



Photo courtesy of Janice James

PART D – THE CAUSE AND CIRCUMSTANCES OF THE FIRES

Under its terms of reference, the Inquiry is required to report on the immediate causes and circumstances of the bushfires which were active on 4 January 2013, with particular focus on the Forcett, Lake Repulse and the Bicheno fires. The Inquiry has not examined any other fires in close detail. Please refer to PARTS B and E for detail on the number of fires over the past 10 years and the 2012–13 fire season.

In preparing this part of its report, the Inquiry wishes to acknowledge the contribution made by the fire cause investigators in Tasmania Fire Service (TFS) and Tasmania Police, Dr Jon Marsden-Smedley¹ and the Bureau of Meteorology (the Bureau).² This part substantially refers to the material they provided and the Inquiry is grateful for their expertise.

Influences on Fire Behaviour

Wind speed, slope, fuel characteristics and fuel moisture are the main factors influencing the fire spread rate. Fire spread rate, fuel height and fuel load primarily determine fire intensity.³

The relative importance of wind speed, fuel characteristics and fuel moisture on fire behaviour varies at different wind speeds. As wind speed increases, it begins to dominate as an influence on fire behaviour.

The conditions at ground level and the atmospheric stability should be considered. In highly unstable atmospheric conditions, fires are more likely to form large convection columns, increasing the fire ventilation rate and, in turn, increasing wind speed and decreasing humidity. Fires burning in unstable atmospheric conditions are much more likely to have enhanced levels of fire behaviour.

¹ Tasmanian wildfires January-February 2013: Forcett-Dunalley, Repulse, Bicheno, Montumana, Molesworth and Gretna, Report prepared for Tasmania Fire Service by Dr Jon Marsden-Smedley BSc (Hons), PhD, 2-13.

² Submission No. 56.

³ Refer to the Tasmanian wildfires Report 2013 for a detailed explanation of the influences on fire behaviour at pp. 6–12, by Dr Jon Marsden-Smedley.

The fuel load significantly influences the fire's intensity. Models for predicting fuel hazard ratings and fuel loads have been developed, as have methods of calculating fuel moisture.

Temperature, as a single factor, has a minor influence on fuel moisture and fire behaviour.

Direction of fire travel is determined by wind speed and terrain. Wind and the direction of a slope have a similar effect of reducing the distance between the fire and unburnt fuel.

There are three zones to a fire:

- head fire: this is the most intense area. It burns in the same direction as the wind or slope. There are different levels of head fires, and the highest level is a crown fire, which usually occurs in the crowns of trees
- flank fires: these are perpendicular to the head fire
- back fire: this burns down a slope or back into the wind. It is the least intense area of a fire.

At low wind speeds and where the vegetation or topography is relatively uniform, the differences in these parts of a fire are not pronounced.

Fire Danger Indices and Ratings

Fire danger indices and ratings provide a description of the fire suppression difficulty. The primary index used in Tasmania is the Forest Fire Danger Index (FFDI) and a numerical rating is provided for a particular location using air temperature, relative humidity, wind speed and a drought factor. An assumed fuel load of 12.5 tonnes per hectare is used and it does not take into account aspect or slope of the landscape.⁴

The forest fire danger can be expressed as either an index number or descriptive rating (Forest Fire Danger Rating, FFDR), as in table D.1.

Table D.1 Pers Comm, Marsden-Smedley, J, 5 September 2013.

Forest Fire Danger Rating	Forest Fire Danger Index	Fire Suppression Difficulty
Low	0 to 5	Fire control relatively easy
Moderate	6 to 11	Direct attack on fires possible if well resourced
High	12 to 24	Fire control operations difficult and frequently fail
Very High	25 to 49	Fire control operations very difficult and normally unsuccessful
Severe	50 to 74	Fire control unlikely to be feasible or safe
Extreme	75 to 99	Fire control not feasible or safe
Catastrophic	100+	Very high level threats to life and property

There are limitations to the FFDI forecasts as an overall measure of risk, in that they vary for particular times and locations.

⁴ Submission No. 56.

For the purpose of forecasting weather, Tasmania is divided into 11 districts. The Bureau has a method for developing an index rating for each district.⁵ In the 2012–13 fire season, fire weather warnings were issued for a district if the FFDI was Very High. TFS considers weather forecasts when issuing a total fire ban.

Spot fire ratings can also be issued on request by TFS for particular areas.

The rating system has only recently been updated nationally by the Australasian Fire and Emergency Service Authorities Council (AFAC). However, it seems to the Inquiry that there are aspects of the rating system which ought to be further considered:

- atmospheric stability will make a difference to fire behaviour, and methods of incorporating this into fire danger indices and ratings should continue to be examined
- depending on atmospheric stability, current danger ratings at a lower level are likely to be more dangerous than is reflected in the model (for example, at Very High or Severe levels) and the model is likely to mislead people on the risk
- Considering the above point, the model may cause a false sense of security in people who may consider a Very High or Severe rating to be not such a risk, because there are more levels to follow. In terms of warning people of the risk and the action they ought to take to minimise that risk, it should be considered whether the Extreme and Catastrophic ratings serve the intended purpose.

The Continuous Haines Index (C-Haines Index) can provide a measure of atmospheric stability, and this may be used to help determine fire danger ratings. The Index varies between zero and 13. This area is still the subject of research and verification of the index will occur as knowledge increases.

Dr Marsden-Smedley told the Inquiry that in his opinion, at a moderate or higher FFDI, the thresholds of the C-Haines Index set out in Table D.2 should apply.

Table D.2 Pers Comm, Marsden-Smedley, J, 5 September 2013.

Continuous Haines Index	Likely fire behaviour and fire prediction reliability
0-4	Fires are easily controlled. Modelling is highly likely to over-predict fire travel.
4-8	Fires may be difficult to control and fire behaviour may be erratic. This is the transition phase of fire behaviour. Modelling is likely to be close to actual fire behaviour.
8-10	Fires will be difficult to control and fire behaviour will be erratic. Modelling is likely to under-predict fire behaviour.
10-13	Fires will be uncontrollable and extremely difficult to extinguish. Modelling is highly likely to dramatically under-predict fire behaviour.

Whether and how this index may help in rating fire risk should be examined by the relevant fire management authorities.

Refer to a section following on the use of predictive modelling.

⁵ Submission No. 56, at pp. 10 and 11.

Recommendation 1 – that Tasmania Fire Service supports the relevant authorities to continue developing methodologies to forecast and simulate fire risk.

Weather Conditions

In its submission to the Inquiry, the Bureau provides a detailed outline of the weather conditions leading up to and during the fires.⁶

Leading up to 2012–13 from 2006 rainfall was variable, but generally above average, especially for the Forcett area:

- during 2006, 2007 and 2008 rainfall was close to average
- in 2009 it was very much above average
- in 2011 it was above average
- in 2010 and 2012 it was below average, but close to average in the Forcett area.

Total rainfall in 2012 was below or close to average for Tasmania, including the Forcett area, but the first nine months had close to average rain and the last three months were drier than average.

Higher rainfall averages indicate possible above-average vegetation growth.

Rainfall and temperature affect the Soil Dryness Index (SDI) and by the beginning of the 2012 summer period, the SDI values increased, indicating that the moisture in heavy fuels was a little drier than normal almost statewide.⁷

On 3 January, under the influence of a high pressure system, a west to northwest airstream brought hot air over Tasmania. Temperatures reached low to mid 30s about the southeast and east as winds reached 30 to 35kph in the afternoon. The FDDI reached the Very High to Severe range in the eastern and southern districts in the afternoon. Some locations in the southeast experienced wind squalls of 40 to 50kph. Stronger wind with thunderstorms occurred in places (including Hobart, with a 98kph maximum gust) as weather moved in from the west.

Lightning strikes occurred in a number of locations, notably on the Forestier and Tasman Peninsulas, near Bicheno, and between Bicheno and the Freycinet Peninsula. Not all lightning strikes are detected by the Bureau. Very little rain fell with the thunderstorms; with 1mm or less across the State for the 24 hour period to 9.00am on 4 January.⁸

On 4 January, a high pressure system, extensive cloud cover and strong winds kept temperatures in the twenties in the southeast. Some areas experienced their highest January minimum temperatures. FFDRs were generally in the Low to Moderate range, but around Hobart it reached Very High.

⁶ Submission No. 56.

⁷ Submission No. 56.

⁸ Submission No. 56, at pp. 23-24.

During the morning, temperatures began to rise slowly. However, conditions remained similar to earlier, as did the FFDRs. FFDRs increased to High at Hobart Airport and Friendly Beaches. The C-Haines Index at Hobart Airport at 10.00am was a high 9.5.

By late morning, the cloud had mainly cleared and temperatures rose rapidly into the 30s. North to northwest winds began to freshen and the relative humidity lowered. FFDRs reached into the Very High range for much of the state across the midday period. Bushy Park and Hobart Airport recorded Severe before midday and Extreme by 1.00pm. Cloud and onshore winds kept the ratings lower at Dunalley.

From 2.00pm to 5.00pm, temperatures reached the 30s in most areas and high 30s and low 40s in the southeast. North to northwest winds strengthened, averaging 35 to 50kph in southern and eastern areas and gusting to 70 to 90kph. FFDRs reached Extreme for most of the southeast and Catastrophic for short periods (Hobart FFDI 112). Detail is provided in Table D.3.

Table D.3 Forest Fire Danger Rating and Index values for six Bureau observation stations, 2pm-4pm, 4 January 2013.⁹

FFDR and FFDI						
Local time	Ouse	Bushy Park	Hobart	Hobart Airport	Dunalley	Friendly Beaches
2pm	Severe 62	Extreme 85	Extreme 77	Severe 66	Severe 56	High 14
3pm	Severe 71	Extreme 99	Catastrophic 112	Severe 69	Severe 72	Very High 34
4pm	Severe 68	Extreme 93	Extreme 81	Extreme 77	Severe 70	Severe 53

From 5.00pm to 7.00pm, weather conditions began to ease, with temperatures gradually dropping. FFDRs remained high, as indicated in Table D.4.

Table D.4 Forest Fire Danger Rating and Index values for six Bureau observation stations, 5pm-7pm, 4 January 2013.¹⁰

FFDR and FFDI						
Local time	Ouse	Bushy Park	Hobart	Hobart Airport	Dunalley	Friendly Beaches
5pm	Severe 59	Severe 58	N/A	Extreme 76	N/A	Very High 45
6pm	Severe 53	Severe 54	Severe 54	Severe 56	N/A	Severe 54
7pm	Very High 42	Very High 43	Very High 45	Severe 56	Severe 63	Very High 43

From 8.00pm to 11.00pm, temperatures remained high in the eastern part of the state and northerly winds averaged 20 to 30kph.

By 11.00pm, there was a west to southwest wind change across the southeast and southern part of the state and the east coast, with southerly winds of 20 to 30kph about the coasts. FFDRs began to lower but remained in the Very High range until about 9.00pm (Tables D.5 and D.6).

⁹ Submission No. 56, at p. 34.

¹⁰ Submission No. 56, at p. 39.

Table D.5 Forest Fire Danger Rating and Index values for six Bureau observation stations, 8pm-10pm, 4 January 2013.¹¹

FFDR and FFDI						
Local time	Ouse	Bushy Park	Hobart	Hobart Airport	Dunalley	Friendly Beaches
8pm	Very High 38	Very High 39	Very High 33	Very High 39	Very High 38	Very High 33
9pm	High 20	High 18	Very High 30	High 22	Very High 35	High 22
10pm	High 17	High 18	High 22	Very High 28	High 21	High 22

Table D.6 Forest Fire Danger Rating and Index values for six Bureau observation stations, 11pm, 4 January 2013.¹²

FFDR and FFDI						
Local time	Ouse	Bushy Park	Hobart	Hobart Airport	Dunalley	Friendly Beaches
11pm	High 13	High 18	Very High 25	Very High 26	Very High 26	Very High 28

Over 4 January, Catastrophic fire ratings were records at five locations:

- Dunalley (for one minute at 3.38pm)
- Campania (for five minutes around 3.00pm)
- Hobart Airport (for about 10 minutes at from 1.10pm to 1.20pm)
- Bushy Park (for about one hour from 2.10pm to 3.10pm)
- Hobart (for about one hour during 2.30pm to 3.36pm).

Temperatures at several weather stations were either their highest on record for any month or the highest in January, with a number of places exceeding 40 degrees. Hobart was the highest at 41.8, breaking a 126 year record.

