Hills of Gold Wind Farm

Submission

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Introduction

I was a resident of Hanging Rock from 1980 until 2016. We owned a grazing property bordering on Ben Halls Nature Reserve. We sold the property to National Parks in 2016. During that time, I acquired considerable knowledge about the climate, geography, ecology, hydrology and an understanding of the unique nature of the region.

Overview

The Hills of Gold Wind Farm project is proposed for a unique Location. There are no other wind farms situated at an altitude of 1200 to 1400 metres with a steep escarpment to the north, west and south, at the headwaters of three major river systems and at the intersection of three bioregions. Comparisons with other locations to illustrate the impacts of the Hills of Gold Wind Farm are irrelevant.

A result of the unique nature of the location is that the area contains several rare ecosystems and vegetation associations that cannot be replicated elsewhere in the form of offsets.

The area contains numerous springs which feed the tributaries of the Hunter, Manning and Namoi river systems. The springs on the western fall feed the Peel River which is the major water source for Tamworth City. This water is stored in Chaffey Dam for Tamworth City, irrigation supply and environmental water. The groundwater reserves stored within the mountain can maintain the flows in the Barnard River, Pages Creek and Peel River during periods of low rainfall or drought. The extended recent drought has depleted the groundwater reserves to an extent not seen since colonisation. This is particularly relevant for the Peel River and Tamworth City water supply.

The current state of groundwater recharge for the Peel River demonstrates a requirement to ensure that a comprehensive and peer reviewed hydrological and geotechnical assessment of the potential impacts on the Peel River and Chaffey Dam inflows.

It can be assumed that when the mountain replenishes after the long drought the water will come out, the question which must be answered is: "What impact the development will have on where the water comes out."

Numerous first order streams originate in the Project Area the majority of which are fed by springs at their source. The importance of these springs and the groundwater system in and below the Project Area to maintaining a flow into Chaffey Dam cannot be understated. The potential impact of up to 70 turbines requiring foundations in excess of 400m^3 of steel and concrete sunk into the ridges feeding the Peel River has not been addressed in the EIS.

The possibility that the nature of the site requires much more highly engineered foundations to cope with the high rainfall, steep and unstable conditions has not been dealt with in the EIS.

The nature of the terrain, geology and high rainfall, and the need for extensive "cut and fill" engineering will potentially require high levels of compaction and the site and access roads to be de-watered to ensure the stability of structures in the project area and access routes.

A study of the Bushfire Assessment indicates a desk-top study with no on-ground verification. The Soil and Water Assessment also shows an absence of on ground assessment. The Biodiversity Assessment does show some on-ground work, however large sections of the information are generic and may not be relevant to the Project Area.

It appears that large sections of the information contained in the EIS is generic. As a result, the document is of limited value in assessing the impacts of the proposed development. Many of the photographs, illustrations and examples shown in the EIS are not relevant to the Hills of Gold Wind Farm Project Area. This demonstrates the need for a more comprehensive on-ground assessment of the site and access routes to the Project Footprint from the public road network.

The need to decarbonise the economy is undisputed. The scientific data is clear that the planet must become carbon neutral by 2050 to avoid catastrophic global warming. To achieve this the development of carbon neutral energy sources it is essential and that wind and solar generation will play a major role.

However, the suitability of locations for renewable energy projects must be considered when siting these projects. The location of the Hills of Gold Wind Energy project is unsuitable for such a development. When considering the potential hydrological impacts on the Namoi, Hunter and Manning Valleys, the environmental damage required for construction and transportation, turbulent air flows over the ridgeline and the complex engineering requirements, the location of the Hills of Gold Wind Energy project must be considered unsuitable. While it is possible to identify a more suitable location for the generation of 420mw of renewable energy it is not possible to move the major water source for Tamworth City's water supply to another location.

APPENDIX J BUSHFIRE ASSESSMENT

Bushfire Risk

The bushfire assessment is inadequate for a project such as the Hills of Gold Wind Farm. Much of the information is generic in nature with virtually no site-specific data. This is not surprising as a planned site visit by the plan author did not eventuate.

The unique nature of the Project Area and surrounds cannot be assessed without on-ground site assessment, comprehensive study and understanding of the variations within the area. Fire behaviour and management are influenced by altitude and slope. The high ridge contains sub alpine vegetation which requires hot fire (not wildfire) at long intervals to maintain ecological integrity. However, the vegetation types, fire behaviour and management regime changes rapidly as altitude falls. The change occurs within a decent of 30 metres. Much of the sub alpine vegetation in the Development Footprint has been removed since 2014.

The bushfire history mapping is inaccurate. A major fire in 2009 which occurred mostly in the Project Area is not recorded, a significant fire in 1994 bordering the Project Area is not recorded and the full extent of the Pages Creek fire is not shown.

There is a contradiction regarding the availability of the "Nycooma" dam for aerial firefighting.

The temperature and wind data from Tamworth Airport and Quirindi Post Office are not particularly relevant to the Project Area. The rainfall data from Nundle Post Office and "Head of Peel" is up to 50% lower than rainfall in the Project Area.

The proponent must be required to reassess the bushfire issues with on-ground investigation and more accurate information. See detailed comments on sections of Appendix J below.

Table 2.2 Summary of Key Consultation

Page 10

NPWS:

Ridge line above steep country north, south, west. Important for Pages Creek Fire control. Dam on "Nycooma" vital water source. Important that it is maintained. Important to minimise helicopter lift. Helicopters require obstacle free approach and departure.

Proponent Response

- *Ensure that Project does not reduce or restrict access along this ridgeline.*
- *Increase water supply along ridgeline for both vehicle and aerial firefighting.*
- *"Nycooma" dam may not be available.*

Comment

The location of turbines along the ridge line will preclude the safe operation of helicopters extracting water from dams along the ridgeline. A turbine (WP21 and the Battery (BESS) will restrict access to the "Nycooma" dam. The space of turbines along the ridgeline will be a limiting factor for aerial firefighting.

The best location for helipad, staging area and refuge area is restricted for helicopter access by turbines WP54, WP55, WP56, WP57.

Page 11

Brian Tomalin:

Hanging Rock Village is particularly vulnerable to fires due to limited escape options and limited fire trails to defend the village.

Proponent Response

Site access points will be constructed as the first stage of development and the final design of access roads will enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.

