A Major Incident Review (MIR) for the Black Cat Creek Fire that occurred on the 12 October 2012 in the Local Government district of Albany, Western Australia was initiated by the Department of Fire and Emergency Services (DFES) in partnership with the City of Albany (C of A) and the Department of Parks and Wildlife (DPaW), formerly the Department of Environment and Conservation (DEC).

During this incident, tragically a number of persons were injured including Ms Wendy Bearfoot, a DEC employee who subsequently died from burns received during the incident.

The MIR was undertaken by Leading Emergency Services (LES) and resulted in 10 recommendations.

**Recommendation 1:** Critical operational procedures such as ‘Red Flag Warnings’, on a common fire-ground need to be consistent across DFES, DEC and Local Government. In particular, the operational procedure of Red Flag Warnings needs to be adopted by all WA fire agencies.

**Response:**
- DFES, the C of A and DPaW have adopted ‘Red Flag Warnings’ as Standard Operating Procedure (SOP).
- Work is continuing to ensure the adoption of the procedure across all Local Governments.

**Recommendation 2:** All agencies ensure fire managers are trained to correctly interpret the new Spot Fire Weather Forecast and to familiarise themselves with the entire format - ensuring consideration of the whole forecast - not just the tabular data containing the 12 hour forecast.

**Response:**
- DFES is training volunteer and Local Government fire managers in the Bureau of Meteorology’s (BOM) Next Generation Forecast and Warning System.
- DFES requires its Level 2 and Level 3 Incident Controllers to complete the training prior to endorsement.
- DPaW has made an annual pre-season briefing ‘Interpreting Spot Weather Forecasts’ mandatory for all staff involved in fire operations.
- In addition, the format of the spot weather forecast issued by the BOM has been changed to ensure critical information, such as significant wind changes and uncertainties associated with the forecast, is placed prominently above tabular data, rather than beneath it as had been the case. DFES has directed that any such information be communicated as a Red Flag Warning if it is a time critical issue.

**Recommendation 3:** As a minimum requirement, all vehicles entering the fire ground must be fitted with an accessible fire blanket – one per person in each vehicle plus roll down, in-cab, radiant heat shields.
Response:

- DFES is currently installing personal protective fire blankets and the necessary storage in appropriate appliances.
- DPaW appliances already carry fire blankets, however storage and access is being enhanced.
- DPaW and DFES will also be installing radiant heat curtains in appropriate appliances and a full crew protection package will be fitted to vehicles identified as being in extreme bushfire risk areas.
- In addition, DFES has been funded to install the full crew protection measures, e.g. in-cab air, deluge systems and under body vehicle protection to vehicles identified as being in extreme bushfire risk areas commencing in the 2013/14 financial year.

**Recommendation 4:** Once Recommendation 1 has been actioned, all agencies give greater priority to the promulgation of ‘Red Flag Warnings’ in order to enhance situational awareness on the fireground.

Response:

- This has been agreed by all WA fire agencies.
- The Red Flag Warning procedure and its use are already an integral part of DFES doctrine and training.

**Recommendation 5:** DFES or DEC (depending on land tenure) is mandated to take over control of emergency incidents from Local Government once they have been declared Level 2 incidents. WESTPLAN BUSHFIRE and legislation to be amended accordingly.

Response:

- The current statutory environment allows support to Local Governments, including the taking over of control of incidents if the need is determined.
- A review of existing legislation is underway and this recommendation will be considered as part of this review.
- Neither DPaW nor DFES have the statutory role or sufficient resources to meet the requirements of this recommendation.

**Recommendation 6:** DFES and Local Government Bushfire Brigades ensure that only those with the required AIIMS competence have the authority to manage Level 1 incidents, noting they may not be Fire Control Officers.

Response:

- DFES is currently delivering a Level 1 Incident Controller skills recognition process for volunteers across the state.
- This process has resulted in 298 volunteers from all services being endorsed as Level 1 Incident Controllers.
- In addition, a Level 1 Incident Controller course has been developed and is now available across the state for volunteers to access.
- The course has been conducted with volunteers from the C of A.
**Recommendation 7:** Future coordination/support/control of integrated emergency management across all agencies in Albany needs to be merged and located in a single joint facility. This issue needs to be reviewed statewide.

**Response:**
- DFES has completed a state-wide review of Incident Control Centres.
- The C of A was recognised as having a fixed Level 3 capable Incident Control Centre.
- The agencies support this recommendation in principle and joint use of the facility will be maximised to the extent that resources and systems allow.

**Recommendation 8:** WA adopts a culture of joint IMTs in future. At Regional and State levels, DFES and DEC maintain standing contributions.

**Response:**
- The existing culture of WA fire agencies encourages joint, multi-agency IMTs where these are consistent with agency statutory roles.
- In addition, DFES is implementing a project which incorporates DFES, DPaW and Local Government staff and volunteers with the aim of establishing appropriate joint IMTs at the incident level, and joint teams to operate within Regional and State Operational Centres.

**Recommendation 9:** WA fire agencies adopt a common set of standing orders, operational procedures, training and competencies for rural firefighting that are produced in hard copy, leading to integrated multi-agency training, IMTs, Regional and State coordination/control centres.

**Response:**
- The recommendation requires further investigation as full implementation of integrated IMTs across all tenures State-wide would have significant requirements for additional human and other resources for DPaW and DFES.
- DFES and DPaW have agreed to adopt a common incident management system, and its procurement and implementation is underway.
- DFES has commenced a project to develop common incident management protocols and procedures.
- DFES and DPaW are investigating the merging of training development between the two agencies where appropriate.
- The full implementation of integrated IMTs across all tenures statewide requires further investigation as it would have significant requirements for additional resources for DPaW and DFES.

**Recommendation 10:** In due course, acts of bravery are considered and recommendations for awards are submitted, including commendations for the delivery of First Aid.

**Response:**
- The agencies support this recommendation.
MAJOR INCIDENT REVIEW
Black Cat Creek Fire
12 October 2012

Prepared for

Department of Environment and Conservation
Department of Fire and Emergency Services
City of Albany
Western Australia

by

Leading Emergency Services

Completed 24 December 2012
# Contents

Appendixes........................................................................................................................................ii
Acronyms / Abbreviations .................................................................................................................. iv
Summary ............................................................................................................................................... 1
1. Introduction .................................................................................................................................. 3
   Overview of the Incident .............................................................................................................. 3
   How the Major Incident Review was conducted ....................................................................... 3
   Relationship to other Reviews .................................................................................................. 4
   Fire Agencies in Western Australia .......................................................................................... 5
   Operational Resources .............................................................................................................. 5
   Bushfire Mitigation and Management within WA ...................................................................... 5
   Climate ......................................................................................................................................... 6
   Legislation .................................................................................................................................... 6
   Recent Ministerial Comment ..................................................................................................... 6
2. An overview of the fire and the burnover event .......................................................................... 7
   Background ................................................................................................................................ 7
   Weather ....................................................................................................................................... 8
   Weather on the day of the fire ..................................................................................................... 8
   Topography ............................................................................................................................... 9
   Vegetation .................................................................................................................................... 10
   Fire Risk ..................................................................................................................................... 10
   Fire Cause .................................................................................................................................. 11
   Operational response ................................................................................................................ 12
   Timeline of Events .................................................................................................................... 13
   Initial Response ........................................................................................................................ 14
   Spot Fire Weather Forecast ...................................................................................................... 16
   Establishing Sectors .................................................................................................................. 17
   Passing Control of the Fire ........................................................................................................ 18
   Wind Change ............................................................................................................................. 20
   The Burnover ............................................................................................................................. 23
3. Analysis of why the Incident Occurred ......................................................................................... 27
4. Other issues identified by the MIR that influenced the outcome, but were less germane to the burnover .......................................................................................................................... 34
5. Enhanced Crew Protection in Vehicles ...................................................................................... 40
   DEC vehicle modifications ......................................................................................................... 40
   DFES vehicle modifications ....................................................................................................... 40
   Crew Protection Measures in Vehicles ...................................................................................... 40
   Further Crew Protection Measures ........................................................................................... 42
Thanks and Disclaimer

We wish to acknowledge the open and frank manner in which members of DEC, Local Government, DFES and other agencies raised issues with us during the MIR and answered our questions.

This MIR was prepared between October and December 2012 based on information as it was available to the MIR in December 2012.

This report was prepared by [redacted] and [redacted]. While every effort has been made to present the most accurate information and assessment, Leading Emergency Services (a Division of Leading by Example Pty Ltd), expressly disclaim all liability or responsibility to any person, organisation or government using the information or advice.

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Appendixes

1. The Black Cat Creek Major Incident Review’s Terms of Reference
2. List of those interviewed as part of the MIR
3. Reason Model of Factors leading to the incident
4. ICAMS PEEPO Observations
5. 10 Fire Orders and 18 Watch Out Situations
6. RFS Bushfire Survival advice if in a vehicle
7. CFA Burnover Media Report 2009
8. Section 4.3.3 of the State Emergency Management Plan for Bushfire (WESTPLAN BUSHIFRE) November 2011
9. Extract from Section 45A The Bush Fire Act 1954
10. Chronology of Burnover Incidents in Australia
### Acronyms / Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AFAC</td>
<td>Australasian Fire and Emergency Service Authorities Council</td>
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<tr>
<td>Agency</td>
<td>A firefighting agency i.e.: DEC, DFES or local government</td>
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<tr>
<td>AIMS</td>
<td>Australasian Inter-Service Incident Management System</td>
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<tr>
<td>AWS</td>
<td>Automatic Weather Station</td>
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<tr>
<td>BFB</td>
<td>Bushfire Brigade (local government)</td>
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<tr>
<td>BFS</td>
<td>Bushfire Service</td>
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<tr>
<td>BoM</td>
<td>Bureau of Meteorology</td>
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<tr>
<td>CFA</td>
<td>Country Fire Authority (Victoria)</td>
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<tr>
<td>CFS</td>
<td>Country Fire Service (South Australia)</td>
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<tr>
<td>ComCen</td>
<td>DFES Communications Centre</td>
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<tr>
<td>COAG</td>
<td>Council of Australian Governments</td>
</tr>
<tr>
<td>CoA</td>
<td>City of Albany</td>
</tr>
<tr>
<td>CP</td>
<td>Control Point</td>
</tr>
<tr>
<td>CRC</td>
<td>Cooperative Research Centre</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<tr>
<td>DCFCO</td>
<td>Deputy Chief Fire Control Officer</td>
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<tr>
<td>DEC</td>
<td>Department of Conservation</td>
</tr>
<tr>
<td>DFCO</td>
<td>Deputy Fire Control Officer</td>
</tr>
<tr>
<td>DFES</td>
<td>Department of Fire and Emergency Services (previously FESA)</td>
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<tr>
<td>ESL</td>
<td>Emergency Services Levy</td>
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<tr>
<td>FCO</td>
<td>Fire Control Officer</td>
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<tr>
<td>FDI</td>
<td>Fire Danger Index</td>
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<tr>
<td>FDR</td>
<td>Fire Danger Rating</td>
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<tr>
<td>FFDI</td>
<td>Forest Fire Danger Index</td>
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<tr>
<td>FOG</td>
<td>Fire Operational Guideline</td>
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<td>FPC</td>
<td>Forest Products Commission</td>
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<tr>
<td>GFDI</td>
<td>Grassland Fire Danger Index</td>
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<tr>
<td>IAP</td>
<td>Incident Action Plan</td>
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<tr>
<td>ICP</td>
<td>Incident Control Point</td>
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<tr>
<td>ICV</td>
<td>Incident Control Van</td>
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<tr>
<td>IC</td>
<td>Incident Controller</td>
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<tr>
<td>ICAM</td>
<td>Incident Cause Analysis Model</td>
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<tr>
<td>IMT</td>
<td>Incident Management Team</td>
</tr>
<tr>
<td>kw/m</td>
<td>Kilowatts per metre</td>
</tr>
<tr>
<td>LACES</td>
<td>Lookouts, Awareness, Communications, Escape Routes, Safety</td>
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<tr>
<td>LES</td>
<td>Leading Emergency Services Pty Ltd</td>
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<tr>
<td>LGA</td>
<td>Local Government Association</td>
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<tr>
<td>MAC</td>
<td>Multi-Agency Coordination</td>
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<tr>
<td>MFB</td>
<td>Metropolitan Fire Brigade (Melbourne)</td>
</tr>
<tr>
<td>MIR</td>
<td>Major Incident Review</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
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<tr>
<td>NSW RFS</td>
<td>New South Wales Rural Fire Service</td>
</tr>
<tr>
<td>NXCG</td>
<td>National Wildfire Coordination Group</td>
</tr>
<tr>
<td>PEEPO</td>
<td>People, Environment, Equipment, Procedures, Organisation</td>
</tr>
<tr>
<td>PIA</td>
<td>Post Incident Analysis</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<tr>
<td>PPPR</td>
<td>Planning, Preparedness, Response, Recovery</td>
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<tr>
<td>ROC</td>
<td>Regional Operations Centre</td>
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<tr>
<td>ROPS</td>
<td>Roll Over Protection System</td>
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<tr>
<td>ROS</td>
<td>Rate of Spread</td>
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<tr>
<td>SC</td>
<td>Sector Commander</td>
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<tr>
<td>SDC</td>
<td>State Duty Coordinator</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>SHOO</td>
<td>State Hazards Operation Officer</td>
</tr>
<tr>
<td>SMEACS</td>
<td>Situation, Mission, Execution, Administration, Command, Safety</td>
</tr>
<tr>
<td>SOC</td>
<td>State Operations Centre</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
</tr>
<tr>
<td>VBRC</td>
<td>Victorian Bushfires Royal Commission</td>
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<tr>
<td>WAERN</td>
<td>Western Australian Emergency Radio Network</td>
</tr>
<tr>
<td>WAPOL</td>
<td>Western Australia Police</td>
</tr>
<tr>
<td>WESTPLAN</td>
<td>Western Australia State Emergency Management Plan</td>
</tr>
<tr>
<td>WWW</td>
<td>World Wide Web</td>
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</table>
Summary

The Black Cat Creek fire, occurred 25 km east of Albany on the south coast of WA on Friday, 12 October 2012. It was initially considered an uneventful fire, albeit occurring well outside the Fire Danger Season. Response was initially the local, supported by the City of Albany. DEC resources also responded. The IC was a local volunteer firefighter.

As the fire was burning towards the Two Peoples Bay Nature Reserve the IC requested DEC take control. DEC suggested the request be referred to DFES, who initially indicated they had limited capacity to take control. Subsequently DFES sent an officer to the ICP and although DFES did not take control, the DFES officer did become the Operations Officer within the IMT.

The incident was supported in Albany by three agencies: The CofA; DEC and DFES all from separate facilities. The CofA representative requested and received a Spot Fire Weather Forecast from the BoM, but did not transmit the entirety of the forecast to the IMT. This omission, relating to severe weather and the arrival of the forecast wind change was not identified by other staff in Albany or by staff at the IMT, even though hard copies of the forecast may have been transported to the ICP.

The effect of this omission was that crews were deployed on Sector Alpha, along the northern flank of the fire at the time a south westerly wind change impacted on the fire and forced it over the fire line where crews were working. As it burnt up a gentle slope and crews were working over the slope, the approach of the fire was not visible until very late. Burning through 50 year old fuels, the fire was extremely intense. Some BFB crews drove rapidly from the area. Two DEC crews (with two personnel in each vehicle cab) were caught in situ as their vehicles stalled.

Neither DEC crew were able to activate their marauder vehicles protection sprays. One crew were not able to access their individual fire blankets as the rear window of the appliance collapsed into the crew cab. Soon after, all crew left their crew cabs. None were wearing complete PPE although what they had offered significant protection. Three sheltered under the one available fire blanket and while all three suffered burns, all survived. The fourth crew member, isolated by exit location from the crew cab adjacent to burning fuel, tragically was badly burnt and eventually died.

At a systemic level, the MIR identified that the vehicle protection for WA fire agencies was less than comparable agencies in other states facing similar risk; that it is imperative that fire ground procedures and incident management be conducted consistently and cooperatively across bushfire agencies; that regional level support should be conducted jointly from a single facility; and Level 2 fires should be managed by DFES or DEC not Local Government.

At a tactical level, the MIR identified that all involved in, or supporting incident management should be thoroughly familiar with the new Spot Fire Weather Forecast format; that competence in incident management is not necessarily comparable to Fire Control Officer appointments; and the minimum protection for all vehicles entering the fireground should be individual fire blankets and roll down, in-cab, radiant heat shields.

The MIR makes the following recommendations:
Recommendation 1
Critical operational procedures such as ‘Red Flag Warnings’, on a common fireground need to be consistent across DFES, DEC and Local Government. In particular, the operational procedure of Red Flag Warnings needs to be adopted by all WA fire agencies.

Recommendation 2:
All agencies ensure fire managers are trained to correctly interpret the new Spot Fire Weather Forecast and to familiarise themselves with the entire format – ensuring consideration of the whole forecast - not just the tabular data containing the 12 hour forecast.

Recommendation 3:
As a minimum requirement, all vehicles entering the fireground must be fitted with an accessible fire blanket – one per person in each vehicle plus roll down, in-cab, radiant heat shields.

Recommendation 4:
Once Recommendation 1 has been actioned, all agencies give greater priority to the promulgation of Red Flag warnings in order to enhance situational awareness on the fireground.

Recommendation 5:
DFES or DEC (depending on land tenure) is mandated to take over control of emergency incidents from Local Government once they have been declared Level 2 incidents. WESTPLAN BUSHFIRE and legislation to be amended accordingly.

Recommendation 6:
DFES and Local Government Bushfire Brigades ensure that only those with the required AIIMS competence have the authority to manage Level 1 incidents, noting they may not be Fire Control Officers.

Recommendation 7:
Future coordination/support/control of integrated emergency management across all agencies in Albany needs to be merged and located in a single joint facility. This issue needs to be reviewed statewide.

Recommendation 8:
WA adopts a culture of joint IMTs in future. At Regional and State levels, DFES and DEC maintain standing contributions.

Recommendation 9:
WA fire agencies adopt a common set of standing orders, operational procedures, training and competencies for rural firefighting that are produced in hard copy, leading to integrated multi-agency training, IMTs, Regional and State coordination/control centres.

Recommendation 10:
In due course, acts of bravery are considered and recommendations for awards are submitted, including commendations for the delivery of First Aid.
1. Introduction

Overview of the Incident
This Major Incident Review (MIR) focuses on the fire known as Black Cat Creek, which occurred 25 km east of Albany on the south coast of WA on Friday 12 October 2012.

