

Red Paper*

How the East Kilmore Black Saturday fire got away Bushfire behaviour and the fire suppression effort in the first few hours

Denis O'Bryan
Red Eagle Bushfire Protection Services
February, 2015

Summary

Our paper asks this question - Why did the East Kilmore Black Saturday fire get away?

Why this fire? Two reasons. It escaped control of the “best ever prepared” fire agencies, but it travelled unusually slowly in the early hours. It exposes worrying deficiencies.

We have engaged a virtual vicarious Treasurer (who is open minded and perceptive) to analyse our paper. **Her comments are throughout the text in green.** She agrees with our concerns to the point that she accepts she is funding a bushfire service that delivers protection by pot luck, that this is not acceptable, and that she is uncomfortable. We asked the Treasurer because we believe that the fire agencies will not voluntarily change their ways. Our hope is that the Treasurer will change their policies by budget pressure and performance requirements.

We systematically analyse evidence from eye witness statements and reports given to the Victorian Bushfire Royal Commission together with wind records, vegetation and topography and combine it with fire behaviour science to deduce fire spread and spot fire activity. We then reconstruct fire fighting strategy to analyse what impact it had on the fire's spread.

- Could we have stopped it with current resources and strategies?
- Could different strategy and resources have stopped it?

We reveal to the Treasurer that she is paying huge money for fire fighting forces that are failing to stop bushfire damage to the taxpayers and their houses.

We reveal major deficiencies that the Royal Commission did not diagnose, deficiencies that, for the security and safety of Victorians, cannot be left untreated. But they have been. The same deficiencies continue to loom in government fire reports since Black Saturday. The same deficiencies will be the ingredients of another bushfire disaster.

We recommend how these deficiencies can be treated so that our bushfire protection service leads us to create a bushfire-protected state.

How the East Kilmore Black Saturday fire got away

Contents

Summary		1
Introduction		3
Chapter 1	Background	5
Chapter 2	Fire spread and the suppression response Period 1 11.47 am to 12.30 pm	11
Chapter 3	Fire spread and the suppression response Period 2 12.30 to 1.30 pm	19
Chapter 4	Fire spread and the suppression response Period 3 1.30 to 2.30 pm	34
Chapter 5	Other Issues	50
Chapter 6	Deficiencies	55
Chapter 7	Recommendations	58
References		61

Introduction

The reader and I will now put ourselves in the position of Treasurer. The Treasurer funds the fire agencies and pays out for extra suppression costs and disaster recovery costs. The evening before Black Saturday, fire agencies assure the government who then reassure the people they are the **best prepared ever**. Next day, 173 people are killed and 2000 houses are destroyed. Treasury payouts equivalent to some \$2B tore a huge unexpected hole in Victoria's 08/09 budget of \$40B, money that should have gone into productive areas. The forgiving Royal Commission found the fire agencies "could have done better". We submit that fire agencies will not voluntarily change their ways, perhaps because they are very well funded without the accountability of meaningful performance criteria and they have successfully lowered public expectations (eg, some deaths and house loss is inevitable during Mother Nature's fury). We therefore want the Treasurer to say "Enough. This is the 21st century. It is time to reverse the ever rising drain on Victoria's budget by eliminating bushfire threat and bushfire damage forever. It is time to tackle the severe bushfire as a manageable disaster, not a natural disaster"

To support Treasury's demand for the fire agencies to deliver a better approach to bushfire protection that is less draining on the budget and actually saves houses, we re-examine the Royal Commission findings to see what went wrong with the "best ever prepared" fire agencies.

On behalf of the Treasurer, our paper asks this question - Why did the East Kilmore Black Saturday fire get away?

Why this fire? Two reasons. It escaped control of the "best ever prepared" fire agencies, but it travelled unusually slowly in the early hours. It exposes worrying deficiencies.

Our paper examines the early development of the Kilmore East fire on Black Saturday. We reveal major deficiencies that the Royal Commission did not diagnose, deficiencies that, for the security and safety of Victorians, cannot be left untreated. But they have been. The same deficiencies continue to loom in government fire reports since Black Saturday. The same deficiencies will be the ingredients of another bushfire disaster.

We look at the moving flame and the progress of the spot fires. We look at bushfire suppression theory and compare it to practice. We assemble evidence from eye witness statements and reports given to the Victorian Bushfire Royal Commission together with wind direction records, vegetation and topography and combine it with fire behaviour science to deduce the likely isochrones of the original fire front and the progressive spread and direction of spot fires. We then reconstruct fire fighting strategy to analyse what impact it had on the fire's spread.

- Could we have stopped it with current resources and strategies?
- Could different strategy and resources have stopped it?

We expect the Treasurer to be very uncomfortable paying huge money for fire fighting forces that are failing to stop bushfire damage to the taxpayers and their houses. We want to take the public with us. We therefore write this report in non

technical language and in the present tense, to allow the reader to relive the action of the day and contemplate the need for a better way of bushfire protection. We have included comments in the paper that a reforming Treasurer might make.

*

The Government has Green papers and White Papers. Red Eagle has Red Papers to highlight major concerns or statements.

This article is one of a series of articles that document aspects of severe fire behaviour in Australian vegetation, observed and recorded during the East Kilmore bushfire on 7 February, 2009.

- 1 How the East Kilmore Black Saturday fire got away - the first few hours
- 2 Spot fire direction and spread in severe bushfire attack - Australian vegetation
- 3 Flame spread and flame height - severe bushfire attack - Australian vegetation

Chapter 1 Background

This chapter contains the type of information that is available to a fire control team in all bushfires. It provides a reference point from which to assess the frenzied activity in the following chapters.

What is the weather?

Between 11.30 am and 5 30 pm, the wind is gale force in the Kilmore area. Its direction changes though the afternoon from northerly (360^0) to north westerly (315^0) and finally after 6pm to westerly (270^0) and south westerly (225^0).

Table 1 Weather data from the Kilmore Automatic Weather Station (AWS), which is approx 12 km south of point of origin

Time	Temperature	RH	Wind speed average	Direction	FFDI
11:30	35.8	17	52	360	75
12:00	36.6	15	56	360	95
12:30	39.4	12	48	350	95
13:04	40.3	11	63	350	100+
13:30	40.1	10	57	330	100+
14:00	42	10	46	330	100+
14:13	41	10	72	350	100+
14:30	41.1	10	61	340	100+
14.42	42.5	9	43	340	100+
14.45	41.7	9	65	340	100+
14.46	41.5	9	65	330	100+
15.30	41.8	10	57	330	100+
16.00	41.6	9	54	320	100+
16.30	40.5	10	54	310	100+
17.00	40.6	10	44	320	95
17.30	40.5	10	46	320	95
18.00	40.1	10	37	310	80
18.10	39.9	10	17	270	50
18.13	33.1	24	26	220	35
18.19	30.3	30	31	210	25

From BOM.901.0069 Meteorological aspects of the Kilmore east fire

This AWS data is best seen as an approximation. There is likely to be a slight time difference between the wind speed and change of wind direction at the AWS and at the fire line, even though there is only 12 km separation distance from fire origin. The difference could be earlier or later. Thus the changes could occur at the fire line either before or after the AWS.

When did fire start?

The towers report the fire at 11.47, and two local witnesses (Jackson and Hibbert) report a power blackout around 11.30. To add a touch of confusion, witness Jackson is later reminded by police that she reported smoke to 000 at 11.20am. Nevertheless, the Royal Commission finds that the Kilmore East fire started at 11:47AM at the top of a rocky hill north of Saunders Road in Kilmore East. The first fire crews arrive in the area just before midday.

What weather forecasts are available to fire fighter control teams?

Fire fighters know that in Victoria, the strong northerlies or north westerlies are followed by W to SW change. They know this means suppression should be focused

on controlling the eastern edge of the fire perimeter, to minimise the length of flank that could be transformed into a head fire.

The early morning forecast clearly says the strong N – NW winds will be followed by a wind change of strong winds from S-SW in afternoon / evening. (BOM.901.0069)

```
Central District Forecast
Issued at 5:40 am EDT on Saturday 7 February 2009
for the period until midnight EDT Tuesday 10 February 2009.

Forecast for the rest of Saturday
Partly cloudy. Areas of raised dust. Isolated showers, mainly near
the coast.
Winds tending north to northwesterly 30 to 40 km/h, increasing to 40
to 60 km/h
during the morning, stronger about elevated areas. A cooler, squally
southwest
change 40 to 60km/h extending from the west this afternoon and
evening.
Temperatures 39 to 44 during the day.
```

A spot fire forecast for Kilmore East is requested at 1pm. It forecasts a wind change at approx 9pm, but says it may come earlier (BOM.901.0069). Yet, at 1 pm, the wind change is already in SW Victoria, on a line between Casterton, Warrnambool and Cape Otway. (VBRC Interim Report, p 41).

```
Spot Fire Weather Forecast
Issued at 1:37 pm EDT on Saturday 7 February 2009.

Forecast No: 006
Name of Fire: Saunders Road
Map Reference: 6km east of Kilmore
Elevation (ASL): 290 metres
Fuel Type: grass
Ignition / Request Time: 1300
Organisation: CFA
Fax Number: 5792 3266
Contact Name: P Sharman
Contact Phone: 5799 1517

Weather overview
Strong and squally north to northwesterly wind will shift cooler
south to southwesterly this evening near 9pm. High wind squalls are
likely near the change with the wind easing thereafter. There is a
slight risk of a high based (probably dry) thunderstorm late today
onwards. Mixing depth will be at least 5000 metres this afternoon and
will slowly decrease this evening until the change arrives, whereupon
it will decrease to just a few hundred metres.

Assumptions and uncertainties associated with the forecast
The timing of the change may be slightly earlier than described here,
and this will be closely monitored by this office. Wind change charts
will be issued throughout the afternoon containing the latest
guidance on the progress of the change.
```

Fire control team is able to supplement these estimates because it has access to on site reports from fire controllers and to weather bureau updates of passage of the front across the state during the afternoon.

Treasurer asks: When does the wind change arrive?

Answer: The actual wind change hits Tullamarine at 5.23 pm and Kilmore Gap at 6.10pm (BOM.901.0069). When the angle of the front is allowed for, the average speed of the cold front between 4 pm and 6 pm is at least 65 kph, which is faster than the recorded average wind speeds.

What fire spread data is available to fire fighter control teams?

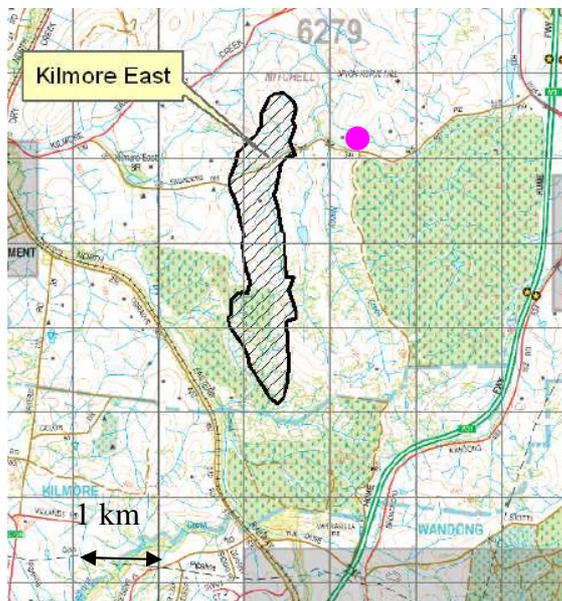
Apart from on the spot observations by fire observers and the initial fire controller (Hibbert), the local and HQ fire control teams have access to two types of fire spread data – line scans and locally made fire maps.

(1) Line scans

Only two line scans are taken in the early stage of the fire. One is requested at 12.33. The first run is at 20,000 ft at 12.46 – 12.49 pm, the second at 10,000 ft at 12.55 – 12.58 pm. Figure 1A, which represents the first run, appears as evidence to the Royal Commission. It was prepared at 13.40 pm and refers to a line scan at 12.33 pm. Technically, it is inaccurate by 13 – 15 minutes and too late by an hour.

(2) Locally made fire spread maps

Fire controller Murphy presents the Royal Commission with a succession of maps made by fire fighter Clancy during the afternoon. Clancy estimates the eastern perimeter because smoke prevented observations. Figure 1E shows the fire area at 1 pm, with an overlaid update based on information received at 1.15 pm. Figure 1F shows an enlarged map updated after 1.15, perhaps at 1.30pm. Figure 1G shows the update after the fire crossed the Hume, perhaps 2.30pm. These maps are made at Kilmore Incident Control Centre (ICC), which is managing the fire at that time.



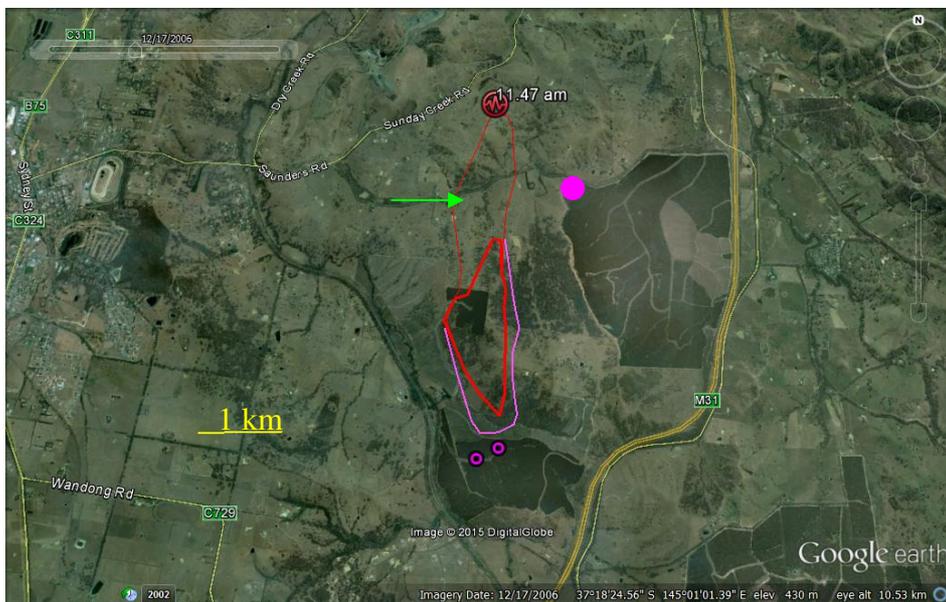
1A 12.47 pm line scan re-branded as 12.33 pm



1B line scan 12.47 pm



1C line scan 12.57 pm

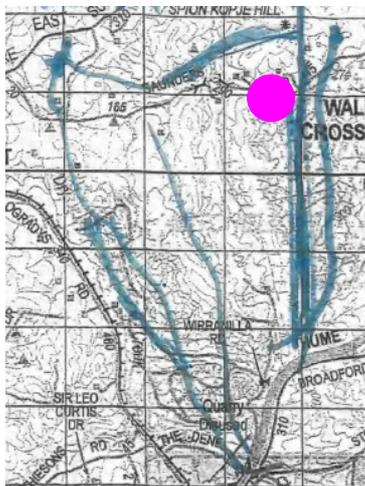


1D Line scans plotted onto Google maps. Green arrow is Saunders Road.

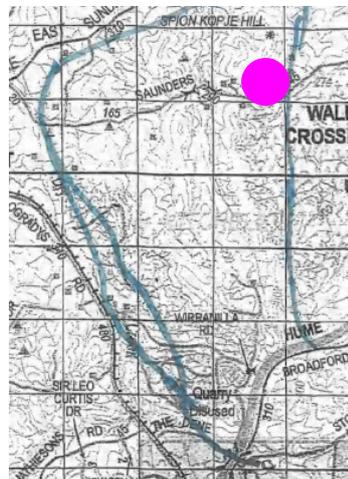


1E

1 pm is solid red line, 1.15 pm is dashed red line.



1F approx 1.30pm



1G approx 2.30 pm

Figure 1 The suite of fire spread maps available to the fire controller. On each map, the pink dot is Operations Point until 2.30 pm.

Treasurer states: The locally made map shows the operations point within the fire area after 1.30 pm. This means fire location was not accurate on the eastern side.

The simple maths of bushfire suppression theory

Bushfire suppression is a perimeter exercise. The perimeter of the running bushfire expands in a given vegetation type according to wind and slope. The primary aim of bushfire suppression is to construct secure control lines that stop the spread of the perimeter. The rate of growth of fire perimeter length has many influencing variables, as does the rate of growth of control line. The fire controller aims to maximise control line construction rate and approves a fire control plan (= Incident Action Plan) that marshals all resources, planning and logistics to do so. Fire suppression is successful when the length of secure control line equals the length of fire perimeter. A fire controller can measure effectiveness of the fire control plan on a simple chart. This sample chart shows that the fire perimeter grows rapidly at first in severe weather, but then slows when weather moderates. We see that control line starts slowly and increases when we deploy extra dozers. When the lines crossover, the fire perimeter is contained.

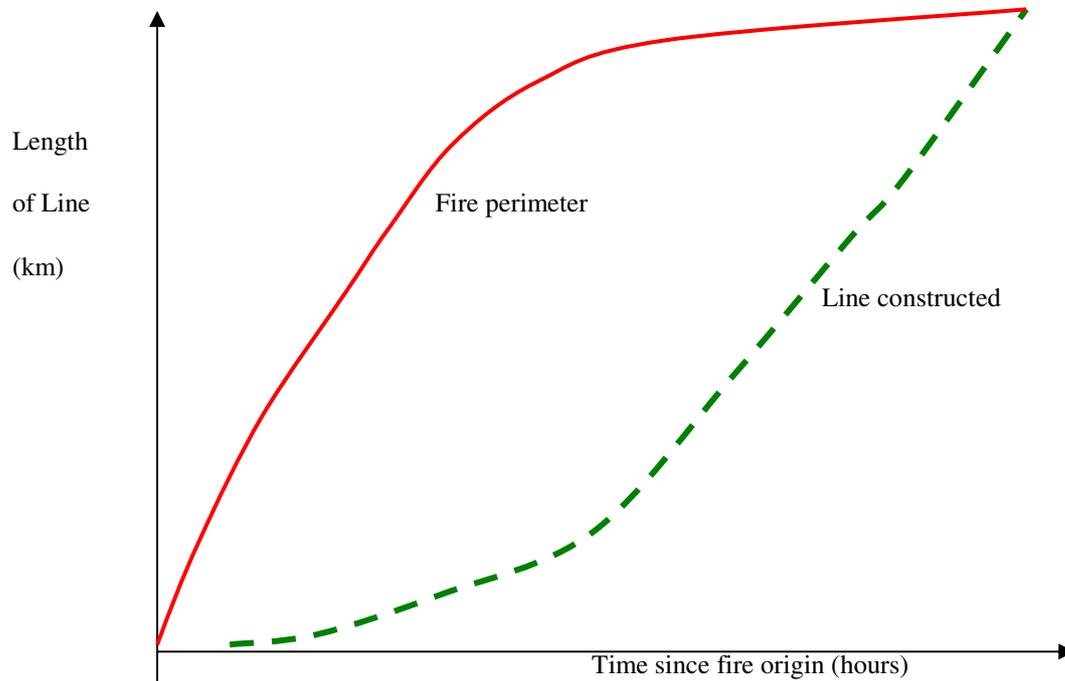


Figure 2 Cumulative fire perimeter and constructed control line over time

There are various methods of constructing control lines (eg, wet and dry fire fighting) and proven methods of securing them (ie, black out and patrol).

