BUSHFIRE RISK ASSESSMENT

FOR THE PROPOSED

ActewAGL TRANSMISSION LINE

FROM THE

THEODORE ZONE SUBSTATION

TO THE

NEW WILLIAMSDALE SUBSTATION,

AUSTRALIAN CAPITAL TERRITORY

PREPARED FOR

ActewAGL.

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Assessment Number	Document	Preparation Date	Issue Date	Directors Approval
B06342	Final Draft	26.12.2006	31.12.2006	

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EXECUTIVE SUMMARY

The Australian Capital Territory (ACT) and surrounding areas are supplied via an ActewAGL operated 132kV transmission network radiating from TransGrid's Canberra 330/132kV Substation which is located in the West Belconnen area.

Following joint planning with ActAGL, the agreed network development strategy is the establishment of a 330/132kV Substation in the southeast area of the ACT, connecting into the existing Canberra to Cooma 132kV lines. This substation will be located in the Williamsdale area to service newly identified urban growth areas to the south of Canberra and to also meet the reliability criteria recently established by the ACT Government to ensure diversity of supply to the ACT.

The total project is referred to as the "Second Supply to the ACT". It involves a number of component tasks performed by both TransGrid and ActAGL, depending on the responsibility of each agency.

The Canberra to Williamsdale section of the Canberra to Cooma 132 kV circuit is a double circuit 132 kV line, strung on single circuit 330 kV structures that are suitable for conversion to 330 kV operation. TransGrid propose to rearrange this existing steel tower line between Canberra and Williamsdale from operation as a double circuit 132 kV line to a single circuit 330 kV transmission line to provide the 330 kV supply to Williamsdale.

To maintain supply to Cooma during the conversion, ActewAGL will construct a new 132 kV transmission line from the TransGrid Williamsdale Substation to the existing ACT distribution network, anticipated to be in the Theodore Substation area.

Following investigation into the route of the proposed transmission line the route layout has been finalized. The preferred route connects to the existing Theodore/Gilmore 132 kV line at approximately 500 metres to the east of the Theodore Substation, running south on the western side of Callaghan Hill and generally parallel to the western side of the Monaro Highway. The line continues to run parallel to the Highway, between Guises Creek and the eastern boundary of the Rob Roy and Gigerline Nature Reserve, turning to the southeast to cross Angle Crossing Road at approximately 500 metres to the west of the Monaro Highway.

The route study identified an alternate route option on the northern and southern ends of the preferred route.

The northern alternative, known as the east option, runs close to the Monaro Highway, on the eastern side of the Callaghan Hill ridgeline that runs along the western side of the Highway. This ridgeline is heavily vegetated with Yellow Box Woodland Red Gum species and will require substantial clearing of this vegetation.

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The preferred, or western, option runs to the west of the latter ridgeline, along a valley that rises to the south. The valley contains less Yellow Box Red Gum vegetation with the line being strung, due to the topography in some locations, above the vegetation.

The southern alternative, known as the western route, 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 option will increase the existing width of powerline clearing and remove additional Yellow Box Red Gum Woodland. The preferred, or eastern, route extends directly from the new Substation, through land which has been cleared and grazed, with minimal clearing the remnant Yellow Box Red Gum trees.

This Bushfire Risk Assessment identifies the potential bushfire risks to the powerline and provides recommendations on bushfire protection measures required to mitigate the bushfire risk and also considers the potential risk that the powerline may generate on the adjoining landscape.

Graham Swain
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Australian Bushfire Protection Planners Pty Limited.
31.12.2006

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TABLE OF CONTENTS.

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SECTION 1

INTRODUCTION

1.1 The Brief.

As part of the Preliminary Assessment for the construction of the new Theodore to Williamsdale 132 kV powerline, ActewAGL require a Bushfire Risk Assessment to examine the potential bushfire risk to the facility and the risk created by the new line. Australian Bushfire Protection Planners Pty Limited has been commissioned to undertake the Bushfire Risk Assessment.

1.2 Objectives of the Brief.

- Prepare a Bushfire Risk Assessment for the proposed ActewAGL Williamsdale to Theodore 132kV powerline.

- The assessment shall provide recommendations on bushfire protection measures required to mitigate the potential bushfire risks.

1.3 Study Area.

For the purpose of this report, the boundary of the Williamsdale to Theodore powerline study area is defined as the land within one hundred metres of the proposed powerline corridor.

