

# Post fire weed control and revegetation following bushfire in an urban environment at Bendigo, Victoria

Black Saturday Victoria 2009 – Natural values fire recovery program

Calum Walker, Alex Sedger



Post fire weed control and revegetation following bushfire in an urban environment at Bendigo, Victoria

**Calum J. Walker**

Department of Sustainability and Environment  
Cnr Midland & Taylor St, Epsom, Bendigo VIC 3551

**Alex H. Sedger**

Department of Sustainability and Environment  
46 Aitken St, Alexandra VIC 3714

**This project is No. 25 of the program 'Rebuilding Together' funded by the Victorian and Commonwealth governments' Statewide Bushfire Recovery Plan, launched October 2009.**

Published by the Victorian Government Department of Sustainability and Environment Melbourne, April 2012

© The State of Victoria Department of Sustainability and Environment 2012

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

Authorised by the Victorian Government,  
8 Nicholson Street, East Melbourne.

Print managed by Finsbury Green  
Printed on recycled paper

ISBN 978-1-74287-483-8 (print)  
ISBN 978-1-74287-484-5 (online)

For more information contact the DSE Customer Service Centre 136 186.

**Disclaimer:** This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

**Accessibility:** If you would like to receive this publication in an accessible format, such as large print or audio, please telephone 136 186, 1800 122 969 (TTY), or email [customer.service@dse.vic.gov.au](mailto:customer.service@dse.vic.gov.au)

**Citation:** Walker, C. J. and Sedger, A.H. (2012). Post fire weed control and revegetation following bushfire in an urban environment at Bendigo, Victoria: Black Saturday Victoria 2009 – Natural values fire recovery program. Department of Sustainability and Environment, East Melbourne, Victoria.

**Front cover:** Sparrowhawk Road, Crown land site (looking south) in Bendigo following a community planting day, August 2010 ( Calum Walker).

# Contents

Acknowledgements	iv
Summary	v
<b>1 Introduction and background</b>	<b>1</b>
1.1 History and context	2
1.2 Management of Crown land	3
1.3 Community views and activities on Crown land	4
1.4 Instigating a proactive management approach	4
1.5 Funding and complementary projects	4
1.6 Project Objectives	4
<b>2 Methods</b>	<b>5</b>
2.1 Initial planning	5
2.1.1 Infrastructure	5
2.1.2 Statutory requirements	5
2.1.3 Risk Assessment	6
2.2 Weed control	6
2.2.1 Manual weed control	6
2.2.2 Mechanical weed control	6
2.2.3 Chemical weed control	7
2.3 Revegetation	7
2.4 Community engagement	8
2.5 Future land management	8
<b>3 Results</b>	<b>9</b>
3.1 Works conducted on Bendigo Crown land parcels	9
3.2 Pre and post project condition of Bendigo Crown land parcels	9
3.2.1 Images of project work on Bendigo Crown land parcels	9



4 Discussion	11
4.1 Planning	11
4.1.1 Assessing Public Land Status	11
4.2 Weed control	11
4.3 Revegetation	11
4.4 Community Engagement	12
4.5 Future Management	12
5 Conclusion	14
References	15
Appendix 1 Project Timelines.	16
Appendix 2 Crown land parcels appropriate for future management by agencies other than DSE.	17
Appendix 3 Weed species targeted on Bendigo Crown land parcels.	20
Appendix 4 Revegetation species list.	21
Appendix 5 Works conducted on parcels of DSE managed Bendigo Crown land following the 2009 fires.	22
Appendix 6 Condition of Bendigo Crown land parcels before and after implementation of project works.	27
Appendix 7 Letter to fire-affected Bendigo residents from the Department of Sustainability and Environment, advising of weed control and revegetation activities.	33

## List of figures

Figure 1. Area burnt by the Bracewell Street Fire, Bendigo 2009.	1
Figure 2. A dangerous tree on Keenes Road site (P128020) marked for removal after the 2009 bushfire.	1
Figure 3. An example of bare ground on Crown land at Bendigo, after the 2009 bushfire, showing conditions favourable for the establishment of weed species.	1
Figure 4. Aerial photograph of Sparrowhawk Road/Empire Road site (P126810) taken on 17 February 2009, 10 days after the bushfire.	2
Figure 5. Crown land in western Bendigo (coloured). Colours denote different land managers.	3
Figure 6. Typical unauthorised use (rubbish dumping, vehicle storage and stock grazing) of Upper Road site (P126048), pre fire 17 November 2008.	4
Figure 7. Green Corps crews manually removing woody weeds at Speedy Street site (P125989).	6
Figure 8. A skid-steer groomer working on Crown land at Bendigo, February 2010.	6
Figure 9. An excavator removing large woody weeds from Happy Valley Road site (P127499), December 2009.	7
Figure 10. Approximately 350 grams of seed, used for revegetation works.	7
Figure 11. Eaglehawk High School students participate in a community planting day on Sparrowhawk Road/ Empire Road site (P126810), August 2009.	8
Figure 12. a) California Gully School site (P126010) pre-fire weed infestation showing Bridal Creeper growing amongst Peppercorns; b) following treatment in August 2011.	9
Figure 13. a) Dai Gum San site (P126059) weed control works; 13b) Regeneration after weed control.	10
Figure 14. Tubestock revegetation on treated Land Parcels.	10
Figure 15. Seedling recruitment and regeneration of indigenous species including a) <i>Acacia</i> ; b) a species of <i>Dianella</i> (Flax Lily).	10
Figure 16. Vinton Street, California Gully, a) Post-fire site work June 2010; b) Regeneration of native vegetation following weed control and site works, February 2011.	12

# Acknowledgements

This project is No.25 of the program "Rebuilding Together – Statewide Bushfire Recovery Plan, launched in October 2009 funded by the Victorian and Commonwealth Governments. The Commonwealth Government's Caring for our Country program (CfoC) also funded recovery activities which complemented and overlapped with this project.

Thank you to Stephen Smith, Stephen Platt and Samantha Strong for comments and editing during preparation of this report.

Many thanks go to the individuals who contributed their time and services to this project, as well as those belonging to the following agencies:

- Aboriginal Affairs Victoria
- Amicus (disability support service)
- Bendigo Bank (administrators of the community fund)
- Biodiversity Services (DSE)
- Central Victorian Group Training (volunteers)
- City of Greater Bendigo, staff and Councillors
- Conservation Volunteers Australia (volunteers)
- Eaglehawk High School (volunteers as Junior CFA)
- Green Gym (volunteers)
- Heritage Victoria, in particular, David Bannear
- Land and Fire (DSE)
- Long Gully Community (volunteers)
- Mission Australia
- New Green Jobs Corps
- North Central Catchment Management Authority
- Parks Victoria

Without the support of up to 50 volunteers from the community and various groups, this project would not have achieved what it has to date.

# Summary

This project rehabilitated and restored Department of Sustainability and Environment (DSE) managed areas of Crown land in and around Bendigo which were burnt by the "Bracewell Street", Black Saturday bushfire in February 2009. Weed control and revegetation works were conducted on 55 parcels of land totalling 123 hectares. Approximately 12,000 native seedlings were planted and other areas were direct-seeded. An ongoing management framework was established to ensure the effective, future maintenance of public land.

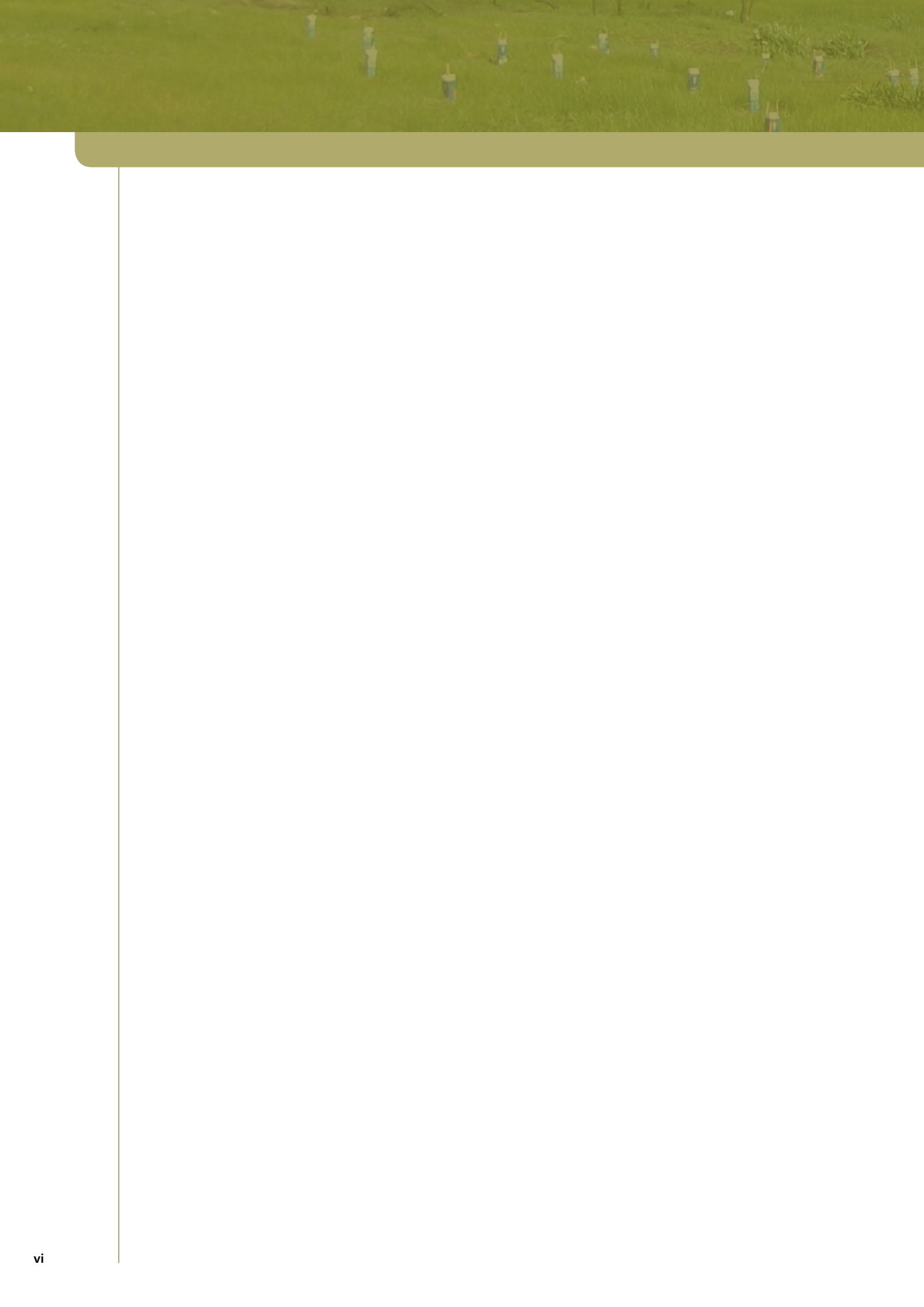
In many areas high intensity fire removed almost all vegetation cover, including weeds. This provided an opportunity to prevent weed re-establishment and promote native vegetation. Weed control activities were an immediate priority followed by establishment of native species. Future fire risk was an important component in setting tasks and priorities. Revegetation works were conducted in targeted parcels of Crown land and were used to control and manage areas prone to erosion, increase ecological diversity and flora and fauna habitat and improve local amenity. Revegetation was only conducted on parcels of land that are planned to be retained in the public estate.

