FIRE SAFETY STRATEGY

Project Maverick

Internal Works - SSD-97688711

225 – 245 Martin Road, Bradfield, 2556

Report Number:

252140_FSS_04

Date:

08/05/2026

Goodman Property Services (Aust) Pty Ltd
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REPORT DETAIL

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Report Revision History

Rev	Date	Comment	Prepared By	Reviewed By
01	09/12/2025	Draft Issue	**Thomas Newton** *MEng Fire Safety* *Certifier – Fire Safety (BDC 3149)*	**Lazar Youkhanna** *MEng (Fire Safety)* *BEng (Civil), MIEAust* *Certifier – Fire Safety (BDC 05330)*
02	20/02/2026	Final Issue	**Thomas Newton** *MEng Fire Safety* *Certifier – Fire Safety (BDC 3149)*	**Lazar Youkhanna** *MEng (Fire Safety)* *BEng (Civil), MIEAust* *Certifier – Fire Safety (BDC 05330)*
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EXECUTIVE SUMMARY

Fire Safety Strategy has been prepared by Affinity Fire Engineering Pty Ltd (Affinity) to address the site-specific Secretary's Environmental Assessment Requirements (SEARs) received in respect of the proposed State Significant Development Application (SSDA) No. 97688711. The proposed development is being undertaken by Goodman Property Services (Aust) Pty Ltd (Applicant) on behalf of Goodman Western Sydney Pty Limited as trustee for the Goodman Western Sydney Trust (Owner). The development is located at 225 – 245 Martin Road, Bradfield, 2556 (the Site).

The SSDA seeks approval for the construction, fit-out (including office and warehouse racking) and operation of 14 warehouse buildings, Active Open Space & amenities precinct (including a café) and internal site infrastructure works. Specifically, this includes:

- **Warehouses and Distribution Buildings**
  - 24/7 use of the Warehouse and distribution use for all warehouse buildings.
  - A total developable site area of approximately 1,124,286 sqm (or 112.4 Ha), comprising construction, fit-out and operation of approximately 597,610 sqm of warehouse and office GLA space across 14 small, medium and large format warehouses, ancillary offices and onsite parking. Warehouses range between 10,000sqm to 100,000sqm with heights of either 14.6m or 16.8m (excluding rooftop plant and solar).
    - The above Warehouse and Distribution buildings will also include guardhouses, dock offices loading bays, landscaping, electric vehicle charging, solar panels and signage.
- **Active Open Space & Amenities Precinct**
  - Active open space & public amenities precinct (including a café) totalling approximately 708 sqm of GLA within the western Enterprise zone to align with Connecting with Country outcomes.
- **Internal Estate Infrastructure**
  - Construction of the following roads, and associated services infrastructure (being electricity, potable, recycled & wastewater and telecommunications network):
    - Internal estate council roads.
    - Internal estate collector roads as identified on the Precinct Plan.
    - Internal estate retaining walls (including importation of engineered fill for backfill of walls)
    - Corridor reservation, design and partial construction of the following primary arterial roads located within the site:
      - Corridor reservation for the Eastern Ring Road (ERR) between the northern site boundary and southern site boundary.

  - Corridor reservation, design and construction (50%) of 'H-Road' being the east-west connection between the proposed ERR intersection and eastern collector road intersection within the site.
- Reservation of the remaining 'H-Road' arterial road corridor to the east of the proposed eastern collector road (N.B. this corridor will ultimately form part of a future arterial regional road connection between Devonshire Road and the ERR identified in Schedule 3 – List of Infrastructure in the Aerotropolis Special Infrastructure Contribution)
- Regional stormwater and drainage infrastructure (on behalf of Sydney Water) identified within the ENZ land. This will include:
  - Stormwater Basins per the Sydney Water Integrated Stormwater Management Scheme
  - Sediment Basin
  - Bio retention Basin
  - Wetland Basin
  - Pond
  - Trunk Drainage channels as identified per the Integrated Stormwater Management Scheme

Other

- Landscaping across the Site in accordance with Precinct Plan, Connecting with Country and airport safeguarding requirements.
- Vegetation Management Plan (VMP).
- 3 x 12m Estate Identification Pylon Signs on Lots 6, 7 and 8 (excludes individual Warehouse wayfinding signage).
- Public art within the western active open space & amenity precinct.
- Subdivision of the estate.

Related Applications/Activities

Part 5 Activity – External Works Lead in Roads and Services

The Applicant is proposing access to the Site via the following route which will be upgraded to be in accordance with the Precinct Plan

Part 1 - Martin Road / Elizabeth Drive intersection upgrades

- It is expected that these works will be undertaken by Transport for New South Wales (TfNSW) via an amendment to the existing Part 5 Activity Approval issued by TfNSW for the Elizabeth Drive Upgrade.
- It is understood that TfNSW will undertake these works with a target completion date of December 2029 (being prior to target date of operations for the first warehouse building at the site);

Part 2 -4 - Martin Road / East West Collector Road / Lawson Road Upgrades

- Further to Part 1, access to the site is proposed to be constructed concurrently as follows:
  - Part 2 – access from the Martin Road / Elizabeth Drive intersection will continue down Martin Road and join the future east / west collector road identified within the Precinct Plan through Lot 36 DP 3050.

  - The portion of road between the Elizabeth Drive intersection and future east / west collector road will be upgraded with a temporary access strategy to be agreed with Council consistent with Part 3.2, Requirement DS5 of the Precinct Plan.

- Part 3 – The east / west collector road through Lot 36 DP 3050 will be delivered in ultimate form to connect Martin Road with Lawson Road consistent with its designation under the Precinct Plan and relevant cross section within the Aerotropolis DCP
- Part 4 – From the east / west collector road connection on Lawson Road, the portion of Lawson Road south through to the Site will be upgraded in ultimate form consistent with its designation under the Precinct Plan and relevant cross section within the Aerotropolis DCP.

- Goodman have discussed the approach outlined within Parts 2-4 with Liverpool City Council. The anticipated completion date for these upgrades is December 2029, based on a commencement date of June 2028. These works are expected to be completed by Council prior to operation of the first warehouse building at the site.

Rehabilitation, Quarrying and Bulk Earthworks SSDA 97711727

Further to this, a separate SSDA No. SSD-97711727 has been proposed by the Applicant for site preparation works only (i.e. no buildings, retaining walls or other infrastructure works), including the rehabilitation of areas disturbed by historic mining and brick-making operations, as well as remediation and bulk earthworks across other areas of the site to make the site suitable for intended future land use. The proposed application also seeks approval for demolition of any remaining structures on the Site.

Cumulatively, these three applications together, seek to facilitate the development of a new industrial estate at the Site.

Building Code of Australia Compliance

This Fire Safety Strategy (FSS) outlines the fire engineering principles that will be utilised in ensuring that the prescriptive non-compliances with the Deemed-to-Satisfy (DtS) provisions of the Building Code of Australia 2022 Amendment 2 (BCA) [1], as noted herein, are resolved through a fire engineered Performance Solution to conform to the building regulations.

The complete fire-engineered analysis will be completed within the Fire Engineering Report and form part of the development Construction Certificate submission, and as such detailed engineering analysis is not documented herein. This Fire Safety Strategy does however outline the construction and management requirements considered necessary to achieve an acceptable level of life safety within each building and satisfy the Performance Requirements of the BCA.

Fire & Rescue NSW Compliance

A specific review has been conducted relative to the emergency vehicular access roads around each Lot in relation to the Building Code of Australia and also Fire + Rescue NSW Guidelines. Based on our review in Section 2.5.1 of this report, and recent experience on similar projects, Affinity Fire Engineering confirms that the design is in compliance with the FRNSW Fire Safety Guideline “Access for fire brigade vehicles and firefighters v5.01” [5].

Government Authority Advice and Secretary's Environmental Assessment Requirements (SEARs)

A review of the fire safety elements of the SEARs and associated Government Authority Advice has been completed within this report. Specifically a review has been undertaken of the Liverpool City Council advice letter (Ref: SSD1-12/2025 dated 10/11/2025) and Fire + Rescue NSW commentary (Ref: FRN25/3309 BFS25/7652 8000046144, dated 03/11/2025).

A summarised list of the fire related items provided within the SEARs and associated Government Authority Advice have been addressed, and their specific location within this report detailed within the below Table.

Subsequent of the following review, review Affinity Fire Engineering confirm that the design put forward as part of this application meets the relevant Authority requirements and is capable of compliance with the Performance Requirements of the BCA.

Summarised Actions/Responses to SEARs and Associated Government Authority Advice

#	FRNSW ADVICE / COMMENT	OUTCOME & LOCATION WITHIN REPORT
1	Compliance is demonstrated with FRNSW fire safety guideline - Access for fire brigade vehicles and firefighters. Perimeter Vehicle Access must be provided at ground level and of an obvious and appropriate hardstand material.	Affinity confirm the vehicular perimeter access road has been designed in accordance with the FRNSW Fire Safety Guideline "Access for fire brigade vehicles and firefighters" v5.01. The design as currently documented is capable of compliance with the BCA and typical conditions of consent. ▸ Section 2.5.1, Section 6.5.2, APPENDIX D
2	It is the experience of FRNSW that the water demand for fire infrastructure servicing a development of this scope is unlikely to be supplied by mains water alone. FRNSW recommend that suitable design considerations are considered for the placement of tanks and other firefighting infrastructure if required.	Each site requires water provisions for both the fire sprinkler and the fire hydrant systems. These are fed from separate supplies with on-site water tanks for the fire sprinkler system. Water supply provisions for the site's fire safety systems have been determined suitable based on the submitted plans and available provisions as currently documented. ▸ Section 6.3, Section 6.3.5, Section 6.5.1
3	That thorough analysis of the Fire Brigade Intervention Model is conducted to ensure that appropriate water supply is provided for hydrant and sprinkler systems.	The fire engineered Performance Solution report developed ahead of the relevant construction certificate will incorporate a detailed Fire Brigade Intervention Model in line with the process and format defined by Australasian Fire Authorities Council (AFAC) [15].
4	Implement the applicable provisions of AS2419 Appendix C (informative).	Each of the warehouse buildings exceed 108,000m^3 in volume, and will subsequently have consideration of the informative guidance provided in AS2419.1:2021 Appendix C when designing their respective fire hydrant systems. Details of the hydrant systems and any additional requirements will be prescribed in the Performance Solution report to ensure ongoing compliance and maintenance of the bespoke fire hydrant system design components. ▸ Section 6.5.1

#	FRNSW ADVICE / COMMENT	OUTCOME & LOCATION WITHIN REPORT
5	Prior to occupation or commissioning an Emergency Plan (EP) is developed for the site in accordance with HIPAP No.1.2	Where Dangerous Goods are to be stored or handled on a respective site, then prior to occupation or commissioning an Emergency Plan (EP) and Emergency Services Information Package (ESIP) must be developed for the site in accordance with HIPAP No.1 [34] the FRNSW Guideline for Emergency Services Information Package and Tactical Fire Plans [35]. ▸ Section 4.4, Section 6.6.5
6	Prior to occupation or commissioning an Emergency Services Information Package (ESIP) be prepared in accordance with FRNSW fire safety guideline – Emergency services information package and tactical fire plans.	

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1 INTRODUCTION & SCOPE

1.1 Overview

This Fire Safety Strategy has been undertaken and nominates Performance Solutions for assessing compliance with the nominated Performance Requirements of the BCA [1] in accordance with the methodologies defined in the IFEG [3] and provide a workable and safe Fire Safety Strategy.

1.2 Fire Safety Objectives

The objective of the Fire Engineering Assessment is to develop a Fire Safety System, which satisfied the Performance Requirements of the NCC whilst maintaining an acceptable level of life safety, protection of adjacent property and adequate provisions for Fire Brigade intervention. At a community level, fire safety objectives are met if the relevant legislation and regulations are complied with. As stated in the NCC, *"Compliance with the NCC is achieved by satisfying the Performance Requirements"*. In addition to this, certain non-regulatory objectives exist as detailed below.

1.2.1 Fire Brigade Objectives

The overall philosophical Fire Brigade objectives throughout Australia are to protect life, property and the environment from fire, according to the Fire Brigade Intervention Model (FBIM) [15] as per the Fire Services State and Territory Acts and Regulations.

Over and above the requirements of the NCC, the Fire Brigade has functions with regard to property and environmental protection and considerations regarding occupational health and safety for its employees.

1.2.2 Building Regulatory Objectives

The following items are a summary of the fire and life safety objectives of the NCC:

- **Life safety of occupants -** the occupants must be able to leave the building (or remain in a safe refuge) without being subject to hazardous or untenable conditions. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of exposing building occupants to hazardous or untenable conditions in an event of a fire.
- **Life safety of fire fighters -** fire fighters must be given a reasonable time to rescue any remaining occupants before hazardous conditions or building collapse occurs. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire

safety systems would facilitate fire brigade intervention and minimise the risk of exposing fire fighters to hazardous or untenable conditions in an event of a fire.

- **Protection of adjoining buildings** - structures must not collapse onto adjacent property and fire spread by radiation should not occur. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of fire spreading from one building to another.

1.2.3 Non-Prescribed Objectives

Fire Engineering has an overarching benefit to many facets of the built environment where non-prescribed objectives can influence the Fire Safety Strategy adopted. The client and stakeholders for the design have not requested any additional nonprescribed objectives required to be met through the preparation of the FER.

1.3 Regulatory Framework of the Fire Engineering Assessment

1.3.1 National Construction Code Series - Building Code of Australia

One of the goals of the BCA [1] is the achievement and maintenance of acceptable standards of safety from fire for the benefit of the community. This goal extends no further than is necessary for the public interest and is considered to be cost-effective and not needlessly onerous in its application.

Section A2G1 of the BCA [1] outlines how compliance with the Performance Requirements can be satisfied. These are as follows:

1. Performance Solution; or
2. Deemed-to-Satisfy Solution; or
3. Combination of (1) and (2).

Section A2G2 of the BCA provides several different methods for determining that a Performance Solution complies with the Performance Requirements. These methods are summarised as follows:

1) A Performance Solution is achieved by demonstrating-

   (a) Compliance with all relevant Performance Requirements; or

   (b) The solution is at least equivalent to the Deemed-to-Satisfy Provisions.

2) A Performance Solution must be shown to comply with the relevant Performance Requirements through one or a combination of the following Assessment Methods:

   (a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.

   (b) Verification Methods including the following:

      (i) The Verifications Methods in the NCC

(ii) Other Verification Methods accepted by the appropriate authority that show compliance with the relevant Performance Requirements.

(c) Expert Judgment.

(d) Comparison with the Deemed-to-Satisfy Provisions.

3) Where a Performance Requirement is satisfied entirely by a Performance Solution, in order to comply with (1) the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Performance Requirements from the Section or Part to which the Performance Solution applies.

(b) Identify Performance Requirements from the other Section or Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Performance Solution.

4) Where a Performance Requirement is proposed to be satisfied with a Performance Solution, the following steps must be undertaken:

(a) Prepare a performance-based design brief in consultation with relevant stakeholders.

(b) Carry out analysis, using one or more of the Assessment Methods listed in (2), as proposed by the performance-based design brief.

(c) Evaluate results from (b) against the acceptance criteria in the performance-based design brief.

(d) Prepare the final report that includes-

(i) All Performance Requirements and/or Deemed-to-Satisfy Provisions identified through A2G2(3) or A2G4(3) as applicable: and

(ii) Identification of all Assessment Methods used; and

(iii) Details of steps (a) and (c); and

(iv) Confirmation that the Performance Requirement is met; and

(v) Details of conditions or limitations, if any exist, regarding the Performance Solution.

Section A2G3 of the BCA states that a solution that complies with the Deemed-to-Satisfy Provisions is deemed to have met the Performance Requirements. A Deemed-to-Satisfy Provision can be shown compliance with the Deemed-to-Satisfy Provisions through one or more of the following Assessment Methods:

(a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.

(b) Expert Judgement.

As described in Section A2G4 a combination of Performance Solutions and Deemed-to-Satisfy Solutions may be used to satisfy the Performance Requirements. When using a combination of solutions, compliance can be shown through the following, as appropriate:

(a) Section A2G2 for assessment against the relevant Performance Requirements.

(b) Section A2G3 for assessment against the relevant Deemed-to-Satisfy Provisions.

Where a Performance Requirement is satisfied by a Performance Solution in combination with a Deemed-to-Satisfy Solution, in order to comply with (1), the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Deemed-to-Satisfy Provisions of each Section or Part that are to be the subject of the Performance Solution.

(b) Identify the Performance Requirements from the same Sections or Parts that are relevant to the identified Deemed-to-Satisfy Provisions.

(c) Identify Performance Requirements from other Sections or Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions that are subject to the Performance Solution.

1.3.2 Australian Fire Engineering Guidelines (AFEG)

The AFEG [4] document has been developed for use in fire safety design and assessment of buildings and reflects Australia's best practices. The document is intended to provide guidance for fire engineers as they work to develop and assess strategies that provide acceptable levels of safety.

The document is particularly useful in providing guidance in the design and assessment of Performance Solutions against the Performance Requirements of the BCA. The prescribed methodology set out in the AFEG has been generally adopted in this Fire Engineering Report (FER) for the assessment of each individual deviation from the prescriptive provisions as identified by the Principal Certifier. The design of each deviation was developed with a holistic understanding of the impact of the requirements and deviations assessed on the overall risk of fire spread, and occupant and fire fighter life safety.

There are professionals employed in the building process that determine the level of compliance with the building code Deemed-to-Satisfy (DtS) provisions. Conformation of compliance with the applicable BCA DtS provisions is the role of the BCA consultant / Principal Certifier and not the project fire safety engineer. Where not commented on within this report it is the expectation that the design complies with the BCA.

1.3.3 Stakeholders

The Performance Solution has been developed collaboratively with the relevant stakeholders as identified in Table 1-1.

