

URBAN CATALYST 3

ABN: 74 622 643 421

PO BOX 7044 SIPPY DOWNS QLD 4556

contact@urbancatalyst3.com

+61 412 788 532



Reference: 21-059

Evan creek Pty Ltd

BUSHFIRE HAZARD ASSESSMENT AND MANAGEMENT PLAN

Proposed Lot 18
Dixon Circuit, Yarrabilba

PLANS AND DOCUMENTS
referred to in the
PDA DEVELOPMENT APPROVAL

Approval no.: **DEV2023/1426**

Date: **06 February 2024**



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Disclaimer

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This assessment has been based on site conditions present at the time of preparation and the setbacks and nature of the building proposed, relying on current hazard assessment methodologies as described in this report. These methodologies are not based on assessments of catastrophic bushfire events which may occur from time to time. By their nature, bushfires are unpredictable, and no guarantee is able to be provided or should be assumed that the area will not be affected by bushfire at some time. Property owners and tenants should be aware of the often unpredictable nature of bushfire and potential consequences of such events, and should be responsible for their property and personnel by being prepared for extreme events accordingly.

Document Issue

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Urban Catalyst 3 Pty Ltd
ABN: 74 622 643 421
PO Box 7044 Sippy Downs QLD 4556
contact@urbancatalyst3.com
+61 412 788 532

Revision No.	Authorised for Issue	Date
Rev 1	D. Willis	31 October 2023

1.0 INTRODUCTION

1.1 PURPOSE

This report documents the outcomes of a bushfire hazard assessment completed for proposed Lot 18 located on Dixon Circuit, Yarrabilba and details and management measures to be included in the development to minimise exposure to bushfire hazards to an acceptable level. This assessment builds on the Sub-Precinct Specific Bushfire Hazard Assessment and Mitigation Plan completed by Bushland Protection Systems Pty Ltd for Sub-Precinct 3D of Yarrabilba Estate. The Sub-Precinct Specific Bushfire Hazard Assessment and Mitigation Plan comprised a broader scale assessment across the entire sub-precinct, taking into consideration the potential risks associated with the adjacent parkland proposed for the site and the vegetation types present. This assessment focusses on Lot 18 and the areas immediately adjacent, with specific consideration of vegetation hazard classes, final earthworks, landscaping treatments and other elements to mitigate bushfire risk.

Particulars relating to the lot are as follows:

Real Property Description:	Proposed Lot 18 in parent land parcel Lot 908 on SP327419
Address:	Lot 18 Dixon Circuit, Yarrabilba
Area:	1.0088ha approximately
Tenure:	Freehold
Improvements:	A sewer traverses a portion of the southern and eastern extents of proposed Lot 18

1.2 STATE PLANNING POLICY BUSHFIRE HAZARD OVERLAY

The subject land is mapped as partially falling within a medium bushfire hazard area under the State Planning Policy (SPP) bushfire hazard mapping, with the eastern and south western portions of the proposed allotment located within an associated potential impact buffer area which extends 100m from the mapped hazard area. While Lot 18 and much of the surrounding area has been completely cleared as a result of the creation of Sub-Precinct 3D and the associated subdivision of the parent allotment, the State mapping still conveys a bushfire risk over the broader area, including the adjacent areas of vegetation (refer Figure 1).

Information gained from the Plan of Development (Figure 2) suggests that the land to the east of proposed Lot 18 will be dedicated as open space/park, with a designated fauna corridor following the wetland environment shown in the Context Plan – Open Space and Linkages. A section of this plan has been shown in Figure 3. The designated fauna corridor includes a number of existing vegetated areas and the adjacent parkland is likely to be vegetated comparable to the adjacent vegetation wooded areas.



Figure 1: State Planning Policy bushfire hazard mapping



Figure 2: Section of Plan of Development

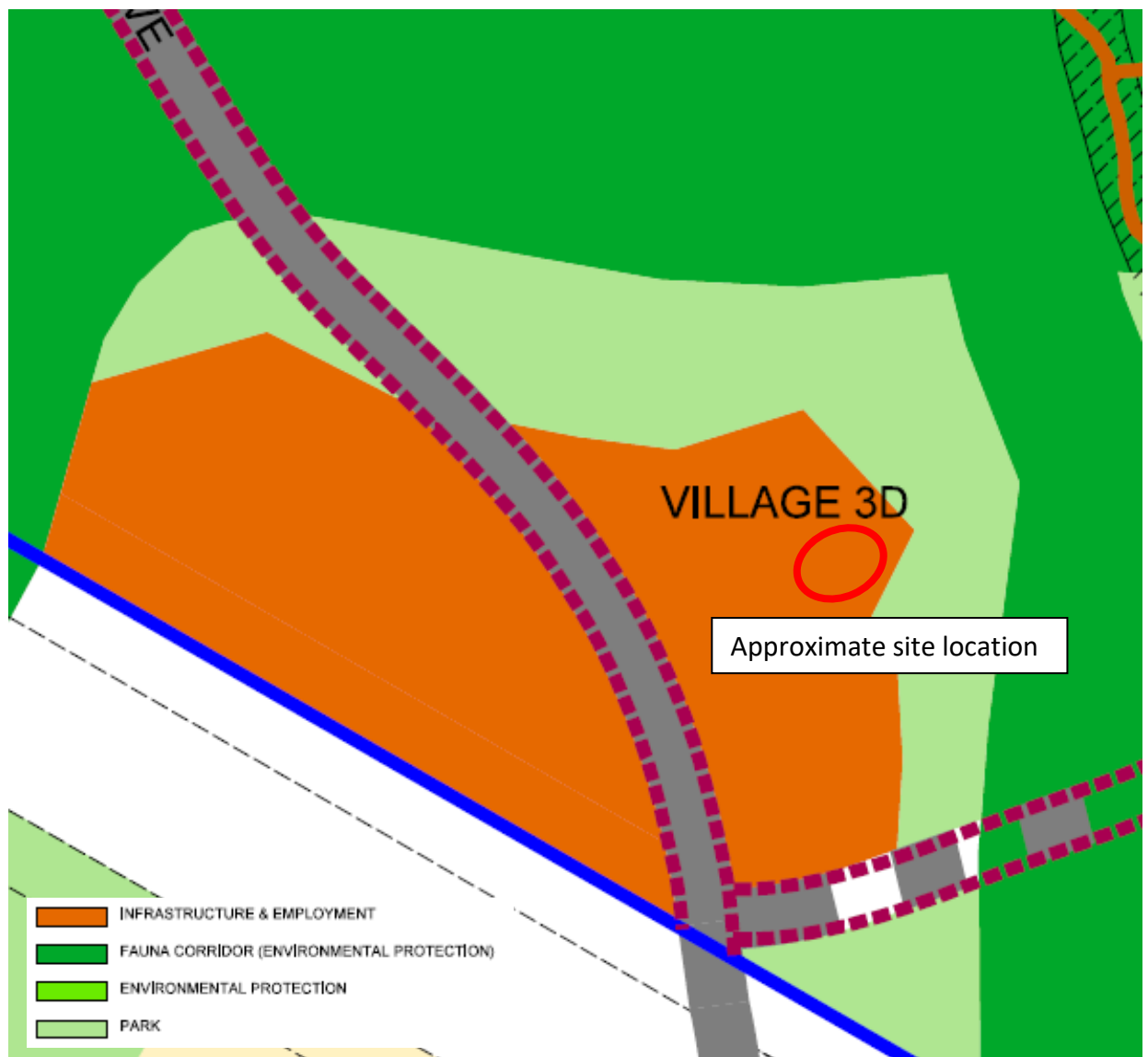


Figure 3: Section of Context Plan – Open Space and Linkages

2.0 SITE DESCRIPTION

2.1 SURROUNDING LAND USES

The subject land is located within Sub-Precinct 3D of Yarrabilba Estate and is characterised by a mosaic of cleared and vegetated areas. Sub-Precinct 3D consists of retail, commercial, community and mixed use areas which have been cleared of vegetation to accommodate the proposed development. The balance of the area appears to be assigned to open space intended to be used for both recreation and nature conservation and will contain vegetation. This assessment focusses on proposed Lot 18 shown in Figure 2, with bushland exposure being corridors of vegetation to the north and east.

The largest patches of hazardous vegetation present within the wider landscape consists of remnant vegetation contained within Lot 9050 on SP296371 to the north as well as larger vegetated areas approximately 800m to the east and approximately 600m to the west. While the larger vegetated areas to the east are separated by urban residential development, and areas to the west are separated by commercial development and an infrastructure corridor, regrowth vegetation adjoins the subject site to the east and will ultimately adjoin a portion of the northern property boundary. A plan showing surrounding land uses and vegetated areas is included as Figure 4.



Figure 4: Surrounding land uses

2.2 TOPOGRAPHY

A watercourse is located approximately 130m to the north of the site and running roughly in a west to east direction. A long waterbody forming a wetland is located to the east of the site approximately 60m from the eastern property boundary. Proposed Lot 18 falls gently toward the east, with land to the east of the allotment averaging an approximate grade of 2 degrees. The site ranges from approximately 29m AHD in the west at the Dixon Circuit frontage and falls to approximately 27.5m AHD in the east. The site batters extend to from 27.5m to approximately 26m AHD over around 20m distance in the east, and the land continues to fall eastward to around 24m AHD to the edge of the waterbody.

2.3 VEGETATION

At the time of this investigation, the surrounding land was largely cleared. Vegetation to the north of the subject site consists of open eucalypt forest along drainage lines, extending to approximately 25 – 30m. The vegetation comprised a number of eucalypt species, including *Eucalyptus siderophloia* (grey ironbark), *Eucalyptus tereticornis* (blue gum) and *Eucalyptus moluccana* (gum-topped box). *Lophostemon suaveolens* (swamp box) was also present along the waterway. Figure 5 depicts typical vegetation conditions within the vegetation along the waterway to the north.

Vegetation to the east comprises shrubby regrowth to approximately 6m dominated by *Melaleuca linariifolia* and *Melaleuca nodosa*, with emergent *Lophostemon suaveolens* in proximity to the water body and *Eucalyptus tereticornis* upslope toward the proposed allotment. A narrow strip of this vegetation also extends between the vegetation to the north and the clearing extent associated with the proposed allotments.

While the shrubby vegetation to the east is structurally different to the vegetation to the north and does not extend to the height of the canopy of the eucalypt community, it is anticipated that over time this vegetation community will continue to mature to ultimately form a similar vegetation type to the vegetation along the waterway to the north. This was based on the observation of similar understorey species in the mature eucalypt community adjacent to the waterway to the north, and the presence of young, regenerating eucalypts within the area dominated by *Melaleuca linariifolia* and *Melaleuca nodosa* immediately to the east of Lot 18.

Accordingly, in assigning vegetation hazard classes, the same vegetation community is proposed in terms of bushfire risk for all vegetated areas within the fauna corridor and parkland adjoining the eastern side of the site. At the time of the inspection, the balance of the area was subject to significant earthworks and had been cleared. In combination with the roadways and other established infrastructure, this area was assigned to a separate vegetation hazard class associated with nil to very low vegetation cover.



Figure 5: Open eucalypt woodland vegetation along waterway to the north

In addition to existing vegetation conditions, consideration was given to the proposed landscaping scheme to be implemented on the batters and within the stormwater management infrastructure adjacent to Lot 18. Details from the approved landscape plans indicate the base of the bioretention basin to the south is to be planted with a range of wetland species including sparse

plantings of small trees (such as *Melaleuca linariifolia*, *Melaleuca quinquenervia*), shrubs (such as *Banksia robur*, *Leptospermum polygalifolium*) and dominated by sedges (such as *Gahnia sieberiana*, *Lepidosperma laterale*, *Lomandra longifolia*). To the north, one of the basins is a detention basin with no vegetation, while the remaining structures comprise bioretention basins with grasses and sedge type vegetation along the base similar to the basin to the south. Shrubs and various ground covers typical of wetland environments are proposed on the batters of the basins, with ground covers (*Cymbopogon refractus*, *Imperata cylindrica*, *Themeda triandra*) planted along the fauna corridor interface.

The batters around the allotment are to be mulched. The fire trail will remain unvegetated, and a strip of *Lomandra logifolia* and *Lomandra hystrix* proposed between the adjacent vegetation and the property boundary for a width of 10m to the north, between the fire trail and the property boundary to the east, and adjacent to the fire trail for a width of approximately 4m along the south. Adjacent areas beyond the fire trail and Lomandra buffer will be afforded similar treatments to the basin batters on the north and will comprise mulch treatments to the east. The easement containing the rising main and extending from the pump station is likely to be maintained with very low vegetated cover.

While the fire trail and adjacent Lomandra plantings immediately adjacent to the property boundary comprise low threat vegetation, the areas subject to revegetation or rehabilitation and in proximity to the east and southeastern side of the allotment are likely to form continuous vegetation to other areas of natural vegetation over time. That is, once the landscaping has become established and is off maintenance, the opportunity for Melaleuca and eucalypts to become self-sown amongst the heathy vegetation (with limited height of between 3m – 8m) is high, resulting in a higher bushfire risk developing over time and until the vegetation community reached maturity.

Areas of mulch treatment may also become overgrown with native vegetation unless the batters remain clear of shrubs and trees through an active spraying or harvesting program. The likelihood of this occurring once the landscaping is placed off maintenance would seem low, and therefore this assessment has considered the long term implications of this area comprising continuous vegetation with adjacent areas across the batters.

The vegetation associated with the bioretention basins, including the area to the north and proposed for landscaping involving Lomandra, grasses and occasional shrubs and trees. This is characteristic of communities supporting continuous low grass to tree cover and has been considered as such in this assessment.

The earthworks plan associated with the proposed development and showing the location of the batters and adjacent stormwater management infrastructure has been included in Appendix A of this report.

3.0 BUSHFIRE HAZARD ASSESSMENT

3.1 STATE ASSESSMENT METHODOLOGY

3.1.1 General

A site-specific bushfire hazard assessment is required to be prepared when a development site is located within a mapped Bushfire Hazard Area.

The *Sub-Precinct Specific Bushfire Hazard Assessment and Mitigation Plan* completed by Bushland Protection Systems Pty Ltd nominates a broader bushfire risk for the Sub-Precinct. This assessment focusses specifically on Lot 18 based on the updated plans that have been provided and a detailed site assessment considering the vegetation present on the ground at the time this assessment was completed.

The State government have described the methodology used to prepare the SPP mapping in the following publications:

- *Natural Hazards, Risk and Resilience — Bushfire State Planning Policy – state interest guidance material* (The Department of Infrastructure, Local Government and Planning, 2019)
- *Bushfire Resilient Communities. Technical Reference Guide for the State Planning Policy State Interest 'Natural Hazards, Risk and Resilience - Bushfire'* (Queensland Fire and Emergency Services, 2019).

The preparation of a Local Hazard Area Map has been undertaken for the site in accordance with the methodology described in the above referenced documents. The input parameters used to determine the bushfire hazard acting on the site are detailed in the sections below.

3.1.2 Vegetation Hazard Classes

Fuel loads need to be determined when preparing a bushfire hazard assessment. The Queensland Fire and Emergency Services (QFES) refers to the process for identifying, classifying and mapping vegetation hazard classes as a Vegetation Hazard Class Assessment. In accordance with the methodology outlined in Section 6 of the *Bushfire Resilient Communities* (QFES (2019)), the following vegetation hazard classes (VHC) were identified within the assessment area (which includes a 150m buffer surrounding the location of the subject site):

- VHC 16.1 – Eucalyptus dominated forest on drainage lines and alluvial plains;
- VHC 40.4 – Continuous low grass to tree cover; and
- VHC 42.6 – Nil to very low vegetation cover.

3.1.3 Maximum Landscape Slope

The slope of land underlying the surrounding vegetation is relatively flat and falling to the east. An average grade of 2 degrees has been applied. Vegetation to the north has been ascribed a lower grade of 1 degree as it is relatively flat.

3.1.4 Forest Fire Danger Index

The Queensland government produce a publicly available data package which includes selected inputs and information used by the CSIRO in conjunction with the QFES to prepare the State-wide Bushfire Hazard Area (Bushfire Prone Area) mapping (July 2014). The data includes Fire Weather Severity (Fire Danger Index - FDI). A review of the dataset for the subject site indicates that the site is located within a band of FDI 54.

For the area described as VHC 40.4 – Continuous low grass to tree cover located to the north of Lot 18, the community has been deemed to largely function as a grassland. Reference to Appendix B, Table B2 of AS3959 indicates a FDI of 50 is equivalent to a Grassland FDI of 70. As the adopted FDI is 54 for the subject site, an equivalent Grassland FDI of 76 has been adopted for this assessment.

4.0 LOCAL HAZARD MAP

4.1 GENERAL

The SPP reference documentation sets out the following methodology for preparing a Local Hazard Area Map:

- Categorising the vegetation within the site in accordance with the vegetation hazard classes derived from QFES (2019)
- Using the patch and corridor filtering process to remove narrow corridors and small patches of hazardous vegetation
- Subdividing the identified vegetation hazard classes into bushfire hazard sub-units based on slope differences and vegetation hazard classes
- Assigning SPP Potential Bushfire Intensity classes to the sub-units
- Application of 100m Potential Impact Buffers to the amended sub-units to derive an overall Local Hazard Map.

4.2 PATCH AND CORRIDOR FILTERING

Section 4.2.6 of *Bushfire Resilient Communities* (QFES (2019) outlines the patch and corridor filtering process to modify potential intensity of small patches and corridors (based on Leonard *et al.* 2017). The process involves the following three stages:

- Merging small patches of a single Vegetation Hazard Class less than 0.5 ha;
- Merging small Vegetation Hazard Class patches between 0.5 and 1 ha with higher or moderate fuel loads (greater than 8 tonnes/ha); and
- Removing narrow corridors of vegetation less than 50m wide through a process of patch erosion and dilation. These small patches are merged with surrounding vegetation by allocating a patch to the Vegetation Hazard Class that is most common to the patch boundary (Leonard *et al.*, 2017).

This process resulted in the detention basin, the small area of wetland vegetation proposed for the two stormwater basins to the north and the single stormwater basin to the south, as well as the Lomandra bed being joined to form a single community of continuous low grass to tree cover. While the basins comprise widths of between 20m and 30m, the landscaping plans show they will support sedges and native grasses, with occasional shrubs and trees. These areas were therefore included in VHC 40.4. The balance of the areas to the east and south that were completely devoid of vegetation at the time of the inspection are proposed to be mulched and it is anticipated that these areas will also become vegetated with similar vegetation to the adjacent natural areas over a number of years. Thus, the areas shown to support mulch treatment under the landscaping plan for the site have also been considered as VHC 16.1

The roadways, pump station, lawn areas as well as the new allotments were included as VHC 42.6 as they are characterised as very low vegetation cover.

For similar reasons, the water body to the east which could accord with VHC 43.6 – Water bodies or very low vegetation cover was also patch filtered out and included in the area of VHC 16.1 – Eucalyptus dominated forest on drainage lines and alluvial plains due to its narrow width.

4.3 CALCULATION OF POTENTIAL BUSHFIRE INTENSITY

Potential Bushfire Intensity is calculated by inputting the site-specific input parameters discussed in Section 3.1 into the FLAMESOL computer model. FLAMESOL uses industry standard bushfire equations and allows numerous input variables to be adjusted including fuel loads, fire danger index, site slope and distance to vegetation.

Table 1 details the Potential Bushfire Intensity classes and their corresponding potential fire-line intensity (KW/m) values as prescribed within Leonard *et. al.* 2017.

Table 1. Potential Bushfire Intensity

POTENTIAL BUSHFIRE INTENSITY	POTENTIAL FIRELINE INTENSITY
Very High	>40,000 kW/m
High	20,000-39,999 kW/m
Medium	4,000 – 19,999 kW/m

Figures 6-9 are presented below and have been prepared as per the above referenced methodology. Figure 8 specifically maps the local bushfire hazard associated with the current status of the site in which no or very limited vegetation is present on much of the area surrounding proposed Lot 18. Figure 9 reflects the local hazard attributed to the ultimate vegetation growth anticipated in the future following the release of the landscaping works proposed for the area surrounding proposed Lot 18 (with reference to the landscaping plan) from being on maintenance and natural regeneration of the mulched areas occurs over time.



LEGEND

- LOT 18, YARRABILBA
- 150m ASSESSMENT BUFFER
- UNIT REMOVED VIA PATCH FILTERING (<50m WIDTH)
- VHC 16.1 - EUCALYPT DOMINATED FOREST
- VHC 42.6 - NIL TO VERY LOW VEGETATION

FIGURE 6 - VEGETATION HAZARD CLASSES

URBAN CATALYST 3

ABN: 74 622 643 421

PO BOX 7044 SIPPY DOWNS QLD 4556

contact@urbancatalyst3.com

+61 412 788 532

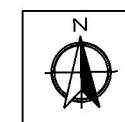
CLIENT: EVANCREEK PTY LTD ATF THE ESMEROSE TRUST

PROJECT: BUSHFIRE HAZARD ASSESSMENT

ADDRESS: LOT 18, YARRABILBA

PROJECT NUMBER: 21-059

DATE: 17/10/2023



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Sub Unit 1						
Vegetation Hazard Class	Combined Surface and Near Surface Fuel Load (t/ha)	Total Fuel Load (t/ha)	Forest Fire Index	Maximum Landscape Slope (degrees)	Fire Intensity (kW/m)	Potential Bushfire Intensity
VHC 16.1 - Eucalypt dominated forest on drainage lines	13.8	16	54	2	8,486	Medium

Sub Unit 2						
Vegetation Hazard Class	Combined Surface and Near Surface Fuel Load (t/ha)	Total Fuel Load (t/ha)	Forest Fire Index	Maximum Landscape Slope (degrees)	Fire Intensity (kW/m)	Potential Bushfire Intensity
VHC 42.6 - Nil to very low vegetation cover	2	2	54	1	143	Low

- LEGEND
- LOT 18, YARRABILBA
 - 150m ASSESSMENT BUFFER
 - MEDIUM POTENTIAL BUSHFIRE INTENSITY
 - LOW POTENTIAL BUSHFIRE INTENSITY

FIGURE 7 - SUB-UNIT HAZARD MAP





LEGEND

- LOT 18, YARRABILBA
- 150m ASSESSMENT BUFFER
- MEDIUM POTENTIAL BUSHFIRE INTENSITY
- POTENTIAL IMPACT BUFFER
- LOW POTENTIAL BUSHFIRE INTENSITY

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ABN: 74 622 643 421

PO BOX 7044 SIPPY DOWNS QLD 4556

contact@urbancatalyst3.com

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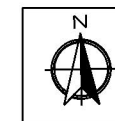
PROJECT: BUSHFIRE HAZARD ASSESSMENT

ADDRESS: LOT 18, YARRABILBA

PROJECT NUMBER: 21-059

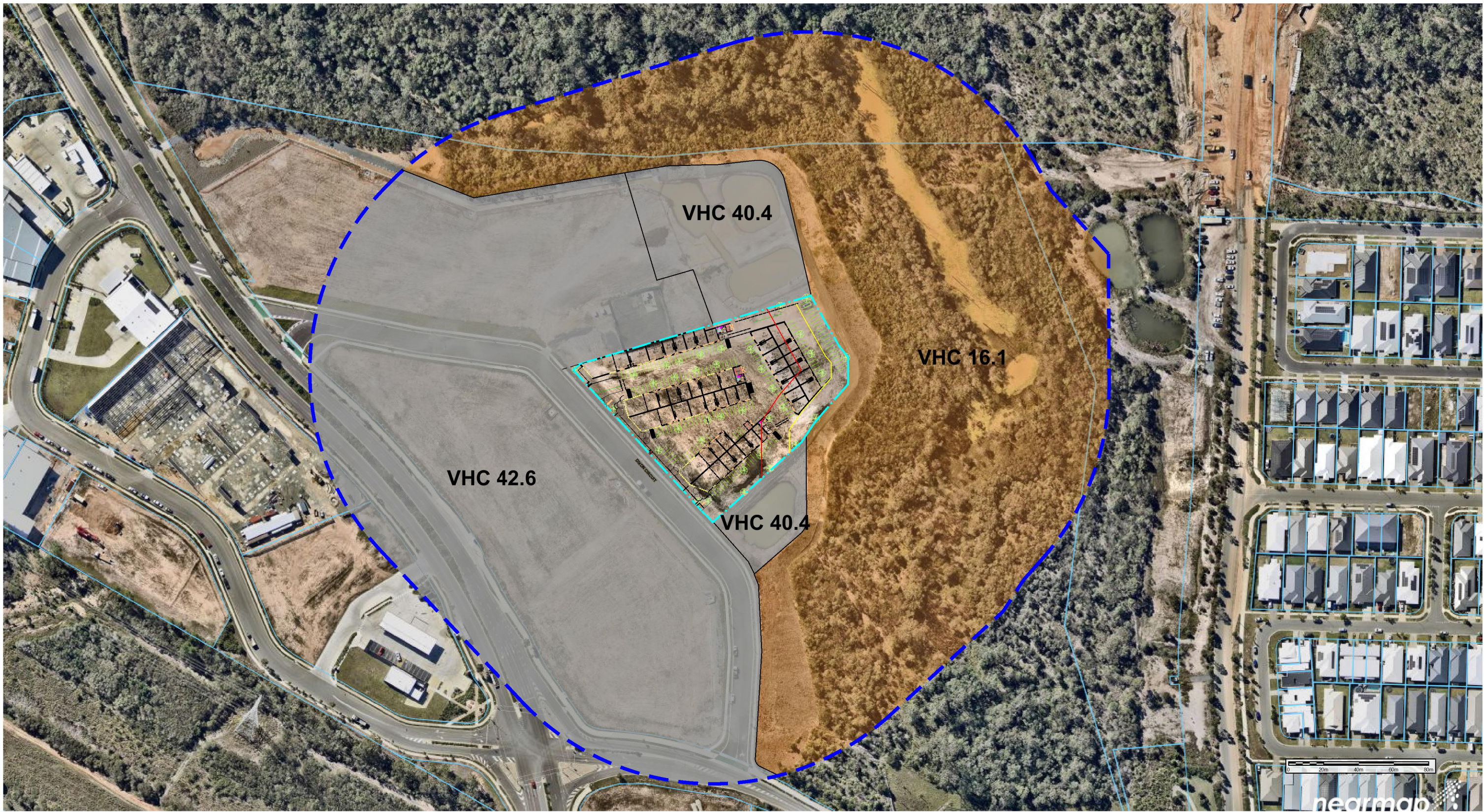
DATE: 17/10/2023

FIGURE 8 - LOCAL HAZARD MAP



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- LEGEND**
- LOT 18, YARRABILBA
 - 150m ASSESSMENT BUFFER
 - MEDIUM POTENTIAL BUSHFIRE INTENSITY
 - LOW POTENTIAL BUSHFIRE INTENSITY
 - 29Kw/m2 SEPARATION - 9.6m
 - 10Kw/m2 SEPARATION - 25.5m

**FIGURE 9 - LOCAL HAZARD MAP
 POST DEVELOPMENT**



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5.0 BUSHFIRE IMPACT REDUCTION

5.1 GENERAL

The site assessment concluded that proposed Lot 18 is to be located within a potential impact buffer adjacent to an area subject to medium potential bushfire intensity. As the proposed development has been confirmed to be located within a potential impact buffer area, several measures are proposed to mitigate impacts associated with bushfire. The measures nominated will reduce the risk of bushfire impact to people and property and have been determined with reference to:

- *Department of State Development, Manufacturing, Infrastructure and Planning's State Planning Policy – State interest guidance material – Natural hazards, risk and resilience – Bushfire (December 2019)*
- *Queensland Fire and Emergency Services. (2019). Planning for Bushfire Resilient Communities.*

5.2 SETBACKS

Assessment Benchmark 4 of the State Planning Policy – state interest guidance material states: Development supports, and does not hinder, disaster management response or recovery capacity or capabilities. Where reconfiguring a lot creating lots of greater than 2000 square metres, to ensure emergency access and operational space for firefighters the subdivision layout results in lots that are sited so that they are separated from the closest edge to the adjacent medium, high or very high potential bushfire intensity area by a distance that achieves a radiant heat flux level of 29 kW/m² or less at:

1. The building envelope, if identified at RaL stage, or
2. Where a building envelope is not identified, at all the lot boundaries.

Compliance with Assessment Benchmark 4 can be attained where proposed buildings are sufficiently separated from the nearby forest hazard so that a radiant heat flux level at any point on the building envelope does not exceed 29 kW/m². The setback must be maintained as a dedicated Asset Protection Zone which comprises only low threat vegetation, such as maintained lawns and cultivated gardens or are designed to ensure a potential available fuel load is maintained at less than 8 tonnes/hectare in aggregate and with a fuel structure that remains discontinuous.

In addition, Compliance with Assessment Benchmark 6 requires risks to public safety and the environment from the location of hazardous materials and the release of these materials as a result of a natural hazard are avoided. Tenancies involving low impact industrial activities that include hazardous material storage will require maximum exposure to a radiant heat flux level of the 10kW/m². The glossary in the SPP sets out a hazardous material means a substance with potential to cause harm to persons, property or the environment because of one or more of the following:

- the chemical properties of the substance

- the physical properties of the substance
- the biological properties of the substance.

An example of hazardous material storage could include a diesel or gas storage associated with industrial activities.

5.3 SETBACK CALCULATIONS

Modelling has been undertaken to determine the setback distance required for the proposed buildings to achieve the recommended 29kW/m^2 separation. The models used comprise industry standard bushfire equations using the FLAMESOL computer model. The FLAMESOL Minimum Distance calculator has been used and comprises an AS3959 Method 2 based calculator which can determine a suite of bushfire behaviour variables including the minimum distances required to achieve a range of different radiant heat level exposures.

The quantitative modelling output has been used to identify the setback requirements to achieve the $<29\text{ kW/m}^2$ radiant heat flux SPP requirement. The modelling output is shown in Figure 10 for VHC 16.1. The results of the modelling exercise has been shown in Table 2.

Table 2. Radiant Heat Flux Minimum Setbacks to secure $<29\text{kW/m}^2$ and $<10\text{kW/m}^2$

Vegetation Description	$<29\text{ kW/m}^2$ Setback	$<10\text{ kW/m}^2$ Setback
VHC 16.1 – Eucalyptus dominated forest on drainage lines and alluvial plains	9.6m	25.5m

Modelling of VHC 40.4 has been assessed for the higher grassland FDI of 76 using the Flamesol Method 2 minimal distance calculator. The model output has been included below in Figure 11. A setback of 10m is calculated to achieve exposure to a radiant heat flux level of 20.39 kW/m^2 which is in compliance with the 29 kW/m^2 radiant heat flux level nominated in the Assessment Benchmark under the SPP.

The proposed industrial development is required to be setback a minimum distance of 9.6m from the adjacent vegetation to the east and the southeast. The medium potential bushfire intensity vegetation that will ultimately exist to the south of the lot is separated from the proposed buildings by a distance of at least 10m as shown in the architectural plans. The location of a sewer easement within the south eastern and eastern extents of the site enables the inclusion of a setback within the property that exceeds the 9.6m setback from adjacent hazardous vegetation without encroaching into the developable area of the allotment.



Calculated October 16, 2023, 7:58 am (MDc v.4.9)

Lot 18 Dixon Cct, Yarrabilba - VHC 16.1

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	54	Rate of spread	1.02 km/h
Vegetation classification	Forest	Flame length	8.59 m
Understorey fuel load	13.8 t/ha	Flame angle	55 °, 66 °, 74 °, 79 °, 81 ° & 86 °
Total fuel load	16 t/ha	Elevation of receiver	3.26 m, 3.58 m, 3.62 m, 3.48 m, 3.35 m & 1.88 m
Vegetation height	n/a	Fire intensity	8,486 kW/m
Effective slope	2 °	Transmissivity	0.884, 0.871, 0.852, 0.83, 0.8169999999999999 & 0.746
Site slope	2 °	Viewfactor	0.5866, 0.4362, 0.2912, 0.1974, 0.1608 & 0.0439
Flame width	100 m	Minimum distance to < 40 kW/m ²	7.1 m
Windspeed	n/a	Minimum distance to < 29 kW/m ²	9.6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m ²	14.4 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m ²	21.1 m
		Minimum distance to < 10 kW/m ²	25.5 m

Rate of Spread - McArthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Figure 10: Flamesol Modelling for VHC 16.1

Vegetation to the south west will also be separated by a distance in excess 14.9m width which is in excess of the 10m requirement nominated for vegetation conforming to the definition of VHC 40.4. The proposed structures associated with Building A, Building F and Building G are all located in excess of 10m from the potentially hazardous vegetation to the north. While Building F and Building G are separated from the northern boundary by an access and landscaping in excess of 10m width, Building A extends up to edge of the northern property boundary. Notwithstanding the land to the north adjacent to Building A comprises developed land associated with the sewer pump station and the designated lawn area immediately east of the pump station infrastructure. Accordingly, Building A remains in excess of 10m from the VHC 40.4 hazardous vegetation to the north.

Revegetation or rehabilitation which maintains a potential available fuel load which is less than 8 tonnes/ha in aggregate and fuel structure which is discontinuous may be contained within an asset protection zone under Assessment Benchmark 5 of the SPP. Landscaping along the northern property boundary will be required to accord with these fuel requirements.



Calculated October 16, 2023, 8:08 am (BALc v.4.9)

Lot 18 Dixon Cct, Yarabilba - VHC 40.4

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Grassland Fire Danger Index	76	Rate of spread	10.58 km/h
Vegetation classification	Grassland	Flame length	6.23 m
Understorey fuel load	4.5 t/ha	Flame angle	73 °
Total fuel load	5 t/ha	Panel height	5.96 m
Vegetation height	n/a	Elevation of receiver	2.8 m
Effective slope	1 °	Fire intensity	27,346 kW/m
Site slope	1 °	Transmissivity	0.867
Distance to vegetation	10 m	Viewfactor	0.3093
Flame width	100 m	Radiant heat flux	20.39 kW/m ²
Windspeed	n/a	Bushfire Attack Level	BAL-29
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Noble et al. 1980

Flame length - Purton, 1982

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Figure 11: Flamesol Modelling for VHC 40.4

5.4 FIRE TRAILS

A fire trail is proposed around proposed Lot 18 providing vehicle access between the allotment and the adjacent bushland. The fire trail should be designed and constructed in accordance with the design parameters in Table 4 of the *Department of State Development, Manufacturing, Infrastructure and Planning's State Planning Policy – State interest guidance material – Natural hazards, risk and resilience – Bushfire (December 2019)*. This includes the following key elements:

1. A trafficable area (cleared and formed):
 - a. with a minimum width of 4 metres that can accommodate a rural firefighting vehicle
 - b. with no less than 4.8 metres vertical clearance from canopy vegetation
 - c. with no adjacent inhibiting embankments or retaining walls
2. A working area each side of the trafficable area:
 - a. with a minimum width of 3 metres each side
 - b. cleared of all flammable vegetation greater than 0.1 metre in height.

Reference to the design details provided in the *Sub-Precinct Specific Bushfire Hazard Assessment and Mitigation Plan* completed by Bushland Protection Systems Pty Ltd suggests a clear width of 6m is provided, with only 4m forming a constructed trail. Where the fire trail deviates from the property boundary, the vegetation between the lot boundary and the fire trail is to be planted with dense *Lomandra* to achieve low fuel levels.

5.5 LANDSCAPING & VEGETATION MANAGEMENT

The areas within the asset protection zone within the subject land are to be maintained in a low fuel state in perpetuity. Assessment Benchmark 5 of the SPP Bushfire 2019 seeks that the site layout places the landscape and open spaces between premises and adjacent mapped medium, high or very high potential bushfire intensity areas. This landscaping and open space comprises protective landscape treatments that:

1. Comprise only low threat vegetation; or
2. Are designed to ensure a potential available fuel load is maintained at less than 8 tonnes/hectare in aggregate and with a fuel structure that remains discontinuous. The vegetation contained within the setback shall satisfy Assessment Benchmark 5 of the SPP Bushfire 2019 and the low threat vegetation criteria prescribed in Section 2.2.3.2 of AS3959.

5.6 WATER SUPPLY

Reticulated water supply is provided to the site.

5.7 VEHICULAR ACCESS

Access from all buildings on the site will be required to provide connectivity to Dixon Circuit. The access driveway will be constructed on a low grade, in a low hazard area and will convey traffic away from the likely bushfire hazard with low potential for egress to be constrained. No specific access provisions are recommended.

6.0 CONCLUSION

The Bushfire Hazard Assessment and Management Plan prepared for proposed Lot 18 on Dixon Circuit has been prepared to assess the degree of bushfire hazard and potential bushfire risk acting on the proposed allotment. A Local Hazard Map has been prepared for the site consistent with the State Planning Policy – Natural Hazards, Risk and Resilience – Technical Manual. The Local Hazard Map Post Development has identified that the areas able to accommodate structures on the proposed allotment are within a potential impact buffer area associated with the adjacent medium potential bushfire intensity area. The proposed development has been considered against the relevant assessment benchmarks under the State Planning Policy and is deemed to comply with the relevant requirements where 9.6m of clearing or low threat vegetation is retained between buildings and adjacent vegetated areas to the east and southeast. A setback of 10m is proposed between hazardous vegetation and buildings in the southwest and the north of the site. All building setback can be completely contained within the allotment.

Of note, bushfire can be unpredictable and requires adequate preparatory planning and actions to be undertaken in order to minimise impacts to property and potential loss of life. This assessment has been prepared with consideration of site conditions observable at the time of inspection, the distance between the proposed development and potentially hazardous vegetation, the extent of fragmentation occurring within the landscape and the nature of the uses proposed. The hazard assessment methodologies described in this report are not based on assessments of catastrophic bushfire events which may occur from time to time. The unpredictable nature of bushfires prevents any guarantee being provided that the area will not be affected by bushfire at some time. Property owners and site users should be aware of the potential consequences of such events and should take responsibility for the protection of property and personnel accordingly.

7.0 REFERENCES

Leonard, J., Opie, K. (2017). *Estimating the potential bushfire hazard of vegetation patches and corridors. An enhancement of Queensland's methodology for State-wide mapping of bushfire prone areas*. CSIRO Land & Water, Australia.

Queensland Fire and Emergency Services. (2019). *Bushfire Resilient Communities - Technical Reference Guide for the State Planning Policy - State Interest Guideline - Natural Hazards, Risk and Resilience 2- Bushfire*.

The State of Queensland, Department of State Development, Manufacturing, Infrastructure and Planning (2019). *Natural hazards, risk and resilience - Bushfire State Planning Policy – state interest guidance material*.

APPENDIX A – Functional Layout Earthworks Plan

DO NOT SCALE THIS DRAWING
IF IN DOUBT - ASK!

LOCALITY PLAN

Revisions

No.	Description	By	Date
A	FOR APPROVAL	20.09.19	DES
B	FOR APPROVAL	14.03.19	GPC
C	FOR APPROVAL	04.12.18	GPC
D	FOR APPROVAL	08.09.20	GPC
E	FOR APPROVAL	01.02.21	GPC
F	LOT 18 BOUNDARY UPDATED	30.04.21	JAS

Approved Consultants

Project

YARRABILBA

PRECINCT 3D-NORTH

PRELIMINARY PLANNING

FUNCTIONAL DRAWINGS

KN GROUP PTY LTD

CONSULTING ENGINEERS

LEVEL 1 - 42 ASTOR TCE
SPRING HILL QLD 4000
PHONE 07 3017 1900
EMAIL kn@knptl.com.au
ABN 35 112 053 611

Expiry Date: 30/03/2020

Drawing Title

**FUNCTIONAL LAYOUT
EARTHWORKS PLAN**

Drawn: RCT

Checked: GPC

Date: SEP 19

Scale: 3 of 4

Revision: F

AS SHOWN

Drawing No: **A1 15-111-SK113**