The project involved a program of community engagement and public interaction. By increasing the community's knowledge of public land management issues, this project aimed to instil a more positive attitude with the hope that this would allow management regimes to focus more on ecological restoration, rather than clean up of rubbish dumping and reduction of other unauthorised activities and encroachments that had previously been occurring prior to the bushfire.

Community groups and local service providers were engaged to conduct project works, which not only promoted Crown land benefits throughout the community, but also supported local contractors. Community groups included Conservation Volunteers Australia, Green Gym, Amicus and Eaglehawk High School. These groups primarily helped with plantings, weed removal and, where appropriate, spraying. Local service providers included arborists, earth movers and nurseries.

The project has rehabilitated and improved many burnt areas of Bendigo Crown land. Many sites already have fewer weeds and more diverse native vegetation than before the fire. Project works and activities, which largely used community volunteers and the services of local contractors, have helped create a shift in attitude among the community regarding the use and value of Crown land. Over the life of the project, positive attitudes have increased amongst the local community. Work initiated under this project continued in spring 2011 with additional native species being planted and direct seeded.

A significant outcome of this project is recommendations for reallocation of sites to appropriate managers, for ongoing management, based on an assessment of their value and status. The management framework developed in this project will be implemented into the future, ensuring Crown land is effectively managed and key environmental qualities preserved.

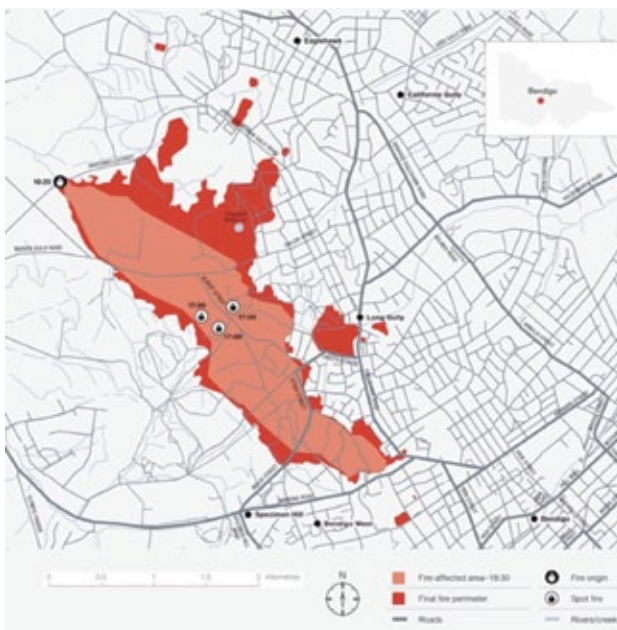




# 1 Introduction and background

The "Bracewell Street" bushfire ignited on the afternoon of 7 February 2009 and burnt 341 hectares of Bendigo's urban area, most at high intensity. Areas affected included Maiden Gully, Eaglehawk, California Gully, Long Gully, West Bendigo and Ironbark (Figure 1). As well as the loss of life and urban property, large tracts of natural bushland on Crown land were also burnt.

Figure 1. Area burnt by the Bracewell Street Fire, Bendigo 2009 (State Government of Victoria, 2010).



Due to the intensity of the fire, most burnt vegetation was either killed, or the top growth was removed. Coupled with the removal of dangerous or dead trees after the fire, the post-fire landscape was mostly bare of understorey vegetation and ground cover (Figures 2, 3 and 4). These conditions are a favourable environment for the re-establishment of weed species present before the fire and the incursion of new weeds.

Figure 2. A dangerous tree on Keenes Road site (P128020) marked for removal after the 2009 bushfire (Calum Walker).



Figure 3. An example of bare ground on Crown land at Bendigo, after the 2009 bushfire, showing conditions favourable for the establishment of weed species (Calum Walker).





Figure 4. Aerial photograph of Sparrowhawk Road/Empire Road site (P126810) taken on 17 February 2009, 10 days after the bushfire.



This project aimed to reduce weed establishment on burnt and bare areas of Crown land managed by the Department of Sustainability and Environment and where appropriate, revegetate sites with indigenous vegetation. Local contractors and volunteer labour contributed significantly to works completed during the project.

### 1.1 History and context

The City of Bendigo was established as a result of the mineral-rich gold mining era of the mid to late 1800's. The frenzied activities of the diggers and the industrialised goldmining period denuded the landscape. The landscape was described by one observer at the time as "what one might suppose the earth would appear after the day of judgement had emptied all the graves" (Dingle 1984, p44). Within a year, a seven by one mile wide stretch of the Bendigo Creek valley was left with "hardly a tree... all one huge chaos of clay, gravel, stones and pipe-clay, thrown up out of the bowels of the earth..." (op. cit. p 52).

As a consequence of this intensive industry, many public land parcels in Bendigo still have physical features related to past mining activities including hazardous shafts, tunnels, mullock heaps and other remnant mining infrastructure. These urban sites also contain significant historical values. Despite historical disturbance, some sites have maintained important ecological values (State Govt. of Victoria 2011). Although much of the pre-1750 vegetation has been removed, a number of sites contain species consistent with Box Ironbark Forest, and a more complex mosaic of Alluvial Terraces/Herb-rich Woodland Creekline and Grassy Woodland Ecological Vegetation Classes (DSE, 2004). Native plant diversity on these sites has been reduced by the incursion of weeds originating from the mining era and well established weediness has inhibited chances of increasing the coverage, quality and diversity of native vegetation (ECC 2001).

Due to many sites containing elements or combinations of, remnant mining infrastructure and historic and ecological values, development on Bendigo's public land has often

been precluded and use of the land restricted. This has resulted in a large amount of land, of varying parcel sizes, that has never been alienated from the Crown estate.

## 1.2 Management of Crown land

Crown land management is the responsibility of a variety of agencies, authorities and public groups. These include the Department of Sustainability and Environment (DSE), Parks Victoria, local council, other committees of management and public authorities. In some cases, Bendigo's Crown land is managed collaboratively by these agencies, and management often reflects recommendations made by the Victorian Environment Assessment Council (VEAC).

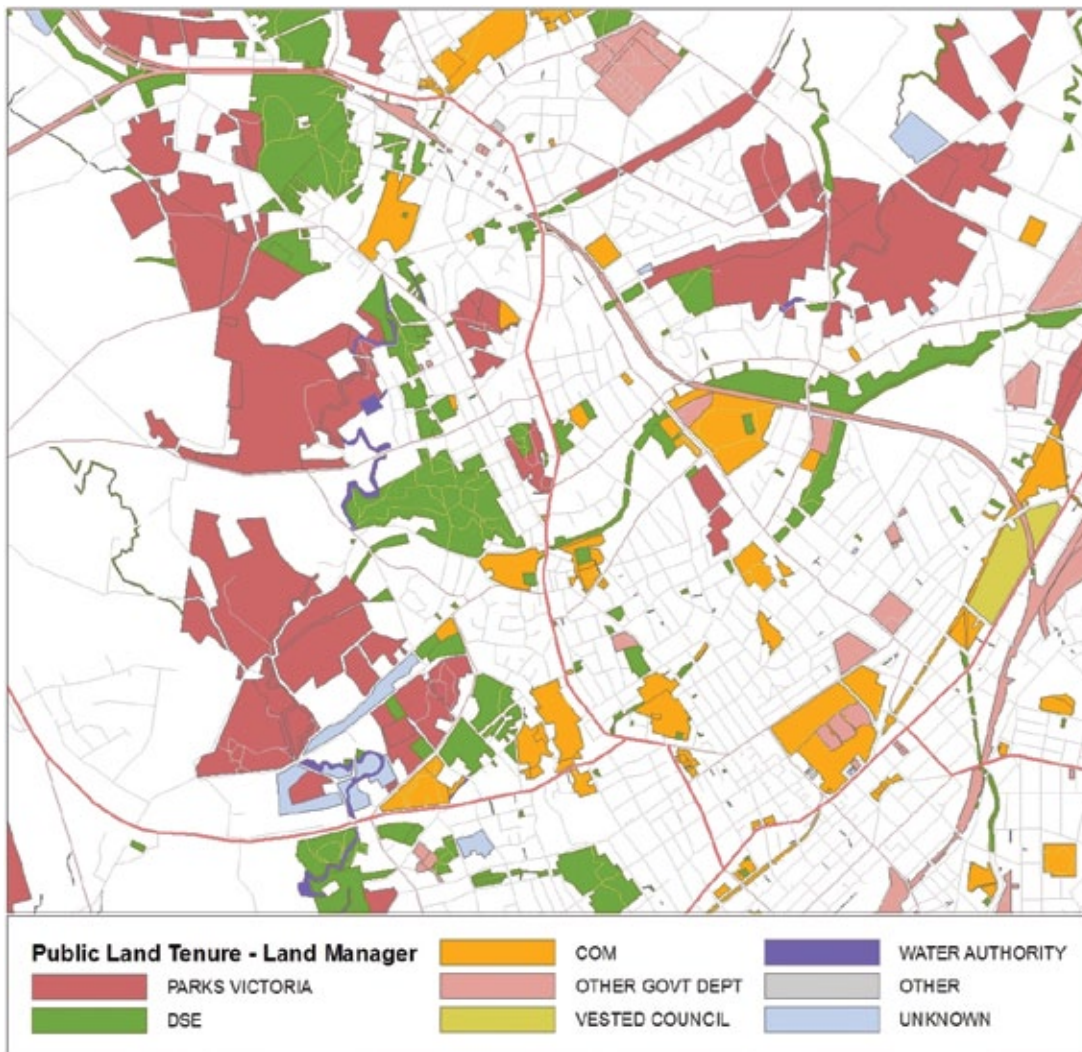
When making recommendations on how public land should be used and managed in Victoria, VEAC takes into account social, economic and environmental considerations. VEAC recommendations typically fall into broad categories relating

to conservation and preservation, resource use and other community uses. Some areas have no particular public purpose.