Table 1-1: Relevant Stakeholders

Role	Organisation	Name
Developer	Goodman Property Services (Aust) Pty Ltd (Applicant) on behalf of Goodman Western Sydney Pty Limited as trustee for the Goodman Western Sydney Trust (Owner)	Lachlan O'Reilly
Traffic	Ason	Rebecca Butler-Madden Tim Lewis
Bushfire	Blackash	Corey Shackleton
Flooding	Colliers	Frank Carrozza Leo Zhu
Civil Engineer	Arcadis	Kevin Mcareavey Kate Robinson
Planning	Urbis	Christophe Charkos Vijay Prabhu
Architecture	SBA Architects	Greg Baird William Ly
Landscape	Scape Design	Sally Brown Chris Houghton
BCA Consultant	BM+G	Dean Goldsmith Nini Quach
Dangerous Goods / Risk	Sherpa Consulting	Giles Peach
Fire Safety Consultant	Affinity Fire Engineering	Thomas Newton Lazar Youkhanna

It should be noted that at times some parties may have a vested interest in the outcome of the Fire Engineering assessment. Such parties can include local fire brigades, insurers, Environmental Protection Authority (EPA), project control groups, end users and community representatives. Although not always a legislative requirement, the design team should give due consideration to their inclusion in the Fire Engineering process. Where not required by legislation it is the client's decision to involve such parties, especially the local fire brigade, to ensure a transparent and adequate fire safety solution for all. Where we are not notified of the inclusion of such parties it is assumed the client/representative has given due consideration to the above.

1.4 Sources of Information

The following sources of information have been relied upon in the preparation of this document:

- Architectural Plans prepared by SBA Architects as listed below:

Table 1-2: Relevant Stakeholders

DRAWING NO.	DESCRIPTION
MP02.1	MASTERPLAN - DELIVERED BY GOODMAN
25123_LOT01_DA30	LOT_1_-_SITE_&_WAREHOUSE_PLAN
25123_LOT02_DA30	LOT_2_-_SITE_&_WAREHOUSE_PLAN
25123_LOT03_DA30	LOT_3_-_SITE_&_WAREHOUSE_PLAN
25123_LOT04_DA30	LOT_4_-_SITE_&_WAREHOUSE_PLAN
25123_LOT05_DA30	LOT_5_-_SITE_&_WAREHOUSE_PLAN
25123_LOT06A_DA30	LOT_6A_-_SITE_&_WAREHOUSE_PLAN
25123_LOT06B_DA30	LOT_6B_-_SITE_&_WAREHOUSE_PLAN
25123_LOT07_DA30	LOT_7_-_SITE_&_WAREHOUSE_PLAN
25123_LOT08_DA30	LOT_8_-_SITE_&_WAREHOUSE_PLAN
25123_LOT09A_DA30	LOT_9A_-_SITE_&_WAREHOUSE_PLAN
25123_LOT09B_DA30	LOT_9B_-_SITE_&_WAREHOUSE_PLAN
25123_LOT10_DA30	LOT_10_-_SITE_&_WAREHOUSE_PLAN
25123_LOT11_DA30	LOT_11_-_SITE_&_WAREHOUSE_PLAN
25123_LOT12_DA30	LOT_12_-_SITE_&_WAREHOUSE_PLAN
25123_AOS_DA30	LOT_13_-_ACTIVE_OPEN_SPACE_(WEST)_-_OVERALL_SITE_PLAN
25123_AOS_DA35	LOT_14_-_ACTIVE_OPEN_SPACE_(EAST)_-_OVERALL_SITE_PLAN

1.5 Limitations and assumptions

In this instance, this Fire Safety Strategy has been developed based on applicable limitations and assumptions for the development which are listed as follows:

- This report is specifically limited to the project described in Section 2 .
- This report is based on the information provided by the team as listed in Section 1.4.
- Building and occupant characteristics are as per Sections 2 and 3 of this document. Variations to these assumptions may affect the Fire Engineering Strategy and therefore they should be reviewed by Affinity Fire Engineering should they differ.
- As per any building design, DtS or otherwise, the report is limited to the fire hazards and fuel loads as prescribed in Section 4 . The report does not provide guidance in respect of areas, which are used for Dangerous Good storage, processing of flammable liquids, explosive materials, multiple fire ignitions or sabotage of fire safety systems.
- The report is prepared on the basis that the development complies with the DtS provisions of the NCC [1] with all aspects relating to fire and life safety unless otherwise specifically stated in this report. Where not specifically mentioned, the design is expected to meet the NCC DtS requirements of all relevant codes and legislation at the time of construction and/or at the time of issue of this report.
- The assessment is limited to the objectives of the NCC and does not consider property damage such as building and contents damage caused by fire, potential increased insurance liability and loss of business continuity.
- Malicious acts or arson with respect to fire ignition and safety systems are limited in nature and are outside the objectives of the NCC. Such acts can potentially overwhelm fire safety systems and therefore further strategies such as security, housekeeping and management procedures may better mitigate such risks.
- This report is prepared in good faith and with due care for information purposes only and should not be relied upon as providing any warranty or guarantee that ignition or fire will not occur.
- Where parties nominated in Section 1.3.3 have not been consulted or legislatively are not required to be, this report does not take into account, nor warrant, that fire safety requirements specific to their needs have been complied with.

2 BUILDING CHARACTERISTICS

2.1 Overview

Building characteristics are assessed as part of the Fire Safety Strategy due to the following:

1. The location can affect the time for fire brigade intervention and potential external fire exposure issues.
2. The structure will impact the ability to resist a developing fire and support conditions to allow occupants to escape the building and the fire brigade to undertake firefighting to the degree necessary.
3. The floor area determines the potential fire size and area required to be evacuated in the event of a fire.
4. BCA details such as Type of Construction, classification and height will dictate passive and active fire safety systems.

2.2 Site Description

SSDA#1 Internal Works (SSD- 97688711)

The Department of Planning, Housing and Infrastructure (**DPHI**) 'Rapid Assessment Framework' guidelines were implemented on 1 October 2021. The Environmental Impact Statement (**EIS**) will need to be prepared in accordance with this 'new' framework.

It will be critical that all plans are reports are prepared by the project team to ensure the relevant requirements are addressed within the EIS guidelines, including the:

- Project description
- Stakeholder engagement
- Assessment and mitigation of impacts

This must include an assessment of the cumulative impacts of the proposed development, considering existing, approved and likely future developments in accordance with the technical guidelines.

The key features of the Site are detailed within Table 2-1, with Figure 2-1 providing and aerial photo of the Site boundary within the neighbouring area.

Table 2-1: Site Overview

DESCRIPTION	SITE DETAIL
Land Configuration	▸ Lot 1 DP 1278780 ▸ Lot 2 DP 1278780 ▸ Lot 3 DP 1278780 ▸ Lot 55 DP 3050 ▸ Lot 56 DP 3050 Note (1) – The above lots do not include the works proposed to be included under External Lead In works.
Existing land use(s)	▸ The Site is Quarry and Brick Making Facility. The structures and hardstand areas used for the quarry operations are located in the central portion of the Site, connected by an internal road network. In addition, three pits are located along the southern and southeast portion of the Site.
Surrounding Land Use	Surrounding land uses include: **North:** Land to the north is predominantly characterised by a mix of rural, agricultural, landscape industries and, residential properties accessed by Lawson and Martin Roads. It is noted that several sites are subject to existing SSDAs for industrial / warehouse developments. Both Martin and Lawson Roads intersect with Elizabeth Drive, a major Arterial Road that provides access to the WSI site and the broader regional road network including the M7, Northern Road and the future M12. **South:** The land to the south is currently rural however is subject to the IPG Master Plan which was approved on 11 July 2025. The approved Master Plan covers 184 hectares and aims to support over 12,400 jobs. Inghams Property Group has allocated around 625,467 sqm for employment space, focusing on advanced manufacturing, logistics, and community services. The plan includes a mix of industrial and commercial zones, a local centre, and accessible public green spaces near the Western Sydney International Airport. Further to the south-west of the site, is Bradfield City Centre, a 114-hectare planned urban development adjacent to Western Sydney International Airport. Designed to be a hub for innovation, advanced industries, and economic growth, it has the potential to create 20,000 jobs and provide 10,000 homes, including affordable housing. The Bradfield City Master Plan prioritises sustainability, integrating green spaces, climate-resilient infrastructure, and a commitment to achieving net-zero emissions.

DESCRIPTION	SITE DETAIL
	East: Further east of the Wianamatta-South Creek which bounds the site, is the suburb of Kemps Creek. This land is characterised by a mix of open space, rural, agricultural, emerging urban development, and residential properties that are non-initial precincts under the WSAP but intended for employment generating uses **West:** To the immediate west of the Site, bound by Badgerys Creek, is Western Sydney International Airport (**WSI**). Located in Badgerys Creek, WSI is a major federal infrastructure project designed to accommodate Sydney's future aviation needs. Set to commence operations in 2026, WSI will initially handle 10 million passengers annually and operate 24/7. Badgerys Creek Road also travels in a north-south direction to the west of the site. It provides a north-south connection between Elizabeth Drive and the Northern Road.
Site Access and road network	The Site is currently accessible from Martin Road which is located at the north-eastern boundary. The ultimate access to the site is in accordance with the proposed design via separate Part 5 Approvals with Transport for New South Wales and Liverpool City Council.

Figure 2-1: Aerial Photo of the Site

Regarding Fire and Rescue operations, the site influences the likely fire brigade intervention times, and given the close proximity to the nearest fire station it is expected to facilitate a relatively convenient and prompt fire brigade response. Furthermore, being in an outer suburb of a major city, the development is provided with the services and facilities expected in an urban setting.

2.3 Building Description

The Estate Masterplan incorporates 14 warehouse facilities, each comprising predominately of warehouse space with associated offices, external staff carparking and dispatch hardstand area.

Each of the fourteen (14) buildings are designed to incorporate their own fire services infrastructure such that fire sprinkler and hydrant tanks, pumps and pipework are not shared between the different Lots.

Additional to the warehouses are dedicated active open spaces, with an Amenities Precinct Building located on the western side of the estate.

Amenity Building

The estate includes open active spaces for the general public, with the western space also provided with a Class 6 Amenities building with public amenities. This is a stand-alone building and requires Type C Construction.

Warehouse and Distribution Areas

The Class 7b warehouses are of a typical structural steel portal frame design. The warehouses' roof sheeting incorporates sections of translucent sheeting to provide natural light into the facility and provision for solar panels also distributed across the roof.

Offices and Ancillary Areas

Each building contains a two (2) level office attached to the corner of their warehouse. The respective offices serve as the building main entry, and provides access to each of the warehouse floor and is connected via pedestrian path to the outside hardstand and occupant carpark.

Dispatch Hardstand, Dispatch Docks and Vehicular Access

The heavy vehicle hardstands connect to the dispatch docks in the façade of the warehouse to the main estate roadways. The perimeter access path will be designed to support brigade appliances and staging equipment; noting that portions of the vehicular access road incorporate permeable pavers (TurfPave) material which has been certified to maintain the fire authority loading requirements.

The Masterplan design for the Estate is provided in Figure 2-2.

Figure 2-2: Estate Masterplan

2.4 Building Structure

Each warehouse has a rise-in-storey of two (2) and considered a large-isolated building requiring Type C Construction.

As the warehouse buildings are each deemed large-isolated buildings, they shall be provided with the relevant BCA DtS provisions requiring an automatic fire suppression system throughout, vehicular perimeter access and an automatic smoke exhaust system (unless otherwise omitted through a Performance Solution as outlined in this strategy).

All materials used in the construction will generally conform with the testing methodology outlined in the DtS provisions so to mitigate the spread of fire and smoke, in turn minimising the fire related risks to occupants and firefighters.

2.5 Building Characteristic Assessment

The following table summarises the characteristics of the subject buildings, relevant to fire and life safety.

Table 2-2: Building Characteristics Assessment

CHARACTERISTIC	DETAIL
BCA Classification	Amenities Building: ▸ Class 6 Warehouses: ▸ Class 5 – Office ▸ Class 7b – Storage
Rise in Storeys	Amenities Building: ▸ One (1)

CHARACTERISTIC	DETAIL
	Warehouses: ▸ Two (2)
Type of Construction	Amenities Building: ▸ Type C Warehouses: ▸ Type C - *Large-Isolated Building*

2.5.1 Vehicular Perimeter Access for Emergency Services

Vehicular perimeter access for emergency services is provided around each of the large isolated warehouse buildings. The provisions for each building are illustrated in APPENDIX D where the sections of the roadway that are not conformant with the prescriptive Deemed-to-Satisfy (DtS) provisions of the BCA are defined. In this instance a fire engineered Performance Solution will be developed ahead of the relevant construction certificate for each Lot, and subject to FRNSW approval through the Fire Authority referral pathway detailed within the Environmental Planning and Assessment (Development Certification and Fire Safety) Regulation 2021. The Performance Solution will specifically address variations from the prescriptive DtS provisions of the BCA; noting that a Performance Solution is permitted within Section 10.2.6 of the FRNSW Fire Safety Guideline "Access for fire brigade vehicles and firefighters" [5].

The emergency vehicle perimeter access provisions rely upon a combination of the main arterial Estate Roads as well as the internal roads within the respective allotment. Affinity confirm that this design principle is in accordance with the provisions of the Building Code of Australia (BCA) and FRNSW Fire Safety Guideline. Furthermore, while utilising these roads results in the vehicular access road exceeding the BCA limitation of 18m from the building in various locations, the design with these setbacks still however facilitate fire-fighter operations and enables fire-fighting water to be applied to the structure. Direct building access is also afforded through provision of pedestrian pathways linking the roadway to the building main entry points along the façade where external hydrants would also be located.

Based on these specific design features Affinity Fire Engineering subsequently confirm that the design is compliant with the FRNSW Fire Safety Guideline "Access for fire brigade vehicles and firefighters" version 5.01 and is capable of compliance with the Performance Requirements of the BCA.

3 OCCUPANT CHARACTERISTICS

3.1 Overview

The occupant characteristics are assessed as part of the Fire Engineering Review due to the following:

1. Population numbers can dictate the time required to evacuate the building and the required life safety systems to be provided due to evacuation times.
2. Physical and mental attributes affects the occupants capacity to respond to various fire cues and react accordingly.
3. Familiarity of occupants can affect the time taken to evacuate the building and subsequent active/passive requirements.

3.2 Dominant Occupant Characteristics Assessment

Table 3-1: Occupant Characteristics Assessment

Characteristic	Description
Population numbers	Generally, the occupant numbers in the buildings are expected to equivalent to the occupant densities (m^2/person) listed in the NCC Table D2D218 for the various areas and the building layout.
Physical and mental attributes	**Staff and Security** Staff in each building are expected to always be awake and alert. Staff are expected to have a level of understanding where they can recognise an emergency and have the ability to take and implement decisions independently. In addition, staff are expected to always respond, and to be unaffected by physical or sensory disabilities. Staff are not expected to be mentally impaired by drugs, alcohol, fatigue or other adverse conditions to degrees greater than in other business places. **Clients and Visitors** This occupant group is expected to be awake and alert. This group may also exhibit physical and mental disabilities to the degree and frequency of the general public. While this occupant group are expected to be capable of making and implementing decisions independently, they may require assistance in locating or accessing the nearest and safest egress path in an

Characteristic	Description
	emergency. The occupant group are expected to be accompanied by a staff member who will be capable of assisting visitors in determining the appropriate response to fire alarm signals and direct them to the most suitable exit in an emergency. **Fire and Rescue NSW** Are expected to be equipped with safety equipment and will be educated in fire-fighting activities and the dangers associated with fire incidents. It is not expected that this occupant group would be present in the building at the time of fire ignition, they are however expected to enter the building at a later stage to undertake fire suppression activities. **Maintenance Personnel** Are expected to be mobile with normal hearing and visual abilities where occupants in this group are considered to take and implement decisions independently and require minimal assistance during evacuation in a fire emergency. This group expected to be fully awake and aware of their surroundings at all times when inside the building.
Familiarity with the building	**Staff and Security** Staff are expected to have a complete knowledge of the building layout and be able to coordinate evacuation of other occupant groups in an emergency. **Clients and Visitors** May or may not be familiar with the layout of the building and may require assistance in locating the exits. While these occupants may not have a good familiarity of the egress paths, they will be accompanied by a staff member who will direct them to the most suitable exit in an emergency. **Fire and Rescue NSW** Are not expected to have any familiarity of the building layout, however, are assumed to obtain the required site-specific information from fire service block plans available prior to entering the building. **Maintenance personnel** This occupant group is expected to have a reasonable familiarity with the building as they would have to undergo site specific induction prior to commencement of work on site.

Characteristic	Description
Pre-movement time	Pre-movement times can vary and is highly dependent on a combination of a variety of factors [4] such as: ▸ Familiarity with building ▸ Commitment to activity being undertaken at the time of fire ignition ▸ Mental capabilities (ability to assess risks and make appropriate decisions, alertness) ▸ Physical capabilities ▸ Group dynamics ▸ Occupant relationships / social affiliations ▸ Frequency of false alarms Documents such as PD7974-6:2004 [10] and CIBSE Guide E [13] provide guidance on estimating pre-movement times for various occupancies.
Travel speed	Travel speeds for individuals can vary depending on factors such as: ▸ Age and sex, ▸ Physical capabilities (ambulant, semi-ambulant, bed-ridden) ▸ Occupant density / crowding ▸ Perceived danger Based on a literature review of work carried out by Boyce et al. [16], Nelson and Mowrer [17], Pauls [15], Milinskii, Pelecheno [16], Pretechskii [17] and Shi et al. [18], the following travel speeds are adopted for an average horizontal travel speed: ▸ 1.2m/s is assumed for an able-bodied adult where congestion is unlikely [13] such as in the breezeway and carpark areas; and ▸ 1.0m/s is assumed for an able-bodied adult where congestion is likely [13] such as in the warehouse and gymnasium areas; and ▸ 0.8m/s for semi-ambulant occupants requiring assistance to evacuate, walking aid or wheelchair users [17] such as in the administration and office areas.

