



**Victorian 2009 Bushfire  
Research Response**

**Final Report**

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# Victorian Bushfires 2009

## Demographic analysis

GEOSCIENCE AUSTRALIA

by

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**Australian Government**  
**Geoscience Australia**

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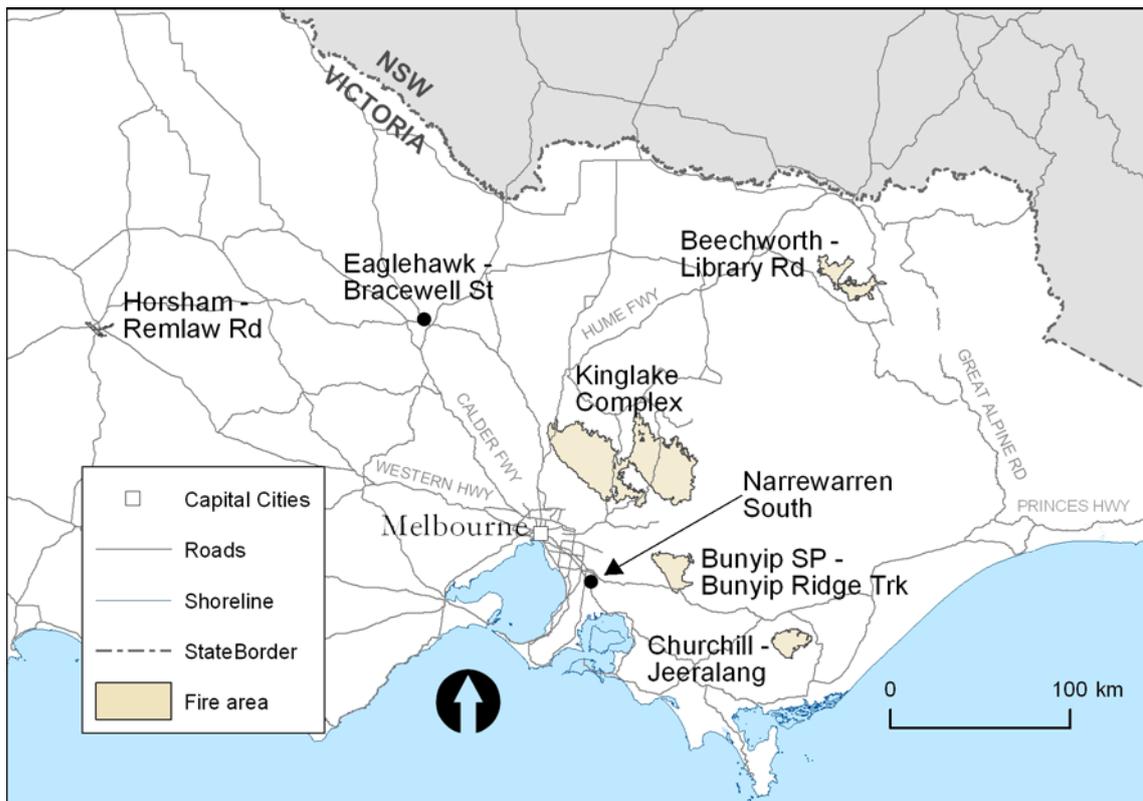
# 1 Introduction

This report was prepared by Geoscience Australia for the Bushfire CRC. It is intended that this report be used as part of the background material for reports prepared for the Royal Commission into the Victorian Bushfires 2009. This report contains a demographic analysis of some of the areas directly affected by the bushfires. The areas included in this report (with alternative fire names in brackets) are:

- Churchill (Churchill-Jeeralang)
- Bunyip (Bunyip SP – Bunyip Ridge Trk)
- Bendigo (Maiden Gully/Eaglehawk – Bracewell St)
- Kilmore (Kilmore East – Murrindindi Complex South)
- Murrindindi/Yea (Kilmore East – Murrindindi Complex North)
- Beechworth
- Horsham
- Narre Warren.

The fire areas covered in relation to each other are mapped in figure 1.1.

Chapter 2 contains a brief overview of the method used to conduct the analysis and a description of the data used. Chapters 3 through to 10 are the analyses of the individual fire areas. Chapter 11 summarises the vulnerability indicators.



**Figure 1.1:** Studied fire areas in context

## 2 Method

This demographic analysis has been conducted at the Census Collection District (CD) level using ASGC (Australian Standard Geographic Classification) 2006. Unless explicitly stated otherwise, it should be assumed that all data is drawn from the 2006 Census of Population and Housing (ABS 2007). The CD is the smallest possible area at which Census data is available. However only the Census is available at this level, and any supplementary data sets used have been analysed at a coarser geographic level.

CDs impacted by the fire area are selected and data for a range of vulnerability indicators is generated. The vulnerability indicators are part of the standard set of data used in analysis in the Risk Impact and Analysis Group, Geoscience Australia. The indicators have been selected on the basis of a literature review and based on feedback from clients. An example of the relevant literature is included with the indicator description below.

### **CD SELECTION**

The CDs chosen for analysis are based upon the distribution of the population in relation to the fire area. The population distribution is assessed using the Geocoded National Address File (GNAF)<sup>1</sup>. Address points are displayed within the CD, the fire area is layered on top, and the suitability is assessed by inspection. If the majority of the address points are within the fire area, the CD is selected for inclusion. In cases where there is doubt about whether a CD should be included due to an even distribution, the CD has been included.

This method of selection means that CDs that have a small geographic area impacted by the fire, but where the population is largely within the fire area, are included. Conversely, some CDs that have a large geographic area impacted by the fire but small population impacts are excluded.

### **VULNERABILITY INDICATORS**

The vulnerability indicators have been chosen to reflect various aspects of vulnerability for individuals within the community. There are no threshold limits for determining whether a group is vulnerable or not. As such the indicators reflect a continuum where high values reflect a high level of vulnerability and low values a lower level. To give a sense of the scale of the indicators, each is compared to the national average. The indicators and descriptive statistics for Australia used in this comparison are given in table 2.1 at the end of this chapter.

#### **Young at risk**

This is defined as anyone under the age of 5.

The very young are at risk because they are unable to care for themselves (Buckle, Marsh and Smale, 2001).

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<sup>1</sup> GNAF is a complete listing of valid addresses in Australia, with each address given a spatial reference. For more information see PSMA Australia Limited, [www.psma.com.au](http://www.psma.com.au).

**Aged at risk**

Defined as anyone aged 65 or older.

The elderly tend to be frailer, have more health problems, and are less likely to be able to care for themselves. While there are some older persons more physically capable than younger persons, the number of people needing assistance increases with increasing age (Buckle, Marsh and Smale, 2001).

**Insufficient English**

Any person who identifies as able to speak English not at all or not well.

People who do not speak English well enough to understand an emergency broadcast or instructions from officials may not get crucial information to protect their safety (Buckle, Marsh and Smale, 2001).

