



**Resilient Organisations
Research Report 2010/04**

**Disaster Waste Management
Case Study:
2009 Victorian Bushfires, Australia**

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About the Resilient Organisations Research Programme

“Building more resilient organisations, able to survive and thrive in a world of uncertainty, through research and practice”

We live in an increasingly complex world dealing with a broad spectrum of crises arising from both natural and man-made causes. Resilient organisations are those that are able to survive and thrive in this world of uncertainty. Resilience integrates the concepts of Risk, Crisis Management, Business Continuity Planning and Organisational Leadership to provide a platform for developing more robust and agile organisations.

Who we are:

The Resilient Organisations Research Group (ResOrgs) is a multi-disciplinary team of 17 researchers and practitioners that is New Zealand based and with global reach. A collaboration between top New Zealand research Universities and key industry players, including the University of Canterbury and the University of Auckland, ResOrgs is funded by the NZ Foundation for Research, Science and Technology and supported by a diverse group of industry partners and advisors. The research group represents a synthesis of engineering disciplines and business leadership aimed at transforming NZ organisations into those that both survive major events and thrive in the aftermath.

We are committed to making New Zealand organisations more resilient in the face of major hazards in the natural, built and economic environments. Resilient organisations are able to rebound from disaster and find opportunity in times of distress. They are better employers, contribute to community resilience and foster a culture of self reliance and effective collaboration.

What we do:

The ResOrgs programme of public good research is aimed at effective capability building through research activities with significant impacts on policy and practice. The group, in existence since 2004, has hosted an international conference, industry and sector workshops, produced over 30 conference and journal articles and 5 industry reports. These research outputs are already influencing government policy and industry practice. Our growing reputation has already resulted in many collaborations in Australia, the US, Canada and the UK, with a number of requests for the group to participate in a wide range of international projects.

Activities and outputs of the group include informing and focusing debate in areas such as Civil Defence Emergency Management, post-disaster recovery, and the resilience of critical infrastructure sectors, in addition to core activities in relation to organisation resilience capability building and benchmarking. We have produced practical frameworks and guides and helped organisations to develop and implement practical resilience strategies suitable to their environment.

Why we do it:

In an increasingly volatile and uncertain world, one of the greatest assets an organisation can have is the agility to survive unexpected crisis and to find opportunity to thrive in the face of potentially terminal events. We believe such resilience makes the most of the human capital that characterises the modern organisation and offers one of the greatest prospects for differentiating the successful organisation on the world stage. This resilience is typified by 20/20 situation awareness, effective vulnerability management, agile adaptive capacity and world class organisational culture and leadership. More resilient organisations lead to more resilient communities and provide the honed human capital to address some of our most intractable societal challenges.

For more information see our website: www.resorgs.org.nz

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Executive Summary

The 2009 Black Saturday Bushfires in Victoria, Australia killed 173 people and affected 430,000 hectares of land. Before communities could begin to rebuild the tonnes of burnt and potentially hazardous debris had to be removed. This report reviews the overall waste management process following the bushfires. In particular the report focuses on the State and Commonwealth sponsored demolition and debris removal contract. Data for the analysis is based on a literature review and interviews with professionals and community members involved with or affected by the bushfire waste.

Overall the demolition and debris removal response to the Bushfires was successful. The government sponsored clean-up was hailed as the best post-bushfire government initiative. Aspects of the clean-up programme such as the opportunity to salvage personal items before demolition were highly successful.

Although there had been little prior planning for how to deal with disaster waste on this scale, there was a collective response to move with urgency towards a common goal: to remove public health hazards and to get communities into the rebuilding process as quickly as possible.

To meet this goal, five key decisions were made:

- Establishment of VBRRRA.
- Single waste classification for waste handling procedures.
- Decision for government to fund the demolition and debris removal on private property.
- Letting a single contract for the above works.
- Construction of a new landfill cell.

For each decision, decision makers needed to balance the environmental, economic and social drivers to meet the above goal. For example a decision was made to stream-line standard peace-time processes such as asbestos handling and disposal in order to remove the hazard quickly and facilitate the rebuild. With limited time to assess possible impacts and outcomes for decisions there was inevitably an elevated risk due to uncertainty associated with the decision-making.

The legal frameworks used to meet the debris and demolition requirements were simple and effective. The organisational structures in this event were unplanned for but collaborative and efficient. The major deficiency identified was the lack of 'peace-time' solid waste managers involved in the decision-making process on the waste management strategy.

The reactive response to the Bushfire clean-up was largely successful, however, the response would have benefited from greater prior planning. Planning is necessary to give decision-makers the tools and information necessary to make good decisions after any given event. Flexible organisational, legal and financial frameworks and suitable impact assessment techniques are essential. For example pre-determining the extent of public financial assistance to the public, relative to disaster impact, and providing prosecution protection for decision-makers, would help to reduce pressure on decision-makers at the time of the disaster. With these in place, decisions can be made more efficiently and in a well coordinated and consultative manner. Many of the delays in the Bushfire response could have been avoided if pre-event planning, focussed around anticipated decision points, had been carried out. Communication at all levels is the key component of this entire process.

It is hoped that those involved in waste management and other disaster responses take the lessons learned here and develop effective plans and strategies for responses in the future.

1 Introduction

1.1 Black Saturday

The 7 February 2009 “Black Saturday” bushfires in Victoria, Australia were the most devastating bushfires in Australian history (VBRRA, 2009a). The fires were fuelled by severe drought conditions, record temperatures and high winds. 173 people were killed in 78 communities and over 430,000 hectares of land and 2000 properties were destroyed (VBRRA, 2009a). The properties affected included public and private; rural lifestyle; semi-urban; commercial; farm; timber mills and forests; tourist complexes; and service towns. Some critical infrastructure (roads, power, fuel supply and telecommunications) suffered damage also. Figure 1.1 shows the extent of the bushfires in Victoria which continued until 23 February 2009.

Due to the intense heat of the fires (up to 1200°C) (Victorian Bushfires Royal Commission, 2009) many of the affected buildings were reduced to a pile of twisted metal, masonry rubble and ash.

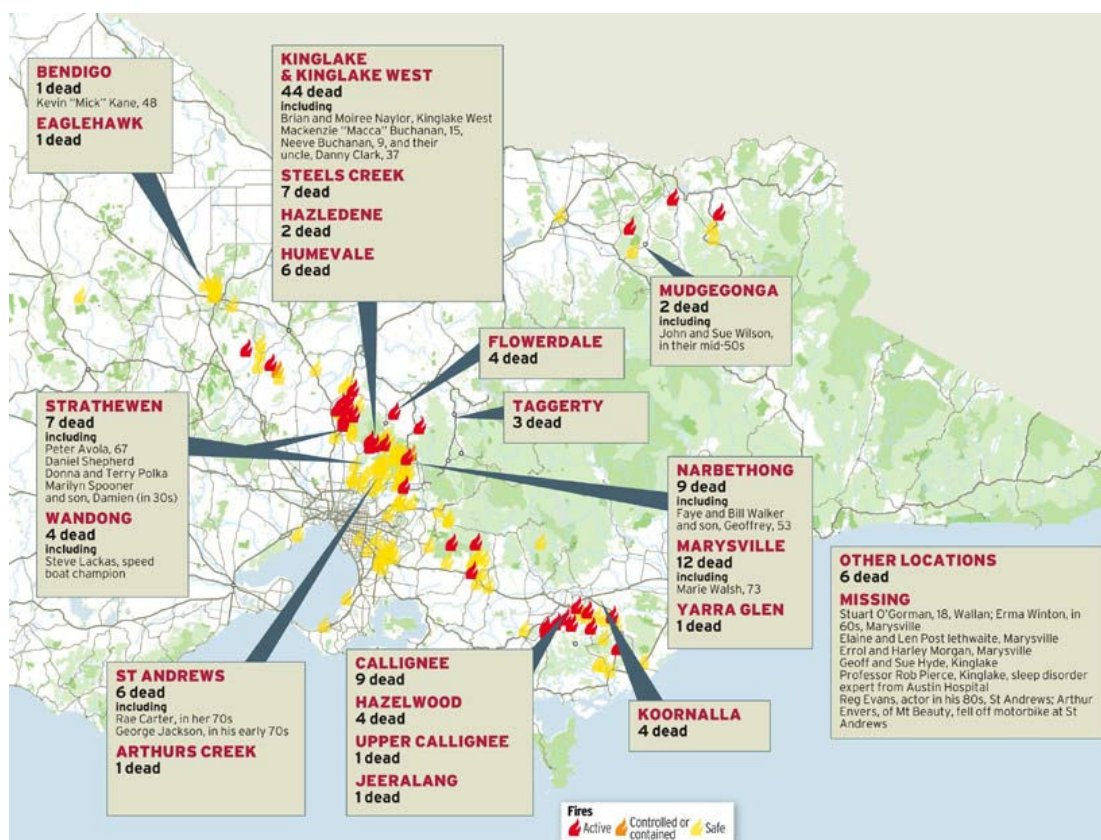


Figure 1.1 Location of fires during the 2009 fire season (SMH, 2009)

1.2 Report Scope

This report introduces the issue of disaster waste management and outlines the methodology used during the case study data gathering and analysis. A brief overview of the 2009 Victorian Bushfires is provided and includes the response and the initial stages of the recovery. The report then describes in more detail the disaster waste recovery process –

including demolition works, collection and disposal. The final section of the report is an analysis of the strengths and weaknesses of the key waste management decisions. It should be noted that the focus of the report is on the recovery phase, therefore waste management during the emergency response phase is commented on but not analysed in any detail.

The report forms a case study of a modern disaster waste management system. It will be used, by the authors, as part of a wider study on disaster waste management systems and will in time be compared with other case studies to try and develop a strategic and integrated approach to planning for and responding to disaster waste.

2 Disaster Waste Management Background

Depending on their type and severity, and the nature of the built environment, disasters can create large volumes of inert and hazardous debris. Recent natural disasters such as the 2010 Haiti earthquake (Booth, 2010, Johnson and Correa, 2010, Kahn, 2010), Hurricane Katrina 2005 (Luther, 2008, USEPA, 2008, Brown and Milke, 2009), and the 2004 Indian Ocean tsunami (Basnayake et al., 2005, Petersen, 2006) have all generated volumes of waste which overwhelmed existing solid waste capacities and required extraordinary management approaches.

Disaster debris can impede rescuers and emergency services reaching survivors; inhibit provision of lifeline support; pose a public and environmental health hazard; and hinder the social and economic recovery of the affected area. Poor management of a clean-up effort can result in a slow and costly recovery which is potentially risky to public and environmental health in both the short and long term.

The first and most comprehensive national guidance on disaster debris management was the USEPA's "Planning for Disaster Debris" (USEPA, 1995) which was updated in 2008 (USEPA, 2008). Most US local government authorities now have plans due to recovery cost incentives provided by the Federal Emergency Management Agency (USEPA, 2008). Outside the US, understanding of the need to plan for debris management is growing (Johnston et al., 2009, JEU, 2010).

Due to the destructive nature of fires, they typically leave less debris than other disasters (USEPA, 1995). There are few documented accounts of waste management following fire events, those reported include the 1991 Oakland firestorm (State of California, 1997), 1993 Malibu, California, coastal fires (USEPA, 1995), 2000 Cerro Grande wildfires (USEPA, 2008) and 2003 Cedar and Pines Fires, San Diego (County of San Diego, 2005). A range of waste management options were employed across these disaster responses (largely due to varied environmental and public health hazard assessments), including private property clearance by property owner; local government facilitated cleanups; a combination of insurance, federal and local government funding; and mixed efforts to recycle.

Establishing a solid waste management system in 'peace' time is a complex challenge – balancing stakeholder desires, community needs, environmental factors and political will. Adding a disaster to the challenge adds another level of complexity by introducing extremely large volumes of debris, time pressures and a shocked community.

3 Methodology

3.1 Literature Review

This case study is developed from both pre-disaster contextual information and post-disaster reporting. Documents cited for contextual information include websites, laws and statutes, design guidelines, reports – all mainly government produced. Post disaster literature, specific to the 2009 Victorian Bushfires, has been limited. Again the main information sources included government status reports, websites, and public information brochures. Some newspaper articles have also been cited. At the time of writing there was limited relevant research material published on the Victorian Bushfires.

3.2 Field Data

Two data gathering trips to the Victorian Bushfire region were carried out. The first, in August 2009, was approximately 6 months after the disaster event. The main aim of this trip was to talk to professionals involved in the debris removal and waste management work to gain an understanding of the processes involved. The second, in March 2010 was approximately 13 months after the disaster. The aim of this trip was to talk to community members about how they viewed the bushfire clean-up process and how it had affected their overall recovery.

3.2.1 Professional Interviews

In total, eight professionals involved in the waste management process (including contractors, private waste firms, council waste managers, government regulators and disaster managers) were interviewed using a semi-structured interview approach. The interviews were approximately one hour long and included questions relating to the following main areas:

- Disaster waste nature / composition etc
- Initial assessments of disaster waste
- Existing waste management system
- Organisational structure of the disaster waste management response
- Property owners responsibility / involvement in clean-up (if any)
- Demolition process
- Disaster waste collection system used
- Disaster waste recycling
- Disaster waste disposal
- Timeline and priorities of waste management activities
- Reconstruction
- Costs
- Economic impact of disaster waste presence
- Legal structures around disaster waste management

The interviews were recorded and a transcript was made available to interview participants to review and amend if necessary. All interviewees agreed to be named in connection with information provided.

3.2.2 *Community Interviews*

Community interviews were also semi-structured interviews (based on the questionnaire described in Section 3.2.3) lasting approximately 1 hour. In total 14 interviews were carried out.

Interview participants were identified through community support groups. While this potentially introduced a level of bias or demographic skew, this was an important step to reduce the potential for traumatised persons to be interviewed. It was felt that the demographic questions included in the interviews may be able to determine if there were any groups excluded and the results could be presented with this limitation in mind. However, it was felt that due to the sensitive nature of disaster research, this sort of potential bias, particularly in a small sample, is unavoidable

Community interviews were primarily with affected residents from Marysville, Taggerty and Kinglake.

3.2.3 *Community Questionnaire*

To try and cover a larger bushfire area, and to endeavour to gain a broader cross section of affected population, anonymous, confidential questionnaires were also used. Six questionnaires were distributed by the lead researcher at the time of the reconnaissance to individuals identified by the community but who did not want to carry out an interview. Questionnaires were also left at two of the temporary accommodation villages (for those displaced by the Bushfires), however, no questionnaires were completed.

The questionnaire used a mixture of Likert scale responses and open-ended questions. The questionnaire covered the following broad areas:

- Respondent demographics (including personal and property details)
- Property damage
- Time line of clean-up activities
- Financial and in-kind assistance received
- Insurance
- Individual clean-up carried out
- Loss of income
- Preparation and planning
- Environment
- Public health and safety

Due to the low number of responses – no statistical conclusions could be drawn from the information. However, rich, qualitative data from the six responses has been analysed alongside the interview data.

4 The Overall Bushfire Response

4.1 Emergency Response

Emergency Management in Victoria is guided by the Emergency Management Act (1986). The State has a State Emergency Response Plan which was enacted at the time of the fires and municipal councils have their own Municipal Emergency Response Plans to guide emergency responses at Shire level. The County Fire Authority, State Emergency Service and Department of Sustainability and the Environment all also had major roles in the Bushfire response. The major activities in the emergency response were fire fighting, evacuation, community welfare centres and restoration of damaged critical infrastructure.

