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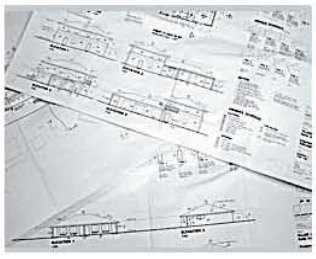


Bushfire Risk Management Plan

for

Black Springs Wind Farm

Prepared for

Wind Corporation Australia Limited
Level 42, AAP Centre
259 George Street
Sydney NSW 2000

Job Reference 23219 – August 2006

Prepared By:

Harper Somers O'Sullivan Pty Ltd

PO Box 428

Hamilton NSW 2303

Tel: (02) 4961 6500

Project: ***Bushfire Risk Assessment – Black Springs***	
Client:	*Energreen Wind Pty Ltd for Wind Corporation Australia Ltd*
Our Ref	*23219*
Date:	*3 July 2006*
Approved by:	*Sarah Jones*
Signature:	
Checked by:	*Steve McCall*
Signature:	

CONTENTS

FIGURES

LIST OF APPENDICES

1 INTRODUCTION

Wind Corporation Australia Ltd have requested that Harper Somers O'Sullivan (HSO) prepare a Bushfire Risk Management Plan (BRMP) for the Black Springs Wind Farm (BSWF) in accordance with the Director-General's requirements (DGRs) for the environmental assessment of the project. Specifically the DGRs states the following:

Bushfire Risk – *the Environmental Assessment must address the potential for wind farms to start / influence the pattern of bushfires, and must include bushfire management strategies and measures, in consultation with the NSW Rural Fire Service and Oberon Council*.

This BRMP has been undertaken in consultation with Terry O'Toole (NSW, RFS) and Ralph Tambasco (Oberon Council).

Bushfire Risk Management involves identifying the risk posed by fire to assets and life and establishing management strategies to reduce the level of risk and offer an increased level of protection. The development of risk management strategies, in accordance with the appropriate legislation, policies and statutory documents, is a tool widely recognised as instrumental in the protection of life and property from the threats posed by bushfire.

Through the development of appropriate management strategies this assessment is designed to afford a higher level of protection to assets and life on site. As required by the *Rural Fires Act 1997*.

2 BACKGROUND INFORMATION

2.1 Objectives of the proposal

The objective of the project is to generate renewable energy with no Greenhouse Gas emissions. By providing distributed electricity generation capacity close to the local demand, electricity transmission losses are reduced and supply reliability potentially is improved.

