Report of the circumstances that led to the escapes of planned burns in the South West and Great Southern Regions of Western Australia on 24 and 25 May 2018

Prepared by the Office of Bushfire Risk Management

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Cover image. Post Stirling Range National Park bushfire (Kevin Haylock 2018)

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Planned burning on remnant marri/jarrah forest on private land under mild autumn conditions. (Kevin Haylock 2017)

Contents

1 Executive Summary

There is no doubt that the bushfire related risk profile in Western Australia has and continues to change. There has been significant progress in the management of bushfire risk since the 2011 Margaret River bushfire however the dynamic nature of the interaction between the social, environmental, economic and cultural aspects creates complexity and requires contemporary and adaptive strategies to mitigate bushfire risk effectively.

The application of traditional and cultural burning practices over millennia were responsible for the creation of a landscape of fire prone vegetation. The exclusion of fire from such a landscape is not possible and it is the ongoing use of both planned fire and its integration with alternative fuel reduction strategies that can achieve an acceptable balance of outcomes across the social, environmental, economic and cultural aspects. Understanding the context that is increasing the complexity of mitigating against large bushfires in Western Australia is an important first step to then developing strategies to effectively mitigate that risk.

Climate in the South West Land Division (SWLD) of Western Australia is changing and this is challenging traditional land management practices. Bureau of Meteorology (BOM) data demonstrates a warming and drying climatic trend. This trend is causing seasonal variations such as longer drier periods into winter and warmer periods into spring. The warming and drying climate coupled with severe weather events are requiring land owners and managers to adapt their fire management strategies and better manage the risk of escape.

The expansion and evolution of agricultural business and tourism in the SWLD has created a mosaic of land use and ownership across the landscape, increased permanent and transient (tourist and absentee) populations and created larger regional centres. This has increased the complexity of managing planned and unplanned fire in the landscape. Changing tenure and responsibility of land owners and managers in the SWLD and Western Australia more broadly, particularly in the context of native title determinations, is adding further complexity.

All fires start small but big fires are harder to manage and put more firefighters and communities at risk of harm. Implementing strategic programs to reduce fuels loads and enable more effective management of bushfire fires is critical to minimise bushfire impact on the social, environmental, economic and cultural assets. The increasing complexity has challenged the achievement of strategic fuel reduction programs over recent decades and this has resulted in a relatively high fuel load across the SWLD. As fuel loads increase, the cost and scale of response to bushfires continues to increase as does the fires impact on the afore mentioned assets.

In late May 2018, the first severe weather event for winter passed over the south-west of Western Australia. The weather event bought strong winds in excess of 120km/hr, highly variable rain and importantly a warm dry air mass ahead of the strong winds. Whilst a strong cold front is not unusual in May, the scale and significance of the event caught many land owners and managers by surprise and caused both the re-ignition and escape of some 'dormant fires' and the escape of still active fires in the SWLD on 23, 24 and 25 May 2018. The Bureau of Meteorology (BOM) provided a report into the severe weather event, at Appendix 4. More than 150 fires were reported to the Department of Fire and Emergency Services (DFES) on 23, 24 and 25 May 2018. Several of these fires, namely the Chester Moonah, Torndirrup, Stirling Range, Peaceful Bay, Redmond and Napier bushfires were significant in scale and in some instances reported insurable losses and incurred considerable uninsurable losses. Due to the significance of some of the fires and their proximity to regional centres, government initiated a review into the circumstances that led to the planned burn escapes in order to identify opportunities for improvement.

A key principle for risk management is continuous improvement. Government has committed to managing bushfire related risk to the communities of Western Australia and things that they value through continuous improvement. Whilst all local governments in the SWLD have drying and warming climatic trends, there was a high level of variability in the amount of planned burning across local governments prior to the severe weather event and the relative number of escapes. The review provided an excellent opportunity to understand what variations at an organisational and local government level exist that contributed to the escapes and their impacts and to also identify where successes existed and why. Seven local governments were subsequently selected for comparative purposes. These were the City of Albany and Shires of Denmark, Esperance, Harvey, Manjimup, Plantagenet and Ravensthorpe.

This report is a concise summary of the understanding that the reviewers gained through their engagement with representatives from the seven local governments and their volunteers, members of the farming community in the Stirling Ranges, Esperance, Manjimup and Denmark, DFES, Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service (DBCA) and Forest Product Commission (FPC). Those that were interviewed were open, honest and enabled the reviewers to gain some valuable contexts that support the development of the opportunities for improvement contained within the report. DBCA also conducted a review into the Chester Moonah, Torndirrup and Stirling Range bushfires attached as Appendix 5. Consideration was given to their review in forming the opportunities for improvement (OFI) of this report.

Governance of private property burning is becomingly increasingly important. Local governments have the primary role in governing and guiding the management of

bushfire risk on private property. Whilst some local governments were wary of greater amounts of administration and restrictions on land owners and land managers it was acknowledged that an improved awareness of fire in the landscape at any given moment in time would be useful. The Shire of Harvey's suggestion for a registration system (OFI 6) could support this improved knowledge. Its integration with existing public web-based platforms such as *EmergencyWA* could be beneficial for local governments, DFES, DBCA and the community.

Communication failings leading up to the Stirling Range bushfire were highlighted in the review. The absence of effective communication with local volunteers and Senior Fire Control Officers meant local conditions were less well understood and resources to support the planned burn were limited. Revised organisational policies, procedures and practices to reduce bushfire risk, must be tailored to the needs of regions, organisations and activities incorporating local knowledge. A centralised, standard "one size fits all" approach should be avoided. The Shire's of Manjimup and Esperance provided locally specific examples of how they effectively communicate and maintain situational awareness of fire in the landscape across organisations and volunteers. The promulgation of these approaches through a lessons sharing or management framework may be useful for other local governments (OFI 15). Equally so, enhancements to existing information sharing platforms and the type and availability of information is seen as a potential enhancement highlighted through OFI 6, 8, 9).

The resourcing of planned burning activities was highlighted as a limiting factor in the success of planned burning outcomes and the lack of appropriate and adequate resources is a common element in planned burn escapes. Organisations such as DFES, DBCA and FPC are already arranging better support for their region's planned burning activities and there are opportunities to better utilise existing resources at a local level (OFI 7).

Skills and experience gaps limit the effectiveness of bushfire response and safe practices. Whilst not a new issue, a systematic process of locally based training, properly supervised practical experience incorporating better use of existing fire vehicles and equipment and aimed at increasing local capacity to undertake fuel load management is critical to achieving better bushfire mitigation outcomes. The creation of the DFES Bushfire Centre of Excellence will go a long way in addressing the training issues but there are some opportunities for improving the accessibility and availability of local resources (vehicles and people) to support planned burning activities. These opportunities have been highlighted in OFI 7b.

The report acknowledges the efforts organisations are making to improve intelligence information, particularly DFES, and highlights an opportunity for improved consistency across organisations in the sharing of intelligence and weekly discussions regarding regional risk profiles. There has been an improvement in collaboration across the sector

in recent years and this is facilitating continuous improvement. The review identified an opportunity for a rationalisation of varied forms of intelligence information/briefings and broader dissemination of some information for the benefit of emergency management staff within other organisations and local governments. These are highlighted in OFI 9 and 12.

Acknowledging the increasing complexity and the imperative to protect Western Australian communities from bushfire has enabled organisations such as DFES, DBCA and local government to focus greater efforts on mitigating bushfire risk. It should be noted that many state government organisations use planned burning as a strategy to mitigate bushfire risk and protect assets. The bushfire reform measures announced in April 2018 by government and focuses on mitigation, the establishment of a Rural Fire Division (RFD) within DFES and creation of a Bushfire Centre of Excellence (BCoE) provides an opportunity to achieve improved bushfire risk management outcomes for Western Australia. The RFD will provide a coordinating role and development of risk mitigation strategies across the sector that incorporates strategic bushfire risk management and training. The creation of the RFD and with the BCoE will support collaboration across the sector by strengthening existing networks and creating new networks between state and local government, bushfire volunteers and Western Australian communities.

In the spirit of continuous improvement, an independent review of the report contents and opportunities for improvement was conducted by Mr David Nugent, Chief Fire Officer, Parks Victoria. This has provided an external and independent perspective to the review and report. It also enabled an inter-jurisdictional perspective and opened the door for further discussions and professional networks to support Western Australia's management of bushfire related risk. A copy of Mr Nugent's review is attached at Appendix 2.

The tracking of the implementation of the opportunities for improvement will be important to ensure integration of these with 'business as usual' going forward. The FES Commissioner will facilitate a review of the implementation of opportunities for improvement arising from this review after the twelve-month anniversary of the report release. The review of the progress on opportunities for improvement will coincide with the lead into the 2020 autumn planned burning season in the south of the State.

2 Summary of Opportunities for Improvement

Opportunity for Improvement 1 (page 17)

DFES through its leadership role on the State Bushfire Advisory Council (SBAC) develop a strategy to support the reduction of fuel on land neighbouring government owned and/or managed land that is limiting the management of bushfire related risk on that government land. (Terms of Reference E).

Opportunity for Improvement 2 (page 18)

Forest Industry Federation Western Australia, in collaboration with DFES and FPC review the *Code of Forest Practice for Timber Plantations in Western Australia* to incorporate a contemporary approach to the management of bushfire risk including clear guidelines on residue windrow dimensions. The implementation of new elements need to be integrated into staff development and plantation management strategies. (ToR - C)

Opportunity for Improvement 3 (page 24)

a) WALGA and local governments through consultation with DFES, develop physical and financial arrangements that can assist landowners to reduce the heavy fuels on private land, particularly on the rural-urban interface. (ToR - E)
b) Local governments with support from DFES, conduct tailored and targeted information campaigns that change the behaviour of bushfire vulnerable communities. (ToR - A)

Opportunity for Improvement 4 (page 25)

WALGA, with project support from DFES develop an online system so that each local government can create a contemporary Section 33 Notice to reflect the integrated elements and local contexts for managing bushfire risk that can be hosted on the WALGA subscription service for local governments. (ToR - C and E)

Opportunity for Improvement 5 (page 30)

Local governments, through their Local Emergency Management Committees and in collaboration with DFES develop pre-season scenario-based exercises to test and practice emergency management arrangements to support learnings and development of effective strategies to prepare for fire weather events. (ToR - C and E)

Opportunity for Improvement 6 (page 31)

WALGA, in collaboration with DFES, develop a web-based, spatially enabled system of registering intention to ignite so that local governments can record a minimum amount

of information on burns being conducted on private land. This information could then be displayed on *EmergencyWA.*

Additionally, DFES, through consultation with DBCA and WALGA explore opportunities to utilise additional features available through *EmergencyWA* to map planned burns links to important situational awareness information and provide notification to registered users. (ToR - A, C, D and E)

Opportunity for Improvement 7 (page 35)

a) DFES, WALGA and DBCA through consultation with local government, Volunteer Bush Fire Brigades, Volunteer Fire and Emergency Services and Volunteer Fire and Rescue Service brigades to develop arrangements that will enable organisations to utilise existing local government equipment for planned burning activities, increasing capacity at a local level to implement bushfire risk treatments. (ToR - C and E)
b) DFES, through its RFD ensure its training programs for planned burning are supported by resourcing models that increase local participation. (ToR - C)
c) DFES, in collaboration with local governments, explore strategies that could engage interested and available people such as part-time workers, fly-in, fly-out workers or the unemployed in planned burn training and operations to increase capacity, build capability and certainty of bushfire risk treatment works scheduling. (ToR - C and E)
d) DBCA assess resource distribution and access to resourcing to provide greater support to the Great Southern Region for planned burning activities. (ToR - E)
e) DFES, DBCA and WALGA develop flexible resourcing options that can provide both state government organisations and local governments support when required to plan and undertake planned burning operations. (ToR - C and E)

Opportunity for Improvement 8 (page 37)

DFES, through the RFD works with government organisations and local governments to provide access to tools and information that can support situational awareness and decisions to burn or not burn. (ToR - A and E)

Opportunity for Improvement 9 (page 38)

DFES, DBCA through consultation with local government and other state government organisations review the number, format and form of the reports and briefings provided internally and externally for their relevance and usefulness.

The review should develop a product that is publicly available to support other organisations and private industries understand the current and forecast conditions that would influence fire behaviour and their operational activities. (ToR - A)

Opportunity for Improvement 10 (page 41)

WALGA, in collaboration with DFES, develop improved systems to achieve absentee land owner compliance with Section 33 Notices. (ToR - C)

Opportunity for Improvement 11 (page 41)

DFES with a small reference group of volunteers, DBCA and CESMs develop an advertising campaign for the 2019 Autumn season. (ToR - E)

Opportunity for Improvement 12 (page 45)

DBCA, DFES regions and local government CESMs review the current assessment criteria for reporting regional risk and resourcing to ensure that the process and consistency of information can inform a common understanding of the regional and state risk profile. (ToR - A)

Opportunity for Improvement 13 (page 45)

DFES and local governments in consultation with DBCA explore strategies to enable a resource sharing priority system to enable daily decision making between risk owners on planned risk treatment programs. (ToR - C and E)

Opportunity for Improvement 14 (page 46)

DFES through consultation with WALGA extend OBRM's Assurance Program to local government and FPC. (ToR - C)

Opportunity for Improvement 15 (page 48)

With support from the BCoE, government and non-government organisations incorporate a lesson learned approach into their business operations. (ToR - E)

Opportunity for Improvement 16 (page 50)

DFES and WALGA through consultation with DBCA develop basic burn security standards that can apply across tenures for land owners and land managers, volunteers and contractors. (ToR - E)

3 Introduction

The Australian continent and its vegetation have evolved over time to be largely adapted to fire. Fire has been used by the first people on the Australian continent and continues to have its place across the landscape (Gammage, 2012). Planned burning is used by government, non-government organisations, private landowners and managers to manage the flammable vegetation (fuel) on the land. During the autumn and spring seasons there is less bushfire risk relative to the summer months and so there is an increasing level of planned burning by land owners and managers.

On 24 and 25 May 2018, a severe weather event in the south of Western Australia resulted in the escape of planned burns on private property and Crown Land. These escapes became bushfires, and some resulted in damage to properties, stock and infrastructure. Whilst the first cold front of the winter season can be problematic at a local scale, it was the magnitude and scale of this severe weather event, coupled with relatively dry soil conditions that made this event exceptional.

The Government of Western Australia is committed to managing bushfire-related risk and requested DFES's Office of Bushfire Risk Management (OBRM) to undertake a review to examine what led to the escapes and how the risk of escapes in the future might be more effectively mitigated. The Terms of Reference for this review are presented in Appendix 1.

During its enquiries, the review team was continually reminded of the importance of fuel management in managing bushfire-related risk and the key role that land owners, volunteer firefighters and government agencies play in helping to protect regional communities from bushfires. The strong desire of the State Government to support fuel management to reduce bushfire risk to Western Australian communities has led to several identified opportunities for improvement detailed in the report.