Interim findings from the Victorian Bushfires Royal Commission inquiry (2009) have revealed a number of serious deficiencies in the emergency response during the Black Saturday fires which will need to be reviewed. Public information and warning systems, in particular, were deemed inadequate. Delayed warnings and overloaded information forums (phone and internet) meant communities did not have accurate information on the location and severity of the fires. The 'stay or go' policy has also received criticism that the degree of risk in staying and defending are not fully understood by the public.

Due to the destructive nature of bushfires, debris had very limited, if any impact on emergency service provision. The largest risk to emergency workers in the bushfires was some dangerous structures and trees and the potential for exposure to airborne and aqueous and hazardous substances.

4.2 Recovery

Victoria has a State Emergency Recovery Plan (SERP) (Emergency Management in Victoria, 2005) which outlines roles and responsibilities in emergency recovery. Generally recovery is delegated to community level with state level support. However, on 10 February 2009 the Commonwealth and Victorian Governments, due to the scale of the disaster, elected to establish the Victorian Bushfire Recovery and Reconstruction Authority (VBRRA). The role of VBRRA was to guide the recovery and rebuild process, including management and distribution of funds. In addition to VBRRA, community recovery committees (CRC) were set up in each affected community (partly elected and partly Council appointed) to plan and direct recovery planning in their community. CRC's are entities which are identified in the SERP.

The overarching aim of VBRRA is "to help regions, towns and individuals to rebuild and recover in a way that is safe, timely, efficient, cost effective and respectful of those different needs". To achieve this VBRRA work with government departments, councils, businesses, CRCs etc to develop and implement local rebuilding plans (VBRRA, accessed 2010).

Temporary accommodation was one of the most pressing tasks for recovery authorities. From one month after Black Saturday temporary villages were set up in the hardest hit areas such as Kinglake, Marysville and Flowerdale to house displaced persons. The Kinglake temporary village is shown in Figure 4.1. Other accommodation options included rental accommodation, caravan or shed accommodation on affected properties (VBRRA, 2009b).

Aside from accommodation provision, the first tangible task that VBRRA undertook was the demolition and debris removal of all buildings destroyed by the bushfires. This project was implemented by an Australia construction company called Grocon and is discussed in further detail in Section 5.2. The clean-up works were completed in 6 months.



Figure 4.1 Temporary housing complex in Kinglake

4.3 Rebuilding

Despite state and commonwealth governments (through VBRRA) offering varying financial and in-kind support and the stream-lining of planning and building permitting processes (Victorian Government, 2009), by March 2010, very little reconstruction had commenced in the hardest hit areas of Kinglake and Marysville.

Community members and authorities we spoke to cited the following reasons for the slow progress of reconstruction / readiness of residents to commit to rebuilding, including:

- A yet-to-be released Royal Commission report on the cause of the bushfires and an investigation into planning for and mitigating future fires. The final report is due in July 2010.
- Under or no insurance and lengthy processes for state government compensation.
- New building regulations (released on 11 March 2009) in fire risk have raised building prices (in most cases above insured house value)
- Uncertainty around the commercial future of businesses in some areas (Marysville in particular)
- A number of non-returnees (due to trauma and slow provision of temporary or permanent housing).

5 Disaster Waste Management

5.1 Waste Streams

5.1.1 Initial assessment

An initial environmental assessment of the waste matrix was carried out by the Victorian Environmental Protection Agency (EPA) (covering environmental aspects) and the State Department of Human Services (health and safety) on request from the State Government.

Debris was generated from a range of private (residential, farm etc), public (toilet blocks, schools, water tanks, reserves, bridges etc) and commercial (motels, shops etc) properties.

The waste matrix included:

- Mixed ash
- Concrete rubble and bricks
- Partially burnt dimensional timber and fence posts (treated)
- Metal
- Vegetation and trees
- Household hazardous wastes
- Vehicles
- Corpses (human corpses removed by Coroner)

5.1.2 Hazardous substances

The main hazardous wastes identified in the debris were asbestos, chromated copper arsenate (CCA) (largely in fencing) and household hazardous wastes such as oil, fridges, electrical and electronic appliances, fuel, explosives, refrigerant, poisons and pesticides. However, due to the intense heat of the fires, the EPA believed that many of the hazardous substances present were likely to have been volatilised (or in the case of asbestos, reconstituted into a non-friable form). Residues may have been present in the ash.

For simplicity and expedience in the clean-up, all waste was considered to be contaminated to some degree (refer Section 5.1.4). No laboratory testing was carried out on the waste. Some air monitoring was carried out

The State and Commonwealth government recognised the hazardous waste materials (in particular asbestos with its significant public health risk) as a hazard within 3 days of Black Saturday and called for a stop to property clearance until appropriate procedures could be put in place. Prior to this decision some local authorities had offered advice to residents on handling of hazardous waste such as asbestos.

5.1.3 Additional waste streams

Some additional waste streams were generated during the emergency response and had to be included in the waste management process:

- Excess in-kind donations (such as clothing, bedding, household goods etc) - up to 15-20 tonnes per week at the peak reducing to 1-2 tonne per week 6 months after the event.
- Increased volumes of household recyclables (individual food packages, water bottles etc) from emergency relief centres and temporary villages.

5.1.4 Waste Classification

In line with the initial assessment a decision was made, by EPA and DHS, to give the waste a single classification, called “Bushfire Waste”. Using Section 30A of the Victorian Environmental Protection Act, 1970, the EPA was able to develop handling, transportation and disposal methods specific to the bushfire waste to expedite recovery and minimise hazards to persons and environment. The Bushfire waste was broadly categorised as Construction & Demolition waste plus other contaminants. Section 30A was activated one month after Black Saturday.

In addition, a Dangerous Goods Order (Victorian Government Gazette, 2009) was issued on 16 February 2009 under Section 55 of the Dangerous Goods Act, 1985, to set out protection methods for minimising asbestos exposure. The Order stated this action was necessary to be “expedient for the public safety”. The Section 30A and Section 55 both advised that all waste be handled and disposed of as Class B (see below) asbestos waste.

In accordance with the Occupational Health and Safety Regulations, Class B asbestos is classified as non-friable asbestos-containing material. Specialised personal protective equipment (PPE) and a Class B asbestos removal licence is required to handle any material with this classification (Victorian Government, 2007).

Section 30A and Section 55 legal provisions are included in Appendix B.

5.2 State and Commonwealth demolition and debris removal programme

5.2.1 Funding

On the 27th of February 2009, the Commonwealth and Victorian Government announced that it would jointly pay and facilitate the demolition and debris disposal of buildings destroyed by the bushfires as debris removal was considered a vital task in facilitating the recovery process. The time goal for demolition and debris removal completion was six months.

“Ms [Jenny] Macklin [Federal Minister for Families, Housing, Community Services and Indigenous Affairs] said clearing debris left in the wake of Victoria’s bushfires was the essential first step in rebuilding communities. ‘We will remove potential hazardous material, such as asbestos, and then clear properties for free, so communities can start to get back on their feet,’ she said. ‘When you see the scale ...[of] the devastation and people sifting through what was their homes, it is clear the pressing priority, both at an emotional and safety level, [is] to start clearing away the debris. We want to help people get started as quickly as we can, and we want to give them the

practical assistance they need to make sure the clean up is done in a safe and sensitive way.’ “

(The Premier of Victoria, 2009)

Clean-up tasks would ordinarily rest with municipalities and private property owners. The State Emergency Recovery Plan (Emergency Management in Victoria, 2005) states that municipalities are responsible for clean-up activities. Generally this would be limited to public property clearance and potentially some additional kerbside collection services for affected properties. Costs incurred by municipalities during the process would be claimable through various established disaster funding mechanisms (see Section 5.3.2). Private property owners are responsible for clearing their own properties by private funds or through insurance.

There is a mechanism for states to gain national funding assistance for state wide natural disaster responses: The Natural Disaster Relief and Recovery Arrangements (NDRRA). Private property clearance as well as public property debris removal works can be claimed back by states through NDRRA (Australian Government, 2007).

Several additional grants were made available specifically following the Bushfires. These included: an alternative funding grant for primary producers (Rural Finance, 2009) to assist with clean-up activities and business restoration; and for residential land owners (Victorian Bushfire Appeal Fund, 2010) for dangerous tree removal.

5.2.2 Contract and scope

The State government elected to let a single “managing contract” to coordinate the demolition and debris removal process for all buildings destroyed in the bushfires. Approximately 2 weeks after Black Saturday the government called for capability statements from the building sector. Contractors had 24 hours to prepare a tender with unit rates and an estimated budget. Within a week (3 weeks after the event) Grocon was announced as the Managing Contractor for the clean-up works. It was felt that a construction company, such as Grocon, would have the systems and networks in place to mobilise quickly and carry out the works effectively. Grocon elected to submit a ‘not for profit’ cost-reimbursement tender based on their staff hourly rates. Grocon were to be reimbursed for approved subcontracts. A small percentage for overheads was also included. A Contract Administrator was appointed under the umbrella of VBRRA.

The scope of the Grocon contract was for demolition and debris removal from any private or public building – house, factory, shed, etc – destroyed by the fires. This was limited to the footprint of the building and did not extend to fencing or trees.

The author is aware of at least one formal proposal to government from the community to manage the clean-up themselves. The proposal used a local labour approach and included for all materials to be disposed and recycled within the area.

5.2.3 Personnel

To staff the project Grocon sourced 48 people internally (most of who volunteered to be involved) and then recruited an additional 24 people to make a 72 person team. No staff in the Grocon team had previous experience in waste management.

Grocon divided their staff into 7 project teams to cover 10 regions. In each project team Grocon established a temporary office (at location agreed with the local Council) and the following personnel:

- project manager
- community liaison officer (often local to area)
- occupational health and safety officer
- site manager
- site supervisor
- contracts administrator

Counsellors were also employed to emotionally help staff working in the affected area and there were regular debriefing sessions.

The remainder of the personnel and equipment requirements (demolition, truck drivers, trucks, asbestos removal contractors, environmental hygienists, landfills etc) were subcontracted. Approximately 70% of subcontracts (and 50% of the labour) were sourced from the local community to minimise resentment of the local community toward outside contractors and to maximise employment and economic benefits to the affected communities. Many local contractors did not have appropriate health and safety / asbestos management accreditation so free training courses for this were provided. However, some communities felt that the efforts to include local labour were either not sufficient or the training requirements and long work hours required were prohibitive.

5.2.4 The clean-up process

All property owners who wanted their buildings demolished and disposed of had to register through VBRRRA via phone or internet. Property owners that had cleared their properties before the announcement that demolition works would be paid for by government, were eligible to apply for reimbursement. Management of the register was officially carried out by VBRRRA, with much of the day to day management of the register being carried out by Grocon for expedience. Only a handful of affected properties elected not to register for the clean-up service.

In total, over 3000 properties were registered. The majority were residential properties but there were also some commercial properties, schools, churches, police stations etc.

Once registered, there were four key steps involved in site clearance as identified and publicised by the Premier's Office of Victoria:

1. The Coroner with Victoria Police approve access to the site;
2. Site assessment for risk, and removal of risks such as burnt gas bottles, dangerous trees, unstable chimneys;
3. Site owners given an opportunity for a final recovery of any possessions at the site; and
4. Site cleared by licensed contractors.

(The Premier of Victoria, 2009)

While these key steps remained the essence of the demolition and debris removal process, a series of more detailed steps were developed by the Contractor. These steps are shown as a flow diagram in Figure 5.1 and are described in detail below.

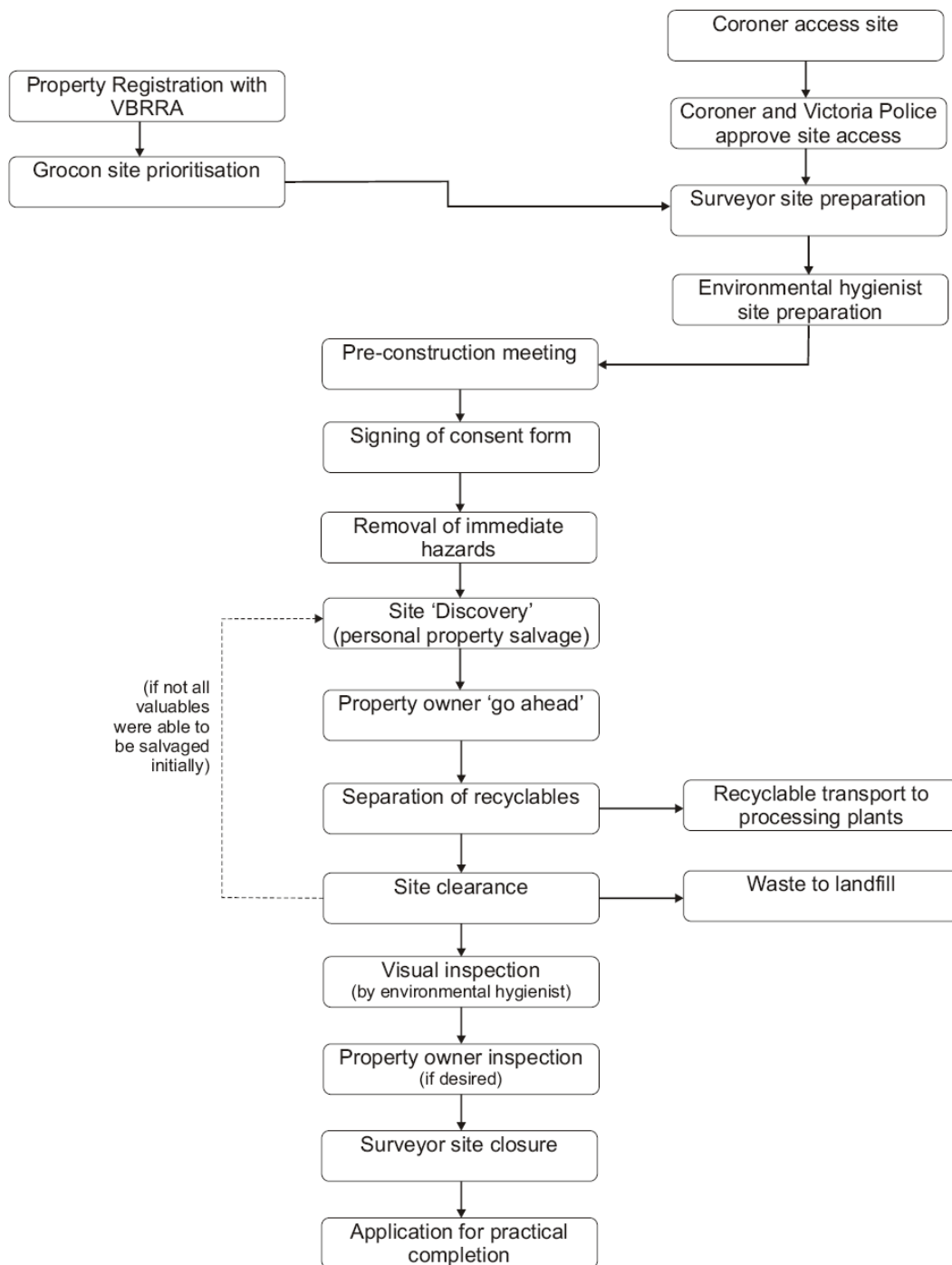


Figure 5.1 Site management process diagram

As discussed, all property owners who wanted to take advantage of the scheme had to register their properties with VBRRA. As the registrations were received, Grocon tried to prioritise the works as much as possible (refer Section 5.2.5). However, site access was restricted to areas cleared by the Coroner. In the case of Marysville, the entire town was locked down for Coronary investigations for 6-8 weeks.