Comment

Outside the Project Area there are limited options for containment lines and fire trails. The nature of the terrain and vegetation can result in the closure of access roads, particularly for the evacuation Hanging Rock Village, which also limits the ability of emergency crews to gain access to the top of the mountain if a fire is approaching from the south or west.

Brian Tomalin:

Opportunities to do hazard reduction burning are being significantly reduced and Indigenous land use practices should be explored.

Comment

A misrepresentation of what was said. Indigenous management created the ecosystems we are dealing with; however, vegetation or ecosystem management needs to be adapted to today's conditions. Sympathetic small scale burning should be the basis of the management strategy. However, the area in question requires differing strategies depending on altitude and aspect. The project area and surrounding landscape contains sub alpine vegetation, cool temperate rainforest dry sclerophyll forest, native and introduced grassland with variations in altitude, temperature and rainfall. All these factors dictate the need for a range of specific vegetation and fire mitigation strategies. A descent of as little as 30 metres in altitude required a different vegetation and fire management regime.

Table 3.1 Identification of Assets

Page 17

Biodiversity

A Biodiversity Development Assessment Report (BDAR) has been prepared by Arup Pty Ltd (Arup 2020) and confirms that the Project Area has a long history of agricultural use, specifically cattle and sheep grazing.

Comment

The properties within the project area have a history of sheep and cattle grazing. The majority of the area from WP1 to WP22 excluding WP21; WP39 to WP42; WP46, to WP58 was not cleared for grazing prior to 2014. (Appendix 1)

Threatened flora

Comment

Fragrant Pepperbush (*Tasmannia glaucifolia)* is not identified. A stand of Fragrant Pepperbush was bulldozed to provide access road to Project Area. (31.333°S 151.094°E)

3.2 Climate and Fire Weather

Pages 22 to 25

3.2 Climate and Fire Weather

3.3 Climate Change and Bushfires

Comment

The temperature and humidity data provided for Quirindi Post Office and Tamworth Airport is not applicable to the Project Area and does nothing more than confirm that temperatures in summer are hotter than in winter.

The temperature in the project area is between 10˚C to 15˚C cooler than Tamworth or Quirindi, both summer and winter.

High rainfall in the project also induces higher humidity than both Quirindi and Tamworth. The rainfall data used for the EIS is taken from Nundle Post Office and the BOM gauge at "Head of Peel".

The rainfall records from my property adjoining Ben Halls Gap Nature Reserve from 1981 to 2014 average 1109mm pa. These records are at 850m. (Appendix 2). Landholder records for 132 Morrisons Gap Road (31.305°S 151.113°E) indicate an average of 1266mm 1.5km north of the Project Area. (Appendix 3).
My experience in the area as well as working on "Nycooma" indicate that the annual average in most of the Project Area is in the vicinity of 1500mm.

The result of high rainfall, higher humidity and lower temperature is that fire conditions are considerably different to the surrounding areas at lower altitudes.

The wind direction data recorded at Quirindi does give a general indication of the wind direction in the Project Area. However, the wind speed over the ridge where the project is proposed is often much stronger and the topography induces high turbulence as the wind passes over the steep escarpments either side of the project area.

These factors including the high altitude (1200m to 1400m), the sub alpine vegetation, long fire intervals resulting in high fuel loads, require a site-specific assessment to adequately assess the bushfire risk in the project area. A generic bushfire assessment is not an adequate approach.

3.4 Vegetation Hazard

Table 3.2 Description and Characteristics of Fuel Groups within the Project Area
Pages 26-31

Comment

The fuel groups and characteristics while based on Keith are generic and not site specific to the project area. Ground truthing is required to accurately assess the vegetation types, associations, and characteristics specific to the project area and particularly Ben Halls Gap Nature Reserve and Crawney Pass National Park. This will give a better understanding of the unique vegetation types and associations which occur within the region.

3.5 Topography

Page 32

Recent research has shown that dynamic fire behaviour can occur on steep slopes of over 24-26 degrees. Areas downwind of these slopes can be exposed to a much greater fisk of damage than normal, due to the occurrence of dynamic fire propagation and the development of catastrophic "firestorms". In the case of eruptive fire behaviour, the spread will be dominated by convective heat transfer (by strong air movement) rather than radiant heat transfer alone. In addition, eruptive fires may produce a larger area of active flame than the standard fire front, which makes containment of a bushfire more difficult.

Comment

Firestorms are not the only threat of erratic fire behaviour to the project and surrounding area. The topography of the surrounding area with steep slopes below the escarpments with either grass or timber cover are conducive generating ember showers. As a fire runs up the slopes with the intensity fuelled by wind and slope a smoke column is generated carrying hot, burning embers. As the fire front crests the summit and starts down the other side of the slope the smoke column will lose energy and collapse allowing the wind to carry the embers a considerable distance. A fire some distance from the project area at a lower altitude can ignite spot fires on the Project Area and a considerable distance on the opposite side.

The village of Hanging Rock is particularly vulnerable to the effect of an ember shower from the south and west. A fire originating near the northern end of the project area could pose a significant threat if early aerial attack it is hindered by the presence of wind turbines. Response times for ground crews to the location is constrained by distance, topography and availability.

5.1 Fire history within the Project Area

Page 36-37
Table 5.1and Figure 5.1

Comment

There are inaccuracies in the information provided in both Table 5.1 and Figure 5.1
Not all fires impacting on the Project Area are recorded.
Pages Creek Fire burnt to Morrisons Gap Road through the 2019 hazard reduction.
Fires directly impacting the Project Area not included:

- Caves and Caves North – 08/12/2009 to 18/12/2009 (Sergeants Gap Road in south to Kirks Road in north) (Appendix 3)

Fires bordering the Project Area to the east

- Honeysuckle Creek 25/09/1994 to 05/10/1994

Fires close to the Project Area (not recorded)

- Bradshaw's Creek 23/12/2009 to 28/12/2009 mapped but not in Table 5.1
- Morrisons Gap Road (Mt Sheba) 2019

Fires ignited by lightning
1982 BHGSF/Nycooma lightning
2002 Gulf Mountain/Gogs Complex lightning
2002 Nycooma lightning
2009 Caves/Caves North lightning
2009 Chittick lightning
2019 Morrisons Gap Road (Mt Sheba)
2019 Pages Creek

5.3 Fire behaviour potential

Page 39
A fire under the influence of wind may travel upslope very fast, reaching assets before firefighters can attend the scene.

