Bushfire Development Report

and

Expert Witness Statement

for the development of
41 Colquhoun Road, Lakes Entrance VIC 3909

Report prepared for
Paynter Dixon Developments

October 2013
Bushfire Development Report and Expert Witness Statement for 41 Colquhoun Road, Lakes Entrance VIC 3909.

Report prepared by Terramatrix for Paynter Dixon Developments.

Terramatrix project code: PD-2013-1 Lakes Entrance Bushfire Risk Assessment

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1. Preface

1.1. Expert's Details

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Collingwood VIC 3066

1.1.1. Qualifications

Bachelor of Applied Science in Environmental Assessment and Land Use Policy  
Victoria College.

Graduate Diploma Bushfire Planning and Design (in progress)  
University of Western Sydney.

1.1.2. Area of Expertise

Bushfire planning and design and environmental planning.

1.1.3. Experience

Over 20 years experience in strategic and statutory land use planning, environmental management and bushfire planning including as a Park Ranger and Environmental Planner for both State and local governments.

Role at Terramatrix includes managing the Terramatrix Bushfire Planning and Design (BPAD) team. This includes leading and undertaking landscape scale bushfire risk assessments for strategic planning projects such as precinct structure plans, producing Bushfire Management Statements and other bushfire development reports for residential and commercial developments, subdivisions and planning scheme amendments.

1.2. Instructions and scope of this report

Terramatrix has been commissioned and instructed by Collie Pty. Ltd., on behalf of Paynter Dixon Developments Pty. Ltd., to provide advice and an expert witness statement, about the suitability of 41 Colquhoun Road, Lakes Entrance for residential development in relation to bushfire safety.

This report constitutes that advice and an expert witness statement in accordance with the Guide to Expert Evidence (Planning Panels Victoria, 2012).

1.3. Declaration

'I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel'.

Hamish Allan  
Manager - Bushfire Planning and Design, Terramatrix Pty. Ltd.  
3rd October, 2013.
2. Introduction

This Bushfire Development Report has been prepared for Paynter Dixon Developments, to advise about the suitability of 41 Colquhoun Road, Lakes Entrance VIC 3909, to be developed for residential living in accordance with the Victoria planning and building provisions as they relate to bushfire.

The land is proposed for rezoning and subdivision as part of the Lakes Entrance Northern Growth Area (LENGA) and planning scheme amendment C112. The purpose of this report is to demonstrate how the proposed rezoning and subdivision can address bushfire risk as required by Ministerial Direction 11 Strategic Assessment of Amendments.

Ministerial Direction No. 11 requires a comprehensive strategic evaluation of any planning scheme amendment and the outcomes it produces, including an evaluation and explanation of how the amendment addresses bushfire risk. This consideration is required regardless of whether the amendment covers an area in the Bushfire Prone Area (BPA) or Bushfire Management Overlay (BMO).

This Bushfire Development Report details how the proposed rezoning and any subsequent subdivision and development could respond to the requirements of the site being in a designated BPA and anticipated coverage of the site by the BMO. It includes:

- The identification, assessment and mapping of classified vegetation, slopes, and commensurate setbacks/extent of defendable space required for the construction of future dwellings in accordance with the BMO and AS 3959-2009 Construction of building in bushfire prone areas;
- The determination and analysis of credible bushfire scenarios that could impact the area;
- A landscape risk assessment in accordance with Practice Note 64 Local Planning for Bushfire Protection (DTPLI, 2013);
- Recommendations for an appropriate development response applying best practice bushfire protection measures including Bushfire Attack Level (BAL) construction standards, defendable space, water and access.
3. Methodology

The approach undertaken in this assessment has included:

- Undertaking a site visit and fieldwork on 9th July 2013;
- Identifying and mapping the classified vegetation present across the study area and 150m beyond it, based on an assessment of aerial photography, GIS analysis of vegetation cover, and fieldwork to determine the fuel hazard and verify the vegetation classification;
- Assessing the slope classes present across the study area;
- Correlating slope analysis with classified vegetation to determine the setback requirements (defendable space distances) for potential residential development with the requirements of the BPA and/or the BMO; and
- Analysing at the landscape scale, the bushfire hazard and risk to the study area, including determining credible fire scenarios that might impact the area.

This approach is consistent with the risk management standard ISO 31000-2009 (Standards Australia, 2009a) and uses the standard site assessment methodologies for assessing bushfire risk to new development in Victoria. It includes the following steps:

1. Establish the context for the bushfire risk analysis;
2. Articulate the fire management objectives based on Clauses 13.05 and 44.06 (BMO) in the East Gippsland Planning Scheme and the Victorian building regulations;
3. Identify and assess the elements of hazard, exposure and vulnerability that contribute to bushfire risk to the proposed development of the site including vegetation and topography;
4. Determine what defendable space setbacks and vegetation management standards commensurate with proposed Bushfire Attack Level (BAL) construction standards are required; and
5. Determine other required bushfire safety measures to mitigate the bushfire risk to the proposed urban development, including water and access/egress.

The context of the risk analysis is the impact that a bushfire may have on the safety of future development, and hence residents, within the study area. Analysis considers the impact of a large fire burning into the site and/or local ignitions.

The safety objective is that future development should be able to withstand the level of bushfire attack credible for the site during a bushfire under Code Red weather conditions.

The performance requirement for this objective is that there is no flame or radiant heat ignition of future buildings from the fire front and that the risk of ember ignition is minimised.

The criteria against which the risk is assessed is that future residential development will be able to meet the requirements of the relevant land use planning and building controls.


Potential mitigation of the impact of bushfire is considered in the context of:

- Our current understanding of building and life safety issues during bushfire;
- The existing suite of bushfire safety controls regulating development in Victoria; and
- The proposed future development concept for the site.
4. Locality and site description

This section describes 41 Colquhoun Road, Lakes Entrance, existing land uses and infrastructure on and around the site and the landscape context (refer Figures 1, 2 and Map 1).

Figure 1 - Study area location (site shown in red) (DEPI, 2013).