Once access was gained, Grocon employed a surveyor to verify that they were working on the correct property. Once verified a sign was erected with property ID, contractor and safety information on it and barrier tape was placed around the property with an approximately 10m buffer. Pre-demolition photos were also taken.

Following that, an environmental hygienist would establish on site with fibre monitoring equipment. The equipment was used primarily for monitoring air-borne asbestos fibres.

A meeting was then arranged and held between a Grocon liaison officer and the property owner before any demolition works took place. The meeting objectives were to define the scope of the works, any special requirements (including property items that they did not want demolished or removed such as bricks, foundations, items with personal value etc) and to determine the demolition works' timing. A consent form with a defined scope (including 3 parts: checklist of hazardous items present; scope of demolition; and special requirements) was prepared and signed by the property owner.

Following removal (by Grocon) of any hazardous items from site, all property owners were given the opportunity to access their properties under safe conditions, including the wearing of Personal Protective Equipment (PPE), to recover any personal belongings (referred to as site 'discovery'). Property owners recovered / elected to salvage and keep a wide range of goods from diamond rings to bricks and burnt dolls. By all accounts this aspect of the debris removal programme was invaluable to ensure community satisfaction with the debris removal process. Frank Bortoletto, Grocon's joint executive project manager for the clean-up, described the personal belonging recovery as "a very important step".

The site was cleared of debris. Then an environmental hygienist would come and visually inspect the site to certify that all potential contaminated material had been removed from the site (no soil samples taken) and the surveyor returned to take post-demolition photos. Property owners were then invited to inspect the property again.

Grocon would then seek a practical completion certificate from VBBRA. These certificates provided a record of the works. Figure 5.2 and Figure 5.3 show the Marysville Medical Clinic site before and after demolition and debris removal.

All parts of the demolition and collection process were documented including time, waste volumes, truck and personnel information and recorded in a day book which was then entered into a master spreadsheet / database. The comprehensive record keeping ensured full transparency and accountability for the government funded operations.

As with any large scale project, there were reports that various steps and processes were not followed on every site. The description above represents the intended, and largely the process followed, during the clean-up. Micro-level anomalies are not the focus of this report.



Figure 5.2 The Maysville Medical Clinic before demolition and debris removal (Photo credit: Dr. Lachlan Fraser)



Figure 5.3 The Marysville Medical Clinic after demolition and debris removal (Photo credit: Dr. Lachlan Fraser)

Grocon had to reverse their thinking on site management because usually contractors build a fence and control a site, but here Grocon were working in the community on someone's property.

"We treat every owner like they're the project manager" (F. Bortoletto, Grocon)

"this wasn't a single project – it turned out to be 3000 individual projects because every single property is somebody's home, every single property is a story, every single property is ... part of an individual's or a family's or someone's road to recovery and dealing with [the fire]... every single one had individual needs" (T. Bamford, VBBRA Contract Administrator)

5.2.5 Work scheduling

At the start of the demolition works Grocon was keen to start work as quickly as possible. Providing access and appropriate authorisation were not obstacles, the first priorities set by Grocon and VBBRA were:

- Schools
- Community buildings
- Petrol stations

After these building types, priority was based on maximising demolition work efficiency by area and anticipating potential access issues due to rain. Grocon were also dependent on property owners determining when they were ready to have works carried out. On average the demolition process took 4.3 days per property (ranging from 1 day to 2 weeks).

Approximately 40 properties had still not been cleared 6 months after Black Saturday. This was due to several reasons:

1. traumatised residents not ready to have their properties cleared
2. deceased estates with legal problems concerning property ownership
3. access or remoteness (e.g. beyond broken bridges, rain affected accessways)
4. uncontactable owners (overseas, hospitalised etc)

5.2.6 Health & Safety

As stated in Section 5.1.4 Health and Safety was a key concern in determining waste management procedures.

It was assumed that there were significant risks in terms of exposure to asbestos and hazardous substances. Workers and property owners were supplied with protective clothing before entering the site. The Department of Human Services (DHS) coordinated a public safety campaign to provide information for affected property owners. The service included provision of "fossicker" kits (including masks, gloves etc) to allow residents to salvage personal belongings from their homes (VBBRA, 2009a), see Figure 5.4. Signage and barricades were also used to identify and isolate the site.



Figure 5.4 PPE provided to residents for salvaging of personal belongings (Photo Source: Dr Lachlan Fraser)

Asbestos monitoring was carried out on every site throughout the clean-up process (by EPA in collaboration with DHS) and no instances of detectable air-borne asbestos were found (VBRRA, 2009a). Truck drivers unions also got involved in health and safety issues and lobbied for a number of protection measures for drivers. All trucks were operated with windows closed, and air conditioning on re-circulate to minimise exposure. And to reduce risk to truck drivers and landfill operators receiving the asbestos waste all trucks eventually had to have auto-release doors for waste release.

According to Grocon there were three loss time injuries on the project. These incidents occurred to truck drivers driving on the Black Spur Road – a narrow, windy road that connects Melbourne with the bushfire area. Initially Grocon tried to introduce slower truck speeds, slow vehicle bays, new truck inspection requirements and restrictions on any persons working double shifts (or two jobs) etc in collaboration with Victoria Roads and Victoria Police. But ultimately an urgency developed to find an alternate disposal site to the north of Melbourne (refer Section 0). According to community members there were many near misses on the Black Spur Road during this time and there was general relief when the alternate disposal site was opened and the trucks were diverted.

5.2.7 Communication

Communication with the public was largely reactionary and uncoordinated and resulted in a lot of mis-information. A range of communication strategies were established by VBRRA (newsletters, community outreach, SMS messaging etc) to

inform the scattered affected population, however, most of the affected persons interviewed did not feel they were well communicated with.

Many residents were initially unaware of the State and Commonwealth Government sponsored clean-up scheme and were confused about the clean-up process. Bortoletto found that community meetings were the most effective way to share information as many people did not have access to phones, computers or newspapers. Bortoletto also noted that as communities saw the demolition and debris removal works in progress more registrations for debris removal work were lodged. It is unclear whether this was due to awareness of the programme or a better understanding and trust in the debris removal process.

Bortoletto expressed that upfront communication with the community was one of the key components in the success of this programme.

5.2.8 Demolition

Most demolition was carried out using heavy plant. However, some demolition was carried out by hand especially if protection of some item of personal property was requested by property owners.

As part of the demolition works, the top 100mm of soil was excavated and disposed of to minimise potential residual soil contamination from ash deposits. Thus a large percentage of total waste to landfill was soil.

5.2.9 Transportation

As part of the waste classification process (refer Section 5.1.4) Grocon was required to get a Section 30A approval from EPA for cartage of the material. Requirements for 30A approval included:

- fully sealed tail gates and top,
- tarpaulins
- spill kits,
- being roadworthy (in consultation with VicRoads)

All trucks (mostly semis, truck and trailers) were certified through a sticker process to identify approved bushfire waste vehicles. Trucks without stickers were not allowed to accept waste from any site or to dispose of waste at any landfill. EPA gave Grocon authority to manage this process through the 30A approval. EPA carried out some audits early on and was satisfied with the procedures in place.

On each site an area would be cleared (of contamination) for the debris trucks to drive onto. All water used for washing and wetting down the demolition site and recovered materials was trucked in or sourced for free from local golf club and residential dams.

Up to 600 trucks were engaged (from both large and independent truck operators) to assist with waste removal works. According to Whelan (EPA) you could not get another truck during this time.

5.2.10 *Recycling*

Very little separation of debris was possible due to the risk of asbestos exposure and the burnt nature of debris. It took one to two weeks for Grocon to establish recycling processes (including securing a market and recycling rates) and during that time all debris was taken to landfill.

Eventually all metals and most concrete was recycled. All recyclables had to be washed and cleaned before removal from site. 11,650 tonnes of steel returned a cash profit of \$1.6 million (VBRRRA, 2010). Concrete was disposed of for free at commercial recyclers. Concrete was then generally crushed and used as an aggregate substitute for public and private works. Proceeds from any recycling activities were invested back into the community through community recovery projects (VBRRRA, 2010).

Vegetation was largely mulched and stockpiled for communities to use for erosion protection. Mulch supply, however, has exceeded demand and local authorities are concerned about the fire hazard associated with large stockpiles. Existing mulch markets have also been overwhelmed. Grocon arranged for local contractors to chop large trees into firewood for residents to use for free. Any remaining organic material was burnt (burning is a permissible activity in Victoria in certain times of the year) (MFB & CFA, 2010).

The author is aware of at least one proposal to establish a waste to energy facility to utilise (in the short term) the wood waste from the bushfires and in the long-term wood waste from the timber industry. The proposal, however, was not adopted.

Grocon tried to establish a recycling facility in one community to minimise transportation but the dust became an issue for the community so they returned to using existing recycling facilities.

There was no requirement for Grocon to recycle materials. Recycling was utilised because it made sense economically by reducing trucking and disposal costs, with the added benefit of reducing use of landfill space. Bortoletto suggested that recycling was also motivated by Grocon's company goals which include minimising environmental effects. All profits from recycling were invested back into the community through various recovery projects, however, residents were largely unaware of this benefit.

5.2.11 *Disposal*

All non-recyclable debris was disposed of at landfill. Any landfills wishing to accept bushfire classified waste were required to gain Section 30A approval (refer Section 5.1.4). Thirteen existing municipal solid waste landfills sought and were granted this approval but only four were used.

Landfills in Victoria are owned both privately and publically. Largely the affected local Councils were relieved to not have to take the bushfire debris. The volumes involved would have been the equivalent of years worth of municipal waste in the respective municipalities.

In total an estimated 380,000 tonnes waste was disposed of to landfill.

Existing Landfills

As discussed in Section 5.1.4, EPA and DHS established standards (generally based on existing standards) for handling and disposal of bushfire waste. Based on these standards, every landfill adopted individual operating procedures.

It was assumed that Class B asbestos was present in every waste load. Asbestos control procedures such as random air monitoring, material wet-down, minimise dozer handling were put in place. For example at Sita Environmental's Taylors Road landfill the entire operation was overseen by an environmental scientist and health and safety compliance officer. Most waste handlers had already received external asbestos identification training. There was some concern, however, that standards were not applied consistently over time and across different landfills.

All debris was weighed and recorded against a property number for later reconciliation and payment.

In most cases landfills were still receiving waste from other clients. At Taylors Road landfill, for example, a separate tipping area was used for safety and to minimise disruption of existing customers and operations.

Prior to EPA approval for Section 30A, Sita Environmental had to meet with their community engagement consultative committee to make sure there were no objections to receipt of bushfire waste. The residents realised the importance of the bushfire clean-up process and were comforted by the presence and consultation with DHS/WorkSafe. Fortunately the debris did not smell - which is a primary concern for landfill neighbours.

New Landfill

Due to several lost time injuries which occurred on the Black Spur Road (refer Section 5.2.6) and the cost involved in travelling such large distances between the affected area and the disposal sites, an alternate disposal site was sought.

An existing but non-operational landfill site in Alexandra in Murrindindi Shire was identified as a potential disposal site for a bushfire waste disposal cell. After initial resistance by the council, Grocon took over development and operation of the landfill cell for the remainder of the demolition works with the approval of EPA.

In 10 days, Grocon:

- Obtained a Section 30A on the Shire's behalf
- Designed the landfill cell (within 48 hours)¹
- Gained EPA approval
- Removed 25,000 m³ of blasted rock to stockpile
- Placed 10,000 m³ of clay liner (on site)
- Laid the aggregate drainage layer
- Installed a temporary weigh bridge
- Made road improvements

Typically the landfills receiving the bushfire waste were municipal waste landfills with synthetic liners (clay, bentofix, geofabric and aggregate drainage layer). The new landfill cell had only a clay liner with aggregate drainage layer. The site location,

¹ The initial design time estimate given by the Council contracted landfill designer was a minimum of 3 weeks.

geology and low risk of leachate generation due to the inert nature of the waste, led EPA to believe a clay-liner was adequate. There were also existing controls in place (i.e. boreholes) at the landfill for environmental monitoring.

The landfill was staffed with three people – gate keeper, foreman and the existing landfill digger / compactor driver. Eventually the landfill accepted approximately 40,000 m³ of bushfire waste (equal to approximately three years worth of landfill volume in this locality's 50 year capacity landfill). Air monitoring and groundwater monitoring at existing site boreholes were carried out by EPA and Grocon.

There were some limitations with the new site especially given the smaller size of the facility. These included limitations on truck size and increased wait times for disposal. Grocon believe that the benefits of reducing the health and safety risk and the economic benefits of reducing haulage distances far outweighed these minor failings.

When the operation was complete the landfill cell was capped and handed back to Murrindindi Shire. The 30 year maintenance requirements for the landfill cell remain with the Shire. According to Grocon and the EPA, Murrindindi Shire was satisfied with the overall outcome.

Levies and disposal costs

Most large landfills in Victoria are privately owned and waste disposal costs are not standardised. Grocon was required to negotiate disposal costs for the bushfire waste with each landfill. Most landfills provided substantially reduced rates. If any operator would not lower their rates Grocon would not send waste to it. Consequently disposal costs were, in general, noticeably reduced for bushfire waste. Hanson Road landfill waived disposal fees during the emergency response (1-2 weeks). Taylors Road landfill significantly reduced disposal costs for bushfire waste.

State government (EPA) waste levies for landfill disposal were waived for all bushfire waste.

Some individual Shires elected to waive tipping fees at their transfer or disposal facilities during the fires to facilitate green waste removal to reduce future fire risk.

5.2.12 Cross-organisational liaison

There was a lot of cross-organisational liaison in the initial stages of the operation – to establish programmes and procedures. By all accounts good open relationships were developed. Audits were carried out with decreasing frequency as the process continued and the various regulatory authorities were comfortable with the procedures in place and Grocon's performance.

Figure 5.5 shows the cross organisational structures involved in the bushfires waste management process. A brief description of key relationships involved in the process is given below.

