

Analysis
of
Bushfire protection review
by
Travers bushfire & ecology
for
Headland Preservation Group Inc
at
10 Terminal Buildings
Middle Head Road
Mosman

Lot 203 DP 1022020

30 July 2014

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Executive Summary

I have been commissioned by the Headland Preservation Group Inc, to review and to comment on a report by Mr John Travers of Travers bushfire & ecology dated 24 April 2014, supporting a proposal for a Special Fire Protection Purpose development of an aged care facility on land within the buffer to fire-prone vegetation. This proposed infill development is assessed as though it were subject to s100B of the *Rural Fires Act 1997* (RF Act).

I am a Level 2 accredited bush fire consultant. As Mr Travers's report uses an Alternate Solution approach, I have been asked by my client to have my work verified by a BPAD – L3 practitioner. Mr Terence O'Toole, a person suitably accredited by the FPAA and thus recognised by the RFS, has certified my findings.

The site is Commonwealth land and thus exempt under clause 71 of the *Sydney Harbour Foreshore Trust Act 2001* (SHFT Act) from the need to comply with many of the provisions of NSW State legislation. However, as the Trust has publicly stated its policy of complying with best practice and relevant guidelines, this report assumes that the provisions of s100B of the RF Act will be used as a yardstick by which to assess the proposal. Section 100B states that the Commissioner [of the Rural Fire Service (RFS)] may issue a bush fire safety authority (BFSa) for development of bush fire prone land for a special fire protection purpose (SFPP). The proposed use is a defined SFPP within the RFS guidelines. I understand that the RFS has been asked to assess the matter.

The provisions of s100B require proposed developments to comply with standards regarding setbacks, access, provision of water supply, and matters considered by the Commissioner of the RFS to be necessary to protect persons, property or the environment from danger that may arise from a bush fire.

Under the *Rural Fires Regulations 2008* – Reg 45, certain developments are excluded from the need for a BSFA. This proposal is not excluded by the provisions of that Regulation.

Under the *Rural Fires Regulations 2008* – Reg 44, an applicant is to describe the location, surrounding vegetation, land slope and various environmental features on the property. Reg 44 nominates the provisions of *Planning for bush fire protection 2006* (PBP) as the benchmark by which compliance will be assessed according to Deemed to Satisfy provisions. The inter-relationship of PBP and the Building Code of Australia (BCA) allows the application of Alternate Solutions as defined in Method 2 of AS 3959-2009 *Construction of buildings in bushfire prone areas* (AS3959) in the assessment of applications which do not meet deemed to satisfy provisions.

s100B checklist summary

APZs and setbacks comply ?	No
Siting and adequacy of water supply?	Not addressed
Adequate capacity of public roads during bushfire emergency?	No
Two-way public roads?	One road only
Adequate emergency response access & egress?	No
Adequacy of maintenance & emergency plans ?	OK?
Construction standards for building elements?	OK
Adequacy of sprinkler systems & other protective measures?	OK?
Meets provisions of Ch 4 PBP?	No

This review concludes that the proposal fails to fully or adequately address a number of issues which industry standard protection measures dictate.

I recommend rejection of the proposal.



Roger Fenwick
B Sc (For)
Grad. Cert. Design for Bushfire Prone Areas
BPAD-Level 2 Certified Practitioner BPD-PA-8787
Corporate Member No. 28974 Fire Protection Association Australia



I accept, confirm and support the findings and calculations within this report. The APZ calculations given by Mr Travers cannot be verified using the information provided by him, and thus appropriate levels of protection cannot be assured. Access is a significant issue. As I do not believe that staying on-site is a suitable strategy, owing to the nature of the proposed occupancy, safe evacuation must be provided.



Terence O'Toole

BAppSc Environmental Health
Grad. Dip Design for Bushfire Prone Areas
Director/Principal Consultant
BPAD-A Certified Practitioner BPD-PA-13734



Introduction

My full name is Roger Fenwick, and my date of birth is 27 December 1946. I reside at 26/16-22 Helen St, Lane Cove, NSW. I hold a Bachelors degree in Science (Forestry), am a former Chief Fire Control Officer of the ACT Bush Fire Council, and have been self-employed as a consultant in bush fire protection planning, management and investigation since 1987. A summary of my *curriculum vitae* is attached as Annex 1.