Comment

A generic comment not, site specific. The extreme gradient of the slopes surrounding the project area will influence the speed of fire travel without the influence of strong wind. The speed of fire travel up the escarpments could pose a threat to live and safety of personnel within the project area. The nature of the terrain means that fire may not be detected before the site is overrun or could be evacuated safely.

No specific modelling is available for the project area. RFS modelling of a fire starting near the Nundle Sawmill, on a day of mild conditions could engulf Hanging Rock Village within 2½ hours if not controlled within the first hour. A distance of approximately 4km with a rise of 400 metres. The speed of spread is influenced by slope not weather in this instance. (Appendix 4)

5.4 Firefighter and public safety

Page 53
As reported by AFAC (2018) wind farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation (Australian Wind Energy Association 2004). The risk of radio communications affecting emergency response operations would be considered in the planning stages of the development however is expected to be manageable.

Comment

Experience during fires within and surrounding the project area has shown difficulties with radio communications due to black spots caused by the terrain and forest conditions.

The information in not site specific and should be assessed on ground.

Table 5.4 Summary of Bushfire Risk Factors

Page 55

Natural ignitions such as lightning strikes are likely and historically common across the region. Human induced ignitions (both accidental and arson) are also known to occur. The risk of the fire starting as a result of a lightning strike is actually reduced by the presence of wind turbines. A built-in lightning protection system safely dissipates the electricity from the blades or the nacelle into the ground.

Comment

Research indicates that the height of the towers increases the incidence of lightning strikes particularly on mountains. *"It has been observed that number of lightning strikes to tall structures and the percentage of lightning discharges initiated from the structure, what we call upward lightning, increase with tower height."*
(A Calculation Method of Effective Height of Structures in Lightning Studies - Takatoshi Shindo [IEEJ Transactions on Power and Energy Vol.132 No.3 pp.292–293 DOI: 10.1541/ieejpes.132.292])

Research also indicates a possibility of increased lightning strikes in the vicinity of wind towers although a variety of factors influence the incidence of lightening in the surrounding area. *"If a tall structure constructed, number of cloud-to-ground lightning flashes around the structure may increase or decrease by the effects of the structure. Several studies have been carried out to clarify the effect.*
Saito et al. [61] investigated the lightning striking characteristics to wind turbines in the coastal area of the Sea of Japan. They compared the lightning density around a wind turbine and found that the lightning density in the area within 3 km from a wind turbine is several times larger than that in the area 9 km from the wind turbine. They call it a 'hot spot'. The increase of lightning in the area is due to the occurrence of upward lightning from the wind turbine . . ."
"However, an increase in the number of lightning occurrences by the construction of wind turbines has been observed in Europe [62,63]. In Ref. [62], number of lightning strikes within about 1 km of a wind turbine is compared with that in a reference area that is 2.5–3 km from the wind turbine at 50 onshore and 2 offshore sites. Observation data by the European Cooperation of Lightning Detection (EUCLID), which is a LLS operated in Europe, show that the number of lightning strikes around wind turbines was higher than those of the reference area by 64.1% for negative strikes and 28.7% for positive strikes, on average. Note that the increase does not appear at all sites; in fact, the number of lightning strikes decreased after the construction of a wind turbine in some sites."
(Lightning Striking Characteristics to Tall Structures - Takatoshi Shindoa [IEEJ TRANSACTIONS ON ELECTRICAL AND ELECTRONIC ENGINEERING
IEEJ Trans 2018; **13**: 938–947])

Considering the close proximity of the ecologically sensitive Ben Halls Gap Nature Reserve and Crawney Pass National Park to the Project Footprint the potential risk of increased lightning strikes within a 1 to 5 kilometre of the Project Area is an unacceptable risk.

Research shows that there will be an increased lightning intensity around the towers. Irrespective of the effectiveness of the lightning protection methods built into the towers and blades a the probability that lightning could cause equipment failure and ignite a fire in the turbine exists. If the engineering design of the lightning protection cannot be assessed with a risk profile of "Exceptionally Unkilely" the risk probability is unacceptable for the location of the Project.

Page 56

Bushfire at Waterloo Windfarm: During this event transmission infrastructure, meteorological towers and guy-ropes were difficult to see; this infrastructure does have potential to limit the effectiveness of aerial firefighting operations.

Comment

Detailed design features of the Project need to be completed before assessment of the impact on infrastructure on aerial firefighting operations.

TABLE 5.4 Summary of Bushfire Risk Factors

Page 61

Damage to ecological values/assets
The risk that wind farm itself will cause a fire is minimal.

Comment

The possibility of equipment failure appears to be discounted. While fires in wind turbines is not common the presence of large quantities of oil in mechanical components and electrical equipment and lightning strike means that there is a potential fire risk. The location of the Project Footprint in close proximity to the ecological sensitive and scientifically valuable Ben Halls Gap Nature Reserve poses a risk of burning material igniting a fire outside the Project Area.

Considering the height of the towers and high velocity of the wind over the wind turbines should not be positioned within 500 metres of the eastern boundary of the Project Area.

6.1 Asset Protection Zone

Page 62

The specifications recommended for the APZ are as follows:

- *APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners. This includes the neighbouring National Parks estates;*
- *Mineral earth fire break ie dirt of gravel;*
- *No trees and shrubs planted within the APZ; and*
- *Where possible, increase the distance between the trees and the APZ.*

Comment

Due to the high rainfall and steepness of the terrain mineral earth containment lines should be allowed to grass over until required for fire suppression during periods of active fire. Mineral earth tracks are prone to developing gutters in periods of high rainfall.

Increasing the distance between trees and the APZ may not be possible for WT40 to WT44 due to the proximity of BHGNR on the east and the escarpment on the west.

6.6 Water Storage

Page 67

The large dam on Nycooma (31°37.781'S 151°8.476'E) was used as a water supply for both vehicles and aircraft during the 2019/2020 bushfire season. As the wind farm development aims to increase the accessibility of the ridgeline to fire fighters and improve strategic fire advantages that already exist, access to water will be maintained such that existing water resources will remain available at all times to support firefighting activities. The requirement for any additional open water supplies (ie large dams) to be provided along the ridgeline will be confirmed in consultation with NSW RFS.