4 HAZARDS AND PROTECTIVE MEASURES

4.1 Overview

The fire hazard analysis forms the basis for the review of non-compliances within each building. In assessing expected and statistically validated hazards, preventative and protective measures are developed commensurate with those expected risks. The following section reviews applicable hazards and recommends possible measures to address those risks. Furthermore, hazards identified can form a justified basis for selected scenarios in fire engineering assessments.

4.2 Fire hazards

4.2.1 Building layout and egress

Occupants are afforded exits around the perimeter of each building to allow for multiple alternative opportunities in an emergency. Due to the open nature of the warehouses, there are limited dead end travel routes to exits. Many of the exits discharge onto the perimeter access road around each building to facilitate fire fighter access into the respective building for fire suppression and search and rescue operations.

4.2.2 General activities

The buildings will be used for general goods storage and distribution and thus it is not expected that regular hot work processes, use of highly flammable materials, manufacturing processes or operation of high friction or high-temperature machinery will be performed within the buildings.

The offices will all contain general office activities with a variety of dedicated office suites, open work areas and meeting rooms.

4.3 Fuel Loads

Quantity of Materials

Due to the nature of the facility, the fire loads within the warehouse will change over time as the tenant changes or the business structure of the same tenant evolves. As such, it is not suitable to provide specific fire load densities for the product and materials being stored within the facility.

The fire load densities with the office areas should however remain consistent and as such the following fire load densities in those parts shall be utilised in the fire engineering analysis where suitable.

The office areas may exhibit mean fire load densities of approximately 800MJ/m^2 with isolated peak values reaching up to 1600MJ/m^2.

4.4 Dangerous Goods

Dangerous goods are not expected to be stored in excessive quantities on the site. As per the Hazards and Resilience SEPP Report undertaken by Sherpa Consulting, the facility is not 'potentially hazardous' as the SSDA scope does not include storage, processing, handling or transport of Dangerous Goods (DG) or other hazardous materials and therefore does not exceed the screening thresholds in the Applying SEPP 33 guideline. Furthermore, as the facility is not 'potentially hazardous' within the meaning of Resilience and Hazards SEPP 2021 a Preliminary Hazard Analysis (PHA) or a transport route evaluation study is not required.

Emergency Plan

The Hazardous Industry Planning Advisory Paper (HIPAP) No 1 [34] requirement for an Emergency Plan (EP) is formulated to minimise the effect of an incident involving dangerous and hazardous goods on the site. The Emergency Plan details, amongst other elements, defined procedures by personnel to ensure adequate training and resources are available to address a hazardous incident.

The current proposal for the development is based on a speculative tenant occupancy, and as such the extent and dangerous goods items is not yet determined; and hence may not eventuate.

For scenarios where a tenant incorporates the storage of Dangerous and Hazardous materials, an Emergency Plan will be developed prior to permitting any of those commodities onto the site in accordance with the HIPAP No. 1 requirements. In the instance however where there are no tenants storing such materials, the above requirement is not applicable or relevant and an Emergency Plan is not recommended to be developed.

- If Dangerous Goods are to be stored or handled on site, then prior to occupation or commissioning an Emergency Plan (EP) and Emergency Services Information Package (ESIP) must be developed for the site in accordance with HIPAP No.1 [34] the FRNSW Guideline for Emergency Services Information Package and Tactical Fire Plans [35].

Emergency Services Information Package

In a similar degree to the above discussion, if Dangerous Goods are to be stored or handled on site an Emergency Services Information Package (ESIP) shall be prepared for the development in accordance with the FRNSW Guideline for Emergency Services Information Package and Tactical Fire Plans [35].

The ESIP must be developed prior to occupation or commissioning of the development and will detail all the fire safety systems of the site along with any provisions for storage and handling of Dangerous Goods.

4.5 Rooftop Solar Panels

Solar photovoltaic systems contribute to an increased probability of a fire event, primarily due to electrical risks [9]. Additionally, should the solar panels be subjected to a fire event, the attending fire brigade can be exposed to hazardous toxins from the combustion of the panel materials.

Where the design incorporates provisions for rooftop solar panels to offset the building's energy requirements, the following design measures shall be included to mitigate the risk to the attending fire fighters in the event of a fire as per FRNSW requirements:

- An A4 notice on fade resistant material must be displayed at the main FDCIE notifying attending fire fighters as to the existence of the Photovoltaic Solar Panel Array on the roof of the building. The notice must include:
  - A figure detailing the location of the panels.
  - A floor plan detailing the location of all associated isolation switches and AC and DC isolators for the shut-off of generated electricity.
  - Notification that the PV do not automatically isolate on fire trip.
  - A statement in 25mm font stating (or similar wording):

    "Photovoltaic (PV) Panels Present — PV panels are mechanically fixed to the roof as shown below"

4.6 Electric Vehicles, Electric Bikes and Associated Charging Devices

Electric Vehicles (EV) are increasingly popular within the general public, however compared to conventionally Internal Combustion Engine (ICE) vehicles, EVs raise doubts regarding fire safety due to the Lithium-Ion batteries which are contained within the EVs to power them. Research [5] has found that many electric vehicle fires are a result of the battery with particular consistency relative to battery abuse, damage due to weather exposure and collisions respectively and in recorded occasions, during charging.

Following thermal runaway, the lithium-ion batteries are known for containing their heat and also continuing heat generations such that reignition is a credible risk to fire fighters. As such a fire hydrant system that is accessible during a fire, and also provides an ongoing supply of water is critical to containing a lithium-ion battery fire.

Additional to the electric vehicles in the carpark, there is also provisions for electric bikes across the sites. These shall also be located externally with associated charging outlets.

Due to the increased risk of the electric vehicle presence in the building, noting that this is the same for all projects and not atypical for this development, the fire engineering explicitly includes provisions with the interest of FRNSW fire intervention as an acknowledgement of the challenges faced in suppressing and extinguishing lithium-ion battery fires.

Power Isolation

- All electric vehicle/bike charging equipment must automatically shut down and be isolated from the mains power on general fire alarm anywhere within the respective building.

Fire Fighter Information / Signage

- Signage must be displayed at each Main FDCIE to indicate the properties of the electric car/bike charging bays to include:
  - The location of the charging bays.
  - The location of manual isolation switches/boards with way finding from the FDCIE and operating instructions.
  - The power rating (kW capacity) of the chargers.
  - Notification that the electric car/bike charging systems automatically ceases operation and are isolated from power supply on general fire alarm.

Fire Hydrant Design

- To enable attending fire fighters to attach to a hydrant and apply water suppression to the potential fire source external hydrants are to be located around the building perimeter to provide coverage to all external car/bike parking spaces. Note that external hydrants must not be located within 10m of an electric vehicle charging bays per the requirements of AS2419.1:2021.
- The hydrant system is to be connected to a pressurised town mains water supply to ensure a continuous water supply for firefighting.

Ventilation

Ventilation of the car parking is a critical measure in any carpark scenario given the type and quantity of combustion products being released from a vehicle fire; this in only enhanced where the fire originates from a lithium-ion battery failure.

Typically for a basement carpark, there is risk of smoke venting up through the lift and stair shafts into the levels above. Where that is the case, a degree of smoke separation could be incorporated to prevent the upper level of the building becoming smoke logged from a basement level fire. In this instance however the carparking areas are external to facilitate smoke venting to atmosphere.

- As a result of the open nature, the carpark is not required to be provided with any additional smoke extraction measures.

4.7 Review of relevant fire statistics

The following discussion is based on the fire statistics attached in APPENDIX A.

4.7.1 Warehouse

From the National Fire Protection Association (NFPA) report on 'Structure Fires in U.S. Warehouses' [32], statistics specific to warehouses can be analysed.

A total of 1,270 structure fires were reported in warehouses between 2007 and 2011. The fires recorded resulted in 4 occupant fatalities, 23 occupant injuries and $188 million in direct property damage per year. Overall, 19% of fires were intentionally set. However, no civilian injuries were reported from these fires. Shop tools and industrial equipment caused 8% of fires; however, these fires resulted in 27% of the civilian injuries recorded annually. The leading area of fire origin in warehouses comes from unclassified storage areas, resulting in 13% of fires and 18% of civilian injuries.

Figure 4-1 illustrates the leading cause of structure fires in warehouses, while Figure 4-2 indicates the leading areas of origin.

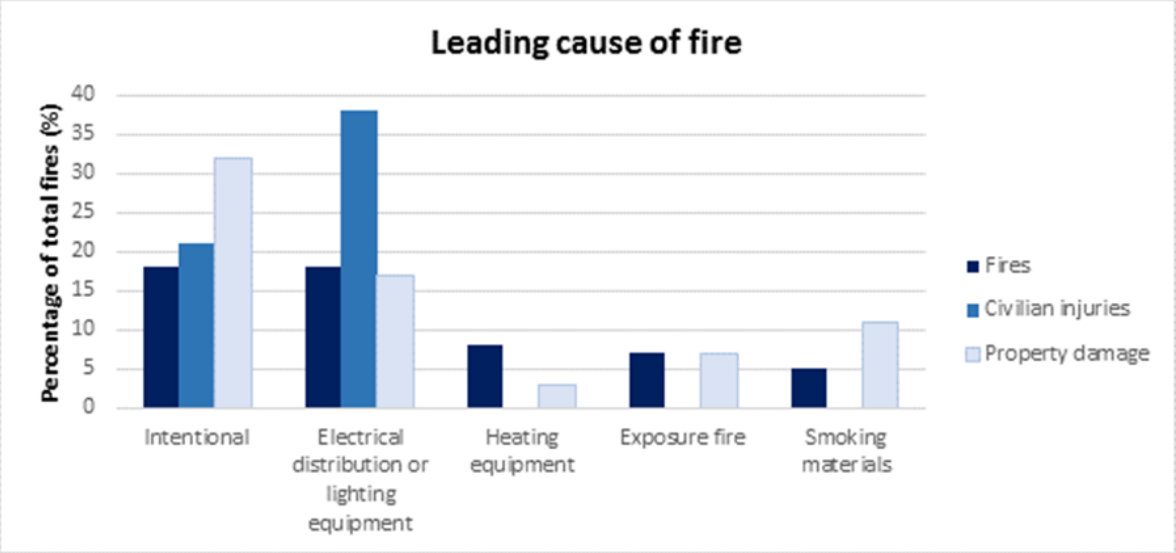

Figure 4-1: Leading Causes of Structure Fires in Warehouses

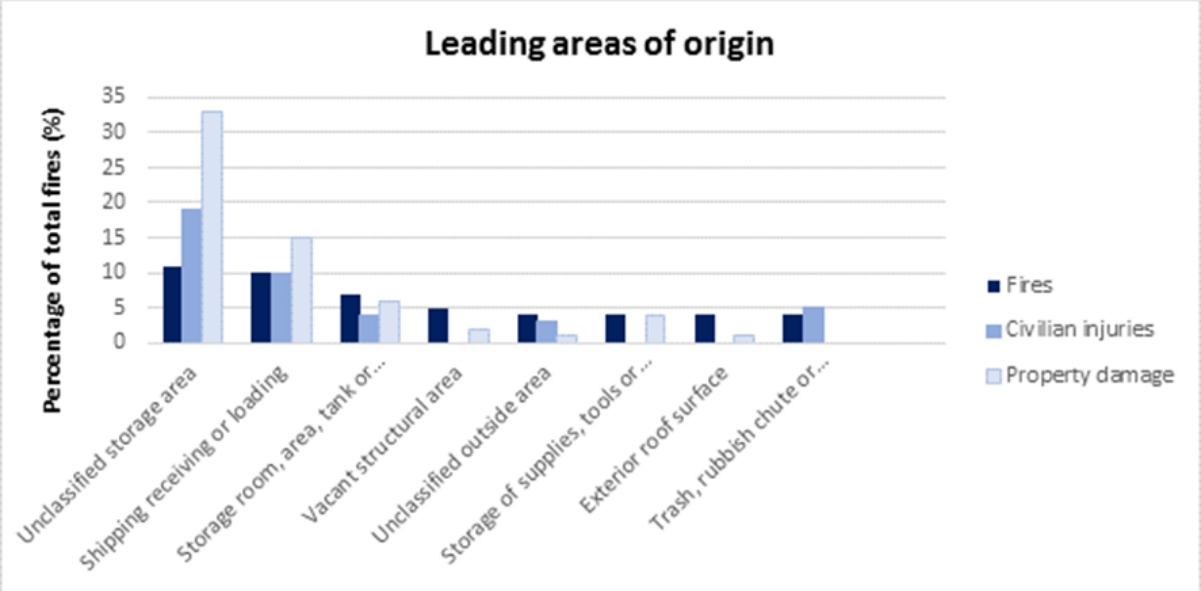

Figure 4-2: Structure Fires in Warehouses by Area of Origin

The most common ignition sources in order of likelihood in warehouse structure fires are:

- Intentional (18%)
- Electrical distribution or lighting equipment (18%)
- Heating equipment (8%)
- Exposure fire (7%)

- Smoking materials (5%)

The most common fire origins in order of likelihood in warehouse structure fires are:

- Unclassified storage area (11%)
- Shipping receiving or loading (10%)
- Storage room, area, tank or bin (7%)
- Vacant structural area (5%)
- Unclassified outside area (4%)
- Storage of supplies, tools or dead storage (4%)
- Exterior roof surface (4%)
- Trash, rubbish chute or container (4%)

4.7.2 Office

NFPA statistics published for the years 2007-2011 estimates an average of 3,340 structure fires in office properties per year. Fires in office properties accounted for less than one in every 100 (0.7%) reported structure fires from 2007-2011. These fires caused annual averages of 4 civilian deaths and 44 civilian injuries. One in every four fires was caused by cooking. Electrical distribution and lighting equipment was the second leading major cause. The percentage of fires, civilian injuries and deaths that occurred in 2007-2011 at different times of the day are presented in the figure below.

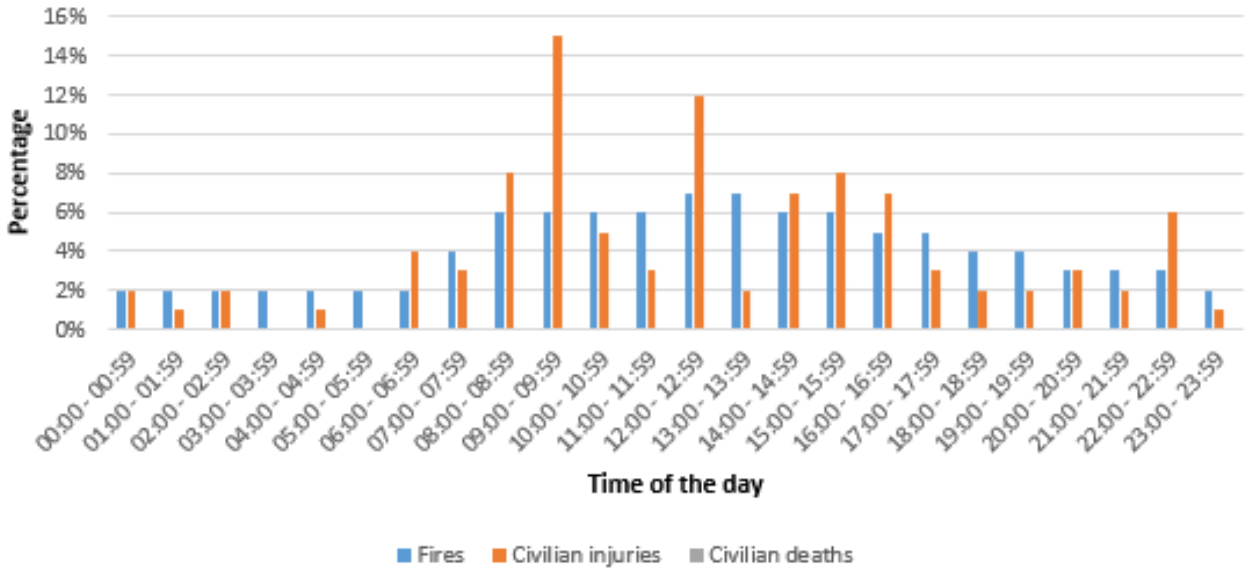

Figure 4-3: Percentage of fires, civilian injuries and deaths at different times of the day (offices)

The following graph that shows the ratio of injuries and deaths to total number of fires has been developed from the data presented in the previous figure. It can be noted that the number of fires during the day is almost four times as many as those during the night. The number of fires peak at midday and are the lowest in the night. This is likely due to the fact that office tenancies are generally unoccupied during the night.