4.1. The site

The site comprises approximately 39ha of farmland and modified native forest, approximately 2km to the northeast of the Lakes Entrance township, in the northeast corner of the Lakes Entrance Northern Growth Area (LENGA).

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<td>Assessors:</td>
<td>Hamish Allan – Manager, Bushfire Planning and Design</td>
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<td>Jon Boura - Managing Director</td>
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4.1.1. Existing land uses

The study area is currently undeveloped. It comprises two cleared areas of pasture and grazing land, one in the northern half of the site and one in the southern half, which are separated by a large wedge of remnant but modified, native forest. This
large area of forest occupies the central and eastern portion of the site. A farm dam is situated at the head of the gully in the northeast of the site (refer Map 1).

Map 1 - Study area (refer Section 4.2, 1st para. for an explanation of the BMO assessment zones).

4.1.2. Existing access and infrastructure

No formal roads or tracks exist on the site however access is possible via Colquhoun Road and Ostlers Road. Farm infrastructure including the dam, fences and stockyards occurs on the site.

Ostlers Road runs adjacent to the northwestern boundary of the site, and will in the future provide the main access into the development. Currently, however, access from Ostlers road is prevented by the narrow strip of remnant native vegetation on the road reserve between the road and the site. Both Ostlers and Colquhoun Roads provide good access to the wider region and the township of Lakes Entrance, which is located approximately 2km to the southwest of the site.

It is anticipated that development of the LEAGA will involve upgrades to infrastructure to provide reticulated water and sewerage services and underground electricity and telecommunications (SMEC Urban, 2012).
4.1.3. **Surrounding landscape**

The site is above, and approximately 2km to the northeast of, the Lakes Entrance township centre. The land immediately to the south of the site is in the Residential 1 Zone (R1Z). Land to the north and northeast, is currently zoned Rural Living (RLZ). Land to the northwest is zoned Low-density residential (LDRZ). The site itself and land to the immediate east and west is in the Farm Zone (FZ3) (refer Figure 3). A landfill exists to the east-southeast of the site across Colquhoun/Palmers Roads.

Figure 2 - Location and landscape context of the site (shown in red outline, 1km buffer of the site shown in blue outline).

Figure 3 - Planning zones/land use around the site (shown in light blue) (DEPI, 2013).
4.2. Vegetation

This section analyses the vegetation within and adjacent to the study area, and classifies it pursuant to the BMO/AS 3959-2009 Construction of buildings in bushfire-prone area, vegetation classification scheme. The BMO site assessment requires the identification of classified vegetation within 150m of the development (CFA, 2012). Outside the BMO, in the BPA, vegetation within 100m of a site is assessed and classified (Standards Australia, 2009). Note that the BMO also requires a description of the landscape within 250m of a site (East Gippsland Planning Scheme, 2011d).

Classified vegetation is vegetation that constitutes a bushfire hazard (CFA, 2012). This is for the purposes of determining the Defendable Space requirements and Bushfire Attack Level (BAL) construction standard.

The classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 7 - Native Vegetation) classification system. If more than one vegetation type is present the ‘worst case scenario’ is applied - the predominant vegetation type present is not necessarily the worst case scenario (Standards Australia, 2009b).

Two types of classified vegetation have been identified within the 150m Site Assessment Zone (see Map 2). In relation to future development, it has been assumed that all areas not shown as classified vegetation in Map 2 will be low hazard, excluded (non-classified) vegetation or non-vegetated areas, including those currently vegetated patches that are proposed to be subject to vegetation removal and development.

4.2.1. Classified vegetation group A - Forest

Patches of treed vegetation on and around the site accord with the AS 3959-2009 classification of Forest, with trees dominated by Eucalypts, with an average height over 10m high and with 30-70% foliage cover (may include understorey of sclerophyllous low trees and tall shrubs or grass) (Standards Australia, 2009b).

A flora, fauna and vegetation quality assessment undertaken by Biosis in 2009 identified that the forest vegetation comprises three EVCs;

- Limestone Box Forest
- Lowland Forest; and
- Lowland Herb-rich Forest

Bioregional EVC benchmarks for these forest types confirm a benchmark tree canopy cover figure of 30% with trees 20 to 25m tall (DSE, 2004).

Forest vegetation in the BMO model, has a presumed fuel load of 25t/ha surface fuel and 35t/ha overall fuel (Standards Australia, 2009b; Douglas, 2010). Whilst no overall fuel hazard assessments were undertaken as part of the site visit\(^1\), it was evident that most, if not all of this vegetation type is below the fuel hazard loads presumed for Forest. Shrubs contributing to the elevated fuel hazard are generally sparse and scattered. Near surface and surface fuel levels are variable, with a higher fuel hazard in the less disturbed, more intact remnants (e.g. most of the roadside

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\(^1\) Due to the disturbed nature of the site current fuel loads in the forest are not a reliable indicator of long term steady state fuel loads and so a precautionary approach of assuming forest fuel levels, for planning purposes, has been adopted.
reserve along Ostlers Road) and only a low to moderate hazard elsewhere. This is likely due to the history of grazing and disturbance on the site.

Map 2 - Potentially classifiable vegetation within the BMO 150m site assessment zone.
Figure 4 - Looking northeast at the large patch of Forest vegetation on the site.

Figure 5 - Looking east-southeast at the large patch of Forest vegetation on the site.
Figure 6 - Looking southwest down the drainage line in the northern half of the site. The large stand of Forest to be retained can be seen at left of picture, a small patch of Forest proposed to be removed at right (refer Map 2).

Figure 7 - Looking west-northwest at vegetation northwest of Ostlers Road. The landscape is managed in a low hazard state except for a 20-30m wide strip of vegetation/revegetation along the drainage line through the centre of the picture.
Whilst the forest has been substantially modified and currently has a fuel hazard level less than that presumed in the BMO model, future management proposes to manage retained vegetation primarily for its biodiversity values (East Gippsland Shire Council, 2012). In the future this may result in a higher fine fuel hazard than currently exists, that may approach or meet the BMO assumptions for Forest vegetation fuels. Accordingly, and in line with the precautionary approach advocated at Clause 13.05 in the planning scheme, proposed development setbacks are based on Forest vegetation with the default BMO fuel loads (refer Map 5).