Given the scale of the severe weather event across the SWLD, the review focussed on seven local governments within the Great Southern and South West Regions. Each local government had varying levels of planned fire activity prior to, and after, the 24 and 25 May. The local governments were the City of Albany and Shires of Denmark, Esperance, Harvey, Manjimup, Plantagenet and Ravensthorpe.

Participants in the review were representatives of the seven Local Governments, including volunteers, numerous landowners, and organisations with responsibility for managing fire including DFES, DBCA and FPC. A list of participants is provided at Appendix 3. Participants were open and honest in their views and opinions and allowed for some meaningful discussion and the identification of opportunities for improvement.

The review identifies the risk management strategies used by the various decision makers leading up to the event, makes an assessment of the effectiveness of these strategies and identifies areas where improvements can be made to reduce the likelihood and consequence of similar events in future. It was however highlighted to the review team, that whilst this large scale event is relatively infrequent, that the first cold front each year can still challenge state agencies and local governments annually. As such opportunities for improvement are designed to assist in the management of bushfire related risk at all times and are made for consideration by Government.

4 Context of the Planned Burning Season

4.1 Climatic and Seasonal Conditions

4.1.1 Historical

Western Australia's climate has changed over the past hundred years with a decline in autumn and winter annual rainfall over the SWLD. Climatic variations reported by BOM describe rainfall decline is as much as 20 percent over the lower South West where slight increases in average temperatures and reductions in ground water (therefore moisture) are also recorded. Figure 2 below depicts this declining trend in rainfall across the SWLD. Rainfall reductions are associated with the persistence of high pressure systems over the region. While heavy rainfall events can still occur, they are often interspersed by longer dry periods.

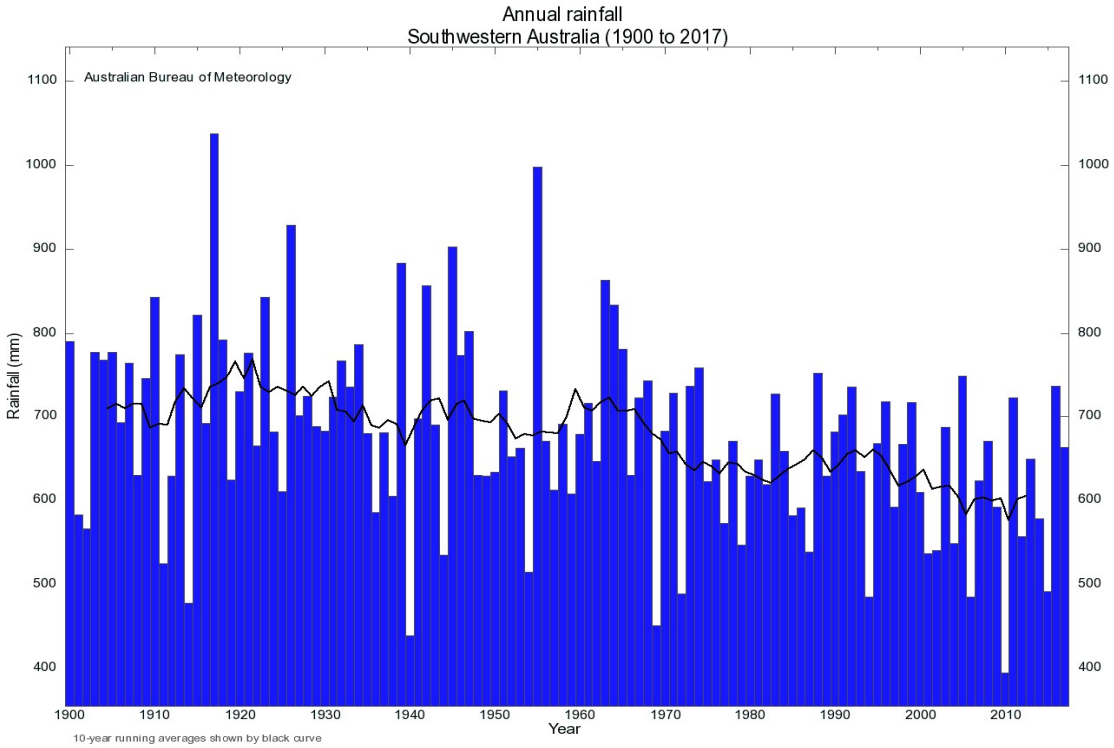

Figure 2. Annual rainfall reduction in the South West Australia. (BOM 2018)

Many of the people consulted for this review noted that bushfire fuels are now flammable for longer periods of the year. Some estimates of the length of the bushfire season suggest an increase of six to eight weeks compared to previous decades. Figure 3 highlights the noticeable decrease in rainfall relative to historical records leading into May.

These climatic trends and variable seasons, coupled with greater complexity across the landscape and increased risk mean fire managers, landowners and volunteers now require an improved understanding of fuel dynamics, fire behaviour and ecosystem responses in a warmer, drier climate.

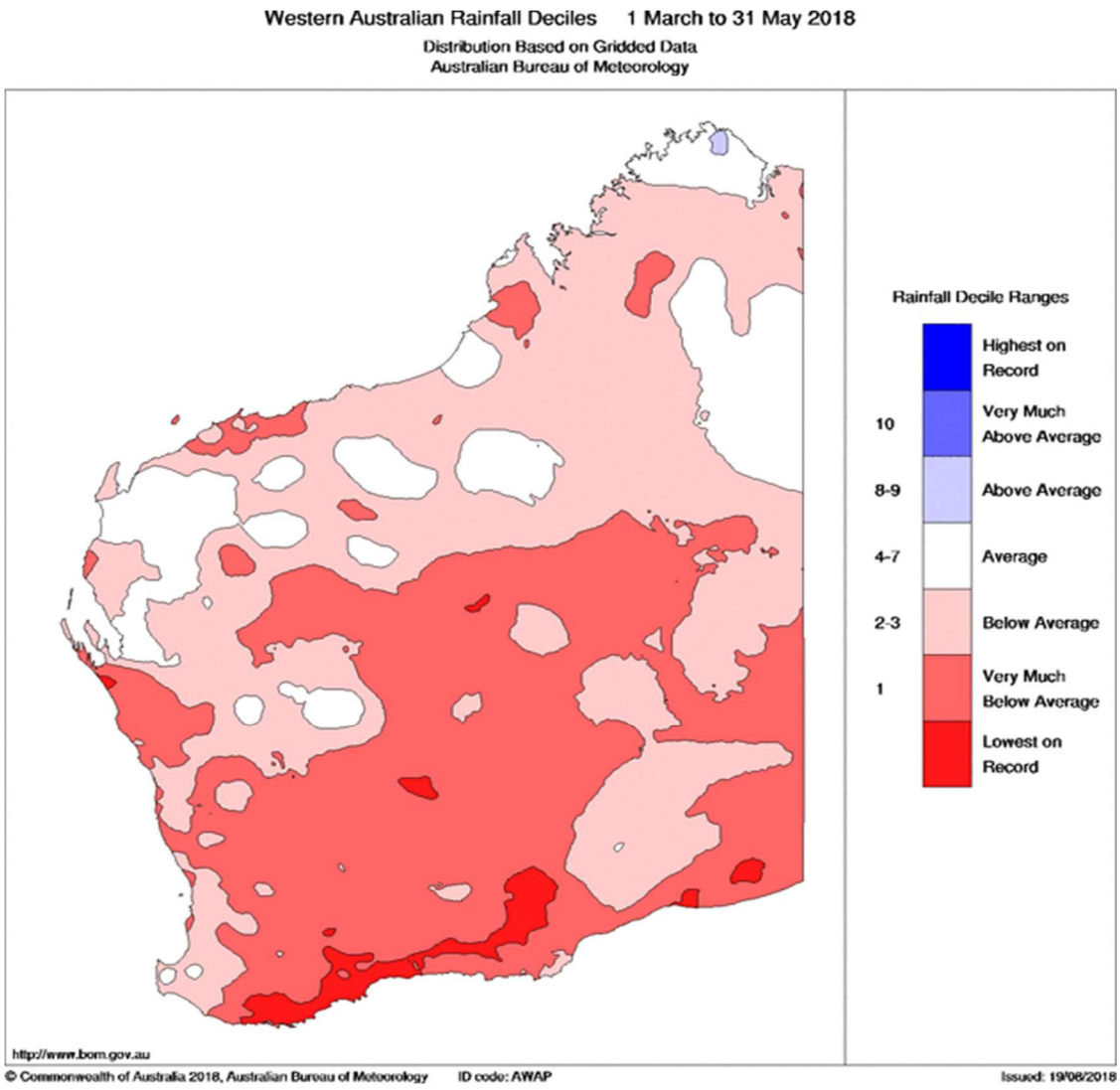

Figure 3. Rainfall deciles for Western Australia, 1 March to 31 May 2018. (BOM 2018)

4.1.2 The 2018 Autumn Season

Rainfall during autumn 2018 was the lowest for over a century in the SWLD. The area around Albany was particularly dry experiencing the lowest rainfall on record for both the autumn period and the month of May. Maximum temperatures ranged from above to very much above average for the autumn period extending well into May. Because of low rainfall and above average temperatures, soil dryness remained at above normal levels throughout the autumn months. Several localities exhibited an unusual trend of declining soil moisture (and therefore fuel moisture) during the first three weeks of May. Figure 4 below indicates that due to the warm and dry conditions during May, the Forest Fire Danger Index (a measure of dryness with meteorological variables for wind, temperature and humidity) was the highest on record in the South West. Pastures remained in a fully cured condition throughout much of the southern Wheatbelt and Albany areas meaning paddock fuels would also carry fire.

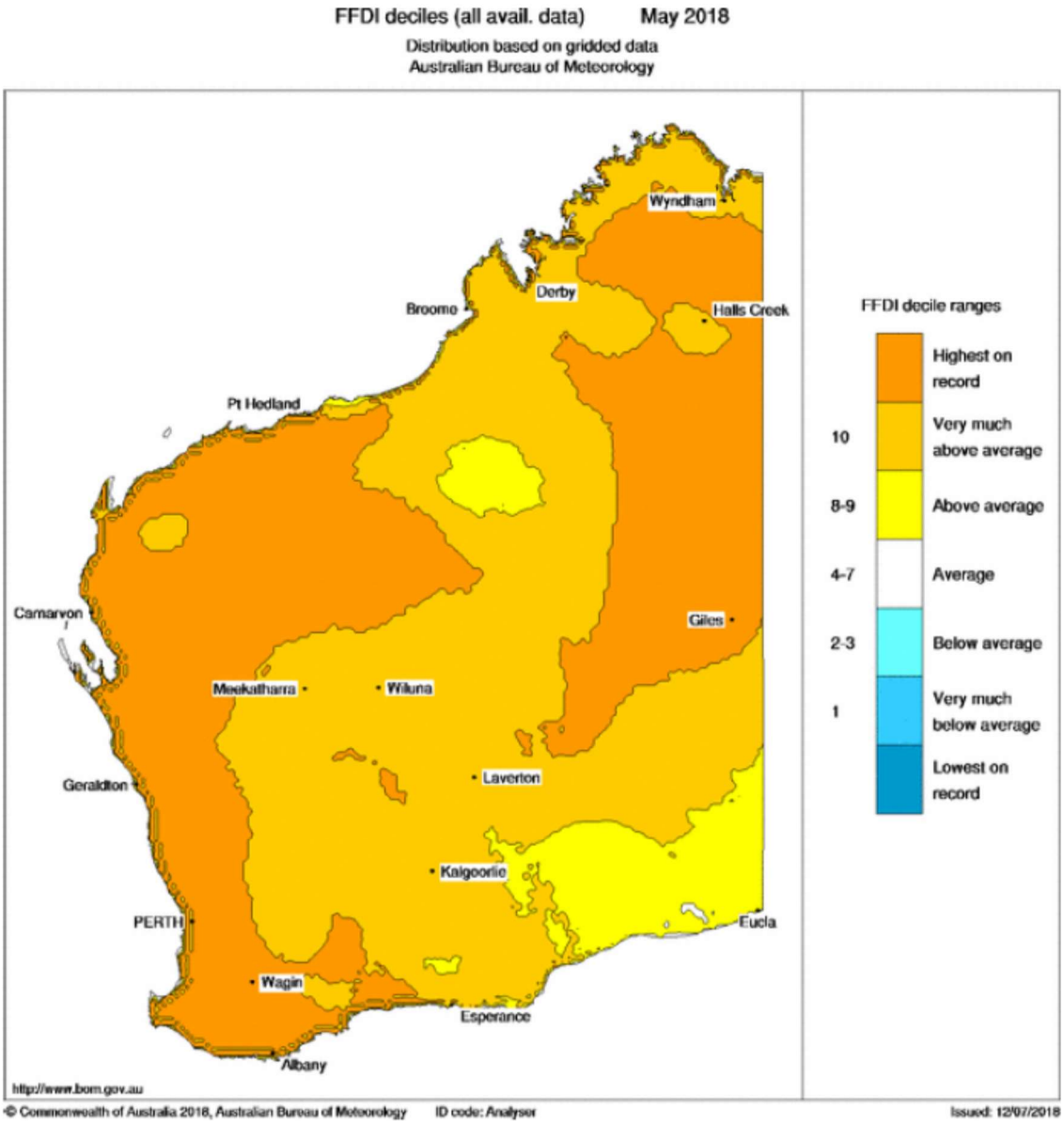

Figure 4. Forest Fire Danger Index (FFDI) deciles for Western Australia, May 2018. (BOM 2018)

Climatic and seasonal fuel conditions leading up to the severe weather event had been conducive to planned burning resulting in many active burns in the landscape on both Crown Land and private property. Forecasts of rain associated with the approaching weather event encouraged many landholders to ignite burns before the forecast rain arrived.

4.2 Fuel Load and Distribution

The landscape in the South West and Great Southern Regions has become highly fragmented since European settlement, with a mix of forest, agricultural, pastoral and settlement areas. Within this landscape, in particular the remnant forest areas, is a mosaic of fuels of varying ages. Many contributors to the review expressed concern over increasingly large areas of heavy fuels on both Crown land and private properties. In the case of the Great Southern Region, despite efforts of the Shires of Esperance,

Jerramungup and Ravensthorpe and state government organisations since the 2015 Cascade Fire near Esperance, heavy fuel on Unallocated Crown Land (UCL) between the farms and Rangelands remain a significant bushfire risk and concern.

Remnant vegetation fuel load on private semi-rural properties is of significant concern to adjoining land owners and managers, both government and non-government, endeavouring to manage fuel on their land. This is particularly relevant to expanding rural subdivisions located amongst coastal heath vegetation resulting from increases in "tree change" occupants. A process of reducing fuel loads on private land in complex and difficult to burn vegetation types is required.