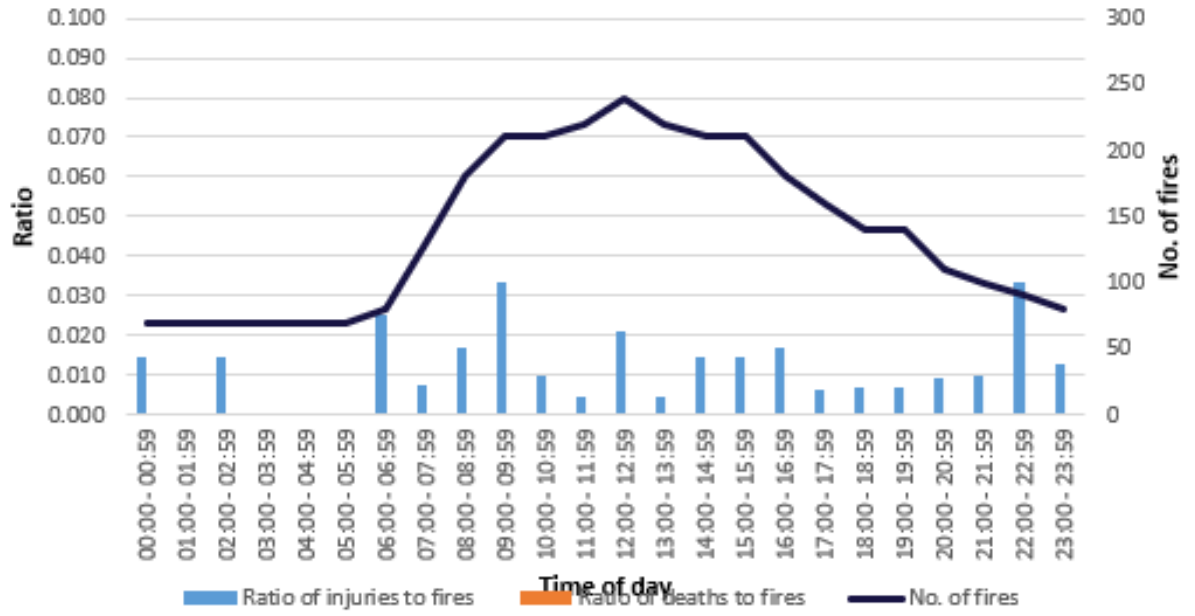

Figure 4-4: Number of fires, ratio of injuries/fires and deaths/fires for different times of the day (offices)

The most common ignition sources in order of likelihood in office structure fires are:

- Cooking equipment (29%)
- Electrical distribution and lighting equipment (12%)
- Heating equipment (11%)
- Intentional (10%)
- Smoking materials (9%)

The most common fire origins in order of likelihood in office structure fires are:

- Kitchen or cooking area (22%)
- Unclassified outside area (4%)
- Lavatory, bathroom, locker room (4%)
- Lobby or entrance way (3%)
- Attic or ceiling/roof assembly or concealed space (2%)
- Duct for HVCA, cable, exhaust, heating or AC (2%)
- Machinery room or elevator machinery (2%)
- Unclassified storage area (2%)

5 BCA DTS NON-COMPLIANCE REVIEW

5.1 Overview

In this instance, the BCA DtS non-compliances have been formulated based on a regulatory review undertaken by the project building surveyor and/or design team and through Affinity Fire Engineering's experience of similar buildings of the size and nature of the subject development. Where not listed herein the building is required to achieve compliance with relevant DtS provisions and relevant codes, reports and Standards.

The following table lists the proposed departures from the DtS provisions of the BCA for the development and the relevant Performance Requirements.

5.2 BCA DtS Non-Compliance Assessment and Acceptance Criteria

Table 5-1: Summary of Performance Solutions

VARIATIONS, ASSOCIATED METHODOLOGY AND ACCEPTANCE CRITERIA
Perimeter Vehicular Access
Relevant Regulatory Requirement: BCA Clause C3D5 requires vehicular access as a continuous means of passage for emergency vehicles in a forward direction around the entire building. Further to this, the roadway is required to have a width of no less than 6m, be located within 18m of the building and have nothing constructed on the pathway that obstructs passage. **Performance Requirement:** The relevant Performance Requirement is C1P9 **Non-compliance with DtS provisions:** **Lots 1-8 and Lots 10-14** ▸ The vehicular access road has sections that are greater than 18m from the building (typically where travel is onto the main Estate Roads, around carparking, around the fire sprinkler tank or past recessed docks). **Lot 9:** ▸ The vehicular access road has sections that are greater than 18m from the building on the western sides where travel is onto the main Estate Road and past recessed docks. ▸ The vehicular access road requires travel beneath the dispatch dock awning on the southern corner of the site. Through this section a clear width no less than 4.5m is maintained. *See full perimeter access markups in APPENDIX D*

VARIATIONS, ASSOCIATED METHODOLOGY AND ACCEPTANCE CRITERIA

Egress Provisions

Relevant Regulatory Requirement:

BCA Clause D2D5 states that in a Class 5 to 7 building the travel distance to the point of choice must not exceed 20m and to the nearest exit must not exceed 40m where more than one exit is available.

BCA Clause D2D6 states that the travel distance between alternative exits must not exceed 60m.

Performance Requirement:

The relevant Performance Requirements are D1P4 and E2P2

Non-compliance with DtS provisions:

All Lots 1-12

Travel distances exceed the DtS limitations throughout various areas of each building, with the following maximum distances to be rationalised through fire engineering:

- Up to 100m distance to an exit in lieu of the DtS 40m.
- Up to 200m distance between exits in lieu of the DtS 60m.

50m Fire Hose Reels

Relevant Regulatory Requirement:

BCA Clause E1D3 requires that fire hose reels are installed in accordance with AS2441 within a building having a fire compartment greater than 500m^2. This requires that all points on the floor are to be within reach of a 4m hose stream issuing from a nozzle at the end of the hose, with the hose length not exceeding 36m.

Performance Requirement:

The relevant Performance Requirement is E1P1.

Non-compliance with DtS provisions:

All Lots 1-12

- Due to the expansive footprint of each building, fire hose reels with a hose length of 50m in lieu of 36m are proposed to be used to achieve coverage within the warehouse areas.

VARIATIONS, ASSOCIATED METHODOLOGY AND ACCEPTANCE CRITERIA

Fire Hydrants System Design

Relevant Regulatory Requirement:

BCA Clause E1D2 requires that the fire hydrant system must be installed in accordance with AS2419.1 given that Schedule 4 of the BCA lists AS2419.1:2021 as the required document to meet BCA DtS provisions.

Within AS2419.1:2021, the following specific clauses are relative to this design:

- AS2419.1:2021 Clause 1.1 states that a building exceeding 108,000m^3 in volume falls outside the scope of AS2419.1:2021 and would require consideration of the informative content in Appendix C of the standard.
- AS2419.1:2021 Clause 2.2.2 requires hydrants beneath awnings with a depth exceeding 3m are to be considered internal hydrants and thus permitted only 40m coverage.
- AS2419.1:2021 clause 3.6.2 (b) requires:
  - Where required non-fire-isolated exits are provided, internal fire hydrants shall be located not more than 4 m from a required exit, except that internal fire hydrants need not be located adjacent to each required non-fire-isolated exit, provided fire hydrant coverage to all parts of the floor is achieved.
- AS2419.1:2021 clause 7.3.1 requires a fire booster assembly located remote of the building to be within sight of the principal pedestrian entrance and:
  - Adjacent to the site boundary and the principal vehicular access for the fire brigade pumping appliances to the building or site; or
  - Not more than 20m from the façade of the building containing the principal pedestrian entrance and not more than 20m from the main pedestrian entrance.
- AS2419.1:2021 Clause 11.5 (e) requires that where a booster assembly is installed, hydrant block plans shall be sized not less than A3 and have a maximum scale of 1 to 250.

Performance Requirement:

The relevant Performance Requirement is E1P3.

Non-compliance with DtS provisions:

The fire hydrant system shall be compliant with AS2419.1:2021 with the following exceptions permitted through the Performance Solution:

All Lots 1-12

- Application of AS2419.1:2021: While the building exceeds 108,000m^3 in volume, the fire hydrant system serving the site will be designed per AS2419.1:2021; taking into consideration the informative details of Appendix C.
- Hydrants under Awnings: External hydrants are located beneath the loading dock dispatch awnings (which have a depth >3m) and shall retain their classification as external hydrants in lieu of being internal hydrants; hence for the purposes of system coverage they will maintain 70m coverage.

VARIATIONS, ASSOCIATED METHODOLOGY AND ACCEPTANCE CRITERIA

- Internal Hydrants Locations: Internal hydrant that are not within 4m of an exit where additional intermediate internal hydrants are required to achieve full coverage of each building.
- Fire Hydrant Booster Assembly: The hydrant booster assemblies are located in a position that is not at the entry to the site, not within sight of each principal pedestrian entrance and/or not at the site boundary.
- Hydrant Block Plan: Hydrant block plans at the booster assembly to be a maximum A1 sized, in lieu of the maximum scale of 1:250. All other blockplans across the site are to be A3.

Fire Sprinkler System Design

Relevant Regulatory Requirement:

BCA Clause E1D4 requires that the fire sprinkler system is to be installed in accordance with AS2118.1:2017 of which under Clause 4.14.1 and 4.14.2, the fire sprinkler booster assembly and suction connection respectively must be in accordance with the requirements of the fire hydrant standard AS2419.1:2021.

AS2419.1:2021 clause 7.3.1 requires a fire booster assembly located remote of the building to be within sight of the principal pedestrian entrance and:

- Adjacent to the site boundary and the principal vehicular access for the fire brigade pumping appliances to the building or site; or
- Not more than 20m from the façade of the building containing the principal pedestrian entrance and not more than 20m from the main pedestrian entrance.

Performance Requirement

The relevant Performance Requirement is E1P4.

Non-compliance with DtS provisions:

All Lots 1-12

The sprinkler booster assembly locations are non-compliant with Clause 7.3.1(c)(i) due to the following:

- Not adjacent to the site boundary and the principal vehicular access for the brigade pumping appliances to the building or site.

Smoke Hazard Management

Relevant Regulatory Requirement:

BCA Clause E2D10 requires in a Class 5, 6, 7, 8 or 9 building, which exceeds 18,000m^2 in floor area or 108,000m^3 in volume, with a ceiling height more than 12m, to be provided with an automatic smoke exhaust system in accordance with Specification 21 throughout.

Performance Requirement:

VARIATIONS, ASSOCIATED METHODOLOGY AND ACCEPTANCE CRITERIA

The relevant Performance Requirement is E2P2

Non-compliance with DtS provisions:

The fire engineering strategy for the smoke hazard management systems within each building is based on the following design principles:

All Lots 1-12

Main Offices, Dock Offices and other Ancillary Areas

- Automatic smoke exhaust is to be omitted from the administration office, dock office, and any warehouse amenity areas.
- No smoke detection is provided to these areas of each building.

Warehouse Areas

An automatic smoke exhaust system shall be provided to the warehouse areas of the building in accordance with the DtS provisions and AS1668.1:2015 with the following exceptions:

- A smoke extraction rate of 1 air change per hour shall be achieved in lieu of extraction rates defined in BCA Specification 21.
- The warehouse shall form a single smoke reservoir resulting in a zone exceeding 2,000m^2.
- The automatic smoke exhaust system shall activate from sprinkler activation in lieu of smoke detector activation.
- No smoke detection shall be provided to the warehouse areas of each building.

Exit and Emergency Lighting

Relevant Regulatory Requirement:

BCA Clause E4D2, E4D4, E4D5, E4D6 and E4D8 specifies that exit and emergency lighting is to be installed to specific design parameters and in accordance with AS2293.1:2018.

Performance Requirement:

The relevant Performance Requirement is E2P2

Non-compliance with DtS provisions:

All Lots 1-12

- Directional exit signs shall be installed 5m above the finished floor level in lieu of the AS2293.1:2018 limitation of 2.7m within forklift travel zones.

6 PROPOSED FIRE SAFETY STRATEGY

The fire safety strategy outlined below has been proposed to satisfy the fire and life safety objectives specified for this project by the relevant stakeholders. In addition, the fire safety strategy is required to adequately address the specific fire and life safety hazards identified for the proposed development, and as such have been generally derived from the preventative and protective measures outlined within the BCA, and fire engineering literature and research.

The specified fire safety strategy will undergo analysis as part of a Fire Engineering Report to ascertain whether the relevant Performance Requirements of the BCA are satisfied. The information herein is therefore pending completion of the fire engineering analysis and as such, it is possible to change and or make modifications through the detailed design phase of the project.

6.1 Passive Fire Construction

6.1.1 Fire Resisting Construction and Compartmentation

Each building structure including floors, walls, columns and shafts shall be constructed in accordance with the requirements of BCA Clause C2D2, Specification 5 for Type C Construction.

6.1.2 Finishes and Linings

Where practicable, internal finishes, internal linings and internal materials used throughout the building should be non-combustible to reduce the spread of fire and the generation of toxic smoke products.

All wall, floor and ceiling, and roof and ceiling assemblies must be tested and rated for their fire hazard properties in accordance with the prescriptive requirements of BCA Clause C2D11 and Specification 7.

6.1.3 Separation of Equipment

Rooms containing equipment listed below must be fire separated from the remainder of the building by construction in accordance with Specification 5 or 120/120/120 FRL construction, whichever is greater, with any door opening into that room consisting of a --/120/30 FRL self-closing fire door.

- Lift motors and lift control panels (unless the lift installation does not have a machine-room); or
- Emergency generators used to sustain emergency equipment operating in emergency mode; or
- Central smoke control plant (other than smoke exhaust systems designed for high temperature operation); or
- Boilers; or
- A battery system installed in the building that have a total voltage of 12 volts or more and a storage capacity of 200kWh or more.

Electricity supply systems inclusive of electricity substations located within a building and main switchboard located within the building which sustains emergency equipment operating in the emergency mode (i.e. the smoke exhaust mechanical board and all switchboards feeding that) must meet the requirements of BCA Clause C3D14. This includes the requirements of being separated from any other part of the building by construction having:

- An FRL of not less than 120/120/120; and
- Any doorway in that construction protected with a self-closing fire door having an FRL of not less than --/120/30.

6.2 Egress Provisions

6.2.1 Evacuation Strategy

Activation of any sprinkler head or manual call point shall initiate the building occupant warning alarm tones throughout the building of fire origin.

Dedicated fire wardens shall ensure that all clients, visitors, maintenance contractors and staff are promptly evacuated if a fire is identified anywhere in the building (see Section 6.3.4).

6.2.2 Egress Provisions

With exception of the following items being addressed through a fire-engineered Performance Solution, travel distances to a point of choice or single exit are to be not more than 20m and the distance to the nearest of two or more alternative exits must not exceed 40m and the distance between alternative exits must be no closer than 9m and no further apart than 60m. The fire engineering assessment shall address travel distances as listed below:

All Lots 1-12

- Due to the expansive footprint of each building, fire hose reels with a hose length of 50m in lieu of 36m are proposed to be used to achieve coverage within the warehouse areas.

As part of the Performance Solution to rationalise the travel distances, the following measures must be incorporated:

Fire-Isolated Passageways

Within Lots 6A and 9B subterranean fire-isolated tunnels are to be provided within the warehouse areas to ensure the FRNSW limitation of having all parts of the floorplate being within 100m of a fire hydrant external to the compartment.

- The tunnels are to be constructed in accordance with BCA Clause D3D3, and fire rated in accordance with BCA Specification 5.
- Doors fitted to the tunnel entry points must be AS1905.1:2014 fire doors achieving a --/60/30 FRL.
- The tunnels must discharge externally in a location compliant with BCA Clause D2D12.

6.2.3 Door Hardware, Operation and Mechanisms

All doors serving as required exits shall have the hardware, door swings, latch operations and signage in accordance with the prescriptive requirements of BCA Clauses D3D24, D3D25, D3D26 and D3D28.

6.2.4 Signage and Lighting

Exit and emergency lighting are to be provided throughout building in accordance with the prescriptive DtS provisions of BCA Clause E4D2, E4D4, E4D5, E4D6, E4D8 and AS2293.1:2018 with the following exceptions:

All Lots 1-12

- Directional exit signs shall be installed 5m above the finished floor level in lieu of the AS2293.1:2018 limitation of 2.7m within forklift travel zones.

As part of the exit and emergency lighting design, the following measures must be incorporated:

- Exit signs are to be pictograph 'running man' signs as per the prescriptive requirements of AS2293.1:2018.
- All exit and directional exit signs are to be power-operated illuminated signs.
- Any directional exit signs located above 2.7m are to be 'Jumbo' sized signs.

6.3 Active Fire Protection Systems

The following figure provides an overview of the fire infrastructure on the project to support the design specification for those systems in the subsequent sections.

Water Supply for the Fire Safety Systems

Each site requires water provisions for both the automatic fire sprinkler system and the fire hydrant system. These are fed from separate supplies as discussed in detail below.

Automatic Fire Sprinkler System

The sites have been provisioned for on-site water storage tanks to serve for the automatic fire sprinkler systems installed throughout each building. The fire sprinkler systems are intended to consist of High Hazard Storage Mode sprinkler systems designed in accordance with AS2118.1:2017. The water storage tanks will be sized to accommodate the required design (~600,000L in volume each), with complete design undertaken prior to the relevant Construction Certificate and once the warehouse racking arrangement and storage commodity have been defined.

Fire Hydrant System

Each site will have a dedicated fire hydrant system which will be fed from the town mains potable water supply. Each fire hydrant system is designed to cater for three (3) fire hydrants to be operating simultaneously, resulting in a 30L/s total flow capacity.

Each development site within the Estate will be provided with a 150-200mm water main connection which will be determined prior to the relevant construction certificate to be adequate to provide the required 30L/s necessary to achieve compliance with AS2419.1:2021.

6.3.2 Fire Control & Indicating Equipment

The fire safety systems within each respective building must be connected to a Main Fire Control & Indicating Equipment (FDCIE) located within the main entry lobby of each office.

This location shall form the Fire Control Centre for the respective large-isolated building, house the Alarm Signalling Equipment (ASE) and form the turn-out address for attending fire fighters.

- The main-FDCIE must incorporate:
  - The ability to enable, disable & reset ALL zones/alarms across that specific building.
  - Contain the site ASE and brigade monitoring system.
  - Contain controls for the automatic smoke exhaust system for that specific building.

6.3.3 Fire Brigade Alarm Signalling Equipment

An automatic link shall be provided directly to an approved monitoring centre on activation of the fire sprinkler system or manual call points installed in the building in compliance with DtS Provisions and AS1670.3:2018.

6.3.4 Building Occupant Warning System

A building occupant warning system shall be provided throughout each building. The system shall be in accordance with the prescriptive requirements of Specification 17, Specification 20 and AS1670.1:2018.

Activation of any fire sprinkler head or manual call point shall initiate the building alarm tones throughout the building of fire origin.