The initial response to the fire was made by the local within the City of Albany (CofA), and subsequently by Department of Environment and Conservation (DEC) resources. The Department of Fire and Emergency Services (DFES) staff later became involved and eventually took control of the fire. During suppression operations, fire fighters experienced a burnover that directly injured four people, two of whom received serious burns. Tragically, one of the fire fighters later died of injuries. The burnover also destroyed two fire trucks and damaged others.

The fire eventually burnt approximately 1300 hectares across private property and some parts of the Two Peoples Bay Nature Reserve which is managed by DEC. It was brought under control on 14 October 2012 and DFES officially handed back control of the Black Cat Creek fire to the CofA on Monday 15 October 2012 at 0900.¹

Throughout this MIR, reference is made to DFES reflecting its current title even though at the time, the agency was known as the Fire and Emergency Services Authority (FESA) of Western Australia.

How the Major Incident Review was conducted

Major Incident Reviews (MIRs) are the third and top tier of review undertaken by the DFES. In this instance, the MIR was completed on behalf of DFES, DEC and the CofA.

The intent has been to analyse the operational response to the fire leading up to the incident where fire fighters were burnt. The Terms of Reference for the MIR are set out in Appendix 1. The MIR visited the scene of the fire, specifically the burnover incident, and received information from those directly involved within DFES, DEC and the CofA. Interviews were conducted with many of those involved, together with representatives from the Bureau of Meteorology (BoM).

The MIR conducted these interviews around the time of the death and funeral of. For those staff directly involved in the incident, the MIR reviewed the transcripts of interviews conducted by DEC staff soon after the incident and chose to rely on them. This decision was made in consultation with DEC management, to protecting the health of those individuals, rather than conduct further interviews at that distressing time. The MIR received extensive material from all three agencies which proved comprehensive and helpful. This included a chronology developed by DEC soon after the event. The MIR is confident it received sufficient information to reach informed conclusions.

There was no requirement to conduct hearings or public meetings, and the authors did not attend the internal agency debriefs, although summaries were provided. MIR interviews were not transcribed. A list of those interviewed and interview transcript is at Appendix 2.

¹ City of Albany. Update on the Black Cat Creek Fire. Statement 17 October 2012.
This MIR has sought to clearly identify the cause of the burnover incident and to suggest improvements to reduce future likelihood and similar impacts. While acknowledging the very positive efforts of all involved, this MIR seeks to extract all available lessons from the tragic events in accordance with the Terms of Reference. It has adopted a ‘lessons learnt’, rather than a ‘forensic investigative’ approach, particularly as the MIR did not have the opportunity to interview all DEC staff involved. Some agency stakeholders appeared to struggle with this approach, seeking detailed reference to more observations in the report than have been provided. The MIR is satisfied that the detail in this report reflects the information provided to it. Where there was a conflict, the MIR favoured the evidence of witnesses on scene, rather than hearsay evidence subsequently provided by agencies.

All times used in the report reflect the 24 hour clock.

Relationship to other Reviews

Apart from this report, the MIR was advised the following formal investigations have, or are being, undertaken independently:

- DEC fire analysis: ‘Reconstruction of the path and behaviour of the Black Cat Creek fire and associated meteorological conditions’;
- Work Safe WA, Department of Commerce; and
- Police investigations potentially in support of the Coroner.

Consultants
Fire Agencies in Western Australia

Authority for fighting bushfires in WA is dispersed across 124 authorities: 122 local governments, DFES and DEC. This arrangement has been in place for many years, even though all other Australian jurisdictions have removed local government from the control and coordination of operational response to bushfires. In 2004, the Auditor General was critical of this arrangement, and subsequently the *Bush Fires Act 1954* and the *Emergency Management Regulations 2006* were amended to provide DFES with legislative authority to take control of fire on local government or DEC managed lands in specific circumstances detailed later in the report, and referred to as a ‘Section 13 Declaration’. While this arrangement potentially addresses the control of major fires, it does little to assist in the vital preparation and planning before emergencies, and it failed to assist in this particular incident prior to the burnover event. After the event, DFES assumed control under a Section 13 Declaration.

Noting the vast size of WA, it is understandable how these arrangements came about and why they remain attractive to some. With so many authorities involved, however, the MIR does raise reservations about efficiencies, competencies, standards and coordination and highlights some of these. As raised in previous MIRs, there are opportunities to improve operational response to bushfires via further coordination through fewer fire authorities, or co-location, or both, and this is further addressed later in the report.

Operational Resources

Operational support for this fire event came from Local Government Bush Fire Brigades (BFB) who are members of the Bush Fire Service (BFS). They were initially supported by DEC Fire Management Resources and subsequently by DFES staff.

Bushfire Mitigation and Management within WA

The provisions of the *Bush Fires Act 1954* are used for the prevention, preparedness and response phases for bushfires. In accordance with the *Fire Brigades Act 1942*, DFES has responsibility for fire suppression within gazetted Fire Districts. Outside these districts, such as where the Black Cat Creek fire occurred, DFES provides support to Local Government (through their Bush Fire Brigades) for bushfire preparedness and prevention strategies in

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pastoral/rural areas, as well as for fire suppression on all non-DEC estate. DEC has responsibility for all aspects of fire management within DEC estate, and as in this case, actively supports Local Government Brigades when fires occur near, or adjacent to, its assets and estate.

Recent amendments to the Bush Fires Act 1954 enable DFES to appoint a person to take overall responsibility for bushfire suppression, regardless of their original jurisdiction or the land tenure of the fire. Amendments also allow for control of bushfires to be handed over between Local Government and DEC when this is agreed and expedient.

Climate

The south coast region near Albany experiences a Mediterranean-type climate with cool wet winters and warm dry summers so is prone to bushfires. The long-term average annual rainfall is ~850 mm, with an average of about 120 wet days per year. Features of fire weather include the predominance of easterly and south westerly winds in summer, and north west to south west winds in winter. At the time of the fire, Albany had experienced a typical winter. However, July was an especially dry month with little rainfall. Prior to the fire, no significant rainfall had been recorded since 28 September 2012 and light rain had fallen on 4 and 5 October 2012.

Legislation

Legislation referred to in this MIR is:

- Bush Fires Act 1954;
- Emergency Management Act 2005;
- Fire Brigades Act 1942;
- Fire and Emergency Services Authority of Western Australia Act 1998; and

Recent Ministerial Comment

The MIR notes the recent comments by the Emergency Services Minister, Hon Troy Buswell, indicating cultural changes to the fire and emergency services were in progress, but there was some way to go. "We must get away from the culture in the agencies that says 'We never make a mistake'. You can never rest in this space," Mr Buswell said.

The MIR applauds the spirit of these comments and has prepared this report with the intention of accepting that occasionally tragic mistakes are made but, most importantly, lessons need to be identified, reported and procedures and training adjusted to reduce the likelihood of such incidents reoccurring.

4 As reported in the Herald Sun. 15 November 2012.
2. **An overview of the fire and the burnover event**

(A factual summary of the incident drawn from statements, interviews and other material).

**Background**

Two Peoples Bay Nature Reserve is a protected area 35 km east of Albany. The bay itself faces due east and is protected from the Southern Ocean by the headland of Mount Gardiner. The nature reserve was established in 1966 and is of notable ecological significance. A number of species previously thought to be extinct were found in this area in the 1960s, including the Noisy Scrub Bird and Gilbert’s Poteroo which are two of the 12 threatened animal species known to currently inhabit the nature reserve.

Fire Area near Two Peoples Bay, Albany (source www.amazingalbany.com.au)

prepared a comprehensive report on the fire’s likely cause and its development. The MIR has reviewed the report and accepts it as a scientific analysis of the fire. It has included excerpts to provide a comprehensive understanding of the fire.
Weather

The Bureau of Meteorology (BoM) is conducting its own analysis into the weather aspects of the fire. The MIR interviewed members of the BoM and undertook further research. The BoM report may become available separately, but was not complete at the time the MIR was drafted. Analysis includes comprehensive comment on the weather and elements are included in this MIR.

The MIR was advised that the fire season in the Albany area traditionally commences later than other parts of WA due to the later curing rates of fuels. However, it is not unusual in October for fires to burn readily in coastal heath/sandy soils.

Albany had experienced a typical winter although July was an especially dry month with little rainfall. Rainfall recorded at Albany up to the end of September 2012 was 732 mm which is about 40 mm below the long-term average for this time of year. Monthly rainfall over the winter months was generally average or above average except for July which was considerably below average. Before 12 October 2012, no significant falls (> 5 mm) were recorded since 28 September (21.8 mm). Light rain was recorded on 4 and 5 October (2.8 mm and 1.2 mm respectively) and on the 9 October (0.2 mm). This rainfall would have had minimal effect on fuel moisture content, so there was effectively a seven day rain-free period before 12 October.

Weather on the day of the fire

The usual fire weather briefing teleconference between DFES and the BoM was held at 0900 on Thursday 11 October 2012, with the local attending the DFES office in Albany to participate. (Twice weekly weather teleconferences are held each Monday and Thursday morning between DFES and BoM. A DEC and BoM teleconference is held just prior to 0830 and 1615 every day).

There were no fire weather forecasts issued for 12 October as there were no fire restrictions, and the fire season in the Greater Southern region was not yet underway. takes up the description of the winds on the day:

“At about 0900 hrs on 12 October the wind shifted from ENE to N with an accompanying significant increase in wind speed as strong northerly winds aloft mixed down to the surface. The mean wind speed was between 30-35 km/hr all morning and gusts over 60 km/hr were recorded. The wind shift from ENE to N was also accompanied by a rise in temperature and a fall in dew point and RH. At about midday, winds started to shift from N to NW to WNW, and then at about 1440 hrs, shifted to SW. On the wind shift to SW, wind speed decreased to a mean of about 25 km/hr with gusts to 35 km/hr. At about 1600 hrs, the wind shifted to the SSW and abated with mean wind speed after 1700 hrs <10 km/hr.”
Figures 1 and 2: Half hourly wind speeds (the day/time axis reads from right to left) and direction recorded at the BoM weather station Albany Airport from 0800 on 11 October to 1700 on 12 October 2012. The wind shift from ENE to N at about 0900 was accompanied by a fall in RH and dew point and a rise in temperature.

Topography

Topography always influences fire behaviour, and slope and aspect have significant influence. The rate of fire spread approximately doubles for every 10 degrees increase in positive (up) slope. describes the topography near the incident and comments that the local topography and the existing pine plantations may have influenced wind speed and direction. The MIR also considers these same features may have masked changes in wind direction from being clearly apparent to the crews on the fire ground.

“An important topographical feature on the fire ground with respect to fire behaviour is a significant creek system that runs approximately east-west through the northern portion of the fire ground as an extension of Moates Lake, and sloping terrain north and south of the creek line. The burnover occurred on a ridgeline north and up slope [a 6 degree up slope] of the creek system at a time when the wind had backed to the SW, thus aligning with the slope. This wind-slope alignment increased the behaviour of the fire following the wind shift.

The terrain, including the topography and the layout of the pine plantations in the north-west part of the fire ground and near the origin of the fire, may have had an influence on wind speed and direction in this area.
Vegetation

Vegetation included largely native woodland and coastal heath and shrublands, together with a number of pine plantations in the north west of the fire ground near the origin of the fire. About five hectares of forest on the western edge of the fireground were burnt but other plantations were protected. described the native vegetation:

“The vegetation involved in the fire comprised a mosaic of woodlands, low forest and a diversity of heath and shrublands, with these non-forest structures forming the dominant fuel type by area. The low forests, occurring higher in the landscape in the northern portion of the fire ground, comprised an overstorey of jarrah (Eucalyptus marginata) and marri (Corymbia calophylla) to 12 m with occasional taller trees. The scattered mid-storey comprised smaller overstorey tree species as well as sheoak (Allocasuarina fraseriana) and Banksia spp. to 6 m with a moderately dense understorey of woody shrubs to 2 m.

While only a small proportion (~10%) of the area of the fire ground comprised low forest, it is of significance because it was in this vegetation / fuel type that fire fighters were trapped in the burnover.”

With the exception of a small area of vegetation in the north west of the fire ground that had been previously burnt in 2000, and was burnt early during the progress of this fire, the remaining fuels which were on private land appears from local knowledge, that they had not been burnt for at least 50 years. Fuel loads near the burnover event were estimated to be about 22 tons per hectare. 50 metres to the north of the burnover event, fuels were significantly less and had been cleared as a result of previous forestry operations:

“The long unburnt condition of the forest as fuel was an important influence on the behaviour and impact of the fire at the burnover location. Long unburnt vegetation is highly flammable when dry and forms a hazardous fuel because of its structure and quantity (Cruz et al. 2010; Cheney et al. 2012)."

Fire Risk

A Bushfire Threat Analysis was completed by DFES in May 2011 identifying areas of higher risk. The area where the fire occurred had been identified as a high risk area, although this particular analysis did not appear to be available to the IMT at the time of the fire.
Black Cat Creek Fire

Fire Cause

Black Cat Creek station adjoins the Two Peoples Bay Nature Reserve. Black Cat Creek is a privately owned property 25 km east of Albany. Located on the road leading to the Two Peoples Bay Nature Reserve, tenants were leasing a house, with an adjacent rubbish pit on the property.

The Black Cat Creek fire was attended by a range of investigators from DFES, WAPOL Arson Squad and [redacted], who all worked together to determine a likely cause for the fire. A rubbish pit behind the home on the Black Cat Creek property was an area for attention by investigators since accounts from the first crews to arrive, as well as fire behavior patterns, indicated the fire was likely to have started in this area.

The rubbish pit had been burnt recently, and grass between the rubbish pit and bush to the south was also burnt. Re-ignition or reheating of the rubbish pit was most likely to have ignited grass adjacent to the south side of the pit and, under the northerly wind, readily burnt the 8-9 metres through the grass to the bushland.\(^\text{14}\)

In his report, [redacted] draws the following conclusion about the fire cause:

\[\text{[Redacted]}\]
“The field evidence suggests that the Black Cat Creek Fire most likely originated from or near the rubbish pit …. And that fire/heat in the rubbish pit was the cause of ignition. This does not discount the only other plausible, but in my view, unlikely cause of the fire, which is that it was lit by a person or persons unknown in the vicinity of the rubbish pit.”

Whilst actual ignition time of the fire is unknown, it is estimated to have been around 0900-0915 on 12 October 2012.

Images of rubbish pit where fire most likely started.

Operational response

Summary of key personnel. For clarity, the MIR has listed key personnel involved in the operational response:

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Timeline of Events
(Times are approximate and based on accounts from witnesses)
Initial Response

At 0925, the [redacted] at the City of Albany received advice of a triple zero call from DFES Communications Centre in Perth. The call advised of a fire at 372 Two Peoples Bay Road, Kalgan. After an initial attempt to contact [redacted], who maintains a radio control point from home for the [redacted], the [redacted] called [redacted] direct and spoke to [redacted], a [redacted] and asked the brigade to respond. Subsequently, [redacted] advised [redacted] that [redacted] was aware of the fire and he took over coordinating radio traffic.

[redacted] generally operates in a support and coordination role from home in these circumstances, as [redacted] did on 12 October 2012. The incident was in the [redacted] response area, [redacted], as the [redacted] and the senior officer present, undertook the role of Incident Controller (IC). [redacted] had assumed that role previously for ‘a couple’ of small fires. [redacted] had no formal AIIMS training, although [redacted] had completed the ‘old suite’ of volunteer FCO training. [redacted] located [redacted] adjacent to the tenanted house at Black Cat Creek station, not far from the rubbish pit that was the likely cause of the fire.

Around the same time, [redacted], [redacted] at the Two Peoples Bay Nature Reserve, was contacted by [redacted], to respond to the fire at Black Cat Creek. On arrival at the property, [redacted] met the [redacted], to receive a situation report on the fire. [redacted] advised [redacted] that other DEC resources were en route.

At about 1045, [redacted], the [redacted] employed by the CofA, was dispatched by [redacted] to the fire. [redacted] then left [redacted] for the scene, arriving at about 1105. Having monitored the radio and having good local knowledge, [redacted] advised DEC and DFES staff [redacted] and Australian Blue Gum Plantations of the fire prior to [redacted] departure. [redacted] also photocopied aerial maps of the area from the Council Office, drove to the Council depot and transported the Incident Control Caravan (ICV) to the site where [redacted] was located at Black Cat Creek Station arriving at about 1130.

The ICV is equipped with laptops, four radios and WiFi capabilities for computer and fax access via a mobile telephone link, and all powered by an in-house generator. It was established near the tenanted house to the north of the rubbish pit on a grassed area.

Pictures of the City of Albany Incident Control Vehicle (ICV)

This location was good for vehicle control into the fireground because all vehicles had to pass the place. This assisted with control and the establishment of ‘T cards’. A battle board had been started by [redacted] and this was moved into the ICV. The location was, however, in a mobile phone black spot that was not identified until the caravan was set up and being used as the Control Point (CP). With little or no mobile coverage, most of the van’s telecommunication functions were inoperable. It was later suggested that the van
should be relocated to enable better telecommunications but this did not happen until much later in the day, well after the burnover incident had occurred. There was a reluctance to move the ICV because the location chosen was good for vehicle control; adequate for radio communications; was close to the scene; was being used as a CP; and the van itself needed to be reconnected to a vehicle to be relocated.

While radio communications were adequate, some line-of-sight deficiencies were experienced on the simplex radio system due to its use within pine plantations. Fire control for the fireground command was being run on Channel 101, with fireground operations using WAERN simplex channel 354. Due to the poor mobile phone communications, DEC resources were communicating with their Regional Office in Albany on both Channel 101, and Channel 546. There was some success with mobiles used in a car phone kit or by moving to a higher vantage point some kilometers back up Two People’s Bay Road, but these were not options for those on the fireground.

During this initial period, continued to coordinate and dispatch local resources based on requests from and knowledge of events from monitoring the radio.

The initial run of the fire headed southwards, from the point of origin towards the lower-lying wet areas of a creek and swamp. During this period, the fire burnt predominantly in woodland and some heath / scrub fringing the creek that was last burnt by a wildfire in 2000. Therefore, the early fire behaviour seen by crews, and reported to the CP, would have reflected the fire burning through limited fuels.

Two dozers were requested from at about 1030, and they were delivered one after the other on a low loader. Water bombers were not available as it was outside the contracted period, although later in the day a DEC spotter plane was engaged by DEC. Up until the time of the burnover incident however, this was not a consideration.