**Not completed year 12**

Any person who has not completed schooling to year 12.

People with higher levels of education are better equipped to understand the implications of warnings and have a greater understanding of preparation requirements (Tobin, 1999)

**Need for assistance**

This is any person who has identified in the Census that they have a need for assistance with self care activities such as feeding, dressing and washing, or, need assistance with communication.

People who need assistance with self care also need assistance in preparing for or evacuating from a disaster (Buckle, Marsh and Smale, 2001).

**Volunteering rate**

This indicator measures the number of people who spend any time in volunteer activities. This measure is our only indicator of social capital within the community.

People who volunteer their time with community organisations such as schools, local sporting clubs or welfare groups tend to have better networks within the community. This leads to a greater ability to access resources.

**Low income households**

The method used to assess low income here is the OECD method of half the national median. In 2006, the national median household weekly income was \$1026. Half of this figure produces \$513 a week. As the Census income measures are grouped into categories, we rounded this down to the nearest category upper limit of \$499. All households on an income of less than \$500 are included in this low income measure.

Low income households tend to lack the economic resources to recover from a disaster. They are less likely to have insurance and often have fewer options for recovery (Buckle, Marsh and Smale, 2001).

**No motor vehicle access**

This indicator measures the number of households that do not have any access to a motor vehicle. It is not a measure of insufficient access for the size of the household

as we are not able to match the household size with the number of motor vehicles in that household.

People who do not have access to a motor vehicle are unable to self-evacuate in an emergency.

### **New 1 year and new 5 year**

These two indicators are based upon the stated address of the person one year and 5 years ago.

If a person has moved some distance they may have lost their networks, are less familiar with the area and may be less familiar with the type of disaster within their new area. Due to the format of the data this indicator treats all moves to a different SLA (Statistical Local Area) as a significant move regardless of whether that move was to the next suburb in an urban area or to the other end of the state.

### **Single parent families**

All families that have children under 15 and only one parent.

Single parents often have to manage many demands but with no additional support (Buckle, Marsh and Smale, 2001).

### **Indigenous**

All persons who identify as being Aboriginal or a Torres Strait Islander.

Indigenous Australians are disadvantaged on a range of issues including health status, life expectancy, education and employment outcomes when compared to non-Indigenous Australians. This disadvantage persists even in Capital City centres, and is not a simple function of the remoteness that many Indigenous persons experience (ABS 2005).

### **Public housing**

All persons who rent their homes from a state or territory housing authority.

Socio-economic disadvantage is a requirement for receiving public housing, so people living in public housing are likely to have a variety of social and economic problems that may need extra support.

### **Unoccupied homes**

When Census forms are collected, the collector notes where a form is not completed and if the house appears to be unoccupied at the time of their visit(s). This count of unoccupied homes, especially where it is large, can be an indicator of the number of second homes.

When combined with other enumeration figures, counting these second homes can give a useful indication of the service population of a community. Where residences are used as second homes, that is weekenders or holiday homes, the owners of those homes are often not there on the Census night, a week night. The connection of the owners with these second homes is then not possible to be made. This can lead to large differences between resident populations and service or weekend populations.

Quite often the demographic characteristics of the absent owners are different from those who live in the area<sup>2</sup>.

There is a risk that absent owners are less engaged with the local community. Week night community meetings are difficult to attend, and they often miss out on other social interactions with the community. They also spread their time across multiple houses, leaving less time to spend on the second home making preparations such as clearing activities.

## **DESCRIPTIVE STATISTICS**

The descriptive statistics provide an overall view of the population and are drawn from the Census. They include:

- The number of persons and households
- The number of dwellings by type
- The number of owned or mortgaged dwellings
- Median age
- Median weekly household income
- Workforce size (from which workforce participation is derived)
- Working age population.

## **SUPPLEMENTARY DATA**

A variety of other data sources have been used in this analysis, though not always expressly stated for each fire.

Regional Population Growth (ABS 2009):

- To assess the growth or decline of a region.

Employment by Industry data (Census 2006)

- Understanding the industry structure gives an indication of the types of employment and in some cases the vulnerability of the workforce to employment disruption.

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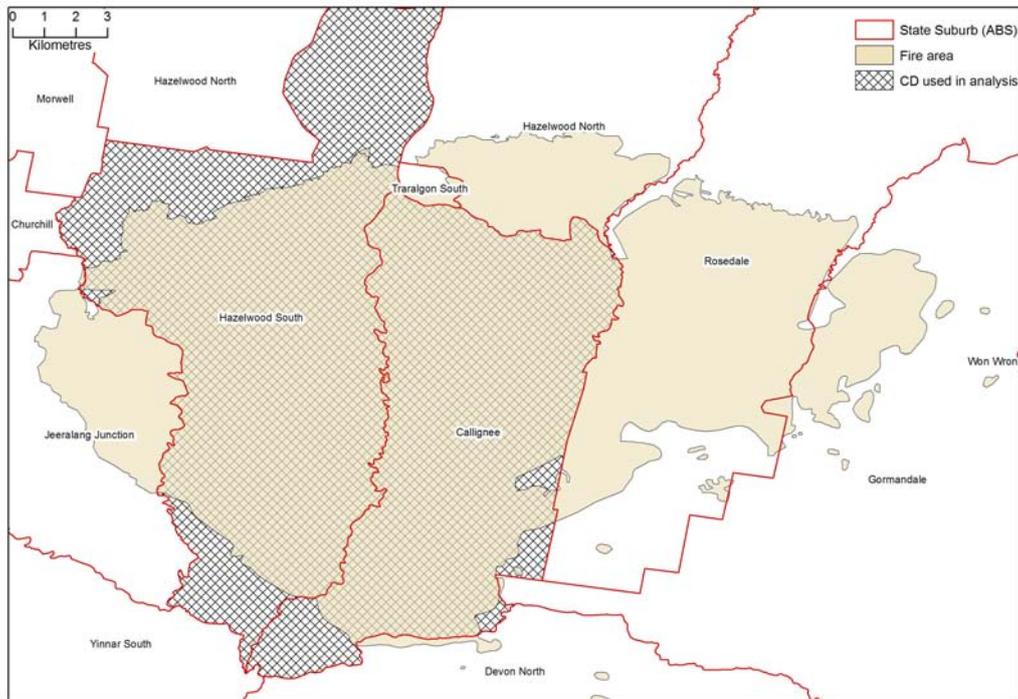
<sup>2</sup> The Victorian Department of Planning and Community Development has been undertaking work, partly using the unoccupied dwelling counts, on the demographic characteristics of absent owners in key locations. See DPCD, 2009 for a recent overview comparing Queenscliffe and Mansfield.