Opportunity for Improvement 1

DFES through its leadership role on the State Bushfire Advisory Council (SBAC) develop a strategy to support the reduction of fuel on land neighbouring government owned and/or managed land that is limiting the management of bushfire related risk on that government land.

Timber plantations across the South West and Great Southern established in the past two decades have reached maturity and are now providing a consistent supply of timber products. Timber residues resulting from clear fell harvesting operations contribute to heavy fuel loads on the ground and in heaps. The layout and distribution of plantation residue fuels is seen to be a source of increased bushfire risk. The review team observed windrows of flammable residue, sometimes hundreds of metres long, stretching across entire plantation compartments and beside standing plantation and remnant vegetation and crops. The structure of residual material for burning is likely to extend the burn completion time compared to shorter, separated windrows that allow sections of the residue to be burnt over a period of a few days, inside more certain weather forecast timeframes. The *Code of Practice for Timber Plantations in Western Australia (2014)* addresses fire management standards for initial establishment however lacks specific standards for post-harvest burning. From the evidence seen during the review it appears that improved operational risk management practices are required to reduce the likelihood of plantation residue burns escaping during drier periods of the winter burning season.

Photo 1. This plantation residue burn escaped into State forest in May as moisture conditions declined. (Kevin Haylock 2018)

Opportunity for Improvement 2

Forest Industry Federation Western Australia, in collaboration with DFES and FPC review the *Code of Forest Practice for Timber Plantations in Western Australia* to incorporate a contemporary approach to the management of bushfire risk including clear guidelines on residue windrow dimensions. The implementation of new elements need to be integrated into staff development and plantation management strategies.

Designated officers issuing permits currently need to apply judgement to manage plantation residue burn risks. Clearer specifications could include pre-planning the maximum area of plantation burning that can be active on any given day given forecast weather and resource availability for the burn to proceed, to monitor and succeed in burning residual material. Training for plantation forester officers and volunteer firefighters is required to:

- Improve capacity to develop burn plans
- Develop appropriate permit conditions
- Implement planned burns
- Monitor burning operations.

4.3 Effect of Heavier Fuels on Fire Behaviour

The quantity of fuel available to a fire is directly related to fire intensity. As more fuel is available to burn, fire intensity increases. Combining high fuel loads with dry fuel conditions resulting from prolonged dry conditions and high wind speeds will cause re-ignition of burns and rapid spread of high intensity fires. Any source of ignition, be it smouldering charcoal or an active fire, is a potential source of bushfire.

Photo 2. Fire in light fuels (on left) will burn at lower intensity compared to fire in heavy fuels (on right). (Kevin Haylock 2017)

Undertaking planned burns adjacent to heavier fuels carries significant risk that a burn escape will result in a bushfire burning at higher intensity than the planned burn. This risk, as well as cost, limited understanding and experience of using fire as a tool and lack of physical resources at critical times of the year means land owners and managers are often unable or reluctant to deal with these fuels. This is a major impediment to achieving bushfire risk reduction across the landscape. Opportunity for Improvement 1 will go some way to addressing this issue.

4.4 An Inevitable Reality – Fire is Here to Stay

Given the climatic trend of a warming and drying climate in the South West and Great Southern coupled with the bushfire prone vegetation and scale of fuel and distribution of fuel ages across the landscape, bushfire is a reality of life in Western Australia.

Ignition source data compiled by DBCA for local governments in the South West and Great Southern between 2002 and 2017, indicate that a small proportion of bushfires initiate from planned burning (approximately 7 percent) and that 17 percent of bushfires are caused by lightning strikes. Nearly half of all bushfires are caused by deliberate human activity which requires the continuation of existing education and enforcement campaigns.

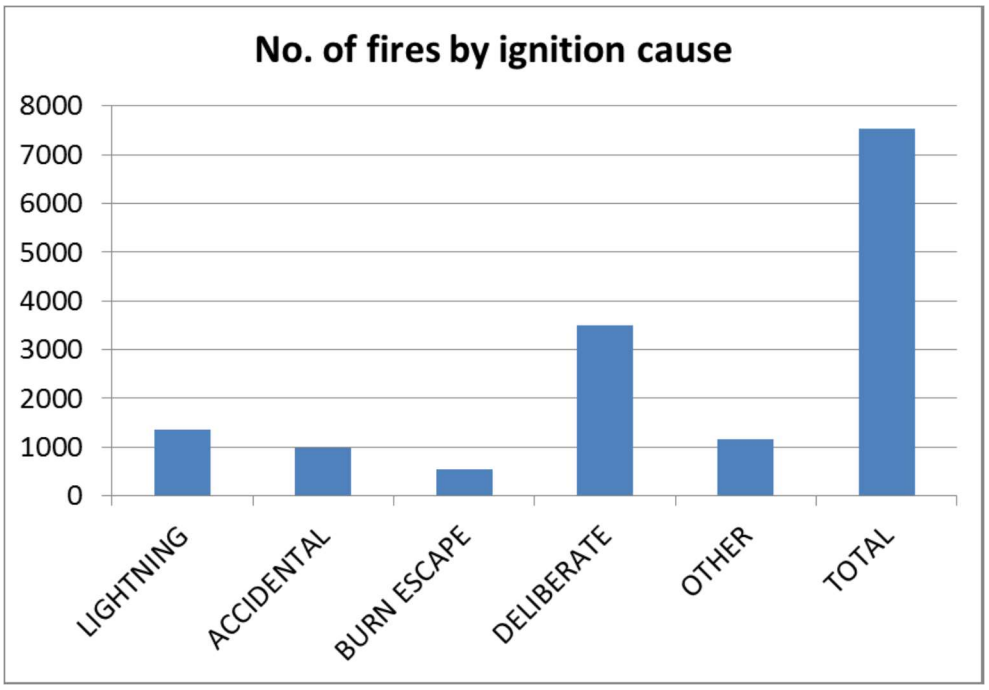

Figure 5. Fire Cause 2002 – 2017. (McCaw 2018)

Although lightning-caused fires are not the most prevalent, they occur during the summer months when fuels in the South West and Great Southern are dry. Lightning is also commonly associated with unstable weather conditions including strong winds. These factors combined with heavy fuels lead to significant areas being burnt by lightning caused bushfires.

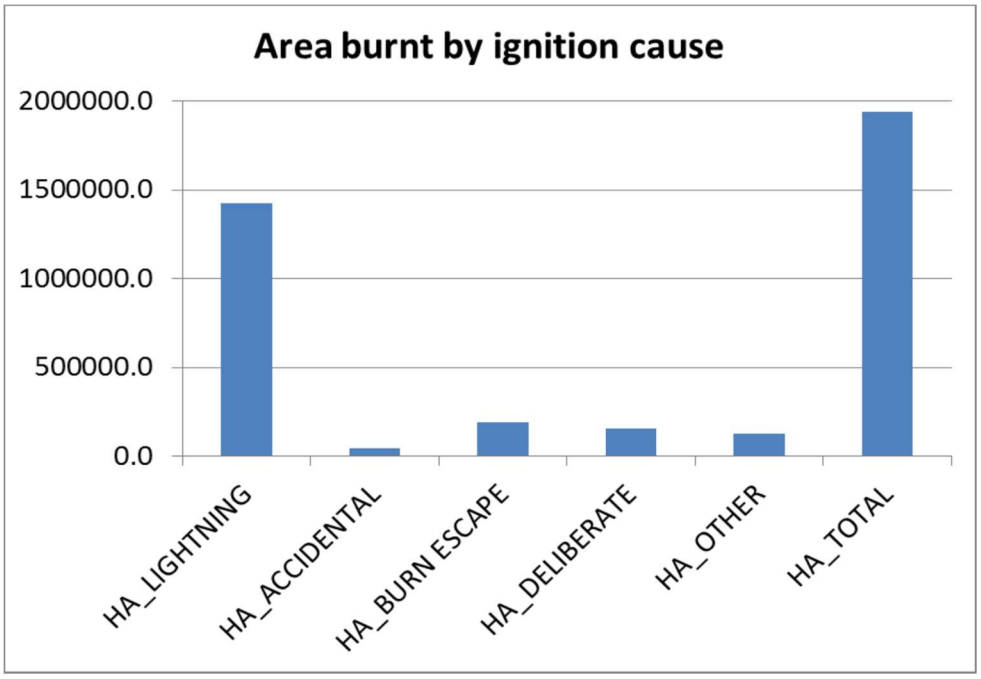

Figure 6. Fire Cause 2002 – 2017. (McCaw 2018)

The high proportion of area burnt by lightning-caused fires demonstrates the scale of bushfires that ignite irrespective of human involvement. Examples of recent bushfires

with devastating impact in Western Australia ignited by lightning include Esperance Cascade Fire in November 2015, Northcliffe and Boddington Fires in December 2015 and Waroona Fire in January 2016. The only means of mitigating the extent of lightning-caused bushfires is to reduce the fuels in which they may ignite.

4.5 Restricted and Prohibited Burning Times

The *Bush Fires Act (1954)* (the Act) allows for the imposition of a Prohibited Burning Time (PBT) during the higher bushfire risk periods, generally during summer. The dates for this period are set by local government in winter (usually June) so that the information can be included in the Rates Notice sent to all ratepayers. The beginning and end of the PBT can be altered by a maximum period of two weeks by a local government utilising an administrative process requiring publication in the *Government Gazette*. Any extension or reduction beyond this period requires the approval of the Minister for Emergency Services. No fires can be lit during this period without exemption from the Fire and Emergency Services (FES) Commissioner.

Before and after the PBT, the Act allows for the declaration of Restricted Burning Times (RBT) when fires can only be ignited under a permit system managed by local government. The permit is a risk management tool that imposes situationally appropriate conditions to each burn including resources and required notifications. The permit is issued by a legally authorised officer (Bush Fire Control Officer, or Chief Executive Officer) under the Act. The FES Commissioner or local governments can alter the dates of the RBT's by any length of time they consider appropriate to manage bushfire risk. Generally, local governments through their respective Bush Fire Advisory Council determine any alteration to the RBT. Once local governments lift the RBT, landowners and managers are able to legally burn without the approval of local government i.e. a permit. Subsequently there tends to be an increase in the number of burns across the local government as people perceive there is a reduced level of risk, do not feel they are being told what to do or do not want to impede on the Bush Fire Control Officer's (BFCO) time as they are often volunteers.

In 2018, several local governments extended their RBT after assessing local seasonal conditions. For some local governments, these assessments included consideration of the soil dryness and distribution of local rainfall. Other local governments had lifted their RBT prior to 24 May 2018, based on their assessments of local seasonal conditions and perceived reduction of bushfire risk. Table 1 below gives an outline of the burn restrictions in place across the seven local governments who were the subject of the review.

Local government	RBT Status at 24/5/18	Comments regarding extended RBT for 2017/18
City of Albany	Current in NE sector until 15/6/18. Ended in SW sector.	After fire events of 24/5 25/5 RBT in SW sector extended to 15/6/18.
Shire of Denmark	Ended.	No extension, ended on 30/4/18.
Shire of Esperance	Ended.	No variation.
Shire of Harvey	Ended.	Had been extended from 14/3/18 to 28/3/18.
Shire of Manjimup	Ended.	No extension, ended on 26/4/18.
Shire of Plantagenet	Current until 28/5.	Extended from 30/4 to 28/5 then again 28/5 until 11/6/18.
Shire of Ravensthorpe	Current - in force all year round.	

Table 1: Status of Restricted Burn Times in May 2018.

The permit is a simple tool to support local governments management of bushfire risk. The permit, when coupled with the Section 33 Notice provided to rate payers annually and published on each local government website can be effective mechanisms for local government to guide and require land owners to manage the bushfire risk on their properties and thus the potential impact of bushfire on their neighbours. This is discussed in section 4.7.

4.6 Tenure and Risk Management Responsibilities

Tenure arrangements generally separate responsibility for managing bushfire risk across the preparedness, prevention and response activities. In Western Australia, tenure arrangements can be complex. Further complexity can arise when agreements transfer responsibilities for management of fire on the land on behalf of someone else. For example, through a Memorandum of Understanding with the Department of Planning Land and Heritage, the DBCA is responsible for fire preparedness on UCL outside of gazetted townsites and DFES responsible for UCL within gazetted townsites. However, local government are responsible for bushfire response on UCL lands. A clear understanding of those responsibilities is important to ensure effective application of mitigation and response activities.

Recent determination of native title claims in the Norseman area has confirmed the rights of Aboriginal people to be engaged in land management on tenure where other government agencies previously acted with sole management responsibility.

Native title is a form of interest in land that recognises the unique ties Aboriginal groups have to the land and an ongoing system of traditional law and custom. In 2014, native title was determined for the Ngadju people. This means that any decision to conduct operations on Ngadju country must be made jointly with the Ngadju Native Title Aboriginal Corporation. Figure 1 depicts the area of determined Native Title for the Ngadju people.

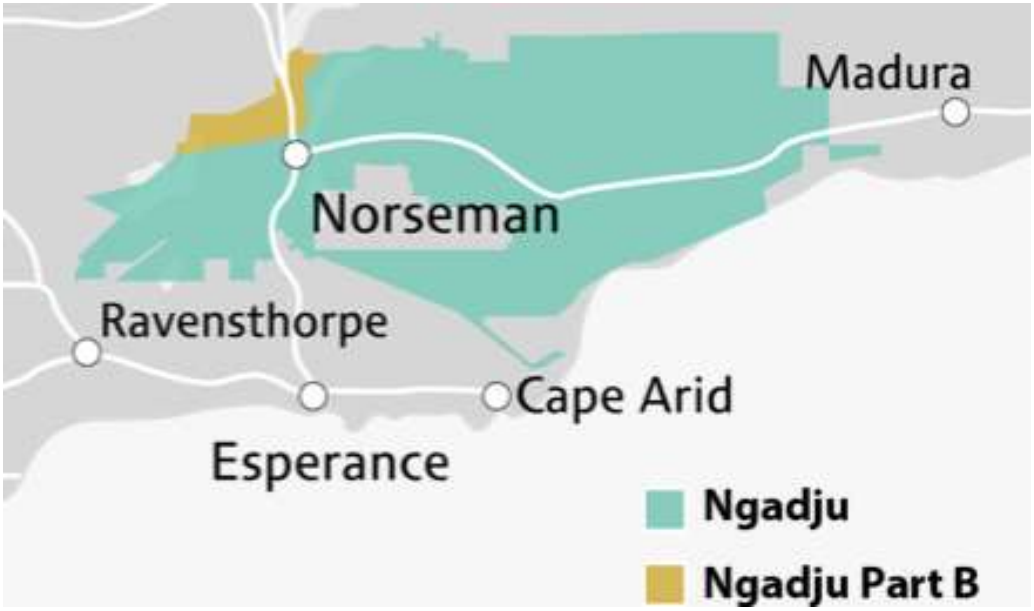

Figure 7. Map of the Ngadju native title determined areas. (Ngadju Native Title Aboriginal Corporation 2018)

Native title gives Ngadju people the right to hunt, gather natural resources, camp, erect shelters and manage and protect country. The need to better manage bushfire risk, coupled with native title rights, provides a unique opportunity to engage with Aboriginal people in land management, including planned and unplanned fire activities. The reviewers noted some local level arrangements in place in Albany and Esperance. DFES and DBCA are developing relationships with traditional owners in the SW so initiatives for land management and particularly bushfire risk can integrate and support traditional burning.

