

Fire Safety Engineering Design Review for DA Submission



Data Centre Development, Lane Cove West

Date: **28 August 2019**
Document ref: **221518**
Issue No: **V6.0**
Author: **Ho-Yong Tiong/Parkan Behayeddin**

Sydney
Melbourne
Hong Kong
Muscat

creating intelligent fire
safety solutions

1. General

Scientific Fire Services has undertaken a preliminary review and assessment for the architectural drawings and concepts proposed for the Data Centre Development at 1 Sirius Road, Lane Cove West, NSW. The following provides a summary of the fire safety risk engineering aspects and 'in-principle' support for the proposed design.

2. The Project

The subject development site is located at 1 Sirius Road, Lane Cove West NSW, whereby it is proposed to construct a new data centre facility. The subject site is bounded by principle entrance at 1 Sirius Road, where access to site is provided through the vehicular driveway connecting Sirius Road to subject site. The 3d perspective of the site and satellite view the proposed development is shown in Figure 2.1 and Figure 2.2 respectively.

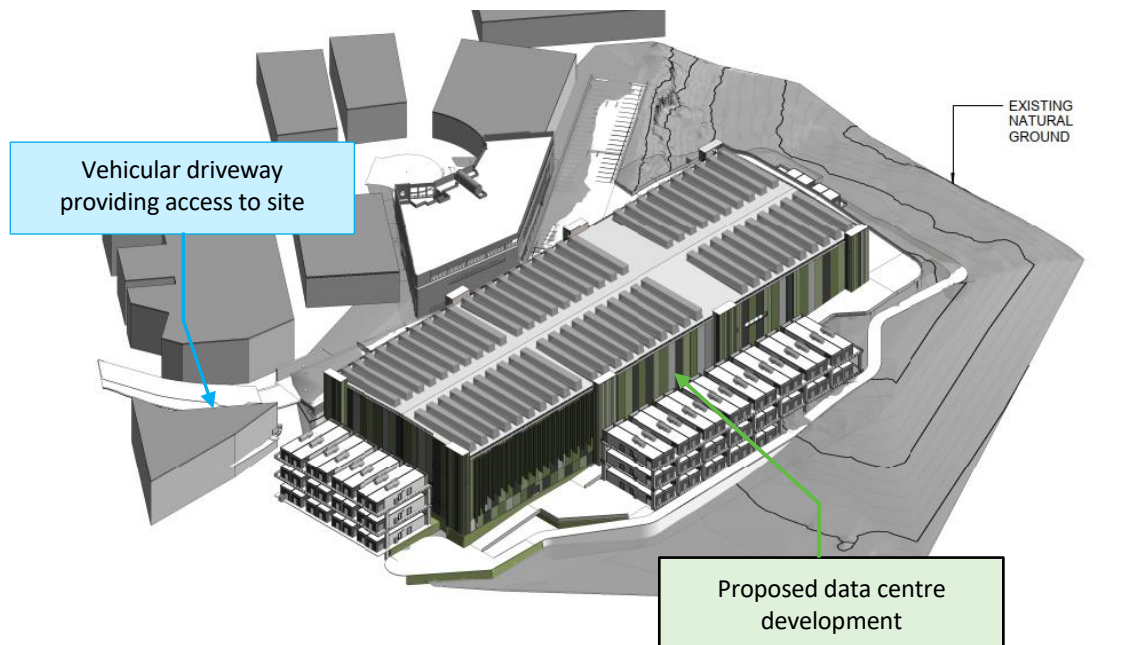


Figure 2.1 3D artistic view

ABN 54 107 159 384

Sydney Suite 2, Level 8, 16 O'Connell Street, Sydney NSW 2000 • T (+612) 9221 3658 • Melbourne Level 2, 46-48 Boundary Street, South Melbourne VIC 3205 • T (+613) 9686 4730

Hong Kong Block M, 4th Floor, Century Industrial Centre, 33-35 Au Pui Wan Street, Fotan Shatin Hong Kong • T (+852) 6533 7270 • F (+852) 2687 4509

Muscat House 2708, Way 3034 Shatii al-Qurm • PO Box 2386 PC 112 Ruwi Sultanate of Oman • T (+968) 24 603177 • F (+968) 24 603177

• E scifire@scifire.com.au • www.scifire.com.au



Figure 2.2 Indicative Site Location (source: <https://www.google.com.au/maps>)

The subject building shall comprise of a fire (5) storey construction with the main occupancy being Class 5 (Office) and Class 7b (Data hall). The main data hall facilities are located at L2-L5. All data hall compartments are provided with a thoroughfare link corridor that provides circulation between the data halls. Each data halls are provided with four (4) exits that are well distributed over the both ends of the data halls. There are office space located at L4 and L5 of the building. Egress provision for the office building are located at the southern and eastern ends of the building. L1 of the subject building consists of plant and store rooms with egress through fire isolated stairs evenly distributed throughout the floor plate. The general lay-out for each levels of the building is shown in Figure 2.3 to Figure 2.8.