**TABLE 2.1 VULNERABILITY INDICATORS AND DESCRIPTIVE STATISTICS, AUSTRALIA**

<b>INDICATOR</b>	<b>AUSTRALIA</b>
Population (persons)	19,855,288
Households	7,144,096
Dwellings (houses)	5,472,521
Dwellings (flats/units)	1,591,714
Dwellings (other – dwellings)	76,089
Owned dwellings (dwellings)	4,866,837
Median age (years)	37
Median household income (\$/wk)	1026.8
Workforce (persons)	9,607,987
Working age population (persons)	13,273,698
Unoccupied dwellings (dwellings)	830,379
Young at risk (%)	6.3
Elderly at risk (%)	13.3
Insufficient English (%)	2.2
No year 12 (%)	53.1
Need for assistance (%)	1.9
Low income households (%)	21.9
No motor vehicle access (%)	9.8
New 1 year (%)	11.2
New 5 year (%)	30.8
Single parent families (%)	8.7
Indigenous (%)	2.3
Public housing (%)	4.4
Unoccupied dwellings (%)	10.4
Volunteering rate (%)	19.8

### 3 Churchill

The extent of the Churchill fire and the CDs that have been used in this analysis are illustrated in figure 3.1. The main communities impacted in this fire are Callignee and Hazelwood South with a population of 495 persons and 533 persons respectively.



**Figure 3.1:** Extent of Churchill fire area and the CDs selected for analysis.

The Churchill fire area has neither a young nor an older population, with a low number of persons at either end of the age spectrum. There is a distinct hollowing out in the 25-34 age group, the key age group for training and early career establishment, but otherwise the population is evenly distributed between 5 and 64.

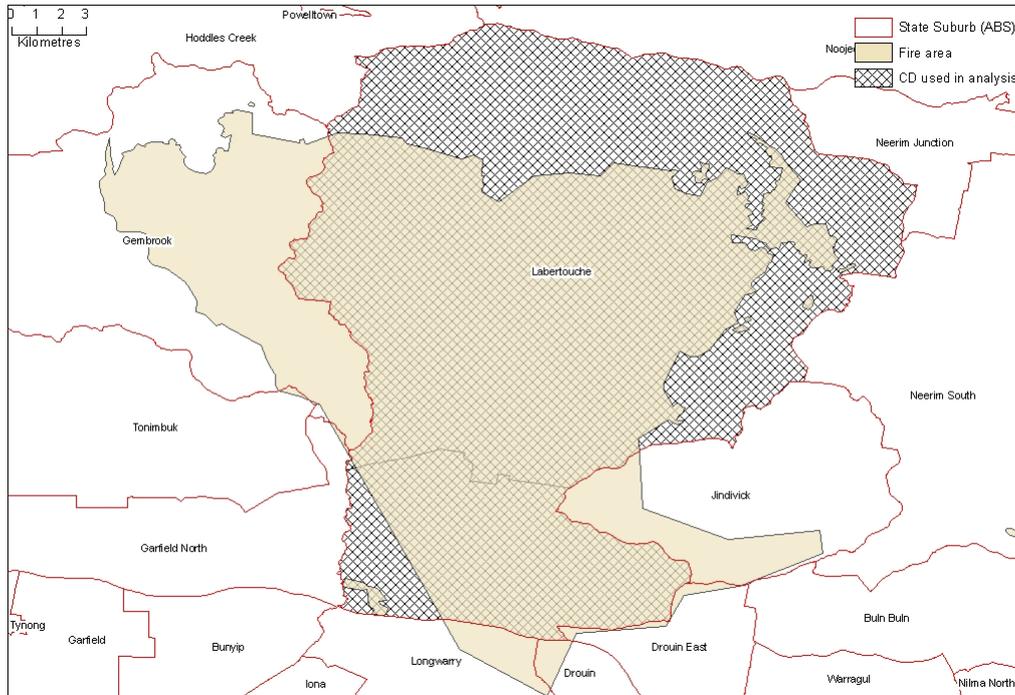
The population is relatively advantaged, with high average incomes and a low number of low income households. The participation rate is high for all ages. There is only a small number of single parent families in the area, and there is no public housing.

The population had been fairly stable in the year prior to the Census, with a small number of persons moving into the area. However the number of persons who moved into the area in the previous 5 years was only slightly lower than the national average. The number of people living in the area has slightly increased, with a 5 year growth rate of 0.6 per cent per annum (ABS 2009).

The employment in the area is quite diverse, but the health care and social assistance, manufacturing, and retail trade sectors dominate each at 13 per cent of the workforce. The construction, electricity, gas, water and waste services, and education and training sectors are also strong. This industry structure is typical of a regional centre, indicating that many residents of the area commute to a nearby centre, most likely Traralgon, to work.

## 4 Bunyip

The extent of the Bunyip fire and the CDs that have been used in this analysis are illustrated in figure 4.1. The largest population base, on the edge of the fire area, is Drouin with around 8000 people. However the fire area encompasses the rural area of Labertouche, a population of 1000 people.



**Figure 4.1:** Extent of Bunyip fire area and the CDs selected for analysis.

Labertouche is dominated by the agriculture, forestry and fishing industry with 23 per cent of the workforce in this sector. The construction sector is also strong at 13 per cent of the workforce.

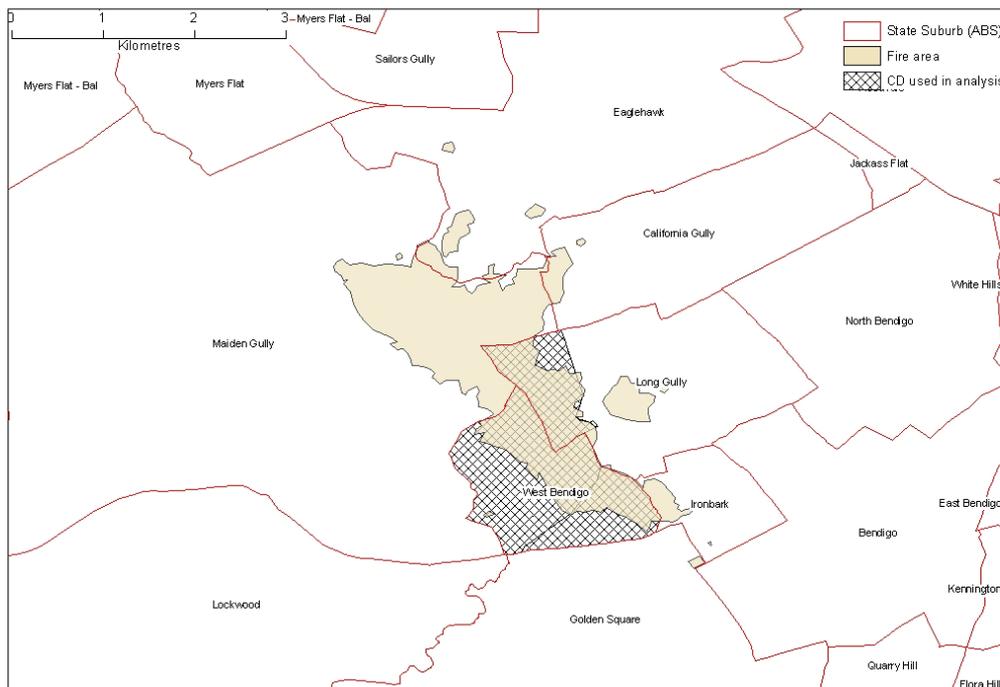
While Labertouche has slightly lower wages than average, normal for an agricultural area, there are very few indicators that cause concern. Most indicators are in line with the national average or are lower. The exception is year 12 completion, with only 30 per cent of the population continuing school to the end of year 12. Again this is typical for an agricultural area.