Dr Marsden-Smedley summarised the fire risk situation over the 2012–13 summer as having elevated levels of fire danger:

- the 95th percentile for the FFDI was 43 from January to March 2013, compared with 31 for the seven years between 1998 and 2005
- the C-Haines Index was 8.5 from January to March 2013, compared to 5.8 for 1998 to 2005.

The most severe fire danger days during the 2012–13 fire season occurred on 3 and 4 January.¹³

Lake Repulse Fire

The Lake Repulse fire started from an escaped camp fire on the western shore of Lake Repulse at about 11.30am on 3 January; the exact location is uncertain.

On this morning, there were a number of groups of people camping in the area. One group described how they made a camp fire the day before. They were away from the camp site

¹¹ Submission No. 56, at p. 41.

¹² Submission No. 56, at p. 42.

¹³ Tasmanian Wildfires Report 2013, at pp. 12 and 13.

swimming on the morning of 3 January when one of them returned to the camp site at about 11.30am and noticed a small fire about a metre from the fire pit. He saw that a fold-up chair had blown into the fire pit.

The fire was about two square metres in size and he attempted to put it out with branches, a pillow and water, but the wind picked up and the fire took hold in the grass. He and others continued to try to extinguish the fire for about 20 minutes and they then contacted the 'fire brigade'. After a short period when they continued trying to extinguish the fire, they left for their safety. The fire was described over this period as '...initially a lot of flames and not much smoke, but then the wind would slow and we'd get on top of it, then the wind would pick up and off it would go again'.¹⁴

A TFS Fire Investigator attended the fire scene on 4 January, but was not able to closely examine the fire ground as it was still active and dangerous. He did observe a camp fire and features on the fire ground which indicated the fire could have started from that point. There were also indications that the fire developed quickly into a fast moving fire travelling in a southerly direction.

On 10 January, the TFS Fire Investigator returned to the fire scene and was shown a number of camp sites close to the one he observed previously. As there was no security on the fire ground, alteration of the fire scene could not be discounted. Other causes of the fire have been discounted. The Investigator concluded that it was probable the fire started in a specified camp fire, but he could not rule out four other camp fires as the probable origin of the fire. A person was charged with a criminal offence by police in respect to the management of a camp fire. It is sufficient for the purpose of this Inquiry to identify that the fire most likely started from a camp fire.

At the time the fire started, the FFDI was probably about 15, with a north westerly wind of 21kmh. Initially it spread from the ignition point towards the south east as a flank fire. It spotted into a previous logged area where there was debris remaining on the western side at 12.05pm and a few minutes later it spotted to the eastern side of Lake Repulse.



Photo courtesy of Warren Frey

¹⁴ Tasmania Fire Service Fire Investigation Report, TFS Incident Number 201635.

This area on the eastern side of the Lake was contained by fire crews and local farmers by 1.30pm.

Between 11.30am and 2.45pm, the fire travelled about 600m from its origin. Then, through a combination of the fire burning past the Repulse Dam and a small change in the wind direction, it became a head fire burning towards the south east.

At 2.20pm, the fire crossed Dawson Road. Throughout the afternoon, warnings were issued to people in the Ellendale, Meadowbank and Hamilton areas.

Between 2.45pm and 8.00pm, the fire had travelled about 3.3km. It was about 311ha in size with a perimeter of 17.6km. Overnight fire crews patrolled, actively tried to suppress the fire, and consolidated containment lines.

Between 8.00pm on 3 January and 3.45pm on 4 January, the rate of spread of the fire was slowed by poorly-stocked eucalypt plantations in the vicinity of the Repulse and Broad Rivers. It was about 877ha in size with a perimeter of 26.9km. Once it travelled past this area and crossed into the State forest, its rate of spread and intensity increased. Weather reports on the fire ground indicated a temperature of 43 degrees and winds gusting to 40kph. The fire then spread very rapidly as a crown fire towards the south east.

The fire crossed the Broad River and reached Ellendale Road by 5.30pm. Police closed this road as power infrastructure fell across the road. Most residents in the area had been personally warned by police patrols, and some had been directed to evacuate.

By 6.50pm on 4 January, the fire was about 4 109ha in size with a perimeter of 67.9km.

From this time, the fire spread rapidly towards the south east. At about 10.00pm the fire dropped in intensity as it ran into areas burnt in 2012 by the Meadowbank fire. Most of the fire front then stopped, with the exception of the south eastern corner of the fire, which increased in intensity again from 10.42pm until it ran into other areas burnt by the 2012 Meadowbank fire. By 11.00pm, the fire was about 9 008ha in size with a perimeter of 101.8km.

Overnight, the conditions eased and the level of the fire behaviour then decreased, but it still was not contained. Fire crews worked through the night to protect homes and other assets.

The fire continued to burn. On 5 and 6 January, fire crews responded to reports of uncontained fires impacting on properties. Flare ups and reports of new fires were received.

By 8.30pm on 6 January, the fire was 9 545ha in size with a perimeter of 109km. The fire was contained in most areas by 9 January, though the Broad River remained problematic because of its remoteness. There were concerns the fire would escape this area and threaten Ellendale. Remote area firefighting teams, in conjunction with aircraft, worked over a week to contain and extinguish the fire.

All fires were contained by 18 January and it was considered safe by TFS on 22 January. The final area of the fire was 10,489ha in size with a perimeter of 124.1km.

Figures D.7 to D.12 show the progress and spread of the fire.

Figure D.7 Lake Repulse Fire at 2.45pm EDST 3 January 2013.



Figure D.8 Lake Repulse Fire at 8.00pm EDST 3 January 2013.



Figure D.9 Lake Repulse Fire at 3.45pm EDST 4 January 2013.

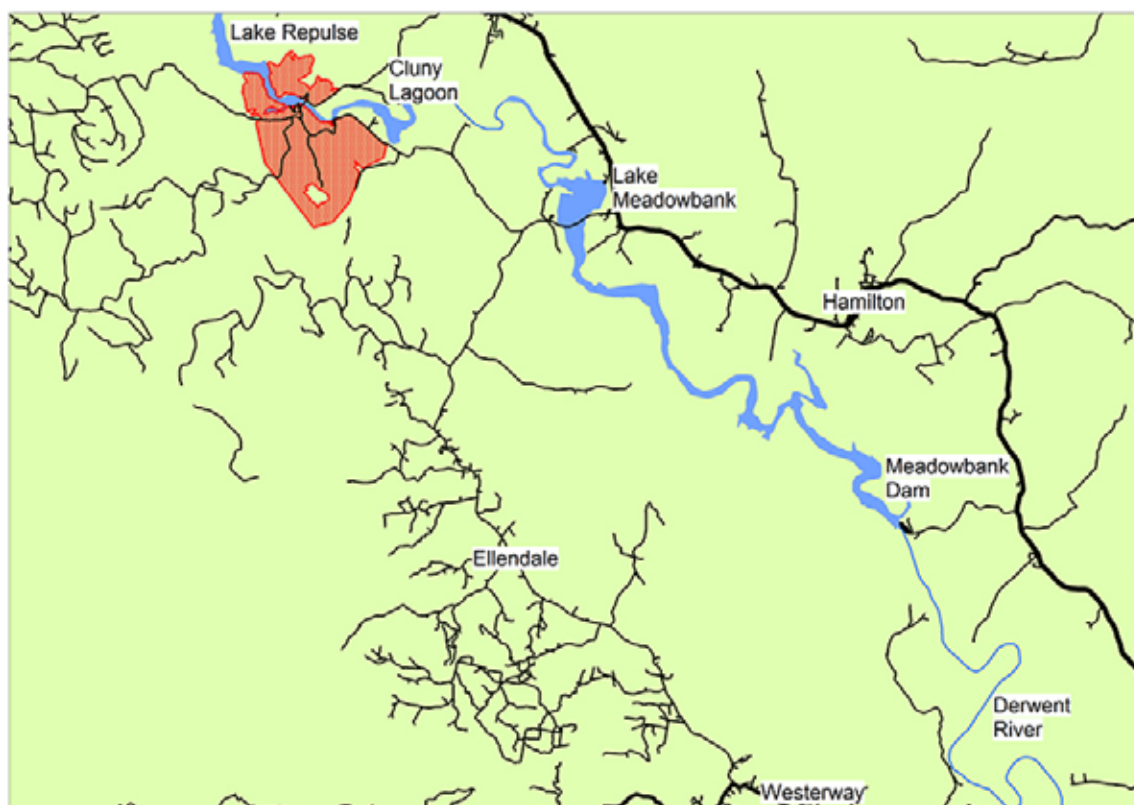


Figure D.10 Lake Repulse Fire at 6.50pm EDST 4 January 2013.

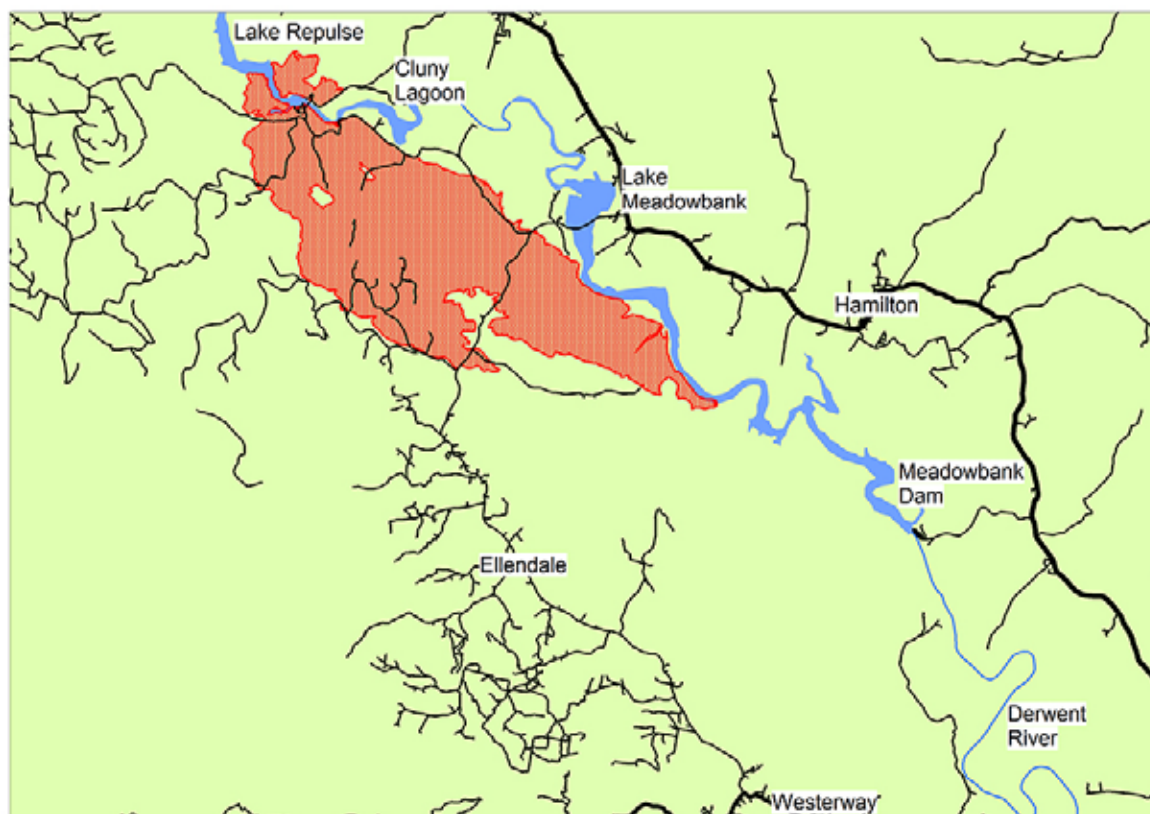


Figure D.11 Lake Repulse Fire at 11.00pm EDST 4 January 2013.

