LINDEMAN GREAT BARRIER REEF RESORT PROJECT

ENVIRONMENTAL IMPACT STATEMENT

APPENDIX S - BUSHFIRE HAZARD ASSESSMENT

Addendum: *This EIS was initially prepared assuming that the safe harbour was to be part of the Lindeman Great Barrier Reef Resort Project. With the commencement of the Great Barrier Reef Marine Park Authority's (GBRMPA) Dredging Coral Reef Habitat Policy (2016), further impacts on Great Barrier Reef coral reef habitats from yet more bleaching, and the recent impacts from Tropical Cyclone Debbie, the proponent no longer seeks assessment and approval to construct a safe harbour at Lindeman Island. Instead the proponent seeks assessment and approval for upgrades to the existing jetty and additional moorings in sheltered locations around the island to enable the resort's marine craft to obtain safe shelter under a range of wind and wave conditions. Accordingly, remaining references to, and images of, a safe harbour on various figures and maps in the EIS are no longer current.*

Lindeman Great Barrier Reef Resort Project

Bushfire Hazard and Risk Assessment

HRP15078

Prepared for
White Horse Australia Lindeman Pty Ltd

7 February 2017

Cardno
Shaping the Future

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A	Client review	JD		5 January 2016
1	For client use	JD		13 April 2016
2	For client use	CF		7 February2017

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Glossary of Terms and Abbreviations

APZ	Asset Protection Zone (APZ) - A fuel reduced area surrounding a built asset or structure.
AHD	Australian Height Datum (AHD) - A common national plane of level corresponding approximately to mean sea level.
AEP	Annual Exceedance Probability (AEP) - the measure of the likelihood (expressed a probability) of an event equalling or exceeding a given magnitude in any given year.
BAL	Bushfire Attack Level (BAL)
PFLI	Potential Fire-line Intensity (PFLI) – a measure of the intensity of heat energy generated by a fire under particular combination of weather conditions (e.g. temperature, wind speed, relative humidity) and taking into account the influences of vegetation type and slope.
QPWS	Queensland Parks and Wildlife Service (QPWS) – State Government entity responsible for the management of National Parks
VHC	Vegetation Hazard Class (VHC) - based on the available bushfire fuel load typically associated with a particular vegetation type.

Executive Summary

White Horse Australia Lindeman Pty Ltd is seeking to establish an integrated resort on Lindeman Island covering the existing resort buildings, golf course, air strip, roads and service infrastructure and some additional areas of land that are not currently developed.

Key aspects of the proposal include:

> Beach resort - redevelopment of the existing resort to achieve a new 5 star beach resort with 136 suites, conference centre, beach club and a central facilities building with restaurants, bars and lounges

> Spa resort - on the headland adjacent to the existing resort, a new 6 star Spa resort is proposed with 59 villas, central facilities, entry lounge, spa, sea view restaurant, pool, and a signature rock bar providing spectacular alfresco dining close to the sea;

> Tourist villa precincts - two tourist precinct villa precincts accommodating 89 tourist villas are proposed to the north-east and the north-west of the existing resort;

> Eco resort - a new 5 Star Eco Resort is proposed at the northern end of the lake gently falling towards the western coastline and will consist of 41 villas, a central facility, a boathouse and a waterside restaurant;

> Village - a central village precinct that will accommodate a bar, night club, restaurant, conference facility buildings, arrival centre, shops, restaurants, sport and recreation centre, and a staff village;

> Services infrastructure precinct – the existing services including power (solar proposed), and sewerage and water treatment plants will be replaced to increase capacity and reflect current best practice;

> Airstrip - the existing airstrip is proposed to be upgraded to provide for near all-weather status, capable of landing small jets and helicopters;

> Golf course – an eight hole golf course is proposed adjacent to the tourist villa precinct;

> Safe harbour - a new Safe Harbour is proposed to provide access for the transfer of guests via ferries, luxury vessels and private charters offering greater protection from the prevailing wind directions;

> Ecotourism Facility (Glamping) – an ecotourism facility for 30 glamping tents and a central facilities building is proposed on National Park land consistent with the State's Ecotourism Plan 2016 - 2020;

> Ecotourism - new ecotourism opportunities are proposed, including a coral planting program and a National Park and Great Barrier Reef Educational Centre (for guests and visitors); and

> Environmental enhancements – a vegetation replanting program is proposed over previously disturbed/cleared areas.

The proposed development is located adjacent to areas of bushland and grassland habitats that are bushfire prone and within which fires periodically occur either due to natural causes or as part of the active a management for hazard reduction and nature conservation purposes.

The presence of bushfire prone areas on Lindeman Island will expose human health and property to a risk of harm and as such bushfire hazard and risk management measures need to be implemented as part of the design and ongoing operation of the proposed development. This requirement is accentuated by the fact that the proposed resort is located on an island and cannot be readily serviced by Queensland Fire and Emergency Services (QFES) fire fighting resources that are based on the mainland.

Provided that appropriate consideration is given to the implementation and maintenance of bushfire hazard and risk mitigation measures, including necessary resourcing and training of resort staff, the resort's infrastructure, patrons and staff should not be exposed to an unacceptable level of risk of harm in the event of a bushfire.

1 Introduction

White Horse Australia Lindeman Pty Ltd propose to redevelop the existing resort at Lindeman Island into a world class integrated resort comprising three resorts (spa, eco resort and beach resort), tourist villas, safe harbour and associated infrastructure. The proposed design incorporates environmental improvements to protect the outstanding universal values of the Great Barrier Reef World Heritage Area and set new international standards in environmental sustainability and integrated resort design.

The Coordinator-General has declared the Lindeman Great Barrier Reef Resort project to be a 'coordinated project for which an environmental impact statement (EIS) is required' under section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). This declaration initiates the statutory environmental impact assessment procedure under the SDPWO Act which requires a proponent to prepare an EIS for the project. On 7 May 2015, the Commonwealth Minister for the Environment determined the Lindeman Island Great Barrier Reef Resort project a 'controlled action' under *the Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act), due to the potential impacts on matters of national environmental significance (MNES) (reference number EPBC2015/7461).

The EIS requires an assessment of the project's impacts, allowing the Coordinator-General to decide whether it should be approved, refused or approved subject to conditions. Its other purpose to inform community and Government about the project and how impacts will be avoided or mitigated. As part of that process this assessment of the potential risks that bushfire poses to the development and the associated design and management requirements is required.

This Bushfire Hazard and Risk Assessment (BHRA) provides:

> in Section 2, a general description of the proposed development;

> in Section 3, an assessment of the post-development bushfire hazard levels that will characteristics of the locality of the proposed development;

> in Section 4, an assessment of the risk that bushfire poses to human health and property in the absence of appropriate hazard and risk mitigation measures; and

> in Section 5, bushfire hazard and risk mitigation recommendations that are designed to ensure that human health and property is not exposed to an "unacceptable" risk in the event of a bushfire.

2 Description of Proposal

The proposed development is located within the south-western sector of Lindeman Island and general nature and extent of the proposed development is illustrated in an extract of the Initial Concept Plan presented in **Appendix A**. Key aspects of the proposal prepared by DBI Design Pty Ltd include:

> Beach resort - redevelopment of existing resort to achieve a new 5 star beach resort with 136 suites, conference centre, beach club and a new central facilities building which includes restaurants, bars and lounges;

> Spa resort - on the headland adjacent to the existing resort a new 6 star Spa resort is proposed with 59 villas, central facilities, entry lounge, Spa, sea view restaurant, pool and signature rock bar. The signature rock bar is proposed to be located at the south-west corner of the headland and will provide spectacular alfresco dining close to the sea;

> Tourist villa precincts - two tourist precinct villa precincts accommodating 89 tourist villas are proposed to the north-east and the north-west of the existing resort;

> Eco resort - a new 5 Star Eco Resort is proposed at the northern end of the lake gently falling towards the western coastline and will consist of 41 villas, a central facility, a boathouse and a waterside restaurant;

> Village - a central village precinct is proposed that will accommodate a bar, night club, restaurant, conference facility buildings, arrival centre, shops, restaurants, sport and recreation centre and a staff village;

> Services infrastructure precinct - the existing services including power (solar arrays proposed), sewerage and water treatment plants will be replaced to increase capacity and reflect current best practice;

> Airstrip - the existing airstrip is proposed to be upgraded to provide for near all-weather status and capable of landing small jets and helicopters;

> Golf course - upgrades to the existing recreational gold course are proposed;

> Safe harbour - a new Safe Harbour is proposed to provide access for the transfer of guests via ferries, luxury vessels and private charters which offers greater protection from the prevailing wind directions;

> Glamping – an ecotourism facility for 30 glamping tents and a central facilities building is proposed on National Park land consistent with the State's Ecotourism Plan 2016 - 2020; and

> Ecotourism and environmental enhancements - new ecotourism opportunities are proposed, including a coral planting program and a National Park and Great Barrier Reef Educational Centre for guests and visitors.

Construction of the development would involve a period of 3.5 years. During the three and a half year construction period, employment on the Island is expected to average 300 persons (FTE). The operational workforce on the Island is expected to average 300 (FTE), all of which are intended to be accommodated on the Island to ensure the provision of a full range of services to guests for extended hours each day. All of the on-site construction workforce is expected to be accommodated on the Island and is to be transported to and from the Island between work period breaks by ferry from Shute Harbour.

Once operating the development is anticipated to have the capacity to accommodate up to 530 guests including day-trippers, resulting in a total human population of up to 830 persons.

3 Bushfire Hazard Assessment

3.1 Overview

On the State Planning Policy's interactive mapping system's bushfire hazard classification scheme the majority of the project area, including adjacent sectors of the Lindeman Island National Park, are classified as being Bushfire Hazard Areas. Relevant extracts from the SPP Bushfire Hazard Area mapping are presented in Map **3-1. Bushfire Hazard Areas**.