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.

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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 28th September 2006 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 proposed Williamsdale to Theodore 132 kV Powerline.

The preferred route connects to the existing Theodore/Gilmore 132 kV line at approximately 500 metres to the east of the Theodore Substation, running south on the western side of Callaghan Hill and generally parallel to the western side of the Monaro Highway through Rob Roy Nature Reserve. The line continues to run parallel to the Highway, between Guises Creek and the eastern boundary of the Rob Roy and Gigerline Nature Reserve, through Blocks 1651, 1640, 1623, 1644, 116, 1470, turning to the southeast through Blocks 1470 and 1471 to cross Angle Crossing Road at approximately 500 metres to the west of the Monaro Highway, continuing through Block 1653 to the new TransGrid Substation.

The route study identified an alternate route option on the northern and southern ends of the preferred route.

The northern alternative, known as the east option, runs through the Rob Roy Nature Reserve, close to the Monaro Highway, on the eastern side of the Callaghan Hill ridgeline. This ridgeline is heavily vegetated with Yellow Box Woodland Red Gum species and will require substantial clearing of this vegetation.

The preferred, or western, option runs to the west of the latter ridgeline, along a valley that rises to the south. The valley contains less Yellow Box Red Gum vegetation with the line being strung, due to the topography in some locations, above the vegetation.

The southern alternative, known as the western route, 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 option will increase the existing width of powerline clearing and remove additional Yellow Box Red Gum Woodland. The preferred, or eastern, route extends directly from the new Substation, through land which has been cleared and grazed, with minimal clearing the remnant Yellow Box Red Gum trees.

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2.3 Existing Land Use.

Except for approximately 500 metres of the northern portion of the route, which passes through the Rob Roy Nature Reserve, the powerline passes through farming land for its full length.

2.4 Topography.

The topography along the powerline route varies from gently undulating farming land within the watershed to Guises Creek to the steep ridgelines within the Rob Roy Nature Reserve on the northern end of the line and the steep western slopes of the Murrumbidgee River corridor on the Williamsdale, or southern end of the line.

2.5 Vegetation within the Powerline Corridor.

The vegetation within the corridor varies from unmanaged Yellow Box Red Gum Woodland within the Rob Roy Nature Reserve, grazed paddocks with scattered shade trees on the farming land to grazed Yellow Box Red Gum Woodland within the river corridor and on the Lease Holdings on the Williamsdale end of the line.

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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, for new development and redevelopments, 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. This assessment determines the level of bushfire risk on the proposed powerline, from ember attack, radiant heat and direct flame contact and assesses the level of risk that the new line may generate in the event that a malfunction of the line occurs.

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SECTION 4

BUSHFIRE RISK

4.1 Introduction.

Bushfire risk is defined as the chance of a bushfire occurring that will have harmful consequences to human communities and the environment. Bushfire risk has two elements: Likelihood – the chance 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). 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)*

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 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

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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 Theodore to Williamsdale powerline is the threat posed by bush/grassfire events that may occur on land within and adjoining the powerline corridor. A further problem is the potential ignition of the vegetation within and adjoining the corridor by a malfunction of the powerline.

Analysis (determine the likelihood & consequence) and the evaluation of risks of bushfire on the Substation facility, require the following criteria to be examined:

- Previous fire history in the area;
- Possibility, probability and sources of ignition;
- 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 to the Powerline.

The following sections provide an assessment of the criteria used to determine the potential bushfire impact on the powerline structure.

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. *(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".*

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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. The majority of the area burnt and most damage (including loss of life) occur over a relatively short time.

These relatively rare, but severe events cause more than 95% of the damage and loss to people, property and assets. Bad or severe fires are not necessarily large scale fires. Planning to reduce the likelihood and consequence of bushfires in the ACT must take into account the full range from small grass fires to landscape-wide severe fires. *(3)*

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 powerline route was not impacted by the 2003 bushfires as the fires' easterly advance was halted on the eastern edge of the vegetation within the Gigerline Nature Rerserve, to the west of Guises Flat.

The 1985 bushfire burnt through the Rob Roy Nature Reserve, on the northern end of the powerline route.