An effective fire control plan (= Incident Action Plan) covers a defined period and its key guiding feature is to calculate the targeted length of control line, and then marshal the resources to achieve it. We calculate this by measuring live perimeter length at the start of the period and determining its desired length at the end.

In the following reconstructions, we estimate length of burnt perimeter, the length of dead and live edge and length of line constructed and patrolled for each period.

Chapter 2 Fire spread and the suppression response

Period 1 11.47 am to 12.30 pm

1 Wind

From 11.30 am, wind is from the North - 360° and blows strongly for 1 hour.

2 Topography and vegetation

Summary

The early part of the fire's run is along the ridges and gullies of an undulating plateau approx 360 – 440m elevation. The plateau sits above an undulating plain of 300 - 320m to the west and south.

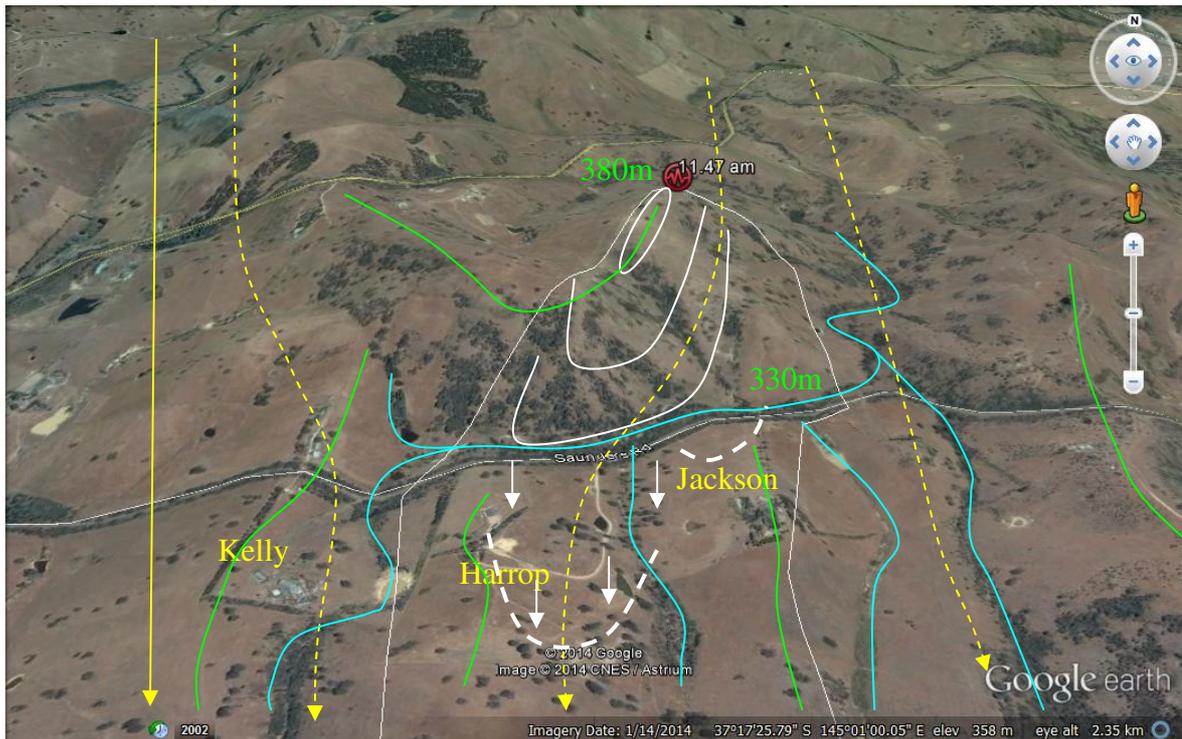


Figure 3 Oblique view to the north across the point of origin (red dot). Ridgelines are green, gullies are blue. Elevation above sea level is in green. Solid yellow arrow is unimpeded wind direction. Dashed yellow arrows indicate likely air flow around hilltops and along gullies. Assuming the fire begins in earnest at 11.47, it reaches Saunders Rd at 12.15. The white lines are likely fire isochrones at approx 10 minute spacing – 11.55, 12.05, and 12.15. Dashed white lines indicate likely location of most spot fire fronts between 12.15 and 12.30. White arrows indicate the spread of initial spot fire runs.

Detail

Elevation of fire origin on Sullivan's hill is approx 380m, and gully along Saunders Road is 330m. Vegetation on southern slope is grass with scattered trees. The distance from fire origin to the gully is approx 1 km. The initial fire front travels across slope on a slight downhill trajectory of 3° ($= 50\text{m} / 1000\text{m}$). It probably follows the curved air flow trajectory shown in Fig 3.

South of the Saunders Rd gully four separate ridge lines run at right angles on a slight uphill slope. The ridge lines run almost due south, as do the gullies in between. The north wind channels up each gully. The vegetation on each ridge and gully is open grassland or grass with scattered trees.

The western-most ridge rises to the highest elevation. It runs south from Saunders Road. Approx 1.3 km south of Saunders Rd, is the NW pine plantation at 400m elevation. This ridge line continues to the SE, gradually rising to a peak of 440m (see Figure 5). Its western slope falls away to 300 – 310 m elevation along O’Grady’s Road, 7-10° down slope. The vegetation on this slope is a mixture of blue gum plantation, open paddock and native vegetation.

3 Fire behaviour 11.47 am to 12.30 pm

3.1 Eye witnesses:

Saunders Rd end

Fire fighter Robinson reported that in the previous week, a Kilmore brigade team “looked at the gullies around the area, including those along Sunday Creek Road and Saunders Road and noticed that there was still a tinge of green amongst the scrub”.

Eastern edge

Resident Jackson sees an arc of flame half way down the hill, about 20m across, 1m tall flame as it descends across the slope, heading towards Harrop’s, with a lot of smoke.

Resident Harrop sees smoke beyond Sullivan’s hill, approx 100m wide. Soon after, he sees flame 600m wide on the ridge line travelling down the hill towards his property. It has to cross a gully and a road first, but very soon, at approx 12.15, grass fire reaches him, and he sees it is already spotting further downwind in the gullies.

Fire fighter Robinson arrives in Saunders Rd at midday, and sees a lot of smoke and not much flame heading for Saunders Rd. But when he arrives by about 12.15, it has reached the road and is spotting across. Soon after, two tankers extinguish 12 spot fires on the south side of Saunders Rd before being smoked out.

Fire fighter Hibbert confirms at 12.15, that the fire has jumped over Saunders Road and is travelling in a south west direction.

Western edge

Fire fighter Court arrives at fire origin on top of Sullivan’s Hill at midday. He sees a strip of fire about 80-100 metres wide running south towards a hill, and then at the base of the hill “the fire had split into two fingers - the western finger of the fire was running almost directly south towards Saunders Road and the eastern finger was running south east”.

The western finger is 200 – 300m long. Two tankers tackle the western perimeter. Fire fighter Hibbert is on Saunders Rd, near the future operations point just before midday. He estimates the fire area is 10 to 20 acres. “The fire was heading in a southerly direction. I could see some flames around the edges, but I couldn’t see the head of the fire due to the smoke. The fire was intense and moving extremely fast (faster than running pace).”

Southern end

Fire fighters on Saunders Rd know the fire has run towards the south, but there are no eye witness accounts at the southern end. Robinson states “I could see that the fire had split and was travelling south - south-east”. His reference to a split fire refers to separate spot fires running downwind.

Interpretation of bushfire behaviour before 12.30 pm:

At midday, the western edge is up to 300m long, but the length of the eastern edge is not reported. This eastern edge becomes the leading front. Before 12.15, a line of flame is progressing across and down the southern slope of Sullivan’s Hill towards

Saunders Rd (See Figure 3). Its spread is consistent with air flow direction around hillside. The fire front runs beneath the trees in the gully alongside Saunders Road, but stops because flame height is too low to stretch across it (see Figure 4). Meanwhile, the eastern flank is extending along Saunders Road. The surface flame runs up the bark on the numerous trees between the gully and the road and strong winds throw firebrands across the road.



Figure 4 Post-fire photo shows crown scorch and green crowns along Saunders Rd, indicating low flame height (Crowe)

By 12.15, the first spot fires are establishing on the south side of Saunders Rd. After 12.15, multiple spot fires are running south of Saunders Rd through the open paddocks and treed areas. Some run through Harrop's, funnelling along the gully and ridge line towards the NW plantations. These spot fires run rapidly, perhaps 10 kph or more, but many also generate firebrands that start new spot fires down wind. By 12.30, the leading spot fires are burning on the southerly slope of the 440m ridgeline, approx 2 km south of Saunders Rd. The western flank is burning on the top of the slope that falls down to O'Grady's Road (See Figure 5).

Meanwhile, the trailing eastern and western flanks continue to work down slope on Sullivan's Hill towards Saunders Rd. By 12.30 – 12.45, they have spread along the tree lined gully for about 1 km between Kelly's and Jackson's (see Figure 3).

3.2 Fire status at 12.30

Figure 5 shows likely location of leading spot fire fronts at 12.00, 12.15 and 12.30 pm.

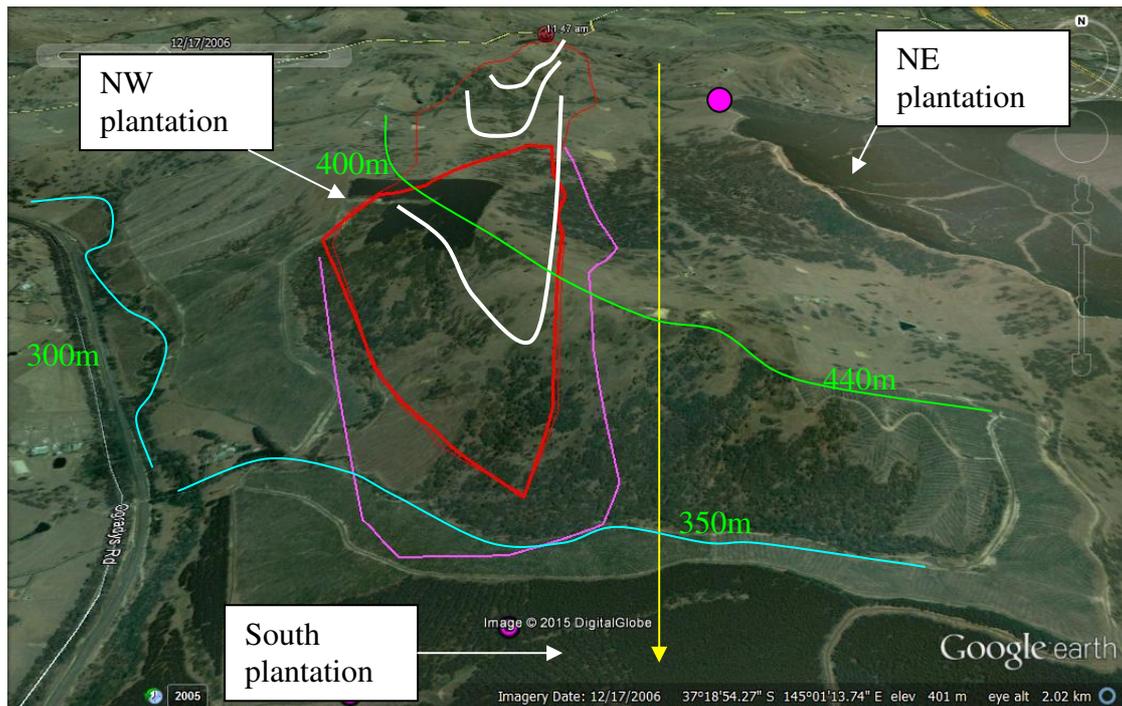


Figure 5 Oblique view to the north towards fire origin. Red is line scan at 12.47 pm, pink is line scan at 12.57 pm. Major ridgeline is green, gully is blue. Yellow arrow is wind direction from the north. White lines show likely location of leading spot fire front isochrones at 12.00, 12.15 and 12.30 pm. Terrain is indicated by elevations above sea level, shown in green. Pink dot is initial operations point. Three plantation areas are shown. The bulk of the south plantation is windrows of logging slash.

3.3 Specific fire behaviour observations:

A Flame height:

Low flame height (1m) is seen as fire descends down slope. High smoke volume and low flame height suggests high moisture content in grass.

B Spotting:

Short distance spotting causes the fire to cross Saunders Rd in multiple spot fires. Short distance spotting occurs as the spot fires run through the paddocks and lightly timbered patches.

This short distance spotting is consistent with short vegetation that has low volume firebrands. In the next half hour period, aircraft will report spotting up to 200 - 300m ahead of fire front.

Treasurer asks: Could the spotting have been stopped at Saunders Rd?

Answer: If the spot fires had been stopped by the fighters or by effective infrastructure south of the road, the fire would have stopped. If there was no spotting, the fire would have stopped at Saunders Rd. If the gully and road reserve had been recently fuel reduced, flame height would have been very low and spotting negligible.

C Area burnt at 12.30 pm: 180 ha approx

D Rate of spread (ROS) measurements:

D1 Perimeter ROS = 12 kph:

At 12.30, total estimated extremity of fire perimeter = 8 - 9 km. Perimeter ROS is approx 12 kph (= 9 km in 45 minutes). This perimeter is the sum of burnt out areas and flaming areas.

D2 Line of flame ROS = 2 kph:

The only coherent line of flame to date is the one that runs across the Sullivan Hill. If the fire begins in earnest at 11.47 am and the main fire front reaches Saunders Road by 12.15, this means it travels 1 km down a slight grade at 2 kph.

D3 ROS of leading spot fire fronts from origin = 4 kph

Maximum ROS of spot fire fronts = 12 kph:

Once the fire jumps Saunders Rd, the fire's progression is dominated by multiple spot fire fronts. At 12.30, the leading flame fronts are estimated to be just over 3 km from origin on the ridge top. This means an average rate of spread from origin of 4 kph (= 3 km in 45 minutes)

We can estimate spread rate of the leading spot fires southward from Saunders Rd as follows. If they travel 2km in 10 minutes, their ROS is 12 kph. The CSIRO Grass Fire Meter predicts grass fire ROS of 10 – 15 kph in these conditions. These rates are in striking contrast the opinions of fire fighters, eg, Court believed the fire was “[doing 60 kilometres an hour travelling south](#)” through the grass.

D4 ROS of leading spot fires = 4 kph:

In the next half hour period, aircraft will report spotting up to 200 - 300m ahead of fire front. This short distance is consistent with short vegetation that has low volume of firebrand material. This means leading spot fires spread at same rate as leading spot fire fronts.

4 Fire suppression 11.47 am to 12.30 pm

4.1 Status of fire perimeter at 12.30 pm

Eastern flank

Length of perimeter 4 km

Length of constructed and patrolled control line zero

Western flank

Length of perimeter 5 km

Length of constructed and patrolled control line zero

Notes: Based on the line scans, the northern half of each perimeter is not spreading, but is active with innumerable hot spots (the intervening grass has burnt out), and the southern half of each is active flaming perimeter, expanding laterally.

Fire fighter crews active on site: We estimate up to 12 CFA and private tankers are active at the Saunders Rd end and zero elsewhere.

4.2 Fire fighter activity 11.47 am – 12.30 pm:

Saunders Rd end

The first crew arrives (Ross Hibbert) at Saunders Rd just before midday. He requests ten extra tankers, and later orders more.

At midday, one Kilmore crew and Dixon go to the fire origin and two Kilmore crews go to Saunders Road.

From the monitoring of the CFA radio I was aware that approximately 30 CFA trucks had been deployed to the fire in the early stages. (Grant)

Eastern flank

12.15 pm

Whilst on the road, small spot fires started on the southern side of Saunders road. We managed to put out about 12 of these fires (Robinson). These spot fires are on the original eastern flank. They are then asked to redeploy to assist other crews at the Kelly property.

“At around 12.15 pm, my brother, Trevor ... asked for tankers to ... try and save Liz Jackson’s property” (Hibbert)

Western flank

“He (Hibbert) advised crews to arrive via Sunday Creek Road” (Dixon), which is the point of origin. Dixon and Kilmore tanker attack western fire edge. For 25 minutes, they work on preventing the western edge expanding towards a house that is 400m away. Just after 12.30, one tanker (Court) then re-deploys to Saunders Rd to join other crews on the western flank to protect the Kelly property, and Dixon redeploys to operations point.

Approx 12.30

Thus, by 12.30, the fire fighters on scene are asset protecting either at Jacksons on the eastern flank or at Kelly’s on the western flank. All fire fighters are at the Saunders Rd end. The fire’s front is over 2 km south of them, but there are no fire fighters there. See Figure 6.

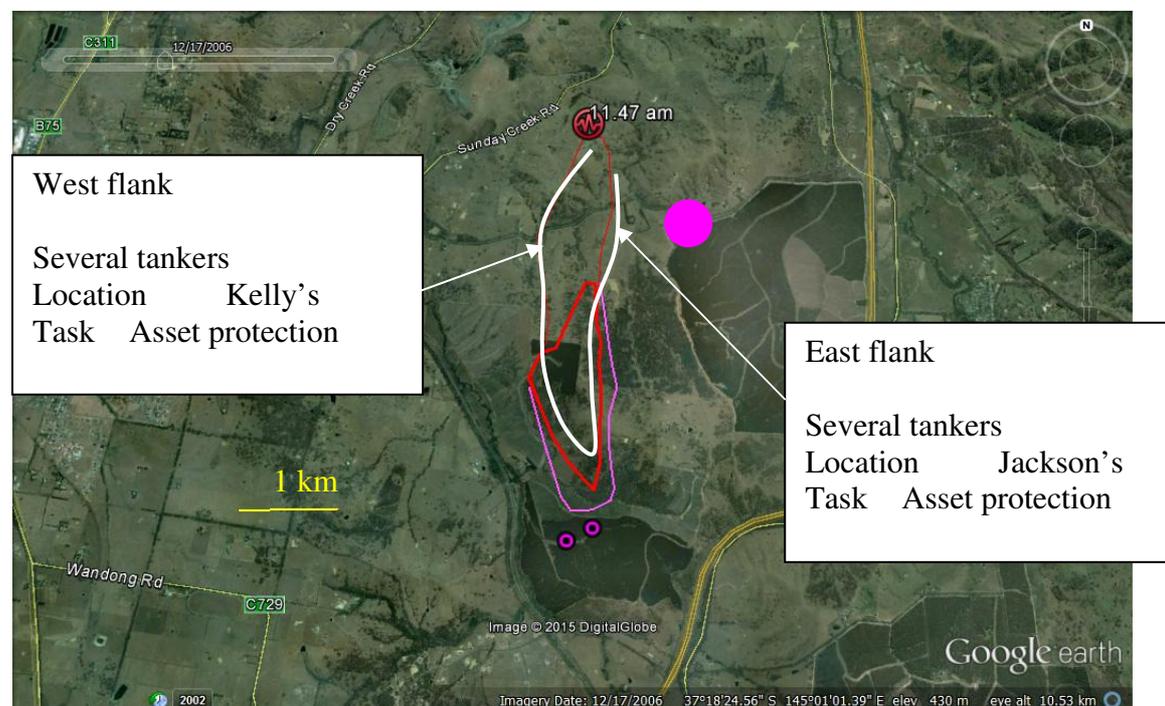


Figure 6 Vertical view of fire ground. Fire fighter resource allocation at 12.30 pm. White line is estimated fire edge at 12.30 pm. Pink dot is Operations Point on Saunders Rd. Red is line scan at 12.47 pm, pink is line scan at 12.57 pm.

