



RESEARCH AND EVALUATION

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11 RESEARCH AND EVALUATION

Research and evaluation were raised by many witnesses during the term of the Commission. Evidence before the Commission demonstrated the need for policies, programs and practices to be regularly reviewed in the light of new technologies and current research. Specific research gaps were also identified by experts and practitioners before the Commission, as well as by some authors of written submissions. The Commission considers it an opportune time for Australia to regain its capacity in both pure and applied research in the fire sciences and allied disciplines such as land management. Creation of a dedicated national research body with secure funding and collaborative partnerships would ensure this.

If fire agencies are to lift their own capability and performance and lead an improvement in the response capacity of individuals and communities, the agencies need to become true evidence-based learning organisations. The Commission proposes that the fire agencies adopt and fund a culture of reflective practice that routinely pursues current research, searches for best practice, and habitually evaluates policies, programs and procedures with a view to improving internal practice and that of the communities they serve.

This chapter considers the current state of bushfire research in Australia, identifies research gaps and priorities, notes the challenges in the way of progress, and proposes a model for future research and continuing evaluation. Although the focus is on research relating to bushfire, the Commission is aware that associated disciplines need to be involved and that there are considerable benefits to be gained from integrated research activity.

11.1 BUSHFIRE RESEARCH IN AUSTRALIA

Having been a leader in fire science research through institutions such as CSIRO, by the late 1980s Australia had only a handful of internationally recognised fire researchers and most of them were nearing retirement age.¹ Funding was ad hoc, often only increasing in response to major fire events, and most fire agencies have not had adequate funding to employ and sustain researchers in house.² This has led to relatively uncoordinated, short-term local research, rather than research with a coordinated, strategic or national focus.

Internationally and nationally there has traditionally been a strong focus on physical fire research such as studies into crown fires.³ This has been promoted by people with forestry interests and has resulted in suppression-focused outcomes.⁴ A new approach is required to fund and promote coordinated bushfire research. It should be national with a focus on pure, applied and long-term physical, biological and social research relevant to bushfires. It should also promote continued scholarship in a broad range of disciplines. Experts before the Commission argued that in bushfire research there is no international leader 'where the best and the brightest students aspire to train'.⁵ Australia has the potential to become a global leader in bushfire research, and by building on existing resources Victoria is well placed to lead the field.

Continuing research into fire is fundamental to the advancement of bushfire management. Research results in the development of new technologies and methods for dealing with fire that have the potential to save lives. Bushfire policies that are based on a robust research foundation and are regularly reviewed enable policy makers to determine if they are meeting their original objectives or if those objectives could be delivered more effectively.

The Commission sees a need to consider fire in broader terms than the physical study of fire and for this to be reflected in the research agenda. Greater research effort is needed, covering a broader range of disciplines, including basic and commissioned research. It requires a funding model that can sustain long-term research as well as shorter term investigative projects. Research should embrace future challenges facing Australia, among them the impact of climate change on the frequency and nature of bushfire and the subject of fire at the peri-urban fringe.

11.1.1 THE BUSHFIRE COOPERATIVE RESEARCH CENTRE

The Bushfire Cooperative Research Centre was initiated in 2003 by the fire and land management agencies in Australia and New Zealand, their research partners and the Commonwealth Government. As Australia's first nationally coordinated multidisciplinary bushfire research program, the Bushfire CRC has a governing board of 10 members and more than 30 partners from fire and land management agencies and research organisations.⁶ It does research in five interrelated areas:

- safe prevention, preparation and suppression
- management of fire in the landscape
- community self-sufficiency for fire safety
- protection of people and property
- education, training and communication.

Overall, the Bushfire CRC has been a welcome initiative that has made gains in re-establishing a community of researchers and a consolidated research agenda. It does not, however, meet all research needs and it is unlikely to continue in its current form.⁷ Commonwealth funding for it is due to expire in 2013. (It received initial funding for seven years and this was extended for another three years after the Black Saturday fires.⁸) The Bushfire CRC's strengths come from its broad focus, the fact that it is industry driven, and the fact that it has caused a cultural shift towards evidence-based approaches.⁹ Its five streams of research provide information that is sought by the fire agencies and is therefore readily adopted.