Comment

The availability of the Nycooma dam is contradictory with Table 2.2 Summary of Key Consultation on Page 10.

Page 10

Proponent Response

- *Ensure that Project does not reduce or restrict access along this ridgeline.*
- *Increase water supply along ridgeline for both vehicle and aerial firefighting.*
- *Nycooma dam may not be available.*

Comment

The siting and spacing between Wind Turbines may preclude the safe operation of helicopters drawing water if sites for large dams with reliable inflow are constructed along the ridgeline. Maintaining the availability of the Nycooma dam for helicopters during firefighting operations must be a priority.

APPENDIX O: SOILS AND WATER

The complexity of soils and water issues in the Project Area and surrounding landscape requires that these aspects be dealt with as separate issues to enable adequate coverage of each issue.

The report is no more than a desk top assessment of some of the available data without ground truthing leading to inaccurate assumptions and misleading conclusions.

The soil pH figures are considerable higher than those recorded on site. While working on "Nycooma" 1983-1986 we conducted extensive soil analysis in conjunction with UNE. Recorded pH was between 3.5 and 3.9. Pot trials showed a requirement of lime at 25 tonne per hectare to elevate pH to 6.5.

Another indication of highly acid soils is steel fence posts rotting off at ground level. If too low to the ground the bottom wire in fences will rot and break within 10 years.

The soil along the ridgeline where the Project Footprint is located is low pH and increasingly aluminium toxic as it rises from "Molonga" to "Nycooma". The impact of the high acid soils on concrete and steel foundations requires further investigation.

The soil classification classes appear to be inaccurate. The 1997 Protected Lands maps show steep and vulnerable land covering a more extensive area than shown in Land and Soil Capability Map provided.

The Project Area is located on a high rainfall (1500mm pa), steep escarpment, basalt cap which is prone to mass movement. This aspect has not been covered in the EIS or Appendix O.

A more comprehensive, peer reviewed assessment of soils and water is required and should be treated separately.

1.6 Climate

1.6.1 Rainfall

Page 9

Climate data is available from BoM weather stations located at Nundle Head of Peel Station No. 055336) which is located within the Project Area, and the Nundle Post Office NSW (station No. 055041) located approximately 8.5km north west of the Project Area.

The Nundle Head of the Peel weather station is located at elevation of approximately 785m, whilst Nundle Post office sits at 595m.

Comment

The weather stations are located between 300m and 500 metres lower in altitude than the lowest turbine. The difference in rainfall between the gauge locations and the Project Footprint is in the vicinity of 650mm per annum. A more accurate assessment of the rainfall in the Project Footprint would be obtained from the Molonga gauge (No. 0555335) at 1200m and Andeva gauge (No. 055200) at 1100m.

Although unofficial records, landholder data from Morrisons Gap Road give a better indication of rainfall in the Project Area than either the Nundle Post Office gauge or the Head of the Peel gauge at one of the lowest points of the Project Area. (Appendix 3). Rainfall totals rise as the altitude increases towards Mt. Wombramurra.

The rainfall in the Project Footprint will have a significant impact on the engineering requirements in order to ensure the stability of the construction in a location prone to mass movement and high flow and high velocity events during periods of wet weather.

This has not been addressed in the EIS.

Water Assessment

Page 14

Groundwater extraction

Although the depth of groundwater within the Project Area has been recorded at 28m (GW967488), landowner discussions have suggested groundwater depth extends beyond 60m in other areas. In addition, any excavations are relatively shallow, with the turbine foundation construction activity at approximately 3m-5m and cuttings approximately 10m-15m, therefore it is not expected that the proposed construction activities would intercept groundwater.

Page 18

3.2.1 Groundwater Pumping

Six groundwater bores are located within the Project area. GW967488 is recorded to intercept groundwater at a depth of 28m and had a yield of 1.26l/s.

Page 18

3.2.2 Surface Water Abstraction

Review of online river flow data (available at https;//realtimedata.waternsw.com.au/) indicated that the Peel River at Taroona (41908) had a daily flow rate or around 109ML/day, as recorded on 19 August 2020.

Comment

The the Project Area and the Project Footprint lie at the top of the major source of water for Chaffey Dam. Notwithstanding the impact of the long drought conditions and severe rainfall deficiencies experienced for the last decade, history has shown that the mountain from Crawney Pass to Hanging Rock is able to maintain flows into the Peel River and Chaffey Dam during periods of exceptionally low rainfall.

The mountain is in effect a big sponge. A basic understanding of hydrology shows that when the rain stops it is groundwater that keeps the rivers flowing.

In all but the driest periods a series of springs along the watershed where the Project Footprint is located start the process and maintain flow and moisture in the numerous first order streams which is then bolstered by springs as the stream order develops down the mountain. The process of maintaining moisture in the gullies and first, second and third order streams is essential to minimise evaporation and drying to maintain flows into the Peel River and Chaffey Dam.

It is acknowledged that at the present time the "big sponge" is still recovering from the extended drought when most of the springs ceased to flow. With the rainfall in January 2021most springs are now working, however a study of the flow pattern of the river gauges on the Peel River at the Pearly Gates and Taroona shows that as soon as the rain stops the flow drops dramatically. This is a clear indication that the groundwater has not yet recovered. Data from the Pearly Gates gauge will give a more accurate indication of the potential impact of the development on Peel River flows than the Taroona gauge. The Taroona picks up inflows from north of the Project Area.

Anecdotal reports from landholders indicate that as pumping from the bores in Project Area commenced the flow in their springs reduced. Vegetation clearing in the Project Footprint since the year 2000 has increased the runoff and reduced the recharge potential for the groundwater systems feeding the Peel River.

The interception of groundwater at bore GW967488 at a depth of 28m is an indication of the depletion of the groundwater resource within the Project Area. Any development which inhibits the recovery of the groundwater must be rejected.

A detailed study of the geology and hydrology of the Project Area or Project Footprint does not appear to have been undertaken. There is no recognition of the possibility of mass movement on the basalt cap in periods of high rainfall.

