Bushfire Management Strategy for Council Owned and Managed Land 2015-2025

City of LAUNCESTON

City Of Launceston Bushfire Management Strategy 2015-2025

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1 INTRODUCTION AND PURPOSE

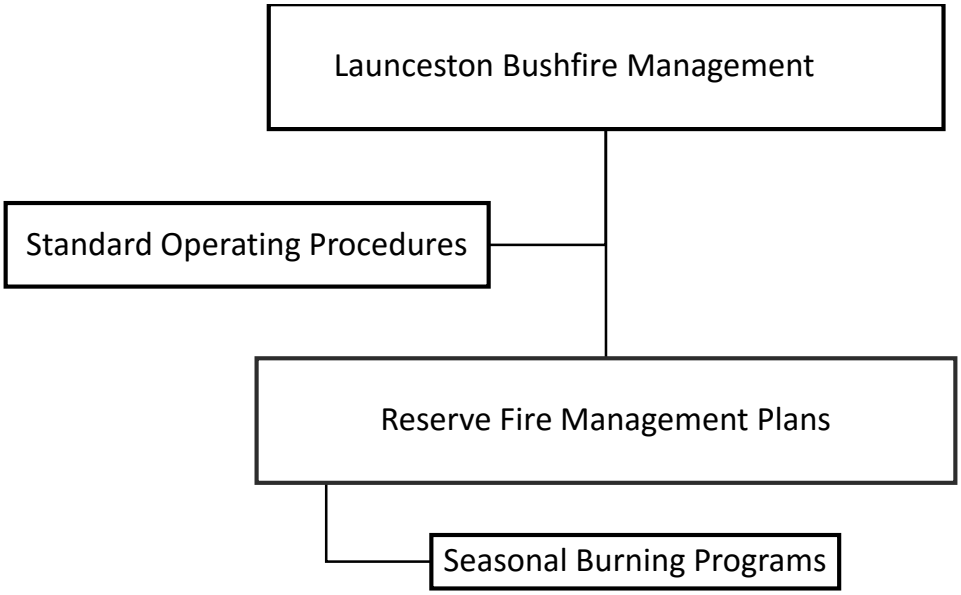
The City of Launceston owns and manages approximately 400 hectares of open forest, woodland and grassland vegetation in 35 reserves. These reserves are spread across the urban area and are important for public recreation, visual amenity and conservation of natural flora and fauna. They include significant popular areas such as Cataract Gorge Reserve and Punchbowl Reserve and also numerous small parcels of land that have been set aside as part of expanding urban development and measure only a few hectares in size. Cataract Gorge is additionally an important regional tourism destination. The reserves are almost all distinguished by their proximity to residential properties, often completely surrounding the reserves. A list of the reserves and area of each reserve is found in Appendix 1. The general location of the reserves is show on the set maps attached to this strategy in Appendix 3.

Fire is an integral part of the landscape in this part of Tasmania. The majority of the vegetation types in the reserves are fire dependent species, and wildfires will occur in these reserves at some time. It is impossible, and not desirable to completely exclude fire from these areas. However planned fire and other fuel management practices can reduce the intensity of wildfires when they occur, reducing the risk of damage to assets inside and outside the reserves, improving visitor safety, and additionally enhance flora and fauna values.

This document sets out the City of Launceston's strategic approach to fire management of the 35 reserves. It describes the context for fire management of the reserves which are largely in an urban setting, relationships to state-wide fire management systems, procedures and initiatives, and other Council plans and programs. The timing of this strategy follows a number of significant wildfire events in Tasmania and Victoria in recent years that have led to a review and publication of updated policies and procedures for wildfire prevention, safety and control. Additionally the most recent climate change modelling predicts a worsening in the fire season for this region. This strategy will assist Council's preparedness for a likely increased frequency of severe fire events.

It is important to note that Fire Management Plans have existed for most of the reserves for many years and there has been an active program of annual fuel reduction and track maintenance. However these plans are in need of review, and the approach taken is a new over-arching Strategy document covering all the reserves, complemented by updated specific Reserve Fire Management Plans. Some parks only require planned burns in selected areas within the park and some parks may require alternative treatments to planned burning such as grass cutting or manual fuel removal.

This Strategy Document describes a number of actions and is accompanied by a set of Standard Operating Procedures (SOP's) for fire management operations. Over the following two years, detailed Management Plans will be prepared for each reserve. The planning hierarchy for this document and the related management plans is shown below.



A Draft Strategy was completed in May and was reviewed by internal and external stakeholders, prior to seeking public comment on the City of Launceston Your Voice Your Launceston online community engagement site. Comments from stakeholders and the community were generally positive and recommended a number of minor changes which were incorporated in this version. In the preparation of this Strategy, Council has consulted the Tasmania Fire Service, Parks and Wildlife and the Tamar Fire Management Area Committee. This Strategy is intended to be a 10 year strategy with a minor review at five years. The Strategy was prepared by Ground Proof Mapping Pty Ltd (GPM) in 2015.

2 OVERVIEW OF THE RESERVES

Significant Reserves for the Launceston Community

Map 1. Cataract Gorge, Gees Hill (193.96ha) , Hardwicke St (32.53ha) and Havelock St (7.99ha) – The regionally significant spectacular Cataract Gorge area and adjacent Gees Hill. Hardwicke and Havelock Reserves are located close by. These Reserves are connected by continuous bushland on mostly public land and some private property. The Trevallyn NRA managed by PWS is located to the North. Cataract Gorge contains a large number of threatened species, significant infrastructure and receives thousands of local, intrastate and interstate visitors each year. A high power transmission line easement passes through the Cataract Gorge and Hardwicke Reserves.

A walking track in Punchbowl Reserve with fuel reduced area on the right.

Map 2. Carr Villa Flora Reserve and Memorial Park (57.98ha). – Located in Kings Meadows, this is Launceston's main cemetery and adjoining parklands. The Reserve and Park contain nine threatened species, predominately in the flora reserve. The majority of the area is dry forest.

Map 3. Punchbowl Reserve (25.64ha) – a locally important and popular picnic area for Launceston residents. Approximately 50% of the areas of the reserve is forest, dominated by dry *Eucalyptus amygdalina.* The golf course on the southern boundary continues south to Carr Villa Reserve, and provides an important wildlife corridor between these two reserves.

Urban Reserves that predominantly serve the immediate residential area and largely surrounded by urban blocks

West Launceston Area & Trevallyn

Map 4. Freelands Lookout (1.92ha) – a small reserve of bushland on the top of hill with a lookout tower in Trevallyn. Primary access from Bald Hill Road.

Map 5. West Launceston Community Park (5.53ha) – a community park with a playing field, open grassland and small patches of trees. Surrounded by urban residential blocks.

Map 5. Christina Place Park (0.48ha) - a small park of grassland and a few trees surrounded by approximately 12 properties in West Launceston.

Map 5. Thomas Martin Park (0.47ha) – a small park of grassland and a few trees close to West Launceston Community Park, surrounded by 19 urban residential blocks. Access via Jessica Place, Sarah Court and Lucy Place**.**

Map 5. Ingamells Reserve (0.87ha) - small lightly wooded bush area surrounded by relatively new housing developments.

Map 5. Pamela Court Reserve (2.37ha) – grassland areas with few trees, surrounded by relatively new housing developments.

Map 6. Fraser Reserve (5.64ha) – largely bushland in close proximity to Cataract Gorge reserve. The Gorge reserve boundary is approximately 100 metres away through residential properties with residences and sparse vegetation.

Woods Reserve

Map 6. Woods Reserve (7.87ha) - a significant area of lightly wooded *Eucalyptus viminalis* forest with large grassy areas. Surrounded by urban residential blocks, and in close proximity to Cataract Gorge.

Map 6. Salisbury Crescent Park (0.75ha) – a small patch of bush almost contiguous with Woods Reserve. A strip of residential properties separate these two reserves.

Map 6. Cambridge Street Reserve (4.31ha) – a small area of bush in close proximity to Woods Reserve, encircled by residential properties.

Map 6. Granville St Reserve (6.92ha) – an area of woodland, which is contiguous to a similar sized area of wooded private property to the south. The North, East and Western boundaries are urban residential areas.

Ravenswood & Waverly Area

Map 7. Ravenswood Bushland Reserve (34.26ha) – sparse bushland with grass on the northern boundary of Ravenswood. Contiguous to a large area of private land of similar vegetation. The south western facing boundary joins approximately 20 residential properties.

Map 8. Vermont Road Bushland Park (5.03ha) – a long narrow strip reserve in Ravenswood of lightly wooded sheoak bounded by residential properties and Wildor Cres to the west and Vermont road to the east.

Map 9. Distillery Creek Gorge (13.26ha) - a historically important public recreation reserve with significant remaining Eucalyptus forest. It also contains an area of significant weed infestation.

Map 10. Tasman Highway Bushland Reserve (8.36ha) – a block of acacia, sheoak and grassland bounded by industrial properties along St Leonards Road to the west and pasture to the east.

Rocherlea Area

Map 11. Heritage Forest (62.00ha) – Grassland reserve with scattered tree plantings. Area consists of Churchill Park sports grounds, City of Launceston nursery, playground equipment, slider complex and several walking and bike tracks. Surrounded primarily by residential and commercial properties on the southern, western and northern boundaries and agricultural ground on the eastern boundary..

Map 12. Rocherlea Recreation Ground (8.20ha) – grassland reserve with a sporting ground and hall, which backs onto a large area of private land which is predominately cleared land with scattered vegetation.

Map 12. Rocherlea Old Rail Trail (5.94ha) – a 4 km section of the old rail reserve. Grassland and scrub, and surrounded by large areas of grassland on either side and in part a boundary to the Mowbray Golf Course to the West.

Map 13. Ti Tree Crescent Park (5.49 ha) – sparse forest on the slope of a hill from Ti Tree Crescent to a water tower.

Youngtown Regional Park

Kings Meadow Area

Map 14. Machens Reserve (4.19ha) - predominately grass and some scattered trees, running between Diprose and Chifley Streets, surrounded by residential properties

Map 15. Meadow Ridge Reserve (1.2ha) - a small area of scrub and forest contiguous to a larger area of reserve with forest important for conservation and scenic value.

Map 16. Norwood Bushland Park (0.67 ha) – bush with light understorey adjacent to Norwood Primary School, and bounded by urban residential blocks to the North and East.

Map 17. Youngtown Regional Park (30.01ha), Miami Place (0.61ha) and Bluegum Parks (3.09 ha) – Youngtown Park is a large linear park following a small creek surrounded by new housing areas. It

is a significant open space and recreation area for the locality. It is a mix of patches of grassland and patches of sparse forest, including one threatened community.

Reserves outside Launceston City, including sporting grounds and roadside picnic areas

Map 18. Karoola Recreation Ground (4.68 ha) – a predominately non-forest area with a sporting ground and pavilion surrounded by farmland.

Map 19. Lilydale Falls Reserve (18.15ha) – a picturesque roadside reserve with a well-established picnic ground and walking track to a small waterfall. It is located 3 km north of Lilydale. The reserve is dominated by dry *Eucalyptus obliqua* forest and surrounded by pasture.

Map 20. Los Angelos Bushland Reserve (2.59ha) - a small area of dry sparse forest adjacent to a new rural housing development at Swan Bay, approximately 20kms from Launceston

Map 21. Merthyr Park (50.1ha) – a significant block of woodland forest mostly surrounded by pasture 3 km North West of Lilydale. Dissected by Second River Road, the northern part of the reserve is contiguous to privately owned native forest.

Myrtle Park

Map 22. Myrtle Park (29.4ha) – halfway between Launceston and Scottsdale on the Tasman Highway, this reserve is dissected by the Saint Patrick River. The smaller Eastern side is a grassy camping ground and recreation area, popular with campervans and tents. The larger western side of the Reserve is predominantly dense wet Eucalypt Forest. This area also contains a small patch of a threatened vegetation community, *Eucalyptus ovata* forest and woodland.

Map 23. Overview Map – this map shows the City of Launceston Region and location of all reserves.

Council also owns and manages the **Launceston Waste Centre** in the suburbs of Mowbray and Rocherlea. Fire management for the bushland surrounding the waste centre is described in the *Launceston City Council Weed and Fire Management Plan. Launceston Waste Centre, Remount Road*, completed in 2012. The majority of the remaining land around the Waste Centre is subject to a long-term farming lease.

3 GUIDING POLICIES AND STATUTORY RESPONSIBILITIES

Council Policy and Documents with Relevance to this strategy

The City of Launceston has recently undertaken a Strategic Planning Process. The **Strategic Plan 2014** contains a number of Priority Areas, Goals and Key Directions. This strategy is one key document to contribute to the achievement of two 10 Year Goals, and directly responds to Key Direction 2.1.1

Priority Area	*2*	*A city where people choose to live*
10 Year Goal	*2.1*	*To promote Launceston as a unique place to live, work, study and play*
Key Direction	*2.1.1*	*To continue to offer an attractive network of parks, open spaces and facilities throughout Launceston.*
Priority Area	*5*	*A city that values its environment*
10 Year Goal	*5.1*	*To reduce the impacts on our natural environment and build resilience to the changing intensity of natural hazards.*

The **Launceston Strategic Tourism Plan** notes Cataract Gorge as a key tourism development site requiring further investment. The Reimagining the Gorge project completed in 2015 sets out an agreed vision for future developments. Effective fire management and protection of assets is essential to realizing the goals of these tourism and reserve developments plans.

All of the reserves covered in this Strategy are noted in the Launceston Council **Open Space Strategy 2007** (currently under revision). Many of these reserves are central or primary Open Space, to which other smaller reserves can be linked to, creating extended recreation areas, and important bushland links. Launceston has long been known for its parks and gardens, and the Councils' Open Space Strategy aims to continue to provide significant areas of opens space for the community. The Open Space Strategy is based on the principles that open space provides an important role in the community contributing to environmental, economic and social well-being. Appropriate fire management of these reserves is essential to maintaining the quality of these Open Space areas. This Fire Management Strategy will contribute to achieving the Vision set out in the Open Space Strategy.

Many of the reserves also include important Play Spaces. Councils **Play Space Strategy 2013** has a focus on spaces for play as social and family recreation activity. It identifies 65 play spaces of which 12 occur within the reserves covered in this plan. The equipment at these play spaces are valuable assets to be protected, and more broadly, the quality of the play space environs are important to the enjoyment and use of the site. It is important for maintaining the popularity of these play spaces that the fire hazard around these sites is demonstrably reduced and actively managed.

The **City of Launceston Emergency Management Plan** describes the response process and approach to a bushfire emergency in the Council Municipality. The Emergency Management Governance and Responsibilities is described. For 'fires-urban, privately managed and rural land', Council is responsible for property identification, road closures and providing plant and machinery. Fire management plans for individual reserves will be an invaluable source of information for any fire in or adjacent to a reserve.

Councils **Fire Hazard Management Procedure 2013** describes Councils approach to management of fire hazards on private property and issuing of abatement notices. Council has the power under the Local Government Act 1993 as noted below to request landowners with fire hazards to remove the hazards by a specified date. If not removed, Council can enter the property to remove the hazard and seek costs from the landowner. Council document Reference number 10 – Pr – 009.

Council Policy Statement

The City of Launceston is committed to managing its bushland reserves in order to minimise the risk from bushfire to life and property, to facilitate habitat management and enhancement, and to ensure the long term sustainability of natural resources within those reserves. It is committed to managing the fire risk to ensure Launceston residents can freely recreate in these reserves, and enjoy in perpetuity the quality open space and the natural environment that these reserves offer.

State Legislation and Policy

The main responsibilities of land owners/occupiers under the **Fire Service Act 1979**, are:

- To take all reasonable precautions to prevent any fire lit on their property from spreading onto neighbouring land **(Section 63)**
- To take diligent steps to extinguish or control any unauthorised fire on their property during a fire permit period, and to report that fire to the Tasmanian Fire Service, or the Police **(Section 64)**

Additionally **Section 66 (1b)** of the Act requires persons lighting fires within the permit period with "the effect of clearing land of vegetation or for a like purpose" to do so "in accordance with the conditions of a permit granted by a fire permit officer"

Furthermore, **Section 66(12)** provides that "A person who lights and controls a fire in accordance with the conditions of a permit granted to that person under this section is exempt from the *Environmental Management and Pollution Control Act 1994".* Outside of the permit period there is no exemption from the EMPCA (for smoke). This will be managed in accordance with guidelines described in SOP 4.

The **Local Government Act 1993, Section 93** allows a council to impose a service rate on rateable land for the purpose of providing fire protection.

Section 200 of the Act requires a council to issue a **hazard abatement notice** whenever it is satisfied there is, or is likely to be, a fire risk on any privately owned land. If the person served with an abatement notice fails to comply with the notice within the specified time, the council is empowered under **Section 201** of the Act to carry out the action specified in the notice, and recover the cost from the owner or occupier of the land.

The Weed Management Act 1999 provides a legislative framework for weed management throughout Tasmania. It includes a list of "Declared Weeds" which have statutory "Weed Management Plans" outlining how they are to be controlled. Actions in Weed Management Plans can be enforced through the Act. For many weeds, fire is a critical tool for control, and conversely with poor management can increase a weed problem. It is desirable to approach weed and fire management together to reduce weed problems. A strategic approach to management of weeds in association with fire will be most effective and addressed in each Reserve Fire Management Plan. Operational Guidelines are described in **SOP 1**.

The **Threatened Species Protection Act (TSPA) 1995**, provides for "the protection and management of threatened native flora and fauna, and to enable and promote the conservation of native flora and fauna". There are 82 known threatened flora sites and 13 known threatened fauna sites across 19 of the Reserves. A large number (39) of these sites occur with the Cataract Gorge Reserve. **Section 51(a)** of the Act states states that: "A person must not knowingly, without a permit - take, trade in, keep or process any listed flora or fauna". The Act defines 'take' as including: "kill, injure, catch, damage, destroy and collect". Accordingly, the implementation of a planned burn may require a permit from DPIWE. As there may be many benefits to threatened species from burning, a more strategic approach would be to agree on management action for threatened species as part of the Fire Management Plan, rather than consideration on an individual burn.

The **Environmental Management and Pollution Control Act 1994** provides for the regulation of smoke, amongst other pollutants. The objectives of the Act stated in Schedule 1 include

"3(c) to regulate, reduce or eliminate the discharge of pollutants and hazardous substances to air, land or water consistent with maintain environmental quality"

However, note that a person lighting and controlling a fire in accordance with the conditions of a permit issued under Section 66 of the Fire Services Act 1979, is exempt from the provision of this Act. As such, providing Council has a permit for fuel reduction burning, this Act does not apply.

The **Environment Protection Policy (Air Quality) 2004** covers "planned burning" which includes low intensity burning for fuel reduction and ecological management, but does not include back burning to control wildfires. **Clause 17** of the policy states that:

> (2) Persons or organisations involved in the conduct of planned burning or in the preparation of management guidelines for such operations must take account of the health and amenity impacts of smoke pollution on individuals and the community.
>
> (3) Best practice environmental management should be employed by those persons undertaking planned burning to minimise the effects of smoke pollution on individuals and the community. This includes, but is not limited to, complying with the State Fire Management Council Guidelines on high and low intensity burning.

The **Tasmanian Air Quality Strategy, 2006** has been developed under this Act, and of relevance is Objective 13, which seeks to improve the co-ordination of planned burning to minimise smoke impacts and additional seek improved ways to manage and respond to community complaints. For improved co-ordination, Council will inform TFS of planned burning and need to rely on TFS for knowledge of other burns in the locality which may need to be considered.

The **State Policy on Water Quality and Management 1997** requires Council to manage tracks including firebreaks in a way that does not reduce water quality. It provides for the provision of Codes of Practices or guidelines to achieve the objectives of the Policy. The main risk to water quality is runoff from tracks, be they roads, fire breaks or walking tracks. Track construction & maintenance standards will follow the **SOP 2.** Current water points will be reviewed during the preparation of the Reserve Fire Management Plans. Any modifications or new construction will follow **SOP 3**.

Aboriginal Relics Act 1975 provides for the management and protection of Aboriginal heritage and artefacts. Of particular relevance is **Section 14. Protection of relics**

> **(1)** Except as otherwise provided in this Act, no person shall, otherwise than in accordance with the terms of a permit granted by the Minister on the recommendation of the Director –
> **(a)** Destroy, damage, deface, conceal, or otherwise interfere with a relic

While fire is unlikely to impact on any artefact, machinery can pose a risk. There are known sites within the reserves. These, and any new sites, should they be identified, will be managed in consultation with the DPIPWE and documented in the Reserve Fire Protection Plan.

The **Nature Conservation Act (2002)** is an act to make provision for the conservation and protection of the flora, fauna and geological diversity of the State; and to provide for the declaration of national parks and other reserved land. Of relevance is **Schedule 3A Threatened Native vegetation communities**. It is of note that a number of these communities occur in the reserves. Appropriate fire management of these communities will be considered in the preparation of the Reserve Fire Management Plans.

National and State Bushfire Policies and Guidelines

The **National Bushfire Management Policy Statement for Forests and Rangelands (2014)** outlines a set of Strategic Objectives and National Goals for broad area fire management. It is written to achieve the vision that *'Fire regimes are effectively managed to maintain and enhance the protection of human life and property, and the health, biodiversity, tourism, recreation and production benefits derived from Australia's forests and rangelands'.* This strategy is consistent with the objectives stated in the Policy statement, namely

1. Effectively Manage the Land with Fire
   - *COL will utilize fire for fuel reduction in some reserves as appropriate*
2. Involved and Capable Communities
   - *COL will consult with residents and inform stakeholders of fire management actions*
3. Strong Land, Fire and Emergency Partnerships and Capability
   - *COL will engage with other key land management agencies and facilitate a partnership approach to land management*
4. Actively and Adaptively Manage Risk
   - *COL will monitor and record information on fuel loads and burn effectiveness to continually improve practices to reduce the impact of unplanned fire*

The statement recognizes in some situations, fire cannot be used as a tool for managing bushfire risk and other techniques must be utilized to reduce fire hazards.

The **State Vegetation Fire Management Policy 2012** identifies a number of Action Areas with a strategy and supporting actions. This Council strategy applies the principles outlined in the policy and in part contributes to *Action Area 5.1 Management of Fire in Vegetation* and *Action Area 5.2 Community Awareness and Engagement.*

The Tamar Fire Protection Plan (November 2014) outlines the regions strategic protection plan, and is endorsed by the State Fire Management Council. The Plan contains a number of priority areas for fuel reduction. A representative of Council sits on the Tamar Fire Management Area Committee. The primary focus of the current plan is strategic cross tenure large scale fuel reduction burning. This does not currently include any of the reserves managed by COL. However, the fundamental principle in the plan, of a tenure-blind approach to fire risk management is an approach that will be taken with the preparation and implementation of reserve management plans.

The State Fire Management Council position paper on the **Management of Smoke Arising from Prescribed Burning of Vegetation** will be used as guide for management of smoke from fuel reduction burning in the Reserves. Further to the legislation noted above, this position paper outlines the related legislation and guidelines, and advocates a number of practices. Council will follow these practices in the use of fire for fuel reduction. Clearly, burning in a residential area has the potential to cause significant nuisance to many households. Great attention will be paid to planning burning to occur in weather conditions that minimise the smoke pollution to residents. Consideration will be given to fuel type and management to minimise smoke and to alternatives to burning where there are particular smoke issues. Where burning is the most appropriate method

for fuel reduction, smoke is unavoidable and good communication with residents is important for affected households to minimise their exposure to smoke and the impact on their environment. The position paper is included as **SOP 4**.

Following the damaging 2013 fires season, a report of enquiry was conducted. The **2013 Tasmanian Bushfires Enquiry** made a number of recommendations. This strategy supports the implementation of some of the recommendations particularly

Recommendation 82: That the State Emergency Management Committee determine suitable risk management tools, such as the Bushfire Risk Assessment Model, and encourages their use in assessing bushfire risk in a consistent manner.

Recommendation 86: That the State Fire Management Committee considers developing a structured, systemic and proactive bushfire hazard reduction program with municipal councils and Tasmania Fire Service; and advises the Government on any legislative or other changes required to implement such a program.

4 RESERVE ASSETS, RISKS AND OPPORTUNITIES

Assets

The primary **assets** in these reserves are:

- Native vegetation and bushland areas important for species conservation, amenity and open space.
- Visitor infrastructure ranging from walking tracks and small picnic tables, to large playgrounds, buildings and a chairlift.
- Utility infrastructure or easements that passes through or on the boundaries of the reserves

Risks

The primary **risks** of fire in these reserves come from:

- Fire from adjacent lands, principally from adjacent properties. With a very high number of adjacent residential properties, the number of potential ignition points in close proximity to the reserves is significant
- Fire starting in a reserve. With high general usage and a large number of visitors during summer, the risk of accidental ignition is not insignificant.
- For any fire occurring in a reserve, there is a risk of escape onto adjacent property which would threaten surrounding assets, principally residential housing.

A fire **risk assessment** will be carried out for each reserve in the preparation of the Reserve Fire Management Plans. The **National Emergency Risk Assessment Guidelines 2010** will be used as a framework.

To assess **landscape level** risk for each reserve, The **Bushfire Risk Assessment Model (BRAM)** developed and managed by PWS (DPIPWE) will be utilised as part of the preparation of each specific management plan. It is a computer based geographical information system (GIS) modelling tool that uses a series of inputs (spatial data, fire behaviour equations & climate records etc.) to assess the spatial risk of a bushfire to a specific area. A representation of risk is developed when the factors of **likelihood** and **consequence** are combined. Likelihood is defined as a qualitative method to assess the likelihood rating to the consequences occurring. The likelihood of an event is generated by the average combinations of the output generated from the following spatial information: ignition potential, suppression capabilities and fire behaviour potential, followed by assigning these output values to categories in a likelihood matrix. Consequences (values at risk) are defined as a qualitative rating of damage from fire to values. Values at Risk are defined as objects or locations that hold a relative economic, social or environmental worth and include Constructed (buildings), Forestry / Agriculture values, Natural – (flora, fauna, geo-conservation).