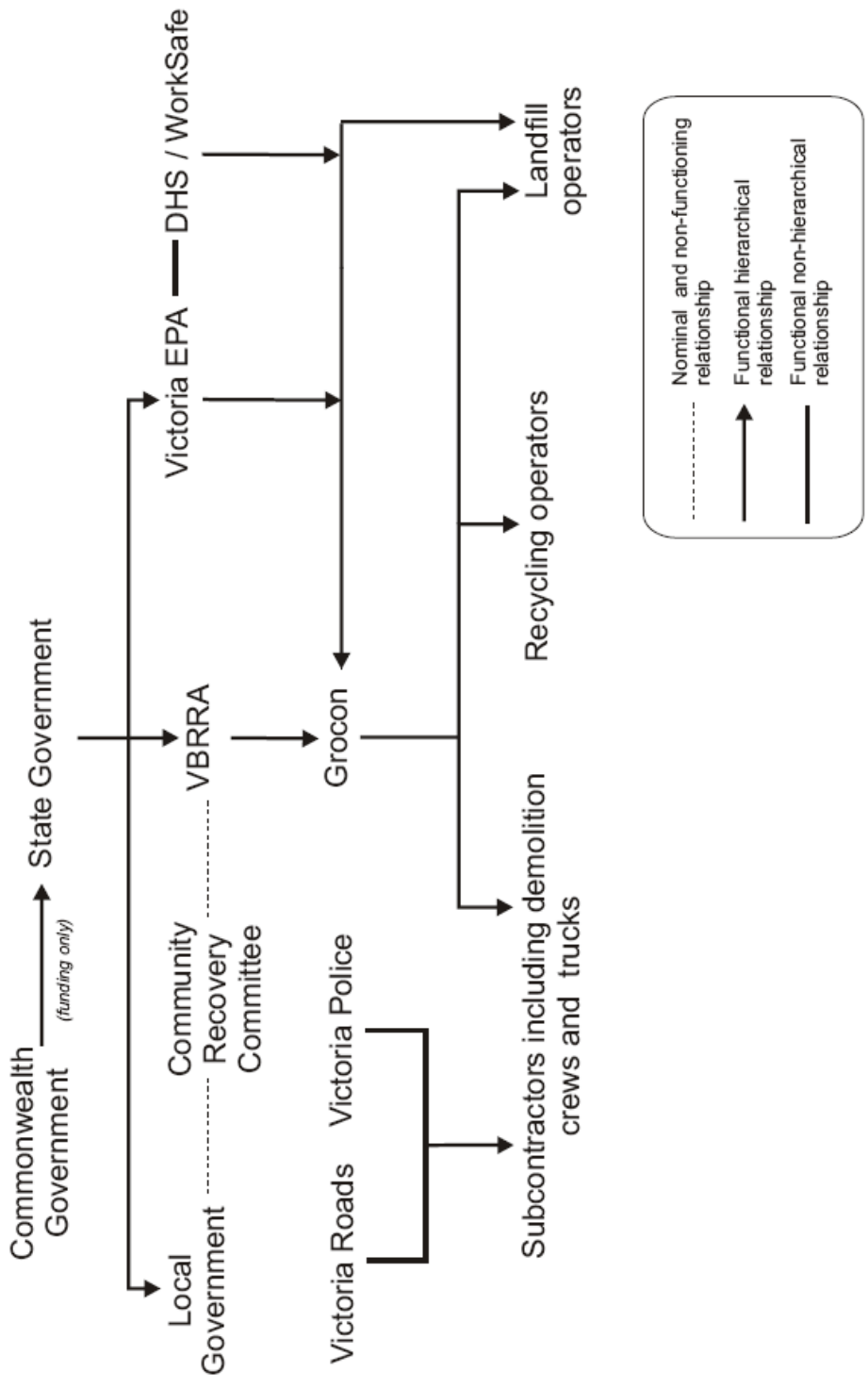


Figure 5.5 Organisational structure for Victorian Bushfires waste management

EPA – VBRRA / state government

EPA was initially approached by state government to facilitate the clean-up process by establishing waste handling procedures.

EPA – DHS / Worksafe

EPA and DHS (implemented through Worksafe) worked closely together to establish appropriate waste management procedures.

Grocon – EPA and DHS / Worksafe

Grocon liaised with both EPA and DHS to determine procedures for waste handling and disposal to ensure public, worker and environmental safety. EPA and Worksafe also helped to police rogue contractors who were offering unauthorised clean-up services for cash. Illegal dumping and inappropriate procedures were allegedly used by some of these contractors.

Grocon - VBRRA / State Government

Grocon was quickly handed almost full control of the clean-up process including day to day management of the property register. Bortoletto described Grocon's relationship with VBRRA/the government as an open relationship with "nothing to hide".

Grocon - Landfill operators

Communication between landfill operators and Grocon was limited to negotiating disposal costs, advising of incoming waste and ascertaining appropriate licencing and capacity.

EPA / Worksafe – Landfill operators

Handling, disposal and operating procedures for landfills receiving bushfire waste were determined directly between EPA, DHS and the landfill operators.

Grocon - Local government

There was adequate communication between Grocon and local government. Initial contact was made when establishing site offices and securing access to the area and following that there was on transportation routes and during consultation with local communities. Local government carried out no monitoring of Grocon's activity as this was assumed to be handled by state government.

EPA - Local government

In terms of debris, EPA provided advice on landfill levy waivers and hazardous material handling and disposal but otherwise there was little contact.

VBRRA/State Government – Local government

There was seemingly no involvement by local government in the strategic planning and/or implementation of the bushfire waste management programme.

Community Recovery Committees (CRC)

The CRC's were established after the start of the clean-up programme, however, even after their establishment there was seemingly no formal consultation between the CRCs (or any community wide groups) and either the State / VBRRA or Grocon - in either the contract planning or implementation stages. Most community level communication was either on an individual level or at isolated community meetings. This lack of consultation led to some dissatisfaction among community members (see Section 6.4.7).

5.3 Local authority waste management

5.3.1 Emergency response

In terms of debris and waste management the emergency response comprised road clearance, damage assessment to public properties and provision of municipal waste services for emergency centres (including volunteers, emergency workers and displaced residents).

In Yarra Ranges Shire the initial response was to set up crews to assess damage to roads, bridges and trees. Working groups were formed using personnel who ordinarily are responsible for the various assets like roads, bridges and buildings (as opposed to establishing a new group or organisational structure).

Waste management for post-event waste generation at emergency centres (generated by displaced residents and emergency services) was arranged by municipalities as part of their emergency response either using existing waste management contractors and facilities or engaging commercial operators.

No municipalities interviewed for this research covered private property clearance in their disaster management plans.

5.3.2 Funding

Any waste management activities (including relief centre waste collection and public property clearance) carried out as part of the emergency response and recovery effort by local government could be claimed back through the Natural Disaster Financial Assistance (NDFA). Only public works can be claimed back through NDFA (Department of Treasury and Finance, 2009). Insurance and alternative grants may also be sought by local authorities.

5.3.3 Public property

Local government is responsible for cleanup work on public property. Any buildings damaged were eligible for cleanup under the Grocon contract. However, some local councils elected to facilitate their own cleanup and subsequently apply for reimbursement through NDFA.

5.3.4 Municipal waste collection

In addition to the demolition and debris removal works for bushfire affected property, municipal waste collection had to continue for those still in the area. Local councils continued their kerbside collection to unaffected properties as far as possible. Road and area closures (for safety and coronary purposes) for up to 8 weeks caused some disruption to normal waste collection. Where necessary, smaller vehicles or skip bins were used for municipal waste collection. In areas closed for coroner investigations, the Army (through the federal initiated Defence Aid for Civil Communities response) provided some waste management assistance.

Due to the number of people who (temporarily) moved out of area a lag was expected in the municipal waste volumes from:

1. Property clearance works outside the scope of the Grocon contract
2. The return of pre-event municipal waste stream volumes.
3. Additional waste from construction activities.

The increase in waste from reconstruction and clearance may, however, be balanced by the reduction in people living in the area over this time.

5.4 *Individual property owners*

Individual property owners were responsible for any clean-up works outside the scope of the Grocon contract. Payment for these works will either be through insurance, the dangerous tree grant (see Section 5.2.1) or private funds.

Generally the public was unsure of what to do with the waste materials and were unwilling to pay to dispose of them at landfill. Some illegal dumping occurrences have been reported. CCA treated pine posts and wire, in particular, have reportedly been thrown into nature strips and waterways etc, causing an environmental and health and safety hazard. Rural people will generally look to burn off debris which again is a potential health and safety and environmental risk. Local councils advise the public on local law on burning restrictions and have advocated for VBRRA to intercept and provide more debris management services for collection of these wastes.

6 Disaster Waste Management

The case study analysis follows the principles set out by Yin (2009) in Case Study Research, Design and Methods. The framework for the analysis is to form a case description of the waste management process using strategic decision points as the unit of analysis. These decision points determined the path and in turn overall success of the waste management process and it is likely that many of these same decision points will also be faced by future disaster waste managers. Being able to anticipate what decisions will have to be made, what the likely impacts of the decision will be, how to better make these decisions and what information is needed to do so will help position communities to respond better in the future. The analysis was informed by both interviews and the study of pre and post-disaster literature.

A diagram summarising the decision-making associated with the waste management process is shown in Figure 6.1. The diagram is a chronological account (although not to scale) and shows the events that occurred (star shape), the activities that took place (rectangular boxes), the decisions that were made (diamonds) and any delays that occurred (vertical parallel lines). The diagram is also divided into 3 levels (local authority, state government and individual) to indicate who undertook the decisions and/or activities. Arrows are used to show the flow through the diagram.

The analysis concentrates on the five key decision points of the Bushfire waste management process (denoted by the diamond shaped boxes in Figure 6.1). For each key decision the analysis focuses on: the decision-making process (how and why the decision was made); the delays associated with the decision; the organisational aspects of the decision; the legal constraints; and the environmental, economic and social effects (both positive and negative). The ultimate aim of this case study is to use these categories and the technique of pattern matching (Yin, 2009) in a cross case study analysis of waste management programmes. The analysis will determine the major drivers and barriers for waste management decisions and will lead to a framework for future disaster waste management.

With limited data available from the waste management process (for example, data from the waste matrix (in terms of hazardous substances, contaminants, quantities etc.), costs and social assessments), it is difficult to quantitatively assess the environmental, economic and social impact of the waste management processes. However, relative (to peace-time standards or status quo) qualitative assessments of the strengths and weaknesses of each key decision can be made.

For the purposes of this report and in line with New Zealand Ministry of Civil Defence and Emergency Recovery guidelines (MCDEM, 2005) environmental effects include direct effects on the natural and built environment including: natural resource degradation and/or depletion; waste pollution; amenity values; biodiversity and ecosystems; buildings and infrastructure. The environmental effects may have secondary effects on human health through contamination of waterways, soil etc. Social effects look at direct effects on human safety and wellbeing, health and welfare which in terms of waste will largely include direct disease or health threat from the waste and health and safety issues related to handling of the waste.

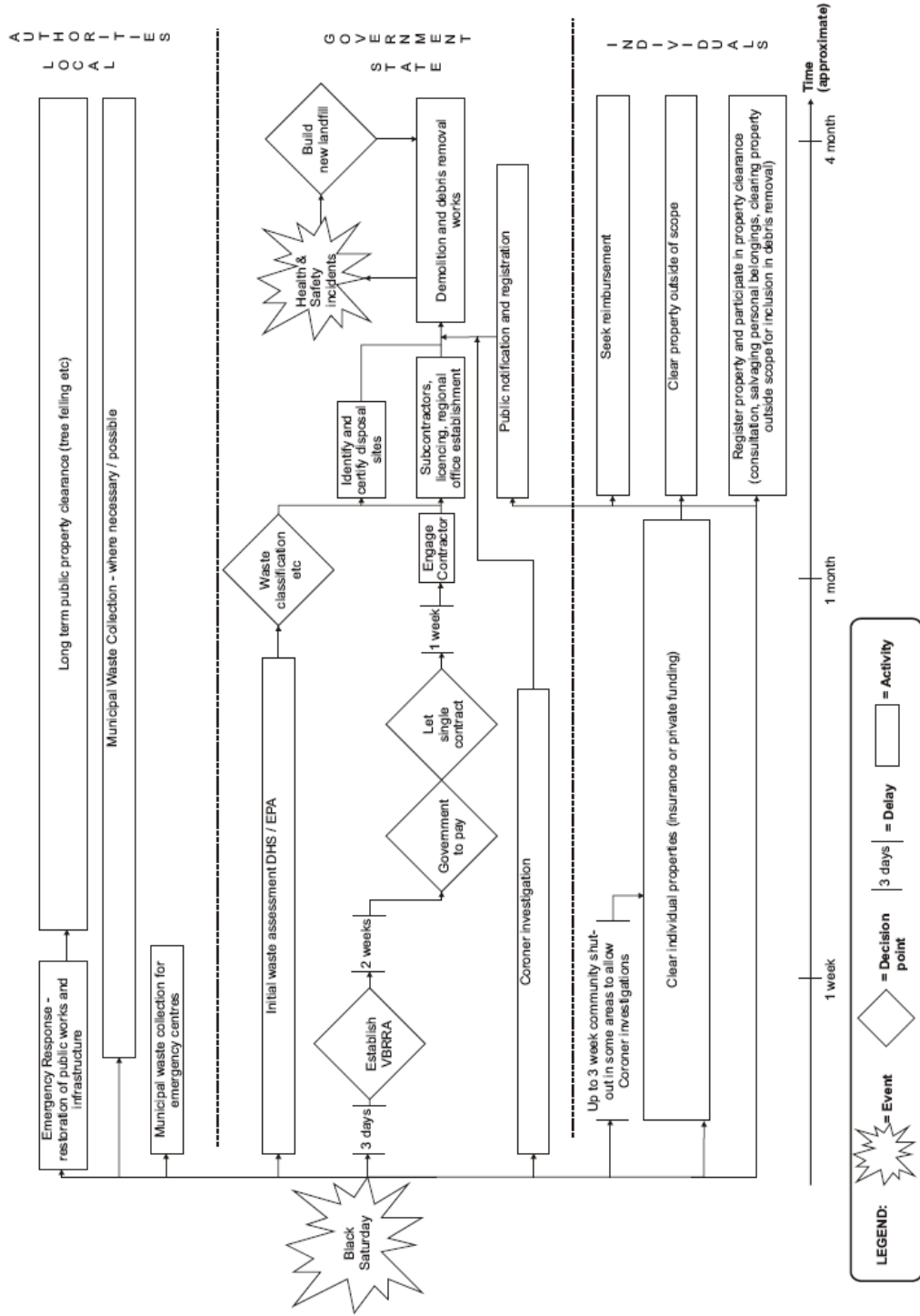


Figure 6.1 Victorian Bushfires waste management decision flow chart

6.1 Decision 1: Establishment of VBRRRA

6.1.1 Decision-making process

The decision to establish VBRRRA was made by the Victorian Government to oversee, coordinate and give a focal point to the recovery and rebuilding following the Black Saturday bushfires. The decision to form this Authority was not directly related to management of the bushfire waste, however, it is included here as VBRRRA forms the umbrella of the entire disaster recovery system which debris management forms a part.

The aim of VBRRRA was to act as a Coordinator for the 3 levels of Government and the community or the Community Recovery Committees. However, as the recovery has advanced, community members interviewed expressed growing discontentment about VBRRRA's role. Many feel that VBRRRA has added a layer of bureaucracy and that the recovery decision-making has been taken away from the communities.

In this section the role of VBRRRA is considered with respect to debris management only.

6.1.2 Delays

It is unclear if the timing of the establishment of VBRRRA had any impact on the waste management system.

6.1.3 Organisational aspects

In peace-time in Victoria, municipal waste management is largely carried out by local authorities using kerbside collection systems, recycling and disposal at landfill. Various governing bodies are responsible for regulating and directing waste management practices including:

- Victoria EPA – regulating disposal and transportation
- Sustainability Victoria – setting recycling targets etc
- Regional Waste Management Groups (RWMGs)– coordinate waste management and education
- Municipal Association of Victoria – coordinating RWMGs
- Local authorities
- Department of Human Services – public health & safety
- Worksafe – health & safety in the workplace

In essence the 'peace-time' waste management system is regulated at State level and implemented by local government.

If a central authority had not been established it is unclear where the overall responsibility and strategic management for the bushfire waste would have rested amongst the diverse range of private, state and local government bodies involved in daily waste management in Victoria. A single authority allowed for a strategic and centralised approach to waste management to be established. VBRRRA was responsible and ultimately accountable for ensuring the clean-up works were complete and implemented effectively and efficiently.

In theory, VBRRRA acted as a coordination body for state government waste regulators and private organisations involved in the waste management process. In this case, however, this coordination role was more or less taken over by the managing contractor Grocon - with the

exception of some VBRRA representatives to oversee the contract management and other aspects including policy and intra-governmental coordination. If a single contract had not been used (refer Section 6.4.3) the role of VBRRA as coordinator for waste management may have been more critical.