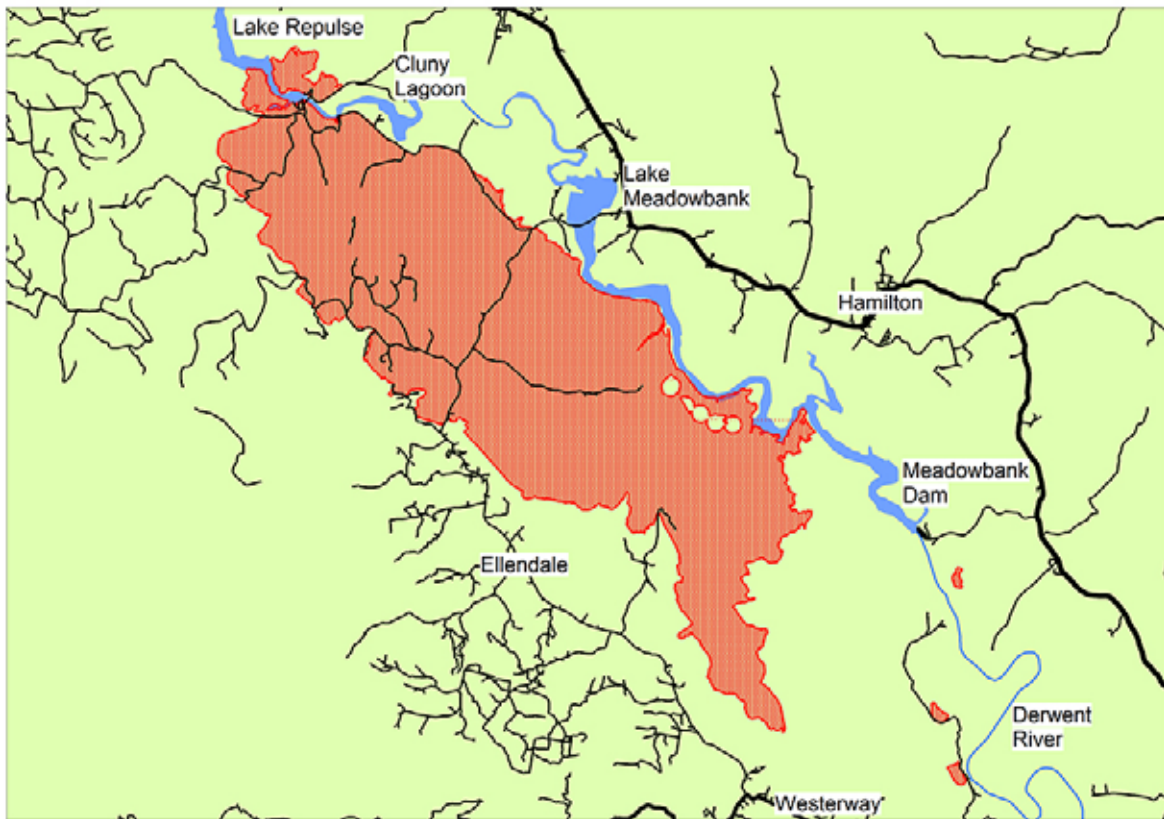
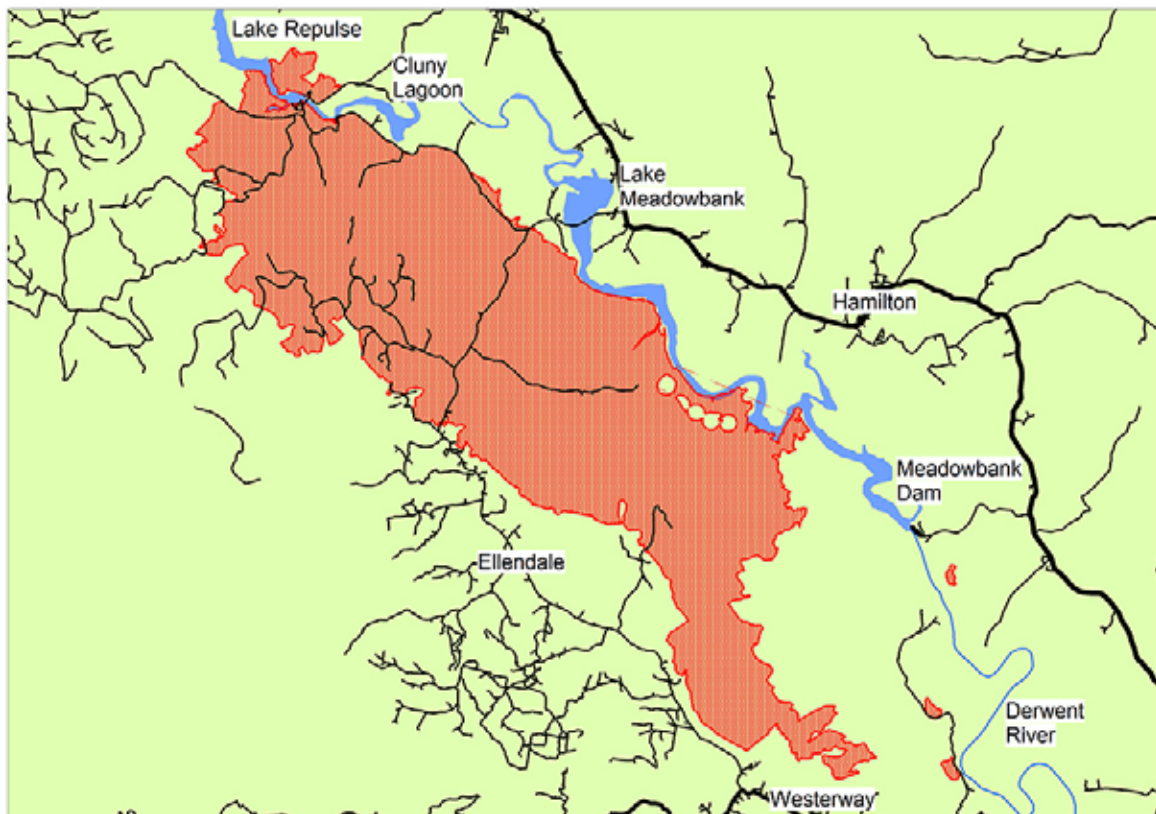


Figure D.12 Lake Repulse Fire at 3.00pm EDST 18 January 2013 (final boundary).



The Forcett Fire

The Forcett fire probably started at about 2.00pm on 3 January from a campfire inside an old burnt out tree stump at a property in White Hills Road, Forcett. The occupants of this property had started a fire in this stump on 28 December 2012, and believed they had extinguished it by smothering it with dirt and pouring water over the top of the dirt. This most likely led to slow combustion taking place in trees roots, and through this process fire reached the surface where free burning took place and winds then carried an ember into nearby grass. Other possible causes of the fire were eliminated, including lightning strikes, which may only have contributed to the rate of spread of the fire. The cause of the fire was classified by investigators as accidental.¹⁵

From this point, the fire spread in a south east direction down a slight slope on a westerly wind as a head fire. Brigade crews arrived at 2.30pm and the fire was estimated to be two hectares in size. Dr Marsden-Smedley comments that it was probable that fire crews could have performed suppression on the northern flank, but would have been unable to suppress the fire's head and southern flank. However by 3.00pm, with the size and intensity of the fire, weather conditions and site access, suppression would not have been feasible with the resources available.¹⁶

At 3.00pm, the FFDI was about 47 and the C-Haines Index was 10.5.

By 3.00pm, the fire was in the vicinity of Gangells Road, about 2.5km from where it started. It was about 2.5ha in size with a perimeter of 0.7km. It moved east and by 4.00pm burnt towards Mother Browns Bonnet. The fire was mapped at 5.35pm; it had travelled 5.9km and was about 506ha in size with a perimeter of 14km. Spotting near Wottenhall Flat had also occurred.

The level of fire behaviour reduced overnight, but it continued to burn southeast in rough country, and the southern and eastern boundary was 12km in length.

A small number of crews remained patrolling the fire overnight.

By 6.45am on 4 January, the fire had increased to about 973ha in size with a perimeter of 19.6km. It was burning slowly in the vicinity of Gangells Road and the southern slopes of Gunns Hill. Smoke and fire made the Arthur Highway dangerous to use and police closed it just before midday.

The fire then began to increase its level of activity. It crossed the Arthur Highway at several locations between Sugarloaf and Blue Hills Roads between 12.00pm and 12.30pm. At 12.30pm, it was about 1 586ha in size with a perimeter of 21.7km.

The fire then spread rapidly in a south easterly direction, mainly as a high intensity crown fire. By 2.30pm, it had increased to 5 819ha in size with a perimeter of 42.8km.

At about 3.00pm, police started to evacuate people from Dunalley to the local hotel and further south to Nubeena.

¹⁵ Tasmania Fire Service Fire Investigation Report, TFS Incident Number 201651.

¹⁶ Tasmanian Wildfires Report 2013, at p. 19.

The fire came on to the Blue Hills on the north east side of Dunalley and reached Dunalley at about 3.25pm. As it impacted on Dunalley there were a large number of embers which caused spot fires throughout the town. This is described by some TFS personnel as a massive ember storm which showered Dunalley and Boomer Bay. Crews defended the hotel where a large number of people were sheltering.

Dr Marsden-Smedley examined this phenomenon of the embers storm. While acknowledging that the exact mechanism driving it is unknown, he indicated that it was probably caused by the collapse of the fire's convection column and a reduction in the height and duration that embers are 'lofted'.¹⁷ A high intensity and fast moving fire would have a high convection column and be lofting embers high into the atmosphere, and when this form of fire reaches a lower-fuel zone, its energy would be reduced, in turn lowering the convection column. This means that the time embers were lofted would decrease, so that they would not carry so far and more would be still alight. An increase in spot fires would be expected.

People and vehicles evacuated from the Dunalley area and moved to Nubeena. Police and fire crews began evacuating people from properties along the highway and at Murdunna.

From Dunalley, the fire continued in a south easterly direction and by 5.30pm it was burning past Murdunna. Murdunna came under ember attack and fire crews defended properties. Multiple properties were reported burning at 6.40pm; at this time, the fire was about 9 623ha in size with a perimeter of 93.6km. There was a minor wind change from north westerly to



Image courtesy of Warren Frey

¹⁷ Tasmanian Wildfires Report 2013, at p. 49.

north north westerly which turned the fire to a south south easterly direction. This wind change, combined with fuel reduction the previous year in dry forest near the town, probably resulted in a lower intensity burn, which explains the lower proportion of houses lost in Murdunna compared to Dunalley.¹⁸

Falling power infrastructure blocked roads and made it difficult for crews to access areas further along the Arthur Highway.

As the fire front was heading down the Tasman Peninsula, between 3.25pm and 8.00pm the southwest flank of the fire spread towards Connellys Marsh and Primrose Sands and impacted on properties on the western side of the Forestier Peninsula.

The fire continued to burn in a south southeast direction along the Tasman Peninsula and by 11.00pm it had reached Eaglehawk Bay. It spotted across the Bay west of Cashes Lookout. At this time, it was about 15 322ha in size with a perimeter of 166.9km.

Some crews protected properties overnight and operations continued the next day.

A south to south west wind change moved across the fire ground between 1.00am and 2.00am on 5 January. This stopped the rapid spread south south east and caused the fire to spread towards the east northeast. At 8.30pm on 5 January, the fire scanned. It was about 19 692ha in size with a perimeter of 246.6km.



Photo courtesy of Oliver Torenus

¹⁸ Tasmanian Wildfires Report 2013, at p. 21.

On 6 January, large scale back burning occurred, mainly in the area north of Forcett. The fire was still burning actively on the Forestier Peninsula north of Hylands Road and back burning was being conducted on the property Bangor. The fire had continued to grow and by 9.00pm, it was 20 981ha in size with a perimeter of 269.1km.

Except for the eastern side of the Forestier Peninsula, the fire was largely contained on 7 January. It continued to burn on the Forestier Peninsula until 18 January progressing towards the east. The Forcett fire was described as contained on 18 January by Dr Marsden-Smedley, but declared to be contained by TFS on 27 January. TFS also declared the fire out on 20 March and the incident as closed.

On 18 January the final area of the fire was about 23 960ha with a perimeter of 309.9km. However TFS describes the ultimate size of the fire as 25 520ha.

Figures D.13 to D.21 show the progress and spread of the fire.

Figure D.13 Forcett -Dunalley Fire at 5.35pm EDST 3 January 2013.