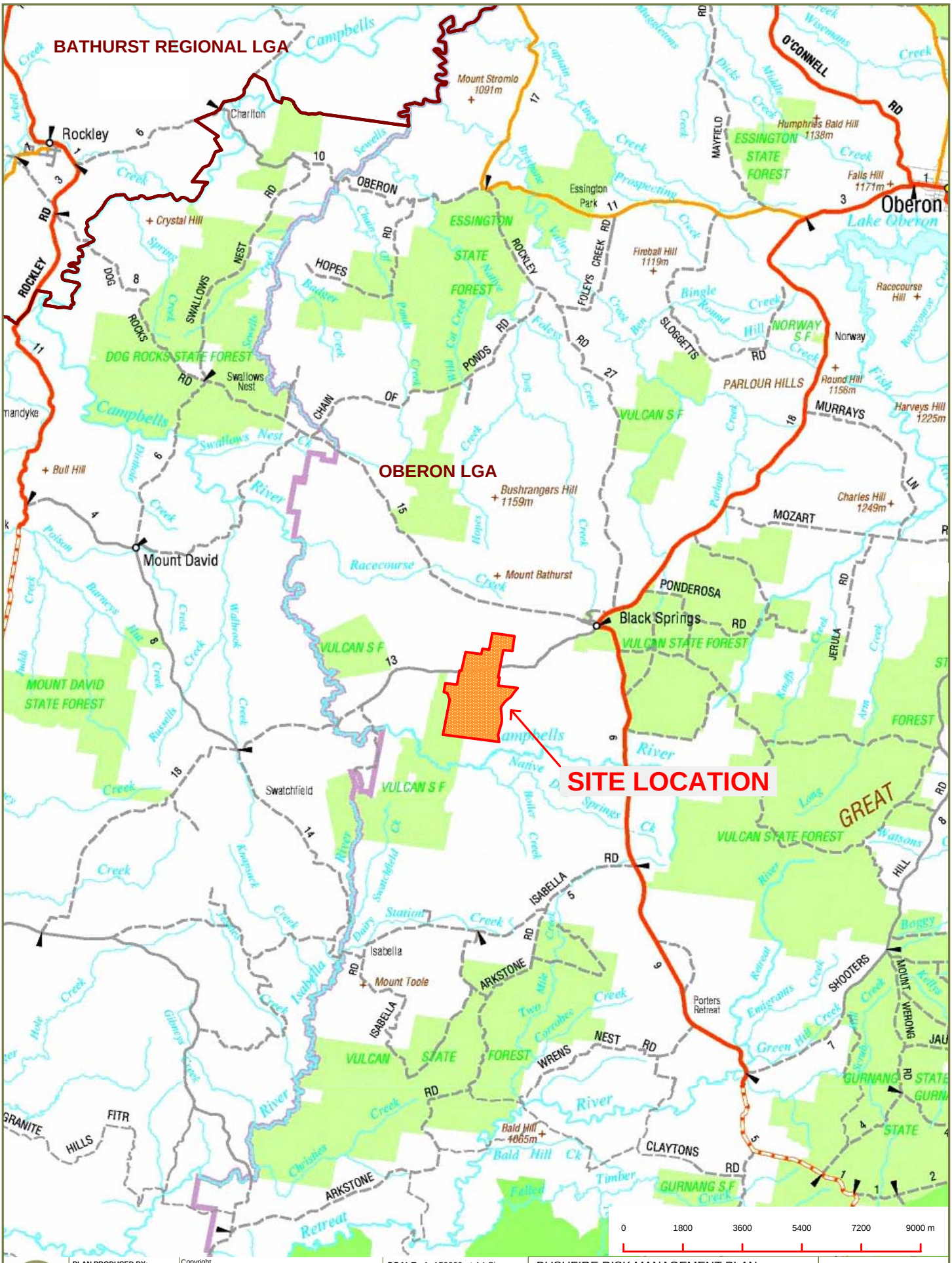
2.2 Description of the proposal

The proposal is known as the BSWF and includes nine wind turbine generators (WTGs) connected via underground cables to a substation and a facilities building. Access roads to the turbines will also be constructed to allow delivery of the turbines and ongoing maintenance.

2.3 The Study Area

The BSWF is to be located within the Shire of Oberon, in the Blue Mountains on the Great Dividing Range west of Sydney. The site is approximately 3km south-west of the village of Black Springs and 25km south-west of Oberon. The two properties being Acqualoria owned by Lorena Mazzotti and Daisy Bank owned by Gavin Douglas

The proposed wind farm covers a total area of approximately 527ha of which the turbines and ancillary structures will cover approximately 0.61ha. The proposal will be situated on two privately owned rural landholdings as listed in Figure 2-1 and **Error! Reference source not found.**.



PLAN PRODUCED BY:
HARPER SOMERS O'SULLIVAN
241 DENISON STREET
BROADMEADOW NSW 2292
PO BOX 428
HAMILTON NSW 2303
T: 02 4961 6500
F: 02 4961 6794
E: survey@hso.com.au
W: www.hso.com.au
ABN: 11 093 343 858

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APPROVED: T. LAMBERT

BUSHFIRE RISK MANAGEMENT PLAN
BLACK SPRINGS WIND FARM, OBERON LGA

FIGURE 2-1

SITE LOCALITY MAP

LAYOUT REF:
J:\JOBS\23k\23219 - Black Springs\Drafting\Mapinfo\Bushfire\23219 - FIG 2-1 SITE LOCALITY MAP-A-A4

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2.4 Topography

The topography of the wind farm site are characterised by a series of rolling hills forming a gentle ridgeline in a north-west – south-east direction. The knolls are separated by shallow valleys with several ephemeral creeks that eventually drain into Campbell's River, located towards the south. The vegetation of the subject site is characteristic of the surrounding area. It consists of large areas cleared, open paddocks covered by grassland with sparsely scattered shade trees. Sheep and cattle grazing are the predominant land use.

The site ranges in elevation between 1100m and 1250m above mean sea level (AMSL). A trig station is located on the Daisy Bank property at an elevation of 1233m AMSL. The high elevation and sparse vegetation results in high average wind conditions with average wind speeds of approximately 6-8m/s (20-30 km/hr).

2.5 Climate

Oberon has four distinct seasons. Frosts occur regularly during autumn, winter and spring. Several snowfalls can be expected each year.

- Average Annual Rainfall - 880mm, spread throughout the year.
- Average Summer Temperature - Day: 21º C Night: 12ºC.
- Average Winter Temperature - Day: 8º C Night: 1º C.

2.6 Vegetation Communities

Large areas of land surrounding the site is used for pine timber plantations and some small remnant forest patches are scattered across the landscape.

