Submission No.462

7 August '03

A Submission to the House of Representatives Select Committee Enquiry into the Recent Australian Bushfires

1 A Six Stage Bushfire Management Strategy

1.1 Much of the evidence presented to this public hearing in relation to the bushfires of January 2003 appears to have focused on conventional elements of ***preparedness***, ***tactical response*** and ***post-fire recovery*** as the primary elements in the bushfire management arsenal.

1.2 Natural resource management agencies have attracted a great deal of criticism over lack of preparation, particularly the poor state of repair of access trails and failure to use controlled burning to reduce the build-up of fuel loads in state forests, national parks and other public lands.

1.3 The tactical response of emergency services personnel during the fire has been generally regarded as grossly inadequate.

1.4 Much of the evidence relating to the mopping up and post event recovery phases seems to have been hijacked by disagreements over the value and danger of homeowners staying to defend their property.

1.5 The main purpose of Agrecon's submission is to encourage the Select Committee to recommend in favour of a more proactive approach to bushfire management that incorporates better ***avoidance***, ***prevention*** and ***adjustment*** measures. Agrecon contends that better access to biophysical, land use and risk related information will leave the community less vulnerable to future bushfires. The prevailing approach is too reactive and based on passive acceptance that more frequent and more damaging conflagrations are inevitable given the increasing population pressures and growing investment in land development.

1.6 Accordingly, Agrecon offers as a model for consideration the following Six Component Bushfire Management Strategy.

6 Component Bushfire Management Strategy

1. **Precautionary Monitoring & Forecasting**
   Vegetative vigour, biomass fuel load, moisture status, land use changes, climate variability
2. **Preparation Through Strategic Planning**
   Self-reliance, improving access, water supply security, controlled burning, adjusting land use management.
3. **Tactical Response - Fighting the Fire**
4. **Mopping Up & Post Event Recovery**
5. **Assessing Probability & Risk**
   Determining propensity, exposure, liability, timing, spacing, duration, severity, extent & impact. Risk related implications for land use and regional policy.
6. **Adjusting Land Use & Changing Management**

2 *Response & Recovery*

2.1 The predominant reaction of disaster and emergency services organizations to fire and other natural hazards is typified by the two "r"s approach - response and recovery.

2.2 Chain of command constraints and turf protection considerations by capital city based emergency services personnel have been blamed for the generally poor response to fire weather conditions as they unfolded. Delays, lack of coordination and failure to effectively deploy fire fighting resources have been blamed on a chronic breakdown in communications within the chain of command.

2.3 A fundamental disagreement seems to have emerged between strong advocates of ground based local expertise to facilitate early intervention and control rather than increasing dependence on modern, spectacular but high cost technologies, such as water bombing helicopters, after initial outbreaks have been allowed to build into a conflagration.

2.4 Submissions by scientific experts appear to have focused on detailed technical issues in relation to building materials, structures, design, infrastructure and planning considerations aimed at reducing or mitigating the damaging impact of fires post reconstruction.

2.5 Agrecon is struck by the stark contrast between finger pointing between stakeholders and the extraordinary upwelling of good will across the community and the eternal generosity of the Australian public during the mopping up and recovery phases.

3 *Preparedness and Prevention*

3.1 Agrecon's submission calls for a more broadbased response to bushfires and other natural hazards based on the two "p"s – preparedness and prevention. An ounce of prevention beats a tonne of cure.

3.2 Agrecon argues that an even longer term perspective is required if governments, communities, businesses and individuals are to effectively manage risks arising from European occupation of this harsh land.

3.3 It is axiomatic and should come as no surprise that this summer's bushfires came directly on the heels of what, some politicians wrongly claim, was the worst drought in 100 years - grassfires follow good seasons, conflagration bushfires follow droughts.

3.4 The growing water crisis, increased salinisation and concerns over climate change are all expressions of the same broad challenge – how to build sustainable and productive communities on a continent characterized by a variable, hostile and risky environment.