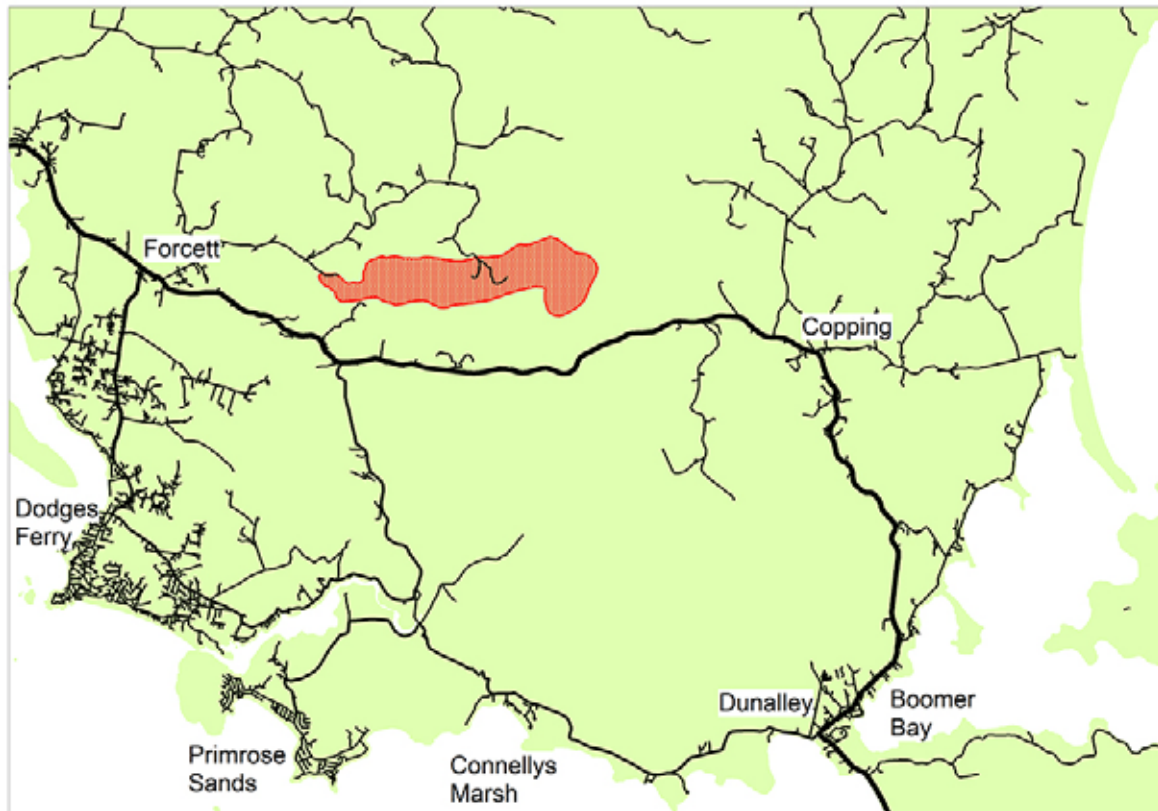


Figure D.14 Forcett -Dunalley Fire at 6.45am EDST 4 January 2013.

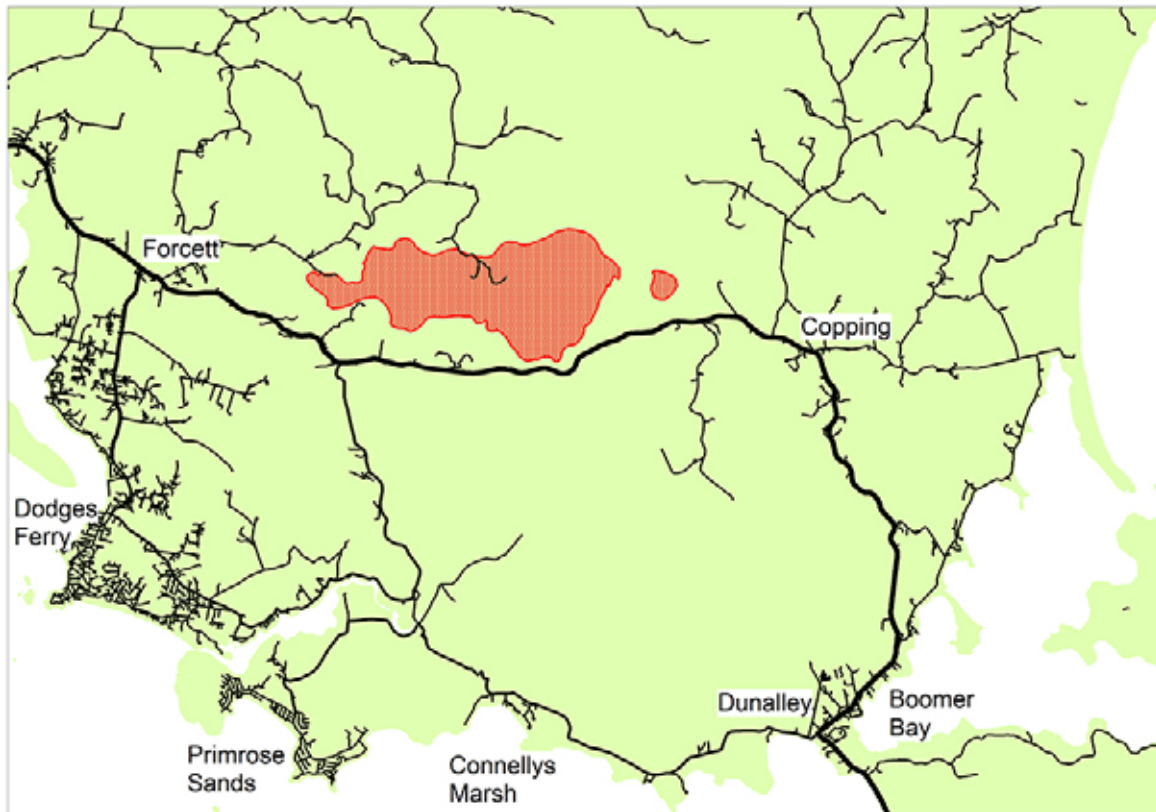


Figure D.15 Forcett -Dunalley Fire at 12.30pm EDST 4 January 2013.

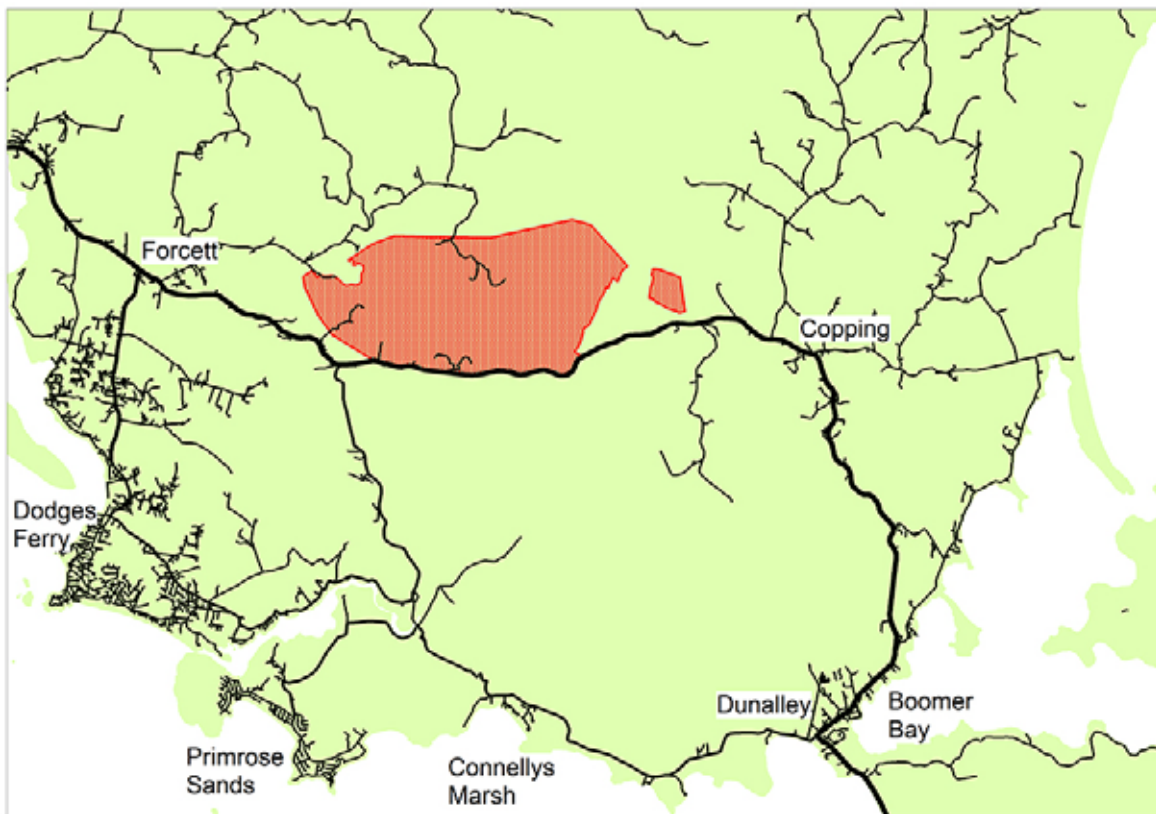


Figure D.16 Forcett -Dunalley Fire at 2.30pm EDST 4 January 2013.

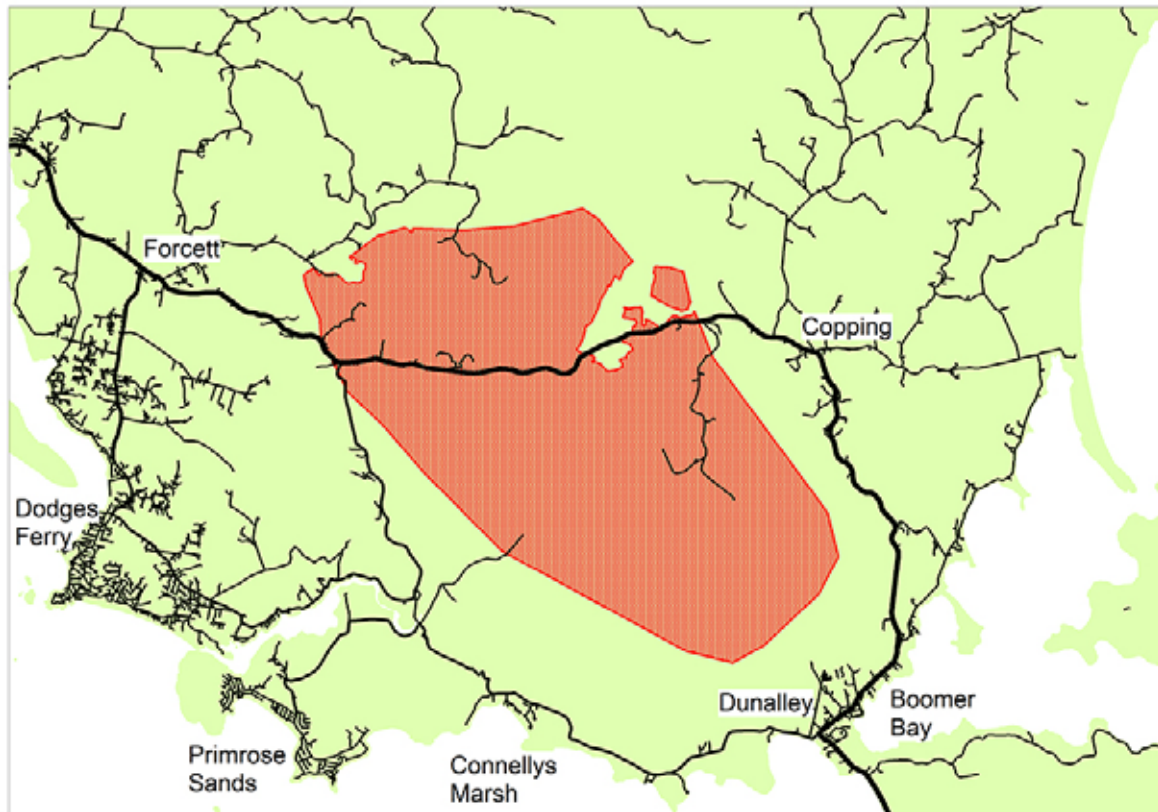


Figure D.17 Forcett -Dunalley Fire at 5.30pm EDST 4 January 2013.