4.2.2. Classified vegetation group D - Scrub

For future development, vegetation along the drainage line to south of the site (refer Map 2) has been classified according to the AS 3959-2009 classification of Scrub. Although the vegetation currently present along this drainage line is potentially excludable under AS 3959-2009 definitions for low hazard vegetation, the Native Vegetation Precinct Plan (East Gippsland Shire Council, 2102) and Paynter Dixon Draft Concept Plan (Collie, 2013) provides for revegetation, presumably back to or near EVC benchmark condition, which is likely to meet the definition of Scrub. The vegetation quality assessment undertaken by Biosis identified vegetation along this drainage line as comprising EVC 53 Swamp Scrub, albeit in only a fair condition (Miller and Sofo, 2009).

Scrub in the BMO model has an assumed height of 3m and overall fuel load of 25t/ha. Both assumptions are likely to be appropriate for the drainage line revegetation and consequently development setbacks shown in Map 5 are the BMO defaults for Scrub (on Upslope or flat land).

Figure 8 - Drainage line in south of site. Remnant scrub vegetation can be seen in the middle ground.

4.2.3. Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas within the 150m Site Assessment Zone can be excluded from classification in accordance with Section 2.2.3.2 of AS 3959-2009 (Standards Australia, 2009b), if they comprise one or more of the following:
i. ‘Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.

ii. Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other.

iii. Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.

iv. Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.

v. Low threat vegetation, including grassland managed in a minimal fuel condition\(^2\), maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks’. (Standards Australia, 2009b).

In relation to future development, all areas not shown as classified vegetation in Map 2 have been deemed to meet one of the above definitions, including currently vegetated areas that are proposed to be subject to vegetation removal and development. If additional vegetation retention and/or revegetation occurs, to that shown in Maps 2 and 5, these excluded areas may become classifiable and hence additional development setbacks would be required.

This includes all current pasture and grazing land, which it is assumed will be developed and/or managed in a low fuel, excludable state. It will be important to manage these pasture areas in this low fuel state during (and before and after) the development phase i.e. as grazed, mown or slashed grass below 100mm high, otherwise development setbacks commensurate with a Grassland definition may be required.

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\(^2\) Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognisable as short-cropped grass for example, to a nominal height of 100mm (Standards Australia, 2009b).
4.3. Topography

Topography can significantly influence the rate of spread and intensity of a bushfire. Fire burns faster uphill – as the slope increases so does the speed of the fire and its intensity. As a general rule, for every 10° slope, the fire will double its speed. Fires move more slowly down hill because the flames reach less fuel, and less radiant heat preheats the vegetation in front of the fire. For every 10° of downhill slope, the fire will halve its speed (CFA, 2012). When winds are light the slope will be the dominant influence on the direction of fire spread (Cheney and Sullivan, 2008).

Map 3 - Elevation model of the site and surrounding land within the 250m landscape assessment zone.

Both AS 3959-2009 and the BMO require classification of the Effective Slope in the same way. Effective Slope is the slope of the land under the classified vegetation that will most influence the bushfire attack (as previously noted, the vegetation
classification zone extends up to 150m from a building/site in the BMO, and up to 100m under AS 3959-2009). The slope of the land between a building and the classified vegetation will also affect the amount of radiant heat impacting on a building, however, it is the Effective Slope under the classified vegetation that will determine the fire behaviour that will most impact on the development. This will usually be the steepest vegetated slope perpendicular to a building or site.

Two broad types of Effective Slope apply in relation to existing or proposed developments.

- **Flat and/or Upslope land** - land under the classified vegetation that is flat or on which a bushfire will be burning downhill, in relation to the development. Commonly land at a higher elevation than that of the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity, and all flat or upslope land is assigned a slope value of 0°.

- **Downslopes** - land under the classified vegetation on which a bushfire will be burning uphill in relation to the development. Commonly land at a lower elevation to that of the development. As the rate of spread of a bushfire burning on a downslope (i.e. burning uphill towards a development) will be significantly influenced by increases in slope, downslopes are grouped into five classes in 5° increments from 0° up to 20°.

Refer to Map 4 for an analysis of slopes on and around the site. Both Maps 3 and 4 show that whilst the topography is undulating and dissected by drainage lines, slopes are only moderate and almost the entire site comprises land with a slope less than 10°. Note that the slope classes shown in Map 4 are conservatively shown as Downslopes in relation to future development, whereas in reality many of these will be Upslope of development.

Based on the development concept plan (refer Map 5) it is considered that development is not likely to be required to be setback more than a distance commensurate with the Downslope 0-5° category, although this will need to be confirmed in relation to a specific development proposal and accompanying BMO permit application requirements i.e. a Bushfire Management Statement (BMS) for a subdivision or dwelling.
Map 4 - Slope analysis of the site and 150m assessment zone (note that the slope classes shown assume all slopes are downslopes in relation to future development).
5. **Bushfire development controls**

This section identifies the existing and proposed planning and building controls that apply to the site, which have bushfire related implications for development.

5.1. **State Planning Policy Framework (SPPF)**

Clause 13.05 of the SPPF deals with bushfire. It has the objective of assisting community resilience to bushfire. 'Overarching strategies' to achieve the objective are to prioritise the protection of human life over other policy considerations in planning and decision-making in areas at risk from bushfire, and, where appropriate, to apply the precautionary principle when assessing risk (East Gippsland Planning Scheme, 2011a).

Clause 13.05 stipulates development control strategies that only permit new development where:

- 'The risk to human life, property and community infrastructure from bushfire can be reduced to an acceptable level;'
- 'Bushfire protection measures, including the siting, design and construction of buildings, vegetation management, water supply and access and egress can be readily implemented and managed within the property; and'
- 'The risk to existing residents, property and community infrastructure from bushfire is not increased’ (East Gippsland Planning Scheme, 2011a).