6.1.4 Legal considerations

To the authors' knowledge, there were no legal constraints or implications of the establishment of VBRRA on the waste management programme.

6.1.5 Environmental effects

As above, a single coordinating body gave a level of coordination and accountability to the management of environmental impacts directly relating to the bushfire waste. If no central body was operational the responsibility for the various environmental issues associated with the waste may have fallen between several organisations (see Section 6.1.3). Waste management stakeholders were able to coordinate their regulatory requirements through this body without taking overall responsibility for all the waste.

VBRRA itself had little or no experience in waste and environmental management issues. As a coordinating body it was VBRRA's role to seek appropriate expertise on waste management and ensure the waste management approach was in-line with long-term waste management strategies and immediate recovery needs. However, it appears that the waste management approach taken by VBRRA was determined entirely independently of the existing waste system with no connection to future solid waste management planning. Factors such as preservation of landfill space, establishment of new recycling facilities etc. were not considered.

In addition, project implementation was handed over to Grocon. Although the programme was largely successful, as a building contractor, Grocon did not necessarily have the expertise to fully understand current solid waste management issues. Neither Grocon, nor VBRRA, had a vested interest in considering the longer term impacts of the waste management operation on future solid waste management operations.

6.1.6 Economic effects

As for the environmental effects, VBRRA was able to coordinate and disseminate all the funding for the waste management operations. If many organisations (say individual councils and/or private contractors) had been dealing with the waste, the funds may not have been used as effectively and there would have been potential for overlap of activities.

6.1.7 Social effects

VBRRA was also a focal point for the community. The establishment of a central authority gave the community a first port of call with any issues they had regarding waste management. Before the establishment of VBRRA, the EPA and local Councils were receiving calls from the community regarding debris management and hazardous substance handling. However, it is interesting to note that once the contract was awarded the focal point actually became Grocon, not VBRRA. During interviews with community members it

was rare for someone to mention VBARRA or the government in respect of the clean-up operation.

6.1.8 Summary

Overall the timely establishment of VBARRA played a positive role in the waste management process. VBARRA initially took responsibility for the waste management programme, established the registration system, facilitated initial environmental assessments. VBARRA then contracted Grocon to manage the implementation of the clean-up operations and delegated much of the ongoing state authority and private waste management operator coordination to them. In this case, Grocon was able to liaise effectively and complete the clean-up operations effectively. This allowed VBARRA resources to be focussed elsewhere. Table 6-1 summarises the strengths and weaknesses of the establishment of VBARRA.

Table 6-1 VBARRA establishment assessment summary

	Strengths	Weaknesses
Organisational	<ul style="list-style-type: none"> Initial focal point for community and stakeholders in waste and environmental issues. VBARRA took accountability for management of the bushfire waste. 	
Legal	N/A	N/A
Environmental	<ul style="list-style-type: none"> VBARRA managed and took accountability for potential environmental hazards associated with the waste. 	<ul style="list-style-type: none"> No prior experience in waste and environmental management. No vested interest or accountability in long term waste management issues.
Economic	<ul style="list-style-type: none"> VBARRA managed and coordinated funding of clean-up works efficiently. 	
Social	<ul style="list-style-type: none"> VBARRA (and subsequently Grocon) was a focal point for community on waste management concerns. 	

6.2 Decision 2: Single waste classification and management procedures

6.2.1 Decision-making process

As Ms. Jenny Macklin noted (refer Section 5.2.1) the Commonwealth and State governments wanted to remove hazardous materials, minimise public health hazard and to get communities back on their feet as quickly as possible. The decision to classify all debris as a single waste classification was clearly designed to meet this goal.

According to EPA, a greater weighting in the informal risk assessment was given to health & safety concerns over environmental aspects of waste handling and disposal. However, by classifying all waste as C&D waste with other contaminants (including Class B asbestos) without extensive testing and designing all handling and disposal procedures accordingly, an elevated (compared to 'peace-time' standards) acceptance of risk of exposure to these hazards was consequently accepted.

6.2.2 Delays

Coroner investigations, and the time taken to decide that the government would fund the clean-up, meant EPA and DHS had approximately four weeks to establish processes for waste handling, transportation and disposal. However, in another event, a four week delay in establishing waste management procedures may not be acceptable, especially if significant acute hazards existed in the waste matrix and threatened residents.

EPA advised that the emergency environmental legislation used, Section 30A, could be activated within 24 hours. Decision-making authority is clearly delegated and approval processes are streamlined. However, the assessments, decision-making and procedural development required to prepare the Section 30A are likely to take more time. Information availability and decision-making guidance would aid in the stream-lining of these emergency environmental approvals.

The Dangerous Goods Order, outlining asbestos handling procedures, was issued within nine days of Black Saturday. This was particularly important to minimise public health threats for those in contact with the fire debris. The sooner a protection measure such as this can be put in force, the lower the risks to the public. As for the emergency environmental legislation above, the decision-making process is the critical path and a strategy (developed pre-disaster) on how to make these decisions quickly would make this process more efficient.

In terms of programme implementation the single waste classification allowed all waste to be handled quickly while also minimising risk to worker safety. Without the single waste classification, all waste would have had to be handled under current 'peace time' regulations, including time consuming testing and management of hazardous substances including asbestos. In particular, if Class A (friable) asbestos was detected, management requirements would include:

- Slow and cumbersome demolition techniques including sealing the site to make it airtight.
- Stringent health and safety procedures including use of certified personnel (which there was an identified shortage of).
- Double wrapping of waste in plastic (health and safety issues and limited material availability).

- Disposal at a prescribed industrial waste landfill – which is costly and there is insufficient landfill airspace available.

6.2.3 Organisational aspects

The majority of the professionals interviewed agreed that collaboration between all the governmental agencies and private organisations involved in the demolition and debris removal works was effective. However, it should be noted that there was no pre-planning to establish this cross-department collaboration. To expedite the process in any future event and to ensure the correct people with decision-making authority are involved in this collaboration a cross-agency collaboration plan would be beneficial.

6.2.4 Legal considerations

Within the scope of this research, it appears that the Victorian legislation and regulatory control of environmental and health and safety processes is simple and clear and was able to be manipulated effectively to suit the single waste classification approach used. Emergency provisions to facilitate the fast response were straight forward to activate and implement and the provisions provided enough latitude and at the same time control to allow for a safe and expedient debris management process. However, as described in Section 6.2.1, a clear procedure for post-disaster assessments and guidance for decision-making under these emergency laws would help to guide decision-makers. To validate and justify the use of these emergency legal provisions the acceptable risks need to be understood relative to varying disaster impacts. The procedure for this could be prepared pre-disaster.

While Section 30A and Section 55 are emergency provisions, they were not necessarily designed for community wide events. According to Wheelan (EPA), the Section 30A provision has not been used on this scale before but Wheelan felt it was the “perfect tool”. However, neither of these emergency law provisions appears to have a prosecution and/or liability exclusion clause in the event of unforeseen consequences of the emergency action. This lack of protection does not support the decision-maker.

6.2.5 Environmental effects

The single waste classification had both positive and negative effects on the environment. The main impact of the waste classification was the speed with which it allowed the debris to be managed. The speed of the process reduced the potential for contaminants to wash into waterways and/or leach into the ground.

Landfill disposal

Without thorough testing / analysis of the waste matrix, there is less certainty over the environmental outcomes of disposal at landfill. A single waste classification means that any significant volumes of harmful substances may go undetected and may not be disposed of appropriately. However, it is likely that any such substances would have been identified as a potential hazard (through odour and appearance) prior to disposal.

Recycling

There was no provision for recycling / reuse of the debris material in the contract or through the waste classification process. Due to the small volume of debris and charred nature of the materials this is not surprising. Within a few weeks, Grocon had established a recycling

programme within the demolition works for two reasons: to meet one of their core business objectives (environment); and secondly to reduce costs (see Section 6.2.6).

In a larger scale event the omission of recycling requirements may have had more significant environmental and economic impacts, particularly where landfill airspace is limited and resource availability for rebuilding is limited. The waste management programme following the 2000 Cerro Grande Wildfire in New Mexico achieved a 95% reuse, recycling rate (USEPA, 2008), demonstrating that fire waste is reusable and recyclable.

6.2.6 Economic effects

Direct Costs

As a result of the single waste classification (including a low hazard rating on the waste) the direct costs of the waste management process were reduced by lowering disposal costs and by eliminating the requirement for site testing.

No provision or requirement for recycling (and associated reduced disposal costs and potential for revenue generation) was considered in this approach to waste classification. However, the classification did not exclude recycling either and Grocon found recycling was beneficial to its operation for economic and environmental reasons. Therefore, in this case, the omission of recycling requirements is not considered to have had a significant economic impact.

Indirect Costs

The fast debris management process using the single waste classification allowed for business regeneration to start quickly, and in turn this would decrease community dependence on government / external financial assistance.

6.2.7 Social effects

The stream-lined procedures established, implemented and monitored through the single waste classification process allowed for a relatively efficient clean-up process. Debris presence is a constant reminder of the losses of a disaster (Petersen, 2004) so any procedure which hastens the removal process will have a positive effect on community recovery.

Perception

This straight forward and consistent approach to waste management also has a positive effect on public perception of the debris management process. If repeated testing and individual site evaluations were required at every site, the public may develop an elevated perception of the risk involved in debris management. An elevated risk perception may in turn slow down the clean-up process as more opposition to debris management practices may develop. It is interesting to note that all community members interviewed were of the understanding that no dispensations had been made to peace-time health and safety standards to facilitate the clean-up.

Speed

The decision to remove waste as quickly as possible significantly reduced the risk of exposure of asbestos and other hazardous substances to the public. If no stream-lining had

been adopted the waste presence in the community would have been prolonged and exposure to the community members extended, particularly those residents going back to salvage personal belongings without appropriate protective equipment.

Health & Safety

A single waste classification allowed for consistent and straightforward worker protection measures to be put in place. The classification accepted a higher level of risk than would perhaps have been assumed in a 'peace-time' situation but the risks had been identified and management techniques adopted (such as air monitoring, fully wetting all debris, covering trucks etc) to minimise risk of exposure to the public and environment. It should be noted that Grocon elected to protect all workers as if Class A asbestos was present. During the March community interview process, health and safety was continually ranked by community members as more important than environmental issues.

It is interesting to note that in 2003, County authorities following the Cedar and Pines fires in San Diego conducted tests on the ash material that showed there were state-regulated levels of hazardous constituents in the ash. Following those tests a county wide property clearance programme was implemented, superseding the previous private property owner managed clean-up (County of San Diego, 2005).

The air monitoring carried out during the demolition works supported the decision to handle all waste as Class B opposed to Class A asbestos waste. No measurable quantities of asbestos fibres were reported, however, in the absence of comprehensive testing on every site, it is impossible to rule out the possibility that Class A asbestos was present. As far as the author is aware, no testing was carried out for other contaminants.

Disposal of asbestos at a municipal waste landfill is not normal practice, so the management of the asbestos containing material may become a future hazard if the landfill is not well managed and asbestos disposal sites are not well documented.

Without extensive testing (available in 'peace-time' situations) to gain a better understanding of the level of risk, the decision-makers here were forced to accept higher risks than they would have in 'peace-time' to meet their objectives. Whether or not the decision is later vindicated, as was the case here, the initial decision still had to be made with limited information and assurance.

Local Labour

The requirement for only Class B asbestos certification for waste handlers increased the number of local contractors that were able to participate in the clean-up works. It also reduced the training requirements for those who wished to gain certification. Local labour use in the clean-up programme was one of the main issues identified by the affected communities (see Section 6.4.7)

6.2.8 Summary

Overall the single waste classification expedited the speed of the cleanup works with both minimal environmental risk and health and safety risk to waste handlers and the public. The legal arrangements that allowed for the waste classification were straightforward to implement, however, benefit would be gained from improving procedures on how emergency legislation is used and what sort of assessments are carried out in order to validate use of these provisions.

Table 6-2 summarises the strengths and weaknesses of the single waste classification.

Table 6-2 Bushfire waste classification assessment summary

	Strengths	Weaknesses
Organisational	<ul style="list-style-type: none"> • Good 'on the spot' collaboration between government agencies. 	<ul style="list-style-type: none"> • No pre-determined inter-agency collaboration (eg EPA, DHS, Vic Roads) for emergency waste management issues.
Legal	<ul style="list-style-type: none"> • Existing legislation was simple and effective to apply to the single waste classification approach. 	<ul style="list-style-type: none"> • Current legislation was not designed with disaster recovery in mind and it is unclear whether liability or prosecution protection is included. • There were no risk assessment processes to help decision-makers justify use of emergency legislation.
Environmental	<ul style="list-style-type: none"> • Removed contaminants from site quickly. • Reduced the potential for contaminants to wash into waterways or leach into the ground (in the event of a slow clean-up). 	<ul style="list-style-type: none"> • Unclear environmental assessment processes used to validate single waste classification. • Uncertainty in environmental outcomes of landfill disposal. • No provision for waste reduction / recycling / reuse.
Economic	<ul style="list-style-type: none"> • Disposal costs were reduced. • Testing / monitoring costs were reduced. • Aided business and general community economic recovery by expediting clean-up process. 	<ul style="list-style-type: none"> • No provision for waste reduction / recycling / reuse.
Social	<ul style="list-style-type: none"> • Expedited recovery (positive psychological effects). • Removed contaminants from site quickly reducing public health hazard. • Reduced the potential for prolonged exposure to air-borne asbestos (in the event of a slow clean-up). • Lowered the public's perception of the risk (by not testing every site). • Ensured a consistent level of worker protection • Increased the number of local labourers qualified to carry out works. 	<ul style="list-style-type: none"> • Potential air-borne asbestos not contained sufficiently (c.f. 'peace-time' standards). • Potential future asbestos hazard at landfill. • Higher acceptance of exposure risk to workers and community given the absence of individual site testing.

6.3 Decision 3: Government funding

6.3.1 Decision-making process

The decision to fund the demolition and debris removal works on private property was clearly driven by the Government's objectives to clear debris and hazardous materials from bushfire affected properties and 'to help people get started as quickly as we [the State and Commonwealth Governments] can' (The Premier of Victoria, 2009). The government wanted to aid the social recovery while minimising the impact on the environment. And while not explicitly stated, there would also be clear benefits to the economic recovery of the community (see Section 6.3.6). By and large the demolition and debris removal works programme appears to have met the state and commonwealth government's objectives.

As noted by Tim Bamford, VBRRA, it takes extraordinary political courage to let a multi-million dollar contract in seven days, in particular, a contract with no overall budget and unknown scope (in terms of number of properties). Pre-determining the extent of disaster waste management assistance relative to disaster impact would help to reduce the pressure on decision-makers at the time of the disaster.

It is important to note that many of the costs incurred by *municipalities* in clearing disaster debris (both on public property and from kerbside collection) is claimable through various government funding mechanisms. Ordinarily this would not include private property clearance. So the major additional funding here was for the clearance on private properties.

Debris management following previous fires in the US have been funded by a range of organisations including insurance, the Federal and Emergency Management Agency and the Local Government (USEPA, 2008), (County of San Diego, 2005), (State of California, 1997).

6.3.2 Delays

The decision for the government to pay for demolition and debris removal was not made (or at least not publically announced) until 20 days after Black Saturday. The delay was a direct result of lack of institutional preparedness for such a large scale event. The decision required political and financial support which took time to establish. In the future the government (at local, state and commonwealth levels) needs to pre-position itself to respond quickly with an array of pre-determined response strategies (in terms of levels of funding and coordination) which can be implemented for varying degrees of disaster impact.