The fire’s behaviour and intensity over this initial period could be characterised as moderate, with flames to 2 metres. Fuel loads were estimated at 22 tons per hectare. Once the fire crossed the creek, this was identified in the DEC draft Chronology as a “trigger for a request for additional resources” as cited in .

Police were notified at about 1100 of the fire by and that a 4WD vehicle had reportedly been seen near the location of the rubbish pit at the time the fire started. This was a report from the tenants and was never confirmed.

A discussion at the ICV around 1130 confirmed that would remain IC, would take the role of Planning Officer, and would take the role of Logistics Officer. and filled out the one page Incident Action Sheet provided by DFES to assist with the management of the fire. Although highly experienced saw role as support and thought it inappropriate to take control of a fire with little local knowledge (having recently arrived in the area) and at the time, saw no requirement to relieve from DEC took on a Liaison Officer role with the IMT until was replaced by
Spot Fire Weather Forecast

In support capacity, [Name] requested a Spot Fire Weather Forecast which was prepared by the BoM in Perth with observations taken from Albany Airport. The forecast was received after 1100 and [Name] subsequently radioed the forecast to the fireground. It appears that [Name] (fulfilling the Logistics Officer role within the IMT) answered the radio call, took down the details transmitted, and the handwritten copy was displayed in the ICV.

Radio logs indicate the Spot Fire Weather Forecast was not transmitted in its entirety, with only the tabular data from the forecast being read out and recorded. The Spot Fire Weather Forecast also indicated a ‘significant wind change between 1500/1700’ in text below the tabular data, but this was not communicated. The Spot Fire Weather Forecast once issued by the BoM is accessible on the www but was not available to the IMT as the ICV did not have internet connectivity. There may have been other copies of the Spot Fire Weather Forecast brought by individuals who printed them prior to travelling to the fireground, although the MIR could not identify any evidence that this was the case. While it may have occurred, and these may have been available to the IMT, it appears that no one identified to the IMT the commentary regarding ‘a significant wind change between 1500/1700’. All appeared to focus on the tabulated data, which reflected that at 1700, the wind change would have occurred.
Figure 4: Spot Fire Weather Forecast– Issued at 1110 12 October 2012

Establishing Sectors

The fireground was divided into two sectors (Alpha and Bravo) around midday, initially under the control of [name redacted] and [name redacted] respectively. Sectorising the fire appears to have been a combined decision proposed by DEC staff and accepted by the IMT. Clarity about the creation of sectors was not consistent, with some arriving at the fire ground describing a lack of awareness that sectors had been established. Alpha Sector extended along the east-west track establishing the northern perimeter of the fire. Bravo Sector extended along the north-south track establishing the western boundary of the fire. These boundaries sought to protect the adjacent pine plantations. Generally this was achieved, although six hectares of pines were lost on the western boundary. Back burning operations had been undertaken by CofA Brigades and DEC crews to the west of the pines in Sector Alpha as early as 1045.

Tabulated data which was transmitted, indicates that at 1700, the wind will have moved from NW to WSW.

This ‘Significant Wind Change’ information was not read out during the radio transmission.
**Passing Control of the Fire**

Close to 1200, a discussion was held about handing control of the fire from CofA to DEC between [redacted] as [redacted] who was on scene as the [redacted], DEC declined to take control of the fire but proposed asking DFES, [redacted] observed that [redacted] was ‘keen to hand the fire over to DEC’. However, this did not occur.

*When agency stakeholders had the opportunity to review this report as a draft, some indicated DEC did not receive a formal request. As the evidence of those interviewed by the MIR who were at the scene, was that it was the clear intention of the IC to pass control to DEC and this was affirmed by [redacted] as a third party, the MIR accepts this intent as a factual account and has reflected this through the report.*
At 1212, the IC, [redacted], asked [redacted] to request via [redacted] that DFES take control of the fire because it was encroaching on DEC assets. [redacted] called [redacted] about handing the fire to DFES, including comment ‘for cost purposes’. At this stage, the fire was burning uncontrolled in heavy fuels and had impacted pine plantations in Bravo Sector. [redacted] told [redacted] that there were only two DFES officers present in the regional office, and that they had little information about the fire.

On receipt of this information from [redacted], [redacted] then left the ICV and phoned [redacted]. The latter called the DFES ComCen in Perth about the reluctance by DFES to take control of the fire. [redacted] spoke with [redacted] who then contacted [redacted] at the DFES Regional Office. [redacted] informed [redacted] that [redacted] was sending a DFES Officer to the fire, [redacted] to make further assessments. [redacted], on hearing that DFES was sending an officer to the fire, assumed that DFES were taking control of the incident.

[redacted] arrived at the fire at around 1330. [redacted] is an experienced Level 3 Controller who reviewed the fire, the response, and the IMT; [redacted] indicated that there was no need for DFES to take control. [redacted] did indicate, however, that [redacted] would assume the [redacted] role at the CP.

In conjunction with the [redacted], the IMT discussed at 1320 the closure of Two Peoples Bay Road at the intersection of Nanarup and Two Peoples Bay Roads. Rangers from DEC closed the Two Peoples Bay Nature Reserve to the public, and road closures were later undertaken by a traffic management contractor arranged by the CoA.

Fire behaviour at around 1030 had been moderate with occasional bursts of high activity in some vegetation complexes. Rates of spread were estimated to be in the vicinity of 430 m/hr when burning in woodland that had been burnt by wildfire in 2000, although this increased subsequently.\(^{20}\) By 1330 and based on a series of photographs taken by an observer on Nanarup Beach, it was estimated that the fire has progressed south and reached the coast, fanned by warm, dry, moderate-strength NNW winds. It burned through heavy fuels in coastal heath and dense woodland. [redacted] described the progress of the fire once it had passed the previously burnt area:

“\textit{The distance from the southern edge of the creek / swamp system to the frontal dunes on the coast is \textasciitilde 2,700 m, so during this phase, [the fire run to the coast] the average ROS [rate of spread] was \textasciitilde 2,160 m/hr. The vegetation was mostly fully defoliated, with flame heights 2.0 m - 4.0 m flaring to 10 m in taller vegetation structures and dense thickets.}^{21} “

At 1400, there was a discussion within the IMT and the fire was designated a Level 2 fire. About the same time, a local news crew from GWN7 arrived at the fireground and was escorted onto the fire to record footage.

[redacted] briefed the resources supporting Alpha Sector at 1430: [redacted] [redacted] and DEC HD.\(^{22}\) [redacted] had recently relieved the incumbent Sector Commander who had gone to lunch after an informal handover. [redacted] had conducted a reconnaissance, identified
the dozer resources in support of Sector, and had briefed the IMT on plan. The briefing, however, did not include a fallback position.

Wind Change

Changes to the wind direction were not apparent to those on the fireground. , who was sent to the fireground to gain experience and became the when was appointed , tied flagging tape to vehicle aerial to assist identifying changes in wind direction. Otherwise the MIR heard no commentary suggesting individuals were specifically monitoring the wind direction or anyone on the fireground was using an anemometer. Statements of those involved, and all those interviewed, indicated they expected the wind change at 1700. The MIR concluded this was the understanding at the IMT and on the fireground, and this was never reviewed or challenged. Casual observation may have been made more difficult because of the terrain and adjacent forestry plantations, apart from any meteorological explanations that may account for a lack of indication by smoke drift.

Volunteer firefighters listening to the radio, reported the wind change to the west of the fireground. At 1338, received a call from at Bornholm, 20 km west of Albany, to advise the wind direction had changed to the south west. then contacted to obtain wind observations from location in Milpara, near Albany. stated that the wind was changing and was coming from the south west. informed the IMT and ‘recommended’ that this information be transmitted to all crews on the fireground. Information from the radio logs transcribed from Command Channel 101 indicates this was not done. However, some crews reported overhearing the discussions on Channel 101 about the wind change.

overheard a transmission from another appliance radio on Command Channel 101 that the wind shift had arrived at Bornholm.

explains the wind shift:

“At about 1419 hrs, the wind observed at the Bureau of Meteorology Albany airport station (BoM Albany) began to back to the NW and at about 1448 hrs, shifted abruptly to the SW. Just prior to the SW wind shift, the northern section of north-east flank of the fire was burning with moderate fire behaviour in long unburnt (50+ years) low forest some 140 m downhill and south-west of a track where DEC fire trucks and crews were positioned."

During this time in Sector Alpha, a bulldozer and crew had deployed along the east-west track. The bulldozer had been tasked with widening the track and had completed one run. Below the track, which ran along a ridge, lay a densely wooded slope estimated to be 6 degrees. DEC and Bushfire Brigade crews were working ahead of the fire edge, effectively in the ‘dead man zone’, lighting spot fires to hasten the removal of fuel between the track edge and the fire. , had viewed this activity earlier in the day and cautioned against unauthorised lighting. had influenced the to issue a
directive on the radio: “No backburning without authorisation”. These crews reported the spot fires were slow-moving but being ‘drawn into’ the main fire. takes up the description of the fire behaviour as the wind changed:

“On the wind shift, the flankfire quickly became a high intensity headfire. The alignment of wind and slope, low fuel moisture content and the hazardous nature of long unburnt, heavy forest fuel resulted in a rapid escalation of fire behaviour with flames 10-15 m high and a rate of spread of ~2,100 m/hr.”

The following description is drawn from statements made by those on scene.

Other resources from DEC were responded to the fire due to the potential threat to the Two Peoples Bay Nature Reserve. , who was previously undertaking a role in the ICP, had agreed to become the for Sector Alpha, which was intended to be predominantly DEC resources. A ground observer was deployed at 1420 to map the fire. travelled down to the area of the bulldozer at the eastern end of the track.

Sometime after 1300, DEC crew HD and ), and Bushfire Brigades crew and were deployed to Sector Alpha.

Prior to the arrival of a D8 dozer, drove along the track to check for turning points and alternative egress, but did not find any due to dense vegetation. HD and the volunteer Bushfire Brigade crews had a briefing with regarding tactics for the dozer work, including the lighting of spots 100 metres apart. These crews followed the dozer along the track until they reached the top of the rise.

Meanwhile, DEC resources from Walpole arrived and, after a briefing at the CP, were also deployed to Sector Alpha. At the CP, , and , and , were provided with an aerial photograph and a hard copy weather forecast from which they understood that the wind change was due at 1700. It is unclear to the MIR whether this hard copy of the Spot Fire Weather Forecast was a hand written copy of what was transmitted over the radio, or a photocopy of the actual Spot Fire Weather Forecast brought out by vehicle.

Missing the initial sector briefing, and made their way along the east-west track to meet with the then . On the way as the trucks travelled east, the crews discussed whether to partially deflate their tyres due to the sandy conditions. Both crews met up with at the south east corner of the pines in Sector Alpha. At this stage, the fire flank was about 50 metres downslope from the crews, with the wind coming from the NNW. Winds were gusty and turbulent around this time, and then a significant lull was observed as the crews were about to be briefed.

explains the minutes before the burnover occurred:

“At ~14.55 volunteer fire fighters lit two spot fires on the south side of the track. One spot was lit on the edge of the track and the other ~15 south of the track. The spots were ~116 m west of the DEC crews and ~116 m east of the flank of the main
fire where it intersected the track (i.e., east of the burnt ground). When lit the second spot, the fire fighter noticed that the main fire was ~100 m away and “was roaring with flame heights up to 8 m”. This fire behaviour suggests that the wind had, or was beginning to shift to the SW at about this time (~1458 hrs). Based on vegetation freeze, the wind shift occurred when the main fire was about 70 m from the second spot fire, which is reasonably consistent with the fire fighter’s observations (~100 m away).

The spot on the edge of the track was photographed at 1501 hrs and videoed at 1502 hrs by the fire fighter. At these times, the spot fire was close to the track, having spread only a few meters in 6 minutes since its ignition. Spot fires develop slowly compared with a line of fire. At the time the spot fires were lit, and when the spot on the track was photographed (1501 and 1502 hrs), the fire fighter recalled that, “the wind still had some north in it”. The smoke and behaviour of the spot fire in the short video clip indicates that the wind was swirling, suggesting it may have been in the process of shifting from WNW to SW. When the spot fire was being videoed the fire fighter recalled that the main fire was, “now 50 m away with flame heights up to 10-15 m”. These flame dimensions indicate that the wind had shifted to the SW and the flankfire was now an intense headfire.”

 refers to the wind taking four minutes to shift from WNW to SW as recorded at the BoM Albany Airport weather station. It is likely the transition time on the fireground was very similar. This would mean it commenced shifting at 1458 and was coming from the south west by 1502. Just prior to the wind change, the crew of HD and ), also lit a spot fire consistent with the strategy of volunteer firefighters further to the west.
The Burnover

returned from a reconnaissance to the east and went to provide a further brief to the crews, in particular to the incoming DEC Walpole crews who had missed earlier briefing. vehicle was facing west and briefed the crews of and who were facing east. noticed the heat on his back and moved to the passenger side of the vehicle before appreciated the intensity of the fire. then instructed the crews to leave the area and left in light vehicle, driving west.

As the wind shifted, the fire intensity created by the combination of old and very dense fuels was estimated to be in excess of 23,100 kW/m. Comparisons with other serious fires, for example the Linton Fire where a similar burnover occurred, had an estimated heat generation of 13,500 kW/m. Clearly the Black Cat Creek fire was an intense burn during the wind shift:

“Within about 4 minutes, fire fighters were trapped in a burnover. The nature of the terrain, thick vegetation and that the fire approached the crews on an angle from behind meant that they may not have been immediately aware of the wind shift and change in fire behaviour until the fire was close, giving them a short time to react.”

The two DEC crews had little time to take cover in the front cabin of their trucks before the fire burned over the top of where they were parked facing east on the northern side of the track. DEC (with and) had their pump running and the marauder sprays on the rear of their vehicle were uncovered. These, however, could not be activated without initiating the sprays from the rear of the vehicle. The vehicle with and having just arrived for a briefing, did not have their pump running and their marauder sprays were still covered. The fire approached from the south west, impacting the vehicles from the right rear.

crew, on the same track also facing east but about 300 metres west of the DEC crews, managed to get their vehicle mobile as the fire front hit them. They drove forward through the encroaching flames, leaving their hoses trailing behind as there was no time to gather them. With low visibility and flames impinging on the cabin, the crew felt it too dangerous to stop.

At the same time, with and, caught fire and accelerated rapidly to make an escape in the same direction as the vehicle. recounts the moment: “Everything has intensified immediately. There was no build up – it was almost an instant-there wasn’t any build-up. There was just a flash; it was there...Within a matter of less than 10 seconds, felt like about two or three...”

Showered with embers, and their side mirror and driver’s door alight, drove for about 600 metres to a cleared sandy area. There they met the dozer driver who saw what was happening and started creating a larger cleared space for the tankers by knocking down the surrounding trees and large bushes as flames burnt around them.

The crew of and took refuge in their truck. After arriving, they noticed the vehicle with their petrol powered pump well alight at
the rear. When it was safe to do so, the crew alighted from the truck, started their pump and began extinguishing the rear of the truck. The crew remained under blankets in the cabin during this time. Then returned to their truck while continuing to spray water onto theirs and as the fire burned around them.

The DEC truck (with) stalled most probably through an electrical alert due to the intense heat soon after the fire reached them. and took shelter under woolen blankets on the floor of their truck. Parked close behind, the crew (with) had also attempted to reverse but their vehicle stalled, most likely as a result of a similar electrical failure. They could not access their blankets behind their seats as their firefighting bags were on top of the blankets. The rear cabin window had also imploded into the truck behind their seats, shattering over their fire bags and making access to their blankets impossible.

They crouched low in the cabin but were struggling with the amount of heat and fumes in the truck cabin. They noted that their helmets that had been on the dash of their truck were melting into the dash, and other plastic items such as radios were also melting. They made the decision to get out. They ran to the crew of parked just in front of their truck, banging on their vehicle as they moved forward. and exited from their respective sides of the truck, having decided moments before to do so and hearing the banging from outside.

and huddled under blanket on the south side of the vehicle and remained as low as possible to the ground. At this time, and did not have their blankets with them as they could not be retrieved from behind their seats when the burnover occurred. They travelled west along the track when the local fire behaviour allowed, then fell again to the ground, covering themselves with the blanket.

had alighted on the northern side of the track and was isolated from the others, not being seen again by the other crew members. As the vehicle had been parked on the northern side of the track, the door would have opened into vegetation which most likely would have been burning.

and who was driving, were travelling west in a light tanker vehicle when the burnover occurred. After leaving the burnover area, realised crews had not made it out safely and he turned around to find them. A radio call was made by to the CP alerting them of the burnover and to put ambulances on standby: ‘Stop. Stop. Stop. We have had a burnover and people are hurt’. and initially came across and and took them to the nearest volunteer tanker to the west, instructing them to be transported to the CP. and then returned a second time to the burnover scene and found badly burnt and disorientated near the vehicles. was without blanket or helmet. They took to the CP where preparations for first aid had been made.

By this time, four ambulances from Albany were on their way. An emergency triage area had been established by the IMT at the CP and first aid treatment for personnel began immediately on their arrival. Oxygen was administered to, clothing was removed and cool water was applied to the burns of all patients. This continued for some 25 minutes until ambulances arrived. All patients were transported to Albany Hospital and and were subsequently flown to the Royal Perth Burns Department.

*unnamed*
Once all evacuations were complete, a check of all crews was conducted. Some at the CP received an initial debrief, and management of the fire continued with [deleted] as IC. At around 1615, [deleted] (previously the [deleted]) took control of the fire as [deleted] under Section 13 of the Bush Fires Act 1954. Fire operations continued, although much of the intensity of the fire had abated. The major concerns were that the fire would reach Two Peoples Bay Road and the adjacent water pipeline; that the fire would jump the road and continue north; and would burn east into the Two Peoples Bay Reserve. Later in the afternoon, the ICV was moved to higher ground closer to Albany in order to gain effective telecommunications.

[deleted] explains the fire behaviour after the burnover:

“Soon after the burnover and after the fire had crossed the ridge, its behaviour abated. Having crossed the ridge, it was now burning downhill in highly modified, mostly cleared (windrowed) vegetation. Weather conditions quickly moderated with the onset of the onshore wind and by 1600 hrs, temperature had fallen to 23o, RH had risen to 39% and wind speed reduced to <20 km/hr.”