5.2. **Zoning**

The site is currently zoned Farm Zone, Schedule 3 (FZ3), however the Outline Development Plan (ODP) proposes rezoning to provide for a mix of low density and conventional density residential development (SMEC Urban, 2012). The zoning is not likely to have significant bushfire safety implications.

5.3. **Overlays**

The site is currently affected by three overlays.

5.3.1. **Erosion Management Overlay (EMO)**

The EMO currently applies to the whole site and has the purpose ‘To protect areas prone to erosion, landslip or other land degradation processes, by minimising land disturbance and inappropriate development’ East Gippsland Planning Scheme, 2011a).

The EMO may not continue to apply to the Lenga including 41 Colquhoun Road (SMEC Urban, 2012). Regardless of whether it applies or is removed, it does not have any appreciable bushfire safety implications for development.

5.3.2. **Vegetation Protection Overlay - Schedule 1 (VPO1)**

The VPO1 applies to those parts of the site adjacent to Ostlers and Colquhoun Roads. The VPO1 schedule Tambo-Bairnsdale Roadside Vegetation Protection Network seeks to protect high conservation value roadside vegetation within Government road reserves (East Gippsland Planning Scheme, 2006).
5.3.3. **Environmental Significance Overlay - Schedule 1 (ESO1)**

The purposes of the ESO1 (parent provision) include:

- ‘To identify areas where development of land may be affected by environmental constraints.’
- ‘To ensure that development is compatible with identified environmental values’ (East Gippsland Planning Scheme, 2011c).

Only a ‘sliver’ of the ESO1 applies to the northern boundary of the site along Ostlers Road. Both the ESO1 and VPO1 require a permit for vegetation removal and invoke the need to avoid, minimise and offset native vegetation impacts including removal.

5.3.4. **Bushfire Management Overlay (BMO)**

The BMO is used to guide the development of land in areas of high bushfire hazard. It requires consideration of the location, design and construction of development and the implementation of bushfire protection measures.

Whilst the BMO does not currently apply to the site, new BMO mapping is being progressively introduced to local planning schemes, and it is anticipated it will apply to those areas of the L ENGA with treed patches of vegetation larger than 4ha in size, and land extending 150m around those patches. This distance is based on research into house loss from bushfires which found that 92% of house loss occurs within 150m of the bushfire hazard (DTPLI, 2013).

The BMO coverage is based on statewide bushfire hazard data, which recognises three hazard levels:

- **Bushfire Hazard Level Low (BHL Low):** Areas where the extent, configuration and/or management of vegetation means there is low potential for bushfire spread. Neither the BPA or BMO apply to these areas, and there is no planning or building response required for bushfire purposes.
- **Bushfire Hazard Level 1 (BHL1):** Areas of moderate bushfire hazard with head fire intensity modelled to be between 4,000kW/m and 30,000kW/m. There is a building response only to bushfire in these areas via designation as Bushfire Prone Areas (refer Section 5.4 below).
- **Bushfire Hazard Level 2 (BHL2):** Areas with the most significant bushfire hazard where the intensity is modelled to be 30,000kW/m or more. These are designated BMO areas requiring both a planning and building response for bushfire safety (DTPLI, 2013).

The mapping excludes areas of contiguous vegetation less than 4ha in area and the final BMO boundaries will be subject to a verification process involving consultation with the CFA and East Gippsland Shire Council.

The purposes of the BMO include:

- ‘To assist to strengthen community resilience to bushfire.’
- ‘To identify areas where the bushfire hazard requires specified bushfire protection measures for subdivision and buildings and works to be implemented.’
- ‘To ensure that the location, design and construction of development considers the need to implement bushfire protection measures.’
- ‘To ensure development does not proceed unless the risk to life and property from bushfire can be reduced to an acceptable level’ (East Gippsland Planning Scheme, 2011d).
Specific objectives, standards, mandatory standards and decision guidelines are set out in the accompanying Clause 52.47 to the BMO.

- **Objectives** describe the desired outcome to be achieved in a completed development;
- **Standards** specify the requirements to meet the objectives. A standard should normally be met but if an alternative design solution can be shown to meet the objective it may be considered;
- **Mandatory Standards** must be met and alternative design solution must not be considered; and
- **Decision Guidelines** specify matters that the responsible authority must consider in assessing and deciding upon an application.

Matters to be considered in the BMO include:

- Location, layout and siting;
- Building construction and defendable space;
- Water supply and access; and
- Implementation of bushfire protection measures.

In adopting the precautionary principle advocated at Clause 13.05, the development setbacks in this report (refer Map 5) assume BMO coverage of the whole site. The Bushfire Attack Level (BAL) construction standards for development within the BMO are shown in Figure 9.

**5.4. Bushfire Prone Area (BPA)**

The whole site is within a designated Bushfire Prone Area (BPA). BPAs are those areas subject to or likely to be subject to bushfires, as determined by the Minister for Planning. Those areas of highest bushfire risk within the BPA are designated as BMO areas.

The Building Regulations 2006, through application of the Building Code of Australia, apply bushfire protection standards for building works in designated BPAs. A minimum construction standard applies to all new buildings in a BPA. Buildings must be constructed to a minimum BAL-12.5, or higher as determined by a site assessment or planning scheme requirement.
A BAL is a means of measuring the severity of a building’s potential exposure to ember attack, radiant heat and direct flame contact. There are six BALs that form part of *AS 3959-2009* (Standards Australia, 2009b). The level of risk and expected fire outcomes at each BAL are explained in Table 1.