The classifications presented in **Map 3-1** are based on the new methodology for State-wide mapping of bushfire prone areas in Queensland (Leonard et al., 2014) which was developed to support the bushfire hazard provisions of Queensland's State Planning Policy, which came into effect on 2 December 2013. The new methodology:

> scales bushfire hazard based on the Potential Fire-line Intensity (PFLI) of a severe bushfire and can be used to predict the radiation profile of areas adjacent to potentially hazardous vegetation and an associated Potential Impact Buffer; and

> classifies land that may be subject to significant bushfire attack as areas of Medium, High or Very high Potential Bushfire Intensity.

The PFLI is also a useful indicator of the level of safety afforded for resident egress and firefighter access.

Land that could be subject to significant bushfire attack from embers, flames or radiant heat is included in a Potential Impact Buffer with a default width of 100m from all areas classified as having a Medium, High or Very High Potential Bushfire Intensity.

The classification of an area's Potential Bushfire Intensity takes into account three key variables being:

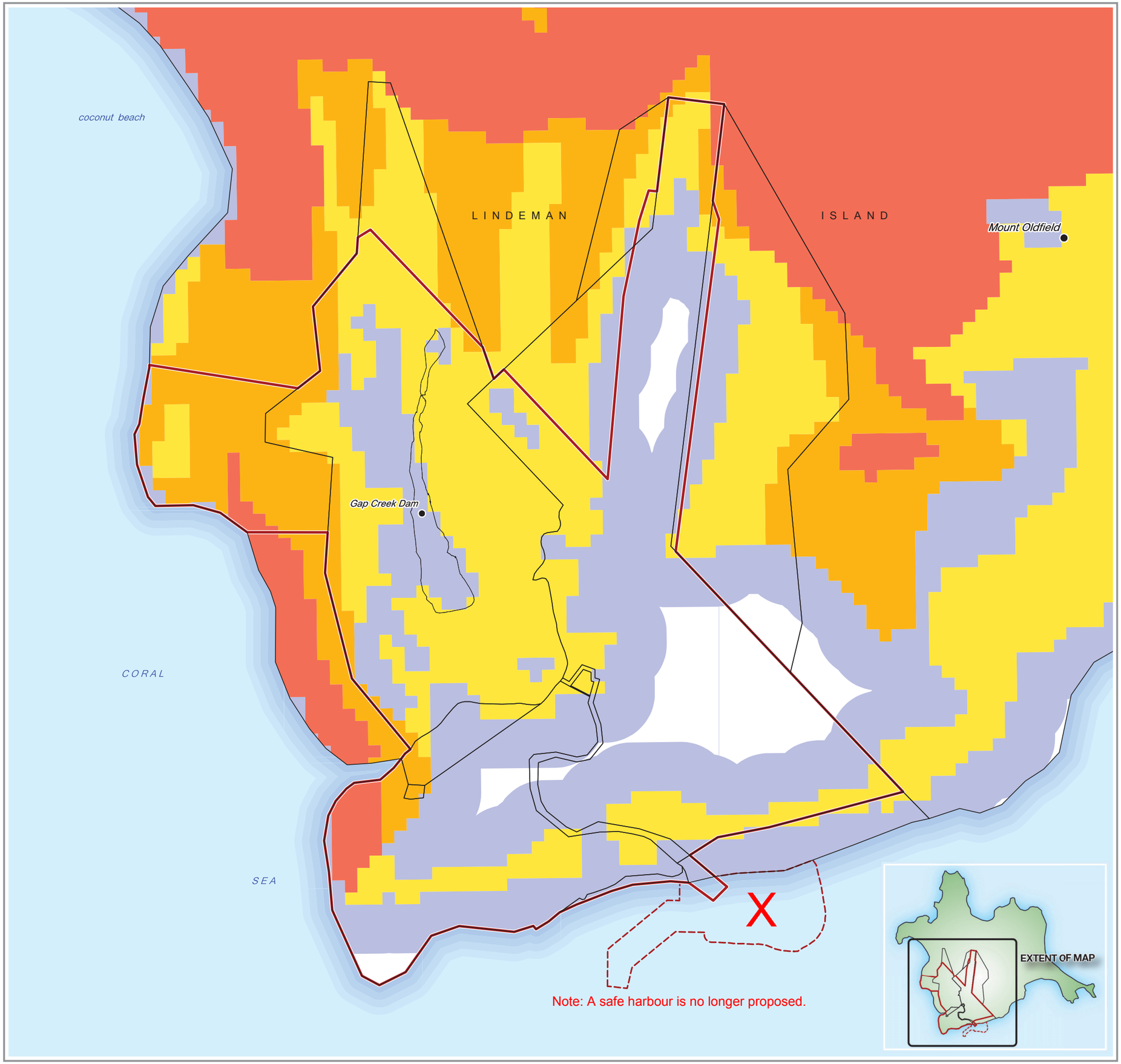
> **total fuel load** (W), which is primarily a function of the Potential Fuel Load (PFL) associated with different vegetation type(s) in the subject area;

> the McArthur **Forest Fire Danger Index** (FFDI), which is an index that considers variability in fire intensity associated with a range of weather variables including recent precipitation, current wind speed, relative humidity and temperature; and

> **slope** (Ɵ), which is an important variable controlling the rate of fire spread and fuel consumption.

Figure 3: Spatial variables used to determine Potential Fire-line Intensity

The following sections provide an assessment of the post-development bushfire hazard levels that will characterise the project area locality. These assessments are provided in accordance with the recently developed State Planning Policy (SPP) – *Natural Hazards, Risk and Resilience -Technical Manual - A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments (August, 2014).*



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LEGEND

Bushfire Hazard Areas

- Very High Potential Bushfire Intensity
- High Potential Bushfire Intensity
- Medium Potential Bushfire Intensity
- Potential Impact Buffer

Other

- Proposed Site Boundary
- Proposed Sea Bed Lease Boundary
- Cadastral Boundary

N, W, E, S

0 75 150 225 300 375

1:7,500 (metres)

original map compiled at A3 size

DRAWING TITLE	Map 3-9: Bushfire Hazard Areas
DRAWING DATE	20 December 2016
DRAWING VERSION	2.0
COORDINATE SYSTEM	GDA 94; MGA Zone 55
MAP PRODUCED BY	Cardno QLD Pty Ltd
JOB NUMBER	HRP15078

DATA SOURCE

Cadastral data: State of Queensland (Department of Natural Resources and Mines) 2015; Property Boundaries Queensland; Publication date: 02/04/2015.

Bushfire Hazard Area data: State of Queensland (Public Safety Business Agency) 2015; Bushfire prone area - Mackay Isaac and Whitsunday; Publication date: 15/07/2015.

Lindeman Great Barrier Reef Resort & Spa

ENVIRONMENTAL IMPACT STATEMENT

Bushfire Hazard Areas

MAP 3-1

3.2 Climatic Conditions and Fire Danger Index

The climate of Lindeman Island is tropical, with mild dry winters and hot wet summers. The average annual rainfall is 1445mm. with approximately 70% of the annual total falls occurring in summer to early autumn (December to March), and only 16% occurring from May to October. The average temperature range for summer is 23 - 30°C and the average temperature range for winter is 13 - 22°C.

The winds in the project area are predominantly from the southeast with an occasional change to northerlies during the latter half of the year. However a high pressure system off the coast of New South Wales or South-east Queensland will often extend a ridge along the Queensland coast. This ridge often forms a 'kink' right on the Whitsunday coastline. Coastal, south-easterly winds that would normally be expected to be mild given the distance between isobars, whip around this 'kink' causing strong south-easterlies. This is mostly a summer pattern but it can also occur in the drier seasons and can intensify any bushfires that are occurring.

Analysis of climate data indicates that the frequency of severe daily fire weather has increased throughout Australia, including tropical Queensland, over the period from 1973–2010 and is anticipated to increase further in line with future climate change projections (BoM and CSIRO, 2015). For the central Queensland coastal region Lucas et al (2007) suggest:

- an increase in temperature, decrease in average rainfall, increase in storms and more severe weather events; and
- an increase in the number of very high and extreme fire days, an earlier start to the fire season and a longer fire season.

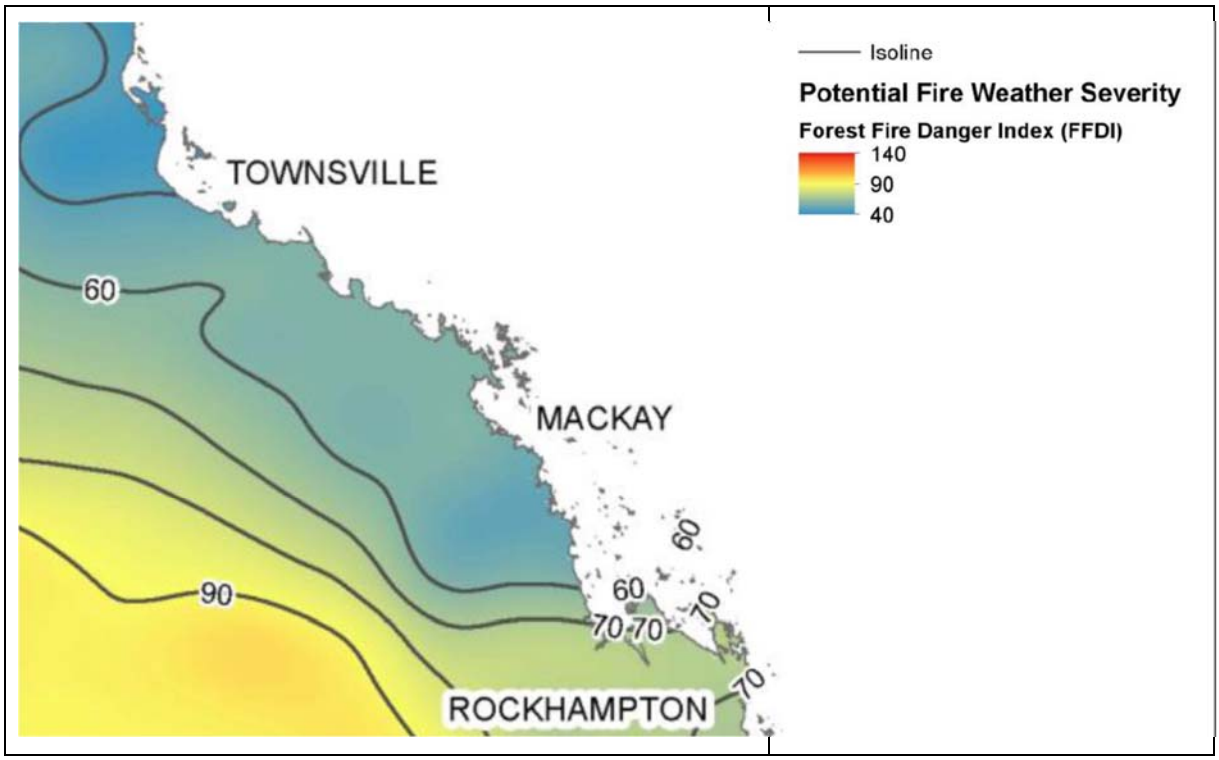
[Lucas, C. Hessessy, K. Mills, G. & Bathols, J. (2007) Bushfire Weather in south east Australia: Recent Trends and Projected Climate Change Impact. Centre for Australian Weather and Climate Research. Bushfire CRC. Melbourne]

It is noted that some care needs to be taken in extrapolating mainland projections to areas such as Lindeman Island where the moderating effects of the surrounding ocean waters on temperature and humidity can have a substantial influence on the severity of local fire weather conditions. Whilst climate change impacts on fire weather are likely to be less severe on Lindeman Island than on the adjacent mainland, the general trend is likely to be the same.

