of the pole to act as an earthwire. The conductors would be insulated from the support points of the pole by horizontal insulators approximately 900 mm in length.

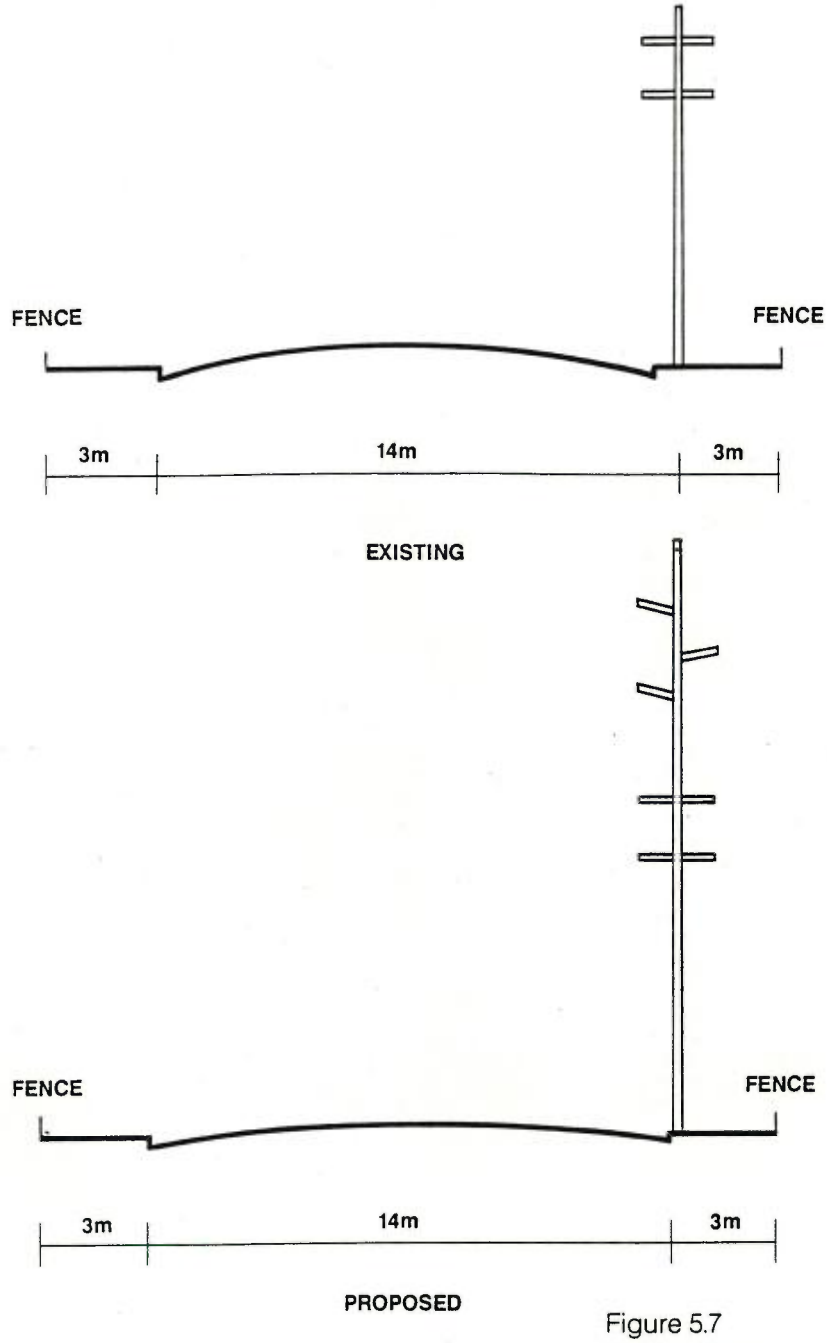


Figure 5.7
JOINT USE
TYPICAL CROSS-SECTION

5.2.4 WINMALEE ZONE SUBSTATION

The proposed Winmalee zone substation would be located on a 4,600 m² parcel of land on the corner of Singles Ridge Road and Vendetta Road (Figure 5.8). The control buildings would face Singles Ridge Road with the transformers located at the rear. The building would be set back 20 m from Singles Ridge Road and 10 m from Vendetta

Road. Access for loading and unloading transformers would be via Vendetta Road. Building setbacks and landscaping would screen the buildings and associated structures.

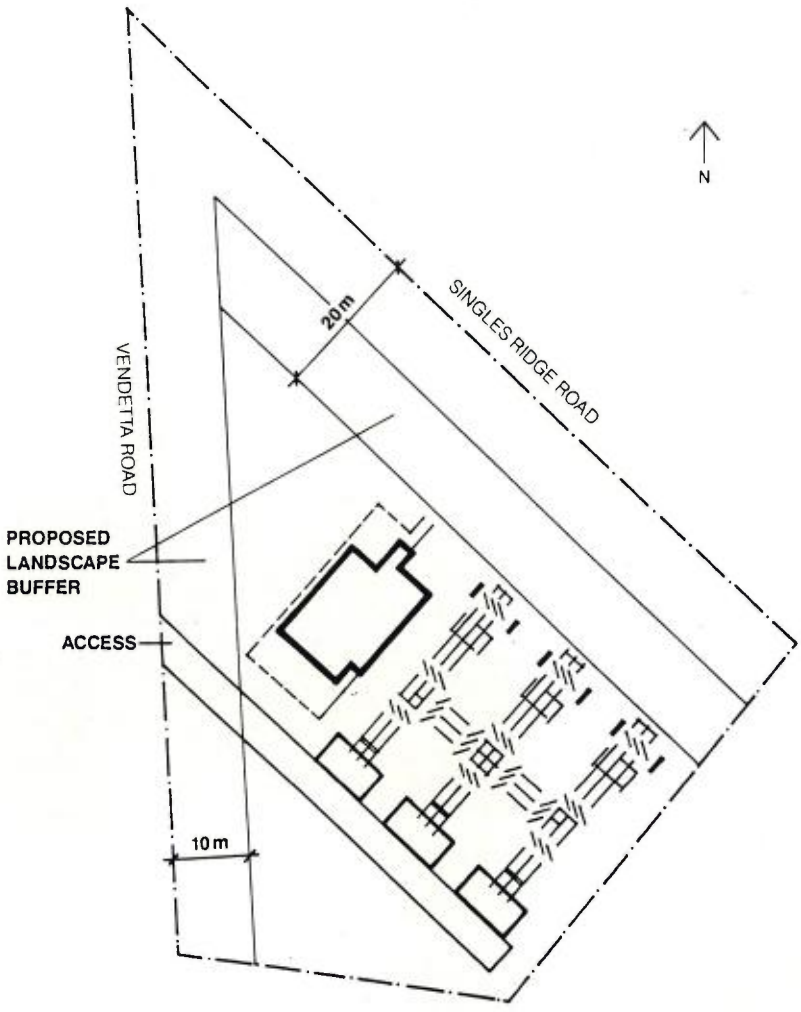


Figure 5.8
PROPOSED WINMALEE ZONE SUBSTATION

5.2.5 EASEMENTS

An easement width of 15 m would be sufficient to permit the construction, maintenance and safe operation of the proposed transmission line. This easement would not be fenced. A cleared width of approximately 9 m would be required to allow sufficient clearance to the conductor in its rest position. Where longer than average span lengths are required, additional clearing may be undertaken to allow a wider space to minimize the risk of a blow out caused by wind. Table 5.1 lists the minimum conductor clearance requirements. Easements would not be required for joint use construction or where the proposed line is to be located within an existing road reserve.

Table 5.1 **Specified Minimum Conductor Clearances**

Location	Minimum Clearance (metres)
Distance from ground in any one direction	7.3
Height over existing power lines	2.1
Clearance from conductors to vegetation	2.0 (plus allowance for regrowth and blow outs)

Source: Prospect Electricity

5.3 CONSTRUCTION OF THE PROPOSED TRANSMISSION LINE

5.3.1 ACCESS AND EASEMENT CLEARING

Upon the completion of a detailed survey of the route, access requirements would be determined to allow the efficient installation of line structures and access for vehicles and equipment. In locations where an existing utility easement did not exist, the construction of access tracks and gates; tree removal; and the disposal of debris would be required.