**Table 1 - Bushfire Attack Levels (BALs) explained (derived from *AS 3959-2009*, Standards, Australia, 2009b).**

<table>
<thead>
<tr>
<th>Bushfire Attack Level (BAL)</th>
<th>Risk Level</th>
<th>Construction elements are expected to be exposed to…</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAL-Low</td>
<td>VERY LOW: There is insufficient risk to warrant any specific construction requirements but there is still some risk.</td>
<td>No specification.</td>
<td>At 4kW/m² pain to humans after 10 to 20 seconds exposure. Critical conditions at 10kW/m² and pain to humans after 3 seconds. Considered to be life threatening within 1 minute exposure in protective equipment.</td>
</tr>
<tr>
<td>BAL-12.5</td>
<td>LOW: There is risk of ember attack.</td>
<td>A radiant heat flux not greater than 12.5 kW/m²</td>
<td>At 12.5kW/m² standard float glass could fail and some timbers can ignite with prolonged exposure and piloted ignition.</td>
</tr>
<tr>
<td>BAL-19</td>
<td>MODERATE: There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat.</td>
<td>A radiant heat flux not greater than 19 kW/m²</td>
<td>At 19kW/m² screened float glass could fail.</td>
</tr>
<tr>
<td>BAL-29</td>
<td>HIGH: There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.</td>
<td>A radiant heat flux not greater than 29 kW/m²</td>
<td>At 29kW/m² ignition of most timbers without piloted ignition after 3 minutes exposure. Toughened glass could fail.</td>
</tr>
<tr>
<td>BAL-40</td>
<td>VERY HIGH: There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.</td>
<td>A radiant heat flux not greater than 40 kW/m²</td>
<td>At 42kW/m² ignition of cotton fabric after 5 seconds exposure (without piloted ignition).</td>
</tr>
<tr>
<td>BAL-FZ (i.e. Flame Zone)</td>
<td>EXTREME: There is an extremely high risk of ember attack and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.</td>
<td>A radiant heat flux greater than 40 kW/m²</td>
<td>At 45kW/m² ignition of timber in 20 seconds (without piloted ignition).</td>
</tr>
</tbody>
</table>
6. Bushfire risk assessment

The bushfire risk to 41 Colquhoun Road was assessed at the site and landscape scale by identifying likely bushfire scenarios and mechanisms of a bushfire that may impact on the proposed development, given the nature of the surrounding landscape.

6.1. Study area and abutting landscape

Clause 13.05 of the Victoria Planning Provisions stipulates that new development is only permitted where ‘the risk to human life, property and community infrastructure from bushfire can be reduced to an acceptable level’ (East Gippsland Planning Scheme, 2011a). This risk reduction is achieved largely by complying with the relevant planning (BMO) and building (BPA) controls, however there are some landscapes in which these controls are considered inadequate and development may be inappropriate.

A number of ‘landscape scenarios’ representing different risk levels, are described in the CFA publication, Planning for Bushfire Victoria: Guidelines for Meeting Victoria’s Bushfire Planning Requirements (CFA, 2012). It is considered that the development site and surrounding land accords with Scenario A and/or Scenario B, as follows:

**Landscape Scenario A**

‘A landscape consistent with the assumptions in AS3959-2009. A steady state rate of spread is likely to be achieved. However, the fire is unlikely to expose the development to severe convective winds. The planning provisions accommodate for this type of landscape’ (CFA, 2012).

**Landscape Scenario B**

‘Established ‘urban’ areas that contain or are within close proximity to significant areas of high fuel loads. The buildings will be exposed to radiant heat and localised flame contact from individual elements burning in the landscape rather than a definable fire front. These include elements such as neighbouring buildings, clumps of vegetation and sheds. Numerous spot fires are likely. However, there will not be a fire front as assumed by AS3959-2009 impacting the building’ (CFA, 2012).

The CFA guidelines also describe two high risk landscapes where development is likely to be inappropriate even if it can comply with the BMO requirements, or where additional bushfire protection measures should be considered. These include landscapes where long fire runs in high hazard vegetation are possible and where severe convective winds and steep topography may generate extreme bushfire behavior beyond BMO assumptions.
The site is not one of these higher risk landscapes. As can be seen in Figure 10, the site itself is within approximately 2km of the Lakes Entrance town centre. Most of the land within 1km of the site comprises low threat pasture or residential development. Like the site itself, the wider topography is undulating however it is not extreme terrain that would substantially increase the bushfire attack beyond the parameters of the BMO.

Accordingly it is considered that proposed development is appropriate if adequate bushfire safety measures are incorporated into the design as provided for by the BMO and discussed in this report (refer Section 7).

6.2. **Wider landscape context**

This section describes the broader landscape extending beyond 1km around the site, to 10km and 20km of the study area, as per *Practice Note 64 Local Planning for Bushfire Protection* (DTPLI, 2013). It identifies credible directions of approach of fire, given the nature of the site and the surrounding landscape, including vegetation and topography and discusses likely impacts to future development of the site.
Figure 11 shows there are substantial areas of contiguous, treed vegetation to the north and northwest of the site, which also coincides with the direction of prevailing winds on with days of extreme fire weather. A large and well-established bushfire could approach the site from these directions (or from the northeast), and under severe weather conditions could pose a threat to existing and future development mainly from embers. To a lesser extent, radiant heat impacts and even flame contact, is possible if future dwellings are not sufficiently setback from classified vegetation.

However, as can be seen more clearly in Figure 10, the landscape between the site and the large areas of forest to the north, northwest and northeast; is a mosaic of grazed pastures and residential/low density residential development including roads. Hazardous, potentially classified vegetation where it is present, occurs in small, fragmented patches, meaning that the bushfire approach would be substantially moderated after it left the contiguous forest and approached the site.

An approach from the southwest (or south) driven by wind typically associated with a cool change after hot weather, is not considered a credible threat due to the lack of classified or hazardous vegetation in these directions.

Similarly, the bushfire threat from the east of the site is not high, due to the absence of hazardous vegetation in this direction and the fact that winds from the east do not generally coincide with extreme fire weather days (Long, 2006).

6.3. **Mechanisms of bushfire attack**

The mechanisms of bushfire attack on a building can be a combination of sparks and embers and/or direct flame contact and/or radiant heat (see Figure 12). Strong winds may also cause structural damage to a building and increase the chances of ignition by embers, radiant heat or flame. These mechanisms and their possible implication for developing 41 Colquhoun Road are briefly discussed in this section.
6.3.1. Ember attack

Ember attack is the most common cause of house loss during bushfires. Ember attack occurs when small burning twigs, leaves and bark are carried by the wind, and land on and around the building. If they land on combustible surfaces they can cause an ignition that can spread to the whole building. Embers can enter gaps as small as 1.8mm (CFA, 2012).