DFES officially handed back the control of the Black Cat Creek fire to the City of Albany Bushfire Brigade on Monday 15th October at 9.00am.33

Tragically, four DEC employees ( [deleted] ) were injured during the burnover, and [deleted] died three weeks after the fire as a result of injuries sustained [deleted]; [deleted] and [deleted] were also recorded as injured, and [deleted] of the [deleted] was also evacuated to have injuries assessed.

[deleted], having reconstructed the fire path, noted

“The location of the fire fighters involved in the burnover just prior to the wind shift and the position of the flank of the main fire just before the wind shift is shown in Figure 13. Important details are:

- DEC trucks and crews were on the track ~140 m north east of the flankfire, on a ridge upslope of the fire. The track had been widened to ~6 m by a dozer which was working on the track ~300 m east of the DEC crews.
- DEC trucks and crews were ~230 m east of the ‘black’ (burnt ground) where the main fire intersected the track to the west [See Figure 6 below].
- DEC trucks and crews were ~ 65 m east of a small patch of low defoliation and scorch, suggesting moderated fire behaviour associated with a spot fire lit by fire fighters and local terrain and fuel factors.”34
Figure 6: Location and proximity of DEC and Volunteer fire fighters involved in the burnover in relation to other features just prior to the SW wind shift at ~1502 on the fire ground. The solid red line approximates the position of the flank of the fire just before the wind shift, the dashed line is approximate position of fire at the time of burnover, red arrows are vegetation freeze, or direction of wind when the fire was at that location.
3. **Analysis of why the Incident Occurred**

The following issues have been identified by the MIR as the major causes of the incident and subsequent injuries. A more detailed identification of all causal factors aligned to both the Reason Model and ICAMS are detailed at Appendix 3 and 4:

1. There was poor situational awareness in the IMT and on the fireground concerning the arrival of the wind change.
   
2. This led to crews being on an exposed fire line when the wind change occurred.
   
3. The crews were operating in the ‘dead-man zone’ with the understanding that the wind change would not occur for two hours.
   
4. Although there was transmission over Channel 101 that the wind change had arrived at Bornholm and at Milpara at 1338, this was never transmitted as a Red Flag Warning [see specific discussion below] and receipt of this advice on the fireground was never confirmed.
   
5. When the wind change did occur, the intensity of the fire in the vicinity of where and were located generated a localised firestorm with up to 10 metre flames burning at 23,100 kW/m through elevated fuel estimated at 22 tonnes per hectare.
   
6. As the fire burnt towards them up a six degree slope and the crew were located just north of the gentle crest rising from a swamp/creek system, their visibility of the fire and its rapid escalation was impeded. Smoke drift did not signal a wind change to the crews.
   
7. Escape routes and safety zones were not specified and rapid relocation to the safer ‘black’ edge of the fire would have required reversing the vehicles west, at high speed, several hundred metres along a sandy track.
   
8. Both DEC vehicles stalled for reasons not specifically identified by the MIR but likely to have been a result of embers entering the air intake and/or electrical controls sensing extreme heat and shutting down.
   
9. Neither vehicle had the opportunity to initiate their deluge systems which required their pumps to be running and an operator at the rear of the vehicle to initiate the system.
   
10. The lack of roll down, in-cab, radiant heat shields in the vehicles minimized the protection offered within the vehicle cab.
11. The crew in the rear vehicle did not have the opportunity to utilise their personal blankets located behind their seats, and it appears burnover drills were not well practiced.

12. On alighting from the vehicles, the MIR identified only one blanket that protected three crews.

13. All crew members lacked some element of PPE that reduced its overall effectiveness.

14. The inability of all four crew members to gather together on exiting the vehicles led to greater injury of.

These factors are now explored in more detail.

1. Poor Situational Awareness. Situational awareness is a term derived from the aircraft industry relating to the perception of environmental elements with respect to time and/or space, and understanding the consequences when these change. It is most pertinent to decision makers in complex and dynamic environments.

The situational awareness of the IMT and those on the fireground was lacking for two fundamental reasons:

- They were provided with an incomplete appreciation of the Spot Fire Weather Forecast due to a partial radio transmission and the inability to access the Forecast on the www; and
- There was too little focus on local weather conditions by the IMT and those on the fireground. The MIR was not able to identify anyone who used an anemometer on the day. Other than , the , who tied flagging tape to the aerial of car in order to identify variations in wind direction, no one appeared to take any measurements of local conditions at the fireground.

A third factor which did not appear to be appreciated was the continued use of the track on the southern side of the adjacent pine plantation when a track less than 100 metres further to the north offered greater escape opportunities as fuel had been significantly reduced. The track used by crews better protected the adjacent pine plantation but once the fire passed this area, the track to the north of this line would have significantly reduced firefighter exposure, but this appeared not to have been identified by those in the IMT or by those on the ground.

2. Crews exposed on the fire line. Crews being on the exposed fire line when the wind change occurred is the very hazard highlighted as a highly dangerous situation. Having unburnt fuel between the flank fire and the crew line generates the potential for being caught in the ‘dead-man zone’. The MIR was advised that it was not unusual for crews to operate in the ‘dead-man zone’ but it required heightened awareness and focus on safety. It is much safer to operate from the ‘black’ progressively moving forward along the fire edge as the fire reaches the fire line and there is no fuel between the fire front and the crews. This, however, often slows the progress of securing the fire edge. While estimates varied, it appears that the crews were about 50 metres from the fire edge when the wind change forced a change of direction.
3. Operating in the ‘Dead-Man Zone’. Three serious fires in the eastern states, where fire fighters died when flank fires became head fires, are used by Cheney, Gould and McCaw as the cornerstone of their ‘Dead Man Zone’ training. This has been implemented across Australian fire services since the Linton fire of 1998. The fires, The Grays Point fire, Wingello State Forest and the Linton fires, all had similarities to the Black Cat Creek Fire in terms of crew positioning, strategy, tactics and fire behavior. The researchers noted that these three examples highlight the risks to firefighters undertaking parallel attack on bushfires in heathland and eucalypt forests.

The common theme in these examples was that firefighters were caught by a sudden and dramatic escalation in fire behaviour that resulted from changes in wind direction and/or strength influencing an established line of fire. The rapid response by the fires to changing conditions and the distance between the fire edge and the fireline left the firefighters with only a very short time to assess the situation, communicate the decision amongst the crew, and take evasive action. Regardless of the specific tactics in each case and subsequent actions taken after the wind change, it appears that the fires spread much faster than the firefighters anticipated and they did not allow sufficient time for safe egress.  

The ‘Dead-Man Zone’ is the area between the fire and crews who are working in parallel or direct attack of a going fire. Time and space are required to find safe refuge as the fire approaches, particularly if fanned by an unexpected wind change. Drawing on McArthur Meter calculations based on a nominal figure of 12.5 tonnes per hectare of fuel, when a Forest Fire Danger Index (FFDI) is 20 and there is level ground, the fire would be expected to travel 87 metres in five minutes, or 174 metres if the fire is burning up 10 degrees of slope. With an FFDI of 60, the fire would be expected to travel 338 metres in five minutes on level ground, and 676 metres on a 10 degree slope. The MIR acknowledges this does not take into account the specific ‘Red Book’ calculations for forests in WA, but it does at least provide an indication of the potential fire spread under these conditions.

Based on these calculations, working on an FFDI of 20 (although this was never calculated on the day as it was outside the Fire Danger Season), with 22 tonnes of fuel as identified by , and a six degree slope as occurred at the incident site, the fire would have most likely travelled the 50 metre distance from the fire to the crews on the track in less than two minutes. This is the likely maximum time the crews had from when the wind change altered the direction of the fire front. For the crews involved, who were over the crest to the north on the track, the time they had to prepare was likely to be less, as they were unaware of the approaching fire until it neared the crest.

4. Lack of Red Flag Warning. DFES advice indicates that “Red Flag Warnings provide a method of ensuring specific safety information (i.e. weather changes, hazardous materials, fire behaviour, structural integrity, equipment failure) critical to ensuring the welfare of operational staff is delivered and received by radio. Red Flag warnings may be initiated by the IC, Operations Officer, Division Commander, Sector Commander or Regional Duty Officer).”  

The crews of and were experienced in prescribed burning, and had extensive fireground experience. Had they known that the wind change may arrive at 1500, the MIR is confident that and the crews in sector would not have been where they were. This lack of situational understanding appeared to arise because:

- Incomplete transmission of the Spot Fire Weather Forecast;

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36 Cheney P; Gould J; McCaw L. The Dead-Man Zone - a neglected area of firefighter safety. Revised Manuscript 4 November 2000.

37 DFES D3.2 Incident Control V1.3. July 2012, p 19.
• Inability to receive the forecast by fax or www at the ICV because it was in a telecommunication black spot;
• Subsequent communication and distribution of incomplete Spot Fire Weather Forecast information on the fireground;
• Possibly speaking on radio to DEC Regional Office when the radio reports were being made concerning the arrival of the wind change;
• Failure to transmit the arrival of the wind change at Bornholm and at Milpara as a Red Flag Warning on the fireground;
• A focus on the BoM Spot Fire Weather Forecast by the IMT and those on the fireground and little apparent analysis of local weather conditions i.e. use of an anemometer; and
• Local topography and vegetation, particularly the pine plantations, potentially masking the development of the wind change from those located at the CP and on the fireground.

Important Note: Red Flag Warnings are commonly used by many Australian rural fire agencies to advise operational crews of critical hazards on the fireground. The MIR was advised DEC and CoF does not use Red Flag Warnings. That such a critical procedure is not consistent between agencies operating on the same fire ground requires immediate addressing. In particular, Red Flag Warnings need to be introduced as operational procedures in all WA fire agencies, as any alternative that may have been in place by these agencies was ineffective on the day.

RECOMMENDATION 1
Critical operational procedures such as ‘Red Flag Warnings’ on a common fireground need to be consistent across DFES, DEC and Local Government. In particular, the operational procedure of Red Flag Warnings needs to be adopted by all WA fire agencies.

5. Fire Intensity. The fire intensity was a result of the available fuels, their moisture content, the fuel’s elevation and the fire burning up a six degree slope. Aerial photography of the area prior to the fire, and scorch analysis after the fire, indicates that the very area where the crews were located had the highest density of fuel and subsequently the highest intensity of the fire. This was estimated at 23,100 kW/m.

6. Lacked visibility of the fire - Watchouts. Because of their position on the east-west track relative to the fire and the fact they were over the crest, the crew’s view of the fire was impeded. The vegetation was thick between the fire and the track. While they could observe the spot fires they had lit being drawn into the fire and aspects of the main fire, they were not well placed to view the changes in fire behaviour as the wind change took effect. “Cannot see the main fire, not in contact with anyone who can” is one of the 18 Watchouts universally acknowledged by rural firefighters and detailed at Appendix 5.

7. Escape Routes and Safety Zones – Watchouts. Safety zones and escape routes not identified are also “Safety zones and escape routes not identified” and are also part of the 18 Watchouts universally acknowledged by rural firefighters and detailed at Appendix 5. The escape route required a vehicle reverse 230 metres to the edge of the pine plantation which had been identified as a possible safety zone, but was unknown to the crew of and, as they were yet to receive a brief having just arrived on the fire ground.
Standing Fire Orders and Watchouts. The Standing Fire Orders were developed in 1957 by a United States task force studying ways to prevent firefighter injuries and fatalities. Shortly after the Standing Fire Orders were incorporated into firefighter training, the 18 Situations that should lead firefighters to shout ‘Watch Out’ were developed. These 18 Watch Outs are more specific and cautionary than the Standing Fire Orders.

The MIR was provided with the DEC publication “Safety in Bushfire Control”, a CALM publication dated 2004 which listed the 10 Standing Orders and 18 Watchouts. The MIR was subsequently advised that only LACES are now used by fire agencies in WA. The MIR favours the mnemonic ‘LACES’ although knowledge and the intent of the 10 Standing Orders and 18 Watchouts is still of value and should be understood by firefighters and are listed at Appendix 5. LACES are detailed in the same CALM publication and a further refinement is highlighted in the RFS firefighter Pocket Handbook:39

For Firefighters:

- **L** Lookouts: Everybody looks out for everybody else.
- **A** Awareness: Everybody is aware of the current and anticipated behaviour of the fire and other incident hazards and precautions.
- **C** Communications: Everybody speaks up about what is happening and their concerns at the incident and everybody listens.
- **E** Escape route: Everybody has an ‘out’ planned and agreed.
- **S** Safety Route: Everybody helps everybody to survive. Everybody supports the decision to get clear of a hazard.

For Crew Leader

- **L** Lookout: Assign a “lookout” to a safe vantage point in communication with crew leader.
- **A** Awareness: of terrain, weather, fire behaviour, the task and nearby activities.
- **C** Communications: Maintain suitable radio or other contact.
- **E** Suitable Escape route/s checked and known by all crew.
- **S** Safety: Suitable, large enough, close enough and free of hazards.

8. Vehicle Stalling. Both vehicles stalled for reasons not specifically identified by the MIR, but likely to have been a result of embers entering the air intake and/or electrical controls sensing extreme heat and shutting down.

9. Inability to initiate deluge systems. On [], [], and [], the pump was running but the deluge system required initiation by moving to the vehicle tray to turn on the system from behind the crew cab or at the pump. On [], [], and [], their pump was not operating and the MIR was advised that the covers were still on the deluge system. Although any deluge system is strongly influenced by the extant wind conditions, had they been operating and the pumps had kept operating (noting the rear of both trucks were on fire), it is likely water would have been blown towards the crew cab as the fire approached from the right rear of the vehicles.

10. In-cabin roll down, radiant, heat shields. The lack of roll down, in-cab, radiant heat shields in the vehicles minimized the protection offered within the vehicle cab. When the rear window of [], [], and [], fell into their cabin, they had not been able to access their fire blankets from behind their seats and their helmets were on the

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39 Rural Fire Service NSW, Firefighters Pocket Book dated December 2012.
dash of their vehicle and not being worn, then the time they could shelter in the cabin of their truck was reduced. Roll down, in-cab, radiant heat shields would have most likely extended this period of crew protection.

11 and 12. Blankets. In referencing other fire agencies, the MIR considers that individual fire blankets should be considered an integral element of PPE in a burnover situation and indeed, they proved effective where utilised during this event. Under the most extreme and horrific conditions, three survived wearing much of the appropriate PPE and utilising a single blanket between them. The blankets must be serviceable and accessible, and no firefighter should leave a vehicle without one during a burnover.

13. PPE. From the available information, the MIR identified that those who sustained substantive injuries were wearing the following:

- Blanket in the vehicle but no blanket once left the vehicle, no helmet, no gloves, PPE Level 1 jacket and cotton drill pants, T shirt, woollen socks, work boots, and underwear.
- No blanket, no helmet, no gloves, DEC green jacket, jeans (although removed jacket once outside the vehicle and draped it over head), jeans, shirt, woollen socks, work boots, and underwear.
- Blanket in and out of the vehicle, no helmet, no gloves, DEC green jacket and trousers, t-shirt, woollen socks, work boots, and underwear.
- No blanket, no helmet, no gloves, DEC green jacket and trousers, T shirt, woollen socks, work boots, and underwear.

The MIR noted that the PPE warn by DEC staff varied considerably between the crew involved. That worn by those in the burnover offered a good deal of protection where it was worn as intended. Clearly the blanket proved a highly valuable level of protection and must be seen as integral to burnover PPE. Sustained exposure as experienced by the individuals concerned was not sufficient to protect from serious and eventually life-threatening injuries.

Such a tragic event presents an opportunity to review PPE. The MIR, however, also raises a degree of caution. There are new products being made available that provide additional protection for firefighters. The most life-threatening hazard for rural firefighters, as advised to the MIR, is heat exhaustion and it is an unfortunate reality that a product which may provide superior fire retardant qualities may prove life-threatening in regard to heat retention.

A salient fact that does not reduce the tragedy of the loss of life, but highlights the lessons identified, is that the injuries sustained that subsequently cost life, was as a result of extended exposure in the fire storm, without a helmet, gloves and blanket, and potentially exposed to direct flame contact. It would appear this was not a result of the PPE failing to perform to specification, which for rural PPE is to protect against radiant heat while allowing for heat loss when active.

14. Inability to gather together on exiting the vehicles. It is highly regrettable, but totally understandable, that all four crew members did not manage to team together when they exited from their vehicles. The MIR has not speculated as to why this did not occur but notes:

- The individuals concerned were in a fire storm. There was thick smoke, intense flame and all were seeking to survive.
• Both vehicles were parked on the northern side of the track, close to vegetation. It is most likely that [redacted] exited from [redacted] vehicle into burning vegetation.
• Without blankets, [redacted] and [redacted] sought the protection offered by [redacted] blanket. This would have demanded [redacted] attention at the critical moments when [redacted] exited the vehicle at the same time as [redacted].
• It is unknown whether [redacted] had [redacted] blanket with [redacted] when [redacted] exited the vehicle. [redacted] was found without helmet, or blanket.
4. Other issues identified by the MIR that influenced the outcome, but were less germane to the burnover

The location of the ICV. It was problematic that the ICV was positioned so close to the fire that it was in a telecommunications black spot. While this close proximity suited the level of incident initially, reassessment of its functionality and operability did not lead to changing its location. If the ICV had been able to receive fax and internet communications, it is likely this would have led to a different outcome with relation to the provision and interpretation of the Spot Fire Weather Forecast.

The disparate coordination and support of the fire in Albany. This issue is addressed separately in Chapter 7. Essentially, the fire was supported from three separate locations across Albany which was inefficient and failed to provide the best opportunity to pool information, understanding and resources.

Fireground Communications. Radio communication on the fireground was adequate, although there were localised issues with fireground simplex. Operating outside mobile phone coverage is not unusual. However, placing the ICV in a black spot when other options were available was an unnecessary impediment to communications. Other issues identified include:

- A failure to confirm positive receipt of messages on the fireground and not using 'Red Flag' warnings hindering fireground communications.
- DEC switching radio channels may have reduced the likelihood of DEC crews receiving advice that the wind change had reached specific locations to the west of the fireground before 1500.
- While the WAERN radio system allows interoperability across agencies, it appears there are shortfalls in the competence of personnel to operate the radios, in particular in dual transmission/receive mode. Nicknamed the “Yellow Peril”, the single yellow vehicle-mounted handset reportedly makes it difficult for the infrequent user to quickly identify who is calling and what mode the radio is operating in. This may have led to agencies reverting back to what they are comfortable with, instead of using all the features the network has to offer.