Where terrain or site conditions permit, Prospect Electricity prefers to have continuous vehicular access along the easement for both clearing and conductor stringing. The need to establish new access tracks for the proposed line would be minimized by the use of existing roads, tracks, cleared areas or utility easements. Permission to enter would be arranged with private property owners and public authorities. Where necessary, gates would be installed across tracks and locked when not in use.

Easement Clearance

Clearing of vegetation is a legal requirement to establish the necessary electrical clearance from the line to earthed material such as vegetation. Clearing is also necessary to maintain a reliable power supply and to reduce the risk of bushfires. The extent of easement clearing would be minimized by the use of existing cleared areas such as roads. Clearing would be undertaken along sections of Long Angle Road and Paterson Road. Hand clearing using chain saws would be carried out where access is difficult, or in sensitive areas such as steep land, watercourse crossings or areas in close proximity to residential dwellings.

In some areas an additional margin of clearance would be required to allow for the expected regrowth during the periods between scheduled reclearing operations. The general policy of Prospect Electricity is to minimize the extent of clearing while ensuring that necessary safety distances are maintained.

5.3.2 POLE ERECTION AND CONDUCTOR STRINGING

Poles would be delivered to a location close to the proposed pole position. Poles would be erected by a mobile on-site crane. Should site conditions be restrictive, poles would be dragged into position by a vehicle.

Foundation holes would be excavated with a truck-mounted drilling machine. Excavation would be by pneumatic hand drilling to remove rock. No explosives would be used.

Erection of Conductors

In order to erect the conductor on to fixed poles, ropes would be laid along the ground from trailer-mounted cable drums and raised into position on the poles in preparation for conductor pulling. In more inaccessible locations such as Long Angle and Fitzgeralds Creeks, ropes would be pulled by hand, or helicopter stringing of small pilot ropes could be used. The conductor is then pulled through the section by the ropes using a trailer-mounted winch.

5.3.3 UNDERGROUND CABLING

Normal construction practices would be involved in underground cable construction. Underground cables would be laid in a cable duct or buried in the road reserve. Works would be carried out after the construction phase to ensure that the disturbed areas are restored.

5.3.4 RESTORATION WORKS

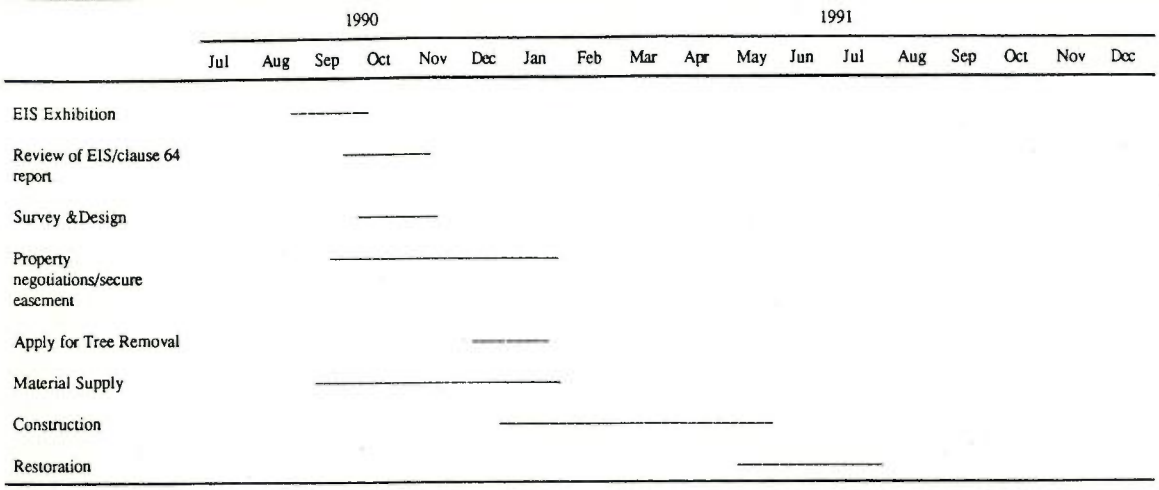
Following construction, all construction materials such as cable drums and packaging would be removed from site. Ground, damaged by vehicles, would be restored where necessary. Landscape works would be undertaken to restore disturbed areas to a stable condition.

Areas which have lost some of their natural vegetation such as access tracks, embankments and construction sites would be rehabilitated with new plant growth and mulch from the trimmings to prevent surface erosion. The advice of the Soil Conservation Service would be sought in determining suitable restoration works.

5.3.5 PROJECT PROGRAMME

The expected timing of the stages in the project programme is shown in Figure 5.9. It is proposed that the Environmental Impact Statement be placed on public exhibition for thirty days. The public exhibition would be advertised in accordance with the requirements of the Environmental Planning and Assessment Regulations, 1980. As required by Clause 64 of the regulations, a report would be prepared that would review submissions made in response to the public exhibition of the Environmental Impact Statement. This report would be made available to the public.

Figure 5.9 **Project timetable**



5.3.6 OPERATING HOURS

During the period of construction, work would be undertaken from Monday to Friday between the hours of 8 a.m. and 4 p.m. Work would be carried out progressively along the route. A maximum work force at any site should not exceed ten workers.

Temporary construction bases would be established at Springwood, Winmalee and Warrimoo. Materials and equipment would be stored at these temporary bases. During the construction period, additional heavy traffic would be generated, primarily along the main construction routes during normal working hours. The volume of construction traffic would depend on the staging of construction works.

5.3.6 COST OF CONSTRUCTION

The estimated cost of construction is $1.47m for line works and $2.54m for substation works.

5.3.7 POWER SUPPLY INTERRUPTIONS

Prospect Electricity would aim to minimize interruptions to power supply during the construction period. Power supply interruptions would normally only occur between 8:00 am and 4:00 pm. Customers would be notified by letter box drop a week in advance of power interruptions. Construction work would be programmed to minimize consecutive daily outages to the same customers.

To maintain supply to customers along the Hawkesbury Road ridgeline east of Linksview Road, it would be necessary to construct an additional 11kV power line on the western side of Hawkesbury Road between Linksview Road and Halcyon Avenue. This additional power line is necessary for the ultimate arrangement of Winmalee Zone Substation. Customers in more remote ends of Paterson, Rickard and Long Angle Road may experience consecutive outages due to absence of alternative supply.

5.4 OPERATION AND MAINTENANCE

Following the construction and commissioning of the transmission line, it would be necessary to maintain the poles and wires through routine patrols, tree trimming and breakdown patrol. Vehicle access routes would be required to permit upgrading of poles. The use of concrete poles should minimize maintenance and the level of usage of access roads.

Routine Patrols

An inspection patrol along the proposed route would be undertaken approximately every six months by two Prospect Electricity workers. The purpose of these patrols is to assess the condition of the access tracks and lines, and the extent of clearances in relation to vegetation growth and any other structures.

Tree Trimming

A tree trimming programme would be undertaken, generally on a three year cycle. The programme would aim to provide a reasonable distance between the trees and the transmission line conductors to minimize the level of hazard in the event of a storm and to reduce possible bushfire risk.

Breakdown Patrol

Patrols would be undertaken along the route in times of emergency to check for storm or bushfire damage. Work could be undertaken to repair conductors, insulators and poles damaged as a result of storms or vehicle impact.

Chapter Six
CONSULTATION

This section describes the process of consultation with the community and government authorities, and the results of such consultation.

6.1 COMMUNITY CONSULTATION

A community consultation programme was conducted following the completion of the route assessment study. The purpose of this programme was to provide information about the proposal and to invite comments from the public, particularly in relation to the route assessment process.

The community consultation programme began with an advertisement that appeared in the Blue Mountains Gazette in November 1989 informing the public of the proposal and advising of a public information display. A public display was held at Springwood Library from Monday, 27 November to Saturday, 9 December 1989. This display included the route selection study, aerial photographs and photographs of 66 kV transmission lines and zone substations.

A questionnaire was available at the public display and forty-nine residents completed a response. A copy of the questionnaire and a summary of responses are provided in Appendix D. The aim of the questionnaire was to provide the community with the opportunity to comment on the proposal and the various route options. Questionnaire responses cannot be considered to represent the opinion of all residents as the survey sample does not have a statistical basis.