The population in the area is very stable, with only a few people moving to the area in the year before the Census. The population is growing at a rate of 2 per cent per annum (ABS 2009).

## 5 Bendigo (Eaglehawk)

The extent of the Bendigo fire and the CDs that have been used in this analysis are illustrated in figure 5.1.

The Bendigo fire lies on the western edge of Bendigo. Bendigo is quite a large and diverse centre, but this fire has impacted on a relatively small area incorporating all of West Bendigo and parts of Long Gully. Due to the difficulty in accurately estimating the population from the fire area, this analysis focuses only on these areas, however it is worth noting that the areas immediately adjacent to the areas of analysis have very similar characteristics to the CDs analysed and have similar vulnerabilities.

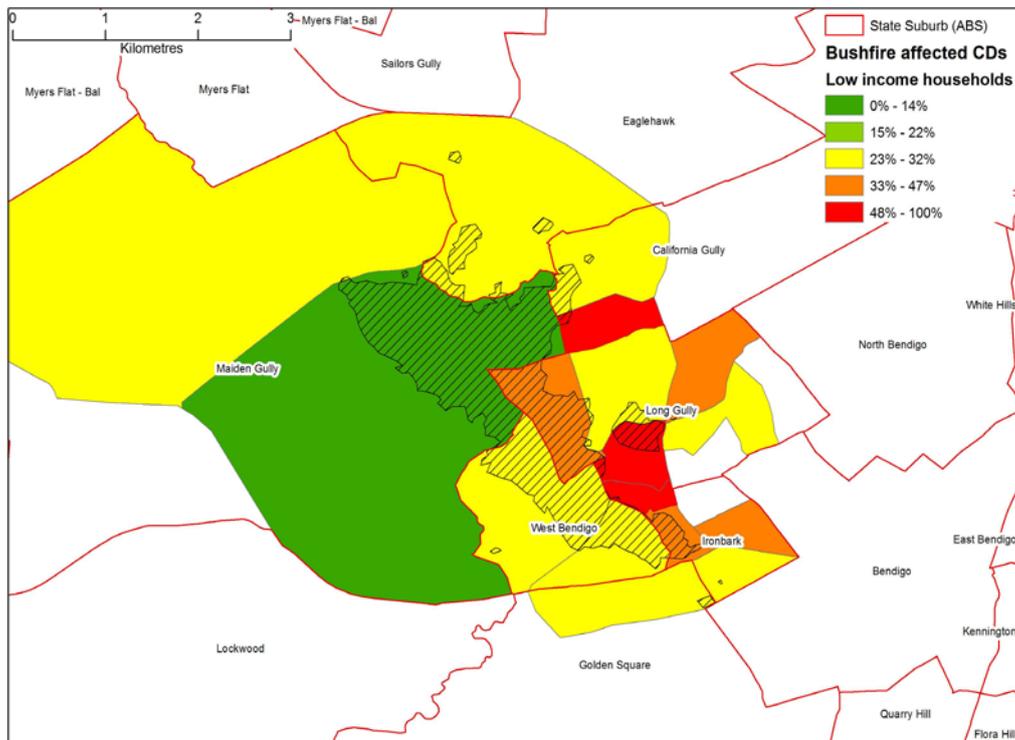


**Figure 5.1:** Extent of Bendigo fire area and the CDs selected for analysis.

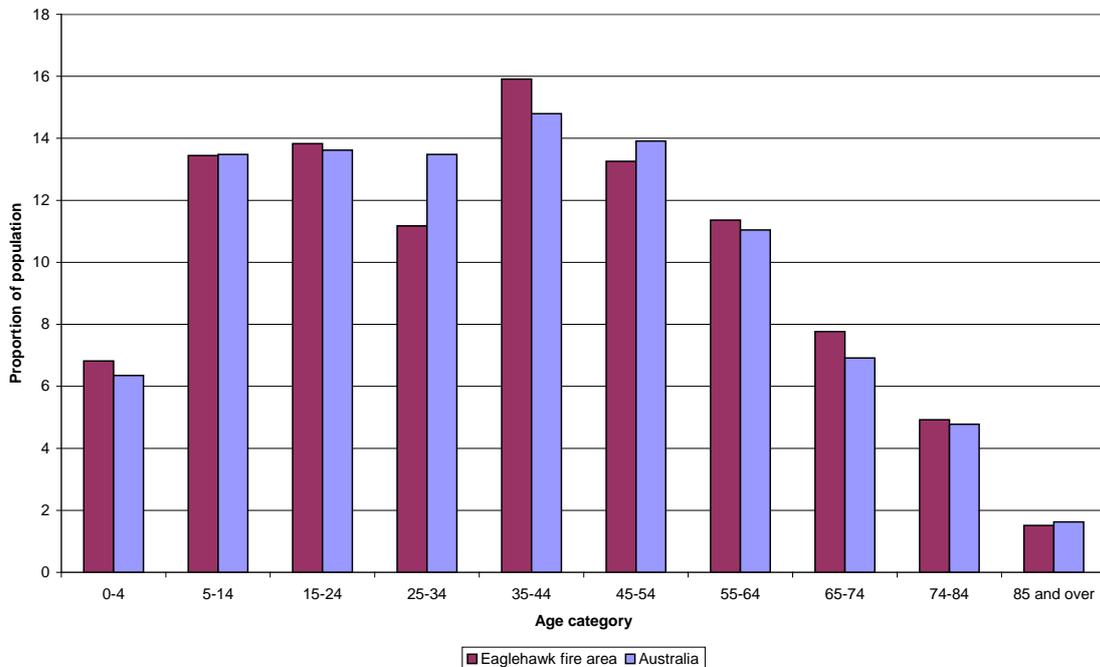
This area of Bendigo is quite socio-economically disadvantaged. In this area between a quarter and a third of all households are considered low income. Figure 5.2 shows the distribution of low income households as a proportion of all households. The national average in 2006 is 22 per cent of households. Most CDs within and outside of the fire area have many more households classed as low income than this average. This is coupled with a high number of single parent families, a high number of elderly persons, and low levels of schooling. These indicators together point to an area that may lack the economic resources, such as savings or insurance, to recover from a disaster.