Future native title determinations or settlement will lead to further opportunities for collaboration and engagement based on tenure and bushfire risk management responsibilities. In relation of bushfire risk management, these additional complexities need to be understood by government and non-government organisations and their representative associations.

4.7 Community Profile and Fuel Management

Changes in land ownership, management and occupancy is considered a significant factor in increased bushfire risk. Contributors to this review were concerned about:

- Landowners' reduced experience and awareness of using fire as a tool to reduce fuel loads
- An increased proportion of landowners living outside the local government (up to 65 percent in the Shire of Denmark) leading to non-compliance with fuel reduction notices
- Residents' poor understanding of bushfire risk resulting in the development of houses being vulnerable to damage by fire
- Residents having an unrealistic reliance on emergency services to "take care" of fire issues
- Past poor planning decisions resulting in subdivisions vulnerable to bushfire
- Lack of action by state governments to effectively address the risks posed by vast tracts of Crown Land adjacent to agricultural land and rural communities
- The Bushfire Risk Management Planning methodology focussing primarily on townsite assets and lacking a strategic landscape-scale assessment of bushfire risk.

During this review, concerns were raised by local governments regarding their limited capacity to deal with a range of external circumstances. These include:

- Deficiencies in information systems to enable engagement with their communities in normal times as well as well during emergencies
- Lack of government incentives and physical assistance to (some) residents in bushfire vulnerable subdivisions to reduce bushfire risk to acceptable levels
- An almost overwhelming increase in fuel loads across the local government.

Opportunity for Improvement 3

a) WALGA and local governments through consultation with DFES, develop physical and financial arrangements that can assist landowners to reduce the heavy fuels on private land, particularly on the rural-urban interface.

b) Local governments with support from DFES, conduct tailored and targeted information campaigns that change the behaviour of bushfire vulnerable communities.

Several local governments interviewed indicated they were in the process of improving their Section 33 Notices, commonly referred to as 'annual firebreak notices'. Primarily these reviews were to provide a more informative and prescriptive format aimed at achieving lower bushfire risk. The review recognised that Section 33 Notices were generally developed without integration of other bushfire risk mitigation strategies developed as part of the bushfire reforms after the Perth Hills and Margaret River bushfires of 2011. This limits the effectiveness of the notice and arguably reduces the cost benefit and risk reduction associated with the mitigation activities within the local government. Concerns include one-off treatments being applied without ongoing

maintenance resulting in assets and occupants becoming exposed to increased bushfire risk and emergency responders' safety being unnecessarily endangered.

Section 33 Notices issued by local governments imply by their title as 'Annual Firebreak Notices,' that the establishment of firebreaks is an adequate means of addressing bushfire risk. The City of Albany has recently revised its Section 33 Notice to provide detailed, measurable standards for access, asset protection and low fuel maintenance. The notice remains a legal document, issued under Section 33 of the *Bush Fire Act 1954*, detailing mitigation measures that local governments require to be in place for a specified period of time. There is variability across local governments in-regards to the period on which different treatments, including fire breaks or low fuel states are required on land. In the interests of mitigation measures that local governments can incorporate into their Section 33 Notice, it would be worthwhile developing an online system that each local government can access to design their template notice each year. A similar mechanism was developed in 2018 for local governments to design their own permit.

A broader roll-out of the improved notice would be of benefit to other local governments.

Opportunity for Improvement 4

WALGA, with project support from DFES develop an online system so that each local government can create a contemporary Section 33 Notice to reflect the integrated elements and local contexts for managing bushfire risk that can be hosted on the WALGA subscription service for local governments.

5 Fire Events of 24 and 25 May and What Could Be Improved

5.1 What happened

On 24 and 25 May 2018 a cold front passed through the southwest of Western Australia that featured very strong winds with gusts recorded at, over, 120km/hr and a warm air mass ahead of the winds. In the week prior to the weather event (from the 21 May 2018), 196 fires were reported to DFES within the South West and Great Southern Regions as can be seen from Images 1 and 2.

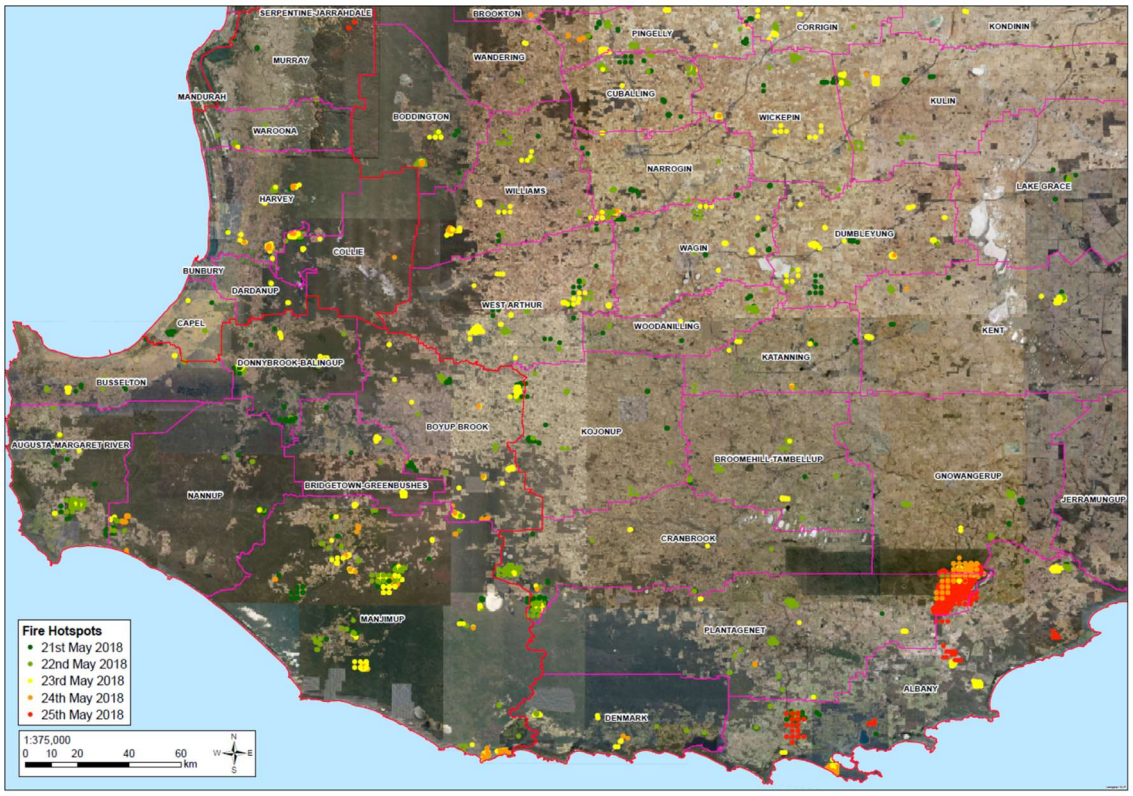

Image 1. The hotspots for fires in the South West Region detected for 21 through to 25 May 2018. (DFES 2018)

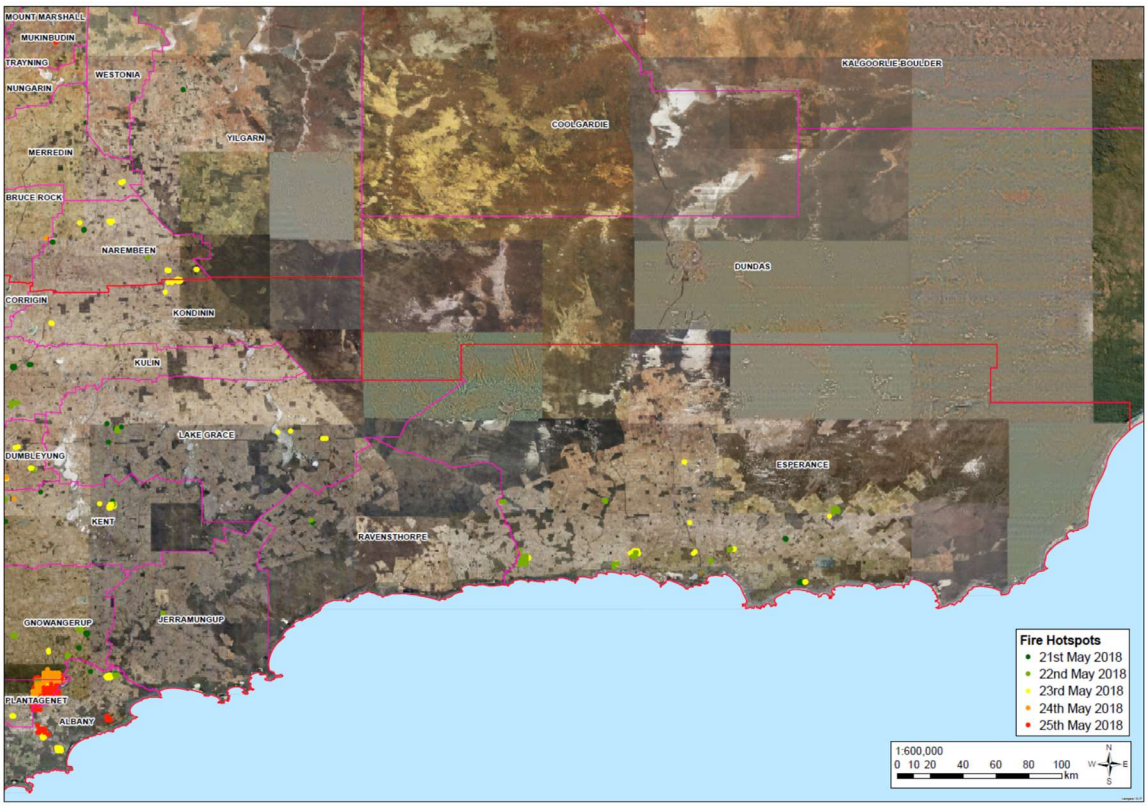

Image 2. The hotspots for fires in the Great Southern Region detected for 21 through to 25 May 2018. (DFES 2018)

Of these 196 reported fires, 118 were reported to DFES on the 24 and 25 May. The table below shows the number of reported fires for the seven local governments interviewed for the review for the few days prior to the severe weather event and then proceeding it.

Local Government	Reported fires 21-23 May	Reported fires 24-25 May
City of Albany	10	43
Shire of Denmark	8	16
Shire of Esperance	0	0
Shire of Harvey	3	9
Shire of Manjimup	7	5
Shire of Plantagenet	1	4
Shire of Ravensthorpe	0	0

Table 2. Number of reported fires to DFES (DFES 2018)

Table 2 is likely to underestimate the number of fires (planned or unplanned) as there is no requirement to notify DFES of the intention to burn once the RBT has ceased. In this case, the SW sector of the City of Albany, Shires of Denmark, Esperance, Harvey and Manjimup did not have RBT in place and may have had more fires on 21 to 23 May.

Image 1 and Image 2 provide a satellite image of the hotspots in the weeks prior to and including the week of 21 to 25 May, demonstrating the amount of fire in the landscape

during May and in particular the number of live burns, depicted as red dots, during the week of the severe weather event.

There were six planned burns that became bushfires in excess of 50ha across the seven local governments. These were the Chester Moonah bushfire (Shire of Manjimup), Napier bushfire (City of Albany), Peaceful Bay bushfire (Shire of Denmark), Redmond bushfire (Albany), Stirling Range bushfire (Shire of Plantagenet and City of Albany) and Torndirrup bushfire (Albany). The Napier, Peaceful Bay and Redmond bushfires which arose from private property burns resulted in the loss of some tourism chalets, one house, two container sheds, one shed and fencing. The Stirling Range bushfire resulted in agricultural losses such as fencing, stock, soil and timber plantation assets.

The DBCA undertook a review into the three escapes from the planned burns on their estate, attached at Appendix 5. Of the three bushfires Chester Moonah, Stirling Range and Torndirrup, the cause of Chester Moonah was uncertain and may not have been an escape from the burn, the Stirling Range bushfire resulted from an escape, and the Torndirrup bushfire was contained by previous planned burning within the National Park.

5.2 Weather Forecasts and Local Knowledge

The Bureau of Meteorology (BOM) prepared an account of the weather conditions across the South West of Western Australia during the period leading up to, and including, the weather event and fire outbreaks of 24 and 25 May (see Appendix 6). The report includes information about conditions that occurred in previous burning seasons and the season leading up to the event. It also addressed weather conditions, fire danger indices, and incident weather forecasts issued between 23 and 26 May 2018.

The approaching strong cold front affecting the entire SWLD was mentioned in the outlook with forecast dry and gusty northerly winds followed by the arrival of a strong front late on 24 May, likely to bring heavy rainfall (>30 mm). There was little change to the outlook over the next four days, with a prediction on 21 May of rainfall of up to 10 mm extending eastwards as far as Albany on 24 May and a rapidly declining rainfall gradient further to the east. This forecast indicated that on 25 May winds ahead of the front would be fresh to strong and gusty from north to north-west, corresponding to surface wind speeds up to about 60 km/hr.

Fire Weather Warnings are issued to the public by BOM when the forecast Fire Danger Ratings (FDRs) are Severe, Extreme or Catastrophic. The afternoon forecast Fire Danger Ratings (FDRs) for the Beaufort, Leeuwin, Stirling Coast and Stirling Inland fire weather districts are summarised in Table 3. Only once did the FDR reach Severe. Public warnings were predominantly Severe Weather Warnings that focussed on destructive winds. Public consciousness was, therefore, focussed on risk management associated with severe storms (rain and wind) rather than fire.

Fire Weather District	Forecast Issued			
	20 May pm	21 May pm	22 May pm	23 May pm
Beaufort	High	High	Very High	Very High
Leeuwin	High	High	High	High
Stirling coast	Very High	Very High	Very High	Very High
Stirling inland	Very High	High	Very High	Severe

Table 3. Forecast Fire Danger Ratings for 24 May 2018. (BOM 2018)

The forecast prompted many landowners and managers to ignite burns prior to the front arriving with the expectation that burns would be complete before the arrival of the forecasted front and predicted rainfall. Relying on rainfall to assist in securing burns is a traditional, and mostly successful, risk management practice across the south of the state utilised by both Government agencies and private land owners to burn windrows, stubble or other vegetation.