Vegetation communities identified within the study area included:

- Cleared Pasture with Scattered Trees (Group 3 Vegetation);
- Narrow-leaved Peppermint - Mountain Gum Open Forest (Group 1 Vegetation); and
- Snow Gum Low Woodland (Group 2 Vegetation).

3 BUSHFIRE RISK MANAGEMENT PLAN

3.1 Aim

The aim of this Bushfire Risk Management Plan is to:

- Describe the bushfire hazards on site;
- Identify the risks to the proposed wind turbines;
- Identify the risks for persons occupying or visiting the site;
- Review the potential to carry out hazard management on the property;
- Provide advice on measures to reduce the risk to life and property, including the provision and maintenance of Asset Protection Zones; and

- Review and provide advice on access/egress and water supply.

3.2 Legislative/Policy Considerations

The bushfire risk management strategies prescribed in this Plan have been developed in accordance with the relevant government policies and plans as set out below.

3.2.1 *Rural Fires Act 1997*

The *Rural Fires Act* was proclaimed in September 1997 and superseded the *Bushfires Act 1949*. The objective of this Act is to provide for:

- The prevention, suppression and mitigation of fire;
- The co-ordination of bushfire fighting and bushfire prevention throughout the State;
- The protection of life and property; and
- The protection of environmental and ecological values.

The BRMP has been developed in accordance with the specific heads of consideration within this Act. These include:

- Section 63(2) prescribes that *"It is the duty of the owner or occupier of land to take the notified steps (if any) and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of bushfires on or from, that land."*
- Sections 100E(1) and 100F(1) establish the legislative provisions under which private land holders can obtain permission to conduct hazard reduction activities. This includes the provisions for obtaining a Bushfire Hazard Reduction Certificate (HRC) from the local authority prior to undertaking any hazard reduction works.
- The provisions of Section 100F(4) establish that a HRC cannot be issued unless a local Bushfire Risk Management Plan applies to the land.

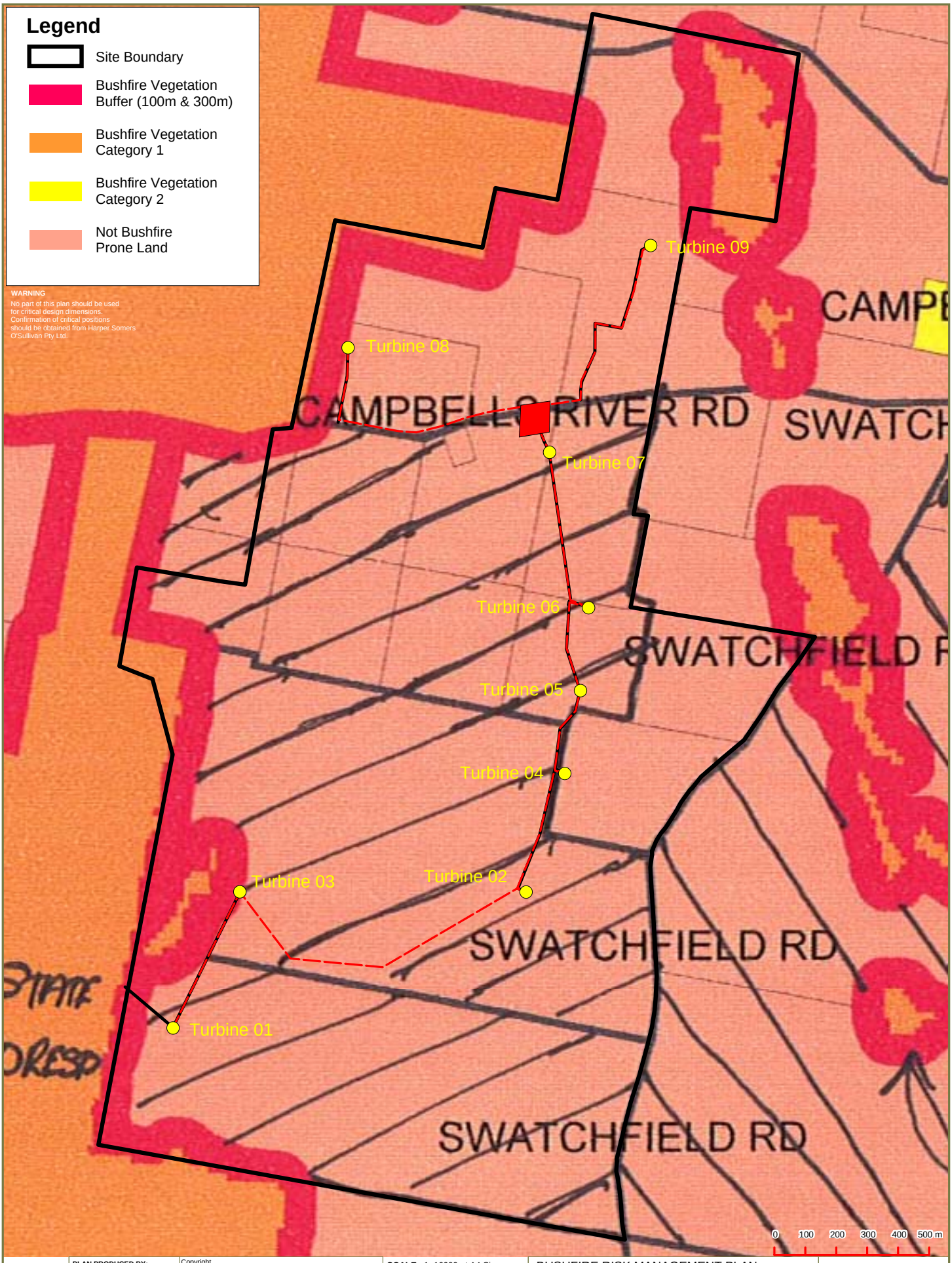
3.2.2 Environmental Planning and Assessment Act 1979