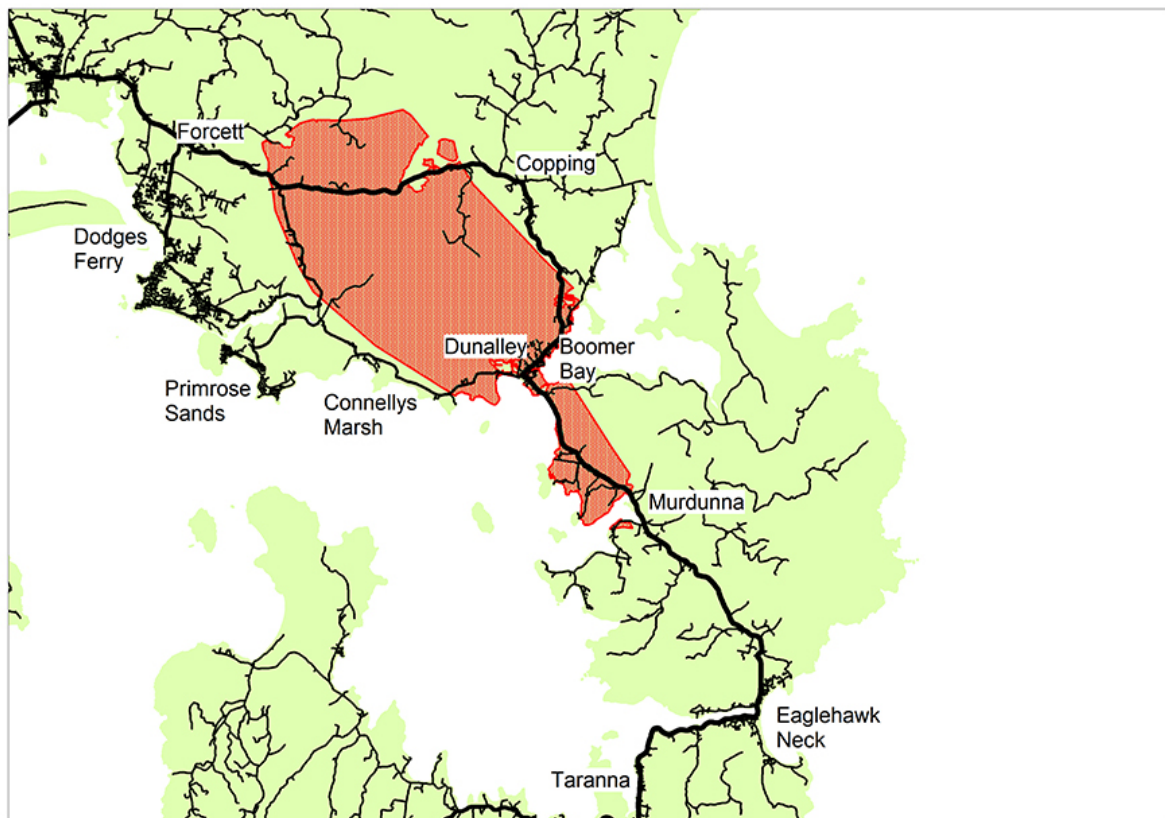


Figure D.18 Forcett -Dunalley Fire at 8.00pm EDST 4 January 2013.

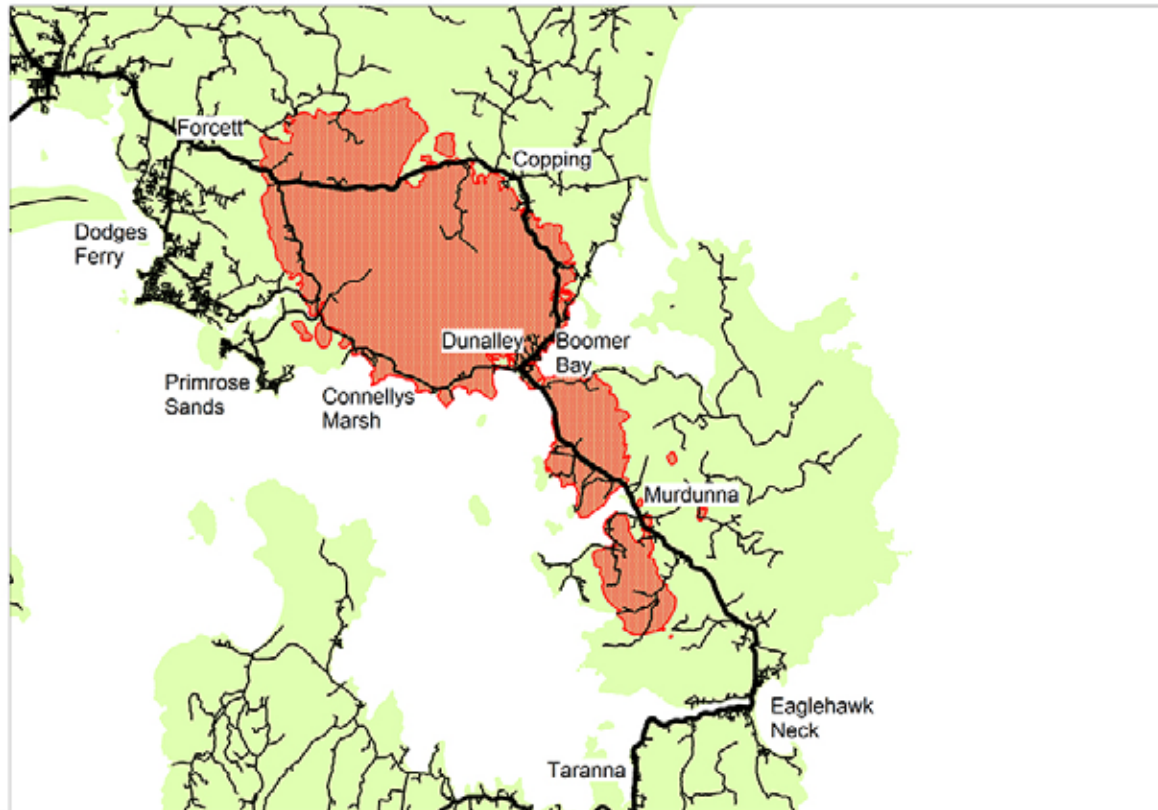


Figure D.19 Forcett -Dunalley Fire at 11.00pm EDST 4 January 2013.

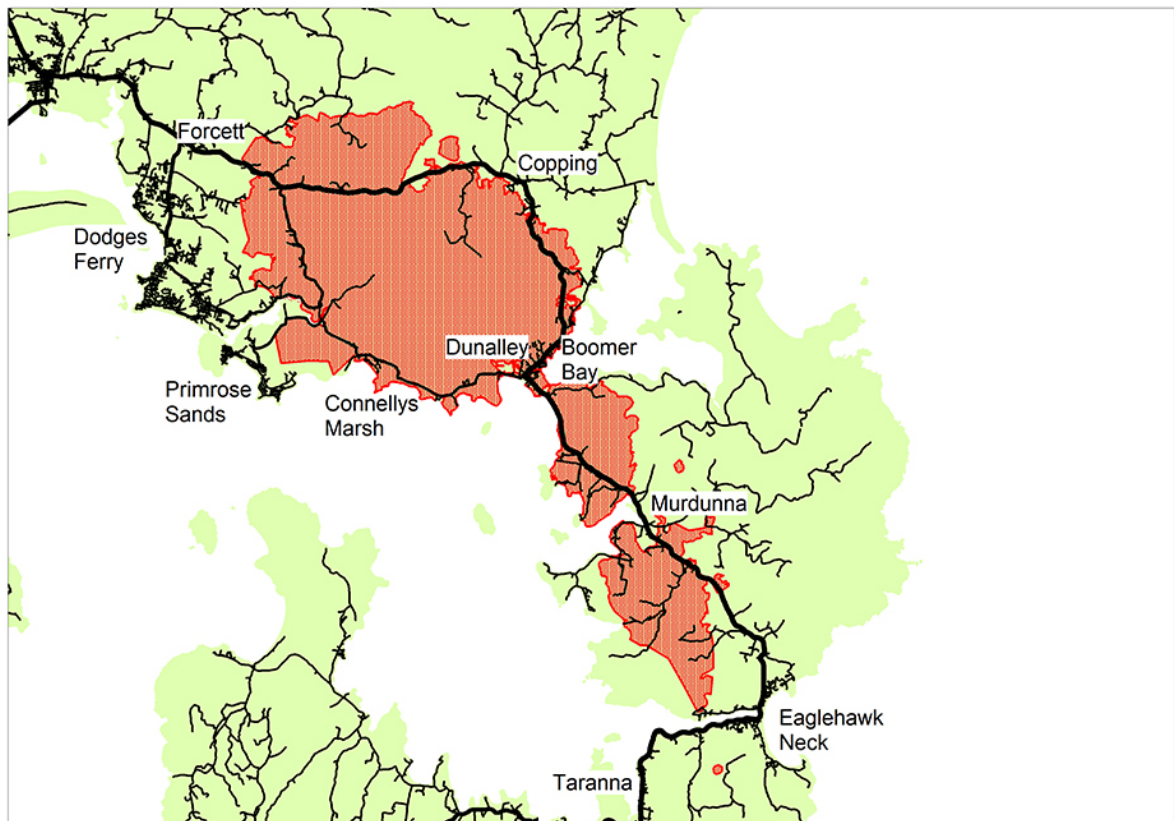


Figure D.20 Forcett -Dunalley Fire at 6.00pm EDST 10 January 2013.

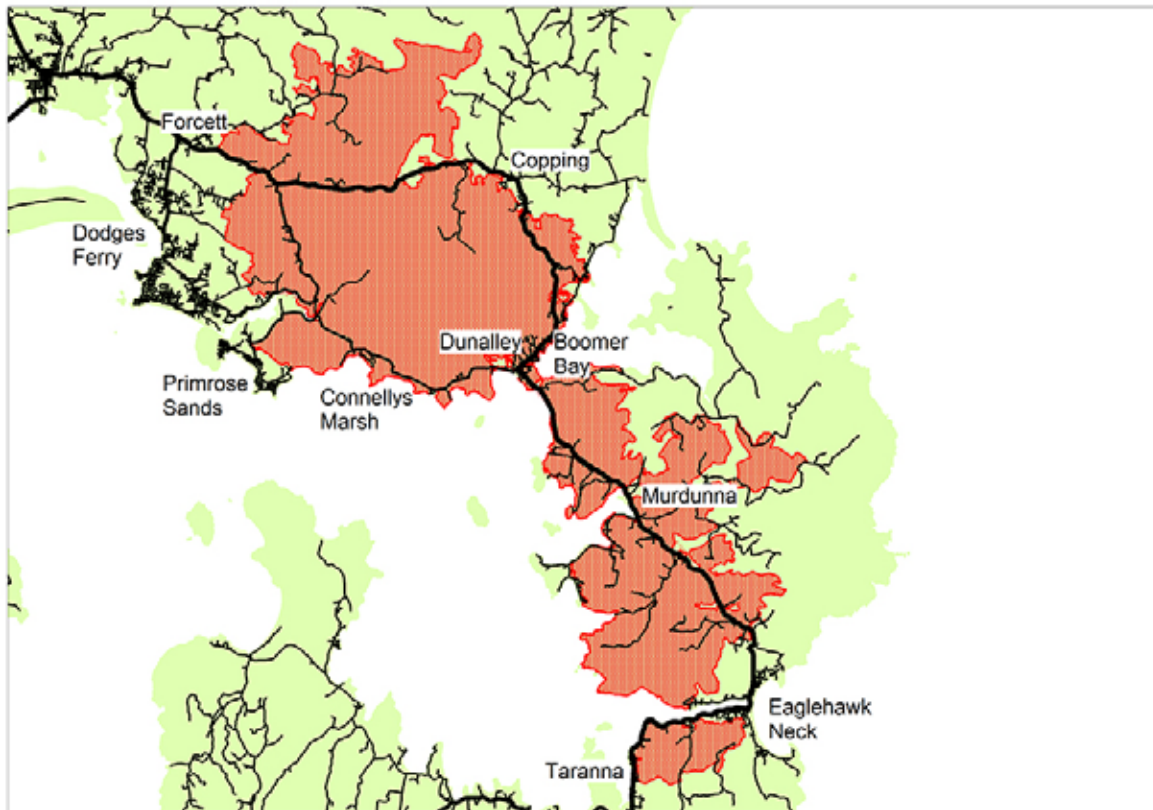


Figure D.21 Forcett -Dunalley Fire at 6.00am EDST 18 January 2013.

