

Utility Management Plan

Electrical Services

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Client: Health Infrastructure

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Table of Contents

1.0	Introduction	i
1.1	Project Context	i
1.2	Client	i
1.3	Design Guidelines	i
1.4	Basis of the Schematic Development Report	iv
2.0	Outline of the Proposed Utility Management Plan	1
2.1	Power	1
	2.1.1 Existing Power Supply to the Site	1
	2.1.2 Proposed Power Supply to the Site	1
	2.1.3 Generator Systems	4
	2.1.4 Power services covered in separate approvals and stages of works	5
2.2	Telecommunication Services	5
	2.2.1 Existing Telecommunication Infrastructure	5
	2.2.2 Proposed Telecommunication Infrastructure	5
	2.2.3 Proposed Private Telecommunication Infrastructure	5
	2.2.4 Telecommunication services covered in separate approvals and stages of works	6
2.3	Ecologically Sustainable Development (ESD)	6
3.0	Appendix A	8

1.0 Introduction

This Utility Management Plan (the Plan) is prepared for the Randwick Campus Redevelopment State Significant Development Application in accordance with the Secretary's Environmental Assessment Requirements (SEARs), Item 13 Utilities dated 12 March 2018:

13. Utilities

- Prepare an Infrastructure Management Plan in consultation with relevant agencies, detailing information on the existing capacity and any augmentation and easement requirements of the development for the provision of utilities including staging of infrastructure.

The Plan will outline existing utility infrastructure and proposed infrastructure modifications to accommodate the new Acute Services Building (ASB) and relates to power and communications services only.

Other utility services will be covered in separate technical and management plans prepared by other consultants.

1.1 Project Context

The ASB will be located on a site to the west of the current Randwick Hospital Campus (the Campus). The new building will border Botany Street, Magill Street and Hospital Road to the west, south and east, respectively. Proposed ASB departments include:

- Emergency Medicine (Adults' Emergency Department)
- Operating Theatres and Central Sterilising Service
- Intensive Care Unit and High Dependency Unit
- Inpatient Units
- Support Services.

1.2 Client

AECOM was engaged NSW by Health Infrastructure (HI) to develop the schematic design of the new ASB. AECOM services also included:

- Power infrastructure; and
- Communications infrastructure

100% Schematic Design (SD) Report and Drawings were issued to HI in February 2018. A list of all drawings is attached to this report as Appendix A.

1.3 Design Guidelines

The Electrical Services, Communications and Security Services shall conform with the requirements of the relevant codes and standards, including:

- NSW Health Infrastructure Engineering Services Guidelines
- Australasian Health Facility Guidelines
- NSW Health ICT Cabling Standard
- National Construction Code (NCC) of Australia: 2016
- NSW Service and Installation rules
- NSW Health Protecting People and Property

- Randwick Health Collaboration Precinct, Prince of Wales Reconfiguration and Expansion Project, ICT Infrastructure Strategy, Version 0.3
- Ausgrid Network Standards and Electricity Supply Policies and Standards
- NSW Government Data Centre Reform strategy (GovDC).

All works shall comply with the following Australian Standards as a minimum:

1049	Telecommunication cables – Insulation, sheath and jacket materials
1158	Lighting for roads and public spaces
1367	Coaxial cable and optical fibre systems for the RF(Radio Frequency) distribution of digital television, radio and in-house analog television signals in single and multiple dwelling installations
1417	Receiving antennas for radio and television in the VHF and UHF broadcast bands - Design, manufacture and performance of outdoor terrestrial television antennas
1680	Interior lighting
1768	Lightning protection
1882	Earth and Bonding Clamps
1940 2201.1	The storage and handling of flammable and combustible liquids Intruder Alarm Systems - Part 1: Client's Premises - Design, Installation, Commissioning And Maintenance
2053	Conduits and fittings for electrical installations
2067	Substations and high voltage installations exceeding 1 kV a.c.
2293.1	Emergency evacuation lighting for buildings
2381.1 + 10	Electrical equipment for explosive gas atmospheres – Selection, installation and maintenance – General requirements
2500	Guide to safe use of electricity in patient care
2648.1	Underground Marking Tape – Part 1: Non-detectable Tape
2834	Computer Accommodation
2990	Quality systems for engineering and construction
3000	Electrical Installations (Wiring Rules)
3003	Electrical installations – Patient treatment areas of hospitals and medical, dental practices and dialyzing locations

