



Dangerous Goods Report

Project Mars Data Centre - 12 Mars Road, Lane Cove West

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Goodman Property Services (Aust) Pty Ltd

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Quality Management

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Executive Summary

Background

This (RCE-24358_GoodmanMarsRd_DGDesign_Final_18Feb26_Revision B - Formal Lodgement) has been prepared by Riskcon Engineering Pty Ltd to accompany a State Significant Development Application (SSDA) for the construction and ongoing operation of a data centre facility at 12 Mars Road, Lane Cove West in the Lane Cove Government Area (LGA). The site is legally described as Lot 22 in Deposited Plan 732062.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the Project Mars Data Centre Project (SSD-82052708) dated 10th April 2025.

Goodman Property Services (Aust) Pty Ltd (Goodman) has proposed to develop a data centre at their site located at 12 Mars Road, Lane Cove West. Industry Specific Secretary's Environmental Assessment Requirements (SEARs) require that a Dangerous Goods (DG) report be prepared to support the development application to address the hazards-related requirements of the Work Health and Safety Regulations and the SEARs. This includes assessment against the relevant design requirements of the following standards and data sheet:

- AS/NZS 4681 – Storage and handling of Class 9 (Miscellaneous) Dangerous Goods and Articles
- UL9540A – Test Method for Evaluating Thermal Runaway Fire propagation in Battery Energy Storage Systems in lieu of AS IEC 62619
- AS 1940 – Storage and Handling of Flammable and Combustible Liquids
- Risk Assessment in lieu of FM Global Property Loss Prevention Data Sheet 5-32

Conclusions

A review of the hazardous chemical storages within the proposed Goodman data centre at 12 Mars Rd, Lane Cove West, NSW was conducted to determine compliance with the Work Health and Safety Regulation 2017 (Ref. [1]) and all relevant design standards. A review of the standards determined that the diesel storages are to be governed by AS 1940:2017 (Ref. [2]) based on diesels classification as a combustible liquid. The Li-ion batteries are to be governed by AS/NZS 4681:2000 (Ref. [3]) based on their classification as a Class 9 substance and tested in accordance with UL9540A. Additionally, a risk assessment approach has been adopted for reviewing the current design against the FM-Global Datasheet 5-32. These standards were used to create a series of requirements to guide the design of the stores.

Additionally, a review of the WHS Regulation determined that the site would operate at manifest quantities; hence, additional documentation is necessary to comply with the requirements of the Regulation as outlined in **Section 5.3**.

Recommendations

The following recommendations have been made for the facility.

Design Requirements:

- The design requirements detailed within this report shall be adhered to.

- Spillage containment with a net capacity of at least 45 m³ shall be installed for each of the power transformers.
- Where requirements have not been omitted by risk assessment, FM Global Datasheet 5-32 shall be adopted as the design basis with respect to the lithium ion batteries of the UPS.
- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and FM Global DS 5-33 for the battery rooms.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be provided in accordance with AS1670.1.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over-temperature to prevent thermal runaway.
- Off gas detection system in the battery rooms shall be provided to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- The battery manufacturer shall ensure that the Li-ion battery cells, modules, units and BMS are compliant with the testing requirements of UL9540A (Ref. [4]).
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.
- An automatic mechanical ventilation system shall be provided.
- No gaseous fire suppression system will be utilised in the design.

WHS Requirements:

- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- Placarding.
- A Manifest and notification shall be submitted to SafeWork NSW.
- A DG Risk Assessment of the storage and handling areas.
- An Emergency Response Plan (ERP).

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Abbreviations

Abbreviation	Description
ASD	Aspirated Smoke Detection
BCA	Building Code of Australia
BMS	Battery Management System
BOWS	Building Occupant Warning System
CBD	Central Business District
FMG	FM-Global
Li-ion	Lithium Ion
NCC	National Construction Code
PCBU	Person Conducting a Business or Undertaking
PHA	Preliminary Hazard Analysis
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SFAIRP	So Far As Is Reasonably Practicable
SoC	State of Charge
SoH	State of Health
WHS	Work Health and Safety
VEWFD	Very Early Warning Fire Detection
UPS	Uninterruptable Power Supply

1.0 Introduction

1.1 Background

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This report has been prepared to address the Secretary’s Environmental Assessment Requirements (SEARs) issued for the Project Mars Data Centre Project (SSD-82052708) dated 10th April 2025.

Goodman Property Services (Aust) Pty Ltd (Goodman) has proposed to develop a data centre at their site located at 12 Mars Road, Lane Cove West. Industry Specific Secretary’s Environmental Assessment Requirements (SEARs) require that a Dangerous Goods (DG) report be prepared to support the development application to address the hazards-related requirements of the Work Health and Safety Regulations and the SEARs. This includes assessment against the relevant design requirements of the following standards and data sheet:

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- AS 1940 – Storage and Handling of Flammable and Combustible Liquids
- Risk Assessment in lieu of FM Global Property Loss Prevention Data Sheet 5-32

Goodman has commissioned Riskcon Engineering Pty Ltd (Riskcon) to review the proposed facility and prepare the DG report. This document provides Riskcon’s assessment of the facility against the standards and data sheet for the proposed data centre at 12 Mars Road, Lane Cove West NSW 2066.

1.2 Objectives

The objectives of the design report are to assist Goodman in designing and constructing a hazardous chemical storage which complies with the Work Health and Safety Regulation 2017 (Ref. [1]) and the relevant standards. The report aims to address the additional assessment requirements identified in the SEARs (**Table 1-1**). Note that the accompanying SEPP-RH and pipeline assessments address the industry specific SEARs for data centres.

Table 1-1: SEARs - Hazards & Risks

Item	Requirement	Report Section
Hazards and risk	<ul style="list-style-type: none"> • It must also demonstrate the development would comply with AS IEC 62619 – Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications and AS/NZS 4681 – Storage and handling of Class 9 (miscellaneous) dangerous goods and articles. 	Section 4.5
	<ul style="list-style-type: none"> • The EIS must demonstrate the relevant aspects of the FM Global Property Loss Prevention Data Sheet 5-32 – Data Centres and 	Section 4.6

Item	Requirement	Report Section
	Related Facilities have been considered and could be implemented as part of the development.	
	<ul style="list-style-type: none"> It must also demonstrate the development would comply with AS 1940 – Storage and handling of flammable and combustible liquids. 	Sections 4.2, 4.3, 4.4

1.3 Scope of Services

The scope of work is to prepare an assessment for the DG stores at the proposed Goodman site at 12 Mars Rd, Lane Cove West, NSW. The assessment does not include any other sites nor additional work which may be identified in the course of the assessment.

2.0 Methodology

The following methodology has been adopted in this assessment:

- The proposed design of the site was reviewed, including details of hazardous chemicals which will be stored and handled on site.
- The applicable design standards were identified based upon the class review.
- Draft Reporting – On completion of the assessment, a draft report was prepared for review and comment by the project team.
- Final Report – On completion of the review of the draft report, any comments were incorporated into the finalised version.

3.0 Site Description

3.1 Site Location and Layout

The proposed data centre is located at 12 Mars Road, Lane Cove West NSW 2066 which is approximately 9 km northwest of the Sydney Central Business District (CBD). **Figure 3-1** shows the location of the site in relation to the Sydney CBD. The site layouts are shown within the complete architectural drawing set provided in **Appendix A**.

