Severe Bushfire Attack Simulation - Daylesford – Hepburn Springs township

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Application of the BAR** technique The BAR technique applies to a worst case bushfire, similar to Black Saturday – >40^{0}C, RH < 10%, >40 kph winds (at 10 m in the open) from N, NW, W or SW.

The 2006 Census found Daylesford–Hepburn Springs township complex had a resident population of 3600. There were 2600 private dwellings, of which1660 were occupied dwellings. The study area as shown on Figure 1 has approx 1400 houses.

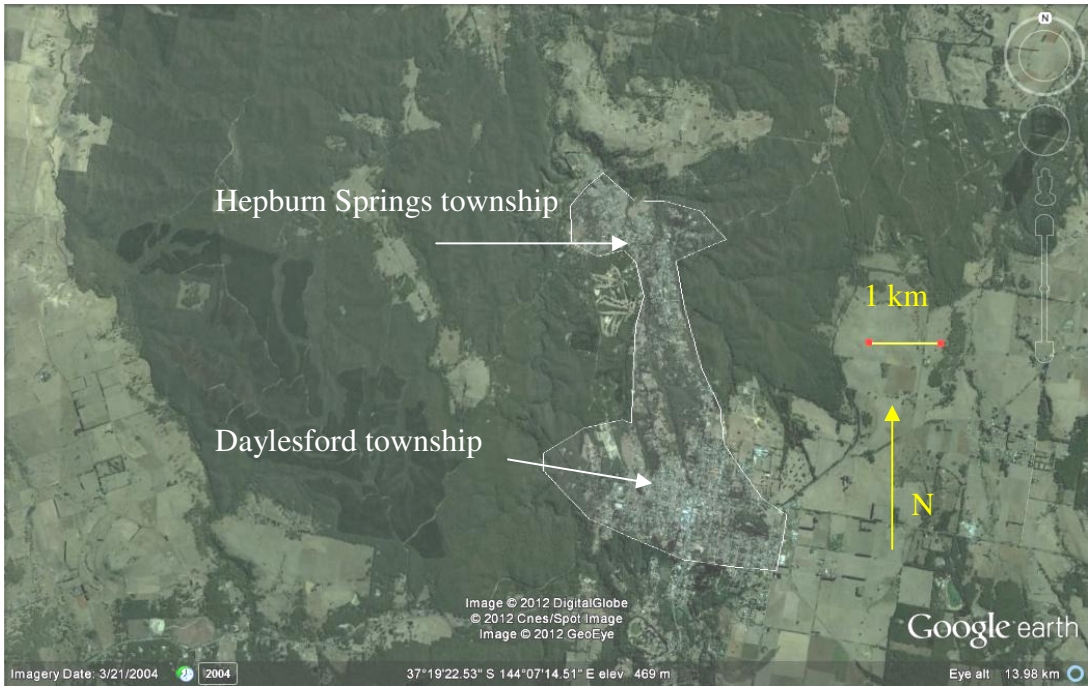

Figure 1 Area of interest is outlined in white - Daylesford and Hepburn Springs

Stage 1 Where moving flame stops, source of embers Maps

The western boundary of the area under examination is some 5 km long. Apart from the golf course and the industrial area, it has no other barriers to the moving flame (see Fig 2). It is therefore almost fully exposed to a severe bushfire attack from the NW and W directions.

Where will the moving flame stop?

The blue lines in Fig 2 and 3 show where a severe moving flame is expected to stop. This analysis considers that the flame will stop at or within 50m of the western / northern edge of a dense residential area and industrial area, and along most of the length of the Daylesford – Hepburn Springs Road, simply because those areas are densely residential or commercial.

Where are the discontinuous fuel bed areas?

See green shaded areas on Figures 2 and 3.

Where are the ember launching ramps?

Figures 2 and 3 show the location of the ember launching ramps that will generate most ember rain onto the township complex.