I have read and agree to be bound by the expert witness code of conduct in Schedule 7 of the Uniform Civil Procedure Act 2005.

I have been asked to provide analysis and comment on a report by Travers bushfire & ecology supporting a proposal for a Special Fire Protection Purpose development of buildings on land within the buffer to fire-prone vegetation. I have assessed this proposal as though it were subject to s100B of the RF Act.

Location

The site is defined as Lot 203 DP 1022020 in the Mosman Local Government Area. The address is Middle Head Road, Mosman. This is in the Greater Sydney Fire Weather Area, for which Fire Danger Index (FDI) 100 conditions apply.

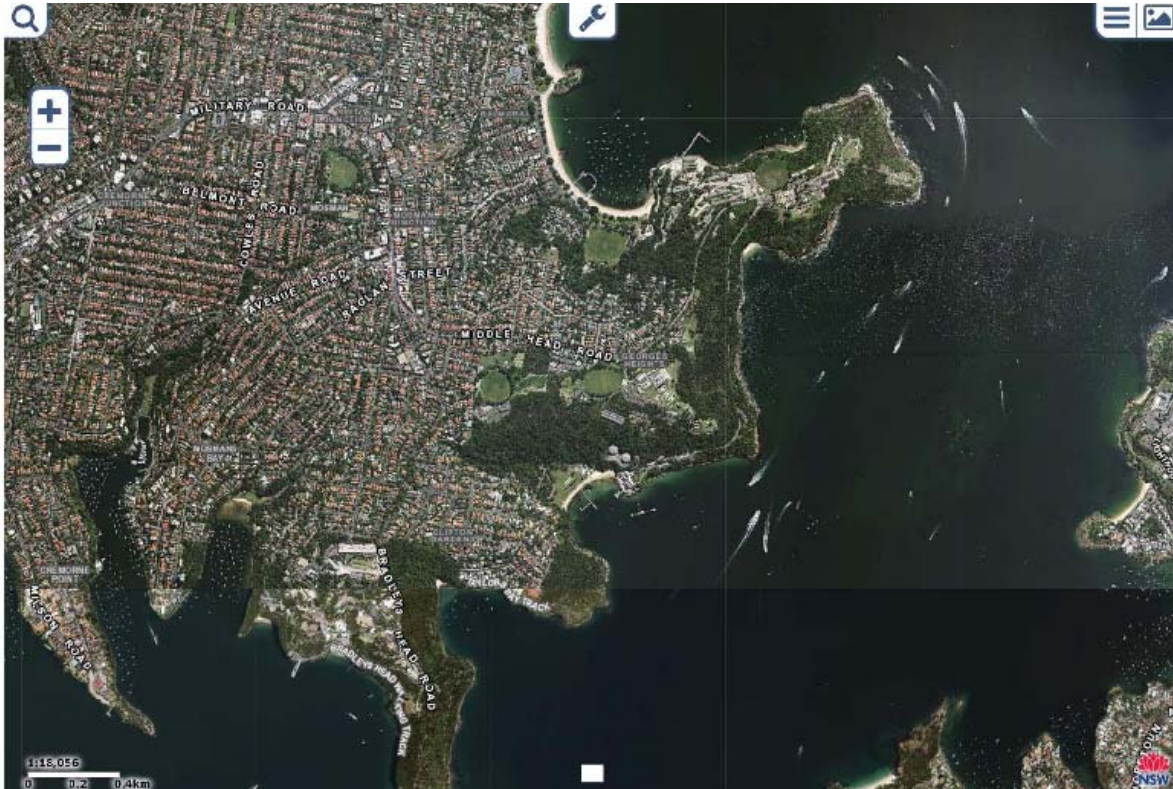


Photo 1 General site location

Vegetation

Fire prone vegetation adjoining the site is defined by Mr Travers (P 20, p 2.7) as tall heath interspersed with emergent trees / rainforest, and (on P 21, Table 2.2) as various classes of wet and dry sclerophyll forest, rainforest and tall heath. Under Keith 2004 as used in PBP, the accepted vegetation community definitions are forest, rainforest and tall heath, equivalent to forest, rainforest and scrub respectively (Specht 1970, in Auslig 1990) as used in AS3959.

