STATE CORONER'S COURT
OF NEW SOUTH WALES

Inquiry:	Inquiry into the Fire at Springwood NSW 17 October 2013 And the Fire at Mt Victoria NSW 17 October 2013
Hearing dates:	1-5 June 2015, 24-28 August 2015, 7 -9 December 2015, 31 October 2017 – 1 November 2017
Date of findings:	23 May 2018
Place of findings:	NSW Coroners Court - Katoomba
Findings of:	**Magistrate Fiona G Toose Coroner**
Catchwords:	CORONERS- General Fire Inquiry-Springwood, Cause and Origin. Mt Victoria, Cause and Origin.
File number:	

Representation:	Assisting the **Coroner, Magistrate FG Toose** Ian Bourke SC with Donna Ward instructed by Ms B Haider, Office of the General Counsel, Department of Justice and Attorney General Mr A McInerney SC with Mr Pintos-Lopez then Mr R Cheney instructed by Sparke Helmore Solicitors for Endeavour Energy Mr T Tobin SC with Mr Fraatz instructed by Maddens Solicitors for various residents. Mr G Donnellan with Mr Edwards for Insurance Australia Limited; CGU Insurance Limited. WFI Insurance Limited and Lumley Insurance Limited. Mr H Newton instructed by Allens Linklater Solicitors for the Rural Fire service; Mr S Prince for Fire and Rescue New South Wales Mr P Braham for Osborne Aviation Ms T Berberian for Asplundh Mr R Andrew for Active Tree Services

Findings:	**Location of fire: Linksview Road, Springwood NSW** **Date of fire: 17 October 2013 -13 November 2013** **Cause of fire: The fire was ignited by the effects of arcing of electrical conductors after the impact by a tree at 108 Linksview Road Springwood** **Location of fire: Mount York Road, Mt Victoria NSW** **Date of fire: 17 October 2013 -11 November2013** **Cause of fire: The fire was caused by electrical arcing when a tree branch located on a property at 80-92 Mount York Road, Mt Victoria impacted with high voltage conductors, leading to the ignition of foliage on the ground.**
Recommendations:	***To Endeavour Energy:*** *Recommendation 1* *That Endeavour Energy revise its policies, procedures and contracts, taking into account amendments to MMI0001 and MMI0013 , so as to clarify in clear and concise wording, the expectations of Endeavour Energy of the contractors and the obligations of contractors carrying out work under the Vegetation Management Program and Pre Summer Bush Fire Inspection Program.* *Recommendation 2* *That Endeavour Energy revise its policies, procedures and contracts so as to require contractors engaged under the Vegetation Management Program and Pre Summer Bush Fire Inspection Program to ensure that persons carrying out scoping work have received appropriate training and equipment including but not limited to a "sounding hammer" or "rubber mallet' and the appropriate training in the use of that equipment to enable them to carry out the works contracted to be performed.*

To the NSW Police Force:

Recommendation 3

That the Commissioner of Police (in consultation with the Rural Fire Service and/or Fire and Rescue NSW if desirable) give consideration to providing personal protective equipment and basic training in the use of that equipment to Police officers in bush fire prone areas.

Recommendation 4

That the Commissioner of Police give consideration to establishing a working party of relevant government and non-government organisations, with the aim of developing a system of Disaster Victim Registration which obviates the need for persons involved in natural disasters to complete multiple documents or other forms of registration.

To Fire & Rescue NSW and Rural Fire Service:

Recommendation 5

That the Commissioner, Fire and Rescue NSW, consider the desirability of providing further instruction and/or training to all firefighters in relation to safe methods of operation when fighting fires in proximity to electricity.

Recommendation 6

That the Commissioner, Rural Fire Service, consider the desirability of providing further instruction and/or training to all firefighters, including volunteer firefighters, in relation to safe methods of operation when fighting fires in proximity to electricity.

To NSW Police Force, Fire & Rescue NSW and Rural Fire Service:

Recommendation 7

That steps be taken to ensure that in the next review of the Interagency Fire Investigation Protocol, consideration is given to the development or improvement of interagency protocols for the investigation of major fires. including major fires in which electrical assets may be implicated.

To Endeavour Energy, NSW Police, Fire and Rescue NSW and the Rural Fire Service:

Recommendation 8

That Endeavour Energy:

a) *Introduce or revise policies and procedures to require employees and its contractors to co-operate with and assist NSW Police, the Rural Fire Service and/or Fire and RescueNSW in the course of fire investigations in which Endeavour Energy assets may be implicated in the cause of the fire; and*

b) *Liaise with NSW Police, the Rural Fire Service and /or Fire and Rescue NSW to develop a memorandum of understanding setting out Endeavour Energy's role in assisting with fire investigations in which Endeavour Energy assets may be implicated in the cause of the fire.*

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Findings and Reasons for Decision

The nature and purpose of Coronial Inquiries

Pursuant to orders made by the State Coroner on 9 April 2015, a general Inquiry under S.30 (3) of the Coroners Act was conducted by me into each of these fires which commenced on 17 October 2013. The preparation for this Inquiry had already been overseen by the then State Coroner Barnes. The matter came to me by way of delegation on 9 April 2015.

The primary focus of a general Inquiry by a Coroner is to determine, if possible, the cause and origin of each fire. This necessarily involves a consideration of all the relevant circumstances concerning each of the fires as presented to the Inquiry. It is an investigation conducted with a view to discovering the truth.

If a determination as to the cause and origin of each fire is able to be made, the finder of fact, that is, the Coroner, needs to be satisfied on the balance of probabilities as to the existence of a fact before it can be found to be so. The finder of fact must feel an actual persuasion of a fact's occurrence or existence before the fact can be found: Briginshaw v. Briginshaw (1938)60CLR336.

A Coroner may also make recommendations as considered necessary and/or appropriate as a result of the Inquiry. Whilst this may involve a consideration as to what was done, not done, or how it was done, it is not the function of the Coroner to apportion blame or enter judgement on matters of law as to duty of care and/or liability for damages; that function lies with other courts of law.

The Inquiry

The two fires have been referred to in this Inquiry as the "Springwood fire" (because it was believed to have started in Linksview Road, Springwood) and the "Mount

Victoria fire" (as this fire was believed to have started in Mount York Road, Mount Victoria).

The Inquiry into the fires proceeded in Court over separate dates in 2015 : 1-5 June 2015, 24- 28 August 2015 and 7-9 December 2015. Throughout 2016 submissions in writing were made pursuant to timetables; these received and considered. It was determined by me, the Coroner, that it was appropriate to hear further evidence and there were two further days in court on 31 October 2017 and 1 November 2017 with further submissions being made pursuant to timetables; these were received and considered thereafter.

In an Inquiry such as this there are no parties as such, but persons, companies/entities who appear to have sufficient interest in the subject matter of the Inquiry. To that end there were a number of legal representatives for each of various residents, various insurers, Endeavour Energy, Fire and Rescue NSW, Rural Fire Service and a contractor of Endeavour Energy: Osborne Aviation and latterly in 2017, as a result of a determination by me as Coroner in early 2017, also from Asplundh Tree Experts Australia "Asplundh') ,Active Tree Services Pty Ltd ("Active Tree Services") and Warpole Pty Ltd ('Warpole), although Warpole chose not to appear. The details of this representation are more particularly set out on the headnote to these Reasons for Decision. Those who became involved in the Inquiry in 2017, were invited to the Inquiry at my direction, via, the Crown Solicitors Office. The Crown Solicitors Office was instructed to be providethose latterly invited with the Exhibits and Transcript of the earlier proceedings. I determined that it was necessary for these entities to be invited to the proceedings as a matter of procedural fairness.

It is noted that Mr Wyper of Pinnacle Arborpro ("Pinnacle) gave evidence in the resumed hearing on 1 November 2017 when it became apparent (in response to subpeonae issued) that this company and not another had provided vegetation management services (by way of scoping and auditing) for Endeavour Energy in 2012/13 at Mt Victoria. It is acknowledged that Pinnacle as such was not invited as a to the Inquiry due to the late revelation as to that company's involvement. Further

Mr Wyper may not have had the benefit full exhibits ,transcripts and submissions of the earlier sittings of this Inquiry.

As referred to above written submissions and submissions in reply, at the conclusion of evidence, were subsequently received in accordance with timetables from persons and corporations/entities legally represented at the hearing.

Oral evidence was taken over the 15 days in the period commencing 1 June 2015 and concluding on 1 November 2017. This has included oral evidence from 27 witnesses and statements from many others. The Inquiry also included a view of the respective areas where the fires occurred and in appreciating the magnitude of the task that confronted emergency services on 17 October 2013.

The Inquiry also received into evidence a vast range of material comprising witness statements, expert statements, maps and reference material along with policy documents and practice guidelines. As the hearing progressed, it became apparent as to the dominating issues.

As a Coroner and a Magistrate, I have no administrative staff to assist me with the writing of this document nor do I have allocated time (off the bench) to write a decision such as this. I have therefore borrowed heavily from the detailed submissions from both of the Counsel Assisting the Coroner in the preparation of this document,however, the conclusions that I have reached are my own on consideration by me of all the evidence and the submissions received in accordance with the respective timetables. I apologise for any lack of aesthetic presentation in this document.

I extend thanks to all involved in the preparation and running of this Inquiry.

The Background

The Springwood fire commenced on 17 October 2013 and continued to burn until 13 November 2013 and resulted in the destruction of approximately 3,623 hectares of land within a perimeter of 76 kilometres. In excess of 650 houses were affected, with 194 properties being completely destroyed.

The Mt Victoria fire commenced on 17 October 2013 and continued to burn until 11 November 2013, by which time it has burnt approximately 9,076 hectares and resulted in the total destruction of 9 properties with a further 61 being affected.

There was no loss of human life but the devastation wreaked by the fires has traumatised many of those who were affected by it. The monetary cost of the damage was estimated to exceed $200million leaving deep financial scars in the community; the emotional damage palpable but incalculable.

Blue Mountains City Council Mayor Mark Greenhill gave a statement to Police on 11 November 2013, only a few weeks after the fires, in which he made the following observations:-

> "the...bushfires have taken a high physical, emotional, structural, financial, educational, economic and psychological toll on the population. The sheer speed with which the fires came and impacted added to these discernible impacts. The character of the residents of the Blue Mountains in the face of adversity and the devastation of these fires is deeply impressive...I have been deeply moved by the generosity of spirit shown by residents in caring for each other and this comes, one suspects, from the inherent and deep sense of community that the people of the Blue Mountains practice in their everyday life"[i]

Weather conditions

In order to really understand the conditions of 17 October 2013 evidence was taken as to what it was like to be caught up in, or near, the path of each fire.

There was some objective evidence, which gave an idea of temperature and wind speed, but of course conditions changed through the course of the first day and across the days following the start of each fire.

At 6.00am on 17 October 2013 a Rural Fire Service (RFS) Fire Weather Forecast for the Greater Sydney Region (including Richmond/Katoomba) recorded the fire danger rating as "severe"[ii] and it remained at this level in the forecast issued at 3.24pm[iii].

There are no objective measures of temperature or wind speed/change specifically for the Springwood or Mount Victoria areas. The readings for Katoomba predicted in the RFS Forecast at 6.00am was for the temperature to reach 26°C at 14.00 with winds from the WNW at 50km/hr, gusting to 80 km/hr.[iv]

These figures however are incapable of adequately explaining the conditions which developed in the hours leading up to and during each fire. In this regard, the Inquiry received evidence from residents, police, fire fighters and others who have tried to provide some sense of what it was like to be there.

Detective Sergeant Bayliss, the Officer in Charge of Strikeforce Corkery (investigating the Springwood fire), was in a police vehicle and engaged in other duties when the Springwood fire commenced. He and his colleague immediately found themselves diverted to front line management of the crisis, trying to evacuate residents and assist the RFS and Fire & Rescue NSW in fighting the smoke and flames. As he told the Inquiry - "it was just crazy at that time. It's really hard to describe in words"[v]. When describing the scene at Gahnia Way, Winmalee, Sergeant Bayliss said "there's fire everywhere…the smoke was white, it was stinging our eyes, visibility was very poor and but the flames, the fire was coming up, back up the other side"[vi]

As Sergeant Bayliss and Detective Clancy later progressed to Single Ridges Road, Winmalee, they saw the smoke: "it literally turned day into night. As soon as you opened the window of the vehicle or opened the door of the vehicle the smoke would overcome you and it would sting you. We…didn't have any breathing apparatus or

anything like that, so by getting out of the vehicle we would have been no use to anybody and we couldn't get further down the street just due to the fact that you couldn't see anything you couldn't see a metre in front of you."[vii]

Similar conditions were reported at the scene of the Mount Victoria fire. Roland Clark, a local resident, described the conditions when he first observed the fire in these terms:- "(t)he wind at this point was howling, maybe 70-80km winds, the trees around there all looked like they were going to blow over."[viii]

Contemporaneous reports over police radio reported "wicked winds" at Mount York Road[ix]. Whilst police and fire fighters were facing these conditions they were also concerned with trying to locate various outdoor recreationalists who were, at one point, believed to be in the vicinity of the Mount Victoria fire. Fortunately these people were later located unharmed but in the course of searching for them one officer, Inspector Colless, observed the fire intensity to be increasing, with spot fires firstly breaching the roadway, and high winds causing the fire to become erratic, eventually overtaking him in his vehicle.[x]

This evidence, along with the video footage taken in the course of fire-fighting at Mount Victoria, gave some insight as what it was like for those present during the immediate crisis posed by each fire.

The State Mine Fire

On 16 October 2013, the day before the Springwood and Mt Victoria fires started, a fire now known as the "State Mine fire" started at around midday in the vicinity of the Marrangaroo Army Base near Lithgow. The State Mine fire advanced in an easterly direction and was visible to residents in, at least, the Mount Victoria area prior to the fires of 17 October 2013. The State Mine fire is referred to at this time for relevance only as to the commitment as to firefighting resources at the time and some other temporal factors. For reasons set out later in these Reasons for Decision, the State Mine fire is not thought to be causally connected to the Mt Victoria fire and/or the Springwood fire.

Bush Fire Risk and Management in the Blue Mountains

The Blue Mountains is a unique world heritage area and also one of the most bushfire prone areas in the world. Around 75,000 people in the 27 towns and villages across the area, call the Blue Mountains "home". Blue Mountains' residents need to balance the ambience that a mountains' lifestyle offers with the harsh reality of the threat of bushfire. It would be unrealistic to think that the risk of bush fire in the Blue Mountains could ever be eradicated.

Fire risk in the greater Blue Mountains is anticipated because of the geography and vegetation found within the region. The Blue Mountains Fire District[xi] covers an area of 143,000 hectares and almost all of the land within the district is classified as "bush fire prone land".[xii]

Superintendent David Jones of the Rural Fire Service gave evidence that the District averages 60 bush fires per year, of which about 28 are considered "major".[xiii]

Like other parts of the State that are bush fire prone, the Blue Mountains does have a Bush Fire Risk Management Plan ("BFRMP"), drafted by the local Bush Fire Management Committee which is updated every 5 years or after any major bush fire event.

As at 17 October 2013, the BFRMP in place for the Blue Mountains was one approved on 17 October 2010[xiv]. The plan established most importantly, key strategies and treatments for ignition management, hazard reduction, community education and preparedness. Whilst much of the content of the plan was mandated by requirements set by the State-wide Bush Fire Co-ordinating Committee, which is the multi-agency peak body for bush fire management in NSW, the application of that plan to the Blue Mountains region was a matter for the local Bush Fire Management Committee.

The BFRMP as it related to Springwood and Mount Victoria is addressed in more detail below.

The Springwood and Mount Victoria fires of 17 October 2013 were, to some extent, specifically anticipated because of the predicted weather conditions. A severe fire danger rating applied, and was not limited to the Blue Mountains area but also applied to the Greater Sydney Region, the Greater Hunter and the Illawarra/Shoalhaven. Other parts of the State also had a high or very high fire danger rating.[xv]

This meant that resources had to be deployed to many parts of NSW, not just the Blue Mountains. In addition, significant resources were already being deployed to the State Mine fire, which had started the previous day, and which was developing into a major fire front.

In anticipation of the increased fire risk, Fire & Rescue NSW implemented its Major Incident Management Plan, which included arrangements for all front-line fire engines to be fully staffed, calling in staff from all retained stations to be available in the Blue Mountains, deploying additional fire engines and crew to the Blue Mountains (and other parts of NSW) and bringing all reserve fire engine, water tankers and crews into service.[xvi]

Fire Fighting Resources

The evidence demonstrates that even though fires were anticipated in the Greater Blue Mountains, once they arrived they travelled with such ferocity that emergency services were very quickly overwhelmed. The number of calls to 000 peaked at 424 calls in a one hour period[xvii] and there was evidence of residents who needed to persist with repeated attempts to reach authorities until lines cleared and calls were answered.

Even after authorities were notified of the spread of fire from street to street, the extent of each fire meant that homes and other property burnt before fire-fighting appliances could even reach them.

No human being died in either the Springwood fire or the Mt Victoria fire. This is no doubt due in part to some warning to residents of approaching fire conditions, to the valiant efforts of NSW Police, Fire & Rescue NSW and the NSW Rural Fire Service, and others such as the NSW Parks and Wildlife Service, local volunteer brigades and many residents.

The fires also occurred during a weekday when many were at work or school; this meant that people were away from home and safely out of the area. It is of course possible that more homes could have been saved if residents had been home and prepared to defend their property, however the greater the number of people within the path of the fire, the greater the chance that the fires would have resulted in loss of human life.