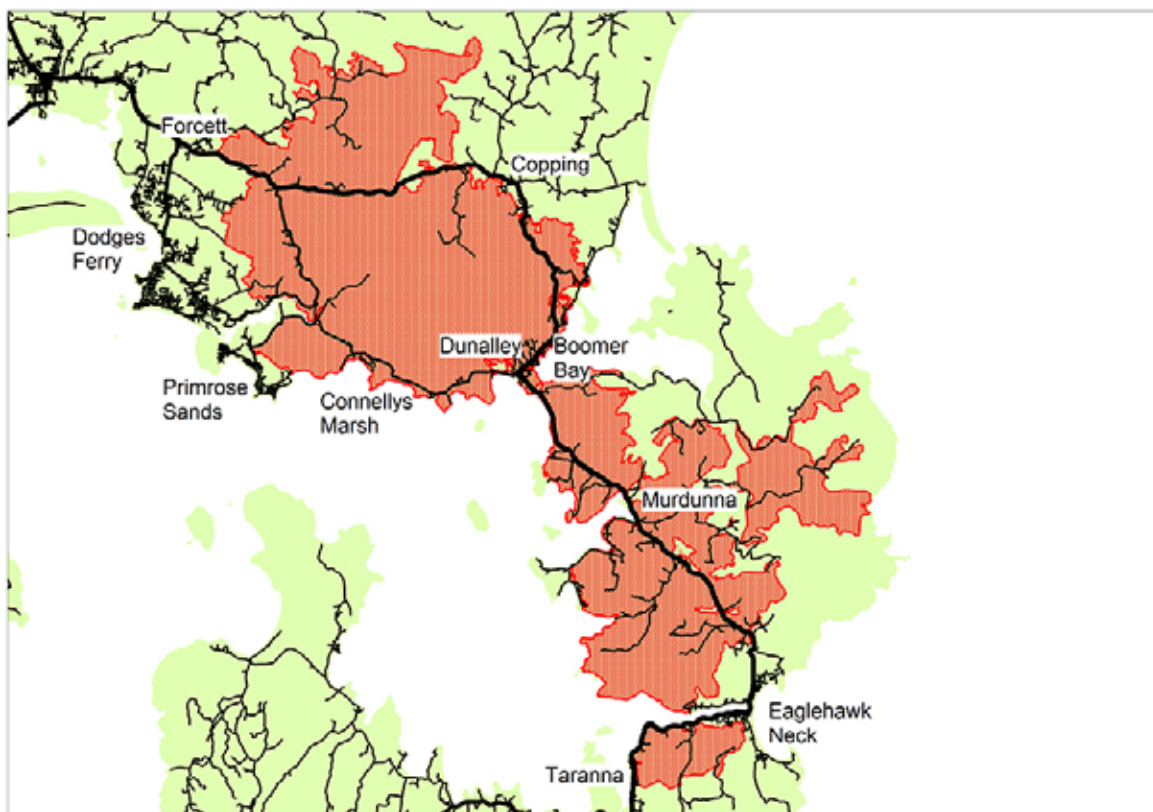




Image courtesy of Bernard Plumptre

The Bicheno Fire

On the evening of 3 January 2013, a large storm cell passed over the Bicheno area. A number of lightning strikes caused fires to start in several locations. Fires started shortly after 8.00pm at Lilla Villa, Butlers Point and Freshwater Lagoon. Other possible causes of the fires have been eliminated and the TFS investigation concluded that the lightning was the probable cause of the ignition of the Lilla Villa fire, hereafter referred to as the Bicheno fire.¹⁹

The Freshwater Lagoon fire was successfully extinguished and the Butlers Point fire was also said to be extinguished. In any event, it was later over-run by the Bicheno fire.

The Bicheno fire initially could not be located by fire crews. Once access was gained to the fire, crews initiated operations and used the landowner's bulldozer to cut a break around the fire. This helped fire crews gain access to the fire to extinguish and black it out. A large tree on the fire's perimeter caused some concerns. Several attempts were made to push the tree over with the bulldozer, but it remained standing.

Fire crews remained on the scene overnight and into 4 January to ensure the fire did not spot over into unburnt fuel. As the weather conditions deteriorated, the tree continued to cause concerns. A number of spot fires were quickly contained by fire crews on the scene.

Eventually the tree was pushed over by the landowner's excavator and the two crews in attendance started to blackout the tree. At around 3.00pm, both fire crews ran out of water simultaneously. As they were refilling their vehicles, the fire spotted over, and was well established by the time the crews had refilled.

The crews at the Butlers Point fire were warned along with the residents at Courland Bay. Police and fire crews immediately started to 'evacuate' these areas. Weather conditions made firefighting impossible. Approximately 1 000 campers and tourists were evacuated from the Isaac Point and Friendly Beach area by Parks and Wildlife Service.

¹⁹ Tasmania Fire Service Fire Investigation Report, TFS Incident Number 201693.

The fire spread rapidly towards the southeast, mainly as a crown fire, and reached Courland Bay at about 5.30pm and Butlers Point by 6.00pm. Properties were destroyed at Courland Bay and fire officers reported flame heights of up to 100 metres at the beach.

At 6.00pm, the fire was about 732ha in size with a perimeter of 15.3km. It continued to spread in a southerly direction and was scanned at 10.00pm, indicating it was about 2112ha in size with a perimeter of 29.0km.

By midnight, the fire burnt up to an area at Isaac Point, which had been the subject of a planned fuel reduction burn in March 2011. It was then 2 746ha in size with a perimeter of 29.5km.

Through 5 January, the fire spread to the west, crossing the control lines on Coles Bay Road between 1.00pm and 2.00pm. It threatened properties at Llandaff. Back burning operations were being conducted on the northern and north eastern sides to bring the boundaries out to safe edges.

Control line construction and back burning operations secured the northern fire line near Harveys Farm Road.

The fire continued to burn over the next few days and back burning operations continued to secure the boundaries. It was reported as contained on 9 January and TFS handed the fire back to local control on 11 January, with the incident closed on 22 January.

Figures D.22 to D.26 show the progress and spread of the fire.

Figure D.22 Bicheno Fire at 3.15pm EDST 4 January 2013.

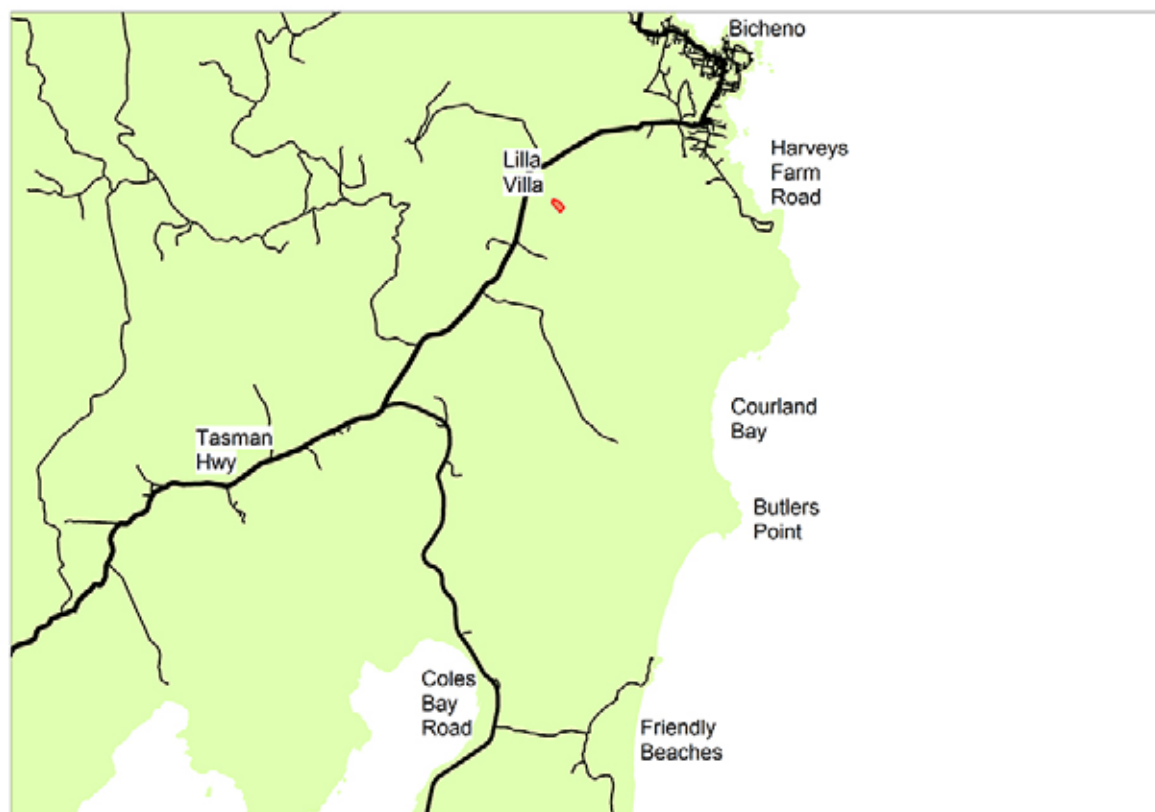


Figure D.23 Bicheno Fire at 6.00pm EDST 4 January 2013.

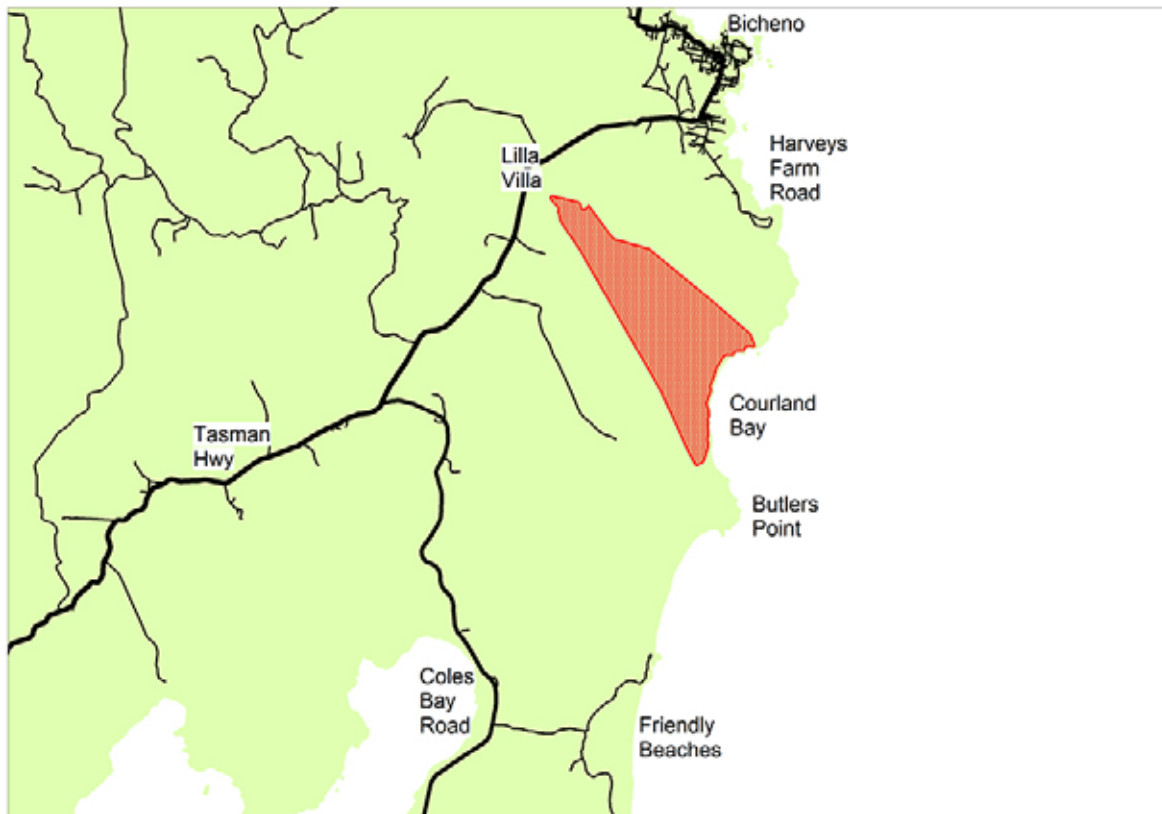


Figure D.24 Bicheno Fire at midnight EDST 5 January 2013.