Suitably small and isolated stands of forest can be regarded as Remnant vegetation and treated as rainforest equivalent for the purpose of determining fire behaviour, under the provisions of both PBP and AS3959. The only allowable Remnant re-classification applicable to this site under AS3959 (P 15, p 2.2.3.2) applies to the formally managed land shown on P 26 of Mr Travers's report at the SE edge of the APZ. Under PBP, (P 52), only parcels of vegetation that allow a fire approach run less than 50m in length may be treated as rainforest equivalent. No such eligible stands affect the subject site.

The environmental impact of the proposal has been addressed in a report by Hannah Reid. She defines the vegetation to the immediate SE of the site as rainforest, and for the purpose of this analysis, that classification will suffice.

The classification of vegetation to the south of the site is given as heath, and for the purpose of this analysis, that classification will suffice.

Vegetation beside Middle Head Road between the Mosman built-up area proper and HMAS Penguin is dry sclerophyll forest - shrubby understorey (Keith), i.e. forest (Auslig). It is described by Mr Travers (P24) as managed on either side in various land ownerships.

Topography

The values given in Mr Travers's report are accepted. Unspecified figures are added, in bold. They are:

East of Middle Head Rd	Downslope >15°
North of site	Downslope >15°
SE of site	Downslope 8°
S of site	Downslope 0 – 5°

Significant Environmental Features

The many issues arising are addressed in separate reports by others.

Some APZ works are proposed on the adjoining National Parks & Wildlife Service land forming Sydney Harbour National Park (SHNP) and may require the removal of additional protected vegetation and habitat.

Current Development

Adequately addressed in reports by others, and by the proponent.

Proposed Development

Adequately addressed in reports by others, and by the proponent.

Potential Fire Exposure

Asset protection zones

Within this report, references to guidelines or PBP means the 'Planning for Bush Fire Protection 2006' (as amended in 2010) publication by the NSW Rural Fire Service (RFS). References to the Standard are to AS 3959 - 2009, Construction of buildings in bushfire-prone areas.

The proximity of the proposed new works to unmanaged vegetation on downslopes on adjoining land is more or less as described in the Travers' report. As noted, the required (PBP Table A2.6) and available setbacks are:

	Veg/slope	Required	Provided
North	Rainforest D >15°	65m	75m
SE	Rainforest D 8°	50m	33-38m
South	Heath D 0-5°	50m	50m

As the available setbacks to the SE do not comply with the deemed to satisfy (DTS) provisions of PBP, Mr Travers has proposed the use of radiant heat shields composed of earthen berms beside part of the common boundary with the SHNP.

To the best of my knowledge, while such barriers of suitable height may provide a sufficient reduction in the radiant heat load impacting a building, the only acceptable alternative to a DTS solution is by use of Method 2 in AS 3959-2009. That methodology prescribes a series of calculations which include analysis of the slope of the land under the adjacent fire-prone vegetation, and the average slope of the asset protection zone between structures and vegetation, but does not provide a methodology for the assessment of the shielding effect of adjacent structures.

The text quoted in Table 2.1 on P 14 of Mr Travers's report is aid to show an acceptable alternate solution derived from P 19 of PBP. However, P 19 of PBP refers to Residential and Rural residential subdivisions, not to SFPP development, which is found on P 33. The text shown in Mr Travers's 'Alternate solution potential' column does not appear in PBP, but is a summary of Mr Travers's general argument in favour of the proposal.

Mr Travers has provided details of a series of pre- and post-shield calculations in Appendix A1 of his report. His base calculation, using litter and total fuel loads of 10 & 12t/ha apparently derived from Keith 2004 in PBP and 1200°K flame temperature, gives a radiant heat value of 19kWm⁻² for fire in Rainforest on an 8° downslope and a site downslope of 3° with a separation of 33m.