The model assists in objectively defining areas where genuine risk is present. In-depth analysis will indicate what factor is driving the risk for a given area. It must be noted that the BRAM and therefore the consequences, likelihood and risk outputs are based on available spatial data. The analysis has been undertaken on a state-wide basis, and maps are presented as complete for Tasmania. Examination of previous state-wide modelling suggest that for the majority of the reserves, the BRAM modelling will indicate a High or Moderate risk. Notwithstanding limitations, the model does provide an objective spatial analysis of bushfire risk in a landscape consequence.

At the **Reserve level**, detailed field assessments will be carried out to classify fire risks and identify mitigation actions. This will include classification of vegetation types and treatable areas, slope, aspect, prevailing fire weather, vulnerability of assets, defendable space, firefighting infrastructure and consequences of an unplanned fire. A fuel hazard assessment **(SOP 5**), will be utilised as a tool for determining the need for fuel reduction operations. The application of the overall hazard rating as a threshold for mitigation action will be with consideration of the needs of special values (such as burning requirements for threatened species) and the value and vulnerability of adjacent assets to be protected. Mitigation actions will be developed in consultation with key stakeholders and a schedule of works included in the Reserve Management Plan.

Opportunities

Fuel Reduction Options

Planned fuel reduction burning is one of the most cost effective methods of vegetation management involving reducing the fuel loads around infrastructure and assets. Fuel management burning is undertaken in asset protection and fuel modified buffer zones, and requires fires of sufficient intensity to meet objectives whilst ensuring safety standards are not compromised and

escapes are minimised. The objectives of fuel management burning are to increase the potential for wildfire suppression and/or the likelihood that fires will self-extinguish. Thus, it is critical that the fuel hazards immediately adjacent to assets and/or sources of ignition are prioritised. The Planned Burning form used by Council is found in **SOP 6**.

In some instances, planned burning for vegetation management may not be able to be undertaken. This could be due to the area being zoned as a fire exclusion zone. These zones are generally located adjoining high value assets (such as some visitor infrastructure), where under no circumstance, should planned burning be used. Another reason for not using planned burning is where weeds may become an issue and the fuel management is actually compromised over a period of time with an increase in fuel loads.

Alternatives to fuel reduction burning may include but not limited to the following;

- Slashing and/or mowing
- Mulching
- Chipping
- Hand Removal
- Mechanical Removal

Planning Approvals and location of new buildings adjacent to reserves.

The reserves are located in established suburbs and residential properties surrounding. However, some of the Reserves are located in new residential developments with as yet, few houses on the boundary of the Reserve. For new buildings adjacent to the Reserves, Council has the power through the residential planning approvals to ensure buildings comply with best practice for building in fire prone areas. There will be opportunities to plan for an effective defendable space and minimise the risk of damage to adjacent assets should a wildfire become established in a

Reserve. The primary reference for planning in these areas is the Council Interim Planning Scheme 2015, section E1.0 Bushfire Prone Areas Code. Additional resources include the Tasmanian Fire Service Guidelines for Development in Bushfire Prone Areas and Australian Standard AS 3959 – 2009.

Where there are existing properties around the Reserves, in the preparation of the Fire Management Plans for each Reserves, particular attention will be paid to creating a defendable space around assets. More information on creating and maintaining defendable space is described in **SOP 7**.

Species conservation and enhancing biodiversity

Many species in the Australian environment are adapted to fire. Changes in fire regimes, in frequency and intensity, can cause one species to become extinct, while favour other species. Planned fuel reduction burning can be effectively used to enhance biodiversity within an area. Through utilising a mosaic burning approach, aiming for a patchwork of burn unit size, and burn intensity, an area of forest can be maintained with variable fuel loads and understorey characteristics, while reducing overall fuel loads to protect the areas from damage that a high intensity damage unplanned wildfire can cause. Variation in habitats created from a mosaic burning regime will best provide for a variety of flora and fauna. Particular attention will be paid to the threatened species that occur with the reserves, and burning regimes will be discussed with experts to ensure they support the recovery of these species.

Working together across the landscape

With recent severe fires in Tasmania and Victoria, greater attention has been placed on strategic risk reduction across the landscape. As wildfires have no regard for property boundaries, the same approach should be taken for fire risk reduction, with a tenure blind approach to burning and fire preparedness. Where reserves bound large bush properties, Council will seek to manage the fire risk in these areas together with neighbours in operationally appropriate vegetation units. One particular opportunity to take this approach is to examine the fire risk management across the Cataract Gorge Reserve and the Trevallyn Nature Reserve managed by PWS.

Through the Fire Protection Plan preparation and implementation, Council will work with residential neighbours for localized fuel management and treatment of fire hazards. Council will identify ways to reduce fire risk from addressing fuel in the reserve and on their properties.

Additionally, the fuel reduction burning program provides an opportunity for Council to work closer with TFS. While Council has its own works crews, some burns are already conducted with involvement of TFS staff. This is of assistance to Council, but beneficial to provide TFS staff with familiarity with the reserves which would be useful for response to a wildfire in the Reserves.

Mitigate intensity of events from climate change

Climate change has the potential to significantly impact Tasmania, and increase the challenge of fire management for these Reserves. The Climate Commission's report of 2013, *A Critical Decade*, identifies for Tasmania a 0.8 degrees warming since the 1950's, together with longer summers, and drying autumns. This lengthening of the fire season is expected to continue.

The ACE CRC *Climate Futures for Tasmania* report has used downscaled projection models to examine extreme climatic events. The project arose from the 4th IPCC report, which suggests that even a small increase in mean temperature could be accompanied by a disproportionate change in the intensity and frequency of extreme climate events. The model projected an increase in the number of summer days (days above 25 degrees) and number of heat waves (three consecutive days above 28). There will be more warm days and warm nights in future decades.

The CSIRO/BOM Climate Futures report 2014, provides the most recent overview of recent trends in temperature and rainfall, and also model predictions for future climate scenarios. In recent decades, fires seasons have been longer and there has been an increase in severe fire weather days. For Launceston, there has been a 0.5 point increase per decade for Forest Fire Danger Index since the 1970's.

Two future scenarios (high and low emissions) have been examined. Taking the period 1980-1999 as the baseline, by 2050, the number of extreme fire days in southern and eastern Australia is expected to increase 10-50 percent under low emissions and 100-400 per cent under high emission scenario. A longer fire season is also expected with additionally an increase in droughts.

The trend towards a worsening fire seasons is clear. Council will need to review its preparedness for dealing with the increased frequency of high fire danger days in coming years. A precautionary approach should be taken with building infrastructure in and adjacent to reserves, and ensure risk assessments take into consideration the probability of an increased frequency of high fire danger days. In preparation of the Fire Management Plans, Council will consider long term fire infrastructure needs and possible scenarios for burning schedules.

Engagement with the local community on fire management practices and fire safety

Recent policy reviews and fire preparedness statements have emphasised the need for building community resilience and improving community preparedness. This is reflected in the **State Bushfire Safety Policy (2014)** and also the **Tamar Fire Protection Plan 2014**. While the priority is for vulnerable communities in more rural bush settings, the principles of improving community information and community preparedness are relevant for residential areas adjacent to the Council Reserves.

There are opportunities for Council to engage with the community in the following ways:

- In the preparation of the Reserve Fire Management Plans, the public will be invited to comment and contribute to risk reduction strategies. Large adjacent properties will be consulted with in detail, as will adjacent properties where particular high fire risks are identified

- For burning operations, every adjacent neighbour to a reserve will be notified of the planned burn. Additionally, other landowners, schools or businesses who may be affected in the nearby vicinity will also be notified. The Council template for written neighbour notification is found in SOP 8.
- Council will utilise its website and other social media to inform the community of fire preparedness.
- Signage will be placed in reserves ahead of fuel management actions.
- Advertisements will be placed in the local paper.

5 FIRE MANAGEMENT OBJECTIVES

1. Manage fuel loads across the reserves in order to
   - reduce the intensity of unplanned burns
   - reduce the likelihood of a burn entering a reserve causing catastrophic damage
   - increase the opportunities for control of any unplanned burn within a reserve
   - protect physical and cultural assets in the Reserves, and reduce the risk of uncontrollable fire to adjacent properties
   - maintain or improve the visitor experience and visitor safety of Council Reserves

2. Maintain or improve biodiversity within the reserve through a mosaic of burning areas and intensities.

3. Reduce weed problems within reserves through burning with pre burn and follow up treatment.

4. Ensure fire infrastructure enables access for effective fuel management and wildfire control

5. Identify and facilitate operational efficiencies and cross tenure infrastructure and vegetation management

6. Work cooperatively with other fire fighting agencies, ensuring that the management and suppression of fires is undertaken safely, efficiently and cost effectively.

7. Record and manage appropriate fire management data about each reserve in an easily accessible format for improved planning, management and incident response.

8. Community and stakeholder engagement in the fire management planning process

9. Improve the communities understanding of fire hazards and actions to remove hazards and reduce the fire risk.

6 STRATEGIC ACTIONS

1. **Management Plans**. Council will prepare management plans to cover each of the 35 reserves. Larger reserves will be covered by an individual plan. Some smaller reserves occurring in the same locality may be included in a single plan if operationally appropriate. The Reserve Fire Management Plans will be prioritised based on the bushfire risk using the BRAM modelling, fuel hazard assessments, together with a priority for high visitation areas and reserves with a significant number of neighbours and other stakeholders.

2. **PWS Partnership** Council will enter into an MOU with PWS with respect to burning adjacent areas and combining burn units regardless of tenure boundaries with Trevallyn State Recreation Area and Cataract Gorge Reserve. This MOU will be agreed during the preparation of the Gorge Fire Management Plan in 2015-2016.

3. **TFS Partnership** Council will renew and maintain the MOU with TFS for planned burning.

4. **Competent Staff**. Council will ensure staff have adequate up to date training in order to implement the annual fire infrastructure inspection and maintenance program and fuel reduction program

5. **Communication**. Council will utilise social media and the Councils online information site to inform the community on fire management actions and responsibilities of adjoining landowners. Other media will also be used to improve community understanding and preparedness.

6. **Community input** will be sought for the implementation and review of this strategy and for the preparation and implementation of each Reserve Fire Management Plan

7. **Management of risks on adjacent land**. Council will discuss fire risks on adjacent land with landowners and where necessary utilize Council regulations to request landowners to reduce the hazard.

8. **Interagency cooperation**. Council will continue to be a member of the Tamar Fire Area Committee meetings and other State Fire Management meetings which have relevance to the City of Launceston lands.

9. **Annual monitoring and mitigation works**. Council will annually inspect each reserve prior to the fire season and prepare a plan of works reducing the risk and severity of unplanned fire. The annual inspection will look at fire risk and hazard within the reserves and adjacent to the reserves.

10. **Weed Control**. Council will consider weed management during fuel reduction treatment and optimise the outcomes for both reducing weeds (including follow-up action after treatment) and reducing fire risk. Council will ensure resources are available for appropriate weed control following burning.

11. **Data Management**. Council will utilize appropriate information technology to assist with the management and control of these reserves. This includes maintaining up to date GIS maps of fire infrastructure, burn history and creation of a database for recording the impact of planned and unplanned burns. This data must be readily accessible for Council and TFS staff.

7 MONITORING AND EVALUATION

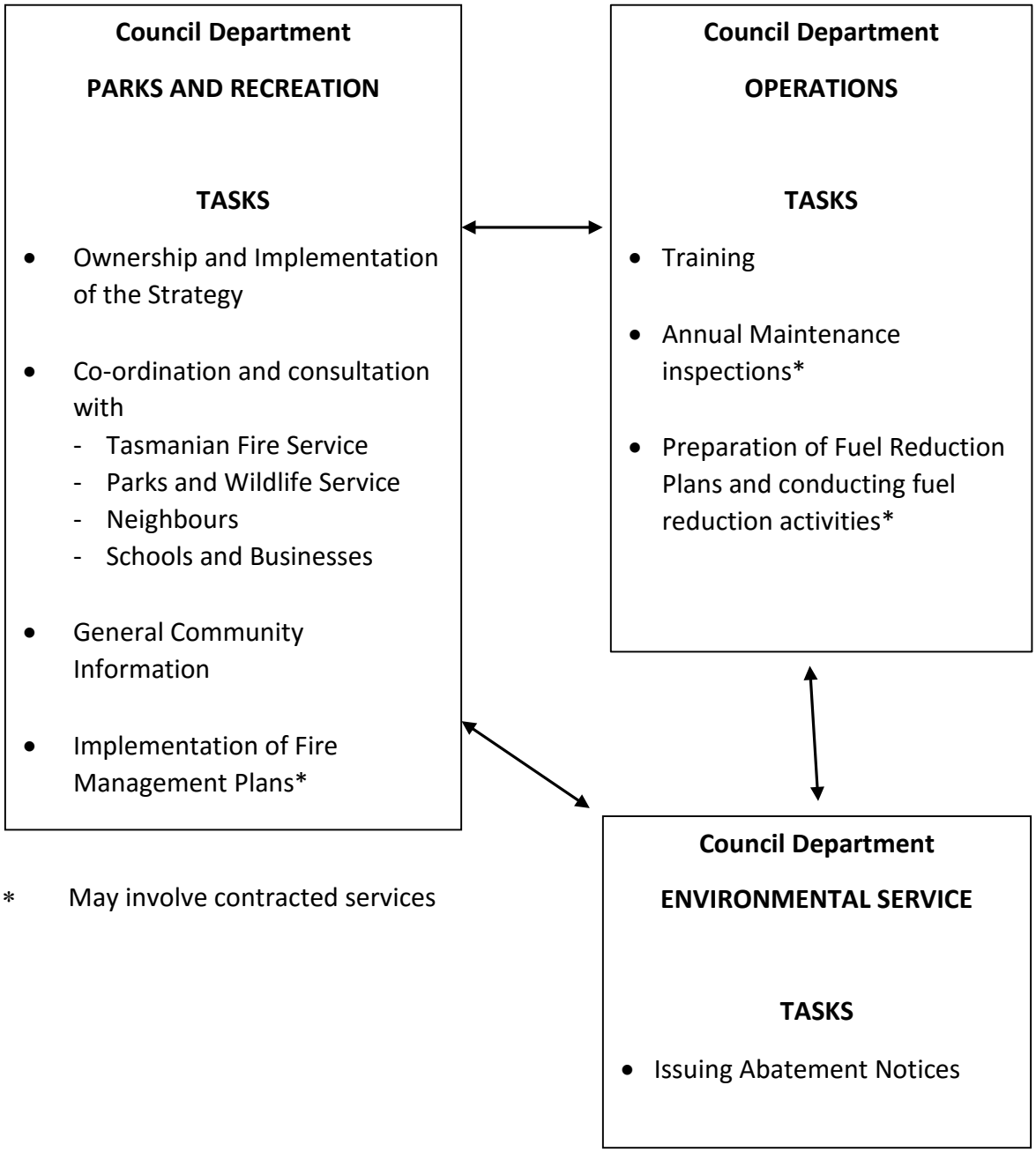
Monitoring and Record Keeping

Prompt and accurate record keeping of management actions and results of planned burns, and impact of unplanned burns is critical to continuous improvement in fire management of these reserves. Consistent with the National Policy Statement Objective *4 Actively and Adaptively Manage Risk*, good records and improving information is necessary for adaptive management of the reserves to be effective. Fire management plans are written at a single point in time and much information will change as will the vegetation and fuel loads. It is important for Council staff be alert to changes in fuels and vegetation, condition of fire infrastructure, new knowledge of species of importance and to adapt plans appropriately. Good records of the burn history and management of a reserve are also a critical piece of information for any Incident Response team when a wildfire does enter a reserve. Knowledge of past actions can be an invaluable tool for choosing the best control option. The majority of fire management information related to a reserve should be recorded spatially. Annual inspection results should be documented in systematic database for easy recovery and use for review and planning.

Post Burn Evaluation and Recovery

After any fire, either planned or unplanned, a post burn assessment will be carried out. For a planned burn, the main focus of the post burn assessment will review if the burn has achieved its objective, record information on burn severity and extent, and any issues or further work required, such as extinguishment of smouldering material, track maintenance or to ensure a safe site. An assessment of the need for any environmental rehabilitation, such as remedial track maintenance, and protection of water sources will be noted. The burn area boundaries should also be recorded and entered on the GIS system. For wildfires, similar information will be recorded, but further attention on safety issues will be required. Periodic assessment of vegetation recovery may be necessary, particularly in areas where there has been a very hot fire, and/or areas where weeds are present and require treatment. A post burn assessment for is specified in **SOP 9**.

8 RESPONSIBILITY AND COMMUNICATION WITHIN THE COUNCIL



* May involve contracted services

9 REFERENCE DOCUMENTS

Council Documents related to this Strategy

City Of Launceston Strategic Plan 2014-2024
http://www.launceston.tas.gov.au/upfiles/CoL/cont/_council/community_engagement/2015/city_of_launceston_strategic_plan_final.pdf

Draft Tourism Strategy 2012
http://www.launceston.tas.gov.au/upfiles/CoL/cont/_council/community_engagement/strategies_plans_and_reports/draft_launceston_tourism_strategic_plan.pdf

City of Launceston Open Space Strategy 2007
http://www.launceston.tas.gov.au/upfiles/CoL/cont/_council/community_engagement/strategies_plans_and_reports/CoL_open_space_strategy_10thJuly_2007.pdf

City of Launceston - A guide to Parks and Reserves.
http://www.launceston.tas.gov.au/upfiles/CoL/cont/_facilities/recreation/parks_and_playgrounds/parks_brochurepdf.pdf

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Launceston Interim Planning Scheme 2015, Part E1.0 Bushfire Prone Areas Code.

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COAG 2014. Forest Fire Management Group *National Bushfire Management Policy Statement for Forests and Rangelands.*

State Fire Management Council 2012 *State Vegetation Fire Management Policy* Version 4.0 June 2012.

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Marsden-Smedley J. B. (2009) *Planned Burning in Tasmania, operational guidelines and review of current knowledge.* Fire Management Section, Parks and Wildlife Service, Department of Primary Industries, Water and the Environment, Hobart.

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BOM and CSIRO 2014. *State of the Climate 2014.*

Climate Commission 2013. *The Critical Decade – Climate Change Science, Risks and Response.* W. Steffen and L. Hughes.

Buildings in Bushfire Prone Areas

TFS (2005) *Guidelines for Development in Bushfire Prone Areas of Tasmania.* Tasmania Fire Service, Hobart. https://www.fire.tas.gov.au/publications/Bush_Guide.pdf

Standards Australia Limited. (2011). AS 3959 – 2009 (Incorporating Amendment No's 1, 2 & 3) – *Construction of buildings in bush fire-prone areas*.

Tasmanian Planning Commission. (2012). *Planning Directive No. 5. Bushfire-Prone Areas Code*.

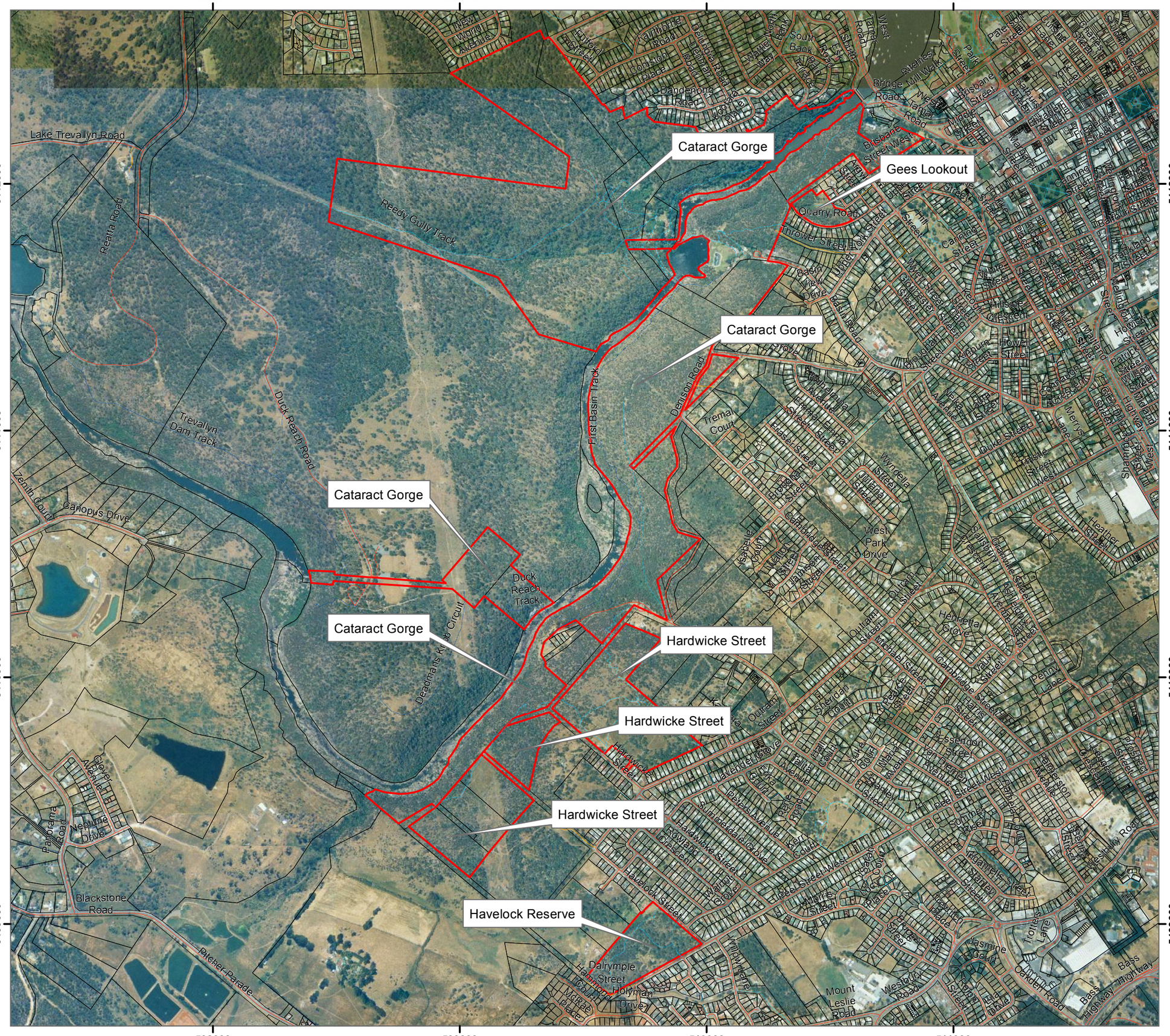
APPENDIX 1

List of Reserves

Reserve Name	Locality	Total Area (ha)	Bushland Area (ha)
Bluegum Park	Youngtown	3.09	0.74
Cambridge Street Reserve	West Launceston	4.31	2.82
Carr Villa Flora Reserve and Memorial Park	Kings Meadows	57.98	21.22
Cataract Gorge Reserve (incl. Gees Lookout)	Trevallyn, West Launceston, Summerhill	193.96	177.22
Christina Place Park	West Launceston	0.48	0.13
Distillery Creek Gorge	Waverley	13.26	8.06
Fraser Reserve	West Launceston	5.64	1.27
Freelands Lookout	Trevallyn	1.92	1.18
Granville Street Reserve	West Launceston	6.92	5.94
Hardwicke Street Reserve	Summerhill	32.53	22.98
Havelock Reserve	Summerhill	7.99	5.73
Heritage Forest	Mowbray/Invermay	62.00	0.00
Ingamells Reserve	Prospect	0.87	0.58
Karoola Recreation Ground	Karoola	4.69	0.66
Lilydale Falls Reserve	Lilydale	18.16	14.98
Los Angelos Bushland Reserve	Windermere	2.59	2.29
Machens Reserve	Kings Meadows	4.20	1.64
Meadow Ridge Reserve	Kings Meadows	1.21	0.57
Merthyr Park	Lilydale	50.01	41.86
Miami Place Park	Youngtown	0.61	0.41
Myrtle Park	Targa	29.40	18.59
Norwood Bushland Park	Norwood	0.68	0.49
Pamela Court Reserve	Prospect	2.37	0.73
Punchbowl Reserve	Punchbowl	25.64	13.06
Ravenswood Bushland Reserve	Ravenswood	34.27	29.36
Rocherlea Old Rail Trail	Rocherlea, Mowbray	5.94	1.84
Rocherlea Recreation Ground	Rocherlea	8.21	1.06
Salisbury Crescent Park	West Launceston	0.75	0.48
Tasman Highway Bushland Reserve	Waverley	8.37	7.26
Thomas Martin Reserve	Summerhill	0.47	0.20
Ti Tree Crescent Park	Rocherlea	5.50	4.43
Vermont Road Bushland Park	Ravenswood	5.03	4.93
West Launceston Community Park	Summerhill	5.53	0.49
Woods Reserve	West Launceston	7.87	6.10
Youngtown Regional Park	Youngtown	30.02	11.55

* as per Council GIS system

APPENDIX 2



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Appendix 2A

Map Type: Map 1

Map Production: GPM P/L

Production Date: 23/04/2015

Reserves:

Cataract Gorge & Gees Hill Lookout - 193.96 ha
Hardwicke Street - 32.53 ha
Havelock Street - 7.99 ha

Legend

- Reserve Boundaries
- Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 100 200 300 400 500 600 Metres

SCALE 1:15,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2B

Map Type: Map 2

Map Production: GPM P/L

Production Date: 23/04/2015

Reserves:

Carr Villa Flora Reserve
Carr Villa Memoral Park
Total Area - 57.98 ha

Legend

Reserve Boundaries

Cadastre

0 50 100 150 200 Metres

N

SCALE 1:4,000 (at A3 Print Size)

City of LAUNCESTON

513600 513700 513800 513900 514000 514100 514200 514300 514400

5410900 5410800 5410700 5410600 5410500 5410400 5410300 5410200

Ellison Street
Beverley Hills Road
Punchbowl Reserve
Punchbowl Road
Hamelheath Way
Haradin Court
Ebonhurst Drive
Veronica Crescent
Norwood Avenue
Leith Street
Herring Street
Molsheed Street
Blamey Road
Vasey Street
Negara Street
Hingston Cres cent

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2C

Map Type: Map 3

Map Production: GPM P/L

Production Date: 23/04/2015

Reserves:

Punchbowl Reserve - 25.64 ha

Legend

Reserve Boundaries

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 20 40 60 80 100 Metres

SCALE 1:3,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2D

Map Type: Map 4

Map Production: GPM P/L

Production Date: 23/04/15

Reserves:

Freelands Lookout - 1.92 ha

Legend

Reserve Boundaries

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 20 40 60 80 Metres

SCALE 1:2,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2E

Map Type: Map 5

Map Production: GPM P/L

Production Date: 23/04/15

Reserves:

Christina Place Park - 4,781 m²
West Launceston Commmunity Park - 5.53 ha
Thomas Martin Reserve - 4,700 m²
Ingamells Reserve - 8,688 m²
Pamela Court Reserve - 2.37 ha

Legend

Reserve Boundaries

Cadastre

0 50 100 150 200 Metres

N

SCALE 1:4,000 (at A3 Print Size)

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2F

Map Type: Map 6

Map Production: GPM P/L

Production Date: 23/04/15

Reserves:

Fraser Reserve - 5.64 ha
Woods Reserve - 7.87 ha
Salisbury Crescent Park - 7,477 m²
Cambridge Street Reserve - 4.31 ha
Granville Street Reserve - 6.92 ha

Legend

Reserve Boundaries

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 50 100 150 200 250 Metres

SCALE 1:5,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2G

Map Type: Map 7

Map Production: GPM P/L

Production Date: 10/03/15

Reserves:

Ravenswood Bushland Reserve - 34.26 ha

Legend

Ravenswood Bushland Reserve Boundary

Cadastre

0 20 40 60 80 100 Metres

SCALE 1:3,000 (at A3 Print Size)

N

City of LAUNCESTON

513400 513500 513600 513700 513800 513900 514000 514100

5415300 5415200 5415100 5415000 5414900 5414800 5414700

Vermont Road

Wildor Crescent

Vermont Road Bushland Park

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2H

Map Type: Map 8

Map Production: GPM P/L

Production Date: 27/04/2015

Reseve:

Vermont Road Bushland Park - 5.03 ha

Legend

Vermont Road Bushland Park Boundary

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 20 40 60 80 100 Metres

SCALE 1:2,500 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2I

Map Type: Map 9

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Distillery Creek Gorge - 13.26 ha

Legend

- Distillery Creek Gorge Boundary
- Cadastre

0 50 100 150 200 Metres

N

SCALE 1:4,000 (at A3 Print Size)

City of LAUNCESTON

514900 515000 515100 515200 515300 515400 515500 515600

5412500 5412400 5412300 5412200 5412100 5412000

Tasman Highway
Brookes Court
Anson Street
Craig Street
St Leonards Road
Tasman Highway Bushland Reserve

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2J

Map Type: Map 10

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Tasman Highway Bushland Reserve - 8.36 ha

Legend

Tasman Highway Bushland Reserve Boundary

Cadastre

0 20 40 60 80 100 Metres

SCALE 1:2,500 (at A3 Print Size)

N

City of LAUNCESTON

512000

5416000

5415000

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2K

Map Type: Map 11

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Heritage Forest - 62 ha

Legend

- Reserve Boundaries
- Cadastre

0 40 80 120 160 200 Metres

SCALE 1:5,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2L

Map Type: Map 12

Map Production: GPM P/L

Production Date: 27/04/2015

Reserves:

Rocherlea Recreation Ground - 8.20 ha
Rocherlea Old Rail Trail - 5.94 ha

Legend

- Reserve Boundaries
- Cadastre

0 100 200 300 400 Metres

SCALE 1:11,000 (at A3 Print Size)

N

City of LAUNCESTON

511500 511600 511700 511800 511900 512000

5419500 5419400 5419300 5419200 5419100 5419000

Sassafras Crescent
Blackwood Drive
Manuka Court
King Billy Crescent
Caladenia Court
Boronia Court
Ti Tree Crescent
Honeysuckle Court
Honeysuckle Court

© LIST Map, State of Tasmania

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2M

Map Type: Map 13

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Ti Tree Crescent Park - 5.49 ha

Legend

Reserve Boundary

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 20 40 60 80 Metres

N

SCALE 1:2,000 (at A3 Print Size)

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2N

Map Type: Map 14

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Machens Reserve - 4.19 ha

Legend

Reserve Boundary

Cadastre

0 20 40 60 80 100 Metres

N

SCALE 1:2,000 (at A3 Print Size)

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2O

Map Type: Map 15

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Meadow Ridge Reserve - 1.20 ha

Legend

Reserve Boundary

Cadastre

0 20 40 60 80 100 Metres

N

SCALE 1:2,000 (at A3 Print Size)

City of LAUNCESTON

514500 514600 514700 514800 514900

5410200 5410100 5410000 5409900

Hingston Crescent
Hymath Place
Hingston Crescent
Heathfield Street
Hawthorn Street
Norwood Bushland Park
Grandview Place
Rossmoyne Street
Avonbury Court
Bolton Hill Road
Charlton Street
Bettina Avenue
Norwood Avenue

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Appendix 2P

Map Type: Map 16

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Norwood Bushland Park - 6,751 m²

Legend

Reserve Boundary

Cadastre

0 10 20 30 40 50 Metres

SCALE 1:1,500 (at A3 Print Size)

N

City of LAUNCESTON

514000 514500 515000 515500

5408500 5408000 5407500 5407000

Techno Park Drive
Techno Park Drive
Wayne Place
Woolven Street
Cue Street
Medina Street
Keithleigh Street
Highgate Street
Clarendon Street
Lorne Street
Kelvin Street
Talune Street
Trent Street
Waroona Street
Miami Place
Delta Avenue
Belgrave Place
Florida Court
Hobart Road
Alma Street
Jubilee Road
Brooklyn Road
Chestnut Road
Oakleigh Road
Myrtle Road
Bluegum Road
Poplar Parade
Redwood Crescent
Dorothy Court
Baulis Court
Hollis Court
Piper Avenue
Integrity Drive
Richings Drive
Redwood Crescent
Poplar Parade
Leichhardt Grove
Spring Grove
Poplar Parade
Lady Mason Court
Opossum Road
Glenwood Road

Youngtown Regional Park
Miami Place Park
Youngtown Regional Park
Bluegum Park

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2Q

Map Type: Map 17

Map Production: GPM P/L

Production Date: 17/04/15

Reserves:

Youngtown Regional Park - 30.01 ha
Bluegum Park - 3.09 ha
Miami Place Park - 6099 m²

Legend

Reserve Boundaries
Cadastre

0 50 100 150 200 250 Metres

SCALE 1:6,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2R

Map Type: Map 18

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Karoola Recreation Ground - 4.68 ha

Legend

Reserve Boundary

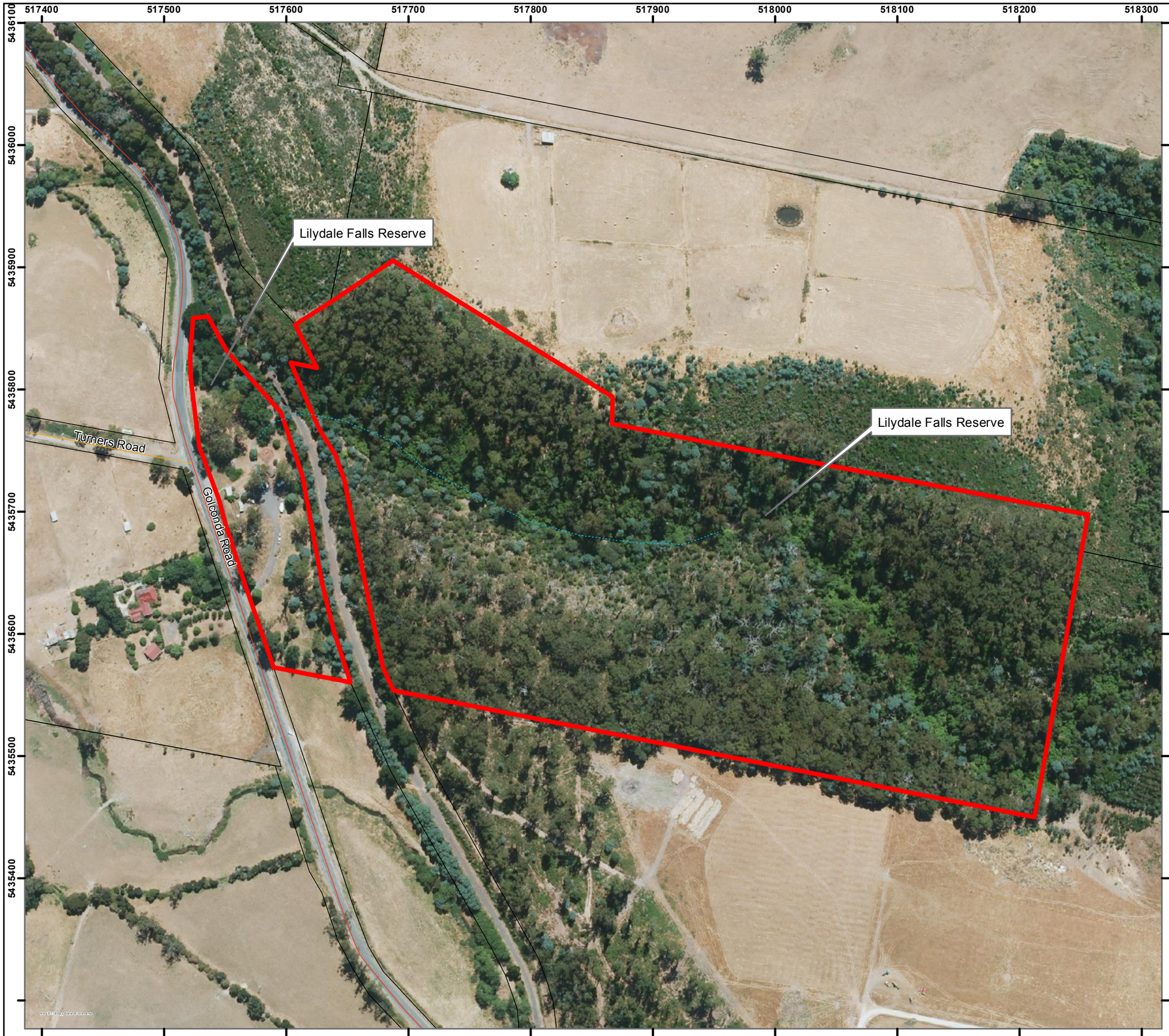
Cadastre

0 20 40 60 80 100 Metres

N

SCALE 1:2,000 (at A3 Print Size)

City of LAUNCESTON



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2S

Map Type: Map 19

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Lilydale Falls Reserve - 18.15 ha

Legend

Reserve Boundary

Cadastre

0 20 40 60 80 100 Metres

SCALE 1:3,000 (at A3 Print Size)

N

City of LAUNCESTON

503300 503400 503500 503600 503700 503800

5427600 5427500 5427400 5427300 5427200

Walford Rise

Sherborne Drive

Los Angelos Bushland Reserve

Los Angelos Road

the LIST © State of Tasmania

GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

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Appendix 2T

Map Type: Map 20

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Los Angelos Bushland Reserve - 2.59 ha

Legend

Reserve Boundary

Cadastre

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 20 40 60 80 Metres

SCALE 1:2,000 (at A3 Print Size)

N

City of LAUNCESTON

GPM
GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2V

Map Type: Map 21

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Merthyr Park - 50.01 ha

Legend

Reserve Boundary

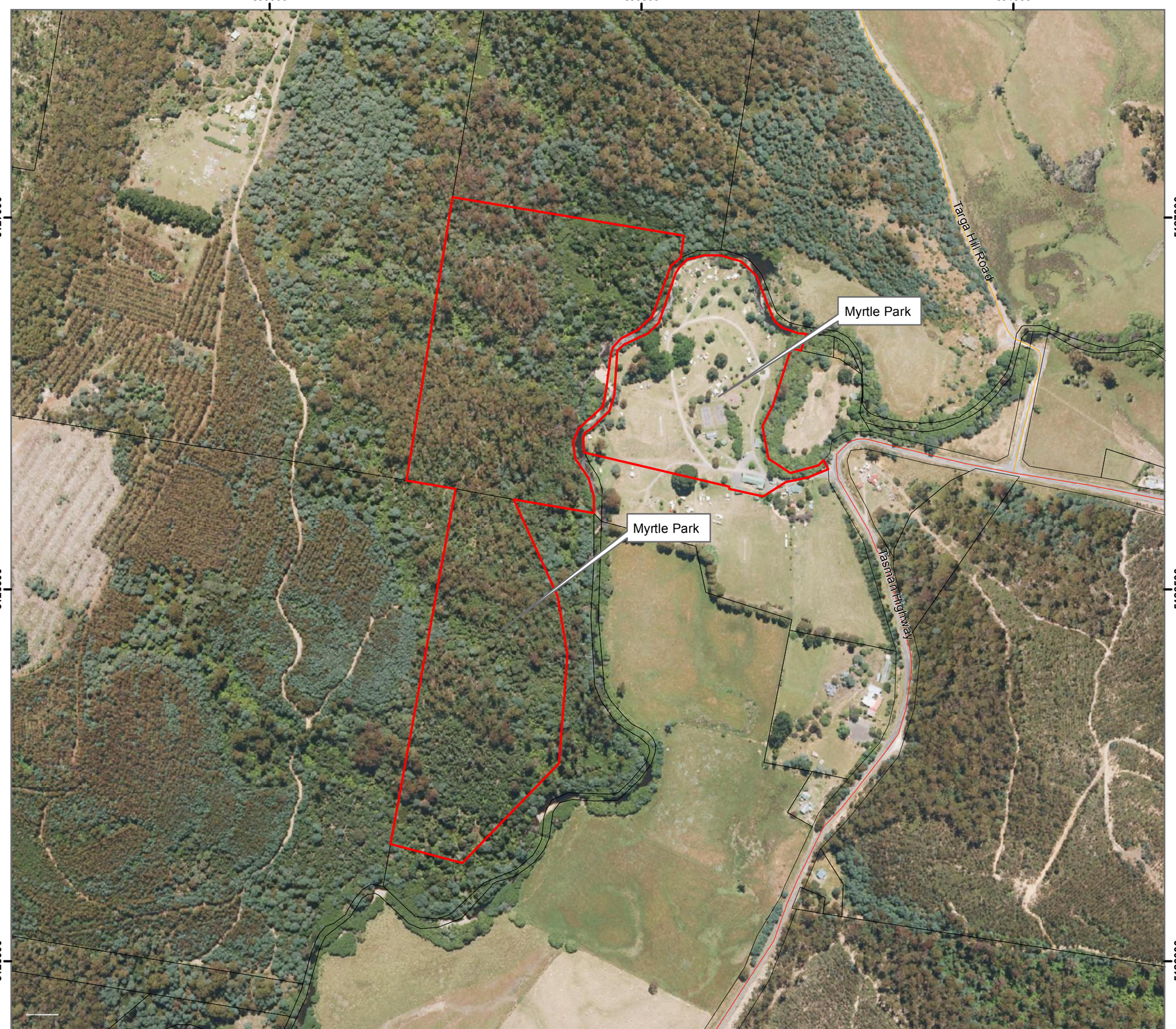
Cadastre

0 50 100 150 200 Metres

N

SCALE 1:4,000 (at A3 Print Size)

City of LAUNCESTON



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2V

Map Type: Map 22

Map Production: GPM P/L

Production Date: 27/04/2015

Reserve:

Myrtle Park - 29.40 ha

Legend

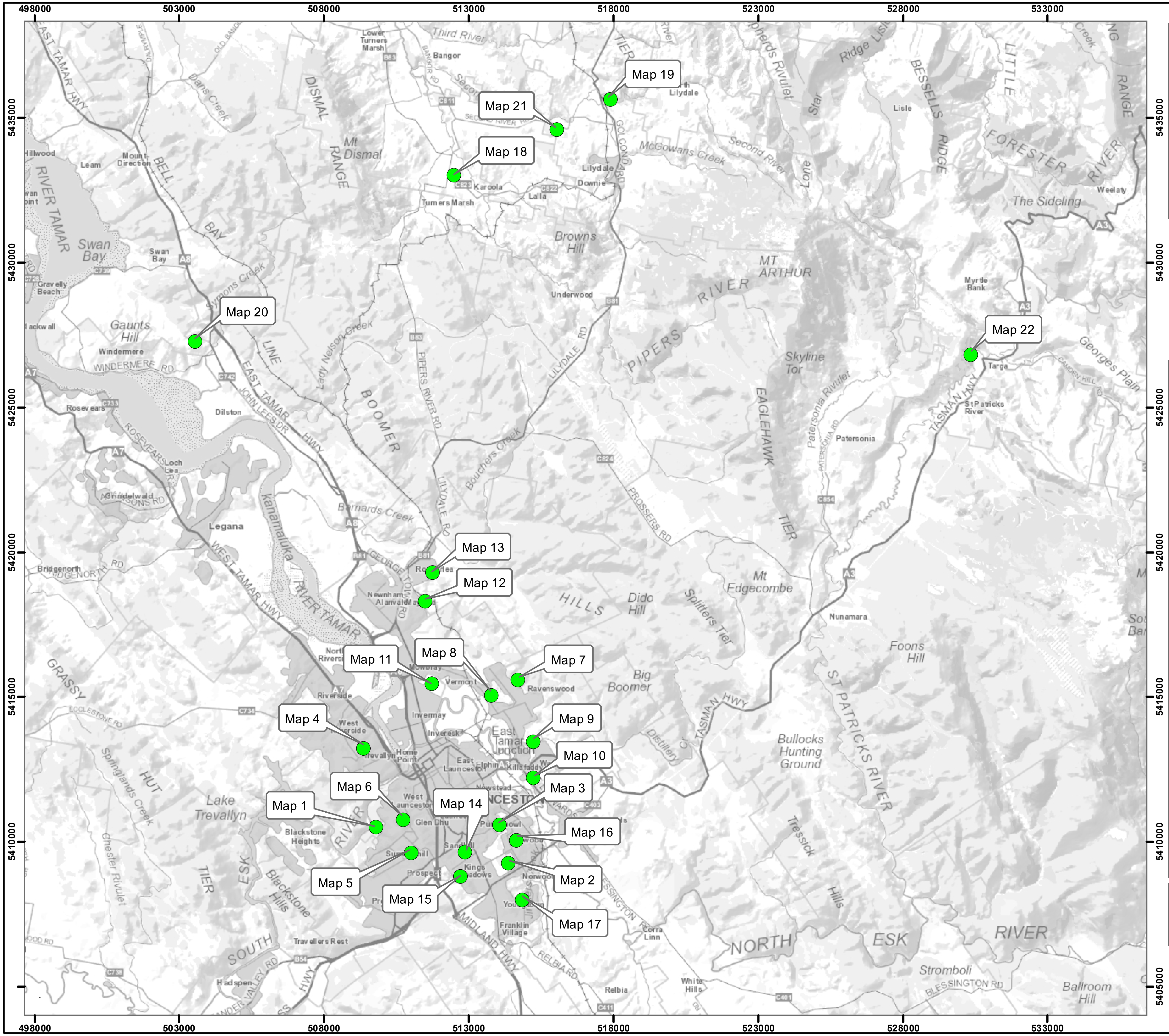
- Reserve Boundary
- Cadastre

0 50 100 150 200 250 Metres

N

SCALE 1:5,000 (at A3 Print Size)

City of LAUNCESTON



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

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Appendix 2W

Map Type: Map 23

Map Production: GPM P/L

Production Date: 27/04/15

Legend

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 1 2 3 4 5 Kilometers

N

SCALE 1:125,000 (at A3 Print Size)

City of LAUNCESTON

APPENDIX 3

Agency Agreements

To be finalised and added to this document prior to the 2016-2017 fire season.

Standard Operating Procedures

Bushfire Management for Council Owned & Managed Land

2015

Standard Operating Procedures for Bushfire Management of Council Owned and Managed Land

City of Launceston

2015

This set of SOP's complements the City of Launceston Bushfire Management Strategy For Council Owned and Managed Land , 2015-2025. These SOP's are key reference documents for the implementation of the Strategy and the implementation of the Reserve Fire Management Plans. Some of these SOP's are produced by key fire management agencies, such as TFS or PWS, or adapted from documents from these or other agencies involved in fire management. These SOP's are current for 2015 but may be periodically reviewed and updated. Council staff using these SOP's should check to see if more current versions exist throughout the period of the Strategy.

Compiled by :
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Launceston TAS 7250
groundproofmapping.com.au

City of Launceston
Town Hall, 18-28 St John St
PO Box 396
Launceston 7250

Standard Operating Procedure

1

Weed Management and Washdown Procedures

SOP 1

Weed Management

Weeds are well established to a varying extent throughout the City of Launceston Reserves. Common weeds including Gorse *(Ulex europaeus)*, Broom *(Cytisus scoparius)*, and Blackberry *(Rubus fruticosa)* are particularly widespread. If used appropriately, fire can be a tool to help control and reduce weed infestations. However, if burning occurs in areas without concurrent weed control actions, weed infestations can worsen. Unplanned fire without follow up monitoring and remedial action may also worsen weed infestations. Where weeds occur, fuel reduction burning should not be carried out unless sufficient resources also exist for preventative and follow up weed control. Exceptions should only occur when the fire risk to an asset is very high, and fuel reductions operations must occur for asset protection and safety.

As the heat and smoke from fire breaks open the seeds of many native species, so too it can encourage germination of weedy species, particularly a species such as gorse. If repeated burning is also followed by weed control efforts, such that weeds do not re-establish and seed, over time, the soil reserve of weed seeds can be reduced and a weed problem can be eradicated. Many weeds will also sprout prolifically from rootstock after low intensity burning, often worsening a weed problem and excluding native plants.

Prior to burning, mechanical and or chemical control can be utilised to reduce current infestations. Mechanical treatment can also stimulate seed germination, and with an appropriate strategy of follow up control, can assist with reducing weed infestations. Mechanical treatment without a follow up strategy may worsen an infestation, just as fire may do. Weed control treatment should happen some months prior to burning to allow dead material time to dry sufficiently to be removed during burning. If too green, under typical fuel reduction burning conditions, this material will not burn away. Mechanical fuel reduction operations, such as slashing, may exacerbate a weed problem and thus a fire hazard problem. In the same way weed control mush be considered with fire, it must also be considered with mechanical treatments.

Where there is dense weed infestations, broad area spraying may be utilised for weed control. However where there are threatened species present, or spot infestations, spot spraying or hand pulling or cutting and painting will need to be used. The Reserve Management Plans will each specify the weed species occurring in the Reserve and treatment options for those weeds. These plans must be referred to with any fuel reduction treatment operations, either mechanical or burning.

A key problem during fire management operations is the transport of weed material or seeds onto a weed free site through machinery used on the reserve. It is essential that all vehicles and tools are free of soil material prior to moving onto a reserves site. The guideline on the following pages developed by the Multi-Agency Committee must be considered by all operations staff.

Useful resources for weed control and specific advice on weeds can be found on the DPIPWE site: http://dpipwe.tas.gov.au/invasive-species/weeds/weed-publications-and-resources/weed-links-and-resources

Guidelines: Machinery Hygiene and Washdown

Custodian: - Forestry Tasmania *Authorised by: - MAC Group 03/10/2014*

Introduction

The spreading of weeds and diseases can result in permanent environmental damage and long term financial burden to land owners and land managers.

Transporting and operating unclean machinery can unknowingly spread weed seeds, some insects and plant pathogens.

Therefore it is important that machine hygiene is seriously considered when hiring and deploying machinery.

Scope

All agencies involved with the hiring, deploying, transport and operation of machinery in a bushfire incident.

Supporting Documentation

- Tasmanian WASHDOWN GUIDELINES for Weed and Disease Control, Machinery, Vehicles & Equipment Edition 1, April 2004.
- For information on freshwater pests and pathogens, refer to KEEPING ITCLEAN: A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens. NRM South, March 2010
- Weed Management Act 1999
- For a list of declared weeds: http://dpipwe.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds
- For a list of diseases: http://dpipwe.tas.gov.au/Pages/document.aspx?path=/Documents/PQMTAS2013ListAListB.pdf

Guideline

It is strongly recommended that all machinery utilised on fire fighting operations are washed down at a designated site before and after operations, especially when after:

- operating in an area affected by a weed or disease that is under containment
- transporting weeds or soil known to be infected with weed seed or a plant pathogen

Or before:

- moving machinery out of a local area of operation
- moving machinery between properties
- moving vehicles or machinery to an island
- using machinery along roadsides or along river banks
- using machinery to transport soil and quarry materials
- using controlled-access vehicle tracks
- visiting remote areas where access is only by boat, helicopter or light plane

General cleaning procedures should meet the following standard:

- remove only those cover plates etc that can be quickly and easily removed and replaced

- no clods of dirt or loose soil should be present after washdown. Smeared soil stains and soil firmly lodged in difficult to access areas are acceptable
- radiator, grills and the interior of vehicles should be free of accumulations of seed and other plant material

Due to time constraints there will be times when the urgency of a fire suppression operation prevents machinery cleaning as described above. In this situation, and if time permits, a rapid hose down of wheels and tyres, wheel arches, vehicle tracks and undersides of vehicles would be preferable to no washdown at all.

Clean machinery should always be requested when placing an order with a contractor and unclean machinery should only be used as a last resort. If any machinery is placed on "standby" it should be washed down during this time to improve preparedness.

If any unwashed machinery is used on a fireground, it should be documented where the machinery came from and what job it was previously doing, and where on the fireground it started working. Any hygiene issues can then be tracked in the future.

Note that some machinery, such as harvesting equipment, cannot be washed with water because of potential damage to sensitive electronic equipment. Always consult and comply with the manufacturer's recommended cleaning method.

Standard Operating Procedure

2

Firebreak construction and maintenance

SOP 2
Fire Trail Construction and Maintenance

TRAIL STANDARD

Fire Trails must be built and maintained to suitable safety and environmental standards. Construction for Fire Trails will follow the Parks and Wildlife Fire Management Infrastructure Categories and Standards (2011). Most of the Fire Trails in the Reserves will be of standard Class 5. Fire Trail standard will be specified in the Reserve Fire Management Plans.