4.3 Management of the fire ground

The first crew arrives (Ross Hibbert) at Saunders Rd just before midday. “As I was the first CFA Officer to arrive on scene, I became the Incident Controller for the fire”. He requests ten extra tankers, and later orders more.

Approx 12.15 – 12.30

Ross was the Incident Controller at this point in time. He was on the eastern flank directing the first tankers that were arriving. Ross Hibbert and I put the first arriving tankers onto the eastern flank. These tankers were from local Brigades such as the Clonbinane, Broadford and Wandong Fire Brigades. (Scicluna)

4.4 Fire control strategy - deduced

12.00 pm

Despite Hibbert’s advice to enter via the point of origin, the Kilmore crews decide amongst themselves to split, one to the point of origin and one to Saunders Rd.

The initial aim of the Kilmore’s fire origin crew is asset protection.

We put out the western flank which was creeping towards the house (Court).

The initial aim of Kilmore’s Saunders Rd crews is to stop the fire crossing Saunders Rd. Tanker 2 and myself went straight to Saunders road with the intention of cutting the fire off before it reached Saunders Road as it was travelling in a southerly direction (Robinson).

Treasurer asks: What strategy is guiding the fire fighters?

Answer: The fire control plan changes within the first half hour by default, from preventing fire spread to asset protection. The smoke, flame and fire direction is clearly visible to the initial fire fighters, as is the lay of the land. In hindsight, the initial goal of stopping the fire at Saunders Road is critical on this day, but is compromised by sending some of the early resources to the point of origin. The goal is defeated because there is no infrastructure along Saunders Rd to assist successful suppression. This area was inspected a few days earlier, but did not include the need for infrastructure to stop spot fires spreading south.

Treasurer states: I can see that if the plan is to stop fire spread, they are in attack or action mode. When they do asset protection, they are in defensive or re-action mode.

Treasurer asks: If all resources are defending two houses, there are no resources allocated to stopping the fire’s run?

Answer: Correct, but many are on the way.

Treasurer: What fall back line has the incident controller identified?

Answer: Nothing is reported. In the next period, we see that the next opportunity for stopping the fire’s spread is identified as O’Grady’s Rd and the railway line.

Treasurer: But this is on the western perimeter, yet they knew a SW wind change is immanent.

Answer: True. In the next period, we see that stopping the fire at the Hume is considered, but not enacted because it was overshadowed by the fire fighters' need to protect assets in Wandong.

Treasurer The incident controller seems to understand the importance of containing the eastern flank. What is his strategy to contain it?

Answer: The next period reveals that this plan is not resourced, and so is not achieved.

4.5 Impact of fire fighters

Impact of fire suppression on fire's spread

Treasurer states: I can see that the initial efforts by both crews have no impact on influencing fire spread. The tree-lined nature of Saunders Road reserve generates spot fires in numbers and volume that exceeds the capability of two tankers. Perhaps a greater concentration of tankers on Harrop's property would have stopped the spread of many spot fires in the grassy paddocks.

Impact of fire suppression on asset protection

Treasurer states: Fire suppression clearly saves two houses, possibly three, from potential ignition. I can see that asset protection diverts resources from preventing perimeter spread.

4.6 Other

Treasurer states: It is clear that bushfire control decisions are made by the first crew leader to arrive at the scene. It seems there is no over-arching spread prevention strategy or pre determined plan of attack for this area in this severe weather. Instead, the first arrivals make deployment decisions based on their own experience and assessment of the situation. In this case, Hibbert is from a different fire brigade district. He may not be aware of local brigade plans or arrangements or plan of attack in this area. Subsequent arrivals of higher rank and experience make their own decisions, yet they may well be from another brigade or group area. Again, they make decisions in absence of a predetermined plan of attack.

Chapter 3 Fire spread and the suppression response

Period 2 12.30 to 1.30 pm

1 Wind

From 12.30 pm, wind blows strongly from 350° for 1 hour

2 Topography and vegetation

Summary

This part of the fire's run features a substantial drop in elevation from the plateau (400m+) down leeward slopes. The fire perimeter is multiple fire fronts with light ember volume and the wind pushes the flame fronts down hill over the ridgeline for a short distance. Spot fires ignite on the slopes and in the gully and the fires coalesce mid slope.

Detail

At 12.30, the fire is burning upwind of the 440m ridgeline in vegetation on the plateau that is a mixture of open paddock, paddock with scattered trees, forest patches and young plantation. The leading spot fires are burning on the SW and southerly slopes of this ridgeline.

Looking south from the 440m ridgeline, the slope falls sharply 90m through scattered eucalypt woodland and scrub to a gully. Beyond the gully is a narrow young pine plantation and a wide area (200ha?) of windrowed logging slash.

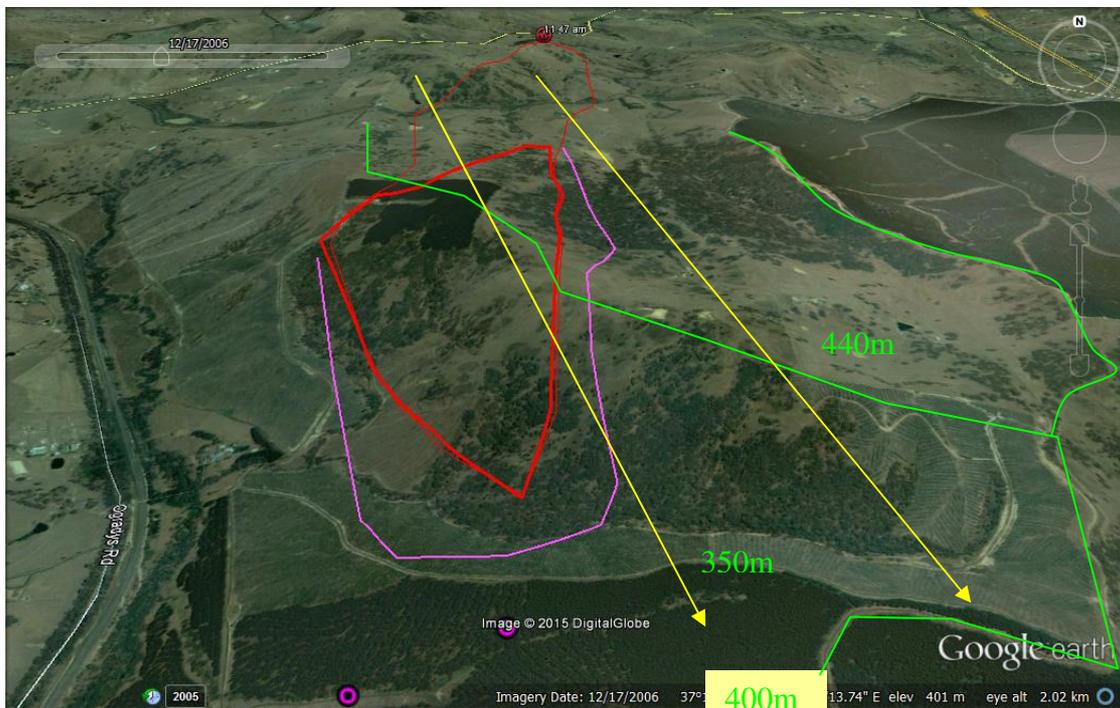


Figure 7 Oblique view towards NNW of terrain that shows fire front location at 1 pm. Green lines are ridges. The red and pink lines are the 12.47 and 12.57 line scan perimeters. Yellow arrows are 350° wind direction

3 Fire behaviour 12.30 to 1.30 pm

3.1 Eye witnesses

3.1.1 Fire fighters

At Saunders Road end of the fire

Eastern flank

No eye witness accounts

Western flank

Approx 12.30

When I arrived at Saunders Road... the fire had come out of the grasslands and had hit the Midway Pine Plantation (Scicluna) = NW plantation

By approximately 12.45 pm, aircraft were working above the fire. I asked the aircraft to attack the spot fires, which they advised were approximately 200-300 metres ahead of the main front. (Dixon)

Approx 12.45 – 1 pm

Coming up the hill at Moira Kelly's, the grass was about a foot high and it had nearly a 12 foot flame height (Court)

Approx 1 – 1.30 pm South of Kelly's, the grass fire was travelling very quickly, probably doing 60 kilometres an hour and then got into the blue gum plantations and taken hold in there (Court)

At around 1.30 pm, the fire was pushing hard through the pine and blue gum Plantation (Scicluna)

At the southern end of the fire

Just prior to 1 pm, Alder in aircraft reports the fire size is 100 – 200 ha in grass and scrub, and spotting 300 - 400m ahead into approx 200 ha of pine plantation windrows (Crowe). See Figure 9A

Eastern flank

At 1.15, an observer at the Dene reports the fire was approximately 400 metres away from The Dene and approximately 500 metres from the Hume Highway (Murphy)

Just before 1.30 pm

Witham is driving north along the Broadford Wandong Road about one kilometre past Stotts Road before we were forced to turn around. I could see a thick smoke haze with a red glow approximately 500 metres ahead. (Witham)

3.1.2 Photographs of the southern end by Alder

Alder provided several photos (taken from aircraft between 12.45 and 12.51 at approx 1000m) to the Royal Commission, from sites which we have identified on Google maps. This information was not visually available to fire fighters, but we presume radio contact was made with fire controller.

(1) Smoke column photos

8A Alder photo at 12.45 View from approx 1000m towards NNE – N (approx 5 - 8 deg E of N)

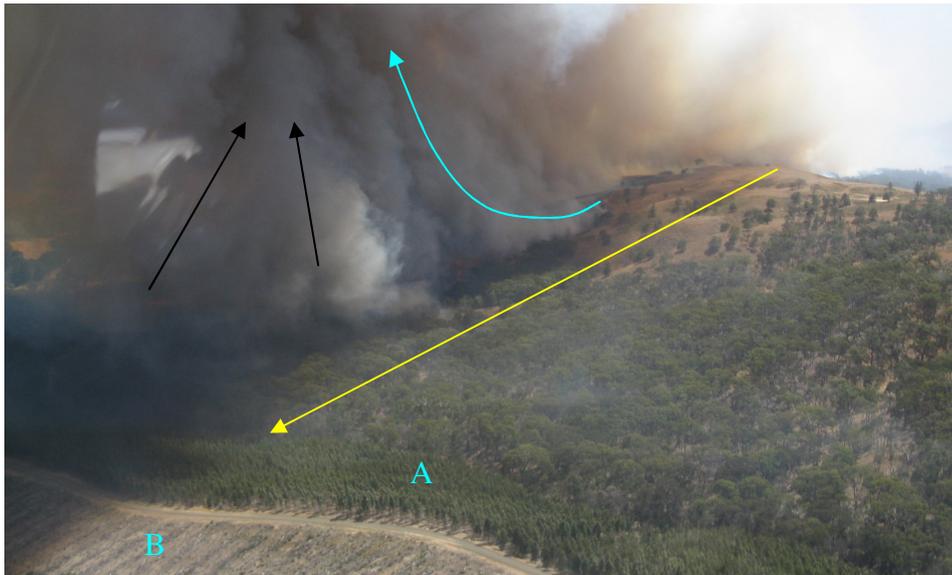


8B Alder photo at 12.48. View from approx 1000m towards NNE – N (approx 5 - 8 deg E of N)
Figure 8

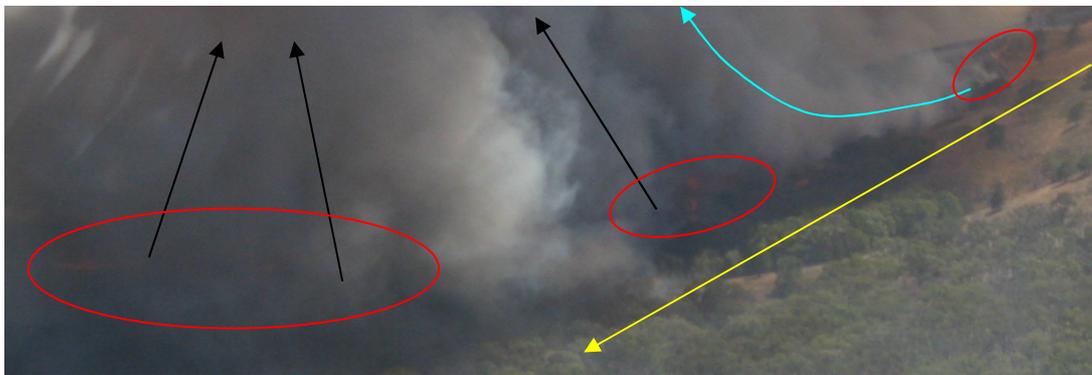
We can see there are significant differences between the two smoke columns over the 3 minute period. Figure 8B is darker and more vertical than Figure 8A, indicating the fire below has just begun burning with a higher combustion rate in heavier fuel. Figure 8A indicates a lean to the left, whereas Figure 8B shows there are two smoke columns. The vertical column appears more erect than 3 minutes earlier, indicating stronger uplift velocity is overpowering the strong 350 deg wind. It originates from the southern end of the fire. The tilted column is whiter in colour, indicating part grass / part vegetation, and appears to originate from the northern end of the fire, has a more easterly lean.

(2) Southern slope fire photo

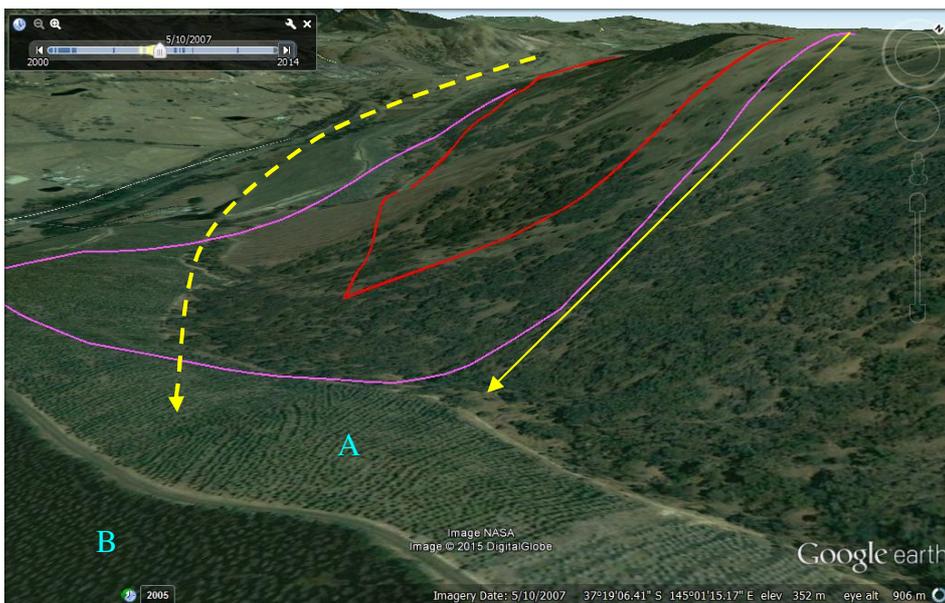
The photograph is taken between the times of the two line scans of Figure 10, whose perimeters are shown approximately on Figure 9C. The Google elevation factor on Figure 9C has been doubled to accentuate terrain. Figures 9A and 9B indicate fire behaviour on the lee slope. The wind clearly pushes the grass fire over the top of the ridgeline and the blue line shows the smoke trail is initially down slope. As fire falls further below the ridgeline, the wind's influence declines and smoke begins to rise.



9A Alder photo at 12.51 pm of fire entering the young pine plantation (blue A) and windrows of logging slash (blue B)



9B Magnification of Figure 9A



9C Replication of Figure 9A on Google maps (with 2X vertical exaggeration) looking to NW. Red circles locate flame. Yellow arrow is north wind direction. Dashed arrow is estimated wind channelling along gully. Red line is approx line scan at 12.47 pm, and pink is approx line scan at 12.57. Blue A is now young plantation, Blue B is now windrows of logging slash.
 Figure 9 Leading spot fire fronts at southern end of plantation just before 1 pm

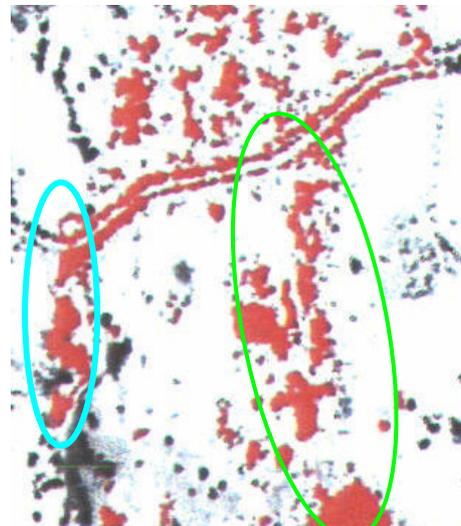
We can expect flame height also decreases. Figure 9B shows flame in the sheltered gully, which we suspect are burgeoning spot fires. Their smoke is vertical. The photo clearly shows the wind driven smoke (blue arrow) merging into the vertical smoke column, which has sufficient vertical momentum to withstand the lateral pressure of the strong wind for a substantial height, as shown in Figure 8B. The yellow arrow approximates the 360° wind direction, and we see the fire edge aligns with it. But we know the wind at this time has been 350° for almost half an hour. This indicates the wind change has not yet influenced this leeward part of the fire front. The dashed yellow arrow indicates the likely NW channelling pathway of the ambient wind through this gully. Figure 12 shows a spot fire aligned to SE, indicating that the NW wind direction has become more influential at a distance from the main flames.

3.1.3 Line scans

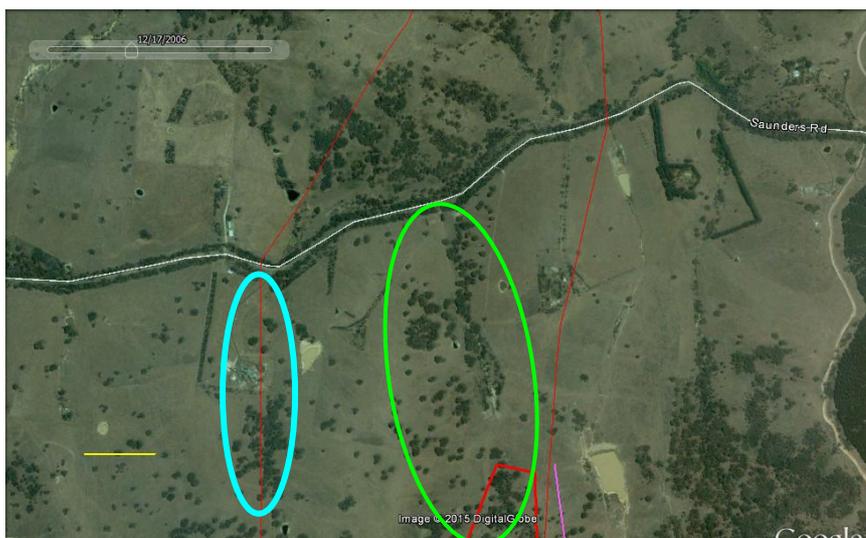
Two line scans are taken between 12.45 and 12.58 pm, one at 10,000 feet and one at 20,000 ft. They have been plotted on Google map.