In his pre-shield calculations for the eastern aspect, Mr Travers uses 2.8 & 3.8t/ha litter and total fuel loads, a flame width of 45m, and derives a radiant heat load at 33m of 3.93kWm⁻². Mr Travers does not explain the basis for his use of the reduced fuel load values, which I believe to be unacceptable.

In his shield calculation for the same location, Mr Travers has used the standard fuel load values, the inappropriate flame temperature of 1090°K, and consequently derived a radiant heat load of 10.07kWm⁻². Using the correct temperature for SFPP of 1200°K gives approx 14kWm⁻² in this setting, suggesting the calculated berm height will be too low to achieve compliance.

The lack of both a defined methodology/calculation strategy and an explanation for the different input values of Mr Travers's shielding calculation makes a review of its validity next to impossible.

I believe that Mr Travers's conclusions regarding the effect of his shielding may be incorrect. His results are based on unsupported and apparently incorrect assumptions.

Similar confusion applies to the Modelled Area B tables provided by Mr Travers, where unexplained pre-shield fuel loads values of 3.5 & 5 t/ha have been used, and the outputs appear to reveal a higher radiant heat load after installation of the shield.

It is fundamental to the provision of suitably wide APZs that they be located on the applicant's land, except where exceptional circumstances provide a certainty of ongoing management to an acceptable level. In this setting the applicant borders land under the management of the NSW National Parks and Wildlife Service. That organisation is not bound to undertake, for the benefit of neighbours wishing to develop commercial or residential building opportunities, vegetation management on its estate.

Some trivial examples of dependence on on-going maintenance of small areas of such land (see the photo collage on Travers P 16) are of no great significance. However, some of the setbacks used in the berm shielding calculations reflect a vegetation boundary some 5m outside Trust land, and on which continued mowing or other maintenance may not occur should the proposed earthworks obstruct access to, and visibility of, those areas. In that case the 33m & 38m setbacks from (future unmanaged) vegetation shown on Mr Travers's unscaled Figure 2.6 (P 17), which were apparently not measured directly towards the closest part of the far side of the proposed radiant heat shield, may be reduced to below the distance depended upon in his calculations.

Construction standards

All structures built to BAL-12.5 specifications meet the 10kWm^{-2} radiant heat limit applicable to SFPP developments.

Water

It is assumed that reticulated town water and hydrants to normal suburban standards will be supplied. Provision of supplementary on-site water storage for fire fighting purposes is not addressed, but I see no necessity to make such provision in this setting.

Access

Access to the site is via the Middle Head Road, only. To describe Middle Head Road as the primary access (Travers. P24) is misleading; it is the only access. Chowder Bay Road to the east does not provide vehicular access from/egress to the existing external urban road network. On-foot access (2km in length) is available via Chowder Bay Road across a beach to Clifton Gardens. Middle Head Road width is tight, but it does accommodate trucks and busses as well as the normal car traffic – all of which is slowed by numerous pinch points and speed control humps

The western side of this road, where it passes HMAS Penguin, is bounded by a chain-link fence impassable to anyone attempting to leave the roadway in that direction. That would form a highly dangerous trap for stranded motorists as well as for pedestrians using the road in the event of fire approaching rapidly uphill from Chowder Bay Road.

The issue of possible fire in roadside vegetation causing a traffic blockage of up to 400m of Middle Head Road for up to several hours should, by itself, be regarded as grounds for disqualifying this site for development involving a SFPP. Even if periodic hazard reduction burning (on land managed partly by others) were carried out, a relatively minor and low-intensity fire could block the road for an unacceptable time period. The only suitable treatment would be conversion of a sufficiently wide strip of adjoining vegetation to APZ standards, such that no flame contact with passing vehicles would be possible under the standard planning guideline conditions. Falling trees on either side of the road could block

it to all traffic for a prolonged period, even if measures were implemented to minimise the likelihood of anything growing within 25m of the trafficable surface from igniting and burning through.

I consider Forest to be the appropriate vegetation classification in this location, based on the species mix and structure, and the length of potential fire run exceeding 50m disqualifies Remnant classification. The slope up to Middle Head Road from Chowder Bay Road exceeds 15°, and the defined flame length in Forest vegetation is 59m (Method 2). The proposed 7m wide protective strip (Figure 2.10, P 25) is manifestly inadequate. I consider that the minimum protection standard which should be applied to each side of this road, were it to be used as the sole SFPP access route, is ongoing APZ standard vegetation management within 35m of each side of the trafficable surface. In addition, the sealed trafficable width needs to be increased to at least 8m, and the fence moved or removed.