Weather. Relevant issues related to the weather include:

- Incorrect interpretation of the Spot Fire Weather Forecast by several personnel. This was raised in the Borrabbin, Linton and Black Saturday reviews and is discussed further in this review.
- Apparent sole reliance on BoM Spot Fire Weather Forecast with no local observations taken or offered to the BoM to assist in forecasting.
- No anemometers appeared to be sought or used within IMT or on the fireground.
- The lack of appreciation of weather influences has been raised in previous MIRs and was a feature of the Boorabbin Fire 2007 and Perth Hills Fires in 2011.
Spot Fire Weather Forecasts. The Spot Fire Weather forecast issued for the Black Cat Creek fire on 12 October 2012 was presented in a format that had been in existence for about 10 years. The Boorabbin Fire outlined the deficiencies:

“Important ‘significant wind change’ forecast information was missed by the IMT personnel who received the Spot Weather Forecast. There is a need to put in place a more systematic approach to weather forecast interpretation, dissemination and acknowledging receipt of routine and spot forecasts.”

Following the Boorabbin Fire, DEC developed a Fire Operations Guideline to address the report recommendations. FOG 18 outlines how daily weather and spot forecasts are to be sought and implemented, with an emphasis on reading the section headed ‘Significant Wind Change’ along with other weather remarks. Despite the recommendation for improvements for the interpretation of this type of forecast following the Boorabbin Fire 2007, it appears there remains a significant need for fire personnel to be trained in this area.

RECOMMENDATION 2
All agencies ensure fire managers are trained to correctly interpret the new Spot Fire Weather Forecast and to familiarise themselves with the entire format – ensuring consideration of the whole forecast - not just the tabular data containing the 12 hour forecast.

With the implementation of the Next Generation forecasting system in WA on 31 October 2012, this particular section of the forecast has more prominence in the new Spot Weather Forecast.

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Findings And Actions From Inquiries Conducted By The Department Of Environment And Conservation Into The Boorabbin Fire 28 December 2007. 8 January 2008, p 88.

**Pre-season Briefings.** The DEC pre-season briefings for the South Coast Region were programmed for the week after the fire. While these occurred later than many other areas across the State, they were planned for before the fire season commenced.

**Human Factors.** The following human factors were identified by the MIR:

- An understandable degree of complacency as admitted by some interviewed by the MIR, due to a fire on a relatively mild day prior to the start of the fire season;
- The inability for all crew members impacted by the burnover to remain together is likely to have led to further injuries;
- When the burnover event became inevitable, the following protection measures impacted on crew survival:
  - Individuals not wearing complete PPE;
  - Blankets not being used by some; and
  - Deluge systems on the vehicles not being initiated.
- The experience of fire crew who undertake extensive prescribed burning, may have meant that they had become too used to working in the ‘Dead Man Zone’ under controlled conditions, and had not identified their vulnerability in uncontrolled conditions.

**Training.** Concerns raised to the MIR in regard to training deficiencies linked to this incident include:

- Not using the SMEACS (Situation, Mission, Execution, Administration, Command and Communications, and Safety) briefing tool to convey orders on the fire ground by the IMT and Sector Commanders;
- Lack of burnover training for DEC personnel (and possibly CoA) (refer to new DFES SOP 3.5.11 Entrapment at Bushfire September 2012 and RFS procedures at Appendix 6);
- Limited knowledge of fire weather detail as reflected by some individuals interviewed by the MIR;
- Difficulty in getting local training for BFB personnel, for example, having to travel and sometimes training being cancelled at short notice due to lack of numbers;
- Unsure as to the extent of AIIMS training amongst senior volunteers; and
- Fire Control Officer competencies not being linked to AIIMS. There should be no expectations that a competent Fire Control Officer can manage operational incidents unless they have completed AIIMS training.

**Tactics.** During the MIR there were conversations regarding the tactics being used on the fireline – whether lighting spots from west to east to reduce the fuel between the fire and the track was a sound strategy with the wind swinging from the west. The MIR did not ask the question but noted the conversations. It is not commenting on the tactics because, as advised by __________, the lighting of these spot fires from the west to east did not directly influence or impact on the burnover incident.

**Dynamic Risk Assessment.** During interviews following the Black Cat Creek Fire, and perhaps with the benefit of hindsight, several fire fighters indicated they were not entirely
comfortable with fire operations just prior to the burnover, but did not speak up. While the MIR has not explored fire fighter awareness of risk assessments or associated training, it would suggest that greater prominence should be given to empowering all personnel to have the confidence and support to raise safety concerns at any time.

The continuous assessment of hazards to fire fighters is a key element of the dynamic risk assessment process used by many fire services. It relies upon all levels of personnel to be actively engaged in the review of their own safety and the safety of others. While the process places an emphasis on the Incident Controller/crew leader being ultimately responsible for undertaking the dynamic risk assessment, every operational member is reminded of the rapid and potential hazardous change in fire conditions. All fire fighters should have the ability, and be encouraged, to speak up about safety.

An excerpt from the CFS Operations Management Guidelines may assist in highlighting the requirements:

**Stop:**
As events occur or before you commit to an action, stop, step back and see the big picture. This may be achieved whilst on route or on arrival. Avoid tunnel vision. Although this is especially important for the crew leader, it applies to everyone involved.

**Think:**
Time is a crucial element. Take time to arrange your thoughts before acting. Determine what’s occurring, what you can control and what is out of your control. Situational awareness is critical to decision making. Observe with your eyes, ears and other senses, and use the resources available to gather information.

**Assess the Risk:**
Assessing the risk involves identifying what the hazard is; analyse what the likelihood of harm is from the hazard; analyse what are the options for minimising the risk, including contingencies/fallbacks; selecting the best option; work out how to implement this option; consider the consequences of any actions decided.

**Talk to Someone About It:**
Talk to someone about what is occurring, what is likely to occur and what actions you are going to undertake. This may occur up or down the chain of command and allows two-way communication before actions are undertaken. In certain circumstances, additional information provided as part of this discussion may result in altering proposed actions.

Once actions are confirmed, they need to be communicated to everyone involved to ensure that situational awareness and the intent is understood.

In addition, details of procedures for survival advice in a vehicle drawn from the NSW RFS Firefighters Pocket Book is a worthwhile comparison. These are detailed at Appendix 6.

43 South Australian Country Fire Service Operations Management Guidelines 2011, p 70.
The Hierarchy of Control has been widely adopted (although the MIR was advised not in WA) as the focus for the reduction of risk through the implementation of a series of prioritised control measures – with risk management practices, standards and now workplace health and safety legislation incorporating the concept within their frameworks.

The concept of risk management using the hierarchy of controls, as mandated in the recently enacted Work Health and Safety Regulations 2011, does not appear to be an entirely clear concept for fire services to grasp. Controlling hazards in a dangerous environment involves complexities that have been previously explored in great detail following the Linton Fire of 1998.

The hazard (fire) cannot be eliminated or substituted, as fire is the very hazard the fire service seeks to combat. A natural progression in the hierarchy is to place greater emphasis on engineering controls to ensure crews are protected by the tools they are using to combat the hazard.

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The MIR heard that personnel are highly trained, experienced and well supervised to ensure they are not put in, or do not put themselves in dangerous predicaments. These administrative controls have been the cornerstone of risk management for firefighting in many Australian agencies. It does, however, appear that this philosophy although sensible, has not given higher or equal attention to engineering controls for crews using fire appliances in rural settings. It does not consider the potential for human error, and as highlighted, a series of such errors lead to the administrative controls failing on this occasion.

**Resourcing.** Observations by the MIR in this regard were limited to:

- Resourcing appeared adequate for the fire event. Greater resources would not have changed the outcome.
- DFES considered at the time that they had a lack of resources to take control of the fire, as advised by the [redacted]. This is dependent on what the understanding was regarding their resourcing responsibilities for the IMT. The MIR understands that DFES could choose to appoint an individual from another agency as IC or IMT members, even when DFES has taken control of the incident.
5. Enhanced Crew Protection in Vehicles

The nature of this incident and the consequences warrant the MIR devoting a chapter to this issue.

**DEC vehicle modifications.** DEC advised the MIR that they completed the following modifications to their large firefighting vehicles:

- Protection to brake lines;
- Wider front tyres;
- Satellite tracking of vehicles;
- Satellite phones in some vehicles;
- Two 250ml marauder deluge sprays positioned either side of the vehicle tray; and
- Woolen fire blanket positioned behind each seat in the crew cab.

These measures are applied to their heavy fleet of 105 fire trucks and 125 items of plant and equipment. (The MIR noted that significant funds [$20,000+] had been spent to fit heavy machinery such as dozers with fire protection systems following equipment losses in previous fires). The heavy fleet is mostly “off the shelf” truck chassis with the rear of the truck set up as a multipurpose vehicle to meet local requirements. The marauder sprays are positioned behind the crew entry on the back tray, and are not specifically designed to protect the crew cab. The controls to operate these sprays are located at the pump at the rear of the vehicle and behind the crew cab.

Other minimal measures for purpose designed fire trucks include replacing some plastic features with metal such as vehicle door handles, fuse box covers, mirror bracket covers, engines guards, metal splash panels, metal mud guards and metal wheel arches and fire proof ‘lagging’ of critical wiring, brake lines and air lines.

No modifications are made to their much larger light fleet (over 600 vehicles) of quick response vehicles and light vehicles that may operate on the fireground. These measures are not adopted for quick response light fleet vehicles simply because their regular turnover makes such measures uneconomic.

**DFES vehicle modifications.** DFES advised that their modifications are similar for chassis protection as listed above, but crew protection measures appear to have been minimal and do not even include fire blankets. The MIR was advised that these are currently being sourced. Local Government are required to meet DFES vehicle and servicing requirements.

**Crew Protection Measures in Vehicles**

Those conducting the MIR are not specialists in rural firefighting protection, but have spoken to personnel who are. It is concerning that WA agencies appear significantly out of step with the other States that face a similar level of bushfire threat. SA, VIC, TAS and NSW all place far higher priority on vehicle protection than DEC, DFES and Local Government Bushfire Brigades, and have done so for years. This lack of action in WA is not a result of ignorance. WA agencies have been well aware of developments in other jurisdictions, participating in AFAC\(^{45}\) committees and other forums which discuss these matters.

\(^{45}\) Australasian Fire and Emergency Service Authorities Council.
No single explanation was provided as to why this strategy of minimal crew protection on vehicles has been pursued. While budgets are always an issue with a balance required between protection and expenditure, risk and consequence, agencies indicated cost was not a consideration in firefighter protection.

The approach appears based around:

- Seeking to ensure firefighters do not place themselves, or are not placed, in a dangerous position on the fireground in the first instance;
- No firefighter having died in DEC as a result of burnovers since 1958, providing a degree of confidence that this approach (outlined above) was effective;
- DEC staff having regular exposure to fire through prescribed burns, making them very familiar with the fireground environment and reducing the likelihood of being caught in a burnover situation;
- The lack of formal national standards appeared to impede WA agencies acting on this issue; and
- Doubt of sufficient scientific guidance that vehicle protection measures had merit.

The MIR does not address each of these issues and it is for agencies to reflect on their position in this regard. It does, however, highlight that a lack of national standards has not impeded any other agency. A broad industry consensus has been achieved within the fire industry, and it disputes that there has not been scientific guidance or practical evidence that vehicle protection measures have merit and reduce the consequence of burnover events. The media report at Appendix 7 illustrates one recent experience where the measures implemented in Victoria were of significant benefit to entrapped crews.

The MIR sought advice from other rural agencies about current engineering controls in firefighting tankers and bushfire appliances. The MIR concluded that the following should be mandatory and fitted to all appliances entering the fireground as a minimum level of protection:

- specifically manufactured personal protection fire blankets (one per crew member); and
- roll down, in-cab, radiant heat shields.

These have been introduced progressively into vehicle design in VIC, SA, NSW and TAS since the Linton Fires in 1998. That said, it is evident that land management agencies in some of those states have been slow to adopt these measures, presumably because of the philosophy identified above. The MIR was advised a likely cost for these two measures would be in the vicinity of:

- $160 per personal protection fire blanket; and
- $2,000 for roll down, in-cab, radiant heat shields.

The MIR has been advised both measures are able to be retrofitted after manufacture. There appears to be some conjecture across jurisdictions as to whether the heat shields should be fitted inside the cabin or outside, although the MIR favours inside the cabin due to accessibility by the crew, protection of the heat shields themselves when not in use and because these have been successfully deployed during recent fires in this configuration and proven effective – see Appendix 7. Most jurisdictions have adopted this approach.

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46 ‘Broad industry consensus’ refers to the adoption of many of these measures by rural firefighting agencies in NSW, VIC, TAS and SA that face a comparable level of risk with bushfire exposure.
Only one jurisdiction (SA) has applied both these measures to Quick Response or Light Attack vehicles. Within the small and relatively low cab of a 4WD type vehicle, the heat shields, particularly along the windscreen, can be problematic for vision out of the vehicle when stored. However, as DEC in particular, has five times the number of these vehicles than the heavy duty fire appliances and they are regularly deployed to fires, the MIR recommends these measures should be applied consistently across all vehicles operating on the fireground.

**RECOMMENDATION 3**

As a minimum requirement, all vehicles entering the fireground must be fitted with an accessible fire blanket – one per person in each vehicle plus roll down, in-cab, radiant heat shields.

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**Further Crew Protection Measures**

Further protection measures identified by the MIR and adopted to a varying degree interstate include:

- **Cabin Deluge or spray systems.** Protection of the truck cabin, (rather than the more generically placed DEC marauder sprays), which is used as a crew protection haven, appears the priority but, despite some CSIRO testing, a conclusive system has not been identified. Spray systems are susceptible to wind, which will almost always be present during a burnover event. Maintaining a consistent water curtain on the windows can be extremely beneficial but requires good design, combined with an adequate water reserve, to maximize the benefit. The MIR was advised that cost of a cabin deluge system is likely to be around $5,000 and that they can be retrofitted after vehicle build, although it is dependent on vehicle design and is likely to increase cost.

  Separate water tanks have been provided in some instances to service deluge sprays, although this approach is not universal and becomes increasingly problematic the smaller the vehicle is.

- **Tyre Protection Sprays.** Tyre protection sprays reduce the likelihood of tyres igniting which can be extremely difficult to extinguish. The cost for this inclusion is minimal during manufacture, but may be difficult to achieve as a retrofit depending on plumbing layout.

- **In-cab breathing system.** SA has included an in-cab breathing system on its tankers. Such systems are mandatory on French forest fire fighting vehicles. Each set comprises six face masks and an air supply which will provide fresh air for the crew for up to four minutes. Approximate cost $2,500.

- **Urban Appliance Protection.** The MIR identified that the Metropolitan Fire Brigade (MFB) in VIC have modified their urban firefighting vehicles such as Scania pumpers to include roll down, in-cab, radiant heat shields consistent with the basic measures identified in this report, as well as a crew cab deluge system. With the exposure of Fire and Rescue appliances to rural fire risk and their attendance at rural fire particularly around Perth, the adoption of crew safety measures on these vehicles has merit. The inclusion of roll down, in-cab, radiant heat shields and one fire
blanket per crew member for urban appliances should be mandatory as per the previous recommendation.

The MIR makes no recommendation in regard to these additional systems discussed above. All have merit but, for efficiency and full integration, they should be introduced during the design phase and fitted during manufacture. Vehicle protection specialists in other jurisdictions and at AFAC are best placed to advise on the merits of each element.

Science and Available Evidence

DEC raised concerns regarding the lack of evidence to support the application of vehicle protection measures and sought clear scientific results from testing in realistic fire environments to support burnover protection initiatives.

In conjunction with the CFA and NSW RFS, the CSIRO in 2005 established a project to analyse crew protection during burnover events using fire simulation which replicated the intensity and residence time for fire behavior in burnovers. After testing involving experiments of moderate intensity flank fires, the following conclusions were validated:

- Radiant heat entry into the cabin and crew areas is a critical factor in limiting crew survival;
- Tyres, mud flaps, and hoses are a source of toxicity and flame if exposed to radiant heat and not protected;
- Windows are durable under radiation and flame contact at moderate intensity;
- Total truck protection is required to provide survivable conditions for crews at moderate bushfire intensity;
- Radiant heat curtains are effective in reducing cabin and crew area radiant heat and high temperatures;
- Well-designed water spray systems will provide useful gains in firefighter safety at moderate bushfire intensity; and
- Fire fighting vehicles are not designed to provide survivable conditions in high intensity bushfire burnover situations.

Findings

The tests resulted in the following observations:

- Radiant heat entry into the cabin is the most critical factor limiting the survival of the fire fighting vehicle crew;
- Cabins are structurally sound yet they could perform better with minor modification to make them less susceptible to outside air intrusion;
- Total vehicle protection is required to promote tenable conditions for crew survival;
- Well-designed spray systems are shown to provide useful gains in firefighter safety at low- to-moderate fire burnover scenarios;
- Tenability limits for toxic gasses are exceeded when the vehicle is unprotected from fire intensities of 5 MW/m or more; and
- Toxic gas concentrations are tenable in the cabin and ROPS areas up to 10MW/m.

In his review of burnover incidents, Dr Paix notes that:

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“It should be noted that sprinklers and hose lines have many dissimilarities as defensive tools. The primary role of the sprinkler is to create a curtain of water between the vehicle and the heat source, thus absorbing radiant heat. Whilst such a system can function independently of an operator, allowing the crew to shelter in the cabin, its efficiency is limited by its vulnerability to winds and its lack of aimability. Conversely, a hose line may be more effectively aimed in the direction of the threat, and can knock the fire down at a greater distance, but may expose the operator to greater risk.

Finally, it should be noted that pumps are a vital part of any defensive system involving water, and so they should be running at all times on the fireground, protected against heat, and resistant to impact with tree branches if, as often happens, the vehicle is reversed into or through trees or bushes whilst attempting to escape.”

A final word on crew vehicle protection.

There is no foolproof solution. Focusing attention solely on protecting firefighting vehicles will leave those on the fireground in quick response vehicles exposed. There are alternatives such as the Fire King illustrated here which was adopted by ForestrySA in SA following a burnover event. It has a higher cost than conventional rural firefighting appliances, offers greater burnover protection, but has less vehicle utility across a range of circumstances.