3008.1.1	Electrical installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV
3009	Electrical installations – Emergency power supplies in hospitals
3010	Electrical installations – Generating sets
3013	Electrical installations – Classification of fire and mechanical performance of wiring system elements
3080	Information technology – Generic cabling for customer premises.(incl Amdt 1 2014)
3084	Telecommunication Installations–Telecommunication Pathways and Spaces for Commercial Buildings
3085.1	Telecommunications Installations – Administration of Communications Cabling Systems
3087.1-2	Telecommunications Installations – Generic Cabling Systems (Part 1 and 2)

3008.1.1	Electrical installations – Selection of cables – Cables for alternating voltages up to and including 0.6/1 kV
3100	Approval and test specification – General requirements for electrical equipment
3200.2.4 1	Medical electrical equipment – Particular requirements for safety – Surgical luminaires and luminaires for diagnosis
61439	Low-voltage switchgear and control gear assemblies
3548	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment
3811	Hard-wired patient alarm systems
3996	Access Covers and Grates
4485.1 + 2	Security for health care facilities
4806	Closed Circuit Television (CCTV) Systems
4897	The design, installation and operation of underground petroleum storage systems
5000.1	Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV
61000.6. 1:2006	Electromagnetic Compatibility (EMC) – Part 6.1 Generic standards – Immunity for residential, commercial & light industrial environments
61000.6. 2:2006	Electromagnetic Compatibility (EMC) – Part 6.2 Generic standards – Immunity for industrial environments
61000.6. 3:2012	Electromagnetic Compatibility (EMC) – Part 6.3 Generic standards – Emission standard for residential, commercial & light industrial environments
61000.6. 4:2012	Electromagnetic Compatibility (EMC) – Part 6.4 Generic standards – Emission standard for industrial environments

AS/CA Technical Standards and Codes

CCM	ACMA Communications Cabling Manual (Volume 1 and 2).
AS/CA S008	Requirements for authorised cabling products
AS/CA S009	Installation requirements for customer cabling (wiring rules)
AMCA TCPR	Telecommunications Cabling Provider Rules 2014
	Telecommunications Act (1997)

International Standards

EIA 310D	Cabinets, Racks, Panels and Associated Equipment
IEC297	Dimensions of Mechanical Structures of the 482.6mm (19 inch) series
IEC 60297-3-100	Mechanical structures for electronic equipment of the 482.6 mm (19 inch) series – part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets
IEEE 802.3	Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
IEEE 802.3an	Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Physical Layer and Management Parameters for 10 Gb/s Operation, Type

EIA 310D	Cabinets, Racks, Panels and Associated Equipment
	10GBASE-T
IEEE 802.3af	Power over Ethernet
IEEE 802.3at	Power over Ethernet enhancements
IEEE 802.5	Token Ring Access Method and Physical Layer Specification
IEEE 802.11a/b/g/n	Wireless Ethernet
ISO/IEC 11801	Telecommunications installations-Integrated Telecommunications Cabling Systems for Commercial Premise
ISO/IEC TR 14763-3	Information Technology – Implementation and Operation of Customer Premises Cabling – Part 3: Testing of Optical Fibre Cabling
ISO/IEC 24764	Information Technology – Generic Cabling Systems for Data Centres
ISO TR 24750	IT - Assessment and mitigation of installed balanced cabling channels in order to support 10GBASE-T
TIA/EIA 758	Customer-Owned Outside Plant Telecommunications Infrastructure Standard

1.4 Basis of the Schematic Development Report

- Site visits carried out by AECOM engineers during the period of November 2016 to January 2018.
- Meeting with Ausgrid representative (David Tomlin) on site on 8 February 2017.
- Meeting with Ausgrid representatives (Jackson De Breczy and Rebecca Pearson) on site on 20 July 2017.
- Teleconference with Ausgrid representatives (Jackson De Breczy and Rebecca Pearson) on 27 July 2017.
- Meeting with Ausgrid (David Tomlin and Manuel Lopez) on 9 October 2017.
- Meeting with Ausgrid (David Tomlin and Manuel Lopez) on 20 November 2017.
- Meeting with Ausgrid (David Tomlin and Manuel Lopez) on 13 December 2017.
- Teleconference with Ausgrid representatives (David Tomlin, Ashvin Prasad, John Wall, Adrian Woodford, Walter Stefani) on 22 December 2017.
- Meeting with Ausgrid (David Tomlin) on 30 January 2108.
- Weekly Design Team Meetings.
- Meetings with POW Services Working Group, ICT and Security representatives.
- Randwick Campus Site Infrastructure Investigation issued by Arcadis September 2016.
- ERG Meetings.