Areas with no particular public purpose are managed by DSE. Portions of Bendigo's Crown land fall into this last category, which are classed as 'unreserved' and 'uncommitted'. In Bendigo, these sites are often unfavourable to urban development, and primarily include heavily mined areas and areas with "significant ground disturbance" (Greater City of Bendigo Cultural Heritage Study 2010).

The resultant patchwork of Crown land and the different management recommendations across the Bendigo area is detailed in Figure 5. Throughout this report Crown land areas are identified by location descriptions, and where accuracy is required, a parcel number. A full list of parcel numbers is given in Appendix 5.

Figure 5. Crown land in western Bendigo (coloured). Colours denote different land managers.





### 1.3 Community views and activities on Crown land

A significant issue for this project arose from a long-term view that Crown land parcels held low public value and therefore could be used as refuse dumps and private parking lots. Attitudes towards Crown land and its management have not been formally measured, but there is long term evidence that some sections of the community display behaviours which show little care or regard for these sites and existing regulations. Past activities on many Crown land parcels include dumping of rubbish, including garden waste (Figure 6), off road recreational driving and other unauthorised occupations and activities (C. Walker pers. observations).

These activities create significant fire hazards, promote weed proliferation, erosion and habitat destruction, and are an impediment to implementing effective, long term and positive management strategies.

This has meant that past management activities undertaken by DSE have generally been confined to some weed control, controlling littering activities and managing risks such as collapsed mineshafts and fire hazards, with little time or resources available for proactive management.

Utilising local volunteers and employing contractors for field work was a strategy used in this project to raise awareness and increase local knowledge of Crown land issues. By promoting the benefits of Crown land, it was hoped that community attitudes would become more respectful of the natural values of these sites, and supportive of their management. Local contractors were consciously employed to support the local economy immediately after the bushfires.

Figure 6. Typical unauthorised use (rubbish dumping, vehicle storage and stock grazing) of Upper Road site (P126048), pre fire 17 November 2008 (Calum Walker).



### 1.4 Instigating a proactive management approach

Until recently, management activities on Crown land have often been undertaken reactively. Following the 2009 bushfire, it became obvious that a proactive management framework, for both prevention of future fire events and ecological restoration, was crucial for Bendigo's public land areas. After the bushfire, an opportunity arose to not only manage and reduce the effects of weed species to aid the recovery of native vegetation and wildlife habitat, but also to instigate an effective ongoing management system for Crown land currently managed by DSE.

By developing an ongoing management regime, restricting weed establishment and developing and fostering positive community attitudes, this project addressed vital issues associated with environmental impacts of the 2009 "Bracewell Street" bushfire. The approach, while providing ongoing weed management, also reduces some inherent fire risks, and assists in increasing biodiversity values at key land parcels and the range of flora and fauna through planting and natural regeneration.

### 1.5 Funding and complementary projects

This project was funded with \$150,000 from the 'Rebuilding Together' program of the Victorian and Commonwealth Government's Statewide Bushfire Recovery Plan, launched in October 2009. The program was overseen by a coordinator and directed by the Natural Values Implementation Committee. Regular reporting was provided to the Victorian Bushfire Recovery and Reconstruction Authority (VBRRRA).

This project complemented a broader ongoing program of Crown land management in and around Bendigo which also included funding from the Commonwealth Government's Caring for our Country (CFoC) program during 2009–2010.

### 1.6 Project Objectives

The objectives of this project were to:

- reduce the impact of weeds on Crown land at Bendigo following the 2009 bushfire and, where appropriate, manage and promote revegetation with diverse native indigenous vegetation
- establish a management system to guide future land use, management priorities and tenure of Crown land parcels currently managed by DSE
- develop a strong community consultation and engagement program to complement and maintain in the long term, the works conducted throughout the project.



## 2 Methods

### 2.1 Initial planning

This project began with assessment of infrastructure and weed distribution on burnt Crown land in Bendigo in compliance with DSE's policies and statutory obligations (see section 2.1.2). The assessment included discussions with service providers to determine where infrastructure lay below and above ground and individual site visits to determine whether cultural, heritage or biodiversity assets were present in the project area.

Project tasks and timelines are documented in the project plan (Table 1, Appendix 1).

Before project works began, each Crown land parcel was evaluated to determine its status and most appropriate future management options. The amount of time, effort and money required for each site was determined, and the project plan and works were implemented with a view to ensure good management beyond this project's completion. Parks Victoria and the City of Greater Bendigo were identified as appropriate future Crown land managers for several project sites, and these agencies were engaged from the outset to ensure the management regime established by this project will continue into the future.

#### 2.1.1 Infrastructure

The National Referral Service for Information on Pipes & Cables ('Dial Before You Dig') was engaged to determine where the infrastructure of different service providers lay within project sites. Agencies that were contacted included the City of Greater Bendigo (stormwater drains), Telstra (telecommunications cables), Optus (telecommunications cables), Powercor (domestic power cables), Coliban Water (sewerage, domestic water supply, stock and domestic water races, and recycled water pipes), Tenex (domestic gas supply) and SPI Powernet (domestic power cables).

The plans sourced from 'Dial Before You Dig' by these service providers determined how project works would be carried out on some sites. Generally, infrastructure did not obstruct implementation of proposed works.

#### 2.1.2 Statutory requirements

To fulfil DSE's statutory requirements, formal discussions and inspections were held with a range of agencies.

The North Central Catchment Management Authority (NCCMA) was engaged to determine whether the proposed works required a Works on Waterways Permit under the *Water Act 1989*. The NCCMA endorsed the proposals and determined that no permit was required.

DSE Biodiversity Officers evaluated whether rare or threatened species listed under the Commonwealth, *Environment Protection and Biodiversity Conservation Act (1999)* and the Victorian, *Flora and Fauna Guarantee Act (1988)* existed in project locations. Flora and fauna species were considered,

and some sites were identified as potentially having the threatened Box Ironbark Forest Ecological Vegetation Class (EVC) (see Table 6, Appendix 6), and existing or potential habitat for rare or threatened fauna species including Barking Owl, Brush tailed phascogale, Speckled Warbler and Swift Parrot. Since the extent of the Box Ironbark Forest EVC has been greatly reduced since European settlement following the long and intensive use of this land for industries such as mining, timber harvesting, grazing and urbanisation, much of this EVC is now fragmented. Due to the presence of remnants of this vegetation class, site inspections were conducted by DSE Biodiversity Officers, who confirmed that the proposed works would be likely to be beneficial to rare or threatened species. These forests support threatened species such as the Brush-tailed Phascogale, Regent Honeyeater, Barking Owl, Squirrel Glider and Powerful Owl (ECC 2011).

A Heritage Victoria archaeologist toured all sites to advise whether proposed works would be detrimental to archaeological mining sites. Heritage Victoria noted certain sites which needed to be avoided and provided operational guidelines to eliminate damage to historic features.

The local DSE Indigenous Facilitator and Cultural Heritage Values Officer was engaged to assist with the project's objective of avoiding and minimising any impact on any sites with indigenous cultural values and compliance with the *Aboriginal Cultural Heritage Act 2006*. Site inspections confirmed that the entire project area has been modified by past mining activities, and that no indigenous cultural heritage remained.

The *Catchment and Land Protection Act (CaLP) (1994)*, and the *Weed management – guidelines and procedures for managing the environmental impact of weed on public land in Victoria (2007)* were referred to in regards to weed management protocols and responsibilities required by DSE on the Public land parcels. The *Advisory list of environmental weeds of the inland plains bioregions of Victoria (2009)* outlined weed species and their status within Victoria (see Appendix 3). This information contributed to development of the weed treatment program, which applied the principles of treating new and emerging and high risk weeds first and of giving priority to protecting high value asset areas.

DSE Land and Fire provided advice on keeping fire hazards to a minimum during revegetation works, and facilitated the development of a planting plan. The resultant plan allows access for grass slashing in summer, more fire tolerant species planted closer to dwellings and freehold land, and for no planting to occur within 30 metres of freehold land. Thirty metres was chosen as it is the maximum height of Box Ironbark Forests.

Although DSE is exempt from the need to obtain planning permits, as a courtesy the City of Greater Bendigo was advised of the works before they commenced.

### 2.1.3 Risk Assessment

As heavy machinery was involved with some of the works, a risk assessment was undertaken for a number of sites known to contain mine shafts. Safe working procedures on sites with potentially dangerous mine shafts were set out and implemented throughout project activities.

These initial planning and assessment actions provided the basis for project work, which was divided into components of weed control, revegetation, community engagement and future land management (sections 2.2 to 2.5 below).

## 2.2 Weed control

Arborists and weed spraying contractors were engaged early to commence weed spraying in the most obvious areas of need, including sites Dai Gum San (P126059), Turner Street (P126015) and Speedy Street (P125989). Works focused on manual, mechanical and chemical removal of weeds.