Although the involvement of fire and land management agencies is a strength of the Bushfire CRC, it is also a weakness because of the associated funding arrangements. Research priorities for the Bushfire CRC are determined by its stakeholders, who are predominately 'industry' based. Consequently, most of the research funding is tied up in applied research.¹⁰ The 2004 Council of Australian Governments report on bushfire mitigation and management noted that 'maintaining sufficient research capacity beyond the term of the Cooperative Research Centre is ... problematic, and action must be taken if research is to continue to adequately inform bushfire mitigation and management'.¹¹ This has not occurred. The Bushfire CRC's funding cycle results in research projects being relatively short term. The funding cycle of seven years means that research projects tend to be completed within four years, with two years spent on research and one to two years on research adoption.¹²

11.1.2 OTHER RESEARCH INSTITUTIONS

Universities and other organisations, including CSIRO, conduct some bushfire research, but it is fragmented and highly dependent on limited funding.¹³ The University of Melbourne's Bushfire Research and Development Group within the Department of Forest and Ecosystem Science, does research in the following areas:

- prevention, preparation and prediction of fire behaviour
- risk management decision-support systems for communities, town planners, power supply companies, firefighters and land managers
- measuring and modelling the impact of fire on stream flow and water quality and developing improved strategies for protecting water from fire risks
- assessing the impacts of fire management strategies on biodiversity and determining how adverse impacts can be minimised.

The School of Land and Environment at the University of Melbourne is also doing social research into the communication of science and risk associated with bushfire warnings.

Disciplines such as forestry that have been historically linked with the study of bushfire have experienced a decline in student interest in recent years, leading to discontinuation of undergraduate courses and a decline in the number of postgraduate scholarships. For example, the CSIRO Division of Forest Research has been disbanded, the Australian National University School of Forestry no longer exists, and the University of Melbourne no longer offers an undergraduate degree in forest science.¹⁴ Professor Richard Roush of the University of Melbourne noted, 'Universities have the breadth and organisational continuity to sustain bushfire research, but depend on short-term grants to fund research and therefore lack a continuity of support to solve bushfire problems'.¹⁵

11.2 RESEARCH GAPS AND PRIORITIES

There is no shortage of bushfire-related research to be done. As noted by Mr Jim Gould, Principal Research Scientist of CSIRO:

Because bushfire cuts across many management and scientific disciplines, because fire affects so much of the country, and because the risks to life and property are public and political issues, the breadth of opportunities for relevant, needed research is nearly unlimited. The great challenge is perhaps not so much what to do next as it is what to leave out in a limited budget climate.¹⁶

Many of the experts who were asked to advise the Commission on this topic adopted the model of bushfire research proposed by Professor Stephen Pyne, School of Life Sciences, Arizona State University. He identified three streams of bushfire research—the physical, the biological and the cultural (or social) science streams. In the physical research stream gaps still exist in relation to many aspects of fire behaviour, such as physical fire processes (for example, fire transitions, heat transfer and fire emissions), the dynamics of weather, the interactions of wind and the aerodynamic drag of vegetation.¹⁷ Among the gaps in the biological stream of research is the recording of the effects of fire regimes on the abundance of plants and animals and on plants' attributes such as seeding or sprouting.¹⁸ Dr Michael Clarke, Associate Professor in the Department of Zoology at La Trobe University, noted that it was necessary to map plants and animals to know 'where they exist in the landscape and the effectiveness of our actions in conserving them'.¹⁹ There is also a need to research the value of fire for biodiversity and how fire can be harnessed to benefit flora and fauna, agriculture and farming.²⁰

Among the gaps in the cultural stream are research into how people develop their beliefs about and understanding of fire behaviour, fire threat and fire response.²¹ This needs to be redressed by researching people's values in a fire environment, what it means to live 'in harmony with fire', how communities see and deal with fire in their environment, the economic costs and benefits of fire, and effective means of modifying human behaviour in relation to fires.²²

