ALKIMOS COASTAL NODE
LOCAL STRUCTURE PLAN

Appendix 2
Bushfire Hazard Assessment

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Bushfire Management Plan

Alkimos Coastal Node

Prepared for
LandCorp
by Strategen

March 2016

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Bushfire Management Plan

Alkimos Coastal Node

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March 2016

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Client: LandCorp

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
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Table of contents

List of tables

List of figures

List of appendices

1. Introduction

1.1 Background

LandCorp is proposing to develop the Alkimos Coastal Node urban precinct. The project area encompasses lots outlined in Table 1. A Local Structure Plan (LSP) has been prepared to guide proposed land use and development within the project area, which is to consist of residential, commercial and mixed use precincts interspersed with Public Open Space (POS) and linked by transport connectors in a predominant north-south orientation (Figure 1).

Table 1: Project area description

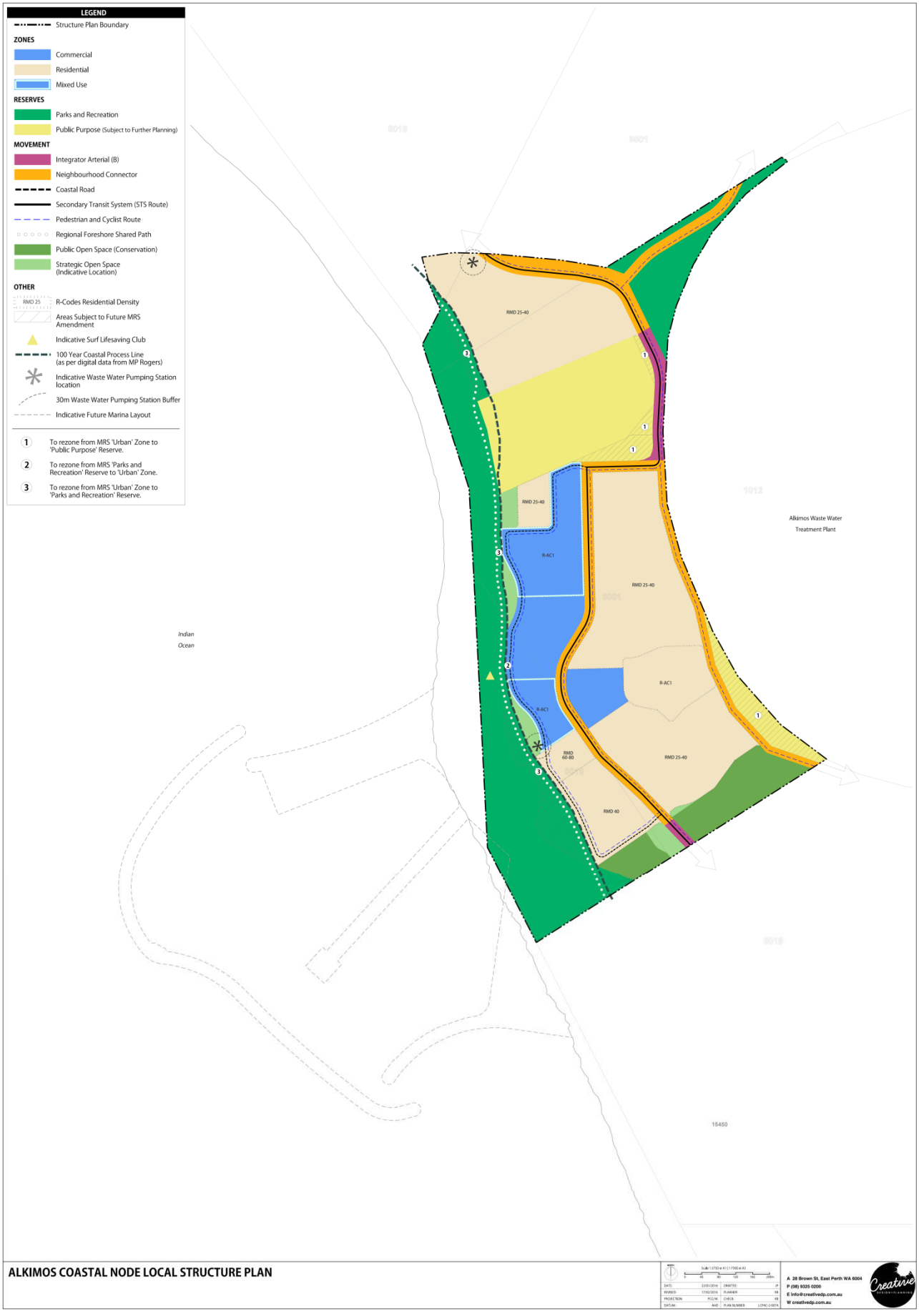
Lot number	Owner	Certificate of Title	Area (ha)
Portion of 9001	Water Corporation	Plan 69492 Volume 2771; Folio 785	61.30
Portion of 9022	Western Australian Land Authority	Plan 403757 Volume 2860; Folio 374	18.69
Portion of 9017	Peet Alkimos Pty Ltd	Plan 403202 Volume 2860; Folio 681	0.76
Portion of 9501	Western Australian Land Authority	Plan 400279 Volume 2819; Folio 691	5.79
Total			**86.54**

Due to the extent of on-site and adjacent vegetation, the project area is designated as bushfire prone, as depicted in the Western Australian State *Map of Bush Fire Prone Areas* (DFES 2016). Consequently, Strategen has prepared this Bushfire Management Plan (BMP) to accompany the LSP submission to City of Wanneroo (CoW) in order to meet requirements triggered under *State Planning Policy 3.7 Planning in Bushfire-Prone Areas* (SPP 3.7; WAPC 2015a).

This BMP has been prepared in accordance with *Guidelines for Planning in Bushfire-Prone Areas* (the Guidelines; WAPC 2015b) and incorporates information Fire Management Plans (FMPs) prepared for adjacent sites, such as Alkimos Beach to the south.

1.2 Purpose and application of the plan

The purpose of this BMP is to provide guidance on how to plan for and manage the bushfire risk to future assets of the project area through implementation of a range of bushfire management measures. The BMP outlines how future on-site assets can be protected during the summer months when the threat from bushfire is at its peak. This is particularly relevant when existing fire appliances in the area may be unable to offer an immediate emergency suppression response; therefore, development planning and design should aim to provide mitigation strategies that protect future life and property from bushfire as a priority.



Source: CDP 2016

Figure 1: Alkimos Costal Node Local Structure Plan

2. Spatial consideration of bushfire threat

2.1 Existing site characteristics

2.1.1 Location

The project area is situated within the greater Alkimos-Eglinton district, approximately 40 km northwest of the Perth CBD in the City of Wanneroo. The project area consists of a strip of land with frontage to the coast, located between the North and South Alkimos Local Structure Plan areas.

The project area is bound by the following (refer to Figure 2):

- Indian Ocean to the west
- Water Corporation's Alkimos Waste Water Treatment Plant (WWTP) and associated buffer to the east
- Parks and Recreation (P&R) reserve and Peet Shorehaven development (North Alkimos Local Structure Plan area) to the north
- conservation POS and LandCorp Alkimos Beach development (South Alkimos Local Structure Plan area) to the south.

2.1.2 Zoning and land use

The project area is currently zoned a combination of 'Urban', 'Parks and Recreation' and 'Public Purposes' under the Metropolitan Region Scheme and similarly zoned under provisions of the City of Wanneroo District Planning Scheme No. 2. The project area is currently undeveloped and in a partially vegetated state. However, the majority of on-site and adjacent vegetation has been significantly degraded as a result of the previous grazing land use, clearing and uncontrolled beach and dune access.

The project area was previously used for agricultural purposes (specifically grazing) resulting in significant areas that now predominantly support weeds (CDP 2016). Lot 9001 (i.e. the bulk proportion of the project area) was purchased by Water Corporation in the 1970s as a future site for a WWTP to service development in the North West Corridor. The 'Public Purpose' reservation within the northern portion of the project area contains the Water Corporation Ocean Outfall Site and is subject to further planning. The outfall site includes piping which transports waste from the Alkimos WWTP located to the east. The Alkimos WWTP contains critical infrastructure and the surrounding WWTP buffer is undeveloped. Urban development is progressing to the north and south of the project area through the respective Shorehaven and Alkimos Beach developments.

2.1.3 Assets

As discussed above, the project area and immediate surrounds is undeveloped so does not contain any life or property assets and is unlikely to contain significant environment value due to the past grazing land use and clearing extent. Water Corporation critical infrastructure occurs throughout the Ocean Outfall Site in the north and WWTP to the east. Future stages of Alkimos Beach to the south and Shorehaven to the north will ultimately be built for residential purposes.

2.1.4 Access

The project area is currently accessed via the WWTP service road (a sealed 6 m wide access road), plus numerous informal access tracks that navigate north-south through the site.

2.1.5 Water and power supply

The project area is not currently connected to a mains supply of water or power, but is in close proximity to utility services provided for Alkimos Beach to the south.

Figure 2 Site overview

Scale 1:10,000 at A4

0 50 100 150 200 250 m

N

Legend

- Project area
- Existing cadastre

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 24/02/2016
Author: JCrute
Source: Aerial image: Landgate, flown 09/2015. Subdivision plan: Client 02/2016. Existing cadastre: SLIP, Landgate 2016.