A peer reviewed geotechnical and hydrological study will be essential to fully understand the engineering requirements to ensure the stability of the wind turbines, other infrastructure and road works. The requirement for cut and fill for hardstands and turbine foundations appear to have been underestimated. Compaction and foundations for turbines may have an impact on groundwater movements within the Project Area.

The potential for mass movement, extensive cut and fill with high levels of compaction may require dewatering of the site for the life of the project. This in itself will be a potential threat to water security for Tamworth City.

Detailed investigation is required to ensure that the project does not have a negative impact on inflows into Chaffey Dam, which is the Tamworth's major water source.
Until data is available to enable an understanding of the impacts on groundwater the Precautionary Principle should be applied and the project should not proceed until accurate data is available. A lack of accurate hydrological data should not be accepted as an indication of low impact. The only acceptable risk profile for surface and groundwater damage should be "Exceptionally Unlikely" on the IPCC Likelihood Scale (Appendix 9).

Soil Profiles

Page 23
Table 4.4 Soil Profiles in Project Area

Comment
The accuracy of the data in Table 4.4 is questionable. I was never able to achieve pH readings as high as the eSPADE data shows for the project area. Introduced pasture growth on "Nycooma" did not indicate anything other than aluminium toxic low pH soil conditions.

The accuracy of the Soil Profile data set requires verification. A perusal of the eSPADE data (Survey No 1005203 No 54 E318 S040) shows a pH of 6.5. In 35 years I was not able to record a soil test with a pH above 4.5 in that area. The most likely location of the sample location is approximately 5km east of the recorded location. This apparent inaccuracy calls into question the data used for Table 4.4.

More detailed soil analysis will be required to accurately assess the pH levels of the Project Area and to determine the suitability of site for concrete and steel foundations for wind turbines**.**

Soil Summary

Page 24
Overall, the soil character of the Project area is identified as having low to moderate erodibility and general permeable soils which reduces runoff potential. The primary concern for soil management is the disturbance of steep sloped areas. Detailed design has avoided proposed disturbance of steep sloped areas, with the primary ground excavation works associated with work pads located on the ridgeline.

Comment
The Soil Summary is a clear indication that on-ground investigation was not undertaken in determining the soil characteristics. The majority of the Project Area is basalt, prone to mass movement and erosion of exposed areas during the high rainfall periods commonly experienced within the Project Area. Detailed geotechnical assessment is required prior to commencement of final design of the engineering requirements. These assessments will require peer review to ensure the integrity of the design and accuracy of the information.

Page 25
A small portion of the eastern portion of the Project area flows east to the Manning Catchment Area.

Comment
An accurate assessment of the cadastral property boundaries will reveal that sections the western boundary of Project Area is positioned to the east of the cadastral boundary. The correct boundary

line of the properties along the eastern side of the Project Area south of the property "Molonga" is on the watershed between the Manning and Hunter catchments and the Namoi catchment. Sections of the boundary were moved to eastern side of the cadastral boundary by a previous property owner. A survey will be required to ensure that the Project Area does not encroach onto adjoining properties and that the distance between wind towers and adjoining properties is the required distance.

4.2.3 Hydrology

Surface Water and Watercourse Crossings

Page 26

Photographs 4-1 Creek Crossings Proposed at Convergence of Woodleys Creek and Talbots Creek

Comment

An assessment of the surface water flows and the impact on watercourse crossings cannot be undertaken without an analysis of the rainfall patterns and volumes within the Project Area. There is little BoM or Departmental data for the Project Area available. (See Comment 1.6.1).

High rainfall and steep terrain in the Project Area induce high volume, high velocity flows which rise quickly and can drop quickly. These high flows can occur suddenly and present safety hazards for workers on the site.

For examples of flood impact on creek crossings see Appendix 6.

5. Conceptual Soil and Water Management Plan

Page 36

Comment

It is recognised that a Water Management Plan cannot be developed until detailed engineering plans are completed.

However, given the sensitive nature of the location at the head of the catchment for Tamworth City's water supply bunding around all infrastructure is essential. In conjunction with this requirement is a management plan for removal from the site and disposal of water and spillage from within the bunding. Design of the erosion control measures will need to consider the high volumes and velocity of water discharge from the Project Footprint. The design of these works will be critical to ensure their stability and maintain the current high-quality water currently flowing into Chaffey Dam.

Chapter 8 ENVIRONMENTAL ASSESSMENT APPROACH

9.1.1 Field Surveys

Page 144

Field surveys were carried out between November 2018 and August 2020 by ecologists from ARUP and Bios.

Comment

The majority of the field surveys were carried out during a long period of severe rainfall deficiency when much of the ecology and biodiversity was under severe stress. The period between mid-January 2020 and August did not provide a sufficient period of recovery to allow an accurate assessment of the biodiversity values of the area.

9.3.3 Threatened Flora Species

Page 150

One threatened flora species, Broad-leaded Pepperbush (Tasmannia purpurenscens), was identified adjacent to the Development Footprint.

Comment

A grid reference for the location was not given.

Fragrant Pepperbush *(Tasmannia glauciflora)* in the Project Area (31.333°S 151.094°E) was bulldozed for an access track. The clearing was investigated by OEH.

Eucalyptus oresbia (small fruited mountain gum) exists in the broader region with specimens of this rare and narrowly distributed endangered species close to the Project Area (151.019°E 31.356°S) (Appendix 7). A targeted survey withing the Project Area is required.

OEH describe the distribution of E oresbia thus: *"Restricted to a small area between Nundle and Hanging Rock in the southern New England Tablelands. A small population has recently been identified in Ben Hall's Gap National Park. Similar specimens are found north of Murrurundi and in disjunct locations along the Liverpool Range, but are not yet confirmed as E. oresbia."* The restricted area is the location or the proposed Devils Elbow private road deviation.

Chapter 13 HAZARDS AND RISKS

Pages 246-285

Comment

An issue that does not appear to be covered in the EIS is blade icing.

In periods of low cloud, freezing temperature and high wind the mist freezes and forms ice on the windward side of all exposed objects including fences and vegetation. (Appendix 8). In such conditions the effect on turbine blades would be the same as ice forming on aircraft wings.

In blizzard conditions on July 4, 1990 and July 13, 2015 the 11,000 KV power line at Morrisons Gap (31.322°S 151.104°E) broke under the weight of ice.