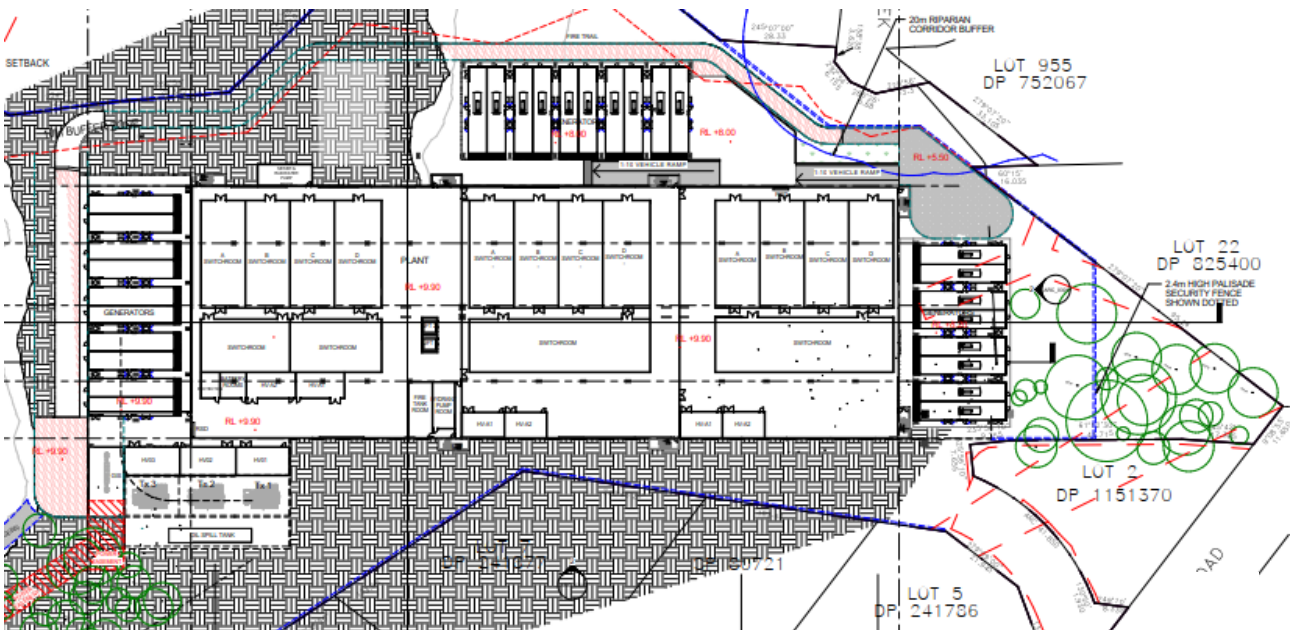


Figure 2.3: L1 Basement Floor Plan

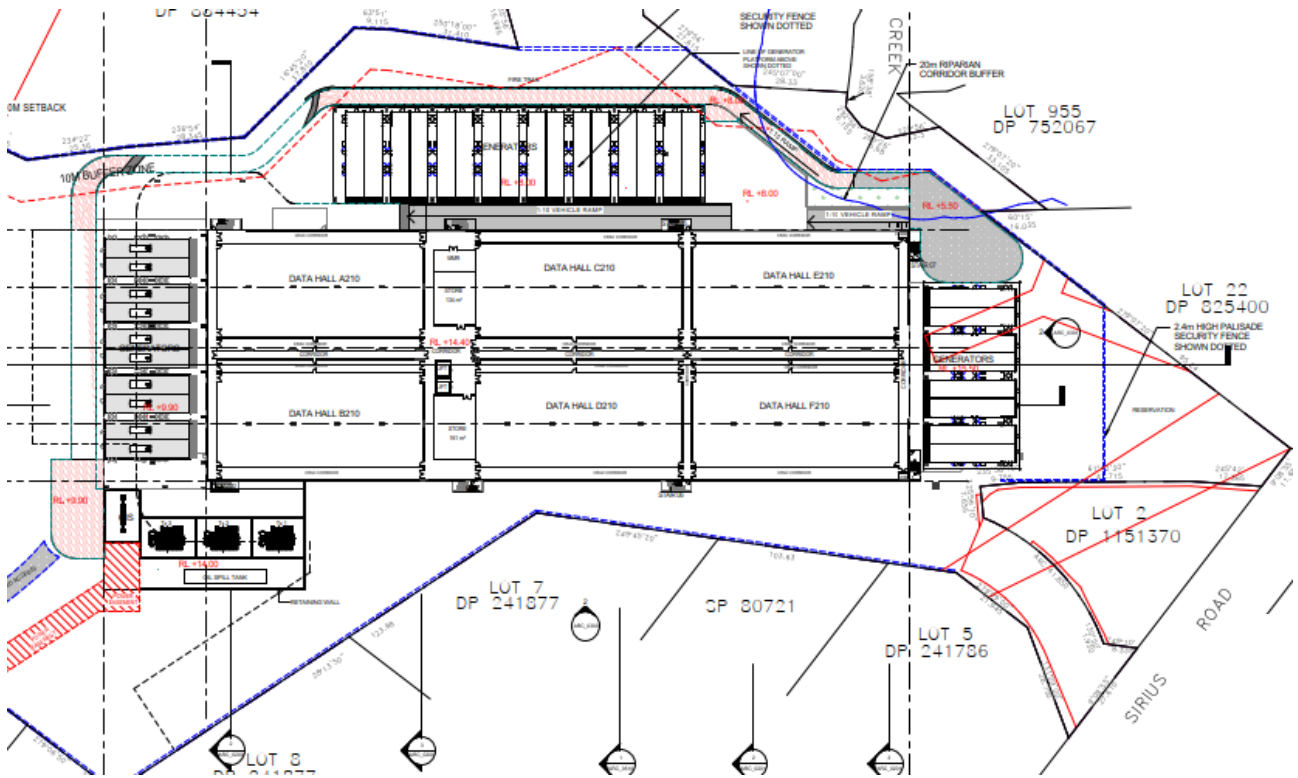


Figure 2.4: L2 Floor Plan

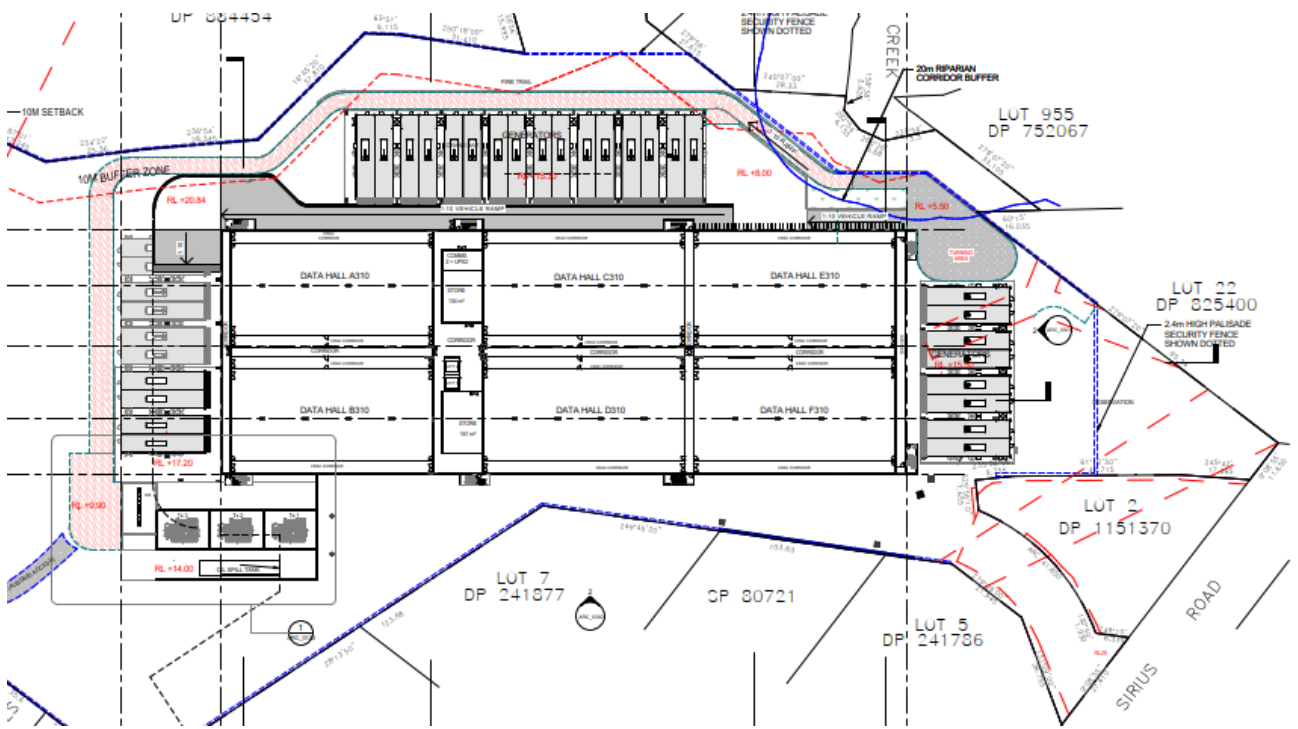


Figure 2.5: L3 Floor Plan

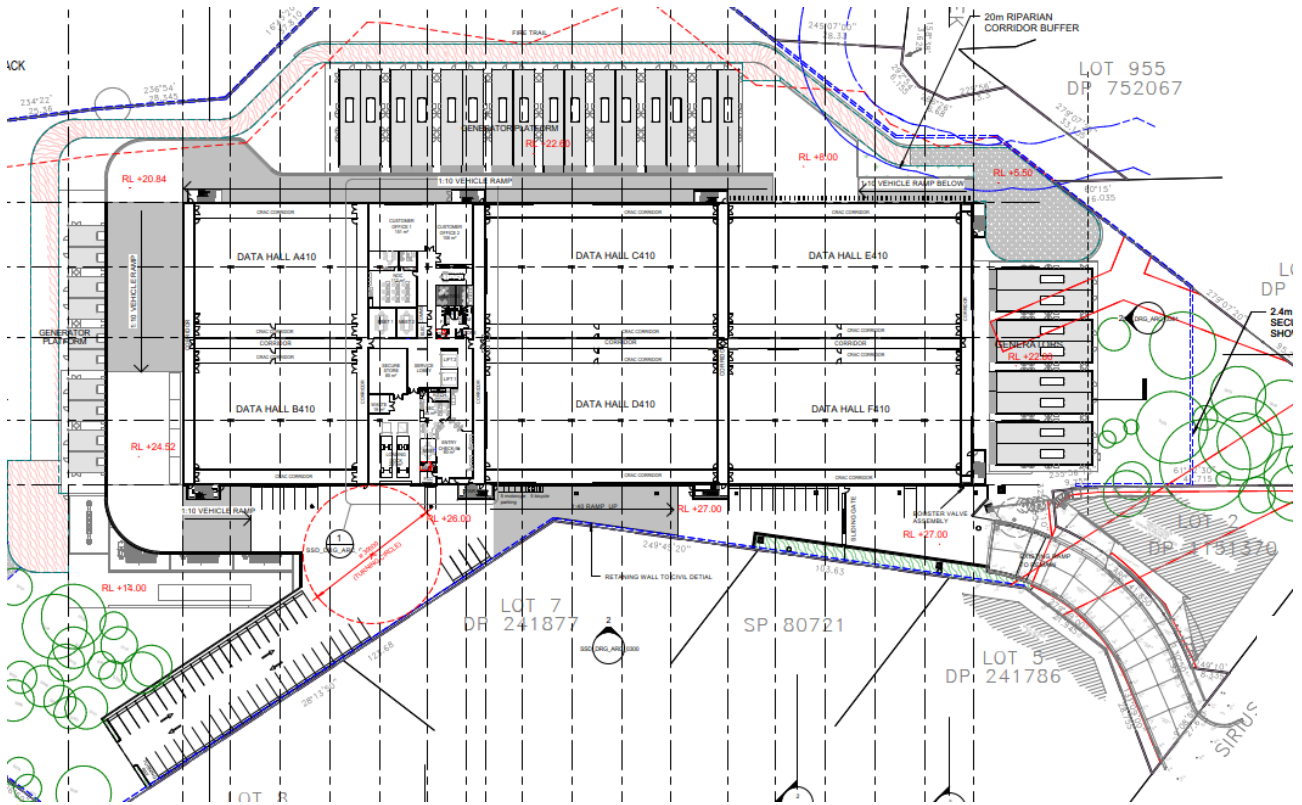


Figure 2.6: L4 Floor Plan

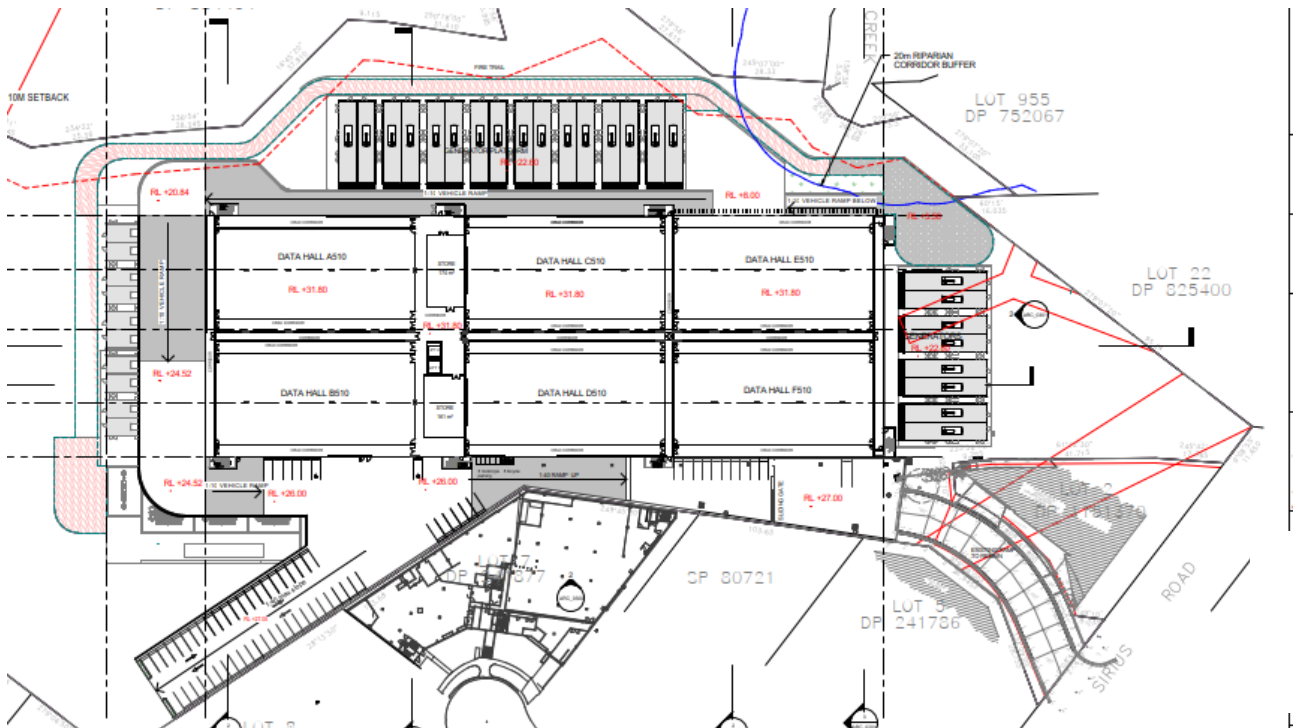


Figure 2.7: L5 Floor Plan

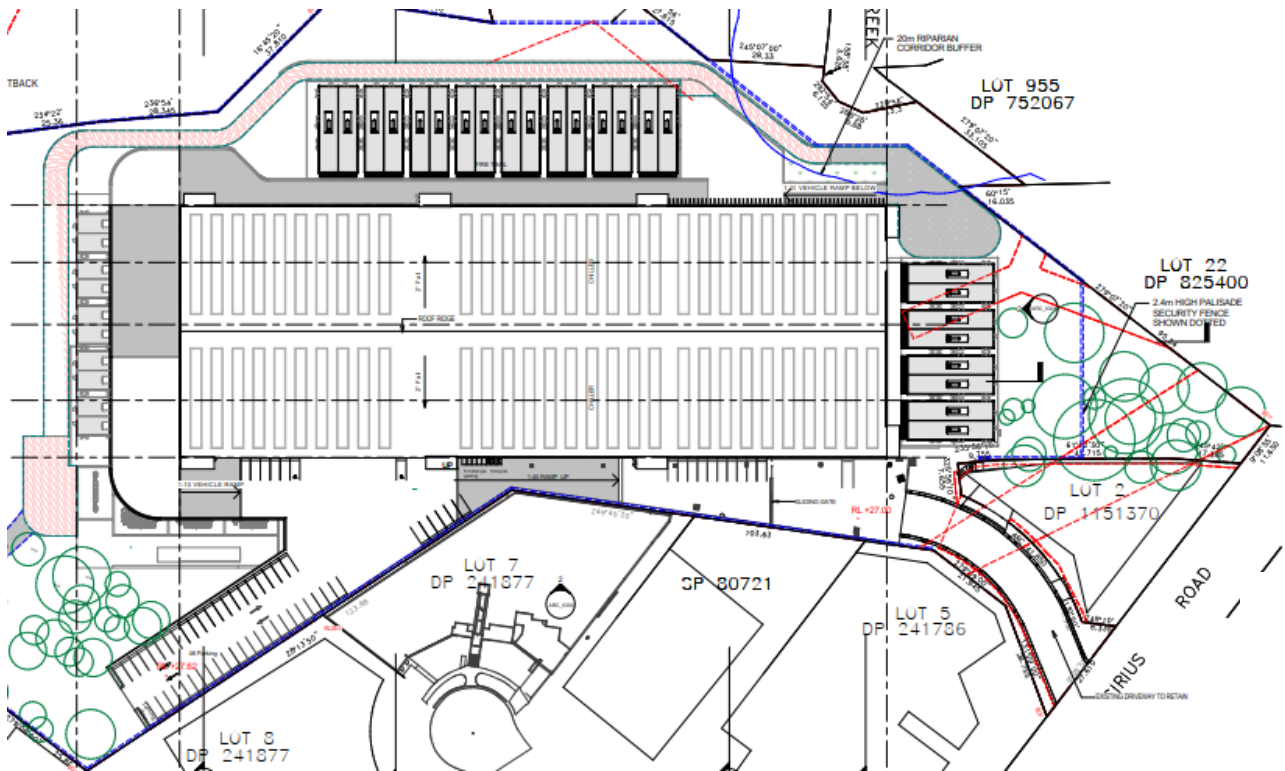


Figure 2.8: Roof Plant Layout

Outlined below is a summary of the overall building detail

Building Classification(s):	Class 7b (Data Halls), Class 7b(storage) and Class 5 (Office)
Number of Storeys Contained:	Five (5)
Rise in Storeys:	Five (5)
Effective Height:	<25m
Required Type of Construction:	Type A Construction

3. Purpose