6.2 AUTHORITIES AND ORGANIZATIONS

A full list of government departments and other organizations consulted is provided in Appendix F. The Director's requirements identified the National Parks and Wildlife Service; the State Pollution Control Commission; the Board of Fire Commissioners of NSW; and the Soil Conservation Services as authorities which should be consulted in the preparation of the EIS. Table 6.2 provides a summary of the responses received from government authorities. These comments have been considered in the relevant section of the EIS.

Table 6.2 **Summary of responses from formal consultation**

Organization and response
Blue Mountains City Council (Appendix B)
• prefer routes located away from Great Western Highway and Hawkesbury Road in order to minimize pole collision accidents;
• proposed Hawkesbury Road alignment may affect option A4;
• option A2 would require work on the highway reserve;
• highway crossings need to consider overhead or underground crossings.
Roads and Traffic Authority
• prefer routes located away from Great Western Highway and Hawkesbury Road in order to minimize pole collision accidents;
• proposed Hawkesbury Road alignment may affect option A4;
• option A2 would require work on the highway reserve;
• highway crossings need to consider overhead or underground crossings.
State Pollution Control Commission
• prevention of soil erosion and subsequent siltation and turbidity in receiving waters and during construction.
• maintenance of access road to reduce erosion.
• noise pollution, including hours of operation and noise control measures to have minimum impact on amenity of residents.
The National Trust
• preferred routes do not impinge upon any classified landscapes. • impact on scenic quality of ridge tops to be assessed • four properties may be affected.
The Bush Fire Council of NSW
• reference should be made to Circular 6/89 Planning Controls in bush fire prone areas.
Soil Conservation Service
• The study area contains areas mapped by the Catchment Areas Protection Board. The destruction or injury of trees within these areas would require the prior authority of the Catchment Areas Protection Board.
• Clearing should be kept to a minimum and upgrading or use of existing access tracks is preferable to the construction of alternative tracks.
• The preferred route options would have the least impact on soil erosion potential.
Heritage Council
• The EIS should include a heritage component. • The route selection study list of items of heritage significance is regarded as adequate, provided it includes all items which are on the National Estate and Heritage Council's register.

Department of Water Resources

- A check list of water resource matters to be addressed in the assessment of environmental impacts is included in 'General Requirements of Environmental Impact Statements' issued by the department.

The Water Board

- Proposed routes do not directly affect Water Board services in the area.
- Discussions with the Board should continue if routes are to utilize existing Board easements.
- Transmission line routes should follow existing easements and corridors where possible.
- Comments were provided on the constraints mapping and route selection methodology.
- Use of the railway/highway corridor between Valley Heights and Warrimoo should be re-examined.

NSW Agriculture and Fisheries

- Confirmed that the preferred routes do not affect any productive agricultural land.

Department of Lands

- Options A1, A2, A3, B1 and B2 (preferred route) affect Crown land of a potentially environmentally sensitive nature.

Public Works

- Proposal may affect Springwood Public School and proposed Springwood TAFE.

Telecom

- No objection to route options.
- Supply details to be provided to Telecom following line approval.

Civil Aviation Authority

- No effects

The Electricity Commission of NSW

- No objection to proposed works.

Department of Minerals and Energy

- No objection.

Chapter Seven

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This chapter assesses the environmental impacts of the proposed transmission line. It also describes measures proposed to mitigate these impacts. The detailed nature of the route assessment process described in Sections 3 and 4 of the EIS has been aimed at selecting a route alignment that has minimal environmental impacts. The assessment of impacts has focussed on the issues identified during the consultation process; the overall findings of the route assessment study; and matters raised in the Director's requirements (Appendix A).

The assessment of impacts is based on the route alignment described in Figure 5.1. The final route alignment would be determined after account has been taken of local conditions including the location of property boundaries, buildings and trees. The detailed design of the proposed line would be determined after final negotiations with affected landowners and the undertaking of a detailed survey.

7.1 LAND OWNERSHIP AND LAND USE

Figure 3.7 shows the extent of land in public and private ownership within the study area. The proposed transmission line alignment has been designed to have the least possible impact on private property. This has been achieved through the route selection process which aimed to locate the proposed line within publicly owned land, existing road reserves or public utility easements.

7.1.1 IMPACTS AND MITIGATION MEASURES

Private Property

The Springwood to Winmalee section of the line would be located entirely within existing road reserves or road widening reserves which have already been acquired by the Roads and Traffic Authority. As part of the detailed design and construction process, Prospect Electricity would consult with relevant authorities such as Blue Mountains City Council and the Roads and Traffic Authority to determine the most suitalbe location of the line within the road reserve.

Only one private property would be directly affected by the proposed Winmalee to Warrimoo line. The proposed transmission line would traverse portion 34 (17 ha) as part of the gulley crossing of Long Angle Creek. Consultation would be undertaken with

owners of this property (J and G.R. Edge) to determine siting of the proposed line and poles to minimize impacts on views, landscaping and property utility. Procedures for obtaining easements over private property are outlined in Section 7.1.2.

The proposed line would be located adjacent to the southern boundary of portion 32 which is located at the eastern end of Paterson Road. Prospect Electricity would consult with the owner of this property (J. Roorda) to undertake suitable screen planting, where necessary, adjacent to the proposed line.

Crown Land

Figure 3.7 shows the extent of land under public ownership. The Department of Lands has been consulted during the preparation of the Environmental Impact Statement regarding the impact of the proposed transmission line on Crown land. The Department of Lands expressed no objections to the alignment of the proposed line but indicated the need to assess the environmental impact of the line on Crown land holdings.

The southern end of the Long Angle Creek crossing would traverse Crown Land. From the eastern end of Paterson Road to the eastern end of Government Road the proposed line would also traverse Crown land. Subject to detailed design, this section of the line would generally be located within or adjacent to an existing Water Board easement which is currently characterized as a cleared track. The impact of the line would be minimized by the overhead spanning of the gully; careful pole placement to minimize the extent of clearing; and restoration of cleared areas.

Land Use

During detailed design, consultation would be undertaken with the Water Board to determine the compatibility of the proposed line with the use and operation of the Water Board easement. Prospect Electricity would aim to utilize the existing Water Board easement to a avoid further clearing of vegetation. The Water Board plans to upgrade the environmental quality of its easements, particularly across Fitzgeralds Creek. This easement has been severely eroded, due to its continued use as a four wheel drive track. The Water Board has agreed in principle to the construction of the proposed line. Prospect Electricity would co-ordinate its construction and restoration activities with the Water Board's proposed upgrading plans.

Apart from the direct impact on one private property, the proposed transmission line could have a minor and indirect effect on residential and commercial land uses during the construction period. The construction of the proposed line within road reserves could have a short term impact on the amenity of those properties immediately adjacent to the road reserve. The construction of underground lines within the Springwood township area would involve excavation would temporarily affect driveway access. Where possible, Prospect Electricity would advise affected property owners of proposed construction activity.

The above ground construction of the proposed transmission line would have less impact on properties adjacent to affected road reserves. Construction activity would generally be confined to working hours, and pole placement would be designed to minimize impacts on individual property access. Details on notification of power supply interruptions are described in Section 5.3.7.

Prospect Electricity would restore any disturbed to vegetation or ground surfaces as a result of underground or above ground construction. This could include replanting of trees and planting of grass cover.

7.1.2 TRANSMISSION LINE EASEMENTS

Private Property

The following standard procedures are undertaken to establish a fifteen metre easement over private property:

- Initial contact would be made with the property owner with the objective of determining the most suitable location for the proposed transmission line to ensure compatibility with present or future land uses and to preserve views and landscape features.

- Where the owner cannot be contacted on site, written notification would be used to make initial contact.

- The property owner would be requested to permit construction of the line prior to completion of formal negotiations.

- A survey would be carried out to prepare detailed plans and to finalize the transmission line siting and design.

- A consultant property valuer would be engaged to determine the market value of the easement effect on the property. The valuer would normally consult with the property owner to negotiate an agreed value.

- Where an agreement is reached, Prospect Electricity would proceed to formalize the easement on the land title and make payment for compensation. The legal fees (scaled) of the property owner would be reimbursed by Prospect Electricity.

- Where agreement is not reached on compensation or location of the easement, and all attempts at negotiation fail, Prospect Electricity may resume the easement under the provision of the Local Government Act 1919 and the Department of Local guidelines. Resumption is only used where no practical alternative exists to allow construction to proceed. In these cases, payment for compensation would be determined by the Land and Environment Court.