6.3.5 Automatic Fire Sprinkler System

A fire sprinkler system shall be provided throughout each Warehouse building in accordance with the prescriptive requirements of BCA Specification 17 and AS2118.1:2017, with the following exceptions:

- The sprinkler booster assembly locations for each respective site are non-compliant with Clause 7.3.1(c)(i) due to the following:
  - Not adjacent to the site boundary and the principal vehicular access for the brigade pumping appliances to the building or site.

As part of the fire sprinkler system design, the following design measures must be incorporated:

- The fire sprinkler booster assembly must ensure an adequate staging area for pumping appliances as per FRNSW Fire Guideline requirements *"Access for fire brigade vehicles and firefighters"* available at https://www.fire.nsw.gov.au/ and AS2118.1:2017.

- The design of any fixed suction provided for a fire brigade pumping appliance to draught from a below-ground water supply is to satisfy Clause 4.4 of Australian Standard AS2419.1:2021. The maximum length of the dry pipe between the lowest section water level and the large bore suction connection must not exceed 2.8m (due to the limitations of the primer on the fire brigade pumping appliances).

Fire & Rescue NSW Hardstand Requirements

As detailed in FRNSW Fire Guideline requirements *"Access for fire brigade vehicles and firefighters"*, any hardstand serving a suction-connection outlet is to have a working space that extends a minimum of 18m from the point of connection to allow a semi-rigid suction hose to be connected to the rear of the fire appliance. This is demonstrated in Figure 6-1.

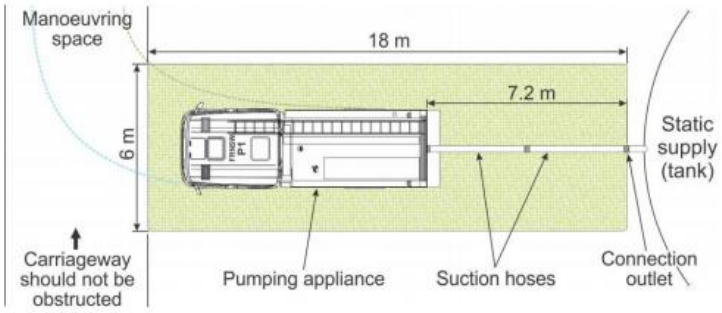

Figure 14 Hardstand area serving a suction-connection outlet

Figure 6-1: FRNSW Access For Fire Brigade Vehicles & Firefighters Excerpt (State Govt NSW 2019)

The preliminary fire engineering assumes that the fire sprinkler suction point is located inward facing to the hardstand and hence necessitate an appliance to back up against it. The orientation of the suction point may be adjusted so long as the design reflects the FRNSW requirements as detailed in FRNSW Fire Guideline requirements *"Access for fire brigade vehicles and firefighters"*. Connection orientations are as per excerpt from the aforementioned FRNSW document per Figure 6-2.

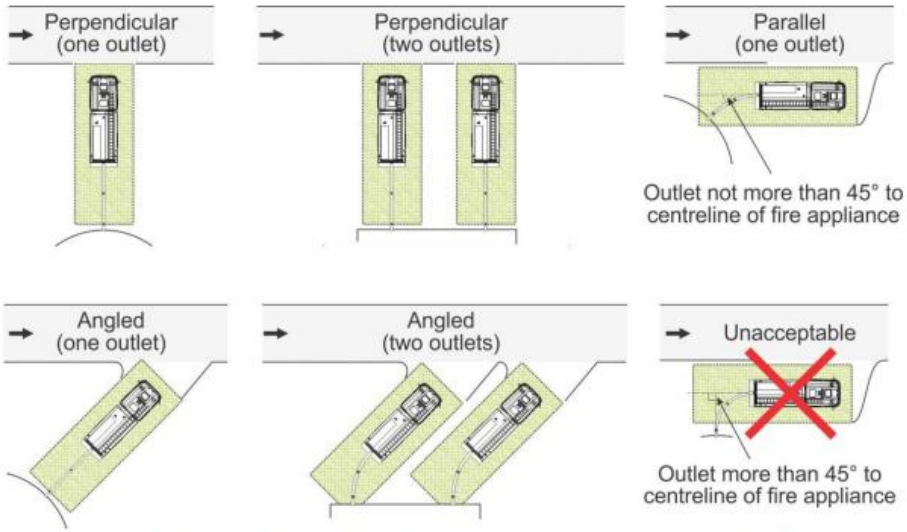

Figure 15 Example of orientation of hardstand area for suction-connection outlets

Figure 6-2: FRNSW Access For Fire Brigade Vehicles & Firefighters Excerpt (State Govt NSW 2019)

Notwithstanding, a detailed design of the fire sprinkler suction connection point and booster assembly respectively must be undertaken by the fire sprinkler design consultant to meet the desired requirements. Note that a minimum 6m clear width has been maintained past the appliance staging area to meet the requirements of BCA Clause C3D5.

6.3.6 Automatic Smoke Exhaust System

An automatic smoke exhaust system shall be provided to the warehouse areas of each building in accordance with the DtS provisions and AS1668.1:2015 with the following exceptions:

- A smoke extraction rate of 1 air change per hour shall be achieved in lieu of extraction rates defined in BCA Specification 21.
- The warehouse shall form a single smoke reservoir resulting in a zone exceeding 2,000m^2.
- The automatic smoke exhaust system shall activate from sprinkler activation in lieu of smoke detector activation.
- No smoke detection shall be provided to the warehouse areas of each building.

Main Offices, Dock Offices and other Ancillary Areas

- Automatic smoke exhaust is to be omitted from the administration office, dock office, and any warehouse amenity areas.
- No smoke detection is provided to these areas of each building.

As part of the automatic smoke exhaust system design, the following design measures must be incorporated:

- The automatic smoke exhaust system provided to the warehouse areas must be designed in accordance with BCA Specification 21 and AS1668.1:2015 unless noted otherwise herein.
- A mechanical system blockplan shall be provided at the FDCIE in accordance with AS1668.1:2015 and also incorporate the following;
  - Signs alerting the Fire Brigade to the operation of the smoke exhaust system.
  - A schematic of the system detailing fan extraction rates, and make-up air locations and free area requirements.
  - Reference the Fire Engineering Report.
  - Notification that the system is automatically initiated by sprinkler activation.
  - Incorporate the same legend and fan numbering as those used on the FDCIE fan control switches.
- The automatic smoke exhaust system must be connected to the site's essential power (safety service).
  - The electrical board must be fire separated from the remaining building per BCA Clause C3D14 (--/120/120 FRL walls and --/120/30 FRL fire door) per Section 7.1.3.

6.4 Occupant Fire Fighting Facilities

6.4.1 Fire Hose Reel

Fire hose reels are to be provided throughout each building in accordance with the prescriptive DtS provisions of BCA Clause E1D3 and AS2441:2005 with exception of the following;

- Due to the expansive footprint of each building, hose reels with a length of 50m in lieu of 36m are proposed to be used to achieve coverage within the warehouse areas.

As part of the fire hose reel design, the following design measures must be incorporated:

- Where 50m long hoses are used;
  - They must be tested to meet the requirements of AS1221:1997 other than the specification of a maximum hose length of 36m.
  - Coverage to any part of the warehouse by a 50m long hose line must be achieved with no more than 2 bends.
- To ensure that the provision of 50m hose reels does not impact life safety, on-site training in the use of the hose reels must be undertaken by key staff members (Fire Wardens and Warehouse Supervisors).

The location of all fire hose reels should be readily accessible to occupants. The use of facilities should be monitored for abuse, mistreatment and servicing. The fire hose reels shall be located within 4m of an exit and provide coverage to all areas of the building based on a 50m or 36m hose length with a 4m water stream.

6.4.2 Portable Fire Fighting Equipment

Portable fire extinguishers are to be provided throughout each building in accordance with Table E1D14 of the BCA with the type of extinguisher selected in accordance with AS2444:2001.

General office areas	Dry Powder (ABE type)	2.5Kg
Computer/server rooms	CO_2	3.5 Kg
Plant rooms	Dry Powder (ABE)	2.5 Kg
Designated exits	Dry Powder (ABE)	4.5 Kg
Adjacent each fire hose reel cabinet	Dry Powder (ABE)	4.5 Kg

6.5 Fire Brigade Intervention

6.5.1 Fire Hydrant System

A fire hydrant system shall be provided throughout each site to serve each respective building in accordance with the prescriptive requirements of Clause E1D2 and AS2419.1:2021 with exception of the following:

- Application of AS2419.1:2021:
  - While the building exceeds 108,000m^3 in volume, the fire hydrant system serving the site will be designed per AS2419.1:2021; taking into consideration the informative details of Appendix C.
- Hydrants under Awnings:
  - External hydrants are located beneath the loading dock dispatch awnings (which have a depth >3m) and shall retain their classification as external hydrants in lieu of being internal hydrants; hence for the purposes of system coverage they will maintain 70m coverage.
- Internal Hydrants Locations:
  - Internal hydrant that are not within 4m of an exit where additional intermediate internal hydrants are required to achieve full coverage of the building.
- Fire Hydrant Booster Assembly:
  - The hydrant booster assemblies are located in a position that is not at the entry to the site, not within sight of each principal pedestrian entrance and/or not at the site boundary.
- Hydrant Block Plan:
  - Hydrant block plans at the booster assembly to be a maximum A1 sized, in lieu of the maximum scale of 1:250. All other blockplans across the site are to be A3.

As part of the fire hydrant system design, the following design measures must be incorporated:

- Each system must incorporate a ring main and associated isolated valves as required for a large-isolated building. Isolation valves shall be numbered with those corresponding numbers indicated on the hydrant block plan.
- All connection points must be fitted with Storz hose couplings which comply with FRNSW Technical Information D15/45534 for *"FRNSW compatible Storz hose connections"*. Further information is available from FRNSW available at www.fire.nsw.gov.au.
- Each hydrant under a dispatch awning must be provided with a twin valve connection (as per the requirements of an external hydrant).
  - External fall-back hydrants are to be provided to achieve full coverage of the area beneath the dispatch awning.
- Per the request of FRNSW, as far as possible the hydrant system should consist of external hydrant points, with internal hydrants only provided where there are shortfalls in coverage from external hydrants.
  - Where internal hydrants are required;
    - They must be designed to allow progressive movement through the building such that an internal hydrant is within 50m of an external hydrant and 25m of an internal hydrant.
    - A localised block plan must also be provided at every hydrant relied upon for progressive movement pictorially and numerically illustrating the location of the next available

additional hydrant. These localised block plans should be of a size appropriate to their notice and location and be of all-weather fade-resistant construction.

6.5.2 Vehicular Perimeter Access

Vehicular perimeter access roadways are provided around each of the large-isolated buildings. These must be designed and constructed in all-weather surface capable of supporting all FRNSW appliances in accordance with BCA Clause C3D5 and FRNSW Fire Safety Guideline "Access for fire brigade vehicles and firefighters" version 5.01" (available from www.fire.nsw.gov.au).

The following variations from the prescriptive requirements shall be addressed through a fire engineered Performance Solution:

- The vehicular access road has sections that are greater than 18m from the building (typically where travel is onto the main Estate Roads, around carparking, around the fire sprinkler tank or past recessed docks).
- The vehicular access road on Lot 8 requires travel beneath the dispatch dock awning on the southern corner of the site. Through this section a clear width no less than 4.5m is maintained.
- The road is reduced to less than 6m clear width on Lots 2, 8 and 11 where the minimum clear width is 4.8m.
- The vehicular access road on Lots 7 and 12 are discontinuous and requires fire appliances to undertake a 3-point turning manoeuvre.
- Due to the presence of overhead sky bridges, the vehicular access road travel beneath the building structure on Lots 6A and 9B.

See full perimeter access markups in APPENDIX D

As part of the fire-engineered Performance Solution for perimeter vehicular access, the following must be incorporated into the design;

Perimeter Access Path Performance

- Gradients upon the access road are suitable for heavy vehicles in accordance with Australian Standards and FRNSW Fire Safety Guidelines;
- The fire appliance access road and surface will be suitable in all weather and are capable of supporting the maximum distributed load over the entire area as per FRNSW Fire Safety Guideline "access for fire brigade vehicles and firefighters v5.01";
- Fire brigade appliances will be provided with adequate room and sweep paths around the building corners to travel in forward direction.
- Skybridges must have a clear height no less than 4.5m.

Security Gate Requirements

- Security gates that cross the vehicular access path at the vehicular entries to the carpark and dispatch hardstand must:
  - Manually operated Gates: are to be locked with a loose chain and padlock, or fixed cylinder hardware set.
  - Mechanically driven Gates: are to have a manual overdrive provided at the gate motor to disengage the gearing and allow manual opening of the gate by FRNSW;

- Operational instructions and diagrams illustrating the gate gear override mechanism must be provided at the Main FDCIE.
- Copies of any access keys/fobs etc. are to be provided to the nearest FRNSW station to the site, and also a copy hung at the Main FDCIE.

Permeable Paving

Where a section of the roadway utilises permeable paving, and that roadway may be used by attending fire fighters during a fire scenario, the permeable paving shall be designed to the following specification:

- Permeable paver within the vehicular access road (i.e. TurfPave XD) must be designed to cater for the loadbearing requirements of FRNSW appliances (both pumping and aerial appliances).
- Regular maintenance of the vegetation must be undertaken in line with Goodman Property Group's Landscaping Maintenance Specification.
- The fire hydrant blockplans must include:
  - The location of the perimeter access road around the site; and
  - Detail the portions of perimeter access path provided with the permeable pavers (TurfPave) material.
  - Provide notification in red coloured 10mm text stating, "TURFPAVE HAS LOADBEARING CAPACITY DESIGNED FOR FRNSW APPLIANCES".
- Annual inspections of the vehicular perimeter access paths must be undertaken to ensure the road base conditions are suitable for general FRNSW appliance and other emergency vehicle traffic.
  - A record of these inspections are to be kept on site with any required rectification detailed in the report.

6.6 Building Management Procedures

The ongoing management of the building is as important in maintaining a high level of life safety as the provisions recommended during the design phase of the building.

6.6.1 Maintenance of Fire Safety Equipment

Any fire detection systems, fire sprinkler systems, emergency warning systems, fire hydrants, hose reels, portable fire extinguishers, emergency lighting and any other fire safety equipment shall be tested and maintained in accordance with Australian Standard AS1851 or another relevant testing regulatory.

6.6.2 No Smoking Policy

A no-smoking policy shall be implemented and enforced throughout all internal areas of the building.

6.6.3 Fire Safety Manual

A fire safety manual shall be developed for the site to provide an overview of all fire safety procedures and systems within the building. The manual should also record false alarms, and outcomes from fire drills and provide details of the ongoing maintenance and inspection procedures. The manuals should

be reviewed annually, and lessons-learned exercises undertaken. Any conclusions drawn from this exercise should be implemented into the fire safety procedures.

6.6.4 Emergency Management Plan

An Emergency Management Plan (EMP) must be developed in accordance with AS3745:2010 Amd 2:2018. The EMP must;

- Developed by an emergency planning committee (EPC).
- Implement emergency control organisation (ECO) procedures for the building.
- Specifically address the types of emergencies that may arise from the industry and/or activities associated with the business operations.
- Ongoing training, education and execution of the emergency management procedures are to be regularly conducted with all building occupants.

An evacuation plan should be developed for the site in accordance with AS3745:2010 Amd 2:2018 and standard fire orders should be displayed throughout the building.

6.6.5 Dangerous Goods

Should future use of the facility incorporate the use and/or storage of dangerous goods that exceed the SEPP thresholds, the site will require review and assessment by a suitably qualified Risk Consultant to determine the associated hazards and required preventative measures to meet BCA Clause E1D17 and E2D21. The fire engineering strategy in this event will require the following measures:

- Storage of dangerous or hazardous goods on this site will require re-assessment of the fire engineering analysis by a registered Certifier- Fire Safety.
- Where the storage quantity trigger requirements for a fire safety study, the above re-assessment of fire engineering analysis must also be submitted to Fire and Rescue NSW for the key stakeholder's review and support.
- Where Dangerous Goods are to be stored or handled on a respective site, then prior to occupation or commissioning an Emergency Plan (EP) and Emergency Services Information Package (ESIP) must be developed for the site in accordance with HIPAP No.1 [34] the FRNSW Guideline for Emergency Services Information Package and Tactical Fire Plans [35].

6.6.6 Rooftop Solar Panels

The following measures shall be provided where the design includes the installation of solar panels to the roof of a building.

- An A4 notice on fade resistant material must be displayed at the Main FDCIE of that building to notify attending fire fighters as to the existence of the Photovoltaic Solar Panel Array on the roof of the building. The notice must include:
  - A figure detailing the location of the panels.
  - A floor plan detailing the location of all associated isolation switches, AC and DC isolators for the shut-off of generated electricity.
  - Notification that the PV do not automatically isolate on fire trip.

- A statement in 25mm font stating (or similar wording):
  "Photovoltaic (PV) Panels Present — PV panels are mechanically fixed to the roof as shown below"

6.6.7 Electric Vehicle and Electric Bike Charging

Power Isolation

- All electric vehicle/bike charging equipment must automatically shut down and be isolated from the mains power on general fire alarm anywhere within the respective building.

Fire Fighter Information / Signage

- Signage must be displayed at each Main FDCIE to indicate the properties of the electric car/bike charging bays to include:
  - The location of the charging bays.
  - The location of manual isolation switches/boards with way finding from the FDCIE and operating instructions.
  - The power rating (kW capacity) of the chargers.
  - Notification that the electric car/bike charging systems automatically ceases operation and are isolated from power supply on general fire alarm.

6.6.8 Hot Works Policy

A hot works policy should be put in place and rigorously enforced to ensure that all hot works, including grinding and welding, are managed to avoid the accidental ignition of fires.

6.6.9 Fire Drills and General Fire Safety Training

All fire wardens are to be trained in first-aid firefighting and emergency response. All staff shall be inducted with a fire safety brief including the actions necessary for the activation of the building emergency warning system and the location of all emergency egress paths and fire exits. In addition, periodic fire drills should be undertaken and any lessons learned included in future fire safety procedures.