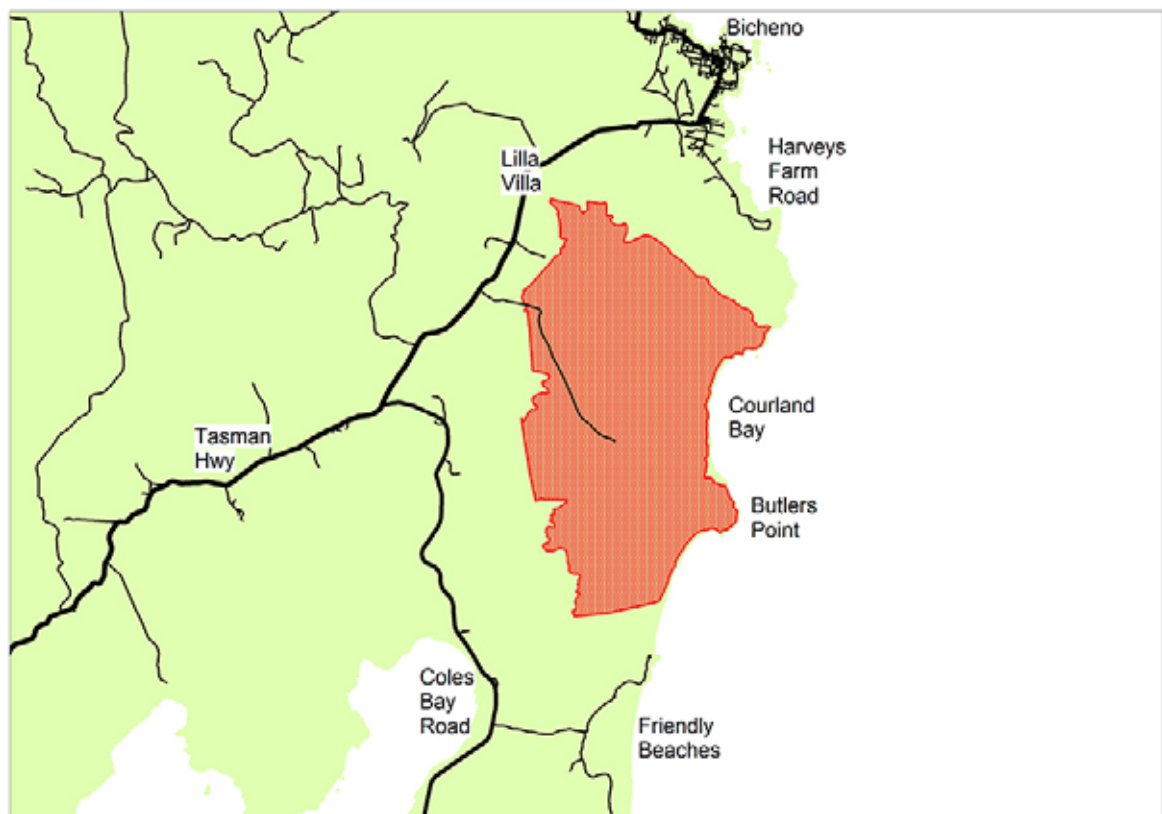


Figure D.25 Bicheno Fire at 7.00pm EDST 5 January 2013.

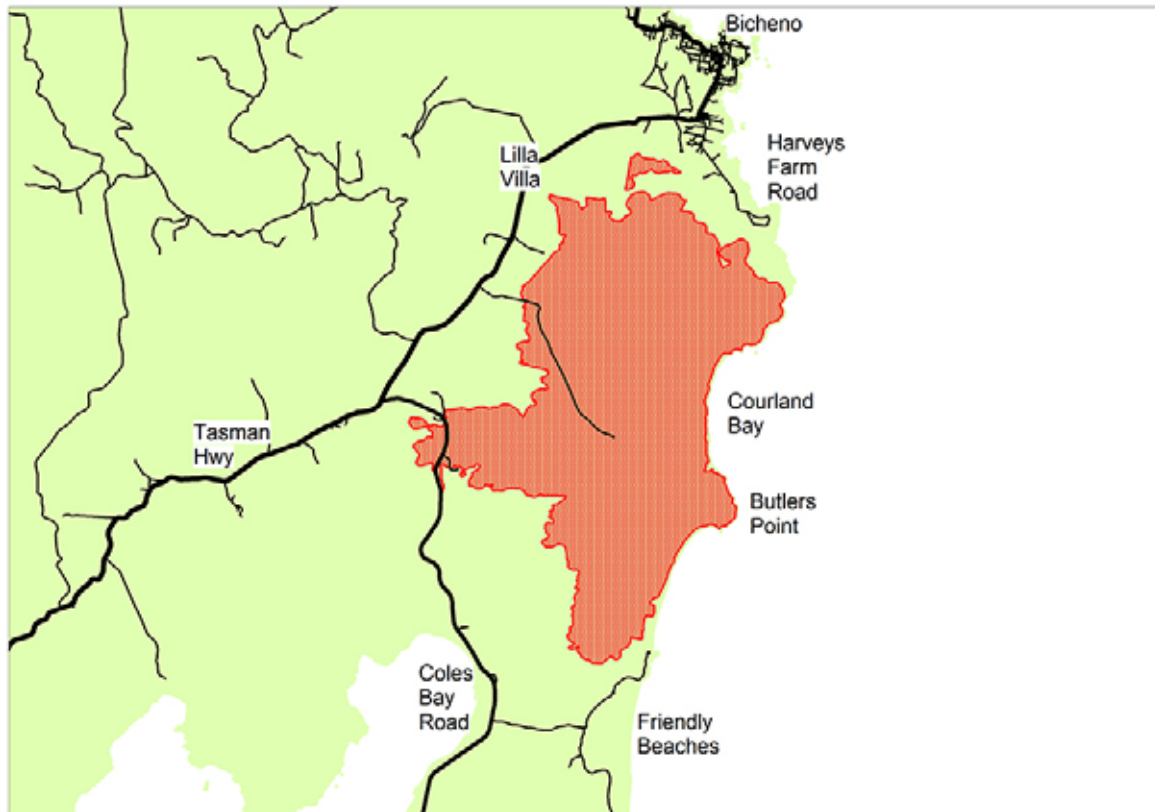
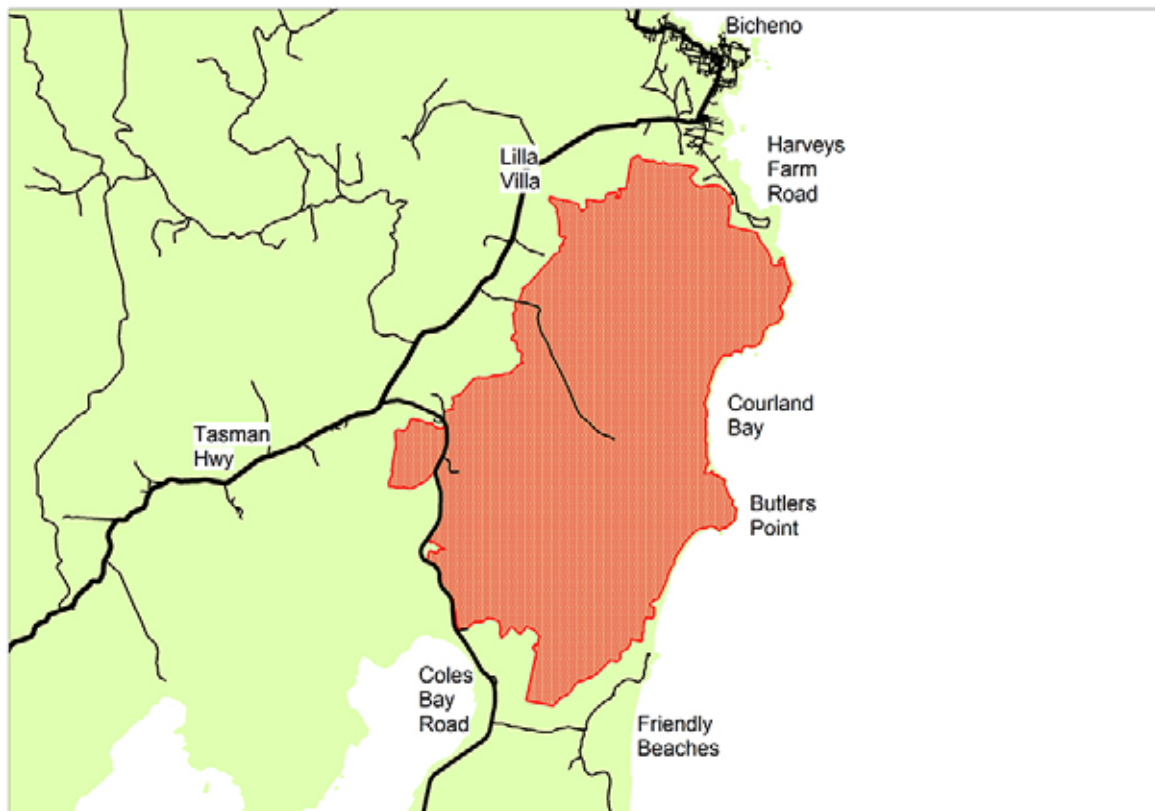


Figure D.26 Bicheno Fire at 11.00am EDST 9 January 2013 (final boundary).



Damage Caused by the Fires

No person was killed in the fires, but the physical, economic, social, psychological and environmental damage was substantial.

Unfortunately, a firefighter from Victoria died of natural causes during fire operations for the Forcett fire.

Much of the damage is not quantifiable and there is presently no aggregation of the financial cost available. Some of the personal costs may not be capable of being financially quantifiable.

Overall structural damage consisted of:

- 431 properties were damaged or destroyed
- of these properties, 203 residential buildings were destroyed
- 301 properties required the removal of a destroyed vehicle, outbuilding or house.

An outline of the damage caused by the fires is provided in the Tasmanian Bushfire Recovery Taskforce Interim Report. This report lists the damage that was assessable in February 2013, including:

- the Forcett fire caused the most damage in the Tasman and Forestier Peninsulas, burning through bushland, primary production and agricultural areas, and in the Dunalley, Boomer Bay, Murdunna, Eaglehawk Neck, Taranna, Copping and Connellys Marsh communities; 193 dwellings, significant infrastructure, such as the school and



Image courtesy of Warren Frey

police station in Dunalley, and 186 other buildings destroyed or seriously damaged

- the Bicheno fire burnt bushland and parks reserve; 10 dwellings and nine outbuildings were destroyed or seriously damaged
- the Lake Repulse fire burnt bushland, primary production and agricultural areas; four farm buildings and two caravans were destroyed
- stock and fencing losses and damage were significant in the primary production and agricultural areas
- there were negative economic effects for many businesses, including in tourism, livestock farming, wine, fruit and seafood industries.

The Tasmanian Farmers and Graziers Association estimated that approximately 662kms of commercial fencing and 10 000 head of livestock, mainly sheep, were lost.

Shortly after the fires in January, the Insurance Council of Australia reported that 410 claims had been received from policy holders and losses were estimated at \$42M. Since then, the number of claims has increased to 1797 and losses valued at \$80M. A breakdown of the claims is:

- average claim payout \$420 000
- 524 domestic property claims
- 862 contents claims
- 106 domestic motor claims
- 245 commercial claims
- 29 business interruption claims
- 31 other claims.

An estimate of the overall financial cost would be in the order of \$100M.

This estimate does not include the cost of emergency response and recovery operations or the myriad of consequential costs across the public and private sectors. Conservatively this would substantially increase the estimated cost, but it is currently not possible to provide a reasonable assessment.

A Comparison of the Weather Conditions with Other Significant Fires

In its submission to the Inquiry, the Bureau has provided a comparison of the weather for the fires being inquired in to with other significant fire events in 2006 and 1967.²⁰

Extreme or Catastrophic FFDR are rare but not unprecedented in Tasmania. A study by the Bureau of weather observations between 1997 and 2009 found that of 62 397 observations, only 18 reached the extreme range and only 8 reached the catastrophic range.

It is concluded that 4 January 2013 was one of the most significant fire days in Tasmania since 1997, and was second only to 12 October 2006 in severity, when the FFDI in Hobart remained above 100 for at least 90 minutes in the morning and again during the afternoon.

²⁰ Submission No 56, at p. 48.

The most damaging fires in Tasmania occurred on 7 February 1967, and the weather leading up to and on this day had both similarities and differences with 4 January 2013. Ground moisture was similar following a wet spring and during a hot summer. Leading up to these dates, antecedent temperatures 'differed markedly' as they were cooler than usual in the 12 months before the 1967 fires, but warmer than usual before the 2013 fires.

The day before the fires varied 'strikingly'. 6 February 1967 was a benign day, whereas on 3 January 2013, Severe fire danger ratings occurred.

On the days of the fires, there were also similarities and difference:

- on 7 February 1967, a Catastrophic rating occurred at about 3.00pm for around an hour, reaching an FFDI of 128 before a change occurred, which eased conditions. On 4 January 2013, the peak was an FFDI of 112 for about an hour; however, the Severe FFDIs occurred for much longer, starting before midday and continuing to near 7.00pm
- peak winds were stronger in 1967, but persisted for longer in 2013
- temperatures were higher in 2013, reaching 41.8 degrees in Hobart compared to 39.3 in 1967
- the change of weather was delayed in 2013 compared to 1967, allowing temperatures to be higher and Severe fire danger ratings to continue longer.



Image courtesy of Bernard Plumpton

The Use of Predictive Modelling

In the evening on 3 January, the Phoenix-Rapidfire system was used to forecast the behaviour of the Forcett fire on 4 January. These systems use data on weather and vegetation to simulate fire behaviour and provide an output which can be used to assist decision making in response operations, such as determining tactics, allocating resources and providing community information and warnings.

A Phoenix-Rapidfire simulation of the Forcett fire predicted it would run south east reaching Dunalley at 3.00pm on 4 January. The fire actually reached Dunalley following this path at 3.25pm on 4 January. However, westerly flanking fires were not predicted in the way they occurred. A comparison can be made by examining Figures D.27 and D.28.