The MIR considers that there is an obligation for agencies to take measures to enhance crew protection. It recommends a minimum standard, while indicating other options. Logically, these measures need to address all vehicles on the fire ground. While some retrofitting of equipment can occur, other measures will need to be brought in progressively as vehicles are replaced. Not taking any action, because there may be a lack of comprehensive scientific proof covering all protection measures, is not an approach accepted by agencies in other jurisdictions nor is it supported by the MIR. This issue will always remain a balance of likelihood and consequence over cost, and there is never a single approach that will overcome the threat of firefighters being caught in burnover situations in the future. That is why fire agencies in Western Australia need to review the measures adopted interstate some years ago and be prepared to make changes to crew protection measures in fire fighting vehicles.

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48 Paix, B. From Wandilo to Linton - Lessons learned from an in depth analysis of 40 years of Australian Bushfire Tanker Burnovers.
6. Incident Management of the Black Cat Creek Fire

Overall Performance of the IMT

A detailed review of IMT effectiveness by the MIR has identified that:

- Positioning the ICV close to the fire, at the expense of available telecommunications, was an unnecessary strategy with unfortunate consequences.
- Control was established quickly for a Level 1 fire including the ICV being in place, copies of aerial photos provided on arrival, battle board/resource summary board established, T cards used, a communications plan established and some IMT members had identification.
- Strategies such as establishing Sectors and identifying where to enhance fire breaks and contain the fire were limited, but developed with advice from DEC staff and subsequently reviewed by DFES staff.
- There was no detailed planning that may have highlighted concerns about the wind change.
- The IAP was inadequate, but followed the very limited IMT outline provided by DFES for local government brigades.
- Longer-term planning did not occur, but was not expected during a Level 1 response.
- The complexity of a fire within forest with dense, aged fuels was likely to have been outside the expertise of local brigade personnel.
- Strategies for parallel attack in an area known for its old and heavy fuels were not identified as risky strategies by anyone present.
- Media liaison appeared to work well with an escort being provided, and checks of PPE for media personnel being undertaken.
- Both DEC and DFES were asked to take control of the fire, but did not do so until DFES assumed control sometime after the burnover event. No member of the IMT, noting their extensive individual experience, identified any major failing in IMT performance at the time to warrant a change in IC, or the error in wind change information. Staff from other agencies present also did not identify the error in the understanding of when the wind change was forecast.
- Failure to issue a Red Flag Warning or an alternative measure, to alert those on the fire ground when advice was received and further confirmed that the wind change had arrived west of the fire ground, was a major omission. While DEC or CofA may not formally use this procedure, the information contained in the warning would have been heard and recognised.

IMT performance could have been improved by:

- Locating the ICV further from the incident where mobile phone coverage was accessible, thereby allowing for direct access to BoM information and other data.
- Maintaining comprehensive IMT and individual logs.
- Completing a more detailed and deliberate IAP once the incident was declared a Level 2 incident.
- Having greater focus on local weather conditions.
- Seeking DFES fire threat analysis maps of the area highlighting fuel age, fuel loads and overall risk early during the incident.
- Recognition of the implications of escalation from a Level 1 to 2 incident and what this means for IMT planning and resourcing.
• Considering the options for escalating incident control once declared a Level 2 incident and relocating it to a larger, more effective facility in Albany, maintaining the ICV as an operations point.

Key Incident Control issues

The had no AIIMS training and very limited experience in that role. Within the IMT however, were over 90 years' experience with two Level 3 ICs - who was present throughout the day and who arrived around 1400. as the who had less formal qualifications, has 22 years' experience with fires plus significant local knowledge.

The impression gained by the MIR was that none of these officers identified failings in the operation of the IMT and indeed, all appeared comfortable with remaining That said, when it was determined to be a Level 2 fire at about 1400, should have had the opportunity to pass control of the fire to a more experienced officer. While it is understandable that they may have sought to provide with the opportunity under a degree of supervision or mentoring, this decision denied the IMT the occasion for more experienced eyes and ears to review the wind change information available, including the receipt of local reports of the arrival of a wind change over the radio.

When addressing communications, this experience becomes particularly applicable regarding the issue of Red Flag Warnings as discussed in the previous chapter. While receiving the incomplete Spot Fire Weather Forecast may have been beyond the control of the IMT, failing to issue a Red Flag Warning or an alternative alert to the fire ground when the information was received from at Bornholm, and indeed sought from regarding the location of the wind change earlier in the afternoon, was a significant omission. If DEC and CofA do not use the Red Flag Warning procedure as advised to the MIR, any alternative they did use was ineffective. Information on wind change arrival warrants a Red Flag Warning and the IMT should have ensured this happened. Within DFES, Red flag Warnings can be initiated by the IC, Operations Officer, Division Commander, Sector Commander or Regional Duty Officer. The MIR notes in the SA CFS, anyone on the fire ground can potentially issue a Red Flag Warning.

RECOMMENDATION 4
Once Recommendation 1 has been actioned, all agencies give greater priority to the promulgation of Red Flag Warnings in order to enhance situational awareness on the fireground.

DFES taking control of Level 2 fires

It appears that administrative concerns and existing legislative arrangements may be hindering these operational decisions. While not specifically stated by anyone, the impression gained by the MIR is that either the CofA wanted DFES to take charge to limit their cost exposure or there may have been reluctance from DFES to accept control of the fire because they would be responsible for subsequent costs. That requested DFES take control ‘for cost purposes’ was an unfortunate embellishment. The reason for taking control should have been because it was a Level 2 fire, with cost not being a consideration. While noting the existing arrangements as reflected at Appendix 8, where DFES may assume control of a fire, the MIR has concluded that DFES or DEC (depending on land tenure) should be obligated, indeed mandated, to take control of all fires from Local Government once they are declared a Level 2 incident, regardless of whether they meet the other criteria specified in WESTPLAN - BUSHIFRE.
This is proposed acknowledging the diversity of standards and competence across 122 Local Governments and to maximise the opportunity for other personnel joining the IMT to review the available information, reassess the situation and confirm the existing plan. The MIR argues that it is not until control is assumed by another agency, are these measures thoroughly completed.

In the view of the MIR, this does not mean DFES or DEC would need to provide all IMT staff, but it does mean they would have overall control and responsibility for the incident. Other agencies should remain engaged in the IMT. Indeed, the MIR advocates elsewhere in this report that the three agencies should, as a matter of routine, contribute to joint IMTs. In this instance, it could have led to DFES appointing a DEC IC or Planning Officer at the Black Cat Creek fire.

**RECOMMENDATION 5**

DFES or DEC (depending on land tenure) is mandated to take over control of emergency incidents from Local Government once they have been declared Level 2 incidents. WESTPLAN BUSHFIRE and legislation to be amended accordingly.

**DEC taking control**

The MIR did encounter a lack of clarity about the ability of DEC to take control of fires. This is apart from any reluctance that may exist which is understandable in the light of recent events. While there was no confusion at State level, there appeared to be doubt locally and on the fireground on whether DEC could still take control of fires adjacent to DEC estate, or whether these deliberations required DFES involvement. The recently included s 45A (reproduced at Appendix 9) may be the source of this confusion.

The MIR has no doubt that the IC sought DEC to take control of the fire on 12 October 2012 and those on scene declined to do so. Various explanations were provided to the MIR from ‘This is not possible post the Keelty Report’ to ‘You have to ask DFES’ (for DEC to take control).

The MIR is of the view that DEC could have taken control. No impediment existed for the situation as it presented itself on 12 October 2012, but DEC should advise DFES when this occurs.

The Memorandum of Understanding (MOU) between Local Governments in WA and DEC for Cooperative Multi Agency Fire Operations reflects this approach, although the MIR notes the copy it received was unsigned and undated. It states specifically:

“Subject to the provisions of Section 45 of the Bush Fires Act 1954, responsibility for control of large bushfire will be assigned as follows:

7.4.1 The decision as to which organisation is to be take charge of a fire burning on private land near DEC land, or on both private and DEC land, will be determined by the Chief Bush Fire Control Officer of the LGA and the DEC District or Regional Duty Officer.”

This occurred on the day, resulting in maintaining the status quo.
Fire Control Officer Training versus AIIMS Training.

and having completed the ‘old regime’ of FCO training, was deemed under Section 44 of the Bush Fires Act 1954 to have control of the incident. He had, however, completed no AIIMS training. FCO training does not provide nationally accredited training in incident control. This placed and most likely many other FCOs, in an invidious position. It is a flawed approach which should not be tolerated. Volunteers should not be eligible to be appointed into IC positions without having the prerequisite AIIMS training, regardless of any FCO appointment. Perhaps the FCO training course could include AIIMS training.

Alternatively, there may need to be an uncoupling of the FCO role and management of an operational incident. Only those with AIIMS training should have the authority to manage an incident. Perhaps this can include brigade officers who are not FCOs. The MIR did not resolve this issue, but has identified that DFES and Local Government must. Individuals with the authority but not the competence represent a dangerous combination, and they should not be allowed to manage emergency incidents.

RECOMMENDATION 6
DFES and Local Government Bushfire Brigades ensure that only those with the required AIIMS competence have the authority to manage Level 1 incidents, noting they may not be Fire Control Officers.

Regional Management

At a regional level in Albany, the support lacked the level of coordination that could be achieved if all stakeholders were collocated. This is addressed in the following chapter.

State Level Management

At a State level, there was a lack of awareness of the overall structure and who was the Incident Controller. As this was being monitored at Regional level, perhaps this is not necessary, although when things go wrong, this detail is critical and responding at a State level without this correct detail is very risky. A more coordinated approach at the Regional level is likely to enable more timely transmission to the State of this level of correct detail.
7. Greater Coordination between Fire Authorities

Local Arrangements in Albany

Local Government. Local Government is identified as the Controlling Agency for Bushfire and therefore the City of Albany administers the Volunteer Bush Fire Brigades and responsibilities for Local Government outlined in the *Bush Fires Act 1954*. There are 16 volunteer Bushfire Brigades within the City of Albany (which covers an area of 4,315 square kilometers) and provides a fire prevention and suppression service for the municipality with the exception of areas under the care and control of DEC and gazetted fire districts controlled by DFES’ Fire and Rescue Service. Private plantations also contribute firefighting resources.

The MIR acknowledges the CofA support to local BFB including:
- An Emergency Management Manager;
- Senior Fire Safety Officer;
- Well-equipped ICV which was deployed on the day;
- Annual vehicle servicing which was completed prior to the event;
- Provision of copies of aerial photographs distributed as crews arrived on scene;
- A potential emergency management facility identified in the Council Offices;
- Extensive logistical support which was highlighted in Brigade debriefs; and
- Local Government Bush Fire Brigade response arrangements which are managed at the local level by a network of Captains, Fire Control Officers, Chief Bushfire Control Officers and Deputy Chief Bushfire Control Officers.

DEC. Management of DEC firefighting response is through its network of District and Regional offices and work centres. On the day, the DEC response was coordinated through the [redacted], and this appeared effective. It was hindered by the lack of telecommunications onto the fireground, requiring the fireground [redacted] to travel back towards Albany to speak on the phone or for crews to change channels to DEC 546 if they wished to speak to the DEC Regional Office on the radio. The MIR was advised that overall coordination of DEC resources during major incidents would occur through presence in DFES State Operations Centre, although for this Level 1 (and then Level 2 incident) this DEC attendance at the DFES State Operations Centre was not warranted.

DFES. The DFES Regional Headquarters in Albany undertakes a range of functions in support of the five different types of brigades/units within the Great Southern region:
- Coordinates activities between brigades;
- Facilitate and delivers training to brigade personnel;
- Develops/delivers public education campaigns;
- Provides advice and support to Brigades and Local Government during incidents; and
- Maintains a directory of contacts within the region.

The Albany office has six Area Officers and four District Officers who support the operational services provided within the region. The Great Southern region has a rostered Regional Duty Coordinator who has the responsibility for operational coordination between relevant agencies.

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agencies throughout the region and providing incident support. They report to the DFES State Operations Centre in Perth.

The MIR considers that the likelihood of this tragic incident occurring may have been reduced had there been greater involvement of all three agencies in the IMT. In addition, while errors were made, fundamentally with the communication of the Spot Fire Weather Forecast detail, the likelihood of this human error translating into a tragedy on the fireground would have been reduced had there been greater interagency coordination in Albany, essentially through colocation.

On 12 October 2012, the fire was being coordinated and supported from three venues across Albany:

- supporting the Bushfire Service;
- DEC Offices; and
- DFES Offices.

The MIR did not visit the house but understands it is well established for the role. The DEC offices are permanently established to support an IMT and, although not modern, appear appropriate for the available resources. The DFES Operations Centre is isolated from the remaining DFES offices in its Regional building and appeared ill-equipped to coordinate even a medium scale event. Its isolation, size and poor layout portrayed a lack of operational focus. The merits of these facilities are further discussed below.

Through geographic isolation, and not necessarily through any inappropriate intent, the three coordination and support efforts in Albany operated in silos, isolated in thought and understanding. Once issued by the , the correct Spot Fire Weather Forecast information was available at each agency support location in Albany. It seems unlikely that the detail of the Spot Fire Weather Forecast would not have been discussed between interagency staff and a common understanding that the severe wind change could arrive as early as 1500 would have been achieved.

If all three agencies moved to a central location, a single Operations Centre, there is a significant likelihood that the error of communicating the incomplete Spot Fire Weather Forecast would have been identified by DEC personnel who, at the time, were operating separately in their offices in Albany, but simultaneously had access to the Spot Fire Weather Forecast on the www. Likewise, the DFES staff would have been in a position to gain greater situational awareness of the fire well before any request was received to transfer control.

Even if the initial communication of the wind change was completed as occurred on the day, the subsequent discussions on the radio, the movement of from DFES to the incident, and other deployments of staff and support from Albany would have more likely had the correct wind change advice and been in a position to advise the IMT.

The DFES staffing limitations on the day could have been overcome through interagency discussions in the one facility regarding resourcing the IMT, perhaps appointing a DEC Incident Controller on behalf of DFES. A further option would have been to appoint a DEC representative to be the Planning Officer.

The MIR did not analyse what facility in Albany could be best placed to be multi-agency coordination centre. Brief observation identified that the existing DFES Operations Centre was ill-equipped, ill-positioned within the DFES complex and ill-suited to be an interagency coordination centre. The existing DEC Operations Centre, while far more operationally
ready and presented as an ongoing operational facility, does not offer the large room that such a function demands. The CoF/A has a large room identified, but whether it is best placed and the Council is prepared for it to be taken over regularly by emergency services is unclear. The option of continuing to support volunteer brigades from a personal house when the response becomes multi-agency is not supported by the MIR. The DFES ‘training room’ as it is currently known within the DFES facility, would probably offer the best functionality, if it was established as a permanent coordination centre.

The MIR is confident that existing facilities could accommodate a joint coordination centre, if the will existed. The MIR is in no doubt that it is required.

Reflections across WA

The MIR suspects these existing sub-optimal arrangements in Albany on 12 October 2012 are consistent in many other places across the State. Equally importantly, it probably reflects the existing mindset across and between agency personnel. There may well be an argument that for a planned activity such as a prescribed burn, it could continue to be coordinated and supported in a single agency facility such as already exists in the Albany DEC offices. Clearly this has been effective and successful many times previously, and other agencies have been kept informed.

For unplanned events which cannot be resolved by the deployment of the initial response capability such as the local volunteer brigade, the MIR is firmly of the view that these should be coordinated/ supported/ controlled from a joint multi-agency facility, and that this approach should be adopted statewide. This is crucial for successful interagency operations and has the likely additional benefit of reducing duplication. It may even save public money.

RECOMMENDATION 7
Future coordination/support/control of integrated emergency management across all agencies in Albany needs to be merged and located in a single joint facility. This issue needs to be reviewed statewide.

Coordination or Control

The MIR is also of the view that all WA fire agencies need to consider carefully if these are coordination or control facilities. The definition of the terms, as used in emergency management and reflected in the AIIMS manual, is clear:

“Coordination is the bringing together of organisations and other resources to support an emergency management response. It involves the systematic acquisition and application of resources (organisational, human and equipment) in an emergency.

Control is the overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation and may be included in an emergency plan and carries with it the responsibility for tasking other organisations in accordance with the needs of the situation.”

Since Black Saturday, Victoria has rebranded its regional and state coordination centres as ‘control facilities’ to highlight that the senior agency personnel at these facilities are in control.

52 The Australasian Inter-Service Incident Management System Third Edition 2011 Revision. AFAC Ltd.
of the IMT managing the emergency event, not simply providing support and coordination. Naming them a ‘coordination facility’ masks this intent. While noting existing legislation and state planning, the MIR raises this issue as an important consideration.

An integrated IMT

All three agencies participated in the IMT at Black Cat Creek, although it was unfortunate that only the CofA and DFES committed officers at the CP to principal IMT positions. DEC provided liaison although the MIR did not establish what formal responsibilities that role entails and Sector Commander support. Perhaps DEC did not have individuals with the capability available to become more engaged in the IMT at the CP, even though the fire was threatening DEC estate. Putting aside the issue of whether DEC could have, or should have, taken control of the fire, not contributing to the IMT at the CP beyond a liaison officer was unhelpful. This may have been as much the fault of the CofA for not asking DEC to contribute more to the IMT (rather than take control) or of DFES not seeking greater DEC involvement. The MIR considers it a joint error of judgment. DEC would have been ideally placed to adopt the role of Planning Officer, having good local knowledge, being most familiar with the potential for threatened species to be impacted by the fire, and being the most skilled in that function.

The MIR has already raised deficiencies in the planning function. DEC could have remedied this and had the opportunity to contribute more to the IMT.

While the MIR is aware of very significant contributions to joint IMTs made by DEC, such as during the Lake Clifton Fire in 2011, it needs to also be willing to contribute a much smaller element to an IMT, perhaps a single officer. The MIR senses a degree of unease by some DEC officers, as they conduct an IMT differently to Bushfire Brigades and DFES. Indeed, the MIR has the highest regard for DEC IMT capability and acknowledges the dilemma.

That said there does not appear to be a culture of joint IMTs in WA. This is commonplace in other jurisdictions and the MIR considers this event needs to be catalyst for change. Bushfire Brigade and DFES IMT capability would be significantly enhanced by greater integration of DEC staff into all IMTs, regardless of the nature of the emergency or the asset under threat.

Specifically for the Black Cat Creek fire, had the three agencies automatically developed an integrated IMT, engaging representatives from the Bushfire Service, DFES and DEC into the single IMT, it is likely the IMT would have had greater functionality, and again the likelihood of confusion regarding the forecast arrival of the wind change would have been reduced. All three agencies were present at the IMT as the fire escalated. There was however, a lack of commitment to integrate.