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2.2 Existing fire environment

2.2.1 Vegetation

Botanical descriptions

The predominant vegetation complex occurring within and adjacent to the project area is the Quindalup Complex, which is described as a coastal dune complex consisting mainly of two alliances, the strand and fore-dune alliance and the mobile and stable dune alliance (local variations include low closed forest of *Melaleuca lanceolata–Callitris preissii* and closed scrub of *Acacia rostellifera*).

Detailed flora and vegetation survey over the site revealed significant areas of degradation that predominantly support a variety of weed species as a result of the previous grazing land use. They survey also confirmed that the project area contains some of the most degraded areas within the Alkimos-Eglinton district, which is due to the historic agricultural land use and recent activity associated with construction of the Alkimos WWTP (CDP 2016). The remnant dune vegetation is dominated by *Melaleuca systena* and *Lomandra maritima*, with some minor areas of scattered *Eucalyptus gomphocephala* (Tuart) trees, which generally occur in locations that are sheltered from prevailing winds near the Alkimos WWTP buffer and the foreshore reserve (CDP 2016).

AS 3959–2009 descriptions

Strategen has assessed vegetation class within the project area and adjacent 100 m through desktop assessment and on-ground verification, as depicted in Figure 3, which is overlain on the indicative density plan layout. The vegetation has been assessed in accordance with methodology outlined in *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-prone Areas* (AS 3959–2009, SA 2009) to inform the bushfire hazard assessment outlined in Section 2.3. Assessment of vegetation class is described in the following subsections.

Foreshore P&R reserve

Development of the project area will result in significant clearance of the current vegetation extent. However, a proportion of vegetation within the foreshore P&R reserve is proposed to be retained. This vegetation is generally degraded from historical grazing activities, maritime effects and ongoing unauthorised access by four wheel drives. This has resulted in a highly fragmented landscape with very low shrubland (i.e. Class C shrubland) of *Melaleuca systena* and *Lomandra maritima* interspersed with cleared areas and bare sand dunes. The average fuel load assessed for this area is 2–5 t/ha.

Public Purpose reservation

Vegetation will be retained temporarily in the Water Corporation 'Public Purpose' reservation located in the northern portion of the site. This vegetation is heavily degraded from clearing, historical grazing activities, maritime effects and ongoing unauthorised access by four wheel drives. This has resulted in a very low shrubland (i.e. Class C shrubland) of *Melaleuca systena* and *Lomandra maritima* interspersed with cleared areas and bare sand dunes. The average fuel load assessed for this area is 2–5 t/ha.

Conservation POS

Numerous POS areas are proposed throughout the development, two of which will comprise full vegetation retention and rehabilitation as Bushland Conservation Zones (POS M and POS N located at the southern boundary of the project area). Vegetation within these two POS areas consists of low shrubland and open heath (i.e. Class C shrubland) of *Melaleuca systena*, *Lomandra maritima* and *Acacia rostellifera*, with the occasional Tuart tree. The average fuel load assessed for this area is 2–5 t/ha.

The remainder of POS areas will consist of landscaped zones to perform public recreation, access and drainage functions. These areas will retain very little of the existing vegetation extent and are not considered to pose a significant bushfire risk provided understorey grasses and weeds are managed regularly to achieve a fuel load of 2 t/ha all year round.

Alkimos WWTP buffer

The Alkimos WWTP buffer adjoins the project area to the east. The buffer is predominantly vegetated with low shrubland and open heath (i.e. Class C shrubland) of *Melaleuca systena*, *Lomandra maritima* and *Acacia rostellifera*, with scattered Tuart trees of poor quality (canopy area is almost negligible). A small thicket of *Xanthorrhoea preissii* (Grass trees) occurs between the project area and WWTP. The average fuel load assessed for this area is 5 t/ha.

Northern P&R reserve

The northern P&R reserve, which separates the project area from Shorehaven, is vegetated with low shrubland and open heath (i.e. Class C shrubland) of *Melaleuca systena*, *Lomandra maritima* and *Acacia rostellifera* in the northwest and northeast and grades to Class B banksia low woodland with increasing distance to the east (note Class B woodland occurs greater than 100 m from the project area boundary). Open heath vegetation to the northeast of the project area is in better condition compared to the northwest and equates to a higher bushfire hazard level. The average fuel load assessed for this area grades from 2–5 t/ha in the west and 5–8 t/ha in the northeast.

Vegetation class summary

The vegetation types discussed above equate to the following vegetation classes (note the coverage of vegetation across the landscape is described as discontinuous and assessed at 30–40% actual coverage and also that Strategen has not assessed vegetation in areas to be cleared as part of proposed development):

- Class C shrubland within foreshore P&R reserve to the west (Plate 1)
- Class C shrubland within 'Public Purpose' reservation in the north (Plate 2)
- Class C shrubland within conservation POS to the south (Plate 3)
- Class C shrubland within Alkimos WWTP buffer to the east (Plate 4)
- Class C shrubland within northern P&R reserve to the north (Plate 5).

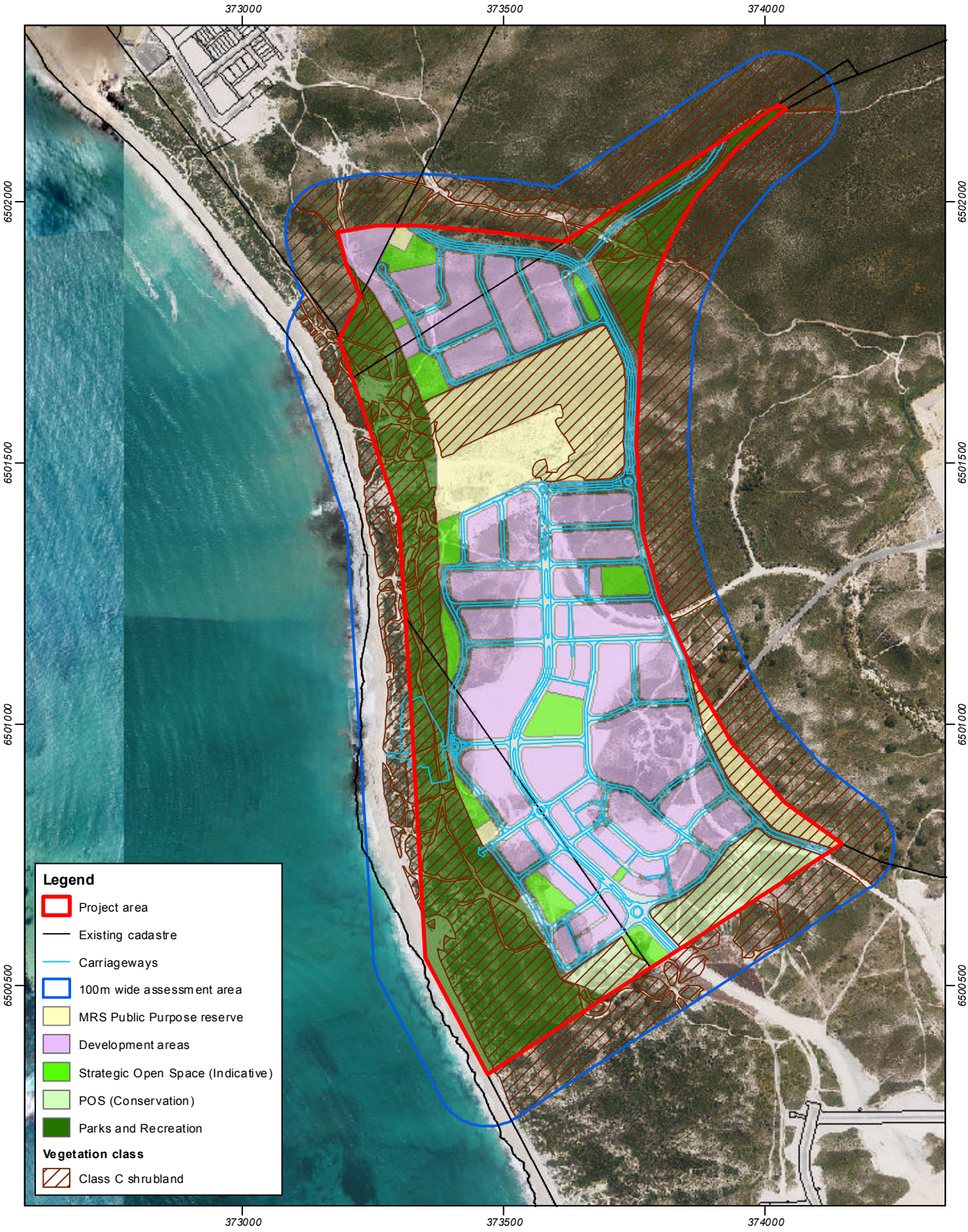

Figure 3 Vegetation class

Scale 1:10,000 at A4

0 50 100 150 200 250 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
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Author: JCrute
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Plate 1: Class C shrubland within foreshore P&R reserve to the west