Fire Weather Severity Mapping for Queensland that has been used by (Leonard et al., 2014) shows that extreme Forest Fire Danger Index weather events occur more frequently in western Queensland than coastal and northern parts of the state. Zones with a less severe Forest Fire Danger Index (i.e. a FFDI < 50) occur in Cape York, the Wet Tropics and in parts of coastal South East Queensland.

As shown in the extract from the Fire Weather Severity Mapping presented in **Table 3-1**, Lindeman Island is located inside of the FFDI 60 contour and as such an FFDI value of 50 is used for the purpose of assessing potential bushfire intensities.

Table 3-1 Fire Weather Severity Mapping Extract (Source: Leonard et al., 2014)



3.3 Vegetation Types and Fuel Loads

Potential Fuel Loads are assigned to vegetation categories (Vegetation Hazard Classes) formed by amalgamating land use and vegetation types with a moderately consistent fuel load and structure. The Potential Fuel Load assigned to each Vegetation Hazard Class is generally representative of the higher fuel load expected for the typical vegetation types, landscape and site conditions within each Vegetation Hazard Class and approximates the 80th percentile fuel load of the "long unburnt condition" for the class (generally greater than 10 years without burning)[1].

The Vegetation Hazard Classes (VHCs) and their associated Potential Fuel Loads that the State based bushfire hazard mapping is based on are presented in Table 3-3 along with an indication of the presence or absence of each VHC in the Peninsula development site locality.

The presence/absence of particular VHCs is based on a review of the State-based Regional Ecosystem (RE) Mapping for the locality, presented in Table 3-2, which identifies the following as the dominant REs within and adjacent to the proposed development site:

(a) RE8.3.2: *Melaleuca viridiflora* woodland on seasonally inundated alluvial plains with impeded drainage. Fire management guidelines: SEASON: Early winter to winter. INTENSITY: Moderate. INTERVAL: 5-8 years. STRATEGY: At least 50% should be left unburnt. ISSUES: Seasonal inundation probably results in high litter decomposition rates and consequent low rates of fuel accumulation. Such inundation is probably a major functional component of this ecosystem.

(b) RE8.12.13a: *Themeda triandra* and/or I*mperata cylindrica* and/or *Chionachne cyathopoda* tussock grassland to closed tussock grassland (0.3-0.7m tall), or *Xanthorrhoea latifolia* subsp. l*atifolia* dwarf open shrubland to open heath (0.3 - 2m tall). SEASON: 8.12.13a: Any time providing sufficient soil moisture is available. In some areas threatened by encroachment of *Timonius timon* and other

[1] While there is likely to be considerable variation between potential and actual fuel loads (which will change in many cases from season to season, year to year and site to site), the assumption of a Potential Fuel Load is appropriate for informing land use planning decisions to mitigate bushfire risk because it is rarely possible to assume the ongoing management of reduced fuel loads in hazardous bushland adjacent to areas proposed for human settlement. Where land use planners have high confidence in the ability and commitment of adjacent landholders to manage fuel loads at reduced levels, it would be possible to adjust the calculation of Potential Fuel Loads and the Potential Fire-line Intensity of adjacent hazardous bushland accordingly.

rainforest emergents, although the dynamics of this process are poorly understood. Need for monitoring of the geographical extent of these areas (re/- encroachment of woodland). It is likely that the extent of this system is maintained more by geology, and levels of exposure than fire.

(c) RE8.12.11 Semi-deciduous microphyll vine forest - Expanding boundary edges. Fire sensitive community but expanding into other communities at some sites. Fire management guidelines ISSUES: This ecosystem readily encroaches into adjacent woodlands and grasslands, and periodic high intensity fire along its margins may be required. This community should not be burnt and should be protected from wildfire.

(d) RE8.12.12d: *Corymbia clarksoniana* woodland to open forest (8-30m tall). Common associated to codominant species may include *C. tessellaris, Eucalyptus platyphylla, C. dallachiana, E. drepanophylla, E. tereticornis* and *Allocasuarina littoralis*. ISSUES: Emphasis should be placed on the general principles of mosaic burning, and diversity of fire types. Care should be taken to maintain tree hollows and also to maintain ground litter and fallen timber habitats.

(e) 8.12.14c: *Lophostemon confertus* closed forest to tall shrubland (3.5-28m tall). The canopy is often exclusively *L. confertus*, however occasional associated species may include *Eucalyptus exserta, E. tereticornis, E. drepanophylla* and *Acacia spirorbis subsp. solandri*. Fire management guidelines: A geographically restricted ecosystem which with few exceptions is largely restricted to islands. Emphasis should be placed on the general principles of mosaic burning, and diversity of fire types.

Within and adjacent to the proposed development most vegetation types are characterised by a high abundance of Guinea grass (*Megathyrsus maximus var. maximus*). This distribution and abundance of this non-native species is known to have been promoted by frequent fire on Lindeman Island as it is a fire tolerant species that rapidly regenerates after fire and creates a large fuel load. Re-sprouting plants are however much more easily controlled by chemical than more mature plants. Where fire is necessary for the protection of life and property it is critical to spray the grass when it re-sprouts after the burn.

Table 3-2 Extracts from regional ecosystem mapping

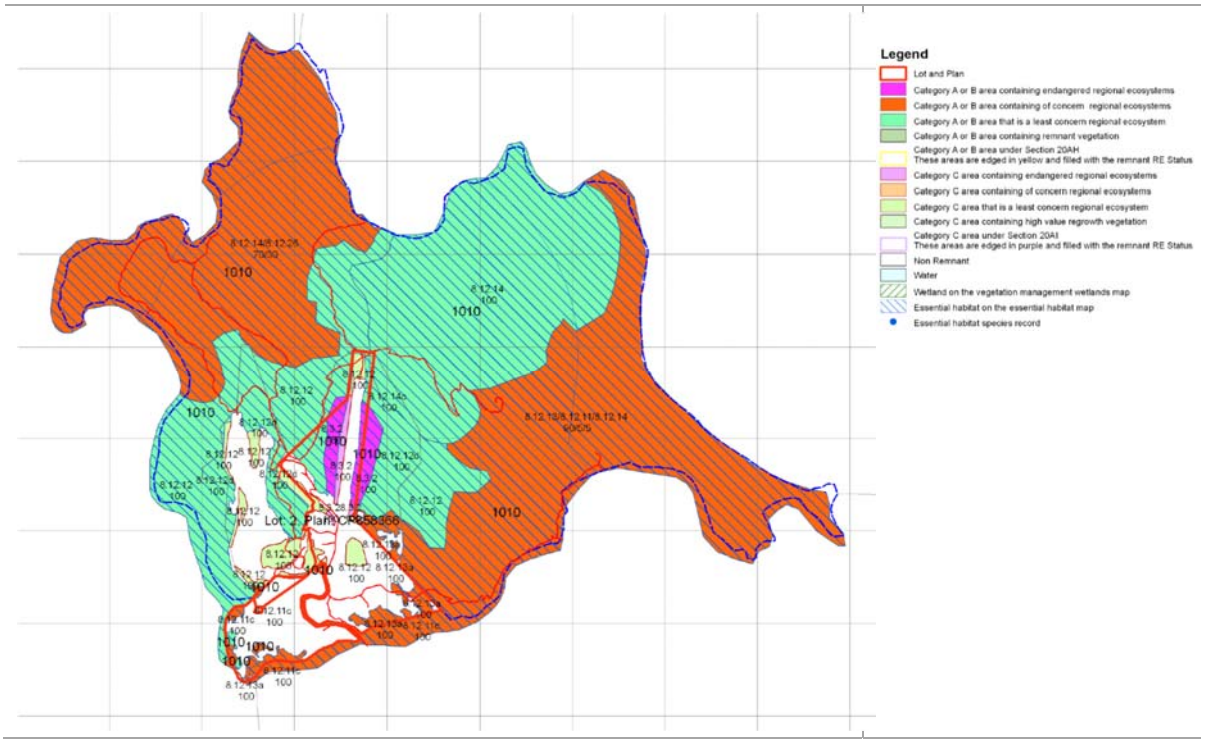


Table 3-3 Vegetation Hazard Classes (VHCs) and associated Potential Fuel Loads

VHC	VHC description	Vegetation Hazard Class	Potential Fuel Load (tonnes per hectare)	Site Presence[2]
1	**Melaleuca communities**	**Bushfire Prone**	**33**	**Present –** RE8.3.2 Melaleuca viridiflora woodland on seasonally inundated alluvial plains with impeded drainage. This vegetation type is present as remnant vegetation in areas adjacent to the northern section of the runway. Non-remnant areas of RE8.3.2 are also present in the centre of the resort to the east of the lake and west of the runway and associated resort facilities.
2	**Open forests / woodlands - shrubby**	**Bushfire Prone**	**30**	**Present –** RE8.12.14c: Lophostemon confertus closed forest to tall shrubland, which are largely confined to those parts of Lindeman Island to the north of the project area. There is no direct interface between this vegetation type and the proposed resort development.
3	Tall open forests	Bushfire Prone	28	Absent
4	Heath communities	Bushfire Prone	27	Absent
5	Exotic and hardwood plantations	Bushfire Prone	26	Absent
6	Cypress and Casuarina communities	Bushfire Prone	20	Absent
7	**Open forests / woodlands – grassy**	**Bushfire Prone**	**19**	**Present –** RE8.12.12d: Corymbia clarksoniana woodland to open forest. This is the dominant vegetation type in the vicinity of the proposed development and in many areas is characterised by heavy infestations of Guinea grass which increase the likelihood of fire and potential rate of spread and intensity.
8	Acacia communities	Bushfire Prone	10	Absent
9	Coastal, fringing and dune communities	Bushfire Prone	8	Absent
10	Riparian and fringing communities [3]	Bushfire Prone	8	Absent
11	**Native grasslands, sedgelands and balds**	**Grassfire Prone**	**5**	**Present –** RE8.12.13a: Themeda triandra and/or Imperata cylindrica and/or Chionachne cyathopoda tussock grassland to closed tussock grassland
12	Mixture of rural classes - mainly grassland	Grassfire Prone	5	Absent

[2] Based on RE types listed in each VHC in Appendix A of Leonard et al., 2014.