10A line scan at 12.47 pm



10B line scan at 12.57 pm



10C

Figure 10 Green circle is remnant burning of initial fire run through trees along the gully and ridge top. Blue circle is a fresh outbreak at Kelly's just after 12.47 pm.

Saunders Road end – line scans

Eastern flank

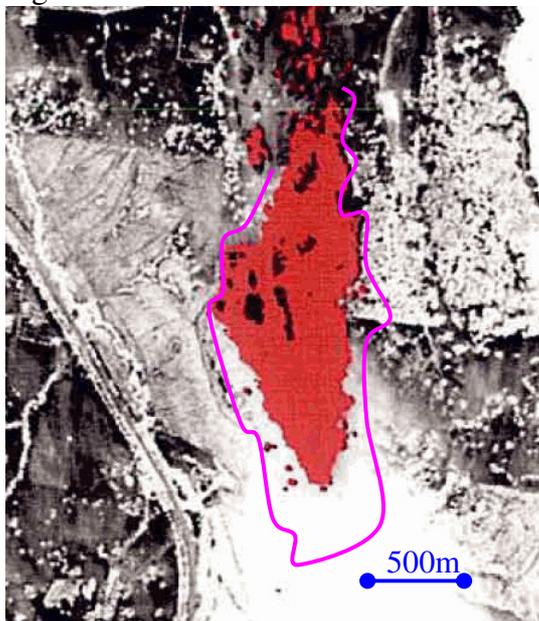
Line scan shows hot spots burning in treed areas, but no new flame activity.

Western flank

Line scan (Figure 10B) shows clearly the fresh flame attacks on the Kelly property just before 1pm. The Figure 10C Google map confirms the spot fires are in paddocks. Their location corresponds with the description by fire fighter Court. Their likely origin is the trees along the Saunders Rd reserve. They could have been generated by turbulence when the wind changes after 12.30 pm from 360 to 350°.

Southern end of fire – line scans

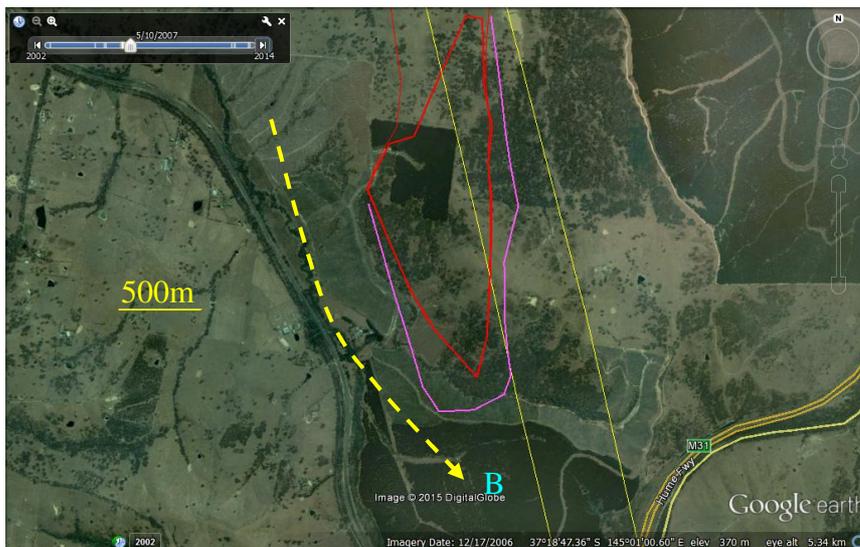
The successive line scans of Figure 11A and 11B show that the gully and lower slope is also alight. The mass of solid flame is 120 ha at 11.47 and 200 ha at 11.57. This extra combustion area helps explain the darkening and more vertical smoke column of Figure 8B.



11A line scan at 12.47 pm



11B line scan at 12.57 pm



11C Yellow tramlines are 350° direction, yellow dashed arrow is wind channelling along gullies
Figure 11 Line scans of southern end of the fire.

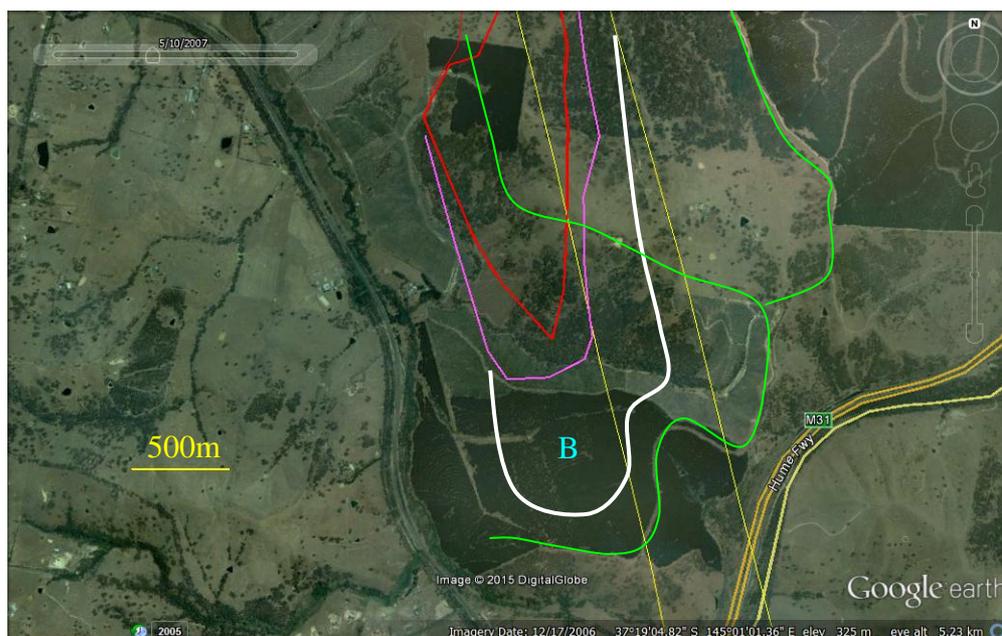
Thus, in 10 minutes, the fire front components progress approx 300m down the southern slope and into the young pine plantation. The initial spread mechanism is by spotting, because the gully area is sheltered from the north wind. Once established, the spot fires are fanned by the channelling NW wind through the gully along the O'Grady Rd, as Figure 12 seems to indicate.



Figure 12 Line scan at 12.57pm. The circled spot fire appears to run SE, indicating a change of flame direction due to the channelling wind (see Figure 11C).

3.2 Fire status at 1.30 pm

By 1.30 pm, the estimated location of the fire front is in the logging slash windrows as shown in Figure 13. It is burning fiercely in row upon row of dead fine and coarse fuels, each with very high fuel load, each throwing embers into the gale force winds aloft. Each windrow is separated by bare dirt, so the primary spread mechanism is by spotting. Spread by flame contact only occurs if wind stretches a tall flame across the gap.



13A Vertical view of southern end of fire

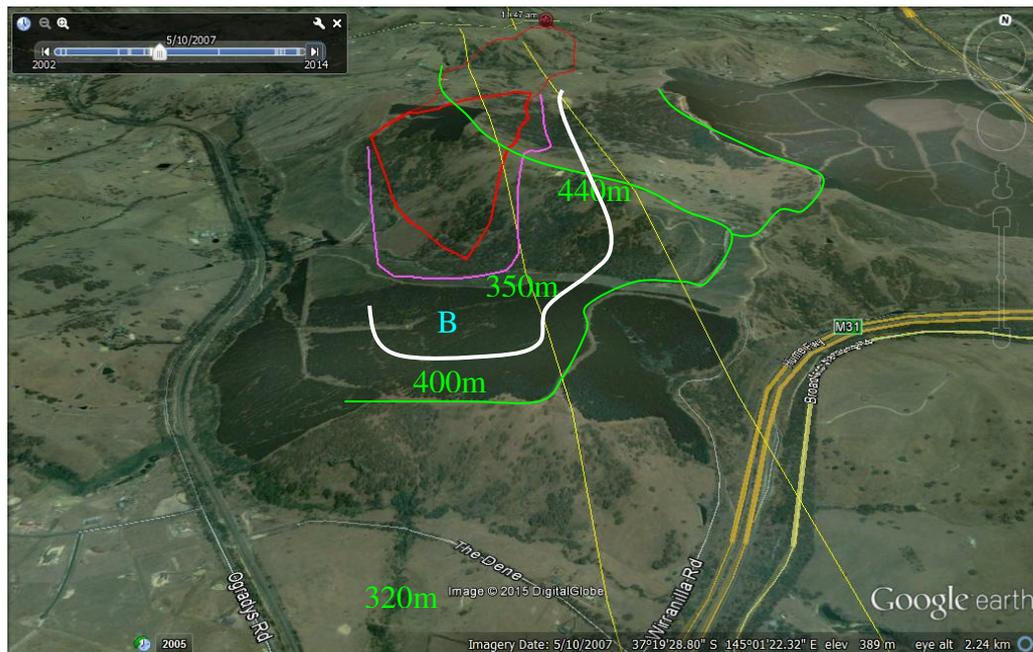


Figure 13B Oblique view towards NNW of terrain that shows fire front location at 1.30.

Figure 13 Estimated fire perimeter at 1.30 pm. Blue B is now logging slash windrow area

Treasurer asks: Did the fire controller or the operations point on Saunders Rd know the speed or location or condition of the southern end?

Answer: Only if they overheard radio chatter

3.3 Specific fire behaviour observations:

A Flame height:

Flame height in 30 cm grass is up to 3m.

Flame height in the Alder photo is less than 2 m.

Flame height in windrows can be estimated to average at least 5m.

Flame height in young pines can be estimated at maximum 2X tree height.

B Spotting:

Short distance spotting is due to low volume fire brand supply.

Likely sources of short distance spotting are the forest / woodland patches on the plateau and vegetation burning vigorously on the southern slope.

C Area burnt to 1.30 pm 260 ha approx

D Rate of spread measurements:

D1 Perimeter ROS = 6 kph:

At 1.30, total fire perimeter = 11 - 12 km. Perimeter ROS is approx 5 - 6 kph (= 12 km in 1.75 hr). Despite the ferocity of the prevailing wind (50 – 60 kph), we estimate the fire perimeter expands only 2 - 3 km between 12.30 and 1.30 as shown on Figures 4A and 4B. The slow growth can be explained by topography (ie, the southerly lee slope) and the discontinuous fuel of the windrows. The leading perimeter is a number of spot fires.

D2 Line of flame ROS

Not applicable because there is no coherent running line of flame.

D3 ROS of leading spot fire fronts from origin = 3 kph:

ROS of leading spot fire fronts from 12.30 – 1.30 pm = 1+ kph:

The leading spot fire fronts make up the southern fire perimeter along the 400m ridgeline overlooking the Dene road. They are now 5 km from origin. Thus ROS of leading spot fire fronts at 1.30 pm is approx 3 kph (= 5 km in 1.75 hours).

The leading spot fires are now in the logging slash windrows, which is just over 1 km from the 12.30 position

D4 ROS of leading spot fires from origin = 3 kph: The line scans suggest spotting is restricted to within a few hundred metres of the leading spot fire perimeters, perhaps due to low volume firebrand supply. This means they spread at same rate as leading spot fire fronts. There are no known reports of spotting on the Hume, but after the fire, we witnessed many small and medium burnt patches.

4 Fire suppression 12.30 – 1.30 pm

4.1 Status of fire perimeter at 1.30 pm

Eastern flank

Length of perimeter 5 - 6 km

Length of constructed and patrolled control line 1 – 2 km (Saunders Rd end)

(Based on our hope that tankers are dousing hot spots along driveable edge)

Western flank

Length of perimeter 5 - 6 km

Length of constructed and patrolled control line 0.4 km (Saunders Rd end)

(We estimate DSE dozer and crews has secured 0.4 km of control line since it arrived)

Note: As before, the northern half of the fire perimeter is stationary with countless hot spots, but the southern half is actively spreading flame.

4.2 Fire fighter activity on site:

Summary

By 1.30, a few fire fighters on scene are line constructing in the NW plantation and innumerable fire fighters are preparing to asset protect on O’Grady’s Rd or in Wandong.

Detail

Saunders Rd end

Eastern side

No reported suppression activity along the fire perimeter, but Hibbert mentions “[strike team leaders in the Eastern Sector](#)”.

[At 1.17 pm, a private dozer, owned by a person who worked with Midway Plantations arrived at Saunders Control. They went to the Houston side of the fire, that was the Hume Freeway side from Saunders Road, it swings out from the Hume Freeway between Plantation and the Hume Freeway. \(Clarke\)](#)

I asked the driver of a private dozer, Mick Ryan, to widen the fire break on a ridge line that runs from Saunders Road on the top of the pine plantation in preparation for the wind change. We were advised in pager messages on 6 February that a wind change was predicted at around 6 pm on 7 February (Hibbert)

Treasurer asks: Is the firebreak near the fire edge?

Answer: The firebreak is 1 km east of fire's eastern perimeter.

Treasurer asks: Is this of value to prevent fire spread?

Answer: If the fire break is over grown, a dozer can clean it up ready for back burning. If the fire break is in good condition, it is a mis use of resources. In this case, this and other dozers would probably have been useful closer to the eastern fire edge.

Ross Hibbert and I put the first arriving tankers onto the eastern flank. These tankers were from local Brigades such as the Clonbinane, Broadford and Wandong Fire Brigades (Scicluna)

At 1 pm

A majority of the resources at this point in time were on the eastern flank of the fire (Scicluna)

Western side

Initial deployment is to defend Kelly property.

Once we realised that the fire was already in the plantation we attempted to try and get across to the eastern flank of that western finger of the fire, to be ready to suppress the fire when it came out. At this point, we were driving through paddocks trying to cut across. We had to leave that area because the terrain was getting too rough and we couldn't keep going safely. On a day like the 7th when you drive off road, the fans and the radiator of your vehicle suck in dirt and smoke, there were sticks flying through the air, it was just horrendous (Court)

Later they redeploy to O'Grady's Rd. Seymour wanted to stay with us because we are local and know the area so we drove back together along Saunders Road and onto O'Grady's Road. (Court)

At 12.52 pm, the Department of Sustainability and Environment (DSE) crew arrived with a dozer (Clarke)

DSE crew was - 15 staff ... the D4 (dozer), the Broadford tanker and five slip-on units (Grant)

At approximately 1 pm a DSE Task Force from Broadford which was comprised of a number of slip ons and a bulldozer arrived at the Control Point. Ross Hibbert and David Williams instructed me to take the DSE Task Force onto the western flank. I then led the parallel attack on the western flank as the Sector Commander for the Western Sector (Scicluna)

Southern end

Eastern side

No reported suppression activity.

By 1.30 pm, many tankers are in Wandong in anticipation of asset protection.

Western side = O'Grady Rd

No reported suppression activity along the fire perimeter but several tankers are doing asset protection along O'Grady Rd.

Kilmore and Seymour tankers drove ... onto O'Grady's Road. Our plan was to do asset protection along O'Grady's Road, because there are a lot of properties on that road ... "We were still radioing and letting people know where we were and what we were doing, but because radio communications were largely unsuccessful ... Anthony and I were deciding together what we should be doing (Court). However, Court also mentions that sector commander Williams is sometimes with the tankers in the support vehicle.

At approx 1.30

I then rang the Kilmore Captain who was also the Incident Controller, Greg Murphy, and advised that he would only need two tankers in the O'Grady's Road area (Witham)

4.3 Management of the fire ground

After Hibbert confirms the fire has crossed Saunders Rd, at approx 12.15, he designates new eastern and western flanks. Hibbert will initially command the new eastern flank south of Saunders Rd with his brother, Trevor and Williams of Kilmore Tanker 2 will command the new western sector.

At 12.30, as fire controller, Hibbert asks Clarke to establish an Operations Point on Saunders Rd to the east of the fire (see **Figure 1**).

Clarke arrived at the scene at 12.33 pm and made contact with Ross Hibbert, the Captain of the Clonbinane Brigade. Ross Hibbert was running the Operations Point at that stage. He was in his own personal ute with a portable radio and my role was to assist Ross. Ross went off to do his own job in his local brigade area and I took over the Operations Point with Peter Robinson. My role was to liaise with incoming Strike Teams that had been deployed and give them a job. Peter Robinson managed the fire ground and I managed the equipment and incoming crews and gave them a briefing and sent them to the fire ground. (Clarke)

We were aware of a predicted wind change which was due in the late afternoon. We decided to place the first resources (i.e. crews and plant) that we received on the eastern flank of the fire and we would then put resources on the western flank.

The head of the fire was too intense for a frontal attack. Crew safety and survival was threatened by any form of direct attack on the head of the fire. Ross and I were of the view that the best thing we could do was try and keep the fire narrow. We undertook what is called a 'parallel attack', where we track the fire on the flanks. We had discussions regarding the Hume Freeway and the Melbourne–Sydney Rail Corridor providing some level of fire breaks. (Scicluna)

At 12.30, Dixon arrives at operations point. Dixon's role is to gather intelligence and redirect crews as they arrive. Hibbert headed down the east side with crews". He also notes As crews arrived at the Operations Point, (we) were tasking them along Saunders Road or to the Wandong area. (Dixon)

Around 1 pm, Murphy becomes fire controller. At approximately 1205 hours, I was informed by Peter Creak that Kilmore would be the ICC and that I would be the Incident Controller at Kilmore ICC ... Transfer of the management of the fire from Seymour Group Headquarters to the Kilmore ICC occurred at 1305 hours (Murphy).

Hibbert told the Royal Commission he was in constant contact with Seymour HQ, and may not have been aware of this - I have been informed that the Kilmore Incident Control Centre (ICC) assumed control of the fire at around 1 pm (Hibbert).

Nevertheless, soon after 1 pm, Hibbert's role changes rapidly from fire controller and eastern sector commander to ground surveillance to asset protection of his brother's house in Wandong. I started travelling around in the Broadford Forward Command Vehicle (FCV) with my brother, Trevor Hibbert. I was more or less performing a ground observing role. I continued to talk to the Strike Team Leaders in the Eastern Sector and feed them information. He then leaves the eastern sector and goes to O'Grady's Rd. He makes no reference to his replacement as eastern sector commander.

Approx 1.30, he then sees the fire came up through the blue gums in the Overdale Plantation (located at O'Grady's Road, Kilmore East), and I said to Margot that resources needed to be deployed to Wandong... I told John Clarke (at operations point) that I was going to head to Wandong ... Trevor Hibbert and I then drove in the Broadford FCV through the front of the fire. The fire was starting to come through the north east side of Wandong. Later, while in Wandong, I informed Tony (Scicluna) that Trevor and I were going to head to Trevor's house. Trevor lives in Wandong (Hibbert).

Meanwhile, Murphy reports a few appointments:

Ground observers:

Observers return to Kilmore where Clancy updates fire maps.