This preliminary fire safety engineering review has been undertaken to determine ‘in-principle’ whether the design will achieve compliance with the relevant *Performance Requirements* from Volume One of the Building Code of Australia (BCA) (ABCB, 2019). The design review relates to the fire-resisting construction, egress provisions and fire protection services proposed for the entire development.

The preliminary design issues which are likely to be identified to the subject building (refer to Appendix A) will be formally assessed through the application of the fire safety risk engineering process in accordance with the International Fire Engineering Guidelines (IFEG) (ABCB, 2005). It is the expectation that a suitable performance design solution will be developed and supported through robust fire engineering methodologies of the current design proposal.

In the context of fire resistance and construction, the proposed fire safety strategy is to rationalise Fire Resistance Levels (FRL) to building elements to achieve a minimum FRL of 120 minutes to switch rooms, MMR rooms, comms rooms, store rooms and data hall. The overall strategy of the Rationalized FRL shall be adopted in conjunction with the input from the Dangerous Goods Consultant.

In the context of occupant egress, the proposed design is to permit extended exit travel distance in various areas of the building based on the function and nature of the space, and fire safety measures provided to assist with occupant egress. It is also proposed to review rationalized egress width provisions within the data hall aisle corridors, which will be substantiated based on a statistical review of the space taken up by occupants during evacuation and the intermittently occupied nature of the space. Further, it is proposed to permit the doors in the data halls to swing against the direction of egress .

In the context of fire services and equipment, it is proposed to not provide fire hose reel coverage to the data halls yet substituted with the provision of suitable portable fire extinguishers in order to facilitate first aid firefighting. Additionally, it is proposed to achieve full fire hydrant coverage to the data hall using two hose lengths (2) of fire hydrant hose from internal hydrants located at the corridor link. Further, it is proposed to permit the location of fire hydrant booster assembly, fire hydrant pump room and sprinkler valve room that is not strictly located at a location that complies with the BCA Dts provisions.