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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 the vegetation within the powerline route are varied. Accidental, malicious ignition, embers from a remote fire or an uncontrolled fires advance to the east, through of the vegetation within the Murrumbidgee River corridor and the Rob Roy/Gigerline Nature Reserves may allow fire to extend to the east, impacting upon the vegetation on the farms through which the line passes.

Accidental/careless ignition of the vegetation within the Monaro Highway corridor, with the fire extending through the adjoining farming land under prevailing northeast to southeast winds, may also impact upon the vegetation within the powerline corridor.

5.2.3 Climate & Weather.

- **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.

Bushfire risk management, planning and operations must take into account the likelihood of severe fire weather and the challenges it presents. Extreme and uncontrollable bushfires typically occur when the fire danger rating is over 50, a rating of Extreme. Analysis of 1951 – 2004 meteorological records identified the days of Very High and Extreme fire danger from the Forest Fire Index (FFDI) at Canberra airport:

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- 0.1% of days (19 Days in 53 years) had a FFDI exceeding 70;

- 0.5% of days (94 days in 53 years) had a FFDI exceeding 50;

- 18% of January days had Very High FFDI, and 2% of January days had Extreme FFDI.

- **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 Woodland/grasslands vegetation to all aspects of the powerline route.

- **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 exposure to wind effects varies along the length of the powerline route.

The west option of the northern portion of the route, to the west of Callaghan Hill, will be fully exposed to the impact of strong westerly winds blowing up the valley line to the west of Callaghan Hill and similar valley lines further to the south. The valley that falls to the north will also be impacted by the effects of strong north-westerly winds.

The east option of the northern portion of the route is located to the east of the Callaghan Hill ridgeline and is protected from the impacts of the predominant north – southwest fire winds. However, fires burning under northeast wind influences have the potential to burn upslope from the Monaro Highway corridor.

The section of the powerline that runs along the eastern side of Rob Roy and Gigerline Nature Reserves is shielded, from the prevailing fire winds, by the high ridgeline within the reserves.

The western option of the southern section of the powerline is located on the western aspect of the eastern bank of the Murrumbidgee River Corridor and therefore fully exposed to the influence of northwest through to southwest fire winds. The east option of the southern route is located to the east of the ridgeline that runs to the north from the Substation site and is therefore protected against the impacts of the prevailing fire winds, until it reaches the knoll on Angle Crossing Road where-upon it comes under the influence of the northwest to southwest prevailing fire winds.

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5.2.4 Topography.

- **Generally.**

The topography along the powerline route varies from gently undulating farming land within the watershed to Guises Creek to the steep ridgelines within the Rob Roy Nature Reserve on the northern end of the line and the steep western slopes of the Murrumbidgee River corridor on the Williamsdale, or southern end of the line.

- **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 western option of the northern route follows a valley that falls the north at > 10 degrees with valley lines falling to the west at similar gradients. The land within the farms along the powerline route generally falls to the south along Guises Creek whilst displaying gentle upslope gradients to the east and west of the creekline. These slopes are punctuated by the numerous gully lines that extend out from the main creek.

The land within the Rob Roy and Gigerline Nature Reserves rises at > 10 degrees to the west, above the farming land. Slopes on the west option route of the southern portion of the powerline fall steeply at > 10 degrees to the west in the Murrumbidgee River whilst slopes on the southern end of the east option rise to the west at 8 degrees.

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.

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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 powerline corridor can be determined using the NRE Overall Fuel Hazard Guide. The predominant fuel available to a fire burning on land within the corridor varies from grazed grassland and grazed Woodland on the leased land holdings to unmanaged Woodland with a shrub and grassland understorey within the Rob Roy Nature Reserve.

Whilst most of the grassland vegetation and grazed Woodland has 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.

Therefore, the assessment of fuel hazard will be determined for unmanaged Woodland vegetation which is the vegetation which will create the most potential for a severe fire event on the powerline.

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:

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- *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 was assessed during the site inspection on the 28th September. 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 Substation, 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 Woodland Vegetation within the Rob Roy Nature Reserve and Leased Land Holdings.

The Overall Fuel Hazard for the unmanaged Woodland vegetation is **Very High**.

5.2.7 Potential Fire Runs.

Wind and topography of the land create the potential path that a fire will take. Therefore, valley lines such as those through which the west option of the northern route travels will be exposed to fire runs that burn upslope from the northwest and west, under the prevailing hot, dry fire winds. The higher ridgelines to the west of the leased land holdings along Guises Creek are downslope of the ridge and therefore protected against fire runs from the northwest and west.