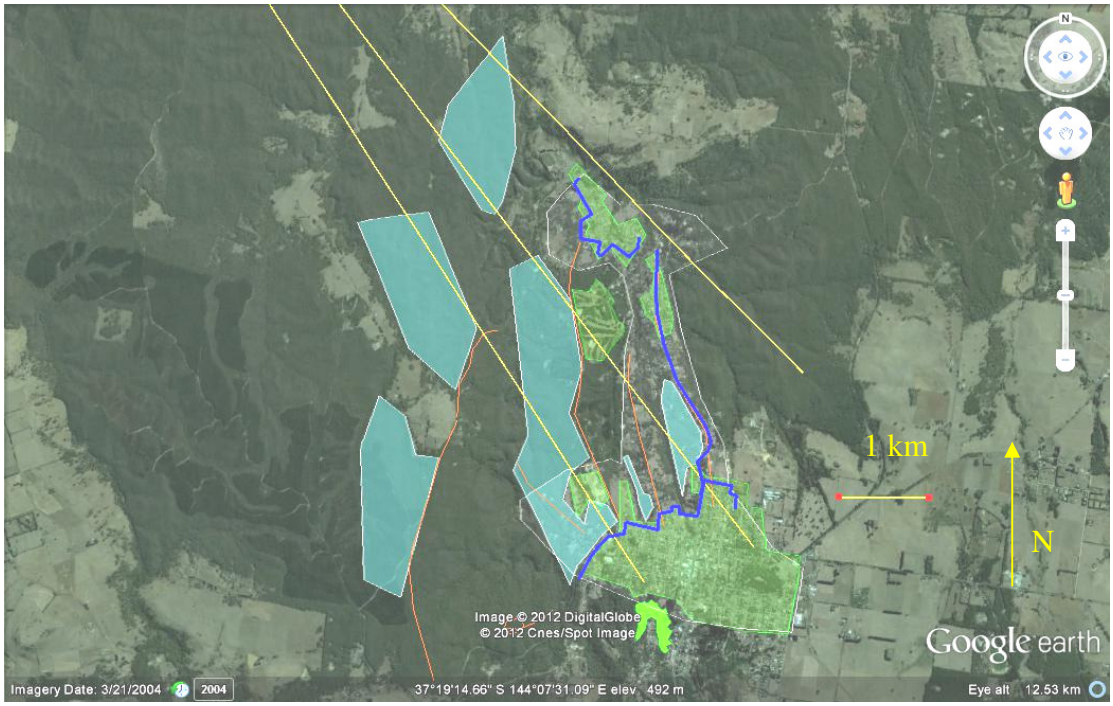

Figure 2 Shaded blue areas are the ember launching ramps. The green shading indicates defacto barriers to the moving flame, includes industrial area, golf course and higher density residential areas. Dark blue lines indicate where moving flame is expected to stop by default. Yellow lines indicate direction of danger winds.