Purcell was ... despatched in the initial stages of the fire as a ground observer in my personal vehicle which is fitted with a CFA radio, before ... my vehicle being reallocated to Peter Robinson. (Murphy)

At about 10 minutes to three I was directed to return to the station by the Kilmore Captain, Greg MURPHY... and was given the task of following the fire. (Robinson)

He also appoints Witham as a ground observer. At 1.15, Murphy asked me to drive out to the fire and assess how many resources I believed were required to fight the fire (Witham)

He may also be aware that the Hibberts are ground observers: I was more or less performing a ground observing role (Hibbert).

He describes two sector command appointments, but they probably evolved later during the afternoon:

O'Grady's Sector

As the fire developed, Ken Castle is appointed - tasked with attempting to hold the fire along O'Grady's Road and asset protection in the O'Grady's Road and Mathesons Road area. (Murphy)

Wandong Sector

Given the spread and likely path of the fire, based on our initial predictions that the fire may cross the freeway, we determined the need for a Sector Commander for Wandong (Murphy).

Trevor **Witham** is appointed.

But, this is not how it happens. According to Witham, his initial role from Murphy is ground observer. Then Witham says at approx 2.30 We were starting to get regular messages over the radio informing us of houses under threat. Mick and I setup a Command Post on the railway overpass on the Broadford Wandong Road in Wandong. As strike teams were deployed to Wandong they would attend the Command Post and I would direct them to where they were needed.

Court says - from about 1600 hours or 1630 hours there was a better structure set up. It was around 1630 hours, or later, when Trevor Witham contacted us by radio to say he was our Sector Commander. He directed us to go back up to Mount View Crescent to start working on any houses we could save.

Treasurer asks: Murphy does not mention Eastern sector. What is Eastern sector status?

Answer: Technically, Wandong is part of the eastern sector, but its status is unclear since Hibbert changed roles. Based on a meeting at 3pm, we infer that the eastern sector has been under command of operations point.

During this meeting an overview of the fire was provided and the Whittlesea Division inclusion confirmed and the strategy for them to combat the head of the fire whilst the units currently deployed and under the control of Saunders Road Operations continued to look after the eastern flank around to and up South Mountain Road. Murphy

However, the following evidence from operators on the fire ground adds to the confusion,

At approx 1.30 pm, we received information that the Incident Control Centre (ICC) in Kilmore was activated and ground command of the fire was transferred to John Clarke and Peter Robinson. They would act as the Operations Point and communicate with the Kilmore ICC. Fire ground Channels were 50 and 51 (Scicluna)

Peter and I sectorised the fire at an early stage into an East Sector and a West Sector. I cannot recall at what time this took place. I think the Eastern Sector would have been put on radio channel 50 and the Western Sector on radio channel 51. I know I requested three Sector Commanders from Communications based at the Kilmore ICC because I thought we were going to go fairly big. I'm not quite sure who was in charge on the Eastern Sector but I think on the Western Sector it was Anthony Archer, from the Kilmore brigade, who went to Wandong (Clarke)

I was not aware at the time when Greg Murphy became the Incident Controller. John Leben, Operations Officer Region 12, John Dixon, DGO of the Northern Highway Group, Peter Robinson and I formed an Operations Team of four to manage the fire (Clarke)

VBRC (p 77) details several problems with staffing at the Kilmore ICC, and includes the following comment: Department of Sustainability and Environment park ranger Mr Anthony Fitzgerald ... contacted DSE duty officer Mr Steve Grant and asked who was in control of the fire. Mr Grant told him the Kilmore ICC was dealing with the fire, 'but they are not functioning very well—you are on your own'.

Treasurer states: The non functioning of the ICC is apparent, but it seems to have been irrelevant to the work at the Operations Point and elsewhere on the fire ground.

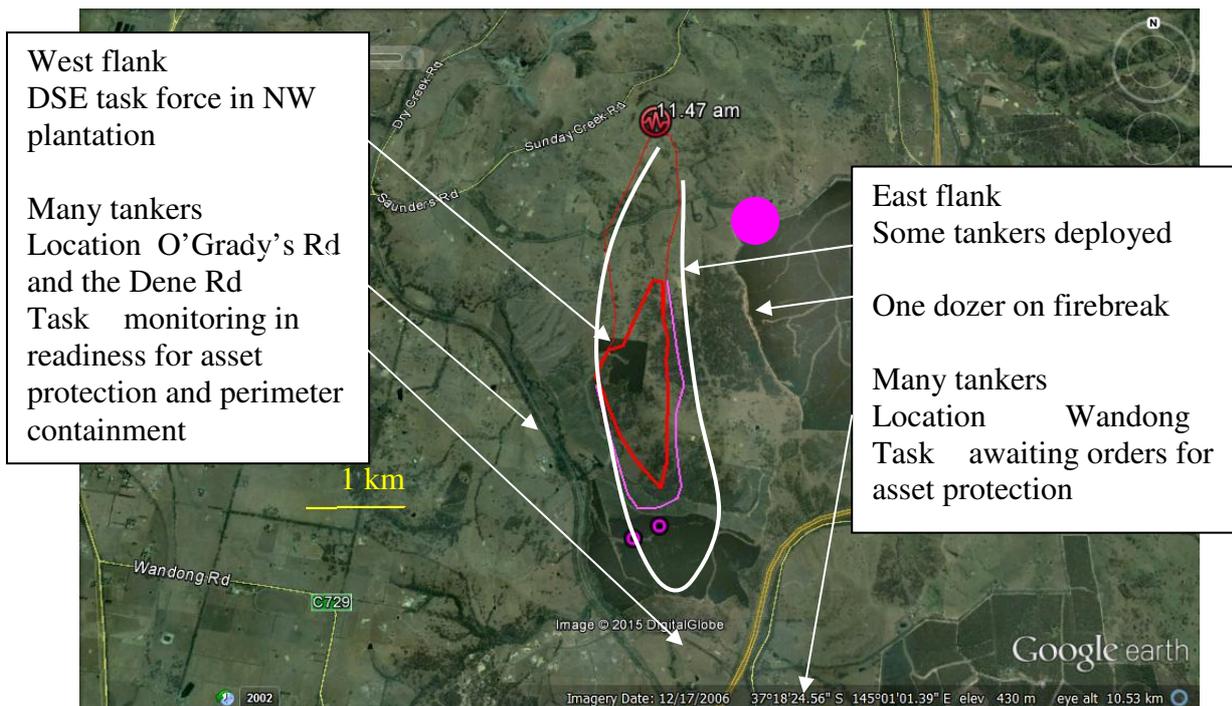


Figure 14 Fire fighter resource allocation at 1.30 pm. White line is estimated fire edge at 1.30 pm. Pink dot is Operations Point on Saunders Rd

4.4 Fire control strategy - deduced

The original control team Scicluna and Hibbert discussed keeping the fire narrow, but within a half hour or so, their roles have changed and the new operations point officer Clarke has strong views about the futility suppression.

The head of the fire was too intense for a frontal attack. Crew safety and survival was threatened by any form of direct attack on the head of the fire. Ross and I were of the view that the best thing we could do was try and keep the fire narrow. We undertook what is called a 'parallel attack', where we track the fire on the flanks. We had discussions regarding the Hume Freeway and the Melbourne–Sydney Rail Corridor providing some level of fire breaks (Scicluna)

The Ash Wednesday fires of 1983 were horrific, however, the fires on 7 February 2009 were twice as bad. Even though there were a number of properties lost in the Macedon area in 1983, we were able to fight the fire. On Black Saturday, we were behind the eight ball from when the fire started. The weather conditions were totally against us. With the wind strength as it was, low humidity, the dryness of the soil and the fuel loads, it was nearly impossible to fight the fire. In fact it was my decision from the fire ground at a very early stage to concentrate on life and asset protection (Clarke)

Of deployments he says:

I basically gave them a briefing and dispatched them to where the most needed requirements were at that stage (Clarke)

Thus, by this stage, the fire control plan mindset is asset protection. The formula seems to be – put more resources where the danger of asset damage is higher.

Treasurer asks: Do the despatching people have any idea of what conditions are like or of any safety concerns in areas where they are sending tankers?

Answer: Probably not

Treasurer asks What resources are being requested and deployed?

Answer The predominant resources deployed are tankers or aircraft. Two dozers have been mentioned, both deployed at the Saunders Rd end.

Treasurer states There is still no priority given to containing the eastern sector to prevent escape when the wind change comes. The southern part of the fire is almost reached the Hume. Is there any chance of stopping it at the Hume?

Answer: The Hume and other roads stop the flame but not the embers. The Hume is a wide fuel free fire break that has short grass paddocks on the upwind edge. The flame in these paddocks is short, and cannot stretch across the wide road, and will therefore self extinguish. Thus there is no need for fire fighters to deploy along the Hume. They need to be on the south side of the Hume where the spot fires will ignite and run through the scrub and paddocks. Unfortunately, this defensive strategy requires pre planning and training and pre season fuel reduction east of the Hume Freeway to reduce flame height. It cannot be implemented today. It is unreasonable to expect a volunteer group to devote time to such concentrated pre planning, and paid CFA staff do not engage in such thinking and pre-planning. Furthermore, by this stage, the reports of fire attack in Wandong and the need to protect assets overshadows the need to stop the spread of spot fires.

4.5 Impact of fire fighters

Impact of fire suppression on fire's spread

Treasurer states: The lack of suppression effort means that the fire's spread has not been reduced or mitigated during this past hour.

Impact of fire suppression on asset protection

Treasurer states: No reports of asset protection during this past hour.

4.6 Other

Treasurer states The disconnection between ICC, operations point and activity on the line is of concern. ICC is too busy to speak to operations point, and operations point are simply despatching apparently without advice from sector commanders. Apart from sketchy radio traffic, nobody knows what anybody is doing.

As this fire perimeter grows unchecked, as radio traffic makes communication to base impossible, experienced fire fighters on the line make their own decisions in isolation. Self interest is also a factor. Individuals call in and report what they are doing rather than work within a predetermined plan of attack.

I can understand that to the individual fire fighter crew, putting out a stationary burning house is more productive and less frustrating than chasing a fire edge in a paddock when they see another one close by getting away.

Stopping a run of spot fires in a paddock requires teamwork and this requires coordination and practice. The task is assisted by fire protection infrastructure. This in turn requires specific preparation, training and planning. All these pre-requisites are absent today. If a fire agency is "the best prepared ever", why are they absent?

Chapter 4 Fire spread and the suppression response

Period 3 1.30 to 2.30 pm

1 Wind

Wind direction changes to 330⁰ at 1.30 pm for 45 min.

At 2.13 pm, wind direction changes back to 350⁰ until 2.30 pm, and average wind speed jumps by 50% to 72 kph.

At 2.30, wind direction changes to 340⁰ for the next 16 minutes and then reverts to 330⁰ until 4pm (1hr 14 min).

2 Topography and vegetation

Summary

This part of the fire's run features a drop in elevation from the plateau (400m+) to the lower plains (300 - 320m) but in this period, the mechanism is spotting - heavy firebrand volume, changeable wind directions and stronger wind speeds. The firebrands ignite on the plains below in a spray pattern as the wind direction changes and a mass of spot fires run through undulating semi forested paddocks into dense forest.

Detail

At 1.30, the southern-most fire is burning fiercely in a large area of high load windrowed fuel on a 400m plateau under a strong 350⁰ wind. At 1.30, wind direction suddenly changes to 330⁰, and for the next hour or so, varies between 330⁰ and 350⁰, complete with much stronger wind speed. The windrows provide the firebrands in unending quantity, the plateau provides the height and the wind fires them large distances from this elevated ember launching ramp.

The 400m ridge line overlooks the Dene, the Hume and a bit further away, Wandong. A grassy slope drops steeply (15 degrees) from the ridge to the Dene Road at 320m, and then has a flat run of 600m through treeless paddocks to the Hume Freeway. The Hume Highway is effectively a 50m wide firebreak, predominantly fuel free (See Figure 13).

Meanwhile at the northern end of the fire, the relatively quiet eastern flank enlivens and runs rapidly up to the ridge tops through the treed areas and generates a further source of fire brands, although not as many and at a slightly lower elevation.

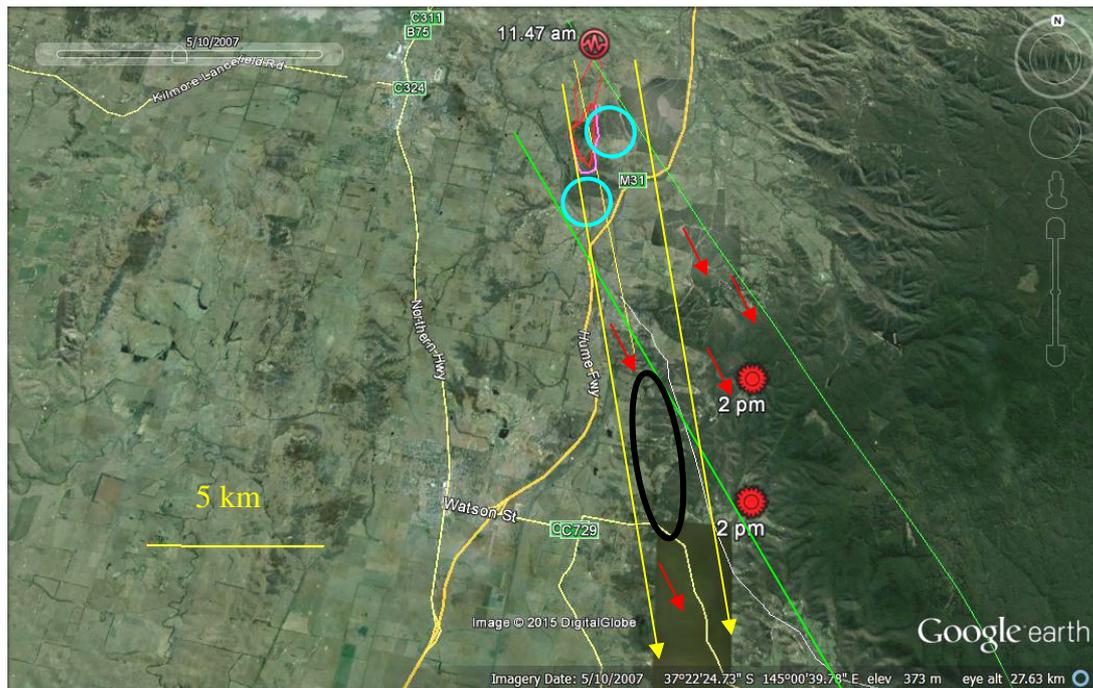


Figure 15 Yellow tramlines show 350⁰ wind direction up till 1.30 and again from 2.15 to 2.30 Green tramlines show 330⁰ wind direction between 1.30 and 2.15. Black is north end of Wandong township. Blue rings are major ember sources on plateau. Red arrows indicate range of fire brand spray pattern. The “2 pm” symbols are most distant recorded spot fires at 2 pm. Both soon after resulted in deaths.

3 Fire behaviour 1.30 – 2.30 pm

3.1 Eye witnesses

At Saunders Road end

Eastern flank

Just before 2.30,

The fire started to burn up the gully towards the Operations Point so we needed to move (Dixon)

At 2.28 pm, due to the run of the fire and safety reasons, we evacuated from the Saunders Control (Clarke)

Treasurer states: This suggests the eastern flank near Saunders Rd has not been secured.

At around this time, we received information that there was a dozer driver trapped near a plantation (Dixon)

Treasurer states: This suggests the eastern perimeter had now spread to the fire break adjacent to the NW pine plantation.

Western flank

No eye witness reports

At the southern end of the fire

Eastern flank

Around 1.30

About one kilometre past Stotts Road before we were forced to turn around. I could see a thick smoke haze with a red glow approximately 500 metres ahead (Witham driving north along the Broadford Wandong Road)



Figure 16 This 13.36 pm photo by McCluskey shows two spot fires approaching and one on the down wind side of the Broadford Wandong Rd, just north of Stotts Rd, just east of Hume Freeway. (Photo provided by Crowe). Red circles are spot fire flames.

At 13.36, spot fires are at Broadford Wandong Rd (Crowe). See Figure 16 photo.

At 1:46 pm, I spoke to Steve Grant who confirmed that the fire had crossed the Hume Freeway at Clonbinane and that it was well out of control and may take out Mt. Disappointment (Williamson)

Pockets of partially burnt vegetation indicate the fire had multiple tongues when it crossed the Hume (Crowe)

(This means the original fire front stopped at the Hume, and multiple new spot fires ignited downwind of the Hume)



Figure 17 Photo taken by Alder at 1.55 pm, looking north across the Dene. Strong wind flattens the smoke, approx parallel to the Dene, which runs NW – SE = 315° . At that time, ambient wind is 330° , which suggests the wind was channelling around the hill side.

Just prior to 2 pm

When I first got to Wandong, other than the main fire which we could see to the north west and was in the pine plantation, spots were now dropping into the east side of the Hume Highway into the back of the Wandong township.