3.1 Fire Resistance

3.1.1 Method and Type of Construction – Fire Resistance Levels (FRL)

It is proposed to review the method and type of construction of the new building elements throughout the building. More specifically, various building elements shall be reviewed and appropriately rationalised to the degree necessary which will also meet the relevant *Performance Requirements* from Volume One of the BCA. The *Performance Solution* shall consider the rationalisation of Fire Resistance Level (FRL) to 120 minutes for the switch rooms, MMR rooms, comms rooms, store rooms and data halls. This shall be demonstrated through the comparison of the anticipated fire-fighter intervention time and occupant evacuation time against the proposed minimum FRL of 120 minutes. Furthermore, burn-out calculations through recognized time-equivalent calculation methods shall be undertaken to demonstrate that the burn-out time anticipated in the fire compartments of the subject site is within the proposed FRL of 120 minutes. The overall strategy of the Rationalized FRL shall be adopted in conjunction with the input from the Dangerous Goods Consultant.

Preliminary assessment undertaken by Scientific Fire Services indicates that the proposed FRL's can achieve an adequate means of protection and furthermore, limit/mitigate the impact of a potential fire while maintaining structural adequacy and achieve a level of life safety for occupant & fire-fighter such that the relevant *Performance Requirements* can be satisfied, namely CP1 & CP2.

3.2 Occupant Egress

3.2.1 Egress Provisions and Construction of Exits

It has been identified that the exit travel distance to a point of choice, exit travel distance to the nearest exit and travel distance between alternative exits shall exceed the BCA Dts prescribed distances in the data hall, basement (L1) plant level, office and Roof plant areas. The *Performance Solution* to address the egress related design issues in the data hall shall be based on the consideration of the straight-forward way finding of the data hall configuration to result in favourable evacuation time and the intermittently occupied nature of the data hall building with relatively low risk of fire. The availability of horizontal exits that results in building occupants in data hall being able to reach a place of relative safety prior to reaching the building's final exit point shall also be considered.

The *Performance Solution* to address the extended travel distance in the roof plan shall be evaluated by considering the area function and use, external nature of the open roof plant, the provision of fire safety measures to assist with early fire notification of occupants and the impact of the extended travel distance on occupant evacuation and fire brigade intervention to demonstrate that occupants in this area can evacuate in line with the Performance Requirements of the BCA.

The *Performance Solution* to address the extended travel distance in the basement (L1) plant level shall be evaluated by considering the intermittently occupied nature of the space to demonstrate the generally low risk nature of the L1 plant area. The evaluation shall also consider the fire compartmentation and signage in place to separate plant equipment and fuel storage (i.e. areas containing fuel load) resulting in the majority of the travel path to be located within the circulation/thoroughfare space that will generally be maintained as a sterile and benign environment. Further, the evaluation shall compare the travel distance between the BCA Dts prescribed solution and the proposed solution where the travel path in circulation/thoroughfare space can be considered as a place of relative safety to demonstrate that the travel distance to a place of safety in the propose design is in line with the BCA Dts prescribed travel distance.

The *Performance Solution* to address the extended travel distance in office area shall be addressed by enhanced smoke detection provision in the office area. The evaluation shall demonstrate that the earlier detection time as a result of the proposed detection shall result in an evacuation time that is comparable to the BCA Dts provisions.

The *Performance Solution* to address the extended travel distance in the crac corridor shall be evaluated by considering the area function and use, the provision of fire safety measures to assist with the notification of occupants, clear line of sights and impact of the extended travel distance on occupant evacuation and fire brigade intervention to demonstrate that occupants in this area can evacuate in line with the Performance Requirements of the BCA.

In addition to the extended travel distance identified, it is proposed to rationalize the unobstructed egress width within the hot aisle corridor to be no less than 850mm in lieu of 1m. The *Performance Solution* to address the rationalized egress width shall take into consideration the high level of familiarity of the building staff utilizing the data hall whom are

aware of the overall egress provisions throughout the building. Research information on typical space occupied by moving occupants shall demonstrate that the proposed rationalized egress width shall facilitate egress from this area of the building in a manner that is comparable to the BCA DTS provision.

Further, it is proposed to permit the door in the data hall compartments to swing against the direction of egress for the purpose of the data hall operations. The *Performance Solution* to address the proposed door swing direction shall be evaluated by considering the function and usage of the area with potential impact of a fire on the emergency evacuation performance with respect to the direction of door swing.

Preliminary assessment undertaken by Scientific Fire Services indicates that the proposed egress provisions throughout the development can satisfy the relevant *Performance Requirements*, namely DP4, DP6 & EP2.2.

3.3 Fire Services & Equipment

3.3.1 Fire Hose Reel System

Fire hose reel system shall be provided within the office portions of the development however will be omitted from within the data halls and its associated link corridor to minimize the risk of water damage. Further fire hose reels will be omitted from the store room less than 150m² (excluding store rooms with Dangerous Goods Storage), Substation and Plant rooms.

Portable fire extinguishers suitable for data hall environment shall be provided where the provision of a fire hose reel system is not available. The portable fire extinguishers shall be suitably selected and mounted in accordance with the relevant codes and standards. Consideration shall be given to suitability of portable fire extinguishers in data hall environment where the risk of electrocution would be minimized when compared to a water based first-aid fire-fighting measure (i.e. fire hose reel system).

Preliminary assessment undertaken by Scientific Fire Services indicates that the proposed fire hose reel design can satisfy the *Performance Requirements*, namely EP1.1.