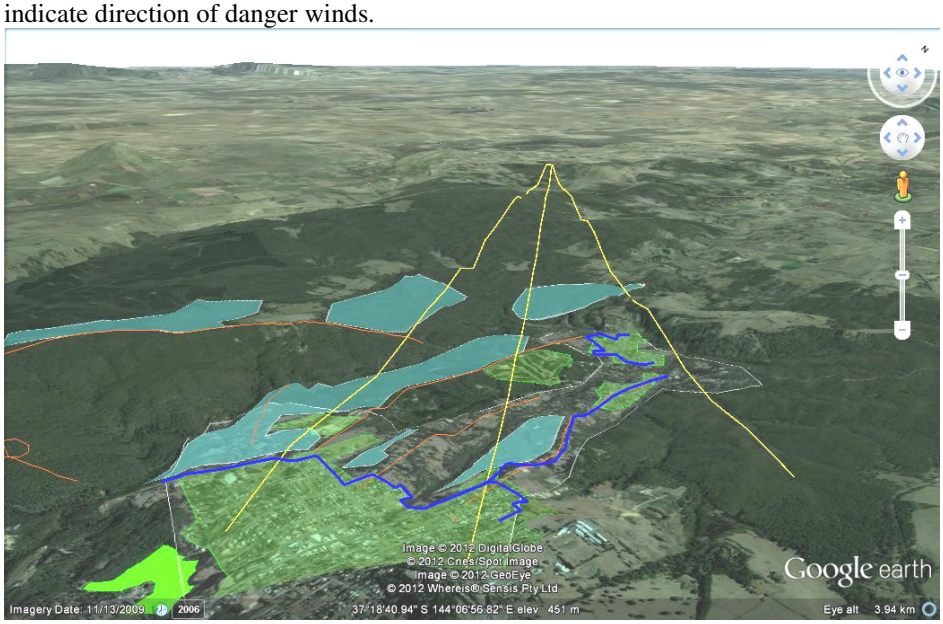

Figure 3 Oblique view of Figure 2, showing fire scenario origin several kilometres to the NW.

Stage 2 Types of bushfire attack Maps

Where are the moving flame areas?

Moving flame areas occur near the township area shaded as red on Fig 4 and 5. The highest risk area is the red area where the running bushfire attacks with two most damaging assault weapons, the moving flame and heavy short distance ember attack. Classified as MFHEA - moving flame, heavy ember attack.

Where are the stationary flame areas?

Stationary flame areas are shown on Fig 4 and 5, shaded as blue and brown.

What is ember attack intensity within stationary flame areas?

Where a fuel free barrier stops the moving flame, heavy ember attack is deemed to occur within 100m (blue shaded on Figs 4 and 5 = SFHEA). Beyond 100m, ember attack is light to moderate (brown shaded on Figs 4 and 5 = SFMEA).

