



Department of **Consumer  
and Employment Protection**  
Government of **Western Australia**

**Energy Safety Division**

## **ELECTRICAL INCIDENT REPORT**

### **POWER LINE FAULT & BUSH FIRE AT BRIDGETOWN, WESTERN AUSTRALIA ON 27 DECEMBER 2003**

2 February 2004

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## **1. INTRODUCTION**

A ground fire occurred near Bridgetown on 27 December 2003 and it was reported by the Fire and Emergency Service (FESA) that it was suspected the cause of the fire was a fault or failure of some kind on a Western Power 12.7 kV overhead power line.

An investigation was carried out by the Energy Safety Division and this report summarises the findings. The cooperation and assistance of officers of Western Power (WPC), Department of Conservation and Land Management (CALM) and Fire and Emergency Service (FESA) is acknowledged.

### **1.1 Time and Date of Occurrence**

Peter and Colleen Browne who reside in the property adjoining the pine plantation reported the fire. Their son David saw smoke due north from their home, coming from behind the Dalgarp pine plantation on Five Gates Road, at between 11:00 – 11:10 am on Saturday 27 December 2003.

### **1.2 Notification of Incident**

Mr Albert Koenig of the Energy Safety Division, Department of Consumer & Employment Protection, was notified of the incident by Mr Phil Cribb of FESA on 27 December 2003.

### **1.3 Investigating Inspector**

The investigation was carried out by Mr Ross Reid, a designated Inspector (Electricity), Electrical Inspection Branch, Energy Safety Division; Department of Consumer & Employment Protection.

Mr Reid initially inspected the fire scene on 28 December 2003 and on a number of occasions subsequent to that.

Mr Reid continued with his investigation on 5 January 2004 and identified an area (GPS position 33.55.720S and 116.00.715E) on land described as Certificate of Title Volume 1374 / Folio 993 Freehold Land held by the Executive Director, Department of Conservation and Land Management, where the fire is believed to have started.

## **2. SUMMARY**

Considering all the information gathered and the circumstances of wind and weather on Saturday 27 December 2003 it is concluded that a fault occurred on the Western Power 12.7 kV overhead power line in the pine plantation adjacent to Five Gates Road, Bridgetown.

Investigation found that the fault was caused by branches of a pear tree located within the pine plantation coming into contact with live, overhead power line conductors. This resulted in hot or burning debris falling to the ground and provided a source of ignition for dry debris.

The property where the fire originated is described as: Certificate of Title Volume 1374 / Folio 993, freehold land. The pine plantation is described as being in the CALM Blackwood District. The land on which the pine plantations are established is owned and managed by the Department of Conservation and Land Management.

The contact between the live conductors and the tree as described can be categorised as a power line maintenance shortcoming related to a vegetation management deficiency, since the clearance between the conductors and the tree should have been maintained in such a way as to avoid such a contact.

### **3. ORIGIN OF THE GROUND FIRE**

On noticing the smoke from a fire Peter and David Browne proceeded immediately to the scene in their fire unit and on arrival found it to be burning under the power line on property owned by CALM. They noticed that a pear tree had grown up into the power line and appeared to be scorched at the top. The tree, identified as a “Manchurian Pear” tree was located directly beneath the power lines. There were two other pear trees in the vicinity. The trees are non indigenous and were apparently originally cultivated.

The overhead power line is part of the WPC distribution system, and consisted of a 12.7 kV single-phase conductor with an earth return conductor. Both the live single-phase conductor and the earth wire, which is slung below it, are of 7/1.60 gauge steel mounted on wood poles.

The tree (which FESA advised as located at GPS coordinates 50H 0408642 6245326) was originally planted in close proximity to an old homestead. Energy Safety was advised that CALM purchased the property in 1974 and following this removed the homestead buildings. It is unclear whether at that time a decision was made to retain the pear tree or whether it was cut it down and then regrew.

#### **4. CONTRIBUTING FACTORS**

There were no suspicious circumstances and no evidence of lightning in the area.

The air had an ambient temperature of 38 °C and a relative humidity of 23%.

The investigation showed that the ignition point of the fire was on the ground at between 40 and 50 metres south east from the pear tree. This is consistent with the wind coming from the north west, reported as gusting to 63 km per hour, such that any burning tree debris material from the pear tree resulting from a power line short circuit would fall away from the line and travel in a south easterly direction to the ignition point on the ground. The ground fire then travelled in this direction towards Bridgetown.

There was no evidence of damage to the overhead line conductors at the point where the pear tree had interfered with them. The only damage consisted of two burn marks 620 mm apart on the tree branch where it had contacted the live phase conductor and the underslung earth wire, and electrical tracking and burning along the surface of the branch between the two points of contact. This is consistent with a tree branch simultaneously contacting the bare live conductor and the earth wire of an overhead line in high wind, causing a momentary short circuit (or “fault”) and thus an electric current to flow between the conductors through the tree branch, and also to ground through the branch and then the tree trunk.