Contractors were engaged between 3–6 times throughout the period of the project, depending on individual site requirements.

Manual labour sources included volunteers from Green Gym (run through Conservation Volunteers Australia), Eaglehawk High School students, disabled adults from Amicus and contracted labour from New Green Jobs Corps (members run through Central Victorian Group Training and Conservation Volunteers Australia). Volunteers were engaged as required. All volunteers were given a preliminary briefing, including occupational health and safety considerations, and provided with appropriate equipment and protective gear.

Appendix 5 lists the main weeds dealt with for each land parcel. For their full scientific and common names refer to Appendix 3.

### 2.2.1 Manual weed control

Two manual methods were used for weed removal. The cut and paint method involved cutting woody weed stems off near ground level and immediately painting the stump with herbicide — generally products with glyphosate as the active ingredient — according to label instructions. This technique prevents regrowth of the plant and kills the root system. Debris from cut tops were then stacked for removal or burning.

The second method involved surveying followed by hand removal of weeds. This method was used when weeds were intermixed with native vegetation that needed protection from the effects of broad scale chemical spraying and mechanical disturbance (Figure 7). It entails methodically walking through a site to identify and remove unwanted weeds by cutting with hand tools such as loppers, secateurs and pruning saws; and machine tools such as chainsaws and brush cutters.

Hand pulling and, where appropriate, selectively spot spraying weeds with glyphosate, was also used during manual weed control.

Figure 7. Green Corps crews manually removing woody weeds at Speedy Street site (P125989) (Charlie Dangerfield).



### 2.2.2 Mechanical weed control

Specialist arborists were contracted to remove large woody weeds such as Willows and Peppercorns using a variety of machinery.

A groomer (flail mower) mounted on either an excavator or a skid-steer bobcat was used to remove smaller woody weeds such as Blackberry, Briar Rose, Cotoneaster and Broom.

Figure 8. A skid-steer groomer working on Crown land at Bendigo, February 2010 (Calum Walker).



Depending on the site, a bulldozer, excavator, front-end loader or bobcat was used to clear land that was entirely infested with weeds, particularly when large woody weeds dominated a site. When such heavy machinery was used, the resulting detritus was either mulched on site, removed for offsite burning, removed from the site to landfill (particularly in the case of *Opuntia* species and other cacti or succulents) or stacked and burnt onsite (in the case of



woody and less pervasive species). Stacking and burning this material also facilitated training of project fire fighters. The method of disposal was determined by the proximity of infrastructure, dwellings and other buildings, and the local community's attitude towards burning in their neighbourhood. Weed species present on each parcel are listed in Table 5, Appendix 5.

Figure 9. An excavator removing large woody weeds from Happy Valley Road site (P127499), December 2009 (Calum Walker).



### 2.2.3 Chemical weed control

All sites where mechanical weed removal was used were also targeted for chemical treatment of weeds. Some sites, which consisted predominantly of herbaceous and grass-like weeds (such as Bridal Creeper, Pampas Grass and Spiny Rush) were treated using broad scale chemical spraying. They were treated with glyphosate and metsulfuron and applied according to Material Safety Data Sheet (MSDS) and other label requirements. Spot spraying and selective spraying techniques were used on sites that had native vegetation which needed to be avoided.

Specialist contractors were engaged to undertake much of this work, although DSE employees from the works depot at Bendigo and Green Corps crews also contributed to this work.

## 2.3 Revegetation

Crown land is broadly divided into Public land (PL) to be retained in the public estate, and Government Land (GL) which may be alienated from the public estate. Sites considered GL were deemed less appropriate for revegetation as they will potentially be passed on to private ownership in the future.

Those Land Parcels classified as PL were revegetated. Pre-1750 Ecological Vegetation Classes (EVCs) were determined for each site using DSE EVC information (DSE 2004). Plants associated with EVCs identified for these sites were ordered from local community and commercial nurseries. Some immediate direct seeding was undertaken to ensure that areas prone to erosion or contributing to raised dust on windy days did not become a greater problem in the future. In particular, sites containing waterways and large tracts of bare earth such as Turner Street (P126010) and Sparrowhawk/Empire Road (P126810) were direct seeded.

A mixture of twenty two indigenous species suited to the relevant EVCs, such as wattles, melaleucas, eucalypts and other lower and mid storey species, were used to revegetate The Crown land parcels. Planting and direct seeding occurred as required on each site.

One kilogram of seed was obtained from the Creswick Seed Bank and direct seeded into hand-scarified soil by Green Corps crews, volunteers and the project leader. This method was more effective than using mechanical rip lines, since soils were exposed and easily erodible and wet weather conditions made access to sites difficult. Direct seeding was undertaken in both the 2010 and 2011 growing seasons.

Two local nurseries supplied approximately 12,000 indigenous tubestock seedlings. Planting of tubestock was staged over two years and the timing of this was adjusted to suitable seasonal conditions, to ensure optimum growth rates and survival. The seedlings were hand planted by Green Corps crews and volunteers. Plants were watered in as necessary. More than 7,500 were planted in the 2010 growing season and to complete the project, an additional 4,500 seedlings were planted throughout the 2011 season.

A species list of plants and seed used for revegetation is included in Table 4, Appendix 4.

Figure 10. Approximately 350 grams of seed, used for revegetation works (Calum Walker).



## 2.4 Community engagement

Establishing partnerships with a range of agencies, land managers and utility providers was required to successfully implement this project. Public engagement sessions, letter drops and direct face-to-face contact was used to discuss with and inform the local community about project works. These methods were also used to increase knowledge and respect for Bendigo's Crown land and its values.

The project leader, Calum Walker, contacted Conservation Volunteers Australia (CVA) as they were already implementing projects on Crown land through the New Green Jobs Corps program (Green Corps). Green Corps crews then made contact with individuals in the community about the schedule for weed removal, fire hazard reduction and rehabilitation works.

At the same time, approximately 350–400 letters were delivered to all dwellings adjacent to, opposite or overlooking burnt crown land (see Appendix 7), informing residents of proposed works and inviting comment. All sixty five locals whose dwellings were unliveable were also contacted with the assistance of Greater Bendigo City Council and the police investigation 'Phoenix' Task Force.

The community was further engaged through bushfire recovery community meetings, which were conducted with both Council and other land managers. Meetings were held as required (approximately monthly, and attended three times by the project leader), and CVA continued to provide input as a key contact for volunteer and community involvement.

Four training sessions were delivered to Green Corps members throughout the project period. Crews were trained in public land values, including ecological, social,

heritage, economic and cultural values. They were taught how to identify weeds and native vegetation, and how to remove and spray weeds appropriately. As part of a TAFE course, Green Corps crews who participated in project work and learnt planting, fencing and plant identification skills, obtained a Certificate III in Land Management.

Volunteer and community groups were engaged with the assistance of the local newspaper (Bendigo Advertiser), council newsletter and a fire recovery newsletter. This assisted in recruitment of volunteers and participation in a community planting day. This was well attended by students from Eaglehawk High School (Figure 11).

## 2.5 Future land management

The status of each Crown land parcel (Public Land or Government Land) and its potential future management options were determined as a guide to appropriate works on all sites. Eleven sites with a total area of 27.2 hectares were identified as appropriate for future management by Parks Victoria, as inclusions into neighbouring Historic and Cultural Features Reserves and Bendigo Regional Park. Five parcels with a total area of 21.7 hectares were identified as appropriate for future management by the City of Greater Bendigo, primarily for walking trails in recreation reserves. See Tables 2a and 2b, Appendix 2 for a list of these sites.

Parks Victoria and the City of Greater Bendigo were formally approached and provided recommendations for future management of the Crown land, and these discussions are ongoing.

The framework for allocating land to relevant management agencies will continue to be implemented beyond the life of this project.

Figure 11. Eaglehawk High School students participate in a community planting day on Sparrowhawk Road/Empire Road site (P126810), August 2009 (Calum Walker).





## 3 Results

### 3.1 Works conducted on Bendigo Crown land parcels

Works were conducted on all DSE managed Crown land parcels at Bendigo throughout this project. Weed control was the principal activity and was primarily conducted using herbicide treatments. All areas received spray treatments. Manual hand weeding was implemented across 46% of the total area, while brush cutting and heavy machinery work was conducted on 43% and 70% of the project area, respectively. Seventy-six per cent of the land was revegetated by direct seeding and 46% was revegetated with tubestock (primarily carried out by volunteer community planting).

### 3.2 Pre and post project condition of Bendigo Crown land parcels

EVC values have been mostly increased to a level above that of their pre recovery status, except on parcels that contained little to no native vegetation when project work began. Based on visual inspections it is estimated that results ranging from 80% to a complete reduction of weeds were achieved in 2011. These results emphasize the value of individual management regimes across parcels. By implementing weed removal and revegetation activities to suit each parcel's unique characteristics, EVC qualities increased and weed coverage reduced across Crown land. Table 6, Appendix 6 outlines EVCs present on each parcel, and evaluates parcel condition before and after project work. A comparison of weed reduction across all land parcels after the implementation of recovery work is itemised as percentages of the total site.

The extent (or percentage) of weediness refers to those weeds denoted in Appendix 3 and Appendix 5.

Regeneration of indigenous flora, stimulated by the effects of fire, occurred in varying degrees at a number of sites where remnant indigenous vegetation had been present prior to the 2009 bushfire. These were species consistent with the Box Ironbark EVC (DSE 2004). Where competition from weeds was reduced as part of this program, growth of recruiting seedlings was vigorous after good rains in late 2010–11 (C.Walker, pers. obs.). For example, Inglewood Street (P127451) and Derwent Gully (p128089) had significant weed control work undertaken to remove woody and herbaceous weeds (ranging from 15–40% weediness). This has been beneficial to recruiting seedlings in areas of the sites where existing vegetation structure had persisted and has resulted in vigorous seedling growth. Although

Bailey Street North had significant weed growth, the removal of these plants has allowed natural regeneration to occur, resulting in an improvement in the site's biodiversity values. It is anticipated that some additional revegetation and ongoing weed control work will greatly enhance these values in the future. Sites that had very little or no existing indigenous vegetation were more suited to revegetation works, verified by the fact that there has been little recorded native flora regeneration at these sites since 2009.