Vegetation Management Around Electricity Assets

Endeavour Energy is a State-owned energy corporation, incorporated under the Energy Services Corporation Act 1995. Endeavour Energy's distribution network is spread across 3 regions: Northern Region (encompassing the Blue Mountains), Central Region and Southern Region. In total, the regions comprised, as at September 2011, some 884,000 customers, with 307,260 poles "bound together" by 34,540km of overhead and underground cable.[xviii]

The Northern region is further subdivided into vegetation management areas. Of relevance to this Inquiry, Linksview Road, Road Springwood is in the Penrith vegetation management area and York Road Mt Victoria is in the Katoomba vegetation management area.

Endeavour Energy's policies and procedures relating to the inspection and clearance of vegetation from around poles and conductors include the following:-

a) The Vegetation Management Program ("VMP").
b) The Overhead Line Inspection/Ground Line Inspection Program ("OLI GLI").
c) The Pre Summer Bush Fire Inspection Program ("PSBI") which forms part of the OLI GLI but will be dealt with separately in these submissions.

d) The Discretionary Works Process.

Whilst the focus of each of these programs differed somewhat, each program provided an opportunity for Endeavour to be notified about vegetation that was too close to conductors or other network assets. This is illustrated in the flow chart at Exhibit X, Volume 6, Tab 50, pg.2215. This flow chart is reproduced on the following page for ease of reference. Further, each of these programs will be described briefly hereunder.

Vegetation Management Program

The VMP is an annual program of inspections and works aimed at maintaining safe clearances between vegetation and Endeavour Energy networks assets including conductors but also involving other assets such as poles and towers.

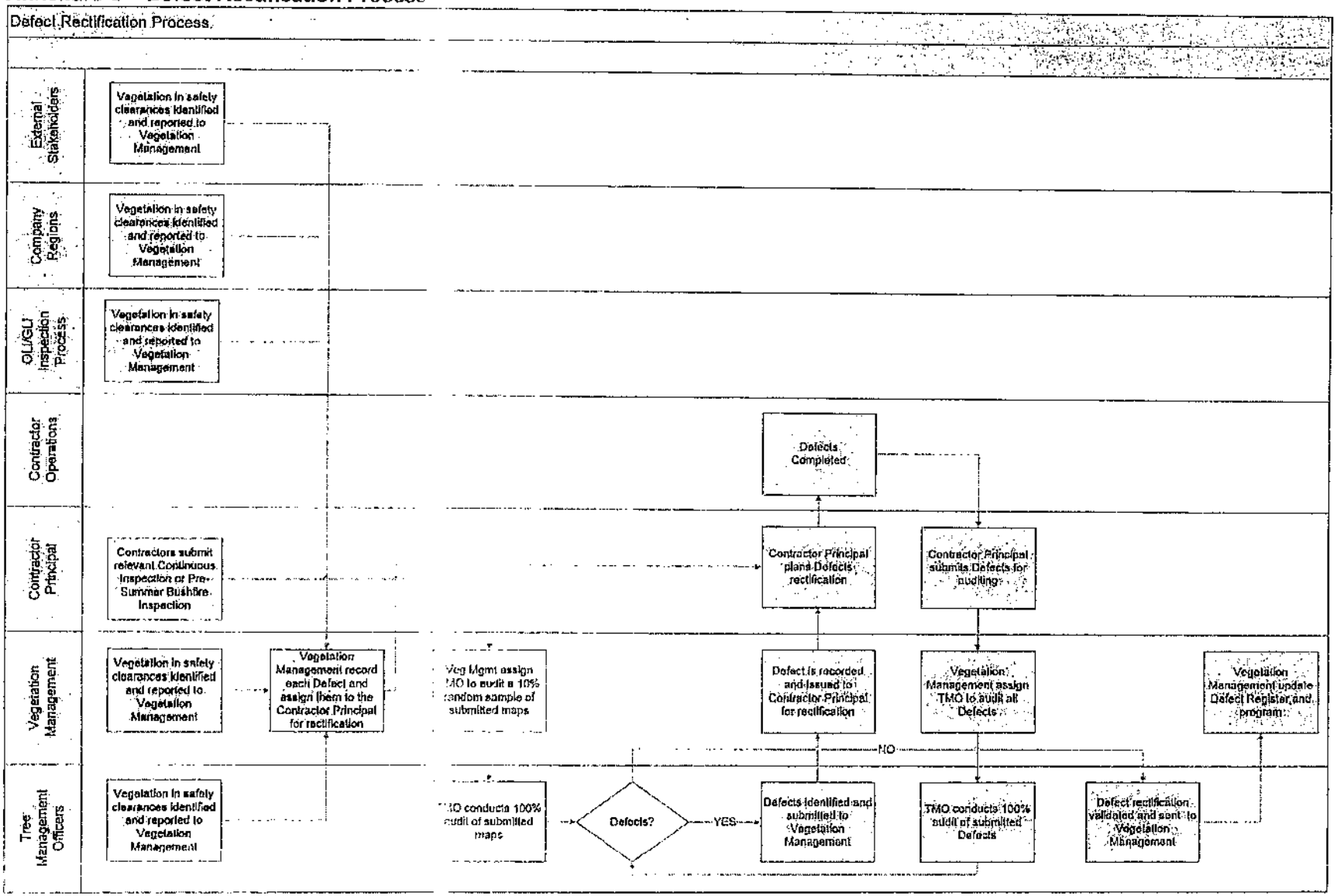
The VMP involves the following steps:

e) "Scoping" - whereby Endeavour Energy contractors travel through designated areas looking for vegetation which encroaches within clearances and needs to be trimmed or removed. Endeavour Energy expects that vegetation contractors would be able to "identify obvious conditions or gross defects that indicate a tree or part of a tree, as being in a deceased or decaying state;"[xix] and

f) "Cutting" - whereby Endeavour Energy contractors remove vegetation which has been identified or "scoped" as coming within clearance spaces. Endeavour Energy also expect that contractors be able to identify obvious or gross defects in a tree; and

g) "Auditing" - whereby Tree Management Officers (TMOs) employed by Endeavour Energy conduct field inspections to audit work undertaken as part of the VMP. Any non-compliance is reported and the job is scheduled for "rework". TMOs have electrical qualifications because their job is to focus upon the "hazards associated with the interaction of vegetation with electricity assets"[xx]. They are not required to have horticultural or arboreal qualifications although they receive training from a company called Arbortrim[xxi] on basic skills to identify obvious or gross defects in vegetation. However, with respect

Annexure C – Defect Rectification Process



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to the Katoomba region (which encompasses Mt Victoria) the auditing responsibility had been outsourced by Endeavour Energy.

Tree Management Officers employed by Endeavour Energy receive basic training on how to identify obvious or gross defects in trees. This is illustrated in the ArborTrim document which is Exhibit "AP". That document makes plain that:

"the ability to predict tree failure is limited…defects
are not always visible, especially those inside the tree or beneath the ground, and the forces of nature are unpredictable. With experience however, one can learn to recognise patterns of failure that will help in recognising risk factors.
…Characteristics such as bowed trunks and asymmetric crowns may be indications of structural problems."

From mid 2008 to mid 2013 Asplundh had been contracted by Endeavour Energy to carry out the scoping and cutting works for Penrith which encompassed the Springwood area and the auditing of these works was carried out in-house by TMOs who were Endeavour Energy employees.[xxii]

From mid 2008 until August 2012 the scoping, cutting and auditing work for Katoomba (which encompasses the Mt Victoria area) was carried out in-house by Endeavour Energy employees: TMOs. In August 2012 the Katoomba each of scoping and auditing work was outsourced by Endeavour Energy to Pinnacle and the cutting work was outsourced by Endeavour Energy to Asplundh .

In the Penrith area. (which encompassed the Springwood). the scoping and cutting work had been done by Asplundh as a contractor to Endeavour Energy since about July 2008. The auditing work for the Springwood area was done in-house TMOs: Endeavour Energy employees. Active Tree Services took over the scoping work from mid 2013 Asplundh continued as the cutting contractor: Endeavour Energy retained responsibility for auditing work for that geographical area.

In or about mid 2013, Endeavour Energy had entered into a number of new Master Supply Agreements for the supply of goods and services with these various contractors to give effect to their roles in carrying out the VMP.

This represented a shift in the contracting process by Endeavour Energy to engage different contractors for the different stages in the VMP. In his statement, Endeavour Energy's Vegetation Control Manager, George Popovski, said that this decision had been made to add "an independent layer of scrutiny to the process."[xxiii]

The outsourcing of these roles were clarified in the evidence of Mr Popovski in November 2017 and this corrected the chronology and facts (as to outsourcing) in the statement of Endeavour Energy's General Manager Mr Ty Christopher made on 19 May 2015.

Each of the July 2013 Master Supply Agreements provided for Supply Schedules to describe the particular goods and services. These Supply Schedules had annexed to them a Technical Specification which referred to a number of other things but in particular the "Endeavour Energy Vegetation Management Authorisation Process PVM 0203".[xxiv]

Annexure "A" to PVM0203 sets out the qualifications that Vegetation Control Workers are required to have before Endeavour Energy will authorise those workers to commence work under the VMP. Vegetation Control Workers Levels 1 to 3 include the position of "scoper" and also those who may perform "cutting" works: this document did not require these workers to have arboreal qualifications. An "Arboreal/Horticulture Certficate" was stated as an optional qualification for a Level 4 Supervisor/Team Leader". This Annexure "A" to PVM0203 was also referred to in evidence as the "Training Matrix".

However, before workers were authorised to undertake work on Endeavour Energy assets Annexure "A" of PVM did require Vegetation Control Workers at each level to have completed induction training on topics including:

1) Endeavour Energy Induction to Vegetation Management Control; and

2) Endeavour Energy Vegetation Contract Specification Standards Induction MM10013 and MM1021. MM10013 sets out the definition of what is a "hazard tree" and also what are the "minimum safety clearances" and "minimum trimming clearances."[xxv]

Some scopers did have some training of a botanical nature notwithstanding that there was no specified requirement by Endeavour Energy that they have same.

For instance Ross Wilson, who was a scoper with Active Tree Services who carried out the Springwood scoping in 2013 prior to the Springwood Fire have a TAFE Certificate III in Parks and Gardens (covering basic botany of ornamentals, specimen trees and specimen shrubs and a Certificate 5 in Agriculture (stock holding and crop production).[xxvi] Mr Wilson also recalled attending a Course conducted by Endeavour Energy on Electrical and Safety rules.

There was also evidence that Active Tree Services and also Pinnacle had a preference for employing scopers with experience and training in vegetation. Asplundh also had an Endeavour Customer Consultant who had arboreal qualifications.

As for in-house training by the contracting scoping companies such as Active Tree Services this seems have been done by a mentoring process on the job with more senior scopers providing training as to the identification of target species and knowledge about vegetation around the Endeavour Energy assets.[xxvii]

However when asked whether he had been given any specific training by Active Tree Services or Endeavour Energy about "hazard trees" as defined in MM10013, Mr Wilson said: " I think due to the horticultural knowledge I've had it was probably a given that I would be able to identify defects contained within trees."[xxviii]
Mr Wilson went on to say that in regard to "hazard trees" as defined in MM10013 he took it to mean, for trees outside the minimum clearance, those that had the potential to fall onto power lines or had limbs with that potential to drop onto power lines.

Ben Turner, the General Manager for Endeavour Energy Contracts at Active Tree Services gave evidence that scopers in that company's service were provided with an in-house induction training as well as the aforementioned training with Endeavour Energy. However, as to the identification of 'hazard trees', Mr Turner said that there was "no requirement under the Scoping Supply Schedule of the Master Supply Agreement for Vegetation Scopers to have and training in hazard tree identification."[xxix] Accordingly, Active Tree Service's training did not extend to any documentation relating to the actual process of identifying a "hazard tree' in terms of any assessment techniques, but was on the job training to look for visual signs of damage and identifying trees with obvious signs of decay.[xxx]

Travis Wyper. Director of Pinnacle gave evidence that the Endeavour Energy induction "touched on" the concept of "hazard trees" but was unable to recall if this involved any specific instruction on the identification of "hazard trees".[xxxi] Mr Wyper was also the lead Project Manager and the relevant employee of Pinnacle who scoped 80-92 Mount York Road Mt Victoria in or about November 2012. He identified cutting works required in the area and who did the follow up audit of these cutting

works in January 2013.

Mr Wyper was a qualified Level 5 arborist.

Mr Wyper described the process that he would have undertaken as a scoper in relation to the inspection for "hazard trees" under MM10013 in 2012/2013:

1) Determine the relevant clearance distance;
2) Inspect for hazard trees within and above the clearance;
3) Inspect for hazard trees or vegetation above a 45 degree line from the lowest Conductor;
4) Assess any trees in those spaces using visual tree assessment principles to determine whether they fell within the definition of 'hazard tree" as per MM10013;
5) He would look for leaning trees, and if they had the potential to hit the target of the powerlines, then he would conduct a closer inspection for things like previous failures, visual damage to trees, cavities, decay, open wounds, presence of reaction wood, wound wood and canopy distribution. [xxxii]

Mr Wilson recalled that his scoping of the vegetation in Linksview Road area was undertaken in the course of his training , whilst he was supervised by Senior Scoper with Active Tree Services, Scott Hiscock. Mr Hiscock was supervising two or three trainees at the time. With the passage of time Mr Wilson had no recollection of the actual scoping work conducted in the relevant area. although agreed that he had issued some notices to Endeavour Energy customers about their trees. In particular those at number 108 and 110 Links View Road. He thought that his supervisor, Mr Hiscock probably had authorised this. [xxxiii]

Mr Wilson gave evidence that it was his practice to look for "hazard trees" as per MM10013 and that he had a copy of it. That is he looked for "hazard trees" in the space above the minimum clearances and above the notional 45 degree line from the lowest conductor. In seeking to identify "hazard trees" Mr Wilson said that he would look in every such span for vegetation in the areas above and to the side of the line under consideration.[xxxiv]

Mr Christopher , General Manager Network Development for Endeavour Energy gave evidence to the effect that scopers were only required to develop skills on the job to " identify obvious conditions or gross defects that indicate a tree or part of a tree as being in a diseased or decaying state".[xxxv]

This issue of training as to the identification of a "hazard tree" is relevant as to what was identified as a "hazard tree" for the purposes MM10013 and also a matter of practice as at 2013. This, and its relevance to the events of 17 October 2013, is discussed further, later in this document.

Scopers working under the VMP in the Springwood area were able to conduct their work either by walking the street or whilst driving slowly down the street.[xxxvi]

Scopers working under the VMP in the Mount Victoria area were/are not limited to walking or driving the streets to scope work. Scoping or assessing can also be undertaken from the air. Although we know from Mr Wyper's evidence that he inspected 80-92 Mount York Road, Mt Victoria on foot.

On properties like 80-92 Mount York Road where high voltage conductors (11kv) are involved, scopers are allowed to enter private property to conduct their inspection (if

that is necessary) to get an appropriate view of the Endeavour Energy assets.[xxxvii] Customers are not expected to clear vegetation around HV conductors.

The collective evidence of Mr Ross Wilson, Mr Ben Turner and Mr George Popovski shed light on the path of information as to scoping, cutting and auditing works.

The Scopers are provided with Grid Maps which they are required to inspect for "the purpose of identifying required vegetation works. The scopers have a "PDA" which is a personal digital assistant that allows then to make a contemporaneous entry of any areas that need remedial work.

Vegetation that is identified within the safety clearances is referred to as a "rework". If the work needing to be done is a "customer service line" then the scoper issues a 'Defect Notice" to the occupier of the property to which the service line is connected; the work needing to be done is the responsibility of the owner of that property, not Endeavour Energy.

Vegetation encroachments that are detected around Endeavour Energy conductors were recorded on the PDA as either a "rework" or a "defect". The scopers would also record "hazard trees" or dead dying or dangerous trees on the PDA if they were "obvious" from a visual inspection.

Once the scoper finishes scoping the territory within the Grid Map the data entered into the PDA is uploaded and emailed to Endeavour Energy . In turn Endeavour Energy emailed the information to the cutting contractor so that the cutting program could commence. The cutting contractors use the information received to know what work needs to be done.

Mr George Popovski of Endeavour Energy gave evidence that the cutters were also

"encouraged" to identify defect that "had not been picked up by the scoping contractor."[xxxviii]

The cutting contractor would advise Endeavour Energy via email as to when the cutting works would be completed. In turn Endeavour Energy would arrange for the work done to be audited. As mentioned above in 2012/13 the auditing work at Springwood was done by employees of Endeavour Energy called "Tree Management Officers" and as at 2012/13 in Mt Victoria, by Pinnacle.

The process for auditing was that people went into the field to inspect the area in the relevant Grid Map where the cutters had been required to do work to remedy the "reworks" and/or defects. The auditing does not involve a re-scoping of the whole of the area in the Grid Map. Endeavour receives the results of the audit by email.

The cutting contractor is notified by Endeavour of any outstanding works, which are then required to be rectified and then re-audited. The cutting contractor was not paid by Endeavour Energy until the work was found to be done and compliant.

Overhead Line Inspection/Ground Line Inspection Program

The OLI/GLI Program is scheduled so that the inspection cycle is completed every 4.5 years. The focus was/is on much more than just vegetation trimming clearances. but extended to an inspection of all network assets looking for defects in hardware such as poles and overhead mains.[xxxix] As with the VMP. the OLI/GLI Program includes an auditing process to audit compliance with Endeavour Energy instructions.