In my opinion this site is as, or more, constrained than many locations identified as unsuitable for SFPP development (for example those locations within the SEPP5 Exclusion Areas in Ku-ring-gai Local Government Area) on the basis of unacceptable access and egress along a dead-end road exceeding 100m in length.

This opinion does not depend on a traffic survey. I base it solely on what in my practical experience would be impossible working conditions for operational fire control personnel, as well as the already mentioned danger to road users attempting to drive through flames which would cross the road, and potential roadway blocking by falling trees on each side of the road. I note that the 6-lane, divided, F3 freeway to the north of Sydney is occasionally closed to all traffic when approached by wildfire.

Internal road access details in Table 2.4 on P 26 appear to adequately address internal road issues.

Services

Mains electricity is presently supplied to the area via overhead cables beside a long stretch of unmaintained forest vegetation beside Middle Head Road.

Maintenance

It is assumed the grounds would be maintained to appropriate standards.

Emergency and evacuation plans

Would be provided on completion of construction and prior to occupation.

Conclusion

I do not agree that most of the essential aims and objectives of PBP with respect to SFPP development can in fact be achieved at this site. Mr Travers's proposed solutions involving the use of radiant heat shielding may provide adequate levels of protection. However, his report has failed to address the alternative solutions documentation requirements of the RFS and BCA, and as a consequence of his lack of documentation the outcome cannot be validated.

In addition, while the report's conclusions notes that on many points compliance could be achieved, the proposal does not show, in a manner that allows proper evaluation, how that could be achieved. In my opinion, there are far too many omissions and points of non-compliance to allow conditional approval.

My specific issues are, as enumerated by Mr Travers in his Conclusions:-

PBP Aim 1 *Adequate protection to occupants*

Has not been shown to meet performance criteria under present planning guidelines.

PBP Aim 2 *Defendable space*

Sufficient space for fire fighting mopup operations can be provided by as little as a 5m clearance between buildings and adjoining vegetation. However, for the protection of dependant evacuees and their carers, it is a requirement that APZs provide a radiant heat level not exceeding 10kWm^{-2} . The proposed non complying APZ widths do not achieve this. The proposed radiant heat barriers do not supply additional protection, they are simply meeting the statutory minimum level.

PBP Aim 4 *Safe operational access and egress*

The necessity to:-

- drive vehicles simultaneously in opposite directions,
 - along a two-lane road which is
 - man-proof fenced on one side,
 - on a ridge-line,
 - beside forest vegetation (management of which is and will remain beyond the complete control of the dependent agency),
 - with fire moving up a slope exceeding 15° ,
 - while conducting fire-fighting operations on one or two sides of the same road,
- exceeds the realms of possibility.

This solitary road cannot possibly be described as safe operational access, or a safe/effective egress, during a bushfire emergency.

PBP Aim 5 *Ongoing management of measures and fuels within the APZ*

To the extent that unmanaged fuels are located within the Trust property boundaries, this can be met. However, there is a high degree of dependence on ongoing vegetation management by other agencies on their own land, none of which can be controlled by the applicant, and which therefore cannot be guaranteed.

PBP Aim 7 *Provide for the special needs of SFPP development residents*

Buildings can be, and are, constructed to resist the likelihood of ignition as a result of exposure to approaching bushfire. Firefighters would be able to attend to fire-fighting activities in the space provided. However, protection of less than fully abled (mentally and physically) evacuees requires much higher levels of physical separation from hazards (such as smoke) than those providing radiant heat protection to structures.

PBP Aim 8 *Provide for the safe emergency procedures*

It is normal practice to prepare emergency response plans prior to occupation, and it is not appropriate to require their production at this stage. However, if an initial review illustrates that the basic elements of such plans are incapable of being implemented, then both the applicant and the consent authority risk being denied properly authoritative approval for occupancy and use. Without purporting to offer legal advice, it occurs to me that a defect

along those lines may have profound implications in the event of litigation following mishaps.