4 *Spatial and Temporal Information Technologies Facilitate Strategic Planning*

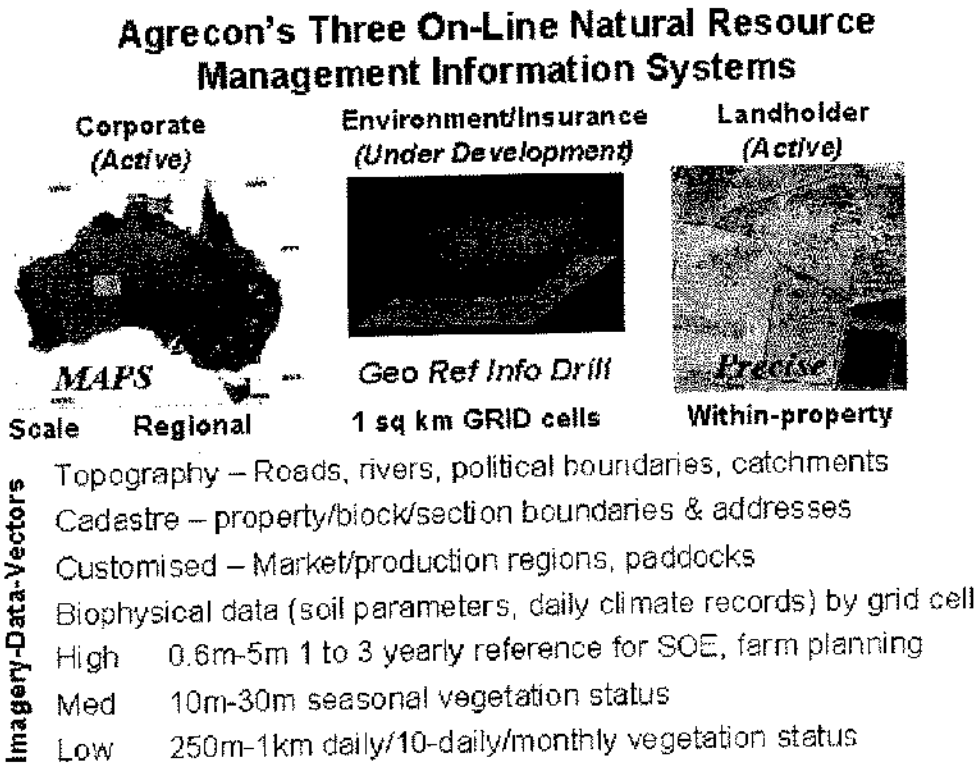
4.1 Agrecon is a strong advocate of timely and cost effective access to spatial and temporal data to improve the mapping, monitoring, forecasting and management of bushfire risk and other perils. Biophysical as well as socioeconomic data should be included.

4.2 This goes well beyond raising the awareness of emergency services personnel to the value of satellite imagery and other types of spatial information which was the stated objective of the GeoInsight project that was recently completed by the Technik Group in Canberra.

4.3 Coverage should be national in extent and incorporate a wide range of reference map and fundamental spatial and temporal data, including multi-temporal low, medium and high resolution satellite imagery, scanned topographic maps, digital terrain and soil data, vegetation and management data layers such as fire trails and water sources. Climatic histories and weather forecasts should also be incorporated at a hierarchy of spatial scales.

4.5 Such a bushfire information, forecasting and management system should incorporate querying and modeling functionality for monitoring and rating fuel loads and moisture status throughout each season. It should enable season specific fire risk for every individual land parcel to be assessed by considering its position in the landscape, seasonal weather conditions, fuel load and condition, fire scar history, adjacent land use, flammability and relative value of structures and materials contained therein.

4.6 The following graphic summarises three such natural resource management systems developed and web enabled for a national market comprising three groups of users.



4.7 Historic and ongoing data acquisition throughout each year is required to underpin such a long term monitoring system. The principal objective should be to assess the seasonal likelihood of fires and other perils and to facilitate preventative planning and preparation, well before the onset of any catastrophic event.