Section 4 of this Act, as amended by the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002,* defines bushfire prone land as '*land recorded for the time being as bushfire prone land on a bushfire prone land map'*. The Act obligates Council (s146) to request the Commissioner of the NSW Rural Fires Service to designate land (if any) within their local government area that the Commissioner considers to be Bushfire Prone Land. Also pursuant to this section of the Act is the need for the bushfire prone land to be recorded on a map. This map is the basis for integrating bushfire assessment into the development assessment process.

Oberon Council in conjunction with the NSW RFS have developed a Bushfire Prone Land Map for the Local Government Area. The majority of the study area has not been mapped as Bushfire Prone Land. The only part of the study area that has been mapped as bushfire prone occurs on land (“Winton Park”) owned by Warwick Turner. These areas of bushfire prone land occurs as small remnant patches of Woodland classified as Group 2 Vegetation in accordance with PBP (NSW RFS, 2001). Refer to Figure 3-1 for Oberon Bushfire Prone Land Maps of the Study Area.

3.2.3 *Rural Fires and Environmental Assessment Legislation Amendment Act 2002*

The *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* amended the *Rural Fires Act 1997, Environmental Planning and Assessment Act 1979* and other miscellaneous provisions of environmental legislation. The intent of the amendments was to simplify and streamline the effective implementation of bushfire hazard reduction, recognising the need to meet ecologically sustainable principles, and to increase the accountability of the various stakeholders in the management of bushfire risk.



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PLAN PRODUCED BY:
HARPER SOMERS O'SULLIVAN
241 DENISON STREET
BROADMEADOW NSW 2292
PO BOX 428
HAMILTON NSW 2303
T: 02 4961 6500
F: 02 4961 6794
E: survey@hso.com.au
W: www.hso.com.au
ABN: 11 093 343 858

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APPROVED: S. JONES

BUSHFIRE RISK MANAGEMENT PLAN
BLACK SPRINGS WIND FARM, OBERON LGA

FIGURE 3-1

OBERON BUSHFIRE PRONE LAND MAP OF THE STUDY AREA

LAYOUT REF: J:\23k\23219 - Black Springs\Drafting\Mapinfo\Bushfire\23219 - FIG 3-1 OBERON BUSHFIRE PRONE LAND MAP OF THE STUDY AREA-A-A4

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4 DESCRIPTION OF BUSHFIRE RISK

Bushfire risk is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community.

The risk of fire at wind farms, or the risk of fire damage to wind turbine generators, is very low, as a result of:

- The height of the wind turbine towers above the ground;
- The lack of vegetation around the base of turbine towers;
- The fact that high-voltage connections are underground;
- Access tracks act as firebreaks and provide good fire fighting access
- Lighting protection devices are installed on every wind turbine; and
- Dedicated monitoring systems detect temperature increases in the turbines and shut them down when the threshold temperatures is reached.

4.1 Effect of Grass Fire on the Wind Turbine

The impact of a bushfire on the wind farm will be very limited. The proposed wind farm is located in an open area (trees cause turbulence in the wind and reduce the commercial viability of the wind farm) and so the surrounding area is comprised of grassland. This sort of vegetation acts as a natural fire break against bush fires.

While grass fires can burn very hot they move quickly and are generally short lived at a given location. Consequently it is very unlikely that the fire would be sufficiently hot, or burn for a long enough period, for it to have any impact on the underground cables. Likewise the flames are unlikely large enough to cause any damage to the blades of the wind turbine generator. Some superficial damage can be expected to the exterior of the wind turbine tower; however there would be no risk of structural heat damage to the tower.