Typically, ember attack can be expected to commence before a fire front arrives, peak with the passage of the fire front and then continue for a number of hours after the fire front has passed as nearby trees continue to smoulder and shed burning bark. Many buildings are lost to ember attack in the period after the fire front has passed.

Due to the presence of rough and loose barked, stringybark Eucalypts in the forest vegetation on and around the site, severe ember attack is possible, especially in a large, landscape scale bushfire. These Eucalypt species can also generate burning materials and firebrands that can be lofted hundreds of meters in advance of the fire. Under unpredictable and variable bushfire wind conditions, such ember attack may be possible from all directions. One of the purposes of the AS 3959-2009 BAL construction standards is to provide sufficient protection from embers.

6.3.2. Flame contact and radiant heat

Radiant heat is the heat generated by burning materials. It can cause combustible surfaces to ignite without direct flame or ember contact, crack and break windows and dry out materials ahead of an advancing bushfire, making them more readily combustible (CFA, 2012).

Arguably it is flame contact or radiant heat that poses the greatest threat to human survival. These mechanisms can result in rapid involvement of the entire building and cause the building to ignite during the passage of the fire front when in most cases there is no option for people present, other than to shelter within the building. Radiant heat is the most common cause of death in bushfires (CFA, 2012).

The BMO site assessment process is used to determine how far away from unmanaged vegetation a building would need to be to receive less than a certain level of radiant heat (e.g. a building constructed to BAL-19 has been designed to
withstand a radiant heat flux of 19 kW/m²). This analysis is used to determine the most appropriate combination of Defendable Space and BAL construction standard for proposed development. The development setbacks proposed in section 7 are nominated to provide sufficient safety from radiant heat and flames.

6.3.3. Wind

Wind has the potential to increase a building’s vulnerability to other mechanisms of bushfire attack. Severe winds can accompany severe bushfires and cause failure of the building structure, allowing ember entry onto combustible surfaces. It can also cause trees and branches to fall, breaking windows, and damaging roofs.

Winds associated with a severe bushfire can be extreme and unpredictable however this is most likely in steeper and more highly variable terrain than that found at Lakes Entrance.
7. Planning and design response

This section discusses appropriate design and development responses pursuant to the development controls in section 5 and bushfire analysis in section 6. Proposed setbacks/defendable space and construction requirements for future development as required by the BMO are identified and shown in Map 5, based on the Paynter Dixon Draft Concept Plan, Version G (Collie, 2013).

7.1. Defendable space setbacks

New development is required to be setback from areas of classified vegetation to create ‘defendable space’. The minimum requirement in the BMO for subdivisions of 10 or more allotments is the defendable space distance required for a BAL-19 construction standard as per Table 1 in Clause 52.47.

New subdivisions of less than 10 dwellings are required to provide sufficient defendable space for a maximum construction level of BAL-29.

Any other occupied buildings, such as accommodation (other than a dwelling or dependent person’s unit), child care centres, education centres, hospitals, leisure and recreation facilities and places of assembly proposed for the site would require additional defendable space to achieve a radiant heat flux of less than 10kW/m² as per Table 2 of Clause 52.47.

The defendable space distance is the area of land around a building where vegetation is modified and managed to reduce the effects of flame contact and radiant heat associated with a bushfire (CFA, 2012). It is also the minimum distance a building must be setback from classified vegetation in the BMO. Defendable space usually consists of two discrete zones, the inner and outer zones (see Figure 13).

![Figure 13 - Illustration of defendable space setback, showing inner and outer zones (DTPLI, 2011).](image)

The inner zone is the area immediately around the building, extending from the building facade (excluding eaves) to the outer zone. It aims to:
- ‘reduce radiant heat on a building through the reduction of fire intensity to a level where the building is unlikely to be ignited during the passage of a fire
- eliminate direct flame contact of the building from the outer protection zone or the unmodified vegetation
- reduce ember attack on the building by reducing the amount of potential fire brands (embers)’ (CFA, 2012).

The outer zone extends from the inner zone to the unmanaged vegetation. The aim of this zone is to substantially decrease the intensity of an approaching fire and restrict the pathway to crown fuels (CFA, 2012). Vegetation management standards for each zone are provided below in Table 3.
Map 5 - Concept plan and possible development setbacks (defendable space) for BMO compliance.
7.2. **BAL construction standards**

All of 41 Colquhoun Road is a designated Bushfire Prone Area. Under the Building Amendment (Bushfire Construction) Regulation 2011 s.1(c) all buildings constructed in a designated BPA are to be constructed to a minimum BAL-12.5. The construction standard needs to be higher if so determined by a site assessment triggered by the planning or building permit process.

In accordance with best practice and CFA policy it is recommended that future development of the site should aim to achieve the lowest BAL possible i.e. setbacks from classified vegetation commensurate with a BAL-12.5 construction standard. Some of the development area will be able to achieve this, however buildings closest to classified vegetation will be required to achieve a maximum BAL-19, as detailed in the proposed setbacks/defendable space distances shown in Map 5 and Table 2 above.

<table>
<thead>
<tr>
<th>Vegetation classification</th>
<th>BAL construction standard</th>
<th>Slope class</th>
<th>Defendable Space distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inner Zone</td>
</tr>
<tr>
<td>Forest</td>
<td>BAL-12.5</td>
<td>Flat/Upslope</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;0 to 5° Downslope</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>BAL-19</td>
<td>Flat/Upslope</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;0 to 5° Downslope</td>
<td>43</td>
</tr>
<tr>
<td>Scrub</td>
<td>BAL-12.5</td>
<td>Flat/Upslope</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>BAL-19</td>
<td>Flat/Upslope</td>
<td>19</td>
</tr>
</tbody>
</table>

7.3. **Vegetation management**

All non-classified vegetation on and round the site will need to be managed in a low threat state. Low threat vegetation includes managed grassland (maintained at <100mm in height), maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks (Standards Australia, 2009b).