Individuals authorised to carry out the inspection are required to have various safety related qualifications and to meet training requirements set out in MMI0001. However. they are not required to have arboreal or horticultural qualifications.

As at 17 October 2013, the delivery of the OLI/GLI Program was contracted to Warpole Pty Limited. Warpole had been contracted in this role since about 2008.

Pre-Summer Bush Fire Inspection Program

The PSBI Program focuses on defects in assets such as poles and overhead mains in the Endeavour Energy network as well as vegetation encroachments affecting Endeavour Energy assets such as poles and overhead mains.

The PSBI Program is a distinct component within the OLI/GLI Program and is aimed to operate as a targeted, extra layer of inspection in bush fire prone areas as identified by the RFS[xl] commencing in mid-March, "with a target for the rectification of all identified defects before 1 October of the same year, being the nominal start date for the 'Bushfire Season' as determined by the RFS."[xli]

The focus of the PSBI is to identify defects in assets, and vegetation encroachment upon assets. Any identified defects are recorded as requiring rectification under the discretionary works process, as set out below.

In 2013, the PSBI Program was contracted to Osborne Aviation Services Pty Ltd ("Osborne Aviation"). Linksview Road. Springwood was classified as an urban area inspected by ground line patrol whilst Mount York Road. Mt Victoria was inspected from the air.

Inspections from the air can involve visual inspection with binoculars. the use of LIDAR technology (high frequency pulse to create a 3D survey) or the use of high resolution photos.

LIDAR technology however will not identify the condition of trees, only encroachments within trimming clearances. Thus it cannot easily detect "dead, dying dangerous or visually damaged" trees.[xlii]

Although the use of binoculars or high resolution photographs might present a better opportunity to identify dead or grossly defective trees, these methods cannot be expected to detect more subtle indications that a tree is dead, dying, dangerous or visually damaged, such as sap staining, borer activity, wound wood.

It is noted however that there is no obligation on Osborne Aviation (as the contractor for the PSBI program) to take aerial photographs of vegetation. Images need to be taken of poles and lines but to the extent that these photos might also show vegetation, this is incidental to the requirement that assets need to be photographed.

The PSBI program as conducted from the air might reveal encroachments to poles and conductors but is unlikely to reveal much about the state of trees that are outside trimming clearances but of sufficient height to reach conductors if they were to fall.

Contractors under the PSBI Program in 2013 were required to complete a one day Network Familiarisation Training Session and Assessment presented by an Endeavour Energy trainer. Whilst that training included reference to MMI0001 and the defects to be identified under the program, Mr Christopher of Endeavour Energy did not know whether the training included components on horticultural matters relating to the identification of "hazard trees" or "dead, dying and dangerous trees".[xliii]

Discretionary Works Process

As well as the programs identified above, Endeavour Energy can be notified at any time of a concern about vegetation encroaching too close to conductors or service lines. These notifications might come from land owners, council workers, members of the public etc.

Such notifications are considered part of a discretionary works process which usually prompts an Endeavour Energy botanist to conduct a visual tree assessment or risk

assessment to determine what further action is necessary (such as removal or pruning). Similarly, if a "hazard tree" outside trimming clearances is identified under any of the three programs it is dealt with under the Discretionary Works Process.[xliv]

Endeavour Energy policies referred to minimum safety clearances around assets, the clearance varying according to the type of asset and the area in which it was located for example, bush fire prone areas. [xlv] This safety clearance was aimed at maintaining the minimum clearance required to keep electrical assets and the surrounding environment safe.

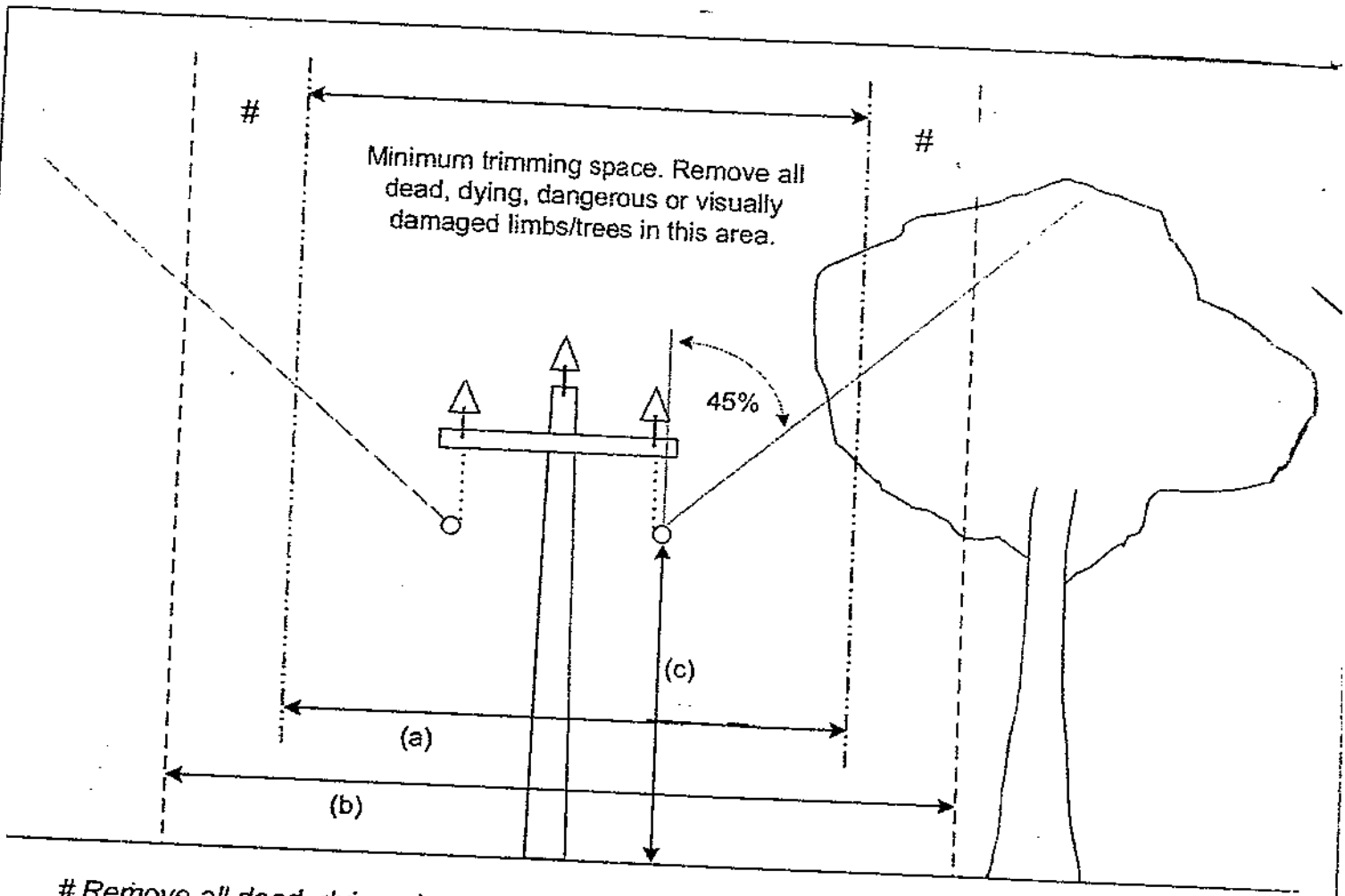
Because trees and vegetation can grow into the minimum safety clearance over time, Endeavour Energy policies imposed an additional minimum trimming clearance that made allowance for "an average annual regrowth factor". These minimum trimming clearances again varied according to the type of asset involved and its location.

Additional requirements applied to all "uncovered" network assets including bare conductors. These applied to certain tree limbs and trees situated above a line projected at 45° from the vertical from the lowest conductor design height. This is best illustrated in the diagram at Exhibit X page 1988 and is reproduced on the next page for ease of reference.

Issue As To Clarity In Instructions To Contractors

The additional requirements referred to above were/are set out in Mains Maintenance Instruction 0013 "Clearances to be maintained between network assets and vegetation" (MMI0013).[xlvi] This instruction was incorporated into Mains Maintenance Instruction 0001 "Routine above and below ground pole and line inspection and treatment procedures" (MMI0001). Also as mentioned earlier, MMI0013 was one of the documents incorporated into the Master Supply Agreements with companies engaged to carry out inspections, and with which they were expected to comply.

At the time of the fires, clause 5.12.4.5 of MMI0001 provided that minimum tree clearances of all mains shall be inspected in accordance with MMI0013. Clause 5.12.4.5 of MMI0001 however also included the following reference:



 # Remove all dead, dying, dangerous and visually damaged limbs ≥ 75mm diameter.

(a) Minimum trimming clearance space.

(b) Established easement width or, in its absence, the nominal easement width.

(c) Conductor at its lowest design height of 7.3m for HV and 5.5m for LV above ground.

Figure 7: Removal of dead trees/branches near overhead power lines

> "Particular attention is to be given to the likelihood of vegetation outside the clearance zone that may be dead or dying **and** at a height that, if failure occurred, impact to the overhead mains would result. Vegetation in this condition is to be reported for removal."[xlvii] (emphasis added)

On the face of MMI0001, as it applied in 2013, this additional reporting and removal requirement would not apply to a tree of sufficient height to hit overhead mains if it failed, unless the tree also had signs that it was dead or dying. This appears to be a sensible approach, given that there must be many thousands (if not hundreds of thousands) of trees within Endeavour Energy regions that sit outside trimming clearances, but are tall enough to reach overhead mains if the tree falls.

Confusion arose, however, from Clause 5.1.8.2:

> "2. All hazard, dead, dying, dangerous or visually damaged trees that are situated above a line projected at 45° from the vertical from the lowest conductor design height...shall be either trimmed to at least the lowest conductor height or removed if requested by the landowner/manager."

The issue as to the potential for confusion arose from the reference in MMI0013, clause 5.1.8.2, to "hazard" trees. The term "hazard tree" being defined in MMI0013 as "Trees that are outside the minimum trimming clearances, including the allowance for bushfire prone areas that could come into contact with an electric power line having regard to foreseeable local conditions."

This definition of "hazard tree" appears to have been based around the definition recommended in Chapter 4 of the 2009 Victorian Bushfire Royal Commission Final Report: "trees that are outside the clearance zone but that could come into contact with an electric power line having regard to foreseeable local conditions."

There was an issue as to whether a "hazard tree" was limited to a dead, dying, dangerous or visually damaged tree or whether reference to a "hazard tree" included

any tree that could come into contact with an electric power line having regard to local conditions.

In practice, according to Mr Christopher, the definition of "hazard tree" in MMI0013 was applied by Endeavour Energy as if it were limited only to "dead, dying, dangerous or visually damaged trees."[xlviii]

The concern was that the definition of "hazard tree" in MMI0013 had the potential to mislead. It may provide false assurance that hazard trees include all trees outside trimming clearances that could come into contact with conductors, having regard to foreseeable local conditions (whether or not they were dead, dying or dangerous). Furthermore, the definition of "hazard tree" in MMI0013 was inconsistent with the concept outlined in 5.12.4.5 of MMI0001 as it stood in 2013.

Mr Christopher in his evidence maintained that there was no inconsistency between MMI0013 and MMI0001, but that MMI0001 was more specific than MMI0013.[xlix]

It is noted that MMI0001 was amended as from 25 June 2014, and the words previously appearing in clause 5.12.4.5 have been removed. Any inconsistency between MMI0013 and MMI0001 appears therefore, to have been corrected.

However, there appeared to remain some confusion as to what MMI0013 required a contractor to do in practice with respect to vegetation and Endeavour Energy electrical assets such as poles, overhead wires, conductors etc.

That is, is the contractor expected to notify Endeavour Energy of:

(a) only trees/ branches within the minimum trimming clearance; and

(b) any trees/branches that are dead, dying, dangerous or visually damaged and which are tall enough to hit electrical assets if they fall;

Or, is the contractor also required to notify Endeavour Energy of apparently healthy trees branches outside minimum clearances, but which are tall enough, if they fall, to hit Endeavour Energy's electrical assets?

Mr Christopher of Endeavour Energy said that Endeavour does not expect to be informed about a healthy tree which is outside minimum clearances but which could hit power lines if it were to fall. That is, Endeavour Energy only expects to be notified of "dead, dying, dangerous or visually damaged" trees which are outside minimum clearances but which might, if they fall, hit power lines or those trees "obviously damaged" or with "gross defects".

While the interpretation suggested by Mr Christopher's represents, presumably, the expectation of Endeavour Energy, it is not an interpretation that is clearly stated in MMI0013, which sets out the requirements imposed on contractors engaged by Endeavour Energy. It was certainly not the view shared by the effected residents represented at the Inquiry. The ambiguity in MMI0013 seems to arise chiefly from the definition of the expression "hazard trees".

The potential practical consequences of the ambiguity are perhaps demonstrated in the evidence given by Mr Christopher when cross-examined by Senior Counsel appearing for Osborne Aviation (the company responsible for PSBI in 2013). Mr Christopher initially maintained that Osborne Aviation (in conducting the PSBI from the air) would be expected (in order to comply with MMI0013 and MMI001) to analyse aerial photos not only for minimum clearances, but also for obvious or gross defects in trees in proximity to power lines. However, after being shown relevant provisions from the Master Supply Agreement with Osborne, Mr Christopher conceded that it did not require Osborne Aviation to take photographs of vegetation.

It should be further noted however, that there are provisions in the Master Supply Agreement between Endeavour Energy and Osborne Aviation which may create ambiguity about Osborne Aviation's obligations. Under clause 5.2(c) (Key Activity Two. Aerial Image Capture). Osborne Aviation is required to "Ensure encroaching vegetation is captured on still images to allow for encroachment Defects to be raised...". Furthermore, under clause 7.0 "Pre-summer Bushfire Defects", the list of items which must be inspected includes "General Vegetation", and provides examples of "Defects which may cause bushfires", one of which is – "Insufficient clearance between mains and trees including hazardous trees outside the clearance

zone...".These provisions, it is submitted, create undesirable doubt about the obligations of the contractor in so far as Osborne Aviation was concerned.

Having had the benefit of hearing evidence from the employees (or sub-contractors) of the contractors to Endeavour Energy, the need to clarify issues as to expectations and obligations became objectively apparent.

The ambiguity in MMI0013, and ambiguities such as that in the Master Supply Agreement with Osborne Aviation are of significance to all aspects of Endeavour Energy's vegetation management regime (ie the VMP, OLI/GLI and PSBI). The terms of the Master Supply Agreements should be clear, but it seems that at least some of them were not as at 2013. And the terms of MMI0013 should also be clear, because its terms are incorporated into the supply agreements with contractors retained by Endeavour Energy.

The expectations of Endeavour Energy as to training requirements of its contractors needs to be fleshed out in plain unambiguous language in any agreement with its contractors so that the requirements can be understood and actioned rather than vague catch phrases that may be open to conjecture and misinterpretation. Particularly when there are other proscriptive documents in existence emanating from Endeavour Energy such as the 'Training Matrix" that appear to specify what is required as a minimum with respect training and qualifications for contractor staff.

For instance the Master Supply Agreement between Endeavour Energy Active Tree Services provides is Clause 7.5 that :

" With respect to any Goods and Services or obligations that do not have an associated Performance Measure, the Contractor must provide such Goods and Services in a timely and professional manner **in accordance with generally accepted industry best practice ("Default Standards').** (emphasis added).

Also Clause 26.1 (b) of the same document that provides that Active Tree Services will provide the Goods and Services:

" In a proper and professional manner with due care, skill and judgement in accordance with the **current and relevant industry standards and codes of practice."** (emphasis added).

By way of example of the confusion and misinterpretation it was clear on the evidence of Endeavour Energy staff and staff of the contractors engaging in vegetation management that the current and relevant industry standards and practice as at 2012/13 with respect to "hazard trees" was to look for what was "obvious" damage. Yet that was not what MM10013 specifically required as at 2013 . The word "obvious" simply did not appear. This places what was acceptable industry standards and practice at the relevant time odds with the "industry " compliance document.

It is noted that since the Inquiry commenced in 2015 Endeavour Energy has returned its audit process of Katoomba area (which includes Mt Victoria) to in-house. It also now providers mandatory training for scopers which deals specifically with "hazard tree" identification and that this is now part of the induction program for the vegetation management contractor staff. This course deals with basic disease and identification of hazard trees, structural integrity and the like.[1] It apparently runs for a which whilst an improvement appears to be less than the instruction and training afforded to the Tree Management Officers employed by Endeavour Energy.

Events have also occurred that address the concerns as to ambiguity with respect to MM10013.

The Industry Standard Safety Committee (comprised of representatives from Endeavour Energy, Essential Energy and Ausgrid, under the auspices of the NSW Department of Industry) have arrived at a "common definition for what is now termed

'fall-in vegetation hazards' to be applied across the State."[li]

The new terminology is apparently agreed to be applicable to the existing contractor agreements (by the parties to those agreements) for vegetation management in Amendment No 11 of MM10013[lii] :

"Fall-in Vegetation Hazard /Hazard Tree" is defined as "Visually defective vegetation(which is vegetation that is dead dying and appears structurally unsound as identified from the perspective of the network Asset as far as is reasonably practicable to do do), that is outside the minimum Clearing Requirement distances from Network Assets and which may require pruning, cutting or removal to obviate the risk of it falling, dropping and contacting assets."