[3] Vegetation associated with the section of Andrew Josey Gully located upstream of Discovery Lake has been classified as Riparian vegetation for the purposes of this assessment.

VHC	VHC description	Vegetation Hazard Class	Potential Fuel Load (tonnes per hectare)	Site Presence[2]
13	Cropping and horticulture	Grassfire Prone	5	Absent
14	**Dry vine forest and vine thickets**	**Bushfire Prone**	**5**	**Present –** RE8.12.11 Semi-deciduous microphyll vine forest which has a patchy distribution along the western and southern shoreline, typically on steep exposed slopes.
15	Hoop Pine Plantations	Bushfire Prone	5	Absent
16	**Mixture of urban classes**	**Low Fuel Load**	**3**	**Present** – the existing resort facilities including the golf course and air strip
17	Rainforest	Low Fuel Load	1	Absent
18	Mangroves and saltmarshes	Low Fuel Load	1	Absent
19	Sparse ground cover	Low Fuel Load	1	Absent
20	**Water bodies**	**Low Fuel Load**	**0**	**Present** – the internal lake and surrounding marine environment

Based on the above, the Potential Fuel Loads available within and adjacent to the proposed development site range from:

> a minimum of 0 t/ha associated with the lake system and surrounding marine environment; to

> a maximum of 33 t/ha associated with areas of remnant and non-remnant *Melaleuca viridiflora* woodland vegetation.

The vegetation type that represents a potential hazard to the proposed development are the areas of RE8.12.12d: *Corymbia clarksoniana* woodland to open forest.

3.4 Slope Assessment

The slope of vegetated land over which a bushfire passes has a strong influence on both the intensity and rate of spread of the bushfire. From a bushfire hazard assessment perspective the relevant slopes to consider are the slopes of land beneath areas of potentially hazardous vegetation that would be retained within or adjacent to the proposed development. Also of particular relevance is whether or not the vegetated land is situated upslope or downslope of the proposed development with downslope vegetated areas presenting a much higher level of hazard.

The majority of the project area is located on a gently undulating area in the south-western sector of Lindeman Island that has a predominant surface elevation of 50m AHD. The project area contains some small isolated pockets and narrow bands of modified native vegetation that are of little concern from a bushfire perspective. The only vegetated land within the interior of the proposed development of concern from a bushfire perspective is the area east of the lake and west of the aircraft hangers and associated infrastructure. This land is situated upslope of the proposed development, is up to 200m in width and is characterised by gentle slopes of less than 12% or 7º.

Extending along the southern and south-western perimeter and downslope of the proposed development is a band of vegetated littoral (shoreline) land, averaging less than 100m in width and characterised by slopes of 50% or 26º.

Extending along the western perimeter and downslope of the proposed development is a broader band of vegetated littoral land, ranging in width from 100-300m and characterised by slopes ranging between 20% and 50% (i.e. 11º - 26º).

To the north-west and upslope of the proposed development are the forested slopes of two un-named peaks with elevations of 100m AHD and 140m AHD and southerly slopes of over 20% or 11º.

To the north-east and east and upslope of the proposed development are the forested slopes of Mount Oldfield which has a peak elevation of 200m AHD and south-western slopes of up to 30% or 16º.

3.5 Post-Development Potential Bushfire (Fire-line) Intensity

The proposed development will result in the clearance of some areas of existing vegetation within the development site with a consequential reduction in the potential for the occurrence and intensity of bushfire. In accordance with the new methodology for State-wide mapping of bushfire prone areas in Queensland (Leonard et al., 2014), for the purpose of bushfire hazard assessments and mapping:

> small patches of a single Vegetation Hazard Class less than 1 hectare in extent are assigned the same VHC as that which dominates the surrounding landscape (i.e. a small isolated pocket of vegetation surrounded by urban development would be assigned the same VHC as the surrounding urban landform); and

> corridors of potentially hazardous vegetation less than 100m wide, that are effectively isolated from other patches of high fuel load VHCs, are assigned the same VHC as that which dominates the surrounding landscape.

For the purposes of this assessment, the development locality has been separated into a total of nine (9) discrete Bushfire Assessment Units (BAUs) for which bushfire hazard ratings have been derived in accordance with the State-wide mapping of bushfire prone areas in Queensland (Leonard et al., 2014). The delineation of BAUs takes into account existing development and future land use intents for the land, as set out in the proposed plan of development, as well as variations in Vegetation Hazard Class and Slope characteristics. All BAUs have been assigned a Forest Fire Danger Index (FFDI) of 50.

The resultant post development potential bushfire fire-line intensity (FI) values for defined BAUs and the corresponding Potential Bushfire Intensity Class, are presented in **Table 3-4.**

Table 3-4 Site Specific Post-Development Potential Bushfire Intensity Classes

BAU	Land Use and Vegetation Description	Predominant Vegetation Hazard Class (VHC)[4]	Potential Fuel Load (PFL) t / ha	Slope Gradient [5] (Θ)	Potential Bushfire Fire-line Intensity[6] (FI) - kW/m	Potential Bushfire Intensity Class[7]
R	Areas occupied by the proposed expanded resort development where substantial clearance and ongoing maintenance of native vegetation is proposed. This are will encompass the resort facilities including golf course, aerodrome and water storage lake. The vegetation in this area will be a mosaic of landscaped areas and small pockets or narrow (< 50m) bands of native vegetation that are not of sufficient size to represent a bushfire hazard. The landscaping of this area will need to be cognisant of the requirement to establish and maintain An area of shoreline RE8.12.11 Semi-deciduous microphyll vine forest in the south-west of the island is included in the BAU due to its low hazard nature. Extent: ~ 102 hectares. Position of hazardous vegetation relative to development assets: na	16 Mixture of Urban	3	2.9-5.7^0 (5-10%)	413	**Low**
A	Encompasses a band of land averaging 150m in width extending along the western perimeter of the proposed development from the shoreline to a row of accommodation units. Vegetation types present in general order of dominance are: ▪ RE8.12.11 Semi-deciduous microphyll vine forest; ▪ RE8.12.12d: Corymbia clarksoniana woodland to open forest; and ▪ RE8.12.13a: Themeda triandra and/or Imperata cylindrica and/or Chionachne cyathopoda tussock grassland to closed tussock grassland. Extent: ~ 7.5 hectares. Position of hazardous vegetation relative to development assets: Downslope	7 Open forests / woodlands – grassy	19	11.3º- 26º (20-50%)	29,403	**High**

[4] Area assigned to Vegetation Class most likely to influence fire intensity and risk.

[5] BUAs located upslope of proposed development assets are assigned a slope weighting of 0º.

[6] FI calculation based on upper slope value.

[7] Potential Bushfire Intensity Class: Very high (potential intensity) > 40,000+kW/m; High (potential intensity) 20,000 – 40,000kW/m; Medium (potential intensity) 4,000 – 20,000kW/m; Low (Potential Intensity) < 4,000+kW/m

BAU	Land Use and Vegetation Description	Predominant Vegetation Hazard Class (VHC)[4]	Potential Fuel Load (PFL) t / ha	Slope Gradient [5] (Θ)	Potential Bushfire Fire-line Intensity[6] (FI) - kW/m	Potential Bushfire Intensity Class[7]
Aa	Located within the broader BAU-A, this subunit encompasses a pocket of land within which it is proposed to establish and operate approximately 30 glamping units and a central facilities building. Each glamping unit will be a relatively small, with a floor area of approximately 33m^2), lightweight accommodation unit that will be accessible from the main resort area by a formed and sealed track, approximately 500m in length, that will have a dual function as a fire trail. The glamping units will have access to a centrally located facilities block, serviced by a reticulated water supply, that will provide amenities and cooking facilities. The glamping units and central facilities are located adjacent to a small beach. BAU-Aa has direct frontage to the shoreline which encompasses a sandy beach which would provide a refuge for patrons in the event that a bushfire approached the glamping units from upslope areas of hazardous woodland vegetation. The vegetation within BUA-Aa is comprised primarily of: ▪ RE8.12.11: Semi-deciduous microphyll vine forest; and ▪ RE8.12.13a: *Themeda triandra* and/or *Imperata cylindrica* and/or *Chionachne cyathopoda* tussock grassland to closed tussock grassland. However the upslope areas of RE8.12.12d: *Corymbia clarksoniana* woodland to open forest, represent the most likely and significant threat to assets within BUA-Aa in the event of a bushfire. Extent: ~ 2.5 hectares. Position of hazardous vegetation relative to development assets: Upslope	7 Open forests / woodlands – grassy	19	0º (0%)	11,191	**Medium**
B	Encompasses a band of land averaging > 300m in width extending along the north-western perimeter of the proposed development from the shoreline up to a row of accommodaton units. The vegetation in BUA-B is dominated by RE8.12.12d: *Corymbia clarksoniana* woodland to open forest. Extent: ~16 hectares. Position of hazardous vegetation relative to development assets: Downslope	7 Open forests / woodlands – grassy	19	8.5º- 11.3º (15-20%)	24,460	**High**