Figure D.27 Phoenix - Rapidfire Prediction for 3.00pm 4 January 2013.

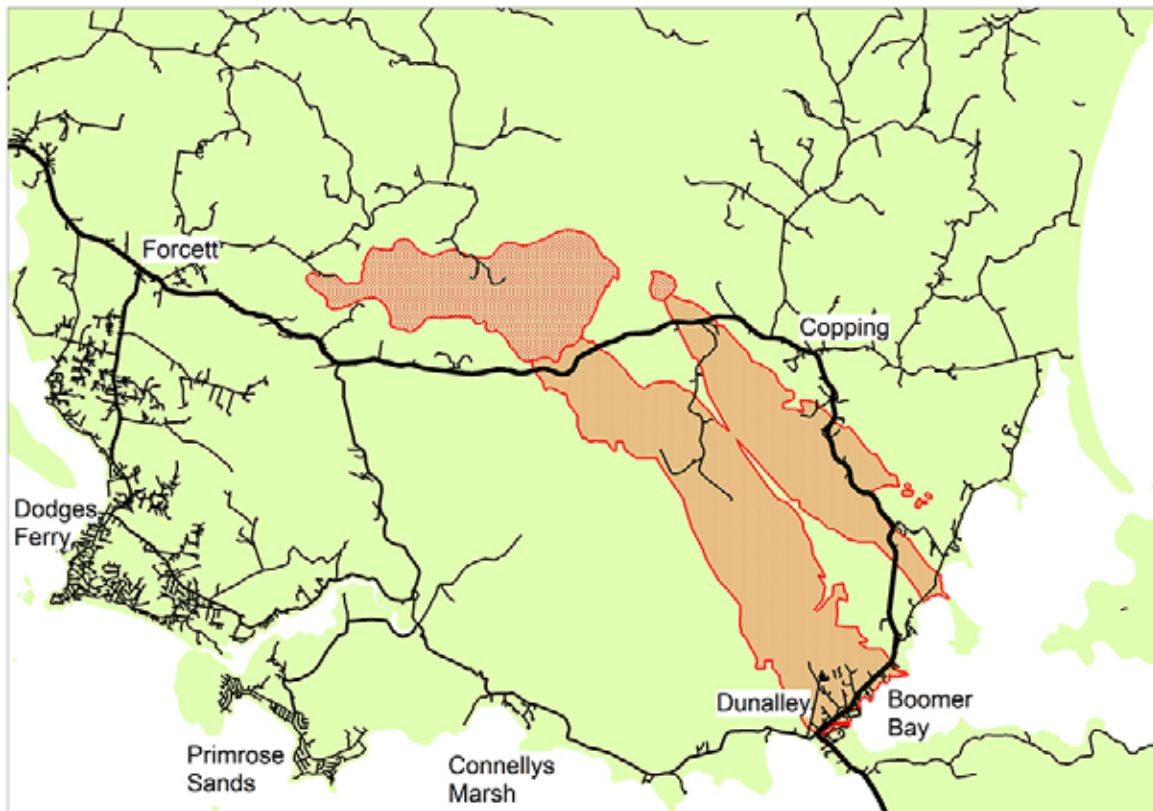
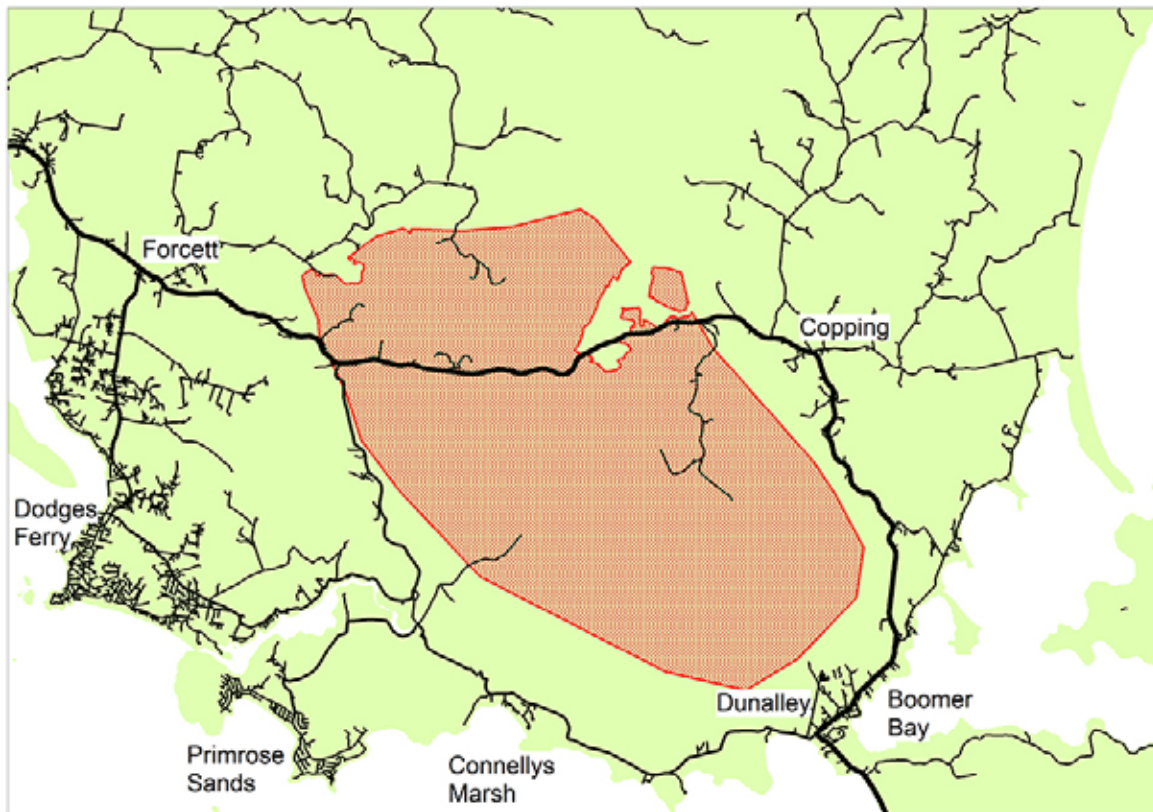


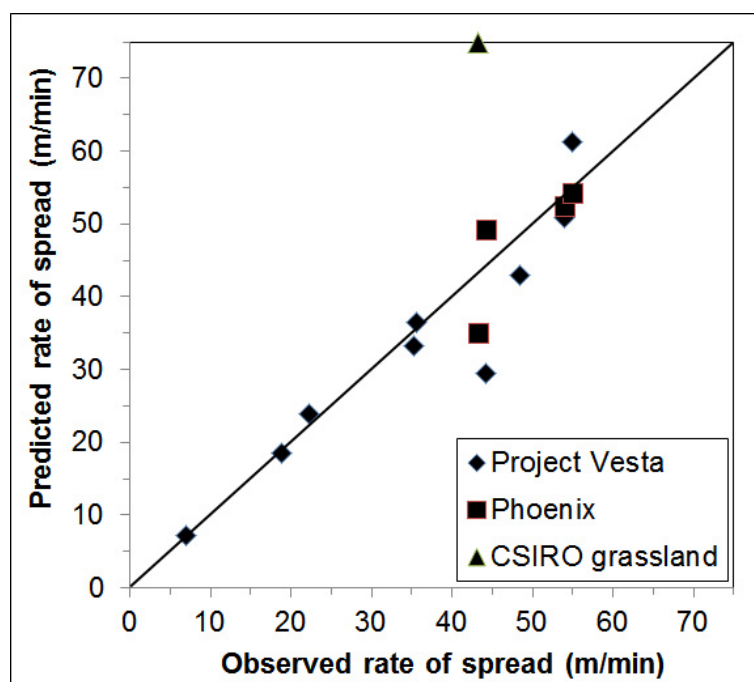
Figure D.28 Actual fire location for 3.00pm 4 January 2013.



An obvious question, and what determines their use, is: how reliable are the models?

Dr Marsden-Smedley has compared the fires on 3–4 January and some other fires, using a Project Vesta and the Phoenix-Rapidfire models. The overall correlation is shown at Figure D.29.

Figure D.29 Observed versus predicted head fire rate of spread.



For eight of the nine fires predicted using the Project Vesta model, there was a very close fit.

There was a large divergence for the Lake Repulse fire, which he explains as possibly being due to the night-time atmospheric de-coupling of wind speed at the Bushy Park and Ouse weather sites. Overall:

- the Project Vesta model slightly under-predicted head fire spread rate
- the Phoenix-Rapidfire model provided good head fire spread rate predictions, with slight over-predictions
- the Phoenix-Rapidfire model greatly under-predicted flank fire spread rates.²¹

Dr Marsden-Smedley told the Inquiry that there were two approaches to predictive modelling: one using the available models and another relying more on the expertise of an analyst who interprets the data and produces a map. Expertise for the latter process is more limited and, though there is still skill required, the use of models is an acceptable process. However, models are dependent on the quality of the assumptions made and data used in them, so expertise is still an important component.

Dr Marsden-Smedley also said that the Phoenix-Rapidfire model does not use local weather, but relies instead on Bureau forecasts.

Further, the models do not take into account atmospheric stability, as represented by the C-Haines Index. Dr Marsden-Smedley argues that the:

*main advantage of incorporating measures of atmospheric stability when predicting fire behaviour is that it overcomes a major shortcoming in all the fire behaviour prediction models currently utilised These models only incorporate the influences of weather, fuel and topography at the ground surface This means that it is not possible at the current time to make quantitative predictions of the increase in rate of fire spread and intensity expected when the atmosphere is unstable.*²²

Current models are likely to over or under predict fire behaviour in highly stable or unstable atmospheric conditions. In unstable conditions there will be higher rates of fire spread, intensity and a larger number of spot fires and spot fire distance.

Fire prediction models, such as Project Vesta and Phoenix-Rapidfire and the Forest Fire Danger Rating, could be used with the C-Haines Index to estimate the likelihood of realising the potential spread rate.²³

Concerns about the reliability and variability of the models are apparently reducing, and they have become more accepted over the past five years. The significance of a risk is a combination of the consequence and the probability of the risk occurring. In this sense it seems to the Inquiry that a simulation indicating a serious consequence ought to be acted upon, though there may be some doubt on the probability of it occurring.

21 Tasmanian Wildfires Report 2013, at pp. 50–52.

22 Tasmanian Wildfires Report 2013, at p. 11.

23 Bushfire Cooperative Research Centre Fire Note, Issue 109, May 2013

How TFS acted upon the information from the Phoenix-Rapidfire simulation that it received on 3 January was a matter of importance to the community, and was examined by the Inquiry.

Research continues in this field — the Bushfire and Natural Hazards Cooperative Research Centre is currently conducting a project on The Fire Impact and Risk Evaluation Decision Support Tool (FireDST)²⁴ — and it should be supported as having real potential to assist in fire management.

There is already a recommendation in this part covering the use of simulation models.

Fuel Reduction and Fire Behaviour

High intensity fires reached recently-burnt areas in each of the fires examined, and the head fire's spread rate, intensity and spotting was stopped or greatly reduced in each case.²⁵ This is a highly relevant outcome for the issue of fuel reduction in preventing or minimising the risk of bushfire (covered in PART I of this Report).

This has been described in this part, and further detail is provided in Dr Marsden-Smedley's report.

The Ability to Suppress the Fires

Dr Marsden-Smedley provides an indication of the ability to successfully suppress the fires through the initial fire attack. In his opinion, a combination of extreme levels of fire danger and atmospheric instability would have made the fires harder to control than normal and the likelihood of successful suppression action lower.²⁶

In the Forcett fire, when crews arrived at 2.30pm the fire was about 2.5ha in size with a perimeter of 0.7km. Taking into account the weather conditions, including a C-Haines Index of 9.6, and poor access, a successful initial attack would require 6 to 10 tankers (at least 4 heavy tankers), 20 to 50 fire crew members on hand tools and at least 4 medium helicopters.

With the Lake Repulse fire, fire crews arrived 28 minutes after the fire was reported when it was about 8.5ha in size with a perimeter of 1.2km. Taking into account the weather conditions, including a C-Haines Index of 6.7, a realistic requirement for a successful initial attack was 6 tankers (at least 2 heavy tankers) and aerial support from at least 2 helicopters.

The Inquiry is not able to determine whether Dr Marsden-Smedley's opinions on this issue are sound.

24 Bushfire Cooperative Research Centre Fire Note, Issue 109, May 2013

25 Tasmanian Wildfires Report 2013, at p. 53.

26 Tasmanian Wildfires Report 2013, at pp. 53 and 54.