	Parks and Wildlife Service Managed Vehicular Fire Trail Categories These categories are for strategic fire trails that are not for public vehicle use and are for fire management purposes only, PWS managed public roads and management only access roads are categorised separately. Fire trails are created to provide access to buildings or natural value assets that would normally be inaccessible by vehicle, limiting fire fighting response.			
Fire trail categories	Class 1	Class 3	Class 5	Redundant
Summary	high standard access, (emergency egress roads) hardened all-weather surfaces	all weather 4x4 access suitable for larger vehicles	dry weather 4x4 access, suitable for Class 5 vehicles in dry weather condition	rehabilitated or naturally rehabilitating trails, generally not to be re opened unless for the control of wildfire
Vehicle suitability	class 1-3-4-5-6	class 3-4-5-6	class 5-6	nil vehicle access without upgrading
Vehicle type	2 wheel drive	4 wheel drive	4 wheel drive	nil vehicle access without upgrading
Surface	hardened all weather constructed surface	all weather with 4x4 capability	dry weather with 4x4 capability	rehabilitated or naturally rehabilitating
Conditions	surface may be gravel hardened	subject to some wheel ruts that when wet may be boggy for short lengths	subject to many wheel ruts that when wet may be boggy for extended lengths	rehabilitated or naturally rehabilitating
Minimum trafficable width	min 6m may include hardened drained shoulders of < 3 degrees	min 4m may include hardened drained shoulders of < 3 degrees	min 4m may include hardened drained shoulders of < 3 degrees	NA
Track cleared width	min 10m	min 8m	min 6m	NA
Track cleared height	min 4m with non continuous over head vegetation	min 4m with non continuous over head vegetation	min 4m with non continuous over head vegetation	NA
Desirable max gradients	±7 degrees normally not exceeded	±7 degrees may be exceeded for short lengths	±10 degrees may be exceeded for short lengths	NA
Curves	min inner radius of 10m	min inner radius of 10m	min inner radius of 10m normally not exceeded	NA
Cross fall	±2 degrees normally not exceeded	±2 degrees normally not exceeded	±2 degrees may be exceeded for short lengths	NA
Vehicle passing	may be single or dual lane	single lane with passing bays	single lane with passing bays	NA
Max space between passing bays	will have many opportunities for passing, 180m max space between bays	provided to maintain visual contact where possible, 200m max space between bays	provided to maintain visual contact where possible, 200m max space between bays,	NA

			extras at intersections and steep terrain	
Vehicle passing bays	min 20m long 8m wide	min 20m long 8m wide	min 10m long 6m wide	NA
Bridges	Must be constructed to a min capacity of 20 tonnes		min capacity of 10 tonnes with fords for heavy equipment	NA
Turning Areas	circular turning area with min carriageway of 10m, may include hardened drained shoulders of < 3 degrees, For 'Y' or 'T' turning bay min 4m width and 8m length			NA

DRAINAGE.

Proper drainage is essential for reducing erosion through runoff on tracks, damaging the track and potentially polluting local waterways. Cross drains (grips) will mostly be adequate for reducing runoff on rarely used fire trails (Class 5). Tracks that receive higher use may require table drains and culverts.

The following drainage guidelines are modified from the Forest Practices Code 2000.

Maximum Spacing between Cross Drains on Fire Trails

	Soil Erodibility Class				
Gradient of Fire Trail	Low	Moderate	Moderate-High	High	Very High
0-3°	Nil	Nil	Nil	100 m	40 m
4-14°	120 m	100 m	80 m	60 m	30 m
15-19°	80 m	70 m	60 m	40 m	20 m
20-26°	40 m	35 m	30 m	20 m	NH
over 26°	20 m	20 m	NH	NH	NH

Note:

See description of Soil Erodibility Class as the end of this Appendix.

Apply cross drain standards for high erodibility class on all karst soils. Sediment traps may be required.

Use drain spacings corresponding to the next highest soil erodibility class for the following situations:

- tracks diagonally across contours;
- areas subject to periods of high rainfall intensities, e.g. eastern parts of Tasmania;
- karst catchments.

Further guidelines for trail construction can be found in the Forest Practices Code 2000 http://www.fpa.tas.gov.au/__data/assets/pdf_file/0020/58115/Forest_Practices_Code_2000.pdf

or the NSW Department of Land and Water Conservation 1994, Guidelines for the Planning, Construction and Maintenance of Tracks
http://www.environment.nsw.gov.au/resources/soils/guidelinestracks.pdf

INSPECTION AND MAINTENANCE

Regular inspection and maintenance is essentially to maintaining good fire infrastructure. Fire trails can rapidly deteriorate if not managed and problems rectified early. Vegetation on either side of the track must be regularly cut back to ensure free vehicle access. Tracks must be inspected:

- after very heavy rainfall events
- following storm events that may have caused trees to fall across tracks blocking vehicular access
- prior to any planned burning
- preceding the fire season, a routine inspection as part of general reserve fire preparedness

Inspection dates and maintenance actions will be recorded in the Reserve management file, or database.

Vegetation removal will be considered in the context of management of fuel modified buffer zones (including firebreaks), which will likely be more extensive than the immediate trail.

ACCESS

Many of the reserves have vehicle gates to prevent access by the public where unlawful behaviour is a problem. In addition to preventing removal or damage to bush areas, and manage visitor access for recreational activities, gates and locks are necessary to prevent damage to fire trails, particularly during the winter season.

- Gated access will be clearly identified in the Reserve Fire Management Plan maps.
- A set of keys will be provided to the Tasmanian Fire Service as their resources will likely be needed both planned burns and for response to a wildfire.

AN OUTLINE OF SOIL ERODIBILITY CLASSES IN RELATION TO SOIL PROPERTIES.

(taken from Appendix 6, Forest Practices Code)

Definition of Soil Erodibility

Erodibility is the inherent susceptibility of a soil to the detachment and transportation of soil particles or aggregates by erosive agents such as rainfall, runoff, throughflow, wind or frost. In the Forest Practices Code, erodibility is concerned principally with susceptibility to erosion byrainfall and runoff, although erosion by wind is important on sites such as sand dunes.

Soil Erodibility Classes

In the Forest Practices Code, measures to prevent erosion are applied to soils according to their classification into one of five soil erodibility classes (low, moderate, moderate-high, high, veryhigh). A semi-quantitative methodology has been developed [37] for assessing the erodibilityclass of Tasmanian forest soils based on both field and laboratory determinations of soil properties. They include the proportion of water-stable soil aggregates using wet-sieving and/ or dispersion tests, soil strength, stone content, thickness of soil layers, and permeability and drainage classes. A brief outline of the five erodibility classes in terms of soil field characteristicsis appended.

Low Erodibility

Soils in this class are characterised by free drainage, moderate or high permeability, clay loamor clay textures with high aggregate stability, or are extremely stony with sandy or loamy textures.They are formed on a wide variety of substrates.

Moderate Erodibility

Soils are freely drained and friable with loamy textures and moderate aggregate stability, or have impeded drainage (imperfectly drained) with clayey textures and high aggregate stability. They are formed on a wide range of substrates.

Moderate-High Erodibility

Soils are imperfectly drained grey and brown mottled clays or poorly drained grey clays orhighly organic with moderate aggregate stability; or they are moderately well drained andhave bleached sandy layers with low aggregate stability overlying moderately permeable clays;or they have pale loams with moderate aggregate stability overlying slowly permeable clays.They occur on a range of substrates.

High Erodibility

a) *By water (rainfall and runoff)*

Soils mostly have texture-contrast profiles characterised by dark-coloured topsoils with moderate or high aggregate stability overlying bleached sandy or very fine sandy/ silty layers (<50 cmthick) with low aggregate stability which in turn overlie slowly permeable clays or hardpans. Ifthe organic-rich topsoils are breached or removed the underlying sandy/ silty layers are highly susceptible to detachment and transport by rainfall and runoff. They are formed mainly underdry forests on sandy substrates including sandstones, conglomerate, and granite. However,also included are loamy soils on dolomite under wet forest, clayey soils with dispersible subsoilson mudstone under dry forest, and sandy or silty soils on Quaternary glacial deposits.

b) By wind

Soils highly erodible by wind include deep, loose sandy soils with dark-coloured topsoils overlying yellowish brown subsoils or bleached sands over humus and iron pans. They occuron relatively stable coastal dune systems and in dry inland areas as dunes, sand sheets andlunettes on floodplains, margins of lagoons, river terraces and at the base of hills.

Very High Erodibility

a) By water (rainfall and runoff)

Soils are mainly formed under dry forest on Quaternary alluvial deposits derived from granite.They occur mainly along drainage depressions and adjacent to small watercourses in north-east Tasmania. Soil profiles are characterised by weakly developed topsoils with low aggregate stability overlying unconsolidated deep coarse sands also of low aggregate stability. The totalthickness of surface and subsurface layers with low aggregate stability is 50 cm or more.

Also included but less commonly occurring, are texture-contrast soils under dry forest on granite hill slopes. Profiles are characterised by weakly developed topsoils overlying thick (> 50 cm),bleached coarse sandy layers which in turn overlie slowly permeable clays. Both these soil types are highly susceptible to gully erosion if surface layers are unduly disturbed.

b) Bywind

These soils occur on recent foredunes and adjacent relatively unstable sand dunes in coastalareas where soil profiles are characterised by deep, loose, uncoloured sands with only veryweak, if any, development of topsoils.

Erodibility in Relation to Soil Colour and Texture

Soil colour and texture can be useful characteristics to help classify soil erodibility. Loamy orclayey soils with dark-coloured topsoils overlying uniformly coloured yellow, brown or red subsoils generally have low or moderate erodibility. In contrast, loamy or clayey soils with distinct grey mottling or dominantly grey colours in subsoils usually have moderate to higherodibility. Soils with bleached, loose, sandy layers are generally highly or very highly erodible depending on their thickness and the degree of development of topsoils.

References:

Forest Practices Board (2000). *Forest Practices Code*, Forest Practices Board, Hobart, Tasmania

PWS 2011: *Fire Management Infrastructure Categories and Standards*, Asset Services Oct 2011 (V4)

Department of Land and Water Conservation NSW 1994. *Guidelines for the Planning, Construction and Maintenance of Tracks*.

Standard Operating Procedure

3

Guideline
Construction marking and recording of water points for firefighting

Guideline: Construction, marking and recording of water points for fire fighting

Custodian: Manager Fire Management **Authorised by: Manager Fire Management**

Introduction

This guideline is a re-formatted version of the Guideline originally developed and written by David Tucker of Derwent District in 2002. Minor changes have been made to accord with current legislation, terminology and procedures.

Thanks are due to Andrew Dix and Stephen Pryor, Regional Water Management Officers, DPIPWE for their checking of the text.

Scope

All existing and planned water storages constructed or maintained on State Forest, whether constructed or maintained by Forestry Tasmania or other agent or agents.

Supporting Documents:

1. *Forest Practices Act* 1985
2. *Forest Practices Regulations* 2007
3. *Water Management Act* 1999
4. Licensing, Allocation and Works Permits (DPIPWE)
   See: http://www.dpiw.tas.gov.au/inter.nsf/ThemeNodes/SSKA-4Y38HT?open
5. Guidelines for Establishing Offsets for Impacts on Natural Values within the Dam Assessment Framework (Assessment Committee for Dam construction: 10 August 2007) see:
   http://www.dpiw.tas.gov.au/inter.nsf/Attachments/JMUY-7PEVVC/$FILE/ACDC%20Offsets%20Guidelines.pdf
6. DPIPWE Guidelines for the Construction of Earth-fill dams. See: FMS > Fire Management > General > Guidelines, or, www.stors.tas.gov.au/au-7-0054-00315

Guideline

General

- Water points can take several forms, ranging from large dams constructed to service aerial operations (Helidams), through to small pools in permanent running streams which can be accessed by either portable pumping equipment or tankers.
- As a general rule, water points should not be constructed in Class 1,2, or 3 watercourses, although constructing a small pump sump in a reliable stream would generally be approved.
- The location and size of water points should be considered from a strategic perspective through fire management planning, particularly in relation to their distribution within the Forest Block, and proximity to high value assets – eg Plantations and Regeneration.
- Risk management for high intensity burning makes it desirable for a water point to be located within 500 metres of all proposed high intensity burns.
- The best sites for water points are generally around springs, in drainage lines or class 4 streams.

Guideline: Construction, marking and recording of water points for fire fighting

Planning

- The level of planning for this activity needs to be consistent with the level of disturbance likely.
- FT internal processes will always apply as appropriate.
- A DPIPWE Dam Works Permit ("dam permit") may be required subject to the location and size of the planned water point (dam). Under the *Water Management Act* 1999 a dam permit is generally required for all dams except in such circumstances as:
  - a dam that is not on a watercourse and that holds less than one megalitre of water;
  - a dam constructed for the primary purpose of storing waste as defined in the Act.
- In addition to a barrier across a watercourse, a "dam" includes an excavation in a water course and a flood levee, both of which also require a permit under the Act.
- As a general rule, any works in a watercourse may require a permit and should be referred to DPIPWE.
- All intended dams / storages sufficiently large to require a dam permit must be inspected by a Forest Practices Officer or consultant for the purpose of preparing a Dam Assessment Report for DPIPWE

	Size		
Water point Location	**<1 Megalitre**	**>1 Megalitre**	**>100 Megalitre**
Not in a defined Watercourse	No permit required	Permit always required	Site Capacity Survey required by DPIPWE before an application is made for a Permit.
In a defined Watercourse (water flowing in a defined channel- permanent or intermittent)	Permit always required	Permit always required	Site Capacity Survey required by DPIPWE before an application is made for a Permit.

- A dam permit will always be required if the dam or waterhole is to be filled by diverting a stream (see figure 1 below)

Where the water point will be small to medium size, the following internal planning process will apply.

- Where it is identified in the text of an FPP that water point construction may occur within the operational area, no additional planning is necessary.
- Where machine disturbance is necessary in an area not covered by an existing FPP, then a Conservation Report must be produced and the MDC checked before construction. Any Special Values identified must be assessed and appropriate mitigation measures implemented.
- The standard operating procedure for State Forest Activity Assessments must be followed if construction of a water point is not covered by an approved and current FPP, or if this construction is to take place within a reserve.
- As the majority of water points will be in and around springs, marshes or drainage lines, the disturbance done to create access must be minimised.

Figure 1: Example of a stream-side storage out of the primary stream line.

Note: current DPIPWE opinion is that this example constitutes a waterhole constructed IN a watercourse, and would not now be an acceptable practice, because the waterhole has been dug deeper than the streambed and in consequence it has the potential to capture and retain all flow during dry periods. A replacement illustration will be used in the next revision of this Guideline

Helidams and Dams in excess of 1 million litres capacity (1 Megalitre)

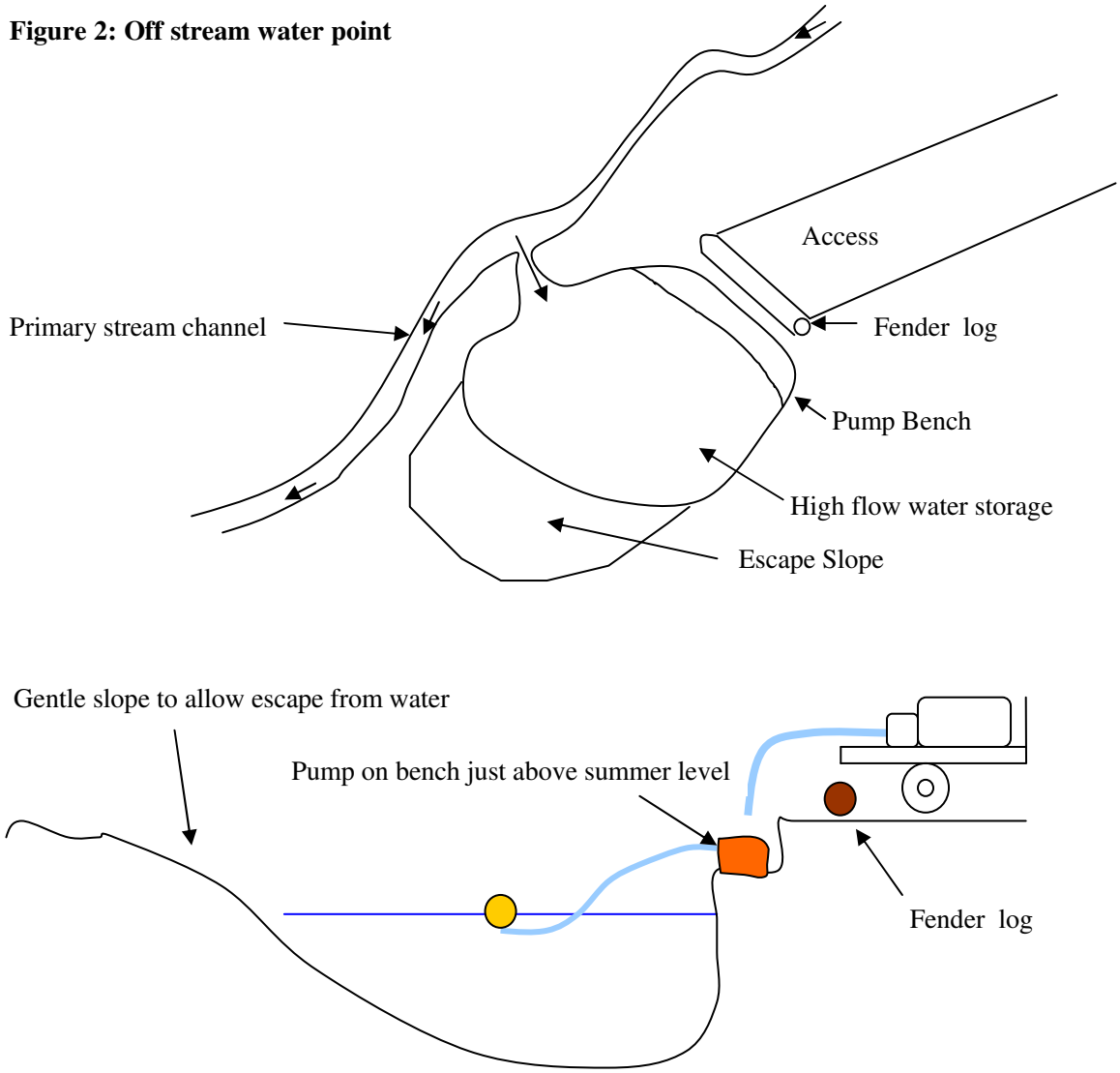
- A complete **Special Values check** must be done for all helidam sites. (water points in excess of 800,000 litres)
- The need for a FPP must be assessed, as often the area involved will be in excess of 1 ha, and on "Vulnerable Land"

For further information on the DPIPWE Dam Works Permit approval process and the flow-chart of the Process for Assessment of Applications for Permits to Undertake Dam Works see:
http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/RPIO-4YG57U?open

Safety

- Where vehicle access to the water point is provided, a fender log or bollard must be placed to prevent vehicles accidentally entering the water point.
- Water points must be built and maintained so as to have at least one side with a gradual slope (< 10%) to enable anyone who falls into the hole to climb out.
- A level platform should be constructed on the edge of the water point to provide a stable platform to locate pumps.
- A water point marker peg must be installed at all permanent water points. The water point identification number must be on the peg.
- Check for, and remove, any hazardous trees around the access to the water point.

Figure 2: Off stream water point



Construction

- Ensure that machinery to used in construction is washed down before delivery to the site.
- "Off stream" water points can be constructed efficiently with excavators which can minimise the surface area ratio by building deep, small area water points. (Remember to provide an escape slope!)
- The water storage holes may be constructed to the side of a streambed. The storage hole can fill from the stream under high flow. (see photo and Figure 2 above)
- Disturbance of the streambed should be avoided.
- Watercourses must not be altered unless approved under a DPIPWE permit.
- Water points should have a minimal surface area to volume ratio.
- Water points should be sited in clayey soils with good water retention properties.
- Where a dam wall needs to be constructed the wall should be "keyed" at the base with clay material to provide an effective seal. The face of a dam wall should also be lined with clay to provide a seal.

- Material dug out with excavators should be levelled off and contoured to leave a tidy and visually acceptable site.
- Gravelling access to water points should be considered where soft ground conditions exist.
- For all Earth-fill dams, the principles behind the DPIPWE *Guidelines for the Construction of Earth-fill dams* should be considered. For earth fill wall heights greater than 2 m, it is recommended that Engineering advice be obtained.
- For other wall heights greater than 2 m, it is recommended that Works advice be obtained.

Administration

- A Water Point Record Form must be completed and forwarded to the District Fire and Works /Engineering Coordinator (see Appendix 1).
- Water point details must be entered into the Forest Operations Database (FOD2) to assist Fire Incident Management Teams to locate water points using GIS.

Marking

The water point must be marked with a blue post as shown in the diagram below.

The preferred Marker is the steel Dura-Post, colour Blue, available from:
Dura-Post Roadside Products Pty Ltd,
45-49 St. Leonards Road, St. Leonards, Tas, 7250
P.O. Box 66, Newstead, Tas, 7250
Tel: 1300 794 397, Fax: 1300 794 511
http://www.durapost.com.au/products/products.html
http://www.durapost.com.au/products/steel-page2.html

The numbers and coding displayed on the post are derived from the Water Point Record Form and help to identify the location, accessibility and reliability of the water point.

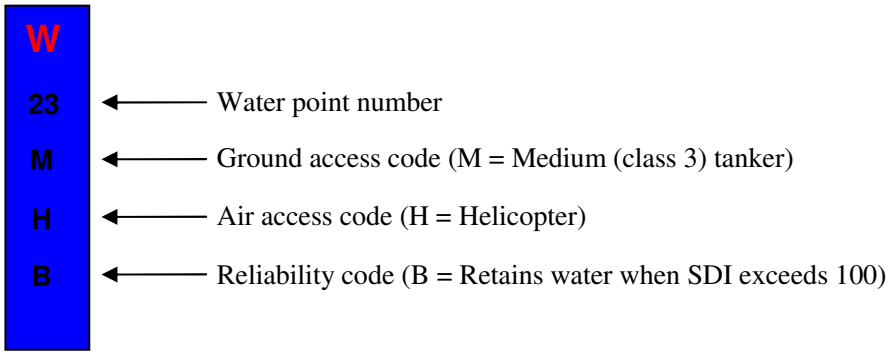


Figure 3
Water point marker general arrangement

WATER POINT RECORD FORM

Items marked with an asterisk * are required information for each water point.

District* …… Block …….. Water Point No.*

Map Sheet* ..…….. Access Road name ..…….

Grid Ref: Easting* ..….. …… E, Northing* ..…… N

Ground Access*

Light Tanker (Classes 5 and 6)	**L**
Medium Tanker (Class 3)	**M**
Articulated Bulk Tanker	**A**
Not accessible	**N**

Air Access*

Helicopter	**H**
Fixed Wing	**F**
Not accessible	**O**

Volume*

Volume = Length (m) x Depth (m) x Width (m) x 1000 Litres

Length (Av) =

Depth (Av) =

Width (Av) =

Volume =

>500,000 Litres	**1**
50,000 - 500,000 Litres	**2**
<50,000 Litres	**3**

Reliability

Permanent Running	**A**
Retains Water when SDI exceeds 100	**B**
Dries up when SDI exceeds 100	**C**
Unknown	**D**

River, Lake or Stream Name*: …….. (if named)

Water point marker installed?* YES NO

Comments (eg needs clearing, leaking, shallow, needs gravel at access, fender log etc)

……

……

……

……

……

Recorder: …… Date Recorded: …….

Standard Operating Procedure

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State Fire Management Council - Smoke Management Guideline V6.0

STATE FIRE MANAGEMENT COUNCIL

Position Paper

Management of Smoke arising from Prescribed Burning of Vegetation

INTRODUCTION

Smoke consists of the visible and invisible airborne by-products of combustion, and is composed of water droplets and vapour, particulates (tar, ash, carbon, unburnt fuel fragments), and gases (CO_2, CO, N_2O, SO_2, NH3, CH4, NOX, ozone and other non-methane hydrocarbons).

On average, the amount of smoke produced by a fire represents between 1.5 and 2% of the quantity of fuel burnt. *(Vines et al. 1971).*

The production of smoke is an unavoidable and natural process in all vegetation fires.

Particulates result from the incomplete combustion of fuels. The proportion of the fuel that is released from fires as particulate matter can be as low as 0.44% for a high-intensity fires burning under very dry conditions, and as high as 2 - 4% for low intensity fires burning under mild weather conditions. *(Evans et al. 1976).*

Prescribed burning is the controlled application of fire, under specified environmental conditions, to a predetermined area and at a time, intensity of heat, and 'rate of spread' required to achieve planned resource management objectives. Examples include 'fuel reduction burning' and 'ecological burning' *(Anon. 2006).*

Prescribed burning is ideally carried out under relatively stable atmospheric conditions. These conditions may be accompanied by the occurrence of atmospheric temperature inversions which can restrict the dispersal of smoke through the atmosphere and trap smoke close to the ground, either throughout the burn operation (if low intensity) or as the fire diminishes in intensity and enters the smouldering stage after the main part of the fuels have been consumed (high intensity burning operations).

Whatever the origin low altitude smoke may reduce visibility, affect the health of sensitive individuals and create a general nuisance.

In the Tasmanian environment smoke may be generated by the burning of vegetation in a wide range of contexts, including;

- the management of fuels and habitat,

- the disposal of agricultural, forest industry and domestic residues and waste,
- seedbed preparation in forest regeneration, and,
- in bushfires.

Thick smoke from vegetation burning does not necessarily cause health problems for everyone exposed to it. Most healthy people recover quickly from exposure to smoke and do not suffer long-term effects. There are a number of factors that determine whether exposure to smoke results in health problems: the concentrations of the air pollutants, the length of exposure, age, individual susceptibility and whether or not there is pre-existing lung or heart disease. (*Anon, 2005)*

Smoke has a range of health effects – from eye and respiratory tract irritation to serious disorders such as breathing problems, bronchitis, increased severity of asthma, cancer and premature death. The very fine particles in smoke can go deep into the lungs and fine particles, and by themselves or in combination with other air pollutants, can make pre-existing diseases of the heart and lungs worse. Where there is short-term exposure to smoke, the particles are the most significant threat to public health. (*Anon, 2005).*

Most healthy people, including children, recover quickly from exposure to smoke and do not suffer long-term consequences. However, certain sensitive groups can experience more severe short-term and chronic effects. These groups are: people with asthma and other respiratory disease, people with cardiovascular disease, children and the elderly. (*Anon, 2005)*

Bushfires and smoke are inevitable and natural components of the Australian and Tasmanian environment.