Design drawings used for the basis of design include:

- Architectural drawings issued 25 January 2018 for the new ASB.

2.0 Outline of the Proposed Utility Management Plan

2.1 Power

2.1.1 Existing Power Supply to the Site

The existing Campus is supplied by multiple Ausgrid substations, including a combination of chambered substations, kiosks and individual Low Voltage (LV) supplies direct from the Ausgrid network in the surrounding streets.

All details of the existing substations and power supplies have been covered previously in Arcadis “Randwick Campus Site Infrastructure Investigation Campus Side Wide Report” issued September 2016.

Based on further investigation undertaken by AECOM, it is evident that most of the Campus infrastructure is in excess of 20 years old, with exception of the Black Dog Institute, the Bright Alliance Building and the Neuroscience Researches Australia buildings.

From the available Ausgrid demand measurements of the substations it appears that there is some spare capacity for minor additional loads.

Existing Campus infrastructure does not have sufficient capacity to meet the demand for the Proposed ASB.

The new building will be located on the area that is mainly residential area with estimated existing load of 300kVA (or 400A as advised by Ausgrid on 9 October 2017). This will not be sufficient for the new building supply.

2.1.2 Proposed Power Supply to the Site

The ASB estimated maximum demand is 5.4MVA.

Formal application for power supply to the Stage 1 works (ASB and the future buildings north of ASB) was submitted to Ausgrid on 25 July 2017 with an update issued on 24 October 2017.

Based on Ausgrid Design Information Package - DIP issued in January 2018 for the site, power supply will be delivered via a new 11kV network from Kingsford Zone substation located approximately 3km to the south-west of the site. Refer Figure 1 - Site Plan Proposed Power Supply.