Trust Aim 1 *Review the level of safety of the site*

Mr Travers states (on the basis of some strongly disputed assumptions and opinions), that the proposed development can be made compliant. The applicant has to demonstrate how the proposal could achieve this result, using approved proven methodologies, but has failed to do so.

Trust Aim 2 *Review access and egress in an imminent emergency*

The Travers report concludes that if ongoing vegetation management (including by other landholders) occurred, access and egress could be made compliant. In fact even if the road into and out of the site were significantly upgraded, and the APZ substantially widened, the single emergency access and egress route would still not properly comply.

Isolated rural subdivisions (PBP P 16 p 4.1.1 [c]) involving travel distances exceeding 200m require a second access arrangement, and this site does not qualify for even that level of development. A proper review must conclude that this is a permanent fatal flaw in the proposal, disqualifying the site for SFPP development.

Trust Aim 3 *Can an aged care facility on this site comply with industry best practice?*

Clearly I do not agree with Mr Travers's opinion, which he simply stated as 'Yes'. The proposal, to the extent that it has actually addressed bushfire issues, contains a series of deficiencies, each of which says 'No'.

Trust Aim 4 *Should the lessee of the facility maintain the APZ?*

Mr Travers recommends that the Trust maintain the grounds. I have no comment on this commercial point, other than to query whether the Trust should engage in grounds maintenance (amounting to gardening over the whole SFPP site, all of which will be part of the APZ), for a commercial enterprise.

Trust Aim 5 *Review the Trust capability to provide effective land management to the level required by an aged care facility in the event of failure to do so by a lessee.*

Mr Travers has provided no evidence that the Trust has any expertise or staff in this respect. No past management regimes or evaluations of effectiveness have been provided.

The 9 **Recommendations** made by Mr Travers (P 32, p3.2) summarise some of the basic principles by which fire safety planning is undertaken, and promotes adoption of a draft Fire Management Plan. They also recommend preparation of fuel, landscaping, and emergency / evacuation plans, and construction of passive radiant heat barriers to his specifications.

None of these are objectionable; in fact all of those actions would be required to be adopted if his report were to be accepted. However, I regard his report as unacceptable in that it fails to adequately address the issues or to demonstrate the efficacy of the proposed solutions. Thus there can be no confidence that the outcome, even if achieved, would meet the required standard for proper protection of the lives of the residents, nor those of the carers and fire-fighters who would be called upon in the event of a bushfire emergency.

Recommendations

The proposal has not fully or adequately addressed a number of important issues which industry standard protection measures dictate. Of those which were addressed, many have significant technical grounds on which they fail to meet the recognised standards applied to such developments. I recommend rejection of the application.

References

Keith D. (2004) *Ocean Shores to Desert Dunes*. Department of Environment and Conservation, Sydney

Rural Fire Service NSW (2005) *Standards for Asset Protection Zones*

Rural Fire Service NSW (2006) *Planning for Bush Fire Protection*

Rural Fire Service NSW (2010) *Planning for Bush Fire Protection Addendum: Appendix 3*

Standards Australia (2009) AS 3959 *Construction of buildings in bushfire-prone areas*.

Annex 1 – cv

Curriculum vitae

Roger Fenwick

CURRICULUM VITAE

Name: **Roger FENWICK**

Born: 1946

Qualifications: B Sc (For), Australian National University, 1969.
Member, Institute of Foresters of Australia.
BPAD-Level 2 Accredited & Corporate Member,
Fire Protection Association of Australia.

Language: English

Positions Held:

1988-Present Consultant

1986-87 Chief Fire Control Officer, (CFCO) ACT Bush Fire Council

1985 Secretary, ACT Bush Fire Council

1982-1984 Experimental Officer, CSIRO, Project Aquarius

1979-1981 Field Service Representative for Chemonics Industries, USA

1976-1978 CFCO of the ACT Bush Fire Council

1972-1975 Deputy CFCO, including one year of acting CFCO, ACT Bush Fire Council

1971 Assistant Forester at Pierces Creek Forest, and assistant to the CFCO

1970 Assessment Section, ACT Forests, and assistant to the CFCO of the ACT Bush Fire Council

Fields of Special Competence:

Fire risk assessment and control measures to minimise fire risk, fire control and organisation and management of rural fire fighting services, fire forensic investigations, training in bush fire fighting, fire fighting equipment selection and maintenance, and chemical fire retardant use.