The BOM report notes that the northerly pressure gradient over the South West was unusually strong during this weather event, ranking equal sixth in strength for May based on a 67-year climatological period from 1952 to 2018. It was 30 years since a northerly pressure gradient of this strength was recorded in the month of May.

Despite BOM staff reporting in their Emergency Services Weather Briefing of 23 May 2018 that the southwest of Western Australia typically experiences a front as windy as this about five time a year, the autumn weather conditions experienced during 24 and 25 May 2018 were uncommon and given the last event was 37 years ago, beyond the experience of many decision makers. For the most part, contributors to the review believed BOM's weather forecast underestimated wind strength and overestimated likelihood and amount of rainfall. The BOM advice for the Stirling Range provided to DFES through the Emergency Services Weather Briefing and issued to the Emergency Services Sector through the BOM registered user pages, indicated that weather forecasts particularly wind strength and precipitation were reasonably accurate and consistent.

Several contributors who had lived close to the Stirling Ranges for decades gave accounts of the localised effects of north-easterly winds including a "rotor" effect resulting in significantly increased wind speeds and history of no rainfall being associated with those winds.

The rotor is a closed, vertical circulation that develops in the lee of high mountain barriers, or in the valley between two mountain ranges, when conditions are appropriate. The rotor is a form of lee eddy that causes surface wind to flow in the opposite direction to the gradient wind. Rotors are often associated with extreme wind speed and turbulence. In the instance of the Stirling Range, light southerly wind was registered at the Stirling South Automatic Weather Station. The southerly wind factored with the high wind speeds (80 to 95km/hr) from a northerly direction observed at the

Albany Airport at 7:00am on 24 May and similar to the winds observed earlier in the morning in the Stirling Ranges would have been a significant contributor to the rotor effect and erratic fire behaviour reported by locals near the Stirling Range.

5.3 Planned Burn Escapes

A comparison of the planned burn escapes in Table 2 demonstrates the impact that weather conditions had on the number of escapes across the seven local governments. Local governments involved in the review had varied approaches to receiving, managing and disseminating information prior to the severe weather event, maintaining an awareness of fire in the landscape and preparing the community and resources for the severe weather event. During these discussions it was clear that:

Working arrangements that facilitate collaboration between fire organisations differ across South West and Great Southern local governments. In the Shire of Manjimup, a high percentage of employees, volunteers and fire officers have decades of experience in their respective roles and a high level of cooperation and collaboration is evident with other local agencies such as DFES and DBCA. Strong personal networks strengthened through professional and social activities provides a sound basis for interaction in fire management. While relationship-based systems work well in this example, evidence was provided of plantation burns escaping where younger, less experienced fire managers were working in isolation from this stable, knowledgeable network of local fire managers. Building and maintaining effective relationships are critical to effective management of bushfire.

In Denmark, shortfalls in appreciating the fire potential of the forecast weather event and the fire response were raised by the Shire. The Shire believe a significant contributor to this performance was reliance on a few, highly skilled and experienced individuals who were on annual leave leading up to and during the severe weather event. The Shire is subsequently reviewing its risk management systems to reduce the likelihood of being in a similar situation in the future. A systems-based approach that is less reliant on individuals for success can improve the robustness of risk management when coupled with appropriate training, supervision and support for fire managers and volunteers.

Opportunity for Improvement 5

Local governments, through their Local Emergency Management Committees and in collaboration with DFES develop pre-season scenario-based exercises to test and practice emergency management arrangements to support learnings and development of effective strategies to prepare for fire weather events.

Fire managers in some local government areas where the RBT had been suspended did not know where planned burns had been implemented, the size of burns, the fuel types being burnt, the name and contact details of the people undertaking planned burns,

precisely how many planned burns were burning, how many were contained and how many were complete. This made risk appreciation and treatment leading up to the event much more difficult. Having a clear understanding of burning activities would have enabled fire managers to effectively communicate with land owners undertaking burning to reduce the risk of escapes prior to the arrival of the weather event. It would also have provided response crews with a much-improved focus on where to allocate limited suppression forces when burns escaped.

Local governments already have the option of extending the RBT throughout the year so that there is only a PBT during summer with the remainder of the year being covered by restricted burning conditions. While extending RBT is relatively simple to do, the consequence of doing so would, in some cases, increase the workload on volunteer bushfire control officers with a significant increase in travel, fuel inspection and permit writing during a relatively low risk time of year.

A suggestion from the Shire of Harvey was to develop a registration system during the low risk period outside PBT and RBT that enabled fire managers to be informed of burning activity. Register details would include a person's name, their location and contact telephone number so that if the fire danger increased, efforts could be efficiently directed to enquiring on burn status and acting where necessary. Other local governments considered tailoring the system to their risk profile by including details of burn size and vegetation type.

Having the registration system linked with the DFES *EmergencyWA* website would be useful to provide fire managers and importantly state government organisations with a better understanding of the quantity and status of burns in the landscape. This could then support decisions about preparedness messaging including TFB and strategic resource allocation and placement prior to known fire weather events.

Opportunity for Improvement 6

WALGA, in collaboration with DFES, develop a web-based, spatially enabled system of registering intention to ignite so that local governments can record a minimum amount of information on burns being conducted on private land. This information could then be displayed on *EmergencyWA.*

Additionally, DFES, through consultation with DBCA and WALGA explore opportunities to utilise additional features available through *EmergencyWA* to map planned burns links to important situational awareness information and provide notification to registered users.

5.4 The Extent of Planned Burning

Although planned burning is increasingly complex, experience of the past 30 years in this State, on the East Coast of Australia and overseas has shown a very clear

relationship between planned burn achievement and reduction in bushfire (see Figure 8 below). Reduction in bushfire through an increase in planned fuel reduction results in a lower cost of fire management, a minimisation of asset loss and a much lower risk of human loss of life and livelihood arising from high intensity bushfires.

The reviewers inspected the Torndirrup bushfire ground, acknowledging that the images portrayed in the media were dramatic because of the age of unburnt fuels and the associated weather. The bushfire was contained within an area that had a younger fuel age and low fuel volume (load) due to planned burning in September 2016. These low fuel areas were used as anchor points on which to manage the bushfire from. This proved effective in-regards to managing the fires progress and providing a safe point for fire crews to work from. This demonstrated the benefit that fuel reduction had in managing a high intensity fire.

The largest burn escape from the May severe weather event burnt 18,000 hectares of farmland in the South Stirling's area. The DBCA's review highlighted the resourcing available for the burn, based on the four-day weather forecast, as being limited but suitable at the time. In retrospect the review acknowledged that greater resourcing would have enabled the completion of the edging of the fire prior to the deterioration of the weather. This would have reduced the likelihood of an escape.

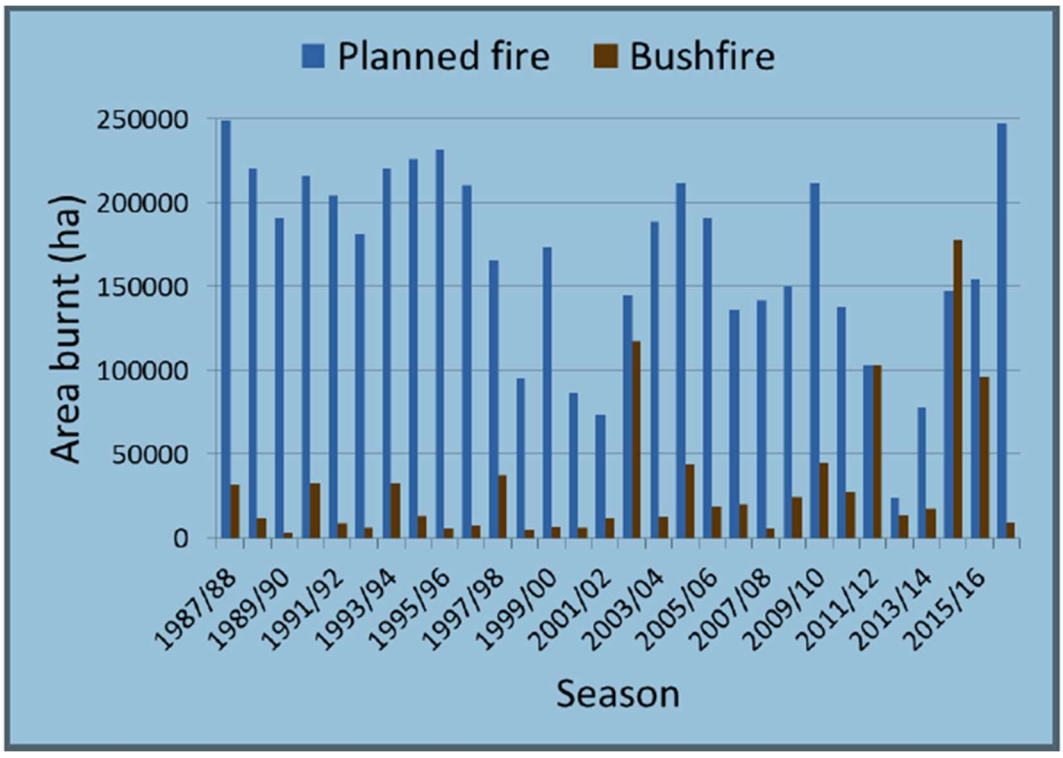

Figure 8. 30-year history of area burnt and bushfires in the Swan, South West and Warren Region of Western Australia. (McCaw 2018)

A high percentage of contributors commented that the resources currently available to them was a limiting factor in safely achieving the required fuel reduction burn program.

Most saw a need for additional resources or greater collaboration across all organisations to improve the use of existing local resources.

Representatives of state government agencies, local governments and volunteer bushfire brigades commented on the difficulties of achieving enough fuel reduction through planned burning to adequately reduce reliance on costlier, and potentially higher risk, bushfire response. For each fire organisation to expand its own fuel reduction program would require additional fire vehicles, more trained people and additional funding.

Limitations on the DBCA's planned burn program include having only two fire trucks available for the entire Albany District. Although the organisation can, and does, allocate trucks and fire crews from the forest regions to conduct planned burns in Albany, this is a costly exercise and a draw on the planned burn programs for those regions. This example of resource need is replicated for all other organisations in the South West and Great Southern Regions that contributed to this review.

The South West and Great Southern Regions have high quality fire equipment and vehicles belonging to local government and brigades that are substantially employed in bushfire response rather than fuel reduction through planned burning. The reviewers acknowledge the efforts Government and DFES are making to invest in mitigation and better integration between organisations, local government resources and volunteers. Since the Waroona bushfire, the Forest Industry Federation of Western Australia has been working with DFES to develop brigades to improve the Industries ability to protect plantation and ultimately community assets from bushfires through planned burning and response to bushfire incidents. The reviewers note these pleasing developments reflecting a shared responsibility.

The South West and Great Southern Regions have high quality fire equipment and vehicles belonging to local government and brigades that are substantially employed in bushfire response rather than fuel reduction through planned burning. The experience gained through planned burning is an effective means of managing risk associated with response activities to bushfire. The shift into prevention and preparedness and improved focus on planned burning is an important feature to better protect communities and fire fighters in the short, medium and long term.

Government has made significant investment into providing greater internal capacity for DBCA to conduct their planned burning activities. This has enabled, the organisation to work towards achieving its objective of an average forest fuel age in the South West Bushfire Zone by having additional, mobile resources that can support regional planned burning priorities. Exploring innovative ways of better utilising the existing fleet of fire equipment and vehicles from all organisations and associations to increase strategic planned burning would be worthwhile. This will enable greater fuel management,

improved utilisation of existing equipment and provide greater opportunity for collaborative work across organisations and associations.

After resources, the second greatest limiting factor referred by contributors to this review was the availability of qualified people to plan and conduct burns. Opportunities for locally-delivered training for local people, including volunteers, state and local government employees and Aboriginal Ranger Trainees are being explored through DFES and the Bushfire Centre of Excellence. Training will address both theoretical and practical aspects of planned burning and be relevant to the fire environment and fuel types in each local area. Engaging with sectors of the community who may be interested, though currently not participating, in part-time work focussed on planned burning should also be explored.

Additional capacity is an imperative as seasonal conditions are beginning to strain existing state and local government resources. The shortening of the wetter winter period reduces the period of time that emergency services personnel have to recharge their batteries prior to the spring planned burning operations and summer bushfire season. This in turn will put a greater pressure on volunteer resources to support fuel and fire management across the regions. The reviewers discussed the merits of having a pool of volunteers who may be available intermittently and willing to be available to assist with planned burning, but on a retainer/paid basis. Several local governments through there may be merit in such a model and appreciated that there may be associated complexity with legal and industrial arrangements. This additional capacity will be locally based and provide for more experienced volunteers and enhanced response capabilities.

In the case of the Great Southern Region, there is a large expansive landscape of unmanaged crown land and both DFES and DBCA have less than two full-time-equivalent personnel based in Esperance with focused planned fire management roles. However, DBCA acknowledged that most of their staff within the Regions are available to assist with planned burning and the response to bushfire. The DBCA review acknowledged the resource deficiency and has identified an opportunity for improvement to take a different approach to the resourcing and management of large, complex burns outside the South West Forest districts. DFES has acknowledged the strain on existing resources and has developed an Upper Great Southern Region enabling the resources within the Great Southern Region to focus on the southern portion of the previous region.

The availability of optimum conditions for conducting planned burning will vary greatly according to annual and seasonal conditions. For example, extended summer conditions with opening rains that persist throughout autumn and winter months can significantly reduce burning opportunities due to conditions being too dry and then immediately too wet for safe and effective burning.

Generally, funding models offer limited flexibility to organisations using planned fire to manage bushfire risk. Funding is offered for short-term annual programs of work that may not be available to provide internal resource capacity for state government organisations to either plan or conduct burning operations. Overlayed with variable seasonal conditions, resource allocation becomes further constrained. However, DBCA have been provided flexible funding over a four-year period via the Government's Enhanced Prescribed Burning Program. This has enabled the hiring of additional resources who can migrate between planned burns and has proven useful in supporting the organisation's achievement of exceeding its annual burning target for the past two years in the South West Forest Zone. This funding ends in 2018-19 and has been viewed as a successful mechanism to begin to bring strategic fuel age back into environmental target ranges.

DFES has a State-Wide Operational Resource Division (SWORD) that supports planned burning and response. This consists of Perth metro-based volunteers available to support planned burning or response activities across the state.

Flexible resource allocation models for local governments and state government organisations would enable utilisation of optimum seasonal conditions. This would provide a 'pool' of resources to assist planned burning activities to be conducted and more effectively manage the risk of a fire escape.