While there is a significant elderly population, the median age of the area is comparable to the national average. Part of West Bendigo has a large number of young children but the lower than expected median age is due to the population being concentrated in the 35-44 age bracket and lower, with a “hollowing out” at the key training and early employment ages of 25-34.

Figure 5.3 illustrates this distribution, with the much smaller numbers of 25-34 years old and the peak at 35-44 year olds apparent in relation to the national average.



**Figure 5.2:** The distribution of low income households as a proportion of all households.



**Figure 5.3:** The age distribution for the Eaglehawk fire area compared with Australia, 2006.

The area of Long Gully impacted by the fire has quite a high number of indigenous persons. Nineteen percent of the population identifies as Aboriginal or Torres Strait Islander. This may in part explain the age structure in this area as indigenous persons tend to have a younger age structure and a lower life expectancy (ABS 2008).

There is some public housing in the selected CDs but the majority of the public housing is on the edges of the fire area. The area at the corners of West Bendigo, Ironbark and Long Gully has the highest rates. Around half of the houses in this part of Long Gully are public housing. Socio-economic disadvantage is a requirement for receiving public housing, so the people in this area are likely to have a variety of social problems that may need extra support, as well as requiring economic assistance.

The people in this area are relatively stable, with very few people moving into the region in the 12 months before the Census. Around a quarter of the population moved into the region in the 5 years previous, below the national average of 30 per cent. The 5 year population growth rate for the region was 0.9 per cent, somewhat less than the 1.6 per cent growth rate for Bendigo as a whole (ABS 2009).

Employment in the area is dominated by the manufacturing sector, with 21 per cent of the workforce working in this sector. The construction, retail trade and health and social assistance sectors also have strong employment at 13 per cent, 13 per cent and 9 per cent respectively. The strength of these latter sectors is typical of a large regional centre.



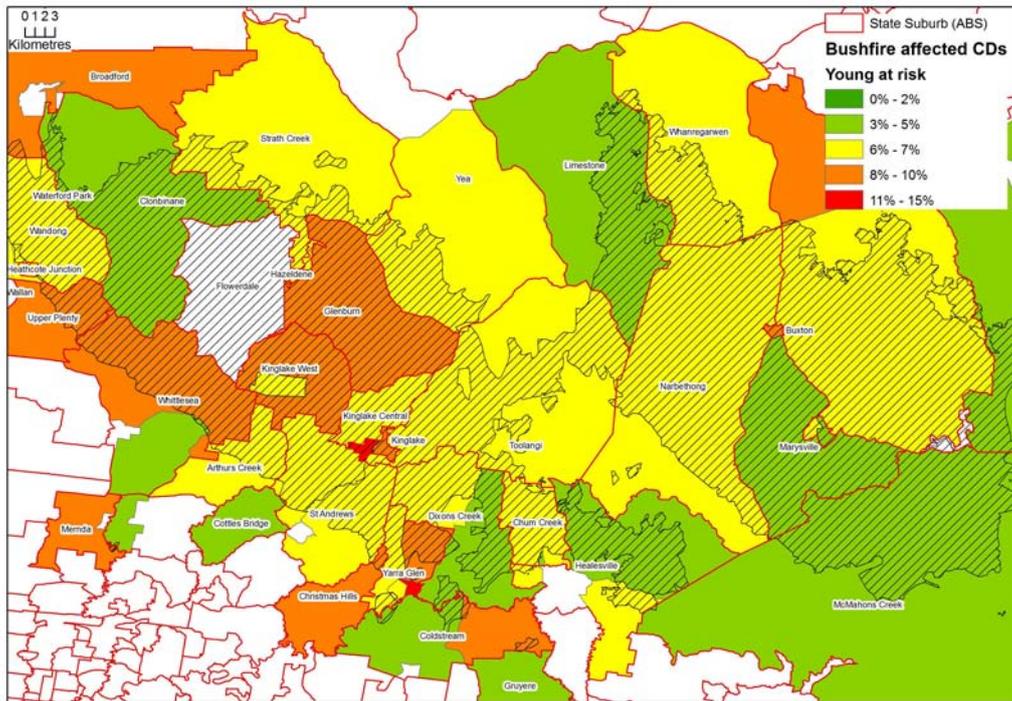


Figure 6.2 Percentage of persons aged under 5 on Census night, 2006, Kinglake Complex

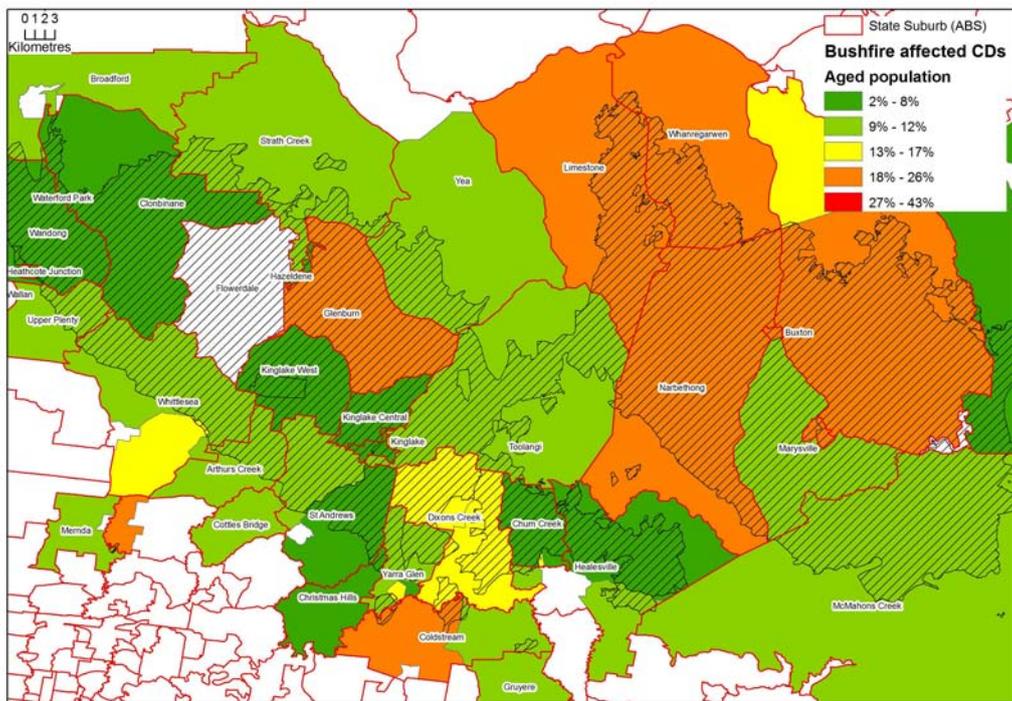


Figure 6.3 Percentage of persons aged 65 and over on Census night, 2006, Kinglake Complex

Glenburn stands out as interesting with a high number of both young and aged persons. Eighteen per cent of the population of Glenburn is aged 65 and over. Dixons Creek also has a high number of the aged at 15 per cent. All other areas have a lower than average number of aged persons. Figure 6.3 shows the distribution of aged persons.