4.8 A spatial and temporal information systems approach to repetitive mapping, ongoing monitoring, forecasting and integrated management offers considerable advantages over a one off enquiry, the National Land and Water Audit, or even the Natural Heritage Trust that disperses funding to a myriad of unlinked investigations and remedial projects.

5 Simulating Event Based Spatial and Temporal Behaviour to Formulate Appropriate Tactical Response Strategies

5.1 Empirical tools such as McArthur's fire wheel are among the traditional techniques for estimating the rate of spread of an individual fire. These have been derived from ground investigations undertaken under a limited range of conditions, are out of date and frequently found to be dangerously inaccurate at critical times.

5.2 Modern techniques of generating digital terrain models, mapping soil properties, spatially interpolating climate data and acquiring multi-temporal imagery enable natural resource managers to discriminate between vegetation types, monitor fuel loads, measure biomass,

5.3 By combining these reference datasets with near real-time fire locations detected from remote sensing instruments (satellites and airborne scanners) and weather forecast grids, the likely location of fire fronts over the coming hours and days can be mapped and modelled in four dimensions. These locations can be overlaid on maps of property, infrastructure, rare ecological enclaves and socio-economic community status to better assess the potential impact of multiple fires.

5.4 Real-time simulations provide a basis for checking likely fire behaviour and developing operational fire control plans.

5.5 Modern spatial and temporal information technologies can be readily web enabled to facilitate regional down to local scale monitoring and operational management by a wide range of users within the community.

5.6 We understands that emergency services personnel do not currently enjoy access to sufficient broadband width to facilitate data downlinking on a real time basis during a bushfire. During the January 2003 fires Agrecon was asked by Telstra to scope the telecommunications requirements that would enable airborne thermal imagery flown on behalf of the NSW Rural Fire Service to be downlinked directly to Agrecon on a real time basis for immediate on-ground processing and web enabling to field crews. Current restrictions on bandwidth mean that the plane must land at the nearest airstrip. Digital imagery is then cut to CD-ROM and transported by road to Rose Hill in Sydney where it is processed by itinerant GIS personnel who have no facilities to provide any resulting products to field crews.

5.7 Modern spatial and temporal information and telecommunications technologies offer the prospect of better bushfire management and more informed public policy making in relation to all forms of acute and chronic perils as well as an overall improvement in the status of natural resource management of Australia.

6 Multi-Peril Risk Rating and Risk Management

6.1 A fundamental problem in assessing and responding to the threat of bushfires and other perils is that the community in general, and the insurance industry in particular, fail to appreciate the basic spatial and temporal ingredients of risk and how these should factor into long term avoidance or relief strategies.

6.2 Susceptibility and exposure to multi-peril risk is determined by two sets of fundamental spatial and temporal ingredients.

6.3 Firstly, the location and spatial distribution of individuals, enterprises and communities seeking protection, relief or insurance against a particular peril or hazard must be known.

6.4 Secondly, the probability of being adversely affected by a particular natural hazard must also be assessed. This is readily expressed in a spatial and temporal context through reference to the magnitude, extent, timing, duration and temporal spacing of each type of peril.

6.5 Several Australian insurance companies have given expression to these ingredients by moving towards a land parcel based risk rating system. Agrecon recently completed a comprehensive program that used high resolution satellite imagery to map the bushland/urban interface across the greater Sydney region, from Newcastle to Wollongong and up to the Blue Mountains. The exposure of each residential land parcel to bushfires was rated to reflect its proximity to this interface and the type of vegetation community involved.

6.6 This is a radical move away from the conventional rudimentary approach to risk assessment and exposure rating in relation to acute perils in Australia and setting risk related premiums. Until now, insurable risk has generally been estimated from the average magnitude of previous

claims within local government, postcode or other administratively convenient regional unit whose boundaries bear no relationship to the physical circumstances giving rise to the risk.

6.7 The conventional approach fails to reflect peril related losses incurred by owners of uninsured property. Nor does it incorporate risk related details of policies issued by competing insurance companies or provide insights into peril related risks of new residential, commercial or land based commodity enterprises that are increasingly encroaching onto marginal lands where there is no previous claims history.