Work Experience

2013

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions, single residences and special developments, NSW. Engaged to provide expert evidence in connection with escaped fire damage in South Australia and Queensland. Prepared reports for litigation on bushfire damage. Advised on fire management planning for catchments managed by SE Queensland Water. Prepared reports for reconstruction post Blue Mts fires.

2012

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions, single residences and special developments, NSW. Completed a Fire Management Plan for a wind farm in Victoria. Prepared reports for litigation on 1407LOS.LAN.YAL1.0

bushfire damage. Prepared advice on a major rebuilding exercise for Dept of Defence, NSW. Advised on fire management planning for catchments managed by SE Queensland Water. Engaged to provide expert evidence in connection with escaped fire damage in each of Tasmania, South Australia and Western Australia.

2011

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions, single residences and special developments, NSW. Gave expert evidence in connection with litigation over the ACT 2003 bushfires. Engaged to provide expert evidence in connection with escaped fire damage in each of Victoria, Tasmania, Western Australia and the ACT.

2010

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions, single residences and special developments, NSW. Investigated and reported on fire safety and fire fighting aspects related to a proposed wind farm in Victoria, and gave expert evidence to a Panel of Enquiry. Gave expert evidence in connection with litigation over the ACT 2003 bushfires. Engaged to prepare a fire management plan for the (approved) wind farm.

2009

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW. Reported on School and Affordable Housing projects for the Nation-Building program.

2007-8

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

2006

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW & South Australia.

2005

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW and SA.

Assist with preparation of a Development Control Plan and Structured Growth Management Plan for Nambucca Shire Council, and a DCP for Penrith Council.

2004

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

Investigate and report on fire causation in connection with civil litigation in Tasmania

2003

Provide advice to ACT Government on protection measures appropriate to Black Mountain Reserve.

Provide advice to Monash City Council in Victoria on preparation of fire management plans for various Reserves, Victoria.

Assist with a study of fire station design for the CFA in Victoria.

Preparation of Maximum Probable Loss estimates for plantations in SA and WA for insurance purposes, and evaluate small-holding plantation insurance proposals.

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

Preparation of Fire Management Plans for the Department of Defence at 2 sites in NSW, and update fire season preparation recommendations for 5 sites in Victoria.

Engaged to investigate and report on fire causation and fire management practice in connection with civil litigation in both NSW and the ACT.

2002

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

Preparation of Fire Management Plans for the Department of Defence at 6 sites, Vic.

2001

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

2000

Preparation of Fire Management Plans for 2 military establishments, NSW.

Investigate and provide expert evidence in connection with litigation arising from injuries to a crew of fire-fighters, NSW.

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions and single residences, NSW.

1999

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions in NSW.

Engaged to investigate and report on fire causation and fire management practice in connection with civil litigation in NSW.

1998

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions, NSW.

Engaged to investigate and comment upon the practices relevant to the cause of a fire on agricultural land in NSW in connection with civil litigation.

1997

Preparation of fire safety guidelines and fire safety compliance reports to accompany applications for development of proposed subdivisions in NSW, and appearances in the Land and Environment Court of NSW.

Fire Management Consultant in FORTECH team preparing a report on plantation risk evaluation for a firm of agricultural insurance brokers.

1996

Investigate the cause and origin of an escaped fire resulting in loss of life, property and stock on a NSW estate.

Fire Management Consultant in FORTECH team developing a draft Fire Management Plan for the Murramarang National Park, for NSW National Parks and Wildlife Service.

Preparation of fire safety guidelines and a fire safety compliance report to accompany an application for development of a proposed sub-division, NSW.

1995

Carried out inspections and provided technical reports for presentation to the Land and Environment Court on fire safety compliance in contested development applications in southern coastal NSW.

Fire Consultant carrying out an assessment of the probable maximum loss for a major pine plantation estate in the Green Triangle of South Australia.

