

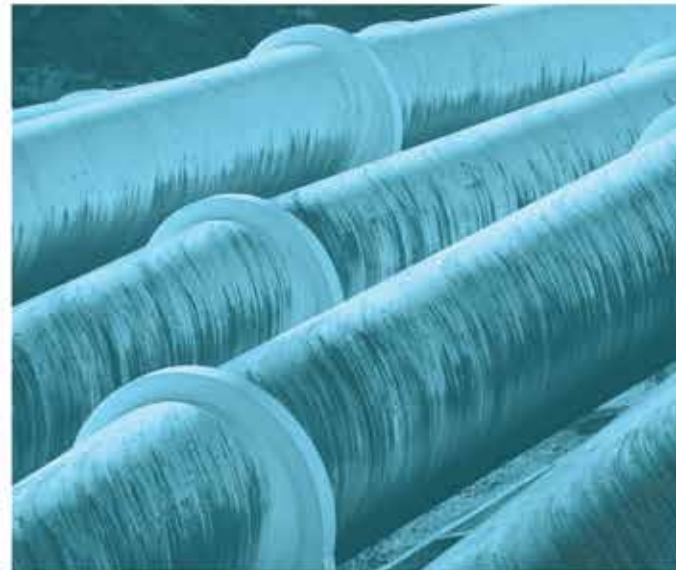


APPENDIX N –
BUSHFIRE ASSESSMENT



Luddenham Advanced Resource Recovery Centr

Prepared for Coombes Property Group & KLF Holdings Pty Ltd
June 2020





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Luddenham Advanced Resource Recovery Centre

Bushfire assessment

Report Number

J190749 RP#27

Client

Coombes Property Group and KLF Holdings Pty Ltd

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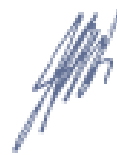
v1 Final

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17 June 2020

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1 Introduction

1.1 Project background

CFT No 13 Pty Ltd, a member of Coombes Property Group (CPG), has recently acquired Lot 3 in DP 623799 ('the subject property') at 275 Adams Road, Luddenham New South Wales (NSW) within the Liverpool City Council Local Government Area (LGA) of NSW (Figure 1.1).

CPG has the following staged vision to the long-term development of the subject property:

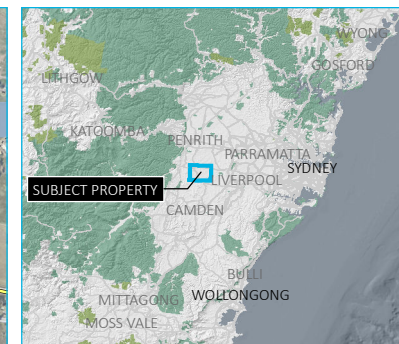
- Stage 1 Quarry Reactivation: **Solving a problem.** CPG intends to responsibly avoid the sterilisation of the remaining natural resource by completing the extraction of shale which is important to the local construction industry as raw material used by brick manufacturers in Western Sydney. Following the completion of approved extraction activities, the void will be prepared for rehabilitation.
- Stage 2 Advanced Resource Recovery Centre and Quarry Rehabilitation: **A smart way to fill the void:** CPG in partnership with KLF Holdings Pty Ltd (KLF) and in collaboration between the circular economy industry and the material science research sector, intends to establish a technology-led approach to resource recovery, management, and reuse of Western Sydney's construction waste, and repurposing those materials that cannot be recovered for use to rehabilitate the void. This will provide a sustainable and economically viable method of rehabilitating the void for development.
- Stage 3 High Value Employment Generating Development: **Transform the land to deliver high value agribusiness jobs.** CPG intends to develop the rehabilitated quarry site into a sustainable and high-tech agribusiness hub supporting food production, processing, freight transport, warehousing, and distribution, whilst continuing to invest in the resource recovery research and development (R&D) initiatives. This will deliver the vision of a technology-led agribusiness precinct as part of the Aerotropolis that balances its valuable assets including proximity to the future Western Sydney Airport (WSA) and Outer Sydney Orbital.

This bushfire assessment relates to a new development application for the development and operation of the Advanced Resource Recovery Centre (ARRC) (the project) relating to the delivery of Stage 2 above. This report has been prepared by EMM Consulting Pty Limited (EMM) on behalf of the applicants.

KLF is an Australian-owned and operated waste management company that operates two strategically located resource recovery and recycling facilities in Sydney; one at Camellia and another at Asquith. KLF has 20 years' experience in the waste recycling and resource recovery industry. KLF facilities are licensed by the NSW Environment Protection Authority (EPA) and have full International Organisation for Standardisation (ISO) accreditation.

There is an existing clay and shale quarry on the subject property approved under Development Consent DA-315-7-2003, as modified. The quarry is currently inactive. CPG and KLF (the 'applicants') have commenced the application process to modify the quarry's consent to allow quarry operations to recommence, with the primary intention of changing the approved access to the subject property to allow quarry operations (Modification 5, also referred to as MOD 5). It is proposed to develop the ARRC within the same lot to the north of the existing quarry void.

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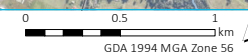
- KEY**
- Subject property
 - ARRC site
 - Western Sydney Airport
 - Major road
 - Minor road
 - Vehicular track
 - Watercourse/drainage line
 - NPWS reserve (see inset)
 - State forest (see inset)

Regional context

Luddenham Advanced Resource
Recovery Centre
Bushfire Assessment
Figure 1.1



Source: EMM (2020); DFSI (2017); Nearmap (2020)



1.2 The project

CPG and KLF propose to develop the ARRC within the subject property to the north of the existing quarry void (Figure 1.1).

The project is integral in achieving the intended future agribusiness/industrial land use for the subject property as the project provides a commercially viable means to fill the quarry void (subject to separate development consent). This will support the Western Sydney Airport and ongoing development of the Western Sydney Aerotropolis.

A new State significant development (SSD) consent under Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) is required to establish and operate the ARRC. On 24 April 2020, the Secretary of the Department of Planning, Industry and Environment (DPIE) issued Secretary's Environmental Assessment Requirements (SEARs) for the environmental impact statement (EIS) for the project. The SSD consent application number is SSD-10446.

A detailed description of the project is provided within the EIS (EMM 2020a), to which this bushfire assessment is appended, with the key components summarised as follows:

- construction and operation of an advanced construction and demolition resource recovery centre;
- all acceptance, processing, storage and dispatch of waste and recycled product will be carried out within an enclosed warehouse;
- accepting and processing up to 600,000 tonnes per annum (tpa) of waste for recycling;
- dispatch of up to approximately 540,000 tpa of recycled product;
- dispatch of approximately 60,000–120,000 tpa of non-recyclable residues either to an offsite licensed waste facility or to the adjacent quarry void (following approval to place the non-recyclable residues in the void);
- upgrade the access road from the subject property to Adams Road;
- use of the access road from the subject property to Adams Road; and
- the ARRC will operate up to 24 hours a day, 7 days per week.

The ARRC will accept general solid waste comprising building and demolition waste as well as selected commercial and industrial waste. No special, liquid, hazardous, restricted solid waste, putrescible solid waste, or odorous waste will be accepted at the ARRC.

The vast majority of materials accepted will be recovered, the remaining minor amount (10–20%) of non-recyclable residues will be disposed of at an offsite licensed landfill or to the quarry void on the site as part of rehabilitating the void (subject to a future separate consent).

1.3 The site and surrounds

The subject property is approximately 19 hectares (ha) and bordered to the east and south by the Commonwealth-owned Western Sydney Airport (WSA) site (Figure 1.1). The construction of WSA is currently underway, including bulk earthworks and road infrastructure upgrades. Other surrounding land uses include a mix of agricultural, rural industrial and commercial, and rural residential development. Oaky Creek forms the eastern boundary of the subject property. The subject property is battle-axe in shape with a thin corridor providing the access from Adams Road, which is a local road joining Elizabeth Drive about 500 metres (m) north of the site and The Northern Road about 2.5 km south of the site.

It is proposed to develop the ARRC on the northern portion of the subject property (the ARRC site). The ARRC site is approximately 3 ha in area. This ARRC site is currently grassed, and there are small vegetation patches in the northern portion with more extensive vegetation along Oak Creek on the eastern part of the subject property.

1.4 Legislative context

1.4.1 NSW Environmental Planning and Assessment Act 1979

Under Section 10.3 of the EP&A Act, the identification of bushfire prone land is required for all LGAs. The bushfire prone land mapping for each LGA provides the trigger for consideration of the provisions of *Planning for Bushfire Protection 2019* (NSW Rural Fire Service) (NSW RFS) (herein referred to as PBP) for new development on land which is bushfire prone.

The ARRC site is partially mapped as bushfire prone (vegetation category 1 and buffer) on the Liverpool City Council bushfire prone land map (Figure 1.2). Vegetation category 1 is considered the highest risk for bush fire and includes areas of forest, woodlands, heaths, forested wetlands and timber plantations (NSW RFS 2019). Vegetation category 1 is given a buffer of 100 m, with the buffer also representing bushfire prone land. As the ARRC site is partially mapped as bushfire prone, the provisions of PBP are to be considered, where applicable to the development type.

Under Section 4.14 of the EP&A Act, SSD projects are exempt from requiring a bushfire safety authority (BFSa). However, given the scale of many SSD projects, the requirements of PBP should be applied as appropriate, and consultation with NSW RFS is encouraged. Even where comments are sought at the approval stage of a project, further consultation with NSW RFS may be required at subsequent stages of project development (eg during detailed design).

1.4.2 NSW Rural Fires Act 1997

The objectives of the *NSW Rural Fires Act 1997* (RF Act) are to:

- prevent, mitigate, and suppress bush and other fires in NSW;
- co-ordinate bushfire fighting and bushfire prevention throughout the State;
- protect people from injury or death and property from damage as a result of bushfires; and
- protect the environment.

The RF Act places emphasis on cooperative fire management and wildfire suppression planning between the various organisations involved in fire management. With respect to the ARRC site and dependent on the fire emergency, either the NSW RFS or Fire and Rescue NSW (FRNSW) would respond to fill the role of designed combat agency and/or assist as the secondary agency. It is also noted that under section 63 of the RF Act, owners and occupiers of land have a duty to take practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bushfires on or from that land.

Part 3, division 4 of the RF Act stipulates that the Bush Fire Coordinating Committee (BFCC) must constitute a Bush Fire Management Committee (BFMC) for each area in NSW that is subject to the risk of bushfires. Each BFMC is required to prepare and submit to the BFCC a draft Bush Fire Risk Management Plan (BFRMP), a strategic document that identifies community assets at risk and sets out a five year program of coordinated multi-agency (including NSW RFS and FRNSW) treatments to reduce the risk of bushfire to the assets identified. The project occurs within the Macarthur BFMC area.

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KEY

- Subject property
- ARRC site
- Cadastral boundary
- Watercourse
- Bushfire prone land
- Vegetation Category 1
- Buffer

Bushfire prone land mapping

Luddenham Advanced Resource
Recovery Centre
Bushfire Assessment
Figure 1.2

1.4.3 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) details mechanisms for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the NSW Biodiversity Conservation Regulation 2017 (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes the Biodiversity Assessment Method (BAM, OEH 2017) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions (including bushfire protection measures such as the implementation of hazard reduction and asset protection zones) on threatened species and threatened ecological communities (TECs) and their habitats and determine offset requirements.

1.4.4 Planning for bushfire protection

The ARRC site is partially mapped as bushfire prone land, therefore consideration must be given to the following overall aims and objectives of PBP:

- afford buildings and their occupants protection from exposure to a bushfire;
- provide for a defensible space to be located around buildings;
- provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
- ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- provide for ongoing management and maintenance of bushfire protection measures; and
- ensure that utility services are adequate to meet the needs of fire fighters.

PBP provides an assessment framework for the potential impacts of bushfire upon the proposed new assets and establishes bushfire protection measures that are to be addressed and collectively form an effective mitigation strategy in order to reduce the bushfire impacts. The bushfire protection measures are:

- assets protection zones (APZs);
- access;
- construction, siting, and design;
- landscaping;
- services; and
- emergency and evacuation planning.

For the purposes of this bushfire assessment report and in keeping with PBP, the project is considered 'other development', as it is not residential subdivision, residential infill, or Special Fire Protection Purpose (SFPP). No bushfire specific performance requirements are provided in the National Construction Code 2019 (NCC) for class 5 to 8 buildings (which include offices, shops, factories, warehouses, public car parks and other commercial or industrial facilities). Therefore, *Australian Standard 3959 -2018 Construction of Buildings in Bushfire-prone Areas* (AS 3959) or the National Association of Steel Framed Housing (2014) *Steel Framed Construction in Bush Fire Areas* (NASH Standard) does not apply as a set of 'deemed to satisfy' provisions. General fire safety provisions and the methodology for determining the bushfire attack level (BAL) (Section 2 of AS 3959-2018) are taken as acceptable solutions. The aims and objectives of PBP apply in relation to other matters such as access, emergency and evacuation planning, water supply and other services. Specifically:

- to provide safe access to/from the public road system for firefighters providing property protection during a bushfire and for occupant egress for evacuation;
- to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development;
- to provide adequate services of water for the protection of buildings during and after the passage of bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and
- to provide for the storage of hazardous materials away from the hazard wherever possible.

Mitigation measures as appropriate for the project are discussed in Chapter 3.

1.5 Aim of this assessment

The SEARs for the project, issued on 24 April 2020, specify assessment of:

- 'Fire and incident management - including a bushfire assessment report...'

Further, the NSW RFS, in their agency input dated 14 April 2020, specify:

'a bush fire assessment report shall be prepared which identifies the extent to which the proposed development conforms with or deviates from the relevant provisions of *Planning for Bush Fire Protection 2019*'.

This bushfire assessment has been prepared for inclusion into the EIS for the project and provides an overview of the existing environment related to bushfire hazard and an assessment of the potential bushfire hazards associated with the project. Based upon this, the report will identify how the bushfire protection measures and aims and objectives of PBP are met. Recommendations in line with PBP, are also provided for bushfire mitigation during the construction and operation of the project. These recommendations address how a bushfire impacting on the project, and the risk of fire potentially emanating from the project should be managed including recommendations to facilitate a coordinated response to bushfire risks.

The SEARs for the project also specify that the EIS provide assessment on a range of additional fire and incident management measures particularly in regard to the appropriate FRNSW guidelines. This bushfire assessment addresses only the NSW RFS agency input, specifying that 'a bush fire assessment report shall be prepared which identifies the extent to which the proposed development conforms with or deviates from the relevant provisions of *Planning for Bush Fire Protection 2019*'. The EIS addresses these additional fire and incident requirements (refer to Section 2.2.8 Fire management and Section 6.9 Hazards of the EIS). It is acknowledged that there are some parallels in the relevant provisions of PBP and FRNSW guidelines (FRNSW 2019a and FRNSW 2019b), particularly in regard to access and water supply, in these cases the more rigorous management measure has and will continue to be adopted during the design process.

1.6 Assessment method

Bushfire risks associated with the project have been assessed in accordance with PBP, with the following steps undertaken in the assessment process:

- determine whether the ARRC site has been mapped as bushfire prone land and requires compliance with PBP (Figure 1.2);
- identify the location, extent, and vegetation formation of any bushland on or within 140 m of the ARRC site (Section 2.1);
- identify the slope and aspect of the ARRC and of any bushfire prone land within 100 m of the ARRC site (Section 2.2);
- identify any features on or adjoining the ARRC site that may mitigate the impact of a bushfire on the proposed development (Section 2.3);
- identify access, water supplies, asset protection zones (APZs), BAL requirements (where relevant to the development type) and building footprint in relation to the bushfire hazards (Chapter 3);
- identify and assess the likely environmental impact of any proposed bushfire protection measures (Chapter 3); and
- identify calculated BAL construction levels (where relevant to the development type) (Chapter 3).

2 Bushfire hazard assessment

2.1 Vegetation assessment

The project is set amongst a historically cleared landscape where the majority of native vegetation has been partially or fully cleared for grazing and cropping. However, patches of native vegetation that represent a bushfire hazard (forested wetland and woodland) remain along riparian corridors, road reserves and as scattered remnant patches in the landscape surrounding the ARRC site. The grassland within the surrounding landscape also presents a bushfire hazard.

In accordance with Appendix 1 of PBP, vegetation within 140 m of the ARRC site was assessed to determine its formation and classification. Plant community type mapping within the subject property has been undertaken by EMM (2020b) for the biodiversity assessment for the project. In addition, regional vegetation mapping (OEH 2015) has been used to assess vegetation beyond that mapped by EMM (2020b). The plant community types (PCTs) surrounding the ARRC site with corresponding vegetation formation (Keith 2004) and vegetation classification (as per PBP and AS 3959) are listed within Table 2.1 and shown in Figure 2.1. The applicable Fire Danger Index (FDI) is also shown within Table 2.1, which is used in the calculation of asset protection zone (APZ) dimensions (refer to Section 3.2.1).

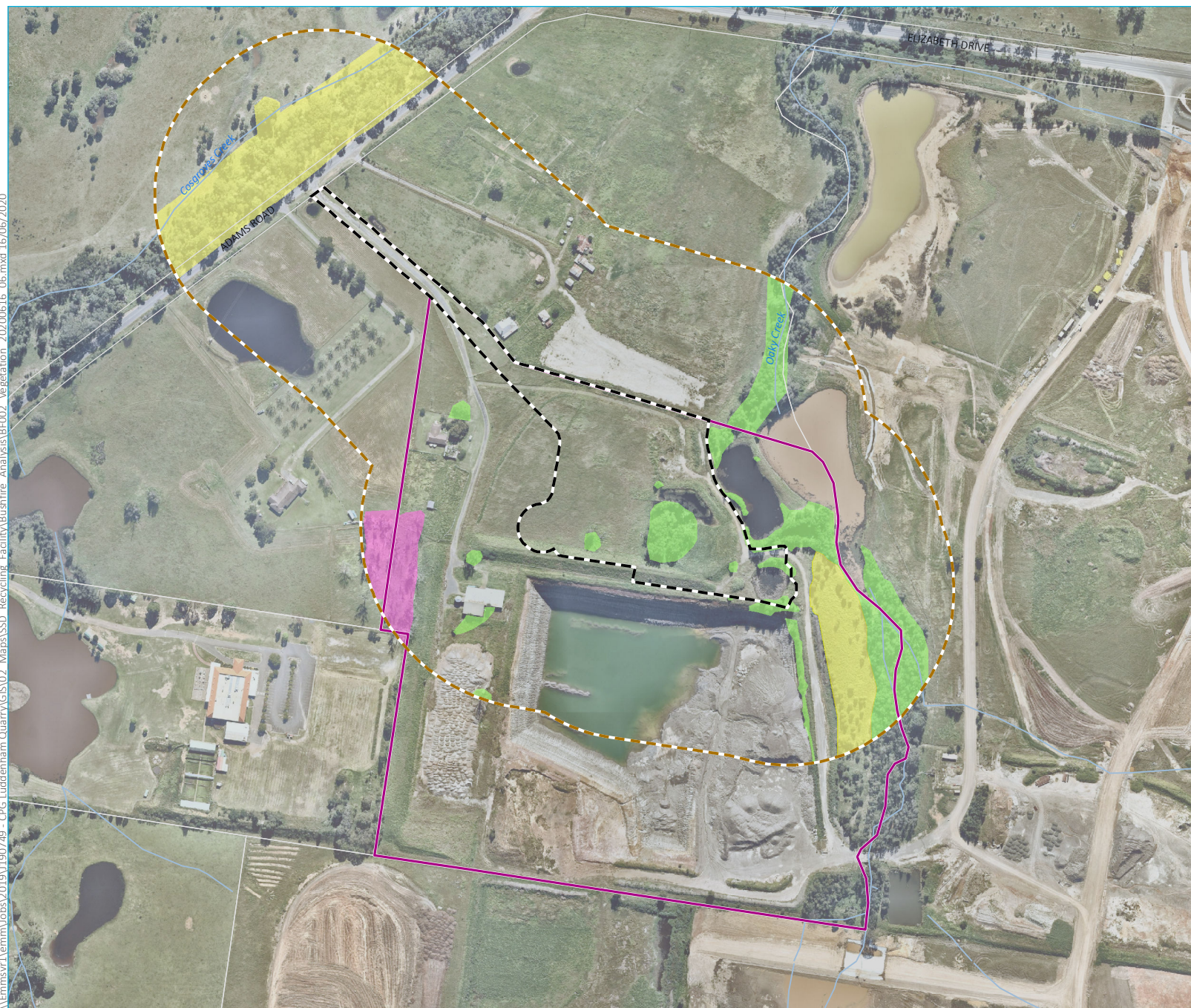
Table 2.1 Vegetation formations mapped within 140 m of the ARRC site

Plant community type (PCT)	Vegetation formation (Keith 2004)	PBP/AS 3959 classification	Proximity to RRC site	Fire Danger Index (FDI)
PCT 1800 – Swamp Oak open forest on river flats of the Cumberland Plain and Hunter Valley	Forested Wetlands	Forested Wetland	North-east, east	100
PCT 849 – Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Grassy Woodlands	Grassy and Semi-Arid Woodland	South-west	100
PCT 835 – Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Forested Wetlands	Forested Wetland	South-east	100
Exotic dominated grassland	Grasslands	Grassland	North, north-west, west, southwest	100
Managed land – roads, managed gardens and lawns within curtilage of buildings, the existing quarry site	Excluded	Excluded	South, south-west, west	Excluded

EMM (2020b) only mapped native vegetation within the subject property. Similarly, OEH (2015) only map areas of woody native vegetation within the surrounding landscape. All other unmapped areas within 140 m of the ARRC site boundary is grassland dominated by exotic grass and forb species, or managed land (roads, managed gardens and lawns within curtilage of buildings, the existing quarry site). The fuel load is significantly reduced in areas of managed vegetation, and completely removed at the quarry site. Photographs of the vegetation for each aspect surrounding the ARRC site are provided within Appendix A.

The vegetation surrounding the ARRC site falls into the Forested Wetland, Grassy Woodland and Grassland classifications of PBP and AS 3959. More detail on the vegetation at each aspect and in relation to the effective slope, is provided within the following Section 2.2.

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KEY

- Subject property
- ARRC site
- 140 m buffer
- Cadastral boundary
- Watercourse

Plant community type (PCT)

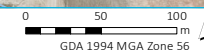
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Vegetation surrounding the ARRC Site

Luddenham Advanced Resource Recovery Centre
Bushfire Assessment
Figure 2.1



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020); DOE (2020)



2.2 Effective slope

Section A1.5 of PBP states that effective slope is the slope of the ground under the hazard (vegetation). When identifying effective slope, it may be found that there are a variety of slopes covering different distances within the vegetation. Effective slope is considered to be the slope under the vegetation which will most significantly influence bushfire behaviours for each aspect. This is usually the steepest slope.

Effective slope has been assessed in accordance with Appendix 1 of PBP. The effective slope for each aspect that contains a vegetation hazard has been calculated through a combination of topographic mapping (2 m contours), aerial imagery interpretation and ground truthing of vegetation mapping (during the biodiversity assessment for the project). The effective slope measured 100 m from the proposed ARRC site boundary and under adjacent vegetation are listed in Table 2.2 and shown within Figure 2.2.

Based on site survey observations, the EMM (2020b) and OEH (2015) mapping has been modified for the purposes of this assessment, to assign any exotic grassland vegetation to the Grassland PBP classification, as well as to assign the planted eucalyptus to the east of the existing quarry site (planted as a condition consent of the quarry) to a more suitable vegetation classification (PCT 835) to assess potential fuel load. In addition, the vegetation to the north-east of the subject property, along Oaky Creek and outside of the area assessed by EMM (2020b), is mapped in the regional vegetation mapping (OEH 2015) as PCT 835. This area has been mapped as PCT 1800 for the purposes of this assessment, based on field observations and the dominance of Swamp Oak (*Casuarina glauca*) along the creek. Nonetheless, both PCT 835 and PCT 1800 fall into the Forested Wetland (Keith 2004) vegetation formation. The vegetation classification mapping, as updated to reflect the aforementioned, is shown within Figure 2.2.

In accordance with PBP, the recommended APZs within Table 2.2 are based on BAL-29, which provides separation between the structures at the site (warehouse and office) and the hazard (beyond the boundary of the ARRC site) so that the buildings would not be exposed to radiant heat levels exceeding 29kW/m² (based on a flame temperature of 1090 Kelvin (K)). This is consistent with the approach identified in Section 8.3.10 of PBP (commercial and industrial development) and Tables 7.4a and A1.12.2 of PBP. Where multiple vegetation formations exist at an aspect, the vegetation formation providing the greatest hazard has been used to determine APZ width. Further explanation around the recommended and proposed APZs for the ARRC site is provided within Section 3.2.1 (bushfire protection measures).

2.3 Features adjoining the ARRC site that may mitigate the impact of a bushfire

There are multiple features on the land adjoining the ARRC site that may mitigate the impact of high intensity bushfire on the proposed development. These include:

- Existing quarry site to the south (Figure 2.2);
- WSA to the east, beyond Oaky Creek (however Oaky Creek will remain) and to the south (beyond the existing quarry) (Figure 1.1); and
- There is a large stockpile of shale-type material on the property adjacent to the northern aspect of the ARRC site, associated with the previous operators of the quarry (refer to Figure 2.2, where a large white area can be seen on the northern aspect). This stockpile currently reduces the grassland hazard significantly on the northern aspect. Further, the owner of this property has indicated an intention to develop industrial type warehouses on the property in the future.

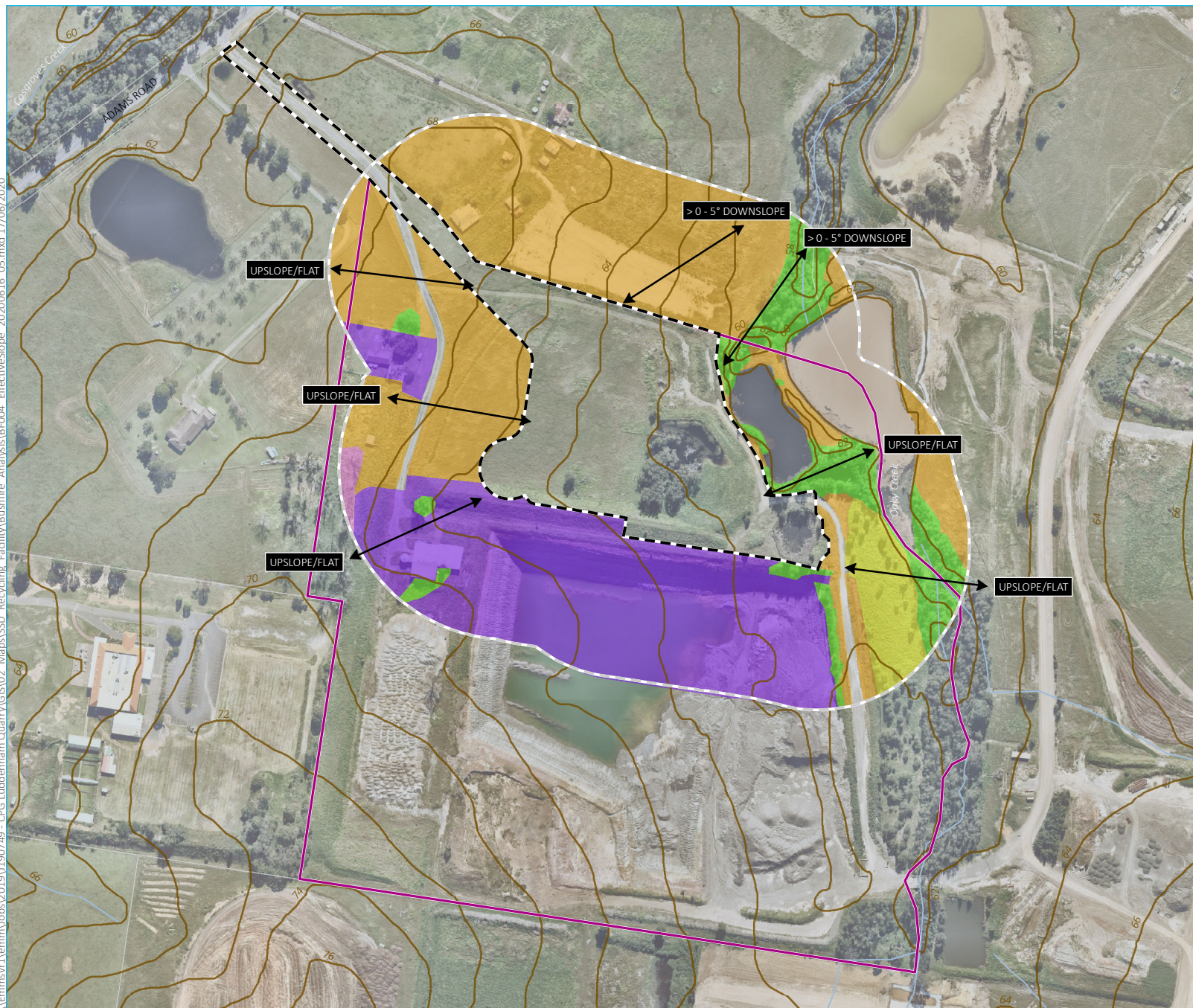
The remaining hazard is the Oaky creek vegetation to east and north-east and grassland to west of the ARRC site. This western portion of the subject property (currently grassland) is intended to be developed with industrial type warehouses in late 2022, subject to a separate development consent.

Table 2.2 **Vegetation, effective slope and proposed APZs (FDI 100)**

	North aspect	Northeast aspect	East aspect	Southeast aspect	South aspect	Southwest aspect	West aspect	Northwest aspect
ARRC site slope	N/A ¹	N/A ¹	N/A ¹	N/A ¹	N/A ¹	N/A ¹	N/A ¹	N/A ¹
Effective slope	>0 - 5° Downslope	>0 - 5° Downslope	Upslope/Flat	Upslope/Flat	N/A	Upslope/Flat	Upslope/Flat	Upslope/Flat
Vegetation formation	Grassland (Exotic pasture)	Forested Wetland (PCT 1800)	Forested Wetland (PCT 1800)	Forested Wetland (planted eucalyptus assigned to PCT 835 and PCT 1800 beyond this)	Managed land (quarry site)	Grassland (Exotic pasture) Grassy Woodland (PCT 849) and managed land (quarry site)	Grassland (Exotic pasture)	Grassland (Exotic pasture)
Recommended APZ (FDI 100, ≤29kW/m ² , 1090K) (for BAL – 29)	12 m	12 m	10 m	10 m	N/A	12 m	10 m	10 m
Achieved separation distance to nearest building (warehouse, site office) (refer to Figure 3.1)	7.2 m (pedestrian area, hardstand)	14 m (pedestrian area, hardstand)	10.9 m (pedestrian area, hardstand)	>60 m (pedestrian area, hardstand, on-site detention, water management infrastructure)	N/A (pedestrian area, hardstand, water management infrastructure, landscaping)	>50 m (landscaping, carpark, hardstand, ARRC access road)	>20 m (landscaping, carpark, hardstand, ARRC access road)	>30 m (landscaping, carpark, hardstand, ARRC access road)
Assessed BAL rating	BAL - FZ	BAL - 29	BAL - 29	BAL - 12.5	N/A	BAL - 12.5	BAL - 19	BAL - 12.5

Notes: 1. The ARRC site will be cleared of all vegetation and completely developed (refer Figure 3.1), therefore the slope of the RRC site is not applicable to the assessment of slope under the hazard (vegetation). Slope on all aspects surrounding the proposed RRC site, where the vegetation hazard will remain, have been assessed.

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KEY

Subject property

ARRC site

100 m buffer

Cadastral boundary

Slope profile

Contour (2 m)

Watercourse

Bushfire classification

PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of Cumberland Plain, Sydney Basin Bioregion (planted eucalyptus) (Forested)

PCT 849 - Grey Box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion (Forested Wetland)

PCT 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain, Sydney Basin Bioregion (Forested Wetland)

Exotic grassland (Grassland)

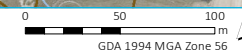
Managed land (Low threat - excluded)

Effective slope under vegetation hazard

Luddenham Advanced Resource Recovery Centre
Bushfire Assessment
Figure 2.2



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020); DOE (2020)



3 Bushfire protection measures

3.1 Aims and objectives of PBP

In order for the project to comply with PBP, the overall aims and objectives of PBP must be satisfied. The following section addresses each aim and objective.

Afford buildings and their occupants protection from exposure to a bushfire

Following the establishment of an APZ (Figure 3.1), the buildings (warehouse and office) within the ARRC site will have a reduced exposure to bushfire. Evacuation planning in the event of bushfire should clearly indicate to workers to evacuate early in a direction away from the fire (refer to Section 3.2.7).

Provide for a defensible space to be located around buildings

The APZ provides defensible space around the buildings (warehouse and office) and measures between 7.2 m to >60 m wide (Figure 3.1). In the event of bushfire, firefighters will have direct access to the vegetation hazard via the perimeter access road, which will support firefighting efforts. In the event a fire front impacts on the buildings, defensible space is available surrounding the buildings from where the fire would be fought (refer to Section 3.2.1).

Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings

Following establishment of the APZs, the buildings (warehouse and office) will be exposed to BAL-12.5, BAL-19, BAL-29 and BAL-FZ (refer to Section 3.2.1). It is noted that the expected industrial type warehouse development of the property to the north of the ARRC site will remove the grassland hazard and therefore reduce the BAL for the northern aspect (refer to Section 3.2.1).

Ensure that appropriate operational access and egress for emergency service personnel and occupants is available

The access road and internal roads are designed for the movements of large vehicles (B-double trucks) which exceed the minimum width and weight requirements of PBP (refer to Section 3.2.2).

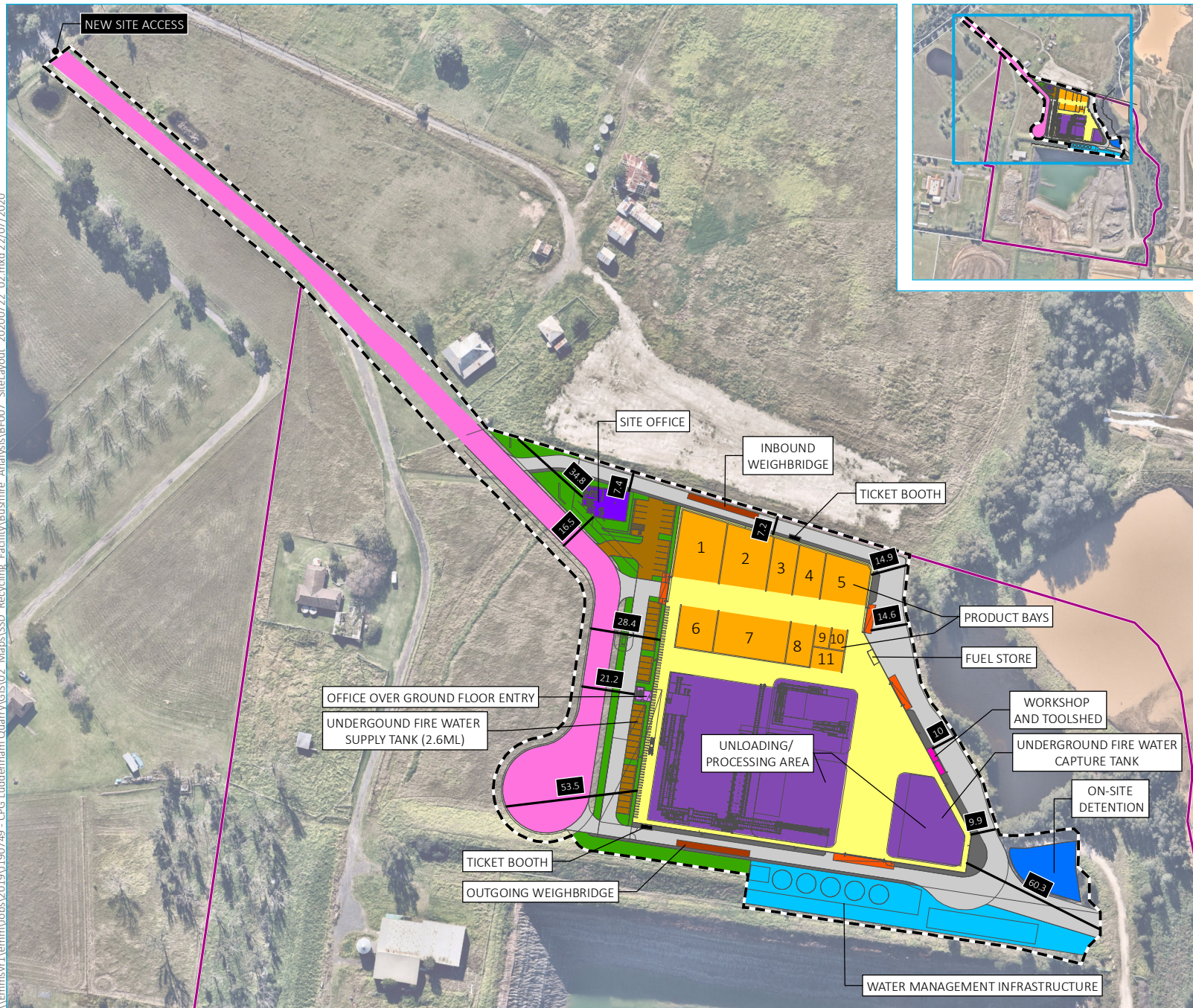
Provide for ongoing management and maintenance of bushfire protection measures

A bushfire management plan (BFMP), to be encompassed within a Construction Environment Management Plan (CEMP) and Operation Environment Management Plan (OEMP) for the project, will provide details for the ongoing management and maintenance of bushfire protection measures (refer to Section 3.2.7).

Ensure that utility services are adequate to meet the needs of fire fighters

The main elements of fire suppression for the ARRC consist of high hazard sprinkler protection throughout and a ring main of external hydrants. The ARRC site will include storage of 2.6 megalitre (ML) of water (one tank for hydrant and sprinklers) (Figure 3.1) for firefighting purposes adjacent a dedicated pump room with duty/standby pumps. Separate tanks will be used for potable water storage. The fire hydrant system will be installed in accordance with the relevant clauses of AS 2419.1-2005 for the specific development type (refer to Section 3.2.3). The electrical substations for the project have been located on the western side of the ARRC site between the access road and carparking area so as to limit possibility of ignition of surrounding bush land or the fabric of buildings (refer to Section 3.2.4).

\\Emmsvr1\emmm\Jobs\2019\190749 - CPG Luddenham Quarry\GIS\02 Maps\SSD Recycling Facility\Bushfire Analysis\BFO07 SiteLayout 20200722_02.mxd 22/07/2020



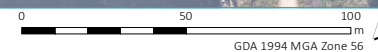
- KEY**
- Subject property
 - ARRC site
 - Indicative detailed layout
 - APZ (m)
- Proposed element**
- Awning
 - Carpark
 - Hardstand
 - ARRC access road
 - Kerb/pedestrian area
 - Landscaping
 - Office over ground floor
 - On-site detention
 - ARRC warehouse
 - Product bay
 - Site office
 - Ticketbooth
 - Tool shed, workshop
 - Unloading/processing
 - Water management infrastructure, including treatment plant and storage
 - Weighbridge
- Product bays**
1. Concrete/ rubble masonry
 2. Clean timber
 3. Rigid plastics
 4. Paper/cardboard/film
 5. Stumps/asphalt/metal
 6. Heavy residual
 7. Fines screened
 8. Soil audit
 9. Ferrous
 10. Non-ferrous
 11. Non-recyclables

Project overview

Luddenham Advanced Resource
Recovery Centre
Bushfire Assessment
Figure 3.1



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020); Reid Campbell (2020)



3.2 Specific issues for commercial and industrial development

In order for the project to comply with PBP, the project must also comply with the specific issues listed within PBP for the development type.

For commercial and industrial development, the following objectives apply in relation to access, water supply and services, and emergency and evacuation planning:

- to provide safe access to/from the public road system for firefighters providing property protection during a bushfire and for occupant egress for evacuation;
- to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development;
- to provide adequate services of water for the protection of buildings during and after the passage of bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and
- to provide for the storage of hazardous materials away from the hazard wherever possible.

For commercial and industrial development, PBP (Section 8.3.1) recommends that the provisions within Chapter 7 of PBP be used as a base for the development of a package of measures with each development being assessed on its own merits.

The bushfire protection measures are:

- assets protection zones (APZs);
- access;
- water supply;
- other services;
- construction standards (as relevant);
- landscaping; and
- bushfire management and emergency planning.

These measures collectively form a mitigation strategy in order to reduce the bushfire impacts on the project, and are addressed within Sections 3.2.1 through to 3.2.9.

Table 3.1 Performance criteria and acceptable solutions - asset protection zones

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
APZs are provided commensurate with the construction of the building; and A defensible space is provided.	<ul style="list-style-type: none"> An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of PBP. 	✓	performance based solution	<p>APZs have been assessed against Table A.12.2 (FDI 100) in Appendix 1 of PBP (refer to Section 2.2).</p> <p>In accordance with PBP, the recommended APZs within Table 2.2 of this report are based on BAL-29. This is consistent with the approach identified in Section 8.3.10 of PBP (commercial and industrial development) which states the provisions of Chapter 7 of PBP (the performance criteria and acceptable solutions in this chapter) be used as a base package of measures.</p> <p>It is noted that non-residential Class 5 to 8 buildings require no specific level of construction in accordance with AS 3959 and the NCC. Structural fire protection measures are deemed adequate if located out of the flame zone. Following establishment of the proposed APZs, the buildings (warehouse and office) will be exposed to BAL-12.5, BAL 19, BAL-29 and BAL-FZ (refer to Figure 3.1). It is noted that the expected industrial type warehouses development of the property to the north of the ARRC site (refer to Section 2.3) will remove the grassland hazard and therefore reduce the BAL for the northern aspect (which is currently BAL – FZ).</p> <p>The APZs comprise pedestrian areas, hardstand, landscaping, the ARRC access road, carparks, water management infrastructure, and on-site water detention (Figure 3.1).</p> <p>A defensible space is provided around the entire ARRC site (the APZ), between the buildings and the vegetation hazard (Figure 3.1). The defensible space is between 7.2 m and >60 m wide.</p>
APZs are managed and maintained to prevent the spread of a fire to the building.	<ul style="list-style-type: none"> APZs are managed in accordance with the requirements of Appendix 4 of PBP. 	✓		<p>APZs will be managed for the life of the development. Those areas of hardstand, pedestrian pathways and access roads will require no vegetation management and will be maintained for the life of development. The landscaped areas will be managed to the standards of an Inner Protection Area (IPA) and in accordance with Appendix 4 of PBP. The bushfire management plan (BFMP) (to be encompassed within a Construction Environment Management Plan (CEMP) and Operation Environment Management Plan (OEMP) for the project) will provide details on suitable landscaping in accordance with IPA standards within Appendix 4 of PBP.</p>
The APZ is provided in perpetuity.	<ul style="list-style-type: none"> APZs are wholly within the boundaries of the development site. 	✓		<p>The APZ is wholly within the development footprint and will be provided for the life of the development, with suitable management measures to be included within the BFMP for the construction and operation of the project.</p>
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	<ul style="list-style-type: none"> APZ are located on lands with a slope less than 18 degrees. 	✓		<p>The APZs are located on land less than 18 degrees.</p>

Table 3.2 Performance criteria and acceptable solutions - access

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	<ul style="list-style-type: none"> Property access roads are two-wheel drive, all-weather roads. 	✓		The property access road and internal project roads are two-wheel drive, all-weather roads.
The capacity of access roads is adequate for firefighting vehicles.	<ul style="list-style-type: none"> The capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways are to clearly indicate load rating. 	✓		The property access road, internal project roads and weighbridges are designed to accommodate fully loaded 26 m long B-double trucks (up to 50 tonnes). There are no other bridges or causeways.
There is appropriate access to water supply.	<ul style="list-style-type: none"> Hydrants are provided in accordance with the relevant clauses of AS 2419.1-2005 <i>Fire hydrant installations. Part 1 System design, installation and commission.</i> 	✓		<p>Water supply will be a combination of rainwater and water transported by road to the ARRC site until the site is connected to mains water and then a combination of rainwater and mains water will be used across the site.</p> <p>A 2.6 ML underground SP water tank located in the south western corner of the ARRC below hardstand and car parks (Figure 3.1) will be used for firefighting water.</p> <p>This SP water tank will also supply a fire hydrant system (ring main of external hydrants) to be installed in accordance with the relevant clauses of AS 2419.1-2005 for the specific development type. Section 2.2.8 and Section 6.5 of the EIS provide further detail on the proposed fire hydrant system and in regard to specific FRNSW requirements for waste facilities.</p>
	<ul style="list-style-type: none"> There is suitable access for a Category 1 fire appliance to within 4 m of the static water supply where no reticulated supply is available. 	✓		<p>A 2.6 ML underground SP water tank located in the south western corner of the ARRC below hardstand and car parks (Figure 3.1) will be used for firefighting water.</p> <p>The design of the project includes provisions for appropriate access of a Category 1 fire appliance to within 4 m of the static water supply.</p>
Firefighting vehicles can access and exit the property safely.	<ul style="list-style-type: none"> Minimum 4 m carriageway width. 	✓		All access roads within the ARRC site are wider than 4 m and range between 5.5 m and 10 m wide.
	<ul style="list-style-type: none"> In forest, woodland and heath situations, rural property roads have passing bays every 200 m that are 20 m long by 2m wide, making a minimum trafficable width of 6 m, at the passing bay. 	n/a		Not relevant to the development type.

Table 3.2 Performance criteria and acceptable solutions - access

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
	<ul style="list-style-type: none"> A minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches. 		✓	The detailed design will ensure that a minimum vertical clearance of 4 m to any overhanging obstructions (including awnings) is provided along all access routes, noting that FRNSW also require minimum overhead clearance of 4 m for general fire appliances or 4.5 m for specialist fire appliances (FRNSW 2019).
	<ul style="list-style-type: none"> Property access must provide a suitable turning area in accordance with Appendix 3 of PBP. 	n/a		There are no dead ends longer than 200 m, therefore no requirements for a turning head area. The following two points provide detail on curves.
	<ul style="list-style-type: none"> Curves have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress. 	✓		<p>EMM (2020c) has undertaken a swept path assessment for the Traffic Impact Assessment as part of the EIS for the project (Appendix L of EIS), including swept path diagrams depicting vehicles entering, exiting, and manoeuvring throughout the ARRC site. Swept path assessments have been undertaken to ensure adequacy of the proposed internal ARRC site road network and have been undertaken by a truck up to 26-m-long (B-double) for the internal roads to ensure adequate manoeuvrability. The swept path assessments indicates that 26-m-long (B-double) trucks can manoeuvre within the ARRC site.</p> <p>All curved access roads within the ARRC site have a minimum inner radius of 6 m.</p>
	<ul style="list-style-type: none"> The minimum distance between inner and outer curves is 6 m. 	✓		The minimum distance between inner and outer curves is 6 m.
	<ul style="list-style-type: none"> The crossfall is not more than 10 degrees. 	✓		The crossfall on access roads is not more than 10 degrees.
	<ul style="list-style-type: none"> Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads. 	✓		Maximum grades for sealed access roads do not exceed 15 degrees and maximum grades for unsealed access roads do not exceed 10 degrees.
	<ul style="list-style-type: none"> A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. 	n/a		Not relevant to the development type.

Table 3.3 Performance criteria and acceptable solutions – water supplies

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
An adequate water supply is provided for firefighting purposes.	• Reticulated water is to be provided to the development, where available.	✓		Water will be transported by road to the ARRC site until the site is connected to mains water and then a combination of rainwater and mains water will be used across the site.
	• A static water supply is provided where no reticulated water is available.	✓		A 2.6 ML underground SP water tank located in the south western corner of the ARRC below pavement (access road) and car parks (Figure 3.1) will be used for firefighting water.
Water supplies are located at regular intervals.	• Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1-2005.	✓		A fire hydrant system will be installed in accordance with the relevant clauses of AS 2419.1-2005 for the specific development type. Section 2.2.8 and Section 6.5 of the EIS provide further detail on the proposed fire hydrant system and in regard to specific FRNSW requirements for waste facilities.
The water supply is accessible and reliable for firefighting operations.	• Hydrants are not located within any road carriageway.	✓		A fire hydrant system will be installed in accordance with the relevant clauses of AS 2419.1-2005 for the specific development type. Section 2.2.8 and Section 6.5 of the EIS provide further detail on the proposed fire hydrant system and in regard to specific FRNSW requirements for waste facilities. There are no road carriageways within the ARRC site, only access roads associated with the project.
	• Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	n/a		Not relevant to the development type.
Flows and pressure are appropriate.	• Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1-2005.	✓		A fire hydrant system will be installed in accordance with the relevant clauses of AS 2419.1-2005 for the specific development type. Section 2.2.8 and Section 6.5 of the EIS provide further detail on the proposed fire hydrant system and in regard to specific FRNSW requirements for waste facilities.
The integrity of the water supply is maintained.	• All above-ground water service pipes external to the building are metal, including and up to any taps.		✓	To be included in detail design of the project.
A static water supply is provided for firefighting purposes in areas where reticulated water is not available.	• Where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 5.3d of PBP.	✓		A 2.6 ML underground SP water tank located in the south western corner of the ARRC below pavement (access road) and car parks (Figure 3.1) will be used for firefighting water.
	• A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65 mm Storz outlet with a ball valve is fitted to the outlet.		✓	To be included in detail design of the project and BFMP.
	• Ball valve and pipes are adequate for water flow and are metal		✓	To be included in detail design of the project and BFMP.

Table 3.3 Performance criteria and acceptable solutions – water supplies

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
	<ul style="list-style-type: none"> Supply pipes from tank to ball valve have the same bore size to ensure flow volume. 		✓	To be included in detail design of the project and BFMP.
	<ul style="list-style-type: none"> Underground tanks have an access hole of 200 mm to allow tankers to refill direct from the tank. 		✓	To be included in detail design of the project and BFMP.
	<ul style="list-style-type: none"> A hardened ground surface for truck access is supplied within 4 m. 	✓		The 2.6 ML underground SP water tank located in the south western corner of the ARRC below pavement (access road) and car parks (hardened surface) (Figure 3.1) will be used for firefighting water.
	<ul style="list-style-type: none"> Above-ground tanks are manufactured from concrete or metal. 	n/a		There are no above-ground static fire water supply tanks proposed for the project.
	<ul style="list-style-type: none"> Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959). 	n/a		There are no above-ground static fire water supply tanks proposed for the project.
	<ul style="list-style-type: none"> Unobstructed access can be provided at all times. 		✓	To be included in detail design of the project and BFMP.
	<ul style="list-style-type: none"> Underground tanks are clearly marked. 		✓	To be included in detail design of the project and BFMP.
	<ul style="list-style-type: none"> Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters 	n/a		There are no above ground static fire water supply tanks proposed near a vegetation hazard.
	<ul style="list-style-type: none"> All exposed water pipes external to the building are metal, including any fittings. 		✓	To be included in detail design of the project and BFMP.
	<ul style="list-style-type: none"> Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19 mm internal diameter. 		✓	To be included in detail design of the project and BFMP, if required.
	<ul style="list-style-type: none"> Fire hose reels are constructed in accordance with AS/NZS 1221-1997, and installed in accordance with the relevant clauses of AS 2441-2005. 		✓	Fire hose reels will be constructed in accordance with AS/NZS 1221-1997, and installed in accordance with the relevant clauses of AS 2441-2005 as appropriate to the specific development type. Section 2.2.8 and Section 6.5 of the EIS provide further detail on the proposed fire suppression and in regard to specific FRNSW requirements for waste facilities.

Table 3.4 Performance criteria and acceptable solutions – electricity services

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	• Where practicable, electrical transmission lines are underground.	✓		Electrical lines will be underground.
	<ul style="list-style-type: none"> • Where overhead, electrical transmission lines are proposed as follows: <ul style="list-style-type: none"> – lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and – no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 <i>Guideline for Managing Vegetation Near Power Lines</i> (Resources and Energy NSW 2016). 	n/a		Electrical lines will be underground.

Table 3.5 Performance criteria and acceptable solutions – gas services

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	<ul style="list-style-type: none"> • Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596-2014 and the requirements of relevant authorities, and metal piping is used. • All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard side. • Connections to and from gas cylinders are metal. • Polymer-sheathed flexible gas supply lines are not used. • Above-ground gas service pipes are metal, including and up to any outlets. 		✓	<p>To be included in detail design of the project.</p> <p>If required, gas will be installed in accordance with AS/NZS 1596-2014, as appropriate to the specific development type.</p>

Table 3.6 Performance criteria and acceptable solutions – construction standards

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	<ul style="list-style-type: none"> BAL is determined in accordance with Tables A1.12.5 to A1.12.7 of PBP. 	✓		<p>APZs have been assessed against Table A.12.5 in Appendix 1 of PBP.</p> <p>Following establishment of the proposed APZs, the buildings (warehouse and office) will be exposed to BAL-12.5, BAL 19, BAL-29 and BAL-FZ (Table 2.2).</p> <p>It is noted that non-residential Class 5 to 8 buildings require no specific level of conduction in accordance with AS 3959 and the NCC. Structural fire protection measures are deemed adequate if located out of the flame zone. The buildings (warehouse and office) at the ARRC site are located outside of the flame zone, apart from the northern aspect, which is located within the flame zone. It is noted that the expected commercial development of the property to the north of the ARRC site (refer to Section 2.3) will remove the grassland hazard and therefore reduce the BAL for the northern aspect.</p>
	<ul style="list-style-type: none"> Construction provided in accordance with the NCC and as modified by Section 7.5 of PBP 		✓ performance based solution	<p>Following establishment of the proposed APZs, the buildings (warehouse and office) will be exposed to BAL-12.5, BAL 19, BAL-29 and BAL-FZ (Table 2.2).</p> <p>The flame zone is the area that has significant potential for sustained flame contact during a bush fire. The flame zone is determined by the calculated distance at which the radiant heat of the design fire exceeds 40kW/m². The NCC references AS 3959 and the NASH Standard. The NSW variation to the NCC excludes both AS 3959 and the NASH Standard as a Deemed to Satisfy solution for buildings that are required to be constructed to BAL-FZ as defined in AS 3959. Although Chapter 9 of AS 3959 and the NASH Standard has not been adopted, they should still be used as a basis for a performance based solution demonstrating compliance with the performance requirements of the NCC and PBP for construction in the flame zone.</p> <p>All flame zone developments should be sited and designed to minimise the risk of bush fire attack. Buildings should be designed and sited in accordance with appropriate siting and design principles to ensure the safest protection from bush fire impacts.</p> <p>Currently, construction standards do not comply with the acceptable solutions of PBP, due to the northern aspect of the development being exposed to BAL – FZ.</p> <p>It is noted that the expected industrial type warehouses development of the property to the north of the ARRC site (refer to Section 2.3) will remove the grassland hazard and therefore reduce the BAL for the northern aspect.</p>
Proposed fences and gates are designed to minimise the spread of bush fire.	<ul style="list-style-type: none"> Fencing and gates are constructed in accordance with section 7.6 of PBP. 		✓	All fences will be made of non-combustible material.
Proposed Class 10a buildings are designed to minimise the spread of bush fire.	<ul style="list-style-type: none"> Class 10a buildings are constructed in accordance with section 8.3.2 of PBP. 	n/a		There are no class 10a structures proposed for the project.

Table 3.7 Performance criteria and acceptable solutions – landscaping

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	<ul style="list-style-type: none"> • Compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 4 of PBP); • A clear area of low-cut lawn or pavement is maintained adjacent to the house; • Fencing is constructed in accordance with section 7.6 of PBP; • Trees and shrubs are located so that: <ul style="list-style-type: none"> – the branches will not overhang the roof; – the tree canopy is not continuous; and – any proposed windbreak is located on the elevation from which fires are likely to approach. 		✓	<p>All landscaped areas (Figure 3.1) will be managed to the standards of an Inner Protection Area (IPA) and in accordance with Appendix 4 of PBP. The BFMP will provide details on suitable landscaping in accordance with IPA standard within Appendix 4 of PBP.</p> <p>All fences will be made of non-combustible material.</p> <p>IPA standards includes no overhanging branches and trees canopy cover of less than 15% at maturity and separated by 2 to 5 m.</p> <p>There is no windbreak proposed.</p>

3.2.7 Storage of hazardous materials

Hazardous materials are to be stored away from the hazard wherever possible.

A 35,000 L diesel tank will be installed on inside the western edge of the ARRC warehouse. The tank will be self-bunded with a bund capacity of 10% more than the tank's capacity. Plant and vehicles will be filled from a bowser located next to the diesel tank. When refuelling, vehicles will be parked within a bunded area drained to a sump with a trap.

Hazardous goods will be stored in a designated bunded area in accordance with the relevant Australian Standards (refer Section 6.8 of EIS).

3.2.8 Bushfire management plan (including emergency management)

A bushfire management plan (BFMP), to be encompassed within a Construction Environment Management Plan (CEMP) and Operation Environment Management Plan (OEMP) for the project to be developed post approval, will provide details for the ongoing management and maintenance of bushfire protection measures, and will encompass the provisions outlined within Table 3.1 to Table 3.7, including:

- APZ locations and management details;
- landscaping requirements including indicative design layout and vegetation density thresholds;
- access provisions such as access locations and alternative emergency access;
- water supplies and bushfire suppression systems (including drenching systems, static water supply, natural water sources etc);
- schedule of the BAL requirements and building footprints as well as any specific construction details;
- details regarding bushfire emergency management and evacuation plan; and
- any other essential bushfire safety requirements.

The BFMP should include a bushfire emergency management and evacuation plan that is consistent with *A guide to developing a bush fire emergency management and evacuation plan* (NSW RFS 2014) and *Australian Standard 3745-2010 Planning for emergencies in facilities*, as appropriate to the project. In addition, FRNSW have their own requirements (FRNSW 2019) for emergency response in waste facilities, that should be included in the BFMP.

3.2.9 Environmental impact of proposed bushfire protection measures

Related to bushfire protection, the implementation of the access roads, pavements and carparks (that are serve as asset protection zones/defendable space) has resulted in impacts to native vegetation.

A biodiversity assessment has been prepared in accordance with the BAM for the project (Appendix O of EIS) and addresses the requirements of the BC Act. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities and their habitats and determine offset requirements. The clearing of native vegetation and fauna habitat is required for the project, with all impacts required to be offset in accordance with the BC Act.

Fire water (ie water from fire suppression/fighting) will drain to the underground 2.6 ML fire water containment tank located under the south-eastern corner of the site (Figure 3.1). Management of this water will be outlined in the approved ARRC site water management plan.

4 Summary of mitigation measures

This bushfire assessment identifies the bush fire protection measures applicable to design, construction, operation and ongoing management of the Advanced Resource Recovery Centre (ARRC) (the project). It has been prepared with reference to a range of relevant standards, requirements and guidelines including *Planning for Bush Fire Protection 2019* and the Australian Standard *AS 3959-2018 Construction of Buildings in Bushfire-prone Areas*.

The table below provides a summary of recommendations to achieve compliance with the relevant requirements for bush fire protection for asset protection zones, construction standards, access, water supply, provision of services, and emergency management and training.

Table 4.1 Summary of recommended management measures

Mitigation element	Protection measure	Bushfire assessment report reference
Asset protection zones	<ul style="list-style-type: none"> APZs are provided commensurate with the construction of the building. A defensible space is provided. Vegetation is managed within asset protection zones in perpetuity. 	Sections 2.2, 3.1 and 3.2.1.
Access	<ul style="list-style-type: none"> Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation. The capacity of access roads is adequate for firefighting vehicles. There is appropriate access to water supply. Firefighting vehicles can access and exit the property safely. 	Section 3.1 and Section 3.2.2.
Water supply	<ul style="list-style-type: none"> Water supply requirements for firefighting, including the provision of hydrants and hose reels, is designed, constructed in accordance with the relevant Standards and PBP. 	Section 3.1 and Section 3.2.3.
Other services	<ul style="list-style-type: none"> Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings. Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings. 	Section 3.1 and Section 3.2.4.
Construction standards	<ul style="list-style-type: none"> The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact. 	Sections 2.2, 3.1, 3.2.1 and 3.2.5.
Landscaping	<ul style="list-style-type: none"> Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions. 	Section 3.1 and Section 3.2.6.
Storage of hazardous materials	<ul style="list-style-type: none"> To provide for the storage of hazardous materials away from the hazard wherever possible. 	Section 3.1 and Section 3.2.7.
Bushfire management plan (including emergency management)	<ul style="list-style-type: none"> A BFMP for the project to be developed post approval, will provide details for the ongoing management and maintenance of bushfire protection measures. The BFMP should include a bushfire emergency management and evacuation plan. 	Section 3.1 and Section 3.2.8.

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Appendix °

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Table A.1 **Vegetation photographs for each aspect**

Photograph ID	RRC site aspect	Description	Photopoint and direction (refer to Figure A.1)
A.1	North	Exotic grassland	A.1 – Facing north
A.2	Northeast	PCT 1800 (Forested Wetland) in distance with exotic grassland in foreground	A.2 – Facing north
A.3	Northeast	PCT 1800 (Forested Wetland) close up	A.3 - Facing north
A.4	East	PCT 1800 (Forested Wetland) in distance, grassy mound in foreground is within proposed RRC site and will be developed	A.4 – Facing north-east
A.5	East	PCT 1800 (Forested Wetland) close up	A.5 – Facing north
A.6	East	PCT 1800 (Forested Wetland) in distance with exotic grassland in foreground	A.6 - Facing south
A.7	Southeast	PCT 835 (Forested Wetland) (planted eucalyptus) and PCT 1800 (Forested Wetland) in distance (pond in foreground will be developed into detention basin in RRC site, with vegetation hazard to remain beyond existing access road)	A.7 – Facing east
A.8	Southeast	PCT 835 (Forested Wetland) (planted eucalypts) in foreground with PCT 1300 (Forested Wetland) in distance	A.8 – Facing east
A.9	Southeast	PCT 835 (Forested Wetland) (planted eucalypts) in foreground near access track with PCT 1300 (Forested Wetland) beyond this	A.9 – Facing south
A.10	South	Managed land (existing quarry) with existing grassy quarry noise bund in foreground (to be developed as part of RRC site)	A.10 - Facing south-east
A.11	Southwest	Land that will be developed into equipment laydown area as part of the quarry operations to the south, as well as existing grassy quarry noise bund. PCT 849 (Grassy Woodland) occurs in the distance beyond this.	A.11 – Facing south-west
A.12	West	Exotic grassland	A.12 - Facing north
A.13	Northwest	Exotic grassland	A.13 – Facing west

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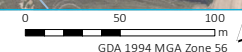
- KEY**
- Subject property
 - ARRC site
 - 100 m buffer
 - Cadastral boundary
 - Watercourse
 - Photograph location and aspect
- Bushfire classification**
- PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of Cumberland Plain, Sydney Basin Bioregion (planted eucalyptus) (Forested Wetland)
 - PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Forested Wetland)
 - PCT 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain, Sydney Basin Bioregion (Forested Wetland)
 - Exotic grassland (Grassland)
 - Managed land (Low threat - excluded)

Vegetation photographs
at each aspect

Luddenham Advanced Resource
Recovery Centre
Bushfire Assessment
Figure A.1



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)





Photograph A.1 North aspect – Exotic grassland



Photograph A.2 North-east aspect – PCT 1800 (Forested Wetland)



Photograph A.3 North-east aspect – PCT 1800 (Forested Wetland)



Photograph A.4 East aspect – PCT 1800 (Forested Wetland)



Photograph A.5 East aspect - PCT 1800 (Forested Wetland)



Photograph A.6 East aspect – PCT 1800 (Forested Wetland)



Photograph A.7 South-east aspect - PCT 835 (Forested Wetland) (planted eucalyptus) and PCT 1800 (Forested Wetland)



Photograph A.8 South-east aspect - PCT 835 (Forested Wetland) (planted eucalypts) with PCT 1800 (Forested Wetland) in distance



Photograph A.9 South-east aspect - PCT 835 (Forested Wetland) (planted eucalypts) and PCT 1800 (Forested Wetland)



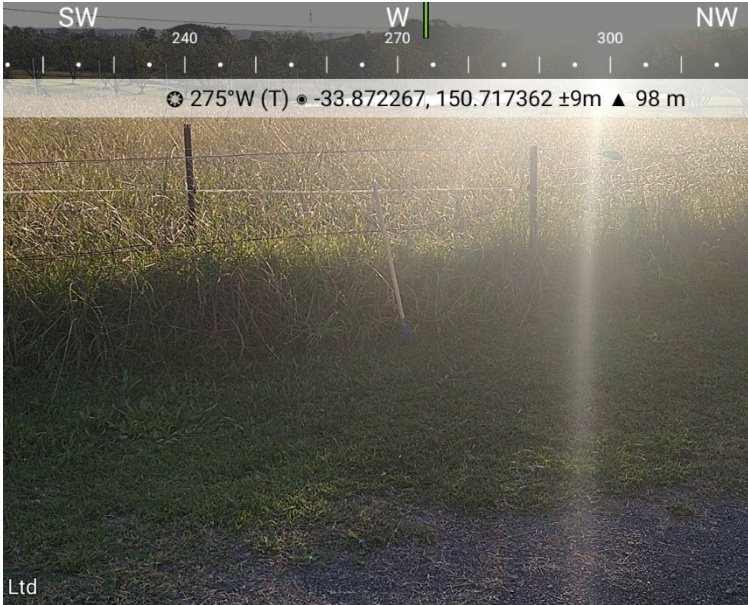
Photograph A.10 South aspect - Managed land (existing quarry) with existing grassy noise bund



Photograph A.11 South-west aspect - Managed land in foreground, PCT 849 (Grassy Woodland) in distance



Photograph A.12 West aspect - Exotic grassland (Grassland)



Photograph A.13 North-west aspect – Exotic grassland (Grassland)