Plate 2: Class C shrubland within Public Purpose reservation in the north

Plate 3: Class C shrubland within conservation POS to the south

Plate 4: Class C shrubland within Alkimos WWTP buffer to the east

Plate 5: Class C shrubland within northern P&R reserve to the north

2.2.2 Site topography and effective slope

Pre-development conditions

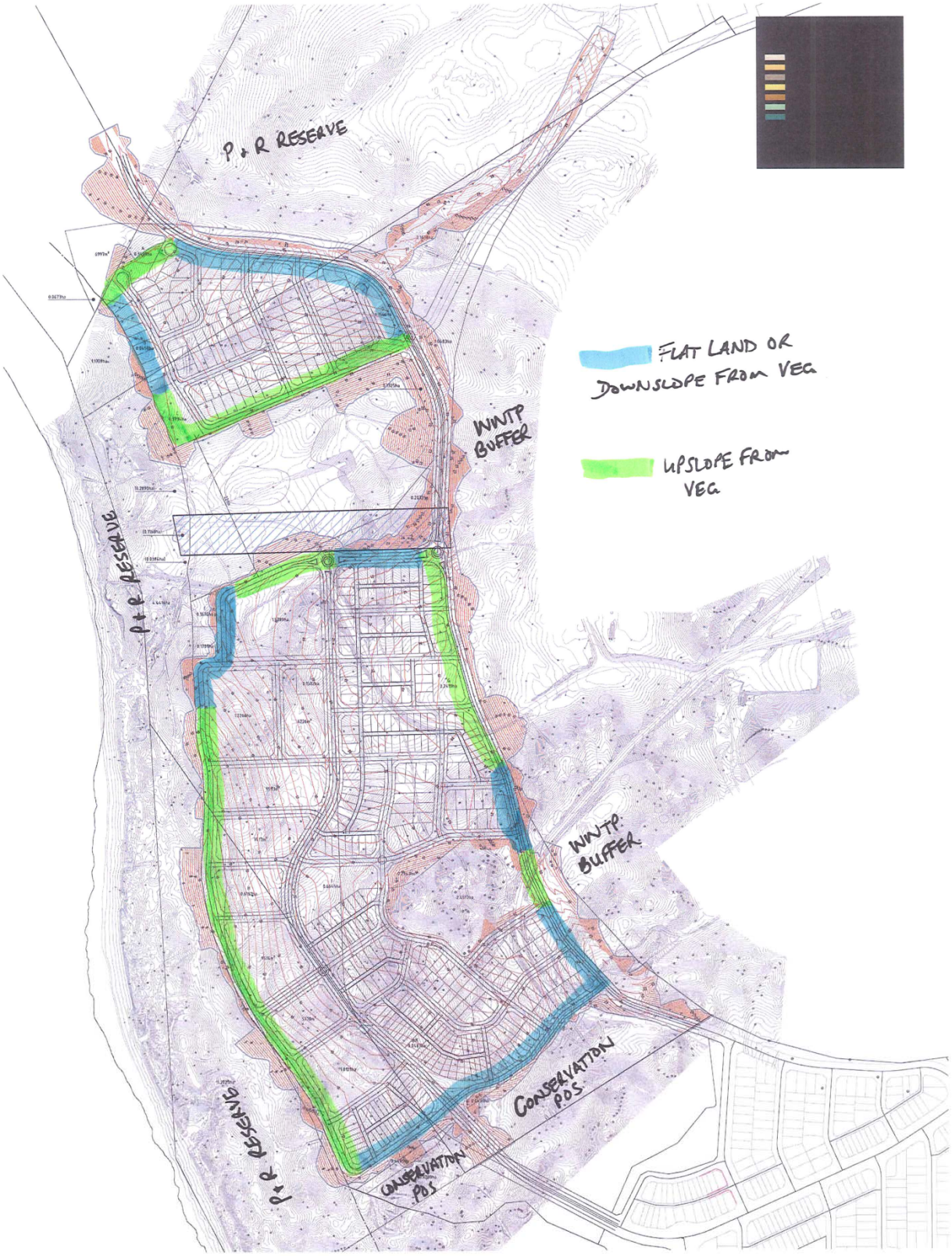
Existing topography comprises undulating limestone and sand dune landforms with younger dunes close to the coast and older, more stable dunes further inland. Pre-development site elevation is highly variable and ranges from 35 mAHD (Australian Height Datum) in the east along dunal ridges to less than 4 mAHD in the west within the foreshore reserve. Effective slope under vegetation varies from 0–10 degrees.

Post-development conditions

Strategen has assessed site topography and effective slope under vegetation within the project area and adjacent 100 m through desktop assessment and on-ground verification to inform the bushfire hazard assessment outlined in Section 2.3.

Following earthworks and development, site topography will be highly modified compared to pre-development conditions. Slope throughout built areas will be significantly reduced and the direction of slope around the periphery of the development will be modified through battering (Figure 4).

Vegetation proposed to be retained occurs around the outer edges of the project area and on site within the 'Public Purpose' reservation in the north and conservation POS to the south. The slope under this vegetation is highly variable and in most cases ranges between 0–10 degrees. Due to the sporadic nature of the dune systems and slope, proposed development areas vary from being up-slope and down-slope of the surrounding vegetation extent (Figure 4).



Source: Cossill & Webley 2015

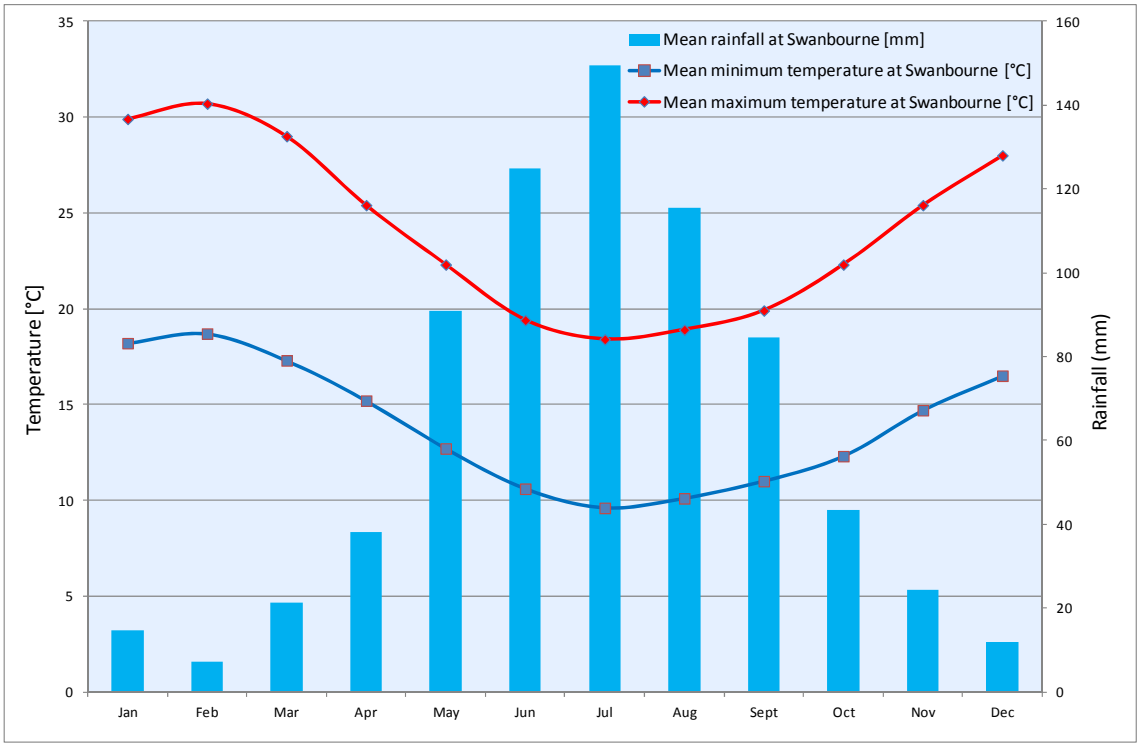
Figure 4: Post-development site topography and effective slope

2.2.3 Bushfire weather conditions

Climate statistics

The Alkimos locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The Bureau of Meteorology (BoM) weather station at Swanbourne (Station No. 9215, located approximately 40 km south of Alkimos) is the nearest weather station to the project area that provides the full range of bushfire weather climate statistics for the Perth Metropolitan coastline. Mean monthly climate statistics for Swanbourne are outlined in Figure 5.

Mean annual rainfall recorded at Swanbourne since 1993 is 717.7 mm (BoM 2015). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between December and March, with mean monthly maximums ranging from 28°C in December to 30.7°C in February (BoM 2015). Lowest temperatures occur between June and September, with average monthly minimums ranging from 9.6°C in July to 11°C in September (BoM 2015).



Source: BoM 2015

Figure 5: Mean monthly climate statistics for Swanbourne (Station No. 9215)

Worst case bushfire weather conditions

Southwest Western Australia generally experiences a cool to mild growing season in the months of August through to November of each year, followed by four months of summer drought conditions, which is when the potential for bushfire occurrence is at its peak.

Worst case (adverse) bushfire weather conditions can occur during this dry period when a low pressure trough forms off the west coast and strong winds develop from the north or northeast. These conditions are sometimes associated with 'Extreme' or 'Catastrophic' fire dangers, which are consistent with very high temperatures, low relative humidity and very strong winds. Based on the predominant summer climatic conditions of the local area, 'Extreme' and 'Catastrophic' fire dangers normally occur less than 5% of the time during the designated bushfire season, which equates to around six days between December and March (McCaw & Hanstrum 2003).

Predominant bushfire weather conditions

Predominant bushfire weather conditions are those that occur 95% of the time during the designated bushfire season. For Alkimos, these generally correlate with average January climatic conditions.

Mean January 9:00 am and 3:00 pm wind profiles for Swanbourne are contained in Appendix 1. These illustrate that the predominant winds during the designated bushfire season are from the east in the morning averaging around 20 km/h; and from the southwest in the afternoon averaging around 28 km/h (BoM 2015).