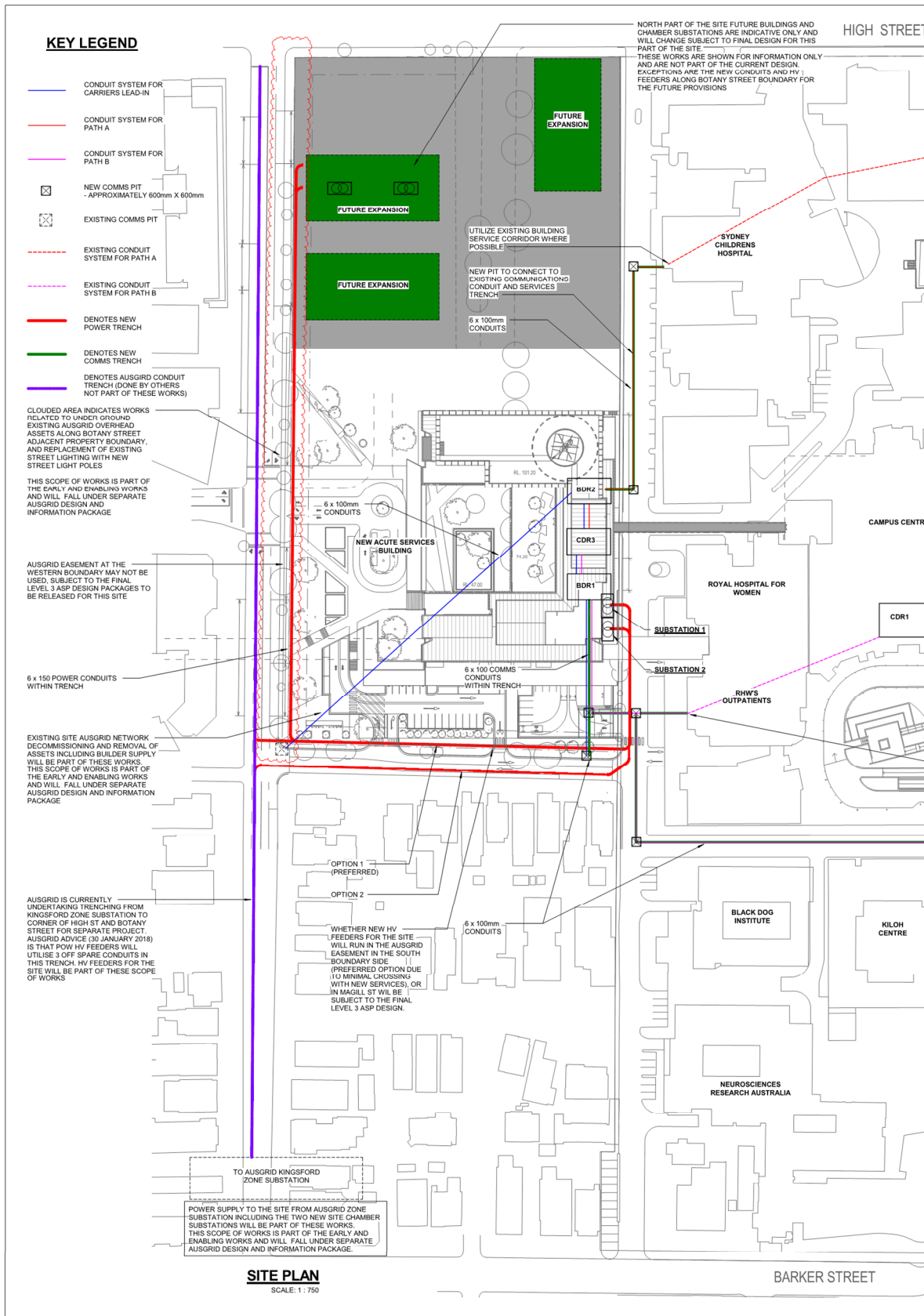


Figure 1 - Site Plan Proposed Power Supply

New HV feeders will be installed to the site to supply new chamber substations located on Level B1, refer Figure 2 - Ausgrid Chamber Substations on Level B1 :

- Substation 1 – 3 x 1500kVA
- Substation 2 – 2 x 1500kVA

Easements are to be registered for the area of these substations and transferred into Ausgrid ownership.

Additional easements are to be registered where Ausgrid cables are located within the private property.

These substations will have 24/7 access for Ausgrid maintenance staff and crane access. Registered right of way will be required within the property boundary.