BAU	Land Use and Vegetation Description	Predominant Vegetation Hazard Class (VHC)[4]	Potential Fuel Load (PFL) t / ha	Slope Gradient [5] (Θ)	Potential Bushfire Fire-line Intensity[6] (FI) - kW/m	Potential Bushfire Intensity Class[7]
C	Patch of forested land to be retained within the interior of the proposed development located to the east of the lake and west of the aircraft hangers and associated infrastructure. The vegetation in BUA-C is comprised of a mixture of RE8.12.12d: *Corymbia clarksoniana* woodland to open forest on more elevated land, with areas of RE8.3.2 *Melaleuca viridiflora* woodland located along the low-lying areas adjacent to proposed development assets. Extent: ~8 hectares. Position of hazardous vegetation relative to development assets: Upslope	1 Melaleuca communities	33	0^0 (0%)	33,759	**High**
D	Encompasses an extensive area of forested land extending along the north-western perimeter of the proposed development. These forested slopes are associated with two un-named peaks with elevations of 100m AHD and 140m AHD. The vegetation in this area is comprised of a mixture of: ▪ RE8.12.12d: Corymbia clarksoniana woodland to open forest; ▪ RE8.3.2: Melaleuca viridiflora woodland; and ▪ RE8.12.14c: Lophostemon confertus closed forest to tall shrubland. Extent: > 50 hectares. Position of hazardous vegetation relative to development assets: Upslope	7 Open forests / woodlands – grassy	19	0^0 (0%)	11,191	**Medium**
E	Encompasses the forested slopes of Mount Oldfield, which has a peak elevation of 200m AHD, situated to the north east of the proposed development. The vegetation in this area is comprised of a mixture of: ▪ RE8.12.12d: Corymbia clarksoniana woodland to open forest; ▪ RE8.3.2: Melaleuca viridiflora woodland; and ▪ RE8.12.14c: Lophostemon confertus closed forest to tall shrubland. Extent: > 50 hectares. Position of hazardous vegetation relative to development assets: Upslope	7 Open forests / woodlands – grassy	19	0^0 (0%)	11,191	**Medium**

BAU	Land Use and Vegetation Description	Predominant Vegetation Hazard Class (VHC)[4]	Potential Fuel Load (PFL) t / ha	Slope Gradient [5] (Θ)	Potential Bushfire Fire-line Intensity[6] (FI) - kW/m	Potential Bushfire Intensity Class[7]
F	Encompasses an area of native and exotic grassland that adjoins the eastern perimeter of the proposed development and which extends to the peak of Mount Oldfield. The vegetation in this area is comprised of RE8.12.13a: Themeda triandra and/or Imperata cylindrica and/or Chionachne cyathopoda tussock grassland to closed tussock grassland, which dominates the eastern sector of Lindeman Island. Extent: ~ 50 hectares. Position of hazardous vegetation relative to development assets: Upslope	11 Native grasslands, sedgelands and balds	5	0^0 (0%)	775	**Low**
G	Encompasses a band of shoreline vegetation, approximately 100m in width, which extends along the south-eastern perimeter and downslope of the development. The vegetation in this area is comprised of: ▪ a shoreline band of RE8.12.11: Semi-deciduous microphyll vine forest; and ▪ a landward band of RE8.12.13a: Themeda triandra and/or Imperata cylindrica and/or Chionachne cyathopoda tussock grassland to closed tussock grassland. Extent: ~ 4 hectares. Position of hazardous vegetation relative to development assets: Downslope	11 Native grasslands, sedgelands and balds	5	22^0 (40%)	3,488	**Low**

The distribution of BAUs and the resultant post-development potential bushfire intensity classes detailed in Table 3-4 are presented in the Bushfire Hazard Assessment and Management Plan presented in **Appendix B**.

4 Bushfire Risk Assessment

As detailed in Section 3 the proposed development will place built assets, staff and patrons in an environment that supports vegetation with the potential to sustain medium to high intensity bushfire events. As such it is prudent to consider the levels of risk of harm to human health and property that are associated with the proposed development.

This risk assessment has been undertaken in general accordance with AS/NZS ISO 31000:2009 Risk Management and SA/SNZ HB 436:2013 Risk management guidelines - companion to AS/NZS ISO 31000:2009 and considers a combination of:

> the likelihood that a bushfire will occur on Lindeman Island in areas of hazardous vegetation located adjacent to the proposed development; and
> the consequences to human health and property in the event of a bushfire.

This initial risk assessment does not take into account the impact of risk mitigation measures that may be incorporated into the design and operation of the proposed development and/or management of the adjacent National park.

4.1 Likelihood Assessment

For the purposes of this risk assessment, the "Risk Likelihood Levels" presented in Table 4-1 have been used.

Table 4-1 Risk Likelihood Levels

Level	Descriptor	Qualitative Description
A	Almost certain	The event is expected to occur; event will occur on an annual basis (or more frequent).
B	Likely	Probable that it will occur; event has occurred several times before at similar developments.
C	Possible	May or may not occur; event may occur once during the life of the development.
D	Unlikely	The event may at some time but is unlikely; heard of happening from time to time at similar developments.
E	Rare	The event may occur in exceptional circumstances; not heard of at similar developments.

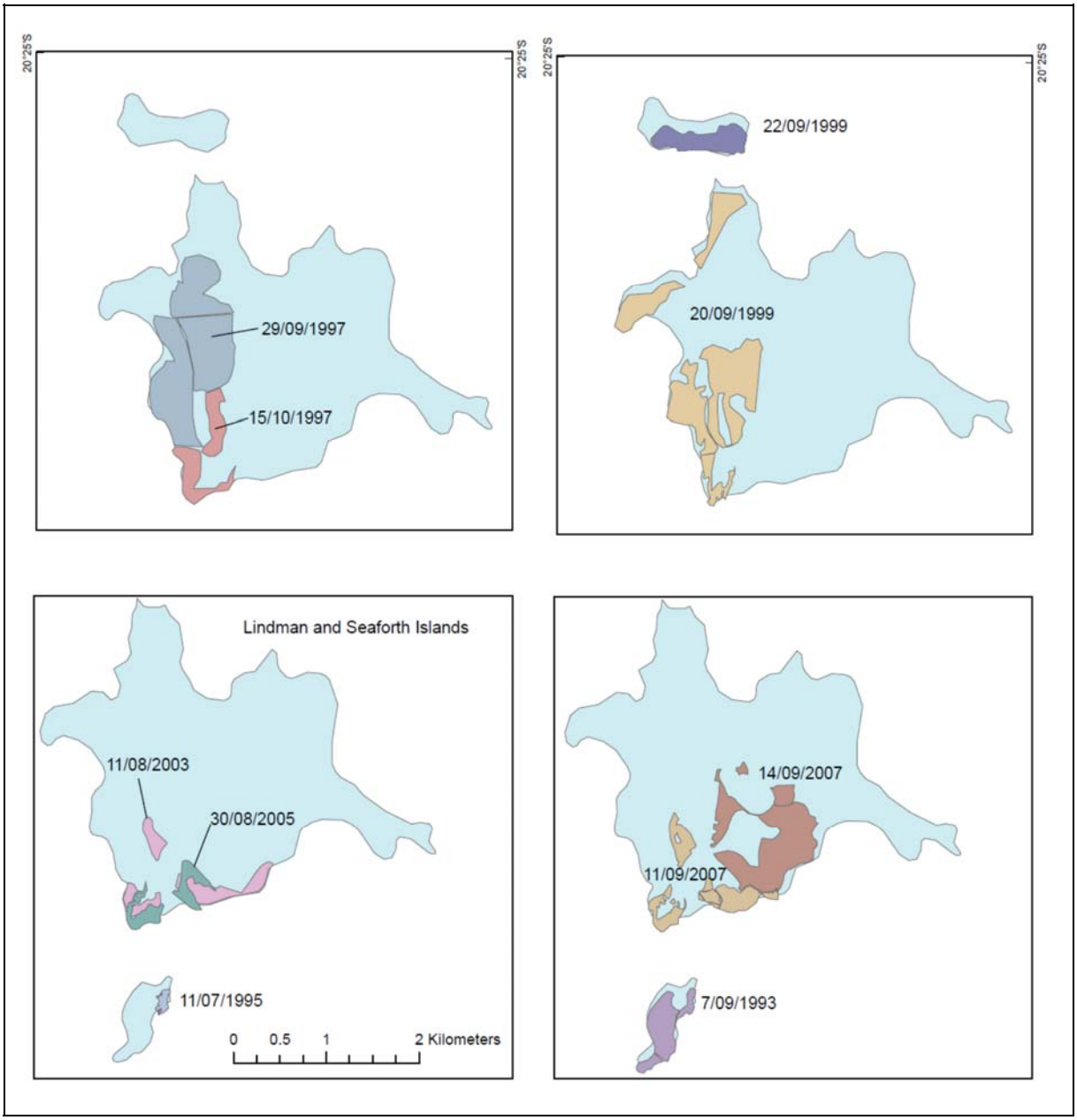
On Lindeman Island a mixture of planned conservation and hazard reduction burns and some wildfires have been recorded (EPA, 2014). Regular, planned conservation burns were undertaken by QPWS in the early-mid nineties but have all but ceased (e.g. only one burn has occurred on Lindeman Island since 1999) although hazard reduction burns continued. The number of planned burns and wildfires on Lindeman Island since 1976 are:

> Wildfire: 3 (1976 & 1985); and
> Planned burns 18 (1985 – 2007).

Records of wildfire events on Lindeman Island almost exclusively list the cause as 'escaped from rubbish dump'. Until the early nineties it was common practice on the island to burn all rubbish rather than transport it back to the mainland. All rubbish must now be transported to a mainland waste disposal facility and green waste is not to be burnt on the island without the permission of QPWS.