Mean January 9:00 am and 3:00 pm relative humidity for Swanbourne is approximately 53% and 55% respectively, with the January mean maximum temperature peaking at around 31°C (BoM 2015).

The predominant bushfire weather conditions discussed above correlate with an average Fire Danger Index (FDI) rating of 'High', as determined using the Commonwealth Science and Industrial Research Organisation (CSIRO) Fire Danger and Fire Spread Calculator (CSIRO 1999).

2.2.4 Bushfire history, potential ignition sources and risk of ignition

Coastal areas at Alkimos have not been burnt for some time and this is expected to be as a result of:

- limited available fuel within and adjacent to the site (i.e. highly degraded and cleared dunal systems)
- broad-scale clearing and urban development to the north (Shorehaven) and south (Alkimos Beach) and associated breaks in the fire run along the coastline
- maritime effects and higher salt and moisture contents compared to inland areas (i.e. resulting in moderated fire danger indices for the site)
- limited public access and resident/visitor occupancy throughout the site (i.e. lower risk of ignition)
- lower fuel tonnages of the predominant shrubland vegetation extent, compared to woodland or forest types located further inland.

The current risk of ignition throughout the project area is considered to be low on the basis of the above site characteristics and justification. However, the risk of ignition within retained vegetated areas post-development is expected to increase with ongoing intensification of residents and visitors at the bushland interface, particularly as a result of deliberately lit fire.

2.2.5 Potential bushfire scenarios

Strategen considers a fire front approaching the project area from the northeast to be the worst case bushfire scenario. This is due to the long fire run in this direction through woodland and heath fuels. Under worst case weather conditions and standard night time/morning weather conditions in summer, the likely prevailing winds from northern and eastern quadrants may be capable of directing a bushfire towards the site and the resulting fire behaviour is likely to escalate over this time and contribute elevated levels of radiant heat and ember attack on the proposed development. Therefore, the bushfire response at the northeast interface should incorporate sufficient defendable space and vehicular access to address the heightened bushfire risk.

2.2.6 Bushfire suppression response capability

Local DFES and/or CoW bush fire brigades stationed at Wanneroo, Quinns Rocks, Wanneroo Fire Support and Two Rocks are expected to provide a best case emergency suppression response time of 30 minutes should a bushfire threaten lives or homes on or adjacent to the project area.

2.3 Bushfire hazard assessment

Strategen has mapped the bushfire hazard levels for vegetation proposed to be retained within 100 m of the project area (refer to Figure 6), which is overlain on the indicative density plan layout. Strategen has not assigned bushfire hazard levels to on-site vegetation proposed to be cleared. The bushfire hazard levels are summarised as follows and have been assessed on the basis of the vegetation classes identified in Section 2.2.1 and the effective slope under classified vegetation assessed in Section 2.2.2:

- Class C shrubland within the foreshore P&R reserve to the west, 'Public Purpose' reservation in the north, conservation POS to the south, WWTP buffer to the east and majority of the northern P&R reserve to the north has been assigned a bushfire hazard level of 'Low'
- Class C shrubland within the northeast portion of the northern P&R reserve has been assigned a bushfire hazard level of 'Moderate'.

2.3.1 Justification for bushfire hazard levels

The bushfire hazard level of the majority of Class C shrubland vegetation within and surrounding the project area is considered to be 'Low'. The vegetation is generally sparse, low in height (often less than 20 cm) and lacks both mid and overstorey species cover. The vegetation is highly fragmented due to numerous areas of bare sand dunes, cleared land and access tracks. These breaks in the landscape will limit a potential fire run in the area. This, combined with the generally degraded nature of the vegetation is indicative of the lack of recent bushfire occurrence in the area. The slope under vegetation is up to 10 degrees in some areas; however, vegetation that is subject to slope is of a low density/height, contains low fuel tonnages (average of 2–3 t/ha with a maximum of 5 t/ha) and lacks an intact fuel ladder beyond the ground level, which will limit the effect of slope on potential bushfire behaviour. Annual fuel accumulation rates in the absence of ongoing vegetation management is not expected to be significant due to ongoing maritime effects, low soil fertility, prevailing winds and salt drift, which will limit vegetation growth, particularly along the foreshore P&R reserve and WWTP buffer. Consequently, Strategen is of the view that the majority of Class C shrubland vegetation is, in most cases, unlikely to support a bushfire with dangerous radiant heat levels (i.e. a radiant heat flux of 5.07 kW/m^2 was calculated using BAL Method 2 calculation). Furthermore, Strategen considers that on the basis of the above justification, the level of ember attack and associated fire behaviour will equate to a 'Low' bushfire hazard rating. At worst, this vegetation has the potential to support a fast moving, wind driven shrubland fire with lower levels of radiant heat and ember attack and limited building exposure timeframes.

An exception to the 'Low' hazard rating and justification outlined above occurs to the northeast of the project area. There is a large area of continuous Class C shrubland vegetation that comprises a higher species density and contains very little disturbance compared to the 'Low' hazard Class C shrubland discussed previously. This vegetation is fully intact, continuous and provides a long fire run to the northeast and east through inland areas of heath and woodland vegetation. Strategen is of the view that this vegetation presents a 'Moderate' bushfire hazard and the potential fire behaviour may exhibit elevated levels of radiant heat and ember attack. The distinction between the 'Low' and 'Moderate' hazard areas to the northeast is depicted in Figure 6.

2.4 BAL assessment

Vegetation with a 'Moderate' or 'Extreme' bushfire hazard level is considered bushfire prone and any proposed development located within 100 m of bushfire prone vegetation will require application of *AS 3959–2009 Construction of Buildings in Bushfire-Prone Areas* (SA 2009) via implementation of increased building construction standards in response to the assessed BAL.

With regards to this development proposal, no proposed development areas are situated within 100 m of 'Moderate' or 'Extreme' bushfire hazard areas (Figure 6). Therefore, there is no formal requirement to apply AS 3959–2009 for the development or for future buildings to comply with an increased standard of building construction. However, due to the long bushfire runs to the northeast and east, plus the proximity of a selection of proposed development cells to the foreshore P&R reserve in the northwest, precautionary application of AS 3959–2009 will be recommended, as described in Section 3.

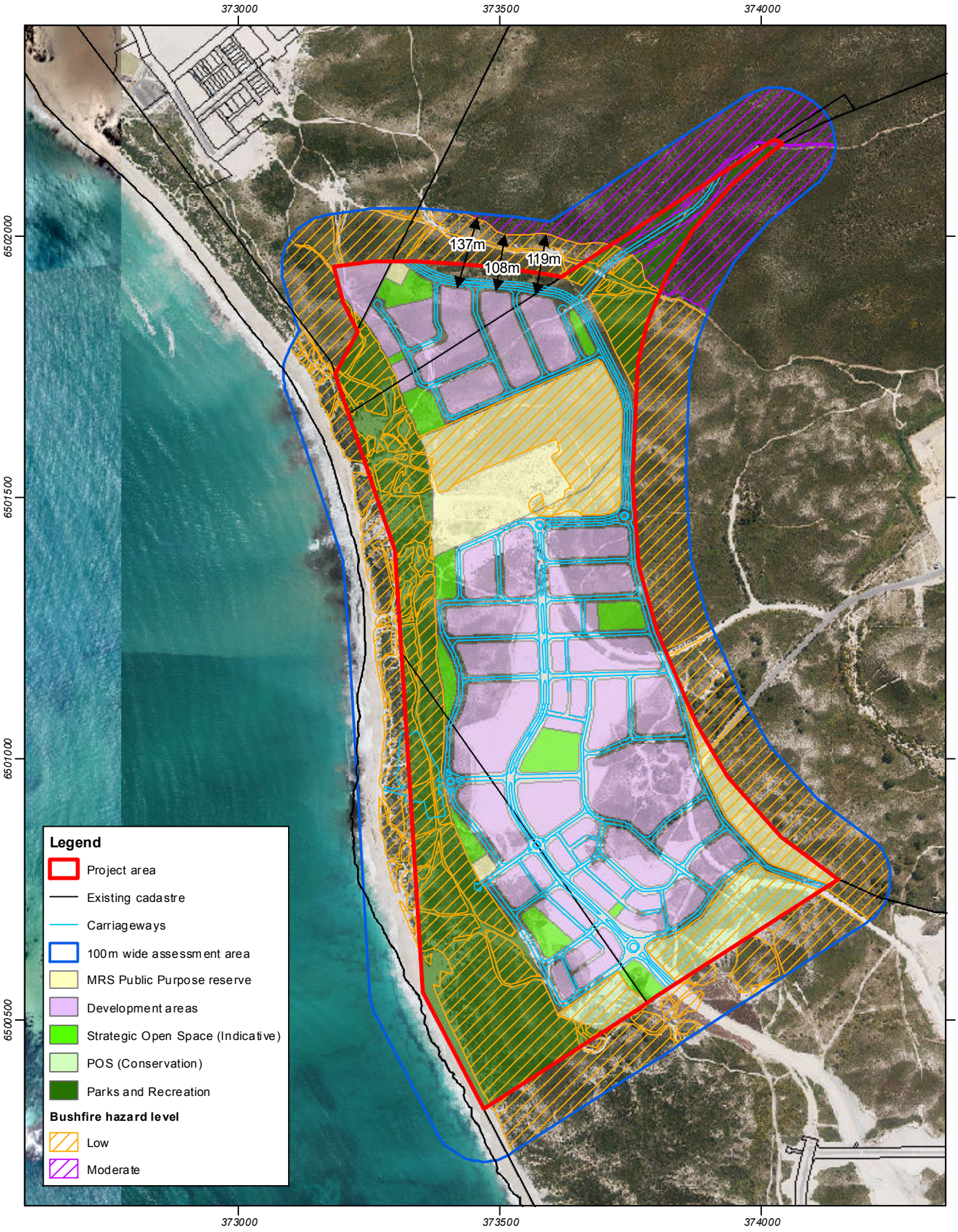


Figure 6 Bushfire hazard levels

Scale 1:10,000 at A4

0 50 100 150 200 250 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 26/02/2016
Author: JCrute
Source: Aerial image: Landgate, flown 09/2015. Subdivision plan: Client 02/2016. Existing cadastre: SLIP, Landgate 2016.

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3. Bushfire management measures

Strategen has identified a range of bushfire management measures that on implementation will enable all proposed lots to be developed on a staged basis whilst maintaining a manageable level of bushfire risk. The bushfire management measures are depicted in Figure 7 (where applicable), which is overlain on the indicative density plan layout. Proposed bushfire management measures are discussed in the following subsections.

3.1 Separation distances

Strategen considers the indicative development layout, as provided in Figure 7, will result in adequate hazard separation between development cells and retained vegetation through provision of a public road network around the majority perimeter of the site. This road network will provide permanent 16–25 m Asset Protection Zones (APZs) consisting of zero-fuel separation and public/emergency vehicular access at the direct vegetation interface. Road reserves are widest along the northeast interface in response to the increased bushfire risk at this location.

Strategen considers these separation distances will provide suitable defendable space and access for an emergency suppression response to contain a fast moving shrubland fire from the east, north or west, or internal to the development from the 'Public Purpose' reservation and conservation POS.

Three development cells situated in the northwest of the site do not contain an interfacing perimeter road reserve. Alternative measures have been recommended for these cells to offset this risk, as discussed in Section 3.2 and Section 3.3.

Development within the northern-most cell may be deferred due to land ownership issues; however, it is recommended that a temporary 20 m wide APZ be installed and maintained annually at less than 2 t/ha by the developer via mechanical slashing along the southeast boundary of this cell (refer to Figure 7) until such time that the cell is cleared and developed.

The proposed development will result in creation of a significant cleared and built footprint across the project area. However, to offset any bushfire risk associated with development staging, 20 m wide cleared buffers are recommended to be constructed adjacent to each development stage within the project area and maintained annually by the developer at less than 2 t/ha via mechanical slashing.

All POS areas, with the exception of conservation POS M and N to the south, will be subject to landscaping and ongoing management via mechanical slashing to achieve an annual fuel load of less than 2 t/ha all year round. These POS areas are therefore not expected to pose a significant bushfire risk to proposed development.

3.2 Increased building construction standards

Strategen recommends precautionary application of BAL 12.5 building construction standards be applied to the first row of lots along the eastern and north-eastern interfaces, plus throughout the full extent of the three north-western-most development cells that lack a perimeter road along the vegetation interface (Figure 7).

Precautionary application of BAL 12.5, as recommended above, will provide an additional level of bushfire mitigation and dwelling protection from ember attack at the eastern and north-eastern development interfaces in response to the long fire runs in these directions, as well as the north-western development interface in response to the lack of interfacing public road separation.

3.3 Vehicular access

Vehicular access to the project area will be provided to the south linking with Alkimos Beach and to the north linking with Shorehaven (Figure 7). Vehicular access will also be provided to the northeast, which will ultimately link with Marmion Avenue (Figure 7).

A small cul-de-sac is proposed to service the three north-western-most development cells. This cul-de-sac is within 200 m in length and will contain a minimum 17.5 m diameter head (Figure 7).

A 6 m wide limestone base fire service access route is recommended along the vegetation interface within the three north-western-most development cells in response to the lack of interfacing public road separation (Figure 7). The fire service access route will initially service the two primary development cells to the south and gates and signage will be constructed at links with the public road network. The fire service access route will be extended along the internal perimeter of the northern-most cell on clearing and development of this cell. The fire service access route should be vested in the local government to ensure ongoing management is achieved.

All public roads, the cul-de-sac and fire service access routes proposed as part of the development will need to comply with technical requirements of the Guidelines, as outlined in Table 2.

Table 2: Vehicular access technical requirements

Technical requirement	Public road	Cul-de-sac	Fire service access route
Minimum trafficable surface (m)	6*	6	6
Horizontal distance (m)	6	6	6
Vertical clearance (m)	4.5	N/A	4.5
Maximum grade <50 m	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33
Curves minimum inner radius	8.5	8.5	8.5
* Refer to E3.2 Public roads: Trafficable surface			

Source: WAPC 2015b

Strategen recommends mineral earth firebreaks with 3 m horizontal and 3 m vertical clearance be constructed within the internal perimeter of the following areas, with access gates constructed at links with the surrounding public road network (as depicted in Figure 7):

- Water Corporation 'Public Purpose' reservation in the north
- conservation POS M and N to the south.

The abovementioned areas comprise the development's predominant on-site vegetation extent and the recommended firebreaks and gates are required for operational management and emergency suppression response access. In addition, both areas mentioned above are bound by public roads that provide APZs to the adjacent development cells. The combined separation and access provisions around these vegetated areas are considered a suitable response to the bushfire risk. In addition, Water Corporation has raised no objection to creation of the abovementioned firebreak within the 'Public Purpose' reservation.

The firebreaks recommended within conservation POS to the south are consistent with measures proposed for the adjoining south Alkimos Beach development in line with DFES expectations to allow for separation of the conservation fencing from the vegetation.

All firebreaks should be implemented in accordance with the current City of Wanneroo annual firebreak notice (Appendix 2).

3.4 Reticulated water supply

All proposed lots will be provided a reticulated water supply through extension of existing services from the south within Alkimos Beach. The reticulated system will ensure an all year round supply of water is provided for each lot to meet minimum domestic and emergency water supply requirements.

A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority and DFES requirements, in particular the Water Corporation Design Standard DS 63 'Water Reticulation Standard Design and Construction Requirements for Water Reticulation Systems up to DN250'. This standard will guide construction of the internal reticulated water supply system and fire hydrant network, including spacing and positioning of fire hydrants so that the maximum distance between a hydrant and the rear of a building envelope (or in the absence of a building envelope, the rear of the lot) shall be 120 m and the hydrants shall be no more than 200 m apart.

3.5 Additional measures

Strategen makes the following additional recommendations to inform ongoing planning stages of the development:

1. Notification on Title: Strategen recommends that a notification be placed on the title of those lots with a recommended BAL rating as a condition of subdivision to ensure the respective landowners/proponents and prospective purchasers are aware that their lot is subject to a Bushfire Management Plan and that increased building construction standards will apply to future buildings.
2. Future development stages: Strategen recommends that all future stages of planning and development (e.g. subdivision, DAP, building licence, etc) incorporate the management measures recommended as part of this BMP where applicable to ensure the measures are implemented correctly.
3. Compliance with City of Wanneroo annual firebreak notice: the developer/land manager and prospective land purchasers are to comply with the current City of Wanneroo annual firebreak notice (Appendix 2).

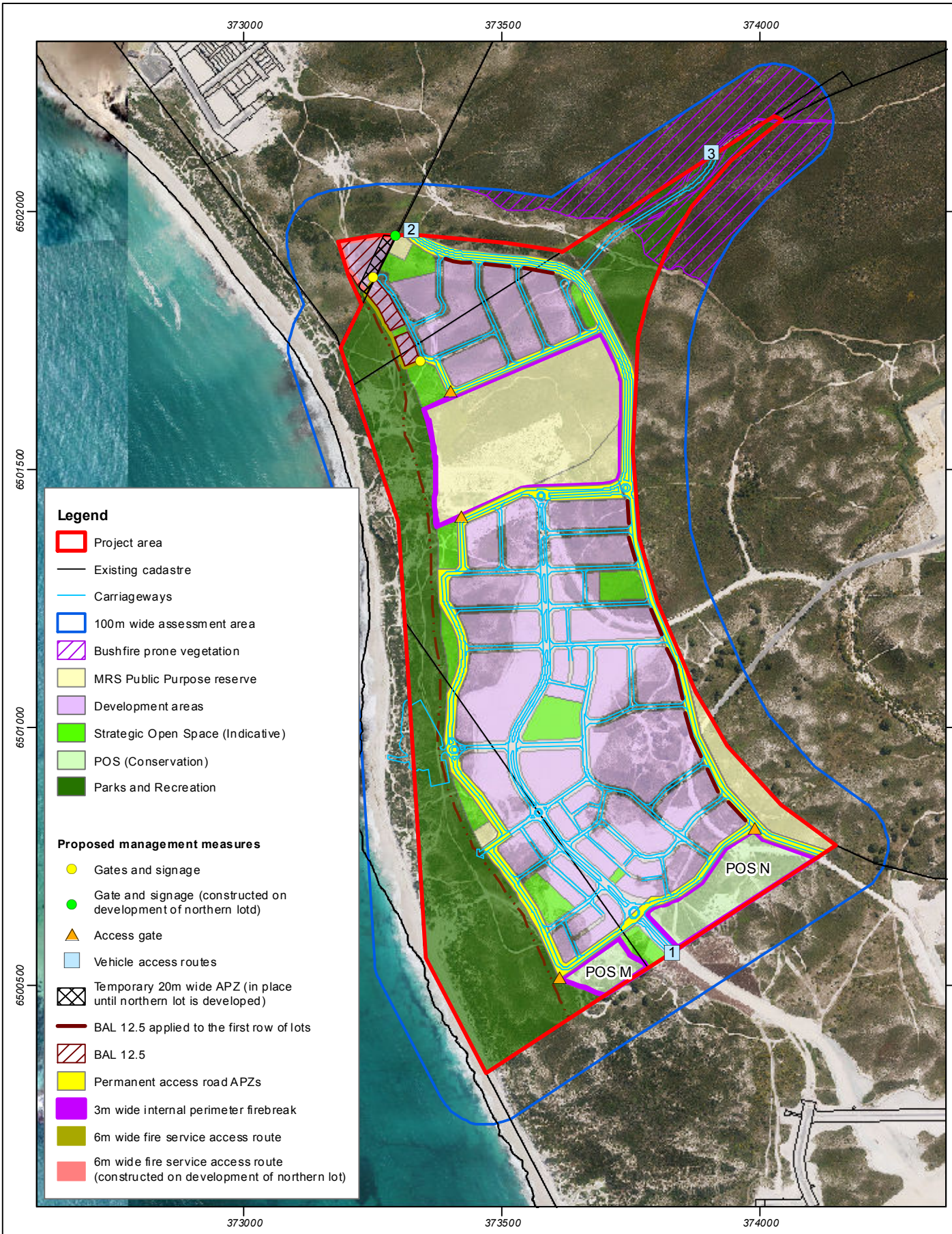

Figure 7 Bushfire Management Plan: Alkimos Coastal Node

Scale 1:10,000 at A4

0 50 100 150 200 250 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 26/02/2016
Author: JCrute
Source: Aerial image: Landgate, flown 09/2015. Subdivision plan: Client 02/2016. Existing cadastre: SLIP, Landgate 2016.

strategen ENVIRONMENTAL
info@strategen.com.au
www.strategen.com.au

Path: Q:\Consult\2016\LAN\LAN16043\ArcMap_documents\R001\RevA\LAN16043_01_R001_RevA_F007.mxd

4. Proposal compliance and justification

Proposed development within Alkimos Coastal Node is required to comply with SPP 3.7 and the Guidelines, as required under the following policy measures:

6.2 Strategic planning proposals, subdivision and development applications

a) Strategic planning proposals, subdivision and development applications within designated bushfire prone areas relating to land that has or will have a Bushfire Hazard Level (BHL) above low and/or where a Bushfire Attack Level (BAL) rating above BAL-LOW apply, are to comply with these policy measures.

b) Any strategic planning proposal, subdivision or development application in an area to which policy measure 6.2 a) applies, that has or will, on completion, have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, may be considered for approval where it can be undertaken in accordance with policy measures 6.3, 6.4 or 6.5.

c) This policy also applies where an area is not yet designated as a bushfire prone area but is proposed to be developed in a way that introduces a bushfire hazard, as outlined in the Guidelines.

6.3 Information to accompany strategic planning proposals

Any strategic planning proposal to which policy measure 6.2 applies is to be accompanied by the following information prepared in accordance with the Guidelines:

a) (i) the results of a BHL assessment determining the applicable hazard level(s) across the subject land, in accordance with the methodology set out in the Guidelines. BHL assessments should be prepared by an accredited Bushfire Planning Practitioner; or

a) (ii) where the lot layout of the proposal is known, a BAL Contour Map to determine the indicative acceptable BAL ratings across the subject site, in accordance with the Guidelines. The BAL Contour Map should be prepared by an accredited Bushfire Planning Practitioner; and

b) the identification of any bushfire hazard issues arising from the relevant assessment; and

c) clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages.

This information can be provided in the form of a Bushfire Management Plan or an amended Bushfire Management Plan where one has been previously endorsed.

Implementation of this BMP is expected to meet the following objectives of SPP 3.7:

5.1 Avoid any increase in the threat of bushfire to people, property and infrastructure. The preservation of life and the management of bushfire impact are paramount.

5.2 Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making at all stages of the planning and development process.

5.3 Ensure that higher order strategic planning documents, strategic planning proposals, subdivision and development applications take into account bushfire protection requirements and include specified bushfire protection measures.

5.4 Achieve an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management and landscape amenity, with consideration of the potential impacts of climate change.

In response to the above requirements of SPP 3.7 and the Guidelines, bushfire management measures, as outlined in Section 3, have been devised for the proposed development on a precautionary basis, adopting acceptable solutions in the Guidelines where applicable to meet compliance with bushfire protection criteria. A performance principle assessment is provided in Table 3 to assess the proposed bushfire management measures against each bushfire protection criteria in accordance with the Guidelines to demonstrate that the measures proposed meet the intent of each element of the bushfire protection criteria.

Table 3: Performance principle assessment against bushfire protection criteria

Bushfire protection criteria	Performance principle	Proposed bushfire management measures	Discussion and justification
Element 1: Location	P1: The subdivision, development or land use is located in an area where the bushfire hazard assessment classification is or will be moderate or low and the risk can be managed.	• Separation distances including permanent perimeter road APZs, temporary APZ in the north, cleared buffers during staging and POS management (refer to Section 3.1)	The bushfire hazard level was assessed to be 'Low'. Notwithstanding, the precautionary measures proposed will ensure defendable space and access exists at all areas where development and vegetation interface, including during development staging. This will meet performance principle P1.
Element 2: Siting and design of development	P2: The siting and design of the subdivision, development or land use (including roads, paths and landscaping) is appropriate to the level of bushfire risk that applies to the site and minimises the bushfire risk to people, property and infrastructure.	• Separation distances as discussed above (refer to Section 3.1) • Increased building construction standards to BAL 12.5 for selected areas (refer to Section 3.2)	The combination of precautionary APZs and increased building construction standards to BAL 12.5 for selected areas will ensure siting and design of development at the various vegetation interfaces is appropriate to the level of bushfire risk to people, property and infrastructure and the bushfire risk can be adequately managed. This will meet performance principle P2.
Element 3: Vehicular access	P3: The internal layout, design and construction of public and private vehicular access in the subdivision/ development allows for emergency and other vehicles to move through it easily and safely at all times.	• Vehicular access provisions including public access routes, cul-de-sac design, fire service access routes, firebreak construction and gates/signage (refer to Section 3.3)	The measures discussed in Section 3.3 will ensure access is provided at all vegetation interfaces. This will meet performance principle P3.
Element 4: Water	P4: The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for fire fighting purposes.	• Reticulated water supply and hydrant provisions (refer to Section 3.4)	The measures discussed in Section 3.4 will ensure a permanent and secure water supply that is sufficient for fire fighting purposes is provided throughout the proposed development. This will meet performance principle P4.

5. Implementation and enforcement

Implementation of the BMP applies to the developer, prospective landowners and relevant land managers to ensure bushfire management measures are adopted and implemented on an ongoing basis. A summary of the bushfire management measures described in Section 3, as well as a works program, is provided in Table 4. These measures will be implemented to ensure the ongoing protection of proposed life and property assets is achieved. Timing and responsibilities are also defined to assist with implementation of each measure.

Table 4: Proposed works program

Bushfire management measure	Timing for application	Responsibility
Creation of permanent access road APZs and temporary APZ in the north	Prior to construction of dwellings adjacent to the respective APZs	Developer
Creation of 20 m wide cleared buffers around each progressive development stage	Applicable to each active stage prior to construction of dwellings within that stage	Developer
Maintenance of temporary APZ, cleared buffers and POS (not including conservation POS) annually at less than 2 t/ha	On a regular basis following creation of temporary APZ and cleared buffers	Developer
Implementation of increased building construction standards	During construction of the relevant dwellings	Builder, prospective landowners
Construction of public roads and cul-de-sac	Staged following subdivision approval and prior to construction of proposed dwellings for each relevant stage	Developer
Construction of fire service access routes, associated gates and signage	Prior to construction of proposed dwellings for each relevant stage and ongoing maintenance thereafter	Developer to construct, managing authority to manage thereafter
Construction of firebreaks and associated access gates	Prior to construction of adjacent dwellings and ongoing maintenance thereafter	Developer to construct, managing authority to manage thereafter
Provision of reticulated water supply and network of hydrants	Staged following subdivision approval and prior to construction of proposed dwellings for each relevant stage	Developer
Notification on Title for lots with a recommended BAL rating	Following subdivision approval	Developer
Incorporation of relevant bushfire management measures into future planning/development stages	At each future stage of planning/development approval	Developer
Compliance with current annual firebreak notice	All year round as specified in the current annual firebreak notice	Developer, managing authority and prospective landowners

5.1 Document review

This BMP will be updated as necessary following the date of approval to ensure:

1. Implementation is assessed and corrective actions are applied in cases of non-compliance.
2. The effectiveness and impact of fire prevention work is evaluated and any significant changes in development design or the surrounding environment are reassessed in a revised BMP or addendum report.

The developer will be responsible for updating and revising the BMP until such time that the development is complete, after which CoW will be the authority responsible for updating and revising the BMP.

6. References

Bureau of Meteorology (BoM) 2015, *Climate statistics for Australian locations: Monthly climate statistics for Swanbourne*, [Online], Commonwealth of Australia, available from: *http://www.bom.gov.au/climate/averages/tables/cw_009215.shtml*, [15/05/2015].

Commonwealth Science and Industrial Research Organisation (CSIRO) 1999, *Fire Danger and Fire Spread Calculator*, Commonwealth Science and Industrial Research Organisation, Perth.

Creative Design and Planning (CDP) 2016, *Alkimos Coastal Node Local Structure Plan*, report prepared for LandCorp, February 2016.

Department of Fire and Emergency Services (DFES) 2016, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: *http://www.dfes.wa.gov.au/regulationandcompliance/bushfireproneareas/Pages/default.aspx*, [21/01/2016].

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McCaw L and Hanstrum B 2003, 'Fire environment of Mediterranean south-west Western Australia', in *Fire in Ecosystems of South-West Western Australia: Impacts and Management*, eds I Abbott & ND Burrows, Backhuys Publishers, Leiden, Netherlands, pp. 171–188.

Standards Australia (SA) 2009, *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

Western Australian Planning Commission (WAPC) 2015a, *State Planning Policy 3.7 Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2015b, *Guidelines for Planning in Bushfire-Prone Areas*, Western Australian Planning Commission, Perth.

Appendix 1
January wind profiles for Swanbourne

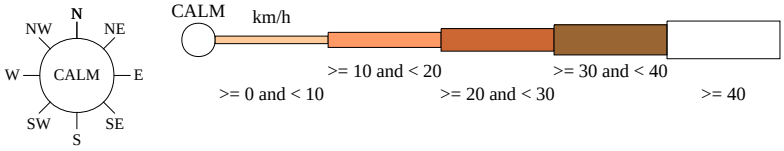
Rose of Wind direction versus Wind speed in km/h (10 Sep 1993 to 30 Sep 2010)

Custom times selected, refer to attached note for details

SWANBOURNE

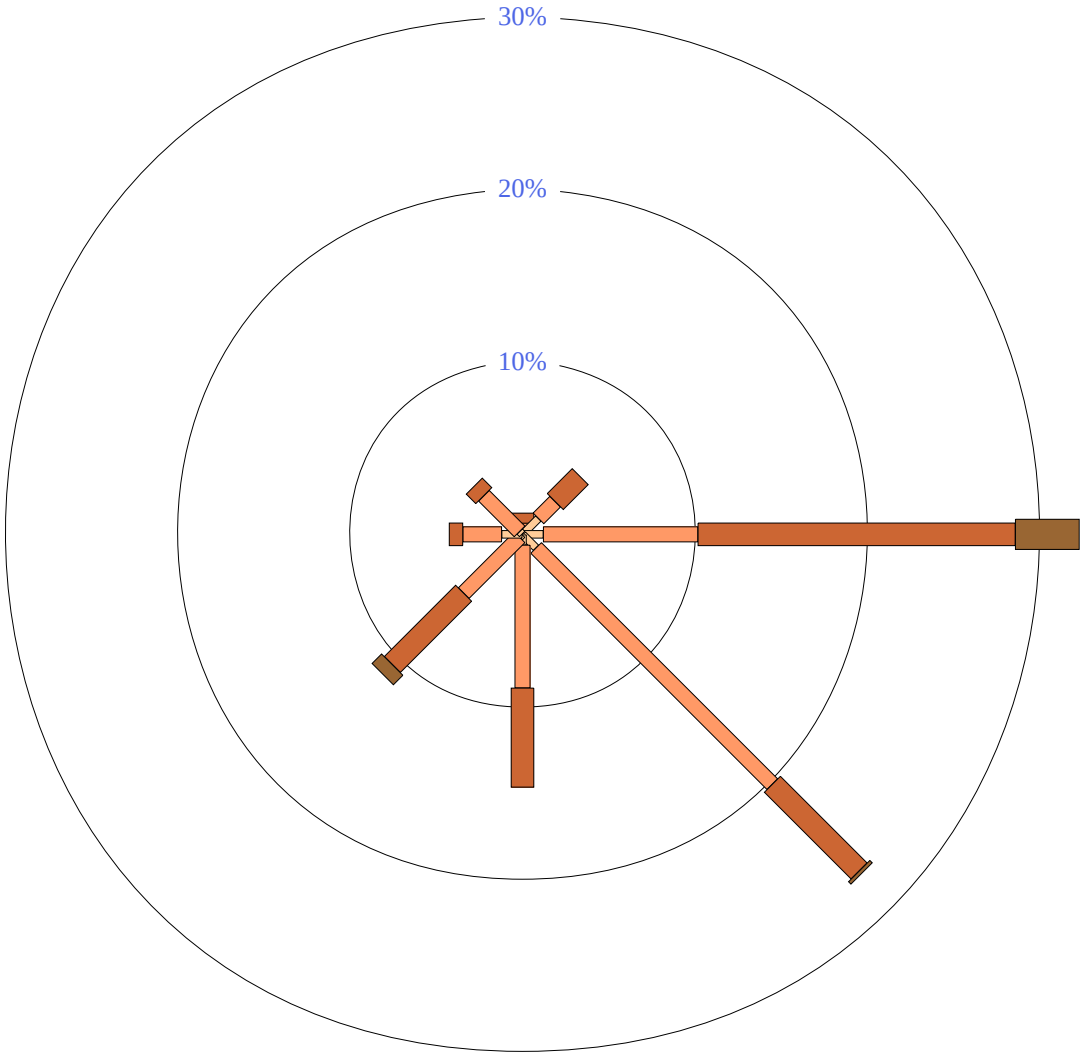
Site No: 009215 • Opened Nov 1985 • Still Open • Latitude: -31.9558° • Longitude: 115.7619° • Elevation 40.9m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Jan
513 Total Observations

Calm *



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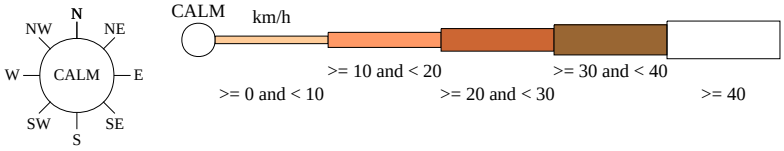
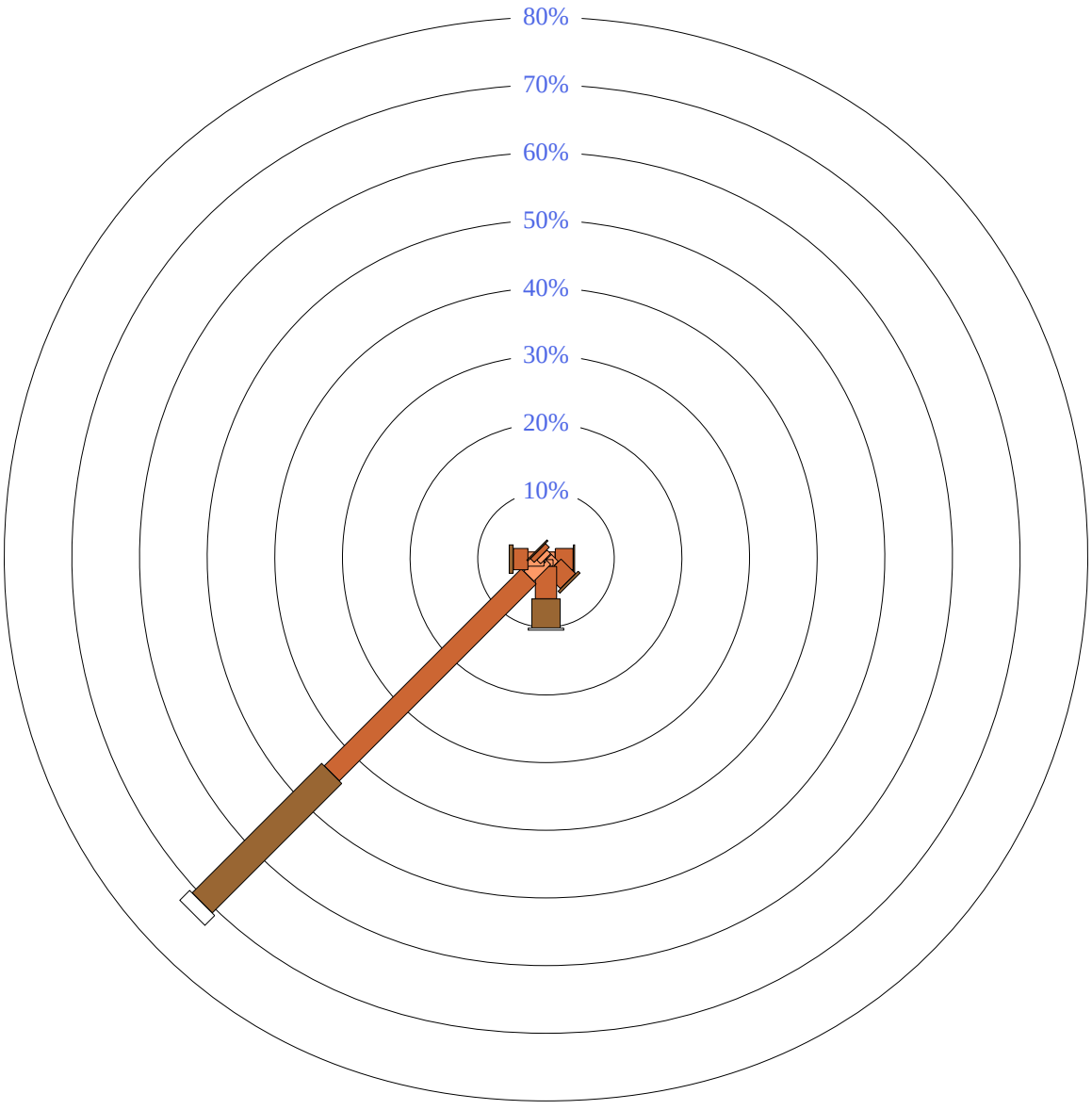


3 pm Jan
514 Total Observations

Calm *



Appendix 2
City of Wanneroo annual firebreak notice

Protect your home and property from bushfires

NOTICE TO ALL OWNERS OR OCCUPIERS OF LAND IN THE DISTRICT OF THE CITY OF WANNEROO REGARDING FIREBREAKS.

The City of Wanneroo hereby gives notice pursuant to Section 33 of the **Bush Fires Act 1954** to all owners or occupiers of land in its district that they are required on or before 15 November, or within 14 days of becoming the owner or occupier of the land if that occurs after the 15 November, to annually plough, cultivate, scarify, or otherwise clear firebreaks as specified in this Notice and thereafter up to, and including the 30 April, annually, to maintain the firebreaks clear of flammable matter.

1. Land having an area of 2000m2 or more
A firebreak not less than 3 metres wide and 3 metres high immediately inside and around all external boundaries of the land must be cleared.

2. Land having an area of less than 2000m²
A firebreak not less than 2 metres wide and 2 metres high immediately inside and around all external boundaries of the land must be cleared.

3. Buildings
A firebreak not less than 3 metres wide immediately around all external walls of every building must be cleared. Whenever a firebreak is cleared by burning the provisions of the Act and Regulations made thereunder must be observed. If pursuant to Item (2) of this Notice, mowing or slashing is carried out the height of vegetation thereafter must not exceed, as far as is reasonably practicable, 20mm over the entire area of the firebreak. The use of chemicals is subject to all restrictions imposed by the Department of Agriculture. Attention is drawn to the Flammable Liquids Regulations made under the Explosives and Dangerous Goods Act 1961,which requires a site on which flammable liquid is stored to be totally cleared of all flammable material for a minimum distance of 5 metres surrounding the site.

If it is considered to be impracticable for any reason to comply with the provisions of this Notice, application may be made not later than the 1st day of November annually to the Council or its authorised officer for permission to provide alternative fire protection measures. If permission is not granted the requirements of this Notice must be complied with.

Penalty
An owner or occupier of land who fails or neglects in any respect to comply with the requirements of this Notice is liable to a maximum fine of $5,000.

DATES TO REMEMBER

- **Firebreaks must be cleared by 15 November (AND KEPT CLEAR UNTIL APRIL 30)**
- **Burning permits required all year round**
- **Burning prohibited between 1 December to 31 March**

When and how to obtain a fire permit

Permits are available from the City of Wanneroo at the following locations:

WANNEROO ANIMAL CARE CENTRE
Located at the rear of the Ashby Operations Centre, 1204 Wanneroo Road, Ashby
The City's Rangers / Fire Control Officers are available to issue permits 7 days a week* from 4pm - 6pm
*Except Good Friday

CITY OF WANNEROO CIVIC CENTRE
23 Dundebar Road, Wanneroo
The City's Fire Control Officers / Permit Issuing Officers are available to issue permits Monday to Friday 9am - 4pm

NEED ADVICE?
Further advice about how to protect your home, constructing firebreaks, and when and how to burn off, is available from the City of Wanneroo during office hours on 9405 5000.

City of Wanneroo
23 Dundebar Road, Wanneroo, WA 6065
Locked Bag 1, Wanneroo, WA 6946
T : (08) 9405 5000 F : (08) 9405 5499
After Hours : 1300 13 83 93
E : enquiries@wanneroo.wa.gov.au
wanneroo.wa.gov.au

PROTECT YOUR HOME AND PROPERTY FROM BUSHFIRES

City of Wanneroo

Keeping your home safe from fire

There are a number of ways you can help keep your home safe from fire:

- Install smoke detectors in your home
- Clear vegetation away from the walls of your home
- Clear all rubbish and flammable material from around your home to create a 20 metre circle of safety
- Store firewood, timber, petrol, and kerosene well away from your home
- Prior to summer, clean all leaves and debris from your gutters
- Don't have flammable trees such as conifers near buildings
- Have branches trimmed that overhang the house or powerlines
- Fit wire insect screens or shutters to windows and glass doors

If a firebreak is impractical along your boundary for environmental or other reasons notify the City of Wanneroo by 1 October to obtain permission to install firebreaks in alternative positions, or of a different nature.

ALTERNATIVE METHODS OF REDUCING FIRE HAZARDS ON VACANT LAND

- For urban land less than 2000m², if mowing or slashing is carried out, the height of the vegetation must not exceed, as far as is reasonably practical, 20mm over the entire area of the firebreak
- The use of chemicals is subject to all restrictions imposed by the Department of Agriculture
- Mulching • Disposal at an authorised rubbish tip site

When and how to burn

NO BURNING FROM 1 DECEMBER - 31 MARCH

Burning off - that is, bush/running fire including grass, on any land is totally prohibited between 1 December and 31 March. Fire permits for burning material other than garden rubbish are required all year round.

A person in control of the fire must stay with the fire until it is completely extinguished.

GARDEN RUBBISH AND REFUSE

The burning of garden refuse is permitted between the hours of 6pm and 11pm, provided the fire danger rating is not VERY HIGH, SEVERE, EXTREME or CATASTROPHIC or a TOTAL FIRE BAN has been declared.

Fire danger rating signs are located at the following locations:

- Corner of Joondalup Drive and Wanneroo Road
- Wanneroo Road, south of the Yanchep Beach Road turn off
- Wanneroo Road, Carabooda • Marmion Avenue, Jindalee
- Neaves Road, Mariginiup • Old Yanchep Road, Pinjar
- Gnangara Road, Landsdale • Country Side Drive, Two Rocks

Other points to remember when burning garden refuse and rubbish are:

- All bush and flammable material must be thoroughly cleared within two metres of all points of the site of the fire
- The material must be on the ground, and be no more than one metre wide and one metre high

Only one heap may be burnt at any one time
Incinerators may be used providing:

- The incinerator is properly constructed and designed to prevent the escape of sparks of burning material
- The incinerator is situated not less than two metres away from a building or fence
- An area of two metres surrounding the incinerator is clear of all flammable material

BARBECUES

Only gas or electric barbecues may be lit during VERY HIGH, SEVERE, EXTREME or CATASTROPHIC fire danger rating or declared TOTAL FIRE BAN. The lighting of solid fuel barbecues is not permitted on these days.

SMOKE NUISANCES

City of Wanneroo residents are advised to be mindful of smoke issues associated with any burning that they conduct. Steps should be taken to avoid undue smoke impact to neighbours and adjacent roads. Smoke across roadways can severely impact motorists' visibility and therefore road safety. Issues of smoke nuisance are regulated by the Waste Avoidance and Resource Recovery Act 2007.

CAMPFIRES

Campfires must not be lit on VERY HIGH, SEVERE, EXTREME or CATASTROPHIC fire danger days or declared TOTAL FIRE BAN. A person must remain in attendance at the site during the whole time the fire is burning. The user must extinguish the fire using water or earth before leaving the area.

Hints for safer burning

- Don't light a fire on a hot or windy day
- Don't burn more than you can control
- Let your neighbours know you'll be burning material
- Make sure smoke and sparks will not affect your neighbour's washing or enter open windows
- Cut or rake long grass around trees, building and fences before burning
- Burn against the wind
- On a sloping block, burn from the top down
- Keep a hose or spray pack at hand to dampen down fierce fires
- If in doubt, don't burn material yourself - call the Volunteer Fire Brigade
- Stay with the fire until it is completely extinguished
- Where possible, don't burn any closer than 20 metres from your home or other buildings

Penalties

Under the Bush Fires Act 1954, failing to comply with regulations can result in a fine ranging from $250 to $250,000 or imprisonment.

Failure to maintain 2/3 metre firebreak as per firebreak order	$250
Offence relating to lighting fire in the open air	$250
Setting fire to bush during prohibited burning times	$250
Failure of occupier to extinguish bush fire	$250

Major offences result in Court action with fines ranging from $250 to $250,000 or imprisonment for 14 years.

THE BIGGEST PENALTY OF ALL

The biggest penalty of all would be losing your loved ones or home to fire. Please ensure you, your family and your home are kept safe by taking the necessary precautions.

Special rural and residential land

Owners and occupiers of special rural and special residential land should be aware of their responsibilities to take bush fire prevention measures, while ensuring they do not contravene Town Planning Scheme provisions which control the removal of vegetation in Special Residential and Special Rural Zones.

These special rural zones were created in areas of natural flora, and the Scheme recognises the importance of preserving the natural environment in these areas. Anyone found cutting down, lopping or damaging trees in these areas without City approval may be guilty of an offence.

However, bush fire prevention, including the installation of firebreaks, is essential regardless of the zoning of the land.

Below are some guidelines for installing firebreaks in special rural zones to prevent bush fires, while minimising damage to the natural environment.

- A 3 metre wide and 3 metre high firebreak should be cleared around the perimeter of special rural or special residential lots
- These firebreaks need not be strictly around the perimeter, but may deviate according to the flora
- The firebreak does not have to be ploughed but can instead be created by clearing and removing all flammable material
- Care should be taken to avoid damaging or removing significant trees and shrubs
- Avoid the build up of undergrowth and leaf litter