The revised MM10013 then adopts this definition at 5.6.10 :-

"Fall-in Vegetation Hazard/Hazard Tree defects" is defined as "Vegetation surrounding network infrastructure must be visually inspected for trees or part thereof, that is visually defective or appears dead dying or structurally unsound, and that has the potential to interact with the electricity network. The inspection must be conducted during any onsite scoping or cutting procedures. The area to be inspected is not limited to the minimum vegetation clearances and must cover all vegetation readily visible from the perspective of the network assets as far as reasonably practicable to do so...In assessing the fall-in vegetation hazard trees, consideration must be given to the height and distance from the line of the vegetation and the likelihood of impacting on the line."

It is not known whether the service agreements between Endeavour Energy and the contractors have otherwise been reviewed to provide greater clarity as to expectations and obligations as to training, qualifications and practice apart from the inclusion of the MM10013 amendments.

However, the amendments effected to MM10013provide the much needed clarity within that document and obviate the need for a recommendation that same be done.

The Springwood Fire

Linksview Road, Springwood is a cul-de–sac running from an intersection with Thomson Avenue, with houses on one side and scrub (falling within land owned by the Trustees of the Roman Catholic Church for the Diocese of Parramatta) on the other. It is best illustrated in photos taken by Michael Forbes at Exhibit A2, Tab 40, pg.300 which are reproduced on the following page for ease of reference.

For the purpose of the BFRMP the area around Linksview Road and Thomson Avenue Springwood falls within a Land Management Zone.[liii] Land managers and owners are responsible for hazard reduction on their own property within a land management zone.[liv] Similarly the Rural Fires Act 1997 imposes certain obligations on land owners or occupiers to prevent the occurrence of bushfires and minimise the danger of spread of bushfires on their land.[lv]

Included in the brief were photos showing vegetation on each side of Linksview Road in the immediate aftermath of the fire. Superintendent Jones (RFS) looked at some of these photos and described "a mixture of fine and heavy fuels. The heavier fuels appear to be a mixture of both native and introduced species. I would suggest that the potential tonnes per hectare, which is the measurement that we use to indicate the amount of fuel that would be available, would not be excessive when comparing it to the wider Blue Mountains area."[lvi]

Thus there was nothing about the amount or type of vegetation that was remarkable prior to the fire. Indeed according to Superintendent Jones, both St Columba's High School and St Thomas of Aquinas Primary School had regularly maintained their land to a suitable level.[lvii]

Facts as to events in the lead up to October 2013

Linksview Road had been subject to the necessary inspections under the VMP, the OLI/GLI Program and the PSBI Program in the years leading up to 2013.

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As at 17 October 2013, no "dead, dying or dangerous or visually damaged" trees had been identified on Linksview Road requiring work under the VMP.[lviii] The most recent VMP inspection occurred sometime between 1 March 2013 and 2 September 2013. A Pre Summer Bush Fire Inspection by ground line patrol was performed by Osborne Aviation on 30 July 2013 with no outstanding work reported as being required on Linksview Road[lix].

Minimum trimming clearances apply to customer service lines, as well as to Endeavour Energy assets such as conductors. Customer service lines are the wires that run from the street side poles and conductors to each home.

The tree that failed at 108 Linksview Road on 17 October 2013 had been reported as a defect by a Ross Wilson the scoper from Active Tree Services Pty Ltd earlier in 2013, as part of the VMP. This led to a customer vegetation report issuing on 9 July 2013, which read in part:-

"We have noted tree/s adjacent to the overhead service lines located on this property are in contact with the lines. A minimum clearance of 500mm from the liens is required. You need to make arrangements to have the tree/s trimmed to maintain this specified clearance as a matter of urgency. Comments TRIM FOLIAGE AROUND SERVICE LINE. "[lx]

It was the obligation of the home owner to attend to trimming the foliage because the foliage was in proximity to a customer service line to the house, not in proximity to overhead conductors. On 25 July 2013 the tenant at 108 Linksview Road faxed the Customer Vegetation Report to the real estate agent managing the rental. An employee of that agency then sent an email to a local property maintenance company seeking a quote to undertake the necessary trimming work at 108 Linksview Road. According to the property maintenance company, this occurred on 31 July 2013. The property maintenance company quoted $99 for the work and the owner approved this expenditure when contacted by the real estate agency.

There is a dispute about what happened next. The real estate agency said that they emailed the property maintenance company to place a work order and received an email confirmation back. However, the property maintenance company dispute ever receiving an email placing a work order or sending an email confirmation in reply.

This dispute was not explored during the hearing because regardless of the reasons why the trimming work did not occur, there is no doubt that the clearance work around the customer service line was not carried out and that the lack of works not being carried out was not detected in any subsequent audit.

Furthermore, this trimming work that was required was limited to clearance around the service wires only, not trimming clearances around the main conductors.

Although it has been necessary for the above history in relation to the trimming of the tree near customer service wires to be set out, the customer service wires can, for reasons set out below, be excluded as a possible cause of the Springwood fire of 17 October 2013.

Chronology of 17 October 2013

At about 12.15pm on 17 October 2013 the Mount Victoria fire started. At about 1.08pm residents in the Springwood area reported smoke from what looked like a new fire to the north, recorded as being towards Chapman Parade, Faulconbridge. This evidence is addressed further below.

Local resident Marilyn Stubbs, living at 110 Linksview Road, returned home at approximately 12.55-1.00pm. She went inside, made a sandwich and a cup of tea, and lay down in her bedroom with a magazine. Ms Stubb's bedroom has a window onto Linksview Road.

Sometime prior to 1.25pm, Ms Stubbs, heard sounds that she described as a "twang" and a "zeep", and a crackling noise. Shortly after this, she looked out the window and saw fire in the bush across the road. She saw a tree that had fallen on to the main power lines and some broken power lines out the front of her house.[lxi] Ms Stubbs made a phone call to 000, which was logged at 1.25pm. However, it is noted that Ms Stubbs said she was waiting on the line for some time before she was put through.

Residents at 24 Thomson Avenue (close to the intersection with Linksview Road) also rang 000 at approximately 1.25pm to report a fire. Pumpers from both Fire & Rescue NSW and the RFS were allocated to respond.[lxii]

At about 1.38pm, a Fire & Rescue NSW pumper arrived on scene, having been dispatched earlier in response to the 1.08pm call reporting a fire near Chapman Parade. The Pumper sent a "RED" message requesting many tankers.

At 1.40pm NSW Police responded from the Mount Victoria fire to an urgent request for additional cars at Springwood.[lxiii] Other police in the local area, including Sergeant Bayliss, were diverted to the Springwood fire. A forward command post was established at the intersection of Fairway Ave and Linksview Road and police began evacuating residents from Linksview Road and Thomson Avenue. An evacuation centre was set up at Springwood Sports Club.

Meanwhile teachers, staff and students at St Thomas Aquinas Primary School and St Columba's High School had been sheltering on school premises until they were eventually evacuated to local shopping centres.

The fire moved quickly with little warning to local residents as it crossed Hawkesbury Road and police began to evacuate residents in Gahnia Way, Winmalee. The fire reached Gahnia Way shortly afterwards.

The fire burnt through Birdswood Avenue, Single Ridges Road and Moray Street. Police made urgent requests for firefighters to attend but resources were overwhelmed by the speed and size of the fire, even with all the additional resources that had been committed in anticipation of the severe fire danger rating.

An examination of some of the 000 calls reveal the speed of the emergency:-

Call at 14:49:53

Caller: I'm ringing about the Winmalee fires, Buena Vista, the whole street is now alight including houses....I rang about twenty minutes ago, there's no firies and I've just had to get out and there's no exit now.

Operator: We've got every single resource we have in that area but we have just run out of fire engines. The first available will be going in there but at this stage we haven't got any left.

Caller: Oh really, so all the houses are just going to burn us.

Operator: Well, hopefully we can get in there, we've already got houses alight in Birdwood Street as well in Winmalee,

Caller: Ok yeah, just the house opposite mine has just gone up...I only just got out in time...There's going to be people trapped.

Call at 15:10:54

Operator: Sorry, where are you?

Caller: Heather Glen Road, there's houses going buddy and there's not a unit in the street, there's a couple of women there. I can't get there. I went to see a few units, stuck on bloody Hawkesbury Road.[lxv]

The fire consumed homes in apparently random ways. In some streets numerous homes were lost, whilst some neighbouring homes were left untouched. Local schools, nursing homes and Springwood Hospital were threatened and evacuated.

The fire even breached the Nepean River at Upper Castlereagh before being declared "out" on 13 November 2013[lxvi].

The Fire Investigation: Area of Origin

Linksview Road forms part of the boundary between a fire district that is the responsibility of Fire & Rescue NSW and a district that is the responsibility of the NSW Rural Fire Service. This led to some initial confusion and tension about which service was responsible for investigating the Springwood fire.

To an extent, this jurisdictional question was circular, because in order to determine who had jurisdiction for the investigation it was necessary to investigate where the fire started (for instance, in the scrub opposite the houses on Linksview Road or in the subject tree at the front of 108 Linksview Road).

In any event, because this was a fire that occurred in circumstances where the Rural Fires Commissioner had taken charge of bush fire-fighting operations pursuant to s.44 of the Rural Fires Act, it now seems agreed that RFS was responsible for co-ordinating the investigation into the fire.[lxvi]

In the events that transpired, it was Superintendent Robert Mathieson (then the Manager Fire Investigation with the RFS) who commenced the investigation. Details of the Mathieson investigation are set out in various parts of the brief and transcript:-

a) Exhibit A2 Tab 39 statement of 25 November 2013.
b) Exhibit A3 Tab 64 annexure 4 Fire Investigation Report Wildfire printed 5 January 2014.
c) Transcript 26 and 27 August 2015.

Mr Mathieson first attended the fire scene on the afternoon of 17 October 2013, when he observed the downed power lines and spoke with Marilyn Stubbs. He returned the next day to conduct a Fire Investigation Scene Examination. having in the meantime examined weather reports and lightning strike data at Blue Mountains Fire Control Centre.

External examination along Linksview Road and Thomson Avenue led Mr Mathieson to conclude that the general "area of origin" was in bushland to the north of Thomson Avenue and east of Linksview Road.

"Area of origin" and "point of origin" are terms that are defined in "NFPA 921 Guide for Fire and Explosion Investigations". This is a document from the United States and is used by RFS and Fire and Rescue NSW as a reference book and some terminology in it is used by those services. However it is a guide only, and neither service is required to complete their investigations in accordance with the said Guide.[lxvii]

The fire investigation report refers to the existence of macro indicators but does not specify what macro indicators were actually observed to permit this conclusion to be drawn. This has led to some criticism of the report by US experts retained by Endeavour Energy, namely Professor Don Russell and Mr Doug Allen.

Walking the "fire ground", Mr Mathieson followed further macro fire indicators and clumps of indicators that he believed showed the run of the fire from the eastern side of Linksview Road towards the east and north of Thomson Avenue. The run of the fire, according to Mr Mathieson, is set out in the sketch map included at Tab 39 p.297-28. Both the fire investigation report and Mr Mathieson's statement refer broadly to indicators or clumps of indicators such as sooting, staining on rocks, damage differential cupping etc.

Those documents however, provide only limited detail and photographic evidence to permit the reader to understand the basis on which Mr Mathieson came to his conclusions. The limited detail in those documents makes it difficult to independently assess whether the conclusions were reasonably drawn.

It may well be accepted that Mr Mathieson did not "have an expectation of...the investigators photographing every indicator that they look at, at a fire scene". However, it would have been desirable for Mr Mathieson's report to include more

detail in the form of photographs of macro indicators that he thought suggested the course and the run of the fire. The photos instead focused upon establishment photos, close ups of the burn holes posited as the point of origin, and then a series of photos taken in the vicinity of 108 Linksview Road after having determined the point of origin.

Mr Mathieson appropriately conceded in his evidence some of the shortcomings in his report arising from a lack of detail around what he specifically observed as indicators. Having tracked the fire run, Mathieson was led back to an area approximately 15 metres directly opposite 108 Linksview Road. Here he said he observed indicators of flanking fire and concluded that the specific area of origin was approximately 15 metres from the eastern side of Linksview Road directly opposite the house at 108.

Mr Forbes (of Fire & Rescue NSW) agreed with Mr Mathieson as to the general area of origin being close to the corner of Linksview Road and Thomson Avenue, in his case based primarily on observations made during an aerial view of the fire by helicopter on 18 October 2013. This occurred after Mr Forbes was advised by the Response Coordinator for Fire & Rescue NSW that 108 Linksview Road was within a Fire & Rescue NSW district. Mr Forbes did not identify a specific area of origin in his report.

During his walk through, Mr Mathieson observed 5 burn holes approximately 1 metre east of the eastern bitumen edge of the road opposite 108. He determined these burn holes indicated the point of origin of the fire because they "showed a heat source has remained for a longer time than any other part of the fire therefore burning deeper into the fuel. There was white ash in the bottom of each of these burn holes also indicating a longer residence time for the fire."

Mr Mathieson's conclusion as to the point of origin has been the subject of some critical comment. Fire Investigator Mr Allen offered the criticism that Mr Mathieson's location of the point of origin appeared to be outside the specific area of origin. This criticism arises in part from the absence of a sketch or map to "plot out the boundary of the Specific Area of Origin.". In his oral evidence, Mr Mathieson clarified that he thought the specific area of origin was approximately "between 10 and 15 metres in a

circle around from Linksview Road from there to the bitumen." This is approximate because he did not measure it or track the specific area of origin. This evidence places the point of origin within the specific area of origin, close to the western margin of the circle as described.

Mr Mathieson's specific area of origin seems broadly to be corroborated by the evidence of Mr Allen who investigated the scene at Linksview Road on or about 21 November 2014. There were no reliable micro indicators left at that time, but macro indicators permitted him to estimate the general area of origin as being across the road from 108 Linksview Road and the specific area of origin as being 10 to 20 metres into "the forest" from the side of Linksview Road.[lxviii]

On the evidence, therefore, it appears that the approximate area of origin was opposite the drive way of 108 Linksview Road, and up to 10 to 20 metres in from the side of the road.

With respect to Mr Mathieson's suggestion that the 5 "burn holes" are a point of origin for the fire, he is the only witness who noted these holes and ash at the scene. Other witnesses are dependent upon Mr Mathieson's photographs to try and determine the significance of the holes. Mr Forbes and Mr Moore each maintained that it is difficult to be confident about the point of origin. Mr Allen was critical of the failure to measure the depth of the "burn holes" or to identify the nature and extent of the material there.

It is difficult to know what to make of this evidence in the absence of further detail about what was actually observed by Mr Mathieson. However, it is not necessary to resolve this question, because as noted below the evidence taken as a whole, provides me with a sufficient basis for to be satisfied as to the essential matters to be addressed that is, the cause of the fire and also the area of origin of this fire (albeit approximate).

Reports of a fire at 1.08pm

At 1.08pm, a Springwood resident, Ms Elaine Dickson, was put through to the Fire & Rescue NSW Communications Centre (after having first called RFS and then being referred to 000). The call was answered at 1.09pm. The call was made from her home at 69 Douglas Street Springwood and was reporting a bushfire thought to be in the Faulconbridge area, near Chapman Parade. The transcript of the call is contained at Exhibit A3 Tab 62 pg. 584, and statements and a DVD of a "walk through" interview with NSW Police are at Exhibit A3 Tabs 70 and 71.

Ms Dickson's report was of "what appears to be a new bush fire in the Faulconbridge area...it's hard to tell, it's really hard to tell, you see plumes of work ("smoke"), I've been keeping an eye on the horizon all day...and the smoke down there it's not dispersing you can see like quite, what do you say, quite small plumes and they're billowing up higher so it gives the impression that it's not that far away...somewhere around that area (Chapman Parade)."

The question arises as to whether Ms Dickson and her son were seeing smoke from flames that became the Springwood fire. If so, this would suggest that the Springwood fire commenced sometime before 1.08pm, and not later, as the evidence of Ms Stubbs suggests. Ms Dickson described being in her backyard bringing in the washing when she observed the plume, "high in the sky", after which she walked into the house and called the RFS. She was then advised to dial '000' and was transferred to Fire & Rescue NSW Communications Centre where her call first rang at 1.08.56pm and was answered at 1.09.16pm. This suggests that the plume high in the sky could have been observed up to a couple of minutes before 1.08pm.

Another possibility is that Ms Dickson saw smoke from the Mount Victoria fire (which had been burning for at least 45 minutes) or the State Mine fire (which had been burning for over 24 hours). Although it is impossible to reach any firm conclusion as to the source of the smoke reported by Ms Dickson, it seems unlikely, for the following reasons, that this smoke was connected with the Springwood fire:-

a) Although the 000 transcript records Ms Dickson reporting smoke from "what appears to be a new bushfire in the Faulconbridge area" she also said "It's hard to tell, it's really hard to tell, you see plumes..."
b) The crew assigned to appliance RP 445 reported smoke in the vicinity "not from Lithgow" (which leaves Mount Victoria as a possibility).
c) There had been a similar report to Fire & Rescue NSW the previous day, reporting smoke in the vicinity of Winmalee[lxix]. When that call was responded to, no fire was found, and Fire & Rescue concluded that it was a "false alarm" and that the report was of smoke from the State Mine Fire. This provides an example of a conscientious resident reporting smoke in the vicinity which was actually related to a fire many kilometres away.
d) There were no 000 calls reporting the fire between 1.08pm and 1.26pm at which time a number of residents near Linksview Road and Thomson Avenue started ringing in to report fire and flames (not just smoke) in the scrub opposite Linksview Road.
e) According to Inspector Moore "in order for them (Ms Dickson and Mr Jones) to see that level of smoke from a distance, the fire would have been getting quite well developed. We've got no calls coming in between for the next 15 minutes, supposedly in an area which is surrounded by houses."
f) Marilyn Stubbs arrived home at 110 Linksview Road about 12.55pm or 1.00pm and did not notice anything out of the ordinary.