Opportunity for Improvement 7

a) DFES, WALGA and DBCA through consultation with local government, Volunteer Bush Fire Brigades, Volunteer Fire and Emergency Services and Volunteer Fire and Rescue Service brigades to develop arrangements that will enable organisations to utilise existing local government equipment for planned burning activities, increasing capacity at a local level to implement bushfire risk treatments.

b) DFES, through its RFD ensure its training programs for planned burning are supported by resourcing models that increase local participation.

c) DFES, in collaboration with local governments, explore strategies that could engage interested and available people such as part-time workers, fly-in, fly-out workers or the unemployed in planned burn training and operations to increase capacity, build capability and certainty of bushfire risk treatment works scheduling.

d) DBCA assess resource distribution and access to resourcing to provide greater support to the Great Southern Region for planned burning activities.

e) DFES, DBCA and WALGA develop flexible resourcing options that can provide both state government organisations and local governments support when required to plan and undertake planned burning operations.

5.5 Available Information and its Dissemination

The BOM provides comprehensive weather forecasts to DFES, DBCA and local government through formalised communication structures primarily on a Monday and Thursday as part of the DFES State Operations Centre (SOC) Operational Preparedness Briefings (OPB). This frequency can be increased depending on the forecast weather conditions or as incidents require. In the instance of a severe weather event, daily briefings were provided by the BOM Meteorologist permanently stationed within the SOC (SOCMET). The permanent stationing of a SOCMET enables DFES to factor forecast conditions with internal intelligence reports, DFES regional reports regarding resource availability and perceived risk and DBCA verbal updates on bushfire activity.

The reviewers found that the conduit between the SOC and DFES Regions and local government Community Emergency Services Managers (CESMs) was reasonably sound. CESM's participate in the weekly meetings, or higher frequency as required. These weekly briefings can be useful for informing regions and local governments of the forecast conditions so they can then assess what it means for their local government. The DFES Situational Awareness Officer, based in the SOC also provides a Daily Forecast and Rate of Spread to a broad range of stakeholders across DFES, DBCA and local government.

One of the observed limitations of the briefings are that they do not currently integrate an agreed view on assessing risk between DFES, DBCA and local government. Through consultation with DFES, DBCA and local government officers for the review, there was limited knowledge of the level and scale of fire in the landscape prior to the severe weather event and thus a limited understanding of resource requirements or their availability. The effectiveness of the OPB could be enhanced through a review of how risk is meaningfully and consistently considered and reported by contributing organisations through regional arrangements. This review should consider how this assessment of risk and a consistent understanding of the risk profile at a regional and state level could give a greater appreciating of the current and forecast risk and support the decisions of both DFES, DBCA and local governments.

DEFS has recently developed an intelligence function that develops and promulgates a weekly report of various hazards including bushfire. The report is titled *Western Australian DFES Weekly Intelligence Briefing (WIB)* and discusses the probabilities of hazards across the Regions of Western Australia, not only bushfire. It integrates the forecast weather conditions and seasonal indicators to provide a very high level of situational awareness and key assessments for those hazards for each of these regions. The briefing is issued on a Wednesday and provides the DFES regions with a high level of information that can support their assessment of risk and resourcing requirements to report back the following day to the SOC during the OPB.

The RFD is well placed to develop tools that can support regions in determining whether the undertaking of planned fires is appropriate at a particular point in time or not through a tool that integrates fire prediction tools with forecast weather and fire behaviour models for Western Australia. The ability to couple intelligence with situational awareness to inform decisions will be a powerful development for DFES, DBCA and others with access to this information and tools.

Opportunity for Improvement 8

DFES, through the RFD works with government organisations and local governments to provide access to tools and information that can support situational awareness and decisions to burn or not burn.

Many of the people that the reviewers met highlighted how much information was available to help inform their decisions. Some CESMs rely on multiple weather sites to validate and cross reference information to assist in making decisions to burn or not to burn or issue warnings. Others rely on information gathered through teleconferences or available through other networks to inform their decisions. It was apparent that there was no one source of truth and an increasing volume of 'information' available to them. This 'volume' has the disadvantage of swamping decision makers with detail rather than providing a concise level of meaningful information with a high degree of confidence to inform their decisions.

Similarly, there are a variety of other reports generated within DFES and tailored for different internal and external audiences. It was unclear to the reviewers of the relevance or usefulness of some of this information for the respective audiences and it appeared as more information became available it was being included in various reports without knowing if it was required or useful. Given the amount of new information available to inform decisions makers it would be worthwhile undertaking an assessment of the various reports developed by DFES and their distribution to see if there are some efficiencies that can be gained.

As more organisations and contractors utilise fire to manage fuel on the land, providing access to meaningful information that could assist in their management of fire related risk would be important. It would also be useful for the proposed review of information to consider who the relevant recipients of this information may be, how some can be made publicly available and where this information may be easily accessible.

Opportunity for Improvement 9

DFES, DBCA through consultation with local government and other state government organisations review the number, format and form of the reports and briefings provided internally and externally for their relevance and usefulness.

The review should develop a product that is publicly available to support other organisations and private industries understand the current and forecast conditions that would influence fire behaviour and their operational activities.

The close working relationships between fire management personnel across jurisdictions facilitated the effective exchange of information in many areas of the state during the severe weather event. Timely and accurate information exchange was significantly compromised where personnel involved in these relationships were absent (e.g. on holidays) or where these relationships were less well developed. The strength of these personal relationships had a significant impact on the ability of individuals and groups to appreciate the fire risk associated with the weather event and to develop and implement risk management strategies prior to the weather occurring.

Many volunteer bushfire brigades use social media (Facebook, WhatsApp and Twitter) to share information and keep up to date with events and discussions in the surrounding and broader community. A plethora of information, sometimes inaccurate, now confronts volunteers and local governments through some of these platforms. Ideas put forward by several volunteer brigades involved linking their social media pages with a state government messaging service that could ensure correct and up-to-date fire and weather information was accessed and could be further disseminated.

An opportunity for improvement is made regarding the DFES' working with volunteer brigades to improve information sourcing and distribution. The means of disseminating correct information on burns, bushfires, weather, restrictions and any other useful information needs to be tailored to the needs of the brigades so that they can effectively distribute the information to their members and other stakeholders.

The intention is to raise awareness of bushfire risk including a pre-winter assessment of volunteer brigades' capacity to defend individual homes. Local governments utilising these strategies have reported a positive response and the establishment of useful networks in the community; however, non-rate-paying residents are more difficult to identify and engage with. Local governments have also utilised social media to create and maintain information flows to residents. Websites and social media have been found to be useful and Facebook was almost universally utilised by all participating local governments. These communication tools have been useful in facilitating relationships between fire management personnel and residents, changing residents' attitudes and behaviours and encouraging compliance.

Many contributors to the review had received a storm warning from their insurance company which they interpreted as meaning cold winds and floods were likely. This led some to overlook the bushfire risk even as the severe weather event unfolded and burn escapes occurred.

Having multiple sources of information can confuse people. Developing one location and 'source of truth' is important for building public confidence and ensuring accurate messaging. Whilst some local government representatives knew about *EmergencyWA*

they still relied on sourcing information from multiple sources such as BOM, Weatherzone and WillyWeather. The enhancement of *EmergencyWA* to incorporate greater diversity of information relevant to fire including location of and map of planned burn activity (government and non-government) will complement existing components within the website such as Fire Danger Ratings. *EmergencyWA* can accommodate notifications to registered users. This can include auto notifications based on an area of interest determined by the registered user. This could assist in an increased public awareness and provide better opportunities for the public to take pre-emptive measures such as the closing of windows in the case of smoke potential. Opportunity for Improvement 6 (page 31) captures this intent.

6 Appreciating and Responding to Risk

Bushfire risk has been traditionally addressed at various levels of government through evaluation of factors including assets, fuel load and distribution, vegetation type and access for evacuation and emergency services. The profile of bushfire related risk to the communities of Western Australia has been constantly changing due to population migration into fire prone areas, the influence of climatic variation on the proneness of vegetation to bushfire and the distribution of varied forms of land ownership and land management practices and industries established throughout the Western Australian landscape.

Since 2015, the DFES Bushfire Risk Management Planning process for local governments has provided an improved measure of appreciating risk through a tenure-blind approach to assessing bushfire related risk to assets of value to the community. Once risk is evaluated, risk treatment options including planned burning can be developed and prioritised to ensure the best use of the available resources to achieve risk reduction within a community setting.

6.1 Community Appreciation of Risk

A community appreciation of bushfire risk varies considerably depending on the community demographic and exposure to bushfire. Sectors of a community such as agricultural and pastoral generally have a better appreciation of bushfire risk than urban and semirural sectors of the community. Community awareness of bushfire risk has an area of significant evolution over recent years. State and local government have focussed considerable resources on improving the planning and awareness of bushfire and recent international bushfire events where there has been loss of life and large scale bushfires such as in Greece, Portugal and the United States of America continue to raise awareness in the South West where a similar climate prevails. However, many respondents to the review believed significantly more needs to be done to achieve an acceptable level of community awareness, particularly among sectors of the community at greatest risk such as the rural-urban interface, heavily vegetated townsites and absentee land owners.

Some of the local government and volunteer brigade members involved in the review expressed concern regarding absentee landowners and their lack of appreciation of fire risk. The reviewers were provided examples of landowners that visit their blocks and light fires to burn off then leave their fires unattended returning home. In addition to the increased risk of escape these behaviours draw considerably on volunteer and government resources. Local governments who identified this as an issue were keen to have greater power to influence behaviour and felt that punitive measures would encourage compliance. The reviewers floated the concept of a registration system as per Opportunity for Improvement 6, which local governments thought would assist

considerably on the assumption that the majority of people would be willing to work within the required system. Local governments also expressed interest in exploring options for absentee landowners who continue to disregard requests with stronger conditions within the Section 33 Notice.

Opportunity for Improvement 10
WALGA, in collaboration with DFES, develop improved systems to achieve absentee land owner compliance with Section 33 Notices.

One suggestion made by volunteers of the Shire of Manjimup is an advertising campaign designed to increase awareness of accountability of individuals lighting fires on their property. One suggested catch phrase was 'You light it, You own it!'. DFES invests significantly in advertising leading up to and during the summer bushfire season. An advertising campaign in autumn could complement messaging promoted through local governments during the restricted and unrestricted burning periods.

Opportunity for Improvement 11
DFES with a small reference group of volunteers, DBCA and CESMs develop an advertising campaign for the 2019 Autumn season.

The reviewers participated in a post incident community meeting at Peaceful Bay on 13 July 2018. On 24 May, a fire escaped from private property and travelled south, damaging some resort accommodation and coming within several kilometres of the Peaceful Bay townsite. It was late at night when the threat to Peaceful Bay was greatest and the situation highlighted how underprepared the community was in such a circumstance. The meeting was structured to discuss the fire event and highlight the issues and provide an opportunity for the community members, volunteer brigade members, local government and state government representatives to discuss and agree to progress the building of preparation and preparedness for bushfire in the town. The outcomes from this meeting was that the town would develop Bushfire Ready Groups with the support of DFES and the development and implementation of planned burning activities on private property to the west of Peaceful Bay with the volunteer brigade members and land owner. Whilst the reviewers acknowledge that not all communities will embrace a Bushfire Ready Group model, the success of the program across local governments where they are functioning is recognised as being an effective means to raise awareness and preparedness for bushfire.

Some respondents to the review expressed satisfaction at the level of input from neighbours, collaboration with state and local government and improvements in identifying and undertaking risk management treatments. This was recognition for the

Bushfire Risk Management Planning program. However, they remained concerned over the potential for the situation to deteriorate while funding models were limited in-regards to where the money could be applied (tenure and types of employment options), and short-term (annual) rather than longer-term that could support a strategic program of works. It was highlighted by the reviewers that the recent announcement by government of $35 million available through the Emergency Services Levy to support strategic programs of works would go a long way to alleviate these concerns. However, the type of resources that the funding supports was considered by many as being inadequate to building capacity within state and local government organisations but more beneficial to developing a contractor-based workforce, bringing its own set of challenges in-regards to oversight and appropriate management of risk.

DFES acknowledges these challenges and has established an Inter-Departmental Committee to navigate issues relating to fuel management on Crown Land. The Minister for Emergency Services has also announced the formation of a State Bushfire Advisory Committee, chaired by the Executive Director of the RFD which would be an appropriate forum to develop options to address these challenges for consideration by government.

6.2 Risk at a Landscape Scale

The increasing fuel load and pockets of very old fuel (greater than 30 years) across the SWLD has contributed to a more fire prone landscape and the occurrence of more frequent and large high intensity bushfires. The unseasonal weather event of 24 and 25 May 2018 leveraged this situation and could have resulted in severe losses and even human fatalities.

The option of applying less fire into the landscape and being more heavily reliant on suppression was without exception seen as foolhardy and unreasonably costly by contributors to this review. Recent tragic events involving bushfire in other Mediterranean climates (Greece, Portugal and United States of America) demonstrate the ineffectiveness of allowing bushfire risk to escalate to unmanageable levels then expecting emergency services personnel, including volunteers, to put themselves at risk in attempting to control high intensity bushfires or to be available to manage traffic in live fire areas.

Undertaking planned fire operations in heavy fuels adjacent to heavy fuels and/or fire vulnerable assets substantially increases the risk of such operations. Fire managers are understandably more reluctant to take responsibility for such operations due to the increased likelihood of a fire escape and its ramifications, including injury to firefighters and residents.

The review team observed a trend amongst fire managers to abandon landscape scale risk treatments in favour of relatively small fuel-reduced zones around assets. While asset protection is a valuable risk reduction measure, it is not enough on its own to

reduce bushfire risk sufficiently to protect communities. This can only be achieved with an appropriate balance of asset protection and landscape scale fuel management. Of all the fuel management options available, only planned burning (in conjunction with vegetation modification where appropriate) is cost effective at a landscape scale appropriate for the South West of Western Australia context (Florec 2016). This can be further evidenced in Figure 2.

The current bushfire risk management planning methodology overemphasises asset protection treatments adjacent to fire vulnerable assets and communities. The review team observed many of these treatments around small communities, particularly Ravensthorpe and Munglinup, which were a vast improvement from only two years ago. Although these treatments are a good starting point, they are insufficient to effectively protect these communities from landscape scale fires i.e. fire in the large areas of heavy fuels surrounding these settlements. The Esperance Cascades bushfire of November 2015 and Waroona bushfire in 2016 are clear reminders of the potential dangers of landscape scale bushfires being able to spread over vast distances and burn towards assets at great speed and intensity. The risk treatment activities should incorporate both landscape scale treatment and treatments along the rural urban interface.

The review team were briefed on a Bushfire Risk Assessment Framework being developed by DBCA that divides the State into risk context regions based on consideration of fuel types, climate and land use. This is a similar concept as the South West Bushfire Risk Zone currently identified for the southwest corner of the State. Risk is assessed within each region using a standardised and transparent approach to identify priorities across the zone for:

- Managing the bushfire risk to assets
- Managing risk at a landscape scale for strategic fuel management
- To manage risk to maintain natural values.