Crown Land

Easements over Crown Land would be secured under the provisions of the Local Goverment Act, 1919. The extent of the required easements over Crown Land would be determined following detailed design and survey of the propose route alignment. Easements are normally secured by negotiation with the relevant government authority.

Road Reserves

Easements are not required where the line is to be constructed within a public road reserve. Consultation with the Roads and Traffic Authority would be maintained throughout the design and construction process.

7.2 LANDSCAPE AND VISUAL QUALITY

The visual and landscape quality of the study area has been described in detail in Section 3.6. The route selection process aimed to minimize the visual impact of the proposal by:

- the use of existing road reserves and utility corridors in preference to new routes traversing bushland areas;
- following existing transmission line routes to minimize visual intrusion;
- 'joint use' of significant sections of the line. This reduces the number of pole structures, the extent of tree trimming and avoids the proliferation of transmission line structures;
- avoiding extensive clearance of vegetation by utilizing previously cleared areas;
- minimizing gully crossings as far as possible;
- placing short sections of the transmission underground near Springwood zone substation, the proposed Winmalee zone substation and the Warrimoo bulk supply point.

7.2.1 ASSESSMENT OF IMPACT

Gully crossings present the highest potential for visual impact. The impact of the proposed gully crossings would be minimized by the use of helicopters rather than ground vehicles to undertake line stringing. The use of low maintenance concrete poles would minimize the required frequency of access. Trees would be trimmed to provide adequate line clearance at specified locations.

Above Ground and Joint Use Lines

Joint use construction along Hawkesbury Road, Long Angle Road, Paterson Road, Rickard Road and Railway Parade would not noticeably increase the visual impact above that of existing lines. These road reserves are currently characterized by substantial roadside vegetation which would not be substantially affected by proposed joint use lines. The visual impact of constructing new above-ground lines would be dependent on the extent of clearing involved. By utilizing existing Water Board easement clearings the extent of additioning vegetation clearing would be minimized.

Underground Lines

The proposed underground construction of sections of line within Springwood and, at railway and highway crossings would eliminate the visual impact of the proposal at these highly visible locations. The use of cable lead connections to the Winmalee zone substation would minimize the visual impact of the proposal in the area surrounding the zone substation. Removal of vegetation to permit construction would have a short term impact on existing landscape and rural quality. Landscaping would be undertaken following construction to minimize the long term visual effects.

7.2.2 MITIGATION MEASURES

A range of mitigation measures have been incorporated into the design of the proposed line to minimize its impact on visual and landscape quality:

- pole height would generally be confined to 20 m above the ground and joint use lines would minimize the number of poles required;
- pole placement would aim to minimize the removal or trimming of existing vegetation;
- concrete poles would be used to reduce the need for unsightly guying cables and disturbance due to maintenance;
- post insulators would be used in lieu of crossings;
- trees would be trimmed rather than felled;
- landscaping of the Winmalee zone substation site.

7.3 VEGETATION AND WILDLIFE

The principal impact of the proposal on the natural environment would occur as a result of construction and maintenance activities. The proposed route alignment has been selected to avoid natural areas as far as possible and to utilise existing easements and road reserves.

7.3.1 VEGETATION AND WILDLIFE HABITATS

The route of the proposed line has been selected to minimize the impact on areas of high sensitivity as described in Section 3.9. The proposed transmission line mainly traverses areas of low and moderate sensitivity. Within the Winmalee to Warrimoo section, the proposed line would traverse two areas of high sensitivity. These areas coincide with the crossings of Long Angle Creek and Fitzgeralds Creek. Impacts on these areas would be minimized by valley spans which alleviate the need for ground disturbance. The Water Board easement within Fitzgeralds Creek crossing is currently characterized as a cleared and severely eroded track.

Mitigation Measures

The following mitigation measures would be incorporated into the design and operation of the proposed transmission line to minimize impacts on vegetation and wildlife habitats:

- Use of helicopter stringing for spanning of valleys to minimize ground disturbances.
- Minimized use of heavy vehicles within the surveyed route.
- Careful selection of pole structures and siting of poles to minimize the extent of vegetation removal.
- Siting on poles on less erodible soils.
- Erosion controls as advised by the Soil Conservation Service.
- Use of existing easements or clearings for access tracks and minimized construction of new access tracks.
- Encouragement of the growth of lower and middle storey vegetation along cleared sections of the route.
- Measures to minimise the introduction of exotic plants. This can be achieved by hosing down vehicle tyres prior to entering the construction area. Where problem weeds appear around construction sites, approved techniques should be used for weed control. Soil active herbicides should be avoided in natural areas. This would be in accordance with Prospect Electricity's current policy of using environmentally acceptable herbicides such as 'Roundup'.
- the adoption of soil erosion control methods to reduce the effects of erosion from construction areas on downstream vegetation.

7.3.2 SOIL EROSION

The Springwood to Winmalee section of the line passes through areas of only low soil erosion hazard. The Winmalee to Warrimoo section of the line passes through two areas of high erosion hazard corresponding with the valley crossings of Long Angle Creek and Fitzgeralds Creek. The advice of the Soil Conservation Service regarding access track design and construction is summarized in Table 6.2.

The extent to which these sections of the line would result in further soil erosion, siltation and water pollution would be dependent on the extent of ground clearing and new access tracks. The extent of new access tracks to be constructed in conjunction with the proposed transmission line would be determined during the detailed design stage. As the proposed route transmission line has been selected to utilize existing road reserves and utility easements, the requirement for new access tracks has been minimized. The construction of new access tracks would only be required on either side of the Long Angle Creek crossing and the western end of the Fitzgeralds Creek crossing, where access tracks do not currently exist. An access track associated with the Long Angle

Creek crossing would extend as far as the supporting poles located on each side of the valley. An access track would not be constructed within the lower and more sensitive sections of the valley. The existing Water Board access track within the Fitzgeralds Creek valley would be utilized by Prospect Electricity for construction and maintenance purposes.

Mitigation Measures

The following measures would minimize the impact of the proposed transmission line and associated works on soil erosion and associated stream sedimentation.

- The use of existing roads and utility corridors to minimize the extent of new access tracks required.
- Helicopter stringing of valley crossings to minimize the extent of ground clearing associated with ground construction techniques.
- Consultation would be undertaken with the Soil Conservation Service in determining the design, location and rehabilitation of new access tracks.
- Minimal disturbance of existing vegetation.
- Regular track inspections.

7.4 BUSHFIRE HAZARD

The Blue Mountains area is generally characterized by high bushfire hazard. Section 3.10 describes the areas of low, moderate, high and extreme bushfire hazard within the study area. The proposed transmission line would traverse areas of low to moderate bushfire hazard and high bushfire hazard in steeper and well vegetated areas. The only areas of extreme hazard traversed by the proposed line, are located at the southern side of the Fitzgerald Creek valley.

The Bush fire Council of New South Wales advised that the proposed transmission line would not affect any issues of State or regional significance. As the proposed line is located in a bushfire prone area, the provisions of circular 6/89 prepared by the Department of Planning should be taken into consideration.

Measures to be incorporated into the design, operation and maintenance of the proposed transmission line to minimize the risk of bush fires would include:

- Utilization of existing cleared areas such as tracks, road reserves and utility easements.
- Provision of adequate safety clearances of lines from vegetation or building structures.

- Consultation with bushfire control officers of Blue Mountains City Council regarding the siting of the proposed line and the construction of access tracks.

- Maintenance of adequate clearances would be maintained between conductors. This would minimize the possibility of conductors clashing in the event of a storm.

- Regular line maintenance as part of the risk management programme.

7.5 PLANNING CONTROLS

The consideration of planning controls as a route selection factor is discussed in Section 3.11. Since the preparation of the route selection study, the proposed planning controls contained in draft local environmental plan (EMP 1) have been the subject of a public hearing pursuant to Section 68 of the Environmental Planning and Assessment Act, 1979.

As a result of the report prepared by the Commissioners of Inquiry, the Draft Local Environmental Plan has been reviewed and is expected to be re-exhibited in late 1990. Blue Mountains City Council has advised that under the revised draft local environmental plan, transmission lines would be a permissible use in any zone.