The minimum vegetation management standard for non-classified, low threat vegetation is Outer Zone standard. Inner and outer zone management prescriptions are provided in Table 3. If these standards cannot be achieved, additional development setbacks to those shown in Map 5 may be required.

This has implications for any revegetation of drainage lines/waterways as advocated for in the ODP and NVPP (SMEC Urban, 2012; East Gippsland Shire Council, 2012). If the vegetation management standards cannot be achieved the revegetation will have to meet one of the other exclusions from classification provided for in AS 3959-2009 and detailed in Section 4.2.3. The most appropriate/achievable exclusion may be to keep the width of any revegetation to no more than 20m and ensure buildings are setback at least 20m from it.
Table 3 - Vegetation management standards for the inner and outer zone (CFA, 2012).

<table>
<thead>
<tr>
<th>Zone</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner zone</td>
<td>Within 10 metres of a building, flammable objects such as plants, mulches and fences must not be located close to the vulnerable parts of the building such as windows, decks and eaves.</td>
</tr>
<tr>
<td></td>
<td>Trees must not overhang the roofline of the building, touch walls or other elements of a building.</td>
</tr>
<tr>
<td></td>
<td>Grass must be no more than 5cm in height. All leaves and vegetation debris must be removed at regular intervals.</td>
</tr>
<tr>
<td></td>
<td>Shrubs should not be planted under trees and must be separated by at least 1.5 times their mature height.</td>
</tr>
<tr>
<td></td>
<td>Plants greater than 10cm in height at maturity must not be placed directly in front of a window or other glass feature.</td>
</tr>
<tr>
<td></td>
<td>Tree canopy separation of 2m and overall canopy cover of no more than 15% at maturity.</td>
</tr>
<tr>
<td></td>
<td>Tree branches below 2m from ground level must be removed.</td>
</tr>
<tr>
<td>Outer zone</td>
<td>Grass must be no more than 10cm in height and leaf and other debris mowed, slashed or mulched.</td>
</tr>
<tr>
<td></td>
<td>Shrubs and/or trees must not form a continuous canopy with unmanaged fuels.</td>
</tr>
<tr>
<td></td>
<td>Tree branches below 2m from ground level must be removed.</td>
</tr>
<tr>
<td></td>
<td>Trees may touch each other with an overall canopy cover of no more than 30% at maturity.</td>
</tr>
<tr>
<td></td>
<td>Shrubs must be in clumps of no greater than 10m², which are separated from each other by at least 10m.</td>
</tr>
<tr>
<td>Inner zone and outer zone</td>
<td>Non-flammable features such as tennis courts, swimming pools, dams, patios, driveways or paths should be incorporated into the proposal, especially on the northern and western sides of the proposed building.</td>
</tr>
<tr>
<td></td>
<td>Features with high flammability such as doormats and firewood stacks should not be located near the structure.</td>
</tr>
</tbody>
</table>

Care will also need to be taken during the development phase that all vegetation in proximity to dwellings is managed in the appropriate low fuel state. There may be a risk of fire spread through any undeveloped or partially developed allotments within the site during the development phase.

Subdivisions within the BMO that are designed to share defendable space between individual allotments are required to provide reasonable assurance that the ongoing land use will provide the defendable space throughout the life of the development, including the period during which the subdivision is only partially developed.

The CFA also have published guidelines on landscaping for bushfire safety that are available on their website at www.cfa.vic.gov.au (CFA, 2012).

### 7.4. Water supply

BMO compliant development has to meet the standards outlined in the CFA publication *Planning for Bushfire, Victoria. Guidelines for meeting Victoria’s bushfire...*
planning requirements (CFA, 2012). The water supply requirements are based on the property size, type of land use, existence of a reticulated supply and proximity to a hydrant and are summarised in Table 4.

Table 4 - Static water supply requirements for dwellings in the BMO.

<table>
<thead>
<tr>
<th>Lot size category</th>
<th>Reticulated water supply and hydrant*</th>
<th>Effective Capacity (litres)</th>
<th>CFA access to supply and CFA couplings?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot size less than 500 square metres</td>
<td>n/a</td>
<td>2,500</td>
<td>No</td>
</tr>
<tr>
<td>Lot size 500 – 1,500 square metres</td>
<td>Yes</td>
<td>5,000</td>
<td>No</td>
</tr>
<tr>
<td>Lot size 500 – 1,500 square metres</td>
<td>No</td>
<td>10,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Lot size greater than 1,500 square metres</td>
<td>n/a</td>
<td>10,000</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Other Development

<table>
<thead>
<tr>
<th>All other developments</th>
<th>Reticulated water supply and hydrant *</th>
<th>Effective Capacity (litres)</th>
<th>CFA access to supply and CFA couplings?</th>
</tr>
</thead>
<tbody>
<tr>
<td>All other developments</td>
<td>10,000 per 1500 square metres up to 40,000</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

*Located within 120 metres of the rear of the building

Future development will also need to comply with the CFA requirements for water supplies in subdivisions, which can be found in their publication ‘Preferred Requirements: Water Supplies And Access For Subdivisions In Residential 1 and 2 and Township Zones, November 2006’.

7.5. Access and egress

Provision of ‘two ways in and out’ is a long-standing design principle in bushfire prone areas both to facilitate fire service access and resident egress. Firefighter access can be facilitated by design of the road network so that there is more than one feeder road linking new lots to the existing residential areas and/or to major access roads such as Colquhoun and Ostlers Roads. It is considered that the Preliminary Concept Plan - Version G (refer Map 5) provides appropriate access and egress with all development on the site likely to have at least two exit/entrance options.

CFA have published performance criteria regarding road access for larger subdivisions in bushfire prone areas that should be taken into account when designing subdivisions. These include the ‘Planning Guidelines for subdivisions in Bushfire Prone Areas’ (CFA, undated).

Future development will also need to comply with the CFA requirements for access in subdivisions in residential areas, which can be found in their publication ‘Preferred Requirements: Water Supplies And Access For Subdivisions In Residential 1 and 2 and Township Zones, November 2006’.