Mr Allen favoured a hypothesis that "the fire observed at about 1.09pm is likely to have ignited at some time between about 12.59 and 1.04pm.". As set out above, the smoke reported by Ms Dickson was first observed prior to the call received at Fire Communications at 1.08pm. Using Mr Allen's timeframe of 5-10 minutes for the smoke to become visible from a distance this conceivably puts the timeframe for the start of the fire back to about 12.57pm -1.02pm. This seems to coincide with the approximate time when Ms Stubbs arrived home, walked into her house, unpacked her groceries, made a sandwich and cup of tea and walked into her bedroom to begin reading a magazine. Yet, Ms Stubbs did not observe smoke or a fire (with a general area of origin in scrub roughly opposite her house) that was

already generating smoke at a sufficient height to be visible on the other side of the suburb. Mr Allen assumed an estimated distance of approximately 1.2km.

There is no reason to doubt that the caller, Ms Dickson, was genuinely reporting a fire that she and her son suspected was somewhere north of their location in Springwood, agreeing to the suggestion that it might be somewhere around Chapman Parade, Faulconbridge. However, there is no evidence of a fire being detected in Faulconbridge, on Chapman Parade or otherwise. There are also no other reports of a fire matching the smoke reported by Ms Dickson.

It is not possible on the evidence to reach any clear conclusion as to the source and location of the smoke observed by Ms Dickson and her son.

Eliminating other possible causes

Theoretically there are a number of means by which the Springwood fire might have started. Mr Mathieson was able to eliminate several of these from his inquiry early in the course of the investigation. In summary the following hypotheses were considered either directly in Mr Mathieson's report or in the course of this inquiry:-

a) Lightning strike was excluded relatively quickly. A search of lightning data revealed no lightning strikes as a possible cause of ignition.[lxv]
b) Fallen service lines at 108 Linksview Road were excluded. On all the evidence of the experts it is clear and agreed (by the experts) that once these customer service lines were brought down by the fallen tree, they had no capacity to start a fire.
c) Burning was evident on the ground surrounding a shrub on the front lawn of the property at 28 Thomson Avenue, which is at the corner of Linksview Road. The fire at this spot has been eliminated as a cause of the fire that burnt through the scrubland opposite 108 Linksview Road because a witness saw the shrub catch fire after the main fire had started. "Nobody else was standing near the shrub and (the witness)

assumed that the shrub caught on fire because of the embers floating across from the reserve."[lxxi] There was no challenge to this evidence.

d) Burning was also evident on and near a wooden fence and through a pile of garden clippings/rubbish against the fence of the property located at 104 Linksview Road. The daughter of the owner of 104 Linksview Road was at home at the time of the fire and told her mother that "when the fence was initially on fire the neighbours further up the road used our hose to *put* the fire out on our fence." This account of neighbours assisting to put out the fire is corroborated by the evidence of the tenant at 108 Linksview Road. He said that as he walked along Linksview Road (which must have taken him past 104 Linksview Road) towards his home he could see "flames in pockets and forks in the trees" in the scrub opposite. He "grabbed the garden hose and started to hose down some embers that were in the road still alight...While putting out the embers that were still alight the woman from two doors down yelled out that her wooden paling fence was on fire. I ran down there along with another man I don't know I was handed the hose and I put the fire out." [lxxii]This evidence strongly supports the conclusion that the burnt fence at 104 Linksview Road occurred as a result of the fire in the scrub opposite. and that the burnt fence and rubbish pile can be excluded as a potential cause of the fire.

e) In his second report, Mr Allen advanced the hypothesis that the fire could have commenced as a result of heated metal or carbon particles from a car

exhaust[lxxiii]. He was critical of the investigation for not considering this possibility. Messrs Mathieson, Forbes and Moore each addressed this in their oral evidence and ruled it out as a likely cause of the fire. According to Mr Mathieson "It can occur with motor vehicles, with cars, however, generally, when you see evidence of ignitions as a result of carbon, a particular carbon coming out of the exhaust, it is spread over a number of miles, kilometres and there's multiple ignitions along the roadway…there was only one single point of origin in this fire and the rescue roads [sic] certainly isn't long enough to have a vehicle under that sort of stress to discharge carbon particles."[lxxiv]

f) Arson must always be considered a possible cause of any fire. However, there is no evidence from any of the residents and visitors who were at the scene before and during the fire, nor in any of the 000 calls reporting the fire, of reports suspicious for arson. Nor is there any evidence the fire was deliberately lit, based upon the various examinations conducted by Messrs Mathieson, Moore and Forbes.

g) It was generally agreed by Fire Investigation Officer Michael Forbes and Inspector Graeme Moore both of Fire and Rescue NSw that as the State Mine Fire was some 43 Km away that it was not the cause of the Springwood fire. The US expert in fire and arson investigations, Mr Doug Allen, also thought that given the distance it was "pretty far fetched" to assume that the State Mine Fire caused the Springwood fire. Accordingly, the State Mine Fire can be discounted as the cause of the Springwood fire.

The role of the conductors

It is clear from the photos within the coronial brief, taken by Constable Franklin on the day, that the subject tree failed in the strong winds on 17 October 2013, and that parts of the tree came into contact with the conductors at the front of 108 Linksview Road.

On 18 October 2013, Mr Mathieson was present when the tree was cut down. He seized part of the tree showing groove marks where it had come into contact with the conductors. He also reported seeing a small burn mark next to one of the grooves. The branch, and some power line samples, were later delivered to NSW Police.

Mr Mathieson concluded that "heated bark embers from the connection with the tree and power lines in the strong Westerly winds travelled across Springwood Road to the eastern side where they came into contact with bush fuel causing the fire."

Mr Forbes inspected the piece of branch seized by Mr Mathieson before it was delivered to Police. He observed three grooves. "On closer examination these grooves showed that the electrical wire had caused two of these grooves. The third appeared to have been created by a chainsaw when the tree was cut. There was no associated burning or heat damage around these grooves."

Mr Moore inspected the photos taken by Mr Forbes. He did not observe any charring or burning and concluded that the bark fibres had "been abraded away on the edges rather than burnt."

Mr Gardner, Electrical Engineer retained by NSW Police, examined the branch that had been seized by Mr Mathieson. He found "no evidence of burning or charring around the edges which indicated that it was unlikely that there had been any conduction of electricity through the branch, between the power line conductors...no evidence of electricity having been conducted through the branch to ground which can often be characterised by black spots when a cut section is viewed end on."

Mr Mathieson has since conceded that he cannot be sure that the black mark he observed on the branch was a burn mark.

There is, therefore, no evidence of any burning or charring on the only portion of the tree that was seized; the only part seized being the short section of branch taken by Mr Mathieson.

Mr Allen was critical of the failure to seize more of the subject tree in light of the hypothesis that part of the tree was ignited by arcing.

Ms Stubbs said that as she was making her 000 call she saw from her bedroom window a long branch on the roadway under the tree. When she went outside she moved garbage bins onto the scene to alert people to the presence of the fallen service lines. She said that at this time, she saw the long branch, then in two pieces, and threw it back onto the fire. She said "it did not look burnt".

Mr Mathieson seized the part of the branch that he believed showed a burn mark. He conceded when he gave oral evidence, that his focus on what he thought was a burn mark may have diverted him from looking closely at other parts of the tree for evidence that might have been relevant.

Unfortunately, it is not known what happened to the remaining portions of the tree that were removed on 18 October 2013 and later occasions when the tree was cut.

Despite Mr Mathieson's early confidence that the fire was due to arcing after the tree made contact with the conductors, Mr Forbes and Mr Moore were concerned about the absence of obvious arcing damage to the wires as they were able to be viewed at that time.

On 19 November 2013, Electrical Engineer Mr Gardner travelled to 108 Linksview Road with Police to inspect the fire scene and power lines. On this occasion Detective Senior Constable Challinor observed a number of bright or shiny marks on the conductors which were confirmed by high resolution photographs. This prompted an application for a Coronial Investigation Scene Order, which was issued on 25 November 2013.

The investigation authorised under that order took place on 29 November 2013, when the conductors were removed and seized. When the conductors were laid out on the ground "arc damage was found at the same point in two locations on both the neutral and red phase conductors".[lxxv] These were the two conductors closest to the house, and closest to the tree which fell. This arc damage was visible on common points along a 1.6 metre section of the conductors[lxxvi].

In his report of 18 December 2013, Metallurgist Professor Young, reported localised melting on the conductors consistent with electrical arcing. He thought the damage had occurred "rather recently" and "most probably less than six months ago" because of the bright non-corroded metal surfaces at the damage site.

Professor Russell was somewhat critical of the manner in which Professor Young expressed his conclusion as to the age of the oxidisation, and said it is sometimes difficult to make such an assessment with accuracy. However, I accept that Professor Young has extensive and specialised experience in "the oxidation and discolouration of metals including aluminium", and that this equipped him with the expertise to ground his opinion. It is also relevant to note that Professor Young's conclusion as to the approximate age of the arcing was not challenged when he gave evidence.

However, even accepting that the conductors showed evidence of recent arcing, it is still necessary to consider the following evidence that was given, when examining the possible link between the conductors and the fire:-

a) Most of the time, when conductors arc, the arcing does not cause a fire and may not cause material damage to the conductor.
b) While it is improbable that arcing will cause a fire, many fires are caused by arcing.
c) Here, at some point in time, probably within the six months prior to the fire, arcing occurred sufficient to cause burning aluminium to be ejected from the conductors, including particles of approximately 2 mm in diameter.
d) It is possible for particles of this size to "represent a competent ignition source if they reach the ground in a burning state" under "ideal conditions"

e) No evidence of molten or burned aluminium was found underneath the power lines and there was no evidence of burning on the roadway at the front of 108 Linksview Road.

f) This might however be explained in part by the strong winds on the day of the fires.

g) Professor Russell said that the idea that burning aluminium particles caused the fire was improbable.

h) Mr Gardner thought it a hypothesis only.

i) It is possible that foliage or bark were ignited during the process of what Mr Gardner described as "multiple arcs but quite small".

j) It is possible that this foliage or bark created embers or firebrands that were carried across Linksview Road by the prevailing wind where a ready fuel bed was available.

k) This would be broadly consistent with the area of origin identified by Messrs Mathieson, Forbes and Allen.

l) This does not however explain the absence of any evidence of burning or charring on the piece of branch that was seized or on the available photos.

m) Professor Russell thought while it was a possibility that bark was ignited, he thought this was of low probability, given the absence of evidence of burning on the branch.

n) Mr Gardner did not think that "the big tree branch on the conductors caused arcing, but rather some other part of the tree had". The absence of burning or charring did not detract from his opinion because "I'd expect a lot of the evidence to have been, have disappeared or that the parts, if there were parts that had ignited and blown across the road, they would have been burnt away and it would be very difficult to know which parts to collect."

It is necessary for all of these opinions expressed in evidence before the Inquiry to be taken into account.

While there is no witness who observed any arcing, embers or firebrands, the evidence of Ms Stubbs is compelling. She first heard sounds which she described as a

distinct "twang" and "zeep" over the noise of the wind which she immediately associated the sound with electricity. She listened to check that she could still hear the sound of her fridge. The fridge was still working so she continued reading until she heard a crackling noise outside which got louder. This prompted her to look out the window and see the undergrowth across the road slowly burning. It appears that this is credible and significant evidence which points to the conclusion that it was the impact of the tree, causing the conductors to arc, which started the fire.

It is of course possible to formulate other theories for the start of the fire. It is also possible (as occurred in this Inquiry) to point to various matters which might suggest that the arcing of the conductors was just a coincidence, and had no connection with the fire.

There also remains the fact that no evidence was found of burning or charring to the tree. However, that does not mean that the tree or parts of it were not burnt. As Mr Mathieson fairly conceded that there may well have been evidence of burning in other parts of the tree. He also appropriately accepted that there could have been evidence of burnt leaves within the 1.6 metre area of arcing, that he missed. Finally, Mr Mathieson acknowledged that because his attention was focussed on the "black mark" that he believed at the time that it was a burn mark, and that he might not have looked as carefully in other areas of the tree. Mr Gardner said in his evidence "...I'd expect a lot of the evidence to have been, have disappeared or that the parts, if there were parts that had ignited and blown across the road, they would have been burnt away and it would be very difficult to know which parts to collect".

The evidence of Marilyn Stubbs was that she heard an electrical sound. She saw a fire directly opposite the point where a tree had fallen onto conductors. Evidence of arcing was found on those conductors, at the point where vegetation had made contact with them. Arcing is a known ignition source. There was fuel, consisting of leaves and bark, in very close proximity to the arcing. There was dry fuel on the ground directly opposite the arcing. There was a strong wind blowing towards that dry fuel. The fire

was first seen burning in that dry fuel. And no credible ignition source other than arcing has been identified.

Finding as to Cause and Origin of the Springwood Fire

On the preponderance of evidence, I am satisfied to the required standard that the Springwood fire was ignited by the effects of arcing of electrical conductors after impact by a tree at 108 Linksview Road, Springwood

Problems with the fire investigation

The Inquiry has highlighted some oversights in the investigation. In particular, the failure to document detailed macro and micro indicators of the specific area of origin and point of origin, and the failure to collect a greater portion of the subject tree for examination.

Whilst the NFPA fire investigation guidelines (which are an American set of guidelines) are not applied in any mandatory form in Australia, both the RFS and Fire & Rescue NSW have their own policies on fire investigation each of which give emphasis to documenting investigations and collaborating with NSW Police to secure exhibits.

It appears however, that insufficient thought was given to particular items that should be seized, and to other evidence or indicators that should be looked for. Mr Mathieson noted an understandable pressure to clear the tree and to get the power reconnected for residents, and all emergency personnel were no doubt also diverted by the pressing need to respond to the continuing fire and its aftermath. These pressures must be acknowledged.

It is possible that some of the oversights in the investigation were contributed to by the tensions and dispute over jurisdiction for the fire investigation. This is said to have improved since 2013 so that there is now greater collaboration in fire investigations. The Interagency Fire Investigation Protocol that presently exists between RFS, Fire &

Rescue NSW and NSW Police was due for review in July 2016. Although the Protocol was in force in 2013, it did not prevent the tensions at the scene of this investigation.

The investigation of the Springwood fire provides an illustration of the problems which can arise in collaboration between agencies, and while there was evidence that cooperation has improved since 2013, it would be desirable for these improvements to be reflected in the Protocol, and for any other available steps to be taken to avoid similar doubt and potential conflict in the future.

There is no suggestion that police should be criticised in relation to their role in the Springwood fire investigation, especially in circumstances where limited police resources were under enormous pressure from a major natural disaster. However, and in part with the benefit of hindsight, it would be beneficial in major fires of this kind, for police to consider appointing, at an early stage, a dedicated investigation team, with experience in arson investigation. This is an aspect that might indeed be considered by the Interagency Panel referred to above

The Linksview Road Tree

With the evidence now available, it is obvious that the tree at Linksview Road was diseased and likely to fail in strong winds because of its compromised (semi-hollow) core. This is starkly illustrated in the photos taken by David McDonald on 24 October 2013.[lxxvii]

There was no evidence that any of the inspections or "scoping" undertaken by Endeavour or its contractors in the years prior to 2013 had identified the tree as being dead, dying, dangerous or visually damaged.

However, an important issue for this Inquiry was whether there was *evidence* to indicate that the tree was dead, dying, dangerous or visually damaged prior to 17 October 2013 and in particular, whether this should have been detected during the

previous VMP inspection in 2013, and/or the PSBI in July 2013. The point of this is not to apportion blame to any organisation or individual but to detect as to whether there are any shortcomings in the process that need to be addressed.

The Inquiry has received evidence from three expert arborists: one commissioned by NSW Police (Mr Isaac Dale), one commissioned by local landholders (Mr Scott Gatenby) and another commissioned by Endeavour Energy (Mr Peter Castor).

It seems most likely that the subject tree was of the species Acacia Binervia, commonly known as a "Coastal Myall". All of the Arboreal experts agreed that at the time of the fire the subject tree was afflicted with brown cubical rot which had caused extensive decay within the tree from its base to about 2 metres above ground level. All agreed that if the tree had been tapped with a sounding mallet during an assessment, any trained observer would have noticed a hollow sound, suggesting internal decay. This in turn should have prompted further investigation into the health of the tree.

Mr Castor said that cubical brown rot can be part of the natural aging process for a mature Acacia Binervia but that some trees will show more visual signs of advancing rot than others. "Sounding" the tree with a mallet was, he said, a more reliable means to identify internal rot than waiting for visual signs to become evident.

There is a significant dispute as to whether signs of this decay, or other evidence that the tree was dead, dying, dangerous or visually damaged, would have been obvious, or at least apparent prior to 17 October 2013. The expert evidence was however limited, by the circumstances, to an examination of the remaining tree stump, photos of the tree on the conductors taken after the fire, and other evidence referring to the appearance of the tree given by witnesses in Linksview Road. Based on these observations, each of the experts attempted, in retrospect, to understand and describe how the tree might have appeared prior to the fire.