State Environmental Planning Policy No. 4

State Environmental Planning Policy (SEPP) No. 4 contains provisions which permit the construction of transmission lines by, or on behalf of, a public authority without the need to obtain development consent, providing the use is not prohibited. The provisions of the existing planning controls (Blue Mountains Local Environmental Plan No. 4) and the proposed planning controls (draft local environmental plan (EMP 1), as revised, do not prohibit the proposal and therefore it falls within the provisions of SEPP No. 4. As the proposed transmission line does not require development consent, it is an activity which requires assessment under Part V of the Environmental Planning and Assessment Act, 1979.

Part V Consent

The route assessment study for the proposed transmission line considered all matters affecting or likely to affect the environment. Following a review of the route assessment study, Prospect Electricity determined that an Environmental Impact Statement should be prepared for the proposal. In accordance with clause 58 (1) of the Environmental Planning and Assessment Regulation, Prospect Electricity consulted with the Director of the Department of Planning. The Director's requirements for the preparation of the EIS are contained in Appendix A.

The Director's requirements indicated that the proposal should be considered as an activity referred to in Section 112 (1) of the Act, subject to confirmation from Blue Mountains City Council to assessment of the proposal under Part V of the Act. Blue Mountains City Council confirmed the appropriateness of assessing the proposal under Part V of the Act, with Prospect Electricity acting as the determining authority (Appendix

B). As the proponent and determining authority, Prospect Electricity's powers and obligations are those outlined in Sections 112 and 113 of the Act.

The Director's requirements identified specific matters pursuant to clause 58 to be addressed in the Environmental Impact Statement. These matters, including details of consultation with relevant authorities are contained in the body of the Environmental Impact Statement. Matters raised in formal consultation with the Blue Mountains City Council have also been addressed throughout the Environmental Impact Statement.

Part IV Consent

The construction of the proposed Winmalee zone substation would require Council consent under Part IV of the Environmental Planning and Assessment Act, 1979. The construction of a zone substation does not fall within the provisions of State Environmental Planning Policy No. 4. The site of the proposed Winmalee zone substation is currently zoned (a1) Rural within Blue Mountain local environmental plan No. 4. Under the provisions of this zone, the proposed zone substation would require the consent of Blue Mountains City Council. Prospect Electricity would submit a development application for the proposed zone substation. Development consent would also be required for the zone substation under the provisions of the revised draft Local Environmental Plan (EMP 1) (Pers Comm. Ian Wood–Bradley, July 1990).

7.5.1 ASSESSMENT OF EFFECTS

The provisions of State Environmental Planning Policy No. 4 override the provisions of existing and proposed planning controls in relation to the assessment and determination of the proposed transmission line. Part V of the Environmental Planning and Assessment Act provides the framework for assessing the environmental impact of the proposed development. Concerns raised by the Department of Planning, Blue Mountains City Council and relevant authorities are addressed throughout the Environmental Impact Statement.

7.6 ABORIGINAL ARCHAEOLOGY

Section 3.1 summarizes the results of detailed investigation into Aboriginal archaeology which was undertaken as part of the route assessment study. Figure 3.1 identifies recorded sites and area of high, moderate and low sensitivity in relation to Aboriginal archaeology. The location of Aboriginal sites and areas of high sensitivity were important considerations in determining the preferred route for the proposed transmission line.

7.6.1 ASSESSMENT OF IMPACTS

The potential impacts of the proposal on Aboriginal archaeology have been minimized by the use of existing roads, tracks and utility easements. Although Aboriginal sites can occur in any environment in the Blue Mountains, the proposed line would, for most of its length, traverse areas of low sensitivity. The Paterson Road spur is the only area of moderate sensitivity traversed by the proposed line. In this area, much of the length of

the proposed line would be located within an existing road reserve, where the surface has already been disturbed. Where the proposed line involves the construction of new access tracks, Prospect Electricity would consult an archaeologist to ensure that the construction of the proposed transmission line did not disturb any Aboriginal sites.

7.7 EUROPEAN AND NATURAL HERITAGE

The proposed transmission line would not directly impact on any building or natural feature of heritage significance, as identified in Section 3.10. Figure 3.8 shows the concentration of heritage items within the Springwood village area. The Springwood section of the proposed line would be located underground and within the existing road reserves. The proposed line would not traverse any property on which a heritage item is located.

The National Trust of Australia (New South Wales) advised that the proposed transmission line would not impinge on any classified landscapes entered on the register of the National Trust. The properties specifically identified by the National Trust would not be affected by the proposed transmission line.

7.8 ELECTRIC AND MAGNETIC FIELDS

Electric and magnetic fields are created in the space surrounding energized transmission lines. The electric field intensity at any point depends on the operating voltage (volts) whilst the magnetic field varies with the line current (amps). The strengths of these fields decrease rapidly with increasing distance from the live conductors. Safety is a major factor in the design of high voltage transmission lines, and safeguards are provided to counter potential hazards.

7.8.1 IMPACTS AND MITIGATION MEASURES

The impact of electromagnetic fields on human health has been the subject of many technical studies. Electromagnetic fields are generated by a range of household appliances such and television sets, hair dryers, radios and microwave ovens.

The National Health and Medical Research Council (NHMRC) of Australia approved Interim Guidelines on limits of exposure. These guidelines have been adopted by Prospect Electricity in designing new lines and monitoring the electromagnetic fields generated by existing lines. Monitoring tests conducted by Prospect Electricity have shown that the electromagnetic field effects are within the safe limits set by the guidelines.

A range of measures would be incorporated in the design and operation of the proposed line to ensure that the associated electromagnetic effects are within the safe recommended limits. These measures would include:

- the careful placement of lines within the easement to provide maximum separation distance from houses and other places of human activity.

- monitoring of world-wide research on the effects of electromagnetic fields on human health.

- earthing of metallic objects such as wire fences within close proximity to proposed line, where necessary. This would prevent build-up of electric charges.

7.9 OTHER EFFECTS

Noise and Corona

Noise would be generated during the construction of the proposed line. Construction noise would generally be confined to a small construction area. Typical noises would include that of human voices, excavation machinery and truck movements. These noises would be short and temporary and would only affect residences in close proximity to construction works.

During operation, particularly in wet conditions, an audible noise emanates from transmission line conductors owing to the phenomenon of corona (produced by electrical discharges at the surface of the conductor). In fine weather the level of noise depends upon the surface condition of the conductors. Corona noise is not unlike the noise produced by rain itself and when outdoors near a transmission line in rain, it is possible for a hearer to mistake the line noise for rain noise. During heavy rain the corona noise is greatest but is obscured by the noise of the rainfall itself. When the rain stops, or during extremely light, misty rain or very heavy fog, a moderate 'fizzing' sound may be heard for a short period of time while the water droplets remain. After a long dry spell minor crackling may be detectable owing to a build-up of dust or other pollutants on the conductors and insulators. This is eliminated by the first good fall of rain that washes them clean (Kinhill Engineers, 1987).

Radio and television reception

Television and radio reception in the primary service area of transmitting stations is normally unaffected by transmission lines. Transmission lines and television signals generate electrical energy. Television and radio reception is not normally affected by transmission lines. Tests have been carried out by both Prospect Electricity (1984) and Sydney County Council (1984). The tests indicated that interference to television reception can occur when the ratio of a TV signal (microvolts) to the transmission line (microvolts) approaches 2:1. The ratios measured (for both 11 kV and 132kV lines) ranged from 20:1 to over 150:1 and were thus well above the 2:1 required to generate interference (Foresite Landscape Architects and Planners Pty Ltd, 1987). There should be no significant interference with the local television reception attributable to the installation of the 66kV line.

Potential for interference can be increased however, when lines are coated with dust or other forms of particulate or chemical matter. Temporary fading of radio reception may be experienced in a car passing underneath the line, particularly if the radio signal strength is low. In fringe areas a properly erected aerial generally overcomes any

potential reduction in quality of television or radio reception arising from proximity of the transmission line.

In event of disruption to radio or television, Prospect Electricity would take immediate actions aimed at overcoming these problems.