Between 2:01 pm and 2:30 pm... the fire was now running parallel to the Epping-Kilmore Road and heading east of the Wandong township and north-east of the Heathcote Junction township, which is about 1-2 km from Wandong. I had a good view of the fire and I could see many spot fires turn into huge fires that were running up to an estimated 40 Kph. When I first got to Wandong, other than the main fire which we could see to the north west and was in the pine plantation, spots were now dropping into the east side of the Hume Highway into the back of the Wandong township. The fires were in grass land and were growing from small to medium grass fires in a matter of minutes. The height of the fires was averaging between three and four metres. (Williamson)

2.15 – 2.30 pm

In Mount View Crescent The fire front was extremely close (Witham)

We were on Mount View Crescent, in position waiting for the fire, which was approaching from the north-west. But when the front came through there was nothing we could do. It was just out of control. We tried everything but it was just hopeless. The visibility was terrible, the smoke was one thing but the wind had blown up all the dirt as well. (Court)

Resident Farrell of Cochrane Court says that he can see flames near Scanlon's Rd / Broadford Rd. I thought it was the fire front; the flames were probably about 50m across (quoted by Crowe)

I returned to the Clonbinane exit and decided to try to get through to Wandong on the Hume Freeway. The Hume Freeway was being overrun by fire. I met a Strike Team from Euroa at the Clonbinane exit and spoke to Strike Team Leader Tom Brodie. We assessed the fire behaviour and length of fire we would need to drive through. The crews agreed to making a run through and were instructed to deploy the fog sprays when needed on their tankers while travelling down the Hume Freeway to Wandong. The Strike Team followed me into Wandong. (Scicluna)

Approx 2.30 pm

I arrived in Wandong at around 2.30 pm. There were multiple structures on fire in Wandong at this point in time. Aircraft were conducting water bombing operations in the township. An air attack supervisor was directing a sky crane, another large capacity helicopter and a number of medium helicopters. (Scicluna)

Drove back to the Broadford Wandong Road and once we reached the intersection of Scanlans Road, I could see fire burning on both sides of the road. (Witham)

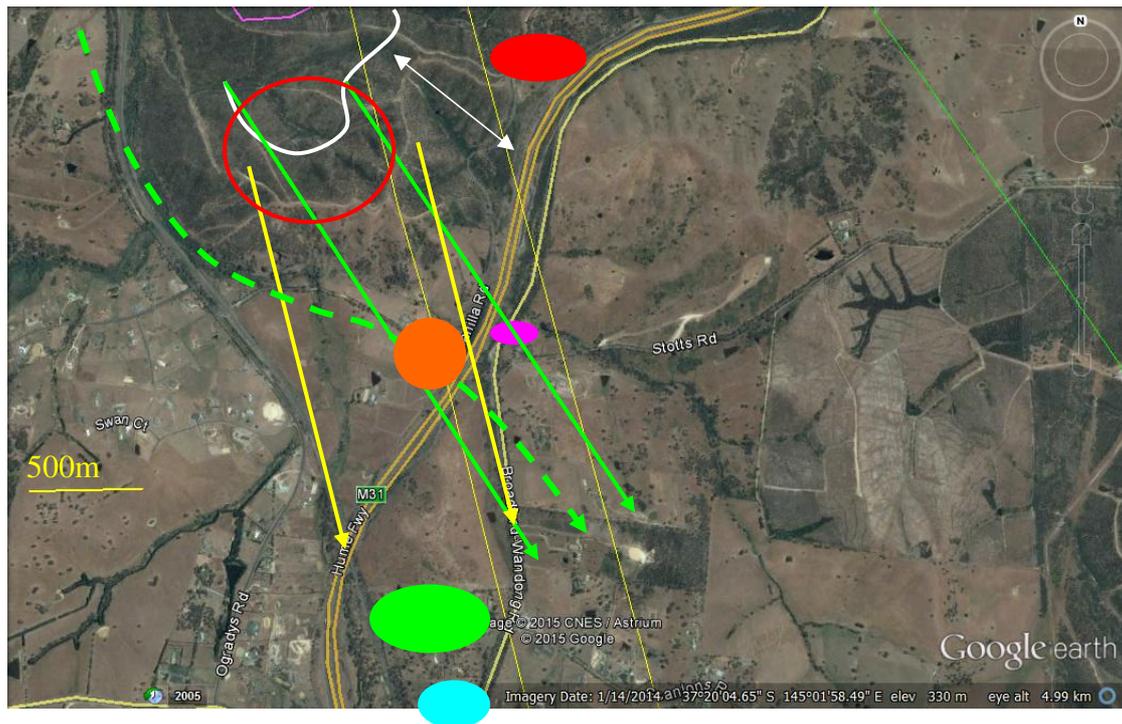


Figure 18 Fire crossing the Hume Freeway, 2.15 – 2.30 pm. White line is approx leading fire edge at 1.30 pm. Yellow tramline arrows show 350° wind direction up till 1.30 and again from 2.15 to 2.30. Green tramline arrows show 330° wind direction between 1.30 and 2.15. Green dashed arrow indicates wind channelling in gullies during 330° wind direction. Red circle is major ember source in windrows of logging slash. White arrow indicates approx 700m from the Hume. Red dot is Witham's fire report at 1.30 pm
 Pink dot is McCluskey's photo of Figure 16 at 1.36 pm } 330° wind direction
 Orange dot is site of Figure 17 photo at 1.55 pm }
 Green dot is Mount View residential area }
 Blue dot is Scanlons Road fire report after 2.15 pm } 350° wind direction

Western flank

At 1.30

I could see the fire was moving slowly through the bush area between O'Grady's Road and Mathiesons Road and would soon be moving on towards grass paddocks. I estimated that it would take about half an hour for the fire to burn through the bush out to the grass area (Witham)

After 4 pm

At 4:19 pm I observed that the fire was now along the railway line from number 240 O'Grady's Road to The Dene. (Robinson)

3.2 Specific fire behaviour measurements:

The 1.30 pm wind change in wind direction energises the 6 km long eastern flank. It becomes a new fire front which soon backs down the leeward side of hills and stops at the Hume Freeway.

A Flame height:

The Figure 16 photo shows 3-4m flame height in forest on left and > 6m flame height in centre of picture, where the road swings to the right. This means it is burning in the roadside undergrowth and on tree trunks. The flame on the right is a developing spot fire, whose fire brand parent has just jumped the road.

Williamson's observation of 3-4m flame height in grass is consistent with the CSIRO Grass Meter if grass height is at least 30cm tall, otherwise, he may be referring to flame in scrub.

B Spotting

Short, medium and long distance spotting is now occurring from different parts of the fire according to local intensity of the flame and supply of fire brand material and local wind strength and direction. The spotting mixture is indicated in Figure 19 by the spray pattern and the reach of leading spot fires.

Likely sources of heavy spotting between 1.30 and 2.30 pm are the forest patch to the east of the NW plantation and the windrows of logging slash in the southern plantation. Higher flame height in the logging slash generates more fire brand volume and greater uplift height. Upper winds carry them across the Hume Freeway and beyond.

C Area burnt by expansion of original flame body at 2.30 pm = 800 – 900 ha. Additional area burnt by spot fires since 1.30 pm is perhaps the same again, but there are unburnt areas in between.

D Rate of spread measures

D1 Perimeter ROS = 5.8 kph:

At 2.30 pm, total perimeter of original flame body is approx 16 km. Perimeter ROS is approx 5.8 kph (= 16 km in 2 hrs 45 minutes).

Perimeter ROS of the multiple spot fires is indeterminate, but at least double or triple this rate.

D2 Line of flame ROS = 0.7 kph:

We estimate the closest eastern edge at 1.30 pm is approx 700m from the Hume (see Figure 18). Under the 330° wind direction, we assume it pushes downhill, complete with short distance spotting, reaching the Hume at 2.30 pm.

This original flame body cannot cross the Hume because the width of the fuel free barrier greatly exceeds the ability of the flame height to stretch across. Apart from an ongoing source of fire brands, the original flame body plays no more role in this fire. The expansion of this fire is now controlled by spot fires.

D3 ROS of leading spot fire fronts from origin = 4.5 kph:

ROS of leading spot fire fronts through paddocks = 10 - 15 kph

The leading established spot fires are estimated to be 5 or 6 km SW of the Hume at 2.30 pm. This is 11 – 12 km from origin. Thus the ROS of leading spot fire fronts from origin at 2.30 pm is 4.5 kph (= 12 km in 2.75 hours).

It is likely that their ROS through open paddocks east of the Hume is between 10 and 15 kph. The longest unhindered run of the green windrow group appears to be 3 – 4 km from the Hume, which can be covered in 15 minutes or so. But when it hits the plantations or the forests, it slows down dramatically.

Compare to Williamson's observations: [I could see many spot fires turn into huge fires that were running up to an estimated 40 Kph.](#)

D4 ROS of leading spot fires from fire origin = 7.5 kph:

ROS of leading spot fire from their source = 60 kph

By 2pm, the furthest recorded spot fires are 13 and 17 km from origin. Thus ROS of leading spot fire is approx 7.5 kph (= 17 km in 2.25 hours).

Their source is the windrow area, which is 12 km upwind from the furthest spot fire. It is generated by the 330⁰ wind, which begins around 2.30 pm. Working backwards, we can assume winds aloft average 60 kph. Thus, the firebrand is airborne for 12 minutes. This suggests lift-off occurs at 2.45 pm, which is a reasonable 15 minutes gestational build up after the wind change. Thus, can estimate its ROS from its source is 60 kph.

3.3 Fire status at 2.30 pm

In the Figure 19 reconstruction of the fire at 2.30 pm, we show the original flame body now stopped at the Hume Freeway (the white line) and two categories of spot fire. The shorter distance spot fires are shown as dashed lines and the longer distance leap frog spot fires are red dots. The difference between the two categories is that the yellow and green dashed spot fires are linked to the original flame body by a trail of burnt vegetation, whereas the leap frog spot fires are separated from the original flame body by a large gap of unburnt vegetation.

The green dashed lines are the leading spot fires due to the 330⁰ wind between 1.30 and 2.15 pm (represented by solid green line). The northern green spot fire group derives from the forest to the west of the NW pine plantation. Its ember supply is lower than the windrow's supply. The southern green spot fire group derives from the windrows in the southern plantation near the Dene. The yellow dashed lines are the spot fires due to the 350⁰ wind between 2.15 and 2.30 pm (represented by solid yellow line). The 2pm long distance leap frog spot fires also derive from the windrows, but are clearly separated by unburnt vegetation.

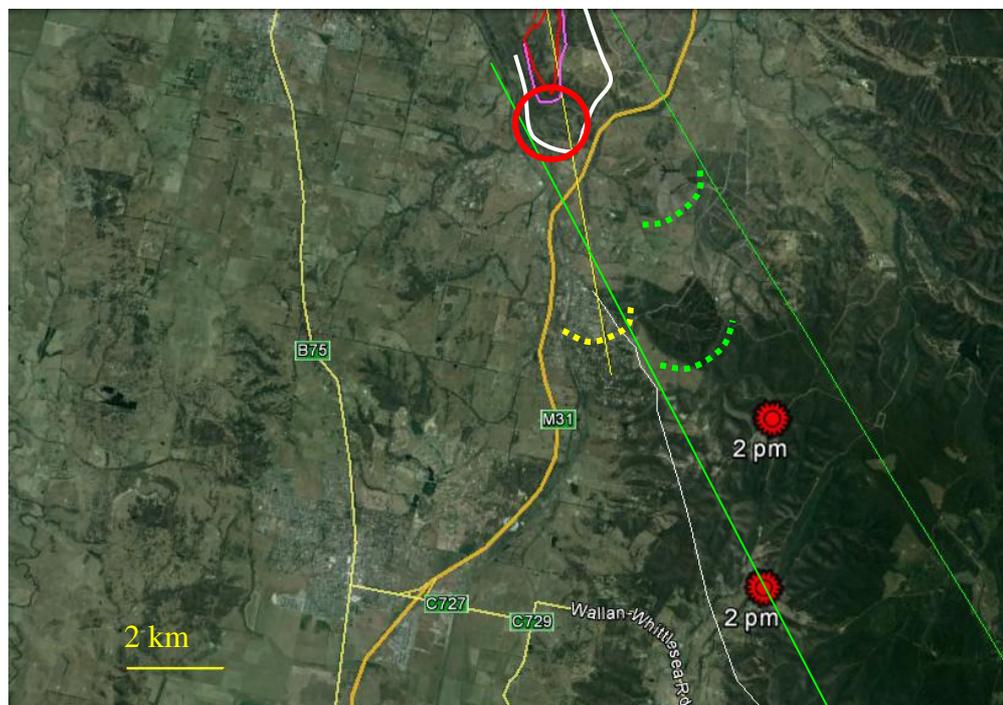


Figure 19 Estimated perimeter of original flame body at 2.30 pm is white line, leading short to medium distance spot fire fronts are dashed arcs, and long distance spot fires are red dots. Green dashed lines are associated with green 330⁰ wind direction line. Yellow dashed lines are associated with yellow 350⁰ wind direction line. Red circle is windrow area, the major source of firebrands.

4 Fire suppression 1.30 – 2.30 and afterwards

4.1 Status of fire perimeter at 2.30 pm

Eastern flank

Length of perimeter = 17+ km

[= 7 km from original fire mass perimeter plus at least 10 km from running spot fires]

Length of constructed and patrolled control line zero

Note: Approx 6 km of the original eastern perimeter is now actively spreading flame and actively generating spot fires down wind.

Western flank

Length of perimeter = 19+ km

[= 9 km from original fire mass perimeter plus at least 10 km from running spot fires]

Length of constructed and patrolled control line we estimate 1-2 km in NW plantation

Note: The southern end of the western perimeter is actively extending via spot fires along the railway line on the west side of Wandong, as shown in Figure 20.



Figure 20 Looking east across the Wandong – Kilmore Rd overpass at 4.07 pm (photo by Alder). A number of smoke drifts continue from several now smouldering spot fires.

4.2 Fire fighter activity on site 1.30 - 2.30 pm and thereafter:

Summary

By 2.30, innumerable fire fighter crews on scene are preparing to asset protect or on O'Grady's Rd or have commenced asset protecting in Wandong.

Detail

Saunders Rd end

Eastern side

No reported suppression activity along the fire perimeter, but Dixon reports at about 2.30 pm that they [received a message that there was a dozer driver trapped near a plantation. We had not deployed a dozer into the area so we didn't know the location of the dozer. I asked John if knew where the dozer was and he said that he didn't. I asked the Air Attack Supervisor to scan the area for the dozer but he was unable to locate it. Shortly after, the crew](#)

on the Wandong Quick Attack came to the rescue. I assume they must have known where the dozer was located. I believe the dozer was a contractor for the Midway plantation (Dixon)

At some stage I was informed that the bulldozer working on the eastern flank was destroyed by fire and that the operator was okay. Scicluna

At 2.31 pm, 425 Saunders Road was under threat. We received a call requesting support. I am not aware if the house was saved. At 2.35 pm, the log records that a Kilmore and possibly a Seymour appliance went to 425 Saunders Road (Clarke)
[This property is north of Saunders Rd and 300 – 400m NW of the original operations point.]

Western side

At 2.48 pm, the Region Spare Tanker went to Moira Kelly's Children First Foundation property. Her property was under threat ... I understand that her property was under threat a number of times throughout the afternoon but was saved. (Clarke)

The DSE fire fighters continued to fight the fire in the plantation and protect the Moira Kelly Children First Foundation property. (Scicluna)

Southern end of fire

Specific location unknown At 1.36 pm, the Region 14 Strike Team that had been deployed in front of the fire called us on the radio to say that they had to pull out as it was too dangerous for them and looked like the fire was going to go over the Freeway. The fire would have been still been in the pine plantation area heading down towards the quarry area at that time. (Clarke)

Eastern side

We estimate the fire attacked north Wandong residential areas during the 350⁰ wind direction period, ie, between 2.15 and 2.30 pm

Before 2.15 pm

We drove south down O'Gradys Road and crossed under the Hume Freeway, turned left to cross over the railway line and came straight up the Broadford-Wandong Road to Mount View Crescent. At this point, Kilmore Tanker 2 went into Wandong somewhere, and I'm not sure what happened to the Seymour tanker, but we ended up on our own at the end of Mount View Crescent (Court).

2.15 – 2.30 pm

At 2.20 pm, we received a report, probably from pager, that houses were under threat on Scanlons Road. We also received a report of a house fire at 200 Wandong Road where three people were trapped.

At 2.21 pm, either John Dixon or John Leben, ordered an air attack on the Wandong Road property. (Clarke)

I received a radio message advising that there was a family of three trapped inside their house along the Broadford Wandong Road. We took the strike team up to where the houses were. At that stage some of the houses had already been engulfed by flames and it was impossible to get near them due to the intense heat I told the strike team that I wanted one tanker at each of the three houses that were still standing. Mick and I then left the three tankers and the Strike Team Leader with the Command Vehicle to protect those homes. We took the two remaining tankers with us and then headed to Mount View Close, which was a residential street

containing about twenty houses. The fire front was extremely close and all the houses were under threat. On the way to Mount View Close, we met up with a few other tankers that weren't attached to strike teams. I instructed them to follow us to assist protecting homes in Mount View Close (Witham)

We were on Mount View Crescent, in position waiting for the fire, which was approaching from the north-west. But when the front came through there was nothing we could do. It was just out of control. We tried everything but it was just hopeless. We stayed there for about 25 minutes, but we were having no impact at all (Court)

When Trevor and I arrived at Trevor's house, his shed was on fire. It wasn't long before the fire in the shed started to impact on the house. The fire pump had already burnt and there were gas bottles exploding. A Kilmore Brigade tanker turned up at the house. My brother, Trevor, collapsed from smoke inhalation and was attended to by the crew of the Kilmore tanker. I then realised that I was on my own, so I tried to defend Trevor's house as best I could.

When the fire front had passed, Trevor Witham (the Captain of the Pyalong Fire Brigade) drove by on a slip-on. I yelled out and he stopped. Trevor Witham and I then dragged a camper van on my brother's property away from the fire. Trevor Witham then left and started rounding up the firefighters that he was looking after. A tanker, which may have been from Strath Creek, was with Tony. They helped tidy up around my brother's house (which was saved) (Hibbert)

Trevor Hibbert, the ex-Captain of Wandong CFA brigade, who lives on that street, walked up to us, and then suddenly collapsed onto the road. His house was in that street and while we were filling up with water the fire came through. At this point the Sunbury Tanker arrived on the scene, and Trevor was pleading for us to save his place which we started to do. We lost his shed, but we managed to save his house. He was telling us to leave him behind but I said "no, we can't leave you here". It was too dangerous, he kept collapsing and there was zero visibility. People were trying to do last minute evacuations in Mount View Road. With the benefit of hindsight, they should have done that an hour earlier. (Court)

Compare to this evidence – same resources, same people but different location and no mention of Hibbert property:

Approx 3 pm

I then received a call from Ross Hibbert requesting assistance. Ross was on his own trying to protect burning houses in an area called **The Dene**. I proceeded to that location, met Ross Hibbert and along with Jaikie undertook some firefighting efforts using what equipment I had in my command vehicle. A tanker from Strath Creek CFA then arrived shortly afterwards at the location and we were able to handover the fire fighting to that tanker (Scicluna)

Around 3 pm

Mick and I then went back down to Mount View Close to make sure the strike team crews were safe and well. The Kilmore tanker was putting out a shed fire on a property in Mount View Close. I directed them to go back into Wandong to take a break as several members were experiencing heat exhaustion. We accompanied the Kilmore tanker back into the main street of Wandong. We had to get an ambulance for a couple of the crew members who were suffering heat exhaustion (Witham)

At this point the Sunbury Tanker arrived on the scene, and Trevor was pleading for us to save his place which we started to do, but with all these guys not well, we had to get out of there. (Court)

Injury toll after Mount View defence

At this stage Anthony Archer started to tell me he wasn't feeling well.

Suddenly, one of my guys on the back of the tanker, Michael Gidman, was down on his knees in the street, gasping for breath.

We arranged for Trevor Hibbert to be transported back to Wandong Magpie & Stump Hotel.

We beat a hasty retreat and went back to the Magpie & Stump Hotel in Wandong. It was between 1400 hours and 1500 hours. When we got to the hotel, it was pandemonium. Some of the guys from Kilmore Tanker 2 were already there, distressed. One of our members, Graham Robertson, the driver of Kilmore Tanker 2, wasn't very well, so we organised to have him taken to hospital. (Court)

Later

About 2300 hours, we drove back to the Kilmore fire station and left the Tankers there. We requested assistance there for our eyes, and while we were waiting we had some cold sausages. Then the St Johns' Ambulance first aid arrived and had a go at flushing our eyes out, but it didn't really help. Michael Gidman had been having difficulties breathing and they gave him some oxygen. (My wife) drove off to casualty at Kilmore Hospital, because I couldn't see properly and any bright light was just killing me (Court)

Western side = O'Grady Rd

After 2 pm

When we were on O'Grady's Road we saw the fire was heading straight towards the Wandong township and we made the decision that we had better get down there quick. At this stage it was still just us and the Seymour tanker together. Kilmore

Tanker 2 was still ahead of us. For the rest of the afternoon, we were working around Wandong (Court)

At 2.07 pm, we were advised that buildings were on fire on O'Grady's Road (Clarke)

After 3 pm

At 3:23 pm I observed that the fire had travelled along the western flank and had engulfed the pine plantation. It had reached Mathersons Road next to the railway line = southern plantation. Our plan was to try and stop the fire from crossing the train line and O'Grady's road. Other units were dispatched including the MFB Pumper Strike Team and were placed from about 400 O'Grady's Road and south to The Dene.