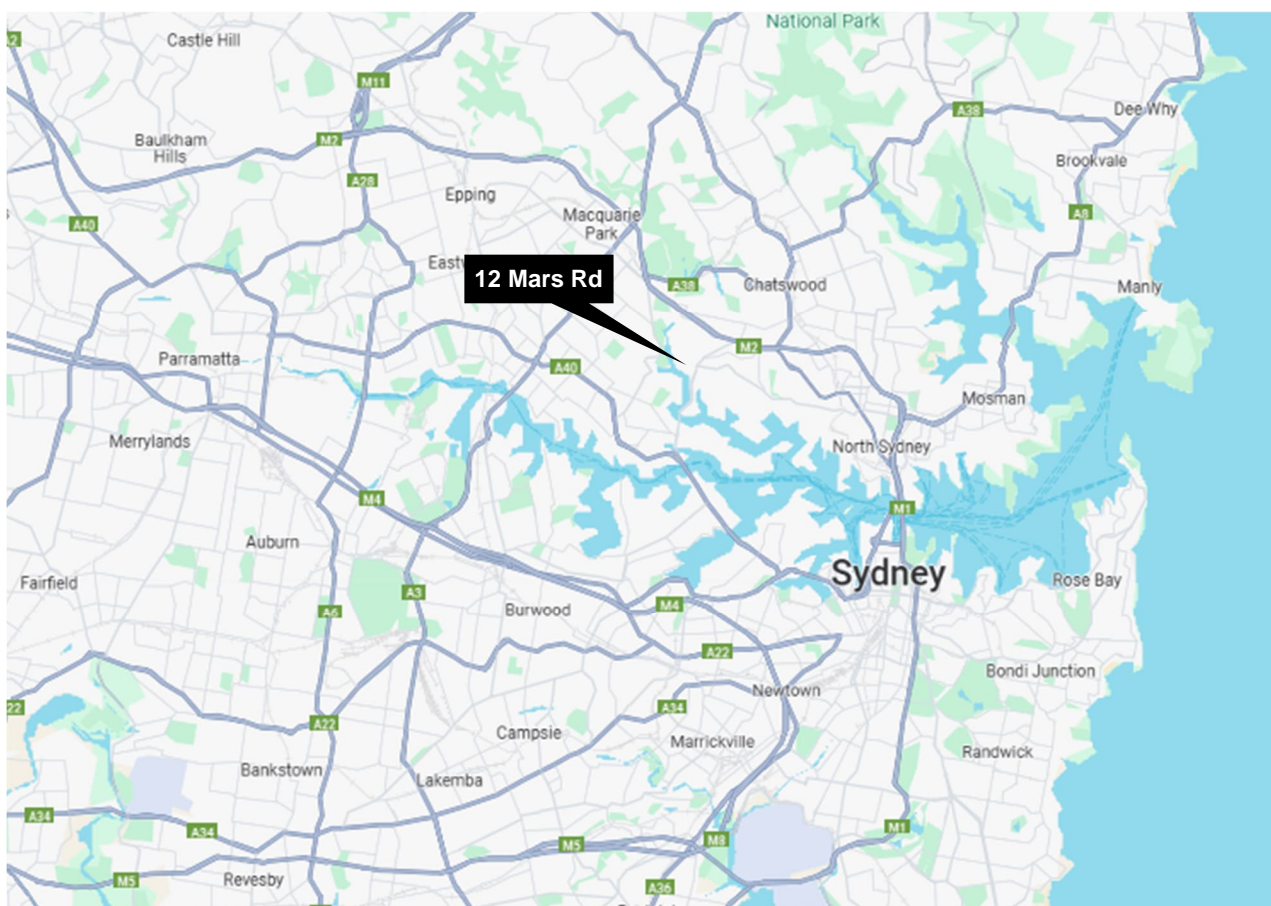


Figure 3-1: Site Location

3.2 Site Description

A State Significant Development Application (SSDA) has been prepared to support a data centre at 12 Mars Road, Lane Cove West. The site area is 33,559m² and is zoned E4 General Industrial.

The proposal will include:

- Site preparation works including demolition, bulk excavation and removal of existing structures on the site, tree and vegetation clearing and bulk earthworks.
- Construction, fit-out and operation of a three-storey data centre building with a total gross floor area of approximately 21,832m² comprising:
 - 24 parking spaces
 - 2 loading dock spaces
 - 2 levels of technical data hall floor space

- 3 level office and amenities building
- Provision of required utilities including:
 - diesel storage tanks
 - water tanks
 - substations on site
- Vehicle and pedestrian access provided via Mars Road
- Associated landscaping and site servicing
- Installation of site services and drainage infrastructure
- A floor space ratio of approximately 0.65:1

3.3 Quantities of Dangerous Goods Stored and Handled & SEPP-RH Screening

The classes and quantities of DGs to be stored at the facility are summarised in **Table 3-1**, alongside the SEPP-RH assessment.

Table 3-1: Maximum Classes and Quantities of Dangerous Goods Stored & SEPP-RH Screening

Class	Packing Group (PG)	Description	Quantity (L or kg)	SEPP-RH Applicable? (Y/N)
9	n/a	Li-ion batteries	194,000 kg	N
C1	n/a	Diesel	1,049,000 L	N
C2	n/a	Transformer oils	68,000 L	N

Note that the classes stored (9 and combustible liquids) are not applicable to the SEPP-RH risk screening process (Ref. [5]), therefore the site does not require a PHA.

4.0 DG Design Assessment

4.1 Introduction

The following DG storage areas were identified for assessment:

- Bulk Diesel Tanks
- Power Transformers
- Day Tanks (Indoor Diesel Generator Tanks)
- Lithium-Ion Batteries (UPS)

Each of these areas have been assessed in detail in the following sections.

4.2 Bulk Diesel Tanks

4.2.1 Introduction

Approximately 1,000 m³ of diesel will be stored across 10 above-ground bulk tanks within two separate four-hour fire rated rooms (tank chambers), one on the lower ground floor level and the other on the ground floor. The bulk tanks are connected to a delivery system that feed the day tanks attached to generator units located throughout the site. Diesel is classified as a combustible liquid; hence, the appropriate standard to assess the storage is AS 1940:2017 (Ref. [2]). Section 5 of the standard outlines the requirements for above-ground tanks. The proposed quantities stored within the diesel bulk tanks is summarised in **Table 4-1**.

Table 4-1: Proposed Quantity of Diesel in the Bulk Tanks Stored and Handled

Class	Description	PG	Quantity (L)
C1/C2	Diesel bulk tanks	n/a	10 x 100,000 L

4.2.2 Design

The design requirements for above-ground diesel tanks based on AS 1940:2017 have been summarised in **Table 4-2**.

Table 4-2: Above-Ground Diesel Tank Design Requirements, in accordance with AS 1940:2017

Item	Requirement
Construction and installation	<ul style="list-style-type: none"> • The tank shall be designed and constructed to comply with AS 1692. • The tanks shall be located on the lowest floor level of the building. It is noted that the tanks are split across the two lowest floor levels, however the site is on a slope so both storages are effectively on the lowest level (i.e. there are no floors in the vicinity below either storage). • Tank room walls shall have an FRL of 240/240/240. • The roof shall be of reinforced concrete at least 150 mm thick. • The floor shall be of masonry or reinforced concrete, or of material of equivalent strength, excluding earth and asphalt. • There shall be a clear space of at least 450 mm between any tank and any wall or roof of the chamber, or any other tank in the chamber.

