

Environmental Assessment Report

Electrical Infrastructure for the Murrumbidgee to Googong Water Transfer Project



Angle Crossing via Williamsdale, ACT

April 2009

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Executive Summary

This report has been commissioned by ActewAGL to assess the environmental impact of a proposed mobile sub-station and underground 11kV electricity cable (proposed development) at Williamsdale in the ACT that is required to provide power to a proposed pumping station in the Murrumbidgee River Corridor as part of the Murrumbidgee to Googong (M2G) water transfer project.

The proposed development is a critical part of this overall M2G infrastructure project which itself is the subject of an Environmental Impact Statement.

The proposed development will entail establishment of a mobile sub-station in a fenced compound (40m x 14m) adjacent to Angle Crossing Road on Block 1471 in Tuggeranong. The sub-station will be linked to a proposed 132kV sub-transmission line that will take power into the ACT grid from the proposed TransGrid 132kV sub-station also at Williamsdale. An underground 11kV cable will link the mobile sub-station to the pumping station via the Angle Crossing Road reserve about 1.5kms west of the sub-station.

Specialist studies have included assessment of fauna/flora, bushfire risk and heritage.

Site and route selection of the facilities has involved evaluation of a number of options in the local area. The preferred site and route have been selected because they meet the technical requirements for the infrastructure as well as minimising environmental impact on threatened box-gum-grassland habitat in the local area. The facilities will have minimal impact on visual amenity and do not present a significant fire risk.

Specific impacts of the proposed development include the following:

- Removal of grassland from a fenced compound (2500sqm) for the mob sub-station
- Excavation of a trench for the 11kV cable along Angle Crossing Road involving disturbance to native grassland as well as limited tree removal.

A series of mitigation measures have been recommended by specialist studies and have been adopted by ActewAGL. These measures relate primarily to construction phase of the project.

The mitigation measures include:

1. A Construction Environmental Management Plan (CEMP) will be prepared by the contractor appointed by ActewAGL to undertake the proposed works.
2. All temporary storage depots onsite shall be located away from water courses and protected in accordance with TAMS requirements.
3. All vehicles will be cleaned before entering and leaving the development site.
4. A soil and water management plan shall be prepared by the construction contractor including identification of all measures to be implemented during the construction and operational phases of the proposal.

5. Areas disturbed to be minimised as far as practical. All exposed areas to be stabilised (that is, compacted or sealed) as soon as practicable following completion of works.
6. Water controls and water retarding structures such as diversion banks, channels and ponds, to be constructed to reduce the effect of sediment-laden runoff on adjacent watercourses.
7. Geotextile filter fabric fences to be placed down-slope of works occurring near watercourses or on slopes of more than five degrees.
8. Inspections and maintenance of sedimentation controls to be undertaken regularly, particularly during and following significant rain events.
9. Chemical spill response kits to be accessible at the construction site and staff trained in their use. These shall be available in ActewAGL vehicles on site.
10. Fuel, oil, chemicals and herbicides to be stored in accordance with Australian Standard 1940B1993.
11. Excavated material to be levelled and spread within the site prior to rehabilitation. Where this is not possible the material is to be removed from the site and taken to an approved landfill site. Any temporary stockpiles required are to be covered and filter fences provided down-slope.
12. Concrete mixers and pump trucks are not to be washed out on-site, and excess slurry shall be contained in plastic-lined pits or skips for off-site disposal.
13. Vehicle movement, vegetation clearance and construction activities are to be minimised within proximity of watercourses, where practicable.
14. No burning activities to be undertaken.
15. Areas disturbed to be minimised to limit the exposure of bare earth and the emissions of dust during windy conditions.
16. Vehicles leaving the site carrying loads likely to give rise to dust emissions to be covered.
17. The substation compound shall be managed to provide no vegetation within the fenced area for bushfire management.
18. The proposed access road to the mobile Substation shall be constructed to provide an all-weather surface capable of carrying a fully laden Rural Fire Service Tanker with a GVM of 15 tonnes.
19. The construction of the mobile Substation provide protection against the entry of burning embers and the shielding of external services to prevent ignition by flying ember attack.
20. To mitigate the risk of ignition of the surrounding vegetation, from a fire occurrence within the Substation Compound Contractors undertaking drilling, cutting, grinding and welding operations on the Substation Site shall not undertake such works without the provision of a portable fire extinguisher.

21. Contractors shall not undertake drilling, cutting, grinding and welding operations on Total Fire Ban days – unless during an emergency in which case a fire fighting appliance shall be on stand-by outside the facility.
22. Busbars, corona rings and stranded conductors treated with low reflective finish.
23. Communications pole to be timber or concrete with darker grey tones.
24. Strung conductor insulators will be a darker colour than the light grey normally used.
25. The substation compound fence to have a dull grey galvanised finish.
26. Construction works shall be limited to the times permitted under the ACT Parks Conservation & Lands (Environment & Recreation) Noise Environment Protection Policy.
27. Reversing alarms on machinery are to be placed as low to the ground as possible and the volume of the alarm is to be adjusted to a minimum value which can be heard as a warning by the workers in close proximity of the machine.
28. A detailed Waste Management Plan will be prepared in accordance with guidelines provided by ACT NOWaste and will include a detailed estimate of waste material generated by substation activities.
29. All waste material generated by workers will be collected, stored and removed from the site for appropriate disposal.
30. An Emergency Response Plan will be prepared for the substation to cover all conceivable emergency situations. This management tool would be required wherever the substation was located.
31. A 54kL tank with pressurised water system to be provided on site. This tank will not be available for any other water use and will be maintained at a full level through occasional importing of water via water tankers.
32. The substation will include a number of hand held extinguishers.
33. Security equipment, including a remotely alarmed and monitored intruder detection system with video surveillance, will be installed in the substation.
34. The design of the oil containment system and operating procedures for the substation to ensure that the environmental risk from accidental spillage is minimal.
35. A security fence is to be erected around the substation. Strict procedures will require gates to be closed and locked when not in immediate use.
36. The fence will carry a number of warning signs to advise would-be intruders of the danger from high voltage apparatus inside.
37. Any construction work by ActewAGL or its contractors will be required to operate within the heritage protocols established by relevant heritage legislation.
38. The construction contractor to implement recommendations 2, and 5-9 contained in the Butler/Vertigo Report (2009)
39. Any construction work by ActewAGL or its contractors will be required to operate within the heritage protocols established by relevant heritage legislation.

40. Any developmental impacts to Aboriginal sites, TUG1 and CR15 or any other significant sites identified within or in the immediate vicinity of the project area are avoided. If this is not possible, strategies to protect or mitigate any proposed impacts to TUG1 and CR15 or any other significant sites identified should be formulated. For Aboriginal sites, these strategies should consider the views of the relevant RAOs.
41. An Aboriginal cultural heritage survey of the project area is conducted in conjunction with one representative from each of the relevant Representative Aboriginal Organisations (ROAs) for the ACT. The main aims of the survey should be to: identify, record and assess the condition of any unrecorded Aboriginal cultural heritage sites; relocate, update the recording and assess the condition of TUG 1 and CR15.

A separate Development Application (DA) will be lodged with ACT Planning and Land Authority (ACTPLA) under a "merit track" assessment for works approval. The proposed development does not trigger consideration under EPBC legislation.

Purdon Associates

March 2009

CONTENTS

EXECUTIVE SUMMARY	I
1 INTRODUCTION	1
1.1 PROJECT OVERVIEW AND STUDY AREA	1
1.2 PURPOSE AND STRUCTURE OF REPORT	1
1.3 DESCRIPTION OF ENVIRONMENTAL ASSESSMENT PROCESS	4
1.4 THE PROPONENT	4
1.5 LOCATION	4
2 PROJECT DESCRIPTION	5
2.1 PROJECT STATUS	5
2.2 PROJECT BACKGROUND AND NEED	5
2.3 OUTLINE OF PROPOSED DEVELOPMENT	6
2.4 SURROUNDING LAND USES	9
2.5 ALTERNATIVES CONSIDERED	9
2.6 CURRENT LEASE CONDITIONS	12
2.7 COMMUNITY CONSULTATION	13
3 ASSESSMENT PROCESS & METHODOLOGY	14
3.1 PROCESS UNDERTAKEN	14
3.2 STATUTORY FRAMEWORK	14
4 ENVIRONMENTAL IMPACTS	19
4.1 LAND USE	19
4.2 GEOLOGY AND SOILS	19
4.3 SITE CONTAMINATION	19
4.4 WATER QUALITY	20
4.5 AIR QUALITY	21
4.6 CLIMATE CHANGE	21
4.7 BIO-DIVERSITY AND NATURE CONSERVATION	21
4.8 BUSHFIRE AND HAZARD REDUCTION	23
4.9 TRAFFIC AND ACCESS	24
4.10 INFRASTRUCTURE	24
4.11 HERITAGE	24
4.12 SOCIAL	25
4.13 ELECTROMAGNETIC FIELDS	26
4.14 ECONOMIC	26
4.15 VISUAL CHARACTER	27
4.16 NOISE AND VIBRATION	28
4.17 WASTE	30
4.18 RISKS	31
5 CONCLUSIONS AND RECOMMENDATIONS	32
5.1 CONCLUSION	32
5.2 RECOMMENDED MITIGATION MEASURES	32
6 GLOSSARY	35

TABLES

Table 1: Lease Details	12
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FIGURES

Figure 1: Locality	2
Figure 2: Study Area	3
Figure 3: Proposed Mobile Substation	8
Figure 4: Alternative Sites and Routes Considered	11
Figure 5: Land Tenure	12
Figure 6: Extract from National Capital Plan	15
Figure 7: Extract from Territory Plan Map	18

ATTACHMENTS

- Attachment A: Flora & Fauna Assessment – Butler & Vertigo Environmental Consultants
- Attachment B: Bushfire Assessment – Australian Bushfire Protection Planners
- Attachment C: Heritage Assessment – Biosis Research

1 Introduction

1.1 Project overview and study area

This Environmental Assessment report assesses the impacts of the provision of electrical infrastructure (a mobile substation and 11kV cable) to enable operation of water pump stations associated with the proposed Murrumbidgee to Googong Water Transfer project (M2G project).

The M2G project is the subject of a separate Environmental Impact Statement (EIS) and is one component of a suite of water security infrastructure initiatives now being progressed by ACTEW to secure the region's water supply.

The M2G project involves pumping water from the Murrumbidgee River near Angle Crossing, through an underground pipeline to the Burra Creek and then to Googong Dam.

It is proposed that a water pump station be constructed close to the Murrumbidgee River and is subject to the above EIS. New electrical infrastructure needs to be installed to service the pump station. This electrical infrastructure comprises:

- Mobile Substation 132kV/11kV and connection to a future 132kV Williamsdale to Theodore line
- 11kV underground cable connection from the proposed substation to the future water pumping station.

The study area for the assessment of this electrical infrastructure (as distinct from the overall study area of the M2G project) is shown in **Figure 1 and 2**. The general locality is at Williamsdale in the District of Tuggeranong near the southern ACT/NSW border, and along Angle Crossing Road.

1.2 Purpose and structure of report

This report is an assessment of environment impact but is not a formal Environmental Impact Statement under the ACT Planning and Development Act (2008) and Regulations.

The report is intended to form part of the suite of documents associated with the EIS for the M2G project.

This report includes:

- Project description and alternatives considered
- Outline of existing situation and an assessment of Environmental Impacts including proposed mitigating measures.

The report will also be used as the basis for a Development Application (DA) to be lodged with the ACT Planning and Land Authority (ATPLA) under the Planning and Development Act 2007.

Figure 1: Locality

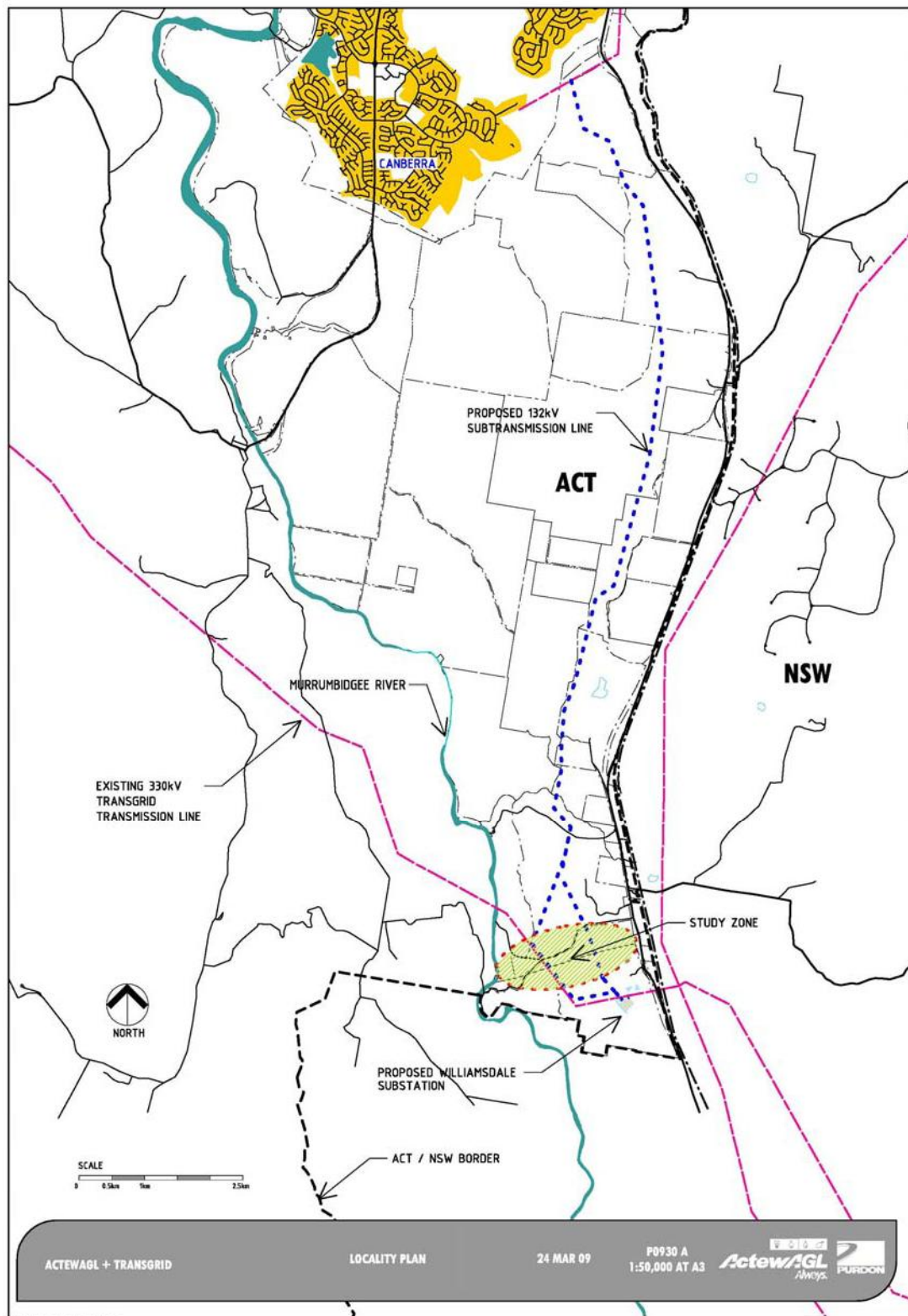
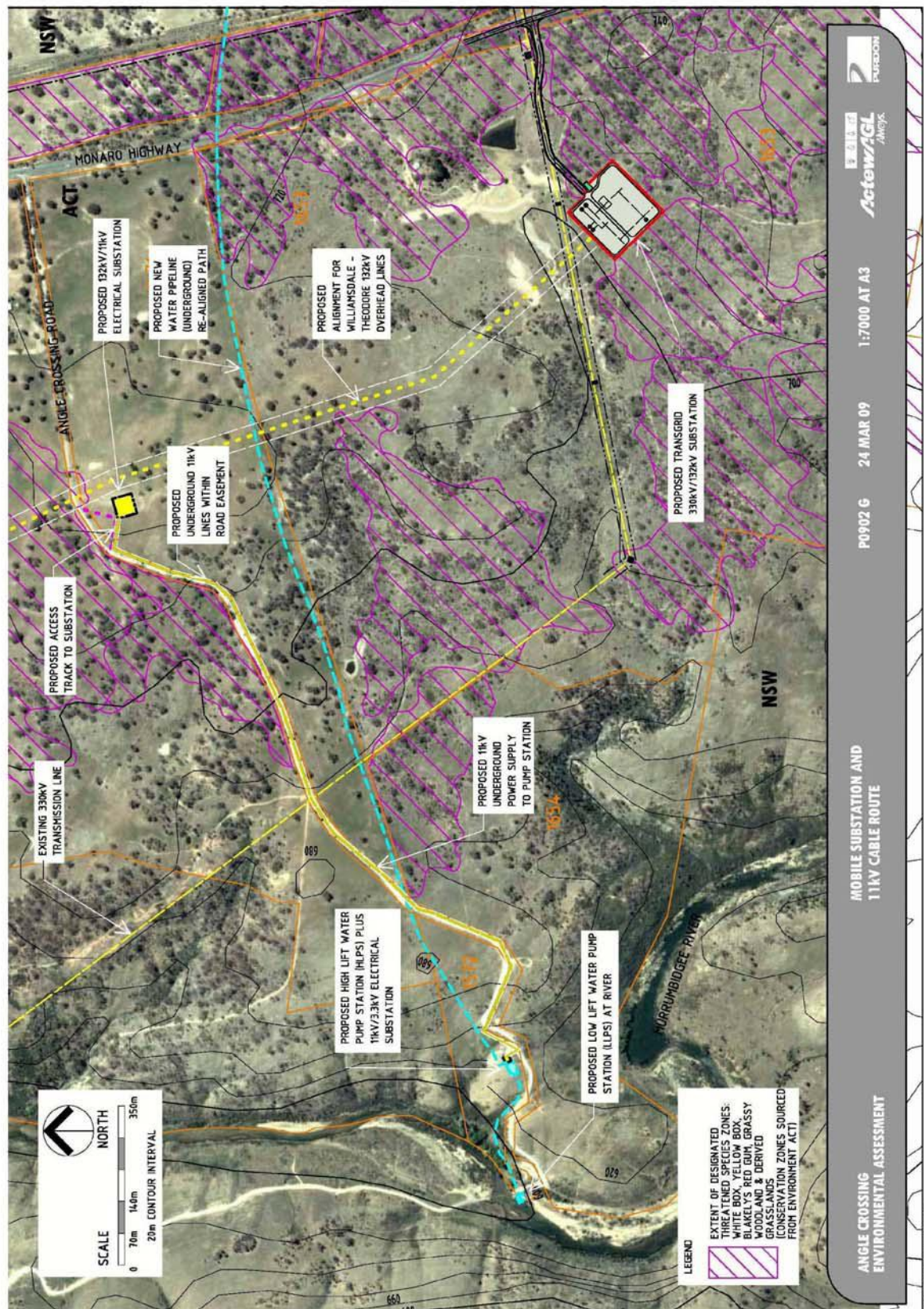


Figure 2: Study Area



1.3 Description of Environmental Assessment process

The M2G project crosses ACT, NSW and Commonwealth Land and a range of approvals are required from each of these levels of Governments.

This assessment of associated electrical infrastructure is located wholly within the ACT and of itself is subject to the Planning and Development Act (2007) and Regulations.

The electrical infrastructure is defined under the Territory Plan as a Major Utility Installation as it involves a major electrical sub-station comprising switching and transformer equipment handling voltages greater than 66kV. The 11kV line to the water pump station is a service reticulation as it involves an electrical cable/line having a voltage less than 66kV. On this basis the 11kV line meets the definition of Minor Use.

Within both the Rural and River Corridor zones in the Territory Plan, a major utility installation falls within the merit assessment track. As such a specific EIS is not required for this electricity infrastructure aspect of the overall proposal.

Under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the approval of the Commonwealth Minister for Environment, Heritage and the Arts may be required if there is a potentially significant impact on a matters of National Environmental Significance. As such, the project may be referred to the Department Minister for Environment, Heritage and the Arts for determination under the EPBC Act.

1.4 The proponent

The proponent for the provision of electrical infrastructure is:

General Manager Networks
ActewAGL
ActewAGL House
221 London Circuit
Canberra City ACT 2600
GPO Box 366, Canberra City ACT 2601

1.5 Location

The study area is shown in **Figure 2**. The site covers a number of separate rural blocks in the ACT identified as:

- part block 1471 Tuggeranong
- the Angle Crossing road reserve
- part Block 1572, Tuggeranong.

Block 1471 is part of a rural lease and will accommodate the mobile substation. The site is located approximately 700m from the Monaro Highway, 25km from Tuggeranong Town Centre and 40km from the City centre (by road).

The 11kV cable route will be located within the Angle Crossing road reserve. The eastern end of the cable starts at the substation on Block 1471. At the western end the route traverses parts of block 1572 to access the pumping station. This is an area of unleased Territory land forming part of the Murrumbidgee River corridor and Nature Reserve.

2 Project Description

2.1 Project Status

ActewAGL owns the subtransmission and distribution networks within the ACT and is responsible for planning and developing those networks.

In response to requirements under the National Electricity Rules, ActewAGL is proposing to increase security of supply to the ACT through implementation of the Southern Electrical Supply to the ACT project.

Essentially this involves establishment of a major substation connecting to the TransGrid 330kV network transforming to 132kV and connecting back to the Theodore substation. The Southern Electrical Supply project is currently subject to final assessment by DEWHA and ACTPLA.

The electrical supply for the M2G project will come from the new 132kV sub-transmission lines to be constructed by ActewAGL as part of the Southern Electrical Supply to the ACT project.

Concurrent with the preparation of this environmental assessment, a separate EIS is also being prepared by the Bulk Water Alliance for the proposed water pipeline comprising the M2G project

The new electrical connection to service the M2G pump station is required not later than August 2010.

The overall M2G project has an estimated cost of \$96.5 million, based on ACTEW's estimates. The estimated cost of the proposed electrical infrastructure to service the M2G project is \$2M.

2.2 Project Background and Need

The M2G project forms part of ACTEW's continued response to securing water supplies for the region and to address more frequent droughts and climate change. The project will make better use of the regions largest water storage, Googong Reservoir, by supplementing water supplies. It will provide up to 20 gigalitres of additional water per year into Googong Reservoir, which is nearly a third of average annual water use.

The provision of electrical infrastructure to the M2G project is critical to the operation of the Water Pump Station, to be located adjacent to the Murrumbidgee River. Without reliable high voltage electrical service the water cannot be transferred from the river to the Googong Dam.

2.2.1 Project Objectives

The only objective for the associated electrical infrastructure is to provide an electricity service from the proposed 132kv Williamsdale –Theodore line (part of the Southern Electrical Supply to the ACT project) to the proposed water pump station adjacent to the Murrumbidgee River.

2.3 Outline of Proposed Development

The electrical infrastructure comprises two main elements being:

- mobile substation 132kV/11kV & connection to future 132kv Williamsdale to Theodore line
- a single 11kV cable to the future water pump station.

These elements of the proposed development are described in more detail below.

2.3.1 Mobile Substation and Connections

The substation will be a 'mobile' facility installed on the site. The siting of the substation immediately adjacent to the 132kV lines will allow for direct connections to the 132kV line without the need for additional poles or towers. The substation will comprise:

- basic earthworks to enable the 'parking' of the mobile facility on a level surface
- stock proof perimeter fence
- a new transmission line connection from the new 132kV lines to the substation, which will be immediately adjacent to the 132kV corridor (up to 50m from lines).

The general location of the proposed substation is shown in **Figure 2**.