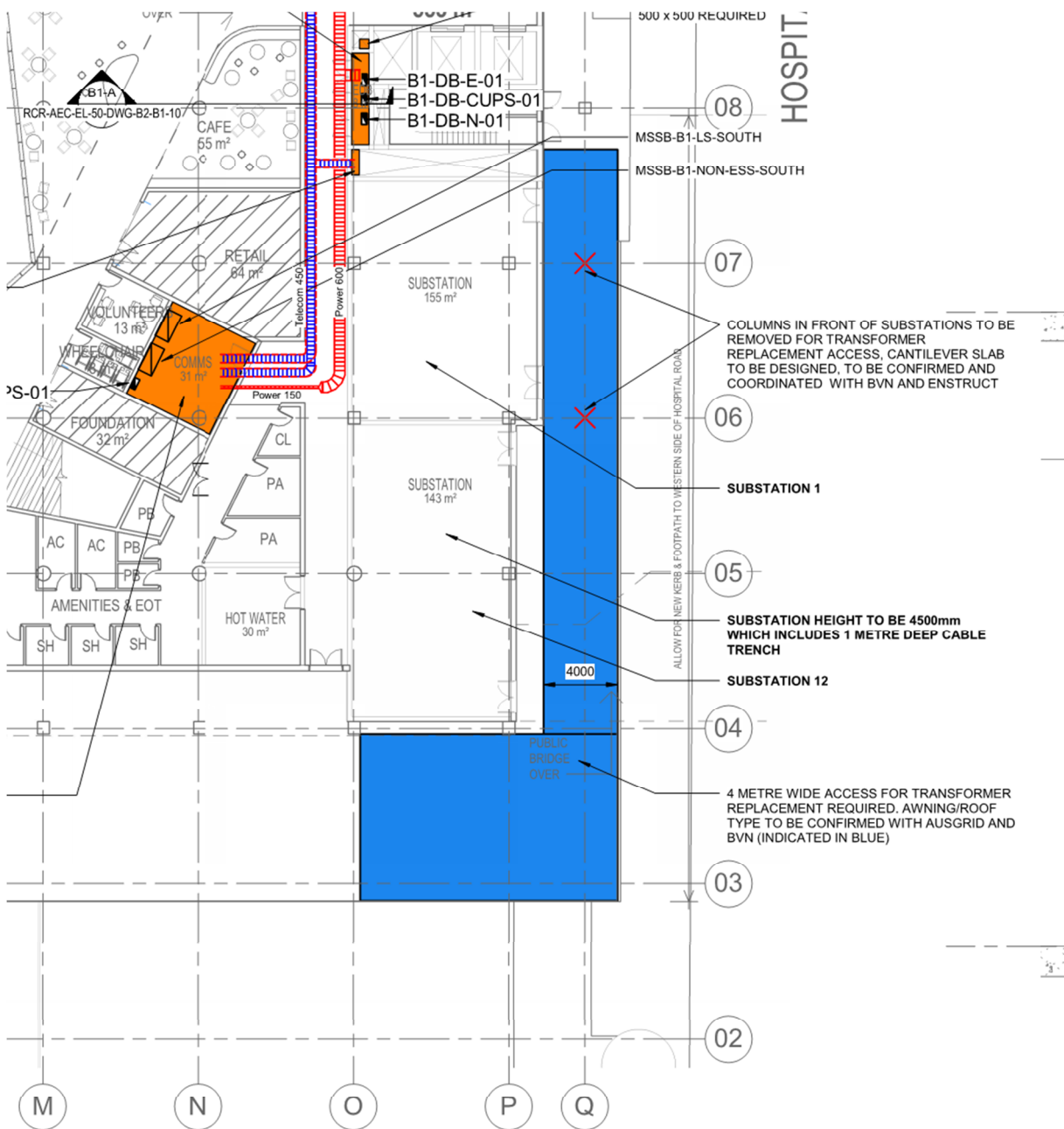


Figure 2 - Ausgrid Chamber Substations on Level B1

Each substation is to have dedicated switchroom which will supply the building via a series of dedicated electrical risers and distribution boards.

2.1.3 Generator Systems

Two separate generator systems to be installed to provide backup power supply to the two chamber substations in the new building. The generators are sized in accordance with the NSW Health Infrastructure Design Guidelines and AS/NZS 3009 – Electrical installations - Emergency power supplies in hospitals.

The two generator systems are to be located on Level 9 (plant level), refer Figure 3 – Level 9 Generator Plantroom in an acoustically modified and anti-vibration treated enclosure in accordance with the acoustic specialist recommendations.

Generator flues will exhaust vertically adjacent to the lift core and away from the helicopter flight path in accordance with the helipad specialist recommendations and AS1668.2. Flue locations will achieve sufficient separation from any residential properties in Magill Street or the existing Campus across Hospital Road. Each exhaust flue will be fitted with air and diesel particulate filters to meet EPA and Randwick City Council requirements.