3.3.2 Fire Fighting Provision

The subject building shall be provided with a fire hydrant system in accordance with the relevant codes and standards and to the satisfaction of the relevant fire authority. Furthermore, the fire hydrant design shall be further assessed via a *Performance Solution* to demonstrate that the proposed design meets the relevant *Performance Requirements* from Volume One of the BCA. Consistent with the typical approaches undertaken in similar data centre developments and to minimize potential water damage to the data hall, it is proposed to locate the internal fire hydrant outlet in the main link corridor and achieve the required coverage to the data hall by utilising two (2) lengths of 30m canvas fire hose for the purpose of achieving fire hydrant coverage. Consideration shall be given to the sterile nature of the link corridor where accessing the fire hydrant outlet from this area would not introduce additional risk to fire-fighting personnel. Signage shall be provided adjacent to the fire hydrant outlet(s) to notify fire-fighter personnel on the required two (2) fire hose lengths to achieve full coverage.

Additionally, the fire hydrant booster assembly has been nominated to be at the landing area of the driveway providing access to the subject site from Sirius Road whilst the main/principle site entrance is considered to be at the intersection between Sirius Road to the vehicular access ramp. This results in a technical non-compliance to AS2419.1 2005 as the fire hydrant booster assembly location is technically not considered to be located at the main entrance of the building. The proposed fire hydrant booster assembly location shall be evaluated by considering the potential risk associated with the proposed assembly location and proposed fire safety measures that shall assist attending Fire Brigade personnel in locating the booster assembly. The proposed fire hydrant booster assembly location shall be referred to FRNSW for approval.

Further, it is also proposed to locate the fire hydrant pump and sprinkler alarm valve room, which is located at the basement (L1) level and is not strictly accessible from a road/open space as prescribed by the BCA DTS provision. The proposed location of the fire hydrant pump and sprinkler valve room shall be evaluated by considering the location of the fire hydrant pump and sprinkler alarm valve room with respect to attending Fire Brigade personnel and their ability to undertake intervention activities, the signage/block plan provided to assist Fire Brigade personnel to locate these rooms and the availability of remote operating device provided for the fire hydrant pump room. The propose design shall be referred to FRNSW for approval.

Preliminary assessment undertaken by Scientific Fire Services indicates that the proposed fire hydrant design can satisfy the *Performance Requirements*, namely EP1.3 and EP1.4.

3.3.3 Smoke Detection and Alarm System

As required by the prescriptive provisions from Volume One of the BCA, the subject site shall be provided with an automatic detection and alarm system. The office portion of the building shall be provided with conventional point type smoke detection and alarm system in accordance with the BCA DTS provisions. In data hall environment where high air-

flows are anticipated, an aspirating smoke detection system designed and installed in accordance with the relevant codes and standard is to be provided. The provision of smoke detection and alarm system to the subject site shall assist to facilitate early fire detection and building occupant notification and shall be considered as part of the overall fire strategy. Preliminary assessment undertaken by Scientific Fire Services indicates that the proposed fire detection and warning design suitable for the specific environment can satisfy the *Performance Requirements*, namely EP2.2.

3.3.4 Client Objective Measures

With respect to the subject data centre development where business operation and continuity is a key consideration and consistent with common approach undertaken on data centre development, fire suppression measures suitable for data hall environments shall be provided in the data hall to minimize the potential risk of fire development and spread from the compartment of fire origin to the adjacent fire compartment. The proposed suppression measures shall be designed and installed in accordance with the relevant codes and standards.

4. Statement of Endorsement

The fire and life safety related design issues will be addressed through the performance based path of compliance. Scientific Fire Services can confirm that the proposed design will achieve fire safety design compliance to the Performance Requirements of CP1, CP2, DP4, DP6, EP1.1, EP1.3, EP1.4 and EP2.2 from Volume One of the Building Code of Australia (BCA) (ABCB, 2019).

The formulation of the Fire Engineering Brief (FEB) represents the next step in the approvals process. Scientific Fire Services shall commence the process of developing this document and will provide a formal comprehensive FEB submission. A Fire Engineering Brief Questionnaire (FEBQ) document shall be prepared as required in accordance with the Fire and Rescue NSW proforma and formally submitted as part of the referrals process where mandated by the legislative provisions.

Finally, and in order to ensure that the client can obtain a Construction Certificate for the proposed building works, Scientific Fire Services will prepare a Fire Safety Engineering Report (FSER) incorporating stakeholder conditions, comments and advice to the satisfaction of the Principle Certifying Authority (PCA).

On the basis of the review of the proposed preliminary list design issues identified herein, Scientific Fire Services can confirm that the documentation in relation to the subject development will achieve fire safety design compliance to the relevant Performance Requirements of the National Construction Code Series – Volume 1, Building Code of Australia (BCA).

I trust the above is satisfactory for your current purposes. Should you have any queries, please do not hesitate to contact me on (+61) 427 392938 or email to parkan.behayeddin@scifire.com.au