5 BUSHFIRE RISK ASSESSMENT

5.1 Onsite Risk Assessment

Vegetation type and structure, the associated fuel build-up, slope and weather are the major determinants of the rate of spread (ROS) of a fire and fire behaviour, influencing flame lengths, intensity and radiant heat (NSW RFS, 2001). Ember generation is dependant on the fire intensity and resultant convection column and types of fuel consumed such as fibrous barks and leaves (NSW RFS, 2001).

An assessment of the vegetation on site estimates that the grassland community across the majority of the site is capable of accumulating fuels of up to 6 tonnes/ha. As such, the maximum fuel loads for this community would at least meet the requirements of an Outer Protection Area (OPA) being 8 tonnes/ha or less.

Fire may start onsite as a result of accidental or deliberate ignitions, or lightning strikes. The locked perimeter fence reduces the risk of arsonists accessing the site for this purpose. The risk of accidental ignitions onsite can be minimised through the appropriate and careful use of fire and other potential sources of ignition.

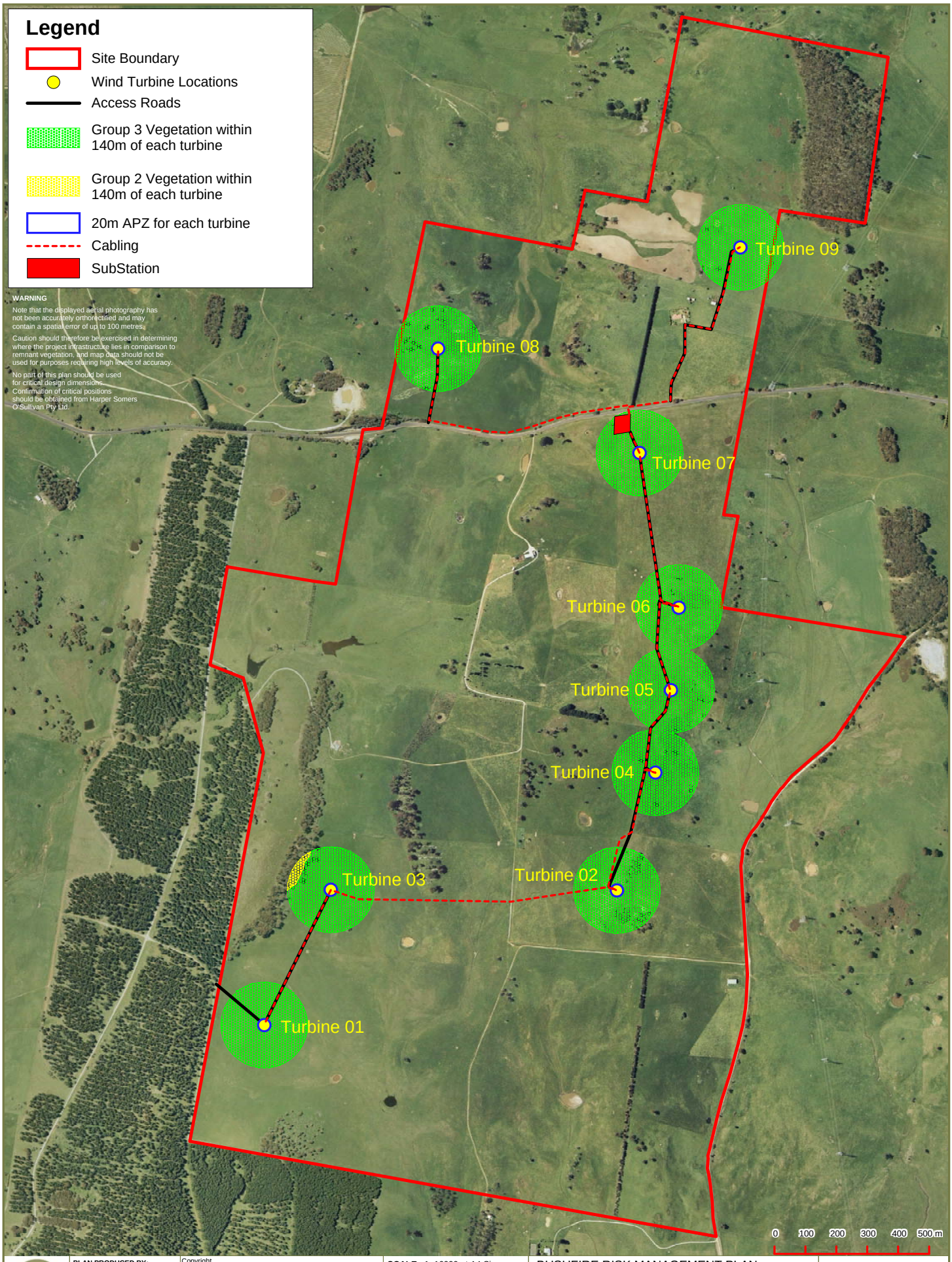
5.2 Risk to Assets

The risk to assets within the study area, given the vegetation type and the current estimated fuel levels onsite (approximately 6t/ha), is considered low.