All lots will need to comply with the BMO access requirements for internal subdivision roads and driveways into lots (CFA, 2012).
8. Supplementary comment

8.1. LENGA Bushfire study

The author of this report has been asked to review and comment on the East Gippsland Shire Council Lakes Entrance Northern Growth Area Bushfire Study (GHD, 2013).

The following brief comments are provided in relation to specific sections of that report. However, as a general comment the author broadly agrees with the overall findings and conclusions of the GHD report i.e. that proposed development is appropriate if adequate bushfire safety measures are incorporated into the design as provided for by the BMO and BPA planning and building controls.

Section 2 - Methodology

Identification of hazardous vegetation and slopes within 100m of the site is required in the BPA, however in areas anticipated to be covered by the BMO the assessment is required to extend out to 150m around a site (CFA, 2012).

Additionally, it should be noted that neither AS 3959-2009 nor the BMO, are based on worst case weather or fire scenarios as is alluded to. A number of presumptions about weather conditions underlie the BMO and AS 3959-2009 modelling of bushfire impact. The key presumption is a Forest Fire Danger Index (FFDI) of 120 in the BMO and an FFDI of 100 in AS 3959-2009. The FFDI gives an indication of the probability of ignition, the rate of spread and the difficulty of suppression of a eucalypt forest fire. The BMO inputs to the FFDI are (DPCD, 2013):

- Drought factor - 10
- Relative humidity - 9%
- Wind speed at 10m - 56 km/h
- Air temperature - 40°C

A separate fire danger index exists for Grassfires - the Grassland Fire Danger Index (GFDI). The GFDI differs from the FFDI in that fuel moisture is based on the degree of curing of the grass and it does not directly relate to the rate of spread. Grassland inputs are the same in the BMO and AS 3959-2009 with both systems applying a GFDI of 130.

These presumptions represent a 'one size fits all' model of extreme fire weather conditions for the state, based on Ash Wednesday (16th February 1983) and exceeded for periods of time at some locations on Black Saturday (7th February 2009). They are not necessarily the worst case conditions for any particular location.

Section 3 - Qualitative landscape bushfire risk context assessment

Terramatrix broadly concurs with the landscape risk scenarios identified and discussed. However, it is suggested that a more appropriate methodology or approach for considering landscape risk is that outlined in Practice Note 64 (DTPLI, 2013), rather than 'Section 1: Am I at Risk' in the CFA Fire Ready Kit (CFA, 2011).

3 The WMO (Wildfire Management Overlay) mapping preceded the BMO and may not have been updated with more recent BMO mapping in some municipalities. WMO defendable space was calculated using Ash Wednesday conditions and assumes the same FFDI of 120 but with inputs for relative humidity of 5%, temperature 41°C and wind speed at 45km/h (Maughan and Krusel, 1999; Douglas, 2011).
Section 4 - Bushfire Attack Modelling Results
As above, it should be noted that within BMO areas, the assessment and classification of vegetation and effective slope is required for 150m around a building/site rather than the 100m that appears to have been used. Consequently the methodology presented in 4.2 of the GHD report needs amending to recognise this. The methodology needs to vary depending on whether a site is in the BMO or BPA. Similarly vegetation discussed in Section 4.1.2, (and the BAL mapped scenarios 1 and 2) should include the identification of all patches of classified vegetation proposed to be retained, that are within 100m of a site in the BPA and within 150m of a site in the BMO.

Section 5 - LENGA bushfire study implications
Terramatrix has no significant points of disagreement about the findings in this section.

Section 6 - Conclusion
Section 6.2 - For areas outside the BMO, a BAL-12.5 cannot be presumed for all future development as is claimed. A BAL assessment identifying classified vegetation within 100m of the development will be required - a minimum BAL-12.5 will apply.

8.2. Proposed changes to the LENGA ODP
Terramatrix has also been asked to provide comment on the changes proposed to the LENGA ODP. Terramatrix has no comments about the proposed text for Section 2.7.5 Bushfire hazard, risk and management.

In the 'proposed inclusion to MSS - Clause 21.12', in relation to further strategic work, it is proposed to provide a dot point saying:
'Produce a schedule to the Bushfire Management Overlay (BMO) where the BMO applies to land in the Lakes Entrance Outline Development Plan'.

Terramatrix query whether the area is suitable for a BMO schedule in accordance with the guidance provided in Practice Note 64 (DTPLI, 2013). It might be more appropriate to change the wording to "Investigate the suitability of the area for development of possible BMO schedule" or words to that effect.
9. Conclusion

The proposed development site at 41 Colquhoun Road is in a bushfire prone landscape, exposed to forest and scrub classifiable vegetation. The level of risk, however, is considered to be within the parameters of the BMO and AS 3959-2009. Most of the land within 1km of the site comprises low threat pasture or residential development. Like the site itself, the topography is undulating however it is not extreme terrain that would substantially influence the bushfire attack.

Accordingly it is considered that proposed development is appropriate if adequate bushfire safety measures are incorporated into the design as provided for by the BMO, which is likely to apply to the whole site.

Future conventional and/or low density residential development, should not pose an unacceptable risk and BMO compliance including vegetation setbacks and vegetation management standards should be achievable.

10. Disclosure

Terramatrix considers it is appropriate to disclose that we bid for the tender to undertake the LENGA Bushfire risk study. We were not the successful bidder - GHD won the tender and produced their report that we have reviewed and commented on in Section 8.2.

We do not consider that the assessment, analysis, findings and comments in this report have been influenced in any way, either directly or indirectly by our unsuccessful tender bid.
11. References


DTPLI (2013) Advisory Note 46: Bushfire Management Overlay mapping methodology and criteria. The former Department of Planning and Community Development (DPCD), Melbourne, Victoria.

DTPLI (2013) Practice Note 64 Local Planning for Bushfire Protection Department of Transport, Planning and Local Infrastructure.


East Gippsland Planning Scheme (2006) Schedule 1 to the Vegetation Protection Overlay, Department of Transport, Planning and Infrastructure (DTPLI). Viewed