Parkan Behayeddin
Director
Scientific Fire Services

BPB 0756 - C10 - Accredited Certifier – Fire Safety Engineering Compliance

Appendix A. Preliminary List of Design Issues

Issue No	Performance Solution Design Issues Addressed	BCA DtS Provision	Performance Requirement(s)
1.	<p>It is proposed to permit rationalized Fire Resistance Level (FRL) to the switch rooms, MMR rooms, store rooms and data halls.</p> <p>Note: This excludes the diesel tank storage room that is required to be provided with a minimum FRL of 240 minutes as required by the Dangerous Goods assessment report. The overall strategy of the Rationalized FRL shall be adopted in conjunction with the input from the Dangerous Goods Consultant.</p>	<p>Clause C1.1 inter alia Specification C1.1</p> <p>Clause C2.7</p> <p>Clause C2.8</p> <p>Clause C2.9</p>	CP1 and CP2
2.	<p>It is proposed to permit exit travel distances on the open roof plant to exceed the maximum distance as prescribed by the deemed to satisfy provisions of the BCA. In this instance, it is proposed to permit travel distances as per the following:</p> <p><u>Open Roof Plant:</u></p> <ul style="list-style-type: none"> Travel distance to nearest exit is up to 55m in lieu of 40m; and Travel distance between alternative exit is up to 90m in lieu of 60m, measured to horizontal exit. 	Clause D1.4 & Clause D1.5	DP4 & EP2.2
3.	<p>It is proposed to permit exit travel distances within the L4 office building to exceed the maximum distance as prescribed by the deemed to satisfy provisions of the BCA. In this instance, it is proposed to permit travel distances as per the following:</p> <p><u>L4 Office Building:</u></p> <ul style="list-style-type: none"> Travel distance to point of choice of up to 25m in lieu of 20m; and Travel distance to nearest exit of up to 50m in lieu of 40m; and Travel distance between alternative exits of up to 65m in lieu of 60m. 	Clause D1.5	DP4 and EP2.2
4.	<p>It has been identified that the egress provision for the crac corridors of the development shall fully consists of horizontal exits.</p> <p>Further, it is proposed to review extended travel distances in the crac corridors</p> <p><u>Crac Corridors:</u></p> <ul style="list-style-type: none"> Travel distance between exit is up to 80m in lieu of 60m, measured to horizontal exit. 	Clause D1.5 & Clause D1.11	DP4 and EP2.2

Issue No	Performance Solution Design Issues Addressed	BCA DtS Provision	Performance Requirement(s)
5.	<p>It has been identified that the egress provision for the data halls of the development shall fully consist of horizontal exits.</p> <p>Further, it is proposed to review extended travel distances in the data halls as per the following:</p> <p><u>Data Halls</u></p> <ul style="list-style-type: none"> • Travel distance to nearest exit is up to 50m in lieu of 40m, measured to horizontal exit; and • Travel distance between alternative exit is up to 80m in lieu of 60m, measured to horizontal exit. 	Clause D1.4, Clause D1.5 & Clause D1.11	DP4 & EP2.2
6.	<p>It is proposed to permit exit travel distances with the L1 plant room to exceed the maximum distance as prescribed by the deemed to satisfy provisions of the BCA. In this instance, it is proposed to permit travel distances as per the following:</p> <ul style="list-style-type: none"> • Travel distance of 120m between alternative exits in lieu of 60m; and • Travel distance of 80m to nearest exit in lieu of 40m. 	Clause D1.4 & Clause D1.5	DP4 and EP2.2
7.	<p>It is proposed to permit the reduced unobstructed egress width in the hot aisle corridor in the data hall to be no less than 750mm in lieu of the required 1000mm.</p>	Clause D1.6(b)	DP6
8.	<p>For the purpose of data hall operations, it is proposed to permit the door in the data hall compartments to swing against the direction of egress.</p>	Clause D2.20	DP2
9.	<p>Consistent with the typical strategy adopted in data hall environment and in an effort to eliminate the potential risk of water damage, it is proposed to achieve full fire hydrant coverage to the data halls utilising two (2) lengths of 30m fire hose.</p>	Clause E1.3 inter alia AS2419.1:2005	EP1.3

Issue No	Performance Solution Design Issues Addressed	BCA DtS Provision	Performance Requirement(s)
10.	<p>It is proposed to omit fire hose reel provisions to the data halls and the link corridor between data halls.</p> <p><u>Plant room level (L1)</u></p> <ul style="list-style-type: none"> • Substation Rooms; and • Store room less than 150m²; and • Switch room and water tank rooms; and <p><u>Data Hall Levels (L2-L3)</u></p> <ul style="list-style-type: none"> • Data halls and horizontal corridor link between data halls; and • MMR rooms; and • Store room less than 150m²; and • Comms rooms. <p><u>Office levels (L4 lower -L4 upper)</u></p> <ul style="list-style-type: none"> • Store room less than 150m² 	Clause E1.4 inter alia AS2441:2005	EP1.1
11.	It has been identified that the fire hydrant booster assembly is not within sight of main/principle building entrance	Clause E1.3 inter alia AS2419.1-2005	EP1.3
12.	It is proposed to review the location of the fire hydrant pump and sprinkler alarm valve room, which is not strictly accessible directly from a road/open space.	Clause E1.3 and Clause E1.5	EP1.3 & EP1.4

Appendix B. Architectural Drawings

Table B.1: Architectural drawings relied upon

Drawing No.	Title	Date / Revision
ATSYD2_SSD_DRG_ARC_0100	L1 Basement Floor Plan	20-08-2019/8
ATSYD2_SSD_DRG_ARC_0101	L2 Floor Plan	20-08-2019/8
ATSYD2_SSD_DRG_ARC_0102	L3 Floor Plan	20-08-2019/8
ATSYD2_SSD_DRG_ARC_0103	L4 Floor Plan	21-08-2019/8
ATSYD2_SSD_DRG_ARC_0104	L5 Floor Plan	20-08-2019/8
ATSYD2_SSD_DRG_ARC_0105	Roof Plan	20-08-2019/8
ATSYD2_SSD_DRG_ARC_0110	Office Plans	21-08-2019/7