The locations and extents of recorded bushfire events on Lindeman Island since the mid 1990's are illustrated in Table 4-2.

Table 4-2 Recorded Bushfire Events



Given the past fire history of Lindeman Island it is considered **Likely** that bushfire will occur in any given year and that during the life of the development multiple bushfire events will occur on the Island and present a potential risk of harm to human health and property. Whilst most bushfire events will be planned hazard reduction or ecological burns, the potential risks to the development associated with a planned bushfire need to be recognised and responded to. The conduct of a regular program of hazard reduction burns will also not eliminate the potential for a wildfire event under the right weather conditions.

4.2 Consequence Assessment

For the purposes of this risk assessment, the "Risk Consequence Levels" presented in Table 4-3 have been used.

Table 4-3 Risk Consequence Levels

Level	Descriptor	Qualitative Description
1	Insignificant	People: Event does not result in injury (i.e. no medical treatment required). Environment: No damaged detected. Property: Insignificant damage to property (<$5,000 to repair).
2	Minor	People: Reversible injury or illness. Environment: Minor impact of short duration or short term damage. Property: Minor damage to property (<$50,000 to repair).
3	Moderate	People: Irreversible disability or impairment (30%) to one or more persons. Environment: Short term damage resulting in complaints, localised impact. Property: Moderate damage to property (<$500,000 to repair).
4	Major	People: Severe injuries to one or more persons, single fatality. Environment: Significant impact locally and potential for off-site impacts. Property: Major damage to property (<$1,000,000 to repair).
5	Catastrophic	People: Multiple fatalities, or irreversible injuries. Environment: Significant impacts to regional ecosystems and threatened species, potential for widespread off site impacts. Property: Significant loss to property (>$1,000,000 to repair).

There are no records of bushfire on Lindeman Island having resulted in direct harm to human health or property. Notwithstanding this fact, it is recognised that under the right conditions and in the absence of appropriate risk mitigation measures, bushfires can result in multiple fatalities and significant loss of property. This assessment takes into account the fact that the proposed resort:

> will accommodate a significant number of people including visitors from overseas who may have a limited awareness of bushfire risks and appropriate responses, combined with potential for language based communication difficulties;

> will establish accommodation facilities in close proximity to and upslope of areas of hazardous vegetation, including lightweight Glamping Facilities that will not provide any physical protection to residents in the event of a bushfire; and

> is not readily accessible to main-land based QFES fire fighting resources.

As such the consequences of an uncontrolled bushfire occurring on Lindeman Island in hazardous vegetation adjacent to the development has the potential to range from Moderate to Catastrophic.

4.3 Risk Level

For the purposes of this risk assessment, the “Risk Categories” presented in Table 4-4 have been used to assign a risk level to the proposed development based on consideration of the likelihood and potential consequences of a bushfire event.

It is noted that the assigned Risk Category does not take into account the implementation of a range of risk mitigation measures that should be implemented as part of the proposed development. Risk mitigation involves identifying the options for management of the risk, the proposed actions, resource requirements, responsibilities, timing, identifying performance indicators and developing reporting and monitoring procedures.

Table 4-4 Risk Categories based on Likelihood and Consequence Levels

Likelihood	Consequence				
	1 (Insignificant)	2 (Minor)	3 (Moderate)	4 (Major)	5 (Catastrophic)
A (Almost certain)	Medium	High	High	Extreme	Extreme
B (Likely)	Medium	Medium	High	High	Extreme
C (Possible)	Low	Medium	High	High	High
D (Unlikely)	Low	Low	Medium	Medium	High
E (Rare)	Low	Low	Medium	Medium	High

Based on the adopted classification scheme, the proposed development has been assessed as having a High to Extreme risk of sustaining harm to human health and property in the event of a high intensity bushfire. This risk level highlights the need for the implementation of appropriate bushfire hazard and risk mitigation measures, such as those detailed in Section 5.

5 Hazard and Risk Mitigation

In order to reduce and maintain the level of risk to human health and property to an acceptable level it will be necessary for appropriate hazard and risk mitigation measures to be implemented as part of:

> the ongoing management of the Lindeman Island National Park in general accordance with an established management regime that responded to the presence of the existing resort and associated infrastructure, with appropriate amendments to cater for the expanded footprint of the resort development; and

> the design and ongoing operation of the expanded resort development, including:
  - ensuring development design, including the layout of roads and driveways, and the location of accommodation units and other resort facilities are responsive to bushfire hazards;
  - appropriate fire-fighting and management infrastructure is provided, including an adequate and accessible water supply, fire breaks and maintenance/access trails;
  - compliance with *AS3959 (2009) – Construction of Buildings in Bushfire Prone Areas* and the Building Code of Australia for all buildings located within 100m of vegetated land with a Medium or High Bushfire Intensity Potential classification;
  - landscape design and maintenance requirements;
  - staff and patron awareness, education and training; and
  - identification of parties to be responsible for specific bushfire management tasks and actions.

5.1 National Parks Fire Management Strategy

Fire management within those parts of Lindeman Island that are managed by QPWS will have a substantive influence on the risk profile of the proposed development. In that respect it will be important that QPWS maintain an active program of fire management within National Park areas, and that a co-operative approach to fire management is implemented with the new operators of the expanded resort development. Under the existing QPWS Fire Strategy – Fire Management System for the Whitsunday Island Aggregation (EPA, 2014) the following are stated.

Cooperative burning arrangements with resorts, particularly South Molle and Lindeman Island Resorts, have been established in the past in relation to infrastructure protection through hazard reduction burns. These arrangements will be continued as part of this strategy though some changes to the regimes are warranted to ensure weed proliferation does not occur. [Sec 1.2, page 9].

In compliance with the Fire and Rescue Authority Act 1990 and the QPWS Good Neighbour Policy, fire management will also minimise the risk of uncontrollable wildfires and their associated risks to life and property. [Sec 1.4, page 11].

On islands where National Park abuts a freehold or leasehold tenure the primary objective will be that of protection of life and property (Lindeman, South Molle, Long, Hook Islands) and thus will have designated protection zones. Additional protection zones will surround areas where cultural sites or major National Park infrastructure exist within fire prone areas (campgrounds, toilet blocks, lookouts and the Nara Inlet Cultural Site viewing platform). [Sec 1.4, page 12].

Failure to prevent unplanned fires leaving the national park and entering adjacent resorts may result in the loss of resort infrastructure including buildings, gardens, maintenance sheds and equipment. [Sec 7.1, page 42].

Three types of tenure affect fire management on Lindeman Island: National Park, Special lease over national park and a perpetual (resort) lease. A Deed of Agreement exists between QPWS and the lessees Club Med Holiday Villages Australia (Club Med). In the agreement the resort agreed to not light fires on either the special lease or resort lease without the permission of QPWS. In addition they were to provide support in the maintenance of fire control lines where the leased lands bound National Park.

QPWS and resort staff have conducted hazard reduction burns on the resort perimeter every two years.

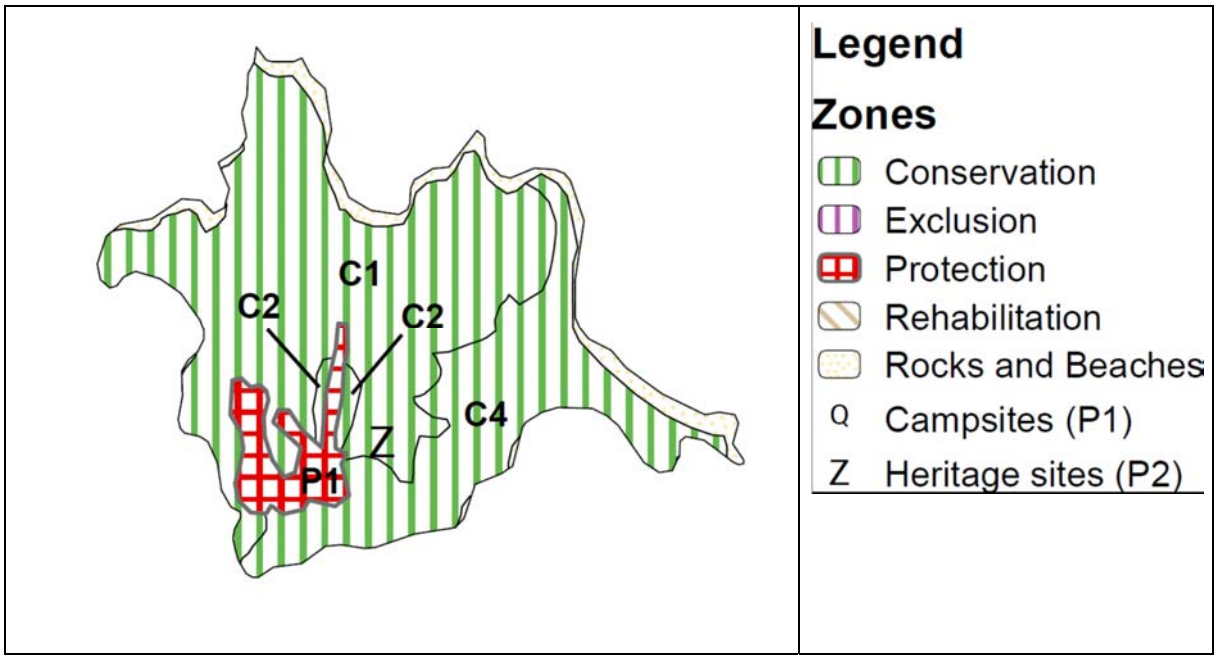
These will continue to ensure the protection of resort infrastructure, staff and guests and to reduce the risk of wildfire leaving resort lands and entering National Park.

Lindeman Island resort and special lease will be placed in a Protection zone (see Section 9). [Sec 7.1, page 43].