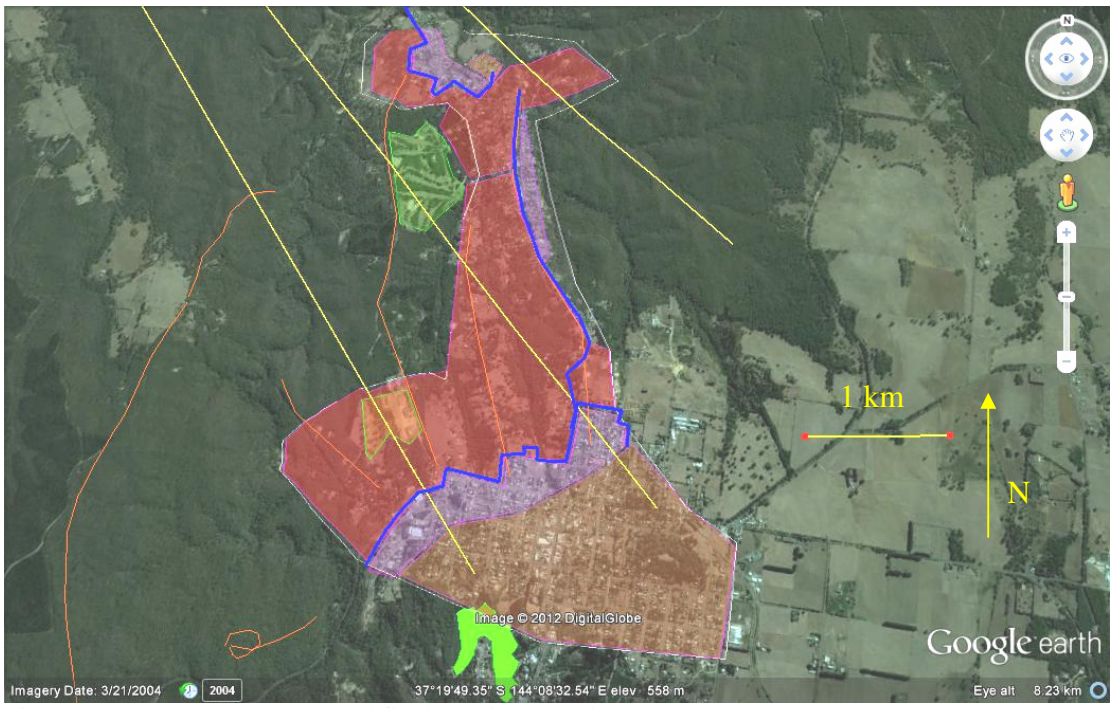

Figure 4 Exposure to bushfire behaviour attack types
Red shaded area = MFHEA, moving flame, heavy ember attack
Blue shaded = SFHEA, stationary flame, heavy ember attack
Brown shaded = SFMEA, stationary flame, moderate to light ember attack

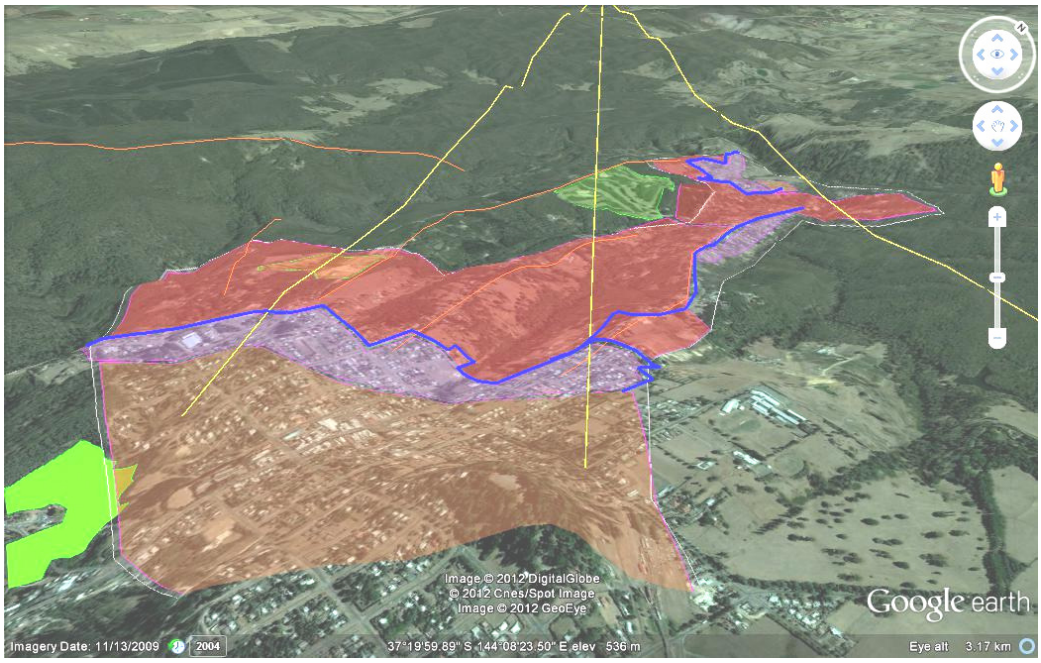

Figure 5 Shows Fig 4 in oblique view, looking toward the NW
Dark blue lines indicate where moving flame stops by default. Yellow lines indicate direction of danger winds. Red shading = MFHEA, blue shading = SFHEA, brown shading = SFMEA.

Stage 3 Assess potential damage [House exposure, house loss rate]

How many houses occur in each fire behaviour category area?
MFHEA (red) is the highest risk area Houses exposed to unimpeded moving flame and heavy ember attack = 240 - 260
SFHEA (blue) Houses exposed to stationary flame and heavy ember attack = 550 - 575
SFMEA (brown) is the lowest risk area Houses exposed to stationary flame and medium to light ember attack = 600 +
Total houses exposed = 1390 – 1435

[Note: House exposure estimate is a quantitative measure of the acceptability of fire planning.]