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APPENDIX A FIRE STATISTICS

PROBABILITY OF FIRE STARTS

The probability of a fire start in a range of building uses, based on UK data, can be established using the data presented in Table 7-1 [11]; the applicable occupancy type is highlighted.

Table 7-1: Overall probability of fire starts for various occupancies, UK data

Occupancy	Probability Of Fire Starts (% Per Year)
Industrial	4.4
Storage	1.3
Offices	0.6
Assembly entertainment	12.0
Assembly non-residential	2.0
Hospitals	30.0
Schools	4.0
Dwellings	0.3

PROBABILITY OF CIVILIAN INJURY AND FATALITY

The probability of injuries and deaths for various occupancy types based on UK data [11] is presented in the following table.

Table 7-2: Probability of occupant injury and fatality by occupancy type, UK data averages for the years 1995 and 1997-1999

Type Of Occupancy	No Of Fires	Probability Of Occupant Injury Per Fire Event (%)	Probability Of Occupant Death Per Fire Event (%)
Further education	535	3.18	0.00
Schools	1669	3.06	0.00
Licensed premises	3317	7.90	0.08
Public recreational buildings	2581	1.86	0.05
Shops	5671	5.01	0.06
Hotels	1021	11.36	0.24
Hostels	1338	4.48	0.04
Hospitals	3063	3.69	0.11
Care homes	1616	8.04	0.28
Offices	1988	11.02	0.02
Factories	5299	5.40	0.08

APPENDIX B FIRE BEHAVIOUR

FIRE GROWTH RATE

As the fire increases in size, the rate of fire growth accelerates. The growth rate of a fire can result in various hazards for occupants due to the following:

- Protective and preventative measures may not be adequate
- Occupants may have insufficient time to evacuate
- Occupants may perceive a reduced threat from slow growing fires

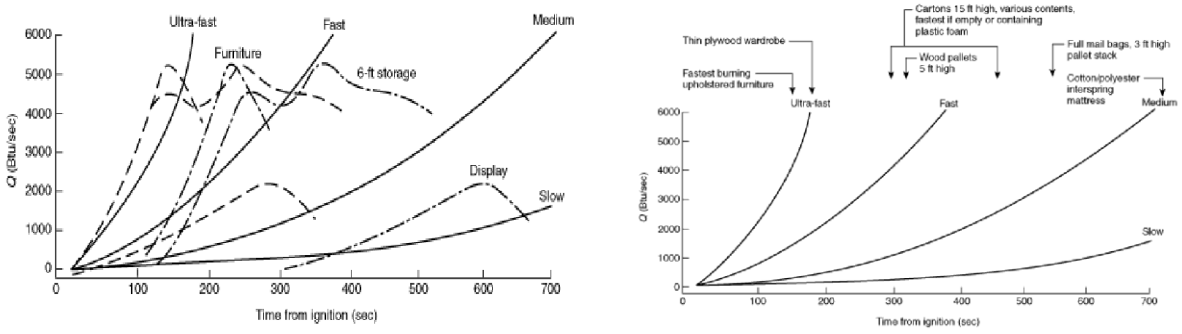
The rate of fire growth is generally expressed in terms of an energy release rate. The most commonly used relationship is what is commonly referred to as a quadratic t-squared fire. In such a fire, the rate of heat release is given by the expression:

$$Q = \left(\frac{t}{k}\right)^2$$

Where; t is time from ignition of the fire (seconds) and k is the growth time (seconds) for the fire to reach a heat output of 1.055 MW.

The continued growth of a fire defined by the above equation relies on both a sufficient source of fuel and air and assumes that flashover has not been reached. The rate of fire growth can be estimated from the results of a number of fire tests that have been performed on various fuel commodities.

National Fire Protection Association Standard NFPA 92B, provides information on the relevance of t-squared approximation to real fire as depicted in Figure 7-1.



(a) t-squared fire, rates of energy release (b) Relation of t-squared fires to some fire tests

Figure 7-1: NFPA 92B design fires and heat release rates

A slow fire growth is not considered to be the most challenging in terms of fire and life safety or fire brigade intervention. The continued growth of a fire defined by the above equation relies on both a sufficient source of fuel and air and assumes that flashover has not been reached. The rate of fire growth can be estimated from data published in CIBSE Guide E [13] and BS9999:2008 are listed below:

- Assembly hall seating : Medium-Fast
- Dwelling : Medium
- Office : Medium
- Hotel bedroom : Medium
- Hotel reception : Medium
- Meeting room : Medium
- Picture Gallery : Slow
- Reception area : Slow
- Restaurant/Canteen : Medium
- Shop : Fast
- Teaching laboratories : Fast
- Warehouse : Medium/Fast/Ultra-fast
- Waiting Room : Slow

From the above list, it can be concluded that the likely fire scenarios in the building may be approximated by the standard Ultra-fast time-squared fire growth rate curve.

APPENDIX C FIRE LOADS

The fire load within a room or compartment will influence the duration and severity of a fire and resultant hazard to occupants. The effective fire load for the building has been estimated by consideration of the typical spaces within the building.

The IFEG has published further fire load densities for broad occupancy groupings (extracted from CIB 1983) as provided in the table below. The CIB compilation emphasises that at least the 95% fractile should be selected for design purposes. The following fire loads have been extracted from the IFEG and are considered applicable to the subject building:

Table 7-3: Fuel load densities for different occupancy groups

Densities in mega-joules per square metre				
Occupancy	Mean	Percent fractile		
	(MJ/m^2)	80	90	95
Dwelling	780	870	920	970
Hospital	230	350	440	520
Hospital storage	2000	3000	3700	4400
Hotel bedroom	310	400	460	510
Offices	420	570	670	760
Shops	600	900	1100	1300
Manufacturing	300	470	590	720
Manufacturing and storage <150kg/m^2	1180	1800	2240	2690
Libraries	1500	2250	2550	-
Schools	285	360	410	450

WAREHOUSES (U.S.A.)

The following data has been extracted from the fire statistics data published by the NFPA for the years 2009-2013. The sum of each column of data may not equal totals due to rounding errors.

Table 7-4: Leading causes of structure fires in warehouse properties (2009-2013 annual averages)

Cause	Fires	Civilian Injuries
Intentional	220 (18%)	4 (21%)
Electrical distribution and lighting equipment	220 (18%)	8 (38%)
Heating equipment	90 (8%)	0 (0%)
Exposure fire	90 (7%)	0 (0%)

Cause	Fires	Civilian Injuries
Smoking materials	60 (5%)	0 (0%)
Cooking equipment	50 (4%)	0 (0%)
Lightning	20 (2%)	0 (0%)

Based on the table above, it can be noted that the leading cause is generally equipment used by the building occupants. Electrical distribution and lighting equipment is the leading cause of fires and civilian injuries, accounting for over a third of civilian injuries (38%). The following table indicates the majority of deaths and injuries occur in storage and loading bays of warehouse buildings.

Table 7-5: Structure fires in warehouse properties by area of origin (2009-2013 annual averages)

Cause	Fires	Civilian Injuries
Unclassified storage area	140 (11%)	4 (19%)
Shipping receiving or loading area	120 (10%)	2 (10%)
Storage room, area, tank or bin	80 (7%)	1 (4%)
Vacant structural area	60 (5%)	0 (0%)
Unclassified outside area	50 (4%)	1 (3%)
Storage of supplies or tools or dead storage	50 (4%)	0 (0%)
Exterior roof surface	50 (4%)	0 (0%)
Trash or rubbish chute, area or container	40 (4%)	0 (0%)
Unclassified equipment or service area	40 (4%)	0 (2%)
Processing or manufacturing area, or workroom	40 (3%)	1 (5%)
Unclassified area of origin	40 (3%)	1 (5%)
Office	40 (3%)	1 (7%)
Exterior wall surface	40 (3%)	0 (0%)
Maintenance or paint shop area	30 (3%)	1 (5%)

Cause	Fires	Civilian Injuries
Unclassified structural area	30 (2%)	0 (0%)
Garage or vehicle storage area	30 (2%)	1 (6%)
Kitchen or cooking area	20 (2%)	0 (0%)
Wall assembly or concealed space	20 (2%)	0 (0%)
Machinery room or area or elevator machinery room	20 (2%)	0 (0%)
Other known area of origin	280 (23%)	6 (27%)

The following table lists the extent of fire spread in warehouse properties and the corresponding number of civilian injuries.

Table 7-6: Structure fires in warehouse properties by extent of flame (2009-2013 annual averages)

Extent Of Fire Spread	Fires	Civilian Injuries
Confined fire identified by incident type	280 (23%)	0 (0%)
Confined to object of origin	170 (14%)	6 (32%)
Confined to room of origin	260 (21%)	4 (19%)
Confined to floor of origin	70 (6%)	1 (6%)
Confined to building of origin	370 (31%)	7 (38%)
Beyond building of origin	60 (5%)	1 (5%)