Photos taken from Google Street View were also relied upon and are included in the reports by Mr Gatenby and Mr Castor. Unfortunately those photos as they appear on paper lack the definition and detail available to the experts when examining them on

screen. To that end it is difficult for me to reconcile the conflicting evidence of Mr Gatenby and Mr Castor as to the analysis of the photos and what they reveal about the long term growth habit and lean of the tree or the spread of the canopy.

The same can be said for attempts to understand what would have been visible around the base of the tree, through the agapanthus and other vegetation, before the fire. Mr Gatenby said that, in addition to the lean of the tree and the reach of the canopy growing towards (and possibly over) the conductors, there would have been other obvious signs that should have prompted a closer assessment, namely:-

a) Sap staining on the outer bark which should have acted as a 'flag' in a visual tree assessment.
b) Deep fissures in the bark of the lower trunk area extending to ground level where it would have been visible as a cavity.
c) Through the cavity, decay from cubical brown rot would have been evident.
d) Borer holes and frass were present on the lower trunk.

Neither Mr Dale nor Mr Castor agreed, but rather suggested that:-

a) Sap staining can be a result of several things and is not necessarily a marker for disease or damage.
b) Fissures are not unusual for this species and "there is a high likelihood that the basal region of the lower trunk was distorted, torn or disturbed during the failure and the subsequent tree removal operation" so that it is difficult to rely on photos taken after the event to interpret how the tree looked before the fire. Because these experts don't agree on the size of the fissures prior to the tree falling, it follows that they don't agree that the decay caused by the brown cubical rot would have been obvious between the fissures.
c) According to Mr Castor, there was some adaptive growth or minor buttressing at the base of the tree but this was typical for the species and age.
d) Mr Dale didn't observe an obvious basal swelling that he would consider unusual. To the extent that there was some swelling in

the stump he thought it fairly common for Acacias and it wouldn't have raised concerns for him.

e) Borer holes and frass may have occurred, or worsened, after the tree fell, and in any event were unlikely to be of sufficient size and proximity to have triggered further investigation prior to 17 October 2013.

The evidence from arborists variously engaged to provide an opinion on this issue remains in part divided, with qualified experts with the luxury of time and resources being unable to agree on the important question of the appearance of the tree before the fire.

In these circumstances, it is difficult to see how a "scoper" or other contractor ,who is not required to have horticultural or arboreal qualifications, and who is not equipped with a sounding mallet, could be expected to identify the decaying state of the tree in the course of the type of inspection ordinarily carried out as part of the VMP or PSBI.

This gives rise to consideration that scoping and other vegetation management contractors engaged by Endeavour Energy should be required to satisfy some minimum training requirement in the identification of diseased or structurally defective trees and some basic equipment to assist in their tasks. It is noted that some basic training is now provided by Endeavour Energy as to detecting 'hazard trees" as part of its induction program for the relevant contractors. There was no evidence that these contractors have also been equipped with a rubber mallet to assist in testing suspect trees and that the training includes use of this diagnostic tool. It is noted that in evidence of Mr Wyper the operative of Pinnacle for the scoping and auditing function (in relation to Mt Victoria) was himself a level 5 Arborist but did not see the need or benefit of a rubber mallet for diagnosing suspect trees. This would seem at odds with the preponderance of expert aboreal evidence before the Inquiry.

The Mount Victoria Fire

Mount York Road, Mt Victoria cuts through dry sclerophyll eucalypt forest with some private bush block properties (such as 80-92 Mount York Road) scattered off the road at some points. The location of the property at 80-92 Mount York Road surrounded by bushland is best illustrated in photos at Volume 1 Tab 4 pp 14 and 16 which are reproduced on the following pages for ease of reference.

Under the BFRMP, the Mount York Road property falls within a Land Management Zone. As with the Springwood properties, land managers and owners are responsible for hazard reduction on their own property within a land management zone.

As noted above for the Springwood fire, the Rural Fires Act imposes certain obligations on land owners to prevent bushfires and minimise the danger of spread of bushfires on their land.

The brief included a range of photos showing the vegetation at 80-92 Mount York Road in the immediate aftermath of the fire. Superintendent Jones, having looked at these photos, estimated "that the fuel loading (prior to the fire) to be in the 10 to 15 tonnes per hectare (range). I would not suggest that the fuel loading would be considered excessive for the environment of the Blue Mountains."[lxxviii] There has been no suggestion in this Inquiry that the owner of the land at 80-92 Mount York Road was in breach of obligations under the Rural Fires Act.

The power lines located at 80-92 Mount York Road were 11Kv (11,000 volt) "High Voltage" conductors. Both conductors were "active" or "energized". Located on the property were three power poles on which the high voltage conductors (in two parallel lines) were strung. Each of the poles had a number. The pole closest to Mount York Road was "pole 4", with "pole 3" being next, and "pole 2" (aka pole 22) being closest to the house.[lxxix]

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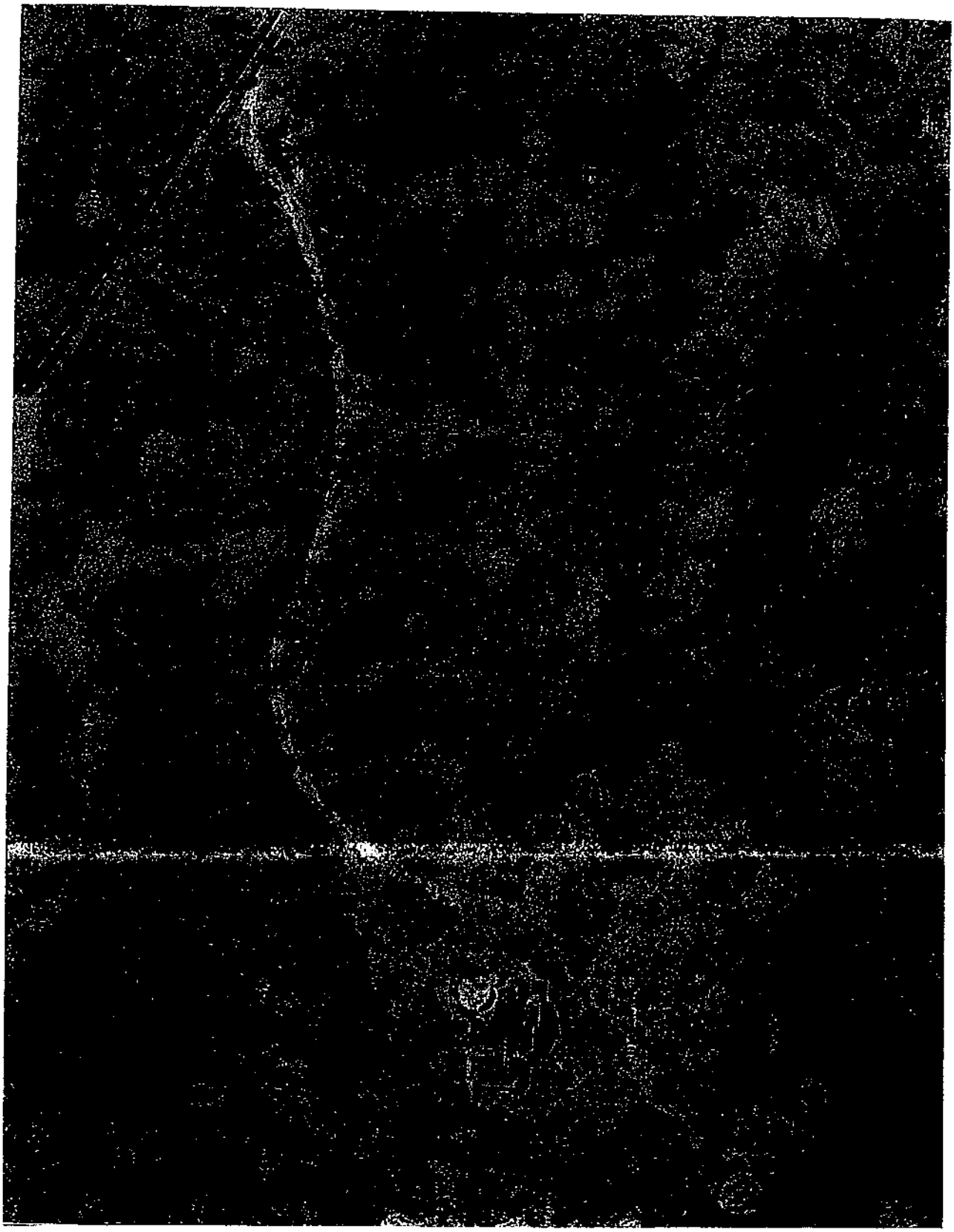
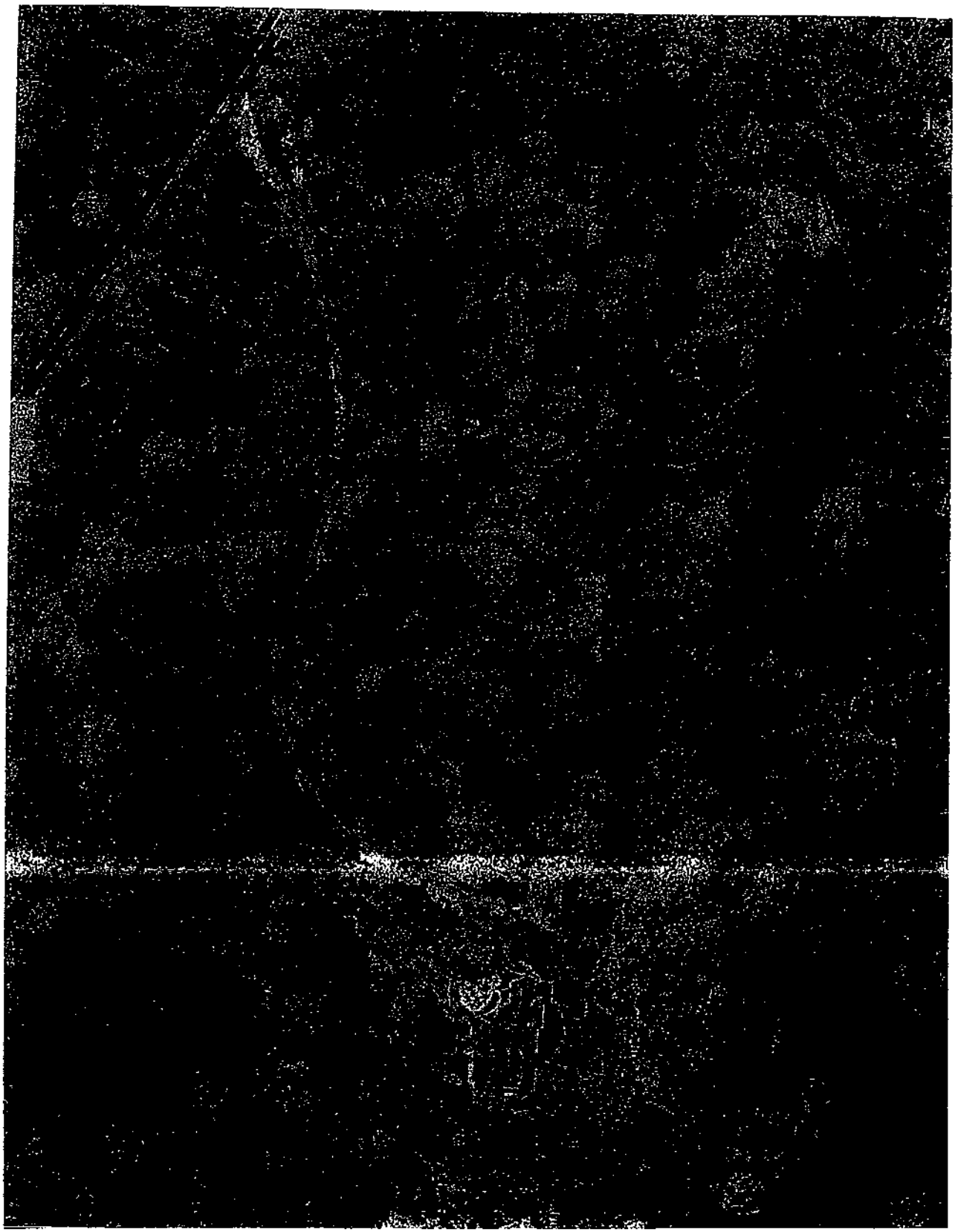




The events of 17 October 2013

Shortly after midday on 17 October 2013, Roland Clarke (a resident of St George's Parade, Mount Victoria) was driving along Mount York Road to try and get a view of the State Mine Fire and its likely progress towards his Mount Victoria home. It was during this fortuitous drive along Mount York Road that Mr Clarke noticed a small fire which appeared to have just commenced (and which subsequently developed into "the Mount Victoria fire").

Mr Clarke gave evidence that he saw a tree across power lines about 200m south of the mobile phone tower located on that road. Mr Clarke said he saw a small fire in an area he described as being near the edge of the driveway of 80-92 Mount York Road.

At 12.14pm Mr Clarke called 000 to report the fire. A copy of the 000 call was part of the brief of evidence to the Inquiry, and logs the call at 12.14.25pm. A Fire & Rescue NSW crew were dispatched to the fire at 12.15pm[lxxx] and Fire & Rescue NSW also informed the RFS of the fire. Mr Clarke told the 000 operator "powerlines have been brought down and a bushfire has started."

At 12.14.57pm, according to Endeavour Energy ("SCADA") records, there was a "sensitive earth fault tripping event at the Blackheath zone substation"[lxxxi]. These records relate to a substation which serviced the property at 80-92 Mount York Road. Investigations by Endeavour Energy have not identified any event (other than fallen power lines at Mount York Road) which might explain this sensitive earth fault.

By the time Mr Clarke finished his 40 second call to 000, the fire had (he said) grown from being small enough to "jump over" to being "the size of a small room" with 3 metre high flames. Mr Clarke's evidence in his statement of 18 October 2013 was that a tree was located on the conductors, with the conductors holding the tree up.

At about this time, local mechanic Sam Miller took a car for a test drive along Mount York Road. He saw Mr Clarke (who he knew) parked by the side of Mount York road and a small fire which Mr Miller described as "about the size of a vehicle". He stopped to check on Mr Clarke who said he had already called 000.

In their evidence, Mr Clarke and Mr Miller each described slightly different locations for the scene of the fire at this point. Mr Clarke recalled that the fire was based just to the right of the driveway entrance, while Mr Miller's recollection was that it was further into the property.

At about 12.23pm, Fire & Rescue NSW crew arrived at Mount York Road. Mr Clarke, who had some experience with the Rural Fire Service ("RFS"), remained on site for a time to assist. Shortly afterwards, RFS crews arrived and requested police assistance.

RFS personnel reported that it was extremely windy at the scene with winds up to about 114km/hr.[lxxxii] A "Go-Pro" video taken by one of the early responders from the RFS was tendered in evidence and viewed by the Inquiry and this gave some indication of what conditions were like.

Sergeant Colless from Police Rescue attended the scene and saw fallen power lines and a large tree branch resting against electrical cables near the front of the Mount York Road property. He said, in evidence, that one of the lines was intact, and was holding up the tree, and the other line was broken and was resting at the base of the power pole.

Firefighting strategies were made more difficult by the hazard created by the fallen powerlines. In addition, an equipment malfunction occurred to one unit working on the eastern flank of the fire, which required the pump to be shut down, and a change of hose. Another unit had to return to the Great Western Highway to re-fill with water and at about this time, strong winds led to the fire spotting across to the eastern side of Mount York Road. One particular area about 100 metres towards the quarry was not able to be contained and this prompted the withdrawal of some firefighting resources to St Georges Parade, so as to undertake property protection as the fire extended into Lawsons Long Alley.

There followed the closure of local roads, attempts to evacuate residents to safety, and the attendance of numerous appliances from RFS, Fire & Rescue NSW and NSW

Parks and Wildlife Service (including a NPWS helicopter). Bucketing was not an option for the helicopter because of high winds, and the helicopter being unable to fly below 5000 feet due to turbulence.[lxxxiii]

By 12.50pm Police radio included a message that said in part "FAIR BIT OF AREA ALIGHT WICKED WINDS 3 APPLIANCES STILL WORKING ON IT CAUSE POWER LINES FROM TREE FALL BRIGADE TELSL (sic) ME ALOREADY (sic) NOTIFIED ENDEAVOUR".

Initially it was believed that the fire had been contained to the (western) side of Mount York Road. Reports from 1.21pm through to about 1.38pm suggest that the fire had been contained, although Sergeant Colless who remained in the area for the first 2 hours, felt that the fire was never fully contained.

Due to the power and changing nature of the winds, several spot fires broke out on the other side of Mount York Road and fire crews began to withdraw due to worsening conditions and lack of water. It was around this time that Sergeant Colless experienced the fire "overrun" his position, with fire passing over the vehicle he was in, as the fire crossed Mount York Road. This is graphically illustrated in the photo at Exhibit B1, Tab 7, pg.46. This photograph is reproduced on the following page for ease of reference.

By at least 2.03pm an evacuation order was in place for St Georges Crescent, the residential street most likely to be next impacted by the fire. Although available crews undertook property protection in the area, houses were lost in St Georges Crescent and the fire continued to burn towards Mount Victoria, the Darling Causeway and into the Grose Valley.

The fire was fierce. One resident on the Darling Causeway described his house being hit by a "fireball" at about 3.50pm which killed his water pump, superficially burnt his face and hands, and stopped his watch.

The fire continued to burn into Berghofers Pass that evening. Although fire fighters continued to monitor the fire they could not actively fight it until daylight.