#### 3.2.1 Images of project work on Bendigo Crown land parcels

Figure 12. a) California Gully School site (P126010) pre-fire weed infestation showing Bridal Creeper growing amongst Peppercorns; b) following treatment in August 2011.

12a



12b





Figure 13. a) Dai Gum San site (P126059) weed control works; 13b) Regeneration after weed control.

**13a**



**13b**



Figure 14. Tubestock revegetation on treated Land Parcels.

**14a**



**14b**



Figure 15. Seedling recruitment and regeneration of indigenous species including a) *Acacia*; b) a species of *Dianella* (Flax Lily).

**15a**



**15b**



## 4 Discussion

### 4.1 Planning

As public land projects have the potential to affect a wide range of stakeholders, each with their own unique concerns regarding the use and development of public land, it was essential that project work was well planned and that the community remained informed throughout the course of this project.

The initial stages of the project focused on identifying and addressing the key issues associated with managing public land. It was particularly important to verify types of infrastructure and their location in order to fulfill DSE's statutory requirements and to identify the public land status of each Crown land parcel. The framework, developed to prioritise works, and to consider future land management options, was expanded and built on as the project progressed. The project's management framework will continue to be used in the future and can be adopted for other projects involving these land parcels.

#### 4.1.1 Assessing Public Land Status

Assessing the public land status of each site helped to determine the appropriate amounts of time, effort and financial input that should be invested and, along with recommendations presented by VEAC, assisted with decisions regarding potential future management options.

Sites with no public land values (GL) had weeds removed, but no further works were undertaken, as better financial value could be gained from spending project funds on sites with current and potential public values.

### 4.2 Weed control

Manual weed control has been a successful method used on Bendigo Crown land sites and was therefore continued throughout this project. Due to the fire removing large amounts of vegetation and creating tracts of bare ground, the use of simple manual methods was very effective. In particular, a large amount of Boneseed (*Chrysanthemoides monilifera*) and small specimens of Wheel Cactus (*Opuntia robusta*) were removed manually.

Some Land Parcels contained minimal native vegetation, and were infested with weeds. On these sites, it was more appropriate to use broad chemical application or mechanical means to control and remove weeds. Hand held brushcutters as well as heavy machinery (excavators, skid-steer tractors, bulldozers, bobcats and front-end loaders) were used to remove both herbaceous and woody weeds.

Weed removal was difficult to implement at the Dai Gum San site due to its undulating and varied terrain, including many mullock heaps, mines and dams. Due to this, extensive manual weed removal by Green Corps crews was effective at this large site. Use of mechanical methods would have risked damaging the historic values, such as mullock heaps. Like many of the project parcels, its natural

state has been greatly improved when compared to its pre-project condition (see Appendices 2 and 6).

As a result, the combination of intensive weed removal activities resulted in reductions of large areas of weed coverage across project parcels. It is anticipated that minimal follow up work will be needed in the immediate future. However, re-emerging weeds will require monitoring and prompt action to avoid longer term predominance of weeds. Encouraging and maintaining healthy native vegetation will also assist with suppression of weeds.

### 4.3 Revegetation

Revegetation was only undertaken on sites that were classified as Public Land (to be retained in the public estate). Government Land sites were not revegetated due to the potential for these parcels to become freehold in the future. Long term maintenance of native vegetation on these sites cannot be guaranteed so investment of time, money and labour was not appropriate. As previously discussed, weeds and fire hazards were reduced on all project sites.

In conjunction with identifying public land status, assessing those sites that should be revegetated was directly influenced by VEAC's recommendations. Based on these recommendations, evaluating the most appropriate Ecological Vegetation Class (EVC) for each Public Land site was essential to ensure areas were revegetated with suitable species. As the results highlight (see Appendix 6), EVC quality has generally increased across project parcels, demonstrating the value of assessing each individual parcel and developing a specific planting plan for each site.

When preparing the planting plan, a crucial consideration was that revegetation also had the potential to exacerbate fire hazards. Therefore, although the recommended species aimed to enhance ecological and amenity aspects of the project area, they were also selected for their low fire hazard properties, such as Sheoaks (*Allocasuarina* sp.) and some Wattles (*Acacia* sp.). As sites were also revegetated with public safety and 'clear line of sight' principles in mind, many herbaceous and understorey species were deemed unsuitable. The planting layout for each site took into consideration fire hazard reduction and fire maintenance works.

Although revegetation using tubestock and direct seeding was a crucial component of this project, these methods were designed to be an adjunct to natural regeneration rather than the primary method of ecological restoration. This important factor was taken into consideration when developing the planting plans and many sites, where appropriate, were left to regenerate naturally. Most sites have good vegetation growth rates following natural regeneration and revegetation activities, highlighting that the planting plans implemented throughout the project were effective and successful. Good rainfall since the breaking of drought conditions in late 2009 is likely to be the main reason for good growth rates.



Figure 16. Vinton Street, California Gully, a) Post-fire site work June 2010; b). Regeneration of native vegetation following weed control and site works, February 2011.

**16a**



Although the project was devised to commence in April 2010, works did not begin until August. This tightened the timeframes markedly. Some seasonal work was deferred to the end of the 2011 planting season. Future planning for projects of this kind should take into consideration seasonal and community readiness and other variables, and offer flexibility in milestone dates.

#### 4.4 Community Engagement

The project engaged extensively with the local community through opportunities to be involved in project work and provision of information sessions. This facilitated volunteer involvement and contributed to a perceived shift in attitude within the Bendigo community regarding the use and value of Crown land.

Community engagement was an essential element of this project. The local community was particularly anxious following the urban bushfire. Anxiety centred primarily on concerns that Crown land would not be actively managed, or that it would be over-planted with native vegetation, leading to perceptions that there would be fire hazards at residents' 'back doors'. Through discussions with individuals in the community and at public meetings, as well as distributing information in letters, community concerns about potential fire hazards were reduced. To ensure fire hazards were kept to a minimum, the project leader developed the planting plans with technical input from DSE Land & Fire and Biodiversity Officers.

From the land manager's perspective, issues relating to fire hazard management were closely linked to community values and attitudes towards land use. Limited access caused by rubbish dumping, exotic vegetation and unauthorised dumping of flammable materials were historical management issues that contributed to fire risk.

**16b**



Current observations (C.Walker, pers. obs.) suggest there has been a positive shift in attitudes and behaviour. As well as the project restoring land parcels to a better condition, a more co-operative relationship between land managers and community will assist in minimising fire hazards and make management strategies easier to implement. As a consequence, future works will not need to focus solely on rubbish removal and reducing unauthorised activities and can be redirected to proactive management.

This change in community perceptions and attitudes towards Crown land has been particularly beneficial for managing some sites, such as Dai Gum San (P126059). DSE has received calls from neighbouring residents to report rubbish dumping and unauthorised encroachments on Crown land. However, at other sites change has not been so apparent and unauthorised use, dumping and encroachments are still occurring on Crown land. Although difficult to quantify, it is evident that unauthorised use of Crown land has generally reduced in the areas targeted by this project. Sustaining desirable attitude and behavioural changes is most likely to succeed with ongoing community engagement between land managers and the local community.

#### 4.5 Future Management

The process to transfer ongoing land management responsibilities of recommended PL parcels (containing heritage, native vegetation or recreation values) to Parks Victoria (PV) or City of Greater Bendigo has begun.

Both Parks Victoria and the City of Greater Bendigo have agreed in principle to manage twelve of the Public Land Parcels. A formal agreement process between the respective agencies is planned.





The remaining Public Land Parcels, totalling approximately 50 hectares, will continue to be managed by DSE using the regime developed during this project. Sites classified as GL (totalling 23.1 hectares) will continue to have weed management until they are sold.

Prior to the 2009 fire, management of unreserved and uncommitted Crown land in urban Bendigo tended to be reactive and ad hoc. The impacts of the 2009 fire, as well as the proactive structure of this project, have placed future management of Crown land issues firmly onto management agendas. As a consequence, the importance of proactively and co-operatively managing fire hazards and unregulated activities has been acknowledged, allowing more positive joint responses to evolve. This process has promoted the development of improved planning and management strategies in regard to revegetating and maintaining DSE managed land in the City of Greater Bendigo.

The actions implemented during this project that should continue to be conducted on DSE managed land include:

- removing weeds and fire hazards through partnerships with local community and volunteer organisations, such as Conservation Volunteers Australia and CVGT Australia Ltd
- concentration on fire prevention works within 30 metres of freehold land for the protection of human life and property
- planting of EVC appropriate fire tolerant plants, and less flammable species such as *Acacias* and *Allocasuarinas* instead of eucalypts in close proximity to freehold land
- planting of clumps of trees rather than swathes to allow for access for slashing to reduce fire hazards
- levelling of land (and removal of stumps) followed by appropriate revegetation to provide easier maintenance of Crown land.

## 5 Conclusion

As a result of the comprehensive combination of project activities focussing on weed management, revegetation and community engagement, a successful management framework has been developed to manage Crown land parcels in Bendigo, now and in the future. The framework allows proactive management of Crown land to protect human life and property whilst maintaining enhanced ecological processes.

As well as facilitating the recovery of Crown land following fire, the project engaged and empowered local community members by providing opportunities to actively participate in the project. This engagement has helped to create positive attitudes regarding Crown land and management agencies.

For the majority of sites managed in this project, DSE will continue to be the manager and implement the management strategy developed in this project. All other Land Parcels will be managed by either Parks Victoria or the City of Greater Bendigo, or will eventually be sold.

Management actions have been identified in this project which DSE's Public Land Services plan to implement, including:

- Transfer management of some public land (PL) sites to Parks Victoria and the City of Greater Bendigo
- Managing DSE public land (PL) parcels according to the principles and methods outlined in the management framework
- Managing the Government Land (GL) parcels for the purpose of future sale.

# References

Dingle, T., (1984). *The Victorians: Settling*. Fairfax, Syme &Weldon Associates, NSW, Australia.