The evidence before the Commission demonstrates the need for further research in a wide range of bushfire-related subject areas, such as the following:

- the effects of fire activity and smoke on radio communications (see Chapter 3)²³
- the effects of prescribed burning and bushfire on biodiversity and on reducing bushfire risk (see Chapter 7)²⁴
- the establishment of databases to map Victoria's flora and fauna, to register Victoria's fire risk and to identify its bushfire-prone areas (see Chapters 6 and 7)
- the extent of deliberately lit bushfires, as well as the causes of these behaviours (see Chapter 5)²⁵
- the long-term effect of trauma resulting from the experience of bushfire and specifically the effect of trauma on children (see Chapters 3 and 8)²⁶
- the use of cars as shelters in bushfires (see Chapter 1)²⁷
- improved measures of house defendability in extreme conditions (see Chapter 1)²⁸
- the circumstances of the thousands who survived the Black Saturday bushfires, whether by leaving early or late or by defending their homes or by sheltering (see Chapter 1)

- the need for greater understanding of the relationship between people's intentions and actions in connection with bushfire (see Chapter 1)
- the shelter options, including factors affecting the safety of different places of shelter, particularly motor vehicles in the open, dams, pools, creeks and water tanks (see Chapter 1).

The Commission received almost 1,700 public submissions, over 70 of which identified specific products or technology the submitters thought could help government and individuals deal with bushfires in Victoria. About another 45 submissions proposed new or innovative ideas or concepts the submitters thought could be further considered or developed for this purpose. It was not the Commission's role to assess the merits of commercial products. Nevertheless, it is desirable that these submissions be further analysed as part of future bushfire research.

The research gaps and priorities the expert witnesses identified, as well as the work and views of the Commission and the public submissions to the Commission, are a good starting point for considering short- and long-term priorities for bushfire research in Australia. Any national approach would benefit from setting agreed priorities for research and collaborating across institutions and jurisdictions.

In addition to this, the Commission invites the Commonwealth to take the initiative on two matters outside the proposed research framework. The first is to consider the development of nationally acceptable bushfire terminology. During the hearings it became apparent that there are a number of bushfire-related terms that are cumbersome, for which meaning is obscure or that have the potential to confuse the general public. Examples are 'neighbourhood safer places', 'designated refuges', 'traffic management points', 'code red/catastrophic days', and 'strategic fuel' and 'strategic firebreaks'. During its hearings the Commission deliberately explored the most suitable word or phrase for fires such as those that occurred on Black Saturday and a more accurate designation for the Country Fire Authority, but it ultimately leaves these matters for resolution by the responsible authorities. Emergency Management Australia has done work on standard terminology in relation to emergency warnings: the Commission considers this work should be extended to bushfire terminology.

The second matter the Commission invites the Commonwealth to take up relates to the absence of an agreed methodology for estimating the cost of bushfires. In undertaking an analysis of the cost of the 2009 bushfires, the Commission experienced difficulty because of the lack of available data and the absence of an agreed methodology for estimating the various costs (see Appendix A in Volume I). This is a deficiency in the nationally available bushfire information and an area in which further research is warranted. If the Commonwealth were to assist in developing a national methodology for estimating the cost of natural disasters, including bushfires, this would be valuable to policy makers and the community.

11.3 CHALLENGES

11.3.1 LONG-TERM, SECURE FUNDING

There was general agreement among the experts who addressed the Commission about the need for dedicated funding for bushfire research and a funding model that supports long-term research projects for pure as well as applied research.²⁹ Professor Richard Roush, Dean, Melbourne School of Land and Environment, University of Melbourne, noted that in Australia the research 'gaps will require decades of research and education to resolve'.³⁰ Professor Mark Adams, Dean, Faculty of Agriculture, Food and Natural Resources, University of Sydney agreed that there is 'an obvious need for a far more significant research effort than has been the case to date'.³¹ Australia's investment in bushfire research is very low compared with that of other countries. Professor Pyne noted that internationally 'there are too few researchers, and their study [is] too narrow and exclusive'.³²