Lindeman Island - Resort infrastructure consisting of the main resort area, maintenance workshop and staff accommodation. QPWS also has accommodation within this protection zone…… Fuel loads within and immediately adjacent to these resources will be kept low by a combination of slashing and low intensity burns if required. Weed control as part of the protection of the infrastructure will also assist in reducing fuel loads…. A 5m break will be cleared adjacent to infrastructure where fire tolerant communities occur. This break will be maintained on a regular basis by Lindeman Island staff. A break will also be maintained directly adjacent to the diesel pipeline running from the jetty to the maintenance area. Fuel loads within the fire tolerant communities in the protection zone will be kept to a minimum through low intensity burns. Burns will be conducted periodically: a) In areas not infested with Guinea grass, every two years, b) In infested areas storm burn not more frequently than once every five years with follow up spraying as weed clumps emerge after burning. Maintenance of the golf course, airport and walking trails will also assist in ensuring fire does not enter the resort area.[Sec 9.1.1, Table 5].

The extent of the designated Protection Zone on Lindeman Island is illustrated in the extract from Map 4.5 Fire Zones and Fire Associations - Lindeman and Repulse Islands of the Whitsunday Islands Aggregation Fire Strategy (EPA, 2014) presented in Table 5-1.

Table 5-1 Existing Risk Categories based on Likelihood and Consequence Levels



With reference to Table 5-1 and the proposed plan of development presented in Appendix A, it is evident that the current extent of the Protection Zone is not sufficient to encompass the expanded footprint of the proposed development.

Expansion of the Protection Zone to encompass the new development footprint and continuation of the existing fire management regime within the expanded Protection Zone will provide a substantial reduction in the risk of harm to human health and property associated with bushfire events on Lindeman Island.

5.2 Resort Risk Mitigation Recommendations

The following sections provide detail concerning some of the key design and management elements that are relevant to ensuring that an acceptable level of risk to human health and property is maintained in the event of a bushfire occurring in the general locality of the resort development.

5.2.1 Building Setbacks and Design

The nature of the interface between urban development and bushfire hazard areas has a critical influence on the likelihood of harm occurring to people and property in the event of a bushfire. The provision of appropriate building setbacks between areas of potentially hazardous vegetation and adjacent urban development is essential to ensuring that the level of risk of harm to people and property associated with exposure to flame, radiant heat, embers and smoke is maintained at an acceptable level.

For the purposes of the State Planning Policy (Natural Hazards – Bushfire) a 100m wide Potential Impact Buffer extends around all areas that have been assessed as having a Medium, High or Very High Potential Bushfire Intensity. Within this Potential Impact Buffer specific consideration is required for measures that are designed to create an acceptable level of risk of harm to human health and property in the event of a bushfire occurring within the adjacent Medium, High or Very High Potential Bushfire Intensity areas. Collectively, areas with a Medium, High or Very High Potential Bushfire Intensity and the associated 100m wide Potential Impact Buffer are defined as a Bushfire Hazard Area. All habitable buildings constructed within the designated Bushfire Hazard Area will need to be designed and constructed in accordance with AS3959 (2009) – Construction of Buildings in Bushfire Prone Areas and the Building Code of Australia.

Those parts of the resort development where specific building setback and design requirements apply encompasses all areas located within 100m of land that supports vegetation with a Medium or higher bushfire intensity potential (refer Table 3-4 and Bushfire Hazard Assessment and Management Plan presented in Appendix B). In these areas all buildings should be setback at least 10m from adjacent areas of hazardous vegetation and within that building setback appropriate arrangements should be available to facilitate access for fire management purposes, including access to a reliable water supply. The 10m wide zone should cleared of potentially hazardous vegetation.

All habitable structures within the defined Bushfire Hazard Area will require assessment against the Building Codes of Australia (BCA) and Australian Standard 3959-2009 - Construction of buildings in bushfire-prone areas. AS3959-2009 determines how a building is to be constructed to resist a hazard level, providing an acceptable construction practice, which is deemed to satisfy the requirements of the BCA. The specific requirements to achieve compliance with AS3959 at each location is beyond the scope of this assessment and will need to be confirmed prior to construction and the dwelling designed and constructed in accordance with that standard.

In respect of the proposed Glamping Facility it is noted that the 30 glamping units are to be constructed primarily of lightweight materials that will provide no protection in the event of a bushfire. To ensure that patrons of the Glamping Facility have access to a structure that can provide protection against the high levels of radiant heat that are experienced during a bushfire it is recommended that the central facilities building be constructed to a Bushfire Attack Level (BAL) 40 or higher standard.

An Asset Protection Zone (APZ) needs to be established and maintained around all accommodation units and associated facilities located within the designated Bushfire Hazard Area. The APZ will provide:

> a buffer zone between a bush fire hazard and an asset;

> an area of reduced bush fire fuel that allows suppression of fire;

> an area from which backburning may be conducted; and

> an area which allows emergency services access and provides a relatively safe area for firefighters to defend the structure from damage.

The APZ should generally extend for a distance of 20m from each structure. The APZ will encompass the 10m wide cleared building setback referred to previously and within the balance of the APZ vegetation management will be required to reduce fuel loads and minimise the potential for the transfer of fire to the asset either from the ground level or through the tree canopy. Specific vegetation management specifications for the APZ are provided in Section 5.2.5.

5.2.2 Roadways and Fire Trails

Best practice road design for developments within or adjacent to bushfire prone areas involves the construction of a perimeter road separating built structures from the adjacent hazard.

Given the nature of the Lindeman Island Resort and the desire to provide patrons with a high level of exposure to the natural environment of the island, it is not proposed to establish a perimeter road system. The alternative arrangements that are proposed involve the establishment of a network of formed roadways and fire-trails that will service all accommodation units and associated facilities that will provide safe access routes for bushfire response personnel and safe evacuation routes for patrons if required.

All internal roadways and fire-trails will be designed and constructed to meet the following design standards[8]:

> have a minimum cleared width of 6 metres, within which all trees and shrubs are removed and ground level vegetation is maintained at a height of < 300mm;

> have a minimum formed width of 4 metres;

> be constructed and maintained to prevent erosion and provide continuous access for 4WD firefighting vehicles;

> if constructed with a stabilised gravel surface, have a gradient no greater than 26%;

> if not constructed with a stabilised gravel surface, have a gradient no greater than 18%;

> have a cross-fall no greater than 18%;

> have fire hydrants located at each entrance/exit point and at intervals of no more than 120m; and

> have signs at each entrance indicating the presence of a fire trail.

The general configuration of the proposed road and fire-trail network is illustrated in the Bushfire Hazard Assessment and Management Plan presented in Appendix B. The road and fire-trial system is to provide connectivity to the existing walking-trail system within adjacent sectors of the National Park which also provides a fire-trail function.

5.2.3 Water Supplies

The resort development must make provision for a reticulated water supply that is designed to provide:

> fire hydrants/outlets along the road network at intervals not greater than 120m in accordance with QFES (2014); and

> flow and pressure characteristics that are suitable for fire-fighting purposes, with a minimum pressure and flow of 10 litres a second at 200 kPa.

Specifically provision needs to be made for pressurised hydrants as part of the Glamping Facility.

5.2.4 Hazardous Materials Storage and Handling

The resort development will involve the storage of hazardous and/or flammable materials including diesel, aviation gas, liquefied petroleum, pesticides and herbicides. The storage and handling of hazardous and/or flammable materials should occur in accordance with relevant Australian Standards.

A cleared APZ and access to water for fire suppression purposes should be established and maintained around all designated storage facilities, including the existing diesel pipeline running from the jetty to the maintenance area.

5.2.5 Vegetation Management

The bushfire severity potential of an area can be substantially reduced by managing vegetation in a manner that reduces potential fuel loads and the associated potential for the spread of fire from the ground into the forest canopy. If the amount of fuel is reduced, a bushfire will burn more slowly and generate less intense heat. This will reduce the impact of the bushfire on life and property and assist fire managers in suppressing the bushfire.

[8] Design standard based on NSW Rural Fire Service (2006) – A Guide for Councils, Planners, Fire Authorities and Developers. NSW Rural Fire Service.

Continuation of the existing vegetation management regimes that form part of the QPWS Fire Strategy – Fire Management System for the Whitsunday Island Aggregation (EPA, 2014), as summarised in Section 5.1, will generally maintain fuel loads in areas adjacent to the proposed resort development to acceptable levels.

In addition to those measures it is recommended that the following vegetation management measures be incorporated into the design and maintenance of the resort development.

Asset Protection Zones: An APZ is a low fuel area established and maintained around a structure that is at risk of being damaged in the event of a bushfire. To be effective low fuel loads must be established and maintained within an APZ. This can be achieved by the following.

(a) Removal of all non-native species, particularly species such as Guinea grass and Lantana throughout the entire APZ.

(b) Establishment of a 10m wide inner APZ adjacent to the building within which all potentially hazardous vegetation is removed and ground layer vegetation is maintained to a height < 300mm.

(c) Within the outer APZ, selective removal of native trees and shrubs that make a significant contribution towards fuel loads (i.e species with rough, flaky or stringy bark such as paperbarks). The clearance and/or pruning of native species should be carried out in a manner such that:

    i. there is not a continuous tree canopy leading from the hazard to the asset, with the tree crowns of retained trees being by two to five metres;

    ii. native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the APZ;

    iii. prune low branches of retained trees for a height of 2-3 metres above the ground to prevent a ground fire from spreading into trees and to assist with access; and

    iv. patches of native vine forest (i.e. RE8.12.11), a fire resistant and naturally low fuel vegetation type, are retained to provide a “green break” that will offer some protection to the structure from an approaching fire front.

(d) Establishment and maintenance of a cleared ground layer which will involve:

    i. regular raking or manual removal of fine ground fuels such as fallen leaves, twigs (less than 6 mm in diameter) and bark as this fuel burns quickly and increases the intensity of a fire;

    ii. regular mowing or slashing of grass to a height < 300mm; and

    iii. where feasible, supplementary watering of grassed areas to prevent the drying out (curing) of grass which significantly increases the potential for spot fires to initiate from embers generated by a distant fire front.

Landscaping: The landscaping of the proposed development will involve a combination of the selective retention of existing native vegetation and the planting of native species indigenous to Lindeman Island. The selection of species and planting patterns to be used in the landscaping of the resort should consider the potential for landscaped areas to convey bushfire into the interior of the resort development from adjacent areas of bushland. In this respect the following recommendations are made.