According to PBP (NSW RFS, 2001) the category of bushfire attack for any asset can be determined based on the distance between any building and an adjacent hazard, the type of hazard, and the slope of the land.

An assessment of risk to the wind turbines as per the specifications of PBP (NSW RFS, 2001) was conducted. Each wind turbine had a 140m buffer placed around it and assessment of risk to the wind turbines as per the specifications of 'Planning for Bushfire Protection' was undertaken.

This assessment showed that Group 3 Vegetation (Grassland) occurred within 140m of each of the nine (9) wind turbines. No woody vegetation occurred within 140m of the wind turbines. The closest woody vegetation to any turbine was Group 2 Vegetation (Woodland) that occurred 140m from wind turbine number 3. Refer to Figure 5-1 for Vegetation Map. Therefore, regardless of slope the resulting category of bushfire attack as per Table A3.3 of PBP (NSW RFS, 2001) is "Low". The expected fire behaviour of this category includes insignificant ember attack, radiation no greater than 14.5 kWm^{-2}. Refer to Figure 5-1 for Vegetation Map and Appendix A for photographs of vegetation.



HARPER SOMERS O'SULLIVAN

PLAN PRODUCED BY:
HARPER SOMERS O'SULLIVAN
241 DENISON STREET
BROADMEADOW NSW 2292
PO BOX 428
HAMILTON NSW 2303
T: 02 4961 6500
F: 02 4961 6794
E: survey@hso.com.au
W: www.hso.com.au
ABN: 11 093 343 858

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APPROVED: S. JONES

BUSHFIRE RISK MANAGEMENT PLAN
BLACK SPRINGS WIND FARM, OBERON LGA

FIGURE 5-1

VEGETATION MAP

LAYOUT REF: J:\JOBS\23k\23219 - Black Springs\Drafting\Mapinfo\Bushfire\23219- FIG 5-1 VEGETATION MAP-A-A4

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6 BUSHFIRE RISK MANAGEMENT STRATEGIES

6.1 Fire Risk During Construction and Strategies

Fire is a risk that needs to be considered in any construction activity and the construction of wind farms is no different. Dealing with risks is relatively well understood and can be appropriately managed through construction occupational health and safety management plans. It is recommended that the following occurs during construction of the wind farm:

- No smoking on site except in prescribed areas.
- All vehicles to carry emergency communications equipment.
- All vehicles to carry fire extinguisher or fire fighting equipment.

6.2 Vegetation Management and Fuel Reduction

The following information provides guidelines for vegetation management around the wind turbines onsite. This information can be used to manage the site in a manner that affords an adequate level of protection to both assets and life.

For vegetation management and fuel reduction purposes for the wind turbines two management options are recommended these are:

- Asset Protection (Section 6.3); and
- Access Road (Fire-trails) (Section 6.4)

The extents of each of these recommended management options are depicted on Figure 6-1.

6.3 Asset Protection Zones

An Asset Protection Zone (APZ) is a managed area surrounding an asset designed to reduce bushfire fuels to a level that will minimise the risk of a fire to that asset (NSW RFS, 2003). As defined by PBP (NSW RFS, 2001) an APZ can consist of an Outer Protection Area (OPA) and an Inner Protection Area (IPA). The OPA is located adjacent to the hazard and is an area where fuel loadings are reduced. The IPA usually extends from the edge of the OPA to the asset. The purpose of the IPA is to ensure that the presence of fuels close to the asset are minimised.

The APZ specifications of PBP (NSW RFS, 2001) and maximum widths for each of the wind turbines onsite are based on vegetation type. The vegetation type surrounding each of the wind turbines is classified as Group 3 Vegetation as per with PBP (NSW, RFS). Therefore, in accordance with Table A2.4 of PBP (NSW RFS, 2001) an APZ of 20m should be established around each of the wind turbines. This 20m APZ should be comprised entirely of a 20m IPA.

6.3.1 PBP Guidelines for APZs

The performance of the IPA must be such that:

- there is minimal fine fuel at ground level which could be set alight by bushfire; and
- the vegetation does not provide a path for the transfer of fire to the asset – that is the fuels are discontinuous.