<table>
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<th>RECOMMENDATION 8</th>
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<tr>
<td>WA adopts a culture of joint IMTs in future. At Regional and State levels, DFES and DEC maintain standing contributions.</td>
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The MIR is aware of reports indicating there are significant constraints on the availability of DEC personnel who may be available for future IMT requirements. Clearly limitations on the availability of DFES staff featured as a consideration when the CofA requested DFES take control of the fire. The MIR suggests that maintaining separate agency IMT rosters simply exacerbates this problem. Adopting a paradigm of joint IMT, often referred to interstate and overseas as MAC (Multi Agency Coordination), may well assist this dilemma but, even more
importantly, will over time and through training, exercising and operational deployments, enhance the emergency management IMT capability within WA.

**Strategic Bushfire Management**

Early in this report, it was identified that authority for fighting bushfires in WA is dispersed across 124 authorities: 122 local governments, DFES and DEC. While noting the longevity of this arrangement, it is a most challenging structure for rural firefighting, and the MIR notes that other jurisdictions across the country have moved away from this approach.

Issues of maintaining competence, standards and ensuring consistency across this number of authorities is beyond the comprehension of the MIR. While noting the arrangements laid out in the State Bushfire Emergency Management Plan (WESTPLAN BUSHFIRE) 2011, the MIR strongly favours arrangement where there is one set of arrangements for rural fire— one set of operational procedures, standing orders, standards and expectations.

This event has seen critical procedures such as Red Flag Warnings both not issued and not used by different agencies operating on the same fireground. Safety measures for fire vehicles on the fireground were not consistent. Competencies of individuals operating within, and in support of, the IMT were not understood by all involved.

These issues may occur in many situations, although maintaining the large number of authorities responsible for fighting bushfires exacerbates these problems.

The MIR does not address how bushfire management should occur in WA. That is outside the Terms of Reference. It does, however, advocate strongly that all agencies should operate on the fireground using the same standing orders, operational procedures, training and competencies. Integrated multi-agency training, IMTs and Regional as well as State coordination/ control centres, would do a great deal to reduce the likelihood of similar events occurring again in WA.

The MIR also notes that maintaining these procedures in electronic format, while perhaps administratively helpful, does little to help individuals remain familiar with the detail and to be able to refer to them on the fireground. Most agencies in Australia regularly produce a handbook or pocketbook for IMTs and firefighters so that this information is readily available when deployed out of the office or home.

**RECOMMENDATION 9**

WA fire agencies adopt a common set of standing orders, operational procedures, training and competencies for rural firefighting that are produced in hard copy, leading to integrated multi-agency training, IMTs, Regional and State coordination/control centres.
8. Post Incident Actions

Application of First Aid. First Aid at the ICV site was reportedly good and personnel responded well to the emergency despite the traumatic circumstances. An emergency triage area for the injured was established and oxygen supply from the ICV was administered by members of the IMT. Personnel at the ICP assisted with the removal of outer clothing, irrigation of burns and reassurance for the injured during very difficult circumstances. In local debriefs, a lack of pain medication was highlighted as a deficiency, possibly exasperating to those observing, plus by the travel time of medical recovery teams from Albany to the fireground. Pain medication is not generally administered by untrained personnel.

Subsequent management of fire event

Operations on the fireground were temporarily suspended while injured crew members were brought to the ICV. All crews in Sector Alpha were requested to leave their positions and to return to the ICP to enable a roll call of all vehicles and crew to be completed. This was completed using T Cards which had been collected and managed at the CP.

Management of the burnover and subsequent treatment of the injured lasted for around one hour. Fire fighting resumed in Sector Alpha with crews from other areas being reassigned to continue work there.

Later in the afternoon, the IMT and WAPOL personnel met to discuss the ongoing management of the fire. Additional personnel from DFES arrived at the scene to assist. A teleconference between senior DFES regional agency personnel occurred around 1725. Following the teleconference, DFES took control of the fire under Section 13 of the Bush Fires Act.

It was determined that the ICV was to be relocated approximately 1.5 kms along Two Peoples Bay Road towards Albany. The new position was more elevated and afforded better phone and radio communications.

Despite the distressing events of the afternoon, many of the IMT remained at the fire until later in the evening, with some not completing their duties until the early hours of Saturday 13 October 2012. Firefighting resources were significantly reduced overnight allowing them to return on Saturday 13 October 2013 to continue duties.

Debriefs. The MIR reviewed the debrief notes provided from the bushfire brigades. Common theses identified were:

- Standardised stowage - type and position of equipment on trucks;
- PPE- unsure of care and also some inadequacies, particularly boots;
- Petrol pumps on some firefighting vehicles;
- Training in general- lack of it, focus on career training and courses cancelled due to lack of numbers;
- Also doesn’t seem to be much formal brigade training;
- ID of key personnel prior to van arriving;
- Communications- issues with simplex channel due to pines; and
- Lack of practical burnover training for most.
Positive issues identified included:

- Logistics seem to be well managed;
- Sectorisation at the fire occurred early;
- Generally firefighters were satisfied with their PPE;
- Early control by local Brigade was seen as positive; and
- Response of resources/brigades was good.

Highlight acts of bravery and commendations
The MIR is not positioned to investigate acts of bravery or other action warranting commendations. The following, however, stood out as selfless acts focused on assisting others that placed those concerned in mortal danger:

- and for returning to the fire line twice to recover injured firefighters;
- The dozer driver , a contractor engaged on the day, for continuing to operate under extreme conditions to hastily secure burning trucks that had arrived where he was working; and
- for protecting and with blanket as they escaped the scene.

In addition, the strong impression gained by the MIR from interviewing those involved in the delivery of first aid to those injured was that this was done well under distressing conditions and warrants commendations.

RECOMMENDATION 10
In due course, acts of bravery are considered and recommendations for awards are submitted, including commendations for the delivery of First Aid.
9. **Previous Reports**

During the development of this MIR, several common themes from local and interstate incidents were noted:

- The presence of firefighters working in the ‘Dead-Man Zone’;
- Incorrect and incomplete interpretation of Spot Fire Weather Forecasts;
- Failure of the IMT to use a formal acknowledgement system for critical information;
- Lack of emphasis on weather observations during the course of the fire;
- Lack of crew protection equipment on firefighting vehicles; and
- Absence of firefighter entrapment training.

The following reports were reviewed in light of these common themes:

- Findings And Actions From Inquiries Conducted By The Department Of Environment And Conservation Into The Boorabbin Fire 28 December 2007 - 8 January 2008 and the Fire Development Chronology (Boorabbin Fire, GHD Pty Ltd. June 2008).

**Linton Fire 1998**

The Linton Fire occurred on 2 December 1998 30 km south west of Ballarat. Twelve tankers were involved in burnovers through the day, with five volunteer firefighters from the Geelong West Brigade losing their lives in a burnover event eight hours after the fire started. A wind change blew the fire front from what was previously a flanking fire, across and engulfed several tankers as they made their way off the fireground to get water.

Like the Black Cat Creek fire on 12 October 2012, the Linton Fire was nothing out of the ordinary and demonstrated that fire behavior was consistent with what would be expected in the area and vegetation types. A panel of expert fire behavior analysts said:

“……there was nothing unusual about the fire behaviour but recognition of the potential changes according to changes in wind direction, wind strength, and topography required that firefighters had been trained and were experienced in forest fire behaviour.”

The Victorian State Coroner’s Office delivered a range of findings. The similarities to the Black Cat Creek Fire include the placement of firefighters in the ‘Dead-Man Zone’, observations regarding the progression of a wind change not being clearly articulated to firefighters or supervisors on the fireground, and not using all available features to protect the crew. Many of the 13 (now 18) ‘Watchouts’ used by the CFA at the time of the Linton Fire were either ignored or were not clearly understood by the crews working in forested areas. Similar issues were identified by the MIR during the Black Cat Creek Fire.\(^54\)

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Boorabbin Fire 2007
The Boorabbin Fire occurred on the Great Eastern Highway, 80 km from Coolgardie in December 2007. Late on 30 December 2007, the fire behavior abated luring incident managers into thinking it was safe to re-open the road and send un-escorted vehicles through the fire area. Unfortunately a wind change sent the fire front across the Great Eastern Highway, engulfing trucks and killing three men.55

The GHD report indicates the Incident Controller and other experienced fire managers only read the tabular data on the Spot Fire Weather Forecast and missed the significant wind change information included below the table. They assumed the wind change was hours away which led to the decision to re-open the highway.

(excerpt from PART 5: Factors Contributing to the Fatalities)

“Information provided by DEC officers to GHD indicated that all key personnel who had received the spot forecasts, issued on 30 December 2007, “missed” the Significant Wind Change notes contained in the forecasts. ..... 

DEC agrees that the failure to read the entire forecast or register the significance of the forecast weather to fire behaviour is a serious matter of concern that requires a suite of prompt remedial actions.

The lack of attention/interpretation of the spot forecast information by the IMT is considered to be a major contributing factor.56

It appears an almost identical misunderstanding of the Spot Fire Weather Forecast by a number of experienced personnel occurred at the Black Cat Creek Fire.

Black Saturday Fires – 2009
Most recently, findings from the 2009 Victorian Bushfires Royal Commission (VBRC) also highlighted a Spot Fire Weather Forecast misunderstanding which had the potential to seriously injure personnel. At the Churchill fire, despite having a pre-designated Level 3 Incident Management Team overseeing the fire, failures in critical fire weather information occurred. In the 2009 VBRC Final Report, the following observations regarding the fire weather and the IMT were made:

“The Planning Officer ... inaccurately reported to successive IMT meetings that the wind change was expected to affect the Churchill fire at 1900 hours, despite local forecasts provided by the BoM saying the change could arrive as early as 1730 hours. The idea that a wind change would arrive at 1900 hours was widely held among members of the IMT and repeated in many contexts – including the Incident Management System data, in media interviews and in logs used by personnel. Senior officers in the IMT used the forecast of a wind change at 1900 hours in a Red Flag Warning that was issued at about 1730 hours; others were advised that the change would arrive at 1830 hours. The change actually reached the fire ground at about 18:18.57

While the fire was at its worst after wind change, three Country Fire Authority (CFA) tankers were caught in burnovers and all were taken by surprise. Fortunately there were only minor

55 Findings And Actions From Inquiries Conducted By The Department Of Environment And Conservation Into The Boorabbin Fire 28 December 2007 - 8 January 2008, p 70.
56 GHD Pty Ltd. Fire Development Chronology Boorabbin Fire, June 2008, p72.
injuries sustained during the burnover events. This reference again highlights the importance of accurate understanding and interpretation of Spot Fire Weather Forecast. Black Saturday also highlighted that while 18 burnover events occurred during that major fire event in the most intense conditions, no crews were seriously injured. Appendix 7 provides one such example.
10. Summary of Recommendations

The MIR identified the following Recommendations in accordance with the Terms of Reference Identifying opportunities to improve service delivery.

**Recommendation 1**
Critical operational procedures such as ‘Red Flag Warnings’, on a common fireground need to be consistent across DFES, DEC and Local Government. In particular, the operational procedure of Red Flag Warnings needs to be adopted by all WA fire agencies.

**Recommendation 2:**
All agencies ensure fire managers are trained to correctly interpret the new Spot Fire Weather Forecast and to familiarise themselves with the entire format – ensuring consideration of the whole forecast - not just the tabular data containing the 12 hour forecast.

**Recommendation 3:**
As a minimum requirement, all vehicles entering the fireground must be fitted with an accessible fire blanket – one per person in each vehicle plus roll down, in-cab, radiant heat shields.

**Recommendation 4:**
Once Recommendation 1 has been actioned, all agencies give greater priority to the promulgation of Red Flag warnings in order to enhance situational awareness on the fireground.

**Recommendation 5:**
DFES or DEC (depending on land tenure) is mandated to take over control of emergency incidents from Local Government once they have been declared Level 2 incidents. WESTPLAN BUSHFIRE and legislation to be amended accordingly.

**Recommendation 6:**
DFES and Local Government Bushfire Brigades ensure that only those with the required AIIMS competence have the authority to manage Level 1 incidents, noting they may not be Fire Control Officers.

**Recommendation 7:**
Future coordination/support/control of integrated emergency management across all agencies in Albany needs to be merged and located in a single joint facility. This issue needs to be reviewed statewide.

**Recommendation 8:**
WA adopts a culture of joint IMTs in future. At Regional and State levels, DFES and DEC maintain standing contributions.

**Recommendation 9:**
WA fire agencies adopt a common set of standing orders, operational procedures, training and competencies for rural firefighting that are produced in hard copy, leading to integrated multi-agency training, IMTs, Regional and State coordination/control centres.

**Recommendation 10:**
In due course, acts of bravery are considered and recommendations for awards are submitted, including commendations for the delivery of First Aid.
11. Conclusion

Burnovers of firefighting appliances remain a reoccurring operational event and until 2002, where a significant cause of firefighter deaths in Australia with 38 fatalities over 25 incidents.\(^{58}\) Details are at Appendix 10. The MIR notes however, that in recent years while burnovers have still occurred, fatalities have been significantly less. During the Black Saturday Fires in 2009 in Victoria, 18 recorded burnover events led to no major injuries.

The Black Cat Creek Fire was not identified as extraordinary until firefighters were injured and subsequently tragically died from injuries. Regrettably this was not the first occasion where an ‘ordinary fire’ led to tragedy.

A better understanding of the weather, both by taking observations on the fireground and through the issue and interpretation of Spot Fire Weather Forecasts, was again critical to this fire event. Those in, and supporting, the IMT need to ensure they have a common understanding, and individuals should seek a second opinion about their interpretation of the Forecast.

This event needs to lead to the following change:

- As a priority, fire agencies in WA need to adopt a similar approach to crew protection in fire vehicles that has been implemented interstate. A minimum requirement of individual crew blankets and internal, roll down, protective, heat shields are recommended for all vehicles that access the fireground.
- Individual training and awareness to ensure thorough familiarity with the presentation and delivery of Spot Fire Weather Forecasts is required for all individuals who may operate in, or support, IMTs, particularly with the updated Spot Fire Weather Forecasts version recently adopted by the BoM.
- Future IMTs need to have a more integrated approach, and where competent individuals are available, reflect participation from all agencies on the fireground.
- Regional and State level support needs to reflect a similar level of integration, collocating at Regional and State level to maximize the likelihood of all involved adopting and maintaining a common operating picture.

Regrettably, risk will always remain for firefighters, but agencies need to pursue opportunities to minimize exposures and maximise training. This tragic event can assist in this journey and ensure that the loss and suffering from this event does lead to positive change and improved safety for WA firefighters.

\(^{58}\) Paix B. From Wandilo to Linton - Lessons learned from an in-depth analysis of 40 years of Australian Bushfire Tanker Burnovers.
Appendixes

1. The Black Cat Creek Major Incident Review’s Terms of Reference
2. List of those interviewed as part of the MIR
3. Reason Model of Factors leading to the incident
4. ICAMS PEEPO Observations
5. 10 Fire Orders and 18 Watch Out Situations
6. RFS Bushfire Survival advice if in a vehicle
7. CFA Burnover Media Report 2009
8. Section 4.3.3 of the State Emergency Management Plan for Bushfire (WESTPLAN BUSHIFRE) November 2011
9. Extract from Section 45A The Bush Fire Act 1954
10. Chronology of Burnover Incidents in Australia
Appendix 1: The Black Cat Creek Major Incident Review’s Terms of Reference

This review of the fire will be known as “Major Incident Review BLACK CAT CREEK FIRE OCTOBER 2012” and, considering the critical aspects of Prevention, Preparedness, Response and Recovery (PPRR) during the analysis process, the review is to address the following:

- Examine and report all aspects of activities relating to the incident including incident background, response factors, resourcing and communications;
- Determine effectiveness of management at the incident, operational area and strategic levels;
- Assess the impacts and effectiveness of the Bush Fires Act 1954;
- Assess the operational effectiveness of the State Bushfire Emergency Management Plan (Westplan BushFire) 2009;
- Examine the effectiveness of relationships with volunteers, industry, Local Government, government agencies and community groups during the incident response;
- Assess the strengths and weaknesses of relevant policies, procedures, practices and equipment standards relevant to the incident;
- Examine any other matters relevant to the incident;
- Identify opportunities to improve service delivery; and
- Assess the effectiveness of Public Information systems related to the event.
### Appendix 2: List of those interviewed as part of the MIR

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**Transcript**

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Appendix 3: Reason Model of Factors leading to the incident

DEC’s guidance to incident controllers: ‘Managing Complex Incidents’ refers to Professor James Reason’s Swiss Cheese Model of Accident Causation that refers to holes in various safety and control systems. It compares human system defences to a series of slices of randomly-holed Swiss cheese, arranged vertically and parallel to each other with gaps in between each slice. He submits that most accidents can be traced to one or more of four levels of failure:

- Organisational Influences;
- Unsafe Supervision;
- Preconditions for unsafe acts; and
- The unsafe acts themselves.

Reducing or eliminating the ‘holes’ decreases the opportunity of system failure or poor operational performance. The theory goes on to refer to both latent and active controls: latent being those that tend to be organisational and in place well before the incident occurs, and active being those decisions and actions made on the day that also align to create a pathway for risk.

**Reason’s Swiss Cheese Model**

![Image of Swiss Cheese Model]

"a trajectory of accident opportunity"

Latent Conditions that appeared to align at the time of the fire

- The incident being supported and coordinated from three separate organisational coordination centres across Albany with none having a direct line of control.

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- Some complacency among crews due to a fire early in the fire season. This was reflected in individual statements, some crew practices and a general inference that: ‘you need that first fire of the season to get back into the groove…’. 
- Fuel accumulation over an extensive period on private land leading to the fire burning extremely intensely just prior to reaching the crews. Fuel loads appear to have accumulated over 50 years and were estimated at 22 tonnes per hectare.\textsuperscript{62} This included substantial elevated fuels. 
- The presentation of the BoM Spot Fire Weather Forecast that left commentary on the ‘severe wind change’ to the lower section of the forecast form, below the tabulated data. 
- A lack of awareness, availability or use of DFES risk maps indicating ignition and fuel hazard. 
- A lack of engineered vehicle protection to crews experiencing a burnover, particularly roll down, in-cab, radiant heat shields. 
- A lack of regular training to practice ‘burnover drills’. 
- Pre-season briefings for DEC crews having not occurred. These were planned in Albany for the following week, still well in advance of the declared bushfire season. These briefings may have assisted in reminding crews of fireground procedures and safety drills. 