6.8 The development of an integrated information system that incorporates spatial and temporal biophysical and terrain related data sets provides an ideal platform for assessing, rating and managing risk of bushfirse as well as drought, flood, frost, hail, wind, earthquake and landslide across Australia. Using a multi-parameter scoring system, susceptibility ratings could readily be generated for each peril within individual grid cells on a national basis.

6.9 If claims histories were geolinked to satellite imagery and fundamental biophysical data, computer based spatial and temporal pattern matching would enable the occurrence, incidence, spatial extent, magnitude and duration of each class of peril be to be readily catalogued and a refined risk rating derived for any major peril at any location across Australia.

6.10 If these biophysical risk ratings were overlaid with commodity production histories, cadastral, property valuation and socio-economic information derived from census data, these risk ratings could be further refined according to economic, social or environmental impact for any region, property, square kilometer or legal parcel of land.

6.11 Maintaining the currency of claims would facilitate dynamic adjustment of risk ratings on an ongoing basis while climate data, satellite imagery and weather forecasts facilitate ongoing monitoring.

6.12 The resulting seamless coverage of localised natural hazard risk ratings across the country at a much higher spatial resolution and accuracy than is currently available would significantly enhance the capacity of governments to formulate more appropriate multi-peril risk related policies and facilitate the deployment of better avoidance, management, post event response and recovery strategies across the community.

6.13 Agrecon contends that the spatial and temporal information systems approach to multi-peril risk rating and risk management advocated in this submission would ultimately facilitate the development and deployment of a national multi-peril insurance scheme, something that has been the subject of ongoing debate and periodic review for decades.

7 Developing an Operational Procedure to Formulate a Bushfire Management Strategy – Homes amongst the gumtrees: Pine Rivers Shire Study as an Example

7.1 In November 2002, Queensland's Pine Rivers Shire Council (PRSC) engaged LANDMARC Ltd, with Agrecon as sub-contractor, to undertake a bushfire management study. Their brief called for:

- the bushfire hazards to be identified and quantified;
- community vulnerability to be assessed;
- the risks to be analysed; and
- risk response options to be developed.

7.2 The bushfire hazard mapping process was based on the methodology currently employed by the Queensland Fire and Rescue Service (QFRS) which allocates weights to the vegetation type

Instead of using a 100 m cell as is the custom of QFRS, a high resolution 25 m square grid cell was used with a recent Landsat image providing a framework for vegetation mapping. Agrecon undertook the imagery analysis and GIS modelling.

7.3 Mapping of vegetation communities within the forested areas was underpinned by field work and two sets of medium scale vegetation mapping produced by State Government agencies in the 1980s and 90s.

7.4 Agrecon contributed and used a 25 m resolution digital elevation model (DEM) to generate slope and aspect maps.

7.5 The weights for vegetation, slope and aspect for each 25 m cell were summed to produce generic bushfire hazard potential values that were, in turn, grouped into zones of high, medium, low and no potential hazard.