Though the live conductor and earth wire are normally 1.2 metres to 1.5 metres apart, the motion caused by the strong wind running virtually parallel with the conductors would have caused considerable erratic movement of the conductors and the tree. The conductors did not break or melt and remained intact and live until several power poles in the vicinity were destroyed by the ground fire and the line collapsed.

In such a case sufficient electric energy passes between the two conductors (i.e. the live conductor and the earth wire) and/or the tree and the ground with a quantity of heat being produced both in the metal and the wood of the tree at the point where the connection is formed. The heat caused some ignition of leaves and charring of wood on the tree branch, resulting in burning tree debris falling away from the point of contact with the conductors.

Peter and David Browne reported that the wind was strong and blowing from the north west and given the situation above it is concluded that the fire was initiated when the conductors and the tree clashed just before the fire was noticed at around 11:00 – 11:10 am on Saturday 27 December 2003. The topography was hilly sloping uphill southwards with dry grass, leaf litter and weed debris on the ground.

## 5. OBLIGATIONS FOR THE CONTROL OF VEGETATION IN THE VICINITY OF POWER LINES

The duty and powers as to vegetation causing interference with power lines are laid down in s.54 of the *Energy Operators (Powers) Act 1979* wherein it states that:

- (1) It shall be the duty of the occupier of any land on or over which vegetation is growing to fell or lop, or to remove or otherwise deal with, in such manner as is reasonable in the circumstances, so much of any vegetation as is necessary to prevent it interfering with or obstructing, or becoming likely to interfere with or obstruct, the construction, maintenance or safe use of any supply system.
- (2) Where in the opinion of a responsible officer of an energy operator\* the duty imposed by subsection (1) has not been carried out –
  - (i) if the interference or obstruction is occasioned solely in relation to premises or apparatus on the land (not being a street or other public place) from which the vegetation is growing, and the occupier of that land so consents; or
  - (ii) in any other case, (but where the vegetation has been planted or cultivated, only if the occupier of the land at the point at which the vegetation interferes or obstructs the supply system has been requested by notice in writing to carry out the work but has not done so within such period, not being less than 3 days, as is specified in the notice, and has been given a reasonable opportunity to make representations as to the manner in which the work should be effected),

the energy operator may enter upon the land without notice and clear or remove the vegetation so far as is necessary causing as little damage as is practicable.

- (3) The reasonable cost of the clearance or removal of vegetation pursuant to subsection (2) may be recovered by the energy operator from the occupier of the land as a debt due to the energy operator, if that vegetation had been planted or cultivated, and for the purposes of this subsection a local government which has planted or encouraged the planting of vegetation on land not occupied by any other person shall be deemed to be the occupier of the land.

*\* means the utility, in this case Western Power*

It is evident that the fire was initiated because the pear tree was not controlled in a manner compliant with the above provisions.

WPC has advised that:

- The overhead line was originally a Contributory Extension Scheme (CES) line and WPC was responsible to clear vegetation until 1996 when the CES expired.
- Since the CES expired the occupier of the land has been responsible for vegetation maintenance according to s.54 of the *Energy Operators (Powers) Act 1979*

Energy Safety's investigation indicates that CALM failed to undertake the necessary tree pruning, and that Western Power did not take corrective action as provided for in the legislation, if the occupier fails to carry out the necessary pruning.

Overall, it became apparent that the parties involved were not clear on their obligations.



## 6. CONCLUSIONS

There are a number of inter-related events, circumstances and factors that coincided on the day of the bushfire. These are summarised as follows:

- There were no suspicious circumstances relating to the origin of the fire.
- Taking account of the burn pattern on the ground, and the prevailing wind at the time, it is concluded that the fire originated in the dry debris on the ground below the 12.7 kV overhead power line in the pine plantation in the area between poles 46 and 47.
- The weather conditions at the time of the fire were hot and dry with very low relative humidity and strong gusting winds from the northwest.

Taking all of the above into account it is concluded that:

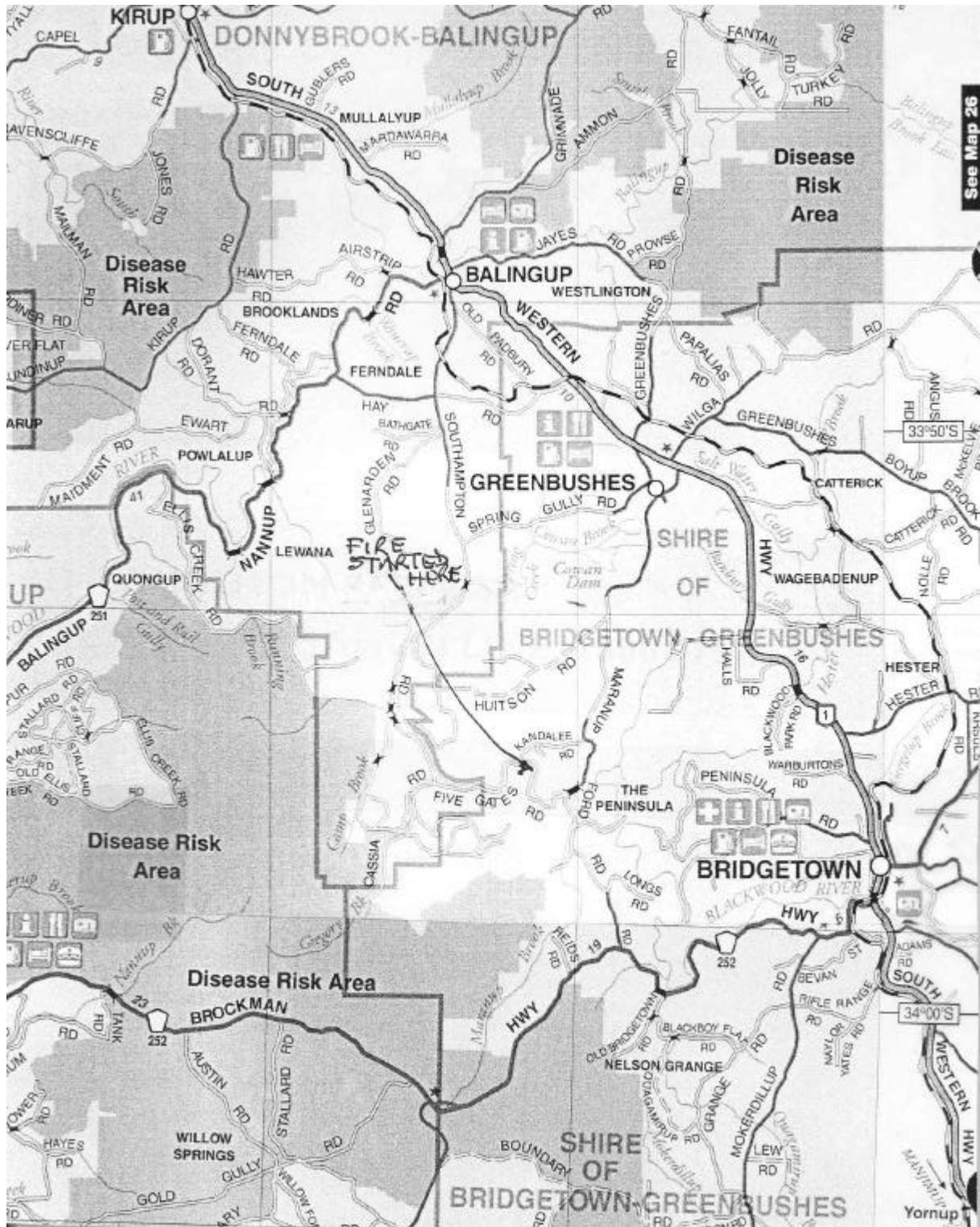
- The fire was caused by the ignition of the dry material on the ground due to burning tree debris falling as a result of contact between a pear tree and a “live” 12.7 kV conductor and earth wire of a WPC overhead power line in the pine plantation adjacent to Five Gates Road (Certificate of Title Volume 1374 / Folio 993)
- The contact between the conductors and the pear tree can be categorised as a power line maintenance shortcoming related to a vegetation management deficiency, since pruning of the tree should have been carried out in order to avoid interference with the power line, and the risk of a wild-fire. These types of events are well known to both Western Power and government agencies involved in forest activities.
- The pear tree should have been pruned clear from the power line in order to comply with the requirements of s.54 of the *Energy Operators (Powers) Act 1979* by the occupier of the land (i.e. CALM) and failing that, as a last resort WPC could have carried out the pruning itself after giving due notice of its requirements and intentions to the occupier.

It became apparent that the parties involved were not clear on their obligations for the management of cultivated or planted vegetation adjacent to WPC power lines. Consequently it will be beneficial to disseminate information about these responsibilities, in the interest of public safety and power system reliability.

Energy Safety plans therefore to develop and provide such information material to industry, government agencies and the public.

Energy Safety will also remind Western Power of its implied obligation to monitor the control of trees near its power lines.

APPENDIX 1 LOCATION MAP



See Map 26

## **APPENDIX 2**

### **DISCUSSIONS WERE HELD WITH THE FOLLOWING PERSONS**

Bob Chandler  
Regional Manager  
Central Forest Region  
CALM

Greg Mair  
District Manager  
Blackwood District  
CALM

Lindon Piggott  
Operations Manager  
Commission Plantations Operations  
Forest Products Commission WA

John Tillman  
Regional Fire Coordinator  
South West Region  
CALM

Maurie Tong  
Fire Investigator engaged by WPC;

Ric Hinch  
Fire Investigator engaged by WPC;

Craig Morgan  
Environmental Scientist, Vegetation Management  
Employed by WPC.