Fire - Mt York Road, Mt Victoria

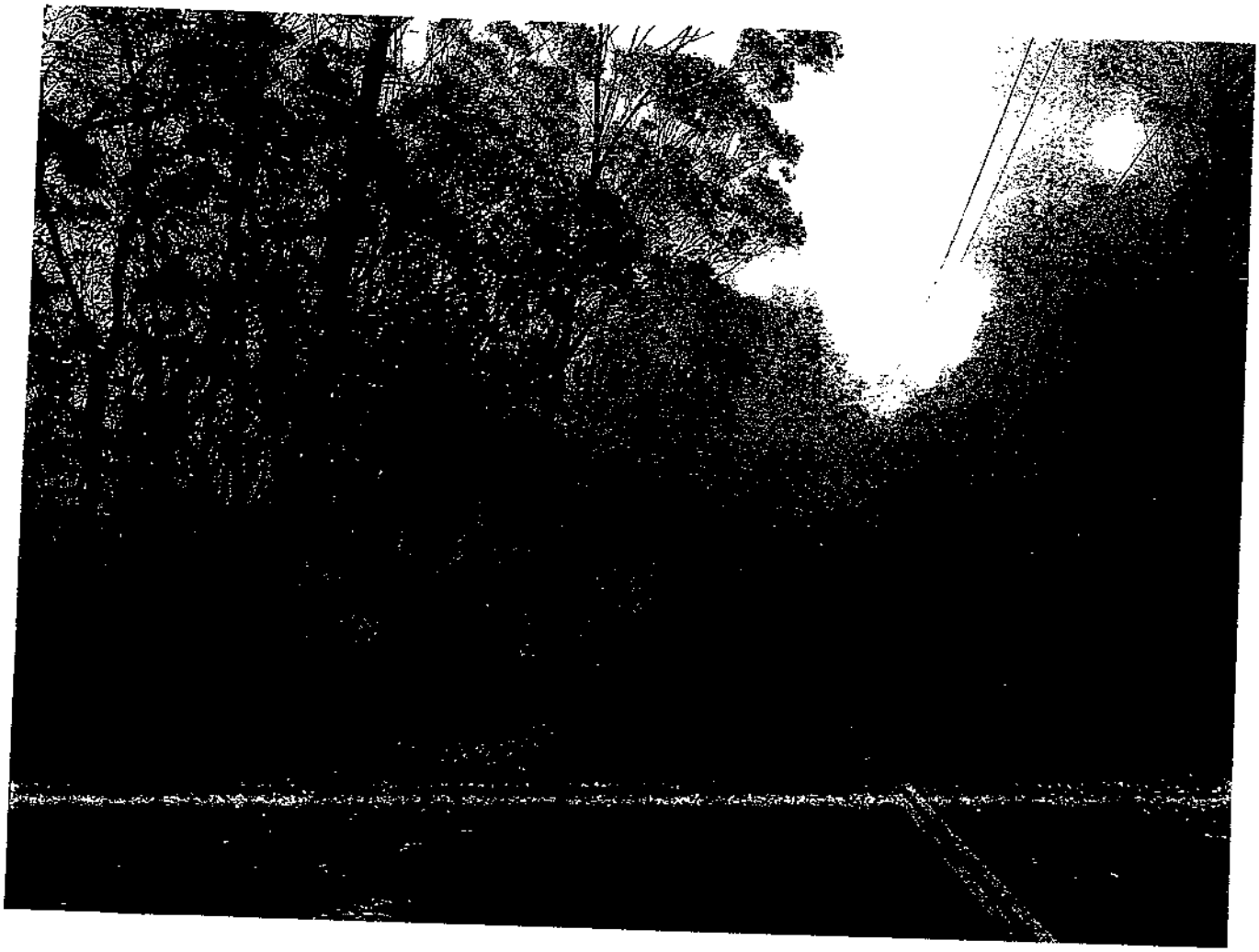
File Number: 1

Product Type: AUDIO/VISUAL FILES:Photograph

Date Taken: 17 Oct 2013 12:30

Brief Description: Attached is a photograph taken by responding police officer Sgt COLLESS (Rescue). Sgt COLLESS responded at 12.30pm on 17/10/2013 to the vicinity of 87 Mt York Road, Mt Victoria in response to a RFS request for Police assistance.

The fire started from power lines which came down approximately 50m down the driveway of 87 Mt York Road.



Records held by Endeavour Energy indicate that on 18 October 2013, an Endeavour worker was present at 80-92 Mount York Road at about 10am. It seems to be accepted that it was an Endeavour employee who cut the conductors that day, although inquiries have not led to the identification of the person.[lxxxiv]

The fire which commenced in Mount York Road continued to burn for more than 3 weeks and was not completely extinguished until 11 November 2013.[lxxxv] Approximately 9076 hectares were burnt in the Mt Victoria Fire.

By the time the Mount Victoria fire was extinguished, 9 homes had been destroyed on St George's Crescent and the Darling Causeway, and outbuildings, sheds and caravans were lost on several properties. A number of other properties were damaged but not destroyed by the fire.

The Fire Investigation

A fire investigation was conducted by District Services Coordinator (DSC) Peter Marshall of the RFS, an authorised fire investigator. [lxxxvi] Mr Marshall attended an initial briefing at Springwood Police Station on 18 October 2013 to discuss the "joint investigation plan" with police.

After examining various records, Mr Marshall travelled to the fire scene that day and conducted an examination. His conclusion was that the fire started at a point below the driveway of 80-92 Mount York Road, about 40 metres from the roadside.

As with the Springwood fire, expert evidence (commissioned by Endeavour Energy) was received from US experts Mr Allen and Professor Russell in relation to the fire at Mount Victoria.

They expressed criticisms of the investigations undertaken into the Mount Victoria fire. Chief among these criticisms was the absence of sufficient description of the fire indicators and how they contributed to a conclusion about area of origin, along with a

lack of detail in the fire investigation report as to what possible causes for the fire were considered, and discarded, and why.

These experts expressed concern that Mr Marshall's report was affected by hindsight bias, and that he was dissuaded from considering and excluding alternate hypotheses by a pre-emptive conclusion that the fire was caused by the conductors.

Mr Allen attributed to Mr Marshall a conclusion that the 2-3 metre length of conductor (actually about 1.5m as Mr Allen later corrected) with the molten end caused the fire. This isolated piece of conductor had been seen and photographed on the ground at 80-92 Mount York Road, near the fallen "Tree 1". However, Mr Marshall did not form this conclusion. Rather in his oral evidence he told the Inquiry that he was not putting the melted conductor forward as a point of origin and that he considered it but couldn't place it at the scene.

While the report of Mr Marshall might not provide great detail as to the way in which the investigation was conducted, in his oral evidence Mr Marshall described observing the area where macro indicators changed from advancing to either lateral or backing fire. Micro indicators within the area were then noted and photographed (sooting on rocks, angle of char on small branches and trees, and foliage freeze).

Although Mr Marshall's fire investigation report does not include detail as to why certain hypotheses were excluded, there is no reason to doubt Mr Marshall's evidence that various other possible causes were considered and excluded, including lightning, arson/use of incendiary, campfires, smoking, debris burning, railways, and juvenile fire play. None of the expert witnesses considered that the State Mine Fire caused the Mt Victoria Fire notwithstanding its proximity to Marrangaroo where the State Mine fire has started given the eye witness evidence of Mr Clarke and the "sensitive earth fault" that was recorded at Mt Victoria.

Mr Marshall placed the point of origin approximately 40 metres from the roadside and below the driveway. His report identified the point of origin by reference to latitude and longitude readings.[lxxxvii]

It would have been preferable for the investigation to have included a sketch map marking the location of the area of origin and point of origin and the location where each of the photographs were taken. However, as at the close of Mr Marshall's evidence his opinion as to the point of origin was sufficiently clear.

Neither of the fallen trees, nor the 1.5 metre piece of conductor (that had melted at one end), nor any of the conductors between pole 4 and pole 2, were seized as exhibits during the investigation in the immediate aftermath of the fire. It would have been desirable for exhibits to have been taken so as to permit appropriate analysis after the event.

In addition to the reports of Messrs Marshall, Allen and Russell, there are two specific items of important evidence which are available for consideration. Firstly, the evidence of Roland Clarke and Sam Miller demonstrates that at least one conductor was already visible on the ground in the vicinity of the fire at a time when the fire was small. Secondly, the evidence from Endeavour Energy records of an otherwise unexplained sensitive earth fault tripping event at the Blackheath zone substation at about the same time that Mr Clarke made his 000 call.

These important pieces of additional evidence point to the conclusion that the Mount Victoria fire was caused as a result of a tree/s or tree branches falling onto the conductors at Mount York Road, causing at least one, and possibly both conductors to come into contact with the ground.

When Mr Allen was taken to these additional pieces of evidence he accepted that they each support the hypothesis that the power lines were brought down by the tree.[lxxxviii]

Endeavour Energy have effectively raised the question of whether the tree and conductors fell so as to cause the fire or whether the tree and conductors fell as a result of the fire.

An investigation was carried out by Endeavour Energy. On 19 October 2013, Bruce Scoble (Distribution Manager, West) attended the Mount York Road property. He

noted two large branches from trees which had fallen on the driveway, and that the north and south conductors at pole 4 had been cut and disconnected before his arrival.

The map drawn by Mr Scoble following his site visit on 19 October 2013 provides the best illustration of the location of the trees and conductors that had fallen sometime on the day the fire commenced. This map is located at Exhibit H, Tab 2, pg. 24.

Mr Scoble's observations led him to the conclusion that the two conductors (which he designated "north" and "south") which had been strung between pole 4 and pole 3 had been hit by a tree (which he called "Tree 1"). He concluded that the "south conductor" had separated, when it was pulled out of a crimp on that conductor, and that the two ends had fallen to the ground. He further concluded that the "north conductor" had been pulled from the pin insulator on the top of pole 3, and had fallen from the pole. He said that while this "north conductor" had been on the ground when he visited on 19 October 2013, he could not say whether it had fallen to the ground immediately after coming off pole 3 (but agreed this was possible).

The north and south conductors from Mount York Road were examined by Emeritus Professor David Young, in 2015. Professor Young found that the "south" conductor had broken off inside a crimp as a result of failure due to tensile load. He also observed mechanical (bending) deformation to each of the conductors, which was consistent with impact by a tree or tree branch. Professor Young also noted that each of the conductors showed signs of arc damage (over an area of about 7 metres on the south conductor and over about 9 to 10 metres on the north conductor).

Various witnesses gave evidence as to the possible or likely consequences of the impact of a tree with the conductors and of the consequences of either or both conductors touching the ground.

Mr McDonald agreed that if the south conductor had touched the ground (while energised) it would be likely to cause arcing, and that that arcing could possibly start a fire if near combustible material.

Professor Russell gave evidence on this topic also. He said it was probable that arcing would have resulted from impact by the tree, and that this could lead to the ignition of foliage, with falling embers, and/or a shower of sparks (ie burning aluminium) while the conductors were still in the air. He said that this was a possible if not probable cause of the fire. He said that it was also possible that the fire commenced from arcing which occurred when an energized conductor came into contact with the ground.

Fire Investigator Mr Allen also gave evidence on this topic. While he was critical (as was Professor Russell) of aspects of the investigation, he agreed that, if the evidence of Mr Clarke is accepted, then it appears likely that it was a tree that caused the power lines to fall, and that on all the available evidence, arcing from the downed power lines is the most likely explanation for the fire.

Mr Battersby, Chief Engineer of Endeavour Energy, was asked in evidence about these opinions, and agreed that each of the suggested fire-starting mechanisms were possible. He said he was not aware of any plausible explanation for the start of the fire other than arcing from the conductors after impact by a tree.

There is one aspect of the evidence from Mount York Road which it has been suggested raises a question as to whether the fire began when "Tree 1" fell on the conductors, or whether the tree fell after the fire had commenced. This question was raised in the cross-examination of more than one witness, each of whom were taken to photographs which seem to show that the splintered section of "Tree 1" from which the branch separated on 17 October 2013, was not burnt.

The fact that this part of the tree remained unburnt is not a matter that raises significant doubt as to the cause of the fire. While at first blush, it might seem surprising that this part of the tree was apparently not damaged by the fire, there are numerous other photos which show that the damage caused by the flames was at times quite random.

Specific examples of this can be found in the following photographs taken on 18 and 19 October 2013:-

a) Windass photographs 8 and 9 - showing green, unburnt leaves of a branch that has fallen to the ground.
b) Windass photograph 13 - showing unburnt leaves on a tree on the ground.
c) Marshall photograph D009 - showing various unburnt areas on fallen tree.
d) Marshall photograph D011 - showing unburnt tree trunks.
e) Marshall photograph D013 - showing unburnt leaves.
f) Marshall photograph D022 - showing unburnt branches and leaves.
g) Marshall photograph - showing unburnt leaves.

In the light of this evidence, the unburnt "splinter" does not amount to evidence refuting the course of events which these submissions have suggested, and which appears to be accepted by virtually every witness with appropriate expertise.

Finding as to Cause and Origin of the Mt Victoria fire

On the preponderance of evidence, I am satisfied to the required standard, that the fire at Mount Victoria was caused by electrical arcing when a tree branch located near to the driveway on a property at 80-92 Mount York Road, Mount Victoria impacted with high voltage conductors, leading to the ignition of foliage on the ground.

Consideration of what may have contributed to the Mt Victoria fire

a) Crimps

One of the conductors (the south conductor) between pole 4 and pole 3 had previously been repaired by the use of crimps. On or about 31 August 2005, there had been a fire on the property which required repairs to the conductor. This repair was done, it seems, by inserting 3 crimps into the south conductor.

There is evidence that the use of crimps may decrease the strength of a length of conductor. In his report of 6 October 2015, Professor Young said "The crimps function by being compressed so as to grip the conductors. This action deforms the conductor strands, thinning them significantly. The load bearing cross-section of the conductor is thus decreased at the compression points within the crimps, making it more vulnerable to mechanical stress." Dr Simon Barter agreed with this, but added that he expected that any reduction in the cross-section was within normal limits, and "...it did not appear to me that the crimping was excessive. The crimp appeared to be consistent with the other crimps on the same conductor that I viewed, and other crimps applied to aluminium alloy conductors that I have inspected previously".

The fact that the south conductor broke within a crimp raises a question as to whether the use of crimps to repair the damaged conductor was a relevant contributing factor to the commencement of this fire.

I am unable to conclude that the use of crimps was a relevant contributing factor. Firstly, the evidence supports a conclusion that the use of crimps is an accepted practice within the industry (certainly there has been no evidence to the contrary). Secondly, the evidence does not support a conclusion that the failed crimp had been incorrectly installed. Thirdly, there is evidence that the impact of the tree branch was sufficient not only to break the south conductor at the crimp, but also to cause the north conductor to be torn from the pin insulator which had secured it to the top of pole 3. As noted earlier, there is also evidence that the force of the impact was such that it caused mechanical bending of the conductors at the point of contact. And, as the evidence of various experts verifies, it is likely that arcing (and a fire from burning foliage or sparks) would have caused a fire, even if the south conductor had not broken. In short, it appears that a fire would have started with, or without the presence of crimps.

(b) Vegetation management

As has already been noted, there was no evidence to support a suggestion that the owner of the land at 80-92 Mount York Road was in breach of any obligation under

the Rural Fires Act to mitigate the risk of fire (see evidence of Superintendent Jones, noted above).

The owner of the property explained that a lot of trees, especially around the house, were cut down at Easter 2011. The owner had a person contracted to maintain trees along the driveway near the house that could impact with the overhead powerlines. The owner has said that he could not recall receiving any letters or warnings from the power company to cut down trees that were posing a danger to the overhead powerlines. This is not surprising, given the evidence that the high voltage conductors were not customer service lines. Customer vegetation reports are not issued for high voltage conductors essentially because of the risk to customers if they tried to clear vegetation near such conductors. Therefore Endeavour Energy (by its contractors) was responsible for inspecting high voltage conductors on private land, under the VMP.

There was an issue as to whether there was some failing by Endeavour Energy and/or its contractors in carrying out appropriate inspections and vegetation management, and if so, whether this contributed to the fire. The investigation of this issue is not to apportion blame to an individual or organisation but to identify any systemic shortfall that may need to be addressed.

There is evidence that Mount York Road had been subject to inspections under the VMP, the OLI/GLI Program and the PSBI Program in the years leading up to the 2013 fire.

As mentioned earlier Mr Travis Wyper, a trained arborist was the employee of Pinnacle, the contractor engaged by Endeavour Energy to do the scoping of the Mt Victoria area. He gave evidence that he inspected the area along the driveway at 80-92 Mount York Road in November 2012. He identified various defects in various trees on his PDA in relation to clearance and sent the appropriate notification to Endeavour Energy for the cutters. Asplundh, to be notified and engaged.

Mr Wyper gave evidence that he understood a "hazard tree" to be a tree that has potential, an imminent potential to fall and impact the line"[lxxxix]. Mr Wyper did not report any "hazard trees" or dead dying or dangerous trees at that location.

Asplundh advised Endeavour Energy in December 2012 that it had completed the works required and this was then referred back to Pinnacle to do the audit. Whilst not all the works in the Grid Map for the relevant area had been carried out, any clearance defects notified as needing to be done at 80-92 Mount York Road had been done by Asplundh. Mr Wyper conducted the audit in January 2013 noting that the primary focus of the audit was to make sure that the correct clearance space had been achieved.[xc]

The tree identified as "Tree 1" by Bruce Scoble appears to have fallen onto high voltage conductors between Pole 3 and Pole 4 on 13 October 2013. According to Arborist Adam Tom, the tree was structurally defective at the time of the failure, with severe asymmetry and other defects that would have warranted closer inspection.