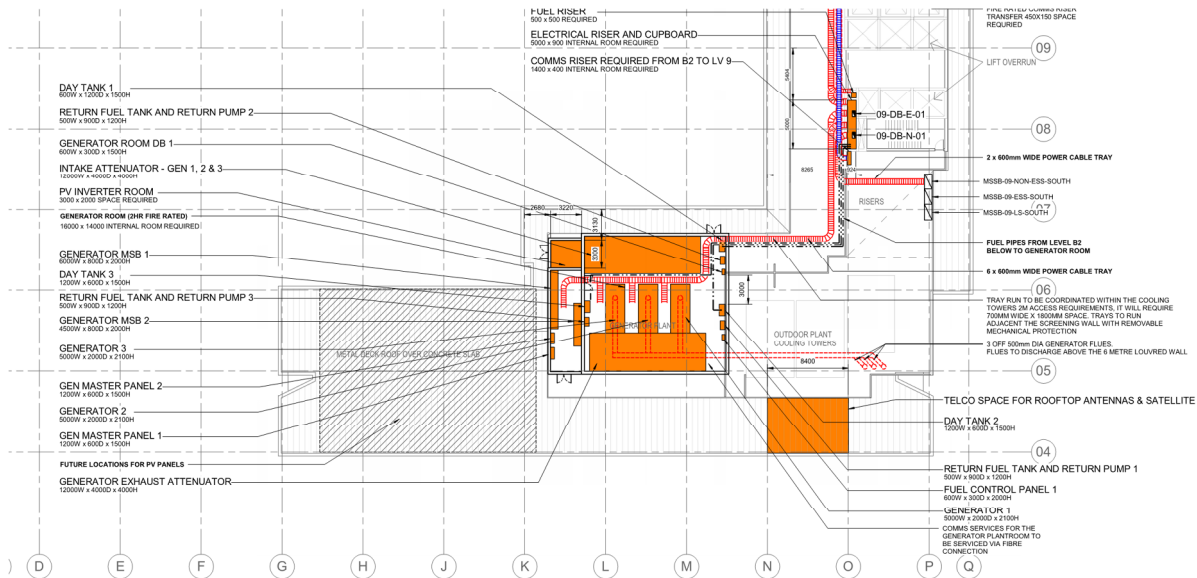


Figure 3 – Level 9 Generator Plantroom

An approximate 20,000L double skin tank will be buried underground external to the building adjacent to the new loading dock facing Magill Street, refer Figure 4 – Generator Systems Fuel Tank. The tank will be connected to the building pump room and network of fuel pipes to supply the generator located on Level 9. The installation will comply with AS/NZS 1940 – The storage and handling of flammable and combustible liquids. The double skin tank will be equipped with leak detection. An alarm will be registered in the fuel control panel both remotely and locally in case of leakage. Any leakage is to be contained within the secondary containment until maintenance crews arrive.

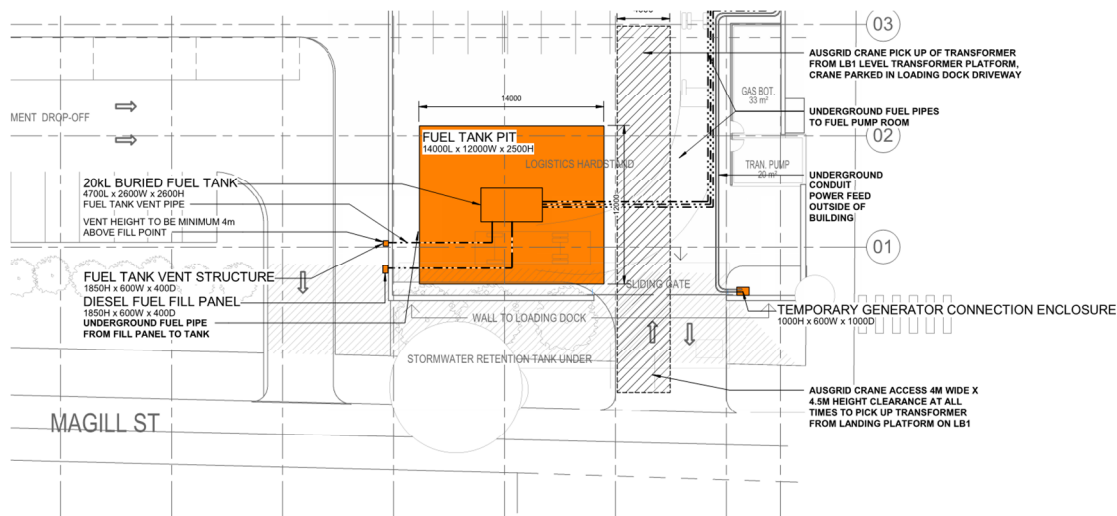


Figure 4 – Generator Systems Fuel Tank

2.1.4 Power services covered in separate approvals and stages of works

Additional modifications will be required on the existing infrastructure including:

- Extinguishing of existing Ausgrid overhead network on the new site and temporary builder supply
- Undergrounding of the existing Ausgrid overhead lines on Botany Street fronting the new site and the replacement of the existing street lighting with a new street lighting installation

These works were covered in the REF for the Randwick Health Campus Redevelopment Project under early and enabling works.

A 3km route related to trenching and installation works for the new HV feeders from Kingsford zone substation to the site boundary is being undertaken as a separate process in a joint venture arrangement with Ausgrid.

2.2 Telecommunication Services

2.2.1 Existing Telecommunication Infrastructure

Currently, telecommunications providers (Telstra, Optus and NBN) are servicing residential and non-residential properties located between Hospital Road, Magill Street, Eurimbla Avenue, Botany Street and High Street. Existing site telecommunications infrastructure does not meet the requirements for the ASB. Telecommunications providers will be decommissioning and removing existing telecommunications services as part of the early and enabling works REF.