11.3.2 CHANGING THE RESEARCH AGENDA

There was among the experts general support for Professor Pyne's three-part research model and for his contention that to date bushfire research has primarily focused on the physical sciences to the detriment of cultural, or social, research. If a comprehensive and integrated approach to bushfire research is to be established, urgent priority should be given to the social sciences. Professor Adams noted that for researchers 'the cultural heading is the most difficult

and challenging and needs a “long view”.³³ Notably, Mr Gould of CSIRO and Mr Gary Morgan, CEO of the Bushfire CRC, agreed with the need for more emphasis on social science research in relation to fire.³⁴

Professor Pyne posited that each stream is coherent but insufficient on its own and that there is value in keeping them segregated: ‘each can only realise its conceptual potential if it can follow its own internal logic to conclusion’.³⁵ Professor Ross Bradstock, Director, Centre for Environmental Risk Management of Bushfires, University of Wollongong agreed that the reality of ‘disciplinary silos’ needs to be built into any future approach to fire research, but he added there needs to be some means of coordinating the three streams and promoting integrated research.³⁶

Future research models and priorities need to encompass all three streams. As Professor Bradstock noted, ‘A highly varied portfolio of research is ... required and this will require a matching commitment from a diverse range of research disciplines and institutions’.³⁷ The Commission considers that it is necessary to continue physical research because ‘there remain significant gaps in our knowledge of how fires burn’ but that this investment should not be at the expense of research in the biological and social sciences.³⁸

11.3.3 BALANCING PURE AND APPLIED RESEARCH

At present the majority of funding is directed to applied research, with very little being available for pure research (also referred to by the academics as ‘blue sky’, ‘basic’ or ‘fundamental’ research).³⁹ The experts before the Commission acknowledged that this balance needs to be redressed.⁴⁰ Professor Gould considered that there should be a focus on basic research to build new knowledge, applied research to solve practical problems, science applications to develop and improve current knowledge, and scholarship to provide educational assistance.⁴¹ Professor Bradstock put the view that funding ‘needs to encompass pure, applied and cross-disciplinary research needs’.⁴²

The Bushfire CRC is a good example of some of the advantages of directed research. (Much of its research could also be described as applied and commissioned, none of these terms being mutually exclusive.) One advantage is the high rate of fire agencies’ adoption of the research results and the results’ influence on evidence-based operations and policies.⁴³ The Commission supports the view that research into the application and adoption of science-based knowledge and tools is important, but it also considers that pure research is essential for developing new knowledge and can lead to important breakthroughs in thinking.⁴⁴ When conducted through universities, pure research provides vital links with teaching, which are important for continuity, ongoing scholarship, links between disciplines, and generating interest in disciplines relevant to bushfire.⁴⁵ Pure research is, however, traditionally subject to fluctuations in funding, and outputs have not always been available to bushfire agencies or the community. One of the challenges of pure research is translating findings into practical applications and moving tools and knowledge into work practice.⁴⁶

Similarly, there is a need for ‘integrated research’ and the sharing of scientific knowledge both within Australia and overseas.⁴⁷ Professor Bradstock nominated as a priority ‘an ongoing and far-reaching “fire research dialogue”’. He said, ‘Research problems can be articulated in differing ways, from widely varying contributors. The widest possible range of contributors needs to be heard’.⁴⁸

The land and fuel management expert panel identified the importance of fire agencies conducting in-house research in order to improve the outcomes of land management programs. There are two examples of this approach in the Department of Environment and Conservation in Western Australia. The first is research mapping the effects of fire on flora and fauna, which has allowed the department to tailor its prescribed burning regime for the benefit of a range of plants and animals.⁴⁹ Related in-house research was begun after the 1961 bushfires; it focused on fire behaviour and led to the department’s development of fuel accumulation and fuel moisture models for Western Australia. The models are used by managers and field staff implementing fuel-reduction burns.⁵⁰

Experts stressed the importance of independence in developing a true research culture associated with bushfires. Fire agencies are important players in the development of research priorities, but they should not be the sole or primary motivator. As Professor Adams noted, ‘Effective research, education, training and outreach require establishment of a culture of inquiry and intellectual rigour, free from but informed by the needs and demands of emergency response’.⁵¹

The Commission accepts that in-house research has a greater chance of influencing policy makers and decision makers and is therefore more likely to be implemented.⁵² It notes additional benefits of in-house research, such as the potential to increase organisational capacity, promote a learning culture and increase an organisation's ability to engage in collaborative applied research with other bodies. Fire agencies should report summaries of their research activities and findings in their annual reports and record the budgets allocated to these projects. For their part, governments should ensure that adequate resources are provided for in-house research.