The presence of a few shrubs or trees is acceptable provided that they:

- do not touch or overhang the asset;
- are well spread out and do not form a continuous canopy;
- are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
- are located far enough away from the asset so that they will not ignite the asset by direct flame contact or radiant heat emission.

Given the above performance requirements of an IPA, the current state of the vegetation surrounding each of the proposed wind turbine locations would meet this performance requirement. However, it is important that these areas are maintained for the life of the development.

6.4 Access

Access in and out of the site is important for two reasons in relation to managing the risk of bushfire. Firstly, suitable access for fire fighting crews is important for the protection of life and property during a fire and for the safe conduct of hazard reduction activities. Secondly, access is important for allowing effective egress in an emergency.

The private access road leading to the wind turbines should comply with the design criteria of PBP where possible. Design criteria relevant to the private access road on the site are:

- The capacity of the road surfaces and any bridges should be sufficient to carry fully loaded fire fighting vehicles (approximately 28 tonnes or 9 tonnes per axle);
- Roads should provide sufficient width to allow fire fighting vehicle crews to work with fire fighting equipment about the vehicle:
    - a minimum vertical clearance of 6 m to any overhanging obstructions, including tree branches;
    - minimum trafficable width of 4 m with an additional 1 m wide strip on each side of the road kept clear of bushes and long grass.

The proposed access road will be a minimum of 4m wide and will have clearing of at least 1m on either side.

There are a number of existing trails through the remainder of the property that can potentially be used as access for fire fighting purposes, and for prescribed burning activities (if necessary).

It is recommended that in order for these trails to be used for **fire fighting** purposes a number of actions must be taken. Such actions include:

- RFS access (keyed) to the locked gates on the property;
- Designation of trail levels;
- Preparation and submission of plans detailing fire trail locations;
- Documentation showing an appropriate level of maintenance on trails; and
- Annual inspections.