2.3.2 11kV Cable

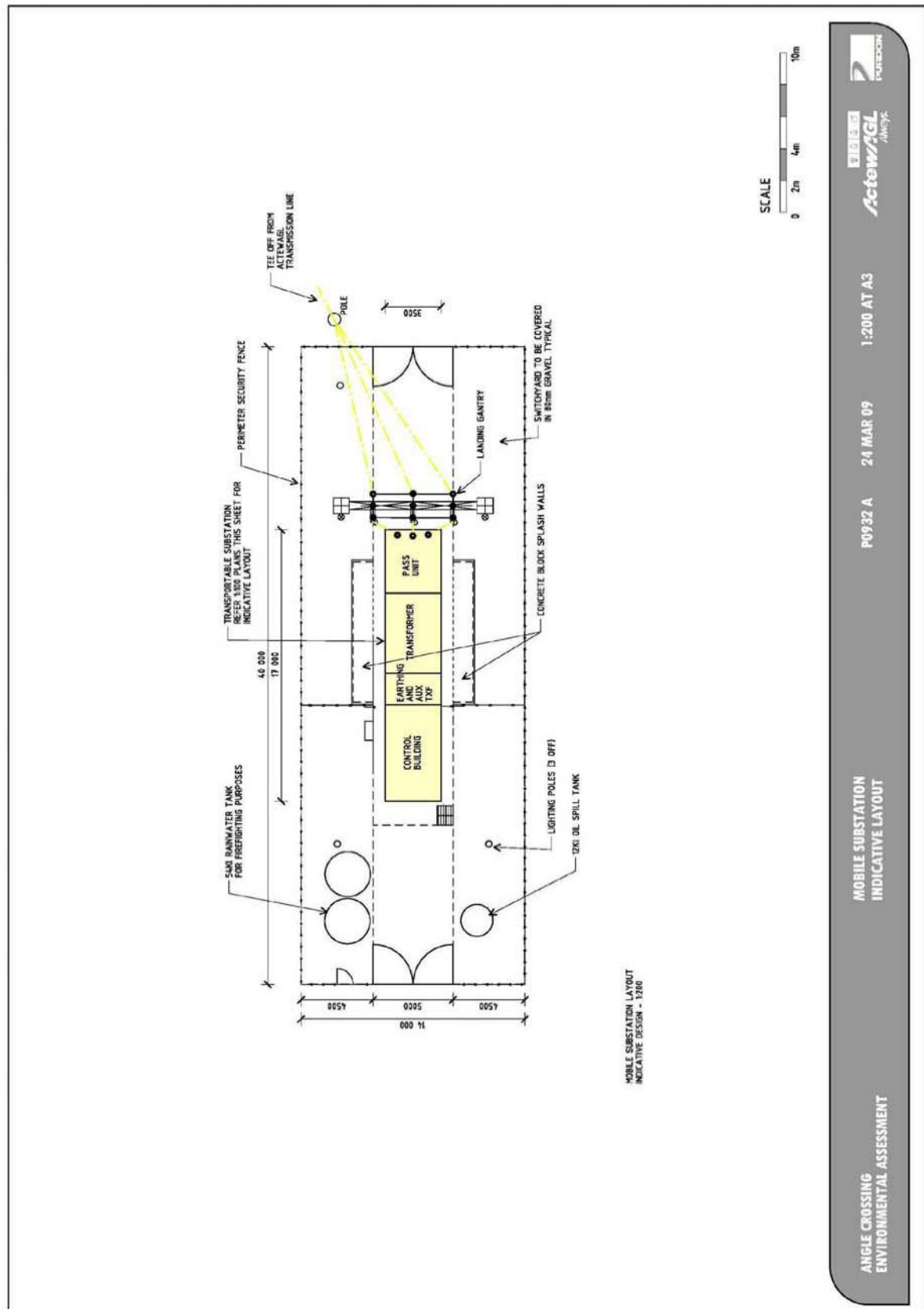
The construction of a single circuit 11kV line from the new 132kV/11kV mobile substation to the site of the proposed High Lift Water Pump Station involves:

- underground cabling for all of the route (within Angle Crossing Road reserve)
- establishment of a 10m wide "corridor" to accommodate the cable.

A 10m wide “corridor” along this route is sought by ActewAGL to ensure ease of access for construction and maintenance as well as vegetation management and land use controls.

ActewAGL considers that sufficient provisions are included in the existing Utilities Act 2000 and (Electricity) Public Safety Regulations to allow ActewAGL to operate the line without establishing a formal easement.

Figure 3: Proposed Mobile Substation



2.4 Surrounding Land Uses

The proposed 11kV line links the water pump station to the ACT ActewAGL electricity network via a 132kV/11Kv mobile substation to be located immediately adjacent to the 132kV lines.

The main land uses adjacent to the 11kV line and mobile substation include:

- rural uses including grazing
- Angle Crossing Road
- other (proposed) electrical infrastructure
- Angle Crossing river recreation area
- nature park and reserves.

The Monaro Highway, Williamsdale Service Station and rural dwellings are located to the east of the site.

2.5 Alternatives Considered

The consideration of alternatives involves three main aspects:

1. Alternative *power supply* to the water pump station
2. Alternative *routes* for electrical cables
3. Alternative *sites* for the electrical substation.

2.5.1 Power Supply Options

The need for reliable power to the pump station limits the options available.

- Solar power generated directly within the pump station compound (thereby avoiding electrical cables from the ACT grid) is not considered sufficiently reliable and would require a substantial land take for a solar farm to generate the necessary power.
- Other means of producing power (e.g. hydro-electric, wind, gas fired power station) are not considered feasible as the means of electricity supply simply to power a water pump station.
- Alternative supply directly from the 330kV TransGrid electricity network is not possible or appropriate.

On the basis that the most feasible option is to supply power from the ACT Grid, the alternative methods of supply include either overhead or underground supply.

- Overhead supply is considered most feasible where ground conditions warrant minimising disturbance and where wires can be strung to avoid impacts to native grassland etc.
- Underground supply is considered most feasible where the visual impacts warrant minimising the electrical 'wire-scape' within the rural landscape.

2.5.2 11kV Route Options

Several routes have been assessed for this facility as shown on **Figure 4**:

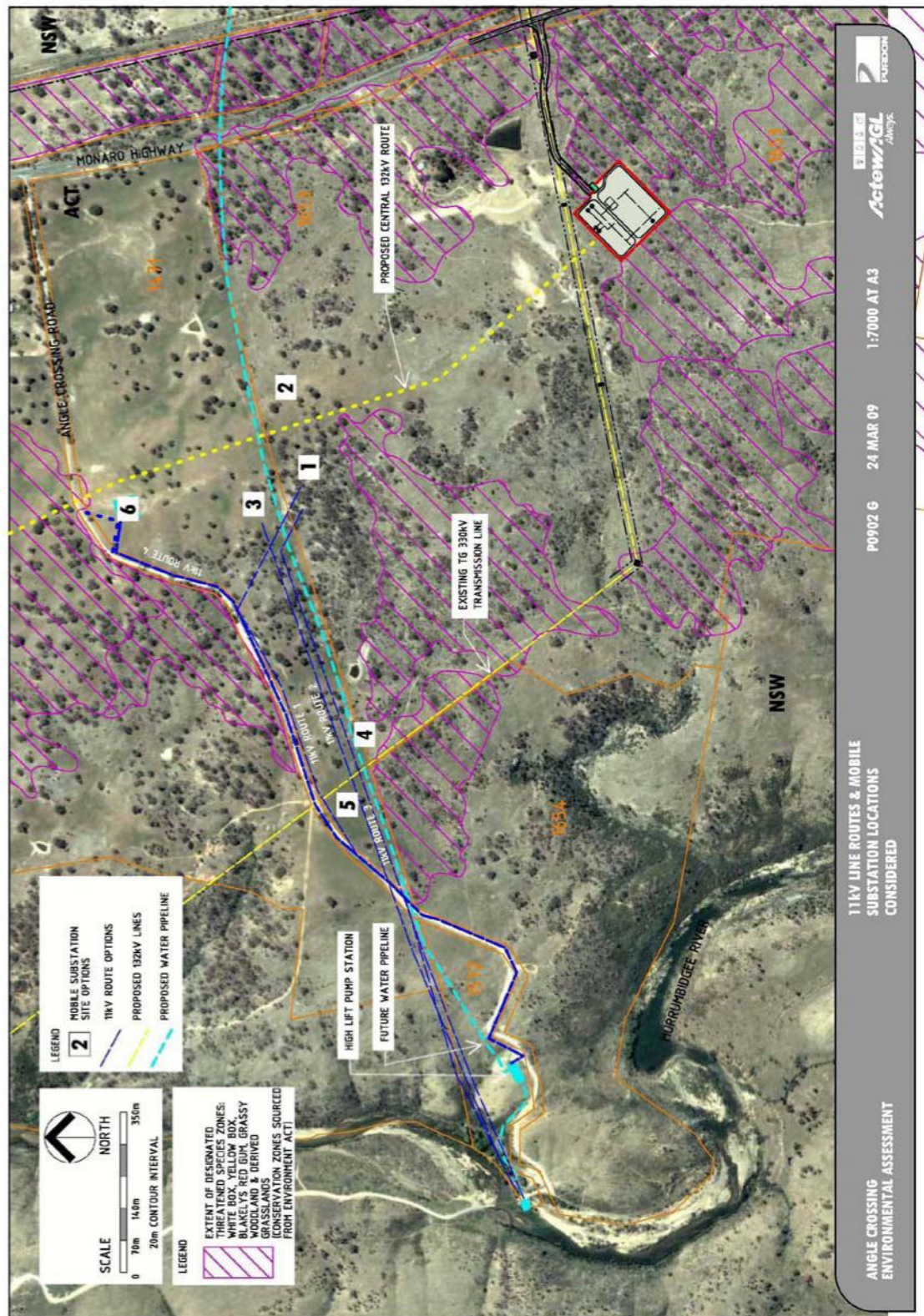
- Route 3 - an alignment adjacent to the proposed water pipeline along the northern border of Block 1675. This route would impact on an existing area of Yellow Box Red Gum Grassy Woodland
- Route 2 - an alignment along the southern boundary of Block 1471. This would not impact on Yellow Box Red Gum Grassy Woodland and would not be readily visible from Angle Crossing Road but creates some access difficulties
- Route 1 - an alignment along Angle Crossing Road. This also would not impact on Yellow Box Red Gum Grassy Woodland but would impact on native grassland
- Route 4 – As for Route 3 but continued along the western alignment of Angle Crossing Road to avoid impact on native grassland.

2.5.3 Substation Site Options

A number of sites have been considered for the substation (refer Figure 4):

- *Sites 4 & 5 adjacent to the 330kV transmission lines* – these option would require disturbance to an existing area of Yellow Box Red Gum Grassy Woodland and would be visible from Angle Crossing Road
- *Sites 1 to 3 adjacent to 132kV subtransmission lines (central route option)* – these options would be less visible from Angle Crossing Road and do not impact on areas of threatened species
- *Site 6* is on Block 1471 adjacent to Angle Crossing Road and would not impact on existing trees or endangered grassland.

Figure 4: Alternative Sites and Routes Considered



2.6 Current Lease Conditions

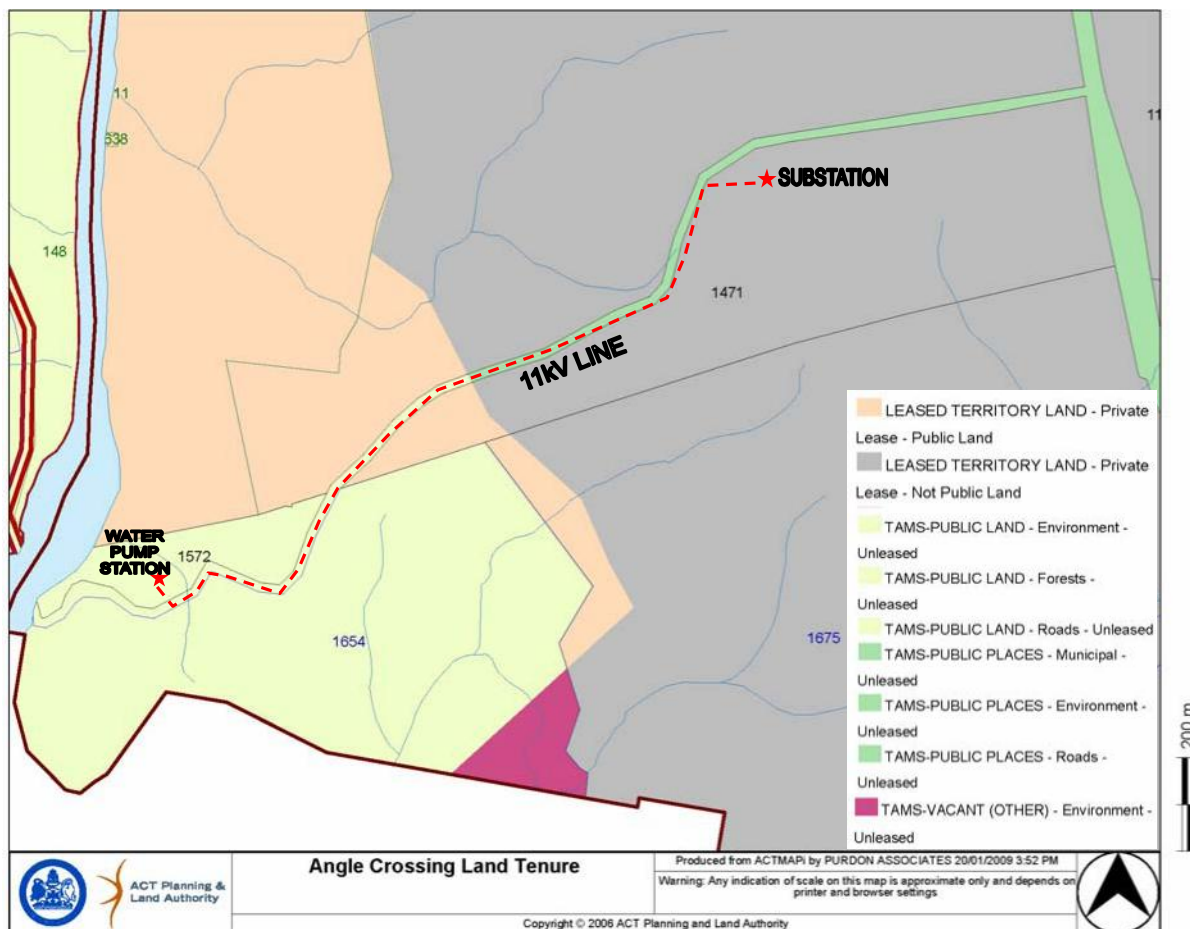
The proposed subtransmission line passes through four (4) rural properties 2 of which are private leases. Figure 5 shows the cadastral boundaries and land ownership of these blocks and the neighbouring ACT Government Nature Reserves.

The private leasehold land is within the rural district of Tuggeranong. Table 1 below identifies block numbers and lease details affected by the proposed development.

Table 1: Lease Details

Block	Rural District	Lease Details
1471	Tuggeranong	Grazing and Agricultural purposes and/or such other purposes previously approved in writing by the Minister
1572	Tuggeranong	Unleased Territory Land
1654	Tuggeranong	Unleased Territory Land
Angle Crossing Road Reserve	Tuggeranong	Unleased Territory Land

Figure 5: Land Tenure



2.7 Community Consultation

The rural lessee affected by the proposed electrical infrastructure has been consulted as part of this study and endorse the action, including consent to lodge a DA for the associated works.

Broader community consultation has been undertaken by ACTEW and the Bulk Water Alliance as part of the M2G project and the Southern Electricity Supply Project. Consultations have included meetings with lessees, as well as newspaper notices, web page information and general media commentary.

ACTEW will continue to engage with the communities and stakeholders who are affected by or have an interest in the project.

A web site has been established for this project with details of likely exhibition dates and details of how to make a submission available at www.actew.com.au/watersecurity.

3 Assessment Process & Methodology

3.1 Process Undertaken

Site inspections, field studies and desk top data reviews have been used to identify and assess the impact of the proposed development.

The specialist studies undertaken by members of the consultant team (bush fire; heritage; flora/fauna) form attachments to this report. These studies encompassed the enlarged area, not just the immediate path of the preferred route of the transmission line as detailed in this report.

Throughout this report the 'study area' refers to the enlarged area and the 'site' or 'subject site' refers to the actual substation site and route of the 11kV line. In some instances there are references to matters of significance in the study area but these matters do not necessarily imply that the matter affects the site or line.

3.2 Statutory Framework

The proposed development triggers assessment under a range of relevant legislation as discussed below.

3.2.1 National Capital Plan

The object of the NCP is "to ensure that Canberra and the Territory are planned and developed in accordance with their national significance".

The National Approach Route (the Monaro Highway) includes land within 200m of the centre line of the road. Special Requirements under the NCP apply to such land. Development adjacent to Approach Routes must be of a type and quality complementary to the role and status of the city. The proposed development is greater than 200m from the Monaro Highway.

A high voltage transmission line is defined under the NCP as a Public Utility, which falls within the broader land use definition of Administrative and Utility Services.

A Public Utility as defined by the NCP means the use of land for the following utility undertakings:

- a. headwork and network undertakings for the provision of sewerage and drainage services or the reticulation of water, electricity, or gas except for gas manufacture and storage;*
- b. communication facilities, including Australia post facilities, Telecom facilities, television/radio broadcasting facilities and air navigation communications facilities;*
- c. municipal uses, including street cleaning depots, public toilets, parks and garden depots, works depots and associated uses.*

The proposed 11kV line route crosses two Land use Policies under the NCP, being Rural and Hills Ridges and Buffers.

Public Utility is permissible within both Rural and Hills Ridges and Buffers Land Use Policy areas.

National Capital Open Space System

The importance of the natural setting of the National Capital has been recognised by the creation and formal adoption of the concept of the National Capital Open Space System (NCOSS). This system includes the distant mountains and bushlands to the west of the Murrumbidgee River near the proposed subtransmission line route.

The National Capital Open Space System (NCOSS) is intended to protect the nationally significant open space framework, visual backdrop and landscape setting for the National Capital.

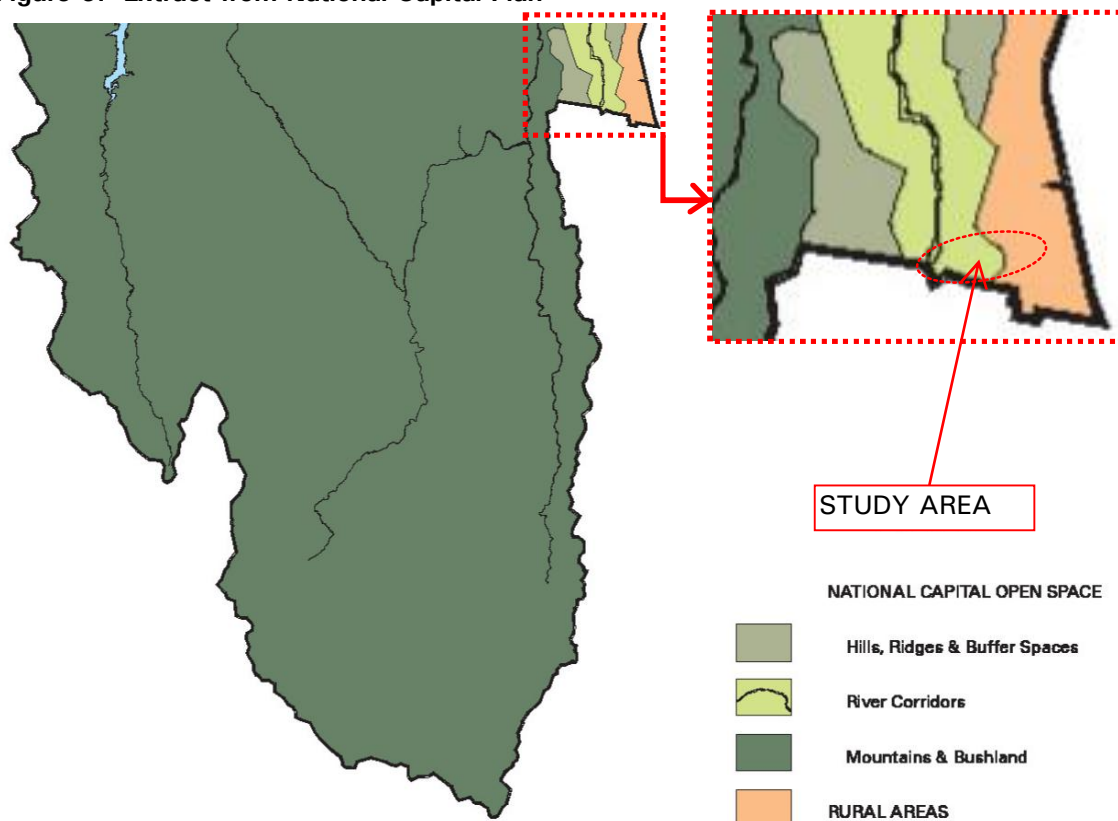
The development is outside the historic landscape significance and heritage values of the Lanyon Bowl Area.

The route does traverse areas identified as Hills, Ridges and Buffers under the National Capital Plan. The NCP states that hills and ridges are intended for multiple uses appropriate to the location and character of each area. Their continued use for recreation, tourism and appropriate urban services must be in a manner consistent with maintenance of their environmental qualities.

The NCP requires that Hills, ridges and buffer spaces remain substantially undeveloped in order to protect the symbolic role and Australian landscape character of the hills and ridges.

The range of uses permitted in the Hills, Ridges and Buffer Spaces part of the National Capital Open Space System include Public Utility.

Figure 6: Extract from National Capital Plan



3.2.2 ACT Legislation

Planning and Development Act (2007) and Regulations (2008)

This Act is administered by the ACT Planning and Land Authority (ACTPLA) and creates land use zones with associated permissible and prohibited land uses, as well as identifying different assessment tracks for development actions.

Spatial Plan

The Canberra Spatial Plan is the key strategic planning document for directing and managing urban growth and change. It sets actions for 30 years and beyond and outlines a strategic direction to achieve the social, environmental and economic sustainability of Canberra as part of The Canberra Plan.

The key principles underpinning The Canberra Spatial Plan are to:

- maximise safety and perceptions of safety within the community
- facilitate a prosperous city
- support Canberra's role as the national capital
- retain and strengthen the open space network, including the hills, ridges, natural water courses and gullies
- recognise the importance of cultural and natural heritage
- create and establish a built form and city layout that minimises resource consumption, including water and energy use
- facilitate the provision of physical, social and cultural infrastructure in a coordinated and cost effective manner
- protect areas of high conservation value from the impact of development
- protect and enhance important assets
- be a responsible partner in the region.

It is considered the construction of a substation and 11kV line is directly consistent with the strategies and principles of the Spatial Plan.

Territory Plan

The Territory Plan provides the policy framework for the administration of planning of land under the jurisdiction of the Territory. The purpose of the Territory Plan is to manage land use change and development in a manner consistent with strategic directions set by the ACT Government, Legislative Assembly and the community. It must not be inconsistent with the National Capital Plan. The Territory Plan includes broad principles and policies that guide development, through zones and specific objectives.

The construction of a mobile substation is defined in the Territory Plan as a Major Utility Installation, meaning "...a distribution reservoir; a major electrical substation; a major gross pollutant trap; a major pump station; a major service conduit; a power generation station; a sewerage storm tank; a treatment plant; a tunnel; an urban lake, pond and/or retardation basin; or a storage dam."

The 11kV line is defined as a Minor service reticulation meaning the water supply, sewerage, stormwater and gas pipe reticulation, electricity lines and telecommunication cables which are normally located in road easements or easements within leases.

The proposed 11kV line crosses two zones shown in **Figure 7**, which includes land reserved as a Nature Reserve. In the western part of the route, the route is generally located within a Hills Ridges and Buffers zone. The eastern part of the route lies within the Rural zone.