If no funding had been provided an additional delay in the demolition would probably have arisen from the time taken for insurance companies, charitable donations and possibly government grants to be assessed and awarded before individual property owners could facilitate clean-up works. These delays would have potentially exacerbated any negative environmental, social and economic impacts - such as delaying removal of potentially hazardous materials which pose a risk to environmental and public safety and slowing local business recuperation etc. Community members surveyed agreed that if funding had not been provided the recovery would have been significantly delayed.

6.3.3 Organisational aspects

Provision of blanket funding allowed waste management activities to be provided and prioritised with other recovery activities. If individual property owners, insurance companies, local government etc had been required to source their own funding, financial resources may

have been allocated inappropriately and ineffectively from the perspective of an overall community recovery (refer Section 6.3.6). Many people may not have had access to any assistance or resources at all. Available waste management resources (plant, trucks, personnel) would also have been used less effectively and undoubtedly given rise to inexperienced opportunists participating in the clean-up.

The blanket funding reduced the potential for inaction by residents slow to carry out their own clean-up. A Councillor from Mitchell Shire commented that it eliminated the potential for Council to have to step into an enforcement role if residents failed to clean-up their properties. Enforcement actions have the potential to alienate the already stressed community.

6.3.4 Legal considerations

At this stage it is unclear whether or not provision of funding has any legal implications in Victoria. In the US there is currently some debate over whether or not the Federal Emergency Management Agency (FEMA) has any liability for adverse effects of emergency activities that it has funded (Luther, 2008).

6.3.5 Environmental effects

While not stated explicitly as a decision driver for the government funding, there was undoubtedly a benefit to protection of the natural environment. Timely and comprehensive funding allowed for a process to be established to minimise the impact of the bushfire waste on the environment. If funding/ assistance had not been provided to property owners, then there may well have been increased incidences of illegal dumping and/or improper waste handling, particularly in this rural setting with a 'dump in the ditch' mentality. Fences (not included in the Grocon contract), in particular were cited by residents as a difficult item to handle and dispose of due to their bulky nature. Some landfills do not accept this type of bulky waste.

However, it must be noted that the decision to fund the process was merely a vehicle to allow appropriate environmental protection. For funding to be 'environmentally' effective and appropriate, an appropriate delivery or implementation mechanism must be employed.

Scope

The limitation in government funding is the inevitable limitation in scope. While the waste management under the contract scope was carried out under controlled and well monitored circumstances, no systems were put in place to cope with works outside the contract scope. Systems needed include disposal facilities, collection services, health and safety advice, etc. Under a government funded approach communities were not educated on how best to manage their own wastes outside the scope of the funding. It is likely that the responsibility for these waste management systems would lie with the Municipality under the Victorian emergency management arrangements. However, regardless of responsibility, the appropriate systems have not been put in place in this response.

The Shire of Yarra Ranges were anticipating that inappropriate management outside the contract scope would become a problem. The Shire were advocating for VBRRRA to extend the scope. Potential problems include illegal dumping and CCA contamination from fence posts. In general, however, the amount of CCA given the large area affected would have minimal environmental impacts.

6.3.6 *Economic effects*

Another, implicitly stated objective (which results from fast community recovery) was to facilitate economic recovery in the area. This includes:

- business regeneration
- economic stimulus through rebuilding
- reduction of dependence on government assistance

If no government or centralised funding was provided and insurance or private funding was needed for debris removal works it is likely the clean-up would have been delayed while insurance claims were processed and individual contractors were engaged.

Residents of tourism centred economies like Marysville in particular, recognised that debris removal was an essential part of recovery and rebuild both personally and for the wider community. However, following the Bushfires, residents found that economic regeneration was limited by other recovery issues such as an unclear / poor recovery planning, lack of economic stimulus assistance for the area, and individual business reluctance to invest in the area.

Funding precedence

While overall the community response to funding provision was very positive, there is a possibility that the state and federal government has now set a precedent for future events. The majority of community members surveyed said that they expected to receive the same assistance in a similar or bigger size disaster. Commonwealth, state and local government now need to consider the precedent that has been set by providing the demolition and debris removal assistance and consider how they want their communities to prepare for future disaster events.

For residents who had already cleaned up their properties (through private funding or insurance) they faced a potentially difficult task of claiming their money back from the VBRRA. This provides a disincentive for property owners in the future who are proactive and help themselves as they find that they face an uphill battle in seeking compensation; whereas those that waited until the government stepped in have a far smoother road. Generally, it is understood that the reimbursement process here was relatively straightforward.

As part of the 'funding precedence' the role of insurance needs to be addressed. Many residents were not insured or were under insured (i.e. many insurance policies did not routinely include for debris removal works) and consequently a lengthy delay in the demolition and debris management process would have undoubtedly occurred if the state and commonwealth governments had not stepped in. However, some who were insured felt that they were due compensation from the insurance companies for work the government had completed essentially on the insurance companies' behalf. In some cases insurance companies did compensate for this but it depended on the policy type, wording and insurance company. If there is an expectation that the government will provide assistance for demolition and debris works, the level of cover desired and provided may reduce and/or there may be increased variability in the insurance coverage of property owners.

Amongst those surveyed, opinion was divided as to whether people without insurance should have received assistance of any kind. While many recognised the benefit of global assistance for overall community recovery, others felt that government assistance should be

evenly distributed between insured and non-insured people. The blanket funding of the debris management programme here, met these two community identified objectives.

Governments at local, state and commonwealth levels need to consider if there is a trigger level or levels, in terms of disaster impact, for provision of global funding assistance for demolition and debris removal. Because of the potential community, environmental and public health impact of disaster debris, there are immense benefits from centralised management of the debris. But government needs to consider what message of preparedness it would like to send to its people: does it intend to always provide assistance? And if so how much? Or do they want to empower communities to facilitate their own demolition and debris management works. This message needs to be consistent, well publicised and in-line with insurance company policies.

6.3.7 Social effects

Public health and safety

One of the two main objectives for providing government funding was to reduce the public health risk posed by the presence of the debris. The provision of funding certainly allowed for this process to be facilitated but as stated above – the provision of funding only facilitated this process and did not necessarily ensure a successful programme.

However, for debris management works carried out outside the scope of the government funded clean-up, there was limited education or support given on health and safety issues.

Community

The demolition and debris removal programme was the first tangible / visible assistance to the community from the government. The funding signalled to the community that the government was willing to help it rebuild quickly.

The funding provision also provided the first necessary step to allow for rebuilding to commence. Bortoletto (Grocon) described the debris clearance as ‘a huge hurdle’ in the recovery process and observed immense gratitude in having the hurdle removed. Community members surveyed described the ‘relief’ felt after having the debris removed. Many of them felt the job was just too big for them to deal with alone. One respondent described the transformation of Marysville as “gone from rubbish heaps to a new housing development” and another as a “a new beginning”. One business owner in Marysville noted that they would not have stayed in the area if the government had not paid for and facilitated debris removal.

All community members surveyed agreed that the government made the right decision to fund debris removal and many called it the best initiative the government had.

Scope

As discussed in the environmental effects section above if the contract scope is limited there will be activities that need to be carried out or facilitated by residents. The limited scope was seen by some surveyed as a failure of the state and commonwealth government to assist fully. In particular, community members with property damage outside the scope of the debris contract (fencing, trees etc) felt that they had been neglected by the government. However, it must be acknowledged that any disaster assistance funding is limited. Authorities needed to communicate the justification for their decisions and *provide guidance on how those who are not included in the assistance scheme can help themselves.*

Assistance dependence

Residents may gain a dependence on external assistance through this sort of government assistance. Direct government assistance may lower both their willingness to help themselves during the recovery from this disaster and lower their preparedness for any future events. However, if communities understand the scope of the assistance and the expected extent of their role in the recovery, from the beginning, this sort of dependence could be avoided.

6.3.8 Summary

Overall, government funding of private property demolition and debris removal was very successful. The initiative had the desired effect of facilitating a timely and well coordinated clean-up operation. The two major disadvantages of the government funding were: the potential for setting a funding precedence for future disasters; and the subsequent non-provision of assistance (in financial, practical or educational terms) of those carrying out clean-up operations which were outside the scope of the government funding.

Table 6-3 summarises the strengths and weaknesses of government funding of the private demolition and debris removal works.

Table 6-3 Bushfire government funding assessment summary

	Strengths	Weaknesses
Organisational	<ul style="list-style-type: none"> • Allowed for prioritisation of financial resources with other recovery activities to aid overall community recovery. • Reduced the potential for Council to have to act in an enforcement role for un-cleared properties. 	
Legal		<ul style="list-style-type: none"> • Possible (unsubstantiated in Victoria) state and commonwealth government liability for potential adverse effects resulting from state / commonwealth funded works.
Environmental	<ul style="list-style-type: none"> • Expedited removal of potential environmental contaminants. • Potentially reduced incidents of illegal dumping / improper waste handling. 	<ul style="list-style-type: none"> • No provisions or guidance for works carried out outside the scope of the government works – which led to improper waste disposal.
Economic	<ul style="list-style-type: none"> • Expedited economic recovery (through business regeneration and reduce welfare dependence time). • Eliminated insurance or private funding lag. 	<ul style="list-style-type: none"> • No existing guidelines on provision of funding for disaster waste management on private property. • Potentially reduced financial preparedness for future disasters. • Potentially impacted on future insurance coverage (both in terms of policies offered and policies taken out).

Social	<ul style="list-style-type: none"> • Allowed expeditious removal of potential public health hazards. • First tangible piece of government assistance. • Aided and in some cases encouraged community rebuilding. • Removed a psychological barrier to recovery. 	<ul style="list-style-type: none"> • Ineligible residents frustrated by non-inclusion in government funded clean-up. • Little or no education or support on health and safety issues for those carrying out works outside the government funded clean-up. • Reduction of community preparedness and willingness to help themselves for future disasters.
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6.4 Decision 4: Single Contract

There are many variations for execution of demolition and debris removal services including:

- Single contract for all demolition and debris removal works
- Letting multiple contracts for combined demolition and debris removal works (perhaps each under a separate Shire)
- Separating demolition and debris removal works and contracting each component to separate contractors
- Requiring residents to facilitate demolition and debris removal works independently and applying for reimbursement
- Requiring residents to facilitate demolition and letting a contract service for kerbside debris collection and disposal

In this report a single contract refers to a contract let to one contractor to carry out both the demolition and debris removal works with no participation from residents.

6.4.1 Decision-making process

To date no contact has been made with state or federal government officials responsible for design of the single contract. However, in general, the selection of the mode of works execution would largely depend on the spread of debris, extent of destruction and degree of hazard in the waste. Given the low volumes of waste, potential for hazardous materials and the large percentage of houses requiring complete demolition it is understandable that a single contract was established.

6.4.2 Delays

There were two delays associated with the government's decision to let a single contract – a two week delay prior to the decision and a 1 week delay following the decision. With pre-event planning both delays could have been reduced if not avoided.

The two week delay prior to this decision resulted from the slow decision to fund the demolition and debris removal works (refer Section 6.3.2).

The one week delay following the decision resulted from the time taken to call for and assess tenders; and agree on the Contract rates and conditions etc. This delay could be reduced if pre-arranged contracts were in place – including agreed rates and terms of conditions. Obviously some Contract details such as scope cannot be established until after the event.

In total it took 20 days for the Victorian Government to award the debris management contract to Grocon. In comparison it took 6 weeks to establish a waste management contract for both the Oakland firestorm (State of California, 1997) and the 2003 Cedar and Pines Fires, San Diego (USEPA, 2008).

It is important to note, however, that the delays for the contract set-up were in parallel with other activities. Firstly, the delay allowed the EPA / DHS to establish waste handling procedures prior to the contract commencing. Secondly, some areas were inaccessible for up to eight weeks due to Coroner investigations. Overwhelmingly the community members surveyed were very happy with the timing of the clean-up works.

The bushfires provided an interesting and perhaps less urgent (when compared to other natural disaster types) waste management problem. The high level of physical destruction, number of displaced people and the absence of need to quickly clear debris for health and safety reasons or emergency access meant immediate waste management action was not critical. This fact, coupled with the delays from the Coroner and EPA/DHS process meant the net effect of the delays on awarding a single contract was marginal.

Despite the initial delays associated with letting the contract, the overall effect of a single contract on timing of the waste removal and demolition works was positive. The governing authorities were able to set a deadline for completion of demolition works and to monitor completion closely. If property owners had been required to facilitate their own clean-up, it would be extremely difficult to enforce debris removal programmes. Delays in waste removal could pose a public health and safety risk as well as an environmental risk. And this would also have a follow-on effect on the recovery programme.

6.4.3 Organisational aspects

Communication

The chains of communication are centralised through a single point (the main Contractor) and disseminated vertically through sub-contractors. Regulatory and operational procedures are easily transmitted through these lines.

The emphasis on local labour use (often independent or small contracting companies) undoubtedly increased the number of sub-contracts that Grocon had to manage. The larger the number of organisations, the more difficult it is for communication. There were inconsistent reports on the performance of Grocon's contractors and this is largely attributed to individual sub-contractors and the inconsistencies between them. There are significant benefits from the use of local labour (refer Section 6.4.7) and with good organisational systems communication and consistency between organisations can be monitored and managed by the Managing Contractor.

Resourcing

A single contractor can more efficiently coordinate and utilise resources (in this case primarily personnel, trucks and some demolition equipment). Of course, if the disaster is too big then a single contractor may not be able to manage the entire operation. In this case a single contract for demolition and debris removal worked well.

In response to a relatively small earthquake event in Te Anau NZ, 2003, the Earthquake Commission (EQC) (which provides statutory funding for natural disaster recovery) trialed a single contract to manage all recovery building works. While this was a small event, and limited conclusions can be drawn, this approach meant that individual property owners did

not have to compete for limited resources and services and thus, was considered an overall success (Rotimi et al., 2006).

State vs local approach

The private property demolition and waste management process was handled almost entirely independently of the Shires or local authorities (regulated and implemented at State level, through the State appointed recovery authority, VBRRRA). Initially some Shires were approached to determine if they had spare capacity in their landfills to accept the fire debris, however, it was decided that capacity was not available in any local landfills. From that point forward there appeared to be no coordination between the government contractor (Grocon) and the activities of the Shire. Largely the municipal waste management system remained unchanged and the government funded contract formed a separate and almost completely independent waste management tier.

This segregated approach had some advantages. Local authorities' resources were stretched during a disaster response, so removing the burden of demolition and debris removal works was an immense relief. Municipalities were able to continue their standard municipal waste collection services without disruption, thus eliminating a potential public health risk from municipal waste. A single approach to waste management was possible across all districts as opposed to varying standards for different authorities. These all undoubtedly resulted in time and cost savings.

The disadvantage of a segregated approach is that there is little communication flow between the groups which may result in some double up of activities and ineffective resource sharing (for example Murrindindi Shire's reluctance to offer its landfill site). This lack of communication may also lead to a lack of integration of the disaster waste management programme into the existing waste management system. For example, long term waste strategies in a community may prioritise certain landfill sites over others or may specify the development of certain recycling facilities which could be expedited through the clean-up process.

Public vs private

The demolition and debris removal programme was open to all public and private buildings. The lack of distinction between building ownership is considered by the author to be a very positive aspect of the funding in this case. The economy of scale, the streamlining of environmental processes and resources achieved through the single private debris management contract would have been lost if there had been a distinction made between building ownership.