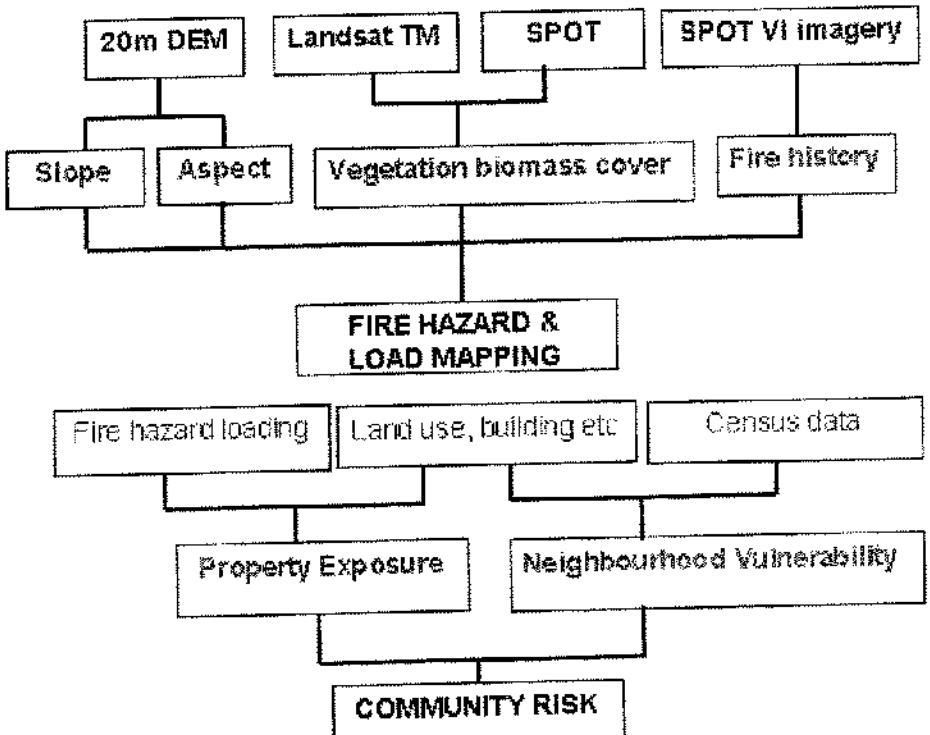
7.6 Eight measures were used to account for physical vulnerability, mobility vulnerability, socio-economic vulnerability and awareness vulnerability across the community. Where they were available, data from the 2001 census were used, otherwise, values from the 1996 census were used. Analysis was undertaken at the census collectors district level and aggregated into the 42 defined localities within the Shire.

7.7 Community exposure to the bushfire hazard was assessed by integrating data on the 45,300 developed properties in the Shire with the hazard potential mapping.

7.8 The availability of water resources (hydrants, dams and swimming pools) for fire fighting was used to 'discount' exposure ratings to reflect the level of protection available.

7.9 Community risk was then measured by combining the exposure data and the vulnerability data to produce a risk index at the locality level. This index was used to create 11 groups of localities, classified on the basis of their generic risk, so that mitigation strategies could be effectively designed and prioritised.

7.10 The following graphic summarises the ingredients of the fire risk rating procedure that was developed for Pine Rivers Shire Council.



7.11 A total of 55 mitigation strategies were identified to reduce either the bushfire hazard, exposure to the hazard or vulnerability to the hazard.

7.12 The experience gained in this study, and from subsequent interaction with fire fighters and risk managers elsewhere, indicated a need to add a more dynamic element to the bushfire hazard potential and community risk ratings. Agrecon formulated an approach that incorporates regular monitoring of synoptic conditions, supplemented by spatial interpolation of daily climatic data, though not at the level of detail that characterises the DEM.

7.13 Repetitive acquisition of low resolution satellite imagery is used to generate fuel loading, curing and moisture status estimates within discrete vegetation communities at a generalised local rather than site scale. These estimates are re-generated on a rolling 10 day cycle to test the hypothesis that such a lead time between early warning and subsequent incidence of potentially hazardous bushfire conditions is necessary to facilitate meaningful forms of intervention.

7.14 Spectral trajectories for different vegetation communities, derived from multi-temporal satellite image composites covering a range of different seasonal conditions, are used to diagnose prospective conditions by comparing current conditions with previous seasons of high fire incidence, especially in and around areas that have been burned during previous events.

7.15 Agrecon and LANDMARC are pursuing the challenge of developing this functionality and web enabling the resulting system for operational fire risk management by local government authorities elsewhere in Australia.

7.16 Agrecon and LANDMARC continue to service individual local government entities, having regard to state based differences in compliance and reporting requirements. However, the benefits of a nationally consistent approach and standardised information system are obvious.

7.17 A Powerpoint presentation extensively illustrated with embedded graphics was developed by Agrecon to accompany this submission. A copy of this presentation on CD-ROM can be provided on request.