Appendix 1

Ben Halls Gap Nature Reserve and Project Area January 2014 prior to clearing along ridgeline.

Appendix 2

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
1981	35	173	0	75	91	239	100	39	63	107	129	64	1115
1982	94	57	158	22	1	40	40	0	89	49	8	49	607
1983	99	44	90	175	191	36	121	82	119	102	130	132	1321
1984	322	90	91	109	30	23	222	88	121	75	147	83	1401
1984	16	51	44	78	41	116	60	251	85	217	64	106	1129
1986	109	42	1	5	49	16	238	106	105	44	152	34	901
1987	131	39	119	23	105	77	41	183	34	91	71	151	1065
1988	148	66	38	185	116	46	102	83	170	19	167	225	1365
1989	82	79	215	143	89	163	171	23	33	75	126	86	1285
1990	97	176	88	244	92	122	187	181	45	97	7	97	1433
1991	219	57	33	10	89	63	81	5	65	32	49	217	920
1992	39	357	19	56	34	33	51	105	91	64	103	120	1072
1993	130	73	57	7	58	127	88	54	100	196	107	162	1159
1994	34	108	97	37	3	43	38	31	16	57	91	73	628
1995	186	36	40	20	134	68	51	1	139	75	185	180	1115
1996	221	54	30	12	80	99	103	165	112	84	114	187	1261
1997	140	154	29	0	64	55	22	24	119	84	95	105	891
1998	79	157	0	87	116	224	290	145	147	153	107	40	1545
1999	117	60	84	143	29	96	62	78	115	176	125	113	1198
2000	67	14	176	90	75	40	91	132	25	128	245	110	1193
2001	49	73	251	36	66	26	93	124	61	116	104	106	1105
2002	83	89	68	3	40	55	4	25	80	19	43	168	677
2003	15	107	83	83	21	88	56	107	26	131	79	89	885
2004	204	144	119	32	50	52	88	82	93	118	77	167	1226
2005	112	91	76	4	37	198	111	59	151	111	117	67	1134
2006	49	40	36.5	68.5	1	68	71	20.5	52.5	22	122.5	79.5	631
2007	61	62	88	81.5	65	173.5	36	124	12.5	51.5	186.5	259	1201
2008	92	190.5	21	44	29	107	55.5	69.5	130.5	94	215	153	1201
2009	28.5	179.6	43.5	77	86	88	75.5	13.5	105.5	81	63.5	154.5	996.1
2010	164.5	139.5	48	40	105	63.5	259.5	183	71	157	202	292	1725
2011	62	47	57	50.5	80	120	20	102.5	111.5	30	204	98	982.5
2012	117.5	239.5	108	43	25.5	81.5	120	25.5	37.25	45.8	31.25	114.5	989.3
2013	182.5	158	111	6	17.5	130.5	42	7	55	34.5	170	54.5	968.5
2014	24.5	72.25	174.8	89	78	60	47.5	105	74	25	52	241	1043
2015													0
2016													0
2017													0
2018													0
2019													0
2020													0
2021													0
2022													0
2023													0
2024													0
2025													0
Avg	106	104	79	64	64	89	95	83	84	87	114	129	1109