The Commission considers that a fully developed bushfire research agenda in Australia would have scope for enhanced in-house research capacity for fire and land management agencies, as well as significantly boosted resources for research institutes and universities. The full benefit of these improved arrangements would be realised if personnel from various organisations could share knowledge and ideas and if attention were given to disciplinary as well as integrated research.

The Commission further believes that there is potential for a revitalisation of education and training in forestry studies and in bushfire (and emergency) management if universities regain some of their research capacity in this area. As noted in Chapters 1 and 6, there are school curriculum gaps in connection with the nature of bushfire and its impact on the Australian community and environment, and in training in areas such as assessing bushfire-prone areas.

11.3.4 COORDINATING AND DEVELOPING PRIORITIES FOR BUSHFIRE RESEARCH

The Commission considered the different approaches suggested by the experts—among them models for a national research centre or institute. The suggested models included the competitive research market model (for example, the National Health and Medical Research Council) and the not-for-profit research company model (for example, the National Aerial Firefighting Centre).⁵³ There was some support for the Bushfire CRC model, either as a primary vehicle with additional funding or with modifications to take it to the 'next level'.⁵⁴

The experts also put forward a range of options for operating a national centre or institute, among them physical and 'virtual' centres and mixed-mode options. Many of the experts suggested that a national centre or institute should be university based (for example, an endowed chair). Professor Roush noted that universities are 'uniquely placed to provide critical underpinning scientific research and education', well placed to conduct long-term research, 'offer a breadth of related critical disciplinary expertise (such as engineering, economics, law, sociology, medicine, and urban planning)' and link directly to teaching.⁵⁵ He suggested that endowed chairs create a 'hub of activity in perpetuity' and cost less than funding an entire centre.⁵⁶

Professor Adams argued that any national centre or institute should be clearly aligned with the university sector but not embedded in one institution. He considered there should be a major presence of several universities within the national centre.⁵⁷ Professor Adams argued that physically co-locating multidisciplinary teams, even for time-limited periods, would offer opportunities for people 'to really get their teeth into specific problems' and would encourage a 'research culture'.⁵⁸ He suggested that the physical location of the national centre or institute be in Victoria and that it be a venue for training, public outreach, visiting researchers and students, as well as a meeting place and an administrative office.⁵⁹ In addition, there should be a mixed mode of delivery through 'nodes', mainly universities.⁶⁰

Good governance was seen as essential for any model, as was the need for public accountability, including annual reporting.⁶¹

11.4 A PROPOSED MODEL FOR FUTURE RESEARCH

The Commission considers that a national research centre or institute is required for bushfire research. It is obvious that governments need to invest more in bushfire research and that there is a need for a 'far more significant research effort than has been the case to date'.⁶² The Commission is aware that the Victorian Government has sought advice on establishing a university-based centre of excellence to be both a training centre for leaders in emergency services agencies and a research body with a multidisciplinary approach to inform policy and strategy development.⁶³ The research exemplar highlighted by the Victorian Government for consideration is the Monash University Accident Research Centre.⁶⁴

The Commission does not consider that its role is to design the proposed national research institute or to determine such an organisation's governance arrangements. It has, however, heard sufficient evidence to form the view that, in developing the model, governments should consider incorporating the following features:

- funding that supports pure and applied research
- funding that supports long-term research projects
- strong governance arrangements, including research independence
- the location of the research centre preferably in Victoria
- a balanced focus that includes physical, biological and social research
- links with teaching and promotion of graduate scholarships
- cross-institutional and jurisdictional collaboration
- international collaboration and sharing of knowledge
- the research priorities highlighted in evidence before the Commission.⁶⁵

RECOMMENDATION 65

The Commonwealth establish a national centre for bushfire research in collaboration with other Australian jurisdictions to support pure, applied and long-term research in the physical, biological and social sciences relevant to bushfires and to promote continuing research and scholarship in related disciplines.