(a) Species selection should be weighted towards species that are naturally found within the RE8.12.11 Semi-deciduous microphyll vine forest.

(b) The use of species with rough, flaky or stringy bark, such as paperbarks and pandanus palms, should be avoided.

(c) Planting patterns should be consistent with the APZ specification provided above in designated Bushfire Hazard Areas.

(d) Landscaped areas will require regular maintenance to prevent the accumulation of high levels of fine fuels that may be ignited by embers emanating from a fire in adjacent bushland.

Weeds: A comprehensive Weed Management Plan needs to be developed and implemented for the resort development with priority given to reducing the prevalence of Guinea grass within and adjacent to (i.e. < 100m from) areas where resort infrastructure is proposed. The current extent of Guinea grass infestations results in

substantially elevated bushfire fuel levels within the surrounding native forest and grassland communities. To be effective the Weed Management Plan needs to be developed and implemented in collaboration with QPWS.

5.2.6 Staff Fire Fighting Training and Resources

As part of the operation of the resort development an appropriate level of staff awareness of bushfire hazard and risk management is required and adequate resources must be provided to enable an adequate response to be provided in the event of a bushfire. In this respect the following recommendations are made.

(a) All staff should be provided with appropriate level of training regarding bushfire hazard and risk management procedures as part of their initial induction and at regular intervals thereafter.

(b) The resort staffing roster should make provision for a designated Fire Warden to be on duty at all times and that person should have formal bushfire management qualifications and experience, including equipment maintenance and operation.

(c) The designated Fire Wardens should work in close collaboration with QPWS staff to ensure an integrated approach to fire management on the island.

(d) The Fire Wardens should be supported by other members of staff who also have direct fire-fighting experience and who have obtained a Volunteer Firefighter Minimum Skills qualification from the Queensland Fire and Emergency Services (or equivalent). At least 5% of the permanent workforce, or at least 12 individuals, should have an adequate level of bushfire fighting experience and training.

(e) All on-site fire-fighting personnel should be provided with regular training opportunities to ensure that they

(f) All on-site firefighting personnel must be provide with appropriate Personal Protection Equipment in accordance with QFES standards.

(g) The resort should maintain at least 2 4x4 bushfire fire response vehicles for deployment in the event of a bushfire and for use in the conduct of hazard reduction burns.

(h) The resort must be serviced by a pressurised reticulated water supply and hydrant network that provides a reliable source of water that can be accessed in the event of a bushfire.

5.2.7 Evacuation and Emergency Response Plan

An Evacuation and Emergency Response Plan (EERP) should be prepared for the resort development and that EERP should include specific provisions relating to bushfire events. The EERP's bushfire elements should provide instructions which all project personnel and emergency service personnel will follow in the event of an uncontrolled bushfire to minimise the potential for loss of life, injury to people and damage to the environment and infrastructure.

The EERP should include operational and emergency procedures and safety management systems that consider all relevant matters including:

> criteria for declaring a potential emergency incident;

> emergency contact details for key personnel who have specific roles or responsibilities under the EEMP (e.g. fire warden, QPWS, medic etc.)

> onsite plans to handle emergency incidents with contact details to emergency services;

> a description of the mechanisms for alerting people to an emergency or possible emergency (e.g. siren) and post emergency procedures (e.g. notifying the regulator);

> testing of emergency procedures under emergency like conditions including the frequency of required emergency drills; and

> evacuation routes and procedures from hazardous areas.

The operating EERP should be revised regularly throughout the project life cycle and if necessary in response to an emergency situation where insufficient mitigation measures are noted.

Specifically the EERP should include provisions relating to the safe evacuation of the Glamping Facility in the event of a bushfire including provision for evacuation via water from the beach in the event that fire is approaching from the north.

Consideration should also be given to the temporary closure of the Glamping Facility during the conduct of any hazard reduction, or ecological, burns within adjacent areas of bushland.

5.3 Residual Risk Levels

The implementation of a range of bushfire hazard and risk mitigation measures during the design, construction and operational phases of the proposed development will substantially reduce the risk of harm to human health and property.

Based on the adopted classification scheme, the proposed development has been assessed as:

- having an Extreme risk of sustaining harm to human health and property in the event of a high intensity bushfire, in the absence of appropriate mitigation measures; and
- having a Medium risk of sustaining harm to human health and property in the event of a high intensity bushfire, in the presence of appropriate mitigation measures;

The overall Medium residual risk is primarily attributable to the fact that a high intensity bushfire on Lindeman Island has the potential to cause a moderate to major level of damage to property (<$1,000,000 to repair). Whilst such a situation is considered to be unlikely to occur in the presence of the proposed mitigation measures, damage to resort structures in close proximity to areas of bushfire prone vegetation has been recorded at other resorts (e.g. El Questro resort in the Kimberley in 2016).

The residual risk to human life associated with a high intensity bushfire event in close proximity to the proposed development is considered to be Low. This assessment is based on the fact that in the event of such a high intensity bushfire with the specified mitigation measures in place it is likely that one or more people will still suffer a reversible injury or illness (e.g. smoke inhalation, heat stress etc).

The above residual; risk assessment is considered to be consistent with the fact that there are no records of bushfire on Lindeman Island having resulted in direct harm to human health or property during the **year period that a resort has been present on Lindeman Island .

Overall the residual risk to human health and property posed by the occurrence of bushfire in the locality of the proposed development is considered to be acceptable.

6 References

Australian Standard AS3959-2009 Construction of buildings in bushfire prone areas.

BoM and CSIRO (2014) State of the Climate 2014 http://www.csiro.au/state-of-the-Climate-2014

Draft State Planning Policy Guideline - State Interest - Guidance on flood, bushfire and landslide hazards (December 2013).

DTMR (2013). Road Planning and Design Manual (2nd Edition) - Queensland Practice. Prepared by the Queensland Department of Main Roads and Transport.

EPA (2014). Whitsunday Islands Aggregation Fire Strategy.

Leonard, J., Newnham, G., Opie, K., and Blanchi, R. (2014). A new methodology for state-wide mapping of bushfire prone areas in Queensland. CSIRO, Australia.

NSW Rural Fire Service (2006). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities and Developers. NSW Rural Fire Service.

QFES (2014). Fire Hydrant and Vehicle Access Guidelines for Residential, Commercial and Industrial Lots. Development design guidelines prepared by the Queensland Fire and Emergency (Rescue) Service.

State Planning Policy 1/03 Guideline – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (SPP 1/03 Guideline)

State Planning Policy (SPP) – Natural Hazards, Risk and Resilience -Technical Manual - A 'fit for purpose' approach in undertaking natural hazard studies and risk assessments (August, 2014).

Lindeman Great Barrier Reef Resort Project

APPENDIX A

Concept Plan of Development

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Note: A safe harbour is no longer proposed.

1. SAFE HARBOUR - INDICATIVE LAYOUT AND LOCATION
2. 5 STAR BEACHSIDE RESORT (136 SUITES)
3. VILLAGE - RETAIL, CONFERENCE AND BUSINESS CENTRE
4. VILLAGE - SPORT CENTRE
5. VILLAGE - STAFF ACCOMMODATION AND AIRPORT LOUNGE
6. MAINTENANCE AND SERVICES
7. HANGARS
8. RUNWAY
9. GOLF COURSE
10. 6 STAR SPA RESORT (59 VILLAS)
11. HEALTH RETREAT AND DAY SPA
12. TOURIST VILLA PRECINCT
13. 5 STAR ECO RESORT (41 VILLAS)
14. GLAMPING PRECINCT (30 TENTS)
15. ROCK BAR
16. POTENTIAL SOLAR PV PANEL AREAS
17. MAPPED VEGETATION COMMUNITIES

KEY PLAN

0 50 150 250 400

25 100 200 300 500

Lindeman Great Barrier Reef Resort Project

APPENDIX B

Bushfire Hazard Assessment and Management Plan

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LEGEND

POTENTIAL BUSHFIRE INTENSITY

- Very high (potential intensity)
- High (potential intensity)
- Medium (potential intensity)
- Low (potential intensity)

BAU-# Bushfire Assessment Unit - discrete areas that within which the potential intensity of a bushfire front approaching exposed development assets has been assessed. The individual BAU labels are colour coded reflecting the previously defined intensity classes. Refer to Table 3-4 for additional details regarding the characteristics of each BAU.

BUSHFIRE HAZARD MITIGATION MEASURES

Bushfire Hazard Area - all parts of the proposed development that are located within 100m of vegetated land that is assessed to have a Medium or higher Potential Bushfire Intensity classification. Within the defined Bushfire Hazard Area specific hazard and risk mitigation measures are required, including but not limited to:

- establishment and maintenance of Asset Protection Zones around all habitable buildings or other exposed structures; and
- design and construction of all habitable structures in accordance with the specifications of Australian Standard 3959 (2009) - Construction of buildings in a bushfire prone area.

Fire Trails - indicative locations for fire trails based on a combination of existing walking tracks some of which will require amendment due to the proposed land use changes such as extension of the airfield runway. The precise location and configuration of fire trails and walking trails to be determined.

* Glamping Facility - light weight accommodation option within a semi-natural bushland waterfront setting situated predominantly downslope of adjacent and potentially hazardous pen-forest vegetation and native grassland communities. Specific bushfire hazard and risk mitigation measures are recommended, including:

- temporary closure periods during high risk fire periods; and
- emergency evacuation procedures, including procedures and resources for water based evacuation from the adjacent beach if required.

Rev.	Date	Description	Des.	Verif.	Appd.

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Drawn JD	Date 05/02/2016	Client	White Horse Australia Lindeman Pty Ltd
Checked	Date	Project	Lindeman Great Barrier Reef Resort Project
	Date		
Verified	Date	Title	Bushfire Hazard and Risk Assessment Bushfire Hazard Assessment and Management Plan
Approved		Status	PRELIMINARY NOT TO BE USED FOR CONSTRUCTION PURPOSES
		m AHD	Scale NTS, Size A1
		Drawing Number	HRP15078 BHAMP
		Revision	1