What is likely house loss rate if evacuation is ordered in these areas, in accordance with current government policy?
Based on nominal house loss rate in recent severe bushfire studies,
In MFHEA, house loss rate* can be 75% = 190
In SFHEA, house loss rate* can be 60% = 330
In SFMEA, house loss rate* can be approx 30% = 180 or 400 x.4 + .15 x 200 = 190
Therefore, some 760 houses are likely to be lost in a worst case bushfire attack.

* Loss estimates of vacant houses use correlations found in Bushfire Solution Papers 6A and 6B.

[Note: House loss count is a quantitative measure of the effectiveness of fire planning]

Stage 4 Options and influences

Is the number of houses in each category area acceptable?
Local residents and authorities can judge this only if they see maps and calculations such as these.

What is impact of government fire plans on location or size of these categories?
These maps and calculations are based on the four layers of current government plans. To check the impact of government plans, ask these questions:

- What will change if the government had no fire plans in place? Zero change
- Can government plans be changed to reduce the number of houses in high risk and increase the numbers in lower risk areas? Yes, if protective infrastructure works are done, nominal loss can fall to 195 (1300 x 15%) if the area is evacuated. Or, if the same works are done and the area is not evacuated, and people are prepared for self defence, house loss rate can be close to zero.
- Can government plans be changed to reduce ember attack intensity? Yes

Where can ember attack be dealt with safely?
Safe and effective defence of ember attack can be achieved only in the areas where the moving flame is excluded. These are the blue and brown areas on Figs 4 and 5. If an individual property within the red MFHEA area is properly set up to self defend by

keeping the moving flame well away, it can also deal with ember attack safely and effectively.

Summary

Government has fire plans which guide its works on the ground. This scenario tests how effective they are.

During a worst case bushfire attack, if works on the ground are up to date in the survey area:

- 250 houses at Daylesford-Hepburn Springs are exposed to MFHEA,
- Another 550 are exposed to SFHEA,
- Another 600 are exposed to SFMEA.
- When Government evacuation policy is enacted successfully, nominal house loss is 760.

These maps allow local residents and authorities to discuss bushfire protection issues and strategies with a common language and understanding. They can see which bushfire attack category their house is exposed to and decide what their options are well in advance of a worst case bushfire attack. They can use these maps to refine or request changes to current government plans to reduce their risk exposure level. They can use house exposure numbers in each bushfire attack category as a quantitative measure of fire plan effectiveness, and work together to reduce them to acceptable levels.

Message to residents:
Check what bushfire attack category is your house located in.
Is your risk level acceptable to you or too high?
If too high, work with authorities to reduce risk exposure level.

**** The BAR technique (Bushfire Attack Recognition)**

The BAR technique uses recognisable indicator fuel bed factors and simplified but meaningful bushfire attack categories. It maps fuel factors and bushfire attack categories on Google Earth, which is publically available. It plans for a worst case bushfire scenario, (defined as worse than 40^0C, 10% RH and 40 kph wind from NNW to WNW - measured at 10m in open), similar to a Black Saturday attack. It assumes the entire study area will be attacked by a broad front or series of fire fronts.

It identifies the fuel bed factors, such as ember generation areas, where the moving flame stops and the discontinuous fuel beds. It uses these to identify moving flame and stationary flame areas and assess ember attack intensity. It then classifies these areas by bushfire attack category. People can see clearly on the map where the flame is moving and where it is stationary, and where ember attack is heavy, or medium to light.

It quantifies the impact of worst-case bushfire attack as follows:
- The number of houses exposed to each bushfire attack category.
- The nominal house loss count in each bushfire attack category, based on houses being unoccupied and undefended.

If government plans and works on the ground are changed, the BAR technique quantifies their impact, and this enables people to reassess their risk exposure.