DSE (2004). EVC and Goldfields Bioregion information sourced from: <http://www.dse.vic.gov.au/conservation-and-environment/evc-benchmarks-goldfields-bioregion>

Environment Conservation Council, (June 2001). *Box-Ironbark Forests and Woodlands Investigation – Final Report*. East Melbourne.

Greater City of Bendigo Council, (2010), *Cultural Heritage Study 2010*, Planning and Development Unit, Hopetoun Street Bendigo.

The State of Victoria, (2007). *Guidelines and procedures for managing the environmental impacts of weeds on public land in Victoria, 2007*. Department of Sustainability and Environment, East Melbourne, Victoria. Viewed at: <http://www.dse.vic.gov.au/plants-and-animals/invasive-species/weeds-and-pests-projects/the-weeds-and-pests-on-public-land-including-national-parks-initiative>

State Government of Victoria, (2009). *Advisory list of environmental weeds of the inland plains bioregions of Victoria*. East Melbourne.

State Government of Victoria, (July 2010). *2009 Bushfires Royal Commission – Final Report, Volume 1: The Fires and the Fire Related Deaths*. Melbourne.

State Government of Victoria, (2011). *Biodiversity Interactive Map 3.1* available at: <http://mapshare2.dse.vic.gov.au/MapShare2EXT/imf.jsp?site=bim> accessed: June 2011.

# Appendix 1

## Project Timelines

Although the project was planned to commence in April 2010, works did not begin until August. This tightened the timeframes markedly. Some seasonal work was deferred to the end of the 2011 planting season.

Table 1. Project tasks and timelines.

Task	Date	Comment
Delineate full area of project	End of April 2010	Deferred to August
Spray contractors engaged	End of May 2010	Deferred to August
Tractor operator engaged	End of August 2010	
Labour Hire contracted	End of August 2010	
Works on Waterways AAV permits applied for, as necessary. Discussions with DSE Biodiversity and Dial B4 you Dig commenced.	End of September 2010	
Completion of community engagement and training package	End of September 2010	
Implement community engagement and training package	October to December 2010	
Commence hand weeding	September 2010	
Works on Waterways, AAV permits received, as necessary. Discussions with DSE Biodiversity and Dial B4 you Dig completed.	End of February 2011	
Earthworks completed	End of March 2011	
Plants and seed etc ordered	End of November 2010	
Completion of first spray	End of November 2010	
Completion of second spray	End of End of May 2011	
Commence planting/seeding	End of May 2011	Too dry to commence seeding and planting
Completion of planting/seeding	End of October 2011	
Completion of hand weeding	End of October 2011	
Completion of funded Project	End of October 2011	



## Appendix 2

### Crown land parcels appropriate for future management by agencies other than DSE

Table 2a. Parcels appropriate for management by the City of Greater Bendigo.

Parcel No.	Local Name or nearby Street	Recommendation (ECC 2001)	Current conditions	Comments
P127462	Harvey Street south	J3A (Community Use – Recreation trail)	Vegetated – passive recreation. Contains council walk/cycle track	Shire has interest in taking management for passive recreation
P127500	Union Street	N1b (Uncategorised)	Vacant	This is an irregular shaped parcel
P127499	Happy Valley Road	J3A (Community Use – Recreation trail)	Vacant	Shire has interest in taking management for passive recreation
P127263	Long Gully Shopping Centre	J2 (recreation Area)	Vacant with mining era building footings. Well used as a car park for Long Gully shopping centre	With permission, council has planted on this site with eucalypts. Informal agreement that this area will be attached to the Long Gully Recreation Reserve
P127282	Long Gully Creek to Kinross St	H2 (Public Land Water Frontage)	Vacant – passive recreation	Shire has interest in taking management for passive recreation
P126820	McGowan Street	N1b (Uncategorised)	Vacant	Could be appropriate to add to council managed parcel next door

The recommendations list is derived from ECC (2001) *Box-Ironbark Forests and Woodlands Investigation – Final Report*. Environment Conservation Council, Melbourne.

Briefly, recommendations range from: “A” recommendations are National Park and “N” recommendations are uncategorised (no recommendation).

Table 2b. Parcels appropriate for management by Parks Victoria

Parcel	Local Name or nearby Street	Recommendation	Current conditions	Connectivity to other Crown land	EVC	Connectivity to other native vegetation Crown and freehold	Heritage value	Site conditions 2010
<b>P374002</b>	Ingليس Street	N1c (Uncategorised)	Vegetated	Yes	Box Ironbark	Good connectivity to Regional Park	Yes – mining	Very good native veg values. Very good connectivity to other native veg and Crown land. Evidence of heritage values. Ideal for inclusion in the adjoining Specimen Hill Bushland Reserve.
<b>P128081</b>	Liddel Street	N1a (Uncategorised)	Vegetated	Yes	Box Ironbark	Yes	2	Connectivity and ecological corridor values. Minimal input needed.
<b>P128020</b>	Keenes Road	H8 (Natural Features Reserve – Bushland Area)	Vegetated	Minimal	Box Ironbark	Yes	Yes – mining	Extremely good native vegetation and historic values.
<b>P126810</b>	Sparrowhawk Road/Empire Road	Part H2 (Public Land Water Frontage) Part N1a (Uncategorised)	Vacant	Good connectivity across roads	Box Ironbark Alluvial Terraces Herb-rich Woodland/ Creekline Grassy Woodland Mosaic	Good connectivity to Regional Park and other Public land	Yes – mining	Good native vegetation values and connectivity to other native vegetation and Crown land. Mostly regrowth. Good opportunity to provide a buffer to Regional Park
<b>P125989</b>	Speedy Street	E13 (Historic and Cultural Features Reserve)	Vacant	yes	**	**	Yes – mining	Recommended historic reserve
<b>P126005</b>	Thomas Street	E13 (Historic and Cultural Features Reserve)	Vacant	Yes	**	**	Yes – mining	Recommended historic reserve
<b>P367058</b>	Thomas Street	E13 (Historic and Cultural Features Reserve)	Vacant	Yes	**	**	Yes – mining	Recommended historic reserve

Parcel	Local Name or nearby Street	Recommendation	Current conditions	Connectivity to other Crown land	EVC	Connectivity to other native vegetation Crown and freehold	Heritage value	Site conditions 2010
<b>P125990</b>	Thomas Street	E13 (Historic and Cultural Features Reserve)	Vacant	Yes	**	**	Yes – mining	Recommended historic reserve
<b>P128071</b>	Battern Street	N1a (uncategorised)	Vacant	Yes	Box Ironbark - depleted	Yes	2	Moderate to good native vegetation value. Linkages to good native vegetation and Regional Park
<b>P378303</b> <b>P133613</b>	Walker Crescent	N1a (Uncategorised)	Vacant – Part licensed	Yes	Box Ironbark – depleted	Yes	2	Very good native vegetation values. Good linkages to native vegetation and Regional Park
<b>P367633</b>	Walker Crescent	N1a (Uncategorised)	Vegetated	Yes	Box Ironbark – depleted	Yes	2	Very good native vegetation values in parts. Good linkages to native vegetation and Regional Park

Notes: Sites that do not contain heritage values are either classified as: 1 with no Indigenous cultural heritage values, or 2 which have mining remnants and mines present. The recommendations list is derived from ECC (2001) *Box-Ironbark Forests and Woodlands Investigation – Final Report*. Environment Conservation Council, Melbourne. Recommendations include: "A" recommendations are National Park and "N" recommendations are uncategorised (no recommendation).

# Appendix 3

## Weed species targeted on Bendigo Crown land parcels

Table 3. Weed species targeted on Bendigo Crown land parcels.

Species	Code	Common Name	Weed Status
<i>Ailanthus altissima</i>	aa	Tree-of-Heaven	Undeclared
<i>Acacia baileyana</i> ,	ab	Cootamundra Wattle	Undeclared
<i>Chrysanthemoides monifera</i>	cm	Boneseed	Regionally Prohibited
<i>Cirsium arvense</i>	ca	Californian Thistle	Regionally Controlled
<i>Convolvulus arvensis</i>	ca1	Bindweed	Undeclared
<i>Cortaderia</i> spp.	cs	Pampas Grass	Undeclared
<i>Crataegus monogyna</i>	cm1	Hawthorn	Undeclared
<i>Cotoneaster</i> spp	cs1	Cotoneaster	Undeclared
<i>Cynara cardunculus</i>	cc	Artichoke Thistle	Regionally Controlled
<i>Cystisus scoparius</i>	cs2	English Broom	Undeclared
<i>Datura</i> spp.	ds	Thorn Apple	Regionally Controlled
<i>Echium plantagineum</i>	ep	Pattersons Curse	Regionally Controlled (CMA priority weed)
<i>Foeniculum vulgare</i>	fv	Fennel	Undeclared
<i>Genista monspessulana</i>	gm	Cape Broom	Undeclared (CMA priority weed)
<i>Hypericum perforatum</i>	hp	St Johns Wort	Regionally Controlled (CMA priority weed)
<i>Juncus acutus</i>	ja	Spiny Rush	Regionally Controlled (CMA priority weed)
<i>Lycium ferocissimum</i>	lf	Boxthorn	Regionally Controlled (CMA priority weed)
<i>Marrubium vulgare</i>	mv	Horehound	Regionally Controlled (CMA priority weed)
<i>Moraea</i> spp.	ms	Cape Tulip	Regionally Controlled (CMA priority weed)
<i>Myrsiphyllum asparagoides</i>	ma	Bridal Creeper	Undeclared (CMA priority weed)
<i>Opuntia</i> spp.	os	Prickly Pear; Wheel Cactus	Regionally Controlled (CMA priority weed)
<i>Oxalis pes-caprae</i>	op	Soursob	Undeclared
<i>Pennisetum villosum</i>	pv	Foxtail Grass	Undeclared
<i>Rosa rubiginosa</i>	rr	Briar Rose	Undeclared
<i>Rubus fruticosus</i>	rf	Blackberry	Regionally Controlled (CMA priority weed)
<i>Salix</i> spp.	ss	Willow	Weed of National Significance (CMA priority weed)
<i>Schinus areira</i>	sa	Peppercorn	Undeclared
<i>Senecio jacobaea</i>	sj	Ragwort	Undeclared
<i>Solanum</i> spp	ss1	Nightshade	Some species: Regionally Controlled (CMA priority weed)
<i>Tribulus terrestris</i>	tt	Bindii	Regionally Controlled
<i>Ulex europeaeus</i>	ue	Gorse	Regionally Controlled (CMA priority weed)
<i>Vinca major</i>	vm	Periwinkle	Undeclared
<i>Verbascum thapsus</i>	vt	Great Mullein	Undeclared
<i>Watsonia meriana</i>	wm	Watsonia	Undeclared
??	bb	Bamboo species	Undeclared

# Appendix 4

## Revegetation species list

Table 4. Revegetation species list.