However, due to the slope of the Guises Creek corridor, which slopes to the southwest and the opening in the land form where the Murrumbidgee River meets Guises Creek, the potential exits for a fire to travel upslope along the creek line under strong south-westerly winds.

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The west option of the southern route is exposed to fast moving fire runs from the northwest through to the southwest. The east option of the southern route will be subjected to uphill burning fires from the southwest of the Substation site.

5.3 Summary of Bushfire Risk to the Powerline.

The last major bushfire to impact upon the vegetation within the vicinity of the powerline route occurred during the 1985 fire season and burnt out the northern portion of the Rob Roy Nature Reserve. The 2003 bushfires burnt the central portion of the Gigerline Nature Reserve and stopped on the western fence line to the leased land holdings.

The powerline will be constructed within an easement having a width of 60 metres, cleared of trees and maintained to minimise combustible fuel loadings within the powerline easement corridor. The tower structures are constructed from steel, are non-combustible and are high enough above the ground so that fires occurring within the grassland and grazed Woodland vegetation, beyond the easement corridor, will not generate sufficient height to directly impact the conductors with flame contact.

The towers and conductors are likely to be impacted by radiant heat from these fire occurrences. The levels of radiant heat are not likely to impact upon the integrity of the tower structure, the conductors and their connectors.

The west option of the northern end of the powerline route is located on the exposed side of the Callaghan Hill ridgeline, within unmanaged Woodland vegetation. This vegetation will be impacted by fast moving high intensity upslope burning fires, driven by hot dry fire winds from the west and southwest.

The likely impact from these fires will be high levels of radiant heat, smoke and potential short term flame contact, depending on the ground litter loadings at the time of the fire. The west option of the southern end of the powerline route will be subject to similar fire impacts.

The overall risk of bushfire on the transmission lines and their supporting structures is Low – Medium, however, if the western options are chosen, it is recommended that a fuel management program be implemented to reduce the accumulated litter loadings to the west of the easement corridor.

5.4 Assessment of Bushfire Risk created by the Powerline.

The distribution of electricity via high voltage powerlines has the potential to cause ignition of bushfire fuels either within or adjoining the easement corridor. Whilst unlikely, ignition sources include:

- Equipment malfunction – broken power line due to wind storm, lightning strike or mechanical damage [i.e. aircraft strike];

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- Arc to ground caused by dense bushfire smoke;

- Human Error – faulty installation.

The incidence of these ignition sources is rare, however if one should occur during prolonged drought conditions when combustible fuels are available, the risk of ignition is high, necessitating monitoring and rapid response to any incident/emergency that is likely to cause line failure and therefore the potential for fire ignition within the bushfire prone vegetation.

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SECTION 6

BUSHFIRE PROTECTION MEASURES.

6.1 Management of the Bushfire Prone Vegetation within the Easement Corridor.

The easement corridor shall be managed by slashing/clearing to maintain separation between tree canopy and the conductors. Ground litter loadings [grass fuels] shall be maintained, by grazing/slashing, to a maximum height of 100mm during the designated "Bushfire Danger Period" [normally 1st October – 31st March however this period maybe adjusted depending on the Fire Danger Index (FDI)].

6.2 Management of the Ground Litter Loadings to the West of the "West Option", Northern and Southern Routes.

The Woodland vegetation to the west of the "west option" corridor should be monitored to determine the accumulated fuel loadings within 100 metres of the easement corridor. A request should be made to the Lessee/Land Managers for hazard reduction burns to be undertaken when the surface fine fuel hazard rating exceeds High.

6.3 Access.

The proposed access road within the easement corridor 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.

6.4 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.

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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 to the proposed powerline infrastructure from fires burning in the vegetation within and adjoining the easement corridor has been assessed as being low. However, the level of impact and therefore risk to the powerline as it passes through the Woodland vegetation on the steep western slopes of the northern and southern "west" option increases and warrants the management of the combustible fuels to a width of 100 metres to the west of the easement corridor.

The risk of fire ignition of the vegetation within and adjoining the easement corridor, from the powerline, remains undetermined as the incidence of such occurrence is statistically low.

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.

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SECTION 8

APPENDIX A

- **Copy of ActewAGL route selection – Purdon Drawing zzzz;**

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