NUZ2 - Rural Zone

The objectives of the Rural zone are:

- a. Conserve the distinctive rural landscape setting of Canberra and maintain its ecological integrity.*
- b. Conserve sufficient wildlife habitats to adequately protect native plant and animal species.*
- c. Make provision for the productive and sustainable use of land for agriculture.*
- d. Make provision for other uses which are compatible with the use of the land for agriculture.*
- e. Ensure that land parcels are appropriate in size for their approved uses.*
- f. Offer leases for time periods which reflect planning intentions for the locality.*
- g. Reinforce a clear definition between urban and rural land.*

NUZ3 - Hills Ridges and Buffers Zone

The objectives of the Hills Ridges and Buffer Areas zone are:

- a. Conserve the environmental integrity of the hill system as a visual backdrop and a unified landscape setting for Canberra.*
- b. Provide opportunities for appropriate recreational uses.*
- c. Conserve the significant cultural and natural heritage resources and a diversity of natural habitats and wildlife corridors.*
- d. Provide predominantly open buffer spaces for the visual separation of towns and to provide residents with easy access to hills, ridges and buffer areas and associated recreation facilities.*
- e. Provide opportunities for appropriate environmental education and scientific research activities.*

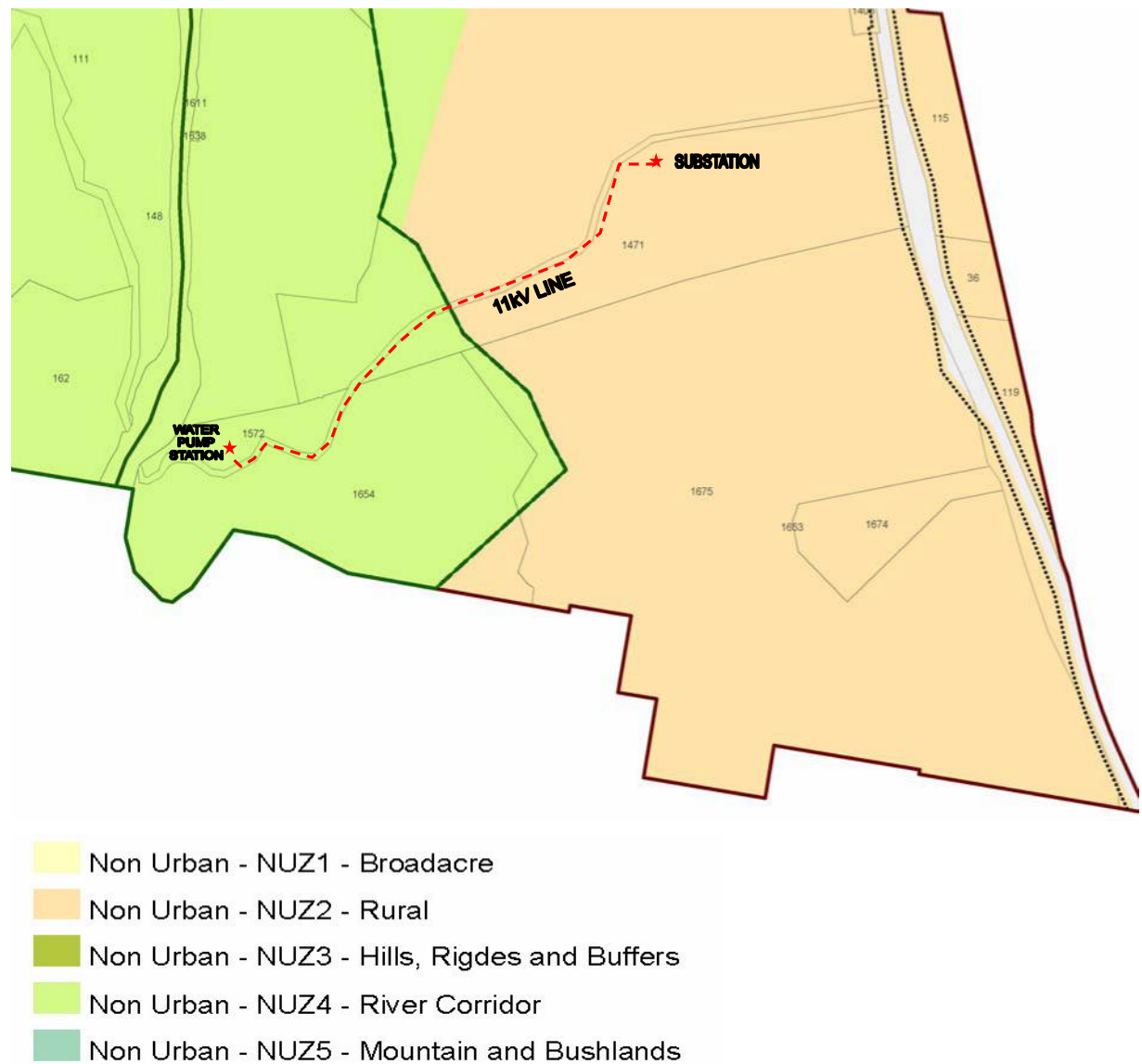
The Hills Ridges and Buffers Land zone permits the use of the land for a Major Utility Installation. The land use policy states that development on the lower and upper slopes may only be permitted where it does not have a significant visual impact from roads and other significant vantage points.

No specific policies are identified for the land located within the study area.

Conclusion

The construction of a substation and 11kV line within the defined route is considered permissible under both the NCP and Territory Plan.

Figure 7: Extract from Territory Plan Map



4 Environmental Impacts

This section outlines the existing situation, describes the possible impacts of the proposed development and identifies mitigating measures where relevant and appropriate to avoid or minimise the predicted impacts.

4.1 Land Use

The mobile substation site is currently used for grazing.

Potential Impact

The fencing of an area of approximately 80m by 30m will prevent this current land use. The loss of approximately 0.24ha of grazing land is considered negligible to the overall local grazing activities on the block.

The 11kV cable will be located underground and adjacent to an access track minimising impact on current land uses and visibility from Angle Crossing Road.

Mitigation Measures

No specific measures are proposed for land use other than security fencing.

4.2 Geology and Soils

The 1977 Geological Survey of NSW, Department of Mines, 1:100,000 scale geological map covering the Williamsdale Region (Michelago, Geological Series Sheet 8726, Edition 1) indicates that the proposed route is underlain by Late Silurian rhyolitic and rhyodacitic tuff, and minor siltstone, sandstone and limestone of the Colinton Volcanics.

The amount and prominence of outcrop along the proposed route is varied.

The exposed outcrops near Angle Crossing Road have rhyodacitic to rhyolitic compositions, with quartz float evident in a number of places.

Extremely weathered rhyodacitic and rhyolitic rocks are apparent as fine to coarse grained gravelly sand.

There is no geotechnical constraint to establishing a level base for the mobile sub-station or for trenching for the cable.

4.3 Site Contamination

Records held by the Environment Protection Unit (EPU) for the subject land indicate that there is no evidence of contamination from sheep dips, municipal tips or fuel storage facilities. The site is not recorded on the Register of contaminated sites under section 21(A) of the Environment Protection Act 1997.

Potential Impacts

During construction there is a minor risk that the construction vehicles and machinery may bring contaminants onto the site. Contamination could potentially include:

- oil/fuel spills
- import of foreign soil
- garbage left by workers.

Mitigation Measures

- It is not proposed to import soil onto the site.
- all waste material generated by workers will be collected, stored and removed from the site for appropriate disposal
- all temporary storage depots onsite shall be located away from water courses and protected in accordance with TAMS requirements
- all vehicles will be cleaned before entering the development site.

4.4 Water Quality

The substation and 11kV line do not cross any major water course, however both facilities are within the catchment of the Murrumbidgee River. Site disturbance is likely to be minimal with only minor site levelling for the mobile substation and trenching for the underground cable.

Potential Impacts

Construction of the proposed substation and 11kV line may have a minor impact on stormwater drainage and water quality through:

- transport of sediments (or other pollutants) from construction site, cable trenching, work compounds or vehicle access tracks
- carriage of spoil on the tyres of vehicles leaving construction sites and deposition onto local roads where sediment may be washed into local watercourses
- accidental spills and leaks of fuels, chemicals, herbicides or other pollutants into nearby watercourses.

Mitigation

Mitigation measures would include:

- Preparation of a soil and water management sub plan by the construction contractor which would include identification of all measures to be implemented during the construction and operational phases of the proposal.
- Areas disturbed would be minimised as far as practical. All exposed areas would be stabilised (that is, compacted, sealed or vegetated) as soon as practicable following completion of works.
- Appropriate water controls and water retarding structures such as diversion banks, channels and ponds, would be constructed to reduce the effect of sediment-laden runoff on adjacent watercourses.

- Geotextile filter fabric fences would be placed down-slope of works occurring near watercourses or on slopes of more than five degrees.
- Inspections and maintenance of sedimentation controls would be undertaken regularly, particularly during and following significant rain events.
- Chemical spill response kits would be accessible at the construction site and staff would be trained in their use. These would normally be available in ActewAGL vehicles on site.
- Fuel, oil, chemicals and herbicides would be stored in accordance with Australian Standard 1940B1993.
- Excavated material would be levelled and spread within the easement prior to rehabilitation. Where this was not possible the material would be removed from the site and taken to an approved landfill site. Any temporary stockpiles required would be covered and filter fences provided down-slope.
- Concrete mixers and pump trucks would not be washed out on-site, and excess slurry would be contained in plastic-lined pits or skips for off-site disposal.
- Vehicle movement, vegetation clearance and construction activities are to be minimised within proximity of watercourses, where practicable.

4.5 Air Quality

Activities undertaken during the construction and maintenance of the substation and 11kV line have the potential to generate minor impacts on local air quality. These include:

- dust generated during earthworks
- emissions from vehicles during construction and maintenance.

Mitigation

Mitigation measures required are likely to be minimal given the temporary nature of the potential impact. Measures used to abate impacts on air quality may include:

- no burning activities to be undertaken
- areas disturbed would be minimised to limit the exposure of bare earth and the emissions of dust during windy conditions
- vehicles leaving the site carrying loads likely to give rise to dust emissions to be covered.

4.6 Climate Change

The proposed development will not have any perceptible impact on greenhouse gas emissions or air quality.

4.7 Bio-diversity and Nature Conservation

Geoff Butler and Associates together with Vertigo Environmental Consultants were engaged to undertake an assessment of the ecology of the areas affected by the proposed mobile substation site and 11kV cable along Angle Crossing Road. A copy of the Butler/Vertigo report is provided at **Attachment A**.

The Butler/Vertigo Report should also be read in conjunction with other independent flora/fauna studies undertaken independently for the water line but in the general vicinity by Biosis for the Water Alliance EIS.

The Butler/Vertigo report identified a range of ecological impacts that would be made by the proposed development including loss of trees and native grassland along the route, and potential; loss of habitat for a number of endangered fauna species that may be located in the area. The most significant area of potential impact was in the Murrumbidgee grassland at the west end of the route.

Construction of the proposed mobile substation and fence is in an area that will not impact on threatened or endangered habitat, although the construction of the cable will involve removal of some trees and native grassland along the road reserve.

It is noted that as a result of field work by Butler/Vertigo in conjunction with ActewAGL, the original route for the 11kV cable and the substation was changed to avoid impact on areas of Yellow Box Red Gum Grassy Woodland habitat. **Figure 4** shows the alternative sites and routes considered in the planning stages of this project.



The underground cable will minimise visual impact of the development along Angle Crossing Road



A few trees and native grassland will be damaged by the underground cable route



Mitigation along the road corridor will restore native grassland

Mitigation Measures

Since receiving the Butler/Vertigo Report, ActewAGL has **further modified the proposed substation site and 11kV cable route** to address concerns identified in the report.

Specific changes include:

- Avoidance of the Murrumbidgee grassland area at the west end of the cable route by continued use of the road corridor.
- Selection of a mobile substation site adjacent to Angle Crossing Road at the northern boundary of Block 1471 in a locality that has been highly degraded by intensive sheep grazing and which contains no trees

These changes substantially ameliorate any habitat impact of the proposed development.

Whilst recognising the impact of trenching on roadside vegetation, ActewAGL accepts the recommendations contained in the Butler/Vertigo Report that address land care issues, specifically recommendations 2, and 5-9.

4.8 Bushfire and Hazard Reduction

Australian Bushfire Protection Planners Pty Limited were commissioned to undertake an assessment of the potential bushfire risks for the site as it is identified in “ACT Planning for Bushfire Risk Mitigation” as being located within a designated Bushfire Prone Area. Attachment B refers.

The Bushfire Risk Assessment identifies the potential bushfire risks to the development and provides recommendations on bushfire protection measures required to mitigate the bushfire risk. These seek to address the protection of the substation from future bushfire events that may occur within the vegetation surrounding the substation.

Mitigation Measures

- Mobile Substation Compound - The Substation compound shall be managed to provide minimal vegetation within the security fence.
- Construction Standards to Building/s - The construction of the mobile Substation provide protection against the entry of burning embers and the shielding of external services to prevent ignition by flying ember attack.
- Provision of Portable Fire Fighting Equipment - To mitigate the risk of ignition of the surrounding vegetation, from a fire occurrence within the Substation Compound Contractors undertaking drilling, cutting, grinding and welding operations on the Substation Site shall not undertake such works without the provision of a portable fire extinguisher.
- Works on Total Fire Ban Days - Contractors shall not undertake drilling, cutting, grinding and welding operations on Total Fire Ban days – unless during an emergency in which case a fire fighting appliance shall be on stand-by outside the facility.

4.9 Traffic and Access

The 11kV route will be within Angle Crossing Road reservation and no new maintenance trails will be constructed.

Potential Impact

It is estimated that during the construction phase the number of hourly truck movements would only be 1-2 for the electrical infrastructure works, with occasional maintenance vehicles accessing the substation during operation.

Mitigation

No specific traffic management measures are proposed for traffic or site access other than those relating to erosion control, contamination, and water quality control outlined above.

4.10 Infrastructure

There is no existing infrastructure in the immediate locality of the proposed works.

The proposed works will not adversely affect new infrastructure associated with the M2G water pipeline and the 132kV sub transmission line from Williamsdale to Theodore.

4.11 Heritage

Biosis Research Pty Ltd were engaged to undertake an assessment of the Heritage values of the proposed site and along the proposed route. A copy of the Biosis report is provided at **Attachment C**.

The report covers a desktop review of Aboriginal and European Cultural Heritage in the general vicinity of the mobile substation and 11kV cable route. The assessment also included a section of the proposed overhead electrical transmission lines (132kV).

From, from a preliminary desktop examination:

- the archaeological significance of site, TUG1, appears to be low
- there is insufficient desktop information to provide a significance statement for CR15
- as no consultation has been yet been undertaken with the relevant RAOs, the cultural significance of the sites is unknown.

Mitigation Measures

Any construction work by ActewAGL or its contractors will be required to operate within the heritage protocols established by relevant heritage legislation.

It is recommended that any developmental impacts to Aboriginal sites, TUG1 and CR15 or any other significant sites identified within or in the immediate vicinity of the project area are avoided. If this is not possible, strategies to protect or mitigate any proposed impacts to TUG1 and CR15 or any other significant sites identified should be formulated. For Aboriginal sites, these strategies should consider the views of the relevant RAOs.

It is recommended that an Aboriginal cultural heritage survey of the project area is conducted in conjunction with one representative from each of the relevant Representative Aboriginal Organisations (ROAs) for the ACT. The main aims of the survey should be to:

- Identify, record and assess the condition of any unrecorded Aboriginal cultural heritage sites
- Relocate, update the recording and assess the condition of TUG 1 and CR15.

4.12 Social

Potential Impacts

The proposed mobile substation is located approximately 600m from the nearest occupied dwelling.

Television and radio interference can occur near substations and transmission lines due to gap discharges (sparking) between insulators and metal locating brackets. This interference most commonly occurs during hot, dry and windy weather. A similar problem can occur in the evenings as dew forms on dust that has deposited on the line, or on industrial pollution that has collected on the insulators and brackets of the line. In both instances, the interference generally clears after rainfall. If the interference continues after rain, the transmission line may be physically faulty and would need to be inspected (Australian Communications and Media Authority 2005).

Mitigation Measures

The substation and 11kV line would be constructed and maintained in accordance with current industry standards which would reduce the potential for gap discharges to occur. Therefore, no mitigation is considered necessary.

Notwithstanding this, ActewAGL would investigate any concerns regarding deteriorating reception of radio or television stations normally received by the community in the vicinity of the lines. If the new subtransmission lines are shown to be the cause, ActewAGL will accept responsibility to modify aerials and restore reception to the standard enjoyed prior to the erection of the subtransmission lines.

4.13 Electromagnetic Fields

Potential Impacts

Electric fields are created by differences in voltage: the higher the voltage, the stronger will be the resultant field. An electric field will exist even when there is no current flowing. Magnetic fields are created when electric current flows: the greater the current, the stronger the magnetic field.

The substation is more than 800m from the nearest house and is outside areas used frequently for recreation or intensive agricultural activities. This distance substantially reduces the likelihood of increased exposure to electric and magnetic fields generated by the substation.

The impact of electric and magnetic fields from the 11kV underground cable is considered negligible.

Mitigation

No mitigation measures are required.

4.14 Economic

Potential Impacts

Although much of the capital equipment needed for the substation will be imported into the region, local companies will benefit from expenditure on the project.

The average number of workers during the construction period is expected to range between 10 and 20. No new staff will be employed to specifically maintain the substation although there will be ongoing expenditure associated with the maintenance.

These impacts are considered to be positive.

Research on the impact of substations on property values has been undertaken for a range of similar projects throughout Australia (specifically refer Vineyard to Rouse Hill Electricity Upgrade Environmental Assessment 2006 for TransGrid).

This study attempted to quantify the magnitude of social and environmental externalities associated with the proposal as part of the economic assessment. Externalities can be generally regarded as an unintended consequence of an action.

The externalities identified included visual impact, safety, health concerns and operational noise. The study used estimated changes in property values as a measure of the value of social and environmental externalities associated with electrical infrastructure developments.

The study referred to above indicated that there would be no impact on properties greater than 50m from the alignment. The literature also indicated that the effect on property values would diminish over time.

The proposed development is not close to any residential property.

Mitigation

Based on the review of similar published studies, one of the most significant causes of the decline in property values relates to the visual impact of transmission lines. Effective approaches to mitigate the visual impact of the proposal would, therefore, assist in minimising property value impacts.

4.15 Visual Character

Visual characteristics are described below according to selected viewpoints along the Monaro Highway and Angle Crossing Road. A field survey of potential viewpoints was undertaken to assess the localities from where the substation may be visible.

The substation site forms part of the scenic rural landscape characteristic of the Canberra environs. It has been used for grazing over an extensive period and contains no trees.

Potential Impact

The main visible features of the substation will include:

- substation and associated switchgear
- new transmission line connection within the switchyard
- fence around the outside of the substation

In general, the proposed substation is considered to have a very low visual impact from major public thoroughfares and residential dwellings.

Views from the Monaro Highway – The substation is located more than 700m to the west of the Monaro Highway, and is for the most part shielded from view by vegetation and topography. No mitigation is considered necessary.

Angle Crossing Road - This is a relatively low frequency use public road. The proposed substation will be visible from only a very short section of Angle Crossing Road due to local topography and vegetation. The mitigation measures listed below will also lessen the visual impact of the substation at this point.

Residential property – the mobile substation is not visible from the nearest residential property because of shielding by a shearing station as well as local vegetation. There are no other residential properties near the site.

In summary, the substation development is considered to have a very low visual impact when viewed from surrounding areas, with the exception of a short section of Angle Crossing Road in the vicinity of the substation.

The 11kV underground cable will not be visible but will result in the loss of some existing trees along the verge of Angle Crossing Road.

Mitigation Measures

The proposed substation comprises electrical installations that are essential to the operation of the substation and as such cannot be readily changed in design, height, or appearance. Notwithstanding this, a range of mitigating measures will be implemented to minimise visual impacts through choices of colours and materials that do not compromise the electrical function of the facility. These measures include:

- busbars, corona rings and stranded conductors treated with low reflective finish
- communications pole to be timber or concrete with darker grey tones
- strung conductor insulators will be a darker colour than the light grey normally used
- the security fence to have a dull grey galvanised finish.



4.16 Noise and Vibration

The site is located in a relatively isolated rural area with the nearest dwelling being approximately 800m from the substation.

The ACT Noise Environment Protection Policy has been prepared in accordance with Part IV of the Environment Protection Act 1997 and provides details on the management of environmental noise in the ACT.

The Noise Environment Protection Policy does not apply in relation to noise resulting from maintaining an essential service (this noise is authorised by the Environment Protection Regulation 2005).

The Environment Protection Regulations identify 'zones' for the purpose of setting noise standards. The subject site and adjoining area comprising the dwelling is within Zone G. This zone establishes a noise standard of 45dB(A) Monday to Saturday between 7am and 10pm and Sundays and public holidays between 8am to 10pm. For all other times the noise standard is 35dB(A). As the noise emitted from the substation and associated lines will be continuous noise, the noise level of 35dB(A) at the nearest dwelling has been adopted.

Potential Impacts

In the general area noise sources in the area are primarily created at present by traffic and agricultural activities.

It is expected that there will be little to no noise impact on nearby residents or people travelling through the area due to the operation of the proposed substation and 11kV lines.

Noise during the construction phase will generally be associated with heavy vehicle movements. At different times this may include tractors, cranes, trucks and digging equipment.

The proposed line route traverses a rural environment and is well separated from the nearest residence. Given this separation there is likely to be little nuisance to residents, particularly given the temporary nature of the disturbance.

No vibration impacts are expected because of the anticipated type of plant involved and the limited amount of excavation work.

Similarly, because of the low volume of earthworks, the small number of truck movements proposed and the prevailing traffic volumes on surrounding roads, it is anticipated that construction traffic noise will be minimal.

The primary noise emanating from the substation site will be a continuous hum emitted by the transformer. This hum is known to be a common source of annoyance for residents who live near substations due to its mild tonality.

The transformer proposed to be installed will be specified to limit the source sound power. The design of the new substation will ensure that any noise levels from the operation of the substation would comply with relevant requirements, both initially and in the future.

In addition to transformer noise emissions, the types of noise associated with any overhead lines serving the substation or near the water pump station site are:

- aeolian noise ("wind in the wires") when the wind is blowing hard; and
- corona noise (due to localised electrical discharges) during rain, fog and other periods of high humidity.

The adjustments to the existing transmission lines to connect to the new substation will be consistent in design to the existing transmission line. On this basis it could be expected that an audible electrical noise level of 45 dB(A) $\pm$ 1 dB(A) or less would be recorded at the easement boundary in typical everyday weather conditions.

Wind-generated noise (aeolian) is caused by regular air fluctuations across the conductor and is largely eliminated using well-established design practices to modify (or "spoil") the airflow. Aeolian noise is rarely a problem in practice.

In terms of aeolian noise there would need to be significant wind for the level to be above 45 dB(A) at the easement boundary. Under such conditions, the background noise (wind through trees and fence wires, etc.) closer to the receptor is highly likely to exceed and mask noise from the transmission lines.

Electrical noise (corona) is generally audible only under conditions of high humidity, such as during rain or fog (i.e. hiss, crackle etc.). In heavy rain the noise would generally be masked by the background noise of the rain itself.

For the benefit of comparison, the typical noise level in a quiet rural area is often around 35-40dB(A), without considering any noise intrusion from road traffic.

An increase of up to 2dB(A) above background level is generally not perceptible by the human ear, and an increase of 3-5dB(A) is just noticeable. It should be noted however, that there is no activity near the proposed substation and the closest dwelling is approximately 600m to the north-east of the transformer and shielded by the terrain. As such the occupants of the dwelling will be unlikely to experience an increase in noise levels from the substation.

Mitigation Measures

The potential noise impacts will be mitigated through the following measures:

- limiting construction works to the times permitted under the ACT Parks Conservation & Lands (Environment & Recreation) Noise Environment Protection Policy
- ensuring the construction contract limits construction works to the times permitted under the Environment ACT Noise Environment Protection Policy
- ensuring reversing alarms on machinery are placed as low to the ground as possible
- ensuring the volume of the alarm is adjusted to a minimum value which can be heard as a warning by the workers in close proximity of the machine.