Species	Common Name	Tubestock	Seed
<i>Acacia aspera</i>	Rough Wattle	✓	✓
<i>A. ausfeldii</i>	Ausfelds Wattle	✓	✓
<i>A. brachybotrea</i>	Grey Mulga	✓	
<i>A. dealbata</i>	Silver Wattle	✓	
<i>A. implexa</i>	Lightwood	✓	
<i>A. lanigera</i>	Woolly Wattle	✓	✓
<i>A. melanoxylon</i>	Blackwood	v	
<i>A. pycnantha</i>	Golden Wattle		✓
<i>A. rigens</i>	Nealie	✓	✓
<i>A. williamsonii</i>	Whirrakee Wattle	✓	✓
<i>Allocasuarina leuhmannii</i>	Buloke	✓	
<i>Calytrix tetragona</i>	Common Fringe-myrtle	✓	
<i>Eucalyptus behriana</i>	Bull Mallee	v	
<i>E. camaldulensis</i>	River Red Gum	✓	
<i>E. leucoxylon</i>	Yellow Gum	✓	
<i>E. polybractea</i>	Blue Mallee	v	
<i>E. viridis</i>	Green Mallee	✓	
<i>E. tricarpa</i>	Red ironbark	✓	
<i>Indigofera australis</i>	Austral Indigo	✓	✓
<i>Melaleuca decussata</i>	Totem Poles		✓
<i>M. parvistaminea</i>	Melaleuca		✓
<i>M. wilsonii</i>	Violet Honey-myrtle	✓	✓



## Works conducted on parcels of DSE managed Bendigo Crown land following the 2009 fires.

Table 5. Works conducted on parcels of DSE managed Bendigo Crown land following the 2009 fires. Refer to Table 3 for weed code full names.

Parcel	Name or nearby street	Area (ha)	Chemical weed removal				Total	Manual hand removal			Heavy Machinery	Main weeds controlled	Revegetation	
			Sprayed by project officer	Sprayed by Green Corps	Sprayed by other contractor	Sprayed by other contractor		Weeded	Brush cutter	Tube stock			Direct Seeding	
P127458	Sterry Street	2.4		1	1	2	Y	Y	Y	Y	ab, cm, ca1, cs1, gm, hp, ma, op, rr, ss1, wm		Y	
P374002	Inglis Street	1.2			1	1	Y				ab, cm, gm, hp, mv, ma, op, ss1			
P128081	Liddel Street	0.6	1		1	2	Y				cm, mv, ma, os, op			
P128020	Keenes Road	4.0			1	1	Y				cm, cs1, cs2, hp, mv, ma, os, op, rr, ss1,			
P126810	Sparrowhawk Road/Empire Road	5.0			1	1	Y		Y		ab, cm, ca, ca1, cs, cm1, cs1, cc, ds, fv, hp, ja, mv, ma, os, op, rr, rf, ss, sa, ss1, tt, vm, vt, wm	2000	Y	
P126809	Sparrowhawk Road/Stray Street	1.3			1	1					as for P126810			
P125989	Speedy Street	2.1	2	1	1	4	Y		Y		ab, cm, ca1, ccm1, cs1, cc, ds, gm, hp, lf, mv, ma, op, pv, rr, rf, sa, ss1, vm, vt		Y	
P126005	Thomas Street	2.9	2		1	3			Y		aa, ab, cm, ca1, cs, cm1, cs1, ds, fv, gm, hp, ja, lf, ma, op, pv, rr, rf, ss, sa, ss1, vm, vt, wm, bb		Y	
P367058	Thomas Street	0.4	2			2					as for P126005		Y	
P126002	Thomas Street	0.1			1	1					as for P126005			
P125990	Thomas Street	0.1	2			2					as for P126005		Y	

Parcel	Name or nearby street	Area (ha)	Chemical weed removal				Manual hand removal	Mechanical weed removal			Main weeds controlled	Revegetation	
			Sprayed by project officer	Sprayed by Green Corps	Sprayed by other contractor	Total		Weeded	Brush cutter	Heavy Machinery		Tubestock	Direct Seeding
P128071	Battern Street	1.2	2		1	3				cs1, lf, ma, op, sa, ss1			
P378303	Walker Crescent	3.5	1		1	2				aa, ab, ca1, cs, cs1, ep, fv, hp, mv, op, rr, rf, sa, ue, vm, vt, bb		Y	
P133613	Walker Crescent	3.5	1		1	2				as for P378303		Y	
P367633	Walker Crescent	0.3	1		1	2				as for P378303		Y	
P126063	Bracewell Street	0.1			2	2				as for P378303			
P126064	Bracewell Street	0.1			2	2				as for P378303			
P127462	Harvey Street south	6.4		1	1	2				ab, cm, ca, cs, cm1, cs1, hp, ja, ma, op, rr, rf, ss, sa, ss1, ue, vt, wrm, bb	2000	Y	
P133493	Lazarus Street	0.1			1	1				as for P127426			
P127503	Harvey Street corner	2.0			1	1			Y	as for P127426			
P127499	Happy Valley Road	14.0	1		2	3			Y	cm, ca1, cs, cs1, ds, fv, hp, ja, mv, ma, op, pv, rr, ss, sa, sj, ss1, vm, vt, wrm, bb		Y	
P127500	Union Street	1.4			2	2			Y	as for P127499			
P127497	Union Street	0.2			2	2			Y	as for P127499			
P127502	Union Street	0.7			2	2			Y	as for P127499			
P127263	Behind Long Gully Shopping Centre	0.6	2		1	3			Y	ab, ca1, cs1, ma, op, sa, ss1, bb		Y	

Parcel	Name or nearby street	Area (ha)	Chemical weed removal				Manual hand removal	Mechanical weed removal			Main weeds controlled	Revegetation	
			Sprayed by project officer	Sprayed by Green Corps	Sprayed by other contractor	Total		Weeded	Brush cutter	Heavy Machinery		Tubestock	Direct Seeding
P127282	Long Gully Creek to Kinross St	2.0			1	1				Y	ca, cs, cm1, cs1, cs2, fv, gm, ja, ma, op, rr, rf, ss, sa, ue, vm, wm		
P126820	McGowan Street	0.7			1	1					cs1, gm, ma, op, rr, rf, sa, ss1, vm		
P126829	Excell Street	1.7			1	1	Y				as for P126820		
P126010	California Gully School	1.3	2		1	3				Y	aa, ab, ca1, cs1, cc, gm, hp, ja, mv, ma, os, op, rr, rf, sa, ss1, vm, vt, bb		1000
P126015	Turner Street	2.2	2		1	3				Y	aa, ab, cs, cs1, ds, ep, hp, mv, op, rr, ss1, vt		Y
P125992	Bailey Street South	1.7			2	2					ab, ca, cm, cs1, fv, gm, ja, lf, ma, op, rr, rf, sa, vm, vt, wm, bb		
P126046	Bailey Street North	2.2			2	2					as for P125992		
P133474	Bailey Street North	0.1			2	2					as for P125992		
P128089	Derwent Gully	1.3			1	1					cm1, cs, ja, ma, op, rr, rf, vm		Y
P133481	Derwent Gully (south)	0.6			2	2				Y	as for P128089		Y
P126059	Dai Gum San	44.5		1	1	2	Y	Y	Y	Y	aa, ab, cm, ca, ca1, cs, cm1, cs1, cc, cs2, ds, ep, fv, gm, hp, ja, lf, mv, ms, ma, os, op, pv, rr, rf, ss, sa, sj, ss1, tt, ue, vm, vt, wm, bb	5000	Y



Parcel	Name or nearby street	Area (ha)	Chemical weed removal					Manual hand removal	Mechanical weed removal	Main weeds controlled	Revegetation	
			Sprayed by project officer	Sprayed by Green Corps	Sprayed by other contractor	Total	Weeded				Brush cutter	Heavy Machinery
P125995	Part of Dai Gum San	0.3		1	1	2				cm, ca1, cs1, ep, gm, ma, op, pv, sa, vm,		Y
P125996	Part of Dai Gum San	0.2		1	1	2				as for P125995		Y
P125983	Part of Dai Gum San	0.2		1	1	2				as for P125995		Y
P127452	Inglewood Street	2.1		1	1	2	Y	Y	Y	cs1, fv, gm, ja, lf, ma, op, rr, rf, sa, sj, ss1, vm, wvm, bb		Y
P127451	Inglewood Street	0.8		1	1	2	Y	Y	Y	as for P127452		Y
P128030	Inglis Street	0.1			1	1			Y	ab, cm, ca1, cs1, gm, hp, mv, ma, op, rr, rf, vm, vt		
P128031	Inglis Street	0.1			1	1			Y	as for P128030		
P128032	Inglis Street	0.1			1	1			Y	as for P128030		
P128033	Inglis Street	0.1			1	1			Y	as for P128030		
P127492	Dare Street (triangle)	0.6			1	1		Y	Y	cm1, cs1, fv, hp, op, rr, rf, sa, ss1, vm, vt		
P133447	Sparrowhawk Road	0.1			1	1		Y		ca1, op, vm		
P128010	Sparrowhawk Road	3.6			1	1		Y		Minimal		
P126017	Upper Road	0.1			1	1				Minimal		

Parcel	Name or nearby street	Area (ha)	Chemical weed removal				Manual hand removal	Mechanical weed removal		Main weeds controlled	Revegetation		
			Sprayed by project officer	Sprayed by Green Corps	Sprayed by other contractor	Total		Weeded	Brush cutter		Heavy Machinery	Tubestock	Direct Seeding
P126047	Upper Road and Brown Street	0.2			2	2		Y	aa, ab, ca, cs, cm1, cs1, fv, gm, hp, mv, ma, os, op, pv, rr, rf, ss, sa, ss1, vm, vt, wm				
P126049	Upper Road and Brown Street	0.6			2	2		Y	as for P126047				
P126048	Upper Road and Brown Street	0.1			2	2		Y	as for P126047				
P126040	Upper Road and Brown Street	0.2			2	2		Y	as for P126 047				
P132876	Upper Road and Brown Street	0.4			2	2		Y	as for P126047				
P126037	Upper Road and Brown Street	0.0			2	2		Y	as for P126047				
P126038	Upper Road and Brown Street	0.0			2	2		Y	as for P126047				
P126039	Upper Road and Brown Street	0.1			2	2		Y	as for P126047				
P126006	Upper Road and Brown Street	1.3			2	2		Y	as for P126047				
Total area		123.8	32.7	60	123.3	123.8	57.2	53.1	86.7	n/a	57.2	94.7	
% total area							46%	43%	70%			46%	76%

## Condition of Bendigo Crown land parcels before and after implementation of project works

Table 6. Condition of Bendigo Crown land parcels before and after implementation of project works.

Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition	Estimated Post recovery condition	Current condition (2011)
			EVC quality (high, medium, low) Weediness % area	EVC quality (high, medium, low) Weediness % area	<b>Indigenous species recruitment (revegetation and regeneration) &amp; comments</b>
P127458	Stery Street	Box Ironbark	low to medium 8%	medium 2%	Not observed yet as the work is only just completed
P374002	Inglis Street	Box Ironbark	low to medium 2%	medium 0%	Relatively well vegetated site so not much change. Some further midstorey revegetation will occur Spring 2011
P128081	Liddel Street	Box Ironbark	low to medium 2%	medium 0%	Relatively well vegetated site so not much change. Some further midstorey revegetation will occur Spring 2011
P128020	Keenes Road	Box Ironbark	low 10%	medium 2%	80% of area shows recruitment. Regeneration and response to direct seeding has been highly successful on this site, however, the structure needs to be improved with minimal planting of canopy species. Herbaceous and shrub layers are well established and diverse.
P126810	Sparrowhawk Road/Empire Road	Box Ironbark & Alluvial Terraces Herb-rich Woodland/Creepline Grassy Woodland Mosaic	low 25 – 50%	medium 5%	60% of the area showing recruitment. Revegetation with direct seeding and tubestock has been highly successful over two thirds of the site. Growth is young as yet but will improve in quality and extent over the coming years as all components of the structure of the EVC are present.
P126809	Sparrowhawk Road/Stray Street	as for P126810			
P125989	Speedy Street	non-existent	** 85%	nil to low <5%	This site is ready for revegetation works, but as there was almost nil indigenous vegetation, no regeneration has occurred.



Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition		Estimated Post recovery condition		Current condition (2011)
			EVC quality (high, medium, low)	Weediness % area	EVC quality (high, medium, low)	Weediness % area	
P126005	Thomas Street	non-existent	**	85%	nil to low	30%	<b>Indigenous species recruitment (revegetation and regeneration) &amp; comments</b> No revegetation has been undertaken on this site. Regeneration is minimal as no indigenous species present. Works undertaken on this site are continuing as a part of ongoing work.
P367058	Thomas Street	as for P126005					
P126002	Thomas Street	as for P126005					
P125990	Thomas Street	as for P126005					
P128071	Battern Street	Box Ironbark	low to medium	2%	low	0	Some recruitment of shrub layer, but only pioneer plants. Some minimal potential for revegetation in the future
P378303	Walker Crescent	Box Ironbark	low	50%	low to medium	<5%	Weeds have been reduced significantly but grassy weeds (not generally considered in this report) have persisted where there is no competition from canopy species. Some recruitment is occurring in the south of the site where indigenous vegetation exists
P133613	Walker Crescent	as for P378303					
P367633	Walker Crescent	as for P378303					
P126063	Bracewell Street	as for P378303					
P126064	Bracewell Street	as for P378303					
P127462	Harvey Street south	Box Ironbark	medium	25%	medium	<5%	Regeneration and revegetation on this site has been very successful. Some areas may be considered to contain many of the aspects of the EVC. Existing revegetation will improve the vegetation structure in the long term.

Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition		Estimated Post recovery condition		Current condition (2011)	
			EVC quality (high, medium, low)	Weediness % area	EVC quality (high, medium, low)	Weediness % area		
P133493	Lazarus Street	as for P127462					Indigenous species recruitment (revegetation and regeneration) & comments	
P127503	Harvey Street corner	as for P127462						
P127499	Happy Valley Road		low	30%	low to medium	<5%		Works on this site were completed late in the project. Revegetation (tubestock and seed) on the site will continue during winter and spring 2011 where appropriate.
P127500	Union Street	as for P127499						
P127497	Union Street	as for P127499						
P127502	Union Street	as for P127499						
P127263	Behind Long Gully Shopping Centre	non existent	**	60%	**	<5%		This site is small, some revegetation work (established trees) have been planted by City of Greater Bendigo with DSE permission. This site is a very high use site and is unlikely to be representative of an EVC.
P127282	Long Gully Creek to Kinross St	non existent	**	85%	**	20%		Revegetation (tubestock) is responding well to the good season. This site has had a great deal of mechanical weed removal work done on it. Council appears willing to continue with the weed removal works into the future.
P126820	McGowan Street	non existent	**	80%	**	<20%		Although covered with lots of weeds, this site does not contain as many invasive weeds as other sites. No revegetation has been undertaken.
P126829	Excell Street	as for P126820						

Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition		Estimated Post recovery condition		Current condition (2011)
			EVC quality (high, medium, low)	Weediness % area	EVC quality (high, medium, low)	Weediness % area	
P126010	California Gully School	Box Ironbark	low	25%	medium	<5%	<b>Indigenous species recruitment (revegetation and regeneration) &amp; comments</b> Removal of weeds, natural regeneration and revegetation (tubestock and seed) has greatly improved the quality of this site. Needs further work on revegetation to improve structure.
P126015	Turner Street	as for P126010					
P125992	Bailey Street South	Minimal Box Ironbark	nil to low	60%	low	<5%	Weed removal has increased the recruitment through regeneration of pioneer species. This has been enhanced by tubestock planting.
P126046	Bailey Street North	as for P125992					
P133474	Bailey Street North	as for P125992					
P128089	Derwent Gully	Box Ironbark	low	40%	low	<5%	This gully has been cleared of weeds. Southern area recovering well and indigenous plant recruitment obvious.
P133481	Derwent Gully (south)	As for P128089					
P126059	Dai Gum San	Box Ironbark	low to medium	25%	low to medium	15%	A number of weeds have been almost eradicated (Boneseed and Pampas Grass). This has allowed for strong recruitment of indigenous vegetation – mostly through regrowth, but also a large amount of tubestock planting.
P125995	Part of Dai Gum San	As for P126059					
P125996	Part of Dai Gum San	As for P126059					



Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition		Estimated Post recovery condition		Indigenous species recruitment (revegetation and regeneration) & comments
			EVC quality (high, medium, low)	Weediness % area	EVC quality (high, medium, low)	Weediness % area	
P125983	Part of Dai Gum San	As for P126059					
P127452	Inglewood Street	Box Ironbark	low to medium	15%	low to medium	<5%	Weeds have been reduced significantly but grassy weeds (not generally considered in this report) have persisted where there is no competition from canopy species. Other areas have a good structure including mature and recruiting species. No revegetation has been undertaken.
P127451	Inglewood Street	Part Box Ironbark	Low to medium	10%	Low to medium	5%	This site is an old School Plantation Reserve. The site has many planted native and exotic trees. The habitat and amenity values are quite good. All high priority weeds have been removed.
P128030	Inglis Street	non existent	**	8%	**	0%	All weeds removed, no revegetation work undertaken.
P128031	Inglis Street	non existent					
P128032	Inglis Street	non existent					
P128033	Inglis Street	non existent					
P127492	Dare Street (triangle)	non existent					
P133447	Sparrowhawk Road	non existent					
P128010	Sparrowhawk Road	non existent					
P126017	Upper Road	non existent					
P126047	Upper Road and Brown Street	non existent					

Parcel	Local name or nearby street	EVC	Estimated Post fire, (pre recovery) condition		Estimated Post recovery condition		Current condition (2011)
			EVC quality (high, medium, low)	Weediness % area	EVC quality (high, medium, low)	Weediness % area	
P126049	Upper Road and Brown Street	non existent					Indigenous species recruitment (revegetation and regeneration) & comments
P126048	Upper Road and Brown Street	non existent					
P126040	Upper Road and Brown Street	non existent					
P132876	Upper Road and Brown Street	non existent					
P126037	Upper Road and Brown Street	non existent					
P126038	Upper Road and Brown Street	non existent					
P126039	Upper Road and Brown Street	non existent					
P126006	Upper Road and Brown Street	non existent					

## Letter to fire-affected Bendigo residents from the Department of Sustainability and Environment, advising of weed control and revegetation activities

1 June 2009

### **BUSHFIRE RECOVERY AND PROTECTION WORKS**

Dear Resident

The Department of Sustainability and Environment is proposing works on Crown land in your vicinity.

To ensure that the works are undertaken in an appropriately sensitive manner the Department is working closely with the City of Greater Bendigo; the North Central Catchment Management Authority; Heritage Victoria and other authorities.

The works include recovery works after the fire of 7 February 2009 as well as preventative works for future fire seasons.

The proposed works include rubbish and weed removal; the levelling of some areas to allow access for a slasher; creation of firebreaks and some track maintenance to ensure access for emergency vehicles.

Some works such as rubbish removal and the removal of dangerous trees have already commenced.

If you have any questions regarding this matter please contact me on.

**Calum Walker**

Case Manager, Public Land Services