The approach enables the development of risk treatments that are sensitive to the risk context of the region and will provide a valuable aid in identifying the priorities for implementing risk treatments within regions and between regions. The review team noted that this approach conformed with the Risk Management Standard ISO 31000 and was tailored to fire management in WA.

The current bushfire risk management planning process needs to more effectively incorporate strategic landscape scale risk treatment into the framework. DFES, through the RFD has commenced a review of the *Guidelines for Preparing a Bushfire Risk Management Plan* to address this issue and refine the methodology to reflect the

lessons learned through three years of Bushfire Risk Management Planning (BRMP) program implementation.

6.3 Risk Management at an Organisational Level

For the most part, the risk management measures in place at a state and local government level are sufficient to address bushfire risk for all except the most severe weather periods of the bushfire season. Significant improvement in aligning planned fire policy, practices and procedures with accepted risk management principles and guidelines has been made over the past six years. There remains real potential to expand the effectiveness of risk alignment through continuing to assess risk at a strategic level and address those identified risks through better resource allocation, increased collaboration within regions and expansion of the existing OBRM Assurance Review program for planned burning.

DBCA commenced alignment of its planned fire activities with accepted risk management principles and guidelines in 2012 in line with opportunities for improvement from the Keelty report of the 2011 Margaret River Bushfire Special Inquiry, *Appreciating the Risk*. Since that time, a significant increase in area treated with planned fire has been achieved while maintaining high percentages of burn containment. A requirement of DBCA's involvement with OBRM is a review of escaped planned burns that had the potential for or did have a significant impact.

DFES is now also a significant contributor to risk reduction through planned burning, having recently shifted its focus from largely response to prevention and preparedness through increased bushfire risk mitigation. The creation of the RFD within DFES is an important step to ensuring this shift in focus results in risk reduction across rural communities. The significant shortfalls, identified in this review, must be addressed through a significant increase in planned burning. This need provides an opportunity for the RFD to build on existing relationships and work with state and local government to deliver:

- Improved strategic risk assessment through bushfire risk management planning
- On the job training to support local communities, through their volunteer brigades to increase planned burn capability
- Assurance review of planned fire organisations' risk alignment.

With the rollout of BRMP program, potential for better resource allocation amongst fire agencies and revised training provided by the RFD, local governments will be better equipped to assess bushfire risk, treat those risks and minimise the potential adverse consequences of applying planned fire into a fire prone landscape.

Planned burning needs to be applied according to a strategic focus to protect regional communities. This requires a tenure-blind approach to risk assessment. Where high risk

fuels occur, ownership may complicate risk treatments as landowners or managers may lack the capability, experience and resources required to conduct planned burns or apply other treatments. A mechanism to prioritise risk treatments identified through BRMPs at a local government level has been useful. However, there is currently no way of prioritising treatments of a similar order of risk between local governments. Equally, there is no framework in place within state government organisations to prioritise their own treatments and as such this limits the efficiency of the resource investment in the activity. Given limited resourcing and competing priorities, organisations need to develop strategies that can efficiently allocate resources to meet their organisational outcomes and when feasible, share resources to support the treatment of highest risk identified through a Bushfire Risk Management Planning process.

Opportunity for Improvement 12

DBCA, DFES regions and local government CESMs review the current assessment criteria for reporting regional risk and resourcing to ensure that the process and consistency of information can inform a common understanding of the regional and state risk profile.

Opportunity for Improvement 13

DFES and local governments in consultation with DBCA explore strategies to enable a resource sharing priority system to enable daily decision making between risk owners on planned risk treatment programs.

Recognising the risks associated with applying planned fire into a fire prone environment with historically higher levels of flammable fuel loadings will enable local governments to develop strategies to reduce the risk to as low as reasonably practical. A challenge for local governments and contractors will be to learn the myriad of lessons associated with planned burns without the consequences of unplanned outcomes. In recent years, Western Australia has experienced escapes from planned burns that, although a low percentage of planned ignitions, have had costly and sometime tragic consequences. Managing the risk of putting fire in to the landscape is an imperative of state government. Ensuring government and non-government organisations and the public have adequate strategies for planning and managing planned burning activities will reduce the likelihood of escapes and continual improvements to policies and practices.

Organisations within OBRM's Assurance Program report on planned burn escapes as part of their requirements. Information gathered through this review process is currently only shared internally with the respective organisation. The United States of America have a mature approach to highlighting safety issues arising from bushfire

incidents promoting the issue, its cause and impact so firefighters in particular can be aware of the issue and hopefully avoid the same issue. The State Emergency Management Committee (SEMC) is currently developing a lessons management framework. As the use of planned fire in Western Australia becomes a bigger player in the public discourse, the public will likely cast a higher level of scrutiny on the activity. It will be incumbent on the planning and undertaking of those activities to manage risk and maintain public confidence. The integration of a lessons management framework to support this enhanced understanding will be a useful mechanism to enhance the way in which planned fire and bushfire risk is managed in Western Australia. DFES, DBCA and other organisations including WALGA are involved in the development of this lessons management framework.

Whilst DFES has worked WALGA to enhance local government tools to better manage bushfire risk, local governments would benefit from access to the OBRM Assurance Program for planned burning. The development of a strategic program of assurance for planned burning by local government and their volunteers would benefit from development with WALGA.

The Forest Products Commission (FPC) manages plantations on freehold land across the South West and Great Southern Regions. It has recently adjusted its focus on bushfire risk reduction with an increase in on-ground fire management capacity. Although in its infancy in this risk reduction model, the FPC has an experienced management and field structure but limited alignment of its systems, processes and policies to risk management, however reliance on people rather than systems brings an additional element of risk. The opportunity exists for the FPC to work with OBRM to align its policy, procedures and practices to Government accepted risk management standards. Those FPC representatives involved in the review thought there would be merit in FPC formally engaging with OBRM and OBRM's Assurance Program to improve their management of risk associated with planned burning.

Opportunity for Improvement 14

DFES through consultation with WALGA extend OBRM's Assurance Program to local government and FPC.

6.4 Appreciating risk in developing burn plans

Western Australia has a multi-tiered system of burn planning that ranges from a Permit to Burn through to complex Prescribed Fire Plans. Bush Fire Control Officers use their local knowledge and understanding of fire to place controls on the permit holder to manage the risk of planned fire escape. This level of risk management is effective in both setting constraints and enabling discussion between burn proponents and those issuing permits.

To further support the management of risk of planned burning, DFES developed a basic fire plan. This plan includes a decision matrix to assist determine if the planned burn is basic or complex, guides the planning process and includes a post incident assessment and example map. The plan and associated documents has been made publicly available. Additionally, DFES has, with WALGA and local government bushfire volunteer representatives developed a web-based application for local governments to develop their own contemporary permit to burn which:

- Reflect their local circumstances
- Are badged to their local government
- Have additional risk management elements including unique identifiers for each permit
- Are easy and cheap to update and can be issued via email.

DBCA have a prescribed burn planning process based on risk analysis and the development of appropriate risk treatments that modify the risk of implementing the burn to acceptable levels. However, in the instances where the risk management process is not appropriately applied, escapes can result. An area of potential improvement, highlighted through the planned burn escape in the Stirling Ranges and identified in the DBCA's review, would be for additional consideration of local knowledge to be incorporated into DBCA prescribed fire plans, particularly in agricultural zones where forested reserves are surrounded by farms and farmers may be more aware of local conditions.

While the government planned fire agencies involved in this review have varying degrees of policies, procedures and practices that conform to internationally recognised risk management principles and guidelines, there is scope to further develop the understanding of risk at an operational level. The current gaps in understanding at an operational level weaken the opportunity for practical, effective measures to minimise burn escapes. Contingency planning is an example of where shortfalls can, and often do, lead to additional unplanned workloads on fire managers and volunteer firefighters.

Whilst noted above in-regards to a lessons management framework, a system of transferring lessons from past incidents into planned fire training is needed to provide practical techniques and guidance to operations staff to enable a better understanding of risk management. It was evident to the reviewers that some local governments and DBCA are adjusting their planned burning programs and strategies to accommodate a changing risk profile that a drying climate is causing. DBCA in Esperance in particular, given the resource constraints and scale of area under management, have been working with local government, their volunteers, traditional owner groups and farmers to trial different strategies to achieve desired burning outcomes. These examples are worthy of sharing across the Region and would undoubtedly encourage others.

Agencies currently have varied ways of capturing and sharing lessons identified internally, often through incident. Often there is caution regarding the publication of related incident reports however it would be worthwhile organisations seeing if there is some level of meaningful information that can be shared without fear of prosecution to better inform others and potentially reduce similar incidents from occurring within other organisations. The State Emergency Management Committee has embarked on the development of a lessons learned management framework across all natural hazards. Whilst in its infancy this framework could support the promulgation of lessons identified through operational activities. DFES, DBCA and WALGA have been involved in this project. The BCoE will be promoting a lessons learned approach through its training and so will be supporting organisations to integrate a lessons learned approach into their bushfire risk management activities.

Opportunity for Improvement 15

With support from the BCoE, government and non-government organisations incorporate a lesson learned approach into their business operations.

6.5 Appreciating risk prior to igniting planned burns

Generally, DBCA, DFES and local governments undertake an assessment of the site prior to planning a burn. DBCA have an advanced and mature planning process developed over decades of planned burning experience and involvement in OBRM's Assurance Program. DFES and local governments have a maturing process for planned burning having, in the case of local government, varying forms of planning templates. An opportunity for improvement from the 2016 Ferguson Report of the Special Inquiry into the January 2016 Waroona Fire, *Reframing Rural Fire Management*, required DFES to develop a fast track permit approval process. To meet this requirement, DFES through OBRM developed a template and guidance material for 'simple' planned burns. These documents were published on the DFES website and made available to local governments (and members of the public) to utilise and develop to suit their own business purposes. These templates were designed with risk appreciation in mind including mapping assets of value within and nearby the proposed burn site, assessment of risk during the burn, after the burn and documenting any issues/concerns. It is not clear how many local governments, members of the public or brigades use the templates to adequately assess risk prior to, during and following a burn.

DBCA undertake a daily teleconference with its regional staff to share information on the status of fires and burns on land they manage. This includes:

- Resource (including aircraft) availability
- Burns nominated for ignition that day and in coming days

- Resource and equipment positioning to meet burn and fire suppression objectives
- Weather forecasts (both four-day outlooks and local spot forecasts
- Fuel moisture conditions in a variety of fuel types
- Observed fire behaviour in active burns and fires.

This information exchange results in very dynamic risk assessment and treatment based on current situational awareness. However, the development of technical skills in understanding fire behaviour and complex components of weather that influence fire behaviour is largely restricted to paid staff within DFES and DBCA. This is an identified need to increase the understanding of the scientific aspects of fire in the Western Australian environment within local governments and brigades. The Bushfire Centre of Excellence is developing training to meet this need. In the interim, the RFD is developing guidance materials and tools to support this understanding. This includes case studies for planned burning in particular vegetation types and tools to determine rates of spread and fire intensities in particular vegetation types under variable fuel and climate conditions and using the state adopted fire behaviour models.

As detailed in section 4.5, DFES have a weekly OPB that DBCA and local government CESMs participate in. However, these do not include local governments without CESMs. This information exchange is important to provide situational awareness and provides an opportunity for participants to query the SOCMET on forecast weather conditions for regional areas. Registered users can request locality specific 'spot' weather forecasts from BOM to assist with planned burning activities. This can be an expensive option for some local governments and in some region's strong relationships between DFES, DBCA and local government staff enable the informal sharing of this information. There are however improvements that could enhance the way in which organisations such as DFES and DBCA share information with local governments.

As identified in OFI 6 (page 31), one such enhancement could be provided through the *EmergencyWA* website with a new feature that includes the location of planned burns and associated links to relevant information such as spot weather forecasts for some larger burns. Improvements in information sharing would benefit local government's bushfire preparedness.

6.6 Burn Security

DBCA staff in Pemberton highlighted the efforts that had been made in the days leading up to the severe weather event in securing the live burns within the Region. This included ensuing that the perimeter of each burn was completed and that appropriate depths of edging was achieved to reduce the risk of embers escaping from the burn when the wind arrived. Additionally, the DBCA State Duty Coordinator seeks updates from the DBCA regions on live burns in the instances when adverse weather conditions

are forecast. On the 23 May 2018, the Regional Fire Coordinator South West Region also provided a detailed update of live burns to the DFES Regional Operations Centre to support their awareness of fire in the landscape as the severe weather event moved through. These proactive measures reflect a strong understanding of risk management and assist in providing an awareness of bushfire risk in the landscape.

Shire of Harvey staff highlighted the challenges volunteers have each year when the RBT is lifted and people are no longer required to seek a permit. Whilst they acknowledged that many people await the cessation of the RBT to reduce the administrative burden on volunteers, the irony is that the volunteers become busier attending to planned burn escapes initiated by land owners and managers. This example highlighted the risk of people with little or no understanding of fire behaviour not appreciating the risk of that fire escaping from their property and impacting on others.

There are standards that agencies use to guide mop up and burn security that is applicable equally during bushfire as in planned burning. Local governments and other land owners and managers may not be aware of or have access to this information and yet it could prove useful to further limit the risk of escapes. The development of some basic standards that local governments could use to guide land owners and managers in the minimum standards for securing a burn will assist in guiding people in better managing risk.

Opportunity for Improvement 16

DFES and WALGA through consultation with DBCA develop basic burn security standards that can apply across tenures for land owners and land managers, volunteers and contractors.

7 Desired Future State

The role that organisations such as DFES, DBCA and local government play in managing bushfire related risk is to protect communities and provide a public good. A more complex landscape, changing climate and differing community expectations are factors influencing the necessity for organisations, local governments and their communities to adopt adaptive management strategies for the management of bushfire related risk.

There have been significant improvements in the way that bushfire related risk is being managed collaboratively in Western Australia recently and a wide variety of opportunities to continually improve these management strategies. There is no single solution to addressing bushfire risk and as such it is the utilisation of a suite of options, across the sector and over varying time scales that will support the best outcomes. Key to achieving this will be a collaborative approach that acknowledges fire's role in the landscape and the need to address the common challenge of bushfire that directly and indirectly impacts all Western Australians.

The growing community interest in planned burning activities is calling for a higher level of accountability of people using fire in the landscape, particularly government organisations. Consultative strategies that can support this growing interest will be critical for a common understanding of the issue and the role that each member of the community plays in addressing this common issue. The utilisation of technology will need to feature in this strategy, particularly the provision of timely and accurate information. Providing easy and reliable access to this information can complement preparedness and prevention strategies for organisations and local governments.

Community appreciation of the complexity and dynamic environment of the social, environmental, economic and cultural aspects will be as equally important as identifying the opportunities to navigate this complexity. Whilst additional land management arrangements may be considered by some to add complexity, it can also add opportunity for additional resources and management strategies to support bushfire risk management and achieve different outcomes for the benefit of the communities of Western Australia. The more people aware of bushfire and its risks and willingness and ability to do something about managing that risk the better position Western Australian's will be in as the climate warms and dries.