Mr Wyper did not identify Tree 1 between Pole 3 and 4 as encroaching within safety and/ or trimming clearances. Further, Mr Wyper acting for Pinnacle (as scoper and subsequent auditor) did not detect that the tree was a "hazard tree" or a "dead, dying or dangerous tree." Mr Wyper gave evidence that he had no recollection of seeing the tree in question. This is not surprising given the effluxion of time. It is also noted that Mr Wyper did not have the opportunity to inspect the relevant area back in 2015 when other experts did, when his memory may have been fresher.

Mr George Popovski of Endeavour Energy in his statement[xci] identified that the

defects advised by Pinnacle in the relevant were as follows:

1) Between Pole 5 and Pole 4 – inside safety clearances, trees overhang to be raised, trim eucs LHS line.

2) Between Pole 4 and Pole 3 – inside trimming clearances but outside safety clearances trim euc and scrub near gate.

3) Between Pole 3 and 122 – inside trimming clearances but outside safety clearances, tri, eucs both sides of line.

4) Between Pole 122 and 1 – low (priority) groundline euc scrub.

"Tree 1" also did not excite the attention of the cutters for contractor Asplundh when they were carrying out the works in the area (of which they had been notified to carry out).

It is noted, on his evidence that the primary focus of Mr Wyper's scoping inspection was to identify intrusions into safety and trimming clearances and that his inspection was limited to a visual one. He advised the Inquiry that he did adopt the practice of use a device like rubber mallet for detecting dead, dying or dangerous trees as it was not "a science" for doing so given the difference one person may hear from another.[xcii]

When conducting the auditing role Mr Wyper's primary focus was to ensure that any clearance work that he had noted on scoping had been done and the safe clearances from assets achieved.

The evidence of the Arborist Mr Adam Tom suggests that "Tree 1" was probably in a defective state for some time before the fire.

A PSBI was carried out in Mount York Road on 31 July 2012, and in May 2013. Neither of these inspections identified any "vegetation defects" (including encroachments of trees within minimum clearance spaces). The 2013 Pre Summer Bush Fire Inspection was conducted by Osborne Aviation from the air using LIDAR technology and those inspections were recorded as complete on 7 June 2013. The use of a helicopter to carry out aerial inspections makes sense because of the distances and terrain involved. However, one limitation in relying on inspection from the air using the LIDAR technology is that, as explained by the General Manager, Network Development, Endeavour Energy (Ty Christopher), "a 3D survey identifies encroachments within the vegetation clearance space as well as trees that are located outside the vegetation clearance space but it does not in and of itself to my understanding identify the condition of those trees."

There were no outstanding work orders under the OLI/GLI Program for 80-92 Mount York Road. The inspection details for the Program in this area had been recorded as closed on 7 September 2013.

The evidence thus demonstrates that the tree which fell at 80-92 Mount York Road on 17 October 2013, which was "Tree 1", was never identified as requiring consideration, either on the basis that it was "encroaching" (it is not thought that it was in fact encroaching) or because it was "dead, dying, dangerous or visually damaged".

Evidence was called from Arborist Adam Tom, who was engaged on behalf of the Inquiry in 2015 to examine the remains of "Tree 1" from which a large branch had separated.

Mr Tom provided a report in which he stated that the tree was most likely a "Sydney Peppermint", and that the tree was structurally defective at the time of its failure in October 2013. He said that the tree exhibited severe asymmetry (with a trunk lean of 40 degrees from vertical), and that it also exhibited a severe internal defect, with advanced fungal decay and severe termite damage. The tree also had a large, decayed stub resulting from a previous failure, located about 3-3.5 metres from the ground. He

also noted that the tree showed no evidence of "buttress roots" (adaptive growth to increase stability), and that the absence of buttressing increased the risk of failure.

Mr Tom asserted that these defects would have been apparent prior to October 2013, and that the presence of the tree in the immediate vicinity of a "target of significance" (power lines) would warrant closer inspection by a competent person. In particular, Mr Tom said that using a "sounding hammer" would have easily detected the internal decay. He added that if someone had conducted an inspection of the tree (prior to its failure) then he would have expected them to have detected that the tree had some problems. He said a proper inspection would not require Arboreal qualifications, but that a basic level of training in tree assessment would be needed, and that this type of knowledge could be conveyed to scopers in a training course of 3 to 4 days.

As noted above, the electrical assets at Mount York Road had been, in the period before the fire, subject to inspections under both the PSBI Program, and the VMP.

As has been noted earlier, the services agreements with contractors (such as Osborne Aviation, who did the 2013 PSBI) were less than clear as to the obligations of a contractor carrying out an aerial PSBI. But, in any event, it is unrealistic to expect that an aerial inspection (even with detailed photographs) would be capable of detecting the sort of faults which Mr Tom suggested were being displayed by "Tree 1" in the years before the fire. It is not appropriate to be critical of Osborne Aviation for not detecting the dangerous state of "Tree 1" following its aerial inspections.

Mr Christopher told the inquiry that Endeavour Energy records show that no "dead, dying or dangerous" trees were identified at 80-92 Mount York Road as at 17 October 2013. Furthermore, in one of the statements by Mr Battersby, he explained that in late 2012, Endeavour Energy had been informed by its scoping contractor of a "HV defect inside trimming clearances between Poles 3 and 4". According to Mr Battersby's statement, the work involved trimming a Eucalypt tree and some scrub near a gate. He said that on 13 November 2012, Endeavour Energy notified this work and scoping data to its trimming contractor, and on 9 January 2013, Endeavour Energy was informed that the work was completed. Furthermore, the scoping contractor verified on 17 January 2013 that the work was compliant.

It is apparent therefore, that not only were (on the ground) inspections carried out (under the VMP) at Mount York Road, but those inspections led to the identification of a non-compliant tree and other vegetation, between pole 3 and pole 4. This is, of course, the very same area in which "Tree 1" was located, and which (according to the evidence of Mr Tom) was at that time displaying signs of severe asymmetry, as well as other very significant defects. Clearly, the defective nature of this tree was missed, despite the fact that two different Endeavour Energy contractors had carried out work "on the ground" within metres of the tree.

There evidence as to why the defective and dangerous nature of this tree was missed. However, a possible contributing factor there was the lack of clarity which arose from the then wording of MM10013 and confusion as to obligations by contractors performing the works. As a level 5 qualified arborist therewas could be no suggestion that Mr Wyper was not sufficiently trained in relation to detection of trees that may be "dead, dying or dangerous".

Recommendations mooted under s.82

A number of possible recommendations, of a very general nature, were raised at the outset of the proceedings, and are set out below. However, by the close of the evidence, some of these no longer seem to be appropriate, for reasons which follow:-

1) Ability to turn off power in extreme conditions. Endeavour Energy operates under the National Energy Consumer Framework which imposes certain limitations on when and how electricity supply can be disconnected. Any recommendation that Endeavour Energy has the discretion to turn off power in certain extreme conditions would require legislative amendment. More importantly, there is evidence that as at March 2015, Endeavour Energy had 18,314 registered life support customers[xciii] who could be affected by decisions to turn off power in extreme conditions, even if this were permitted by the legislation.

2) Remove overhead lines and place underground. Conductors and other electrical infrastructure should ideally be placed underground where possible. However this would be a very large and extremely expensive undertaking, and one which Mr Christopher said in his evidence would take decades to complete even where this were possible. Mr Christopher also said that in some cases of proposed undergrounding, Endeavour had encountered considerable community resistance. For these reasons, no recommendation of this kind is supported. Furthermore, in terms of *new* developments in the Blue Mountains local government area, the Blue Mountains City Council already includes underground conductors as a prerequisite for development approval.

3) Install aerial bundled cables (ABC) in fire-prone areas or install more fire-resistant insulation on conductors. Evidence has been presented by Endeavour Energy that the installation of ABC would be prohibitively expensive given that so much of the area that Endeavour Energy covers is classified as bush fire prone. The statement of Mr Christopher estimates that the cost of converting all of Endeavour's existing bare conductors to LV ABC or HV ABC would be in excess of $3 billion. Such expenditure would also first require approval by the Australian Energy Regulator for approval (amongst other things) of an increase in customer prices to fund the necessary capital expenditure. It is relevant however to note that for new LV construction in bush fire prone areas, Endeavour Energy is already required to use either LV ABC or underground LV cabling.

4) Authority to power company to remove foliage where resident fails to. This recommendation is unnecessary because such powers already exist. For example, s.48 of the Electricity Supply Act 1995.

5) Install more spacers in fire-prone areas. This does not apply to the Mount Victoria fire because evidence has been given that spacers cannot be used on high voltage conductors. As for the Springwood fire, a spacer was already in place in the span between poles. This spacer appeared to perform its function by keeping the conductors in the vicinity of the spacer apart, even as the tree lay on the conductors. Whilst it is true that more spacers would make the conductors more rigid and less likely to come into contact with each other if a

tree were to land in proximity to the spacer, there is a cost both in terms of retrofitting spacers and in terms of servicing the line thereafter.

6) Increase minimum safety clearances to 3 metres. Minimum safety and trimming clearances as already in place distinguish between the types of conductor, the length of span, the voltage of the overhead line and make additional allowance for bush fire prone areas. These clearances take into account guidance as recommended by the NSW Industry Safety Steering Committee (ISSC). Thus, the proposed recommendation is unnecessary.

7) Relax restrictions on residents removing trees. This proposed recommendation does not arise on the evidence available in either fire. Neither fire resulted from residents wanting to trim or remove trees but who were prevented from doing so.

Reasoning as to Recommendations made by the Coroner under S.82

Recommendations Involving Endeavour Energy

Much time was spent during the hearing on the concept of "hazard trees" and the way in which Endeavour Energy Mains Maintenance Instructions specifically use that term in connection with safety and trimming clearances. These issues have been clarified in so far as subsequent amendments to MM1001 and MM10013. However.

it is noted that, for the reasons set out above. Endeavour Energy should revise its policies, procedures and contracts, including the incorporation of the revised MMI0001 and revised MMI0013. so as to set out the expectations of Endeavour

Energy and also the obligations of contractors in clear and concise language.

Agreements , instructions and other documents which include which set out the duties are of little benefit unless those conducting the duties such as scoping, cutting and inspecting are informed of their obligations in the clearest of terms.

It is unrealistic to expect that those carrying out scoping and cutting, or otherwise assessing assets and trees under Endeavour Energy programs should be qualified arborists. However, it is both desirable and sensible for those contractors to have at least basic hazard tree identification training as that which is provided to Tree Management Officers employed by Endeavour Energy. It is a pleasing development that Endeavour Energy now provides scopers with one day of training with respect to identifying "hazard trees". A review should be taken as to whether this is sufficient. It is noted that Mr Tom felt such appropriate training would take a training course of 3 to 4 days.

Accordingly I have made the recommendations to Endeavour Energy as set out in the Headnote to these Reasons for Decision.

Recommendations involving the NSW Police Force

The spread of the fires on 17 October 2013 occurred so quickly that NSW Police were diverted from routine work into the fire front with very little warning. Detective Sergeant Bayliss gave evidence of the desirability of having some personal protective equipment available in Police vehicles during the bushfire season.

This initiative was broadly supported by the Rural Fire Service and Fire and Rescue NSW with Inspector Moore noting that this should include training in the proper use of equipment.

Another issue raised in the statement of Detective Sergeant Bayliss is the desirability of developing a Disaster Victim Registration Form, so as to obviate the need for

victims of natural disasters to submit multiple forms to the various agencies with whom they may need to deal. Detective Sergeant Bayliss made the suggestion that a working party be established with the various agencies taking part to cause this to happen; an eminently sensible suggestion.

Accordingly, I have made the recommendations to NSW Police Force as set out in the headnote to these Reasons for Decision.

Recommendations involving Fire and Rescue NSW and Rural Fire Service

Evidence in the form of video footage from the Mt Victoria fire highlighted the danger of trying to fight fire in the proximity to conductors and the need to reinforce safe clearances around live or potentially live electrical assets.

Accordingly, I have made the recommendations to Fire and Rescue NSW and Rural Fire Service as set out in the Headnote to these Reasons for Decision.

Further Recommendations to NSW Police Force, Fire and Rescue NSW and Rural Fire Service and Endeavour Energy.

In each of the fire investigations at Mt Victoria and Springwood there were a number of pieces of potentially relevant evidence that were not seized as exhibits. These items were of importance to the investigations. It is desirable that clear protocols be developed among the relevant agencies to ensure that investigations in to major fires are conducted in accordance with best practice.

Accordingly, I have made the recommendations to NSW Police Force, Fire and Rescue NSW and Rural Fire Service as set out in the Headnote to these Reasons for Decision.

Coroner Magistrate Fiona Toose

ENDNOTES

i Exhibit A2, Tab 60 p. 521
ii Exhibit B1, Tab17 p.224
iii ExhibitB1,Tab 17 p.228
iv Exhibit B1,Tab16 p.224
v Transcript 01/06/15 p16.49
vi Transcript 01/06/15 p 16.49
vii Transcript 01/06/15 p 17.43
viii Exhibit B1,Tab 12,p154
ix ExhibitB1Tab8,p53
x ExhibitB1Tab7,p39
xi A rural fire district for the purposes of the Rural Fires Act 1997
xii Exhibit A3, Tab 64 p 775.17
xiii Exhibit A3, Tab 64 p 775.19
xiv Exhibit A3, Tab 64 p 777.42
xv Exhibit B1, Tab 16, p.224
xvi Exhibit A3, Tab 62, p.761 ff
xvii Exhibit A3, Tab 63, p 763
xviii Exhibit X, Vol 1,Tab 1, p 4ff
xix Exhibit R, p. 12.55
xx Exhibit R p 8.32
xxi Transcript 24/08/15 p46
xxii Transcript 01/11/17 p.40ff
xxiii Exhibit AZ p.11
xxiv Exhibit X Vol 6 Tab 54
xxv Exhibit X Vol 6 Tab 41
xxvi Transcript 31/10/17 p.7
xxvii Transcript 31/10/17 p.11
xxviii Transcript 31/10/17 p.11
xxix Exhibit AW p.3
xxx Transcript 31/10/17 p.51
xxxi Transcript 31/10/17 p.4ff
xxxii Transcript 1/11/17 p 23
xxxiii Transcript 31/10/17 p 21
xxxiv Transcript 31/10/17 p 33
Exhibit R Statement of Ty Christopher
xxxvi Transcript 24/08/15 p.12
xxxvii Transcript 24/08/15 p. 28
xxxviii ExhibitAZ p7
xxxix Exhibit R p.12
xl ExhibitA3,Tab64 p 773
xli Exhibit R, p.17
xlii Transcript 24/08/15 p 31
xliii Transcript 25/08/15 p 5ff
xliv Transcript 24/08/15 p.47
xlv Exhibit X Vol 6 Tab 41 p 1982ff
xlvi Exhibit X Vol 6 Tab 41p 1970
xlvii Exhibit X Vol 6 Tab 57 p 2313
xlviii Transcript 24/08/15 p.16
xlix Transcript 24/08/15 p 17
l Transcript 31/10/17 Mr Turner p 46 ff
li Transcript 1/11/17 p58

liii	Exhibit AU
liii	Transcript 28/08/15 p.56
liv	Exhibit A3 Tab 64 p. 780
lv	Rural Fires Act s63
lvi	Transcript 28/08/15 p 60
lvii	Exhibit AU Tab 64 p 785 and Transcript 28/05/15 p 59-60
lviii	Exhibit R p 8
lix	Exhibit X Vol 7 Tab 70 p 2677
lx	Exhibit X Vol 7 Tab 77 p 2700
lxi	Exhibit A1 Tab 13 p 114
lxii	Exhibit A2 Tab 40 p 305
lxiii	Exhibit A1 Tab 8 p 94
lxiv	Exhibit A3 Tab 62
lxv	Exhibit A2 Tab 39 p 287
lxvi	Transcript 26/08/15 p 50
lxvii	Transcript 27/08/15 p 10 ff
lxviii	Transcript 26/08/15 p 42
lxix	Transcript 27/08/15 p 80 ff
lxx	Exhibit A2 Tab 39 p 288
lxxi	Exhibit A3 Tab 69
lxxii	Exhibit A1 Tab 10 p 104
lxxiii	Exhibit U1 Annexure A p 7
lxxiv	Transcript 26/08/15 p 66
lxxv	Exhibit A2 Tab 43 p 340
lxxvi	Exhibit A2 Tab 40 p 307
lxxvii	Exhibit C Tab 28 p 79
lxxviii	Transcript 04/06/15
lxxix	Exhibit H p 4
lxxx	Exhibit B1 Tab 14p163
lxxxi	Exhibit B 1 p 153 at Q1
lxxxii	Exhibit B1 Tab 14 p 166
lxxxiii	Exhibit B1 Tab 8 p 53
lxxxiv	Exhibit B1 Q1
lxxxv	Exhibit B1 Tab 3 p 17
lxxxvi	Exhibit B1 Tab 14
lxxxvii	Exhibit B1 Tab 14 p166
lxxxviii	Transcript 26/08/15 p 5
lxxxix	Transcript 01/11/17 p 20
xc	Transcript 01/11/17 p18
xci	Exhibit AZ
xcii	Transcript 01/11/17 p 23
xciii	Exhibit R p 51