Some local authorities, however, elected to manage their own demolition and debris management of public buildings in order to minimise disruption of private clean-up works under the Grocon programme. While these public works were monitored, this additional layer in the debris management system has the potential to add several possible burdens to the recovery programme:

- Additional QA for debris handling, disposal and associated certification required.
- Additional sharing, sourcing and coordination of resources.
- Loss of economy of scale both in terms of costs and debris management options (e.g. resource recovery is more feasible in large quantities).
- Community disaffection over government prioritising public over private works.

Independent contractors

Some independent operators (not associated with the Grocon works) also participated in debris removal operations – through insurance companies, private works or as opportunists trying to capitalise on people’s misfortune and vulnerability by providing unregulated disposal services. Landfill operators tried to discourage this by requiring the independent contractors to develop and demonstrate that they had suitable handling and transportation measures in place prior to waste acceptance.

6.4.4 Legal considerations

Right of entry

A single contract allowed for a stream-lined process of gaining authorised entry onto properties to carry out the clean-up works. To the author’s knowledge, all works have been carried out with the owner’s permission through the VBRRRA registration process (Section 5.2.4). At the time of writing the author had only heard of one property which elected not to register under the Grocon programme. It is unknown what will happen to this property (or others like it) if they are not cleared by (or with the consent of) the owners. It is understood that there are provisions in Victorian law to act to remove acute and/or chronic hazards without owners’ consent, if required.

Waste ownership

The single contract also allowed stream-lining and appropriate handling of waste ownership issues. After the property owners had salvaged their belongings residents were required to sign an agreement that the Contractor (Grocon) assumed ownership and responsibility for the debris. Ownership included the rights to any proceeds from the sale of recyclable material and the responsibility of appropriate disposal of the debris. However, it should be noted that Grocon elected to reinvest the recycling proceeds back into VBRRRA and therefore the affected communities.

6.4.5 Environmental effects

Monitoring

A single contract allowed regulatory authorities (in particular EPA and DHS/WorkCover) to closely monitor the waste handling, transportation and disposal of the waste. Determination of procedures and processes for waste handling could be quickly agreed upon in collaboration with the Contractor. If multiple contractors had been used, agreement on stream-lining, certification and monitoring of processes would likely have been more cumbersome and the environmental outcomes less certain.

Recycling

If residents (or persons engaged by private property owners) were involved in the demolition and/or debris disposal process, good recycling rates (in terms of quantity of recyclable and profit from their sales) would potentially be harder to achieve. This would result in more landfill airspace being utilised and lower material recovery (also see economic effects below).

6.4.6 Economic effects

Economy of scale

If it is well managed, as was the case here, a single contract has the potential to benefit from economies of scale. Grocon secured bulk savings for material and service supply, contract services, recycling, disposal costs etc². There is of course a potential for a single contractor to monopolise the situation, however, if the correct contract controls are put in place then the economy of scale effects will likely prevail.

If residents were required to arrange their own demolition and debris management for cost reimbursement from government then the economy of scale benefits would be lost.

Profiteering

Price gouging and profiteering in disaster recovery is common (Jackson, 2008) (Pelling et al., 2002). The recovery from the Bushfires was no exception. Opportunists arose in many forms, including:

- Private Contractors trading on Grocon's name – offering clean-up services for cash
- Landfills charging high disposal rates
- Locals selling water to Grocon for clean-up works

Having a single contract enabled profiteering to be monitored and kept to a minimum. Grocon was also able to demand the lowest and/or high volume prices from service providers for anything from accommodation to landfill disposal costs. Grocon also generously elected to re-invest the profits or processed materials such as mulch from the recycling back into the community to aid in the recovery process.

6.4.7 Social effects

It is important to note here that the author is unaware of any formal community level consultation related to the single contract award prior to or during the clean-up operations.

Prioritisation

A single contract allowed demolition and debris removal works to be prioritised within the communities. Grocon and VBRRRA advised that they prioritised schools, community buildings and petrol stations where they could. This ability to prioritise, if well managed and coordinated with local leaders, enables primary industries, services and community facilities to begin the rebuilding process quickly to kick-start the community and economic recovery in a region. However, there does not appear to have been any community wide input sought on appropriate works prioritisation.

Community acceptance

A single contract, if well communicated, is potentially less confusing for residents. Bortoletto (Grocon) noted that early community misconceptions (including cost, timing, local labour use, personal belonging salvation etc) about the demolition and debris removal works were rectified through open communication. Grocon attended multiple community meetings and engaged community officers to explain the process. Complaints (only 15-20 complaints in over 3000 project sites) were also able to be managed and monitored centrally through a complaints register.

² Note this that economies of scale and supply discounts are limited by the competition in the market. The ability to negotiate landfill disposal rates at New Zealand landfills for example would be severely limited due to the likely lack of alternative disposal sites.

Community based research in March 2010 indicated that the majority of residents were unaware who funded Grocon as Grocon essentially became “the focal contact point for the government” (Bortoletto) in terms of clean-up. There was considerable speculation within the communities as to the legitimacy of the award of the clean-up Contract to Grocon.

Private and Public Health & Safety

The potential for hazardous materials in the waste matrix meant that resident participation in the clean-up was not desirable. A single contract eliminated the need for residents to participate in the clean-up thus reducing the public health risk. Based on the March 2010 community interviews those that carried out their own clean up or engaged a contractor to do so (for works outside the Grocon contract scope) did not use any health and safety precautions. If no single contract had been employed then it is likely that health and safety over the community may have been compromised. Health and safety issues for those carrying out their own clean-up needed to be more widely publicised (see Section 6.3.7).

The single contract also allowed the health and safety issues that arose on the Black Spur to be quickly identified and addressed. If individual haulers or contractors only had been operating, incidents across a number of organisations may not have been noticed. The drive and focus to mitigate the health and safety risk (ie construction of a better located disposal site) might also not have materialised.

Local labour

There are some potential drawbacks to single contract use in a disaster waste management situation. As was the case here, a contract of this size would often have to be outsourced to a large company from outside the immediate area. The author is aware of at least one proposal from a local contractor to manage debris from some of the affected areas. The proposal included for all labour to be sourced locally and for all recycling to be carried out locally. Despite backing from local parliamentary members, the proposal was not accepted.

Despite Grocon contracting approximately 50% of its workforce from local communities, there was a feeling within some communities that:

1. The economic benefits from the clean-up activities were not being kept in the community;
2. Control of the clean-up and overall recovery had been taken away from them (some attributed this feeling of helplessness to longer term mental health issues)
3. Jobs were being taken away from those affected (many had lost their jobs / businesses as well as their homes).

The reaction of communities to this use of non-local labour varied across the affected communities. Those communities with low employment and independent lifestyles appeared to be more eager to be involved in the waste clearance activities. Communities with a tourism based economy or primary producers, were not so interested in being involved in the clean-up. Farmers were busy doing their own recovery works and those involved in the tourist centres, such as Marysville, were not generally skilled and/or willing to work in demolition or waste management.

There were also some barriers to inclusion of locals in the labour. Many were not certified or appropriately qualified; many did not have the appropriate equipment; and others were simply not ready to participate when the clean-up started. Some believe that Grocon was under time pressure (from VBRR and the community) to finish and were not willing to accept the delays associated with increasing local labour participation.

There is widespread acceptance that communities must be involved in the recovery process to mitigate potential mental health issues, and that communities must feel empowered during the recovery process (Gordon, 2009). The State Emergency Recovery Plan acknowledges that communities recover best when they are supported to manage their own recovery (Emergency Management in Victoria, 2005). The Victorian Government Department of Human Services (DHS) also recognised in their psychosocial recovery framework the impact of social determinants on mental health – such as poverty, isolation and unemployment (DHS, 2009). Thus, the impact of not including the communities at all in the clean-up process, in the decision-making or during the physical works, must have had some level of impact on some community members. Exactly how much impact is not clear. Conversely it could be argued that the centralisation of the debris removal process allowed those affected to focus on other recovery efforts instead of clean-up. Either way, community consultation and involvement in the recovery needs to be considered for all aspects of the recovery.

6.4.8 Other

Contractor business impact

Grocon believes that their involvement in the debris clean-up had multiple non-tangible benefits, including a positive impact on their public reputation or brand; personal satisfaction for workers; and company togetherness through the development of a culture to “sacrifice for the common good”. Some employees were voluntarily working up to 15 hours a day (with pay).

Sacrifices were made from other projects to assist in the effort which created a sense of togetherness across the company. On one existing Grocon project site every worker agreed to work an extra hour a day to cover the staff who were assisting in the bushfire clean-up. Payroll, IT and HR departments were also strained but they did what was necessary to get the job done.

Grocon’s involvement has also led to further work following the bushfires. The state government has recognised the trust Grocon has established within the community and has brought them into the rebuilding process as well as a building advisory service.

Contract type

In addition to the organisation of the contract, the details of contract (cost reimbursement, lump sum, incentives etc) play a role in the success of the demolition and waste management process. This contract was carried out using a cost reimbursement contract (contractor costs plus an overhead fee which excluded profit margin), as provided for in Grocon’s tender.

In this case, the cost reimbursement contract worked well. Grocon was a conscientious contractor and endeavoured to minimise costs as much as possible. Contracts of this kind generally require close monitoring to ensure the contractor remains inside the scope of the works. If a contractor who was more focussed on profiteering from the disaster had been let the contract, then there would have been potential for cost overruns and time delays (as there is no incentive to finish quickly) – particularly as it appears there was no budget cap for the operation.

In the US, the Federal Emergency Management Agency (FEMA) allows only three types of contracts:

- Lump sum (for work within a clearly defined scope)
- Unit price (cost on an item by item basis)

- Cost plus fixed fee (either lump sum or unit price contract with fixed contractor fee)

Typically, according to FEMA, the initial response phase for any disaster is paid for on a time and cost basis – before a detailed assessment of the damage can be made. However, once the emergency response is over (say after the first 70-100 hours) and contracts are let for some or all of the waste management and demolition works, lump sum, unit price or cost plus fixed fees should generally be employed. FEMA notes that it is important to impose a budget cap on the works to deter cost overruns (FEMA, 2008).

Within the contract, overtime payment to employees needs to be considered. Excessive use of overtime may lead to price gouging and unnecessarily increased clean-up costs. However, in a situation where speed of debris removal is paramount, these additional costs may be justified and readily accepted by the community and authorities. FEMA considers overtime labour costs, consistent with pre-disaster company policies, a legitimate cost and therefore eligible for reimbursement (FEMA, 2007).

6.4.9 Summary

Overall all respondents agreed that the single contract, implemented by Grocon, for debris removal was a success in this case and community feedback was largely positive, including thank you emails, letters and scones! The single contract allowed for streamlined and consistent health and safety and environmental procedures across all affected areas. Organisational structures were simple and economy of scale for the physical works was also possible. The major drawback to the single contract was the limited community consultation and use of local labour.

Table 6-4 summarises the strengths and weaknesses of using a single contract for demolition and debris removal works following the bushfires.

Table 6-4 Bushfire single contract assessment summary

	Strengths	Weaknesses
Organisational	<ul style="list-style-type: none"> • More efficient use of resources. • Reduced pressure on local government resources. • Municipal waste collection continued as usual. • Clear and simple lines of communication established between regulatory and governmental authorities and the contractor. • Streamlining of QA and monitoring processes across all affected areas. • Minimised individual and/or rogue contractors. 	<ul style="list-style-type: none"> • Potentially reduced communication between contractor and ‘peace-time’ waste managers (which may impact resource sharing and effective waste management within the existing and future waste management system). Inconsistency between performance of individual subcontractors
Legal	<ul style="list-style-type: none"> • Right of entry requirements were stream-lined. • Waste ownership issues were stream-lined. 	<ul style="list-style-type: none"> • There were no procedures identified for properties that posed a public health risk but did not register for property clearance.

Environmental	<ul style="list-style-type: none"> • Greater control over environmental outcomes through monitoring and process establishment. • Greater ability to recycle. 	
Economic	<ul style="list-style-type: none"> • Economy of scale (recycling and landfill disposal etc). • Minimise profiteering / price gouging. 	
Social	<ul style="list-style-type: none"> • Greater control over health and safety through monitoring and process establishment. • Allowed for prioritisation of works within communities. • Simple process for community to understand. • Easy to monitor community acceptance of the waste management programme. • Greater control on timing of waste management works. 	<ul style="list-style-type: none"> • Potential for resentment from local community over lack of local labour use. • Non-inclusion in recovery reinforced 'victim' mentality and allegedly led to mental health issues. • Does not empower residents to participate in own recovery and potentially reducing future disaster resilience.

6.5 Decision 5: Construction of a new landfill cell

6.5.1 Decision-making process

The decision to construct a new landfill cell was largely driven by health and safety concerns for workers and the public. The decision had secondary benefits of reduced transportation costs and associated environmental benefits (such as reduced carbon emissions).

In the initial phases of the programme, Grocon investigated disposal options at landfills within the fire affected areas in order to reduce transportation time, costs and carbon emissions. But it was determined that the local landfills did not have sufficient capacity or were not willing to accept bushfire waste. However, following the health and safety incidents along the Black Spur Road (refer Section 5.2.6) there was increased urgency to find an alternative disposal site.

The decision to construct the new landfill was largely driven by Grocon and then approved by EPA. EPA facilitated a landfill consenting process which would normally take months, in just one week. In doing this the EPA was essentially accepting an increased environmental risk (within its mandate) in order to mitigate a health and safety risk (in another agency's mandate) even though existing approved facilities were available for disposal of the bushfire wastes. According to the EPA, the risk of adverse environmental effects was low at the site.

The essence of the decision is the question of whether or not an additional facility with a potentially higher environmental risk, should have been primarily used to reduce an occupational health and safety hazard, especially if alternative facilities were available. It is unclear how these potential effects were assessed and traded-off. Perhaps, the decision is

an illustration of the integrated and cross- organisational cooperation that was achieved during the bushfire response.

6.5.2 Delays

Effectively the decision to construct a new landfill caused no delays to the overall waste management programme. This was because the programme continued while the landfill was conceptualised, approved and constructed.

6.5.3 Organisational aspects

Without adequate prepared landfill area, Murrindindi Shire Council was overwhelmed by the prospect of having to construct and operate a landfill in time to receive the bushfire waste whilst managing a disaster struck community.

This initial response from the Shire is perhaps indicative of the limited ability of local authorities to react in certain crisis situations. Limited resources to devote to disaster preparedness, common in local authorities, could severely hamper a recovery effort. Therefore, in terms of debris management, in a widespread / regional event, there are significant benefits in operating a regional approach to debris management.

6.5.4 Legal considerations

The new landfill cell was approved under existing legislation and expedited regulatory processes. There is speculative doubt that the constructed landfill would have been certified in 'peace-time' conditions. The main legal concern over the landfill is the potential liability from unforeseen future adverse environmental effects.

The question is whether this disposal facility should have been constructed under 'peace-time' processes or whether it would have been more suitable to provide for it under an emergency provision. While the end result would remain unchanged, the blurring of activities carried out in 'peace-time' and those carried out in an emergency response could be avoided. This is particularly true if there is a potential for future liability for any adverse effects. While most parties agree the risk of environmental and public health risk was low, in this case, due to the nature of the site and waste, there was undoubtedly elevated risk acceptance given the landfill was designed and built so quickly.