The area as a whole has a relatively large number of houses unoccupied on Census night. This is particularly true for the north, where Hazeldene, Strathburn and Glenburn have 25 per cent or more houses unoccupied. Figure 6.4 shows the distribution of unoccupied houses across the Kinglake complex.

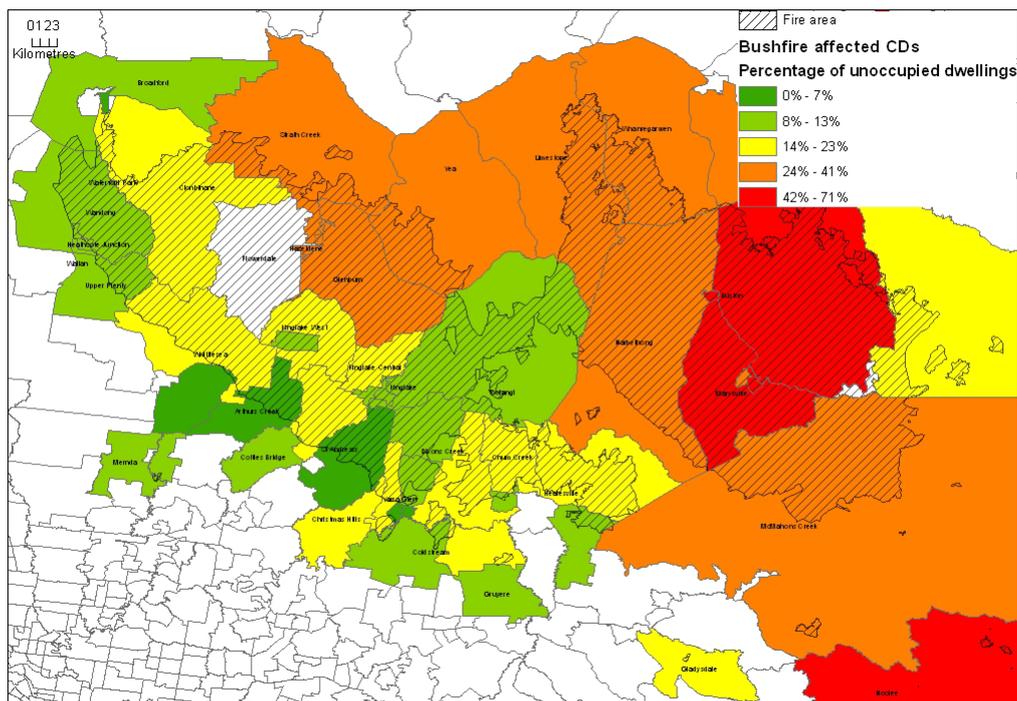


Figure 6.4 Percentage of unoccupied dwellings on Census night, 2006, Kinglake Complex

The population is relatively stable in most areas, the exceptions being Dixons Creek and Kinglake West, where more than 10 per cent of population have moved into the area in the year prior to the Census, and more than 30 per cent in the 5 years prior. However there has been some strong population growth in the area, with Wandong and Clonbinane combined experiencing a 5 year growth rate of 3.5 per cent. This area has a high number of young children, so families are obviously important to the area. The area covered by the Kilmore and Murrindindi fires as a whole has experienced an average annual growth of 1.8 per cent (ABS 2009).



Accommodation and food is the dominant industry with a quarter of the workforce employed in this sector. This has some negative consequences on the economy of the area following a disaster, and hence families' incomes, as businesses are no longer able to generate an income. The agriculture, forestry and fishing, manufacturing, and health care and social assistance sectors also have a strong representation. These latter industries are typical of a largely rural population.

One area for concern is the difficulties this area faces in accessing transport, due to geographic isolation. There are 24 households, 14 of which are in Marysville, that do not have access to a motor vehicle and may require assistance evacuating. This is in addition to any individuals in nursing homes or hostels who will need to be evacuated.

Of particular concern for the community of Marysville and the surrounding areas is the large number of unoccupied houses. In Marysville alone, around 45 per cent of homes were unoccupied on Census night, a total of 170 homes. Figure 7.2 maps the distribution of the unoccupied homes across the whole fire area, including Kinglake.

If you consider the enumerated population of 597 persons as a starting point (excluding all visitors who live outside of Victoria, and nearly 100 people more than the number of usual residents). We multiply the average number of people per house (2.25) by the 170 houses and we get an additional 383 people who may (or may not) be in Marysville on the weekend, giving a total service population of 1000 people.

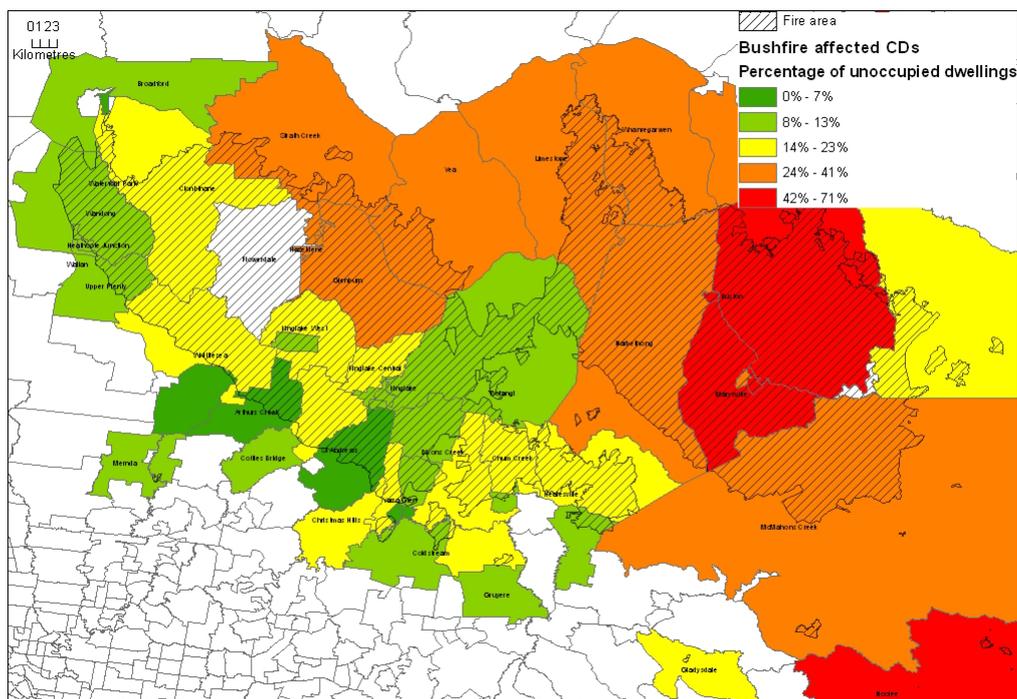


Figure 7.2 Percentage of unoccupied dwellings on Census night, 2006, Kinglake Complex

This area does have a significant positive characteristic. Up to 40 per cent of residents, nearly twice the national average, volunteer their time in the community. This indicates a well networked community where locals are supportive of each other.