At 3:25 pm we located the Broadford Tanker protecting a house at about 370 O'Grady's Road. One of the crew members was suffering from heat exhaustion and we transported him to Kilmore Hospital, arriving at 3:38pm. (Robinson)

The Wandong battle

Approx 3 pm

After directing tankers with Ross Hibbert for a while, I spoke to Ross and suggested I conduct a reconnaissance of the fire. My job was then to go from one end of town to the other and identify the trouble spots, direct tankers to those spots and try to respond to as many pager messages as possible. Many pager messages were coming in from VicFire advising of properties which were being impacted by fire.

Jaike and I drove (in my CFA command vehicle) to North Mountain Road, which is the south side of Wandong, up towards Mount Disappointment to scout where the fire was. I then came back into Wandong. I noticed a number of houses being threatened by fire in Dry Creek Road and local residents trying to beat out flames. Jaike and I stopped to assist the locals. I had a fire plug (which is a portable hydrant) and hoses in my command vehicle. We managed (with the assistance of locals) to slow down the advance of the fire and suppress spot fires. A tanker from Mt Camel CFA then came around the corner and I asked them to take care of that particular street. At this stage, we had around 30 to 40 tankers in Wandong.

I would estimate that 70 to 80 houses in Wandong were impacted by fire. I think we lost 34 houses in total. Every tanker put out a couple of houses. It was a street by street fire fight undertaken by the firefighters on tankers. (Scicluna)

I received a message over the radio advising that the businesses in the main street of Wandong were under threat. From information from the Incident Control Centre I was aware that a MFB Strike Team had been deployed to Wandong. However, I couldn't reach them on the radio as they are on a different channel. (Witham)



Figure 21 Spot fires in Wandong source unknown

Later in Wandong

The spotting had caused the Wandong Primary School to catch fire. Kilmore Pumper was at the Wandong Medical Centre and they then went to the Primary School to put the fire out there. (Robinson)

After 4.40 pm

The fire was still behind the service station, medical centre and hotel in Wandong ... We drove back and we were working on Rail Street along the railway line. At this stage, the whole of the back of the town was burning. Then the fire somehow funnelled across and jumped over the railway line and the railway station and the platforms were on fire. We kept working on Rail Street until one of the sheds beside the Primary School caught fire, then we started working to save the school. (Court)

4.3 Management of the fire ground

At 2.09 pm, the Staging Area was relocating to Clonbinane. We thought we would put it back into Clonbinane and they could set it up there which would be fairly safe at that stage because the fire was going away from Clonbinane. I am not sure where the Staging Area was eventually set up. (Clarke)

After 2.30 pm

On that day there was not much use dispatching them to the Staging Area and then bringing them back, we really needed them on the fire ground as quickly as possible and most of the northern based Strike teams that came down the Hume Freeway went past our Operations Point so we made the decision to pull them straight off the freeway and put them to work straightaway. (Clarke)

We were starting to get regular messages over the radio informing us of houses under threat. Mick and I setup a Command Post on the railway overpass on the Broadford Wandong Road in Wandong. As strike teams were deployed to Wandong they would attend the Command Post and I would direct them to where they were needed. (Witham)

I met up with Ross Hibbert at the railway bridge in Wandong. At this location, Ross and I started directing tankers to where we thought the problems spots were. The Euroa Strike Team was deployed to South Mountain Road where a number of homes were on fire. The priority of the fire fight was to save lives and protect assets. Ross and I effectively became Sector Commanders in Wandong alongside Trevor Witham (Pyalong Fire Brigade Captain), Frank Amorosi (Wandong Fire Brigade 1st Lieutenant) and David Williams (1st Lieutenant Kilmore Fire Brigade). I was not officially assigned that role – the dynamics of the fire demanded that we automatically assume those roles. (Scicluna)

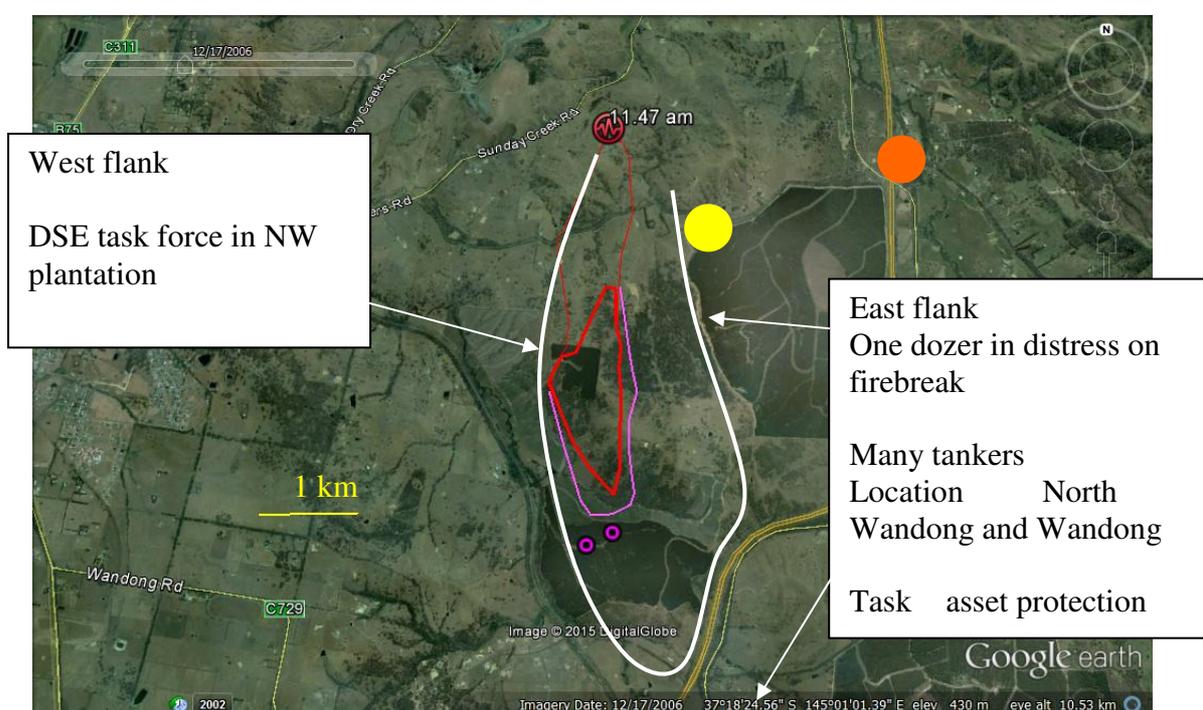


Figure 22 Fire fighter resource allocation at 2.30. White line is estimated fire edge at 2.30 pm
Yellow dot is Operations Point on Saunders Rd until 2.30 pm, orange dot is operations point after 2.52 pm.

4.4 Fire control strategy - deduced

Experienced fire fighters declare the fire is unstoppable. Their fire control plan is asset protection.

Approx 1.30 pm

I rang Greg Murphy again and told him that I needed seven strike teams immediately for the Wandong area to help protect homes. At this stage I knew that it wasn't a fire fighting time as the fire was too intense and out of control. We would be best utilised for asset protection (Witham)

It became clear by approximately 1.45 pm to 2.00 pm that the fire was uncontrollable. Fire was burning on both sides of Saunders Road and it was no longer possible to send trucks along Saunders Road. Direct attack was not possible as the tankers were unable to manage the

flanks faster than the front was spreading. Our strategy was to focus on asset protection, particularly around Wandong which was in the face of the fire (Dixon)

Approx 2 pm, troops from western flank go to Wandong for asset protection
 Around 2.00 pm, there were reports of fire spotting into Wandong. Weather conditions were now hotter and the wind was gusting in excess of 80kph. Prior to this, we were actually holding the western flank of the fire. As soon as we got reports that houses were on fire in Wandong, Ross Hibbert, David Williams and I conferred via radio Channels 50 and 51 and collectively decided to redirect the fire fight from the plantation (= NW plantation) and into Wandong. Our priorities had changed and we were now dealing with lives and property. We directed all CFA tankers into Wandong to mount an asset protection fire fight. (Scicluna)

Later, one fire fighter is belatedly considering making a stand along the Hume.

Approx 4.30 pm

I was making plans to arrange for Tankers to make a stand along the Hume Freeway to stop the fire from continuing but I did not have any time to implement this idea as the fire travelled so fast that it had already made it to the Freeway. (Robinson)

Strategy planning for the next battle - the impending wind change

After 3 pm

I had started to think about the wind change from approximately 3.00 pm in the afternoon. I sent the Benalla and Murchison Strike Teams into Clonbinane to try and protect that area as best as possible, knowing that the eastern flank on the wind change becomes the head of the fire. I knew Clonbinane needed protection because the 2 tankers were already out fighting the fire and the township of Clonbinane was certainly going to bear the brunt of the fire. We were planning as best we could to protect the north east flank of the fire but the biggest problem was it got to the stage where we couldn't get the equipment or incoming Strike Teams we would have liked so we had to manage with what we had.

I wanted to speak with the Operations Officer at the Kilmore ICC on a few occasions but was advised he was too busy. In the end we got the message that I had to plan as best as I could without support and that is what I did. (Clarke)

After 4.30 pm

Tony Scicluna and I knew that the fire would hit Clonbinane. Tony, Tony's son (Jaikie Ludwig) and I jumped into Tony's CFA command car and headed off to Clonbinane. (Hibbert)

At around 4.30 pm, Ross Hibbert and I discussed the impending wind change and the potential impact of the fire on Clonbinane.

At around 5.15 pm, Ross and I met up with John Leben (Region 12 Operations Officer), John Clarke and Peter Robinson who had set up an Operations Point at the top of the Clonbinane exit. We informed them that we were heading up to the top of the Spur Road and we were going to have a look at the fire and see what we could put in place. The wind change from the south west was now starting to turn the fire direction and the multiple fires on the eastern flank were forming into a long fire front. At around this time, there was a Strike Team working at Waterford Park, which is a little community of about 100 houses at the bottom of the Spur Road. Ross and I proceeded to the top of the hill on Spur Road where we could get a good view of the fire. Right across the horizon from one end to the other was just a wall of grass fire coming towards the Spur Road. (Scicluna)

4.5 Impact of fire fighters

Impact of fire suppression on fire's spread

Treasurer states: The lack of suppression effort means that the fire's spread has not been reduced or mitigated during this past hour. There has been very little priority given to containing the eastern sector to prevent escape when the wind change comes. This explains why there is no suppression activity. How many tankers are in the fire ground?

Answer: This evidence is given to the Royal Commission:

I believe that there were about 100 units dispatched between Saunders Road and Wandong to this point. (Robinson)

At this stage, we had around 30 to 40 tankers in Wandong. (Scicluna)

Impact of fire suppression on asset protection

Treasurer states: There has been significant asset protection during this past hour and thereafter. One reference suggests 80 houses have been threatened and 34 have been destroyed. Does this mean fire trucks attended 80 houses and lost 34 or were the 34 lost houses not attended at all? We heard they focused resources in Mount View Close area, but not in other exposed areas. We heard that of 20 houses in Mount View Road area, 8 were destroyed. This raises the question about the coverage or fairness or value of the asset protection strategy. Say, ideally, one or two trucks are required to protect each house from spot fire ignition during an ember attack. There will never be enough tankers on the fire ground. What therefore happens to the houses that fire trucks cannot attend? This means one house is protected, and another misses out. Am I therefore funding a fire fighting force that delivers bushfire protection by pot luck?

Answer It would appear so in this case

Why Mount View Close?

Treasurer asks: Why the concentration of effort at Mount View Close? Any strategic reasons?

Answer Perhaps because it is the first settlement to be hit by the fire front.

These are the only reasons provided in evidence:

Mount View Crescent is one of the most northerly roads in Wandong and we knew there was a lot of property there and it is also quite elevated. We knew when the fire came out of the plantations it would go straight towards that area. (Court)

A residential street containing about twenty houses. The fire front was extremely close and all the houses were under threat" (Witham)

We presume their unstated logic is this: This is the first residential area to be attacked, so we need to get troops there fast.

However, Hibbert apparently went there because his brother's house was there. I informed Tony that Trevor and I were going to head to Trevor's house. Trevor lives in Wandong (Hibbert)

Treasurer asks: Is it safe to make a stand there? Is infrastructure in place to protect houses and fire fighters, eg, fire break or street hydrant?

Answer: Geographically, it is the top of a slight grassy slope. There is no constructed fire break or fuel free barrier between grass and rear fences. Court mentions a hydrant at corner of Mount View Crescent and Broadford Wandong Road.

Treasurer asks Is the defence effective?

Answer: Court does not think so: when the front came through there was nothing we could do. It was just out of control. We tried everything but it was just hopeless. We stayed there for about 25 minutes, but we were having no impact at all. We were just wasting time and wasting water there.

Robinson checks house losses: the ICC asked me to do a count of houses lost in the fire in Wandong and I noted down that there were eight houses lost in Mount view Road, Scanlons Road had lost 6 houses and Cochrane Court had lost one house (Robinson)
Therefore house loss rate appears to be $8/20 = 40\%$

Treasurer asks: How many fire fighter units attended?

Answer: At least six. Court was there first, alone in Kilmore tanker 1. Witham mentions two tankers from a strike team and other tankers. Hibbert mentions Strath Creek tanker and Witham's Pyalong slip on. Court later mentions a Sunbury tanker.

Chapter 5 Other issues

Injuries to fire fighters / Fire crew safety

Treasurer states: I am concerned about fire crew safety. How do we measure if it is safe for fire crews to attend? There is also a productivity element. If a crew member becomes ill, the whole crew may become disabled.

For example, Court initially says he is not concerned about crew safety at Mount View, but very soon after, three people are in distress, cannot defend any longer, and they divert resources while they are taken to medical care. Were they wearing protective gear or not? Was it too unsafe to be there? Do we need to assess the threats (eg, flame, embers, smoke, wind caused dust and debris) at each house? If it is too dangerous for fire fighters to asset protect or construct control lines that stop fires, how can we make it not dangerous?

Answer The only way is to make entire residential areas safe from flame attack and therefore safe for fire fighters and residents to attend. **If the area is protected, the house is protected and the person is protected.**

Suppression strategy deficiencies

(1) Perimeter control strategy overlooked in favour of asset protection strategy

Treasurer states: The only reported fire fighter resources being requested or deployed are tankers or strike teams. Tankers are asset protectors - they put out flames. We have heard about two dozers only, and they are at the Saunders Rd end. One has been destroyed and the other is on the non danger western flank. Dozers build control lines. Both are essential to limit a bushfire's damage.

We have to accept that the fire brigade is an asset protector machine. It is not a control line constructor machine. In a severe fire attack, there are two different tasks requiring two different machines. If we deploy only the asset protector machine, the fire escapes. This why the ICC must take the lead and deploy the control line constructor machine as well. This is the theory. However, in practice, the influence of the ICC on fire ground activity is almost zero.

It appears I am funding a fire fighting force that chooses asset protection over stopping runaway fires. In this case, the runaway fire ran through a town and several settlements by 3pm. Many more towns and settlements were destroyed after 3 pm because the fire's run was not stopped. It is an unacceptable outcome.

(2) Planning for the wind change is minimal

Treasurer states: There is no apparent direction from ICC about planning for wind change. Three operators on the line mention planning for the wind change, one is operations point, two are next level down. All are busy with emergencies at hand and deployments. A curious related decision is to set up the staging area at Clonbinane because it is in the direct path of the wind change.

Asset protection strategy has limitations

Treasurer states: In this severe bushfire, mass ember attack occurs on multiple Wandong houses simultaneously. The fire tankers are present in great numbers, but they save some but not others. Therefore, the community is only partly protected because there are never enough tankers to deal with all simultaneous burning houses. Their choice is arbitrary. People pay fire levies for protection when they need it most,

ie, on days like these. But the only protection they get is pot luck. I am funding a fire fighting service that delivers house protection by pot luck. Is there is a pre fire season role needed – to protect the houses that will miss out from fire brigade protection? How can we protect all houses?

Answer The asset protection machine focuses on protecting one house at a time. The single house protection approach is no doubt due to the limited capacity of the core “tool”, the tanker. For example, a burning house typically requires 5 or 10 tankers to extinguish it. There are a couple of issues here. Firstly, the safety factor. Houses vary in danger level. They are just as much a threat to resident as the fire fighter. Fire fighters will choose the safer ones to defend. Secondly, if a multi-house or area based protection approach is implemented, all houses are equally protected from flame exposure. If the area is protected, the house is protected and the person is protected. This makes it safe for the resident and the fire fighter. To defend large numbers of simultaneously ignited houses and yards requires large numbers of trained extinguishers on site to deal with spot fires while small and innocuous. This means encouraging residents to remain and self defend.

Self defence by the residents

Treasurer states: Have we made residents so scared of bushfires that they evacuate in fear? Have we now made residents dependent on fire tankers that can only deliver protection by pot luck?

Answer: It would be better value for money for residents and better workplace safety to bushfire-protect whole towns from severe bushfire attack. They will no longer have pot luck asset protection because they each defend their own houses in safety and help their neighbours. The more bushfire-protected towns we have, the more fire fighter resources are available for stopping fire spread, and therefore the lower the fire fighting and disaster recovery drain on the budget. Other benefits would flow on through lower fire levies and lower fire insurance premiums and higher community resilience.

Treasurer asks: How can we make this occur?

Answer The core “tools” are fuel bed management, community training and neighbourhood coordination, which all require time to implement and maintain, something which is an unfair imposition on volunteer fire fighters, and may be foreign to their culture. They would need to be paid. The tanker would still have a role in extinguishing spot fires. Fire agencies would need to change their thinking, but they are the relevant lead agency to implement it.

Busy vs. effective

Treasurer asks: There is no doubt that senior CFA volunteers are very busy. In this case they operate without direction from ICC. There is no obvious plan. They seem to make their own decisions based on urgency, personal experience requests by the public, status of crew health, need for water. But are they effective?

Answer If we measure effectiveness by performance criteria, the only one among fire agencies is attendance time after callout. They all passed this test at midday. Fire ground performance criteria are absent. As asset protectors, they can be

judged by houses saved or lost. For example, if they save one house in a severe bushfire attack, have they been successful? If they save one house but lose 9, have they been successful? If they save one house but lose 90, have they been less successful? In the Mount View area, 8 houses are lost and 12 are saved. This is an acceptable ratio if the 12 would have burnt down if not defended. The best result is 20 saved.

Performance goals are powerful tools. If the goal is to save all houses in a severe bushfire attack, fire agencies will recognise that their pot luck asset protector model cannot achieve this.

Treasurer asks: Does the asset protector machine analyse why 12 were saved and not 20? Do the asset protectors regard plantations as assets?

Answer (1) The simple answer is NO because there are no performance criteria relating to house loss. The sad thing is that the reason why 8 were saved and 12 were burnt therefore remains one of life's mysteries, and nobody learns anything. If the unspoken goal of asset protector culture is to do what we can with what we have, saving 8 houses is a good effort.

(2) Plantations are not regarded as assets. Asset protectors aim to be ready to suppress the fire when it came out (Court)

The volunteer is relied on but undervalued

Treasurer asks: I pay for their trucks and tools and support staff, but they are volunteers who do not charge for their services. Is it right that we now rely on them but we do not pay them?

The fire agencies depend on them. The budget now depends on them because they are a huge productive labour force that costs nothing.