Upon completion, the landfill cell was handed back to the Shire for maintenance and monitoring as part of their ongoing landfill operations. Grocon (contractor for construction and operation of the cell) was not required to assume the standard liability period of 30 years (for any adverse effects on the environment such as ground water contamination). Given the nature of the waste, Murrindindi Shire were happy to accept that responsibility. The details of the legal agreement and handover between Grocon and Murrindindi Shire have not been seen, however, if there were any future adverse effects all parties involved would likely be investigated, including:

- Council –owner of the site and landfill operators
- Grocon – Contractors and their subcontractors
- EPA – for approving the works
- State and Commonwealth Government / VBRRA – for funding the works
- Landfill designer – for designing the works

Sita Environmental, the Taylor's Road landfill owner and operator, advised that ordinarily 12 months would be required to construct a new landfill cell. They would not consider it feasible in a disaster unless they were provided with total indemnity for any liability for adverse environmental effects for the standard 30 year maintenance period.

6.5.5 Environmental effects

Without observing the design, construction, waste placement, covering operation etc., it is difficult to accurately assess the potential environmental impacts of this landfill operation. Given the inert nature or low putrescibility of the waste (EPA described it as essentially construction & demolition waste), the EPA concluded that there was relatively low environmental risk and that the level of protection by a single clay liner, in this environment, constructed over a two week period was sufficient protection to the surrounding environment from bushfire classified waste.

A cursory analysis indicates that:

- There will probably be little or no landfill gas from the bushfire waste
- Asbestos will cause little problem as it is essentially benign once it is buried.
- There may only be small amounts of heavy metals and other hazardous substances depending on demolition sites taken to landfill (eg industrial properties).

The specifications of the constructed landfill were well below the accepted normal practice for a landfill accepting mixed waste – such as the waste included in the bushfire waste classification – and below existing liner specifications at the Murrindindi site. The Victorian Best Practice Guidelines for Landfills (Victoria EPA, 2001) do not explicitly state the minimum liner specifications or requirements but state that approval is subject to site specific design.

It is understood that the staff provided by the contractor for operation of the landfill cell had previous landfill operation experience. Inexperienced personnel would have had limited skills in identifying and mitigating potential risks specific to landfill operations.

Reduced traffic movements and waste haulage distances led to reduced carbon emissions.

6.5.6 Economic effects

Savings were made to the Contractor (on behalf of the state and commonwealth government) in transportation by reducing the waste haulage distances. Note that, according to Grocon, this was a secondary benefit and not a main decision-driver.

Clearly additional costs were incurred in the construction and operation of the landfill. It is unknown whether or not the costs of the landfill construction and operation were considered in the justification for the landfill construction.

6.5.7 Social effects

Health & Safety

The construction of the landfill reduced truck movements through Melbourne and along the Black Spur Road. The health and safety risk to truck drivers and other road users on the Black Spur Road was also lowered by reducing travel times and driver fatigue and lessening the difficulty of the transportation route. This also lessened the risk of spilling the

contaminated waste in a crash. Many of the community members interviewed identified the truck travel along the Black Spur as a significant concern. Some also experienced near misses personally.

While reducing truck movements on the Black Spur, trucks movements in the affected region were increased. Due to the high number of displaced people in the affected areas it is unlikely that the additional truck movements would have made a significant impact on the community. According to Murrindindi Shire Council, only a handful of complaints were received about the speed of truck travel in the area.

The landfill was staffed by three persons – two Grocon staff and a Council employee all with previous experience operating a landfill. The use of trained staff was an important mitigation measure to reduce the health and safety risk to personnel operating the landfill and truck drivers offloading waste.

6.5.8 Summary

Overall, the construction of the new landfill cell was a success. The fast design, construction and consenting process showed good collaboration between organisations. The new landfill significantly reduced health and safety risk to the public and the truck drivers and reduced haulage costs. Environmentally, the landfill cell is relatively low risk. However, the execution of the new landfill siting and consenting could have been improved. The assessment process and justification for the reduced environmental standards (based on a health and safety risk) was unclear. In addition, the authors believe the expedited ‘peace-time’ processes for consenting has the potential to introduce future liability issues at the site.

Table 6-5 summarises the strengths and weaknesses of the construction of the new landfill cell in Murrindindi Shire.

Table 6-5 Bushfire landfill construction assessment summary

	Strengths	Weaknesses
Organisational	<ul style="list-style-type: none"> No impact on Shire resources. 	<ul style="list-style-type: none"> Limited Shire resources available to monitor operations of their site, if desired.
Legal		<ul style="list-style-type: none"> Liability transferred to Local Council who had limited involvement in construction and management of landfill during acceptance of bushfire waste. Questionable use of ‘peace-time’ regulations and expedited processes for an emergency.

Environmental	<ul style="list-style-type: none"> • Reduced carbon emissions by reduced transportation distances. • Landfill operations staff with previous landfill management experience with skills to identify and mitigate potential environmental risks. 	<ul style="list-style-type: none"> • Higher environmental risk due to limited assessment of effects possible in such short time
Economic	<ul style="list-style-type: none"> • Reduced travel costs. 	<ul style="list-style-type: none"> • Additional cost for landfill construction.
Social	<ul style="list-style-type: none"> • Reduced public safety risk by reducing truck trips on Black Spur. • Reduced health and safety risk in transportation of wastes. • Reduced driver fatigue by shortening travel distances. • Landfill operations staff with previous landfill management experience – reduces health and safety risk. 	<ul style="list-style-type: none"> • Increased traffic movement in affected area.

6.6 Communication

An overriding theme within all the above decisions is communication. This includes communication:

- to gather information to assist in decision-making;
- to facilitate decision-making (particularly inter-agency communication);
- to inform the public on how decisions were made; and
- to educate on how the outcome of the decision will be implemented.

In general, inter-agency communication for information gathering, sharing, analysis and decision-making was reactionary but effective. In terms of waste management, there were no pre-disaster communication plans in place. Roles and responsibilities were undefined and overall responsibilities for various aspects of the waste management process were unclear. Despite the relative success of the response to this event, planning for inter-agency organisation and communication would greatly improve the decision-making process.

Communication of the waste management decisions with the public, however, was poor, despite efforts by VBRR. The State Emergency Recovery Plan (Emergency Management in Victoria, 2005) outlines that community communication plans should be established 'as soon as practicable' in the recovery process. Despite this no community-wide consultation was carried out prior to establishment of the clean-up programme or during implementation. EPA and local councils offered informal community information services. Interestingly, according to Wheelan (EPA), 95% of the time EPA reported they were managing emotion rather than technical questions.

Consequently there was a general lack of awareness of:

- a) Health and safety procedures for independent clean-up.
- b) Waste disposal options for individual clean-up.
- c) Who funded the demolition and debris removal programme.

- d) How Grocon was awarded the contract (even amongst various government officials).
- e) The level of recycling carried out and the reinvestment of the recycling profits into the community.
- f) Efforts to use local labour and the associated challenges in doing this.
- g) The availability of mulch for erosion protection etc.

Effective communication may have short-circuited some community dissatisfaction, mitigated potential health and safety concerns (for individual clean-up) and potential environmental impacts through improper waste disposal.

7 Planning for the future

7.1 Existing attitudes on disaster waste management plans

The majority of the professionals we spoke to who were involved in the bushfire waste management response expressed that they did not believe a generic debris management plan could be generated prior to an event. Many felt there were lessons to be learnt but did not see the importance of documenting them for a future response. It is interesting to note that no previous experience was used (in terms of reports or personnel) from the Canberra 2003 fires prior to implementation of this clean-up as VBRRRA felt that the situation in Canberra was too different to the 2009 fires. This reluctance to plan for and effectively mitigate bushfire risk in Australia has also been noted by other authors (Underwood, 2009). Most respondents also expressed that they would not position their organisation any differently to heighten their preparedness for debris management after a future disaster. It is understood, however, that VBRRRA is currently working to compile lessons learnt from this disaster for integration into plans for future disaster responses.

Several of the private companies expressed that their involvement was mainly due to good commercial citizenship but would not have taken on a level of work that would disrupt their day to day operations. Most companies carry spare capacity as part of their normal business but would not consider carrying additional capacity for dealing with low probability events. However, some companies expressed that they would be open to having stand-by contracts for disaster response (subject to conditions).

For local authorities it was generally unclear as to what would have happened if the government had not established the Grocon contract. Most local authorities had no disaster waste policy or plan in place, particularly for private property clearance. There is a move by emergency managers in the respective councils to actively build relationships and develop a resource sharing for disaster response. Memorandums of understanding already exist between neighbouring councils and are used for personnel and equipment sharing in emergencies but nothing has been specifically developed for waste management

State MP Ben Hardman noted that, in general, municipal emergency response plans and state wide emergency plans were in place but these were not wholly adequate in this case. The scale of this disaster just had not been anticipated in the preparation of these plans. Any future guidelines made would need to be flexible to mould to any scale / type of disaster.

7.2 Recommendations for future disaster waste management

It is unfortunate, that even in the wake of such a disaster, that organisations still fail to realise the benefit of planning. Given the acknowledgement that lessons have been learnt, the reluctance to plan for future disasters was surprising. There are several possible reasons for this viewpoint:

- The perceived difficulty in planning for the unknown.
- The low frequency of such large scale disasters.
- The success of this particular debris management process (implemented without a plan in place).

The first step in planning for disaster waste management is consequently transcending the paradigm that planning is not possible or useful. The analysis in this report has highlighted areas where planning, in particular decision-making guidance, may have assisted the response.

A possible approach is to develop the plan around decision points. This can be achieved by anticipating: what decisions will need to be made, who should make the decision, what information will be needed, how the decision will be made; and how the decision will be communicated and then implemented. This approach may be more effective than instituting operational plans which may not be appropriate for every disaster situation.

Commonwealth / State Government level

- Determine a government funding policy on disaster waste management - either a blanket policy or a tiered approach based on disaster impact.
- Define the role of insurance and include insurance operators in the development of the above funding strategy.
- Establish a demolition and debris removal strategy (physical works), alongside the funding strategy above. Consider state vs local approach, property owner roles and responsibilities, scope of works, provisions for property owners outside scope of works. Again a tiered approach relative to disaster impact is best.
- Establish service contracts for demolition and waste removal for different levels of disaster response above – including contractors, landfill disposal, recyclers etc. where possible.
- Establish a disaster waste management organisational structure including roles and responsibilities at all levels of government and including community representatives and how this structure fits within the overall recovery framework. The inclusion / consultation of personnel involved in strategic long-term waste management is important.
- Review emergency legislative provisions for managing disaster waste, in particular:
 - Liability and prosecution issues.
 - Private property clearance for acute and/or chronic hazards without owner consent.
- Develop a policy on community communication for:
 - Waste management programme design, to aid post-disaster decision-making including for protocols for use of local labour.
 - Programme implementation at time of disaster
 - Public awareness on financial preparedness for disaster waste management

Environmental and Health & Safety authorities

- Establish environmental and health and safety information gathering and risk assessment processes for a post disaster situation.
- Establish guidelines on decision-making processes post-disaster, including:

- Cross-agency liaison strategy (EPA, DHS, VicRoads etc)
- Clear delegation of authority for decision-making within organisations.
- Regulatory support for decision-makers (liability and prosecution protection within emergency legislation).
- Minimal acceptable environmental and health and safety risks for different levels of disaster impact and/or development of a transparent process for assessing risks post-disaster and translating that assessment into the programme implementation.
- Guidelines for the appropriate use of recycling in disaster waste management.
- Establish a post-disaster communication plan for dissemination of environmental and H&S information for those carrying out their own clean-up.

Local authorities

- Establish memorandum of understandings with neighbouring authorities for sharing of resources.
- Prepare and share resource register including personal, facilities, plant and equipment.
- Prepare local disaster waste management plans including provisions for residents when no government funding is available and/or for works outside the scope of a government or municipal clean-up programme.
- Review regulatory processes for private property clearance for acute and/or chronic hazards without owner consent (in the event of no government funding for private property clearance).
- Establish service contracts for demolition and waste removal – including contractors, landfill disposal etc. where possible, for different levels of disaster response.
- Develop a policy on community communication for:
 - Waste management programme design, to aid post-disaster decision-making including for protocols for use of local labour.
 - Programme implementation at time of disaster
 - Public awareness on financial preparedness for disaster waste management

8 Acknowledgements

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Appendix A

- **Data gathering**

August reconnaissance

Team

The reconnaissance team comprised:

- Suzanne Wilkinson
- Tom Charleson
- Greg Edwards
- James Beckett
- Alice Chang (all University of Auckland)
- Regan Potangaroa (Auckland Unitec)
- Charlotte Brown (University of Canterbury)

Funding

The funding for the trip came from the Resilient Organisations programme – a collaborative effort between University of Canterbury, University of Auckland and Kestrel Group, which is looking at recovery from hazard events.

Reconnaissance Programme

The reconnaissance programme is shown in the table below. Note all references to persons or organisations came from information obtained in the below interviews, unless stated otherwise.

Victorian Bushfire August Reconnaissance Programme

Time and Date	Person	Position & Organisation
11am 7 August 2009	Tim Bamford	Contract Administrator's Representative Victorian Bushfire Recovery and Reconstruction Authority (VBRRA)
10am 10 August 2009	Frank Bortoletto	Executive Project Manager Grocon
2pm 10 August 2009	Michael O'Keeffe	Post Collection Manager Sita Environmental Solutions
11:30am 11 August 2009	Grant Jack	Manager Asset Maintenance & Services Shire of Yarra Ranges
2pm 11 August 2009	Ben Harries	Team Leader Environmental Operations Infrastructure City of Whittlesea
10am 12 August 2009	Myles Whelan	Client Relationship Manager Victorian Environmental Protection Agency
9am 13 August 2009	Matt Nind	Regional Manager Solid Waste Division Transpacific Industries Group Ltd

March reconnaissance

Team

Charlotte Brown was the sole researcher on this reconnaissance trip.

Funding

Funding for this work was by the University of Canterbury, Department of Civil and Natural Resources Engineering, departmental research fund.

Programme

The research programme for this work was carried out between the 12th and 21st of March 2010. 14 community members were interviewed and 6 completed a questionnaire. In addition to community interviews, 2 government representatives for the area and a Council representative from Murrindindi Shire were also interviewed, as shown in the table below.

Victorian Bushfire March Reconnaissance Programme

Time and Date	Person	Position & Organisation
3pm 17 March 2010	Ben Hardman	State MP for Seymour
11am 18 March 2010	Darren Ritchie	Co-ordinator Waste Management Murrindindi Shire
3pm 19 March 2010	Fran Bailey	Federal MP for McEwen

Appendix B

- **Victorian Emergency legal provisions related to waste management**

There were two main pieces of emergency legislation used to facilitate the demolition and debris removal works:

- Section 30A of the Victorian Environmental Protection Act 1970
- Section 55 of the Dangerous Goods Act 1985

The provisions are valid for 120 days and 6 months respectively. The Section 30A was renewed once during the clean-up works.

Verbatim, these Acts respectively state:

Victorian Environmental Protection Act 1970

30A. *Authority may authorise emergency storage, use etc. of waste*

(1) *Despite anything to the contrary in this Act, the Authority may approve-*
(b) the storage, treatment, handling or disposal of waste on or from any premises.

(1A) *The Authority may only grant its approval under this section for the purposes of –*

(a) meeting a temporary emergency; or

(b) providing for the temporary relief of a public nuisance or community hardship; or

Dangerous Goods Act 1985

55 *Governor in Council may make Order with respect to dangerous goods*

(1) *The Governor in Council may by Order published in the Government Gazette prohibit absolutely or subject to conditions or restrictions the manufacture, storage, supply, transfer, transport, sale or use of any dangerous goods when in the opinion of the Governor in Council it is expedient for the public safety to make the Order.*

(2) *A person who contravenes an Order made under subsection (1) is guilty of an offence.*