THE LEGAL ENVIRONMENT

Land owners, occupiers and land managers have statutory obligations to prevent fires occurring, and if any such fire does occur, to attempt to contain the fire to the land they own, occupy or manage.

Meeting these obligations will commonly require the use of prescribed burning to manage fuel loads and fuel arrangement.

Both Commonwealth and Tasmanian legislation imposes requirements and restrictions upon actions producing smoke.

NATIONAL LEGISLATION

Tasmania is a participant in the National Environment Protection Council (NEPC), consisting of Commonwealth, State and Territory Ministers which, on 26 June 1998, made Australia's first national ambient air quality standards as part of the National Environment Protection Measure for Ambient Air Quality *(the 'Air NEPM').*

The NEPC is a statutory body with law making powers established under the National Environment Protection Council Act 1994 (Commonwealth) and corresponding legislation in the other jurisdictions.

The Air NEPM established a set of standards and goal, for six air pollutants (carbon monoxide, nitrogen dioxide, photochemical oxidants (as ozone), sulphur dioxide, lead, and particles as PM_{10}) legally binding on each level of Government, and required the NEPC member jurisdictions to monitor air quality. In Tasmania this is done by the Environment Protection Authority Division of the Department of Primary Industries, Parks Water and Environment *(DPIPWE).*

In terms of smoke management the most critical standard is that for particles as PM_{10}, i.e. particles of aerodynamic diameter of 10 microns or less.

The PM_{10} standard sets a maximum level of 50 micro-grams per cubic metre of air ($50\mu g/m^{3)}$ averaged across each 24 hr. period midnight to midnight.

TASMANIAN LEGISLATION AND POLICY

The following Tasmanian legislation, code, policy and strategy deal with the production of smoke in the course of the burning of vegetation.

- *Fire Service Act 1979*
- *Environmental Management and Pollution Control Act 1994*
- Forest Practices Code 2000
- Tasmanian Environment Protection Policy (Air Quality) 2004
- Tasmanian Air Quality Strategy June 2006

In addition, in some Municipalities the burning of vegetation is governed by bylaws.

Section 4(1) of the *Environmental Management and Pollution Control Act 1994* (EMPCA) describes “best practice environmental management” in relation to an activity as being the management of the activity to achieve an ongoing minimization of the activity's environmental harm through cost-effective measures assessed against the current international and national standards applicable to the activity.

Section 5 of EMPCA then goes on to describe and define environmental harm as “any adverse effect on the environment (of whatever degree or duration) .....” and distinguishes between “material environmental harm” and "serious environmental harm”

EMPCA further states that the occupier or person in charge of a place or vehicle at or from which a pollutant escapes or is discharged, emitted ..... is taken to have polluted the environment with the pollutant”

Smoke is a pollutant, capable of causing both material and serious environmental harm according to the circumstances of the event. Consequently any person or persons undertaking burning, for whatever reason must consider the provisions of EMPCA

However, in 1995 the *Fire Service Act 1979* was amended by the insertion of Section 66(12) which provides that "A person who lights and controls a fire in accordance with the conditions of a permit granted to that person under this section is exempt from the *Environmental Management and Pollution Control Act 1994*".

This amendment arose from Recommendation 8 of the report of the Tasmanian Fire review Committee, established by the Tasmanian Government in September 1993:

"the *Fire Service Act 1979* be amended to provide that a person who lights and controls a fire in accordance with the conditions contained in a permit issued pursuant to the Act is exempt from the provisions of the Environmental Management and Pollution Control legislation (Bale 1994).

That the government accepted and implemented this recommendation remains a clear acknowledgement of the role of and need for managed fire, and the smoke arising from that fire in the Tasmanian environment.

Subsequently the Tasmanian Environment Protection Policy (Air Quality) 2004, made under Section 96K of the *Environmental Management and Pollution Control Act 1994* came into effect on 1 June 2005. The Policy requires that persons undertaking planned burning should use best practice environmental management practices to minimise the effects of smoke pollution on individuals and the community, and in particular that those "…agencies, companies or organisations undertaking burning on a regular basis or on a large scale should:

- *adopt efficient and effective air quality monitoring programmes;*
- *adopt a uniform approach to recording and assessing complaints;*
- *focus upon minimising the impact of smoke on the community in terms of health, amenity and safety;*
- *encourage the planning and execution of planned burning in a way that minimises the generation of smoke and improves the management of the effects of smoke; and*
- *require a responsible person involved in planned burning for land management to be competent in relevant burning procedures."*

In June 2006 the Tasmanian Government launched the Tasmanian Air Quality Strategy which among other things, places an emphasis on improved management of pollution sources such as outdoor burning.

This State Fire Management Council Position Paper is consistent with Actions 6.2 and 6.3 of that strategy (i.e. '*develop smoke management guidelines*' for open burning and *'educate the community on open burning restrictions*').

Improving the management of smoke from planned burning

The Environment Protection Policy (Air Quality), "the Air Quality Policy", requires that persons undertaking planned burning should use best practice environmental management to minimise the effects of smoke pollution on individuals and the community.

The Air Quality Policy also requires that:

SFMC POSITION

The State Fire Management Council's position on smoke management is that:

Persons lighting fires for the management of vegetation fuels must act responsibly in ensuring the protection of human and environmental values and minimising any adverse or undue effects of the smoke arising from that burning.

In particular the State Fire Management Council advocates that:

1. Smoke arising from both wildfires and prescribed burning must be recognised as inevitable and natural components of the Tasmanian environment
2. Low intensity prescribed burning be recognised as the most cost effective tool available to those managing vegetation fuel loads.
3. In appropriate vegetation types prescribed burning is an efficient, ecologically sound and economically suitable method of reducing fuel loads over large areas
4. Cooperative interaction between the Tasmania Fire Service, The Parks and Wildlife Service, Forestry Tasmania, the Bureau of Meteorology, the Environment Protection Authority, the EPA Division of DPIPWE, and appropriate special interest groups should be developed and encouraged to disseminate information on the effects on quality of life of smoke emanating from prescribed burning
5. Smoke from prescribed burning should be managed to minimise affecting population centres and other sensitive areas by a combination of strategies including, but not limited to:
    - Scheduling burning in periods in which meteorological conditions will assist in the dispersion of smoke
    - modifying burn prescriptions to minimise smouldering of partly consumed fuels
    - separating burns in time and space when and where possible.

PLANNING

6. Smoke sensitive locations or areas (e.g. residential areas, schools, scenic areas, retirement villages and hospitals etc.) should be identified in fire management plans.
7. Fire management plans should identify strategies to minimise the risk of adverse smoke impacts in smoke sensitive areas.
8. Alternatives to burning (e.g. slashing, selective shrub removal, construction of radiation barriers, chipping, mulching and composting etc.) should be considered as fuel management and hazard/risk management strategies where a high risk of adverse smoke impacts is likely.

9. Operational burn plans should incorporate appropriate prescriptions for fuel moisture content, wind speed and direction and atmospheric stability so as to reduce the risk of smoke effects on sensitive locations or areas.

TRAINING AND EDUCATION

10. Smoke management principles, policies and procedures should be incorporated within fire management training delivered by Forestry Tasmania, the Parks and Wildlife Service and the Tasmania Fire Service.

PERMITS AND NOTICES

11. Fire Permit Officers should consider the likelihood of adverse smoke effects on sensitive locations or areas arising from fires lit under permit, and specify appropriate conditions in the permit.
12. Fire Permit Officers should make smoke management guidelines available with each permit issued.
13. When issued for burning in or near identified smoke sensitive locations or areas fire permits should detail wind directions which minimise nuisance
14. To avoid excessive smoke generation, fire permits should detail fuel moisture content parameters where this can be controlled (e.g. heap burning).

MANAGEMENT OF BUSHFIRE SUPPRESSION OPERATIONS

15. Incident Action Planning should give due consideration to the smoke management aspects of public safety including:
    - Management of special areas at high risk of adverse health impacts from high level smoke exposure (e.g. aged care facilities, hospitals, schools etc)
    - Public safety management and service disruption in smoke affected transport corridors (e.g. airports, freeways, major roads, railways etc)
    - Safety and operational implications of smoke for other, concurrent fire fighting operations, particularly those involving aircraft.
16. Smoke management should be included in the list of topics that are to be routinely covered during fire debriefs.

MANAGEMENT OF PRESCRIBED BURNING OPERATIONS

17. Fire control and safety requirements should not be compromised in accommodating smoke dispersal objectives.
18. Weather systems which provide for good smoke dispersal should be used to advantage when conducting large scale burning operations.
19. Wherever it is safe and practical to do so, burning should not be undertaken when:
    - The likelihood of prolonged poor dispersion conditions is high;
    - The likelihood of smoke adversely affecting significant community events is high, and
    - CSMS smoke management prescriptions are not likely to be met.

OPERATIONAL TECHNIQUES

20. Where safe to do so, lighting techniques and patterns that reduce the smouldering phase of combustion and minimise the burning of material during times of the day where atmospheric dispersion is poor should be used.
21. Where practical and safe to do so (e.g. small scale burns along road edges or property boundaries, and pile burns) aggressive mop-up procedures (e.g. maximum use of water and the breaking up or dousing of large fuel masses such as logs and stumps) should be applied so as to minimise the smouldering phase of combustion.
22. The use of backing fires (i.e. fires burning down slope and/or against the prevailing wind direction) is encouraged as an operational technique to maximise combustion and minimise smoke emissions.
23. Any person undertaking burning operations should whenever possible:
    - take advantage of weather conditions which optimise smoke dispersion without compromising other fire management objectives,
    - be aware of appropriate smoke impact mitigation strategies and tactics and the location of any nearby smoke sensitive areas,
    - avoid the burning of noxious smoke producing debris (e.g. tyres, dumped rubbish etc.),
    - avoid the burning of rubbish piles and backyard clippings.

References

Anon, (2005) Smoke from biomass burning: Air quality fact sheet, Department of the Environment and Heritage, http://www.environment.gov.au/atmosphere/airquality/publications/biomass.html *(as viewed Feb. 2012)*

Anon. (2006) *Smoke and the Control of Bushfires*, FireNote 3 Bushfire CRC Melbourne.

Bale, W.C.R. (Committee Chair) *Review of Vegetation Based fire in Tasmania* (1994) Report of the Tasmanian Fire Review Committee, Hobart.

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Vines, R.G., Gibson, L., Hatch, A.B., King, N.K., MacArthur, D.A., Packham, D.R. and Taylor, R.J. (1971), *On the nature, properties and behaviour of bushfire re smoke,* CSIRO Div. Applied Chemistry, Tech. Pap. No.1. (In Anon. (2006) *Smoke and the Control of Bushfires*, FireNote 3 Bushfire CRC Melbourne).

Further Reading: Legislation and Policies

Environmental Management and Pollution Control Act 1994

Fire Service Act 1979

Both of the above Acts are available on line from the Tasmanian Legislation website, http://www.thelaw.tas.gov.au/index.w3p

Forest Practices Code 2000

Available online from the Forest Practices Authority website: http://www.fpa.tas.gov.au/__data/assets/pdf_file/0020/58115/Forest_Practices_Code_2000.pdf

Environment Protection Policy (Air Quality) 2004

Available online from the Tasmanian Environment Protection Authority website: http://epa.tas.gov.au/policy/air-quality-epp)

Tasmanian Air Quality Strategy June 2006

Available online from the Tasmanian Environment Protection Authority website: http://epa.tas.gov.au/epa/tasmanian-air-quality-strategy

Standard Operating Procedure

5

Fuel Hazard Assessment Guide

Department of Sustainability and Environment

Overall fuel hazard assessment guide

4th edition July 2010

Fire and adaptive management

report no. 82

State Government Victoria

Overall fuel hazard assessment guide

4th edition July 2010

Fire and adaptive management, report no. 82

By Francis Hines, Kevin G Tolhurst, Andrew AG Wilson and Gregory J McCarthy

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Australian Government
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Emergency Management Australia

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Cover image: Elaine – Atchison Rd Fire, Victoria, January 2008. Bark Hazard – Extreme, Elevated Fuel Hazard – Moderate, Near-surface Fuel Hazard – Low, Surface Fuel Hazard – Very High. Overall Fuel Hazard – Extreme. Fire burning under FFDI 17 – High.

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Contents

1. About this guide

1.1 Purpose

The main purpose of this guide is to allow people to:

- make a rapid, visual assessment of fuel arrangement, and
- gain an understanding of how this will affect the chances of controlling a bushfire.

1.2 Audience

This guide has been principally designed to provide information on fuel arrangement to be used by:

- firefighters to assess the difficulty of controlling a bushfire.

Information on fuel arrangement may also be used by:

- asset owners and managers to assess potential bushfire risks to assets
- land and fire managers to provide a measurable objective and trigger for fuel management in fire management plans
- personnel to identify which key attributes and fuel layers are contributing the most to the hazard
- personnel to plan and conduct planned burns
- personnel to assess the effectiveness of planned burning or mechanical hazard reduction
- fire behaviour analysts to produce fire-spread predictions and community warnings.

Those who use the guide for these other purposes need to be mindful of its limitations and how the results are applied and interpreted.

1.3 What fuel is assessed

This guide is for assessing fine fuels that burn in bushfires. Fine fuels are the fuels that burn in the continuous flaming zone at the fire's edge. They contribute the most to the fire's rate of spread and flame height. Typically, they are dead plant material, such as leaves, grass, bark and twigs thinner than 6mm thick, and live plant material thinner than 3mm thick. Once ignited, these fine fuels generally burn out within two minutes.

This guide focuses on assessing the key structural layers of the fine fuel complex, in particular those of bark, elevated, near-surface and surface fuels.

1.4 How the fuel is assessed

Each fuel layer is assessed simply and visually. Assessing the fuel takes only a few minutes and is based on the premise that the eye is better able to integrate local variations in fuel than systematic measurement. Each fuel layer is assessed in turn and given a hazard rating. Particular emphasis is placed on how the fuel is arranged within each of these layers. The hazard ratings are then combined to produce an Overall Fuel Hazard Rating that ranges from Low to Extreme.

1.5 Why fuel arrangement is more important than fuel load

The image below highlights the effect that changing the arrangement of the fuel can have on fire behaviour. Both fires were ignited at the same time in the same way. Both fires are burning in the same fuel load, approximately two broadsheets of newspaper over a 20cm diameter area. The fuel on the right was laid flat and has little vertical orientation. The fuel on the left was crumpled up, which gave it more vertical orientation and exposed more of the surface to the air. As a result, the fire on the left shows significantly greater flame height and the fuel is consumed much faster.

The simple difference in the arrangement of the fuel significantly affects the resulting fire behaviour. The effect would not be discerned if the fuel assessment was based purely on fuel load. An assessment of fuel hazard takes into account the fuel arrangement. It gives a better indication of potential fire behaviour and suppression difficulty.

1.6 Suppression difficulty is not just about fire behaviour

This guide has been mainly developed to allow people to assess the impact of fuel arrangement on suppression difficulty. An assessment of suppression difficulty (how hard it is to control a bushfire) is not based solely on the anticipated fire behaviour. Many other factors affect the chances of a firefighting operation succeeding, including resources, fire size and terrain.

In order to consider the impact of fuels, the other factors need to be treated as if they are constant. The factors that have been held constant are referred to as the Reference Extended First Attack Conditions. Further detail on these conditions is contained in Appendix 1.

1.7 Basis of the Overall Fuel Hazard classification

A comprehensive explanation of this guide is contained in DSE's *Overall fuel hazard assessment guide: a rationale report – fire and adaptive management report no. 83* (in prep.).

This assessment guide updates and builds on work previously published by Wilson (1992a, 1992b, 1993), McCarthy *et al.* (1998a, 1998b, 1998c, 1999, 2001), the Department of Environment and Heritage (2006) and Gould *et al.* (2007a, 2007b).

Classifying Overall Fuel Hazard is complex, with few available measurements. Therefore, we have relied on the perceptions of experienced fire personnel (e.g. fire behaviour specialists, fire managers and firefighters). The collective experience of these personnel is vast, with a broad geographic base across Australia.

1.8 Need for continual learning and development

Although our knowledge about fuels has many gaps, this guide is based on the best available information and experience. The authors acknowledge that this guide will need to change and improve as more information is obtained.

Observers of firefighting operations can improve future editions of this guide by carefully recording what they see. Observations, comments and feedback can be emailed to fire.monitoring@dse.vic.gov.au.

2. How to use the guide

This guide has been kept concise and should not be considered as a standalone document. To produce reliable and consistent results requires extra knowledge which may be gained through local hands-on training in fuel assessment.

2.1 Application

This guide is a tool for rapidly assessing fuel arrangement and its effect on the chances of controlling a bushfire. It may also be used for a range of other fire management purposes, as shown in the table below. Users of this guide should understand the underlying assumptions and limitations before applying it, particularly if applying it for purposes other than the assessment of suppression difficulty.

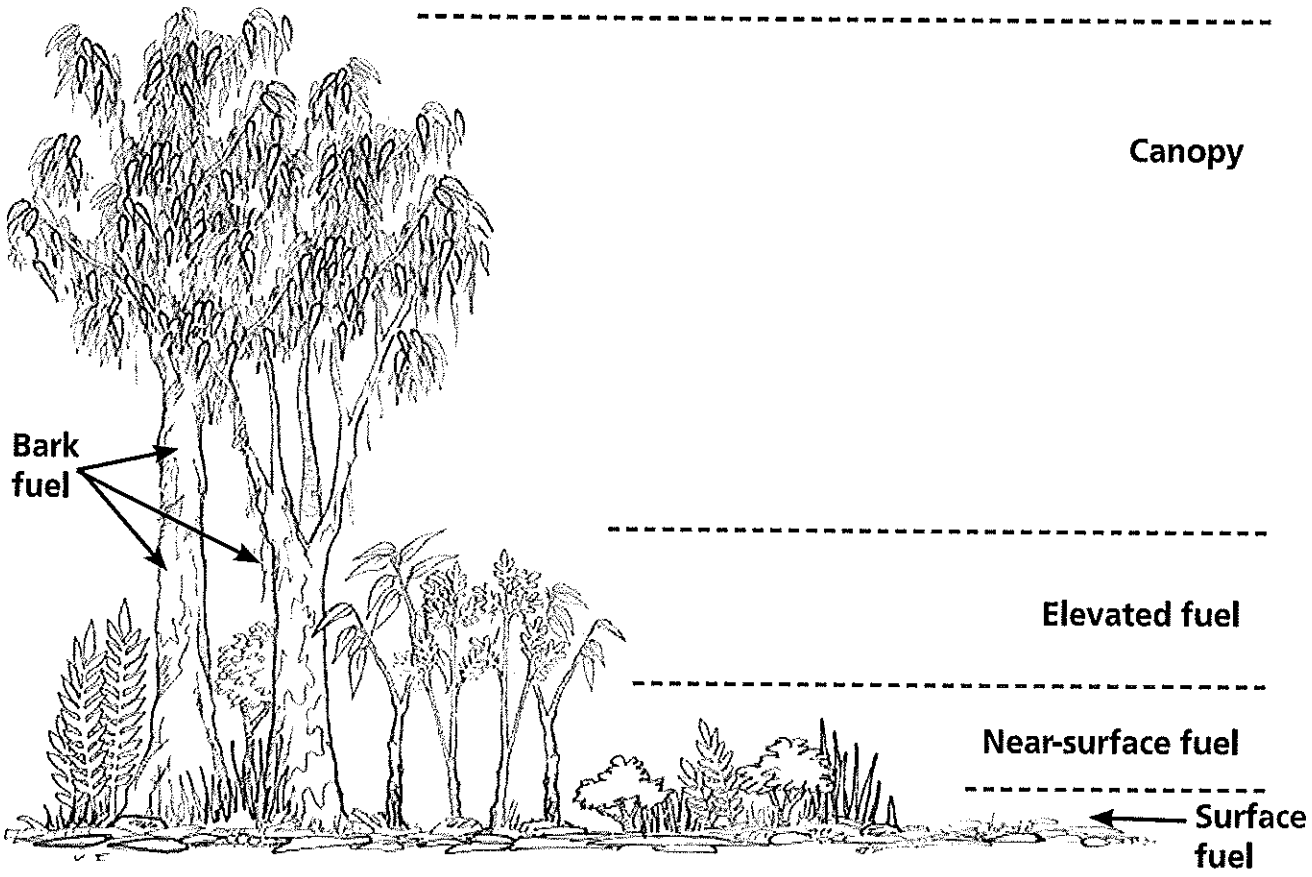
Application	Methodology
Assess suppression difficulty	Assess the fuels in which the fire may occur or is actually occurring.
Assess fuels for predicting potential risk to assets	Assess the fuels immediately adjacent to the asset as part of an assessment of possible radiant heat loads and defendable space. Assess the fuels further away from the asset; paying particular attention to areas that may generate spotting, such as ridges. Assessments should be focused, particularly in the direction of likely fire attack.
Assess the need for, or success of, fuel management activities	Assess the average fuels across the nominated area by sampling within major vegetation types, slopes and aspects.
Plan and conduct planned burns	Assess the variability in fuels across the nominated area by sampling within major vegetation types, slopes and aspects. Pay particular attention to areas where the burn may escape, such as the tops of gullies, ridge tops and areas adjacent to planned burn boundaries.
Assess fuels for predicting fire behaviour	Assess the fuel values needed as inputs for the appropriate fire behaviour model.

2

2.2 Fuel layers

Fuel in forests, woodlands and shrublands can be divided into four layers, each based on its position in the vegetation profile (Fig 2.1). This guide focuses on assessing the key structural layers of the fine fuel complex, those of bark, elevated, near-surface and surface fuels.

Figure 2.1 Fuel layers and bark



Use the following descriptions to determine how to separate vegetation into fuel layers.

Layer	Description	Contribution to suppression difficulty
Canopy	• Crowns of the tallest layer of trees. • Under some conditions canopy fuels can play a significant role in fire behaviour and suppression difficulty. Currently, however, these fuels are not assessed as part of Overall Fuel Hazard.	
Bark fuel	• Bark on tree trunks and branches, from ground level to canopy.	Spotting
Elevated fuel	• Fuels are mainly upright in orientation. • Generally most of the plant material is closer to the top of this fuel layer. • Sometimes contains suspended leaves, bark or twigs. • Fuels that have a clear gap between them and the surface fuels. • Can be highly variable in ground coverage. • Low-intensity fire (flame height of less than 0.5m) may pass beneath this layer without consuming much, if any, of it.	Influences the flame height and rate of spread of a fire.
Near-surface fuel	• Live and dead fuels, effectively in touch with the ground, but not lying on it. • Fuel has a mixture of vertical and horizontal orientation. • Bulk of the fuels are closer to the ground than to the top of this layer, or are distributed fairly evenly from the ground up. • Sometimes contains suspended leaves, bark or twigs. • Coverage may range from continuous to having gaps many times the size of the fuel patch. • Low-intensity fire (flame height of less than 0.5m) will consume most or all of this fuel. • Fuel in this layer will always burn when the surface fuel layer burns.	Influences the rate of spread and flame height of a fire.
Surface fuel (litter)	• Leaves, twigs, bark and other fine fuel lying on the ground. • Predominantly horizontal in orientation.	Influences the rate of spread of a fire.

This guide is for assessing fine fuels only. Coarse fuels including logs are not considered. See Section 1.3 for further details.

The descriptions of the fuel layers exclude references to species' names or common vegetation forms, such as shrubs. During a plant's life it may transition back and forth between different layers. For example, juvenile bracken fern can be classified as near-surface fuel before becoming elevated fuel as it matures. Once it dies and collapses it may become near-surface fuel again.

2.3 Assessment based on key attributes of fuel hazard

A fuel hazard rating of Low, Moderate, High, Very High or Extreme is assigned to each fuel layer by assessing it against the key attributes listed below.

Key attribute	
Horizontal continuity of the layer	Determines how readily a piece of burning fuel may ignite the fuel beside it. Identifies which of surface, near-surface or elevated fuels will determine the average flame height.
Vertical continuity of the layer	Determines how readily a piece of burning fuel may ignite the fuel above it.
Amount of dead material in the layer	Determines how much dead material is present to burn and thus help with igniting the live (green) fuels.
Thickness of the fuel pieces	Determines whether the fuel pieces will burn in the flaming front of the fire.
Total weight of fine fuel	Determines the weight of fine fuel contributing to the flaming front of the fire.

The descriptions in the hazard assessment tables do not cover all possible combinations of the key attributes. Users will need to exercise judgement and make an assessment using all key attributes when actual conditions fit between the descriptions.

2.4 Using the descriptions and photographs

This is **not** a photographic guide for assessing fuels. The **descriptions** for each of the key attributes should be used as the basis for determining the fuel hazard rating. Photographs cannot adequately show all of the key attributes that are important in determining fuel hazard. The photographs are provided to illustrate **some** of the key attributes for each fuel hazard rating. They do not represent all possible variations of that particular hazard rating.

2.5 Area of assessment

Within an area of interest fuels are assessed in small patches or plots. The size and number of plots depends on the reason for assessing the fuels. Some applications (such as for input into fire behaviour models) may require a more rigorous and systematic approach to sampling. Other applications (such as assessing fuel hazard during firefighting operations) will necessitate a more rapid informal approach. For whatever purpose the guide is being used it is recommended that the following principles be applied:

- Any assessment of fuels should try to assess the variability in fuels across an area by assessing the fuels at multiple plots.
- The size and number of plots should reflect the level of reliability required of the results.
- For surface, near-surface and elevated fuel layers the result of assessing the plot should reflect the average state of that fuel layer.
- For bark hazard the result of assessing the plot should be based on the trees with the highest rating.
- Always record with the result the name and the version of the guide used.

2.6 Tips for assessing fuel hazard

The process of assessing fuel hazard using this guide is largely subjective. Implementing the following techniques will help to improve accuracy and reliability:

- Identify and agree on examples of the highest rating of fuel hazard for each layer that occur locally. These examples should be used as benchmarks.
- Conduct assessments in pairs of observers and regularly change assessment pairs.
- Assessors should be no more than one hazard rating apart when assessing each layer (e.g. Low or Medium, not Low or High).
- Use different assessors to re-assess completed work and provide feedback.