## 8 Beechworth

The extent of the Beechworth fire and the CDs that have been used in this analysis are illustrated in figure 8.1. The largest population base in the immediate area is Yackandandah, with a population of 2100 people. The outer areas of Stanley are also impacted (689 people). However the fire has not directly impacted on the bulk of this population. The main areas affected are Gapsted (294 people), Mudgegonga (385 people) and Dederang (422 people).

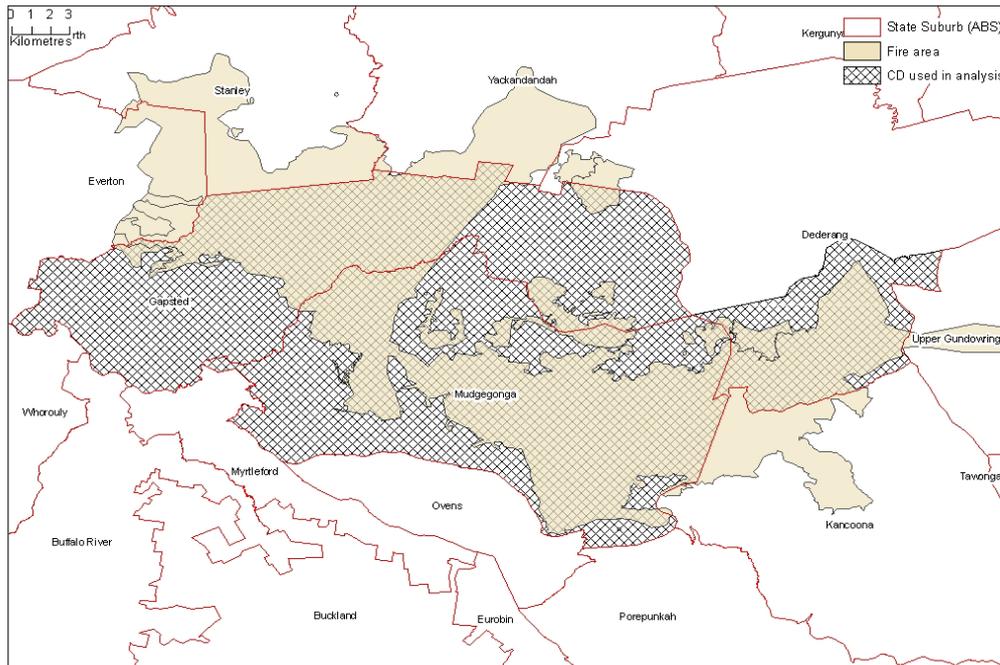


Figure 8.1: Extent of Beechworth fire area and the CDs selected for analysis.

Median income levels in this area are low, but the number of low income households is only slightly above average in Gapsted and Mudgegonga, at 25 per cent each, and below the national average in Dederang. There are a low number of single parent families, and the workforce participation rates for all ages are quite high.

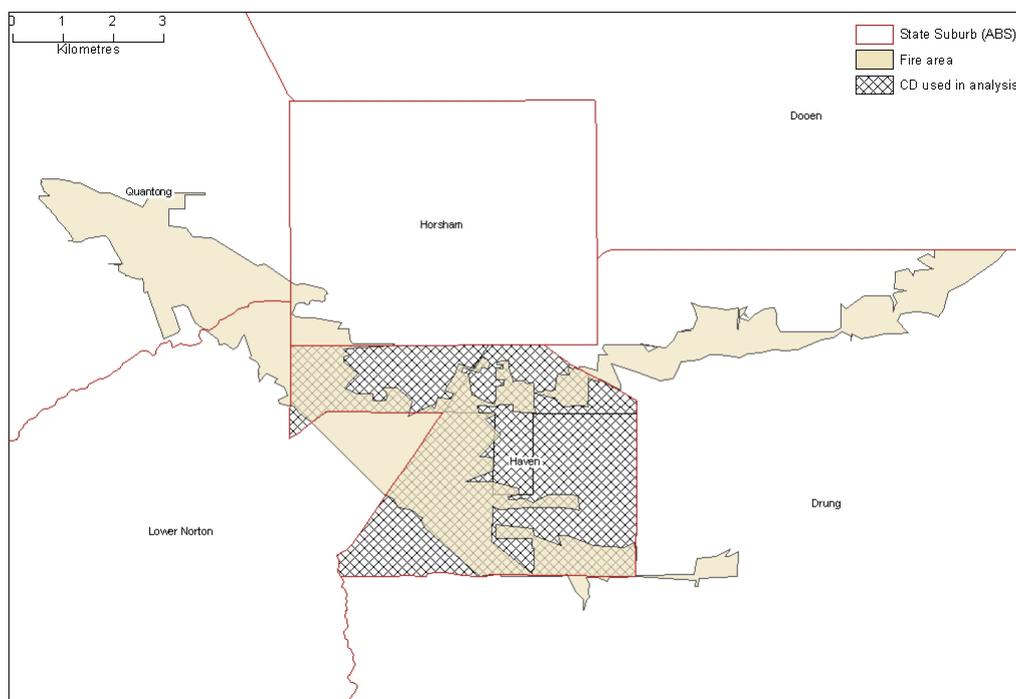
The low incomes are partly explained by the main industries of employment in the area. The dominant industry is agriculture, forestry and fishing with 28 per cent of the workforce working in this industry. The second major industry is manufacturing with 17 per cent. These industries are characterised by low wages and low skilled jobs, partly explaining the low average wage. The third industry is health care and social assistance. This industry is often dominant in regional centres.

While this area has neither a significant number of older or younger persons, the median age is somewhat higher than the national average. This is because a quarter of the population are aged between 45 and 54. This is quite a distinct feature of this area.

Mudgegonga and Dederang have a high number of unoccupied houses on Census night. In the case of Dederang the high proportion has come from a relatively low number of houses. In Mudgegonga there were 26 houses unoccupied on Census night.

## 9 Horsham

The extent of the Horsham fire and the CDs that have been used in this analysis are illustrated in figure 9.1. This fire occurred on the outskirts of Horsham, a regional centre of over 13000 people. The area directly impacted by the fire is the community of Haven, a community of 940 people.



*Figure 9.1: Extent of Horsham fire area and the CDs selected for analysis.*

Haven is a relatively advantaged area, with a higher than average median income and a very low number of low income households. There is no public housing, and only a small number of single parent families. Workforce participation is higher than average. Employment in Haven has a structure similar to a regional centre, dominated by the health care and social assistance sector and complemented by the retail sector.