11.5 EVALUATION AND CONTINUING POLICY DEVELOPMENT

Policy development and implementation are not linear processes. They require continuing evaluation and review to test that desired policy outcomes are being achieved and to re-assess where the evidence suggests the outcomes are not being achieved. Policies need to be based on current research, the experiences and lessons learnt by agencies, the views of the people affected by the policies, and good data and formal evaluations (which need to be built into policy and program development).

Translating these elements into workable policy solutions can be difficult. The evidence before the Commission suggests that some policies and standards have not been well evaluated or reviewed in a timely or ongoing way—for example, the State's 2005 Fire Refuges Policy and the 1999 Australian Standard for the Construction of Buildings in Bushfire Prone Areas. This situation should be remedied.

Similarly, the Commission heard evidence of some agencies waiting for research to be completed before implementing change. There is a risk that incomplete research might be used as a reason for delaying policy implementation. The Commission is strongly of the view that policy should be underpinned by robust research and that there are times when programs and standards should not proceed without a solid research base. In relation to prescribed burning targets, however, the experts who appeared before the Commission stressed the need for new targets in the foothill forests of Victoria to be introduced without delay.⁶⁶ DSE's stance—to wait for further research before committing to targets—is unnecessary and unproductive (see Chapter 7).⁶⁷

Policy, particularly in an area such as bushfire safety, needs to be periodically reviewed and evaluated for a number of reasons:

- Circumstances can change in areas such as building standards and communications. For example, new technologies and improved products can mean that current approaches are no longer effective or no longer represent the best way of achieving the policy's objectives.
- Communities change. Their demographics and profiles change with time, and approaches need to be monitored to ensure that they still offer the best way of improving community safety.

- The way policies and programs are implemented can have unexpected or unintended consequences. This needs to be monitored to ensure that, in practice, the policies and programs are achieving their original objectives.
- New information can come to light that should be used to further develop or refine a policy, procedure, program or standard. This Commission is one example of a catalyst for change: evidence has been rigorously tested and conclusions reached that can be used by government and fire agencies to effect improvement.

A final consideration for effective evaluation and policy development is the need to ensure that the results of an evaluation are communicated to those who are responsible for a particular policy, program, procedure or standard and its implementation.

During its hearings the Commission heard, from practitioners of land and fuel management and experts in research and elsewhere in academia, of difficulties in the resourcing and support of bushfire research in Australia. The Commission proposes a dedicated national research body, a strengthening of the internal research capacity of fire agencies, and continued improvement in policy development and evaluation. Related to this is the discussion in Chapter 12, which deals with monitoring the effectiveness of implementation of the Commission's recommendations.