Appendix A

DIRECTOR'S REQUIREMENTS

New South Wales Government

Department of Planning

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

Telephone: (02) 266 7111 Ext. 7234
Fax No: (02) 266 7599

Contact: Barbara Callcott

Our reference: 89/2103

Your reference: 70/53/1
DAM:CM

Prospect Electricity
PO Box 389
PARRAMATTA NSW 2150 220

Attention: Dennis Morgan

PROSPECT ELECTRICITY
FILE No. 70/53/1
RECEIVED 25 SEP
LETTER No. 618369

Dear Sir

Proposed powerline from Winmalee Zone Substation to Warrimoo and Springwood Zone Substation

Thank you for your letter of 21st July, 1989 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. The Department understands that there may be some difference of opinion between Prospect Electricity and Blue Mountains City Council as to whether this proposal is an activity referred to in Section 112(1) of the Act. In view of this uncertainty, you should consult with Blue Mountains City Council to attempt to resolve the statutory position prior to the exhibition of an EIS. You should note that this proposal does not constitute a designated development as defined in Schedule 3 of the Environmental Planning and Assessment Regulation, 1980. Accordingly, an EIS is not required if development consent is required and the proposal is to be assessed in accordance with Part IV of the Act.

4. In order to avoid undue delay in the event that you decide to pursue assessment of the powerline under Part V of the Act, the requirements for an EIS for the proposal have been issued. This should not be taken as endorsement of either the position of the Blue Mountains City Council or Prospect Electricity in regard to the statutory position.

file MGR. SYS. DEV
21.9.89
MGR SYSTEM DEVELOP:

Pursuant to clause 58 of the Regulation, the Director requires that the following matters be specifically addressed in an EIS for the project:

- justification for the proposed development;
- evaluate alternatives giving details of costs and benefits. Where social or environmental costs/benefits are not quantifiable, they should be described. Suggested alternatives include the "do nothing" option, the demand management option, as well as partial/complete undergrounding;
- assessment of any increased bushfire risk related to the proposed development and measures proposed to minimise such risk;
- visual impact of the proposed powerline;
- justification for size of easement and extent of clearing, description of any associated restrictions on the use of land, arrangements for maintenance access;
- assessment of impact, during construction and operation, on the natural environment. A detailed survey of flora and fauna should be conducted and any rare or endangered species or species at the limit of their distribution specifically identified. 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;
- assessment of measures proposed to prevent erosion and siltation during both construction and operation of the powerline. Measures proposed for site rehabilitation including revegetation and landforming should also be assessed;
- identification of any section of the proposal and alternatives which would require consent under Part IV of the Act;
- a statement of the statutory powers and obligations of the determining authority in relation to the proposed development, and
- any matters considered by Blue Mountains City Council to be appropriate for addressing in the EIS.

5. Attachment No 2 is a guide to the type of information most likely to be relevant to the development you propose; not all of the matters raised therein may be appropriate for consideration in the EIS for your proposal; equally, the guide is not exhaustive.

6. Additionally, in preparing the EIS, you should consult the National Parks and Wildlife Service, the State Pollution Control Commission, Board of Fire Commissioner's of NSW (Bushfire Section) and the Soil Conservation Service and take into account any matters they may raise.

7. If assessment of the proposal will take place in accordance with Part V of the Act, your attention is drawn to the procedures outlined below. When an adequate EIS has been prepared for the subject proposal, as determining authority, you should then proceed with the matter in accordance with Sections 112 and 113 of the Act, and place the document on public exhibition. The procedures for public display that are to be followed by the proponent and/or determining authority are as in clauses 60 to 64 of the Environmental Planning and Assessment Regulation, 1980.

8. When the EIS is completed, four (4) copies should be forwarded to the Secretary (Attention: Manager, Assessment Branch) pursuant to Section 112(2) of the Act, as well as details of the exhibition period and public display locations.

9. 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, Project Electricity 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.

10. Should any submissions be made during the period of public exhibition, it is advised that such submissions should be forwarded to the Secretary in accordance with Section 113(3) of the Act.

11. If the determining authority has not received a reply within 21 days of sending submissions to the Secretary, it should proceed to determine the matter. The Department will only contact the determining authority after the receipt of submissions if an issue of major significance is involved.

12. If there is no objection to the proposed development as a result of the exhibition, the determining authority may determine the matter at any time after the last day upon which submissions are accepted.

13. It would be appreciated if a copy of the determination could be forwarded to the Department for our information.

14. Should you require any further information regarding this matter please do not hesitate to contact us again.

Yours faithfully

B Adams 21/9/89

B Adams
Manager, ASSESSMENTS 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 State Pollution Control Commission in regard to air, water and noise impacts and relevant pollution control legislation requirements.
- The Soil Conservation Service 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.

Appendix B

BLUE MOUNTAINS CITY COUNCIL CORRESPONDENCE

City of Blue Mountains

17th November, 1989

Please quote file 19959
RN:AG

Mr D A Morgan
Environmental Officer
System Development Branch
Prospect Electricity
PO Box 389
PARRAMATTA NSW 2150

If telephoning or calling regarding this matter, please contact:

Senior Strategic Planner

SUBJECT: Proposed 66 kV Transmission Lines - Warrimoo to Springwood and Winmalee.

Dear Sir,

This advice is to confirm the points raised by Council's Senior Strategic Planner, Roger Nethercote and Environmental Scientist, Michael Eades with yourself and Prospect consultants representative Maureen Wade of 3rd November, 1989.

Council wishes to thank Prospect for providing the opportunity of having input into the proposed Environmental Impact Statement to be prepared for the subject proposal and to commend Prospect on the approach taken thus far with the environmental assessment report prepared by Kinhill Engineers Pty Ltd and resultant decision to prepare an Environmental Impact Statement (EIS) for the proposal.

The specific issues Council would like to draw to yor further attention are as follows:

1. Zone Substation - although previous discussion with Council has occurred in regard to the proposed new zone substation, it is considered more appropriate for the siting of such facilities to be a result of the environment assessment process, rather than a precursory to it. This is particularly important when considering the ultimate positioning of related transmission line routes which have destination at a proposed zone substation.

2. Directors requirements - Council wishes to reiterate the points raised in the Department of Planning's advice to Prospect of 21st September, 1989 for inclusion in the EIS particularly those concerning:

   * visual impact of the lines
   * evaluation of alternatives, including undergrounding options
   * measures to prevent erosion and siltation, particularly access tracks.

3. Opportunities and Advantages - the EIS should clearly outline and map any physical or manmade advantage which may influence the location of the transmission line e.g. fire trails, road reserves, cleared areas etc. A more detailed elaboration of all options, their advantages and disadvantages should also be incorporated in the EIS.

4. Archaeological survey - will need to be done in more detail, and should be a mitigating factor in route selection as indicated in relation to the Fauna surveys.

5. Road Options - should address the various methods possible for joint usage of existing pole lines, possibly with undergrounding of existing transmission lines and use of Aerial Bundled Cable where appropriate vegetation screening is proposed or presently available. The visual impact of any new pole line within road reserves must be considered. Hawkesbury Road widening programmes specifically should be ascertained.

6. Access tracks - the location, visibility, extent and proposed maintenance of tracks providing construction and long term vehicular access to proposed lines should be fully assessed. Long term environmental effects of retaining access tracks should also be addressed.

7. Community attitudes - should be surveyed and determined in relation to the preferred option and a discussion on the views presented in the EIS.

The procedure outlined by you concerning Prospect's decision to pursue the environmental assessment of the subject proposal having regard to the provisions of Part V of the Environmental Planning and Assessment Act, 1979, as the determining authority is noted by Council. It is confirmed that this course of action is appropriate given Prospect's decision to both implement the savings provisions contained within State Environmental Planning Policy No. 4 - "Development without Consent" and also to have prepared an EIS in relation to the activity for exhibition purposes and ongoing decision making.

Trusting the above is of further assistance and Council looks forward to receiving copies of the completed EIS document for formal commentary when available for exhibition.

Yours faithfully,

R. FENNELL,
Town Clerk/City Manager.

Per: Regan Thacker

Appendix C

SPECIES LIST

Appendix C
SPECIES LIST

RARE AND ENDANGERED SPECIES

Species	Locations
Acacia byoneana	Faulconbridge
Acacia pubescens	Mountain Lagoon
Boronia fraseri	Springbrook, Lapstone, Glenbrook
Cypanthera scabrella	Glenbrook Gorge
Dillwynia tenuifolia	Glenbrook, Blaxland, Mitchells Pass
Eucalyptus burgessiana	Faulconbridge
Gonocarpus longifolous Leucopogon fletcheri	Springwood
Lissanthe sapida	Glenbrook to Springwood
Lomandra fluviatilis	Glenbrook Gorge
Monotoca ledifolia Personia hirsuta	Glenbrook
Rhizantella slateri	Paterson Road
Zieria involucrata	Sun Valley, Springwood, Sasafras Gully, Valley Heights, Kurrajong

Appendix D

QUESTIONNAIRE AND SUMMARY OF RESPONSES

Appendix D

QUESTIONNAIRE AND SUMMARY OF RESPONSES

QUESTIONNAIRE

PROPOSED SPRINGWOOD—WINMALEE—WARRIMOO 66 kV TRANSMISSION LINES

Please tick the appropriate box.