2.7 Vesta fire behaviour predictions

In dry eucalypt forest with a litter and shrub understorey the *Field guide – fuel assessment and fire behaviour prediction in dry eucalypt forest* (Gould *et al.* 2007b) provides a systematic method for assessing fuel and predicting fire behaviour (rate of spread, flame height, and spotting). The Project Vesta fuel hazard scoring system is similar to the Victorian system developed by Wilson (1992a, 1992b, 1993) and revised by McCarthy *et al.* (1999). The scale that underlies the Vesta fuel hazard scores is directly related to fire behaviour. These scores, along with height measurements of various fuel layers, are needed as inputs into the fire behaviour prediction tables in Gould *et al.* (2007b). Section 9.3 contains a table for translating the fuel hazard rating for each fuel layer into Vesta fuel hazard scores.

2.8 Effect on fire behaviour

Each table for assessing fuel hazard contains information on the effect that the fuel arrangement is likely to have on fire behaviour. This effect is for weather conditions equivalent to a Forest Fire Danger Index (FFDI) of 25 (McArthur 1973). An FFDI of 25 can be achieved in many ways. For the purposes of this guide the specific conditions required to achieve this are:

Temperature: 33°C	Relative Humidity: 25%	Wind Speed: 20km/h
Drought Factor: 10	Slope: 0°	

If weather conditions vary from those listed above the effect on fire behaviour will also vary.

2.9 Fuel assessment data sheet

Appendix 2 contains a sample field data sheet that can be used when assessing fuels.

3. Bark fine fuel

3.1 Identification

Bark fuel is the bark on tree trunks and branches. Bark lying on or near the ground or draped over understorey plants is considered to be surface, near-surface or elevated fuel.

3.2 Identifying bark types

The key attributes for assessing the effect of bark on suppression difficulty are shown below:

Key attribute	Determines	How it is assessed
Ease of ignition	• How readily the bark will ignite. • Whether the fire will burn up the trunk and into the branches of the tree.	Thickness, size and shape of bark pieces.
How bark is attached	• How likely the bark is to break off the tree.	How easily the bark breaks off the tree.
Quantity of combustible bark	• Volume of potential embers that a fire may generate.	Relative quantity of combustible bark.
Size-to-weight ratio of the bark pieces	• How far the wind is likely to carry bark pieces once they break off the tree.	Thickness, size and shape of bark pieces.
Burn out time	• Length of time a piece of bark will stay ignited once it breaks off the tree.	Thickness, size and shape of bark pieces.

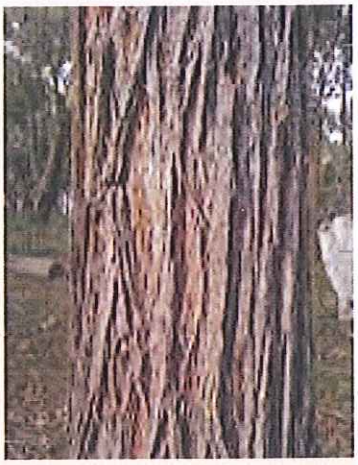
Descriptions of trees have been separated into three broad bark types using three of these key attributes – ease of ignition, burn out time and size-to-weight ratio:

1. Fine fibrous barks, including stringybarks
2. Ribbon or candle barks
3. Other bark types, including smooth, platy, papery and coarsely fibrous. The reason for describing these types in some detail is to help observers distinguish them from the above two types.

3.3 Identifying Stringybark and other fine fibrous bark types

Contribution to suppression difficulty	• Bark types that can produce massive quantities of embers and short distance spotting.
Physical description	• Bark is fine fibrous material with easily visible fibres less than 1mm thick covering the whole trunk. • Bark fibres resemble the fine fibres that are twisted together to form natural string. • Old bark is retained on the trunk of the tree for decades, forming a relatively spongy fibrous mass with deep vertical fissures. • Outer bark may weather to a greyish colour, while underlying bark retains its original colour. • Bark may form large strands when peeled off. • Fine, hairlike pieces also break off from the tree when it is rubbed.
Ease of ignition	• Bark is very flammable (can be easily lit with a match when dry). • Fires will readily climb the tree and branches.
How bark is attached	• Young or new bark is held tightly to the trunk. • As bark ages it becomes less tightly held. • Old, long-unburnt bark is held very loosely.
Quantity of combustible bark	• Bark on old, long-unburnt stringybarks can be more than 10cm in depth. During fires it can produce massive quantities of embers.
Size-to-weight ratio	Burning pieces of bark tend to be either: • Very fine lightweight fibres that will be carried for less than 100m. • Small lightweight wads (about the size of a thumb) that will be carried for less than 300m. • Very large wads (bigger than a fist) that fall close to the tree.
Burn out time	• Very fine fibres of bark that will burn out within one minute. • Small wads of bark that will burn out within 2–3 minutes. • Very large wads of bark that will burn for up to 10 minutes.
Hazard accumulation	• Bark hazard can reach Extreme. • Bark hazard increases over time as the thickness and looseness of the old bark increases. • Repeated low intensity fires (<0.5m flame height) may produce a 'black sock' effect on the base of the trunk, but this may have limited effect in reducing the overall quantity of bark and the hazard.

Examples



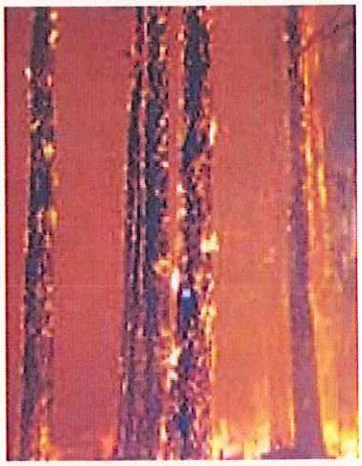


Table 3.1 Assessing the hazard of fine fibrous bark types including stringybarks

Only use this table if at least 10% of the trees in a forest have fine fibrous bark. To achieve a given hazard rating a best fit of both key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

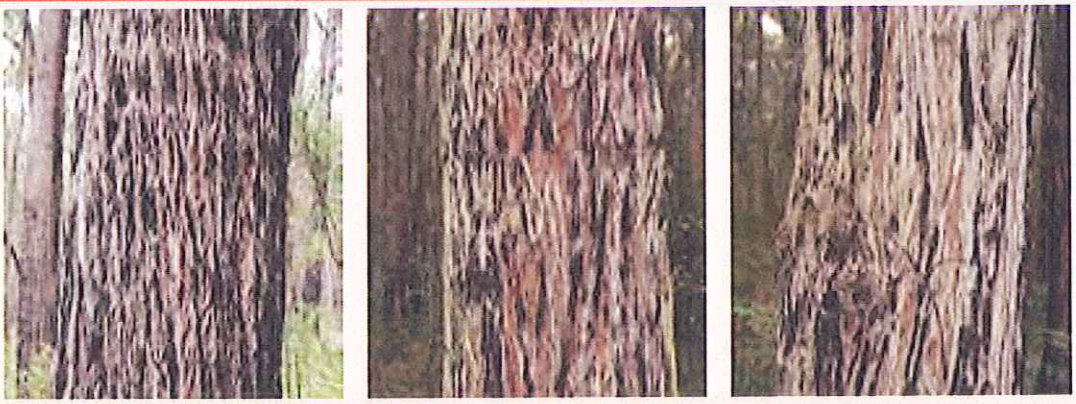
Key attributes		Hazard rating	Effect on fire behaviour (at FFDI 25)[1]
How bark is attached	Quantity of combustible bark		
This hazard rating cannot occur when only this bark type is present.		Low	
Bark tightly held. Requires substantial effort to break off bark by hand.	Very little combustible bark. Entire trunk almost completely black or charred.	Moderate	Spotting generally does not hinder fire control. Fires will not climb these trees.
Bark is mostly tightly held with a few pieces loosely attached.	Limited amount of combustible bark. 50–90% of trunk charred. Most of the bark is charred, especially on the lower part of the trunk.	High	Infrequent spotting. Fires will climb some of these trees.
Many pieces of bark loosely held. Deep fissures present in bark.	Large amounts of combustible bark. 10–50% of trunk charred. Upper parts of the tree may not be charred at all.	Very High	Substantial spotting. Fires will climb most of these trees.
Outer bark on trees is weakly attached. Light hand pressure will break off large wads of bark. Deep fissures present in bark.	Huge amounts of combustible bark. <10% of trunk charred. Minimal evidence of charring.	Extreme	Quantity of spotting generated makes fire control very difficult or impossible. Fires will climb virtually all these trees.

Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as being the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

1 FFDI 25 is a Forest Fire Danger Index of 25 (McArthur 1973). Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 3.2 Examples of Stringybarks and other fine fibrous bark hazard

Low	This hazard rating cannot occur when only this bark type is present.
Moderate	
High	
Very High	
Extreme	

The photos above show some of the variation possible within each bark hazard rating.

3

3.4 Identifying ribbon or candle bark types

Effect on suppression difficulty	• Bark types that can produce substantial quantities of spotting at distances greater than 2km. Will also produce short distance spotting.
Physical description	• Trees characterised by the annual shedding of old bark layers, exposing the smooth new bark underneath. • Bark is shed in the form of long strips or ribbons of bark. • Long strips of bark curl tightly inwards to form a candle-like shape (see image lower right). • Bark strips 50cm or more in length fall off and often drape around the trunk and over branches and surrounding shrubs. • Strips of bark are usually less than 2mm thick. • Bark is shed at various times of the year so that the trunk may have a mottled appearance.
Ease of ignition	• Bark is moderately flammable (can be lit with a cigarette lighter when dry). • Fires will climb up ribbons of bark.
How bark is attached	• Bark strips may drape over, or be weakly attached to, the trunk and branches.
Quantity of combustible bark	• Large quantities of bark can be retained in upper trunk and head of the tree.
Size-to-weight ratio	• Bark pieces are relatively light for their large size. • Easily transported by strong updrafts – may travel up to 30km downwind.
Burn out time	• Bark can burn and smoulder within the curled up ribbons for longer than 10 minutes.
Hazard accumulation	• Bark hazard never exceeds Very High. • Bark hazard tends to increase over the long term as ribbons accumulate on the tree. • A low intensity fire (flame height of less than 0.5m) may not reduce the hazard in this bark type.

Example

Note: Loose ribbon or candle-like bark that is retained on the trunk near ground level is not included in the assessment of ribbon or candle bark types. It is usually:

- firmly attached to the trunk of the tree
- consumed in place by a surface fire.

This bark is considered in 'Other bark types' and can also be considered as near-surface fuel.

Smooth-bark trees also shed bark as slabs or flakes. These bark types are considered in 'Other bark types'.

Table 3.3 Assessing the hazard of ribbon or candle bark types

If more than 10% of the trees in a forest are fine fibrous bark trees use Table 3.1 (Assessing the hazard of fine fibrous bark types) to determine the bark hazard for a site.

Key attribute Amount of combustible bark	Hazard rating	Effect on fire behaviour (at FFDI 25)[2]
This hazard rating cannot occur when only this bark type is present.	Low	
No long ribbons of bark present. Trunk and branches of trees almost entirely smooth.	Moderate	Spotting generally does not hinder fire control. Fires will not climb these trees.
Long ribbons of bark present on upper trunk (>4m above ground) and in head of trees. Lower trunk mainly smooth.	High	Infrequent spotting. Fires will climb some of these trees.
Long ribbons of bark in the head and upper trunk with: • ribbons hanging down to ground level or, • flammable bark covers trunk.	Very High	Substantial spotting. Fires will climb most of these trees.
This hazard rating cannot occur when only this bark type is present.	Extreme	

Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

2 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 3.4 Examples of ribbon or candle bark hazard

Low	This hazard rating cannot occur when only this bark type is present.
Moderate	
High	
Very High	
Extreme	This hazard rating cannot occur when only this bark type is present.

3.5 Identifying other bark types

This bark type includes all other bark types not included in the previous two types. As a result, many different tree species are grouped together. This grouping is based on the ease of ignition, burn out time and size-to-weight ratio of the bark, rather than on botanical values. These other bark types can produce limited quantities of short distance spotting.

This bark type group has been divided into several subgroups. These subgroups are described in some detail to help observers distinguish them from the other two main bark types.

3.5.1 Ironbarks and Platy barks

Physical description

- Trees characterised by layers of old, coarse bark retained on the trunk and branches.
- Bark becomes rough, compacted and furrowed with age
- Bark feels very abrasive when rubbed by hand.
- Bark pieces tend to be more than 2mm thick when they break off.
- There may be little or no evidence of charring on the bark following planned burns.

Hazard accumulation

- Bark hazard never exceeds Moderate.

Example

3.5.2 Coarsely fibrous barks

Physical description

- Trees characterised by short strand fibrous bark.
- Layers of old dead bark are retained on the trunk and branches.
- Unlike stringybark trees, the bark on these trees forms only short strands or chunks when peeled off.
- Evidence of charring on the bark may last for up to 10 years.

Hazard accumulation

- Bark hazard never exceeds High.
- Bark hazard increases over the long term as the thickness and looseness of the old bark increases.

Example

3.5.3 Papery barks

Physical description

- Shrubs and trees growing from 2m to 30m tall, often with flaky shedding bark.
- Old bark is retained on the trunk and branches and builds up into a thick spongy mass.
- Bark layers tend to split allowing sheets of bark to become loose and eventually peel off.
- Evidence of charring on the bark may last for up to 10 years.

Example

Hazard accumulation

- Bark hazard never exceeds High.
- Bark hazard increases over the long term as the thickness and looseness of the old bark increases.

3.5.4 Slab bark, smooth bark and small flakes

Physical description

- Trees characterised by the annual shedding of old bark layers, exposing the smooth living bark underneath.
- Bark shed is often seasonal and often annual.
- Species where the old bark tends to peel into large slabs (<50cm in length) or small flakes when shed.
- Most of the bark falls off the tree soon after it is shed.
- Some small amounts of bark may be retained on the stem or branches for several months before falling off, leading to a mottled effect.
- The mottled effect leads to discontinuous bark fuel up the tree.

Example

Hazard accumulation

- Bark hazard never exceeds Moderate.
- Bark hazard tends to be seasonal.

Table 3.5 Assessing the hazard of other bark types

If more than 10% of the trees in a forest are fine fibrous bark trees use Table 3.1 (Assessing the hazard of fine fibrous bark types) to determine the bark hazard for a site. To achieve a given hazard rating a best fit of both key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

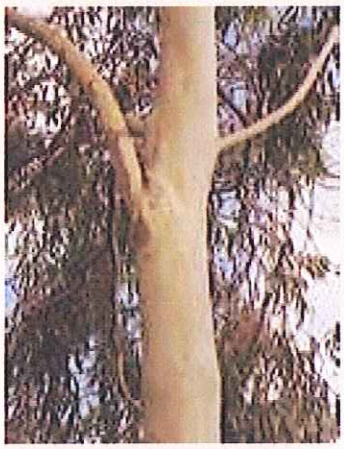
Key attributes		Hazard rating	Effect on fire behaviour (at FFDI 25)[3]
How bark is attached	**Quantity of combustible bark**		
No trees present. or Trunk and branches of tree entirely smooth or free from loose bark.		Low	No bark present that could contribute to fire behaviour.
Bark rubs off by hand with firm pressure.	Limited amount of combustible bark.	Moderate	Spotting generally does not hinder fire control. Fires will climb some of these trees.
Light hand pressure will break bark off.	Large amounts of combustible bark.	High	Infrequent spotting. Fires will climb most of these trees.
This hazard rating cannot occur when only this bark type is present.		Very High	
This hazard rating cannot occur when only this bark type is present.		Extreme	

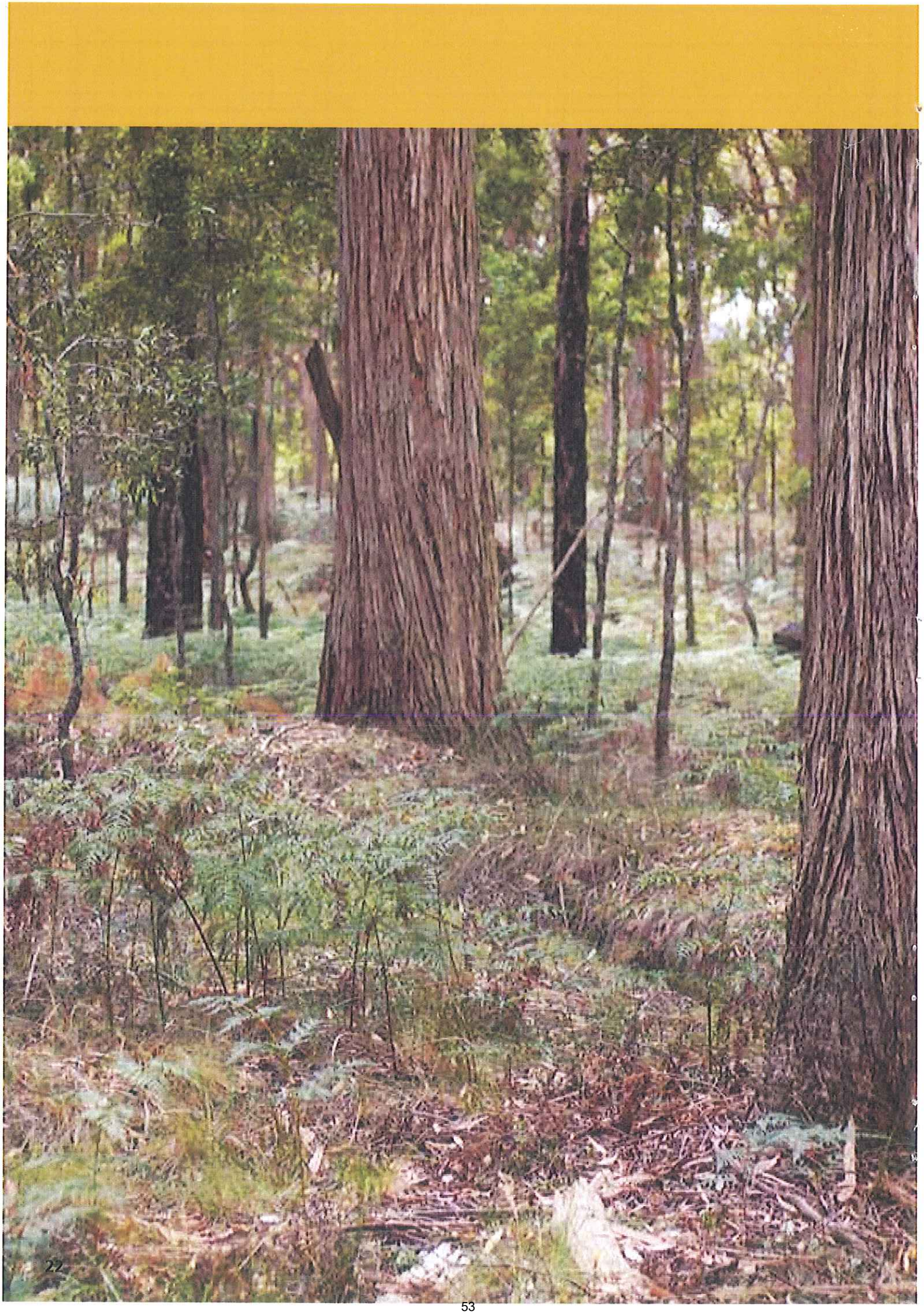
Assess bark hazard over a plot 20m in radius. Assessing multiple plots will give better results. Trunk is defined as the part of the tree between the ground and the branches.

See Section 9.3 for application of bark hazard ratings for the Vesta fire behaviour tables.

3 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 3.6 Examples of other bark types

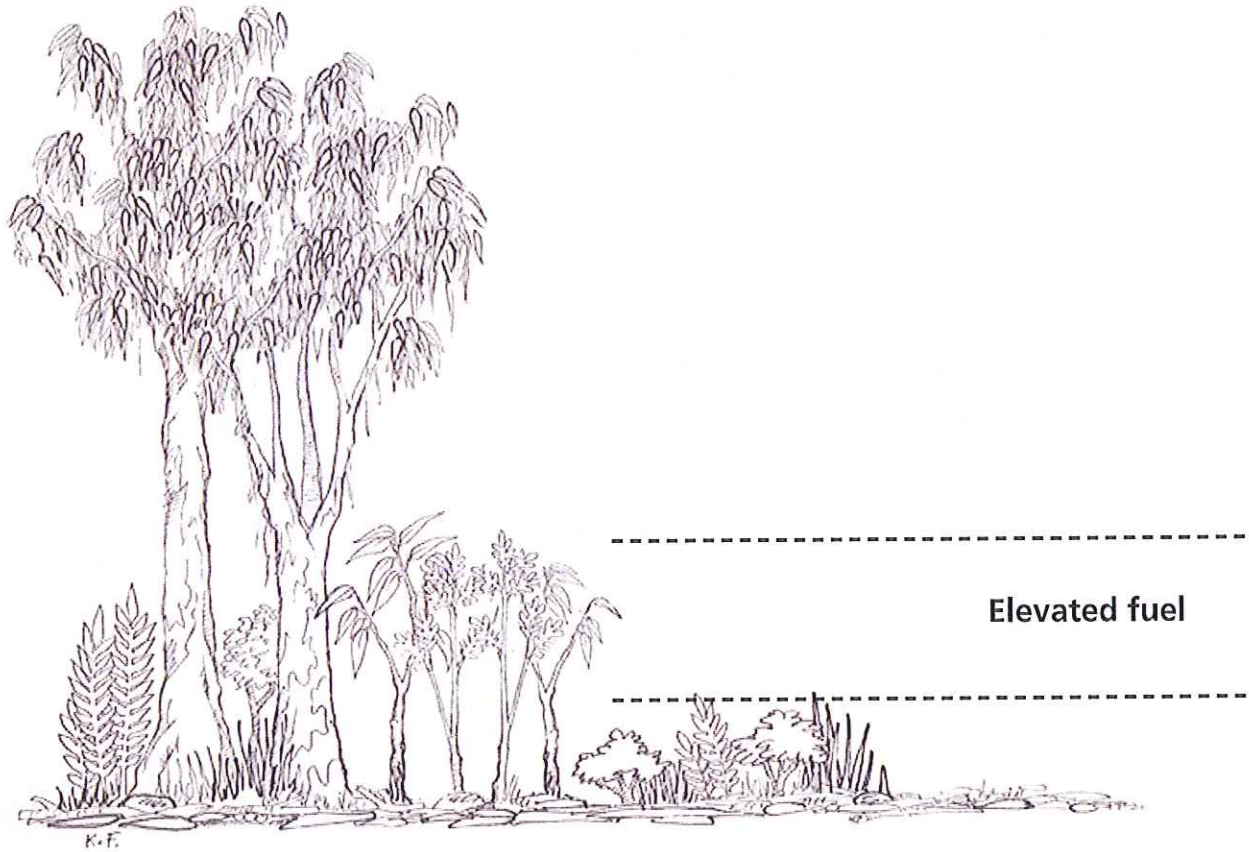
Low	No trees present. or Trunk and branches of tree entirely smooth or free from loose bark.	
Moderate		 
High		 
Very High	Does not occur when this is the only bark type present on a site.	
Extreme	Does not occur when this is the only bark type present on a site.	


22

4. Elevated fine fuel

4.1 Identification

- Fuels are mainly upright in orientation
- Generally most of the plant material is closer to the top of this layer
- Sometimes contains suspended leaves, bark or twigs
- Fuels that have a clear gap between them and the surface fuels
- Elevated fuel can be highly variable in ground coverage
- A low intensity fire (flame height of less than 0.5m) may pass beneath this layer without consuming much, if any, of it.



4.2 Assessment

The elevated fuel hazard is highest when the:

- foliage, twigs and other fuel particles are very fine (maximum thickness 1–2mm)
- proportion of dead material is high
- fuels are arranged with a high level of density and/or horizontal and vertical continuity that promotes the spread of flames
- live foliage has low fuel moisture content.

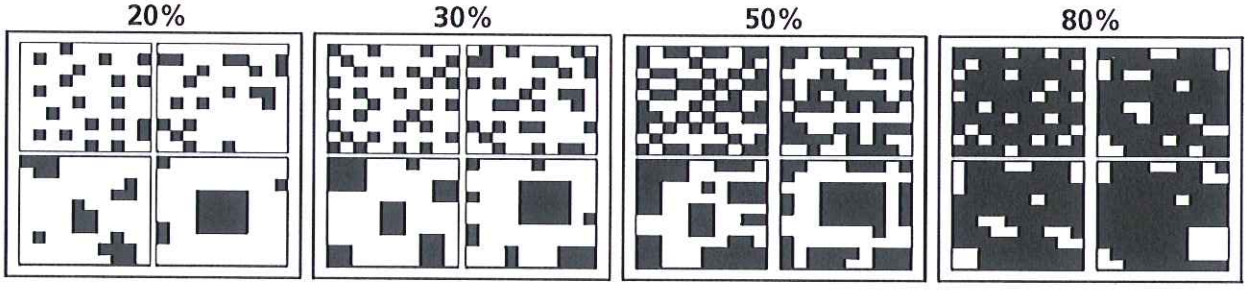
Table 4.1 Assessing elevated fine fuel hazard

To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes					Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[4]
Plant Cover	% dead	Vertical continuity	Vegetation density	Thickness of fuel pieces		
<20% or low flammability species	<20%		Easy to walk in any direction without needing to choose a path between shrubs.		Low	Little or no effect.
20–30%	<20%	Most of the fine fuel is at the top of the layer.	Easy to choose a path through but brush against vegetation occasionally.		Moderate	Does not sustain flames readily.
30–50%	<20%	Most of the fine fuel is at the top of the layer.	Moderately easy to choose a path through, but brush against vegetation most of the time.		High	Causes some patchy increases in the flame height and/or rate of spread of a fire.
50–80%	20–30%	Continuous fine fuel from the bottom to the top of the layer.	Need to carefully select path through.	Mostly less than 1–2mm thick.	Very High	Elevated fuels mostly dictate flame height and rate of spread of a fire.
>70%	>30%	Continuous fine fuel from the bottom to the top of the layer.	Very difficult to select a path through. Need to push through vegetation.	Large amounts of fuel <2mm thick.	Extreme	Elevated fuels almost entirely determine the flame height and rate of spread of a fire.