4.17 Waste

Potential Impacts

Waste streams and waste types likely to be generated during construction include:

- construction and process waste – surplus materials from construction of the substation and general site reinstatement, likely to comprise concrete, gravels, fencing and materials associated with the substation (metals)
- general waste – domestic refuse (litter) generated by construction workers
- green waste generated during construction of the substation including grasses, shrubs and trees.
- The proposal will not involve any demolition or road pavement waste as there are no existing structures on the site to be demolished.

The operation of the substation will generate very little waste. Waste streams and waste types likely to be generated during operation include:

- general waste – domestic refuse (litter) generated by occasional maintenance personnel
- maintenance waste – waste generated from maintenance during operation (mainly lubricants and oils).

Mitigation Measures

A detailed Waste Management Plan will be prepared in accordance with guidelines provided by ACT NOWaste and will include a detailed estimate of waste material generated by substation activities.

4.18 Risks

Potential Impact

A number of unlikely emergency events could affect the site requiring implementation of emergency procedures. These include bushfire, toxic material spill, internal fire, vandalism and/or deliberate attack.

Mitigation Measures

An Emergency Response Plan will be prepared for the substation to cover all conceivable emergency situations. This management tool would be required wherever the substation was located.

- *Site fire control – This will include a 54kL tank with pressurised water system. This tank will not be available for any other water use and will be maintained at a full level through occasional importing of water via water tankers. The substation will include a number of hand held extinguishers. Security equipment, including a remotely alarmed and monitored intruder detection system with video surveillance, will be installed in the substation.*
- *Accidental Spillage - Liquids used on the site include transformer oil, miscellaneous solvents, cleaning agents and oils used for maintenance of substation components. Except during maintenance, the only significant quantities of fluids within the substation will be contained within the transformer. The design of the oil containment system and operating procedures for the substation will ensure that the environmental risk from accidental spillage is minimal.*
- *High Voltage Safety - Safety for the public will be provided by means of a security fence around the switchyard. Strict procedures will require gates to be closed and locked when not in immediate use. The fence will carry a number of warning signs to advise would-be intruders of the danger from high voltage apparatus inside.*

5 Conclusions and Recommendations

5.1 Conclusion

This environmental assessment has examined the suitability of the preferred site and route for a new mobile substation and 11kV underground cable to service the M2G project, and has evaluated its impact on the immediate and surrounding environment.

The site and route was selected as the preferred location for the proposed development following a review of options and consideration of stakeholder concerns.

The combination of reviewing substation design, and revising the proposed line route to be outside key ecological areas, results in a development that is considered to have minimised the environmental impact.

ActewAGL will be responsible for ongoing management of the site, which will include ensuring that the relevant mitigation measures are maintained and upgraded as required.

In summary, there are no substantial or significant social, economic or other environmental impediments to the proposed development on the site/route proposed, provided the recommended mitigation measures are implemented.

5.2 Recommended Mitigation Measures

The recommended mitigation measures are summarised as follows:

42. A Construction Environmental Management Plan (CEMP) will be prepared by the contractor appointed by ActewAGL to undertake the proposed works.
43. All temporary storage depots onsite shall be located away from water courses and protected in accordance with TAMS requirements.
44. All vehicles will be cleaned before entering and leaving the development site.
45. A soil and water management plan shall be prepared by the construction contractor including identification of all measures to be implemented during the construction and operational phases of the proposal.
46. Areas disturbed to be minimised as far as practical. All exposed areas to be stabilised (that is, compacted or sealed) as soon as practicable following completion of works.
47. Water controls and water retarding structures such as diversion banks, channels and ponds, to be constructed to reduce the effect of sediment-laden runoff on adjacent watercourses.
48. Geotextile filter fabric fences to be placed down-slope of works occurring near watercourses or on slopes of more than five degrees.
49. Inspections and maintenance of sedimentation controls to be undertaken regularly, particularly during and following significant rain events.
50. Chemical spill response kits to be accessible at the construction site and staff trained in their use. These shall be available in ActewAGL vehicles on site.
51. Fuel, oil, chemicals and herbicides to be stored in accordance with Australian Standard 1940B1993.

52. Excavated material to be levelled and spread within the site prior to rehabilitation. Where this is not possible the material is to be removed from the site and taken to an approved landfill site. Any temporary stockpiles required are to be covered and filter fences provided down-slope.
53. Concrete mixers and pump trucks are not to be washed out on-site, and excess slurry shall be contained in plastic-lined pits or skips for off-site disposal.
54. Vehicle movement, vegetation clearance and construction activities are to be minimised within proximity of watercourses, where practicable.
55. No burning activities to be undertaken.
56. Areas disturbed to be minimised to limit the exposure of bare earth and the emissions of dust during windy conditions.
57. Vehicles leaving the site carrying loads likely to give rise to dust emissions to be covered.
58. The substation compound shall be managed to provide no vegetation within the fenced area for bushfire management.
59. The proposed access road to the mobile Substation shall be constructed to provide an all-weather surface capable of carrying a fully laden Rural Fire Service Tanker with a GVM of 15 tonnes.
60. The construction of the mobile Substation provide protection against the entry of burning embers and the shielding of external services to prevent ignition by flying ember attack.
61. To mitigate the risk of ignition of the surrounding vegetation, from a fire occurrence within the Substation Compound Contractors undertaking drilling, cutting, grinding and welding operations on the Substation Site shall not undertake such works without the provision of a portable fire extinguisher.
62. Contractors shall not undertake drilling, cutting, grinding and welding operations on Total Fire Ban days – unless during an emergency in which case a fire fighting appliance shall be on stand-by outside the facility.
63. Busbars, corona rings and stranded conductors treated with low reflective finish.
64. Communications pole to be timber or concrete with darker grey tones.
65. Strung conductor insulators will be a darker colour than the light grey normally used.
66. The substation compound fence to have a dull grey galvanised finish.
67. Construction works shall be limited to the times permitted under the ACT Parks Conservation & Lands (Environment & Recreation) Noise Environment Protection Policy.
68. Reversing alarms on machinery are to be placed as low to the ground as possible and the volume of the alarm is to be adjusted to a minimum value which can be heard as a warning by the workers in close proximity of the machine.
69. A detailed Waste Management Plan will be prepared in accordance with guidelines provided by ACT NOWaste and will include a detailed estimate of waste material generated by substation activities.
70. All waste material generated by workers will be collected, stored and removed from the site for appropriate disposal.
71. An Emergency Response Plan will be prepared for the substation to cover all conceivable emergency situations. This management tool would be required wherever the substation was located.

72. A 54kL tank with pressurised water system to be provided on site. This tank will not be available for any other water use and will be maintained at a full level through occasional importing of water via water tankers.
73. The substation will include a number of hand held extinguishers.
74. Security equipment, including a remotely alarmed and monitored intruder detection system with video surveillance, will be installed in the substation.
75. The design of the oil containment system and operating procedures for the substation to ensure that the environmental risk from accidental spillage is minimal.
76. A security fence is to be erected around the substation. Strict procedures will require gates to be closed and locked when not in immediate use.
77. The fence will carry a number of warning signs to advise would-be intruders of the danger from high voltage apparatus inside.
78. Any construction work by ActewAGL or its contractors will be required to operate within the heritage protocols established by relevant heritage legislation.
79. The construction contractor to implement recommendations 2, and 5-9 contained in the Butler/Vertigo Report (2009)
80. Any construction work by ActewAGL or its contractors will be required to operate within the heritage protocols established by relevant heritage legislation.
81. Any developmental impacts to Aboriginal sites, TUG1 and CR15 or any other significant sites identified within or in the immediate vicinity of the project area are avoided. If this is not possible, strategies to protect or mitigate any proposed impacts to TUG1 and CR15 or any other significant sites identified should be formulated. For Aboriginal sites, these strategies should consider the views of the relevant RAOs.
82. An Aboriginal cultural heritage survey of the project area is conducted in conjunction with one representative from each of the relevant Representative Aboriginal Organisations (ROAs) for the ACT. The main aims of the survey should be to: identify, record and assess the condition of any unrecorded Aboriginal cultural heritage sites; relocate, update the recording and assess the condition of TUG 1 and CR15.

Purdon Associates

April 2009

6 Glossary

Capacity – the load for which an electric generating unit, other electrical equipment or subtransmission line is rated.

Circuit – A conductive path over which an electric charge may flow.

Conductor – A wire or combination of wires suitable for carrying an electrical current. Conductors can be insulated or bare. OR Any material that allows electrons to flow through it.

Corona – An electrical discharge at the surface of a conductor caused by the ionisation of the surrounding atmosphere. It is normally accompanied by light and audible noise.

Cross arm – The horizontal section attached to a pole at which the conductor is held.

Easement – A right given to a third party to use a portion of property for certain purposes.

Electricity – The flow of electrons through a conducting medium.

Electricity Grid - The network of wires or cables that supplies electricity to users. It is the common, interconnected electricity network of transmission cables located along the east coast of Australia.

EMF – Electric and Magnetic Fields

Frequency – In A.C. systems, the rate at which the current changes direction, expressed as hertz (cycles per second); a measure of the number of complete cycles of a wave-form per unit of time.

High Voltage – An electrical system or cable designed to operated 1000V or higher.

High Voltage System – An electric power system having an A.C. voltage above 1000V.

Insulator – A device that is used to electrically isolate a conductor or electrical device from ground or a different electrical potential. Electrical insulators are often manufactured from porcelain.

Kilovolt (kV) – 1000 volts

Line – Refers to the conductor in an overhead or underground distribution or transmission line.

MVA – Mega Volt Amps

NEMMCO – National Electricity Market Management Company; The National Electricity Market Management Company was established to manage the operation of the wholesale electricity market and security of the power system.

Power – Rate at which energy is released or consumed, expressed in watts.

Substation – A facility where the voltage of electricity is transformed, normally reduced, prior to distribution to customers. Part of the electrical distribution system where changes in electrical voltage and switching takes place.

Security of supply – In general terms, the security of supply is a measure of the ability of the network to provide backup electricity supply during stated credible contingency events. A lack of supply security can lead to reduced reliability performance. Strategies to improve security of supply might include increasing the level of redundancy built into network components, or providing the ability to back up electricity supplies by alternative means.

Supply reliability – An outcome-based measure of the effectiveness of various network management and investment strategies in terms of their ability to provide a continuous

electricity supply to customers. Reliable supply is achieved through a combination of supply security, and sound network maintenance practices.

Transmission Line - *Lines mainly made from aluminium and carrying direct electrical current. One of the most commonly used is aluminium-stranded conductor which has a steel reinforced centre (ASCR) to increase its strength.*

Volt (V) – *A unit of electromotive force. The electrical potential needed to produce one ampere of current with a resistance of one ohm.*

Attachments

Attachment A: Flora & Fauna Assessment – Butler & Vertigo Environmental Consultants

Attachment B: Bushfire Assessment – Australian Bushfire Protection Planners

Attachment C: Heritage Assessment – Biosis Research

Attachment A

Flora & Fauna Assessment – Butler & Vertigo Environmental Consultants

**FLORA and FAUNA ASSESSMENT
for proposed ACTEW 11kv power line,
Angle Crossing Road, southern ACT
February 2009**



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CONTENTS

SUMMARY	1
1) INTRODUCTION.....	2
1.1 The Brief	
1.2 Aims of Assessment	
1.3 Study Area	
1.4 Threatened Species & Communities	
1.4.1 Flora	
1.4.2 Vegetation Communities	
1.4.3 Fauna Species	
2) METHODS USED	4
2.1 Vegetation Assessment	
2.2 Fauna & Fauna Habitat Assessment	
2.3 Literature	
MAP 1 – LOCATION OF STUDY AREA	5
MAP 2 – DETAIL OF STUDY AREA.....	6
3) RESULT OF VEGETATION SURVEY	7
3.1 The Vegetation Communities	
3.2 Vegetation to be Cleared	
3.3 Threatened Plant Species	
3.4 General Comments	
4) RESULTS OF FAUNAL HABITAT SURVEY.....	12
4.1 Faunal Habitats	
4.2 Threatened Animal Species	
5) POTENTIAL IMPACTS OF THE DEVELOPMENT.....	14
6) SUGGESTED MEANS TO AMELIORATE IMPACTS .	15
7) REFERENCES	16
Appendix 1 – Indicative Flora Checklist	17

SUMMARY

This report assesses the proposed route of an 11kV powerline through a section of the Murrumbidgee River Corridor Nature Reserve and along the side of the Angle Crossing Road.

It finds that very significant native grasslands and woodlands are present – both threatened ecological communities under both ACT and Commonwealth legislation – and that they will be negatively affected by the proposal as it currently stands. Additionally five threatened grassland animal species find suitable habitat along the route. One – Pink-tailed Worm Lizard (*Aprasia parapulchella*) – is regarded as very likely to be present. The presence of the others must be presumed until appropriate surveys show otherwise.

The key recommendation of this report is ‘that no trench be cut through the Murrumbidgee River Corridor’. The strong preference is for the route to follow the road; if this is not deemed possible, then a line across the Murrumbidgee River Corridor must be on poles.

Another seven recommendations – found in Section 6 – relate to important measures to ameliorate the impacts of the project. Of these, particular attention is drawn to the need for immediate implementation of Recommendation 5, ‘that all vehicles associated in any way with the project be kept out of the grassland unless this is impossible to avoid’.

This report also provides an indicative plant checklist and comments on plant communities and fauna habitat.

1. INTRODUCTION

1.1 The Brief

The brief for the project was provided verbally by Trevor Fitzpatrick of Purdon Associates, and was to undertake a flora and fauna assessment of the route of a proposed 11kv power line as defined on Map 1.

The line is associated with a proposed pipeline from the Murrumbidgee River at Angle Crossing, to supplement Googong Reservoir. The route begins at a planned 11kV substation by the road at the south-western end of the line, and ends where the line leaves the road to head east to a planned 132kV substation. The sector of line from the road to this substation is not the subject of this report.

1.2 Aims of Assessment

To meet the above the aims of the assessment were to:

- *conduct a survey of the flora, fauna and fauna habitat associated with the study area;*
- *assess whether the proposed development is likely to significantly affect flora and/or fauna species in accordance with requirements of the various State and Federal Acts;*
- *suggest ways to ameliorate any known or potential impacts of the proposed development.*

1.3 Study Area

The study area consists of nature reserve – the section north of the road, until the line crosses the road, is in the Murrumbidgee River Corridor – and of roadside reserve thereafter. The length of the route in Nature Reserve is 380 metres; the distance along the road is 820 metres.

The proposed 11kV substation is at 635m above sea level, from where the route climbs to the top of the Murrumbidgee River valley at 675m asl. After a minor descent, this is essentially the elevation where the route crosses the road; from there it climbs steadily to 695m asl, where the route of the study ends.

The Murrumbidgee River Corridor sector of the road comprises high quality secondary grassland. The roadside ranges from sectors dominated by weeds, to extensive areas of native grassland, some of moderate quality; even this quality of grassland is limited in the ACT.

The surrounding area comprises remnants of Yellow Box – Red Gum woodland, much of it in good condition (for more detail see Butler et al 2007).

1.4 Threatened Species and Communities

1.4.1 Flora

The ACT listed threatened plant species which were considered during this assessment are:

Tarengo Leek Orchid (*Prasophyllum petilum*). Endangered ACT; Endangered NSW; Endangered nationally.

Small Purple Pea (*Swainsona recta*). Endangered ACT; Endangered NSW; Endangered nationally.

Button Wrinklewort (*Rutidosia leptorrhynchoides*). Endangered ACT; Endangered NSW; Endangered nationally.

Ginninderra Peppercress (*Lepidium ginninderrense*). Endangered ACT; Vulnerable nationally.

Tuggeranong Lignum (*Muehlenbeckia tuggeranong*). Endangered ACT; Endangered nationally.

The subject site does not provide suitable habitat for all the above species and all these species are discussed in more detail later in this report.

1.4.2 Vegetation Communities

The threatened vegetation communities listed in the ACT are:

Natural temperate grassland. Endangered ACT; Endangered nationally.

Lowland woodlands. Endangered ACT; Critically Endangered nationally.

Both these vegetation communities are represented on the subject site.

A further conservation strategy, the ACT Aquatic Species and Riparian Zone Strategy (ACT Government 2007) has been legislated to protect riparian zones and the species they contain. Only one threatened flora species, Tuggeranong Lignum (*Muehlenbeckia tuggeranong*), which is dealt with above, is listed in the riparian strategy.

1.4.3 Fauna Species

This fauna habitat assessment concludes that the subject area has potential habitat values for five threatened grassland species.

Of these the presence of **Pink-tailed Worm-lizard** (*Aprasia parapulchella*), which is nationally Vulnerable, is regarded as highly likely.

In addition, given the presence of suitable habitat, the presence of **Striped Legless Lizard** (*Delma impar*), **Grassland Earless Dragon** (*Tympanocryptis pinguicolla*), **Golden Sun Moth** (*Synemon plana*) and **Perunga Grasshopper** (*Perunga ochracea*) should be presumed until appropriate surveys indicate that they are absent. For further discussion of all these species, see Section 4.2.

2. METHODS USED

An assessment of the subject site was undertaken on the 10th February 2009 in clear conditions with temperatures of approximately 15⁰C.

2.1 Vegetation Assessment

The subject site was defined by an aerial photomap provided by Purdon Associates. The photomap provided the proposed route for a 11Kv powerline which is to be trenched from a 132Kv/11Kv electrical substation situated 1.5km to the northeast of the high lift pumping station and electrical substation situated in the Murrumbidgee River Corridor – see Map 1.

The flora assessment covered the route of the proposed electrical cable along Angle Crossing Road to the site of the pumping station. The area assessed was some 20m wide within the Murrumbidgee River Corridor section, and along the southern side of the Angle Crossing Road reserve to a point on the road reserve where the cable enters the road reserve from the electrical substation. The area from the substation to the road reserve was not assessed as this area had previously been examined.

Random meander was the option selected for assessment of the subject area. The meanders traversed all aspects and habitats of the subject site. An indicative flora checklist was compiled and is attached as Appendix 1.

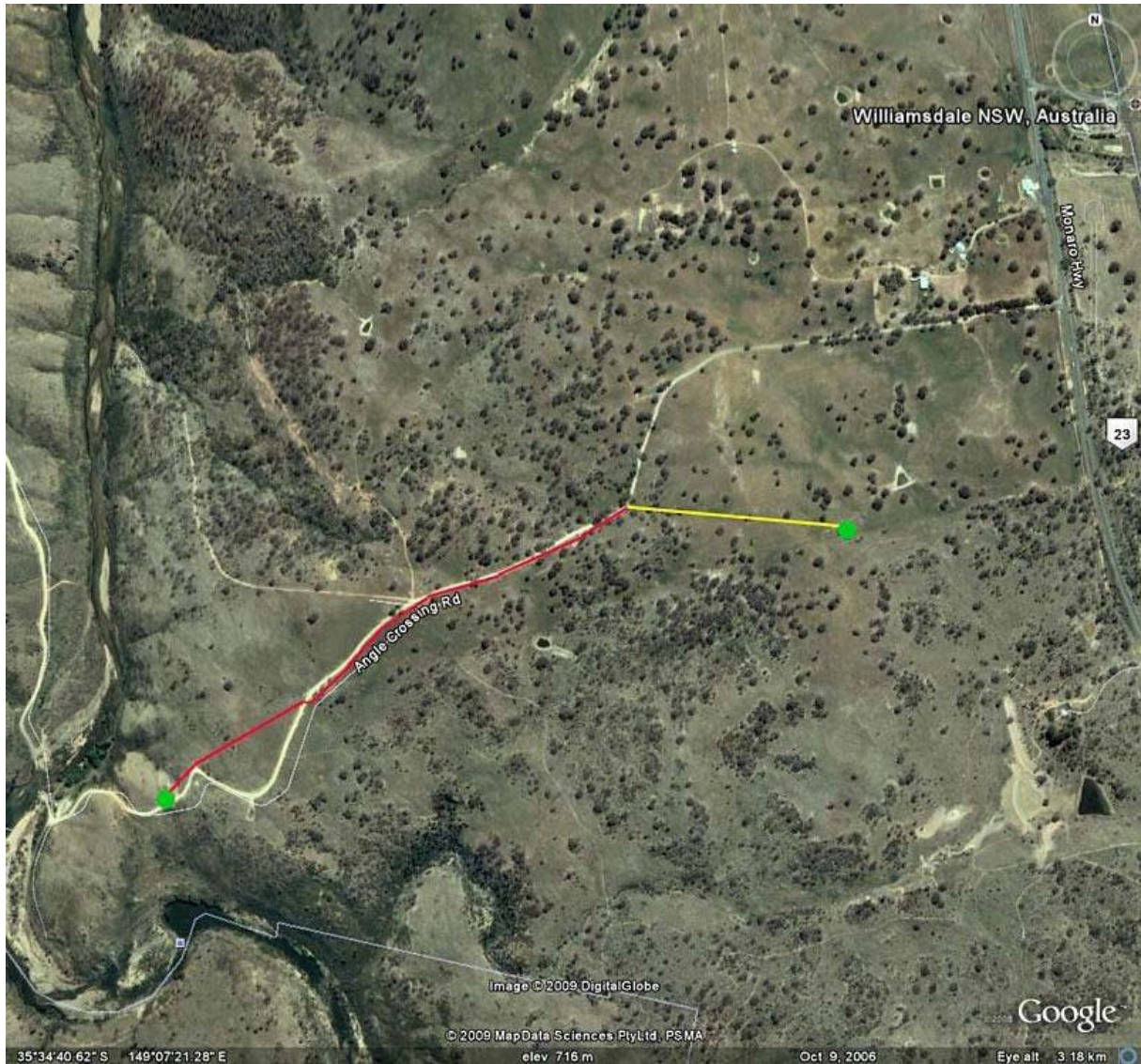
2.2 Fauna Habitat Assessment

The focus was on available habitat as a means of inferring species, especially threatened species, likely to be present. It is believed that the site visit made was enough to adequately assess the faunal habitat values of the site.

2.3 Literature

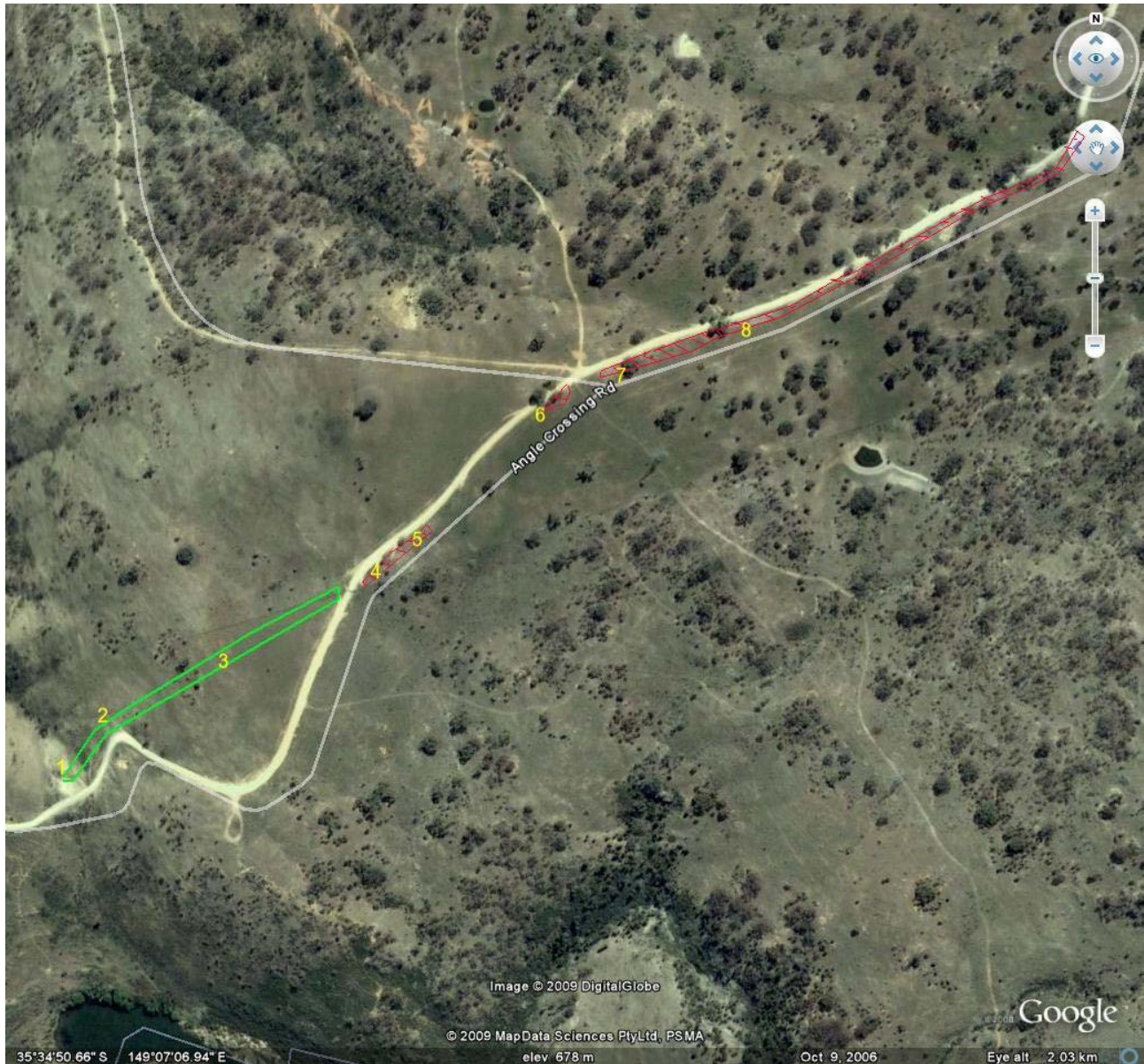
All known relevant literature and reports were taken into account, to supplement the site assessments.