1. In which area of the Blue Mountains do you live?

   Springwood ☐ Winmalee ☐ Warrimoo ☐

   Other (specify): .....

2. The route assessment study evaluated the range of route options for the proposed transmission line. Have you reviewed this study?

   Yes ☐ No ☐

3. Of the route options outlined in the route assessment study, please nominate your preferred option.

   Springwood to Winmalee

   Option A1 ☐ Option A2 ☐ Option A3 ☐ Option A4 ☐

   Winmalee to Warrimoo

   Option B1 ☐ Option B2 ☐

4. Do you intend making a submission on the Environmental Impact Statement when it is placed on public exhibition?

Yes ☐ No ☐ Not sure ☐

5. Do you have any general comments to make about the proposal or matters which should be considered in the EIS?

.....

.....

.....

SUMMARY OF RESPONSES TO QUESTIONNAIRE

	Question	Response	Number of Responses
1.	In which area of the Blue Mountains do you live	Springwood	13
		Winmalee	24
		Warrimoo	9
		Other/not specified	3
			49
2.	Have you received the route assessment study.	Yes	46
		No/no response	1
4.	Nominated preferred option	A1	15
		A2	3
		A3	1
		A4	8
		B1	27
		B2	12
5.	Intention of making submission to EIS	Yes	12
		No	13
		Not sure	19
		No response	5
6.	Additional comments		
	Line routes should avoid residential areas		14
	Visual impact		12

Question	Response	Number of Responses
	Line should be partially/fully underground	14
	Health impacts	4
	Electro magnetic fields	2
	Line should follow existing roads	4
	Line should avoid Purvine Road	10
	Road accident safety	4
	Noise/TV reception	2
	Land values	2
	Other suggested routes	10
	Joint use of poles	2
	More information required	2
	Use Crown land	2

Note: total number of responses for each question do not always total 49 due to response errors or multiple responses to one question.

Appendix E

NATIONAL TRUST LISTINGS AND REGISTER OF SIGNIFICANT TREES

Appendix E

NATIONAL TRUST LISTINGS AND REGISTER OF SIGNIFICANT TREES

Heritage items (National Trust listing)

Item Number	Item	Location	Significance
1	House	167 Great Western Highway Corner of Taringa Street, Blaxland	Part of classified group
2	Gatehouse	Greens Parade opposite Cambridge Street, Valley Heights	Part of classified group. Significant physical remnant of early construction of the Great Western Highway
3	Gatehouse	7 Macquarie Road, Springwood	Part of classified group. Significant physical remnant of early construction of the Great Western Highway
4	Railway Station	Great Western Highway, Springwood	Classified. One of the oldest remaining late Victorian station buildings in the Blue Mountains
5	Christchurch Group	Great Western Highway, Springwood	Recorded
6	'Stanway'	Macquarie Road, Cnr Stanway Avenue, Springwood	Recorded
7	'Danebury'	100 Macquarie Road, Springwood	Recorded
8	'Braemar'	104-106 Macquarie Road, Springwood	Classified, early villa with boom-style character

Item number	Item	Location
9 Fraser Memorial Presbyterian Church	Macquarie Road, Springwood	Classified. Elegant country church with fine stone detailing and well maintained interior

Heritage items (Blue Mountains Heritage Study)

Item number	Item	Location
10	House and former convent	10 Railway Parade
11	Cottage, Winmalee	27 Great Western Highway
12	Residence	Great Western Highway, Springwood
13	Buckland Convalescent home and garden	Hawkesbury Road, Winmalee
14	'The Spinnery'	57 Hawkesbury Road, Springwood
15	St. Thomas Catholic Church	Hawkesbury Road
16	Buckland Park Baxter Memorial Gates	Macquarie Road, Springwood
17	Grove of mature eucalypts	West of Macquarie Road
18	Springwood Hotel (now Oriental Hotel)	Corner of Macquarie and Raymond Roads
19	10 Railway Parade	Convent (Eringath) and grounds
20	Cottage	94 Patterson Road
21	Railway Station	Great Western Highway

Item number	Item	Location
22	Locomotive Roundhouse	Tusculum Road
23	Residence	4 Green Parade, Valley Heights
24	Two residences	16, 17 Green Parade, Valley Heights
25	Garden 'Gurawin'	16 Railway Parade, Warrimoo
26	Railway overpass	Wilson Way, Blaxland
27	'Twenty two'	22 Koala Road, Blaxland
28	Residence and grounds	Great Western Highway, Valley Heights
29	Residence	5 The Valley Road, Valley Heights
30	Roxy Theatre	Macquarie Road
31	Fire Station (former station masters residence)	Macquarie Road
32	Boland Inn (site only)	Intersection Ferguson Jerseywold Avenue and Station Street, Springwood
33	Police Station (lock up only remaining) Post office	Macquarie Road, Springwood
34	Site of first school	Macquarie Street, Springwood
35	Railway water reservoir	Adjacent to Springwood Bowling Club, off Macquarie Road, Springwood

Source: *The National Trust of Australia (New South Wales)*

Register of significant trees

Registration Number	Name	Location	Ownership	Significant
14	Eucalyptus deanei (Deanei Forest) Stand	Hawkesbury Road, Springwood (Eastern side of Hawkesbury road between Lawson Road and Buckland Paddocks on the slopes into the gully.)	Blue Mountains City Council	One of the few of this species prolific in producing young ones. On land part of first land grant to William Lawson.
15	Angophora costata (Smooth Barked Apple)	Birdwood Gully, (375 m along the track from Boland Street entrance), Springwood.	Private ownership	An extremely tall tree aged 500 years plus.
17	Angophora costata (Smooth Barked Apple)	(Christ Church, Great Western Highway, Springwood, west of Lot 11, DP 9200)	Private ownership	Significant aesthetically and in relation to its context.
25	Eucalyptus golboidea (White Springybark)	Buckland Park, Macquarie Road, (18 m behind the War Memorial and 16 m west of the Bowling Green), Springwood.	Blue Mountains City Council	Remnant of original vegetation of the area.
30	Syncarpia glomulifera (Turpentine) x 4	Buckland Park, Macquarie Road, (behind the Red Cross building and the War Memorial, towards the railway line), Springwood.	Blue Mountains City Council	Remnant native vegetation.
31	Cedrus libani (Cedar of Lebanon)	Grounds of the Fraser Memorial Presbyterian Church, Macquarie Road, Springwood.	Private ownership	A prominent feature of the centre of Springwood Commercial Area.
32	Jacaranda mimosifolia (Jacaranda) x 2	Grounds of the Fraser Memorial Presbyterian Church, Macquarie Road, Springwood.	Private ownership	Two trees of important historical value; prominent feature of Springwood commercial centre.

Source: Blue Mountains City Council.

Appendix F

CONSULTATION WITH RELEVANT AUTHORITIES

Appendix F

CONSULTATION WITH RELEVANT AUTHORITIES

The following is a list of authorities that were formally consulted during the preparation of the EIS:

Blue Mountains City Council
National Parks and Wildlife Service
Water Board
Heritage Council of NSW
Department of Water Resources
Department of Planning
Department of Lands
Soil Conservation Service of NSW
Bushfire Council of NSW
State Pollution Control Commission
Telecom
State Rail Authority
Electricity Commission of NSW
National Trust of Australia
Department of Public Works
Department of Minerals and Energy
Roads and Traffic Authority
NSW Agriculture and Fisheries Department
Civil Aviation Authority

Appendix G

GLOSSARY

Appendix G

GLOSSARY

Conductor	The wires of a transmission line, which are designed to conduct electricity
Current	The flow of electricity, measured in amps (A)
Earth wire	Conductor erected continuously above transmission line for protection against lightning strike
Easement	A right over land, permitting the supply authority to construct, operate and maintain a transmission line
Field	Electric fields are produced by the voltage of an electrical system and magnetic fields are produced by the flow of electric currents.
Feeder	A power line to supply electricity.
Insulator	Hardware items, usually of porcelain intended to prevent electrical conductors from coming into direct contact with their supporting structures
Joint use	Sections of the transmission line where the overhead lines carry more than one circuit.
kV	Kilovolt (1000 volts). A 66 kV transmission line is a transmission line designed to operate at 66,000 volts
Loading	The amount of power being transmitted or generated.