This severe fire attack, we see how fire agencies rely on them as if they were paid. Senior volunteers can request as many as they want and allow or ask them to work long hours on the fire ground. Agencies do not oversee their basics like their food, drink, health, rest periods and working hours. They seem to manage them by non supervision, perhaps recognising a peer pressure element is in play. The agencies do not treat paid employees like this. They have set work hours and rest times and food is organised. If they exceed these times, they are compensated with overtime. If we use payment as an indicator of value in the real world, volunteers are therefore not as highly valued by the fire agency as is paid staff.

They therefore should be rewarded at market rates so that their contributions are focused and not wasted. This will also encourage fire agencies to better deploy highly trained paid staff in operational roles. Paying them and linking performance criteria to eliminating community damage, will see them become less reliant on wet fire fighting as the only tool, and adopt more cost effective methods and options.

Treasurer states: I feel obliged to deliver an effective bushfire protection capability to the community of tax payers that is designed to work on severe bushfire days. Why? This is when the community desperately relies on it to work.

Answer: There is a range of possible targets in bushfire protection:

- Protect communities from small bushfires where single houses are threatened simultaneously.

- Protect communities from medium to high severity bushfires where several houses are threatened simultaneously.
- Protect communities from the most severe bushfires where tens or hundreds of houses are threatened simultaneously.

The current fire brigade model delivers the first one comfortably. The current model delivers No 2 if they are already mobilised and on location at the threatened town, like what happened in Wandong. The current model fails dismally with No 3, but I believe community would support a fire protection policy that delivers it.

Treasurer asks: How can I understand what the fire brigade model delivers now, and what we can aim to deliver to achieve full community protection from severe bushfires, complete with social and economic ramifications?

Answer There are four levels of bushfire protection service:

Level 1 Provide a token bushfire suppression service

eg, one tanker per ten towns

Economic model minimal cost outlay

Operating Model suppression only - truck responds to call out, truck protects houses under threat

Response People deal with emergencies when truck does not come. Town's people will self fund another tanker

Capability small, slow moving bushfires

What is Plan B when capability is exceeded none, expect deaths and major damage

Level 2 Provide a reasonable bushfire suppression service eg, one or two

tankers per key town

Economic model cost of bushfire protection balances community expectation of losses

Operating Model suppression only - trucks respond to call out, trucks protect houses under threat

Response People expect truck to deal with emergency, town's people may be happy with balance

Capability small - medium, slow to medium moving bushfires

What is Plan B when capability is exceeded none, expect deaths and major damage

Assumption / theory:

- In an average fire season,

If we spend \$10M on fire suppression, we lose 50 lives and 1000 houses per 5 year period

If we spend \$100M on fire suppression, we lose 10 lives and 100 houses per 5 year period

If we spend \$1000M on fire suppression, we lose 1 life and 10 houses per 5 year period

- On a severe fire day, expect deaths and major damage, and major suppression costs

Level 3 Provide a cost effective fire prevention and suppression service eg, one or two tankers per key town

Economic model cost of bushfire protection balances community expectation of losses

Operating Model

- programs to prevent occurrence, to provide infrastructure for assisting suppression and reducing damage
- suppression - trucks respond to call out, trucks protect houses under threat

Response People expect fire agency to reduce threats and expect truck to deal with emergency, town's people may be happy with balance

Capability small - medium, slow to medium moving bushfires

What is Plan B when capability is exceeded none, expect deaths and major damage

Assumption / theory:

- In an average fire season,

If we spend \$10M on fire prevention, we budget for \$90M on suppression, we lose 10 lives and 100 houses per 5 year period

If we spend \$50M on fire prevention, we budget for \$70M on suppression, we lose 5 lives and 50 houses per 5 year period

- On a severe fire day, expect deaths and major damage, and major suppression costs

Level 4 Provide a zero death, zero damage bushfire protection service

Model Bushfire-protect entire township areas by fuel management, self defence and supplement by spot fire suppression = principles of dry fire fighting

Note: Many towns are already bushfire-protected by default, not by design, and authorities and residents do not recognise it.

Operating Model

- identify threats in each town when under severe bushfire attack, manage fuel loads strategically to eliminate flame threat, and to minimise ember threat.
- Empower / incentivise residents and brigades to monitor fuel managed areas and manage ember attack
- Suppression by fire brigades is to assist during ember attack and prevent spread of fire perimeter towards other towns.
- Pay volunteer fire fighters from the savings in budget outlays

Response People work with or without fire trucks to deal with emergency, town's people will be happy with resilience and benefits that flow from reduced fire protection costs

Capability severe, fast moving bushfires, ember attack

What is Plan B when capability is exceeded Not exceeded.

Assumption / theory:

- In an average fire season, \$10,000 x 1000

If we spend \$10M on bushfire prevention, we bushfire-protect 1000 towns per year, we budget for \$10M on bush fire suppression within these areas, we lose 0 lives and 0 houses per 5 year period within bushfire protected areas

If we spend \$50M on bushfire prevention, we bushfire-protect 5,000 towns per year, we budget for \$30M on bush fire suppression within these areas, we lose 0 lives and 0 houses per 5 year period within bushfire protected areas

- On a severe fire day, expect deaths, major damage, and major suppression costs outside bushfire-protected areas if this plan is not complemented by suppression program.

We are currently in Level 3 model. I recommend fire agencies to adopt Level 4. This will eliminate deaths and damage and reduce suppression costs substantially in bushfire-protected areas. As the bushfire-protected area program extends, suppression costs will also reduce substantially in severe bushfire seasons.

Treasurer asks The questions for me are these – given that the fire fighter agency I have been funding is now valued at \$1.2 Billion and they deliver a very limited and therefore unsatisfactory asset protection service in severe bushfire attacks, can the asset protectors be re-jigged to deliver a no-death, no-house loss service, or do we deploy them to their capability limits and establish a separate entity that delivers a fire spread stopping capability?

Answer This study shows that three coordinated specialist teams are needed to deal effectively with a severe bushfire attack:

- 1 Perimeter spread stoppers
- 2 Township self-defenders of bushfire-protected towns / settlements
- 3 Asset protectors - assist within towns and in outside areas

Chapter 6 Deficiencies

This paper reveals a number of observable deficiencies in the current fire fighting service:

Fire agencies rely on fire tankers to deliver community protection against severe bushfire attack

Today's response shows clearly that tankers are the only serious tool of choice ordered and deployed by experienced fire fighters. This confirms that the CFA's delivery of bushfire protection in severe bushfires, which is when the community most need defence, relies on one means – wet fire suppression by 1200 volunteer fire brigades with 1300 tankers (there are now 1800 tankers).

Throwing tankers into a severe bushfire attack is counterproductive

Despite the mass of tankers thrown into this fire ground, they saved some houses at the expense of some fire crew casualties, but they lost many more houses and the fire escaped downwind, destroying very many more.

Tankers have design capability limitations

They are limited to areas with driveable access but can stretch a further 100m or so with hose line. They are specialists in asset protection of individual house fires by wet fire fighting and in stopping grass flames in driveable paddocks. If they are outside these parameters (eg, multiple house ignitions, forest or scrub fires, non-drivable or inaccessible terrain), they are operating beyond their capability, through no fault of their own.

Tanker crews are restricted when in unfamiliar territory

In this severe bushfire attack, almost all tanker crews are in unfamiliar territory. They visit operations point are deployed. They may arrive there or they can be redeployed on route by a mobile senior officer. They may be diverted by an emergency request on the way. They may hook up with a local brigade. To be productive, they need to be part of a coherent team, but there is no evidence of this today.

Fire brigades are not prepared for severe bushfire attack

The fire brigades are very well prepared for rapid call out. This is their major performance criteria. But they are not prepared for what to expect in a severe bushfire attack or what to do to stop perimeter spread.

Crew leaders make decisions in isolation

Crew leaders on the fire ground in severe bushfire attacks typically make deployment decisions in isolation from advice from sector commanders or ICC. This is because radio communications are overloaded.

Line of command deficiencies

The lack of coherence (communication, coordination and teamwork) between ICC, operations point, sector command and crew leaders is very poor for the first few frantic hours. It occurred during the ICC build up phase, the resources build up phase, the fire build up phase, the fire escape phase. It occurred at precisely the time when maximum coherence was essential.

Strategic decisions awry

- At midday, incident controller advises tankers to go to point of origin, yet he knows it is burning in inaccessible terrain and is heading down hill to Saunders Rd and there are clear paddocks beyond. He did not contemplate stopping the fire at Saunders Rd, like the Kilmore tanker crews did. Better to send all forces to Saunders Rd.
- There is no application of bushfire behaviour knowledge. Expected ROS in grass in these conditions is 15 kph. Therefore by 1 pm, a grass fire could be 15 km south = Wallan. Yet he orders 10+ tankers to go to point of origin. Why did not someone alert Wallan to mount a defence?
- As it happens, the fire travels barely 4 km by 1pm, and is slowed up in a pine plantation windrow area. Did anyone in CFA know about the windrows, know that

windrows are designed to keep the fire inside boundaries, know that windrows are driveable? Did anyone contemplate stopping the perimeter spread there? No. Their mindset is this – the fire is unstoppable, we will do asset protection. No troops are sent there, not even to look. So the windrow fires build up over the next hour and become the major source of firebrands that carry the fire towards Kinglake and beyond.

- Do they not know the wind direction will change through the afternoon and that they can use BOM data to get at least an hour's notice from indicator weather stations in the Victoria's west?
- Prior notice of wind change would have alerted them earlier that the Hume is in the fire's path. Did they not know that flame will stop and self extinguish at the edge? Did anyone contemplate stopping the perimeter spread there? No. Their mindset is this – the fire is unstoppable, we will do asset protection. They see the spot fires into the scrubby verges between freeway and main road. This has not been fuel reduced. Do they not know that these flames will stop at roads? Perhaps because they are visiting fire brigades, they are not comfortable. The main danger is spot fires that ignite and run in paddocks. But many paddocks are driveable, and therefore they can be squirted out. Does anyone organise a chase team? No. they prepare for asset protection, and are now responding to Vicfire emergency calls.
- The change in wind direction back to 350° at 2.15 pm is unexpected, and this time, embers pepper Mount View area and they fall into Wandong township. If the wind had stayed at 330°, Wandong and Mount View would not have been attacked. The asset protectors would have been surplus. Nevertheless, their presence allows the asset protectors to save some houses.

Strategic deficiencies during a severe bushfire attack

- Perimeter control strategy is overlooked in favour of asset protection strategy
- Perimeter control prior to the wind change is minimal
- Asset protection strategy by fire trucks in a severe attack delivers house protection by pot luck, and no protection is provided for the other houses
- Asset protection is done house by house basis. Houses vary in danger factor, which is a threat to resident and fire fighter

No fuel bed management infrastructure to prevent perimeter spread or protect townships

Saunders Rd northern verge is long unburnt and shrubby and allows flame to readily climb trunks and throw spot fires into the southern shrubby verge and the paddocks beyond. The scrubby forest between the Hume Freeway and Broadford-Wandong Road is long unburnt. It grows tall flames that generate embers to cross the roads and railway lines.

Strategic road systems and terrain not acknowledged as fall back control lines

The Dene and the Hume both have extensive short paddocks upwind. Why where they not considered as potential places to stop fire spread, ie, as fall back control lines? This is exactly where the original flame body stopped. The escapees are the spot fires, but the tankers and crew leaders are preoccupied with what they do best, asset protecting.

But these deficiencies are only part of the story. Their unspoken corollaries expose the core deficiencies that remain unspoken and untreated because of traditional and unquestioned reliance on the fire brigade model.

- Fire agencies fail to acknowledge the fire brigade model has a maximum design capability
- Fire agencies fail to quantify its maximum design capability
- Fire agencies fail to acknowledge that they have no Plan B to protect the community in areas where design capability is exceeded.

- Fire agencies have no Plan B to protect the community in areas where design capability is exceeded.
- Fire agency provides no protection for houses that fail the pot luck selection method of asset protection on a house by house basis
- Fire agency choice of asset protection strategy over perimeter control strategy allows fires to escape control and exacerbates damage downwind

We believe these deficiencies are the unacknowledged root causes of community destruction in severe bushfires. They have never been addressed.

Non-capability areas Non-capability areas are areas that exceed fire brigade bushfire suppression design capability. In this bushfire attack area, the only areas that are within capability are the roads, driveways, driveable paddocks and residential areas. This is where the tankers go to. It is a small fraction of the area of the burnt area or the perimeter.

The true extent of non-capability areas is very worrying. Non-capability areas can be quantified by distance from brigade, Fire Danger Index (FDI) and fuel bed identification, and by displaying such areas on a map. Eg, we estimate that when FDI is 25, non capability areas cover 30% of CFA territory, or when FDI exceeds 30 and the wind is strong, non-capability areas cover 85+% of CFA territory, or on Total Fire Ban Days, 95% of CFA area exceeds fire brigade model design capability.

Plan B protection When the fire passes Kelly's and Harrop's, the fire trucks on scene have reached their capability limits. They are unable to stop the spot fires in non-driveable terrain and are unable to provide any alternative or Plan B protection to plantations and properties that the escaping spot fires are running towards. The incident coordinator is unable to provide any Plan B protection, apart from a fire bombing aircraft, because the only tools he has are tankers that cannot operate there. To break out of this circular argument requires new approaches, new strategies and new tools.

Consequences

This means the fire escapes in these non-capability areas and runs as a fierce inferno towards unprotected communities. This happens at Kilmore East in very severe bushfire weather. It continues to happen, even in milder weather since then, even in 2015.

Chapter 7 Recommendations

We recommend the Treasurer funds and implements the Level 4 bushfire protection program to achieve a zero death, zero house loss bushfire protection service, complete with incentivising performance criteria, and expectation of progressively and substantially lowering the bushfire protection and disaster recovery outlays when severe bushfire weather occurs. The program will deliver the goal of a bushfire-safe Victoria. The downstream benefits for Victorians includes reduced fire levy, reduced insurance payouts and regional stimulus as volunteers are paid market rates out of the savings in overall bushfire protection budget savings.

We highlight two program areas that need urgent attention for the safety and security of Victorians.

Plan B protection program for communities

Plan B protection requires a different set of tools such as strategic fuel bed management, community training and neighbourhood coordination, which all require time to implement and maintain, something which is an unfair imposition on volunteer fire fighters, and may be foreign to their culture and possibly to the culture of most paid CFA staff and leadership. If so, fire agencies will not be willing to invest current resources to overcome these entrenched deficiencies, and may have to be persuaded with a supplementary budget.

In the meantime, the least the fire agencies should do is to acknowledge that communities are at risk from running infernos and commence a program with a clear timetable to protect them.

They will find that

- Many communities in non-capability areas are already bushfire-protected, but not recognised as such
- Many communities in non-capability areas are not bushfire-protected, and it is simple to protect them against severe bushfire attack.

Suppression program

Introduce a reformed suppression program to deliver zero death / zero house loss protection during severe bushfire attacks:

The aim within the fire season is to protect houses in non-capability areas

How:

Acknowledge that fires will escape above windy FDI 30

When they escape, deploy three coordinated specialist teams:

- 1 Perimeter spread stoppers
- 2 Township self-defenders of bushfire-protected towns / settlements
- 3 Asset protectors - assist within towns and in outside areas

The aim in the off season is to increase numbers of bushfire protected towns and progressively reduce bushfire flame and ember threat in non-capability areas

How:

Implement strategic infrastructure to stop spread of flame

Implement strategic infrastructure to stop spread of spot fires

Implement strategic infrastructure to protect towns from flame

Apply targeted fuel hazard notices strategically to supplement these

A futuristic look at how this suppression program might have worked at Kilmore:

Before the fire ... There is a bushfire specialist unit

- IC (incident controller) and core IMT (incident management team) are on duty for this area, together with perimeter spread stopper and brigade captain is asset protector
- Town defenders are on standby
- Fire behaviour and suppression response are known for all parts of brigade area for current / forecast weather

**** Kilmore East fire is reported ****

First attack: Specialist perimeter stopper troops automatically despatched based on pre-determined battle plan for that area in those conditions. Sole aim is to stop fire spread.

While on route, Perimeter spread stopper plots unrestrained fire path for next 2 hrs – maps it electronically, distributes it

Perimeter spread stopper identifies:

- Closest pre-prepared spread flame stopping areas, prepares 2 hr action plan, and alerts troops to catch spot fires,
- Fall back control line, mobilise troops, orders reinforcements

IC alerts IMT

If fire escapes first attack ...

Initial response period commences ...

IC installs IMT

Perimeter spread stopper

- Confirms closest pre-prepared flame stopping areas, deploys troops to catch spot fires,
- Fall back control line, mobilise troops, orders reinforcements
- Launches drone for continuous aerial pics, beamed to all parties east flank, west flank, front view.
- Launches fire spotter equipped with IR, visible spectrum and real time relay, will remain permanently above fire. Will be alert for short and long distance spotting.
- Despatches ground based spotter, equipped with visuals, who confirms fire behaviour and response issues in path of fire front, and reports length of secured edge.

Perimeter spread stopper submits 2 hr action plan to IC

Brigade captain

- Deploys troops to capability areas as pre planned, either to stop spread on driveable areas or to asset protect exposed houses
- Mobilise reinforcements
- Warns threatened towns / deploys tankers according to pre planning
- Submits 2 hour action plan to IC

Town / settlement defenders (Wallan, O'Grady's Rd area, The Dene area, Wandong)

Are brought into information loop - prepare to defend – as pre planned

They submit 2 hour action plan to IC

Next response period ...

Perimeter spread stopper updates expected 2 hour fire path using current weather and observed fire speed and suppression action (= length of secured edge)

Perimeter spread stopper also updates expected fire path weather 3-4 hours ahead based on forecast, weather at stations to the west, and plots 3-4 hour path.

Advises IC and others in the info loop

Perimeter spread stopper submits 4 hour action plan to IC for OK

Local brigade captain submits 4 hour action plan to IC for OK

IC plots proposed growth and response visually

Approves if all is good for delivering zero death / zero house loss goal, otherwise asks for review

Key players deploy accordingly

Repeat same pattern for next response period ...

References

The following documents can be viewed on the Victorian Bushfire Royal Commission (VBRC) website

<http://www.royalcommission.vic.gov.au/Commission-Reports.html>

VBRC Interim Report

VBRC Final Report

Alder photos	TEN-263-001-0003-1 (12.45 pm)
	TEN-263-001-0004-1 (12.48 pm)
	TEN-263-001-0006-2 1 (12.51 pm)
	TEN-263-001-0008-2 (1.55pm)
	TEN-263-001-0024-1 (4.07pm)
BOM.901.0069	Meteorological aspects of the Kilmore east fire
Clarke	WIT-3004-021-0318
Court	WIT.3004.021.0292
Crowe	WIT.3004.022.0001
Dixon	WIT.3004.021.0348
Grant	VPO.001.041.0107
Harrop	SUMM-044-002-0662_R
Hibbert	WIT-3004-021-0384
Jackson	SUMM-044-002-1409_R
Line scans	TEN-017-001-0001
Local maps	WIT-3004-021-0133
Murphy	WIT-3004-021-0001
Photos	McClusky photo WIT-3004-022-0419 (1.36 pm)
	Saunders Rd VPO-001-036-0367-1
Robinson	SUMM-044-002-2460_R
Scicluna	WIT-3004-021-0364
Williamson	WIT.3004.009.0029
Witham	VPO-001-010-0384_R