MAP 1 – LOCALITY

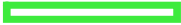


- = proposed route, subject of this study
- = proposed route, not subject to this study
- = electricity substations

MAP 2 – DETAIL OF STUDY AREA



2 = photo locations

 = high quality secondary grassland, Murrumbidgee River Corridor

 = moderate quality secondary grassland, roadside reserve

3. RESULT OF VEGETATION SURVEY

3.1) The Vegetation Communities

The subject site for flora survey purposes was divided into two areas. The first was the section of the proposed route through the Murrumbidgee River Corridor (an area of nature reserve), from the cattle grid on Angle Crossing Road to the proposed pumping/electrical station. The second was the Angle Crossing Road reserve from the cattle grid to the point on the road reserve where the cable leaves the reserve and travels to the east-southeast to an electrical substation.

Photo numbers correspond to the site numbers indicated on Map 2.



Photo 1:

35° 34' 59.5"S 149° 06' 45.5"E
Looking north-east from 11kV
substation site; green line
indicates proposed route of
powerline to ridge.

Murrumbidgee River Corridor

The vegetation community of the subject site in the Murrumbidgee River Corridor is native grassland. This area is almost completely open with some scattered trees on the ridge, and patches of shrubs in the small gully on the western side of the ridge. There is some evidence (in the form of isolated scattered tree stumps) of a former tree cover. In the broader study area, Yellow Box/Blakely's Red Gum is common (Butler & Vertego 2007). With the occurrence of Apple Box on the ridge and the present understorey component species, it is highly probable that the subject site was originally covered by this vegetation community. The native grassland now dominating the site derived from the woodland community. Both Yellow Box/Blakely's Red Gum woodland and Natural Temperate Grassland are found as a continuum, and both vegetation communities are listed as endangered in the ACT (ACT Government 2004; ACT Government 2005). While this section of the route is probably derived from an area of woodland, it is one of the highest quality substantial areas of native grassland that has been observed by the authors in the general region of the subject site, and closely matches the area described in a previous report (Butler and Vertego 2007).



Photo 2:

35° 34' 57.5"S 149° 06' 47.5"E
Rock outcrops in native grassland; potential Aprasia parapulchella habitat.

The grassland is dominated by Kangaroo Grass (*Themeda australis*). There are a few small isolated locations within the grassland that have very obviously been disturbed, and these areas contain bare ground and weed species have established. Occasional plants of African Love Grass (*Eragrostis curvula*) are also established within the grassland.

At the top of the ridge, a few mature trees and some regeneration of Apple Box (*Eucalyptus bridgesiana*) occur.

On the western side of the ridge the grassland is dominated by Kangaroo Grass, and a small, highly



Photo 3:

35° 34' 55"S 149° 06' 53"E

Looking north-east from ridge across high quality *Themeda australis* grassland; green line indicates proposed route of powerline from ridge to grid on road, where it crosses the road.

eroded gully running to the north-west is surrounded by shrub growth, primarily Burgan (*Kunzea ericoides*). The gully itself has been conducive to the establishment of a number of invasive weed species.

The site for the proposed pumping station is already highly disturbed, and a variety of ubiquitous weed species are established on and around a roadside lay-by on the site. However, high quality native grassland occurs right up to the edges of the lay-by.

On the eastern side of the ridge a number of 'spider-hole' PVC tubes have been set up, apparently part of a reptile monitoring project. It is of great concern that vehicles have been driving across extensive areas of the native grassland, and vehicle tracks have been impressed on the grassland. The dry conditions have ensured that the tracks are very visible from Angle Crossing Road, and these may encourage more traffic onto the site. This has also caused soil compaction, and the tracks run up the slope. This is likely to diminish the grassland and establish routes for water to run downhill, inevitably increasing the potential for erosion on the site. It is not necessarily being suggested that the tracks are associated with the current project, but damage has certainly been done and further vehicle movements over such a high quality site within a nature reserve should be prevented.

Angle Crossing Road Reserve

As would be expected in a road reserve, the vegetation has been more disturbed than in the Murrumbidgee River Corridor site. Woodland trees (Yellow Box, Apple Box and Blakely's Red Gum) occur at scattered intervals along the road. Some trees are mature, while others represent young regeneration. Some sections are highly infested with weeds, and other areas have been disturbed by road construction and maintenance activity. A highly eroded and deep erosion gully occurs on one part of the site. Despite this, other parts of the subject site still contain moderate quality woodland ground storey vegetation (see Map 2). The moderate quality areas vary, from some dominated by Spear Grass (*Austrostipa bigeniculata*) to other areas dominated by *Austrodanthonia* sp.

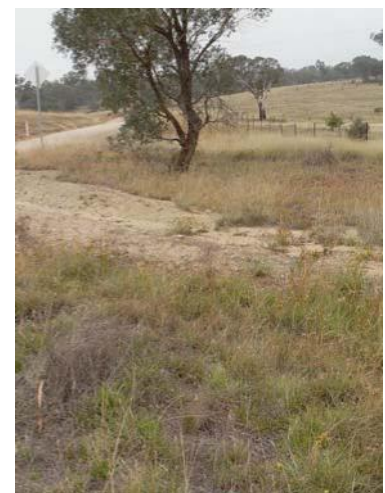


Photo 4:

35° 34' 52"S 149° 06' 59.5"E

South-western end of roadside reserve; more disturbed than the majority of it.



Photo 5:
35° 34' 51.5"S 149° 07' 01"E
Good quality roadside grassland.

Photo 6:
35° 34' 46.5"S 149° 07' 07"E
Good quality roadside grassland under Apple Box.



Photo 7:
35° 34' 45.5"S 149° 07' 09.5"E
*Good quality roadside grassland with
Austrodanthonia carphoides.*



Photo 8:
35° 34' 43.5"S 149° 07' 16"E
*Good quality roadside grassland with
Austrostipa bigeniculata.*

3.2) Vegetation to be cleared

The proposal is to bury the electrical cable and construct an 11kV substation and high lift pumping station. This will entail the use of moderately heavy equipment for excavation or ripping of the cable into the ground. Either method will produce a considerable machine-disturbed area from excavation, temporary storage of excavated soil and manoeuvring room to refill the trench. There may also be a requirement for storage of sand or other material to cover the cable in the trench. The vegetation that would be cleared will be as follows:

Murrumbidgee River Corridor

The cable alignment is from the cattle grid on Angle Crossing Road up a gentle slope to the west, across the ridge and down a moderately steep slope to the high lift pumping station. The easement is likely to be at least 7 metres wide. From the top of the ridge down to the pumping station, a direct route will not be possible due to the rocky nature of the site, so it is likely that the route will deviate to the north to allow use of the excavation machinery. Whatever route is followed in the Murrumbidgee River

Corridor, it will result in the complete destruction of all the natural temperate grassland that occurs within the easement, with a high potential for further serious weed establishment due to the ground disturbance. Unless very seriously monitored, there is also a high potential for other vehicle movements over the grassland, and the likelihood of storing other construction materials on site.

Angle Crossing Road

The proposed route along Angle Crossing Road is quite narrow, and the full width of the reserve on the southern side will be affected. Vegetation removal will be total. This would include the trees, as even if the trench can be placed alongside the trees, they are unlikely to survive the root damage that will occur during trenching.

High-lift Pump Platform and Substation

Vegetation removal for these facilities will be total. However, the area where the pumping station and substation is located is heavily disturbed, and the loss of vegetation on the lay-by site is not of concern. The dimensions of the full development area required for the pumping station and substation are not known though, and there is highly likely to be some spill-over damage into the high quality surrounding grassland. It is anticipated that construction of the facilities will lead to traffic and other disturbances into the native grassland.

Fire Protection Requirements.

It is unknown what the Rural Fire Service will be recommending with regard to fire protection for the pumping station and substation site. The pumping station, while sited in native grassland, is also sited in a mid-slope position near the top of a very steep slope with a westerly/northwesterly aspect. The degree of slope places the pumping station in what could be a rapid uphill fire path through low native grass fuels. Fire protection for the pumping station will be required. There is however potential for minimising fire damage, and the security fence that will be required for the facilities would be an obvious place to build in fire protection for the subject site. Fire protection for the facility should not impose an onus on the Murrumbidgee River Corridor to manage vegetation fuel levels.

3.3) Threatened Plant Species

The possible occurrence of the ACT's five listed threatened plant species was given special attention during the survey. These species were:

1. **Tarengo Leek Orchid (*Prasophyllum petilum*).** Endangered ACT; Endangered NSW; Endangered nationally. This species is known to grow in grassland and woodland sites in the broader region, but locations are very disjunct and distantly removed from the subject site. It favours moist sites on fertile soils (ACT Government 2004). The original woodland and grassland of the subject site is extremely well drained and not of great fertility, and would not have provided suitable habitat for this species.
2. **Small Purple Pea (*Swainsona recta*).** Endangered ACT; Endangered NSW; Endangered nationally. Open grassy areas in open woodland habitat dominated by Kangaroo Grass, *Poa Tussock* (*Poa sieberiana*) or Speargrass provides suitable habitat and Kangaroo Grass dominates the subject site. The largest population of the Small Purple Pea occurs nearby on the railway easement from Tralee to near Williamsdale (ACT Government 2004). The habitat of the subject site is not dissimilar to the Tralee/Williamsdale location, so its occurrence is possible. The timing of the assessment was not conducive to locating this species if it is present, as it is deciduous (dying back to a perennial rootstock) after its spring flowering. No plants or remnants were located.
- **Button Wrinklewort (*Rutidosia leptorrhynchoides*).** Endangered ACT; Endangered NSW; Endangered nationally. This species occurs on the margins of yellow Box/Red Gum Woodland and in Natural Temperate Grassland. It does not cope well with tall surrounding vegetation (ACT Government 2005). The soil of its habitat is often shallow, so other larger growing species do not occur. Button Wrinklewort is an obvious species if present, but no plants were located.

- **Ginninderra Peppercress (*Lepidium ginninderrense*).** Endangered ACT; Vulnerable nationally. The only known population of this species is located in the suburb of Lawson in Belconnen, growing on the floodplains of Ginninderra Creek (ACT Government 2005). The habitat of the subject site is unsuited to this species.
- **Tuggeranong Lignum (*Muehlenbeckia tuggeranong*).** Endangered ACT; Endangered nationally. This species is known from a small population of some 8 plants in the MRC to the north of the subject site. It occurs in silty sandy soil in rocky outcrops in the flood plain of the river (ACT Government 2007). The habitat of the subject site is very dissimilar to the known sites, and occurrence is highly improbable. No plants were located.

One other species, listed as Endangered nationally, the Hoary Sunray, inhabits sites similar to the subject site:

3. **Hoary Sunray (*Leucochrysum albicans* var. *tricolor*).** Endangered nationally. This species is known from sites similar to the subject area. It is known from the broader region, and is a very conspicuous species, but no plants were located.

3.4) General Comments

The subject site contains natural temperate grassland and lowland woodland of varying quality. The grassland in the Murrumbidgee River Corridor has exceedingly high values. The small patches of woodland understorey along Angle Crossing Road reserve are not as high quality, having been more highly disturbed and invaded by weeds. Notwithstanding, these patches indicated in Map 2 retain moderate conservation values.

If this proposal proceeds as suggested, a substantial area of high quality native grassland will be lost, and the disturbed area open to weed establishment. Weed infestations would have longer term repercussions on an even wider area of the grassland.

In this case, if the route absolutely must traverse the Murrumbidgee River Corridor grassland, power poles should be used, though installation of poles and lines would still be damaging. A more obvious solution is to place the cable under Angle Crossing Road, which would be of similar cost but with good environmental outcomes both for the Murrumbidgee River Corridor and Angle Crossing Road sections.

4. RESULTS OF FAUNA HABITAT SURVEY

4.1) Faunal Habitats

The subject area, as discussed above, is substantially comprised of secondary native grassland, derived from Yellow Box – Red Gum woodland. The quality of this grassland ranges from very high quality along the proposed route in the Murrumbidgee River Corridor Nature Reserve, to moderate quality along much of the roadside reserve. There are sections of the roadside route – left unmarked on Map 2 – which are too disturbed to be still regarded as native grassland, but these form a minority of the area traversed.

The only native animal species which will be found along the route – and thus affected by it – will be grassland species; there are too few trees within the route for them to be regarded as significant habitat.

4.2) Threatened Animal Species

There are five ACT grassland animal species which are listed as threatened under ACT or Commonwealth legislation.

Pink-tailed Worm-lizard (*Aprasia parapulchella*) Vulnerable under Commonwealth legislation.

A species essentially restricted to the ACT region, where it is associated with treeless or near treeless native grassland, especially but not exclusively that dominated by *Themeda triandra*, and a scattering of partially-buried rocks under which it shelters. (Osborne et al 1991; Osborne & McKergow 1993).

The species is known from Angle Crossing (Osborne et al 1991), suitable habitat is present in the form of rock outcrops in Themeda, and its presence is regarded as highly likely.

Striped Legless Lizard (*Delma impar*) Vulnerable under ACT and Commonwealth legislation.

A lizard essentially of unploughed primary grasslands, dominated by tussocks of *Themeda triandra*, *Austrostipa* spp and *Austrodanthonia* spp with good cover. It can exist in secondary grasslands where these are within 2km of primary grasslands. It is known from half a dozen scattered sites on the NSW south-western slopes and from scattered sites in Victoria. In the ACT there are four known populations. (ACT Government 1997b, 2005; Coulson 1990; Kukolic 1993; Kukolic et al 1994).

Suitable habitat for this species is present, although it has not been recorded in the vicinity, and its presence should be presumed for prudence until surveys show otherwise.

Grassland Earless Dragon (*Tympanocryptis pinguicolla*) Endangered under ACT and Commonwealth legislation.

A recently described species (until late 1999 given only sub-species status) which has declined dramatically, and is apparently now restricted to the immediate area of the ACT. It is found in essentially undisturbed primary native tussock grasslands of *Themeda triandra*, *Austrostipa* spp and *Austrodanthonia* spp, characterised by both more open and denser areas. (Osborne et al 1993; Osborne pers comm; ACT Government 1997a, 2005).

While appropriate habitat is present along the route, both in the Murrumbidgee River Corridor and along the roadside, there are no known populations in the vicinity. However its presence should be presumed for prudence until surveys show otherwise.

Golden Sun Moth (*Synemon plana*) Endangered under ACT legislation.

This grassland moth relies on natural temperate grassland and grassy woodland. It has declined dramatically in numbers since 1950, though recent intensive surveying has increased the number of known sites. It is now known from about 60 sites, most of them in the ACT area, many of them tiny and urban. Of these 40 are on the southern tablelands, about 13 in the ACT and 6 in Victoria. It requires native grasslands dominated by *Austrodanthonia* (especially *A. carphoides*) at altitudes below 700m. In addition the grassland structure is low-growing with open space between tussocks. (ACT Government 1998; ACT Government 2005.)

While there is some Austrodanthonia carphoides present, along the roadside, it is sparse and the area is limited. Furthermore there are no known populations nearby. Its presence is regarded as unlikely, though spring surveys are required before its absence can be confirmed.

Perunga Grasshopper (*Perunga ochracea*) Vulnerable under ACT legislation.

This native grassland species - found where there are tussocks of *Austrodanthonia* spp, *Austrostipa* spp or *Themada triandra* - is also known from grassy woodlands. It was formerly known from the NSW south-western slopes with a total range of perhaps 150km north to south and 180km east to west, but was unreported from 1970 to 1992, since when it has been reported from just seven sites in the ACT and one in adjacent Queanbeyan (ACT Government 1999; ACT Government 2005).

Suitable habitat is present for this species, though there are no records from the vicinity. Its presence should be presumed for prudence until surveys show otherwise.

Given these habitat assessments, it would be highly undesirable to disturb the grassland habitat – particularly, but not solely, in the Murrumbidgee River Corridor – at least until appropriate surveys had been carried out. It is noted too that even if these threatened species are not present, the threatened ecological communities would still require protection.

5. POTENTIAL IMPACTS OF THE DEVELOPMENT

The subject site contains natural temperate grassland and lowland woodland of varying quality. The grassland in the Murrumbidgee River Corridor has exceedingly high values. The small patches of woodland understorey along Angle Crossing Road reserve are not as high quality, having been more highly disturbed and invaded by weeds. Notwithstanding, these patches indicated in Map 2 retain moderate conservation values.

If this proposal proceeds as suggested, a substantial area of high quality native grassland will be lost, and the disturbed area open to weed establishment. Weed infestations would have longer term repercussions on an even wider area of the grassland.

In this case, if the route absolutely must traverse the Murrumbidgee River Corridor grassland, power poles should be used, though installation of poles and lines would still be damaging. A more obvious solution is to place the cable under Angle Crossing Road, which would be of similar cost but with good environmental outcomes both for the Murrumbidgee River Corridor and Angle Crossing Road sections.

6. SUGGESTED MEANS TO AMELIORATE IMPACTS

The following recommendations are based directly on the previous discussions.

1. That no trench be cut through the Murrumbidgee River Corridor.
2. That the route should follow the road-line if at all possible for its full length.
3. That if this is absolutely impossible, then the line should pass above the Murrumbidgee River Corridor grasslands on poles.
4. That if the use of poles and lines within the Murrumbidgee River Corridor grasslands is unavoidable, then all construction materials are to be kept away from the grassland, and that vehicles avoid the grassland as far as is at all possible.
5. That all vehicles associated in any way with the project be kept out of the grassland unless this is impossible to avoid. *Immediate implementation of this recommendation is required.*
6. That the trees along the roadside, in particular mature ones, be avoided as far as is possible. Where a tree is removed, or if roots are cut, then offset plantings, at a ratio of 10:1, should be carried out.
7. That all hollow branches or trunks that need to be removed be retained and used as habitat and nesting hollows in adjacent paddocks.
8. That all topsoil removed for trenching along the roadside be retained for later replacement.
9. That only local native grasses be used for rehabilitation work; in particular no dryland grass mixes or hay must be used.
10. That the responsibility for fuel management to protect the substation not be an imposition on the Murrumbidgee River Corridor management budget. To this effect the major fire protection emphasis should be within the boundary fence. This may include a fence of steel panel construction to a height of 1.5 metres.

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APPENDIX 1 – Indicative Flora Checklist

Murrumbidgee River Corridor Section

Family/Species	Common Name
Apiaceae	
<i>Eryngium rostratum</i>	Blue Devil
Asteraceae	
<i>Cassinia quinquefaria</i>	Cough Bush
<i>Chrysocephalum apiculatum</i>	Yellow Buttons
* <i>Hypochaeris glabra</i>	Smooth Catsear
* <i>Hypochaeris radicata</i>	Catsear
<i>Leptorhynchus squamatus</i>	Scaly Buttons
* <i>Onopordum</i> sp	Scotch Thistle
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Vittadinia muelleri</i>	Fuzzweed
<i>Xerochrysum viscosum</i>	Sticky Everlasting
Boraginaceae	
* <i>Echium vulgare</i>	Viper's Bugloss
Campanulaceae	
<i>Wahlenbergia</i> sp	Bluebell
Caryophyllaceae	
* <i>Petrorhagia nanteuilii</i>	Pinks
Clusiaceae	
<i>Hypericum gramineum</i>	Small St John's Wort
* <i>Hypericum perforatum</i>	St John's Wort
Dilleniaceae	
<i>Hibbertia obtusifolia</i>	Grey Guinea Flower
Epacridaceae	
<i>Acrotriche</i>	
<i>Brachyloma daphnoides</i>	Native Daphne
<i>Melichrus urceolatus</i>	Urn Heath
Fabaceae	
<i>Bossiaea buxifolia</i>	Box-leaf Bossiaea
<i>Daviesia mimosoides</i>	Bitter-pea
<i>Glycine clandestina</i>	
<i>Pultenaea microphylla</i>	
<i>Pultenaea procumbens</i>	
Gentianaceae	
* <i>Centaurium erythraea</i>	Centaury
Haloragaceae	
<i>Gonocarpus tetragynus</i>	Common Raspswort
Lomandraceae	
<i>Lomandra bracteata</i>	
<i>Lomandra filiformis</i>	a Mat-rush
<i>Lomandra longifolia</i>	Spiny Mat-rush
Mimosaceae	
<i>Acacia dealbata</i>	Silver Wattle
Myrtaceae	
<i>Eucalyptus bridgesiana</i>	Apple Box
<i>Kunzea ericoides</i>	Burgan
Pittosporaceae	
<i>Bursaria lasiophylla</i>	Native Blackthorn
Plantaginaceae	
* <i>Plantago lanceolata</i>	Plantain
Poaceae	
<i>Aristida ramosa</i>	Wire Grass
<i>Austrodanthonia</i> sp.	Small-flowered Wallaby Grass
<i>Austrostipa scabra</i>	Speargrass
<i>Bothriochloa macra</i>	Red Grass
* <i>Chondrilla juncea</i>	Skeleton Weed
* <i>Eragrostis curvula</i>	African Love Grass

<i>Microlaena stipoides</i>	Weeping Grass
<i>Panicum effusum</i>	Hairy Panic
<i>Themeda australis</i>	Kangaroo Grass
Polygonaceae	
* <i>Acetosella vulgaris</i>	Sheep Sorrel
<i>Persicaria prostrata</i>	Creeping Knotweed
<i>Rumex brownii</i>	Native Dock
Ranunculaceae	
<i>Clematis microphylla</i>	Old Man's Beard
Rhamnaceae	
<i>Cryptandra amara</i>	
Rosaceae	
<i>Acaena ovina</i>	Sheep's Burr
* <i>Rosa rubiginosa</i>	Briar Rose
Scrophulariaceae	
* <i>Verbascum thapsus</i>	Great Mullein
Sinopteridaceae	
<i>Cheilanthes sieberi</i>	Rock Fern
Verbenaceae	
* <i>Verbena bonariensis</i>	Purple-top