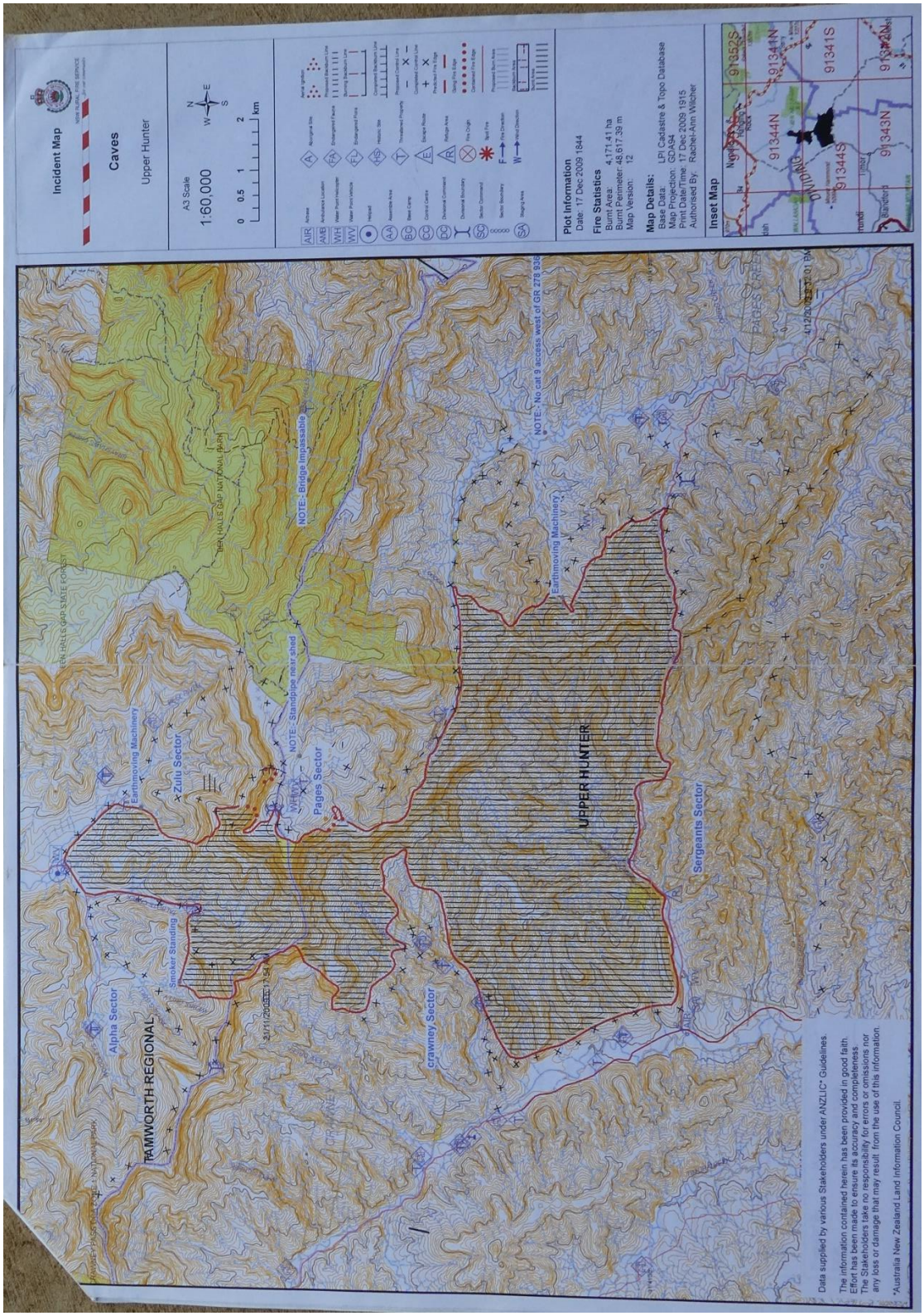
Appendix 3

RAINFALL REGISTRATIONS FOR 132 MORRISONS GAP ROAD, HANGING ROCK, 1988-2020
31.305°S 151.113°E

1988	1501 mm
1989	1470
1990	1770
1991	1004
1992	1278
1993	1345
1994	613
1995	1322
1996	1617
1997	1322
1998	1759
1999	1461
2000	1599
2001	1600
2002	779
2003	1078
2004	1487
2005	1395
2006	857
2007	1423
2008	1536
2009	1181
2010	2082
2011	1309
2012	1075
2013	1123
2014	1248
2015	1202
2016	1598
2017	1043
2018	784
2019	496
2020	1549
Average	1266

Appendix 4

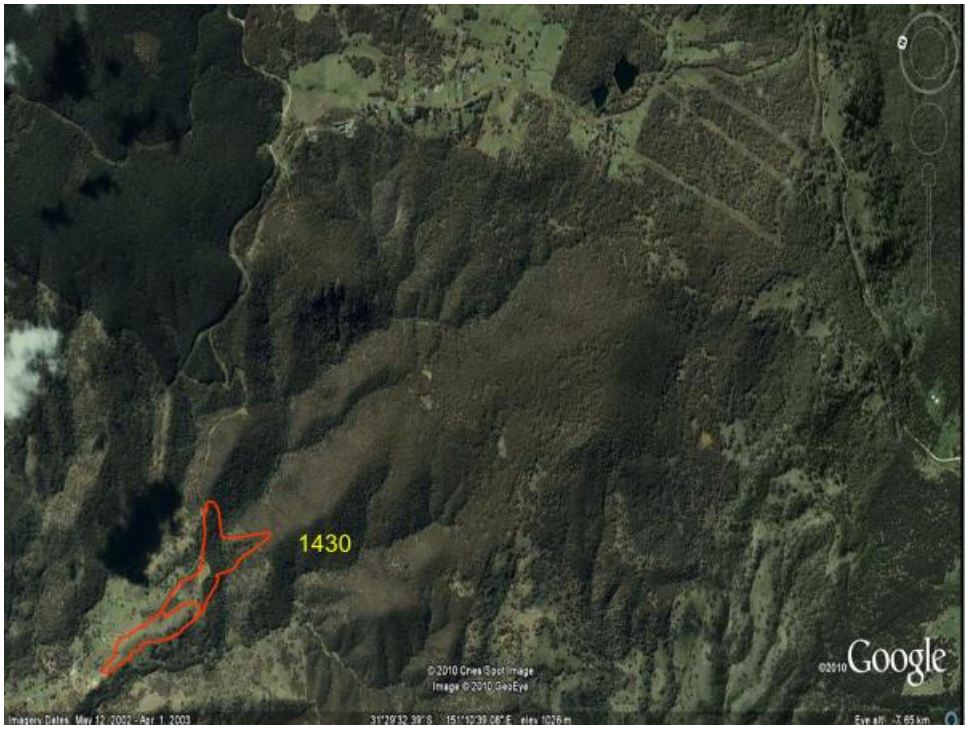
Caves and Caves North Fire Duration: 08/12/2009 to 18/12/2009
Map date:17/12/2019 Area Burnt: 4,171.41ha

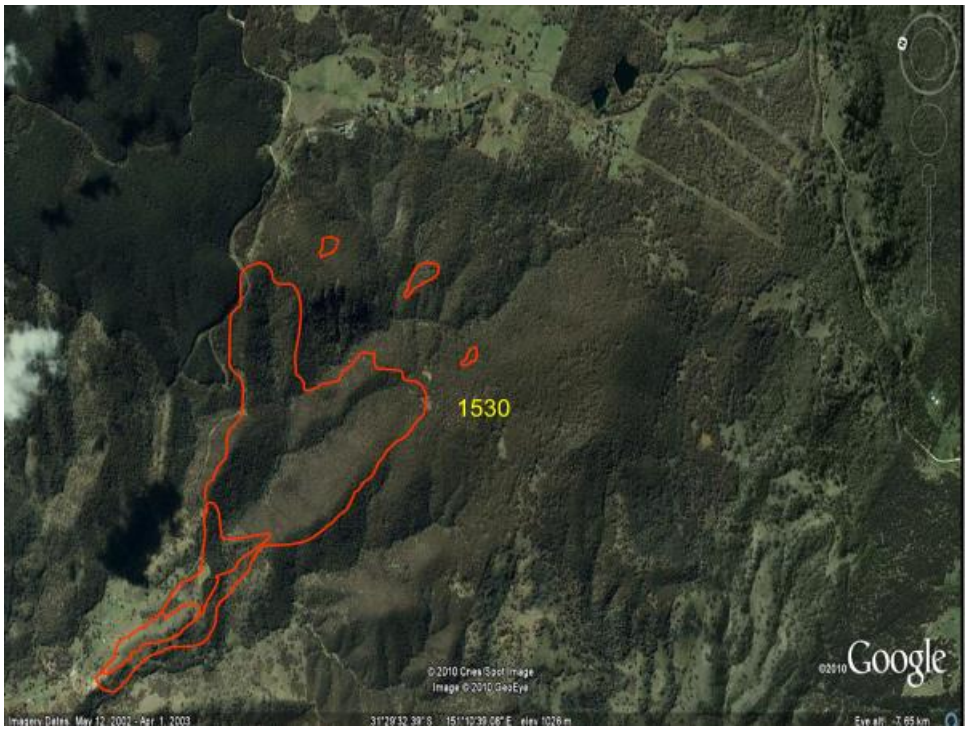


Appendix 5

Hanging Rock Fire Scenario

- Temperature: 28°
- Humidity: 40%
- Wind direction: North West
- Wind speed: 15-20kmh