Inspections, technical advice and report preparation on fire safety guideline compliance for various development applications within NSW.

1994

Preparation of fire safety guidelines and a fire safety compliance report to accompany an application for development of proposed sub-divisions, NSW.

Expert witness in the matter of an escaped bushfire in the Bungendore area, NSW.

1993

Preparation of a detailed bush fire control training manual for the Department of Defence, specific to the needs of Puckapunyal Training Area, Victoria. This assignment follows on from earlier work in which a fire management plan was prepared.

Expert witness in the matter of two escaped bushfires in the Mudgee and south coast areas of NSW. The investigations required determination of the cause and origin of the fires.

Preparation of fire safety guidelines and a fire safety compliance report to accompany an application for development of proposed sub-divisions, NSW.

1992

Consultant to Shoalhaven City Council in southern NSW responsible for the interpretation and mapping of the "subdivision strategy for high bushfire risk areas" which was developed in a related project in 1991.

Fire Management Specialist on Puckapunyal Bushfire Management Plan study for Department of Defence. This major study involved 9 specialist consultants and produced an operational plan for fire management including hazard reduction and control strategies, training and equipment needs, emergency fire procedures and the role of bushfire decision support systems in augmenting current expert land management systems.

Expert witness responsible for provision of technical advice and investigation of the conduct of a roadside hazard reduction burn in NSW.

Preparation of fire safety guidelines and a fire safety compliance report to accompany an application for development of proposed sub-divisions, NSW.

Expert witness investigating origin and cause of grassfire in the Hunter Valley, NSW.

1991

Preparation of fire safety guidelines and a fire safety compliance report to accompany applications for development of proposed sub-divisions and single dwellings, NSW.

Consultant to the Shoalhaven City Council in Southern NSW responsible for the preparation of a "subdivision strategy for high bush fire risk areas" within the city of 4600 square kilometres. The task involved identifying a set of objective criteria by which subdivision applications could be assessed in respect of bush fire danger. The consultant worked with a committee involving Council and State Government Land and Fire Management Agency representatives.

1990

Preparation of fire safety guidelines and a fire safety compliance report to accompany applications for development of proposed sub-divisions and single dwellings, NSW.

Team Member in a study for the NSW Government Insurance Office to assist in the defence of a Supreme Court writ against a NSW Government land manager.

1989

Preparation of fire safety guidelines and a fire safety compliance report to accompany applications for development of proposed sub-divisions and single dwellings, NSW.

1985-87

Chief Fire Control Officer for ACT Bush Fire Council responsible for fire management planning and co-ordination of fire suppression activities in forest and grass fires in and around the ACT. In this and previous roles with Bush Fire Council attended or attended to (from Control Room) over 1000 fires in grass, heath, eucalypt forest and pine plantations. Responsible for training and co-ordination of volunteer fire fighters.

1984

Consultant in court case arising from 1980 Ash Wednesday fires in South Australia. Provided expert opinions as to probable course of events in respect of these fires.

1982-84

As experimental officer with CSIRO Project Aquarius was team member in several major fire investigations to determine fire behaviour including fire spread rates, intensity and origin. Investigated the major Mt Hickey fire in Victoria which was one of the first using new aerial suppression techniques.

1984

Consultant and expert witness for Tasmanian Crown Law Department investigating the probable cause and origin of a fire in the Deloraine area.

1981

USA For the East Bay Regional Parks District prepared a hazard reduction and fire management plan for the Lake Chabot Eucalyptus plantation near Berkeley, California.

1979-81

USA As field service representative for Chemonics Industries, USA advised on use of chemical fire retardants in a variety of fuel and fire types in west coast USA. Team member in US Forest Service Investigations involving fire forensic work to determine cause and origin of wild fires in various locations.

1972-78

As Deputy then Chief Fire Control Officer of ACT Bush Fire Council, responsible for fire management planning and co-ordination of fire suppression activities in and around the ACT. Lectured in fire behaviour, fire management and fire planning at graduate level at Australian National University and Canberra College of Advanced Education.

1970-71

In varying capacities assisted the Chief Fire Control Officer of the ACT.