Outage	The interruption of the supply of electricity. The outage may be planned, such as for maintenance, or unplanned, such as faults caused by lightning.
Rating	Design power capacity of the system subject to the industry's standards and conditions.
Subtransmission system	Lines which carry electricity supply from bulk supply points to zone substations
Termination structure	Structures used at a turning point or end point of the transmission line and are designed to support additional loads due to conductor tension.
Three phase power circuit	A system is a three wire electricity supply which has an alternating current flowing in each wire. The currents in each wire rise and fall in a fixed time relationship to each other. This is an efficient way of generating, transmitting and using electricity.
Transmission line	A linear construction erected for the conveyance of electricity, incorporating supporting structures and overhead wires, often located on an easement.
Voltage	Indicates the ability of the system to deliver energy for a given current and can be thought of as the pressure of supply.
Zone substation	An electrical installation for the purpose of transforming electrical power from one voltage to another and controlling its subsequent distribution; a station at which voltage is transformed from a subtransmission voltage (66 kV) to a distribution voltage (11 kV).

Appendix H

REFERENCES

Appendix H

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Appendix I

STUDY TEAM

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This Environmental Impact Statement was prepared for Prospect Electricity by the study team listed below under the direction of Mr Dennis Morgan, Environmental Officer, Systems Development Branch.

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M.T. Wade	Project Manager
M. Erickson	Landscape Planner
L. Stupples	Environmental Scientist
Y. Chew	Graphics
M. Szabo	Graphics
J. Newman	Technical Review
A. Templeton	Editing
H. Kyriacou	Word Processing
L. MacGregor	Word Processing

Subconsultants to Kinhill Engineers Pty Ltd (for Route assessment study) which has been incorporated into the EIS)

M Denny R. Lambit	Mount King Ecological surveys for flora and fauna investigations.
J. Kohen	Investigations into Aboriginal archaeology.

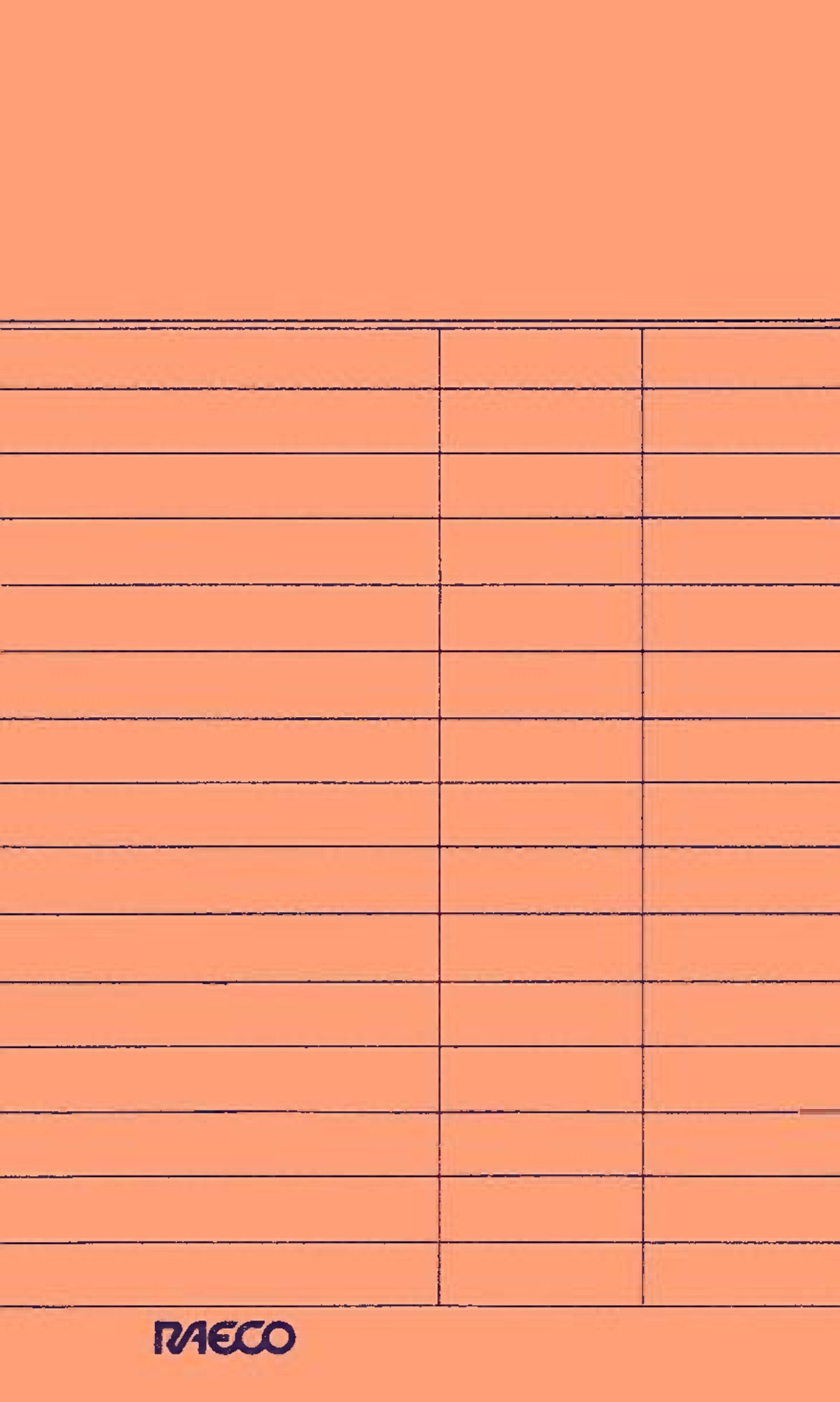
PROSPECT ELECTRICITY

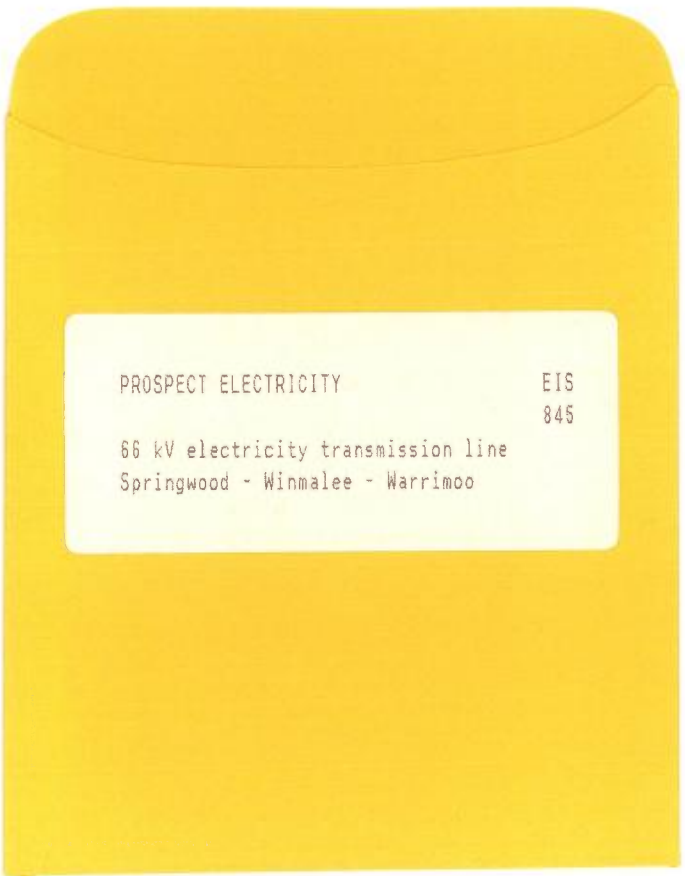
EIS
845

66 kV electricity transmission line
Springwood - Winmalee - Warrimoo

Borrower's name	Date	Ex.

RAECO




PROSPECT ELECTRICITY
EIS
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