**Active failures that appeared to fail and subsequently align on the fireground**

- Positioning the ICC van so close to the fire that it was in a mobile phone black spot, leading to an inability to receive a faxed Spot Fire Weather Forecast; an inability to view the forecast on the www and an inability to report and use mobile phones from the ICV. 
- Unwillingness to subsequently move the ICV once it was identified that it was in a mobile phone black spot due to the van being a caravan, needing towing and already located where it could control vehicle movement into and out of the fireground. 
- Failure to initially communicate by radio the entire weather forecast from the CoFADCFO to the IMT. 
- The IMT collectively not identifying that the wind change information, as understood on the fireground, was not consistent with the information provided in the Spot Fire Weather Forecast by the \textsuperscript{3}; that may have been subsequently provided by safe hand and subsequently reported through local reporting. 
- A general reliance on the Spot Fire Weather Forecast by both the IMT and those on the fireground, with too little consideration of local weather conditions and observations. 
- Failure to use a ‘Red Flag Warning’ procedure when local advice/reporting indicated the arrival of the wind change at locations to the west of the fire-ground. 
- Lack of confirmation of critical messages being sent and received on the fireground.
• No single log maintained by the IMT that may have assisted other staff subsequently visiting the IMT to identify an incomplete understanding of the Spot Fire Weather Forecast.
• An apparent reluctance of DEC staff to become directly involved in the IMT on the day.
• With over 80 years of fire fighting experience across the IMT staff, yet none of these staff in the ‘Incident Controller’ position or identifying failures in Incident Control.
• Some local weather conditions and smoke drift being masked by inversion layers, pine plantations and local topography.
• Remaining with a Level 1 IC when the incident was formally categorised a Level 2 fire. Changing the IC may have provided an opportunity for a fresh set of eyes to review the existing BoM forecast that may have been provided to the IMT location by safe hand, sometime after the incomplete radio transmission.
• DEC and/or DFES staff not taking control of the fire when requested by the CofA IC. Again, this may have provided an opportunity for a fresh set of eyes to review the existing BoM forecast that may have been provided to the IMT location by safe hand sometime after the incomplete radio transmission.
• DEC crew not wearing full PPE when committed to the fire line.
• DEC crew not fully readying their vehicles prior to committing to the fire line.
• Working in the ‘Dead Man Zone’, and reporting there is ‘nothing unusual in that’.
• Failure to adhere to the following Firefighter Watchouts:
  o Instructions and assignments not clear;
  o Building line downhill with fire below;
  o Unburnt fuel between you and the fire;
  o Cannot see main fire, not in contact with anyone who can;
  o Wind increases or changes direction; and
  o Terrain or fuels make escape to safety zones difficult.
• DEC Sector Commander switching channels, perhaps due to a lack of phone coverage, that may have meant DEC crews missed tacit information regarding the arrival of the wind change at locations to the west of the fire.
• The arrival of a wind change and highly intense fire with little or no warning concurrently with the Sector Commander briefing crews on the fire line.
• Inability to initiate the vehicle sprays on either DEC vehicle.
• Lack of accessibility to woollen blankets in one DEC vehicle.
Appendix 4: ICAMS PEEPO Observations

The MIR also made reference to aspects of the ICAM (Incident Cause Analysis Model)\textsuperscript{63} referred to as PEEPO:

- People;
- Environment;
- Equipment;
- Procedures; and
- Organisation.

And organised the observations made above into the PEEPO headings. This is only one aspect of the ICAM system. It does highlight that the majority of Latent Conditions and Active Failures were related to People and Procedures.

**People**

- The incident being supported and coordinated from three separate organisational ICC's across Albany.
- A reluctance of DEC staff to become involved in IMTs already established by local Brigades, perhaps because of the challenges of re-establishing and conducting the IMT to DEC standards.
- A reluctance to take control by DEC staff following the recent Keelty Reports.
- Failure to initially communicate by radio the entire weather forecast from the City of Albany DCFCO to the IMT.
- The IMT collectively not identifying that the wind change information, as understood on the fireground, was not consistent with the information provided by the BoM; subsequently provided by safe hand and subsequently reported through local reporting.
- Over 80 years of fire fighting experience across IMT staff yet none of these staff in the Incident Control position.
- The DEC Liaison Officer present not being aware or not intervening regarding Spot Fire Weather Forecast information.
- DEC and/or DFES staff not taking control of the fire when requested by the CofA IC, again may have provided an opportunity for a fresh set of eyes to review the existing BoM forecast that may have been provided to the IMT location by safe hand sometime after the incomplete radio transmission.
- A lack of regular drills to practice ‘burnover drills’.

**Environment**

- Fuel accumulation over an extensive period on private land leading to the fire burning extremely intensely prior to reaching the crews. Fuel loads appear to have accumulated over 50 years and were estimated at 22 tonnes per hectare\textsuperscript{64}. This included substantial elevated fuels.
- The arrival of a wind change and highly intense fire with little or no warning concurrently with the Sector Commander briefing crews on the fire line.

Some local weather conditions being masked by inversion layers, pine plantations and local topography...

Equipment
- A lack of vehicle protection for crews experiencing a burnover, particularly roll down, in-cab, radiant heat shields.
- Unwillingness to move the ICV van once it was identified that it was in a mobile phone black spot due to the van being a caravan, needing towing and already located where it could control vehicle movement into and out of the fire.
- DEC switching channels, perhaps due to a lack of phone coverage, that may have meant DEC crews missed tacit information regarding the arrival of the wind change at locations to the west of the fire.
- Inability to initiate the vehicle sprays on either DEC vehicle.
- Lack of accessibility to woollen blankets in one DEC vehicle.

Procedures
- The presentation of the BoM Spot Fire Weather Forecast that leaves commentary on the ‘severe wind change’ to the lower section of the forecast form, below the tabulated data.
- A lack of awareness, availability or use of DFES risk maps indicating ignition and fuel hazard.
- A lack of pre-season briefings for DEC crews. These were planned in Albany for the following week, still well in advance of the declared bushfire season. These briefings may have assisted in reminding crews of fire ground procedures and safety drills.
- Lack of confirmation of critical messages sent onto the fireground.
- No single log maintained by the IMT that may have assisted other staff subsequently visiting the IMT that there was an incomplete understanding of the forecast wind change.
- A general reliance on the BoM Spot Fire Weather Forecast with too little consideration of local weather conditions by both the IMT and those on the fireground.
- Positioning the ICC van so close to the fire that it was in a mobile phone black spot, leading to an inability to receive a faxed Spot Weather Forecast; an inability to view the forecast on the www and an inability to report and use mobile phone from the ICV.
- Remaining with a Level 1 IC when the incident was formally categorised a Level 2 fire. Changing the IC may have provided an opportunity for a fresh set of eyes to review the existing BoM forecast that may have been provided to the IMT location by safe hand sometime after the incomplete transmission.
- DEC crew not wearing full PPE when committed to the fire line.
- DEC crew not fully readying their vehicles prior to being committed to the fire line.
- Working in the ‘Dead Man Zone’, and reporting there is ‘nothing unusual in that’.
- Failure to adhere to the following Firefighter Watchouts:
  - Instructions and assignments not clear;
  - Building line downhill with fire below;
  - Unburnt fuel between you and the fire;
  - Cannot see main fire, not in contact with anyone who can;
o Wind increases or changes direction; and
o Terrain or fuels make escape to safety zones difficult.

**Organisation**
- The incident being supported and coordinated from three separate organisational ICCs across Albany.
Appendix 5: 10 Standing Fire Orders and 18 Watch Out Situations

The 10 Standing Fire Orders were developed in 1957 by a task force studying ways to prevent firefighter injuries and fatalities. Shortly after the Standing Fire Orders were incorporated into firefighter training, the 18 Situations That Shout Watch Out were developed. These 18 situations are more specific and cautionary than the Standing Fire Orders and described situations that expand the 10 points of the Fire Orders. If firefighters follow the 10 Standing Fire Orders and are alerted to the 18 Watch Out Situations, much of the risk of firefighting can be reduced.

The 10 Standing Fire Orders
The NWCG Parent Group just approved the revision of the 10 Standing Fire Orders in accordance with their original arrangement. The original arrangement of the Orders is logically organized to be implemented systematically and applied to all fire situations.

Fire Behaviour
1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behaviour of the fire.

Fireline Safety
4. Identify escape routes and safety zones and make them known.
5. Post lookouts when there is possible danger.

Organizational Control
7. Maintain prompt communications with your forces, your supervisor and adjoining forces.
8. Give clear instructions and ensure they are understood.
9. Maintain control of your forces at all times.
If 1-9 are considered, then...
10. Fight fire aggressively, having provided for safety first.
   ‘The 10 Standing Fire Orders are firm. We don’t break them, we don’t bend them. All firefighters have the right to a safe assignment’.

The 18 Watch Out Situations
1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behaviour
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link between crewmembers and supervisors.
8. Constructing line without safe anchor point.
9. Building line downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and the fire.
12. Cannot see main fire, not in contact with anyone who can.
13. On a hillside where rolling material can ignite fuel below.
15. Wind increases and/or changes direction.
17. Terrain or fuels make escape to safety zones difficult.
18. Feel like taking a nap near fireline
Appendix 6: RFS Bushfire Survival advice if in a vehicle

• Full personal protective equipment (PPE) correctly worn and fastened.

• Be aware of your surroundings, note areas of little vegetation, natural shelter places, escape routes and refuge areas.

• Be aware of current weather conditions and fire behaviour.

• Assess the risk of fire overrun.

• Don’t put yourself in this position in the first place – anticipate and avoid hazardous locations – use the LACES checklist.

• Don’t panic or cause others to panic – warn others who may be in immediate danger.

• Send an emergency radio call giving your details, callsign and location.

• Don’t drive through dense smoke, you may have an accident or drive off the road.

• Park in open space, bare or burnt ground or in an area of least vegetation, furthest from the path of the fire.

• Stay in your vehicle and operate protective equipment (spray bars).

• Turn on the headlights, emergency lights and hazard warning lights, leave engine running and sound horn.

• Petrol motors may stop working due to vapour lock.

• Close windows and air vents and turn off the air conditioning.

• Shelter under a coat or blanket to protect your body from the radiant heat and lie down as close as possible to the floor.

• When the fire has passed – if vehicle is still safe, remain in the vehicle – if vehicle is hazardous remain together as a crew and seek refuge in a safer location until conditions cool.

• The air closest to the ground is the freshest.

• Coats or blankets should be taken and worn to provide supplementary protection against radiated heat from the burnt out ground.

• Don’t touch the interior or exterior parts (particularly metal) of the vehicle, it will be very hot and may still be burning.
Appendix 7: CFA Burnover Media Report 2009

Included to provide an indication of the open reporting of effective burnover protection measures.
Huddled in their tanker, Peter Smith and his crew went into a scorcher warning.
mates can thank the sad lesson learnt at Linton

survival mode

It seemed like an eternity but it might have been seconds or minutes.

The fire became a sudden event of extreme, sudden, severe forces and sudden impact.

The fire turned out to be a living, breathing, unpredictable force. It spread, grew, and threatened everything in its path.

The fire became a monster, an entity, capable of destruction and irreparable damage.

The fire became a deadly, dangerous, and destructive force. It threatened the very existence of the community.

The fire became a terror, a nightmare, and a nightmare. It threatened the very existence of the community. It threatened the very existence of the community.
Appendix 8: Section 4.3.3 of the State Emergency Management Plan for Bushfire (WESTPLAN BUSHIFRE) November 2011

Criteria for DFES Control under Section 13 BF Act

“FESA, in consultation with the other agencies where practicable, may assume control of a fire(s) when:

- A bushfire has assumed or is likely to assume such proportions as to be incapable of control or suppression by the firefighting agency in whose jurisdiction it is burning;
- A bushfire is not being effectively controlled or suppressed by the firefighting agency or agencies in whose jurisdiction(s) it is burning; and
- A multi-agency or multi-jurisdictional fire requires or may require the coordination of resources and public information.

FESA Regional Duty Coordinators will advise the FESA State Hazards Operations Officer when it is considered that this situation may exist based on the one or more of the following triggers:

- There is not a clear plan or objectives established within four hours and the fire is continuing to burn uncontrolled;
- An urban settlement is in direct path of the fire;
- The Incident Controller believes the fire is not likely to be contained using existing/available resources;
- The fire weather at the incident is Severe or above; and
- The nature and extent of the bushfire requires State-level coordination of resources or public information.”
Appendix 9: Extract from Section 45A, The Bush Fire Act 1954

45A. Requests to authorise CALM officers to take control of bush fires

(1) If:

(a) an officer or member of a bush fire brigade or a bush fire control officer (a *bush fire officer*) has supreme control and charge of all operations in relation to a bush fire under section 44; and

(b) an authorised CALM Act officer is present at the fire, the bush fire officer may request the authorised CALM Act officer to take control of all operations in relation to the fire.

(2) If the authorised CALM Act officer agrees to take control of all operations in relation to the bush fire:

(a) the officer
   (i) must inform the Authority of having done so; and
   (ii) must comply with any requirements prescribed by the regulations for the purposes of this subsection.

(b) subject to section 45(5) and (6), the officer has in relation to the fire the powers, authorities and control referred to in section 45(2) and (3).

[Section 45A inserted by No. 25 of 2009 s. 15.]
## Appendix 10: Chronology of Burnover Incidents in Australia

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Feb 1948</td>
<td>Wistow, South Australia.</td>
<td>Mount Barker Emergency Fire Unit destroyed by fire, crew uninjured.</td>
</tr>
<tr>
<td>2 Jan 1955</td>
<td>Mount Barker, South Australia.</td>
<td>Mount Barker EFS No1 Unit trapped by fire with 2 crew injured.</td>
</tr>
<tr>
<td>2 Jan 1955</td>
<td>Kingston, South Australia.</td>
<td>2 civilian trucks carrying wet bag firefighters are overrun by fire with 1 killed and 14 injured.</td>
</tr>
<tr>
<td>5 April 1958</td>
<td>3 Forestry department trucks destroyed with 3 survivors and 8 deaths.</td>
<td></td>
</tr>
<tr>
<td>25 Jan 1961</td>
<td>Mount Lofty, South Australia.</td>
<td>Mount Barker Unit severely scorched in burnover without crew inj.</td>
</tr>
<tr>
<td>15 Mar 1964</td>
<td>Mount Beevor, South Australia.</td>
<td>Brukunga Tanker destroyed by fire with one crew injury.</td>
</tr>
<tr>
<td>22 Feb 1980</td>
<td>Longwood, South Australia.</td>
<td>Bridgewater Tanker destroyed by fire with 5 crew injured. The nearby Upper Sturt 28 was also severely scorched in the same incident.</td>
</tr>
<tr>
<td>22 Feb 1980</td>
<td>Longwood, South Australia.</td>
<td>Mylor EFS light 4x4 seriously scorched when abandoned by crew following petrol vaporisation. There were no crew injuries.</td>
</tr>
<tr>
<td>3 Nov 1980</td>
<td>Waterfall, New South Wales.</td>
<td>Headquarters 81 Tanker destroyed and 5 crew killed.</td>
</tr>
<tr>
<td>15 Feb 1981</td>
<td>Mingbool, South Australia.</td>
<td>Suttontown CFS Tanker seriously scorched and 4 crew injured</td>
</tr>
<tr>
<td>9 Jan 1983</td>
<td>Grays Point, New South Wales.</td>
<td>Heathcote 81 Tanker destroyed with 3 killed and 6 injured</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Upper Beaconsfield, Victoria.</td>
<td>Panton Hill and Narre Warren Tankers destroyed with 12 killed</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Mount Bonython, South Australia.</td>
<td>Carey Gully Tanker destroyed with 1 killed and 3 injured</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>McLaren Flat, South Australia.</td>
<td>Echunga Tanker scorched with 2 crew injured</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Tea Tree Gully, South Australia.</td>
<td>Tea Tree Gully Tanker destroyed without crew injury when abandoned following breakdown</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Eight Mile Creek, South Australia.</td>
<td>Eight Mile Creek Tanker damaged and 2 crew injured by burnover</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Ansteys Hill, South Australia.</td>
<td>Cudlee Creek Tanker destroyed by fire with one crew injury following breakdown.</td>
</tr>
<tr>
<td>16 Feb 1983</td>
<td>Branxholme, Victoria.</td>
<td>Private fire truck destroyed by fire with 1 crew killed fleeing on foot.</td>
</tr>
<tr>
<td>1990</td>
<td>Ridgeway, New South Wales.</td>
<td>RFS Tanker seriously scorched in burnover with no crew injury.</td>
</tr>
<tr>
<td>22 Sept 1991</td>
<td>Toolara, Queensland.</td>
<td>2 Forestry Department light 4x4 units destroyed by fire with 3 crew injured</td>
</tr>
<tr>
<td>8 Nov 1994</td>
<td>Beerwah, Queensland.</td>
<td>The Coochin &amp; Bells Creek Tanker was damaged and the Palmwoods light 4x4 was destroyed by fire with all 10 crew burned, one critically.</td>
</tr>
<tr>
<td>1995/6</td>
<td>Serpentine; Armidale Fire, Western Australia.</td>
<td>1 crew member killed</td>
</tr>
<tr>
<td>21 Jan 1997</td>
<td>Creswick, Victoria.</td>
<td>Glen Park Tanker destroyed with survival of all 5 crew uninjured.</td>
</tr>
<tr>
<td>2 Dec 1997</td>
<td>Gwabegar, New South Wales.</td>
<td>State Forests Tanker FC 5296 destroyed by fire with 2 crew injured.</td>
</tr>
</tbody>
</table>

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65 Paix.B. From Wandilo to Linton - Lessons learned from an in-depth analysis of 40 years of Australian Bushfire Tanker Burnovers.
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Jan 1998</td>
<td>Wingello, New South Wales</td>
<td>Wingello Tanker destroyed by fire with 1 killed and 7 injured.</td>
</tr>
<tr>
<td>2 Dec 1998</td>
<td>Linton, Victoria</td>
<td>Snake Valley Tanker damaged by fire with 3 crew injured</td>
</tr>
<tr>
<td>2 Dec 1998</td>
<td>Linton, Victoria</td>
<td>Geelong West Tanker destroyed by fire and all 5 crew killed. The nearby Geelong City Tanker was also scorched, but without crew injury.</td>
</tr>
</tbody>
</table>