1430
© 2010 Cnes/Spot Image
Image © 2010 GeoEye
©2010 Google


1530
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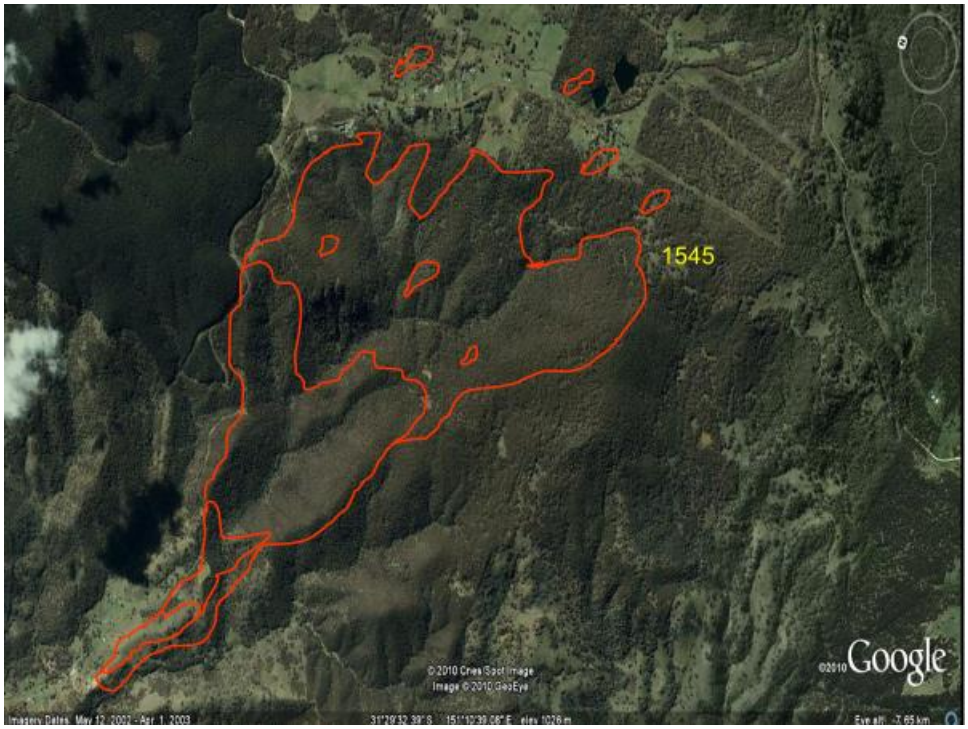
1545
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Appendix 6

Flood damage

Flood debris on farm track following heavy rain.

Flood debris on Shearers Road showing overbank flow

Flood debris on Shearers Road culvert

Flood damage on McDivitts Creek with a 2 X 1.8m pipe culvert unable to cope

McDivitts Creek overflow washed away

March 1984: Pearly Gates Bridge near the confluence of Peel River and Wombramurra Creek with the January 26, 1984, flood debris evident on the bridge deck

Appendix 7

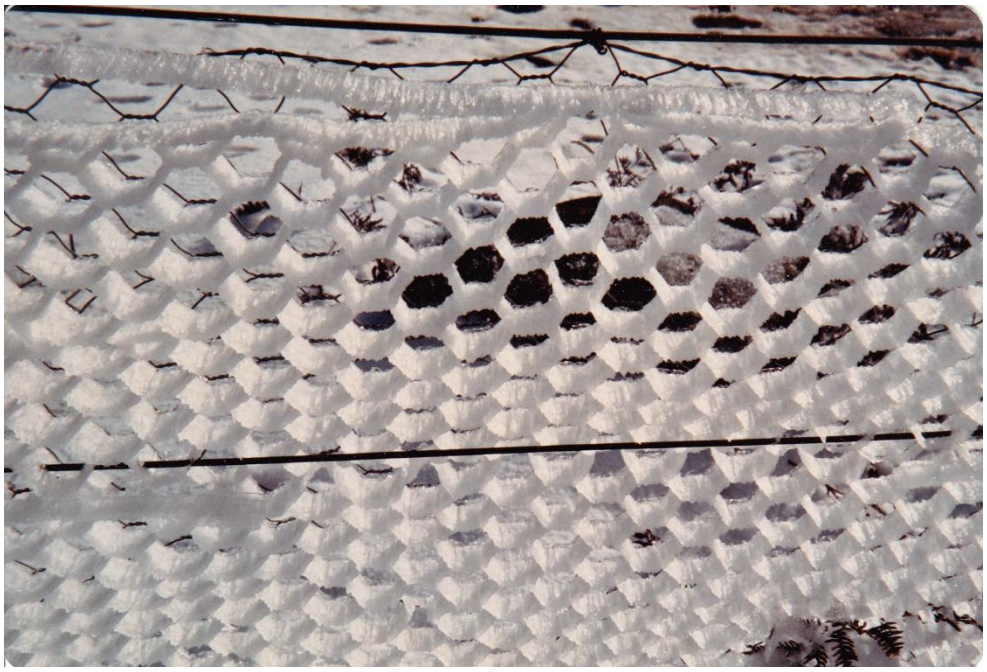
Threatened Species

Eucalyptus oresbia close to the southern end of the Project Area151.019°E 31.356°S

Eucalyptus oresbia fruit found at 151.019°E 31.356°S

Appendix 8

Threatened Species



Wind driven frozen mist formed on the windward side of a fence and tree at “Nycooma” August 1983

Appendix 9

IPCC Likelihood Scale

Appendix A:

Table 1. Likelihood Scale	
Term*	**Likelihood of the Outcome**
Virtually certain	99-100% probability
Very likely	90-100% probability
Likely	66-100% probability
About as likely as not	33 to 66% probability
Unlikely	0-33% probability
Very unlikely	0-10% probability
Exceptionally unlikely	0-1% probability

* Additional terms that were used in limited circumstances in the AR4 (*extremely likely* – 95-100% probability, *more likely than not* – >50-100% probability, and *extremely unlikely* – 0-5% probability) may also be used in the AR5 when appropriate.

Source:

International Panel on Climate Change: "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties" (6-7 July 2010).