Angle Crossing Road Section

Family/Species	Common Name
Apiaceae	
<i>Eryngium rostratum</i>	Blue Devil
Asteraceae	
* <i>Carthamus lanatus</i>	Saffron Thistle
* <i>Chondrilla juncea</i>	Skeleton Weed
<i>Chrysocephalum apiculatum</i>	Yellow Buttons
* <i>Cirsium vulgare</i>	Spear Thistle
* <i>Hypochaeris radicata</i>	Catsear
* <i>Conyza</i> sp	Fleabane
<i>Euchiton sphaericum</i>	Cudweed
* <i>Hypochaeris radicata</i>	Catsear
<i>Leptorhynchus squamatus</i>	Scaly Buttons
* <i>Onopordum</i> sp	Scotch Thistle
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Vittadinia muelleri</i>	Fuzzweed
Boraginaceae	
* <i>Echium vulgare</i>	Viper's Bugloss
Campanulaceae	
<i>Wahlenbergia</i> sp.	Bluebell
Caryophyllaceae	
* <i>Petrorhagia nanteuillii</i>	Pinks
Clusiaceae	
* <i>Hypericum perforatum</i>	St John's Wort
Dilleniaceae	
<i>Hibbertia obtusifolia</i>	Grey Guinea Flower
Epacridaceae	
<i>Acrotriche serrulata</i>	
<i>Brachyloma daphnoides</i>	Native Daphne
Fabaceae	
<i>Glycine clandestina</i>	
* <i>Trifolium angustifolium</i>	
Gentianaceae	
* <i>Centaurium erythraea</i>	Centaurry
Haloragaceae	
<i>Gonocarpus tetragynus</i>	Common Raspwort
Lamiaceae	

* <i>Salvia verbenaca</i>	Wild Sage
Myrtaceae	
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Eucalyptus bridgesiana</i>	Apple Box
<i>Eucalyptus melliodora</i>	Yellow Box
Pittosporaceae	
<i>Bursaria lasiophylla</i>	Native Blackthorn
Plantaginaceae	
* <i>Plantago lanceolata</i>	Plantain
Poaceae	
<i>Austrodanthonia carphoides</i>	Wallaby Grass
<i>Austrodanthonia sp.</i>	Wallaby Grass
<i>Austrostipa bigeniculata</i>	
<i>Austrostipa scabra</i>	Speargrass
* <i>Avena sp</i>	Wild Oats
<i>Bothriochloa macra</i>	Red Grass
<i>Chloris truncata</i>	Windmill Grass
<i>Cynodon dactylon</i>	Couch Grass
* <i>Eleusine tristachya</i>	Goose Grass
* <i>Eragrostis curvula</i>	African Love Grass
<i>Microlaena stipoides</i>	Weeping Grass
<i>Panicum effusum</i>	Hairy Panic
* <i>Paspalum dilatatum</i>	Paspalum
<i>Themeda australis</i>	Kangaroo Grass
Polygonaceae	
* <i>Acetosella vulgaris</i>	Sheep Sorrel
* <i>Polygonum aviculare</i>	Wire Weed
<i>Rumex brownii</i>	Native Dock
Rosaceae	
<i>Acaena ovina</i>	Sheep's Burr
* <i>Rosa rubiginosa</i>	Briar Rose
Rubiaceae	
<i>Asperula conferta</i>	Common Woodruff
Scrophulariaceae	
* <i>Verbascum thapsus</i>	Great Mullein

Attachment B

Bushfire Assessment – Australian Bushfire Protection Planners

BUSHFIRE RISK ASSESSMENT
FOR THE
ANGLE CROSSING WATER PROJECT –
MOBILE SUBSTATION SITE

&

11KV CABLE ROUTE,
WILLIAMSDALE,
AUSTRALIAN CAPITAL TERRITORY

PREPARED FOR

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BUSHFIRE RISK ASSESSMENT
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ActewAGL

Assessment Number	Document	Preparation Date	Issue Date	Directors Approval
B08847 - 2	Final	29.3.2009	2.3.2009	<i>G.L.Swain</i>

EXECUTIVE SUMMARY

This report by Australian Bushfire Protection Planners Pty Limited [ABPP] provides an assessment of bushfire risk for a proposed 132/11kV Angle Crossing Mobile Electrical Substation and 11kV underground line to the Angle Crossing Pump Station, Williamsdale, ACT.

In late 2006 Australian Bushfire Protection Planners Pty Limited undertook, on behalf of ActewAGL and Transgrid, investigations into the bushfire risk on, and potentially created by the establishment of a 330/132kV Substation on Block 1653, Williamsdale, connecting into the existing Canberra to Cooma 132kV lines, to meet the reliability criteria recently established by the ACT Government to ensure diversity of supply to the ACT.

In conjunction with the above study into the bushfire risk associated with the Transgrid Substation development, Australian Bushfire Protection Planners Pty Limited also undertook a bushfire risk assessment for the construction of the new 132kV transmission line from the Transgrid Substation to the Theodore Substation. The southern portion of the new line runs to the west, from the proposed TransGrid Substation site, following the existing powerlines, turning to the northwest to cross Angle Crossing Road at approximately 1 kilometre to the west of the Monaro Highway. This route will increase the existing width of powerline clearing and remove additional Yellow Box Red Gum Woodland.

The Bushfire Risk Assessments for the substation and transmission line development identified the potential bushfire risks to the proposed development and provided recommendations on bushfire protection measures required to mitigate the bushfire risk and also considered the potential risk that the substation and transmission line may generate on the adjoining landscape.

Since the preparation of these reports, ActewAGL have identified the need to install a 132/11kV mobile substation and 11kV power supply cable within Block 1653 that will supply power to the Angle Crossing water project on the Murrumbidgee River.

A site inspection was held on Wednesday the 29th October 2008 to examine the potential site locations for the proposed ActewAGL 132/11kV mobile Substation and cable route to the proposed water project at Angle Crossing.

Two site locations for the mobile 132/11kV Substation were considered with requirements for a 50m x 50m site compound including wire fencing and a cleared, level site. The preferred site option would be at the northern boundary of the Transgrids' property [Block 1653], either within the 'floor' of the valley or slightly to the west, on the eastern facing slope of the higher ridgeline which rises to the west.

The site chosen and shown on the Master Plan prepared by Purdon Associates is the latter site located on the ridge-slope. This site was determined to be subject to a low level of bushfire risk due to the open nature of the vegetation and the protection afforded by the nature of the topography [upslope to the west].

The route for the 11kV supply cable from the mobile Substation was also examined and identified that it would be buried up to one [1] metre and located within the Access Easement which extends to the northwest from the mobile substation site to Angle Crossing Road thence west to the Pump Station site, within the Angle Crossing Road reserve. Due to the cable being buried up to one [1] metre below ground, there is no bushfire risk to the 11kV cable installation.

This Bushfire Risk Assessment therefore identifies the potential bushfire risks to the preferred site of the mobile 132/11kV Substation facility and provides recommendations on bushfire protection measures required to mitigate the bushfire risk. The Bushfire Risk Assessment also considers the potential risk that the Substation facility may generate on the adjoining landscape.



Graham Swain
Managing Director,
Australian Bushfire Protection Planners Pty Limited.

TABLE OF CONTENTS.

EXECUTIVE SUMMARY	3
TABLE OF CONTENTS	5
SECTION 1	
INTRODUCTION	6
1.1 The Brief	6
1.2 Objectives of the Brief.....	6
1.3 Study Area	7
1.4 Scope of the Study.....	7
SECTION 2 DESCRIPTION OF STUDY AREA.....	8
2.1 Site Inspection	8
2.2 Location of the Study Area.....	8
2.3 Existing Land Use	8
2.4 Surrounding Land Use	9
2.5 Topography	9
2.6 Vegetation within the Substation Compound	10
SECTION 3 CONTEXT OF THE BUSHFIRE RISK ASSESSMENT...	13
SECTION 4 BUSHFIRE RISK	14
4.1 Introduction	14
4.2 Management Strategies	15
SECTION 5 BUSHFIRE RISK ASSESSMENT	16
5.1 Introduction	16
5.2 Assessment of Bushfire Risk to Substation.....	16
5.2.1 Fire History of the ACT.....	16
5.2.2 Bushfire Ignition/Fire Sources	18
5.2.3 Climate and Weather	18
5.2.4 Topography	19
5.2.5 Bushfire Fuels	20
5.2.6 Assessment of Bushfire Fuel Hazard	21
5.2.7 Potential Fire Runs.....	22
5.3 Summary of Bushfire Risk to the Mobile Substation	23
5.4 Assessment of Bushfire Risk created by the Mobile Substation	23
SECTION 6 RECOMMENDATIONS	25
SECTION 7 CONCLUSION	26
REFERENCES	27

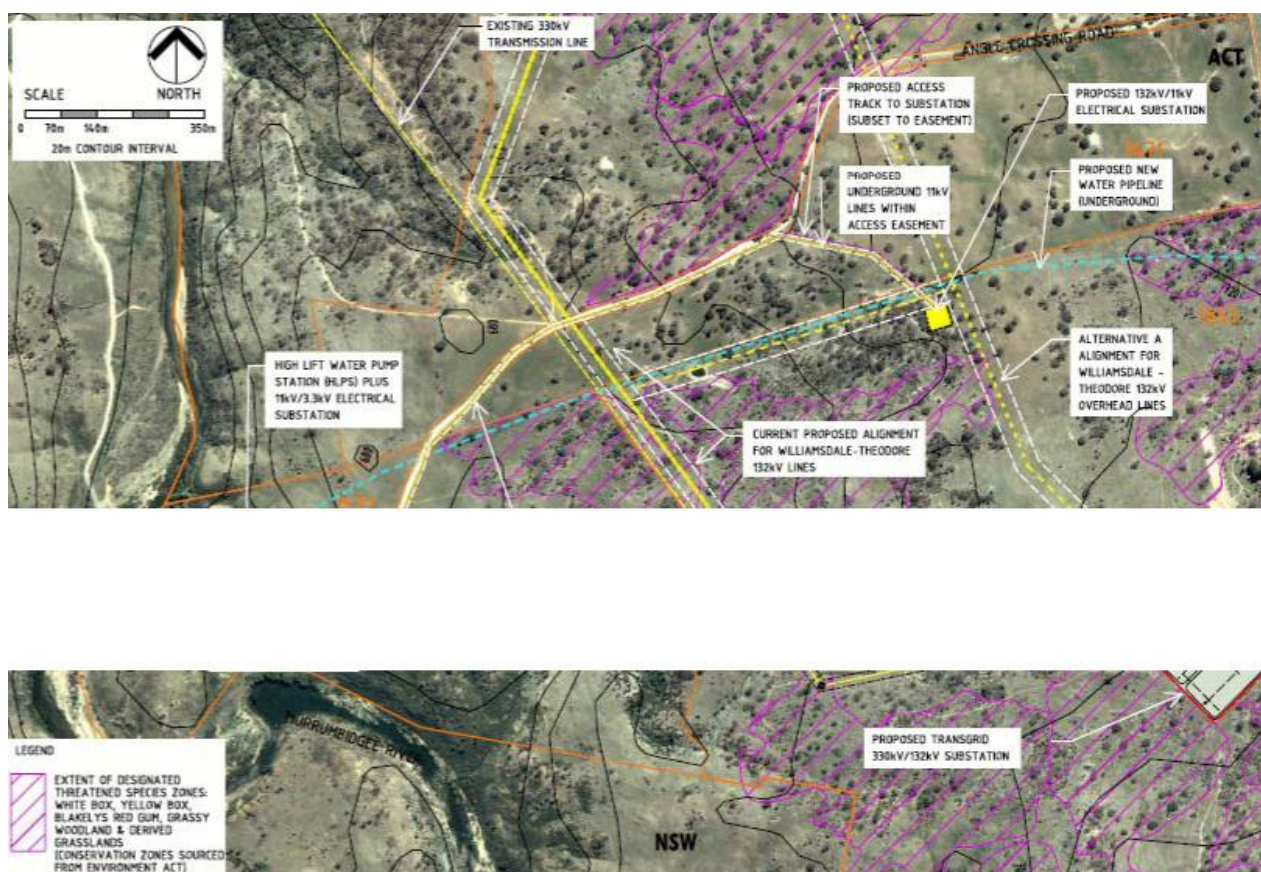
SECTION 1

INTRODUCTION

1.1 The Brief.

As part of the provision of a mobile 132/11kV Substation and 11kV service to the proposed water project at Angle Crossing, ActewAGL require a Bushfire Risk Assessment to inform the detailed design of the Substation on the potential bushfire risk to the facility and the protection measures required to mitigate the risk. *Australian Bushfire Protection Planners Pty Limited* has been commissioned to undertake the Bushfire Risk Assessment.

Figure 1 – Plan showing the location of the proposed mobile Substations site and 11kV underground supply line to the Angle Crossing Pump Station.



1.2 Objectives of the Brief.

The objectives of the brief are to prepare a Bushfire Risk Assessment for the proposed mobile 132/11kV Substation and electricity service to the proposed Angle Crossing water supply facility.

The assessment shall provide recommendations on bushfire protection measures, including the provision and management of fire protection zones, construction standards to buildings and access provisions.

The assessment shall also determine the potential risk of ignition, of the adjoining landscape and built form, from events that may occur within the proposed Mobile Substation.

1.3 Study Area.

For the purpose of this report, the boundaries of study area are defined by land within Block 1653 and Block 1654, Monaro Highway, Williamsdale.

1.4 Scope of Study.

1.4.1 Establish the context:

- Define the problem.
This involves the identification of the nature and scope of issues to be addressed.

1.4.2 Identify the bushfire risk including an assessment of:

- The exposure to possible ignition / fire sources;
- Vegetation type and likely fuel loads and fire hazards arising using the “Overall Fuel Hazard Guide” – Third edition (NRE May 1999);
- The impact of climate and likely fire runs during severe fire danger periods;
- Wind effects;
- The impact of surrounding land uses and fuel loads.

SECTION 2

DESCRIPTION OF STUDY AREA

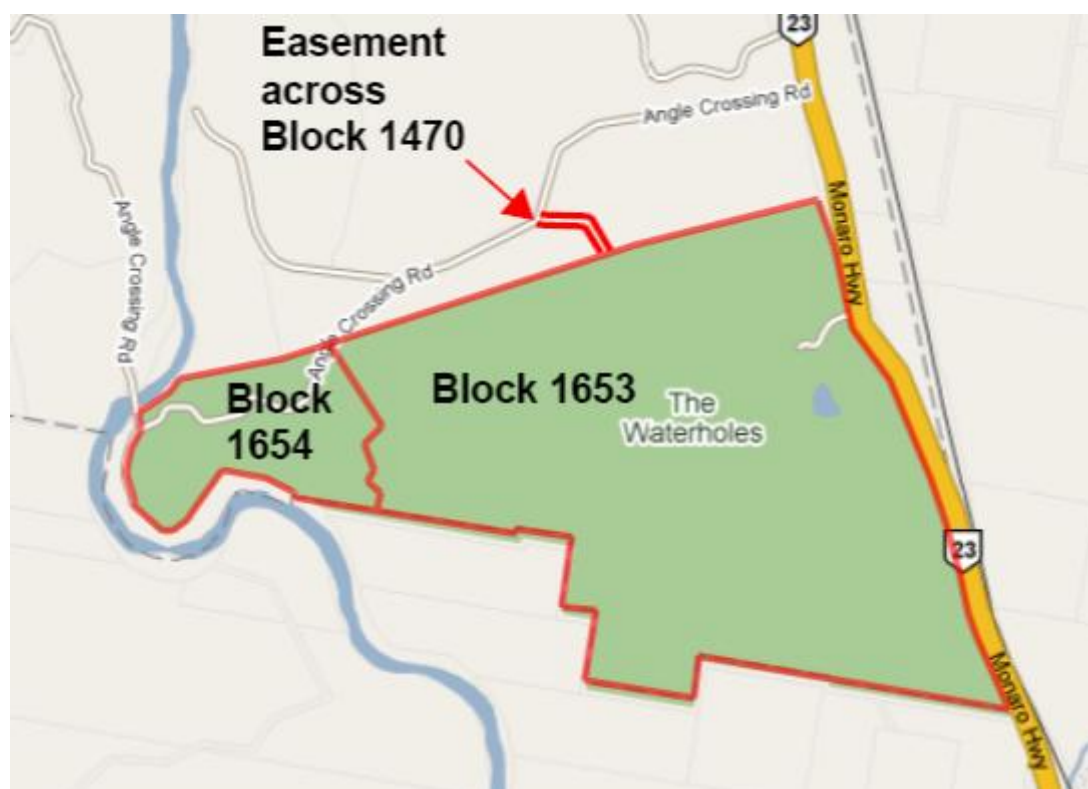
2.1 Site Inspection.

Graham Swain of *Australian Bushfire Protection Planners Pty. Limited* inspected the study area on the 29th October 2008 to assess the topography, slopes and vegetation classification within and adjoining the development precinct. Adjoining land was also inspected to determine the surrounding land use/land management, vegetation communities and topography.

2.2 Location of the Study Area.

The study area forms the land within Block 1653 and Block 1654 which are located to the west of the Monaro Highway, south of the township of Williamsdale, ACT. An easement for access to the proposed mobile sub-station and the 11kV cable crosses Block 1470 [Refer to Figure 2 below].

Figure 2 – Location of Study Area.



2.3 Existing Land Use.

Block 1653 was recently purchased by Transgrid and the previous Lessee [W. Nash] has ceased grazing operations.

2.4 Surrounding Land Use.

a) North

The land to the north of Block 1653, within Block 1471, is leased by Bob Moore and is used for grazing.

b) East

The land to the east of Block 1653 consists of the Monaro Highway with grazing land further to the east.

c) South

The land to the south of Block 1653 forms grazing land within New South Wales.

d) West

The land to the west of Block 1653 forms the land within Block 1654 which is used for grazing.

Figure 3 – Aerial Photograph of northern portion of Block 1653 & part Block 1654.



2.5 Topography.

2.5.1 Within the Study Area.

The topography of the land within Block 1653 falls to the west from the Monaro Highway, forming into a watercourse that flows to the southwest, across the eastern portion of the Block, turning to the west and flowing across Block 1654 into the Murrumbidgee River.

A valley forms within the central portion of the Block, rising gently to the north and extending into the adjoining Block 1471.

To the west of the valley the landform rises in a series of knolls with inter-connecting saddles before falling steeply to the west, forming another valley and watercourse that flows to the west.

2.5.2 Beyond the Study Area.

a) North

The topography of the land to the north of the study area, within Block 1471, rises to the north, adjacent to the eastern portion of Block 1653 and falls steeply to the west, north of the western portion of Block 1653.

b) West

Topography of the land to the west of Block 1653, within Block 1654, falls to the west to the edge of the Murrumbidgee River corridor.

2.6 Vegetation within the Study Area.

The location of the 132/11kV mobile Substation is located within an area of Yellow Box Red Gum Grassy Woodland regrowth. The vegetation on Block 1471, the land to the north through which the access easement and the 11kV line traverses consists of grazed grassland with scattered shade trees.

[Refer to Site Photographs on following pages].

SITE PHOTOGRAPHS.



Photograph 1 – Looking northeast to the location of 132/11kV mobile substation site on Block 1653.



Photograph 2 – Looking east along northern boundary of Block 1653 from the mobile substation site.



Photograph 3 – Looking south from mobile substation site, down valley to the future Transgrid Substation site.



Photograph 4 – Looking west along northern boundary of Block 1653, from top of ridgeline west of the mobile substation site.

SECTION 3.

CONTEXT OF THE BUSHFIRE RISK ASSESSMENT

The ACT Government enacted the *Emergencies Act 2004*, as part of its response to the needs identified by the McLeod Inquiry to replace the *Bushfire Act 1936* and sets the legislative basis for bushfire related planning.

Resulting from the changes in legislation, the ACT Planning & Land Authority prepared “*Planning for Bushfire Risk Mitigation*”, a guideline adopted under the Territory Plan, that provides guidance to mitigate adverse impacts from bushfires in the ACT.

The Guideline is one of many documents that informs planning and development in the ACT and is taken into account by the ACT Planning & Land Authority when determining development applications and is complementary to the ACT Emergency Services Authority’s *Strategic Bushfire Management Plan*, a strategic document outlining measures for the Prevention, Preparedness, Response and Recovery from bushfire in the ACT.

A *Bushfire Prone Area* for the ACT was declared through the *Building Regulations* and came into effect on the 1st September 2004. Under the declaration, all parts of the ACT outside the defined urban area have been designated bushfire prone and the Authority, under Part A (Consideration of Land Use and Development Proposals) of the Territory Plan, can require a site specific bushfire risk assessment to be undertaken during the planning/design process.

This Bushfire Risk Assessment addresses this requirement and has been undertaken using the *Australian Standard for Risk Management AS/NZS 4360* and AS 3959 -1999.

The following Risk Assessment and resultant recommendations seek to address the protection of the mobile substation and its equipment from future unplanned bushfire/grass fire events that will occur within surrounding bushfire prone vegetation and provides recommendations on measures required to mitigate the effects of the escape of fire from the facility.

SECTION 4

BUSHFIRE RISK

4.1 Introduction.

Risk has two elements: Likelihood – the chances of a bushfire occurring and consequence – the impact of a bushfire when it occurs. Risk reduction can be achieved by reducing the likelihood of a bushfire, the opportunity for a bushfire to spread or the consequence of a bushfire (on natural and built assets). Bushfires will always occur.

Bushfire Management should have a clear objective to reduce both the likelihood of bushfires and reduce the negative impacts of bushfires. It should also consider the costs, inconvenience and dangers of measures taken to reduce the risk of bushfires. (3)

Many options are available to reduce the risk of bushfires starting, spreading and causing damage; reducing the unintended negative consequences of options taken to control risk; and the failure to achieve bushfire management programs. (3)

Bushfire risk is defined as the chance of a bushfire occurring that will have harmful consequences to human communities and the environment. Bushfire risk is usually assessed through consideration of the likelihood of ignition and consequences of a bushfire occurring. The consequences of bushfire management activities alone and the failure to implement programs also need to be considered.

A range of factors influence bushfire risk – these include:

- The likelihood of human and natural fire ignitions, as influenced by time, space and demographics;
- The potential spread and severity of a bushfire, as determined by fuel, topography and weather conditions;
- The proximity of assets vulnerable to bushfire fuels, and likely bushfire paths; and,
- The vulnerability of assets including natural assets, or their capacity to cope with, and recover from bushfire. (3)

4.2 Management Strategies.

Broad strategies to manage bushfire risk include:

- Eliminate the bushfire (fire) risk (make the land-use decision first by asking the question about whether development should or should not proceed in a given area);
- Design or substitution (review location);
- Engineering controls (infrastructure, building standards and landscaping); and
- Administration and organisation; (community preparedness measures). (3)

(3)Strategic BFMP

SECTION 5

BUSHFIRE RISK ASSESSMENT

5.1 Introduction.

The Australian Standard AS/NZS 4360:2004, the ACT Government Enterprise-wide risk management framework and the Emergency Management Australia (EMA) emergency risk management process provide the framework for establishing the context, analysis, evaluation, treatment, monitoring and communication of risk. (3)

Context defines the problem, which in the case of the mobile substation on Block 1653, is the threat posed by bush/grassfire events that occur in the Yellow Box Red Gum Grassy Woodland vegetation on the steep slopes within the western portion of the block.

A further problem is the potential escape of fire from within the substation facility and the impact that that fire may have on the surrounding landscape / built form.

Analysis (determine the likelihood & consequence) and the evaluation of risks of bushfire on the mobile substation the following criteria must be examined:

- Previous fire history in the area;
- Possibility, probability and sources of ignition (both external and internal);
- Vegetation type and fuel loads of available vegetation;
- Topography;
- Likely fire runs;
- Climatic or seasonal influences;
- Surrounding influences on fire behaviour;
- The type of development proposed and type of construction.

5.2 Assessment of Bushfire Risk.

The following sections provide an assessment of the criteria used to determine the potential bushfire impact on the 132/11kV mobile substation facility.

5.2.1 Fire History of the ACT.

Natural fires have long been part of the ACT landscape. A combination of inherently inflammable vegetation, dry summers, periodic drought and lightning ignitions, resulted in fires of small and large size, of high and low intensity, with periodic conflagrations that have covered the landscape.

Much of the native vegetation in the ACT is subject to periodic fires; particularly the dry forest, woodland and grassland communities, and many are fire-adapted ecosystems. Recurrent bushfires and management burning have shaped the condition of the existing plant communities. (3)

The Strategic Bushfire Management Plan for the ACT states: “*The ACT has a history of severe damaging bushfires with large areas burnt in the bushfire seasons of 1919/20; 1925/26; 1938/39; 1951/52; 1978/79; 1982/83; 1984/85; 2000/01 and in 2002/03*”.