APPENDIX D VEHICULAR PERIMETER ACCESS

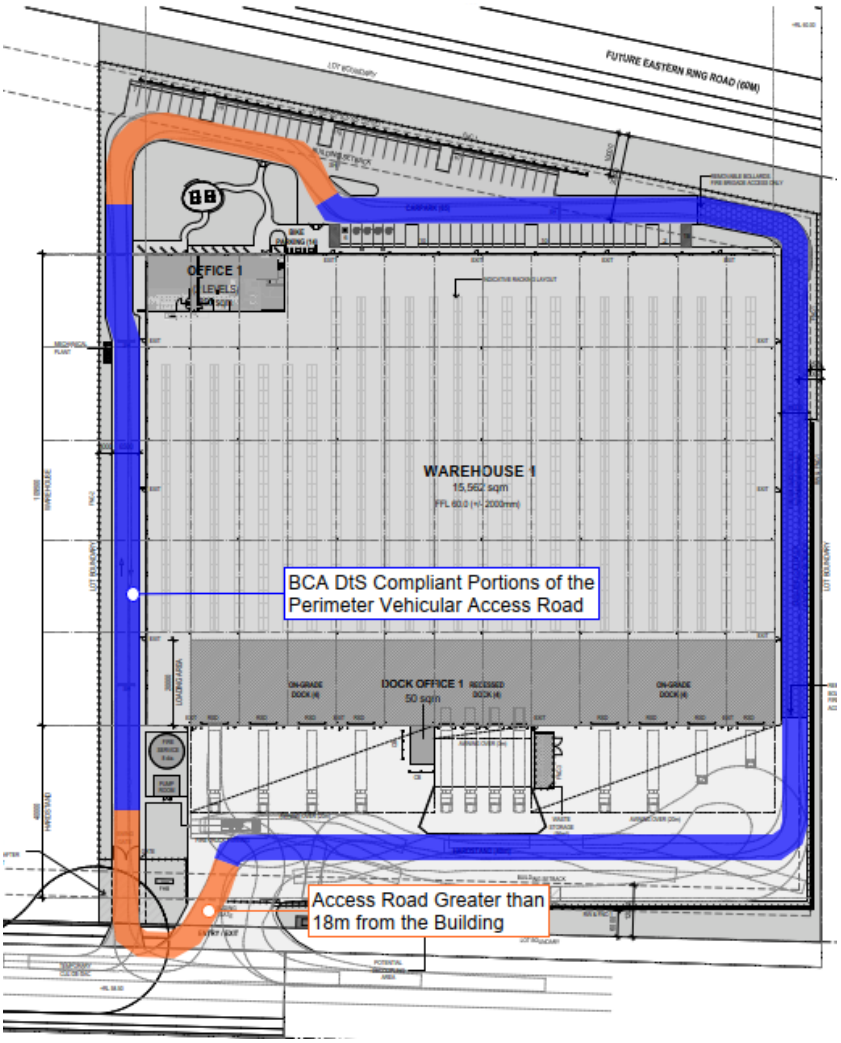


Figure 7-2: Lot 1 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

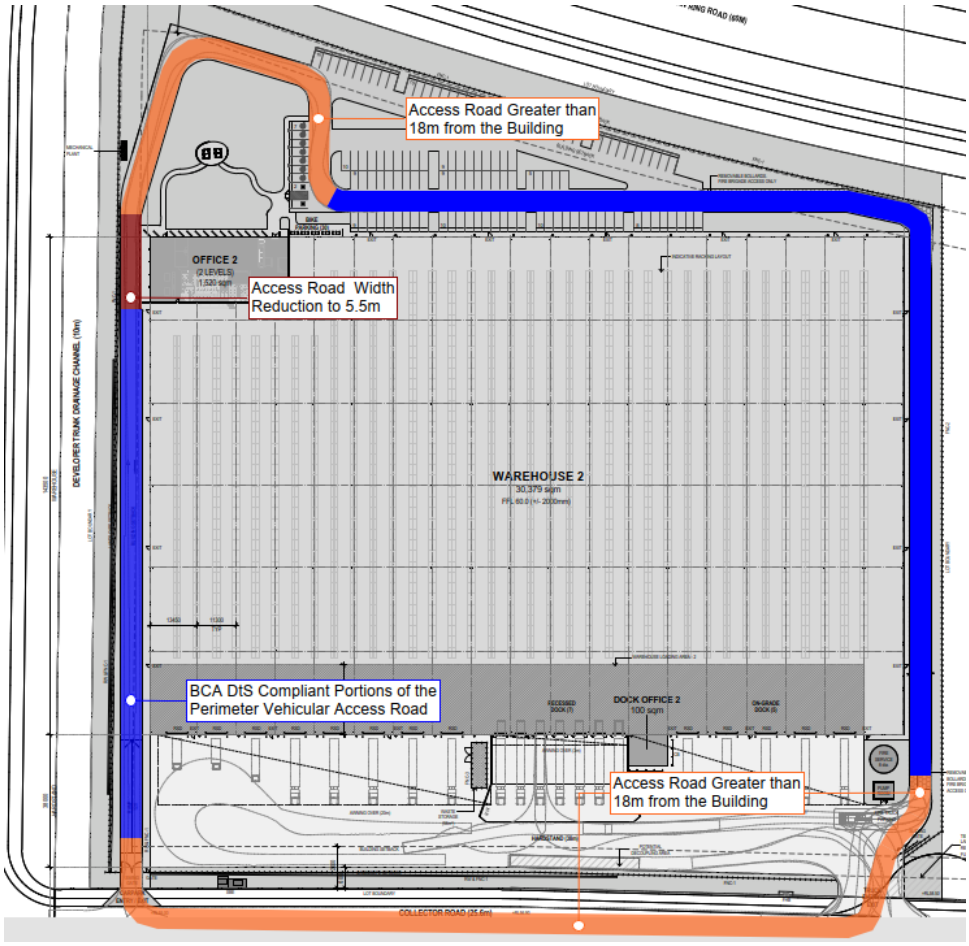


Figure 7-3: Lot 2 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

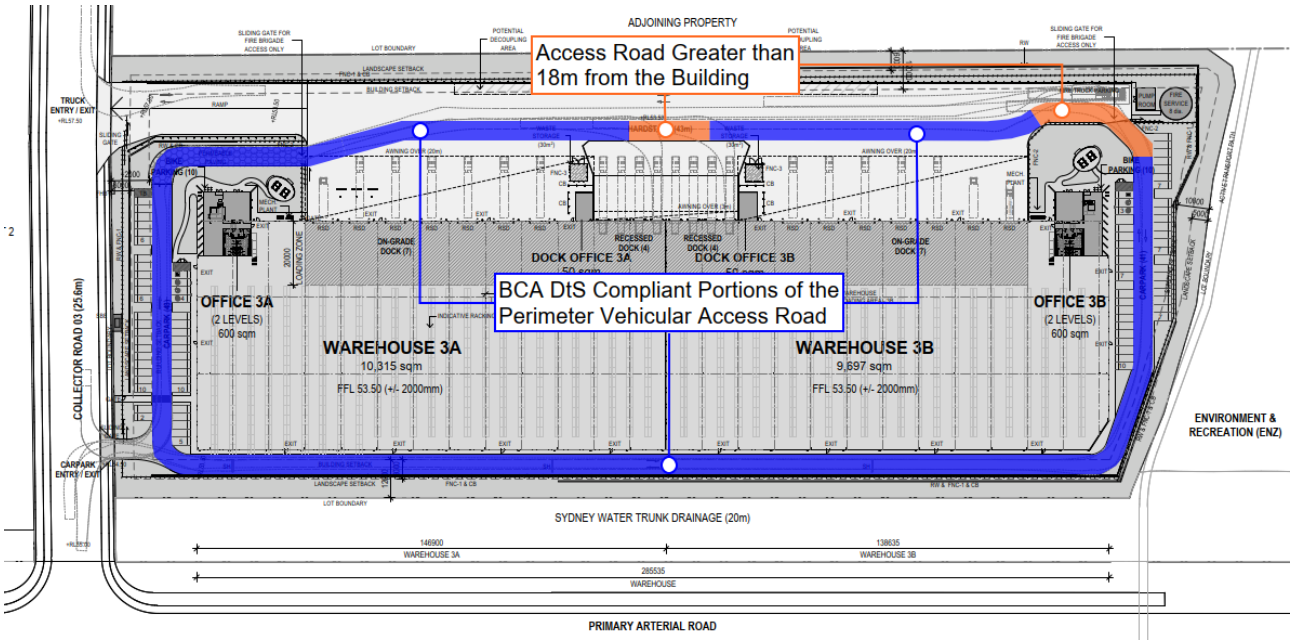


Figure 7-4: Lot 3A and 3B - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

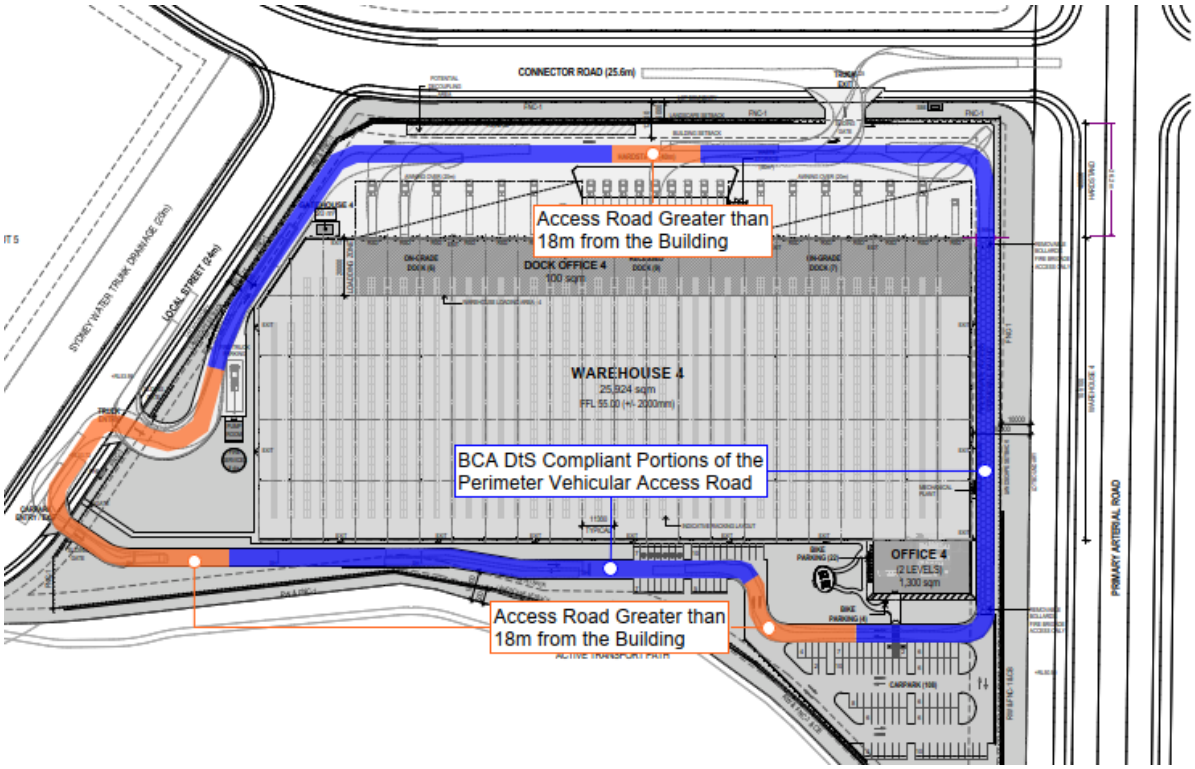


Figure 7-5: Lot 4 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

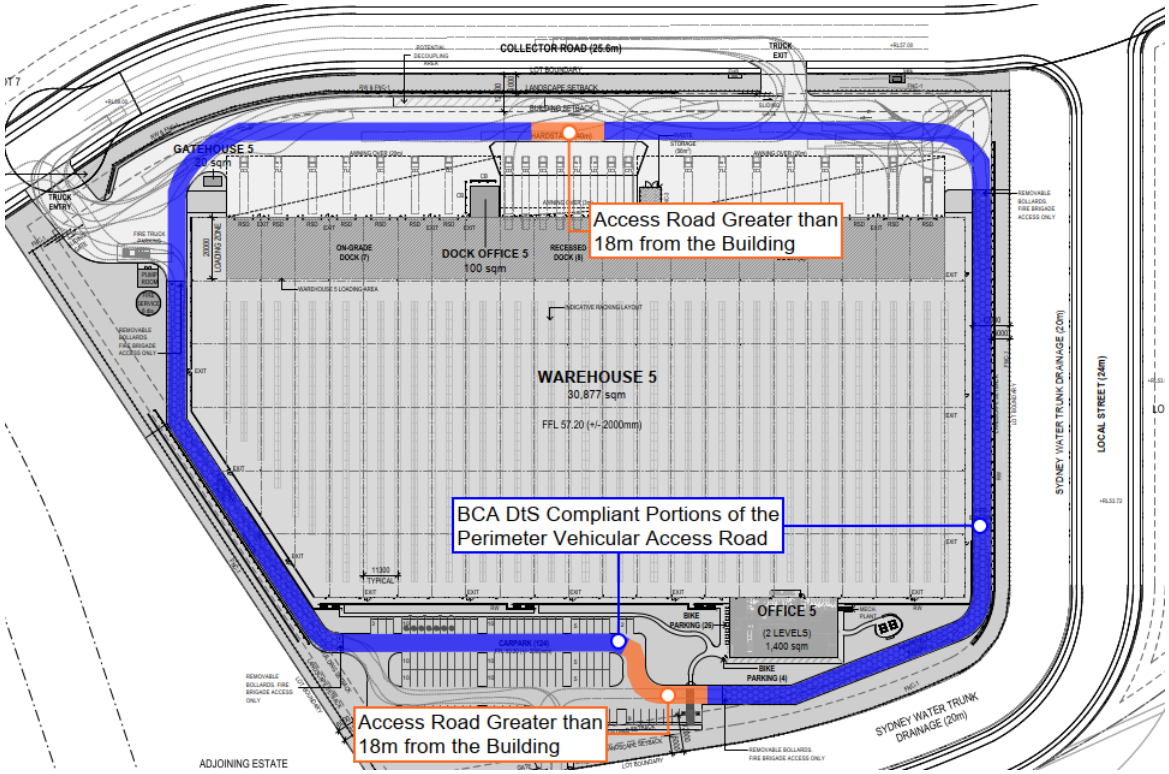


Figure 7-6: Lot 5 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

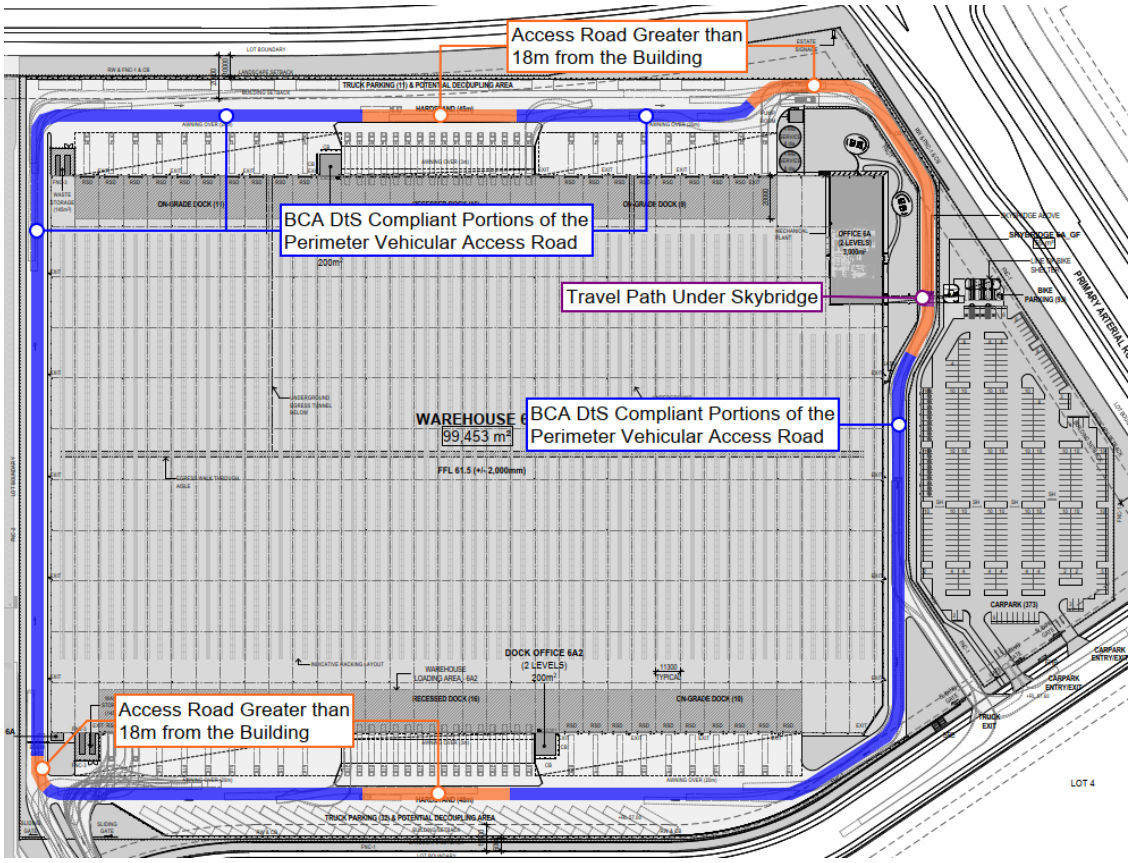


Figure 7-7: Lot 6A - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

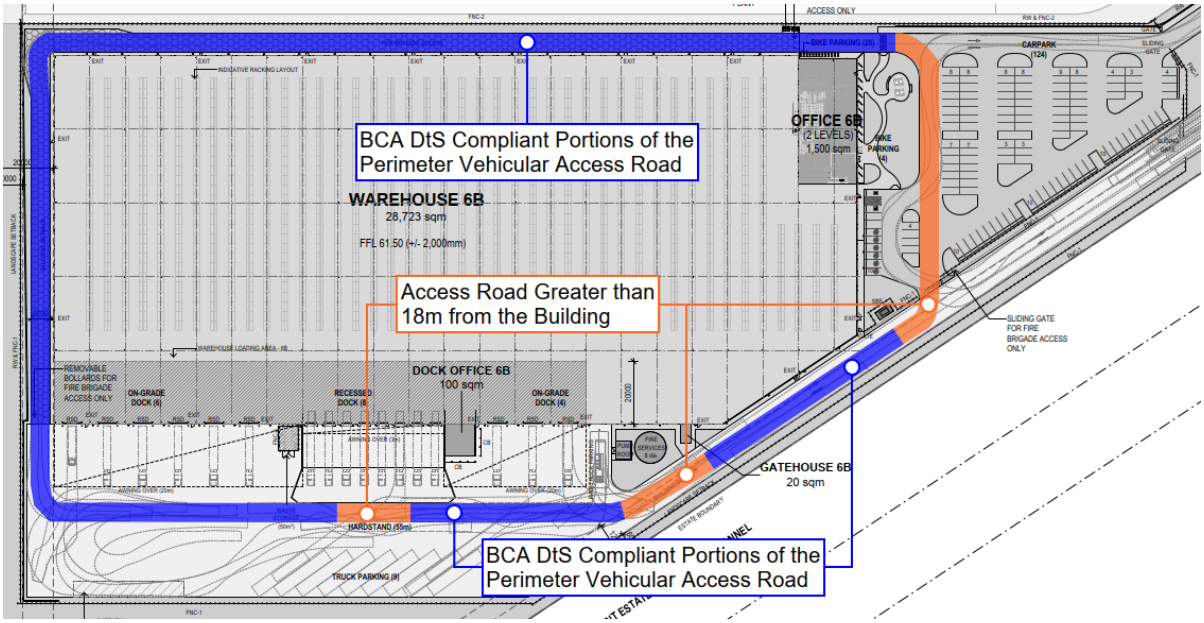


Figure 7-8: Lot 6B - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

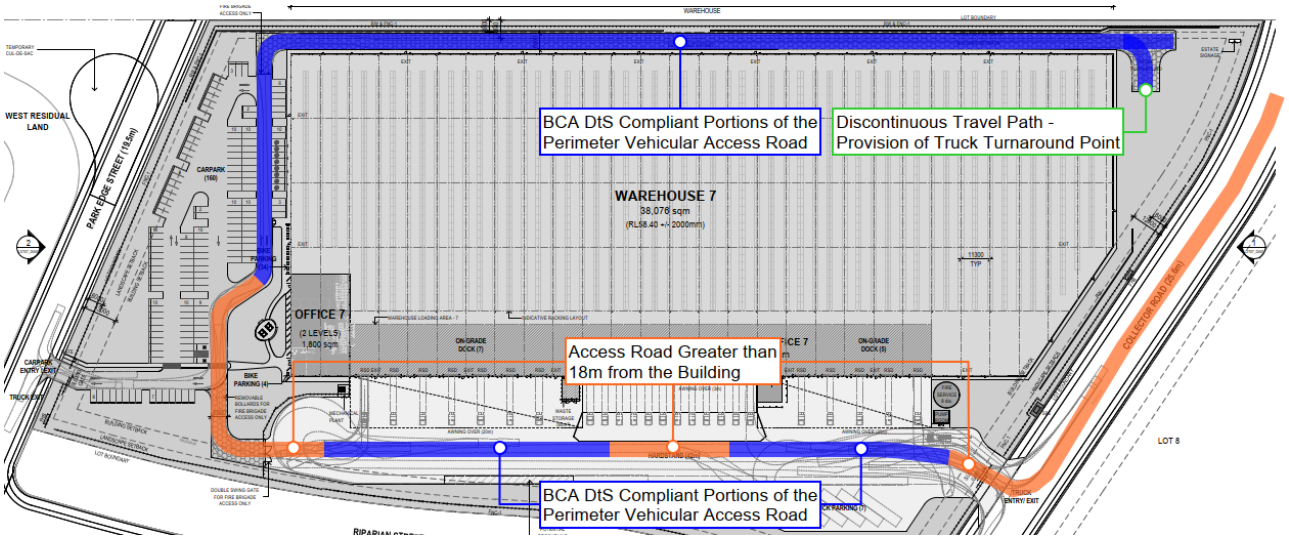