Item	Requirement
	<ul style="list-style-type: none"> Any doorway or other access opening in any wall shall be protected by a fire door or cover having an FRL of at least -/120/30. Such a door or cover shall be designed to normally be closed. The sill of any doorway shall be raised to provide a liquid-tight compound capable of sustaining the hydrostatic load and having a net capacity at least that of the largest tank. A specialised DG tank manufacturer is to be commissioned to commence design, construction and installation of the diesel tanks; ensuring the design will comply with the requirements outlined in this table.
Fill Points	<ul style="list-style-type: none"> The tank fill points shall, where practicable, be in a readily accessible location (outside), on areas that are impervious to diesel (i.e. fill point located on hardstand area), and protected from impact damage by bollards, vehicle safety barriers, etc. The proposed tank position is compliant with this requirement. The fill, dip and vapour recovery point for each tank shall be marked to identify it. A spillage containment that has a minimum capacity of 15 L shall be provided for the fill points.
Level Indication	<ul style="list-style-type: none"> The tank fill level shall be able to be monitored or gauged. This gauge or monitor shall also show the normal fill level of the tank. A high-level alarm (LAH) shall be set to no more than 97% of the maximum fill level. The alarm shall be set to warn when the normal fill level has been exceeded.
Venting	<ul style="list-style-type: none"> The vent shall discharge outside and be separate from the filling pipe. The vent pipe shall be protected from physical damage by bollards or other barriers. The vent shall discharge at least 2 m from an opening to any building (including doorways, windows, etc.) and at least 4 m above ground. The discharge end of a vent shall be protected from the ingress of foreign materials by means of a protective cage or fitting.
Separation Distances	<ul style="list-style-type: none"> To site boundary at least 3 m. To building foundations: the tanks shall be located with respect to building foundations and supports so that the building loads cannot be transmitted to the tank. Between tank chambers: at least 7.5 m. <p>Distances may be measured around firewalls. It is noted in the design that the tanks will be located within a 4-hour rated enclosure; hence, a review of the location of the tanks indicates that the location is compliant with the above separation distances.</p>
Fire Protection	<p>Tank</p> <ul style="list-style-type: none"> Per Clause 11.10, the tanks are located in a fire rated enclosure such that no additional fire protection other than that which is specified by the BCA is required. <p>Tanks vehicle delivery location</p> <ul style="list-style-type: none"> The location where a tank vehicle will refill tanks shall be provided with at least two powder-type fire extinguishers.

4.3 Day Tanks (Indoor Diesel Tanks)

Diesel will also be stored in day tanks attached to generator units located across level 1, level 2 and the roof of the data centre. The site will contain approximately 49 generators, each containing 1 m³ of diesel fuel. As previously discussed, diesel is classified as a combustible liquid; hence, the appropriate standard to assess the storage is AS 1940:2017 (Ref. [2]). As the day tanks are

connected to the generator units, they are outside the scope of the DG report per Clause 1.2.2(g) of AS 1940:2017.

4.4 Power Transformers

Two (2) power transformers will be installed on-site within the substation building. Each of the transformers will hold approximately 45 m³ of MIDELE n 1204 or equivalent, which is a natural ester combustible oil with a high fire point. Note that although the AS 1940:2017 would apply for the transformers as combustible liquids are contained, Appendix G states that the standard does not typically apply for electrical equipment which in normal operation uses combustible mineral oil as an insulating and cooling medium. Natural ester oil has a higher flash point than mineral oil and is more difficult to ignite.

Notwithstanding this, to ensure that a release does not result in an adversarial impact to the environment, a recommendation has been put forward:

- Spillage containment with a net capacity of at least 45 m³ shall be installed for each of the power transformers.

4.5 Lithium-Ion Batteries (UPS)

4.5.1 Introduction

The Uninterruptible Power Supply (UPS) systems include a set of Li-ion battery cabinets per UPS. Each cabinet will have an integral Battery Management System (BMS) which will monitor the status and health of the batteries, with a variety of features to facilitate a shutdown or isolation of various parts of the system in the event that a fault is detected. UPS battery cabinets will be located across the lower ground floor, ground floor, level 1 and level 2 of the data centre.

The proposed quantity of Li-ion batteries to be installed is summarised in **Table 4-3**.

Table 4-3: Proposed Quantity of Li-ion Batteries Stored and Handled

Class	Description	PG	Quantity (kg)
9	Li-ion batteries	n/a	194,000 kg

Li-ion batteries are classified as Class 9 DGs, which is only a transport classification and is not strictly applicable during storage; hence, it is not subject to the Work Health and Safety Regulation 2017 (Ref. [1]). Notwithstanding this, Li-ion batteries have the potential for thermal runaway, which may result in fires or explosions. Therefore, it is necessary to demonstrate that the products are stored appropriately to minimise the potential for incidents to occur so far as is reasonably practicable (SFAIRP) as required by the Regulation. The applicable standard to govern the storage and handling of the Li-ion batteries is AS/NZS 4681:2000 (Ref. [3]).

It is noted that compliance with the relevant aspects of AS IEC 62619 is required. However, from previous experience it has been decided to use the testing method UL9540A in lieu of AS IEC 62619 due to the former being more readily available and assessing safety of the whole battery system rather than solely electrical safety at the cell and module level. The UL9540A testing standard is an industry recognised and credible test method for evaluating thermal runaway propagation in battery energy storage systems. The results from the testing will address key issues associated with Li-ion battery energy storage system (one of them being the UPS), such as: installation instructions, ventilation requirements, fire protection effectiveness, thermal propagation measures, and fire service strategies. Hence, a recommendation has been made:

- The battery manufacturer shall ensure that the Li-ion battery cells, modules, units and BMS are compliant with the testing requirements of UL9540A (Ref. [4]).

A review of this standard indicates that the Li-ion batteries to be stored at the site would be classified as a minor store as the standard does not place a threshold limit for Li-ion batteries above which the quantity ceases to be a minor store. Nonetheless, for conservatism the UPSs have been assessed as a package store under Section 3 of AS/NZS 4681:2000.

4.5.2 Design

The design requirements for Li-ion batteries based on AS/NZS 4681:2000 have been summarised in **Table 4-4**.

Table 4-4: Li-ion Battery Storage Requirements, in Accordance with AS/NZS 4681:2000

Item	Requirement
Separation Distances	<ul style="list-style-type: none"> • No specific separation distances apply to stores of Li-ion batteries
Ventilation	<ul style="list-style-type: none"> • Adequate mechanical or natural ventilation shall be provided. • As the batteries are sealed, they are unlikely to release any vapours; hence, ventilation in accordance with the BCA is considered sufficient.
Spillage Containment	<ul style="list-style-type: none"> • Where liquids are stored, spillage containment shall be provided. • Li-ion batteries contain solid anodes and cathodes as well as a liquid electrolyte. The whole unit is sealed to provide containment within the battery. Furthermore, the batteries are individual cells stacked together to form an overall unit resulting in low volumes of electrolyte within a solitary unit. Failure of an individual cell within a unit does not result in large volumes of liquid release and total failure of all cells within a unit is incredibly unlikely. • Therefore, any spills which occur would be contained within the immediate vicinity of the batteries. Hence, spillage containment is not considered to be required for this storage.
Fire Protection	<ul style="list-style-type: none"> • The standard requires a dry chemical fire extinguisher to be provided for the data halls; however, this type can potentially corrode electrical equipment. Hence, this requirement can be omitted. • It is noted in the design that an automatic sprinkler system and fire extinguishers will be used as additional fire protection measures for the Li-ion batteries.

In addition to the requirements above, there is planned for additional protection measures to be installed for the data halls to further mitigate the risks associated with the UPS system and Li-ion batteries. These are as follows:

- Battery cabinets separated in two-hour fire rated battery rooms adjacent to each low voltage switchroom.
- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and NFPA 855 and FM Global DS 5-33 for the battery rooms.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be designed and installed.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over temperature to prevent thermal runaway.

- Off gas detection system in the battery room shall be installed to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- An automatic mechanical ventilation system shall be provided.

4.6 FM-Global Datasheet 5-32 Compliance

4.6.1 Introduction

It is noted that a condition set by the Department is to consider the relevant aspects of FM Global DS 5-32 – Data Centres and Related Facilities which contains the design requirements concerning the main hazards associated with data centres, which is the Uninterruptible Power System (UPS). The risks posed by the lithium-ion batteries in the UPS require an increased level of fire safety that is not considered adequately addressed in the standard of performance utilised for a building containing DGs; hence, the data centre project is to be assessed against FM Global DS 5-32.

The design complies with FM Global DS 5-32 in principle; however, it is important to note that FM-Global DS 5-32 adopts a distinct approach to establishing its requirements, as the context of the document is centred around the U.S. industry. As such, fully complying with some of the clauses for the data centre is not considered to be commensurate with the risk of the UPS, as it requires specific equipment and procedures that are not appropriate for implementation in Australia. Nevertheless, as lithium-ion batteries will be stored on-site, additional fire safety measures (i.e., FM sprinkler design with respect to design density and area of operation, fire sprinkler design, UPS separation barrier, fire/smoke detection, etc) have been included in the design to mitigate the risk of the UPS SFRAIP.

This section contains a risk assessment on whether the relevant designs of the Data Centre comply with the requirements set out in the FM Global DS 5-32 in principle.

4.6.2 Design

The design assessment against applicable FM Global Datasheet 5-32 loss prevention recommendations is provided in **Table 4-5**.

Table 4-5: Summary of Design Assessment against Related FM Global Data Sheet 5-32 Recommendations

Item	Related Recommendations	Compliant?	Assessment
Construction and Location	<ul style="list-style-type: none"> Construct data centers of non-combustible materials. 	<p>The design is compliant.</p> <p>The data center design is to comply with the BCA which sets requirements on constructing the data center with non-combustible building elements.</p>	N/A
	<ul style="list-style-type: none"> Protect data centers against external fire exposure. Do not allow combustible material to expose the building or the air intake(s) for the building. Provide blank masonry walls or other suitable protection when there is an unfavorable exposure or the potential for vandalism from outside the building. 	<p>The design is compliant.</p> <p>Protection against outdoor elements and external fire exposure has been accounted for in the BCA compliance.</p>	N/A
	<ul style="list-style-type: none"> Do not locate data centers in multistory buildings that have inadequately sprinklered or unprotected areas of the building. 	<p>The design is compliant.</p> <p>Sprinkler systems will be installed throughout the building.</p>	N/A
	<ul style="list-style-type: none"> Provide prevention and mitigation associated with a liquid release and the potential damage in accordance with Data Sheet 1-24, <i>Protection Against Liquid Damage</i>. 	<p>The design is compliant.</p> <p>Any liquid release from generators, transformers, and combustible liquid tank will be contained within the bunding.</p>	N/A
	<ul style="list-style-type: none"> Locate data centers so they are not exposed to damage from any hazardous process, storage, corrosive or ignitable liquid or vapor, industrial pollutants, or mechanical equipment such as overhead cranes. 	<p>The design is compliant.</p> <p>This has been considered in the design stage of the project.</p>	N/A
	<ul style="list-style-type: none"> Provide one-hour fire rated interior walls, partitions, and floors in accordance with Data Sheet 1-21, <i>Fire Resistance of</i> 	<p>The design is compliant.</p>	N/A

Item	Related Recommendations	Compliant?	Assessment
	<p><i>Building Assemblies</i>, for all of the following:</p> <ul style="list-style-type: none"> ○ Data processing equipment rooms ○ Battery power rooms, UPS rooms ○ Network/fiber optic rooms 	<p>The data halls (containing UPS and data processing equipment) will be contained in the primary structure which is four-hour fire rated.</p>	
	<ul style="list-style-type: none"> ● Provide fire-rated interior walls, partitions, and floors for power equipment rooms (standby generator and AC power) in accordance with Data Sheet 5-23, <i>Design and Protection for Emergency and Standby Power Systems</i>. 	<p>The design is compliant.</p> <p>The diesel tanks are located in four-hour fire rated rooms in compliance with AS1940:2017. The primary structure walls are to be four-hour fire rated.</p>	<p>N/A</p>
	<ul style="list-style-type: none"> ● Have fire-rated interior walls built from the structural floor of the room to the structural floor above (or to the roof). 	<p>The design is compliant.</p>	<p>N/A</p>
	<ul style="list-style-type: none"> ● Minimize interior windows and doors to the data processing equipment room. For essential interior windows and doors, use tempered or wired glass for windows and minimum ¾ hour fire-rated doors. 	<p>The design is compliant. Interior windows and doors are minimized. Doors are 2 hour fire rated.</p>	<p>N/A</p>
	<ul style="list-style-type: none"> ● If doors are held open intermittently or permanently, provide an electromechanical or electromagnetic holding mechanism interlocked to close the door on smoke detector actuation. 	<p>The design is compliant once the recommendation has been actioned.</p>	<p>The fire doors in the building may not possess electromechanical or electromagnetic holding capability, however these are installed with a self-closure mechanism that keep these closed when unused. Hence, this is considered appropriate for the purposes of this clause. However, it has been noted that lockable bolts will be installed in the door leaf which may inhibit the self-closing mechanism if it were to be engaged when the door is open. Therefore, a recommendation has been made:</p>

Item	Related Recommendations	Compliant?	Assessment
			<ul style="list-style-type: none"> Personnel shall be trained to ensure that the inactive door leaf remains in the closed position when not in use.
	<ul style="list-style-type: none"> Any penetration in a fire rated wall must be provided with an FM approved penetration seal with a fire-resistance rating equivalent to the rating of the wall or floor. 	The design is compliant. All fire rated walls and slabs are rated to the same equivalent per National Construction Code (NCC).	N/A
	<ul style="list-style-type: none"> Limit the maximum height of ceilings in data centers to 30 ft (9 m). 	The design is compliant. The ceilings of the data halls do not exceed 9 m.	N/A
	<ul style="list-style-type: none"> Construct floors, raised floors, and structural supporting members for raised floors of noncombustible materials. 	The design is compliant. No combustible materials are to be included for the floors or structural supporting members.	N/A
	<ul style="list-style-type: none"> If the facility is located in FM Global 50-year through 500-year earthquake zones as defined in Data Sheet 1-2, <i>Earthquakes</i>, adhere to the recommendations in this section. 	The design is compliant. The site is not located in a 50-year through 500-year earthquake zones as indicated by FM-Global's Natural Hazard Map.	N/A
	<ul style="list-style-type: none"> Design buildings, roof-mounted equipment, and ground-mounted equipment for wind forces in accordance with Data Sheet 1-28, <i>Wind Design</i>, and Data Sheet 1-29, <i>Roof Deck Securement and Above-Deck Roof Components</i>. 	The risks these codes aim to address are managed via compliance with the BCA/NCC. Subsequently, the design does not comply with these FM data sheets but is managed by an equivalent design approach.	The BCA/NCC details requirements that address the measures documented in the referenced FM data sheets. Subsequently, the risks the FM data sheets aim to address are adequately managed by compliance with the BCA.
	<ul style="list-style-type: none"> Select a building site that is above the predicted 0.2% annual exceedance (500-year) flood elevation and includes 1 to 2 ft (0.3 to 0.6 m) of freeboard. Ensure the 	The design is compliant. A flood risk assessment prepared by BG&E has indicated that the site is not considered	N/A.

Item	Related Recommendations	Compliant?	Assessment
	<p>building site is at least 500 ft (152 m) from direct wave impacts and/or high flood-flow velocities.</p>	<p>to be at risk from flooding due to the sites elevation.</p>	
	<ul style="list-style-type: none"> Protect data centers, critical systems, and equipment of the facility and related facilities against storm water runoff in accordance with Data Sheet 1-40, <i>Flood</i>. 	<p>The design is not compliant with Data Sheet 1-40; however, a storm water design has been adopted which addresses the risks this data sheet aims to address. Subsequently, the intent of the Data Sheet has been met by the local design approach.</p>	<p>The design does not currently consider the FM-Global Datasheet 1-40 for storm water runoff protection; however, in lieu of that, a civil engineering report incorporating stormwater management plan has been prepared as part of the SEARs. Following the implementation of these measures, it is considered that the risk of damage due to storm water runoff and flooding have been minimized so far as is reasonably practicable, in conjunction with the prior flood risk assessment.</p>
	<ul style="list-style-type: none"> Provide water-removal capability for all below-grade areas subject to flooding from storm water runoff or sewer back up. 	<p>The design is not compliant with Data Sheet 1-40; however, a storm water design has been adopted which addresses the risks this data sheet aims to address. Subsequently, the intent of the Data Sheet has been met by the local design approach.</p>	<p>The design does not currently consider the FM-Global Datasheet 1-40 for storm water runoff protection; however, in lieu of that, a civil engineering report incorporating stormwater management plan has been prepared as part of the SEARs. Following the implementation of these measures, it is considered that the risk of damage due to storm water runoff and flooding have been minimized so far as is reasonably practicable, in conjunction with the prior flood risk assessment.</p>
Occupancy	<ul style="list-style-type: none"> Do not store or stage combustible materials in the data processing rooms. 	<p>The design is compliant.</p> <p>No combustible materials will be stored in the data halls.</p>	N/A
	<ul style="list-style-type: none"> Do not store combustible materials in electrical or mechanical equipment rooms. 	<p>The design is compliant.</p>	N/A

Item	Related Recommendations	Compliant?	Assessment
		No combustible materials will be stored in electrical or mechanical equipment rooms.	
Protection	<ul style="list-style-type: none"> Provide automatic sprinkler protection throughout all building spaces associated with this occupancy for the appropriate hazard classification in accordance with Data Sheet 3-26, <i>Fire Protection Water Demand for Nonstorage Sprinklered Properties</i>, hazard-specific data sheet, in addition to the recommendations in this section. 	<p>The design is compliant for building spaces other than areas where Li-ion batteries will be stored.</p> <p>The fire sprinkler system will have discharge densities in compliance with FM Global DS 5-32 for the data halls with in-rack UPS, NFPA855 and FM Global DS 5-33 for the battery rooms.</p>	<p>The site does not consider the Data Sheet 3-26 for the installation and design of the automated fire sprinkler system; however, it will be designed in accordance with AS2118.1:2017 for places other than the data halls and electrical rooms.</p> <p>Nevertheless, the FM-Global Data Sheet 3-26 requires more stringent specification of the sprinkler systems which may not be SFAIRP with the risks associated with the Lithium-ion battery. It should be noted that if lithium-ion batteries experience thermal runaway, the chemical reactions can continue even in the presence of water; therefore, the aim of a sprinkler system is to attenuate radiant heat emitted from the resultant fire and cool other battery modules to prevent propagation (not to extinguish).</p> <p>Additionally, there will be off-gas detection sensors that enable early detection and recognition of the thermal runaway process. Furthermore, a BMS will be installed to monitor the batteries and can commence shutdown procedures to prevent thermal runaway. The sprinkler system has been designed by a certified fire services engineer (with increased design density and area of operation which will comply with FM Global DS 5-32 for the data halls, FM Global DS 5-33 for the battery rooms, and AS 2118.1:2017) and is expected to be</p>

Item	Related Recommendations	Compliant?	Assessment
			<p>able to provide effective radiant heat mitigation.</p> <p>Moreover, in Clause 3.4.1.2 of Datasheet 5-32, it has been stated that there is currently no way to extinguish a Li-ion battery module fire with sprinklers; thus, opting for FM approved sprinklers will introduce more stringent requirements which will result in undue costs (maintenance, testing, replacement of parts, etc.) and does not result in extinguishment of the fire. Therefore, it considered that the current sprinkler design is appropriate for the purposes of this clause.</p>
	<ul style="list-style-type: none"> Install fire detection in areas that are adjacent to the data processing equipment room and in rooms containing systems or equipment critical to the continued operation of the data processing facility. 	<p>Design is compliant.</p> <p>Fire detection is to be designed in accordance with AS1670.1 and be provided throughout including discrete zoning for corridors bounding the subject data halls.</p> <p>Heat and flame detectors within the diesel enclosures are to be interlocked with a water misting system with open nozzles in accordance with NFPA 750:2019.</p>	N/A
	<ul style="list-style-type: none"> Install fire detection in accordance with Data Sheet 5-48, <i>Automatic Fire Detection</i>. 	<p>The design is not compliant with Data Sheet 5-48; however, the detection system has been designed according to the local standard and engineering design which aims to address the same requirements that Data Sheet 5-48 covers.</p>	<p>Fire detection is to be designed in accordance with AS 1670.1. Although there are differences inherent with the specifications of the FM Global Data Sheet 5-48 and AS1670.1, the fire detection system is to be designed by a fire services engineer with the current situation in mind (data center with UPS) and will be tested accordingly. Hence, for the purposes of this</p>

Item	Related Recommendations	Compliant?	Assessment
			clause, the current fire detection system is appropriate.
	<ul style="list-style-type: none"> Limit cooling air velocities in data processing equipment rooms and utility rooms upon activation of the pre-alarm for the FM Approved Very Early Warning Fire Detection (VEWFD) system. 	The requirement does not apply in this instance.	No FM approved VEWFD system has been installed. However, in lieu of this, off-gas detection for the Li-ion battery which is linked to the BMS will be implemented, in addition to an Aspirated Smoke Detection (ASD) system. These are considered adequate for the purposes of this clause. Additionally, this requirement is in place due to the installation of cleaning agents or inert gas systems which require the maintaining of a certain concentration of the extinguishing agent in the room. An automatic smoke exhaust system could reduce the effectiveness of the fire suppression system. However, the site is not intended to use a clean agent or inert gas fire suppression system (only wet or mist sprinklers); hence, this clause is not applicable for in this instance, thus the current design is considered appropriate.
	<ul style="list-style-type: none"> Do not install automatically operated smoke exhaust systems in the data processing equipment rooms. 	The requirement does not apply in this instance.	This requirement is in place due to the installation of cleaning agents or inert gas systems which require the maintaining of a certain concentration of the extinguishing agent in the room. An automatic smoke exhaust system could reduce the effectiveness of the fire suppression system. However, the site is not intended to use a clean agent or inert gas fire suppression system (only wet or mist sprinklers); hence, this clause is not applicable

Item	Related Recommendations	Compliant?	Assessment
			for in this instance, thus the current design is considered appropriate.
	<ul style="list-style-type: none"> Install fire alarm systems in accordance with Data Sheet 5-40, <i>Fire Alarm Systems</i>. 	<p>The design is not compliant with Data Sheet 5-40; however, the fire alarm system has been designed according to the local standard and engineering design which aims to address the same requirements that Data Sheet 5-40 covers.</p>	<p>A Building Occupant Warning System (BOWS) shall be installed in accordance with the requirements of the NCC 2022. This is considered adequate for the purposes of this clause, which is to provide an alarm to all occupants in case of a fire.</p>
	<ul style="list-style-type: none"> Do not use aerosol generator fire extinguishing system units for the protection of the data center, related areas, or electronic equipment. 	<p>The design is compliant.</p> <p>No aerosol generator fire extinguishing system units have been included in the design.</p>	N/A
	<ul style="list-style-type: none"> Do not use oxygen-reduction systems for the protection of the data center, related areas, data processing equipment, or electronic equipment. 	<p>The design is compliant.</p> <p>No oxygen-reduction systems have been included in the design.</p>	N/A
	<ul style="list-style-type: none"> Do not provide oxygen-reduction systems for protection of the data center, related areas, data processing equipment, or electronic equipment using Li-ion batteries. 	<p>The design is compliant.</p> <p>No oxygen-reduction systems have been included in the design.</p>	N/A
	<ul style="list-style-type: none"> Provide at least one carbon dioxide or clean agent portable fire extinguisher listed to protect electronic equipment in accordance with Data Sheet 4-5, <i>Portable Fire Extinguishers</i>. 	<p>The design is compliant once the recommendation has been actioned.</p>	<p>It is not known at this stage if these specific types of fire extinguisher will be provided; hence, a recommendation has been made:</p> <ul style="list-style-type: none"> At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.

Item	Related Recommendations	Compliant?	Assessment
			Note that this is not to be used for data hall protection.
	<ul style="list-style-type: none"> Do not use dry chemical fire extinguishers in data processing equipment rooms with data processing equipment or electronic equipment. 	<p>The design is compliant.</p> <p>Note that the AS4681 standard requires a dry chemical fire extinguisher; however, given that dry chemical can corrode electrical or electronic equipment, this recommendation by the 5-32 Data Sheet will take precedence over AS4681.</p>	N/A
	<ul style="list-style-type: none"> Locate a portable fire extinguisher at each entrance of the data processing room. 	The design is compliant.	N/A
	<ul style="list-style-type: none"> Locate a sign adjacent to the portable fire extinguisher to identify the type of fire it is intended to extinguish. 	The design is compliant.	N/A
	<ul style="list-style-type: none"> Provide training to staff working in the area on the selection and safe use of use of portable fire extinguishers. 	The design is compliant. It is expected that staff is trained to use the fire extinguishers should an early response to a fire be necessary.	N/A
	<ul style="list-style-type: none"> Provide FM Approved VEWFD in the data processing equipment room and HVAC return air systems. 	The VEWFD in the design is not FM Approved; however, an ASD for the data halls and off-gas detection for the server racks will be utilised; hence, which achieves the same requirements that the clause covers.	In lieu of an FM approved VEWFD, an ASD system is to be installed and designed in accordance with AS 1670.1. The ASD provides a very early warning smoke detection by continuously sampling the air. It is expected that the system will be maintained and tested routinely for adequacy per the relevant requirements of AS 1670.1. This is considered adequate for the purposes of this clause.

Item	Related Recommendations	Compliant?	Assessment
	<ul style="list-style-type: none"> • Where Li-ion battery back-up units are installed in a server rack as a distributed power system, the recommendations in this section are to be applied if the following conditions exist: <ul style="list-style-type: none"> ○ Maximum power capacity of 20 kWh per server rack as a distributed power configuration. ○ No more than 2 shelves containing BBU modules should be located together in the same area of the rack. Aisle spacing between server rows is a minimum of 4 ft (1.2 m) ○ Maximum 30 ft (9 m) ceiling height. ○ No limitation on the building/room size 	<p>The design is compliant with these configuration requirements.</p>	<p>N/A</p>
	<ul style="list-style-type: none"> • Do not use halocarbon or inert gas (clean agent) fire extinguishing systems or water mist systems to provide protection for the data halls. 	<p>The design is compliant. No halocarbon, inert gas, or water mist system is to be used to provide protection.</p>	<p>N/A</p>
	<ul style="list-style-type: none"> • Use FM Approved quick-response sprinklers. 	<p>The design is compliant for building spaces other than areas where Li-ion batteries will be stored.</p> <p>The fire sprinkler system will have discharge densities in compliance with FM Global DS 5-32 for the data halls with in-rack UPS, NFPA855 and FM Global DS 5-33 for the battery rooms.</p>	<p>The site does not consider the Data Sheet 3-26 for the installation and design of the automated fire sprinkler system; however, it will be designed in accordance with AS2118.1:2017 for places other than the data halls and electrical rooms.</p> <p>Nevertheless, the FM-Global Data Sheet 3-26 requires more stringent specification of the sprinkler systems which may not be SFAIRP with the risks associated with the Lithium-ion battery and with the level of protection currently in mind. It should be noted that if lithium-ion batteries experience thermal runaway, the chemical reactions can continue even in the</p>

Item	Related Recommendations	Compliant?	Assessment
			<p>presence of water; therefore, the aim of a sprinkler system is to attenuate radiant heat emitted from the resultant fire and cool other battery modules to prevent propagation (not to extinguish).</p> <p>Additionally, there will be off-gas detection sensors that enable early detection and recognition of the thermal runaway process. Furthermore, a BMS will be installed to monitor the batteries and can commence shutdown procedures to prevent thermal runaway. The sprinkler system has been designed by a certified fire services engineer (with increased design density and area of operation which will comply with FM Global DS 5-32 for the data halls, FM Global DS 5-33 for the battery rooms, and AS 2118.1:2017) and is expected to be able to provide effective radiant heat mitigation.</p> <p>Moreover, in Clause 3.4.1.2 of Datasheet 5-32, it has been stated that there is currently no way to extinguish a Li-ion battery module fire with sprinklers; thus, opting for FM approved sprinklers will introduce more stringent requirements which are difficult to implement in Australia (maintenance, testing, replacement of parts, etc.) and is not SFAIRP. Therefore, it considered that the current sprinkler design is appropriate for the purposes of this clause.</p>
	<ul style="list-style-type: none"> Provide vertical barriers in all server rack rows where Li-ion distributed power systems are used or expected to be used, 	Barriers are not intended to be installed, however the risk is alternatively managed.	While vertical barriers are not included in the design, it is expected that all in hall lithium battery installation within racks have been

Item	Related Recommendations	Compliant?	Assessment
	<p>irrespective of the power capacity. Provide vertical barriers as follow:</p> <ul style="list-style-type: none"> ○ Spaced every third rack along the entire length of server rows, ○ Use a minimum 20-gauge (0.9 mm) solid sheet metal for the vertical barriers on the side of every 3rd rack to limit the fire spread. ○ Completely cover the side of the server rack and fit the rack profile. ○ Installed in a way that will not reduce the effectiveness of the hot/cold aisle arrangement. 		<p>tested per UL9540A and are listed to UL9540. Thermal runaway events have been shown to self-extinguish without propagation beyond the initiating module with no external flaming or flying debris. A hazardous mitigation analysis (HMA) has been prepared for compliance with the International Fire Code.</p> <p>The UL9540A testing standard addresses key issues in battery storage, such as: thermal propagation, installation instructions, ventilation requirements, fire protection effectiveness, and fire service strategy. The UL9540A is considered to be the more definite standard in this instance as it uses data gathered from primary experiments conducted on the UPS system that will be used in the data halls. To further capture this, a recommendation has been made:</p> <ul style="list-style-type: none"> • The manufacturer shall ensure that the Li-ion battery cells, modules, units and BMS are compliant with the testing requirements of UL9540A (Ref. [4]).

4.7 Summary of Additional Measures

An assessment of the current design against FM Global DS 5-32 was conducted in **Table 4-5** and additional measures were implemented to provide the same level of protection that is required by the datasheet. A summary of **Table 4-5** has been provided in the list below, which are as follows:

- Where requirements have not been omitted by risk assessment, FM Global Datasheet 5-32 shall be adopted as the design basis with respect to the lithium ion batteries of the UPS.
- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and FM Global DS 5-33 for the battery rooms.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be provided in accordance with AS1670.1.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over-temperature to prevent thermal runaway.
- Off gas detection system in the battery rooms shall be provided to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- The battery manufacturer shall ensure that the Li-ion battery cells, modules, units and BMS are compliant with the testing requirements of UL9540A (Ref. [4]).
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.
- An automatic mechanical ventilation system shall be provided.
- No gaseous fire suppression system will be utilised in the design.

5.0 Work Health and Safety Regulation

5.1 Introduction

In addition to meeting the requirements of the relevant standards, the Work Health and Safety (WHS) Regulation 2017 (Ref. [1]) requires additional documentation to be prepared based upon the quantity of DGs stored on site. Provided in **Table 5-1** is a comparison of the quantities being stored at the site against the thresholds detailed in Schedule 11 of the WHS Regulation. It should be noted that Li-ion batteries are classified as Class 9 DGs, which is only a transport classification and is not strictly applicable during storage; hence, it is not subject to the Work Health and Safety Regulation 2017 (Ref. [1]).

Based on the quantities of goods being stored, the site would be classified as a Manifest site.

Table 5-1: Placard and Manifest Thresholds

Class	Description	PG	Quantity (kg or L)			Classification
			Stored	Placard	Manifest	
9	Lithium-Ion Batteries	n/a	194,000	n/a	n/a	n/a
C1	Diesel (combustible liquid)	n/a	849,000	10,000	100,000	Manifest
C2	Transformer oils (combustible liquid)	n/a	64,000			

5.2 Applicable WHS Clauses

The applicable clauses from the Work Health and Safety Regulation 2017 for a manifest site are outlined in **Table 5-2**.

Table 5-2: Relevant WHS Clauses and Requirements

Clause	WHS Requirement
346	A Hazardous Chemicals [<i>Dangerous Goods</i>] register shall be prepared which must include: <ul style="list-style-type: none"> A list of hazardous chemicals stored, used or handled. The current Safety Data Sheet (SDS) for DGs stored, used or handled. The register must be readily accessible to workers involved in handling or storing the chemicals, and anyone who is likely to be affected by the chemicals.
347	A manifest of chemicals stored on site shall be prepared in accordance with Schedule 12 of the regulation.
348	A notification shall be made to the regulator of the DGs that exceed the manifest quantities detailed in Schedule 11 of the Regulation.
349 & 350	An outer warning placard shall be prominently displayed at the site. The placard is to show the words "HAZCHEM" in red lettering on white or silver background and must have minimum dimensions 120 mm x 600 mm, in compliance with Schedule 13, as shown in Figure 5-1 . A Person Conducting a Business or Undertaking (PCBU) shall ensure placards are displayed for all chemicals which exceed placard quantity of Schedule 11, and that placards comply with Schedule 13, as shown in Figure 5-2 . A Placard Schedule shall be prepared to indicate the placard requirements (type and location).

Clause	WHS Requirement
351	<p>A PCBU must manage the risk to health and safety associated with using and storing a hazardous chemical [<i>Dangerous Good</i>] and have regard of the following:</p> <ul style="list-style-type: none"> • Hazardous properties of the chemical. • Reactions between chemicals (physical) or between the chemical and other substances/materials. • The nature of the work to be carried out with the hazardous chemical. • Any structure, plant or system of work used in the handling, generation or storage of the hazardous chemical [<i>Dangerous Good</i>] or that could react with the hazardous chemical [<i>Dangerous Good</i>] at the workplace. <p>In order to comply with this requirement, it is necessary to conduct a risk assessment and to identify those hazards and risks associated with the storage and handling of the hazardous chemicals [<i>Dangerous Goods</i>]. The following recommendation has been made:</p> <ul style="list-style-type: none"> • A risk assessment of the hazardous chemical [<i>Dangerous Good</i>] storage areas be conducted, including the use of the chemicals in the manufacturing areas; or • If there is an existing risk assessment, it should be reviewed.
358	A PCBU must ensure containers of hazardous chemicals are protected against impact damage and damage from excessive load.
361	A PCBU must prepare an emergency response plan (ERP) and submit it to the primary service organisation (Fire and Rescue NSW)



Figure 5-1: HAZCHEM Placard



Figure 5-2: Combustible Liquid Placard

5.3 Summary of Requirements

In summary, the site will require the following prior to DGs arriving on site:

- A Manifest and notification to SafeWork.
- A DG Risk Assessment of the storage and handling areas.
- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- An Emergency Response Plan (ERP).

- Placards shown in **Figure 5-1** affixed to the site entrance(s) and in **Figure 5-2** affixed to the diesel tanks.

6.0 Conclusion and Recommendations

6.1 Conclusions

A review of the hazardous chemical storages within the proposed Goodman data centre at 12 Mars Rd, Lane Cove West, NSW was conducted to determine compliance with the Work Health and Safety Regulation 2017 (Ref. [1]) and all relevant design standards. A review of the standards determined that the diesel storages are to be governed by AS 1940:2017 (Ref. [2]) based on diesels classification as a combustible liquid. The Li-ion batteries are to be governed by AS/NZS 4681:2000 (Ref. [3]) based on their classification as a Class 9 substance and tested in accordance with UL9540A. Additionally, a risk assessment approach has been adopted for reviewing the current design against the FM-Global Datasheet 5-32. These standards were used to create a series of requirements to guide the design of the stores.

Additionally, a review of the WHS Regulation determined that the site would operate at manifest quantities; hence, additional documentation is necessary to comply with the requirements of the Regulation as outlined in **Section 5.3**.

6.2 Recommendations

The following recommendations have been made for the facility.

Design Requirements:

- The design requirements detailed within this report shall be adhered to.
- Spillage containment with a net capacity of at least 45 m³ shall be installed for each of the power transformers.
- Where requirements have not been omitted by risk assessment, FM Global Datasheet 5-32 shall be adopted as the design basis with respect to the lithium ion batteries of the UPS.
- An automated sprinkler system shall be installed in accordance with increased design density and area of operation to comply with FM Global DS 5-32 for the data halls and FM Global DS 5-33 for the battery rooms.
- Personnel shall be trained to ensure that the inactive leaf remains in the closed position when not in use.
- A VEWFD system, which is the Aspirated Smoke Detection system, shall be provided in accordance with AS1670.1.
- Battery Management System (BMS) shall be provided to monitor and protect the Lithium-ion batteries, shutting them down on fault / over-temperature to prevent thermal runaway.
- Off gas detection system in the battery rooms shall be provided to provide early detection and will be linked to the FIP. The system will automatically alert the fire brigade upon alarm. Additionally, on activation, the exhaust fans will run in emergency mode.
- The battery manufacturer shall ensure that the Li-ion battery cells, modules, units and BMS are compliant with the testing requirements of UL9540A (Ref. [4]).
- At least one (1) carbon dioxide portable fire extinguisher shall be provided on each floor.
- An automatic mechanical ventilation system shall be provided.

- No gaseous fire suppression system will be utilised in the design.

WHS Requirements:

- A Dangerous Goods Register, indicating the type of chemical, any notations that may be required from the risk assessment and the Safety Data Sheet for the chemical.
- Placarding.
- A Manifest and notification shall be submitted to SafeWork NSW.
- A DG Risk Assessment of the storage and handling areas.
- An Emergency Response Plan (ERP).

7.0 References

- [1] SafeWork NSW, "Work Health and Safety Regulation," SafeWork NSW, Lisarow, 2017.
- [2] Standards Australia, AS 1940:2017 - Storage and Handling of Flammable and Combustible Liquids, Sydney: Standards Australia, 2017.
- [3] Standards Australia, "AS/NZS 4681:2000 The Storage and Handling of Class 9 (Miscellaneous) Substances and Articles," Standards Australia, Sydney, 2000.
- [4] UL Solutions, "UL 9540A - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems," UL Solutions, Chicago, 2022.
- [5] Department of Planning, "Applying SEPP 33," Department of Planning, Sydney, 2011.

Appendix A
Architectural Drawing Set

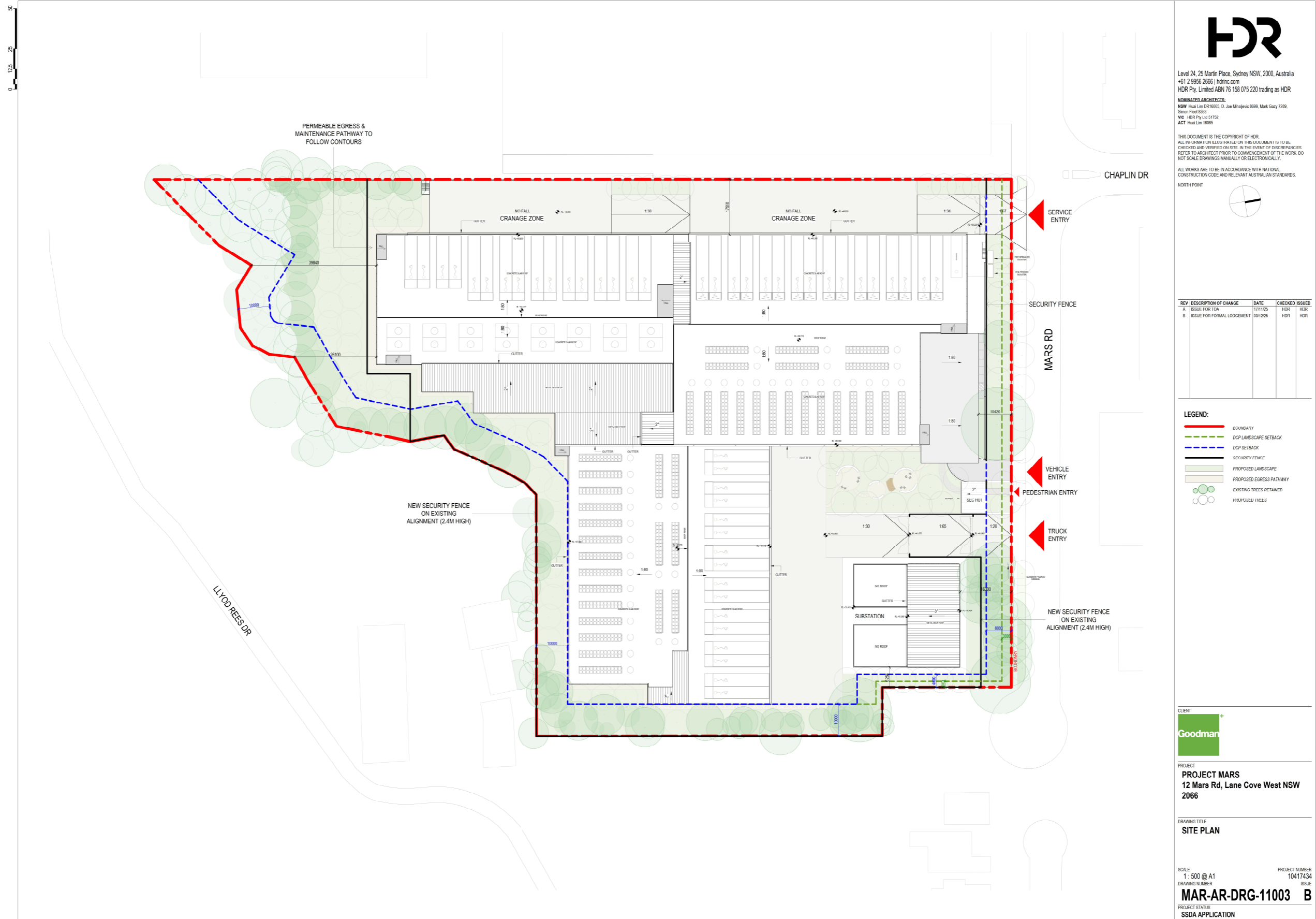


Figure 7-1: Site Layout