The impact of the 2002/03 bushfire is regarded as the most serious since the ACT was established. Severe fires will burn out large areas of land, travel long distances, threaten homes, lives and other assets and be uncontrollable until the weather moderates.

Historically, there are patterns and trends in which fires, especially severe fires that cause significant damage to built and/or natural assets, start and spread.

For the purpose of analysing fire risk that might emerge in the ACT, a dangerous and damaging fire has the potential to occur when the following conditions prevail:

- Continuous available fuel – fuel at moisture content sufficiently low to enable rapid combustion, arising from drought effects or the maturing and drying, of grasslands.
- Exposure of vulnerable assets. The ‘catchment’ for such bushfires may be within several hundred metres or many (60-70) kilometres from the asset/s.
- A combination of weather conditions that generate a forest or grass fire danger index of Very High (24) or greater. Typically in the ACT, prevailing adverse fire weather will have a strong northerly through south westerly influence.
- Fire in the landscape not effectively suppressed. (3)

Figure 1 of the *Strategic Bushfire Management Plan for the ACT* identifies the approximate location of major fires and shows that the land within Block 1653 site was not impacted by the 2003 bushfires as the fires’ easterly advance was halted on the Murrumbidgee River, to the west of the site. The 1939 fire also advanced towards the site from the west and was controlled on the Murrumbidgee River.

(3)*Strategic BFMP.*

5.2.2 Bushfire Ignition / Fire Sources.

Causes of bushfires, including those in the ACT, are natural or human caused. Human causes can be categorised as:

- Malicious – including arson;
- Careless – such as escaped campfires, children and burning off without a permit; and
- Accidental – uncommon but includes motor vehicle and industrial accidents.

The only common natural cause of bushfires in the ACT is lightning. The vast majority of ACT bushfires are human caused with many classified as arson.

The likely causes of a bushfire impacting Block 1653 are varied. Accidental or malicious ignition of the vegetation within the Murrumbidgee River corridor to the northwest through to the southwest may threaten the substation facility. Ignition of this vegetation by embers from a remote fire, or an uncontrolled wild fires advance to the east, out of the Murrumbidgee River corridor, may also extend through the vegetation in the valley system to the west and northwest.

Accidental/careless ignition of the vegetation within the Monaro Highway corridor may also impact upon the vegetation on Block 1653 with the fire extending through the Grassy Woodland vegetation under prevailing milder northeast to southeast winds.

5.2.3 Climate & Weather.

(a) Generally.

The use of climatic indices such as air temperature, rainfall, relative humidity and wind (both speed and direction) allow predictions of likely fire behaviour and determine the severity of a bushfire event.

The fire season in the ACT corresponds with the summer months' high temperatures and low rainfall, and can occur from September to April with a proclaimed bushfire danger period from October to March.

There is significant variability from year to year. Fire seasons may be serious in three out of every 15 years, but this can vary considerably. Uncontrollable bushfires typically occur when the fire danger rating is over 50, a rating of Extreme.

(b) Temperature & Humidity.

Very High and Extreme Forest Fire Danger conditions mainly occur between November and March, with average temperatures ranging between 23 degrees to 28.5 degrees. The hottest month is January with an average 28.5 degrees daily although regularly higher temperatures are recorded with December and January sharing the driest daily humidity ratio of 35 percent.

These weather conditions will influence the behaviour of fires burning within the Grassy Woodland within the western portion of Block 1653 and within Block 1654, to the west of Block 1653. The open grassy woodland vegetation on Block 1471, to the north of Block 1653 also has the potential, under very high to extreme fire weather to extend across the paddocks to the north and impact upon vegetation within Block 1653.

(c) Wind.

Wind is an important factor in bushfire behaviour as it influences the rate of spread of the fire front and spreads burning embers / sparks, providing ignition sources for spot fires to distances up to 35 kilometres ahead of the main fire front.

The western portion of Block 1653 and the exposed higher ridges to the west of the central valley will be fully exposed to the influence of north-westerly, westerly and south-westerly winds which will increase the rate of spread of fires burning upslope from the southwest, west and northwest, out of the Murrumbidgee River corridor. Due to the site of the mobile substation being located to the east, and below this ridgeline, the wind impact on the fires advance will be mitigated and the fire will burn downslope towards the substation at a lower rate of spread.

Hot north easterly winds have the potential to generate a threat of bushfire impact on the mobile substation site. However, the impact from the northeast will be mitigated by the shielding effect of the higher ridgeline to the east of the Monaro Highway and the downslope fire approach across the Grassy Woodland vegetation within the eastern portion of Block 1653. Milder south and south easterly winds have the potential to extend fires towards the site, but the higher ridgeline and saddle to the south and southeast will slow the forward approach of fire from this direction.

5.2.4 Topography.

(a) Generally.

The topography of the land in the local area is dominated by undulating low ridgelines that fall from a higher ridgeline located to the east of the Monaro Highway. From the foot of this ridgeline, the landform falls to the west, incised by numerous watercourses that flow to the west into the Murrumbidgee River.

These watercourses have cut valley lines which generally run east to west and have full exposure to the prevailing northwest, west and southwest wind influences.

(b) Slope.

Slope is a critically important factor when assessing fire risk and likely fire behaviour. The rate of fire propagation doubles up a slope of 10 degrees (18%) and increases almost fourfold up a slope of 20 degrees (40%).

The rate of progress downslope tends to slow at a corresponding rate although wind direction in the lee of the hills/ridgelines tends to be unpredictable and can cause fires to change direction unpredictably.

The mobile substation site is located in the central valley area on Block 1653 with the landform rising at 5 – 6 degrees to the north and east and 6 – 8 degrees to the west whilst to the south the valley floor falls at 2 – 3 degrees to the south. Except for the southern aspect, all fires advancing towards the facility will be “downslope” burning fires with resultant milder fire conditions.

Fires which approach from the southwest will also burn downslope from the higher ridgeline which extends along the western side of the valley whilst the southerly fire approach is not likely to a fire event that will threaten the facility.

5.2.5 Bushfire Fuels.

Fuel is a critical element in bushfire risk management, as it is the one factor relating to fire behaviour that can be managed.

There are three ‘types’ of fuel that contribute to bushfire hazard. They relate to the distribution and nature of combustible material within a vegetated environment and are defined by the Overall Fuel Hazard Guide – Third Edition (NRE May 1999), as

- Elevated fuel load
- Surface fine fuels; and
- Bark.

Elevated material is defined as shrubs, heath and suspended material greater than 0.5 metres above ground. The level of bushfire hazard depends on fuel continuity, height, amount of dead material, foliage thickness and flammability of live foliage. Flammability of vegetation is at the highest when composition is fine, it contains a lot of dead material, is dense vertically and horizontally and has low moisture content.

Surface fine fuels are defined as the litter bed and vegetation up to 0.5 metres above the ground. Grasses add to the surface fine fuels and therefore need to be taken into account when assessing the hazard. The risk is higher where greater depth and volume of litter and surface material are present.

Bark has the potential to travel significant distances in a fire situation (spotting) and act as a ladder between surface fuels and the forest crown. Bark contributes to fire hazard when it is loose and fibrous, present in large quantities and in long loose ribbon forms.

5.2.6 Assessment of Bushfire Fuel Hazard.

An overall Fuel Hazard for vegetation within the land adjoining the mobile substation site can be determined using the NRE Overall Fuel Hazard Guide.

The predominant fuel available to a fire burning on the land within Block 1653 and the adjoining Block 1654, to the west, varies from grazed grassland within the central valley area to Woodland with a shrub and grassland understorey on the higher ridgeline to the west.

Whilst most of the vegetation has had some level of management by grazing, the success of this management practice can vary depending on the amount of rainfall in the spring period to produce abundant growth of grasses and the stock loading and their ability to crop the grasses to levels which will mitigate the intensity of fires that may occur in the cured grass and accumulated ground fuels within the woodland vegetation.

Therefore, the assessment of fuel hazard will be determined for unmanaged Woodland vegetation within the western portion of Block 1653 and Block 1654 which is the predominant vegetation which will create the most potential for a severe fire event on the land.

- ***Unmanaged Woodland vegetation.***

Using the methodology provided within the NRE Overall Fuel Hazard Guide, the following Fuel Hazard observation was determined.

(a) *Bark Hazard:*

The Woodland vegetation includes Yellow Box Red Gum, which has a smooth trunk and long ribbons of bark into the crown of the tree. Therefore this vegetation has a High Bark hazard.

(b) *Elevated Fuel Hazard:*

Elevated fuel comprises shrub, heath and suspended material.

The level of hazard depends on the fuel continuity (horizontal and vertical), height, and proportion of dead material, thickness of the foliage and twigs and flammability of the live foliage.

The flammability of the elevated fuel is highest when:

- *The foliage, twigs and other fuel particles are very fine (e.g. maximum thickness 1-2 mm)*
- *The proportion of dead material is high.*
- *The fuels are arranged with a high level of density and horizontal and vertical continuity that promotes the spread of flame.*
- *The live foliage has low, live fuel moisture content.*

The vegetation type and time lapsed since the most recent fire substantially determines the level of elevated fuel hazard.

Site investigation was undertaken to determine the structure of the elevated fuel and an estimated Elevated Fuel Hazard of High – Very High, was determined for those areas of Woodland vegetation that may remain, from time to time, unmanaged by either grazing or hazard reduction burning.

(c) Surface Fine Fuel Hazard:

Surface Fine Fuel Hazard is assessed by measuring litter-bed height. The Surface Fine Fuel in the Woodland vegetation consists predominantly of grass with accumulated leaf litter beneath trees. The vegetation within the leased land holdings to the northwest through to southwest was assessed during the site inspection on the 29th October 2008.

The inspection revealed that due to severe drought conditions and grazing by Kangaroos and livestock, minimum surface fine fuels were available, except for leaf litter loadings beneath trees. The estimated Surface Fine Fuel Hazard Rating is Low. However, over the lifetime of the proposed development, growth periods will occur when Surface Fine Fuel Hazard Ratings will be Very High to Extreme due to the extent of cured grasses and accumulated leaf litter fuels.

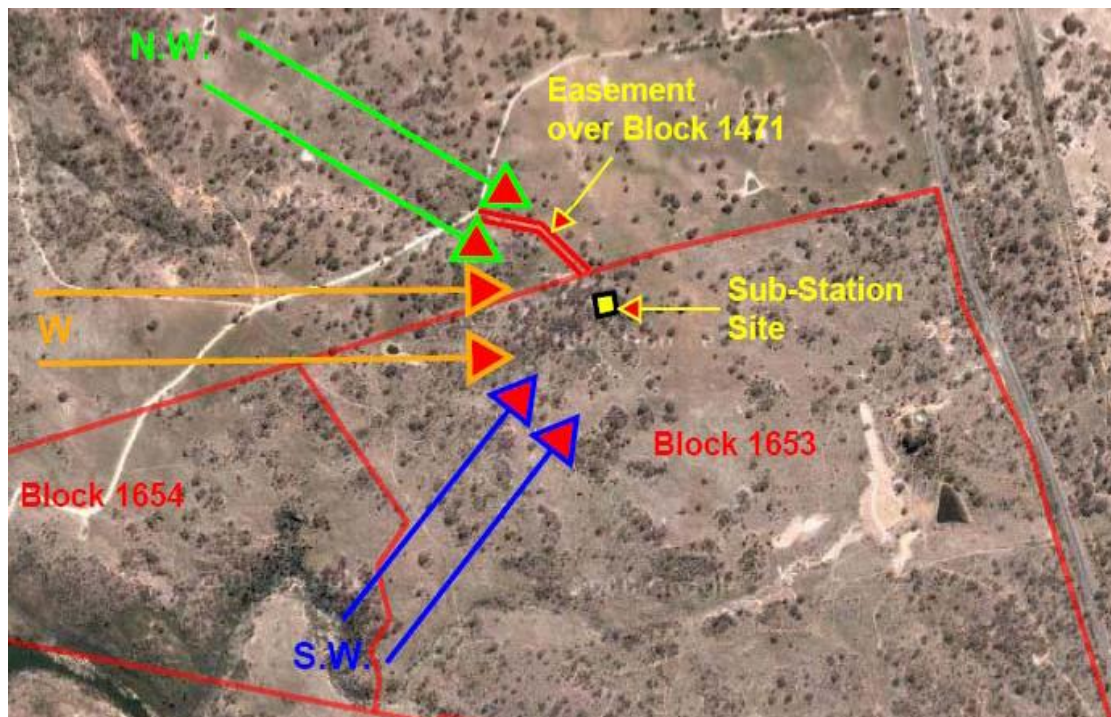
Overall Fuel Hazard of the unmanaged Open Woodland Vegetation.

The Overall Fuel Hazard for the unmanaged Open Woodland vegetation on the western portion of Block 1653 and Block 1654 is **Very High**.

5.2.7 Potential Fire Runs.

The mobile substation site is located in the central valley area and will therefore be protected from direct exposure to the predominant northwest, west and southwest fire paths. However, the site may be impacted by wind eddies caused by the ridgeline to the west.

Figure 4 – Potential Fire Runs.



5.3 Summary of Bushfire Risk to the 132/11kV mobile Substation on Block 1653, Monaro Highway, Williamsdale.

The last major bushfire to impact upon the vegetation within the vicinity of Block 1653 occurred during the 2003 fires when the properties to the west of the Murrumbidgee River were burnt under wildfire conditions. Had the fire not been stopped on the river, the vegetation and the facilities within Block 1653 would have been impacted by this fire event.

The mobile substation site is located in the sheltered valley in the centre of Block 1653 therefore the bushfire risk to a substation in this location will be substantially reduced with the management of the 50m x 50m curtilage to the substation providing adequate protection against a future fire event on the property. The mobile substation should be designed to withstand ember attack with mesh screening to openings and shielding of exposed services [electrical conduits etc.]

5.4 Assessment of Bushfire Risk created by the Mobile Substation.

The generation and distribution of electricity has the potential to cause fire ignition within the Substation Compound. Ignition sources include:

- Equipment malfunction – transformer explosion; burn out of motors/fans and overhead wiring failure; and
- Human Error.

The incidence of equipment malfunction is rare. Transformers can however explode and have the potential to shed molten metal and burning oil for some distance from the transformer. Fans and motors fail with the potential impact restricted to localised sparks and in some cases, the shedding of hot/molten metal.

Overhead wiring failure is uncommon and is usually the result of physical damage from lightning strikes or sparks given off during light rain, as a result of dust build up on the insulators over extended dry periods.

Whilst these occurrences may generate a potential ignition source, it is the human error factor that is likely to cause the greatest level of risk of ignition to the surrounding bushfire prone vegetation.

The extent of the clearance between the equipment and the compound fence, and the gravel ground cover within the compound, mitigate the risk of the transfer of an ignition within the compound to the surrounding vegetation.

Work practices should be established in recognition of the likely risk of ignition of the adjoining vegetation. These should include the provision of portable fire extinguishers during maintenance activities that involve cutting, grinding, welding etc.

SECTION 6

RECOMMENDATIONS.

6.1 Management of the Bushfire Prone Vegetation within the Mobile Substation Compound.

The 132/11kV mobile substation compound shall be managed to provide minimal vegetation within the security fence.

6.2 Access.

The proposed access road to the mobile substation shall be constructed to provide an all-weather surface capable of carrying a fully laden Rural Fire Service Tanker with a GVM of 15 tonnes. Passing bays shall be provided at 400 metre intervals in grassland vegetation and 200 metre intervals in Woodland vegetation.

6.3 Construction Standards to Building/s.

The construction of the mobile substation shall provide protection against the entry of burning embers and the shielding of external services to prevent ignition by flying ember attack.

6.4 Provision of Portable Fire Fighting Equipment.

To mitigate the risk of ignition of the surrounding vegetation, from a fire occurrence within the Substation Compound, the following measures will be implemented:

- Contractors undertaking drilling, cutting, grinding and welding operations on the Substation Site shall not undertake such works without the provision of a portable fire extinguisher.
- Contractors shall not undertake drilling, cutting, grinding and welding operations on Total Fire Ban days – unless during an emergency in which case a fire fighting appliance shall be on stand-by outside the facility.

SECTION 7

CONCLUSION.

“Canberra is – and always will be – prone to occasional serious bushfire attack and the realisation of this needs to pervade the psyche of the City, its inhabitants and those who govern it.”

(Ron McLeod (August 2003) Inquiry into the Operational Response to the January 2003 Bushfires in the ACT).

The risk from fires burning within the Grassy Woodland vegetation on the western side of Callaghan Hill Ridgeline has been determined as being Extreme, due to the availability of combustible fuels, exposure to the prevailing fire winds from the northwest to the southwest and the topography of the landform.

Whilst the proposed development is not for a habitable purpose, damage to the mobile substation resulting from severe bushfire events in the local area will have an impact on the electricity supply to the Angle Crossing water supply plant.

Therefore, management of the substation compound and protection of the facility against wind borne ember attack have been recommended.

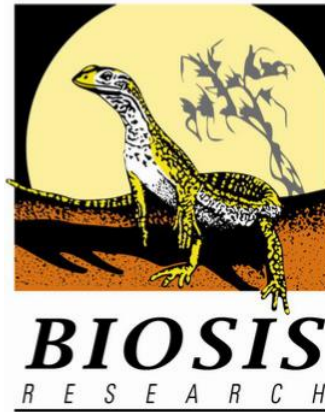
The provision of the underground 11kv cable supply from the mobile substation site, within the access easement and along Angle Crossing Road to the water supply plant on the Murrumbidgee River will not be exposed to bushfire risk as the line will be buried.

REFERENCES:

- Strategic Bushfire Management Plan for the ACT – January 2005.
- The Canberra Spatial Plan – ACT Planning & Land Authority – March 2004.
- AS/NZ - 4360 : 2004 Risk Management
- Emergency Risk Management – Applications Guide. (EMA) 2000).
- Overall Fuel Hazard Guide – NRE. May 1999.
- Planning for Bushfire Risk Mitigation for new development & redevelopment – ACTPLA.

Attachment C

Heritage Assessment – Biosis Research



Trevor Fitzpatrick
Purdon Associates Pty. Ltd.
7 April 2009
Our ref: 5332

Dear Trevor,

**Re: Proposed Electrical Substation and Transmission Lines Alignment, Williamsdale, ACT:
Aboriginal and Historical Cultural Heritage Preliminary Desktop Assessment**

Brief

ActewAGL proposes to construct an electrical substation (132kV/11kV) and an underground electrical transmission line (11kV). They are also considering an alignment for a section of the proposed overhead electrical transmission lines (132kV) between Williamsdale and Theodore. The proposed developments are all located in close proximity to Angle Crossing Road, Williamsdale, ACT, which is located within the Tuggeranong District. See Figure 1 for a concept plan of the proposed developments.

Biosis Research Pty. Ltd. was commissioned by Purdon Associates Pty. Ltd. to conduct an Aboriginal and historical cultural heritage preliminary desktop assessment for these developments.

Previously, Navin Officer Heritage Consultants (see 2006 and 2007) completed a draft cultural heritage assessment for the electrical substation (330kV/132kV), Williamsdale, ACT, in 2006, and for the original alignment of the overhead electrical transmission lines between Williamsdale and Theodore, ACT, in 2007.

The proposed *original* alignment for the overhead electrical transmission lines traverses the project area and the electrical substation (330kV/132kV), both assessed by Navin Officer (2006 and 2007), are located within the immediate vicinity of the project area. The reports of Navin Officer (see 2006 and 2007), therefore, remain relevant and directly applicable to the project area and should be used as a reference for:

- The ethnohistory of Aboriginal and historical occupation of the local area;
- A detailed description of the influence of the environment on past human occupation and land use; and the impact of local environmental processes on the preservation of cultural heritage sites.
- A detailed summary and synthesis of heritage reports and studies relevant to the project area; and
- A detailed predictive model used to predict the likelihood of sites being identified throughout the local area.

As per correspondence with Purdon Associates Pty. Ltd., the aim of this report is to update the Navin Officer reports (2006 and 2007) with reference to the proposed electrical substation (132kV/11kV), underground electrical transmission line (11kV) and alignment for a section of the proposed overhead electrical transmission lines (132kV) between Williamsdale and Theodore. This report is an addendum to the Navin Officer reports (2006 and 2007), and it should *only* be read in conjunction with those reports.

This project will be assessed under the *Heritage Act 2004* (ACT).

Consultation

At this stage of the project, no consultation with Aboriginal people has been undertaken (but see Recommendation 4 below).

Statutory and non-statutory heritage register searches

A search of statutory and non-statutory heritage registers was conducted (February 2009) to identify any cultural heritage sites within the study area. The searches included the following registers:

- World Heritage List;
- Commonwealth Heritage List;
- National Heritage List;
- Register of the National Estate; and
- ACT Heritage Register.

Registered Aboriginal sites

The results of the searches identified two Aboriginal sites (TUG1 and CR15), listed on the ACT Heritage Register, immediately relevant to the proposed developments.

TUG1, an isolated artefact, is located within the impact zone or immediate vicinity of the proposed underground electrical transmission line (11kV) (see Figure 3). According to the ACT Heritage Register, TUG1 (ACTMG 209839E 570820N) consists of an isolated artefact, located close to Angle Crossing Road at a containment line, which is likely to have been “severely” disturbed over a prolonged time period. Consequently, a low likelihood has been noted for potential artefact deposits to occur.

CR15, an open artefact scatter, is located within the immediate vicinity of the proposed alignment for a section of the proposed overhead electrical transmission lines (132kV) (see Figure 3). According to Navin Officer (2007:8), CR15 (ACTMG 210970E 570270N) consists of “an open artefact scatter comprising quartz and silcrete flakes and chips”.

Registered historical sites

No historical sites were identified within or in the immediate vicinity of the proposed developments.

Environmental context

The topography of the project area is characterised by rounded steep to rolling mountains and hills of the Murrumbidgee Valley and undulating to rolling low hills and alluvial fans (Jenkins 1993:39,139). The Murrumbidgee River is located immediately west of the project area, and many of its tributaries traverse the local area. The soil landscapes that occur within the project area include Campbell, a colluvial landscape, and Burra, a transferral landscape (Jenkins 1993).

The main geological formations that outcrop or underlie the project area include the Colliton Volcanics and Branby Beds (Richardson 1976). The Colliton Volcanics, which date to the Late Silurian (Richardson 1976:45), consist of rhylitic and dacitic tuffs (Richardson 1976:39). The Bransby Bed, which dates to the Late Silurian (Richardson 1976:55), consists of rhyolitic tuffs (Richardson 1976:49).

Extrapolating statistics collected from the nearest weather station, Honeysuckle Creek, the project area has a total average annual rainfall of 1001.9 mm, an average annual maximum temperature of 15.6 °C, and an average annual minimum temperature of 4.8 °C <<http://www.bom.gov.au/climate/averages/>>.

The local plant community for the project area appears to be Tableland Clay Grassy Woodlands (Keith 2004). The community is dominated by eucalypts and tussock grasses and herbs (Keith 2004:88-9). Terrestrial and

freshwater animals presumably would have been abundantly and consistently present all year round in the local area.

The local area would have provided ideal conditions for Aboriginal occupation, and Aboriginal people would have utilised the local resources of the area.

Previous cultural heritage studies

A number of cultural heritage assessments and site recordings have been conducted within an approximately 8 km buffer of the project area. These include: Barz (1980); Barz and Winston Gregson (1981); Access Archaeology (1991); Heffernan (1991); Winston Gregson (1991,1992); Paton (2003); Dearling (2003); McKay (2004); and Navin Officer (2003, 2006, and 2007).

Predictive model

With reference to Aboriginal cultural heritage, a search of the ACT Heritage Register encompassing an approximately 8 km buffer of the project area identified 59 Aboriginal sites (see Figure 2 and Appendix 1). These sites, however, are only representative of areas that have been surveyed.