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- 1 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0018
 - 2 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [48]; Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0007
 - 3 Exhibit 885 – Problems, Paradoxes, Paradigms: Triangulating Fire Research (TEN.261.001.0001) at 0002
 - 4 Exhibit 885 – Problems, Paradoxes, Paradigms: Triangulating Fire Research (TEN.261.001.0001) at 0002
 - 5 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0005
 - 6 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0014; Exhibit 815 – Bushfire CRC – Annual Report 2008–09 (CRC.306.001.0001) at 0003
 - 7 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [41]; Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0007; Adams T18519:15–T18519:19
 - 8 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0015
 - 9 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0008
 - 10 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [49]
 - 11 Exhibit 142 – 2004 COAG Report (TEN.049.001.0001) at 0123
 - 12 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [49]
 - 13 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0010
 - 14 Exhibit 890 – Australian Bushfire Research: Gaps in Knowledge (WIT.7548.001.0001) at 0006; Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0010
 - 15 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0004
 - 16 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [47]
 - 17 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [21]
 - 18 Exhibit 890 – Statement of Adams (WIT.7548.001.0001) at 0005
 - 19 Clarke T15343:21–T15343:25
 - 20 Exhibit 888 – Bushfire CRC – Australian Fire Research – (WIT.7542.001.0001) at 0016
 - 21 Exhibit 888 – Bushfire CRC – Australian Fire Research – (WIT.7542.001.0001) at 0016
 - 22 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0003; Exhibit 142 – 2004 COAG Report (TEN.049.001.0001) at 0120
 - 23 Exhibit 868 – Statement of Lloyd, Annexure 4 (WIT3028.001.0059) at 0067; Powell T18159:4–T18159:18
 - 24 Land and Fuel Expert Forum T15247:11–T15248:14
 - 25 Exhibit 382 – Statement of Ogloff (WIT.106.001.0001_R) [36]; Exhibit 383 – Statement of Muller, Attachment 2 (WIT.077.001.0008) at 0015; Exhibit 715 – Letter from Victorian Government Solicitor's Office, Dated 24 December 2009 (CORR.1001.0033) at 0033–0034
 - 26 Exhibit 535 – McFarlane Report (EXP.007.002.0005) [35], [148]
 - 27 Handmer T18567:5–T18568:21
 - 28 Exhibit 894 – Review of fatalities in the February 7, 2009, Bushfires – Final Report (Amended Version without mark up) (EXP.029.003.0001) at 0036
 - 29 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [49]–[53]
 - 30 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0004
 - 31 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011

- 32 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [48]; Exhibit 885 – Problems, Paradoxes, Paradigms: Triangulating Fire Research (TEN.261.001.0001) at 0005
- 33 Exhibit 890 – Australian Bushfire Research: Gaps in Knowledge (WIT.7548.001.0001) at 0002
- 34 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [44]; Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0010
- 35 Exhibit 885 – Problems, Paradoxes, Paradigms: Triangulating Fire Research (TEN.261.001.0001) at 0005
- 36 Exhibit 892 – Statement of Bradstock (WIT.7549.001.0001) at 0001
- 37 Exhibit 892 – Statement of Bradstock (WIT.7549.001.0001) at 0003
- 38 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [43]
- 39 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [48] – [49]
- 40 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0008; Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [49]
- 41 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [48]
- 42 Exhibit 892 – Statement of Bradstock (WIT.7549.001.0001) at 0003
- 43 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0008
- 44 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [33]
- 45 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0013
- 46 Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0008
- 47 Exhibit 887 – Statement of Gould (WIT.7545.001.0001) [51], [53]; Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0009
- 48 Exhibit 892 – Statement of Bradstock (WIT.7549.001.0001) at 0003
- 49 Sneeuwjagt T14999:28–T15000:26
- 50 Exhibit 725 – Statement of Sneeuwjagt (WIT.135.001.0001_R) at 0008_R
- 51 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011
- 52 Tolhurst T15360:29–T15361:10, T15361:26–T15361:30
- 53 Exhibit 892 – Statement of Bradstock (WIT.7549.001.0001) at 0004; Exhibit 888 – Bushfire CRC – Australian Fire Research (WIT.7542.001.0001) at 0008–0009
- 54 Exhibit 891 – Statement of Kanowski (WIT.7543.001.0001); Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011; Adams T18526:16–T18527:1
- 55 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0004
- 56 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0005
- 57 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011
- 58 Adams T18526:23–T18526:29
- 59 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011
- 60 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0013
- 61 Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0003
- 62 Exhibit 890 – Australian Bushfire Research: A Way Forward (WIT.7548.001.0009) at 0011
- 63 Exhibit 931 – Statement of Armytage (WIT.3003.002.0001) [171.2 (b)]
- 64 Exhibit 931 – Statement of Armytage (WIT.3003.002.0001) [171.2 (b)]
- 65 Exhibit 887 – Statement of Gould (WIT.7545.001.0001); Exhibit 886 – Statement of Roush (WIT.7544.001.0001) at 0004
- 66 Bradstock T15178:26–T15179:5
- 67 Wilson T15075:19–T15076:16