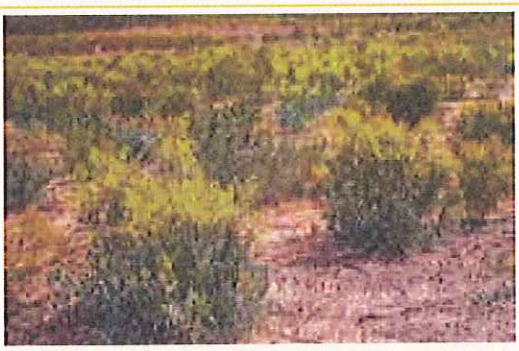
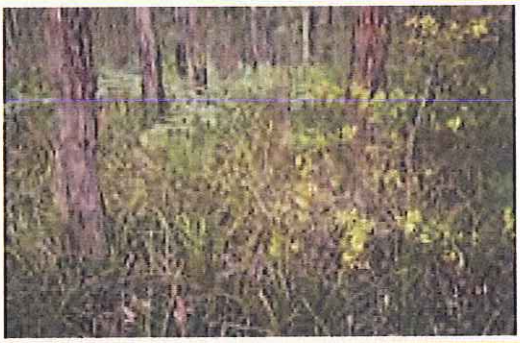
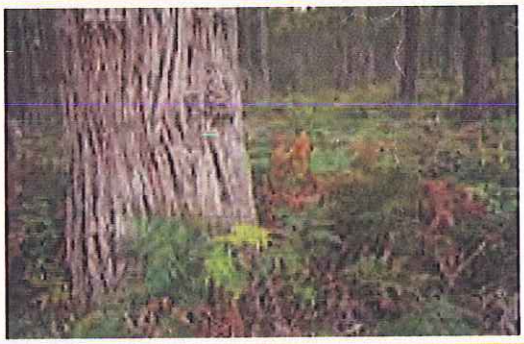
Assessing plant cover

For the purpose of this guide, plant cover is defined as the amount of ground blocked out by that fuel layer if viewed while looking straight down from above. Each plant is considered opaque – any ground within the perimeter of the plant cannot be seen. The following visual guide can be used to assist in assessing plant cover. Each quarter of any one square has the same percent cover.



4 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 4.2 Examples of elevated fine fuel hazard

Low	Elevated fuel absent or virtually absent
Moderate	 
High	 
Very High	 
Extreme	 

Assess elevated hazard over a plot 10m in radius. Assessing multiple plots will give better results.

See Section 9.3 for application of elevated fuel hazard ratings for the Vesta fire behaviour tables. For the Vesta fire behaviour tables the elevated fuel height (m) should be the average of 10 measurements taken along a 300m walk-through. Measure the typical height from ground level.

5. Near-surface fine fuel

5.1 Identification

- Live and dead fuels effectively in touch with the ground but not lying on it
- Fuel has a mixture of vertical and horizontal orientation
- Either the bulk of the fuels is closer to the ground than the top of this layer, or is distributed fairly evenly from the ground up
- Sometimes contains suspended leaves, bark or twigs
- Coverage may range from continuous to having gaps many times the size of the fuel patch
- A low intensity fire (flame height of less than 0.5m) will consume most or all of this fuel
- Fuel in this layer will always burn when the surface fuel layer burns.

5.2 Assessment

The near-surface fuel hazard is highest when the:

- foliage, twigs and other fine fuel particles are very fine (maximum thickness 1–2mm)
- proportion of dead material is high
- fuels are arranged with a high level of density and /or horizontal and vertical continuity, that promotes the spread of flames
- live foliage has low fuel-moisture content.

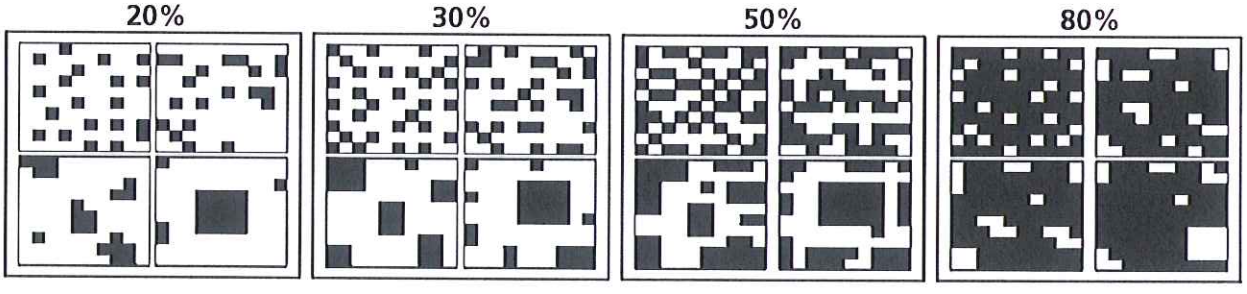
Table 5.1 Assessing near-surface fine fuel hazard

To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes			Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[5]
Plant cover	% dead	Horizontal connectivity		
<10%	<10%	Near-surface fuel is absent or virtually absent.	Low	Little or no effect.
10–20%	<20%	Gaps many times the size of fuel patches.	Moderate	Occasionally increases flame height.
20–40%	>20%	Gaps between fuel patches are greater than the size of fuel patches. Starting to obscure logs and rocks.	High	Contributes to surface fire spread and causes patchy increase to flame height.
40–60%	>30%	Fuel patches are equal to or larger than the gaps between the fuel patches.	Very High	Contributes significantly to fire spread and flame height. A fire will spread readily in this layer without having to consume the surface layer.
>60%	>50%	Very small gaps between fuel patches. Logs and rocks obscured.	Extreme	Contributes significantly to fire spread and flame height. A fire will spread readily in this layer without having to consume the surface layer.

Assessing plant cover

For the purpose of this guide, plant cover is defined as the amount of ground blocked out by that fuel layer if viewed while looking straight down from above. Each plant is considered opaque – any ground within the perimeter of the plant cannot be seen. The following visual guide can be used to assist in assessing plant cover. Each quarter of any one square has the same percent cover.



5 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 5.2 Examples of near-surface fine fuel hazard

Low	Near-surface fuel is absent or virtually absent	
Moderate		
High		
Very High		
Extreme		

Assess near-surface hazard over a plot 10m in radius. Assessing multiple plots will give better results.

See Section 9.3 for application of near-surface fuel hazard ratings for the Vesta fire behaviour tables. For the Vesta fire behaviour tables the near-surface fuel height (cm) should be the average of 10 measurements taken over a 300m walk through. Measure the typical height from ground level.

6. Surface fine fuel

6.1 Identification

- Leaves, twigs, bark and other fine fuel lying on the ground
- Predominantly horizontal in orientation
- Usually contributes the most to fuel load or quantity
- Includes the partly decomposed fuel (duff) on the soil surface.

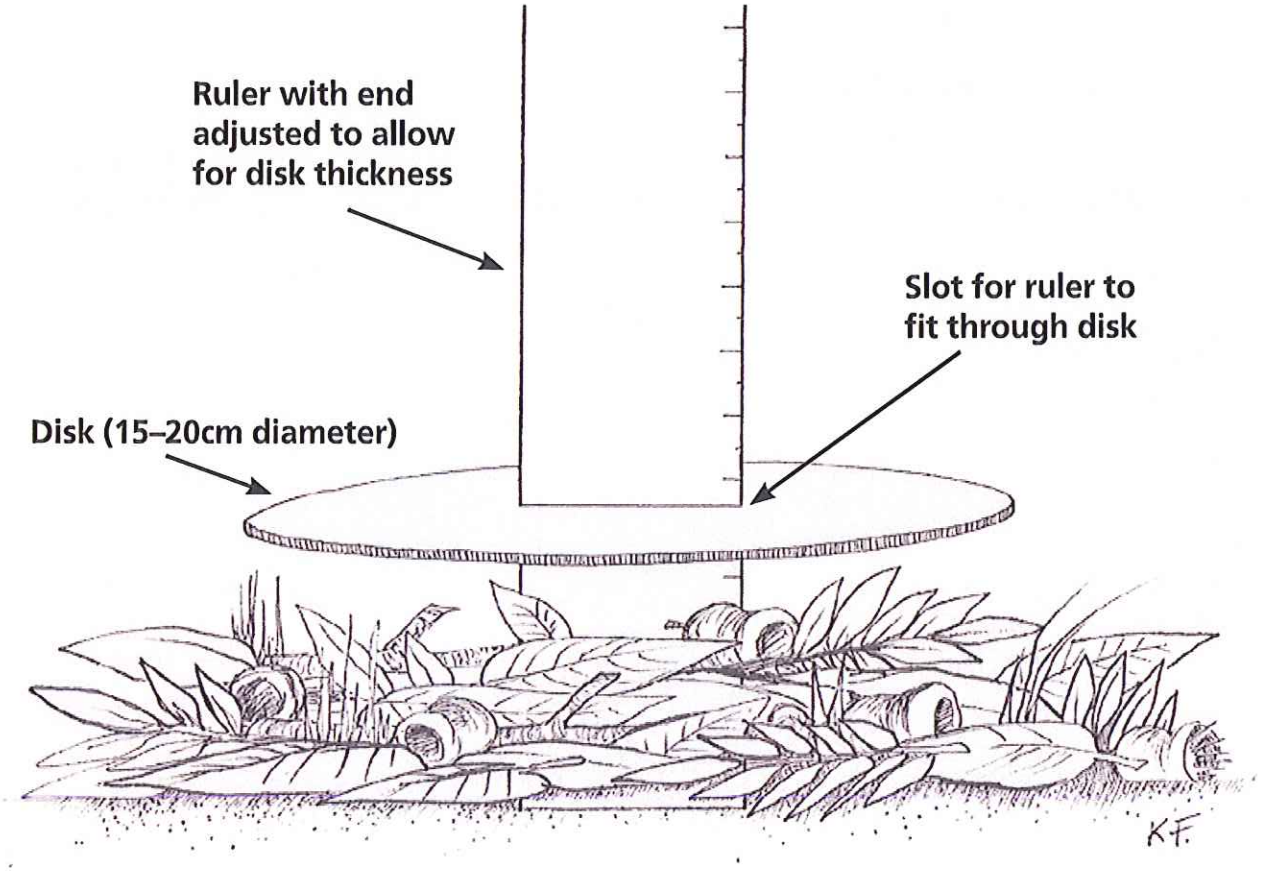
6.2 Assessment

The surface fine fuel hazard is highest when the:

- litter pieces are well connected
- surface litter cover is high, with minimal interruption from rocks, logs or patches of bare soil
- surface litter has substantial depth (greater than 30mm).

6.3 Measurement

Surface litter-bed depth should be measured using a simple depth gauge, as pictured below. This follows the methodology described in McCarthy (2004) and McCarthy *et al.* (1999).



Litter depth should be measured in areas where near-surface fuels do not obscure the litter. Fuel depth is measured using a 15cm circular disk with a ruler through a slot in its centre. To use this gauge, a small gap is made in the litter bed down to mineral soil, then the end of the ruler is placed resting on the mineral soil surface. The disk is pushed down with light pressure until its whole perimeter is in contact with the fuel. Light pressure can be described as 'enough pressure to hold a tennis ball under water'. The ruler is read off level with the top of the disk. Note that the end of the ruler needs to be adjusted to match the thickness of the disk.

Five measurements of litter bed depth should be made at each site. The average of these measurements is one of the attributes that can be used to determine the surface fine fuel hazard.

Table 6.1 Assessing surface fine fuel hazard

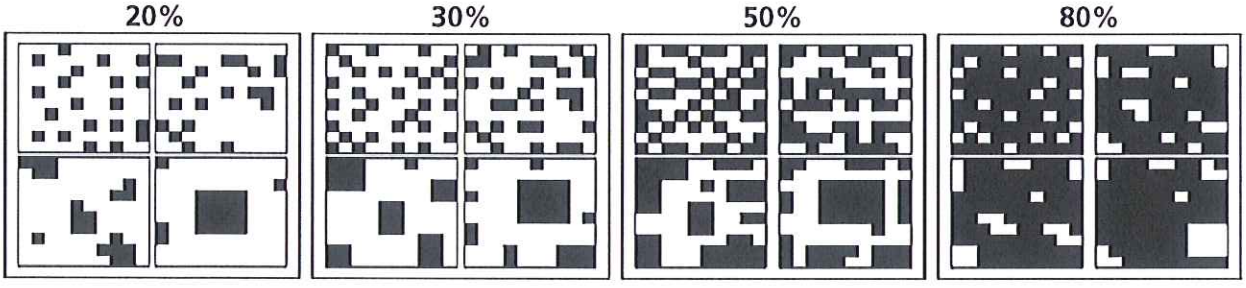
To achieve a given hazard rating a best fit of all key attributes should be sought. Choices for the hazard rating of fuels that fit across several descriptions may be informed by the effect that different levels of key attributes have on fire behaviour.

Key attributes			Fuel hazard rating	Effect on fire behaviour (at FFDI 25)[6]
Horizontal connectivity	Surface litter cover	Litter-bed depth		
Litter poorly interconnected. Large areas of bare soil or rock. More soil than litter. Soil surface readily visible through litter bed.	<60%	Very thin litter layer <10mm	Low	Surface fires will not spread.
Litter well connected. Some areas of bare soil or rock. Soil surface occasionally visible through litter bed.	60–80%	Thin litter layer 10–25mm	Moderate	Litter connected well enough to allow fire spread to overcome bare patches.
Litter well connected. Little bare soil.	80–90%	Established litter with layers of leaves ranging from freshly fallen to decomposing. 20–30mm	High	Surface fires spread easily with a continuous fire edge.
Litter completely connected.	>90%	Thick litter layer 25–45mm	Very High	Surface fires spread easily. Increasing flame depth and residence time.
Litter completely connected.	>95%	Very thick layer of litter >35mm	Extreme	Surface fires spread easily. Increasing flame depth and residence time.

Assess surface hazard over a plot 10m in radius. Assessing multiple plots will give better results. For each plot litter bed depth should be an average of five measurements (McCarthy 2004) or more.

See Section 9.3 for application of surface fuel hazard ratings for the Vesta fire behaviour tables.

The following visual guide can be used to assist in assessing surface litter cover. Each quarter of any one square has the same percent cover.



6 Refer to Section 2.8 for the specific weather conditions used to achieve this FFDI.

Table 6.2 Examples of surface fine fuel hazard

Low		
Moderate		
High		
Very High		
Extreme		

7. Determining the combined surface and near-surface fine fuel hazard rating

Assessments of surface and near-surface fuels must be combined together before an Overall Fuel Hazard rating can be determined. The near-surface fuel rating is used to adjust the surface fine fuel hazard rating, according to Table 7.1.

To determine the effect of near-surface fine fuel hazard:

1. Select the **surface fuel hazard rating** from column ①
2. Select the **near-surface fuel hazard rating** from column ②
3. Select the resulting **combined rating** value ③
4. Use this value to determine the Overall Fuel Hazard rating using the Table 8.1.

Table 7.1 Determining the combined surface and near-surface fine fuel hazard rating

① Surface fine fuel hazard rating	② Near-surface fine fuel hazard rating				
	Low	Moderate	High	Very High	Extreme
	③ Combined surface and near-surface fine fuel hazard rating				
Low	L	L	M	H	VH
Moderate	M	M	H	VH	E
High	H	VH	VH	VH	E
Very High	VH	VH	E	E	E
Extreme	E	E	E	E	E

8. Determining Overall Fuel Hazard

Overall Fuel Hazard = (sum of the influences of) Bark Hazard + Elevated Fine Fuel Hazard + Combined Surface and Near-surface Fine Fuel Hazard.

The following table is used to combine the assessed levels of Bark, Elevated and Combined Surface and Near-surface Fuel Hazard to give an Overall Fuel Hazard rating.

To determine the Overall Fuel Hazard rating:

1. Select the row that corresponds to the **Bark Hazard** ①
2. Select the row that corresponds to the **Elevated Fine Fuel Hazard** ②
3. Select the column that corresponds to the assessed level of **Combined Surface and Near-surface Fine Fuel Hazard** ③
4. Identify where these two intersect and this will provide you with the corresponding Overall Fuel Hazard rating.

Table 8.1 Determining the Overall Fuel Hazard rating

① Bark Hazard	② Elevated Fine Fuel Hazard	③ Combined Surface and Near-surface Fine Fuel Hazard *				
		L	M	H	VH	E
Low or Moderate	L	L	M	M	H	H
	M	L	M	M	H	H
	H	L	M	H	VH	VH
	VH	VH	VH	VH	VH	VH
	E	E	E	E	E	E
High	L	L	M	H	H	H
	M	L	M	H	H	H
	H	L	H	H	VH	VH
	VH	VH	VH	VH	VH	E
	E	E	E	E	E	E
Very High or Extreme	L	L	VH	VH	VH	E
	M	M	VH	VH	E	E
	H	M	VH	E	E	E
	VH	E	E	E	E	E
	E	E	E	E	E	E

* Combined Surface and Near-surface Fine Fuel Hazard is a measure of the Surface Fine Fuel Hazard adjusted to account for the level of near-surface fine fuel (see Table 7.1).

9. Interpreting and applying Overall Fuel Hazard

9.1 Chances of extended first attack success

The chances of extended first attack being successful[1] for a fire ignited in these fuels under the reference extended first attack conditions (Appendix 1) is approximately as follows:

Table 9.1 Chances of extended first attack success

GFDI[2]	FFDI[3]	Overall Fuel Hazard rating[4]				
		Low	Moderate	High	Very High	Extreme
0–2	0–5					
3–7	6–11					
8–20	12–24					
20–49	25–49					
50–74	50–74					
75–99	75–99					
100+	100+					

Chance of extended first attack success is greater than 95% (almost always succeeds)

Chance of extended first attack success is between 95% and 50% (succeeds most of the time)

Chance of extended first attack success is between 49% and 10% (fails most of the time)

Chance of extended first attack success is less than 10% (almost always fails)

Notes:

1. Extended first attack is deemed successful when a fire is controlled by 0800hrs the day after ignition and at less than 400 hectares.
2. GFDI is the Grass Fire Danger Index at the time of ignition and is assumed to be the highest GFDI expected before 0800hrs the next day.
3. FFDI is the Forest Fire Danger Index at the time of ignition and is assumed to be the highest FFDI expected before 0800hrs the next day.
4. Chance of success is for a fire ignited in fuels with this Overall Fuel Hazard rating.
5. Predicted outcomes will differ if the conditions vary from those listed in the reference extended first attack conditions.
6. Predicted outcomes based on expert opinion and informed by work carried out by Wilson (1992b, 1993), McCarthy *et al.* (1998a, 2001) and Plucinski *et al.* (2007).

9.2 Indicative fuel loads (t/ha)

In the absence of local data obtained by sampling fuel loads destructively the following table of indicative fuel load data from Project Vesta and Victorian studies may be useful. These tonnes per hectare figures may be applied to the Forest Fire Danger Meter Mark V (McArthur 1973) for predicting forward rate of spread and flame height for forest fires.

Table 9.2 Indicative fuel loads (t/ha)

Fuel	Fuel hazard rating				
	Low	Moderate	High	Very High	Extreme
Bark	0	1	2	5	7
Elevated	0–1	1–2	2–3	3–5	5–8
Near-surface	1–2	2–3	3–4	4–6	6–8
Surface	2–4	4–10	8–14	12–20	16–20+

9.3 Determining Vesta fuel hazard scores

The following table translates fuel hazard ratings for each fuel layer into Project Vesta fuel hazard scores. These scores can be used with the fire behaviour prediction tables in publications such as Gould *et al.* (2007b).

To determine the Vesta fuel hazard score:

1. Select the row that corresponds to the fuel hazard rating for required fuel layer ❶
2. Select the Vesta fuel hazard score column that corresponds to the same layer ❷
3. Identify where these two intersect and this will provide you with the corresponding Vesta fuel hazard score.

Table 9.3 Determining Vesta fuel hazard scores

	Vesta fuel hazard score ❷			
Fuel hazard rating ❶	**Surface**	**Near-surface**	**Elevated**	**Bark**
Low	1	1	1	0
Moderate	2	2	2	1
High	3	3	3	2
Very High	3.5	3.5	3.5	3
Extreme	4	4	4	4

Notes:

- Surface and near-surface hazard score and near-surface height (cm) is required for fire spread prediction.
- Rate of spread and elevated fuel height (m) is required for flame height prediction.
- Rate of spread, surface and bark fuel hazard scores are required for prediction of spotting distance.

Acknowledgements

This Fuel Hazard Assessment Guide updates and continues to develop work previously conducted by a number of authors. Andrew Wilson laid the foundations for this guide, with the conceptual framework presented in Research Report No. 31; and the visual guides for assessing the influence of bark and elevated fuels on suppression difficulty in the *Eucalypt Bark Hazard Guide and Elevated Fuel Guide* (Reports 32 and 35, respectively). Greg McCarthy (2004) detailed a method for rapidly assessing surface fine fuels in Research Report No. 44.

These three techniques were brought together in the first three editions of the *Overall Fuel Hazard Guide* (McCarthy, Tolhurst and Chatto, 1998b, 1998c, 1999). A subsequent unpublished edition of the guide, produced by Kevin Tolhurst (2005), provided greater detail on the assessment of near-surface fuels. In 2006, Mike Wouters adapted the guide for South Australian conditions, and incorporated the preliminary results from Project Vesta (CSIRO and Department of Conservation and Environment, Western Australia). Further information and results from the final Project Vesta report (Gould *et al.* 2007a) have also been incorporated.

Thanks to Lachie McCaw (Department of Environment and Conservation, Western Australia), Mike Wouters (Department of Environment and Heritage, South Australia), Jim Gould and Miguel Cruz (CSIRO) for their advice and comments during the production of this guide. Thanks must also go to the many other people across Australia who have provided comments and feedback during the production of the guide.

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Appendix 1. Reference extended first attack conditions

This guide assesses the impact of fuels in suppressing a fire during extended first attack, using local resources. Several factors affect the success of an extended first attack. Therefore, to consider the impact of fuels alone, the other factors must be treated as if they were constant. Table A1 below adapted from Wilson (1993) summarises reference extended first attack conditions for four fuel types.

Table A1. Revised reference extended first attack conditions

Fuel type	Forest fuels	Grass fuels	Mallee and scrub fuels	Heath fuels
Examples of typical resources (on scene within the designated arrival time)	Small dozer (D4) 1 to 2 small 4WD tankers (400l) 6 firefighters	5 x 4WD heavy tankers (4000l) each with 5 firefighters	Small dozer (D4) or tractor with scrub roller 1 to 2 small 4WD tankers (400l) 6 firefighters	Small dozer (D4) 1 to 2 small 4WD tankers (400l) 6 firefighters
Extended attack resources	Potential additional resources deployed to the fire during extended first attack may include heavy tankers, large plant (dozers, graders or tractors) and fire bombing aircraft.			
Arrival time	Within 60 minutes of detection			
Suppression workload	A single fire			
Topography and terrain	Burning on level ground with good access			
Fuel availability[1]	MDF is 10 or AFF is 1.0	100% grass curing	MDF is 10 or AFF is 1.0	
Wind speed[2]	20km/h	30km/h		20km/h
Fire danger rating system[3]	McArthur FFDI	McArthur GFDI	McArthur FFDI	

Notes:

1. MDF (McArthur Drought Factor) is calculated using the Forest Fire Danger Meter (McArthur 1973) and is a measure of the short-term availability of forest fuels. AFF (Available Fuel Factor) is used in Western Australia to define the proportion of litter fuel available for burning (Sneeuwjagt & Peet 1998).
2. Wind speed is measured at 10m height in the open above ground level.
3. FFDI is the McArthur Forest Fire Danger Index, GFDI is the McArthur Grass Fire Danger Index.

The rationale for the reference first attack conditions is documented in DSE's *Overall fuel hazard assessment guide: a rationale report – fire and adaptive management report no. 83* (in prep).

Appendix 2. Sample fuel assessment field work form v3

Date Assessed:	Assessors:
Sampling Location:	Veg Type:

Plot Information			
Plot No.			
Zone:			
Easting (GDA94 MGA UTM):			
Northing (GDA94 MGA UTM):			

Canopy height (Assess over a 20m radius)			
Average Height to Top of Canopy:	m	m	m
Average Height to Base of Canopy:	m	m	m

Bark fuel (Assess over a 20m radius)															
Stringybark Fuel Hazard:	NP	M	H	VH	E	NP	M	H	VH	E	NP	M	H	VH	E
Ribbon Bark Fuel Hazard:	NP	M	H	VH		NP	M	H	VH		NP	M	H	VH	
Other Bark Fuel Hazard:	L	M	H			L	M	H			L	M	H		

Select the Bark Hazard rating from above that will be used to determine Overall Fuel Hazard. (Only use the Stringybark hazard rating if more than 10% of the trees are Stringybark **AND** it has the highest rating. Otherwise use the bark with next highest rating.)

Bark Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Elevated fuel layer (Assess over a 10m radius)															
Elevated % Cover:	%					%					%				
Elevated % Dead	%					%					%				
Elevated Fuel Ave Height (m)	m					m					m				
Elevated Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Near-surface fuel layer (Assess over a 10m radius)															
Near-surface % Cover:	%					%					%				
Near-surface % Dead	%					%					%				
NS Average Height (cm):	cm					cm					cm				
NS Fuel Hazard:	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Surface fuel layer (Assess over a 10m radius)															
Surface Litter % Cover:	%					%					%				
Average Litter Depth (mm):	mm					mm					mm				
Surface Fuel Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Combined Surface and Near-surface Fine Fuel Hazard calculation (refer Section 7)															
Combined Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Overall Fuel Hazard calculation (refer Section 8)															
Overall Fuel Hazard	L	M	H	VH	E	L	M	H	VH	E	L	M	H	VH	E

Are the plots representative of the average fuels across the sampling location?	Yes	No

If no, explain any significant difference between plots. For example, wet gully runs through the sampling area, no plots were located in this gully.


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Standard Operating Procedure

6

Planned Burn FORM_LCC customised 2012

LAUNCESTON CITY COUNCIL
FUEL REDUCTION/ECOLOGICAL BURNING PLANNING FORM (2012)

CONTACT DETAILS

Plan Prepared By: ……..……. **Contact No.:** ……..

LOCATION AND OBJECTIVES

Suburb: ……. ……..... **Park:** ……**Nearest Street**…….