Simple preliminary analyses of these results indicate:

- The most commonly identified site types appear to be open artefact scatters (74%), followed by: isolated artefacts (23%); scarred trees (4%); a quarry (2%); a possible shelter (2%); and a possible stone arrangement and associated artefact (2%);
- The more common landforms associated with sites appear to be elevated landforms (75%), followed by slopes (19%), with areas associated with drainage (9%) and flats (5%) occurring less frequently. 64% of sites appear to be located within 100 metres of water sources and 36% of sites were located within 500 m;
- The more common materials used in stone tool manufacture appear to be quartz, with quartzite and chert occurring less frequently. There are only two recorded instances of tuff and one example of imported jasper; and
- Many of the sites appear to be small, sparse artefact scatters.

As people describe sites using varying amounts of detail, it is difficult to identify detailed categories with consistent applicability. For these analyses, blank entries were not used when calculating percentages, and field entries could be used more than once if the information applied to more than one category.

Within the locality of the project area, potential sites appear more likely to be identified on elevated landforms within 500 metres of water sources. This is considered to be a tentative interpretation due to the small size of the sample.

Historical context

The project area is located within the Parish of Keewong, County of Murray.

On 1 and 21 November 1906, the Government granted the land over which the project area now extends to Andrew Jackson Cunningham and James Cunningham, both from Lanyon (Lands Titles Office (LTO) Certificate of Title (CoT) V.1741 F.181 and V.1737 F.74). The land included Portions 37 (40 acres), 151 (40 acres), 176 (44 acres), 210 (80 acres), 211 (100 acres) and 217 (50 acres), and 218 (187 acres) (LTO Crown Plans (CP) 672-1956, 2481-1956, 3280-1956, 3683-1956, 3797-1956, and 7523-1603; Parish Maps 109676 and 109677 – see Figure 4). Then, on 19 August 1906, these Portions were transferred to Andrew Jackson Cunningham (LTO CoT V.1804 F.7). The difference in dates indicates that the Cunninghams had taken possession of the Portions slightly before the grants were drawn up.

The project area extends over the following roads:

- The road reserve of what is today known as Angle Crossing Road, which was resumed by the Government on 18 February 1905, within Portions 37, 217, and 210;
- Unnecy Road, which was granted to Andrew Jackson Cunningham, along the entire southern boundary of Portion 217;
- One Chain Road along the eastern boundary of both Portion 176 and 210 and
- A road (unnamed?) along the entire western boundary of Portion 37 that intersects Unnecy Road from the north.

For due diligence, although outside the study area, a small hut is noted in the northern eastern area of Portion 151.

It seems likely that the lands were used for grazing. The 16 April 1906 Certificate of Title refers to Andrew Jackson Cunningham as a grazier. Furthermore, the descriptions of the canopy cover throughout the properties do not seem suggestive of cropping activities: Portion 37 is described as thinly timbered, Portions 151, 210 and 217 are described as open forest and Portion 218 is described as open forest and well grassed and watered.

No indications of any structures or land use were evident from a 1951 aerial photograph of the project area obtained from the Department of Lands NSW.

It is unlikely that any significant historical cultural heritage is present throughout the project area; with any potential archaeological sites likely to be associated with common agricultural activities.

Preliminary significance assessment statements

A preliminary statement of significance for Aboriginal site, TUG1, is provided here. There is insufficient desktop information to provide a statement for CR15.

TUG1 appears to be representative of the most common site in the regional and local area: the open site. According to the ACT Heritage Register, the integrity of the site is low, and there is a low likelihood for

potential artefact deposits to occur. The significance of the site appears, *from a preliminary desktop examination*, to be low.

Recommendations

Prior to any impacts to the project area, the following is recommended:

Recommendation 1 – *No further historical work*

It is unlikely that any significant historical cultural heritage sites are present throughout the project area. Consequently, no further historical work is recommended at this stage.

If, however, any significant historical sites are discovered during the construction of the proposed works, they remain protected by the provisions of the *Heritage Act* 1994. Further assessment and consultation with the ACT Heritage Unit is required in these cases.

Recommendation 2 – *Initiate consultation with relevant RAOs*

It is recommended that consultation with Aboriginal people is undertaken in accordance with the Australian Heritage Commission document, *Ask First: A Guide to Respecting Indigenous Heritage Places and Values*, and the ACT Heritage Unit endorsed document, *Draft ACT Heritage Guidelines* 2007.

Identifying the relevant Aboriginal people with rights and interests in the project area, followed by consultation and negotiation with any identified stakeholders, is the best means of addressing Aboriginal cultural heritage issues. Preliminary consultation with any identified stakeholders should include discussions about their views on the proposed development, the existence of any Aboriginal heritage places within the project area, and the level and process of Aboriginal involvement in the project.

Presently, the relevant Representative Aboriginal Organisations (RAOs) for the ACT are:

- Buru Ngunawal Aboriginal Corporation;
- Consultative Body Aboriginal Corporation on Indigenous Land and Artefacts in the Ngunnawal Area;
- Little Gudgenby River Tribal Council; and
- Ngarigu Curawong Clan.

Recommendation 3 – *Conduct an Aboriginal cultural heritage survey of the project area*

It is recommended that an Aboriginal cultural heritage survey of the project area is conducted *in conjunction* with one representative from each of the relevant Representative Aboriginal Organisations (RAOs) for the ACT.

The main aims of the survey should be to:

- Identify, record and assess the condition of any unrecorded Aboriginal cultural heritage sites;
- Relocate, update the recording and assess the condition of TUG 1 and CR15.

It is anticipated that the survey should take one day in total, with all ROAs present on the same day.

Recommendation 4 – *(conditional on the completion of Recommendation 3) - Avoid developmental impacts, or prepare strategies to protect or mitigate any impacts, to cultural heritage sites within or in the immediate vicinity of the project area*

It is recommended that any developmental impacts to Aboriginal sites, TUG1 and CR15, or any other cultural heritage sites identified from the survey within or in the immediate vicinity of the project area are avoided.

If this is not possible, strategies to protect or mitigate any proposed developmental impacts to these sites should be formulated. For Aboriginal sites, these strategies should consider the views of the relevant RAOs.

The formulation of these strategies should be influenced by current best conservation practice, including the principles embodied by the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter and the ACT Heritage Unit endorsed document, *Draft ACT Heritage Guidelines 2007*. These strategies should be contextualised with background information that includes:

- The proposed developmental impacts to cultural heritage sites and their rationale;
- Significance statements for these sites prepared in accordance with the criteria outlined in the Australian ICOMOS Burra Charter and *Heritage Act 2004*. This includes cultural significance statements provided by the relevant RAOs.
- A detailed methodology for the protection or mitigation of proposed impacts to these sites including justification for the design.

These strategies must be submitted to the ACT Heritage Council for endorsement.

Biosis Research Pty. Ltd. project details

Author: Dominic Brady

Reviewers: Fenella Atkinson, and Jamie Reeves

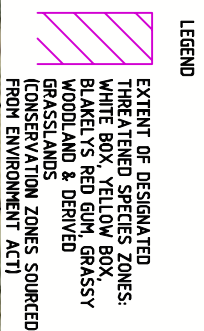
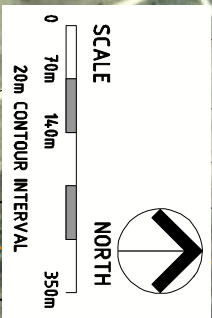
Mapping: Robert Suansri and Ashleigh Pritchard

Acknowledgements

Biosis Research Pty. Ltd. acknowledges the contribution of the following people and organisations in preparing this report: Sophie Collins, Euroka Gilbert and Mark Nizette (ACT Heritage Unit); Trevor Fitzpatrick and Rob Purdon (Purdon Associates Pty. Ltd.); and staff (NSW Department of Lands, State Library of NSW and Sydney University Library).

Figures

Figure 1: Concept plan including the proposed developments - provided by Purdon Associates Pty. Ltd.



ANGLE CROSSING
ENVIRONMENTAL ASSESSMENT

MOBILE SUBSTATION AND
11kV CABLE ROUTE

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24 MAR 09

1:7000 AT A3

ActewAGL
Always.

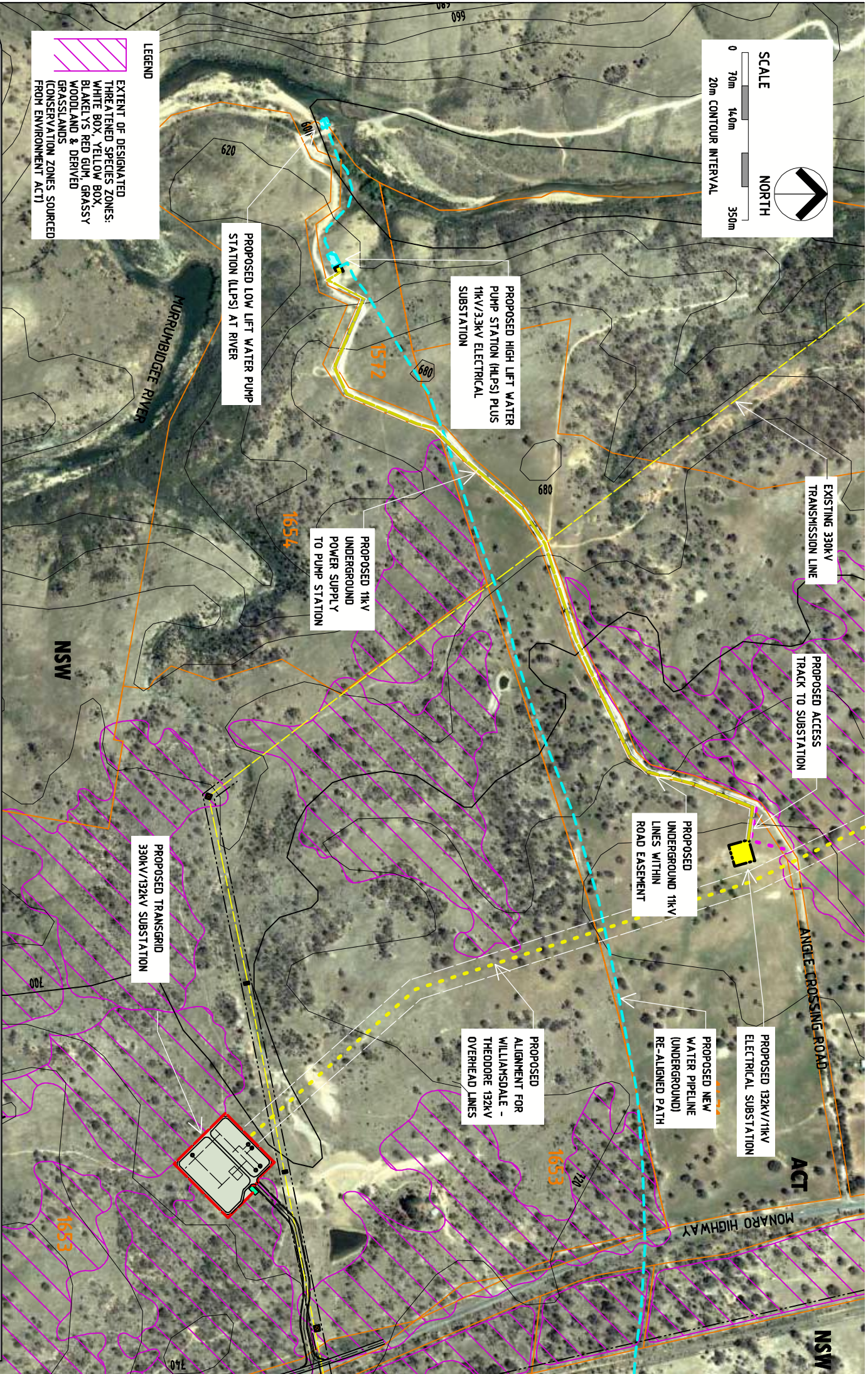


Figure 2: Aboriginal and historical cultural heritage sites within an approximately 8 km buffer of the project area within the ACT.

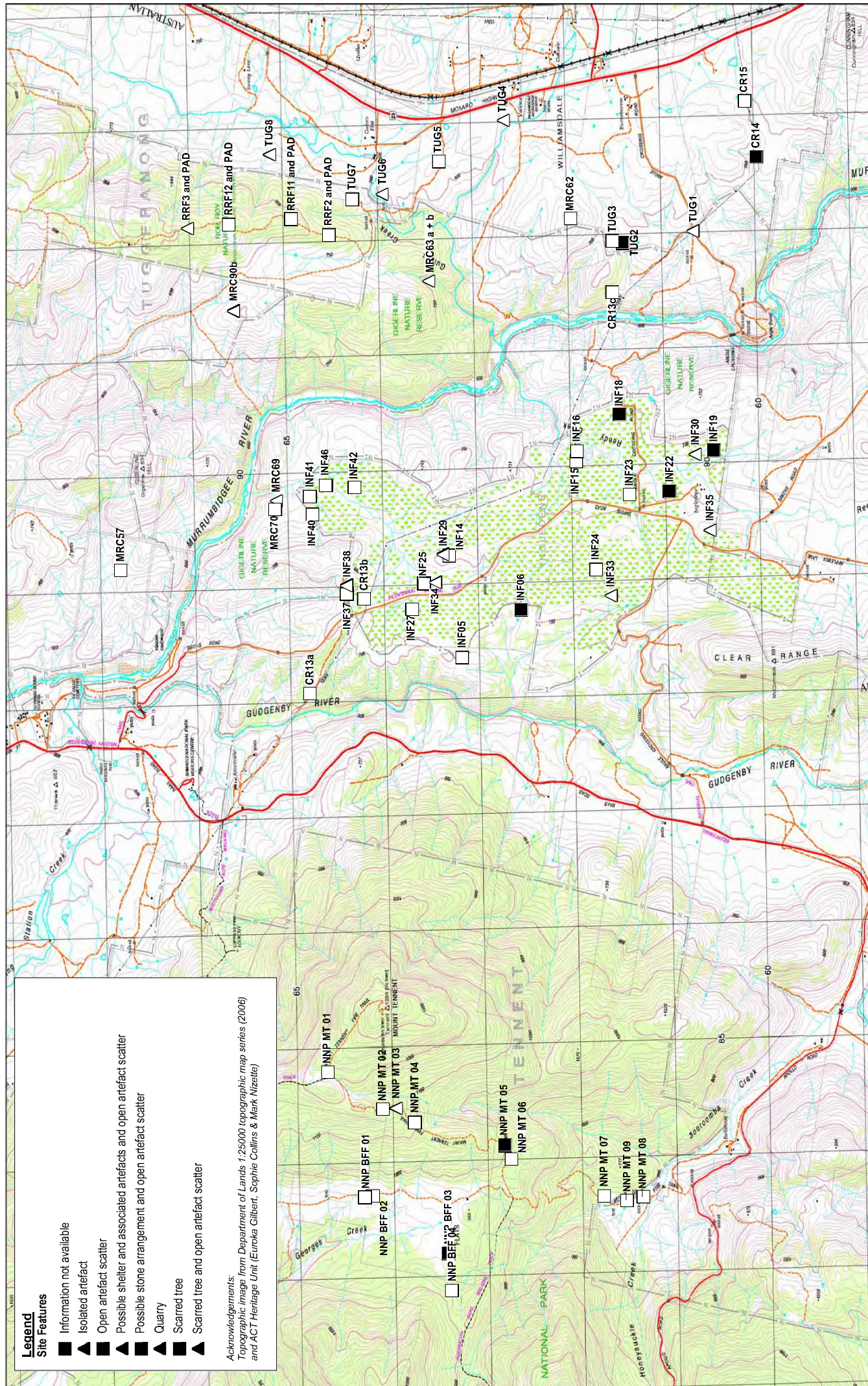


Figure 3: Aboriginal and historical cultural heritage sites within the impact zone or immediate vicinity of the project area.

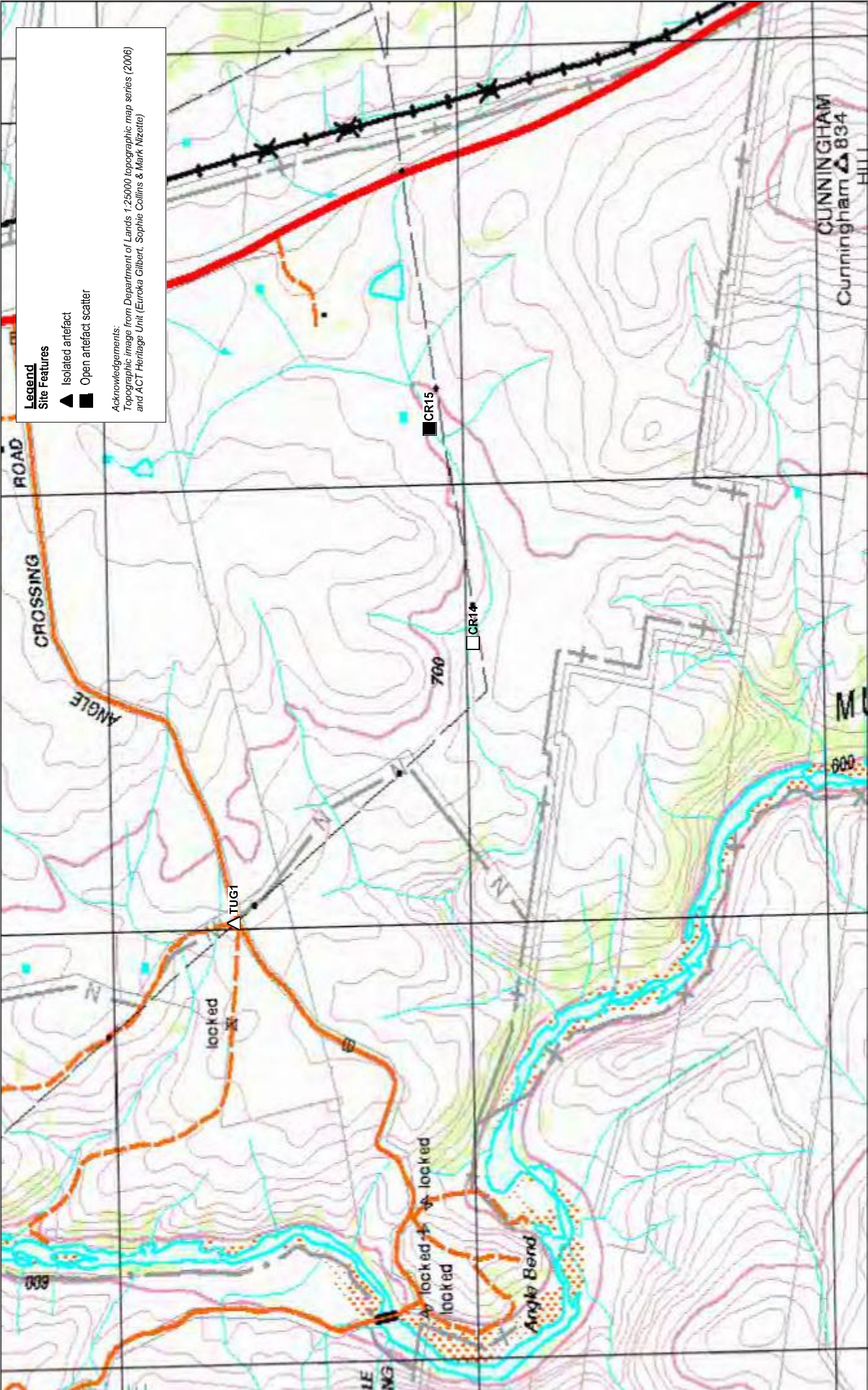


Figure 2 : Aboriginal and historical cultural heritage sites within the impact zone or immediate vicinity of the project area.

Figure 4: The Parish map of Keewong (source: Parish Map 109676) with a focus on the project area.



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Winston Gregson. 1992. Site recording form lodged with ACT Heritage Unit (Sites: INF05; and INF06)

APPENDICES

Appendix 1: Details of Aboriginal and historical cultural heritage sites within an approximately 8 km buffer of the project area within the ACT.

Key:

INA: Information not available from ACT Heritage search results

SITE NAME	SITE TYPE	ARTEFACT NUMBER	LANDFORM DESCRIPTIONS	DISTANCE FROM WATER
CR13a	INA	INA	INA	INA
CR13b	INA	INA	INA	INA
CR13c	INA	INA	INA	INA
CR14	INA	INA	INA	INA
CR15	INA	INA	INA	INA
INF05	Open artefact scatter	2	INA	INA
INF06	Open artefact scatter	4	INA	INA
INF14	Scarred tree	INA	INA	INA
INF15	Open artefact scatter	3	Moderate slope	INA
INF16	Open artefact scatter	8	Side of ridge spur	INA
INF18	Open artefact scatter	5	Gentle slope	INA
INF19	Open artefact scatter	5	Low ridge spur	INA
INF22	Open artefact scatter	400	Broad flat ridge-top area	INA
INF23	Open artefact scatter	5	Ridge spur	INA
INF24	Open artefact scatter	2	Saddle of a long narrow ridge	INA
INF25	Open artefact scatter	7	Gully, sloping land	INA
INF27	Open artefact scatter	4	Gully	INA
INF29	Isolated artefact	1	Ridgetop	INA
INF30	Isolated artefact	1	Low ridge spur	INA
INF33	Isolated artefact	1	Moderate slope	INA
INF34	Isolated artefact	1	Gully	INA
INF35	Isolated artefact	1	Ridge spur	INA
INF37	Open artefact scatter	2	Saddle	INA
INF38	Isolated artefact	1	Upslope from saddle	INA
INF40	Open artefact scatter	3	Knoll on spur	INA
INF41	Open artefact scatter	10	Small flat on spur	INA
INF42	Open artefact scatter	2	Break of slope	Above creek flat
INF46	Open artefact scatter	4	INA	INA
MRC57	INA	INA	INA	INA
MRC62	Open artefact scatter, possible stone arrangement	INA	Hill top	INA
			Scarred tree	
			(steep hillside),	
			Open artefact scatter	
MRC63 a + b	Scarred tree, open artefact scatter	INA	(hill side/ slope and hill top)	INA
	Possible shelter and associated artefact and			
MRC69	open artefact scatter	INA	INA	Along a creekline
MRC70	Open artefact scatter	INA	Flat land	Just north of a creekline
MRC90b	Quarry	INA	INA	INA
NNP BFF 01	Open artefact scatter	3	Low laying spur	INA
NNP BFF 02	Open artefact scatter	2	Gully	INA
NNP BFF 03	Open artefact scatter	2	Low rise on basal slopes	INA
NNP BFF 04	Open arefact scatter	1	Basal slopes	INA
NNP MT 01	Open arefact scatter	62	Saddle, gully	INA
NNP MT 02	Open artefact scatter	4	INA	INA
NNP MT 03	Isolated artefact	1	INA	INA
NNP MT 04	Open artefact scatter	44	Saddle	INA
NNP MT 05	Open artefact scatter	2	Small saddle	INA
NNP MT 06	Open artefact scatter	7	Small saddle, low (locally elevated) knoll	INA
NNP MT 07	Open artefact scatter	7	Locally levated area,	
NNP MT 08	Open artefact scatter	4	stream terrace	Beside stream
NNP MT 09	Open artefact scatter	13	Locally levated area	Beside stream
RRF11 and PAD	Open artefact scatter	5	Ridgeline	500 m
RRF12 and PAD	Open artefact scatter	5	Ridgeline	200 m
RRF2 and PAD	Open artefact scatter	< 100	Ridge/ spurline	Adjacent to creek flat
RRF3 and PAD	Isolated artefact	1	Ridgeline	INA

TUG1	Isolated artefact	1	INA	INA
TUG2	Open artefact scatter	2	Low rise	200 m
TUG3	Open artefact scatter	4	Low rise	250 m
TUG4	Isolated artefact	1	INA	INA
TUG5	Open artefact scatter	3	Moderate rise	Adjacent to small creek
TUG6	Isolated artefact	1	Flat level ground	Near small creek
TUG7	Open artefact scatter	4	Small level rise	100 m
TUG8	Isolated artefact	1	Small flat rise	Above creek