The sharing of lessons identified from planned burns and integrated into training and planning strategies will also feature in a successful model to manage risk. The maturity to identify and willingness to share these lessons will be critical to achieve this. It should not be a matter of awaiting a severe weather event and subsequent review such as this to assess merits and weaknesses of existing strategies and identify opportunities to improve. Every planned burn (and bushfire) should be considered an opportunity to learn.

Importantly, the ability to sustain the management of bushfire related risk will require a balance of:

- acknowledging the varied roles that each organisation and the community plays in managing bushfire risk to achieve the differing outcomes;
- addressing areas of greatest bushfire risk;
- ensuring public engagement, participation and confidence in the management of this risk;
- providing adequate advice and training to support this participation and growing confidence; and
- resourcing that can support this across multiple years on an ongoing basis.

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Appendix 1. Terms of Reference and Review Particulars

The Review Team consisted of:

- Tim McNaught Director, Office of Bushfire Risk Management, DFES
- Kevin Haylock Director, Sandalwest
- Roger Armstrong Fire and Land Management Consultant

The Terms of Reference for the review were to consider whether management actions leading up to the severe weather event were adequate and whether current mechanisms to mitigate the risk of planned fire escapes are adequate. The was to examine and report on:

(a) The availability and effectiveness of information available to the public and land owners and land managers who were responsible for burns that escaped in the South West and Great Southern Regions on the 24 and 25 May 2018.

(b) The effectiveness of land owners' and land managers' burn management and risk mitigation activities prior to the 24 and 25 May escapes.

(c) The governance arrangements available, and in place, for land owners' and land managers' to manage planned burning prior to the severe weather on the 24 May.

(d) Adequacy of legislative provisions to manage planned burns and the extent to which these provisions are understood by agencies, local governments and their representatives.

(e) Available measures that could practicably and effectively assist in managing the risk of escape for future planned burning activities by land owners and land managers in Western Australia.

The review did not examine the response to the fires or incident management.

Appendix 2. Independent Review of the Report

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ABN 95 337 637 697

19 September 2018

Mr Murray Carter
Executive Director
Rural Fire Division
Department of Fire and Emergency Services
20 Stockton Bend
Cockburn Central WA 6164

Dear Murray

I refer to your request for me to undertake a review of the *Report of the Circumstances that led to the planned fire escapes in the South West and Great Southern Regions of Western Australia on 24 and 25 May 2018*.

I am pleased to provide you with my review.

I commend the review team in their work. Planned burning is an important and complex undertaking in the work to manage bushfire risk. The report has addressed the relevant factors that led to the escapes and provided recommendations that will improve management of planned burning in the future. I provide commentary on the themes within the report, and supporting information on some aspects that will build on the recommendations.

I would be pleased to provide any further advice as required.

Yours sincerely

David Nugent
Director Fire and Emergency Services

Report of the circumstances that led to the planned fire escapes in the South West and Great Southern Regions of Western Australia on 24 and 25 May 2018

Review by David Nugent, Director Fire and Emergency Services, Parks Victoria

The underlying circumstances around the planned fire escapes in South West and Great Southern regions of Western Australia reflect those that exist in many parts of Australia. In fact, they will be reflected in other parts of the world where bushfire risk exists in similar climatic conditions. The report prepared by the Office of Bushfire Risk Management that examines the planned burn escapes on 24 and 25 May, effectively identifies a range of environmental, institutional and community conditions that led to the planned fire escapes, and provides a suite of recommendations that work to reduce the risk of future escapes.

The future of planned burning must address community expectations to protect life and property from bushfire, but also recognise that burning has other impacts and risks. High expectations of access to information on bushfire and planned burning are now normal, but we must ensure we reflect ongoing developments in communications channels and technologies to meet this need into the future. The changing climate will highlight the increased risk of bushfire and focus attention on the health of the environment. The effect of smoke on health and wellbeing, and local economies, is becoming better understood and must be a factor in managing a planned burn program.

Risk Management

In managing the risk of bushfires, it is well accepted that planned burning is one of the most effective tools available to agencies and the broader community. While it is important to recognise that there are other ways to address this risk (e.g. mechanical treatment of fuels, effective preparedness and response to bushfire) planned burning must continue to be the primary tool to manage the availability of fuels to acceptable levels on a broad scale. Best practice shows us that the management of bushfire risk can only be effectively addressed across whole landscapes, independent of land ownership or management. The report identifies the complexity of this task with multiple land uses occurring in forested landscapes and communities located in or near these environments. The use of fire as a component of land management must also recognise the reliance of many vegetation communities and habitats on a regular cycle of fire, as well as the cultural use of fire by Traditional Owners.

The report appropriately identifies the need for all agencies to come together with community to plan for and manage bushfire risk. To support risk management on public land it is critical to create the right environment for private landholders to work towards risk reduction on their land. This principle is also being pursued in Victoria where for the first year a 'Joint Fuel Management Program' is being prepared across private and public lands. This follows strategic bushfire management planning that occurs at the regional landscape level.

The report makes a number of recommendations to identify potential community incentives (e.g. financial support), but also regulatory conditions for burning to be effectively undertaken. The report also correctly identifies the importance of community understanding of bushfire risk and the need to build this understanding where this is not well developed. These recommendations are supported.

The treatment of bushfire risk through planned burning carries its own set of risks. The use of fire on a broad scale is a very complex undertaking, particularly where we have communities and businesses located

close to bushland. The report makes many recommendations to assist in reducing the likelihood of escapes from planned burning. These recommendations are sound and reflect good practice. It is important to recognise that the variety of risks associated with planned burning will continue to change seasonally, and on a daily basis. Underlying conditions of fuel levels and hazard, seasonal conditions, location of community assets to bushland, and community understanding and engagement, will all present a particular risk profile for a given landscape. In addition, daily weather conditions and community issues (e.g. stage of grape harvest, community events, etc.) will also affect this risk profile. It is recommended that a focus be given to processes and systems that ensure each of these changing profiles are recognised, monitored and addressed.

The report highlights the complexity of delivering a large scale planned burn program across a region and multiple regions. Awaiting appropriate weather conditions will often mean that many scheduled burns need to be coordinated within short windows of time. This effectively adds another element of risk with only a finite level of resourcing available to deliver on the number of burns that could be undertaken. The report provides recommendations to expand the pool of resources, however there will always be a need to make decisions on the number of burns that can be safely undertaken in any given period. To support this decision, a tool or process to allocate resources across a region or a number of regions would be beneficial. A tool recently introduced in Victoria considers current burn priorities (regional and state), highlights timing of critical burns (burns windows related to each burn) and other social constraints. This information guides transparent decision making for resource allocation and prioritisation of burns during peak burning windows, and informs engagement and communication about burn scheduling decisions, and potential impacts. It would be beneficial to consider this type of decision support in Western Australia.

In Victoria, where the burn program has had a significant focus since the 2009 Black Saturday fires, the impact of smoke has been a growing community issue. This ranges from the impacts on health and wellbeing, to the effects on a range of local businesses like apiarists, vignerons and tourism. These are becoming better understood and must be considered a factor in managing a planned burn program.

External oversight of the planned burn and bushfire risk management programs will provide a valuable mechanism to ensure standards and best practice are applied. The report identifies the opportunity to apply the Office of Bushfire Risk Management Assurance Program to local government and organisations with less experience and systems that are not well developed. These recommendations are supported.

Information Management

The safe and effective delivery of individual or multiple planned burns relies on the dissemination of information via a range of sources. It is critical for this information to reach the right audience at the right time. The report recognises that there were a number of issues with access to information for both community and agencies involved in delivering the planned burns. The recommendations to improve information management are supported.

Social media and online sources are now recognised as integral channels of community information. The use of these to both share information and engage with local communities in real time is critical.

Systems to provide information on the number of burns planned or underway across all land tenures in a region will be critical to effective decision making on burn planning. While this is generally available for public land burns the inclusion of information on private land burning will be extremely beneficial to understanding fire load in a landscape.

Developing knowledge and expertise will continue to be important in successful planned burning. The training of personnel involved in burning is well addressed in the report, and the importance of local knowledge is well highlighted. A good understanding of local conditions and landscapes is vital in managing risk and achieving positive burn outcomes.

Continued development of knowledge will be informed through the training provided by the Western Australian Bushfire Centre of Excellence (BCoE), and also through linkages to the national Planned Burn Centre of Excellence. The national centre will support the BCoE to provide access to best practice and continued bushfire research.

Cooperation and Resource Sharing

The report has identified the importance of a cooperative approach to the management of bushfire risk across whole landscapes. The use of planned burning to manage bushfire risk has traditionally been undertaken independently across private and public land, and often independently between agencies on public land. Recommendations to develop a more integrated and cooperative approach reflect best practice in landscape bushfire risk management.

A true partnership approach to planned burning will involve the sharing of resources - including equipment, people and knowledge. The report identifies some innovative approaches to identifying community resources for planned burning and the need for agencies to make equipment available for whoever is undertaking a burn. These approaches will challenge cultural differences in community and agencies, but are an important aspect that must be explored to improve engagement with community and provide access to currently untapped resources. Experience in Victoria shows that working together over time builds a trust and understanding that results in more effective working partnerships. Government policy setting provides important support to this partnership approach.

The report identifies the important relationship with Traditional Owners in the use of fire. This partnership will continue to develop and provide important opportunities for Traditional Owners to use fire in managing land. Traditional Owner aspirations in healing country provide an important basis for the effective use of fire that will support objectives in both biodiversity and bushfire risk outcomes.

The report has considered the range of factors that preceded the planned burn escapes in the South West and Great Southern Regions and developed a number of recommendations that will benefit future bushfire risk strategy and operations. The report's focus on better information dissemination and risk assessment will in particular see some critical short-term improvements, while developing a stronger partnership approach across bushfire landscapes will support the ongoing strategic management of risk. I commend the report and provide my comments to support the work of the review team.

David Nugent
Director Fire and Emergency Services
Parks Victoria

Appendix 3. Acknowledgments

The Reviewers met Local Government representatives, Bush Fire Control Officers, volunteers, landowners and State Government organisation representatives in face-to-face meetings to hear of their experiences, views and desire for improvements that could practicably reduce the chance of similar fire events occurring in future.

Throughout the review process, the level of engagement from paid, elected and volunteer personnel in the management of bushfire risk was highly evident reflecting a strong desire to see improvement.

The Reviewers are grateful to the numerous volunteers and professional fire managers for supporting their review and listen to the numerous stories that contributed a great deal to the insight into the lead up and events that followed the severe weather event. To those who fought the fires, supported those fighting fires and suffered stock and property losses, the Reviewers are grateful that you could spare even more time and energy to participate in this review.

The Reviewers would like to acknowledge the people in the following roles and organisations for their support and assistance in compiling this report.

City of Albany
City Mayor
Chief Executive Officer
Executive Director Corporate Services
Executive Director Development Services
Community Emergency Services Manager
Manager, City Reserves
Reserves Fire Liaison Officer

Shire of Denmark
Shire President
Shire Councillor – Bush Fire Advisory Council Chair
Shire Councillor – delegate on Bush Fire Advisory Council and volunteer)
Chief Executive Officer
Manager, Community Services
Bushfire Brigade Volunteers
A/Community Emergency Services Manager
Chief Bush Fire Control Officer

Shire of Esperance
Shire President – Eastern Councillor
Central Councillor
Western Councillor

Chief Executive Officer
Director External Services
Community Emergency Services Manager
Chief Bush Fire Control Officer

Shire of Harvey
Shire President
Chief Executive Officer
Executive Manager Corporate Services
Community Emergency Services Manager
Deputy Bush Fire Control Officer

Shire of Manjimup
Chief Executive Officer
Community Emergency Services Manager
Chief Bushfire Control Officer
Deputy Chief Bushfire Control Officer

Shire of Plantagenet
Shire Councillor (Chair of Bush Fire Advisory Committee and a Bush Fire Control Officer)
Manager Community Services
Acting Community Emergency Services Manager
Acting Area Officer
Deputy Bush Fire Control Officer
Retired Chief Bush Fire Control Officer
Volunteers

Shire of Ravensthorpe
Shire President (Captain Hopetoun Brigade)
Chief Executive Officer
Community Emergency Services Officer
Chief Bush Fire Control Officer
Deputy Bush Fire Control Officers

South Stirling Range community
Senior Bush Fire Control Officer, North East Sector
Deputy Senior Bush Fire Control Officer, North East Sector
Deputy Bush Fire Control Officer Green Range Brigade
Deputy Bush Fire Control Officer Kojenerrup Brigade
Bush Fire Control Officer Kojenerrup Brigade
Bush Fire Control Officer Gnowellen Brigade

Secretary Gnowellen Brigade
Lieutenant South Stirling Brigade
Land owners impacted by the Stirling Range bushfire
Chief Executive Officer of Stirlings to Coast Farmers Group

Department of Fire and Emergency Services
A/Chief Superintendent State Operations Centre
A/Superintendent State Coordination
Superintendent Great Southern Region
A/Superintendent Lower South West Region
A/Superintendent Intelligence and Hazard Planning
A/DO South West Region DFES
AO Great Southern Region, Esperance

Department of Biodiversity, Conservation and Attractions
Regional Manager South Coast Region
Regional Fire Services Coordinator, Fire Management Service Branch
Regional Fire Manager Warren Region
District Manager Donnelly District
District Fire Coordinator Donnelly
District Manager Frankland District
District Manager Esperance District
District Fire Coordinator Esperance District
Sustainable Forest Management Coordinator Warren Region
Senior Ranger Donnelly District

Forest Products Commission
Director Operations
Manager Strategic Asset Protection

Parks Victoria
Director Fire and Emergency Services (Independent Reviewer)

Appendix 4. Bureau of Meteorology Report into the Meteorological Aspects of the Fires in the Stirling Ranges and near the South Coast of Western Australia May 2018

Appendix 5. Department of Biodiversity, Conservation and Attractions Prescribed Burn Escapes Review – May 2018

Appendix 6. Glossary of Terms

BCoE	Bushfire Centre of Excellence
BFCO	Bush Fire Control Officer
BOM	Bureau of Meteorology
BRMP	Bushfire Risk Management Plan
DFES	Department of Fire and Emergency Services
DBCA	Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service
FPC	Forest Products Commission
OBRM	Office of Bushfire Risk Management
OPB	Operational Preparedness Briefing
PBT	Prohibited Burning Time
RBT	Restricted Burning Time
RFD	Rural Fire Division
SBAC	State Bushfire Advisory Council
SOC	State Operations Centre
SOCMET	State Operations Centre Meteorologist
SWLD	South West Land Division
SWORD	State Wide Operational Resource Division
ToR	Terms of Reference
WALGA	Western Australian Local Government Association
WIB	DFES Weekly Intelligence Briefing