Figure 7-9: Lot 7 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

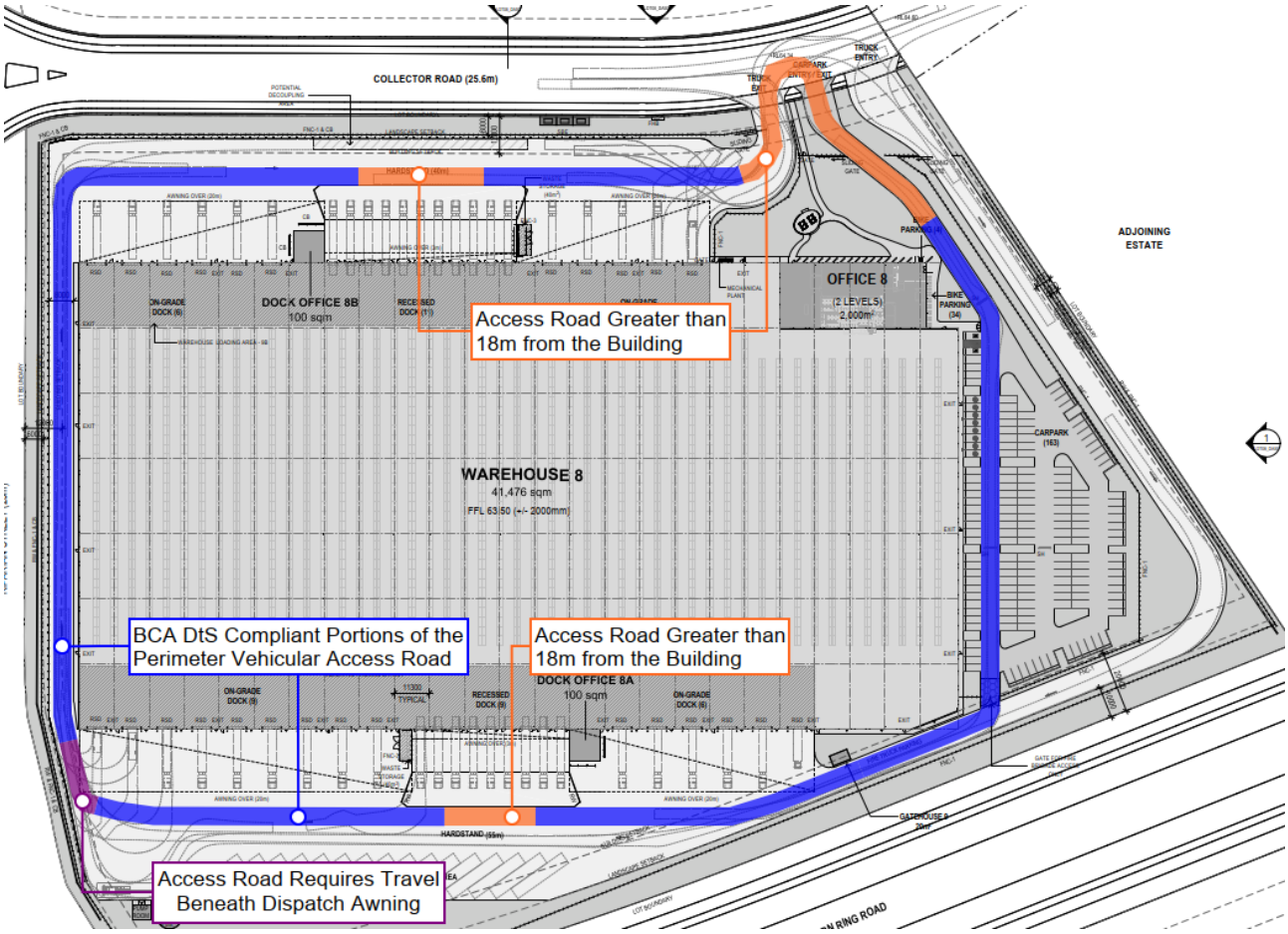


Figure 7-10: Lot 8 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

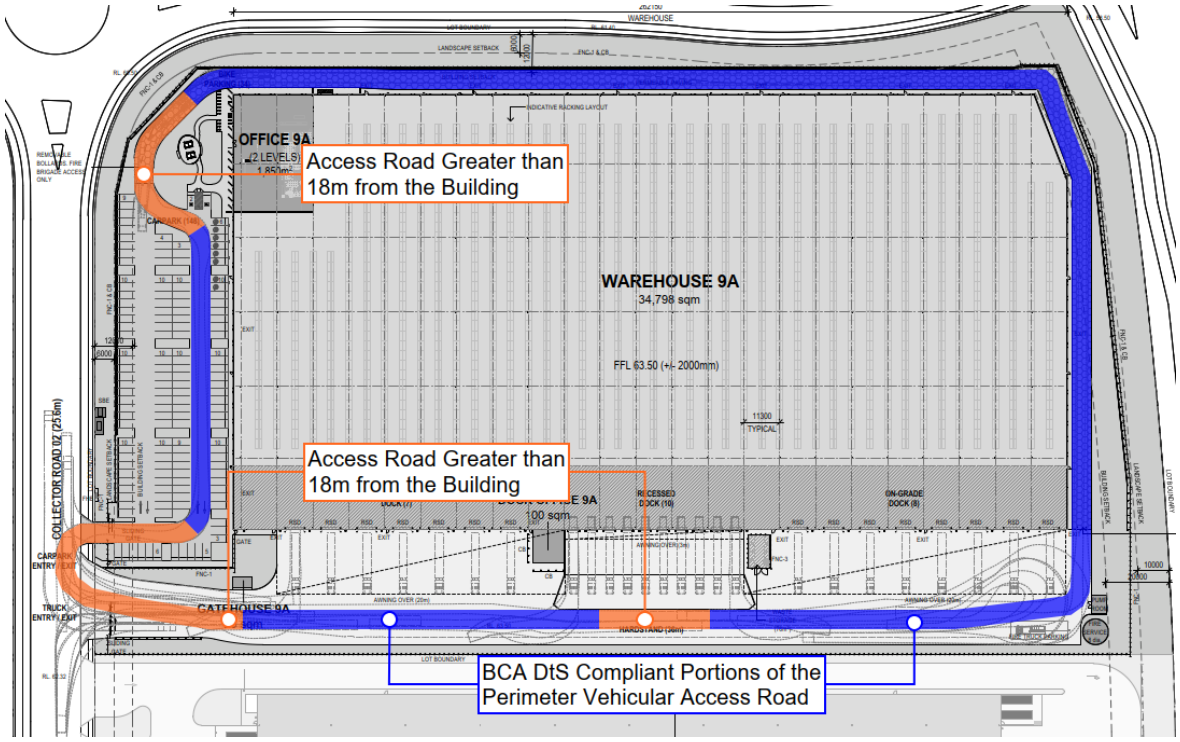


Figure 7-11: Lot 9A - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

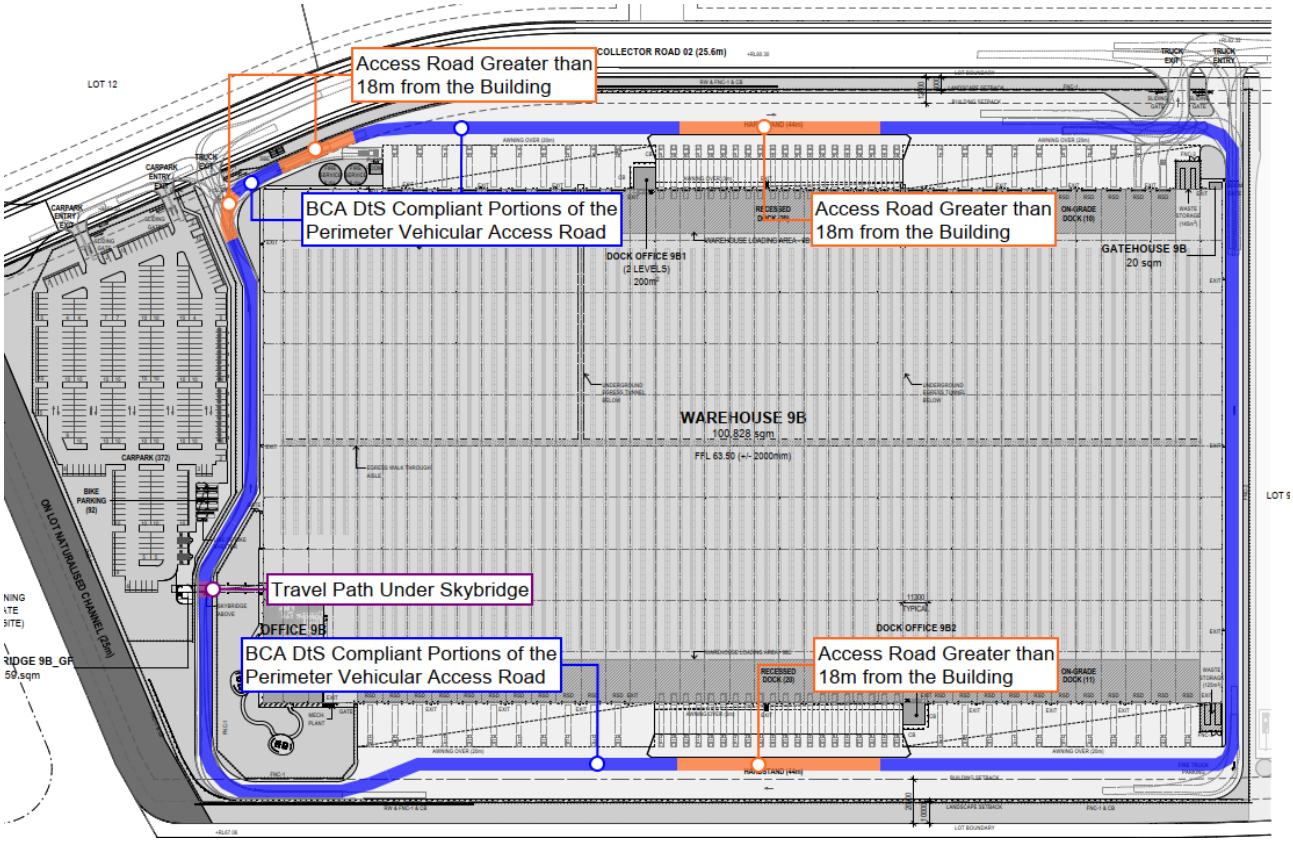


Figure 7-12: Lot 9B - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

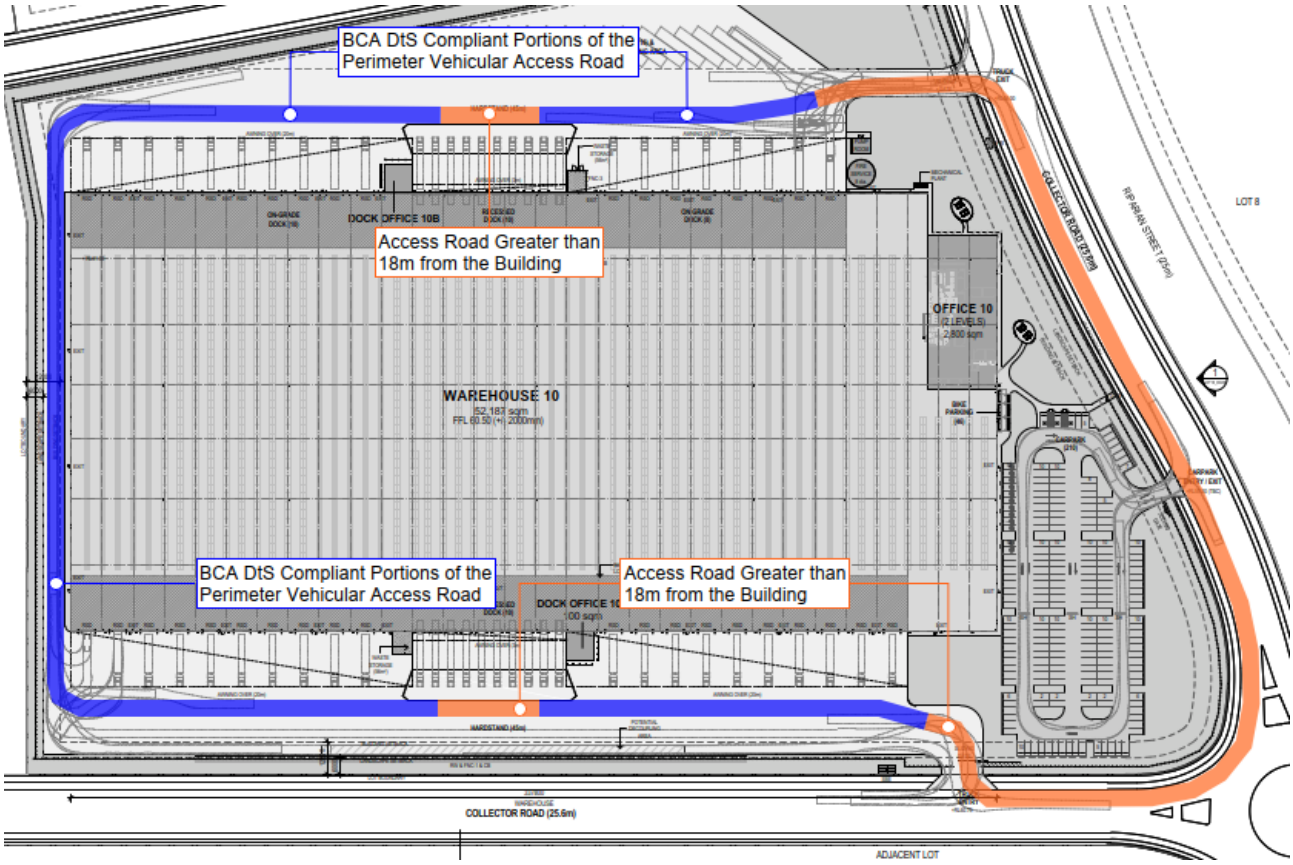


Figure 7-13: Lot 10 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

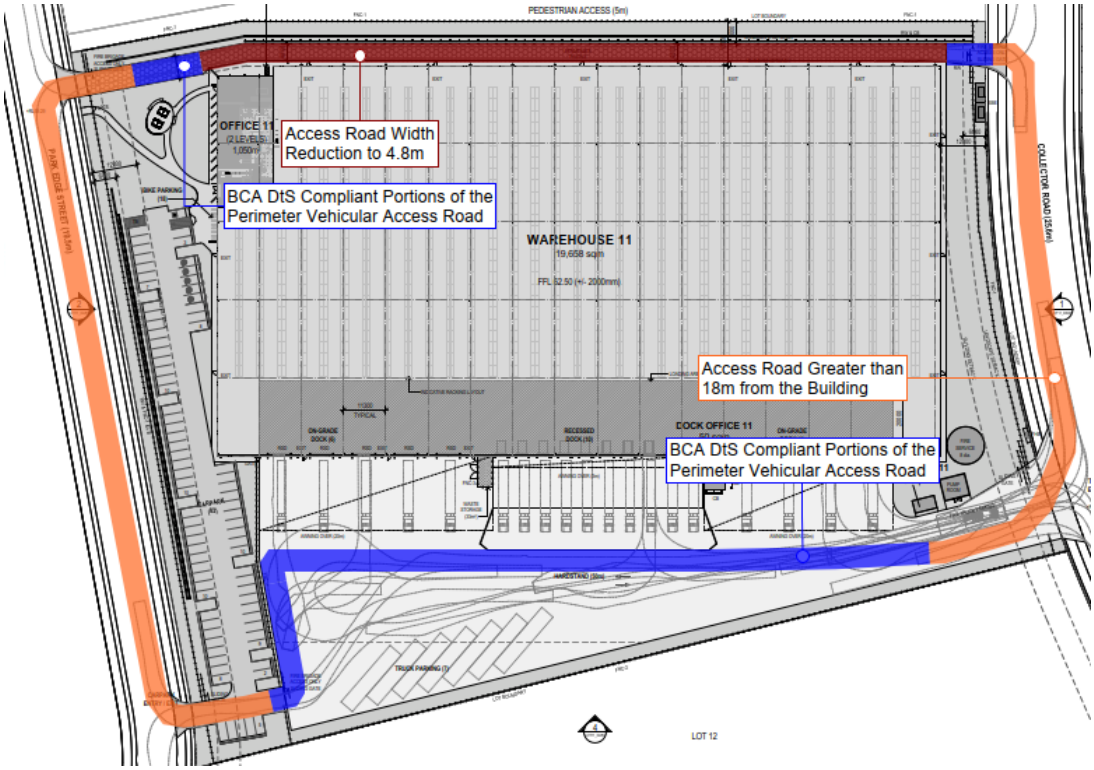


Figure 7-14: Lot 11 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

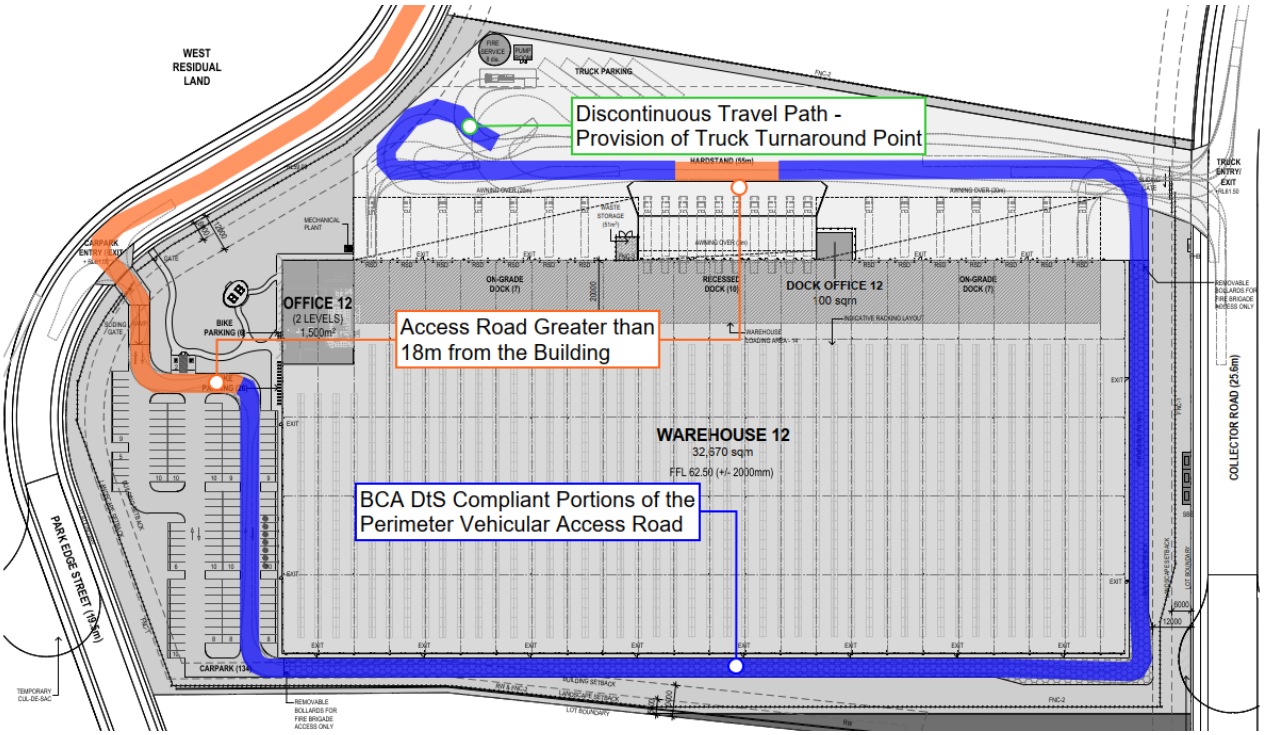


Figure 7-15: Lot 12 - Vehicular Perimeter Access Provisions – Areas of Non-Compliance Highlighted

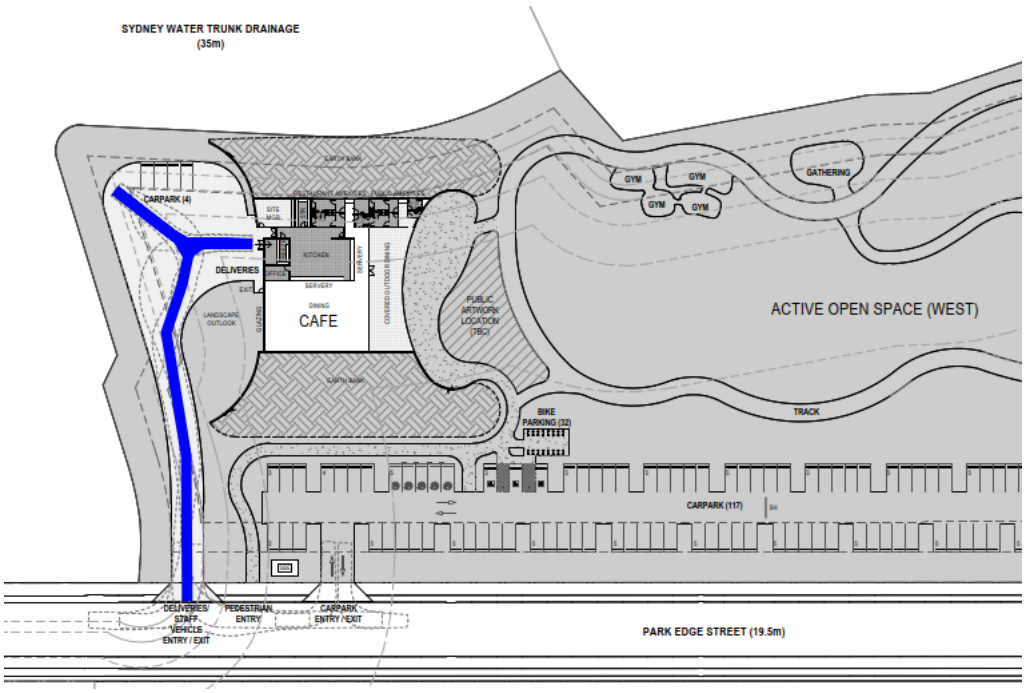


Figure 7-16: Lot 13 – Emergency Vehicular Access (noting perimeter vehicular access is not required for this building)