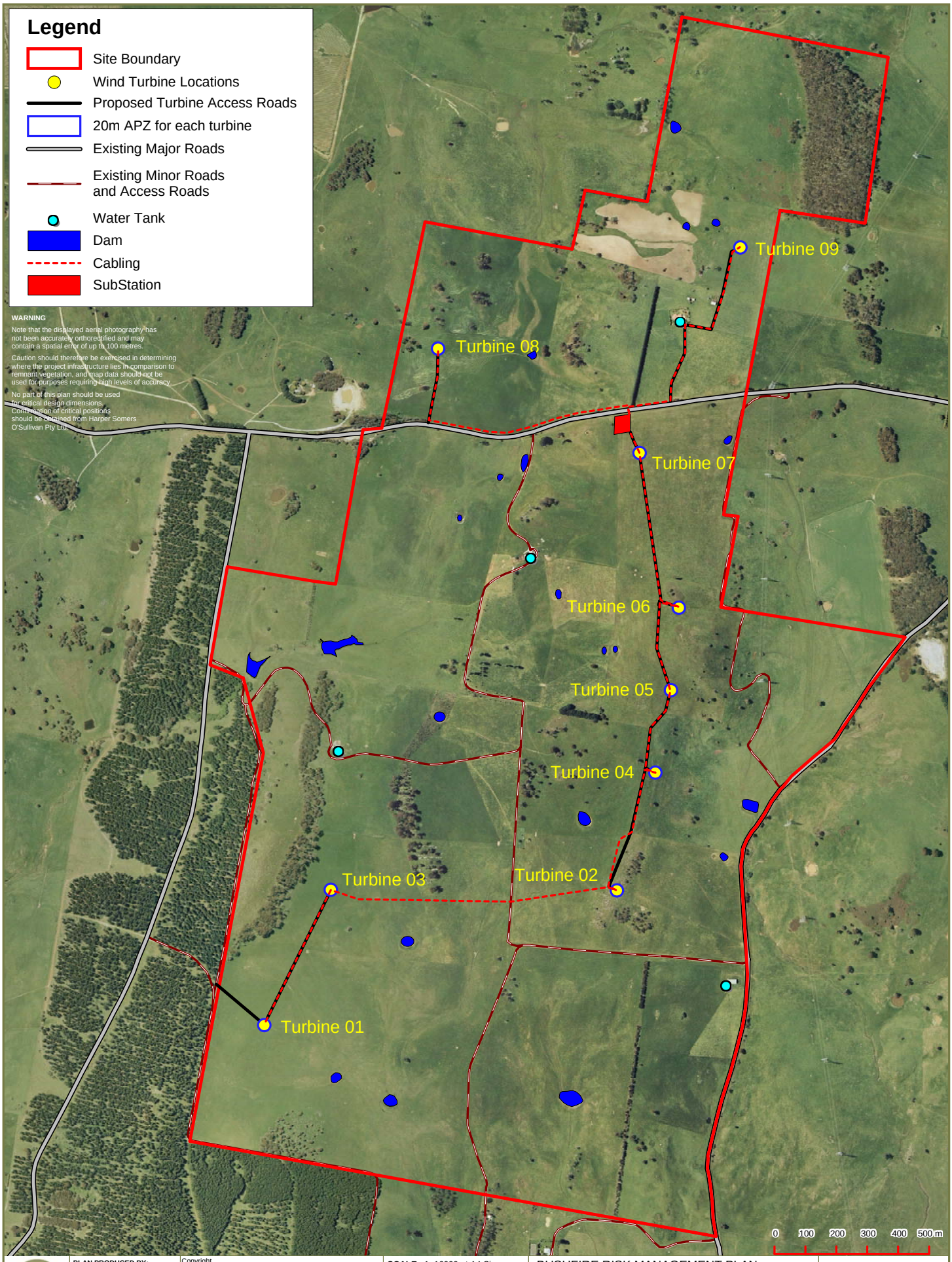
6.5 Water Services

All measures should be taken to maintain a water supply for fire fighting purposes to ensure the safety of fire fighters, life and property. The site is not connected to town reticulated water supply and maintaining a water supply will enable water replenishment for fire fighting tankers during the emergency.

Dams are an appropriate secondary supply of water on occasions where a dedicated supply, as outlined above, is not available. The RFS have indicated that the fire fighting units can draw water from such sources if need be.

6.6 Local Emergency Response

Calls to the emergency 000 number are likely to trigger an initial response from the closest Rural Fire Service Stations. Calls may also trigger a response from various other emergency authorities including State Forests.



HARPER SOMERS O'SULLIVAN

PLAN PRODUCED BY:
HARPER SOMERS O'SULLIVAN
241 DENISON STREET
BROADMEADOW NSW 2292
PO BOX 428
HAMILTON NSW 2303
T: 02 4961 6500
F: 02 4961 6794
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BUSHFIRE RISK MANAGEMENT PLAN
BLACK SPRINGS WIND FARM, OBERON LGA

FIGURE 6-1

BUSHFIRE MANAGEMENT STRATEGIES

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7 CONCLUSIONS & RECOMMENDATIONS

The risk management strategies provided within this Plan have been developed in accordance with the appropriate legislation, policies and statutory documents. They have been designed to protect life and property onsite. Recommendations have been made for strategies to manage this risk.

Strategies include management of the vegetation onsite, provision of adequate services such as access and water supply for use during a bushfire emergency.

7.1 Recommendations

During construction

- No smoking on site except in prescribed areas.
- All vehicles to carry emergency communities equipment.
- All vehicles to carry fire extinguisher or fire fighting equipment

Implement Asset Protection Zones

- A 20m APZ should occur around each of the wind turbines. This 20m APZ is to be comprised entirely of a 20m IPA.

Provide and Maintain Suitable Access

Establish and maintain access to the wind turbines onsite:

- minimum trafficable width of access road to 4 metres with an additional 1 metre strip on each side of the road clear of bushes and long grass.
- minimum vertical distance of 6 m to overhanging obstructions.

Water Services

Provide access to dams within the site for fire-fighting purposes. Dams are an appropriate secondary supply of water on occasions where a dedicated supply, is not available. The RFS have indicated that the fire fighting units can draw water from such sources if need be.

Overall, this assessment has shown that the proposed wind farm will not impact upon bushfire behaviour and if the above recommendations are implemented they would contribute to reducing the impact of any potential bushfire upon the wind turbines.

8 BIBLIOGRAPHY

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9 ACKNOWLEDGEMENTS

Thanks to Ralph Tambasco (Oberon Council) and Terry O'Toole (NSW, RFS) for advice in regards to managing bushfire risk for this proposed development.

APPENDIX A PHOTOGRAPHIC RECORD

Photo 1 - Location of wind turbine No. 1. Showing Group 1 Vegetation in foreground and Pine Plantation in background.

Photo 2 - Location of wind turbine No. 2. Showing Group 3 Vegetation.

Photo 3 - Woodland to the west of wind turbine No. 2.

Photo 4 - Woodland to the west of wind turbine No. 3.

Photo 5 – Location on wind turbine No. 4. Showing Group 3 Vegetation

Photo 6 – Location of wind turbine No. 5. Showing Group 3 Vegetation

Photo 7 – Location of wind turbine No. 6. Showing Group 3 Vegetation.

Photo 8 - Location of wind turbine No. 7. Showing Group 3 Vegetation.

Photo 9 – Location of wind turbine No. 8. Showing Group 3 Vegetation.

Photo 10 - Location of wind turbine No. 6. Showing Group 3 Vegetation.