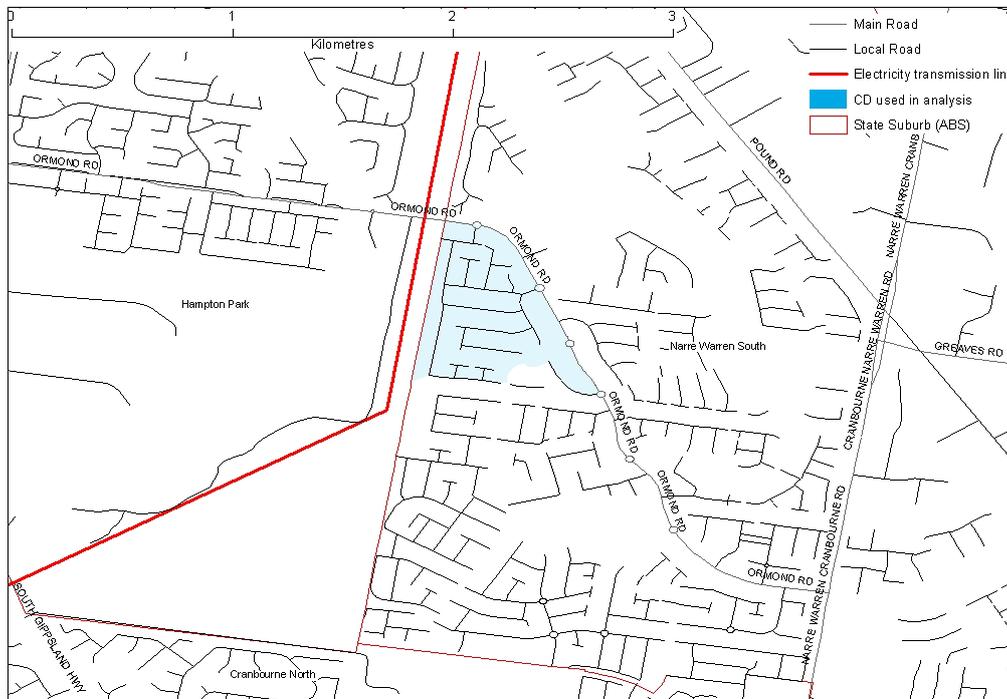
The number of people who moved into the area in the year before the Census is slightly below the national average. However the number of people who moved into the area 5 years before the Census is high. This is particularly true for the area closest to Horsham where 55 per cent of the population moved into the area in the previous 5 years. Horsham has had a 5 year annual average growth rate of 1.2 per cent, while the surrounding areas a growth rate of 1.1 per cent. The large increase in the number of people reflects the growth of Horsham pushing into the surrounding areas.

Haven has a relatively high proportion of people who need assistance with everyday activities. The high percentage is a feature of the small population base, with only 19 people in this category. However, due to the small community size, there may not be enough resources in the local area to assist these people.

Haven has a high volunteering rate of 40 per cent, twice that of the national average. This reflects a population base that is active in their community, leading to strong support networks.

# 10 Narre Warren South

The extent of the Narre Warren South fire is not available, but the CD selected for analysis is illustrated in Figure 10.1.



**Figure 10.1:** CD selected for analysis, Narre Warren South fire.

This area of Narre Warren South is a relatively new suburb. Nearly 9 per cent of the population moved into the area 1 year before the Census, but this is following 50 per cent of the population moving into the area in the 5 years before hand.

The area has many young families, with 12 per cent of the population aged under 5 and only 1 per cent aged 65 and over. The median age is 27, much younger than the national average of 37.

There are very few single parent families, indigenous persons or public housing in the area. More than half of the population have completed year 12. Most households have a car.

Incomes in the area are generally high, with a high median income and a very small proportion of low income households. The dominant industry of employment, at 24 per cent, is the manufacturing sector. A further 13 per cent of the workforce is employed in the retail trade sector.

An interesting feature of this area is the very low proportion of people who volunteer their time in the community. Only 9 per cent of the population participate in voluntary activities. This could indicate a community that is not well networked.

# 11 Summary and conclusions

A summary of the vulnerability indicators for each fire relative to the national average is presented in table 11.1. This summary represents the communities affected as a whole, and may not reflect the state of individual communities in a larger fire area. None of the indicators stand out as being the significant indicator of vulnerability. Rather, it is the combination of factors that increase a community's vulnerability.

This report has included a new indicator – the number of unoccupied homes – collected during the Census and recently purchased from the ABS. The analysis of this indicator has shown that some of the areas affected by the bushfires of February 2009 have a significant number of unoccupied homes on Census night. This measure indicates the number of second homes, that is, holiday homes or weekenders. While we can make some assumptions about the significance of this indicator further work investigating the link between the number of unoccupied homes, fatalities and house loss is warranted. Marysville provides an opportunity to test this relationship, with a high number of fatalities, house loss and unoccupied homes.

**TABLE 11.1 INDICATORS OF VULNERABILITY, RELATIVE TO THE NATIONAL AVERAGE<sup>1</sup>**

<b>VULNERABILITY INDICATOR</b>	<b>CHURCHILL</b>	<b>BUNYIP</b>	<b>BENDIGO</b>	<b>KILMORE</b>	<b>MURRINDINDI / YEA</b>	<b>BEECHWORTH</b>	<b>HORSHAM</b>	<b>NARRE WARREN</b>
Young at risk	Low	Low	Average	High	Low	Low	High	High
Elderly at risk	Low	Average	High	Low	High	High	Low	Low
Insufficient English	Low	Low	Low	Low	Low	Low	Low	Low
No year 12	High	High	High	Average	Average	High	High	Low
Need for assistance	Average	Low	Low	High	High	Average	High	Low
Low income households	Low	Average	High	Low	High	Average	Low	Low
No motor vehicle access	Low	Low	Low	Low	Average	Low	Low	Low
New 1 year	Low	Low	Low	Low	Low	Low	Average	Low
New 5 year	Low	Low	Low	Average	Average	Low	High	High
Single parent families	Low	Low	High	Average	Average	Low	Low	Low
Indigenous	Low	Low	High	Low	Low	Low	Low	Low
Public housing	Low	Low	High	Low	Low	Low	Low	Low
Unoccupied dwellings	Average	Average	Low	High	High	High	Average	Low
Low volunteering rate <sup>2</sup>	Average	Low	High	Average	Low	Low	Low	High

1. A high rating increases vulnerability more than average or low.

2. Volunteering rate in this instance has been reversed to reflect the same direction as the other indicators. A low rating has decreases vulnerability

## Glossary and abbreviations

ABS	Australian Bureau of Statistics
ASGC	Australian Standard Geographic Classification
Bushfire CRC	Bushfire Cooperative Research Centre
CD	Census Collection District
DPCD	(Victorian) Department of Planning and Community Development
enumerated population	the count of persons according to their actual location on Census night
GNAF	Geocoded National Address File
OECD	Organisation for Economic Co-operation and Development
usual resident population	the count of persons according to their stated usual residence location

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