Description of burn area: ……

Grid Reference: x……**y**……..……

Date(s) of Burn: ……..…. **Area** (ha) **:** ……

TFS Fire Permit No. (if required) **:** ……..…… **LCC Fire Permit No.** ……..

Objectives: ……Minimise risk of bushfire to life and property, facilitate habitat management, ensure long-term sustainability of natural resources ……

Origin of Burn: ……Fire Management Plan ……

SAFETY PLAN

General Safety Points	
Everyone must report in and out of the fire ground through the LCC officer in charge of the burn. If the LCC Officer is not in charge of the burn then reporting must be made through the TFS officer in charge.	
Remember LACES: **L - Lookout(s)** **A - Awareness, Anchor Point (s)** **C - Communication(s)** **E - Escape Route(s)** **S - Safety Zone(s)**	**Maintain regular SITUATION REPORTS via line supervisors:** **Location** **Weather** **Fire Behaviour** **Progress on tasks** **Problems**

Specific Safety Points

- Drive to the conditions
- After rain watch for slippery conditions on steep slopes and roads
- Power lines throughout the fire ground
- Pedestrians and other park users
- Traffic on park roads - close roads when required
- Traffic on nearby public roads - close roads when required
- Keep hydrated - drink plenty of water
- Be aware of snakes and insects on the fire ground
- Be aware of falling trees and rocks especially in cliff areas
- Be aware of dangerous trees
- Warning signage for park and road users
- Other
- Other
- Other

Safety Zone Locations

These are marked on the attached burn plan - all safety zones are to be downhill from and separate from the fire ground

MEDICAL PLAN

Hospitals		
Launceston General Hospital	**Charles St Launceston**	**63487111**
Transportation		
Tasmanian Ambulance Service	000	
Special Emergency Procedures		
For all emergencies dial 000 Notify Council on 63233333 for all incidents and emergencies		

FUELS TO BE BURNT

Vegetation Community Type (eg open forest, woodland, grassland)	**Area** (ha)	**Fuel Age** (yrs)	**Fuel Qty** (t/ha)

SPECIAL PLANNING CONSIDERATIONS

Rare & Threatened Species Present: ……Refer to Management Plan for the Reserve ……..

……

……

Other Planning Constraints including smoke management (eg: Assets, hazards, fuel distribution, neighbours, overhead power lines, direction of smoke travel, nearby schools, park users)**:** ……

……

……

……

……

BOUNDARY PREPARATION

Boundary Type	**Length (m)**	**Work Required**	**Date Completed**

OTHER PRE-BURN PREPARATION

Work Required Eg: fence lines, line construction, edge burning	**Date Completed**
Weeding	

WEATHER PRESCRIPTIONS

Max Flame Height (m) **:** ……1.5 ……. **Temperature** (°C) **:** ……10 ……to……20 ……..

S.D.I. (mm) **:** ……25 ……to……50 …… **Humidity** (%) **:** ……40 ……to……60 ……..

Forest F.D.R. : …….low ……to……low ….. **Wind** (km/hr) **:** ……5 ……to……20 ……..

Other (eg. Sunshine, days since rain) **:** .low fire intensity, scorch height < 7m, Drought Factor 5-10

……..……..……..……

LIGHTING AND PATROL STRATEGY

Lighting Method (circle) **:** ……drip torch ……..

Lighting Strategy :

……..……..

……

……

……

……

……

……

……

Mop Up and Patrol Strategy (eg: resources, timing, next high FDR day) **:** ……

……..……

……..……

LIGHTING PLAN

Attach: Scale map (name, scale and North point)

Indicate: -Access -Assets -Potential hazards

-Boundary types -Test fire locations -Water points

-Fuel types, distribution and quantity -Crew placement/Assembly points -Lighting pattern

RESOURCES

LCC Personnel (names) **:** …… **Ignition Equip** (no.)**:** ……..……

……**Ignition Fuel:** …diesel/petrol 3/1 ……

……..…….. **Tankers:** ……

TFS Personnel (names) **:** ……. ……..……..

……. ……..……

……**Other:** ……

NOTIFICATION CHECK-LIST

TO CONTACT	NAMES	PHONE No.	DONE
Tick box			Date/Time
❑ **FireComm** ……..		……1800000699 ……..	……
❑ **Local Brigade** ……..		……63365607 ……..	……
❑ **Local Council** ……..		……63233610 ……..	
❑ **Local Police** ……..		……63363701 ……..	
❑ **P & WS if applicable** ……..		……63362678 ……..	……
❑ **Aurora** ……..		……63247582……..	
❑ **Transend** ……..		……63247154……..	
❑ **Warning Signs Posted** ……..		……..	
❑ **Neighbours** notified……..		……..	
❑ **neighbours letterboxed**……..		……..	
❑ **Other** ……..		……..	
❑ ……..		……..	
❑ ……..		……..	
❑ ……..		……..	
❑ ……..		……..	

WEATHER FORECAST FOR DAY OF BURN (attach weather report if available)

Relative Humidity (%) **:** ……. **Max Temperature** (^{o}C) **:** ……

Wind Speed (km/h) : …… **Wind Direction :** ……

Forest F.D.R : …… **S.D.I** (mm) **:** ……

BRIEFING CHECK-LIST

A briefing is essential at all prescribed burns. Deliver briefing in sections, each covering one aspect of the plan. Solicit feedback to the end of the briefing. The briefing should cover:

1. Objectives
2. Chain of command
3. Lighting and control strategy
4. Allocation of crews to tasks
5. Coordinating Instructions
- timing
- communications channels
- reporting requirements

6. Logistics
- fuel location
- water points identified

7. Safety
- safety equipment
- hazards
- escape routes

8. Recording requirements

TEST FIRES

Time Test Fire Lit : ……**Headfire Rate Of Spread** (m/min) **:** ……
H**eadfire Flame Height** (m) **:** ……

LIGHT-UP

Date : ……. **Time Light-up Commenced :** ……..**Time Light-up Completed :** ……

WEATHER AND FIRE BEHAVIOUR OBSERVATIONS

Time (24hr clock)								
Temperature-dry bulb (°C)								
Temperature-wet bulb (°C)								
Relative humidity (%)								
Tree Top Wind Speed (km/h)								
1.7m Wind Speed (km/h)								
Wind Direction								
Cloud (%)								
Forest/Moorland F.D.R								
Flame Height (m)								

POST BURN EVALUATION

Vegetation Type code	**Area Burnt** %	**Fuel load remaining** t/ha	**Overstorey scorched** %

Comments on Light Up (Note modifications to burning plan or lighting pattern as a result of conditions on the day) :

……

……

……

……

Comments and Recommendations :

……

……

……

……

……

……

……

Date Burn Declared Out : …… **Checked By :** ……..

ESCAPES

Did the burn escape? (circle) : No/Yes

……

Attachments:

Burning plan
TFS Permit
LCC Permit
Fire Warning Letter
Fire Warning Letter Distribution Map
Weather Report

DECLARATION

I have read and understood the burning plan as detailed in this form and any associated attachments:

Name:……..

Signature:……..

Date:……

Standard Operating Procedure

7

Maintaining a defendable space - guide

SOP 7

Maintaining a defendable space

A defendable space is a managed area around an asset designed to reduce the risk of damage during a bushfire. With an inadequate defendable space, an asset could be subject to intense radiant heat and wind-blown burning embers. With an adequate defendable space the asset should only be subjected to attack by wind-blown burning embers. The defendable space consists of an inner building protection zone known as the asset protection zone (APZ) and an outer zone known as the fuel modified buffer zone (FMBZ). In some cases it may not be possible to adequately reduce the bushfire risk either due to site constraints, the critical value of the asset, or the dependence of the asset on infrastructure not controlled by City of Launceston.

A defendable space should fulfil the following functions:

- Ensure there is a reduction in fine fuel load between a bushfire hazard and any structures.
- Break up the continuity of fine fuel between bushland and any structures.
- Provide an area free of fine fuel around structures where wind-blown burning debris are unlikely to ignite spot fires during a wildfire.
- Minimise the risk of building ignition by radiant heat or direct fame contact during a wildfire.
- Provide access for firefighters during a wildfire.
- Provide a control line for firefighting operations.
- Provide a relatively safe refuge area for firefighters and residents during a wildfire.

The following minimum defendable space widths are recommended by the Tasmanian Fire Service (TFS):

Slope[1] (degrees)	Building Protection Zone Width[2]	Fuel-modified Buffer Zone Width	
		Grassland	Forest
0	20 m	10 m	15 m
5	20 m	15 m	25 m
10	25 m	20 m	30 m
15	30 m	30 m	45 m
20 +	40 m	40 m	50 m

1 – Use widths for 0 degrees for downslope bushfire approaches.
2 - Distances are measured outwards from the dwelling, or the asset at risk, towards the bushfire hazard.

Asset Protection Zone (APZ):

The APZ provides a space around assets with minimal fine fuel (comprises of dead plant matter less than 6mm diameter and live plant matter less than 2mm diameter) that allows them to be defended from bushfires. It also reduces the risk of windblown burning embers from starting spot fires close to assets. The APZ extends outwards from the side(s) of the asset being protected.

Establishment of an APZ requires the removal of almost all the fine fuel on the ground surface, and isolation of any remaining fuels in the shrub layer to ensure that they are discontinuous both vertically and horizontally. Trees and shrubs can be retained within the building protection zone, however trees should not overhang dwellings and there must not be a continuous vegetation cover at any level between the building and the surrounding bushland. Trees and large shrubs should be pruned to remove dead branches and to ensure there is a gap of at least 2 m between the lower branches and the ground. Any accumulations of dry fine fuel must be removed before, and regularly during, the annual bushfire danger period.

General recommendations for fuel management within an APZ include, but are not restricted to:

- Only mown lawn, bare ground (hardstand areas, driveways, paths etc.) immediately adjacent to buildings (within 2 to 5 metres).
- Maximum tree canopy cover should be less than 30%, and maximum shrub canopy cover less than 20%.
- Remove combustible materials such as vegetation debris heaps and flammable fuel stores etc., outside the APZ and not deposited within the FMBZ or nearby bushland where it can increase the fire hazard.

- Incorporate non-flammable areas, such as roads, hardstand areas, car parks, paths etc., into the APZ.
- Buildings with combustible cladding should have a minimum 400mm wide strip of bare earth, gravel, pavers etc. around their base or non-combustible material for the first 400mm of wall above ground level.
- Trees and shrubs should be isolated or in small clumps; avoid continuous canopies.
- Shrubs should not be allowed to grow within 2m of windows with annealed (standard) glass, or within 1m of windows with heat toughened glass or walls with timber cladding.
- Where tree removal is required to establish canopy breaks, remove rough-barked tree species in preference to smooth-barked species.
- Canopies of trees and shrubs should not touch walls or overhang buildings.

Fuel Modified Buffer Zone (FMBZ): (includes what is commonly referred to as a firebreak)

The FMBZ forms a concentric ring around the APZ and has fine fuel loads reduced sufficiently to ensure that a high intensity bushfire will not reach the APZ. It also helps protect the asset from radiant heat. Fuel-modified buffer zones can be established in bushland by hand thinning and clearing, mechanical slashing, or planned burning, either singly or in combination.

Hand clearing is preferred in weed infested areas, in dense forest or shrubland, and where there are threatened plant species present. Slashing is preferred in grasslands and grassy woodlands. Burning may be sufficient in open grassy woodlands where there are few weeds and no fire sensitive threatened plant species.

General recommendations for landscaping and maintaining the FMBZ include:

- Understorey shrub cover should not be more than 30% total cover, and the cover should be discontinuous. □ Trees and large shrubs should be pruned to remove branches within 2 m of the ground.
- Retain individuals of any threatened plant species.
- Reduce fine fuel loads in fuel-modified buffer zones in forest and shrubland to less than 5 tonnes per hectare (fine fuels consist of dead plant matter less than 6 mm in diameter and live plant matter less than 2 mm in diameter).
- Slash grassland areas so that fuels are below 100 mm in height when more about 50% to 60% cured.
- Remove combustible materials such as vegetation debris heaps and flammable fuel stores etc., outside the FMBZ and not deposited within the nearby bushland where it can increase the fire hazard.

When removing vegetation by hand to create a fuel-modified buffer zone in a bushland area, the order of preference for vegetation removal should be:

1. Noxious weeds.
2. Other environmental weeds.
3. Other introduced species (except special ornamental plantings).
4. Rough barked indigenous trees and shrubs.
5. Indigenous trees and shrubs that hold dead leaves and twigs in their canopy.
6. Relatively flammable sclerophyllous species.

Standard Operating Procedure

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Template
Council Letter to Residents for Burning Notification

File No: [Insert Reserve Specific File Number]

[Insert Date]

Dear Householder

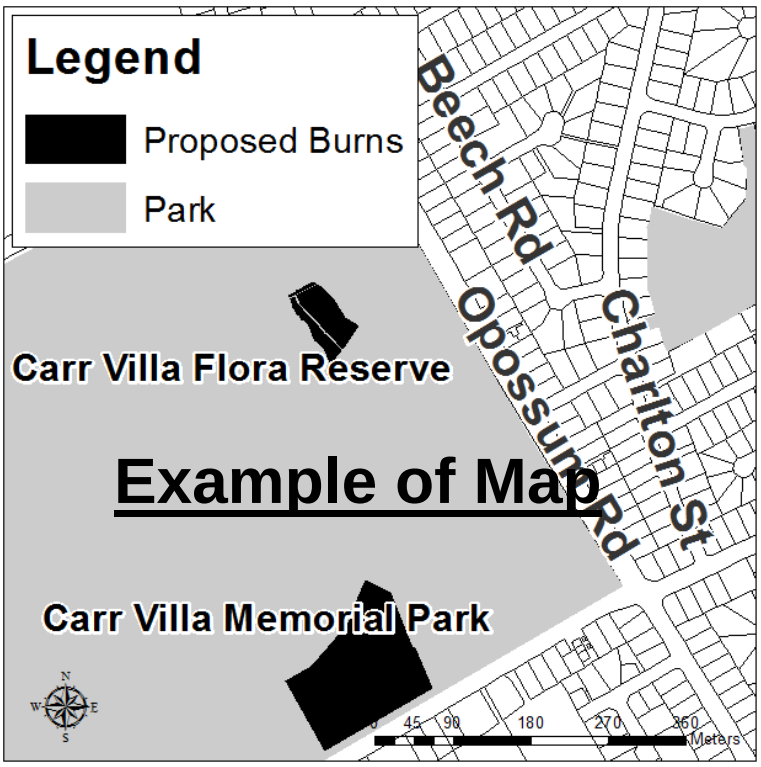
FUEL REDUCTION BURNING PROGRAM

The City of Launceston will be conducting a fuel reduction burning program this autumn at [Insert Reserve Name]. As a neighbouring property owner or resident, a map of the area(s) to be burned this year is attached for your information.

This burning program is part of a detailed Fire Management Plan that has been prepared for the Reserve. The primary objectives are to:

(a) Reduce the existing fire hazard;
(b) Protect property and other assets;
(c) Assist in the supression of wildfire;
(d) Protect flora and fauna and their habitats;
(e) Assist in the regeneration of degraded bushland;
(f) Assist in the control of weeds.

The area(s) to be burned within this Reserve have been designated as low intensity burns, to be carried out on days when soil dryness and weather conditions are suitable. We will be unable to advise you of the exact day of the burn(s) as the decision to burn is made on the day if and when suitable weather requirements and resources are available. If conditions are not suitable we may not be able to burn this season and will re-schedule the burn(s) to the next suitable fire season.



If you require further information please contact me on 6323 3619 during normal office hours.

Yours sincerely

[INSERT NAME & POSITION]

Standard Operating Procedure

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Post Burn Assessment

Post-burn monitoring template

Date of burn:		**Time burn lit:**	
Block ID/name:		**Vegetation type:** e.g. woodland with grassy	
Actual wind speed:		**Actual wind direction:**	
Actual temperature		**Actual humidity**	
% block burnt		**Intensity of Burn:**	
What were the objectives of the burn?	**List all the objectives here**	**How well did the burn meet objectives?**	**Against each objective note how well they were met** (e.g. 100%, partially, etc.)
Any other comments?	e.g. What next?, Only X% burnt, will try again next year when fuels are drier. Were there enough resources? Anything you would change for future burns? Any threatened species in the burn area? How have they been affected by the burn?		

Post-burn monitoring template

Photopoint ID		**Description:**	
Post ID (e.g. N, S, E or W)	**Easting:** **Northing:**	**Post ID** (e.g. N, S, E or W)	**Easting:** **Northing:**
Insert photo here **Describe what the photo is of** (e.g. looking south)		**Insert photo here** **Describe what the photo is of** (e.g. looking south)	
Photopoint ID		**Description:**	
Post ID (e.g. N, S, E or W)	**Easting:** **Northing:**	**Post ID** (e.g. N, S, E or W)	**Easting:** **Northing:**
Insert photo here **Describe what the photo is of** (e.g. looking south)		**Insert photo here** **Describe what the photo is of** (e.g. looking south)	

Standard Operating Procedure

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Council Safe Work Method Statement
Hazard Reduction Burning

SAFE WORK METHOD STATEMENT

Activity: Hazard reduction burning
Qualifications Required: Competency training for plant / Relevant current vehicle licence.
Plant & Equipment Required: Firefighting equipment, water tankers, pumps, drip torches, signage, PPE

High Risk Tasks:
☒ Working on / New Roadway (Traffic Management) ☒ Work near fire

Warnings:				
☒Sign	☒Barricades	☐Safety Tape	☐Solid Barriers	☐Other (list)
☒Traffic Management Plan				

Personal Protective Equipment Required:


☒Safety Glasses


☐ Earmuffs


☒ Gloves


☒ Hi-Vis Safety Vest


☒Safety Boots


☒Coveralls


☒Safety Helmet


☐ Face Shield


☒ Respiratory Protection (smoke masks)


☐Welding Shield


☐ Self-Contained Breathing Apparatus


☐ Safety Harness

☒ Sun protection (broad brimmed hat, long sleeves etc)

Associated Procedures / Permits / Work Instructions: Burning planning form

		Score Before Controls				Score After Controls		
DESCRIBE TASK STEP	**HAZARDS/POTENTIAL INCIDENTS**	**Li**	**Co**	**Risk**	**RISK CONTROL OR ACTION**	**Li**	**Co**	**Risk**
List logical task steps (not too detailed)	*What type of injuries/incidents can happen at each step?*	*Table over the page*			***List your controls. Consider hierarchy of controls or some of the attached list:***	*Table over the page*		
Prestart check done on all vehicles and plant	• Accidents/incidents involving vehicle mechanical failures including: • Lights failure • Brake failure • Trailer attachment failure • Load restraint failure • Tyre failure	2	5	H	• Conduct pre-start checks in accordance with pre-start checklist and load restraint training	1	4	S
Drive to and from worksite	• Road traffic accident / traffic infringement	2	5	H	• Drive to conditions • Plant checked & maintained • Licensed, competent operators • Fit for work, not fatigued. • Seatbelts must be worn at all times • Defensive driving attitude at all times	2	3	M
Assess site for hazards	• Dangerous trees • Overhead power lines • Building exposures • Excessive fuel loads • Topography-Steep slopes, drop offs • Escape routes, vehicular access clear • Slips trips falls	3	3	S	• Walk the area to assess hazards • Take care walking, good footwear • Clear breaks away from exposures • Mark dangerous trees and clear around them • Notification as per checklist under burning planning form	2	3	M

Pre burn communications & set up	• People not aware of hazards • Unaware of escape routes, safe areas • Conditions deteriorate-too hazardous • Unable to locate water points • Inadequate communications • Inadequate drinking water on site, dehydration • First aid not accessible	3	4	H	• Communicate identified hazards to all • Communicate methodology to all • Ensure all are aware of Escape routes & safe areas • All water points are identified • Ensure communications are adequate • Check weather forecast • All competent, trained people • Emergency procedures in place • First Aid Trained people & Kits on hand • Adequate water on site o Drinking water carried • Traffic Management to meet AS 1742.3	2	4	S
Burning operations	Wildfire, burns, smoke inhalation, serious injury, fatality, fatigue, heat exhaustion, bites and stings, Dangerous trees, dehydration	2	5	H	• All PPE worn • Follow burn plan • Stay vigilant and monitor conditions • Do not get too far ahead with drip torch • Drink plenty of water • Knock down any escaping spot fires • Stay aware of trees, overhead limbs etc • Look out for snakes/biting insects • Look where you walk - Hot embers etc. • Stay out of direct smoke or stay low • Take breaks or rotate tasks	2	4	S
Mop up and exit site	Wildfire, burns, smoke inhalation, serious injury, fatality, fatigue, heat exhaustion, bites and stings, Dangerous trees	2	4	S	• As above for control # 5 • Ensure all hot areas are blacked out and there is no smoke evident • Ensure fire ground is safe before leaving • Patrol the area daily to ensure no hotspots	2	3	M

					• Notify TFS before when site			
					•			
					•			

THIS SWMS HAS BEEN DEVELOPED IN CONSULTATION AND HAS BEEN READ, UNDERSTOOD AND SIGNED BY ALL WORKERS UNDERTAKING THE SCOPE OF WORKS:

Print Names:	Signatures:	Dates:	Print Names:	Signatures:	Dates:

PURPOSE:

To record details of job risk analyses in Council.

SCOPE:

Applies to Launceston City Council employees

TRAINING:

Training in the use of this Job Risk Analysis Worksheet is available from the Safety Compliance Officer (Remount Road) or the Health and Safety Coordinator (other areas).

RELATED POLICIES & PROCEDURES:

- **21-Pr-064 Job Risk Analysis Detailed Procedure**

DOCUMENT INFORMATION:

Reference Number:	26-Fm-041
Version:	07/04/2014
Review:	07/04/2016
Key Function:	Recreation Services and Facilities
Document Type:	Form
Responsible Directorate:	Infrastructure Services
Approved by:	Parks Services Supervisor
Action Officer:	Brad Robinson
Text Search Key Words	Infrastructure services operations parks recreation job risk analysis worksheet safety hazard identification

To be Communicated To: *(To be identified by Action Officer or Approver)* (Insert ✓ in relevant row)		Department/Area only
		Directorate via Director and Managers
	✓	Specific Areas: • Parks Services
		Council-wide
		Council Website
		Intranet

Hard Copy Distribution	When changes made the following locations must be updated: 1) Remount Road Office - Lunch Room Pigeon Holes (along with a copy of the JSTMR) 2) NOTE: Copies of the 'Rating the Risk' & 'Hierarchy of Control Measures' are to be given to all Coordinators.

Standard Operating Procedure

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Wildfire Report Form

Fire Report: 1	Initial Report (to be filled out at initial notification or inspection)

General Information:

Fire Name:		**Time:**	
Fire Location:		**Date:**	
Grid Reference:	E	N	*Always use GDA 94 Datum*

Current Fire Status: GOING CHECKED CONTROLLED SAFE UNKNOWN *(please circle best option)*

Size of Fire:	Area (Ha's):		Perimeter (Km's):		Fire line Required (Km's):	

Fuel Characteristics:

Fuel Types: FOREST WOODLAND GRASSLAND OTHER (please circle best option or if other note type)

Fuel Loads: HEAVY MODERATE *LOW (please circle best option)*

Topography:

Slope: STEEP UNDULATING *FLAT (please circle best option)*

Aspect: EASTERN NORTHERN WESTERN *SOUTHERN (please circle best option)*

Current Fire Weather:

Wind (kph);		**Direction:**		**Temp (°C):**		**Humidity (%):**		**FDR Rating:**	

Fire Behaviour:

Rate of Spread (m/hr):		**Flame Height (m):**		**Spotting Distance (m):**	

Potential Loss: HIGH MODERATE LOW UNKNOWN (please circle best option)

Potential Spread: HIGH MODERATE LOW UNKNOWN (please circle best option)

General Fire Information:

Access to fire:

How did the fire start:

Who started it:

Assets endangered:

Control problems:

Losses so far:

Location of water:

Other relevant information:

Resource Information:

Resources at Fire:	**Fire-fighters:**		**Tanker units:**	
	Aircraft:		**Dozers:**	
Resources Required:	**Fire-fighters:**		**Tanker Units**	
	Aircraft:		**Dozers:**	
Location Required:		**Time & Date Required:**		

Update Information:

Time of Next Situation Report:

Expected Fire Status: GOING CHECKED CONTROLLED SAFE UNKNOWN *(please circle best option)*

Other Relevant Information:

Fire Report: 2	Situation Update Report (to be filled out continually when required)

General Information:

Fire Name:		**Time:**	
Fire Location:		**Date:**	
Grid Reference:	E	N	*Always use GDA 94 Datum*
Current Fire Status: GOING CHECKED CONTROLLED SAFE UNKNOWN *(please circle best option)*			
Size of Fire: Area (Ha's):		Perimeter (Km's):	Fire line Required (Km's):

Fuel Characteristics:

Fuel Types: FOREST WOODLAND GRASSLAND OTHER (please circle best option or if other note type)
Fuel Loads: HEAVY MODERATE *LOW (please circle best option)*

Topography:

Slope: STEEP UNDULATING *FLAT (please circle best option)*
Aspect: EASTERN NORTHERN WESTERN *SOUTHERN (please circle best option)*

Current Fire Weather:

Wind (kph);		**Direction:**		**Temp (°C):**		**Humidity (%):**		**FDR Rating:**	

Fire Behaviour:

Rate of Spread (m/hr):		**Flame Height (m):**		**Spotting Distance (m):**	

Potential Loss: HIGH MODERATE LOW UNKNOWN (please circle best option)
Potential Spread: HIGH MODERATE LOW UNKNOWN (please circle best option)

Resource Allocation Information:

Personnel & Equipment arrived at the Fire ground:

Names:	**Equipment:**	**Time of Arrival:**

Personnel & Equipment departed from the Fire ground:

Names:	**Equipment:**	**Time of Departure:**

Resource Requirement Information:

Resources Required:	**Fire-fighters:**		**Tanker Units**	
	Aircraft:		**Dozers:**	
Location Required:		**Time & Date Required:**		

Update Information:

Time of Next Situation Report:
Expected Fire Status: GOING CHECKED CONTROLLED SAFE UNKNOWN *(please circle best option)*

Other Relevant Information: