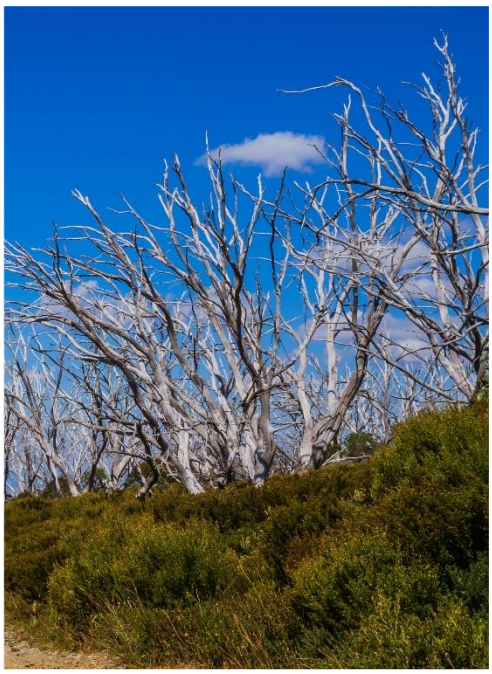
NGH

Bush Fire Assessment Report

Hillsborough Indoor Stadium

August 2021

Project Number: 20-378



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W. www.nghconsulting.com.au

E. ngh@nghconsulting.com.au

BEGA - ACT & SOUTH EAST NSW
Suite 11, 89-91 Auckland Street
(PO Box 470) Bega NSW 2550
T. (02) 6492 8333

NEWCASTLE - HUNTER & NORTH COAST
Unit 2, 54 Hudson Street
Hamilton NSW 2303
T. (02) 4929 2301

BRISBANE
T3, Level 7, 348 Edward Street
Brisbane QLD 4000
T. (07) 3129 7633

SYDNEY REGION
Unit 17, 21 Mary Street
Surry Hills NSW 2010
T. (02) 8202 8333

CANBERRA - NSW SE & ACT
Unit 8, 27 Yallourn Street
(PO Box 62) Fyshwick ACT 2609
T. (02) 6280 5053

WAGGA WAGGA - RIVERINA & WESTERN NSW
35 Kincaid Street (PO Box 5464)
Wagga Wagga NSW 2650
T. (02) 6971 9696

GOLD COAST
19a Philippine Parade
Palm Beach QLD 4221
(PO Box 466 Tugun QLD 4224)
T. (07) 3129 7633

WODONGA
Unit 2, 83 Hume Street
(PO Box 506) Wodonga VIC 3690
T. (02) 6067 2533

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W. www.nghconsulting.com.au
ABN 31 124 444 622 ACN 124 444 622

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Acronyms and Abbreviations

APZ	Asset Protection Zone
AS 3959-2018	Australian Standard – Construction of Buildings in Bushfire Prone Areas
BAL	Bush fire Attack Level
BFMC	Bush Fire Management Committees
BFRMP	Bush Fire Risk Management Plan
BFSA	Bush Fire Safety Authority
BFPL	Bush fire Prone Land
BPL Map	Bush fire Prone Land Map
BPMs	Bush fire Protection Measures
Council	Lake Macquarie City Council
EPA Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA Reg	Environmental Planning and Assessment Regulation 2000 (NSW)
FFDI	(Forest) Fire Danger Index (also FDI)
Ha	Hectare
HIS	Hillsborough Indoor Stadium
IPA	Inner Protection Area
kW/m^2	kilowatts per square metre (being a measure of radiant heat)
LGA	Local Government Area
NCC	National Construction Standard (comprising Building Code of Australia)
OPA	Outer Protection Area
PBP	Planning for Bush Fire Protection (2019)
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation 2013
SFAZ	Strategic Fire Advantage Zone

1. Introduction

On behalf of the Basketball Association of Newcastle Limited, Catalyst Project Consulting has commissioned NGH to undertake this Bush Fire Assessment Report (BFAR) for a proposed indoor basketball stadium. The indoor basketball stadium is referred to herein as Hillsborough Indoor Stadium (HIS).

The proposal seeks obtain development consent under a Development Application (DA) from Lake Macquarie City Council (LMCC) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The proposed development is categorised as a Recreation Facility (Indoor Stadium). The proposed indoor stadium would provide ten (10) full size courts. The stadium would provide seating for approximately 2,200 people.

1.1 Subject land and location

The subject land comprises holdings situated adjacent to Hillsborough Public School and has frontage to the Newcastle Inner-City Bypass and Waratah Avenue. The total area of the subject land is approximately 6.78 hectares. The subject land contains an unnamed watercourse (east) and Winding Creek (south).

The subject land is listed below in Table 1-1. A map outlining the subject land is provided in Figure 1-1.

Table 1-1 Subject land

Lot	Deposited Plan	Comment
Lot 12	879281	Partially cleared area within parcel. Approximately one-third (1/3) of area contains unmanaged vegetation. Winding Creek is present.
Lot 6	9594	Partially cleared area (1/3 of area) within parcel. Unmanaged vegetation and an unnamed watercourse are present.
Lot 7	9594	
Lot 8	9594	Unmanaged vegetation and an unnamed watercourse are present.

The subject land is located on land mapped by Council as Bush Fire Prone Land (BFPL) as identified in Figure 1-2. As the land is mapped as BFPL, a BFAR has been prepared, in accordance with Section 4.14 of the EP&A Act.

1.2 Purpose of assessment

This BFAR provides an assessment of the proposed HIS proposal. Specifically, this reports outlines:

- The statutory and policy requirements for bush fire protection in NSW.
- The proposed layout can incorporate prescribed bush fire protection measures, and
- Best practice bush fire planning.

The existing and potential bush fire hazards present through the surrounding landscape are assessed against the methodology and specifications prescribed by the New South Wales Rural Fire Service' (NSW RFS) guidelines, Planning for Bush fire Protection (PBP) 2019 (NSW RFS, 2019).

Figure 1-1 The subject land of the proposal (Source: NGH)

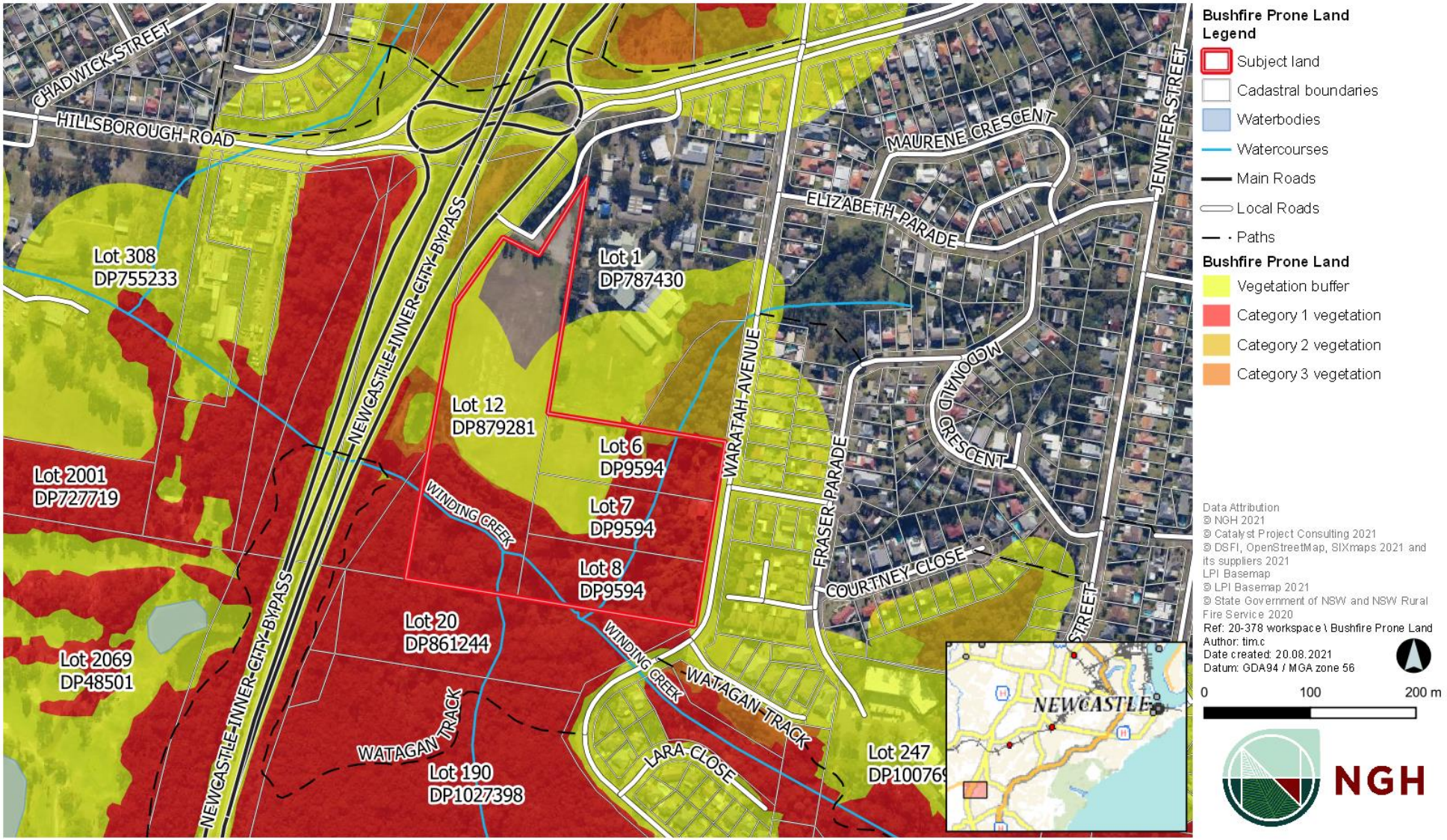

Figure 1-2 Bush fire prone land within proposal area (Source: NGH)

2. Proposal

2.1 Project Description

The proposal would involve development occurring over land zoned RE1 (Public Recreation), under Lake Macquarie Local Environmental Plan 2014 (LMLEP). Land zoned E2 (Environmental Conservation) is present within the subject land, however the proposal does not encroach E2 zoned land.

The proposed development is categorised as a Recreation Facility (Indoor Stadium). As outlined in Section 1, the proposed indoor stadium would provide 10 full size courts, and seating for approximately 2,200 people. The proposed development also includes, but is not limited to:

- Access.
- Carparking and bus parking.
- Landscaping, drainage infrastructure and associated services.
- Office, administration, and staff areas.
- Canteen, kitchen, and bar, and
- Change rooms and amenities.

An overview of the proposal layout is identified in the site plan provided in Figure 2-1. This report shall be read in conjunction with the accompanying plans provided in Appendix A.

Given the nature of the proposed indoor stadium, it is identified as a form of public assembly building. PBP outlines that assembly buildings can accommodate large numbers of persons of various physical capabilities.

Section 8.3.11 of PBP requires any public assembly building comprising a floor space area greater than 500sqm, to address bush fire, as a hazard, where this category of development would be treated as special fire protection purpose (SFPP).The proposal involves a floor area exceeding 500sqm. On this basis, the proposal requires referral to the NSW RFS under Section 4.14 of the EP&A.

2.1.1 Summary of key bush fire considerations - NSW PBP guidelines and objectives

This BFAR has considered the proposal against the NSW PBP guidelines. A summary of bush fire protection measures considered by this assessment are outlined in Table 2-1 below.

Table 2-1 Summary of bush fire protection measures considered.

Bush Fire Protection Measure	Report Section
Asset protection zones	Section 5.1.and Section 6.1
Landscaping	Section 5.2 and Section 6.1
Access	Section 5.4
Water supply and utilities	Section 5.5
Emergency Management	Section 5.6 and Section 6.3
PBP Objectives	Section 7

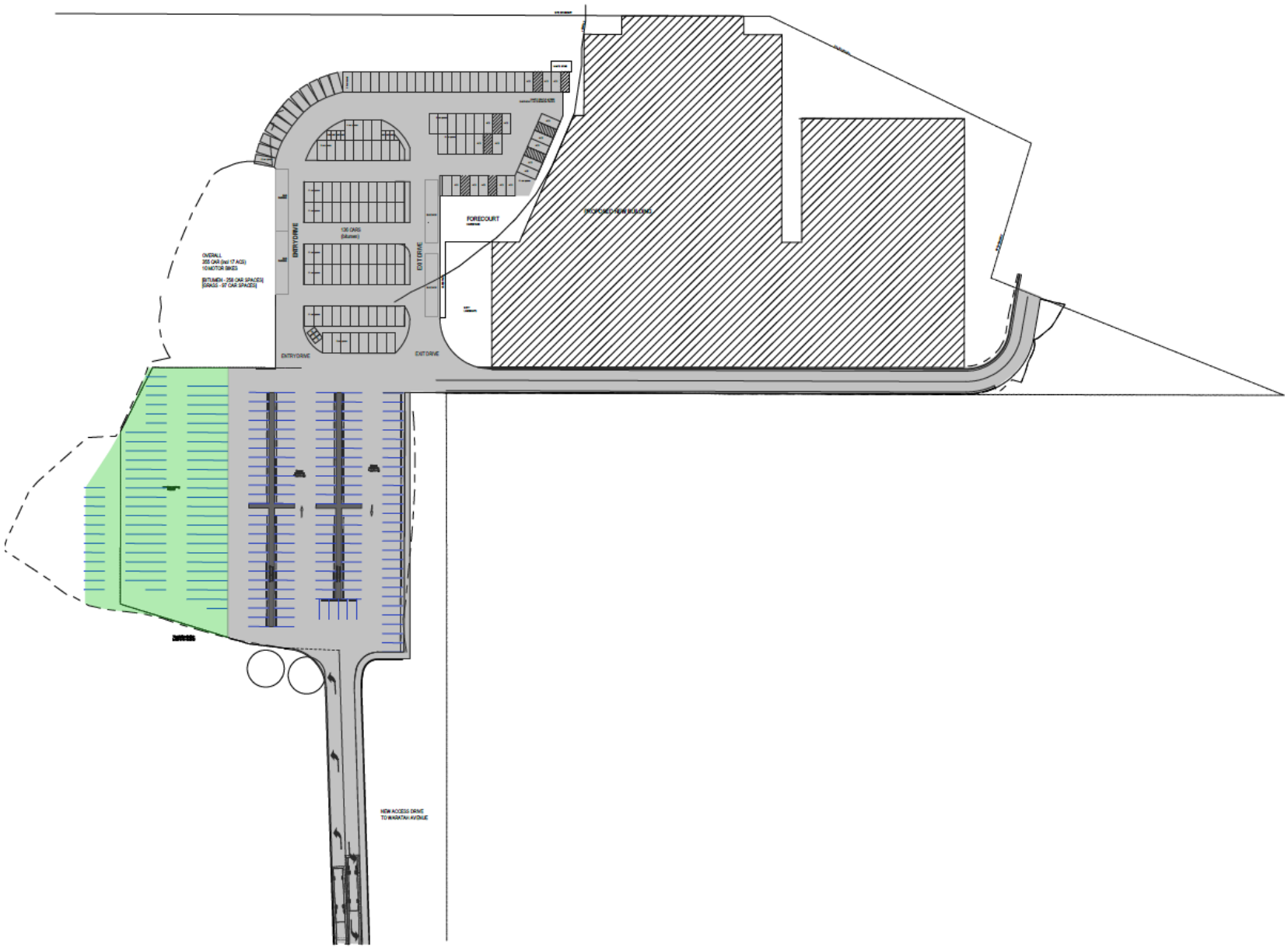

Figure 2-1 Extract: Hillsborough Indoor Stadium Site Plan (Source: EJE Architecture, 2021)

3. Planning Framework

As the proposal is located on BFPL, the DA must demonstrate consideration of, and conformance with relevant legislation and guidelines. This section outlines the relevant requirements and how they relate to this assessment.

3.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Relevant sections of the EP&A Act are discussed below.

Under Section 10.3 of the EP&A Act, Council's must develop a bush fire prone land map every 5 years. The BFPL map designates land as bush fire prone and requires the Commissioner of the NSW RFS to certify the map.

Due to the proposed public assembly building being located on BFPL, this assessment has been prepared under Section 4.14(1) of the EP&A Act. Section 4.14(1) applies, as:

(1) Development consent cannot be granted for the carrying out of development for any purpose (other than a subdivision of land that could lawfully be used for residential or rural residential purposes or development for a special fire protection purpose) on bush fire prone land (being land for the time being recorded as bush fire prone land on a relevant map certified under section 10.3(2)) unless the consent authority –

(a) is satisfied that the development conforms to the specifications and requirements of the version (as prescribed by the regulations) of the document entitled Planning for Bush Fire Protection prepared by the NSW Rural Fire Service in co-operation with the Department (or, if another document is prescribed by the regulations for the purposes of this paragraph, that document) that are relevant to the development (the relevant specifications and requirements), or

(b) has been provided with a certificate by a person who is recognised by the NSW Rural Fire Service as a qualified consultant in bush fire risk assessment stating that the development conforms to the relevant specifications and requirements.

In accordance with Section 4.14 of the EP&A Act, this report assesses the proposal against the specification and requirements of PBP.

3.2 Rural Fires Act 1997

The *Rural Fires Act 1997* (RF Act) governs fire management and wildfire suppression planning between various agencies and organisations. The Bush Fire Management Committees (BMC) and Bush Fire Risk Management Plan (BFRMP) regulates identifying bush fire risk along with treatment of the risk and ongoing performance, monitoring and review processes.

The objects of the RF Act are to provide:

- *for the prevention, mitigation, and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and*
- *for the co-ordination of bush firefighting and bush fire prevention throughout the State, and*
- *for the protection of persons from injury or death, and property from damage, arising from fires, and*

- *for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires.*

With regard to planning and development within NSW, the RF Act largely functions through application of Section 4.46 of the EP&A Act, specifically through Section 100B of the RF Act.

A DA for residential or rural residential subdivision, and SFPP requires a bush fire safety authority (BFSA) to be issued by the Commissioner of the NSW RFS.

In this instance, a BFSA is not required to be issued by the NSW RFS, as the proposal is not defined as SFPP by PBP or the Rural Fires Regulation 2013. In accordance with Chapter 8 of PBP, application is made under Section 4.14 of the EP&A Act.

3.2.1 Rural Fires Regulation 2013

The Rural Fires Regulation 2013 (RF Regulation), Section 44 outlines specific requirements that apply to proposals that require a BFSA to be issued. As the proposal is not defined under the Section 46 of the RF Regulation as SFPP development, nor is it specified under Section 6 of PBP, the requirements of Section 44 of the RF Regulation do not apply.

As required by Appendix 2 of PBP, however, requirements such as, but not limited to, the classification of vegetation, slope, APZs, access, water supply requirements are considered within this report and the accompanying Asset Protection Zone Analysis, prepared by Bushfire Environmental Management Consultancy (BEMC, 2021), refer to Appendix B.

3.2.2 Central Coast Bush Fire Management Plan 2020 - 2025

The Central Coast Bush Fire Risk Management Plan (Central Coast BFRMP) (NSW RFS, 2020) identifies the subject land as being within the Central Coast Bush Fire Management Committee (CCBFMC) area. The aim of the BFRMP is to minimise the risk of adverse impact of bush fires on life, property and environment. To achieve the aim of the plan, the objectives of the BFRMP include:

- Reduce the number of human-induced bush fire ignitions that cause damage to life, property and the environment.
- Manage fuel to reduce the rate of spread and intensity of bush fires, while minimising environmental/ecological impacts.
- Reduce the community's vulnerability to bush fires by improving its preparedness, and
- Effectively contain fires with a potential to cause damage to life, property and the environment.

3.3 Planning for Bush Fire Protection 2019

Planning for Bush Fire Protection 2019 (PBP 2019) guideline, published by the NSW RFS is a planning document that applies to all development located on land classified as BFPL across NSW.

The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment. PBP 2019 indicates that bush fire protection can be achieved through a combination of strategies, which are based on the following principles:

- Control the types of development permissible in bush fire prone areas.
- Minimise the impact of radiant heat and direct flame contact by separating development from bush fire hazards.

- Minimise the vulnerability of buildings to ignition and fire spread from flames, radiation, and embers.
- Enable appropriate access and egress for the public and firefighters.
- Provide adequate water supplies for bush fire suppression operations.
- Focus on property preparedness, including emergency planning and property maintenance requirements, and
- Facilitate the maintenance of APZs, fire trails, access for firefighting and on-site equipment for fire suppression.

The subject land incorporates land mapped by Council as BFPL. As referred to in Section 2.1, the public assembly building (in excess of 500sqm floor area) is to apply SFPP specifications. As part of this assessment, consideration has been given to the SFPP objectives of PBP, identified in Table 7-1.

A proposal shall be assessed to identify risks commensurate to the category of development. Once identified, appropriate mitigation measures can be applied to the subject land. PBP applies a suite of BPMs to development on BFPL, which include:

- Access.
- Landscaping.
- Asset protection zone.
- Building construction and design.
- Emergency management arrangements, and
- Water supply and utilities.

For the purpose of analysing and determining asset protection zones (APZs) using Detailed Method 2 calculator, a performance solution has been prepared. In accordance with Appendix 2 of PBP, the performance solution has been prepared by a Level 3 Bushfire Planning and Design (BPAD) practitioner. The APZ analysis has been prepared by BEMC and is included in Appendix B. Where appropriate reference has been made to BEMCs independent investigation and results.

This assessment has considered and assessed other BPMs specified under Section 6 of PBP.

3.4 National Construction Code

The National Construction Code (NCC) is prescribed in NSW through the EP&A Act. The NCC prescribes Australian Standard (AS) 3959 as a deemed to satisfy measure, for development on designated bush fire prone land.

3.5 Australian Standard (AS 3959-2018) Construction of buildings in bushfire prone areas

The AS 3959 Construction of buildings in bushfire prone areas is a standard that is applied throughout Australia. In NSW, AS 3959 is a deemed-to-satisfy solution in the NCC, relating to Class 1 and Class 2 buildings and Class 10a structures associated with a Class 1, 2 and 3 buildings, Class 4 parts of a building, Class 9 buildings that are SFPPs, and associated Class 10a buildings and decks.

The standard aims to provide a building with an acceptable level of protection to reduce the risk of ignition from a bush fire as the fire front passes.

Construction requirements identified under AS3959 are able to be applied to all classes of buildings. Chapter 6 of PBP applies AS 3959 to all SFPP development.

4. Consideration of Bush Fire Risk

Appendix 1 of PBP requires the following steps to be undertaken:

Identify APZs

1. *Determine vegetation formation in all directions around the building to a distance of 140 metres;*
2. *Determine the effective slope of the land from the building for a distance of 100 metres;*
3. *Determine the relevant FFDI for the council area in which the development is to be undertaken; and*
4. *Match the relevant FFDI, vegetation formation and effective slope to determine the APZ required.*

Identify Construction Standard

1. *Determine the separation distance by measuring from the edge of the unmanaged vegetation to the closest external wall;*
2. *Match the relevant FFDI, appropriate vegetation, distance and effective slope to determine the appropriate BAL using the relevant tables; and*
3. *Refer to Section 3 in AS 3959 and NASH Standard to identify appropriate construction requirements for the calculated BAL.*

4.1 Vegetation

Analysis of vegetation up to 140 metres from the proposal area has been conducted by:

- Aerial and satellite imagery to identify vegetation location and cover, and
- Inspection of vegetation within and surrounding the development footprint to confirm vegetation classification and structure.

Vegetation within and surrounding the development footprint land to a distance of 140 metres is assessed in accordance with Keith (2004), and further classified in accordance with PBP.

With reference to PBP, *'Where mixes of vegetation formations are located together, the vegetation formation providing the greater hazard shall be used for the purpose of assessment'*.

The APZ analysis undertaken by BEMC has identified and discussed the vegetative context, as it applies to the proposal, refer to Appendix B. Areas of vegetation identified around the proposal area, and within the subject land are described below:

Hazard Vegetation

Hazard vegetation is located around the proposal as follows:

- Sydney Coastal Dry Sclerophyll Forest is located east, south and south of the proposal. All parcels comprising the subject land contain Sydney Coastal Dry Sclerophyll Forest.

In accordance with Keith (2004), the Sydney Coastal Dry Sclerophyll Forest would be assessed as Dry Sclerophyll Forest for assessment under PBP, as identified in Table 4-1 below.

Table 4-1 Predominant Vegetation Formations found within 140 metres of the Proposal Site

Predominant Vegetation (Keith, D., 2004)	Vegetation Formation (PBP)
Sydney Coastal Dry Sclerophyll Forest	Dry Sclerophyll Forest

Non-hazard vegetation

Non hazard vegetation is categorised as managed land and/or low-fuel areas. Non-hazard vegetation areas are further identified in Table 4-2 below.

Table 4-2 Non-hazard vegetation found within the locality.

Non-hazard areas
Existing
Other (sealed) public roads and maintained road verge/footpaths in the locality.
Surrounding built (residential, educational and commercial) land uses.
Transport for New South Wales detention basic (subject to periodic access, maintenance and removal of silt)
Proposed
Proposed building, internal road layout (roads and maintained road verge/footpaths) and carparking areas.
Proposed management of land subject to an APZ. Ongoing management of proposed landscaping, in accordance with Appendix 4 of PBP.

4.2 Fuel

Corresponding fuel loads of vegetation formations identified throughout the proposal area, as identified previously in Table 4-1 and Section 4.1 are outlined in Table 4-3 below. Vegetation fuel loads referenced below are referenced in NSW Rural Fire Service Comprehensive Vegetation Fuel Loads (NSW Rural Fire Service, 2019).

Table 4-3 Fuel loads for vegetation formations

Vegetation Formation (PBP)	Overall Fuel Load (incl. bark and canopy)
Sydney Coastal Dry Sclerophyll Forest	27.3 t/ha

4.3 Fire Weather

A Forest Fire Danger Index (FFDI) of 100 applies to the Hunter Region, as set out in the NSW RFS' NSW Local Government Areas FDI (NSW Rural Fire Service, 2017).

4.4 Local Topography

In terms of fire risk, PBP indicates that effective slope is considered the slope under the vegetation which would most significantly influence the bush fire behaviour.

Steeper slopes significantly increase the rate of spread of a fire throughout the landscape. A wildfire can move quickly up-slope (doubling in speed every 5 degrees of incline). In poor weather conditions significant slope can generate an intense fire over a relatively short distance.

Topography adjacent the proposal area tends to fall towards the unnamed watercourse (east) and Winding Creek (south). BEMC has incorporated consideration of topographic conditions as part of their fire-modelling input data, refer to Appendix B.

4.5 Asset Protection Zone Analysis

In accordance with Table 6.8a of PBP, APZs must be provided to enable sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.

The proposed APZ has been determined by BEMC (2021) using the NBC Detail Method 2 calculator. The minimum APZ is portrayed in Figure 3 of Appendix B. The APZ Analysis proposes a performance solution and has provided evidence in support of the performance criteria throughout the analysis.

An extract of the analysis below is visually portrayed in Figure 4-1 below.

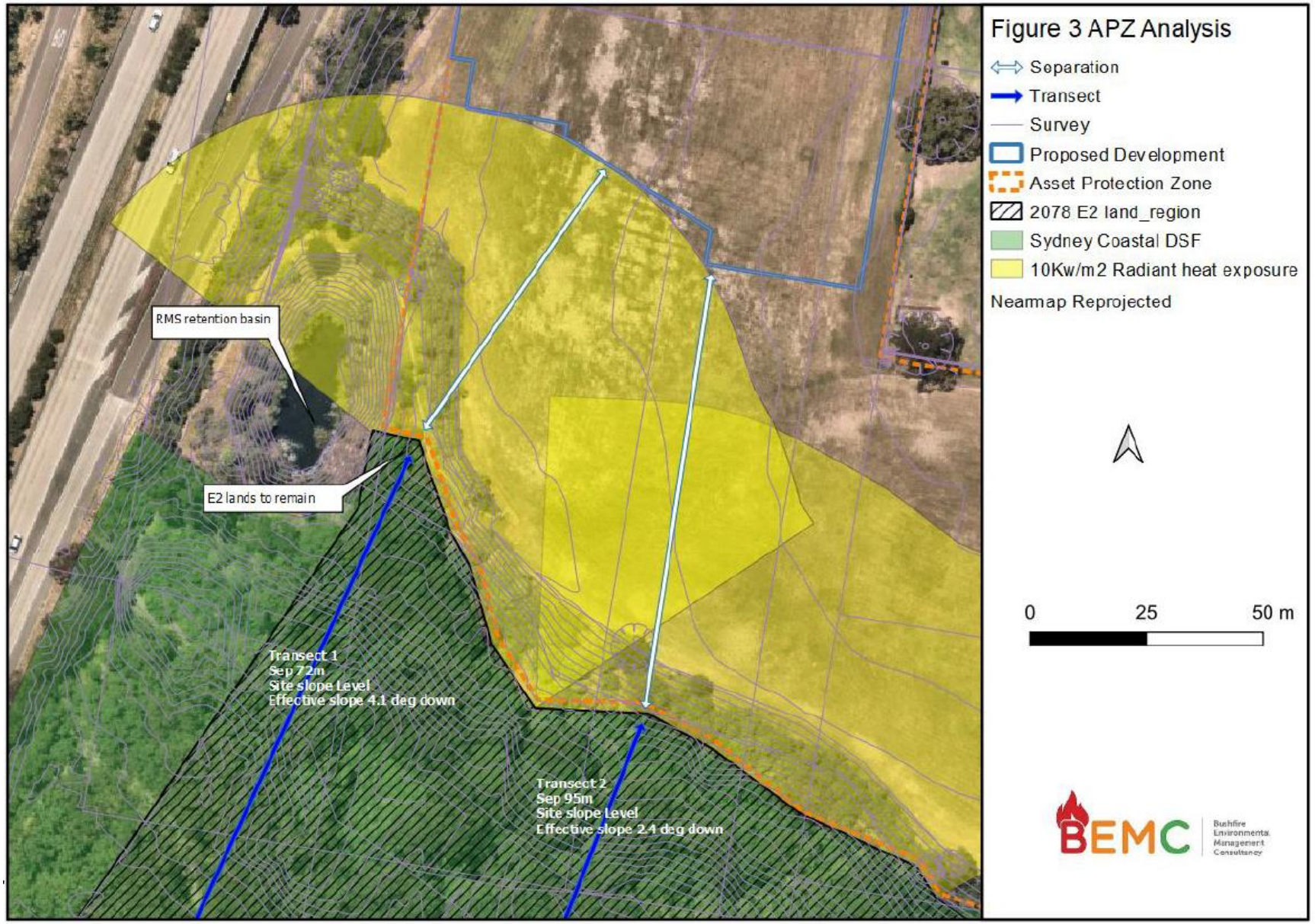

Figure 4-1 Extract: APZ Analysis (Source: BEMC, 2021)

5. Bush fire Protection Measures (BPMs)

This assessment also considers key BPMs as identified in Section 4 of PBP. In accordance with Section 6.8 of PBP, BPMs are provided to minimise the risk of spread to buildings and consider the increased vulnerability of the occupants. The measures considered for the proposal area derive from Section 6.8 of PBP (NSW RFS, 2019) and specifically, Tables 6.8a – 6.8d (extracts below) and include:

- Asset Protection Zones.
- Landscaping.
- Access requirements.
- Water supplies.
- Gas and electricity services, and
- Emergency Management.

5.1 Asset Protection Zones

Intent of measures: To provide suitable building design, construction, and sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants.

PBP APZ performance criteria and acceptable solutions are outlined in Table 5-1 below.

Table 5-1 Summary of Table 6.8a of PBP (APZ)

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***radiant heat levels of greater than 10kW/m² (calculated at 1200K) will not be experienced on any part of the building.***	▪ *an APZ is provided in accordance with Table A1.12.1 in Appendix 1.*	No. A Performance Solution is proposed	Implementation of Appendix B of AS3959:2018 has been completed providing a performance-based solution to meet the performance criteria. Refer to Asset Protection Zone Analysis, prepared by BEMC (2021), included in Appendix B.
▪ ***APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.***	▪ *APZs are located on lands with a slope less than 18 degrees.*	Yes	All areas that are subject to proposed APZs are not located on land that exceed 18 degrees in slope. Refer to Asset Protection Zone Analysis, prepared by BEMC (2021), included in Appendix B.
▪ ***APZs are managed and maintained to prevent the spread of a fire to the building.*** ▪ ***the APZ is provided in perpetuity.***	▪ *the APZ is managed in accordance with the requirements of Appendix 4 of PBP, and is wholly within the boundaries of the development site;* ▪ *APZs are wholly within the boundaries of the development site.* ▪ *other structures located within the APZ need to be located further than 6m from the refuge building.*	Yes	Refer to Asset Protection Zone Analysis, prepared by BEMC (2021), included in Appendix B. APZs would wholly be located within the boundaries of the development site. No other structures are located within the APZ. Proposed carparking (hard stand) areas is proposed for a large proportion of the required APZ.

5.2 Landscaping

Landscaping should be considered throughout the design process and further enforced throughout the operational phase of the development. Suitably positioned and considered landscape design can reduce the risk of flame contact and radiant heat to assets, thus improving the defence of an asset or structure. A well-considered landscape design includes, but is not limited to:

- Increasing chances of filtering wind-driven embers or burning debris.
- Reduces wind forces.
- Create a discontinuous or spaces between vegetation to slow and reduce the intensity of a fire run towards a building.
- Fire retardant species could be selected.
- Plant selection that does not drop large amounts of leaf litter that can act as ground fuel in the event of a bush fire.

PBP Landscaping performance criteria and acceptable solutions are outlined in Table 5-2 below.

Table 5-2 Summary of Table 6.8a of PBP (Landscaping)

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.***	▪ *landscaping is in accordance with Appendix 4; and* ▪ *fencing is constructed in accordance with section 7.6.*	Yes	Future landscaping and fencing within the site would comply with PBP. Ongoing management of designated APZs, would be in accordance with Appendix 4 of PBP.

5.3 Construction Standards

The appropriate design and construction of buildings enhance their survivability from bush fires. Building design needs to ensure adequate protection of vulnerable building elements. Construction standards are outlined in AS 3959 and the NASH Standard to provide various levels of protection for different building elements.

PBP Construction Standards performance criteria and acceptable solutions are outlined in Table 5-3 below.

Table 5-3 Summary of Table 6.8a of PBP (Construction Standards)

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***the proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.***	▪ *a construction level of BAL-12.5 under AS 3959 or NASH Standard and section 7.5 of PBP is applied.*	Yes	As the proposed building does not exceed radiant heat levels greater than 10kW/m^2, BAL-12.5 (Section 3 & 5 of AS 3959-2018) is an appropriate level of construction. The proposed building shall incorporate BAL-12.5 construction standards as outlined in AS 3959-2018. The additional construction requirements specified in Section 7.5 of PBP, would also be incorporated.

5.4 Access

Intent of measures: To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area. The table below summarises the requirements prescribed in PBP.

PBP Access performance criteria and acceptable solutions are outlined in Table 5-4 below.

Table 5-4 Summary of Table 6.8b of PBP (Access)

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.***	▪ *SFPP access roads are two-wheel drive, all-weather roads;* ▪ *access is provided to all structures;* ▪ *traffic management devices are constructed to not prohibit access by emergency services vehicles;* ▪ *access roads must provide suitable turning areas in accordance with Appendix 3; and* ▪ *one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.*	Yes	The proposed layout can achieve the acceptable solutions. Minor refinement of the design would occur through the detailed design phase. Compliance with PBP would be achieved.
▪ ***the capacity of access roads is adequate for firefighting vehicles.***	▪ *the capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges*	Yes	All internal roads and any watercourse crossings (i.e. Waratah Avenue) would be constructed to ensure adequate

	and causeways are to clearly indicate load rating.		capacity for a 23-tonne firefighting appliance.
▪ ***there is appropriate access to water supply.***	▪ *hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression;* ▪ *hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005; and* ▪ *there is suitable access for a Category 1 fire appliances to within 4m of the static water supply where no reticulated supply is available.*	Can comply	Water hydrants would be provided to the proposal. Water hydrants would be designed so that they are located outside of the carriageway and designated parking areas. Hydraulic design would occur throughout the detailed design process.
Perimeter Roads ▪ ***perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.***	▪ *there are two-way sealed roads;* ▪ *minimum 8m carriageway width kerb to kerb;* ▪ *parking is provided outside of the carriageway width;* ▪ *hydrants are to be located clear of parking areas;* ▪ *there are through roads, and these are linked to the internal road system at an interval of no greater than 500m;* ▪ *curves of roads have a minimum inner radius of 6m;*	Not applicable.	Not applicable – a perimeter road is not proposed. Due to prevailing site conditions (limited frontage and access from the Newcastle Inner City Bypass) and the location of the proposed APZ, a perimeter road is not able to be provided to the proposed development.

	▪ *the maximum grade road is 15 degrees and average grade of not more than 10 degrees;* ▪ *the road crossfall does not exceed 3 degrees; and* ▪ *a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.*		
Non-Perimeter Roads ▪ ***non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating.***	▪ *minimum 5.5m carriageway width kerb to kerb;* ▪ *parking is provided outside of the carriageway width* ▪ *hydrants are located clear of parking areas;* ▪ *there are through roads, and these are linked to the internal road system at an interval of no greater than 500m;* ▪ *curves of roads have a minimum inner radius of 6m;*	Yes	The internal access road is considered a non-perimeter road due to the layout, configuration. Non-perimeter roads exceed the minimum carriageway width of 5.5 metres. All ingress and egress for the proposal is via two-way access roads. One way circulation is provided within the carpark. As the proposal has two street frontages, a through road is proposed. Detailed civil/construction design would incorporate requirements of Section 6.8.2. Vertical obstructions are not present. Ongoing management of the proposal would ensure no obstructions occur throughout the operational phase of the proposal.

▪ *the maximum grade road is 15 degrees and average grade of not more than 10 degrees;* ▪ *the road crossfall does not exceed 3 degrees; and* ▪ *a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.*		

5.5 Water and Utility Services

Intent of measures: To provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

PBP Water and Utility Services performance criteria and acceptable solutions are outlined in Table 5-5 below.

Table 5-5 Summary of Section 6.8c of PBP.

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***an adequate water supply is provided for firefighting purposes.***	▪ *reticulated water is to be provided to the development, where available; or* ▪ *a 10,000 litre minimum static water supply for firefighting purposes is provided for each occupied building where no reticulated water is available.*	Yes	Reticulated water would be provided to the proposal area. It is anticipated that a fire pump house and storage tanks would be located at the northern entry to the site.
▪ ***water supplies are located at regular intervals.*** ▪ ***the water supply is accessible and reliable for firefighting operations.***	▪ *fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2005;* ▪ *hydrants are not located within any road carriageway; and* ▪ *reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads.*	Can comply	Subject to future hydraulic and detailed design, hydrants would be located outside the road carriageway.

▪ ***flows and pressure are appropriate.***	▪ *fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.*	Assumed compliance	It is assumed that hydrant flows, and pressures could achieve compliance, at the time of construction. Adequate flows and pressures would need to be maintained throughout the operational life of the development.
▪ ***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.*	Can comply	This measure would be incorporated into future detailed design.
Electricity Services			
▪ ***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; and* ▪ *where overhead, electrical transmission lines are proposed as follows:* ▪ *lines are installed with short pole spacing (30m), 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 Guideline for Managing Vegetation Near Power Lines.*	Can comply	Future service connections would incorporate the requirements of PBP in relation to the provision of electricity services.

Gas Services

▪ ***location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.***	▪ *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 10m and shielded on the hazard side;* ▪ *connections to and from gas cylinders are metal;* ▪ *if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;* ▪ *polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and* ▪ *above-ground gas service pipes external to the building are metal, including and up to any outlets.*	Can comply	Future service connections would incorporate the requirements of PBP in relation to the provision of gas services.

5.6 Emergency Management

Intent of measures: to provide suitable emergency and evacuation arrangements for occupants of SFPP developments.

PBP Water and Utility Services performance criteria and acceptable solutions are outlined in Table 5-6 below.

Table 5-6 Summary of Section 6.8d of PBP

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***a Bush Fire Emergency Management and Evacuation Plan is prepared.***	▪ *Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the:* ▪ *The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan;* ▪ *NSW RFS Schools Program Guide;* ▪ *Australian Standard AS 3745:2010 Planning for emergencies in facilities; and Australian Standard* ▪ *AS 4083:2010 Planning for emergencies – Health care facilities (where applicable).* ▪ *the Bush Fire Emergency Management and Evacuation Plan should include planning for the early relocation of occupants.* ▪ *Note: A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.*	Can comply	A Bush Fire Emergency Management and Evacuation Plan would be prepared in consultation with local fire agencies (the NSW RFS and Fire and Rescue NSW). This plan would comply with relevant Australian Standards and appropriate guidelines, as applicable to this category of development. The proponent shall prepare the Bush Fire Emergency Management and Evacuation Plan prior to an occupation certificate being issued. It is recommended that the Bush Fire Emergency Management and Evacuation Plan is prepared prior to the issue of a Construction Certificate, to accommodate input (if received) by local fire authorities into detailed design plans.

Performance Criteria	Acceptable Solutions	Complies	Comment
The intent may be achieved where:			
▪ ***appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.***	▪ *an Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual; and* ▪ *detailed plans of all emergency assembly areas including on site and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted.*	Can comply	Prior to the operation of the proposal, an Emergency Planning Committee is to be established to develop and implement an Emergency Procedures Manual.

6. Other Planning Matters

6.1 Vegetation Management / APZ Maintenance

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard. An APZ provides:

- A buffer zone between a bush fire hazard and an asset.
- An area of reduced bush fire fuel that allows for suppression of fire.
- An area from which backburning or hazard reduction can be conducted, and
- An area which allows emergency services access and provides a relatively safe area for firefighters to defend an asset.

An APZ, if designed correctly and maintained regularly, would reduce the risk of:

- Direct flame contact on an asset.
- Damage to the asset from intense radiant heat, and
- Ember attack.

An OPA and IPA would be provided within the proposal site (as indicated in Appendix B), where a low-fuel (i.e. presence of hardstand areas) environment would predominantly occur. A defendable and accessible space within the site and IPA would be provided.

In accordance with Appendix 4 of PBP, an IPA shall display characteristics that include but are not limited to: a tree canopy cover of less than 15% at maturity, a maximum 30% of the IPA may contain shrubs, trees should have lower limbs (up to 2m in height) removed, shrubs are not to have a connection with tree canopy layer, shrubs should not form more than 10% ground cover, maintain 2 – 5m canopy separation of trees and branches are not to overhang the asset.

6.2 Bush Fire Risk Management Plan

The locality surrounding the subject site falls under the Central Coast Bush Fire Risk Management Plan 2020-2025 as adopted by the Central Coast Bush Fire Coordinating Committee on 1 December 2020.

The Central Coast BFRMP has strategic fire management zones mapped in the vicinity of the proposal, identified as number 705 – School Complex and number 294 – Charlestown / Mount Hutton - Residential), refer to Figure 6-1 below.

The objectives of a fire management zones are to provide strategic areas of fire protection advantage which will reduce the speed and intensity of bush fires and reduce the potential for spot fire development. In this instance, the proposal and greater subject land does not immediately benefit from a designated APZ or Strategic Fire Advantage Zone (SFAZ) which may be used by authorities and fire agencies to conduct hazard reduction works, or enable access for direct, indirect, and parallel fire suppression treatments. However, periodic inspections and maintenance of nearby assets would benefit the proposal, whereby vegetation within the landscape is subject to partial maintenance, to reduce the broader hazard to adjacent communities and assets.

The objectives of a SFAZ are to provide strategic areas of fire protection advantage which would reduce the speed and intensity of bush fires and reduce the potential for spot fire development. As such, the zone improves the likelihood and safe use of parallel attack suppression and indirect attack to reduce the likelihood of crown fire development and/or spot fire ignition potential from within the zone.

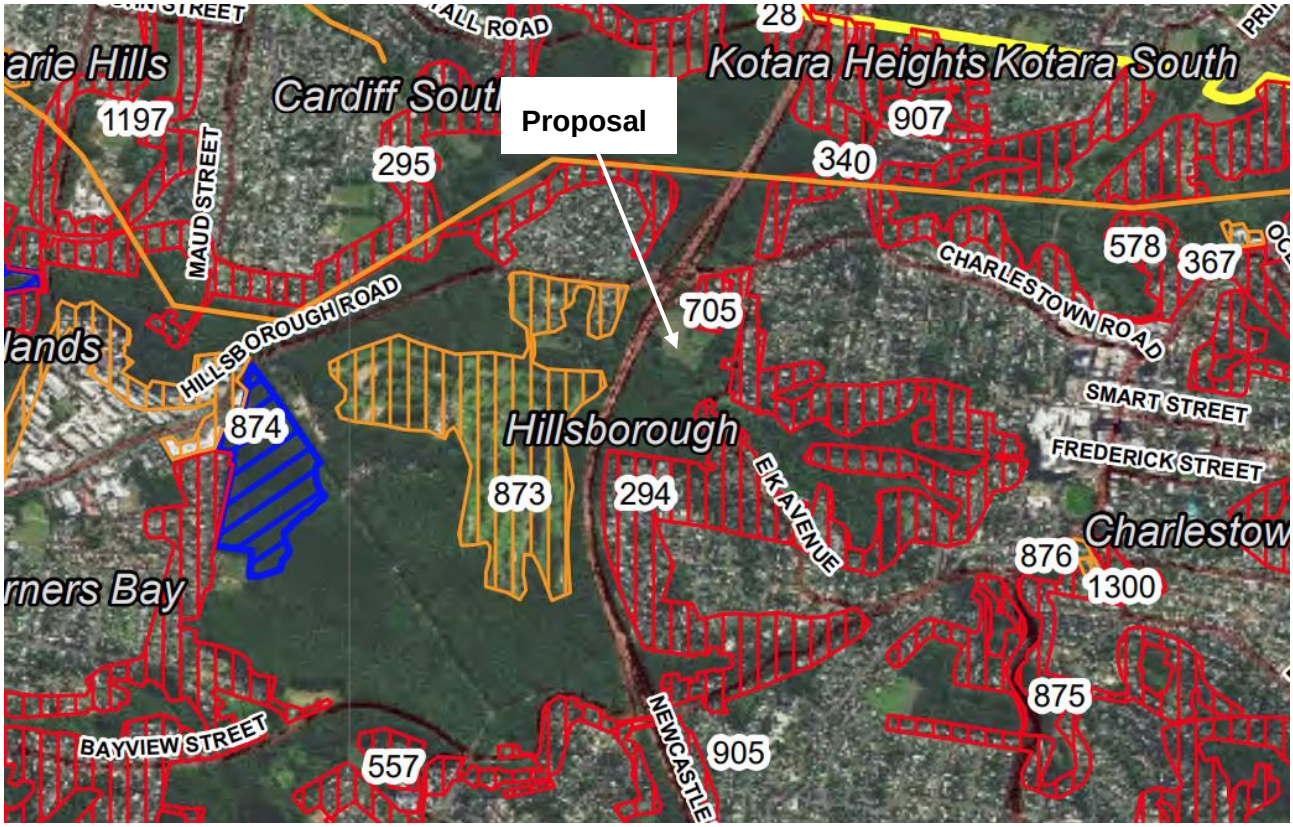

Figure 6-1 Extract: Central Coast Bush Fire Risk Management Plan (NSW RFS, 2020)

6.3 Emergency Services

Several firefighting response resources are situated within a reasonable distance of the proposal. Fire agencies that could attend in the event of an emergency, includes both the NSW RFS and Fire and Rescue NSW. The closest stations and therefore, likely first responders, are identified in Table 6-1 below.

Table 6-1 Closest firefighting resources

Agency	Station	Address
NSW RFS	Cameron Park Rural Fire Brigade	1a George Booth Drive, Cameron Park NSW 2285
Fire and Rescue NSW	Fire and Rescue NSW - Tingara Heights	70 Violet Town Road, Tingira Heights NSW 2290
	Fire and Rescue NSW - Newcastle	56 Appletree Road, Holmesville NSW 2286

7. Strategic Objectives

Upon consideration of the HIS design, layout and function, the proposal would be able to demonstrate and achieve the intent of SFPP objectives outlined in PBP.

Consideration of PBP SFPP objectives is provided below in Table 7-1.

7.1 Aims and Objectives for Planning for Bush Fire Protection (2019)

The proposal can satisfy the specific objectives of PBP for SFPP developments. The objectives identified under Section 6.2 of PBP are outlined in Table 7-1 below.

Table 7-1 PBP Objectives

Objectives	Comment
Minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting;	The proposal layout and application of BPMs would afford the building and users a level of protection from exposure to a bush fire. The building design and siting of the development allows for the provision of APZs, proposed internal roads and carparking areas to provide separation from hazard vegetation. Suitable access and water supply would be provided to the proposal. Refer to Section 4.5 and Figure 2-1
Provide an appropriate operational environment for emergency service personnel during firefighting and emergency management;	An appropriate operational environment for emergency service personnel would be provided, through the provision of SFPP APZs, internal access, two-way through roads and substantial hardstand carparking areas. Refer to Figure 2-1.
Ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development; and	Access for emergency services is provided to the interface through the provision of internal roads and hardstand carparking areas. All roads would be designed in accordance with PBP to ensure appropriate access is provided to facilitate emergency services. Refer to Section 5.4.
Ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.	A Bush Fire Emergency Management and Evacuation Plan would be prepared in consultation with the NSW RFS and Fire and Rescue NSW. Refer to Section 5.6.

8. Conclusion

A bush fire assessment for the proposed HIS (a public assembly building) has been prepared. In accordance with Section 4.14 of the EP&A Act. This BFAR has considered the design layout against the requirements of PBP. The proposed development would conform to the intent, performance criteria and specifications, outlined in PBP.

The proposal can demonstrate that BPMs prescribed in PBP could be satisfactorily incorporated into the development. In summary, implementing the strategies outlined in this report and BEMCs APZ analysis (Appendix B), the proposal would be able to reduce the bush fire risk, by including:

- Compliant APZ setbacks from bush fire prone vegetation.
- The building would be afforded ember protection through application of AS 3959 construction standards.
- Access and egress from the site through a suitable road layout.
- Underground electricity and gas services.
- Compliant water supplies (including hydrants), and
- Emergency response planning.

Although the proposal would be refined through the ongoing detailed design phase, the current proposed layout has allowed for BPMs to be incorporated into the proposal. The proposal can achieve the acceptable solutions outlined in PBP, except for the provision of APZs.

A performance solution is provided for analysis of APZ setbacks and determination of radiant heat that the proposed building may be subjected to in the event of a fire.

8.1 Bush fire Protection Measures

The proposal would incorporate the following BPMs.

8.1.1 Asset Protection Zones

Implementation of Appendix B of AS3959:2018 has been completed providing a performance-based solution to meet the performance criteria.

APZs would be implemented in accordance with the specifications and findings of Appendix B and Table 6.8a of PBP. APZs would be maintained in accordance with Appendix 4 of PBP to ensure the proposed building is not subjected to radiant heat in excess of 10kW/m^2.

8.1.2 Landscaping

Future landscaping shall be in accordance with Appendix 4 of PBP, in accordance with Table 6.8a of PBP. Ongoing compliance with Appendix 4 of PBP would ensure APZ requirements are not compromised; and ongoing regrowth within APZs is appropriately managed.

8.1.3 Construction Standards

In accordance with PBP 2019, the proposed development is assessed as requiring BAL-12.5 (Section 3 & 5 from AS 3959-2018) for the entire building.

The proposed building shall also comply with NSW variations introduced by Section 7.5 of PBP, where additional requirements apply to sarking, sub-floor screening, verandas, decks, steps, ramps, landings and fascias and bargeboards.

8.1.4 Access

Internal access requirements shall comply to the specification of Table 6.8b of PBP.

A through road would be provided within the proposal.

8.1.5 Water & Utilities

Water, Electricity and Gas are to comply with Table 6.8c of PBP.

An internal hydrant network shall be provided, where adequate pressure could be achieved.

8.1.6 Emergency Management

A Bush Fire Emergency Management and Evacuation Plan shall be prepared prior to commencement of construction works to the specifications of Table 6.8d of PBP.

Detailed plans of all emergency assembly areas including on site and off-site arrangements as stated in AS 3745:2010 are clearly displayed, and an annually emergency evacuation is conducted

This report has been prepared by Brad Draper, a person who is recognised by the NSW Rural Fire Service as a qualified consultant in Bush Fire Risk Assessment.

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Brad Draper
Senior Bush fire Consultant

BPAD Accredited Bush fire Practitioner (49517)

9. References

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NSW Rural Fire Service. (2017, May). *NSW Local Government Areas FDI.* Retrieved from NSW Rural Fire Service: https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0007/55285/Local-government-areas-and-FDI.pdf

NSW Rural Fire Service. (2019, March). *Comprehensive Vegetation Fuel Loads.* Retrieved from NSW Rural Fire Service: https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0005/97781/Comprehensive-vegetation-fuel-loads-Fact-Sheet-V8.pdf

Standards Australia. (2018). *Construction of buildings in bushfire-prone Areas, AS3959.*

Appendix A Design Plans, prepared by EJE Architecture (2021)

This report shall be read in conjunction with the accompanying plans.

Reference	Description	Prepared by
Project No. 13017	Drawing: A001 (Revision D) – Site Plan Overall	EJE Architecture
Project No. 13017	Drawing: A010 (Revision D) – Site Plan Part A	EJE Architecture
Project No. 13017	Drawing: A100 (Revision C) – Ground Floor Plan	EJE Architecture
Project No. 13017	Drawing: A101 (Revision C) – Upper Floor Plan	EJE Architecture
Project No. 13017	Drawing: A102 (Revision C) – Roof Plan	EJE Architecture
Project No. 13017	Drawing: A301 (Revision C) – Stadium Seating Plan	EJE Architecture
Project No. 13017	Drawing: A600 (Revision C) – Building Sections Sheet 01	EJE Architecture
Project No. 13017	Drawing: A601 (Revision C) – Building Sections Sheet 02	EJE Architecture

Appendix B Asset Protection Zone Analysis Report, prepared by BEMC (2021)

BEMC
Bushfire
Environmental
Management
Consultancy

BPAD
Bushfire
Planning & Design
Accredited Practitioner
Level 3

ASSET PROTECTION ZONE ANALYSIS

62 Hillsborough Road, Hillsborough

Lot 12 / DP 121982

BE BUSHFIRE READY
BEMC

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Title	APZ Analysis			
Description	Asset Protection Zone Analysis - 62 Hillsborough Road, Hillsborough			
Created By	Duncan Scott-Lawson			
	T: +61 408 667 137 E: duncan@emconsultancy.com.au			
Prepared For	Basketball Association of Newcastle – c/o Kris Leck			
	A: 5/91 Hannell Street Wickham NSW 2293 T: 0439 488 429 E: kris.leck@catalystpc.com.au			
Version Number	**Modified By**	**Modifications Made**	**Date Modified**	**Status**
1	DSL	FINAL	18/08/2021	Completed
2	DSL	Updated site layout	21/08/2021	Completed
3	DSL	Final revision	25/08/2021	Completed

Executive Summary

BEMC Pty Ltd was engaged by Kris Leck to complete an analysis of the Asset Protection Zones surrounding a proposed public assemble areas at lot 11 and 12 / DP879281 and Lots 6,7 and 8 DP 9594 otherwise known as 60 and 62 Hillsborough Road, Hillsborough, NSW; and 109 Waratah Avenue, Charlestown.

The proposed development was redesigned following the inability to reach the 10kW/m^2 radiant heat exposure on the building. The proposed development is classified as Public assembly building >500m^2 in consideration of PBP 2019. Public assembly building >500m^2 are required to be assessed as Special Fire Protection Purpose (SFPP) developments. To determine the planning and construction requirements a site visit in accordance with Appendix 1 of PBP 2019 has be performed. The design fire methodology outline in Appendix B of AS3959:2018 Detailed BAL Assessment is implemented to calculate separations to meet 10kW/m^2.

The separation required to the south are determined through Transect 1 requiring a 72m separation and Transect 2 a 67m separation to achieve 10kW/m^2. The vegetation to the south of the site, immediately east of the retention basin, is required to remain as E2 lands.

This analysis determines the separation of 72m is adequate to ensure the building is not exposed to radiant heat exposures >10kw/m^2.

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TABLES

FIGURES

Table 1 Planning for bushfire protection compliance (PBP 2019)
Extract Chapter 6a - SFPP developments on bushfire prone lands

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTION	COMPLIANCE
APZs	Radiant heat levels of greater than 10kW/ m² (calculated at 1200K) will not be experienced on any part of the building.	• the building is provided with an APZ in accordance with Table A1.12.1 in Appendix 1	**Performance solution – Method 2 calculations**
	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	• APZs are located on lands with a slope less than 18 degrees.	**Acceptable Solution**
	APZs are managed and maintained to prevent the spread of fire to the building. The APZ is provided in perpetuity.	• The APZ is managed in accordance with the requirements of Appendix 4 of this document, and is wholly within the boundaries of the development site • APZ are wholly within the boundaries of the development site, and • Other structures located within the APZ need to be located further than 6m from the refuge building	**Acceptable Solution**

BUSHFIRE CERTIFICATION

The report has been prepared by Duncan Scott-Lawson, BPAD level 3 certifier BPAD 47789. I certify that the proposed development design conforms to the relevant specifications and requirements of PBP 2019 and AS 3959-2018 detailed in Section 4.14 (1) (b) of the *Environmental Planning and Assessment Act* (1979).

1 INTRODUCTION

BEMC Pty Ltd was engaged by Kris Leck to complete an analysis of the Asset Protection Zones surrounding a proposed public assemble areas at lot 11 and 12 / DP879281 and Lots 6,7 and 8 DP 9594 otherwise known as 60 and 62 Hillsborough Road, Hillsborough, NSW; and 109 Waratah Avenue, Charlestown, hereafter referred to as the 'site' (**Figure 1**).

The identification of Bushfire Prone Areas (BPA) in NSW is required under section 10.3 of the *Environment Planning and Assessment Act 1979* (EP&A Act). Section 4.14 of the EP&A Act requires developments to comply with NSW Rural Fire Service, PBP 2019 if any part of a development site is affected by bush fire hazard as indicated within the BPA Map. This development falls within the Bushfire Vegetation Buffer zone on the Lake Macquarie Bushfire Prone Land Map which triggers development assessment provisions under 4.14 EP&A Act and compliance with PBP 2019. The proposed development is classified as Public Assembly building >500m^2 in consideration of PBP2019. Public assembly building >500m^2 are required to be assessed as Special Fire Protection Purpose (SFPP) developments.

To determine the separation requirements and recalculation of the APZ, information within the Bushfire Assessment Report (Brad Draper - Parker Scanlon, 2020) was supported by a site assessment in accordance with Appendix 1 of PBP 2019. New site layout plans are provided in **Appendix 1**. An analysis has been performed in August 2021 to appendices to the Bushfire Assessment Report in accordance with a design fire methodology analysis outline in Appendix B of AS3959:2018 Construction in Bushfire prone lands - detailed BAL assessment.

1.1 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development is an indoor basketball stadium with a main court stadium with seating and nine (9) outer basketball courts. The development is located to the north of the site and covers approximately 6.78ha.

The proposed location of the development is provided in **Figure 1**.

1.2 OBJECTIVES OF ASSESSMENT

This assessment has been undertaken to enable council to make determination of the proposed development in consideration of the requirements of s4.14 of the *Environmental Planning and Assessment Act* 1979, *Rural Fire Act* 1997, PBP 2019 and AS 3959-2018.

The report assesses to requirements of the development to meet four (4) of the six (6) objectives listed in section 1.1 of PBP 2019, which provide for the protection of human life and minimize impacts on property.

- Afford buildings and their occupants protection from exposure to a bushfire.
- Provide for a defendable 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.
- Provide for ongoing management and maintenance of Bush fire Protection Measures (BPMs); and

1.3 METHOD 2 ASSESSMENT PATHWAY

The design fire methodology outline in Appendix B of AS3959:2018 Detailed BAL Assessment provides the mathematical methodology and accepted inputs that the simplified BAL assessment Method 1 matrix was derived. Method 2 fire design model consists of accurately determining input into nested calculations within the modelling that provide increased accuracy in determining radiant heat flux and flame length.

Furthermore, Method 2 can consider the impact of Kataburn rate of spread, radiant heat shielding, and short fire runs will have on the radiant heat exposure of a proposed development.

Understanding the knowledge gaps for bushfire prediction is required to enable accurate interpretation of bushfire modelling and fire engineering calculations used through the detailed assessment (Method 2). The gaps in knowledge include:

- Duration of the initial fie growth phase.
- Fire spread on slopes, in complex terrain and extreme condition.
- Fire spread around the entire perimeter.
- Short-distance (wind-driven) spotting.
- Characteristics of flames in different fuel types.

When interpreting the results of the detailed method, each of these elements should be analysed to determine its effect on the outputs for the calculations.

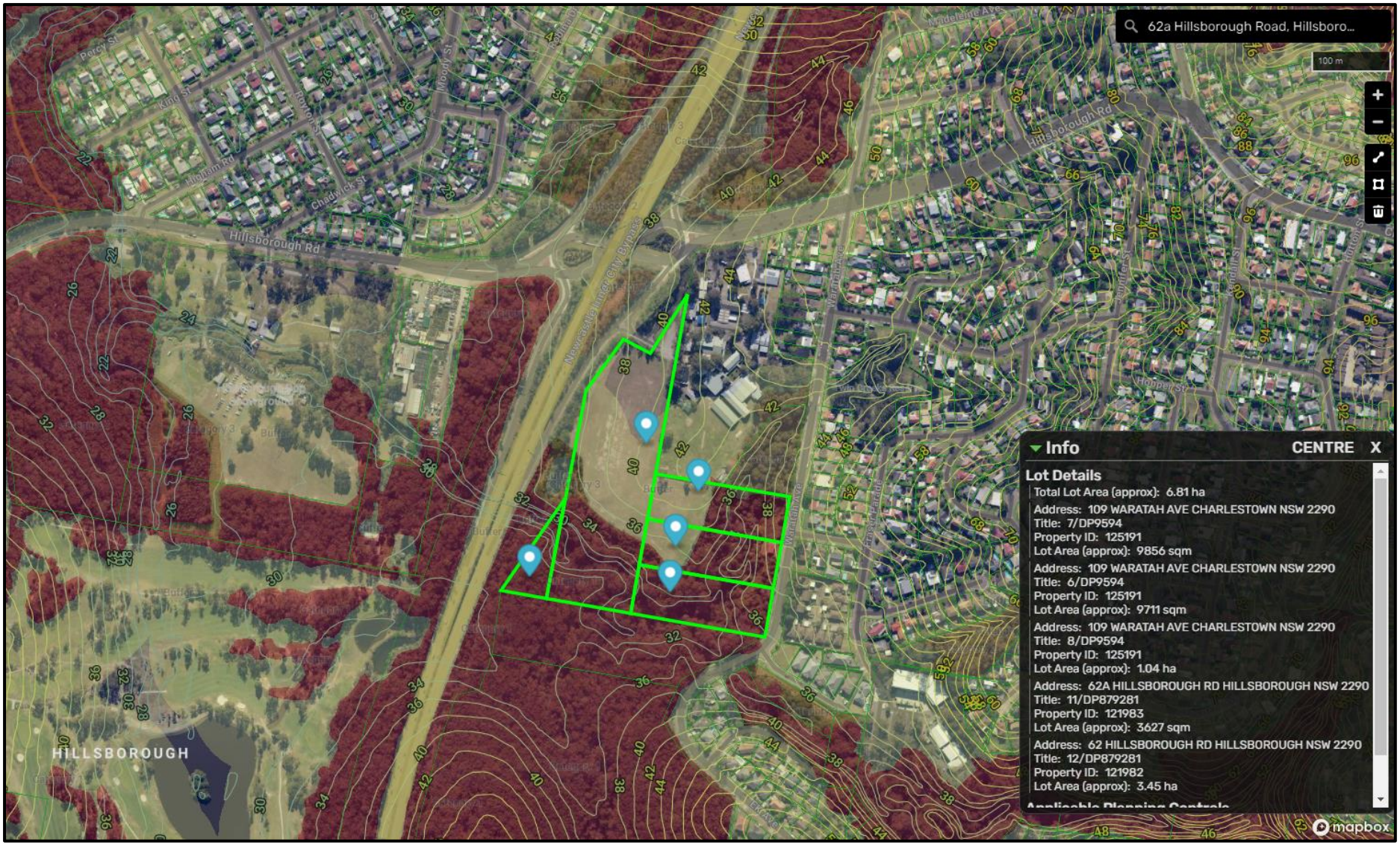


Figure 1 Site Location of proposed indoor Basketball stadium, NSW (Mecone Mosaic, 2020)

2 BUSH FIRE STRATEGIC STUDY

A Bush Fire Strategic Study (BFSS) has been prepared to inform the context of the assessment of the Bush Fire Assessment Report (BFAR). The level of information gathered and analysis within the BFSS depends upon the nature of development, scale of the proposal, the bush fire risk, and potential impact on the wider community and emergency management arrangements. This process provides an opportunity to assess if a proposed development is appropriate in the bush fire hazard context.

Table 2 Bush fire strategic study

Adjoining land	The proposed development will impact on the ability of adjoining Newcastle junior school and Hillsborough public school to evacuate during a bush fire attack if all facilities are operating at the same time. Bush fire emergency management and evacuation procedures shall be developed to inform the operational requirements in the event of a bush fire attack.
Surrounding infrastructure	The proposed development does not significantly impact on the existing infrastructure to operate during a bushfire event.
Access and egress	If Newcastle junior school and Hillsborough public school are operating at the same time as the proposed basketball facility, the capacity of the existing road network will be affected affected by the proposed development during a bushfire event.
Emergency services	The proposed development does not significantly impact on the ability of emergency service to plan, prepare, respond, or recover prior, during or after a bushfire event.
Bush fire landscape assessment	There are a variety of fire run paths towards the development, although the fire runs are interrupted by roads to the west, north and south that provides discontinuous fire fuel and separation between the proposed development and bushfire threat. A bush fire progressing to the site from the south possess the greatest threat. The proposed positioning of car parking areas to the south of the site provides separation between the built infrastructure and bush fire threat, although parked cars can act to propagate a bushfire towards the built infrastructure.

This Bush Fire Strategic Study identifies that the proposed development meeting the broad aims and objectives and the specific objectives of special fire protection purposed development if separations can achieve 10kW/m^2.

The proposed development provides occupants the ability to shelter from a bush fire event, provides separation between the bush fire threat and building, and the building is in areas that will receive <10kW/m^2.

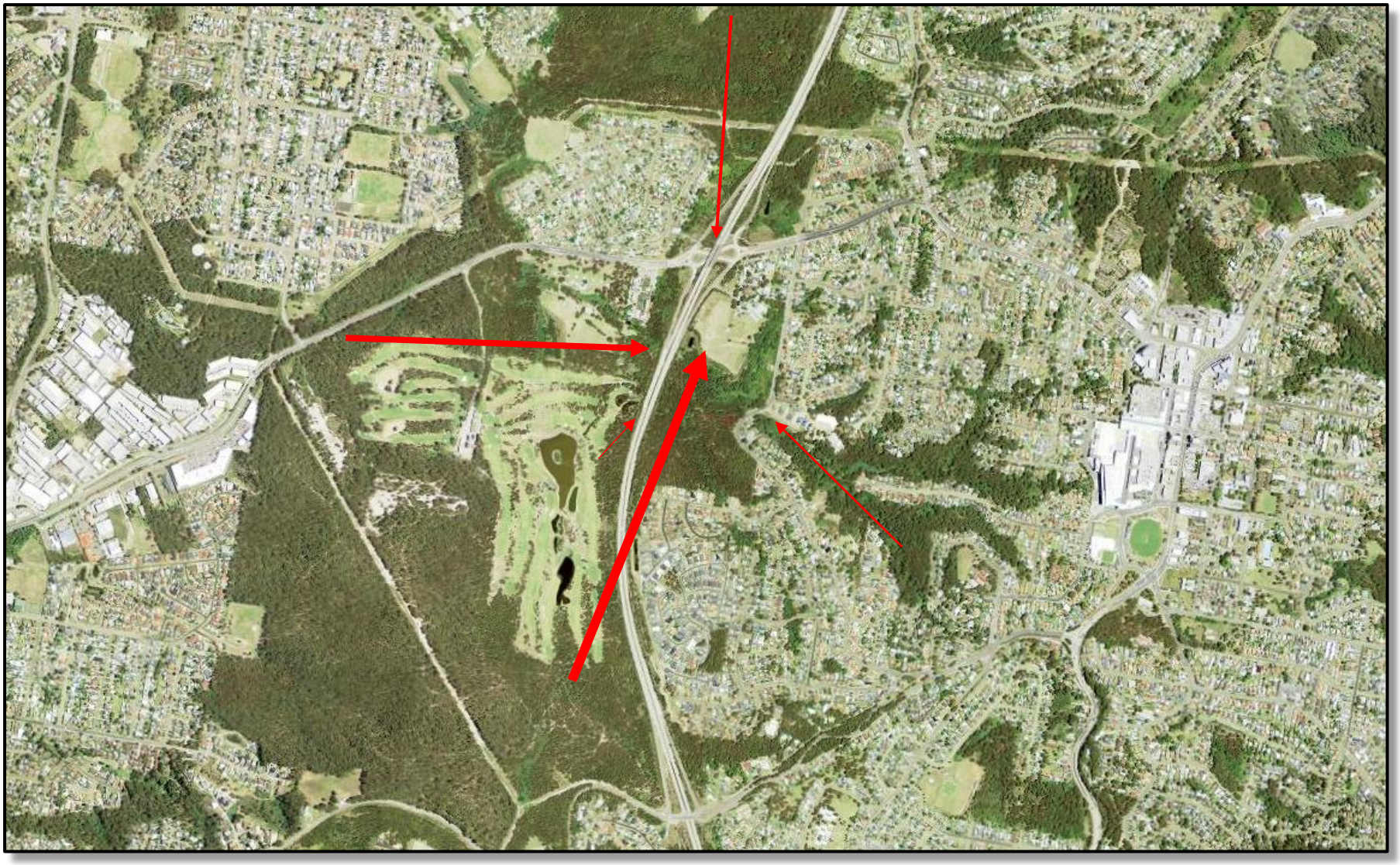


Figure 2 Landscape fire paths

3 BUSHFIRE HAZARD ASSESSMENT

This section details the site assessment methodology in Appendix 1 of PBP2019. It provides detailed analysis of the vegetation, slope, exclusions, vegetation downgrades and shielding elements to provide the required Bush fire Protection Measures.

3.1 FIRE DANGER INDEX

Method 2 assessment considers the worst-case scenario for bushfire impacts and calculates fire behaviour determined from specific inputs. This assessment utilises the council area FFDI of 100.

3.2 ASSESSMENT METHODOLOGY

Vegetation classification over the site has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent.
- Kogan 6*25 Laser distance finder.
- Photo Theodolite application supported by contour and terrain profiles.
- On site vegetation assessment (September 2020) and
- Reference to regional vegetation community mapping.

The classified vegetation, separations, effective and site slope are identified in **Table 4** and displayed in **Figure 2**.

3.3 VEGETATION ASSESSMENT

In accordance with PBP 2019, an assessment of the vegetation over 140m in all directions from the building was undertaken. Vegetation that may be considered a bushfire hazard was identified and classification based on available fuel loads for sub-formations are provided through vegetation fuel monitoring project administered by the University of Wollongong, University of Melbourne and CSRO Ecosystems Science and Bushfire Dynamics and Applications. The results of this research are commonly referred to as the '*NSW Comprehensive Fuel Loads*'.

3.3.1 Vegetation classification, exclusions, and downgrades

The size and shape of small areas of vegetation influences the behaviour of bush fires and the associated risk to the built environment. Small or narrow parcels of vegetation have less opportunity to support fully developed bush fires because of their limited size. Modified landscapes, coastal wetlands and riparian areas vary significantly in structure and composition, but are generally considered as bush fire hazards, except for saline wetlands. Non-hazard and non-vegetated area are not required to be considered for the purposes of PBP 2019.

Anecdotal evidence obtained from previous fire events indicates that exotic vegetation species (weed species) support intense surface fires. Under adverse fire weather conditions these plants can contribute to the intensity of bush fires due to additional fuel loads. Exotic vegetation species display similar fire behaviour characteristics to some native vegetation classifications with lower fuel loads. Table A1.9 of PBP 2018 can be used to convert the Exotic vegetation to native vegetation formations and fuel loads. Where a mixture of exotic and native vegetation exists, the native vegetation fuel loads will apply.

The small patches of vegetation to the north of the site, associated with the Newcastle Inner City bypass are less than 0.25ha in size and greater than 20m from any other vegetation.

3.3.2 Predominant Vegetation Classification

Vegetation in and around the site is classified Sydney Coastal Dry Sclerophyll Forests in accordance with the. NSW Comprehensive Fuel Loads'

3.4 Separation Assessment

Measuring the distance between the proposed building envelop and bushfire threat (vegetation) provides one of the Bushfire Mitigation Measures (BMMs) to reduce the risk from bushfire attack. The land within the separation must conform to the standards of an Asset Protection Zones to be accepted within the separation areas.

3.5 Slope Assessment

This section details the site assessment methodology in Appendix 1 of PBP2019 to assess the effective slope (under classified vegetation) and site slope (slope between the vegetation and proposed development) within the 100m of the proposed building envelop.

3.6 Effective and Site Slope Assessment

The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux.

The effective slope is the slope of the ground under the hazard (vegetation). The slope between the vegetation and the proposed building envelope is the site slope. When identifying the effective and site slopes, it may be found that there are a variety of slopes covering different distances. The effective slope is the slope under the vegetation which will most significantly influence the bush fire behaviour for each aspect.

The topography of the site and surrounds has been assessed and identified with the *Draper, B 16th June 2020, Bushfire Assessment Report – proposed indoor basketball stadium (Public Assembly Building) and ancillary works – Lots 11 and 12 DP879281 and Lots 6,7,and 8 DP 9594 at No. 62 and 62A Hillsborough Road, Hillsborough and No. 109 Waratah Avenue, Charlestown, Parker Scalon Pty Ltd*. The slopes determined within this Bushfire assessment will be utilised within the Method 2 assessment process implements in this report.

3.7 Short Fire Run and Restricted head growth

Short Fire Run or Restricted head growth analysis are not included in this assessment.

3.8 Shielding

Where an elevation is shielded from direct radiant heat arising from bush fire attack, then the construction requirements for that elevation can be reduced to the next lower BAL. An elevation is deemed to be not exposed to the source of bush fire attack if all the straight lines between that elevation and the source of bush fire attack are obstructed by another part of the building.

The shielding of an elevation shall apply to all the elements of the wall but shall not apply to subfloors or roofs. The construction requirements for a shielded elevation shall be not less than that required for BAL-12.5 unless the building has been assessed as being BAL-LOW. The reduced construction requirements do not apply where any elevation is BAL-FZ.

3.9 OTHER METHOD 2 INPUTS

Heat of Combustion

Heat of Combustion (HoC) is an important characteristic I the simulation of wildfires. It is frequently used in the assessment of fuel flammability and a key input to calculate fire-line intensity which provides for flame length calculations. Despite the variability of natural fuels HoC is considered a constant, Research since the development of the method 2 calculations illustrate that fuel moisture content has a significant impact of HoC and argue that lowering the current default heat of combustion of 18600 kJ/kg in forest fire behaviour models.

Flame Emissivity

AS3959:2018 indicates a nominal flame emissivity of 0.95 is justified as the bushfire flames under design fire weather scenarios are generally optically thick ($\varepsilon \approx 1$). The predicted flame emissive power is very sensitive to flame temperature. The selection of the nominal flame temperature for calculation is critical to make sure that the construction standard determined with this flame temperature together with other input parameters can provide an adequate bush fire construction level.

Moisture Factor

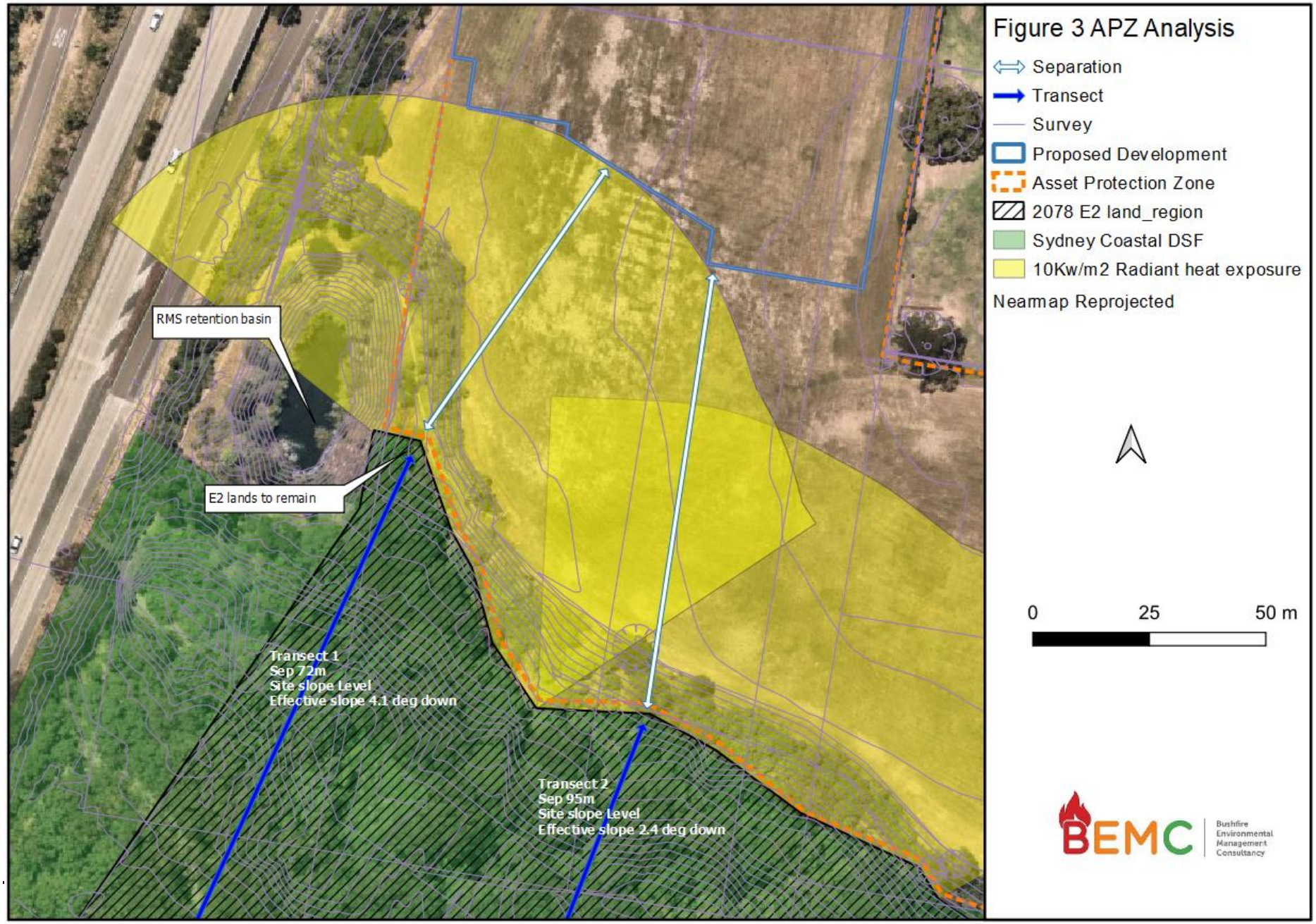
Fuel moisture factor is only used in Marsden–Smedley et al, (1995) fire model for Tussock Moorland, and is default to 5. This input has no effect on fire modelling calculations in other vegetation.

Ambient temperature and Relative Humidity

The default value for ambient air temperature during worst-case scenario fire weather conditions defaults to 35°, converted to Kelvin is 308K. The default value for Relative Humidity is 25%. Worst case scenario fire weather conditions in NSW are generally from the North-west which have high temperatures and low relative humidity. For bushfire threats a from directions other than the north, north-west, and west the ambient temperature and relative humidity can significantly change, especially in coast environments.

Table 3 Bushfire Hazard Assessment (Method 2 AS3959:2018)

Elements	Method (unit)	T1	T2
Vegetation (Keith 2004)	NSW Comprehensive Fuel Loads	Sydney Coastal DSF	Sydney Coastal DSF
Separation provided	Spatial analysis (m)	72m	95m
Site slope	Site visit – Theodolite (°)	Level	Level
Effective slope	Site visit – Theodolite (°)	4.1° down	2.4° down
Shielding Width	Site Plans / Site Visit (m)	100	100
Shielding height	Site Plans / Site Visit (m)	N/A	N/A
Elevation of receiver	Site Plans (m)	6m	6m
Flame temperature	1090 / 1200 Kelvin	1200K for 10Kw/m^2	1200 for 10Kw/m^2
Upslope fire	Kataburn correction	No	No
Fire Danger Index	Douglas Graham (2017)	100	100
Heat of Combustion	Default at 18600 kJ/kg	18600	18600
Flame Emissivity	Default at 0.95	0.95	0.95
Moisture Factor	Default at 5	5	5
Ambient temperature	BoM (Default at 308 Kelvin)	308	308
Relative Humidity	BoM (Default at 25%)	25	25
OUTPUTS (Appendix 2)			
Separation to Achieve 10Kw/m2		72m	67m


RMS retention basin
E2 lands to remain
Transect 1
Sep 72m
Site slope Level
Effective slope 4.1 deg down
Transect 2
Sep 95m
Site slope Level
Effective slope 2.4 deg down
Figure 3 APZ Analysis
Separation
Transect
Survey
Proposed Development
Asset Protection Zone
2078 E2 land_region
Sydney Coastal DSF
10Kw/m2 Radiant heat exposure
Nearmap Reprojected
0
25
50 m
BEMC
Bushfire Environmental Management Consultancy

4 ASSET PROTECTION ZONE ASSESSMENT

This section assesses the requirement to meet the 10kW/m^2 setbacks for SFPP developments for the proposed development in consideration of the acceptable solutions required for Assets Protection Zones each in table 6.8a of PBP 2019.

4.1 RADIANT HEAT LEVELS OF GREATER THAN 10KW/M² (CALCULATED AT 1200K) WILL NOT BE EXPERIENCED ON ANY PART OF THE BUILDING.

The vegetation to the south of the site, immediately east of the retention basin, is identified as E2 lands and will remain as a bushfire threat. This vegetation narrows to form a restricted head, although to allow redundancies within the calculations this restriction is not considered within the radiant heat flux calculations.

The detailed methods 2 assessment has determined the separation required to the south resulting in 10kW/m^2 radiant heat @ 1200K is achieves at 72m separation. The method 2 inputs are provided in **Table 3** and illustrated in **Figure 3**.

4.2 APZ MAINTENANCE IS PRACTICAL, SOIL STABILITY IS NOT COMPROMISED AND THE POTENTIAL FOR CROWN FIRES IS MINIMISED

The area identified to be managed to APZ to the south is an open carpark and complies with APZ requirements in accordance with s3.2 of PBP2019.

4.3 APZS ARE MANAGED AND MAINTAINED TO PREVENT THE SPREAD OF FIRE TO THE BUILDING AND THE APZ IS PROVIDED IN PERPETUITY.

The separation to the south is an open carpark and complies with APZ requirements in accordance with s3.2 of PBP2019.

5 CONCLUSION AND RECOMMENDATIONS

It is clear from this investigation and assessment that the site is located within Bushfire Prone Land. An assessment in accordance with Appendix 1 of PBP2019 has been undertaken implementing detailed assessment pathway described in Appendix B of AS3959:2018 to determine the separation distance to achieve 10kW/m^2.

The separation required to the south are determined through Transect 1 requiring a 72m separation and Transect 2 a 67m separation to achieve 10kW/m^2. The vegetation to the south of the site, immediately east of the retention basin, is required to remain as E2 lands.

This analysis determines the separation of 72m is adequate to ensure the building is not exposed to radiant heat exposures >10kw/m^2.

Finally, the implementation of the adopted measures and recommendations forwarded within this report comply with PBP (2019) and will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

6 REFERENCES

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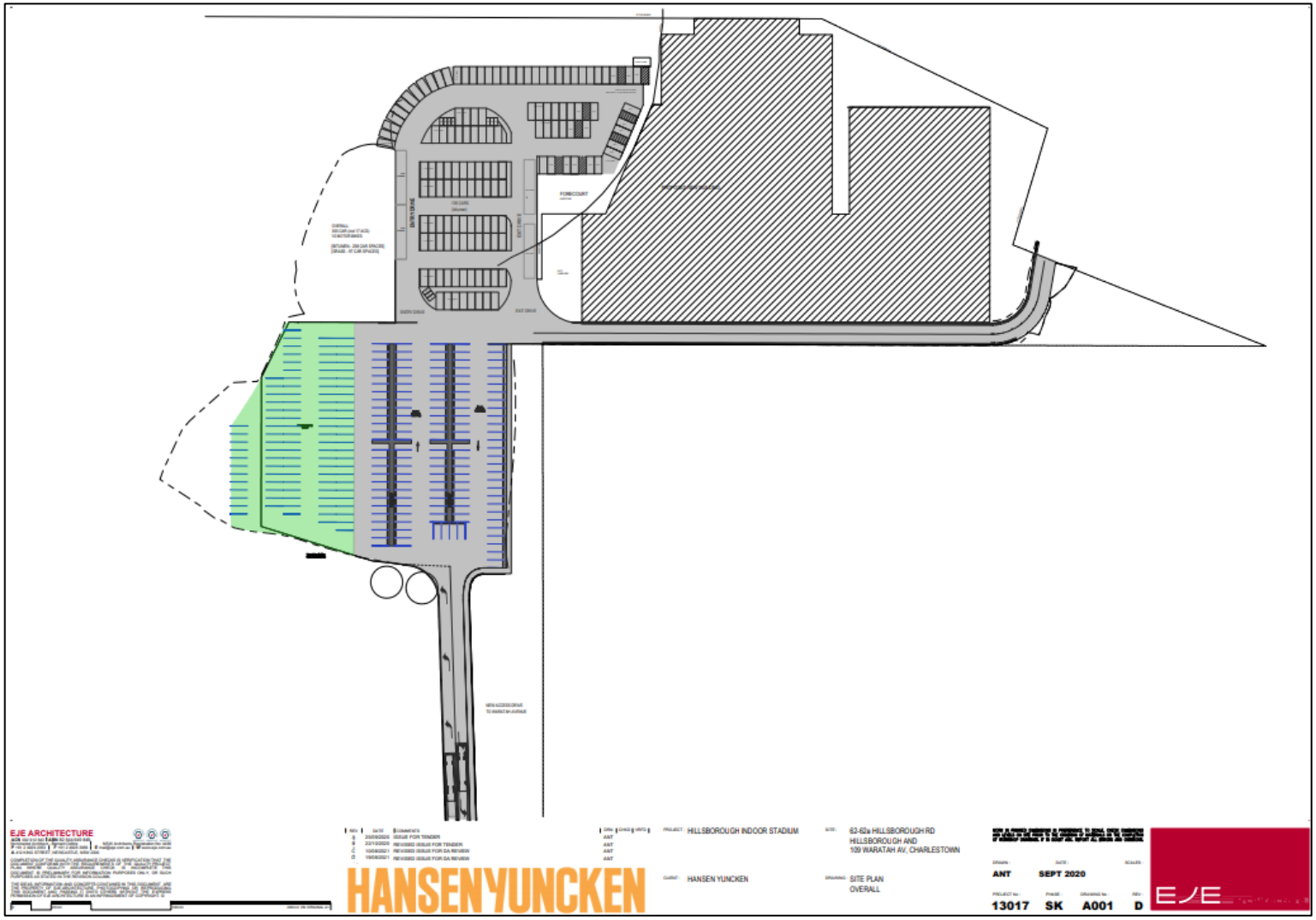
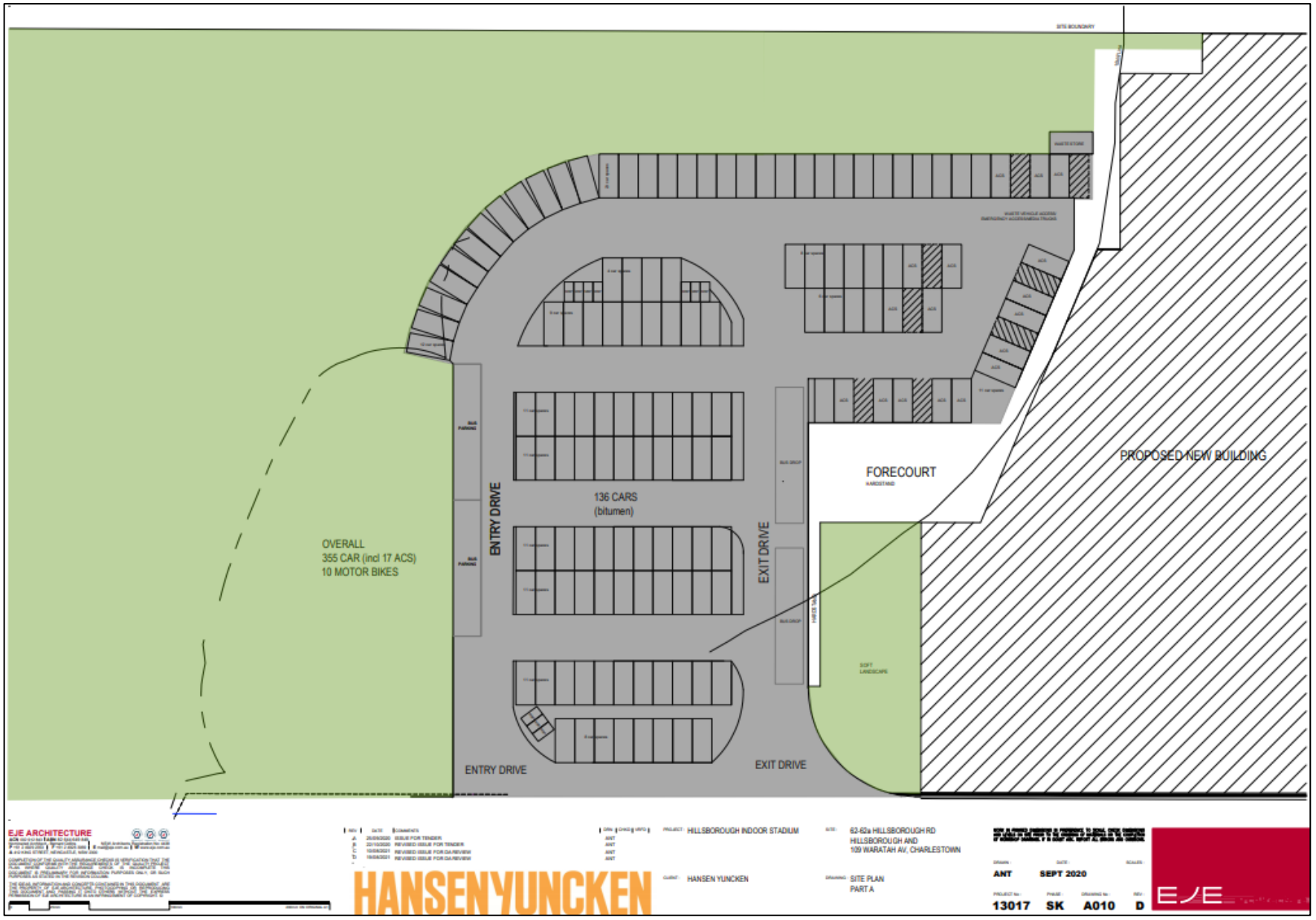
APPENDIX 1 PROPOSED LAYOUT PLANS

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PROPOSED NEW BUILDING
FORECOURT
136 CARS
(bitumen)
ENTRY DRIVE
EXIT DRIVE
OVERALL
355 CAR (incl 17 ACS)
10 MOTOR BIKES
ENTRY DRIVE
EXIT DRIVE
SOFT LANDSCAPE
EJE ARCHITECTURE
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
SITE PLAN
PART A
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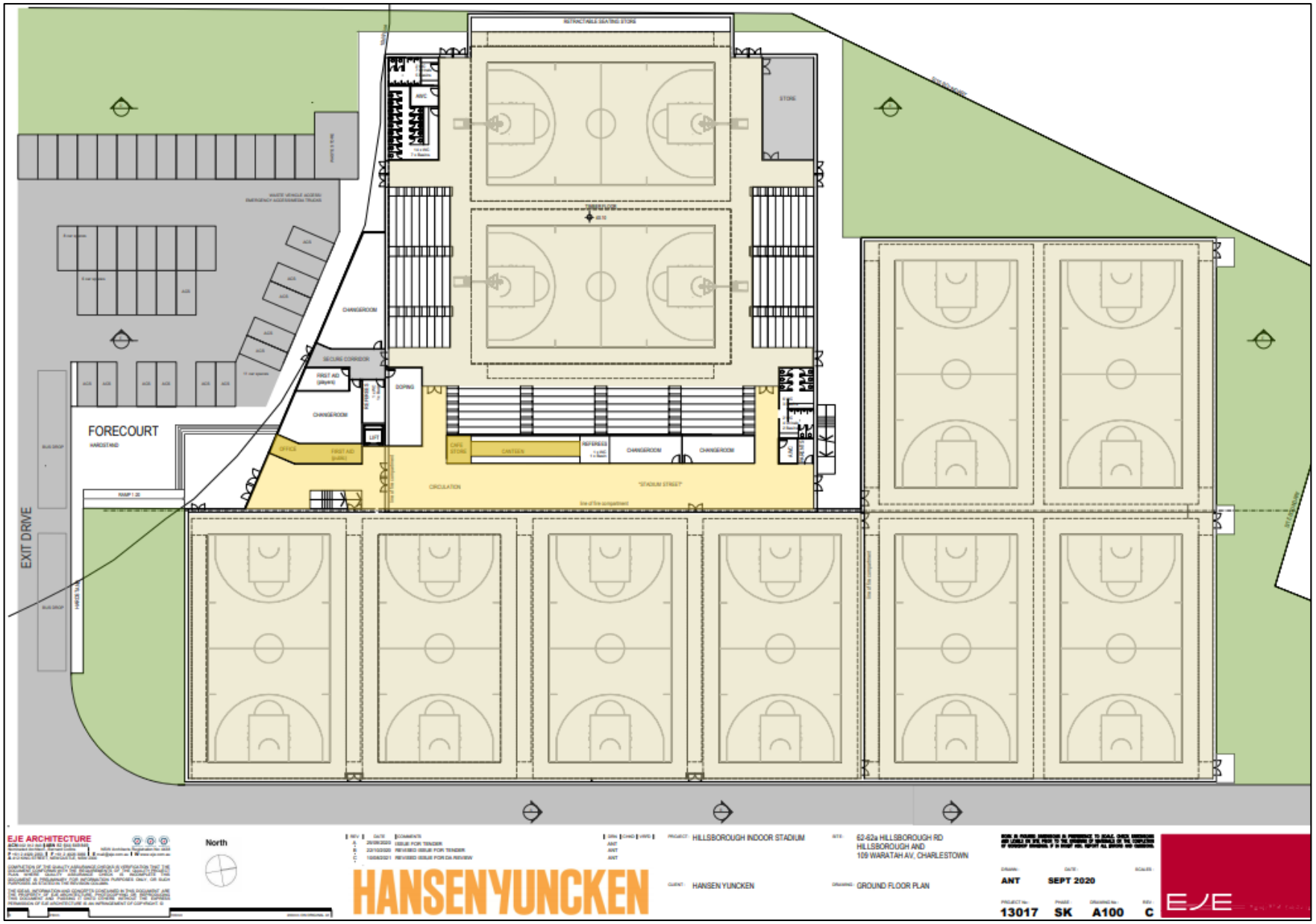
FORECOURT
EXIT DRIVE
CHANGEROOM
SECURE CORRIDOR
FIRST AID
DOPING
OFFICE
CANTEEN
CHANGEROOM
CIRCULATION
"STADIUM STREET"
STORE
EJE ARCHITECTURE
North
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
GROUND FLOOR PLAN
ANT
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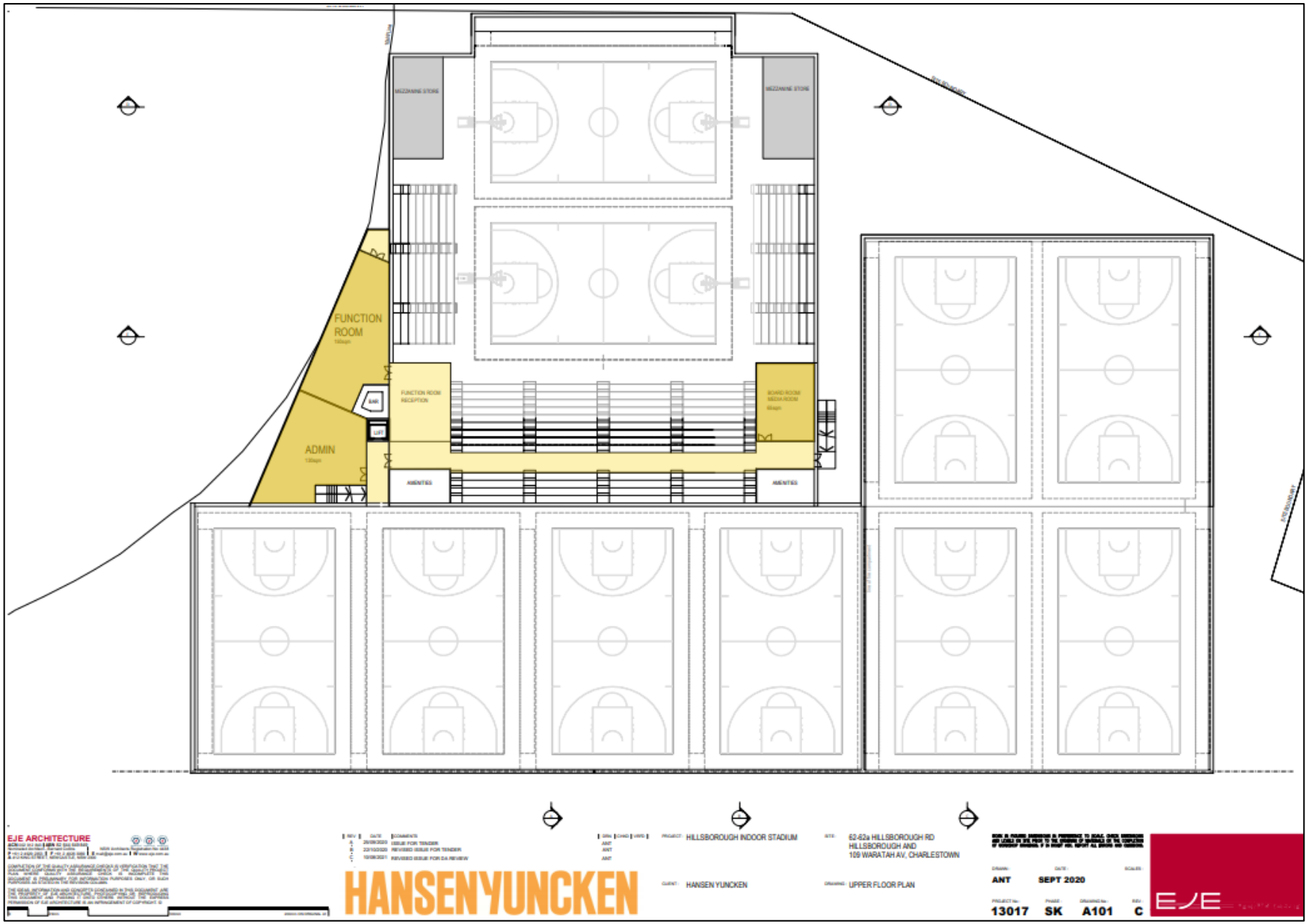
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ADMIN
MEZZANINE STORE
MEZZANINE STORE
FUNCTION ROOM RECEPTION
BOARD ROOM MEDIA ROOM
AMENITIES
AMENITIES
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
UPPER FLOOR PLAN
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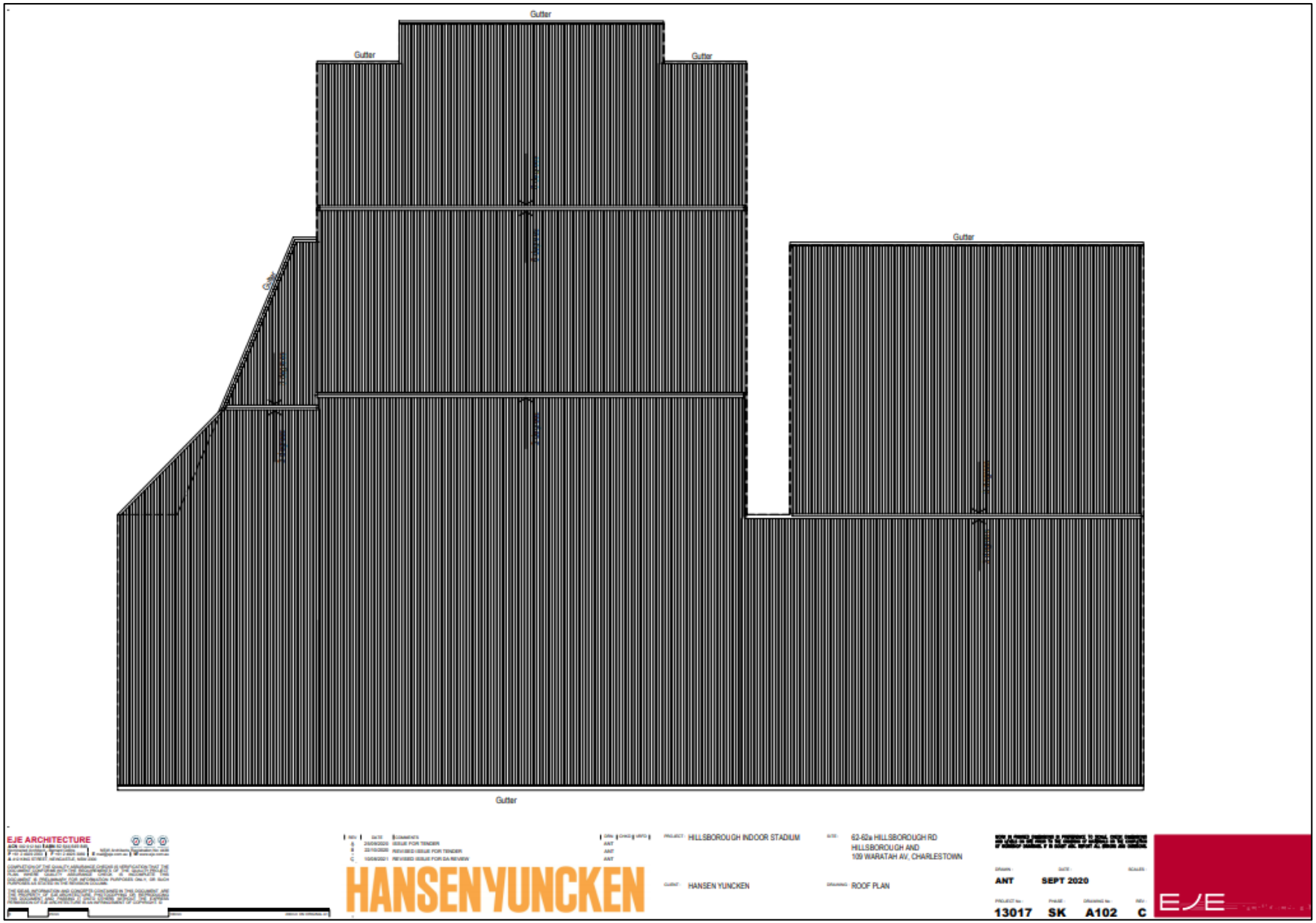
Gutter
Gutter
Gutter
Gutter
Gutter
Gutter
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
ROOF PLAN
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SEPT 2020
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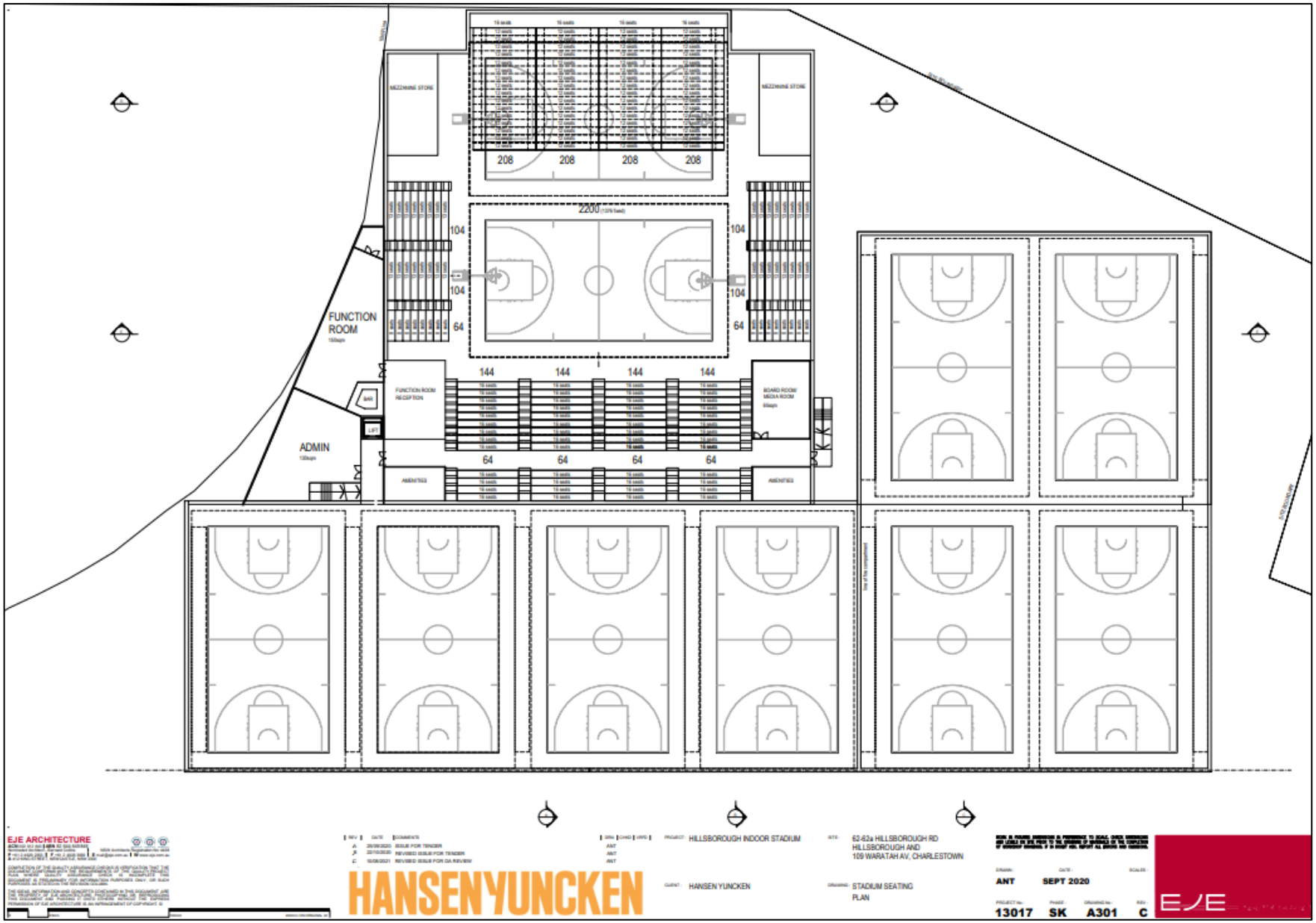
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ADMIN
MEZZANINE STORE
MEZZANINE STORE
FUNCTION ROOM RECEPTION
BAR
LIFT
BOARD ROOM MEDIA ROOM
AMENITIES
AMENITIES
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
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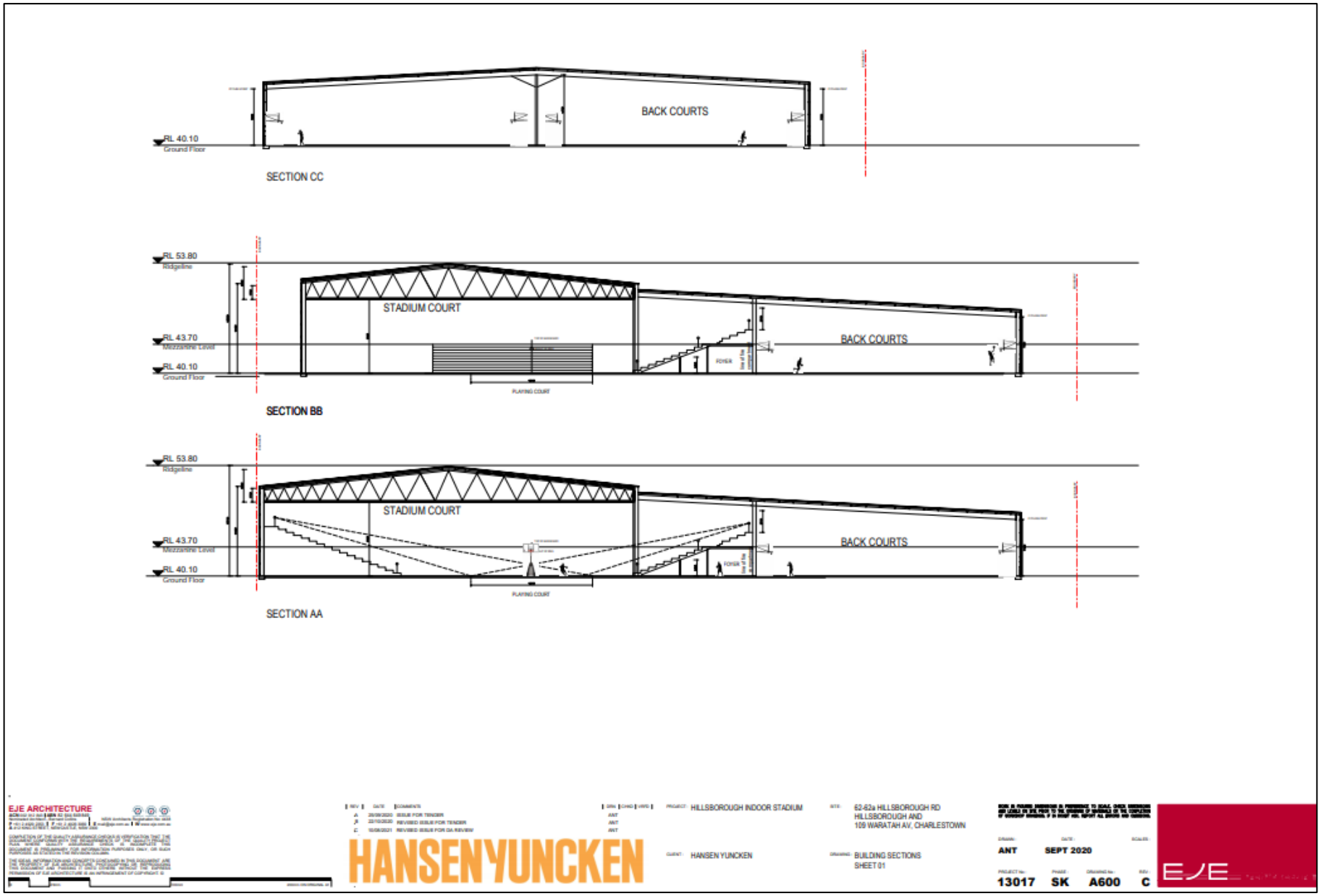
BACK COURTS
RL 40.10
Ground Floor
SECTION CC
RL 53.80
Ridgeline
STADIUM COURT
RL 43.70
Mezzanine Level
RL 40.10
Ground Floor
BACK COURTS
FOYER
PLAYING COURT
SECTION BB
RL 53.80
Ridgeline
STADIUM COURT
RL 43.70
Mezzanine Level
RL 40.10
Ground Floor
BACK COURTS
FOYER
PLAYING COURT
SECTION AA
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
BUILDING SECTIONS
SHEET 01
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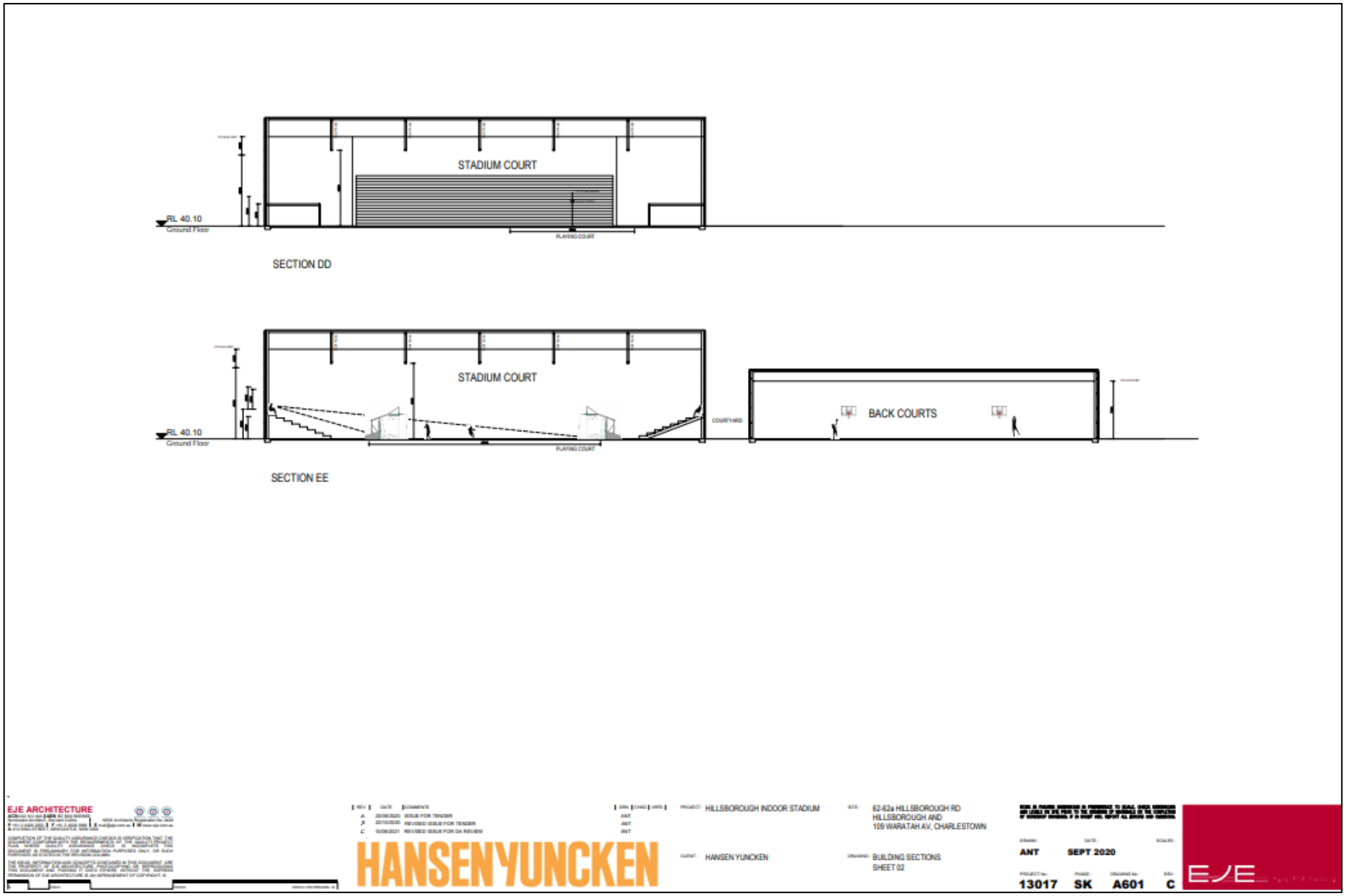
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RL 40.10
Ground Floor
PLAYING COURT
SECTION DD
STADIUM COURT
RL 40.10
Ground Floor
COURTYARD
BACK COURTS
PLAYING COURT
SECTION EE
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-62a HILLSBOROUGH RD
HILLSBOROUGH AND
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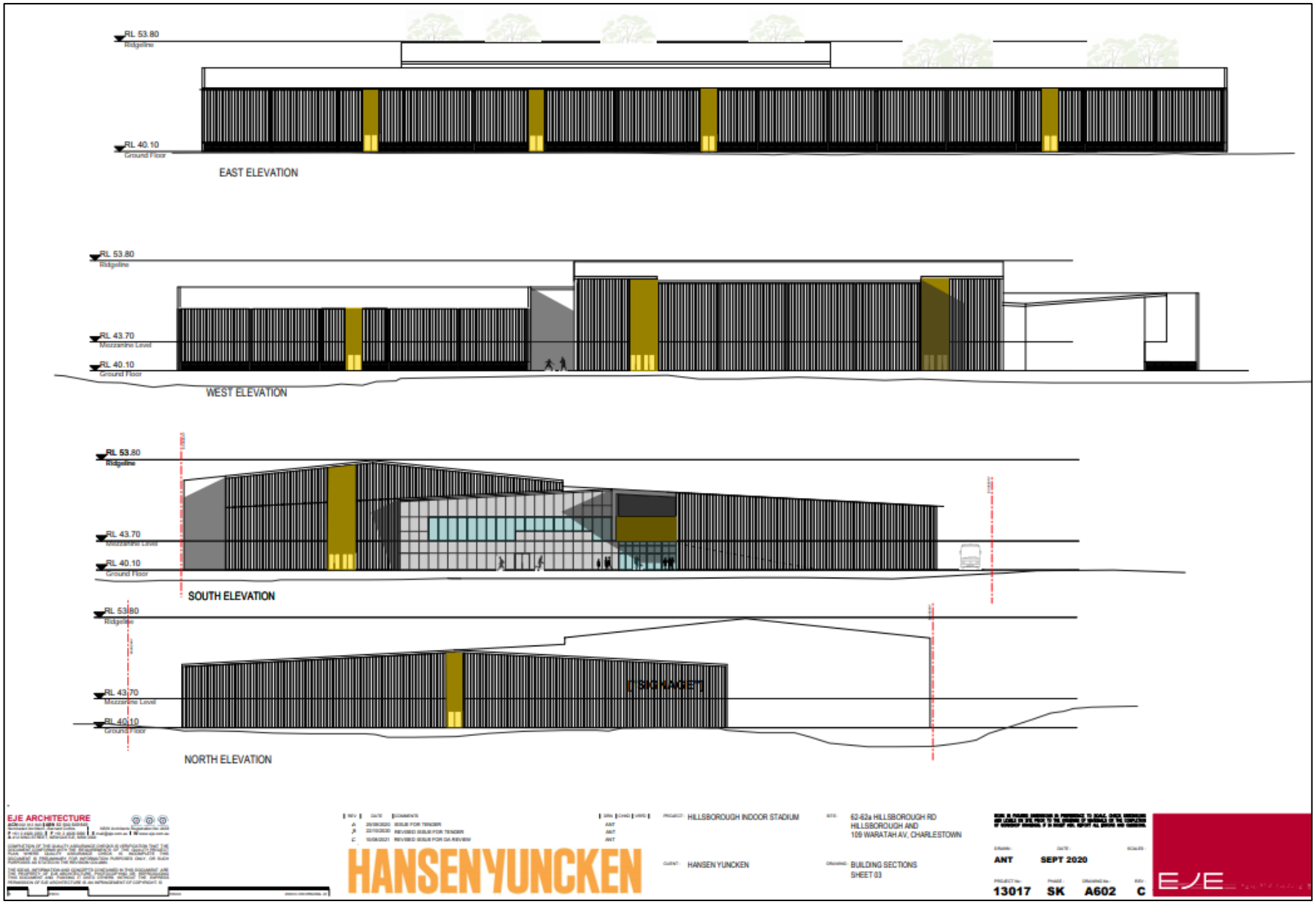
RL 53.80
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RL 40.10
Ground Floor
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Ridgeline
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Mezzanine Level
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Ground Floor
WEST ELEVATION
RL 53.80
Ridgeline
RL 43.70
Mezzanine Level
RL 40.10
Ground Floor
SOUTH ELEVATION
RL 53.80
Ridgeline
RL 43.70
Mezzanine Level
RL 40.10
Ground Floor
[SIGNAGE]
NORTH ELEVATION
EJE ARCHITECTURE
HANSENYUNCKEN
HILLSBOROUGH INDOOR STADIUM
62-82a HILLSBOROUGH RD
HILLSBOROUGH AND
109 WARATAH AV, CHARLESTOWN
HANSEN YUNCKEN
BUILDING SECTIONS
SHEET 03
ANT
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APPENDIX 2 METHOD 2 OUTPUTS

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 17/08/2021 **Assessment Date:** 17/08/2021

Site Street Address:	62 Hillsborough Road, Hillsborough
Assessor:	Duncan Scott-Lawson; BEMC
Local Government Area:	Lake Macquarie
Alpine Area:	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: Transect 1

Vegetation Information

Vegetation Type:	Sydney Coastal DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrubby)		
Vegetation Slope:	4.1 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	21.3	**Overall Fuel Load(t/ha):**	27.3
Vegetation Height(m):	1.4	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	6	**APZ/Separation(m):**	72

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	316
Moisture Factor:	5	**FDI:**	100

Program Outputs

Level of Construction	BAL 12.5	**Peak Elevation of Receiver(m):**	12.17
Radiant Heat(kW/m2):	6.59	**Flame Angle (degrees):**	74
Flame Length(m):	25.32	**Maximum View Factor:**	0.121
Rate Of Spread (km/h):	3.39	**Inner Protection Area(m):**	48
Transmissivity:	0.715	**Outer Protection Area(m):**	24
Fire Intensity(kW/m):	47841		

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	20	26	36	47	72	6

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 17/08/2021 **Assessment Date:** 17/08/2021

Site Street Address: 62 Hillsborough Road, Hillsborough

Assessor: Duncan Scott-Lawson; BEMC

Local Government Area: Lake Macquarie **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: Transect 2

Vegetation Information

Vegetation Type: Sydney Coastal DSF
Vegetation Group: Dry Sclerophyll Forests (Shrubby)

Vegetation Slope: 2.4 Degrees **Vegetation Slope Type:** Downslope
Surface Fuel Load(t/ha): 21.3 **Overall Fuel Load(t/ha):** 27.3
Vegetation Height(m): 1.4 Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope 0 Degrees **Site Slope Type:** Level
Elevation of Receiver(m) 6 **APZ/Separation(m):** 72

Fire Inputs

Veg./Flame Width(m): 100 **Flame Temp(K):** 1090

Calculation Parameters

Flame Emissivity: 95 **Relative Humidity(%):** 25
Heat of Combustion(kJ/kg 18600 **Ambient Temp(K):** 316
Moisture Factor: 5 **FDI:** 100

Program Outputs

Level of Construction BAL 12.5 **Peak Elevation of Receiver(m):** 11.1
Radiant Heat(kW/m2): 5.96 **Flame Angle (degrees):** 75
Flame Length(m): 22.88 **Maximum View Factor:** 0.11
Rate Of Spread (km/h): 3.02 **Inner Protection Area(m):** 48
Transmissivity: 0.715 **Outer Protection Area(m):** 24
Fire Intensity(kW/m): 42545

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	18	24	33	45	67	6