Upgrade or replacement of in-ground infrastructure will be carried out at the discretion of the telecommunications providers on the current footpath allocations along Botany Street and Magill Street as part of the early and enabling works REF.

2.2.2 Proposed Telecommunication Infrastructure

A new telecommunications lead-in will be installed into the ASB. Each lead-in shall be designed as if providing connectivity to the Campus, the ASB and future predicted expansions on the Campus. This connection shall have large capacity and high redundancy. The new Campus Distributor Room (CDR) will be connected by two telecommunication exchanges through High Street and Barker Street.

2.2.3 Proposed Private Telecommunication Infrastructure

The ICT infrastructure is designed for high availability and capacity. There will be a new Campus Distributor installed on Level B2. This will connect to:

- Building 2B Campus distributor
- Building 6 Data Centre

- High Street lead-in
- Barker Street lead-in

Refer Figure 5 - Site Plan Proposed Telecommunications Infrastructure for the proposed communication services connecting the new ASB to the existing Campus including external connections to the telecommunication providers.

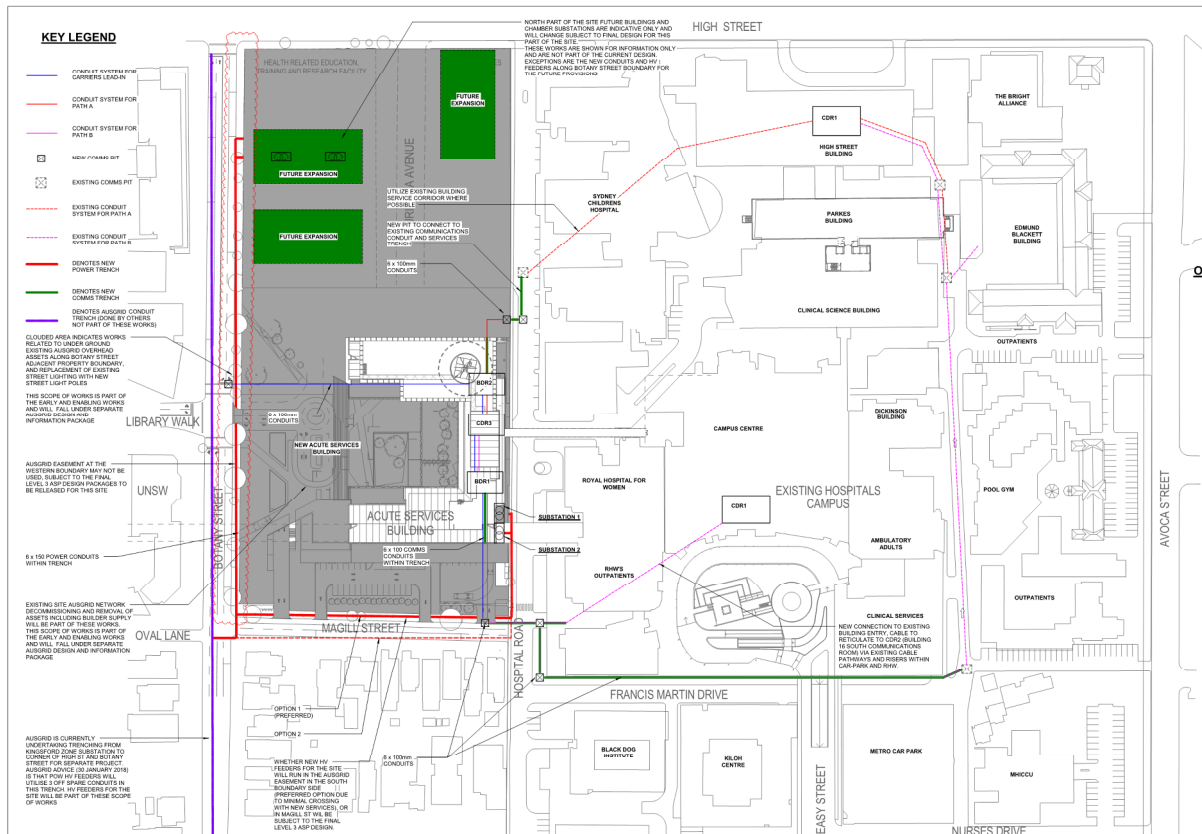


Figure 5 - Site Plan Proposed Telecommunications Infrastructure

2.2.4 Telecommunication services covered in separate approvals and stages of works

Additional modifications will be required on the existing infrastructure including:

- Telecommunication providers will decommission and remove existing telecommunication lines supplying residential properties located between Hospital Road, Magill Street, Botany Street and High Street.
- Some of the existing telecommunication services located on the footpath areas along Botany Street and Magill Street may need to be upgraded or replaced at discretion of the telecommunication providers in order to service the new hospital site.

These works were covered in the REF for the Randwick Health Campus Redevelopment Project under early and enabling works.

2.3 Ecologically Sustainable Development (ESD)

The following is a list of the ESD initiatives to be implemented for the ASB:

- Energy meters will be provided as a minimum to all areas as per NCC section J8 requirements. All meters will be connected to the central energy metering system.
- Daylight dimming will be utilised in all perimeter areas excluding clinical areas

- Motion sensors will be utilised in back of the house areas and offices, with exception to clinical areas and plantroom spaces.
- Low smoke zero halogen cabling and conduits are to be considered by the contractor if pricing is comparable to the best practice PVC materials.
- Solar photovoltaic (PV) installation is to be considered during detailed design in case PV cost drops to a level where payback period will be less than 7 years. Current SD documents show available roof space for future PV installation and inverter room.

3.0 Appendix A

DRAWING NUMBER	DRAWING TITLE
RCR-AEC-EL-50-DWG-A1-XX-00	ELECTRICAL SERVICES - ASB COVER SHEET & DRAWING LIST
RCR-AEC-EL-50-DWG-A1-XX-01	ELECTRICAL SERVICES - ASB LEGEND
RCR-AEC-EL-50-DWG-A2-XX-02	ELECTRICAL SERVICES - ASB POWER & COMMS SITE RETICULATION PLAN
RCR-AEC-EL-50-DWG-B2-B2-10	ELECTRICAL SERVICES - ASB LEVEL B2 SOUTH POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-B2-11	ELECTRICAL SERVICES - ASB LEVEL B2 NORTH POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-B1-10	ELECTRICAL SERVICES - ASB LEVEL B1 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-00-10	ELECTRICAL SERVICES - ASB LEVEL 00 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-01-10	ELECTRICAL SERVICES - ASB LEVEL 01 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-02-10	ELECTRICAL SERVICES - ASB LEVEL 02 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-03-10	ELECTRICAL SERVICES - ASB LEVEL 03 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-04-10	ELECTRICAL SERVICES - ASB LEVEL 04-07 TYPICAL POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-08-10	ELECTRICAL SERVICES - ASB LEVEL 08 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-09-10	ELECTRICAL SERVICES - ASB LEVEL 09 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-10-10	ELECTRICAL SERVICES - ASB LEVEL 10 POWER AND COMMS LAYOUT
RCR-AEC-EL-50-DWG-B2-B2-20	ELECTRICAL SERVICES - ASB LEVEL B2 SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-B1-20	ELECTRICAL SERVICES - ASB LEVEL B1 SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-01-20	ELECTRICAL SERVICES - ASB LEVEL 01 SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-02-20	ELECTRICAL SERVICES - ASB LEVEL 02 SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-03-20	ELECTRICAL SERVICES - ASB LEVEL 03 SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-04-20	ELECTRICAL SERVICES - ASB LEVELS 04-08 TYPICAL SECURITY ZONING LAYOUT
RCR-AEC-EL-50-DWG-B2-XX-4	ELECTRICAL SERVICES - ASB TELECOMMUNICATION SERVICE ROOMS DETAILS
RCR-AEC-EL-50-DWG-B2-XX-50	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - MAIN SWITCHBOARD NO.1
RCR-AEC-EL-50-DWG-B2-XX-51	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - MAIN SWITCHBOARD NO.2

DRAWING NUMBER	DRAWING TITLE
RCR-AEC-EL-50-DWG-B2-XX-52	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - MAIN SWITCHBOARD NO.3
RCR-AEC-EL-50-DWG-B2-XX-53	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - ICT UPS SYSTEM
RCR-AEC-EL-50-DWG-B2-XX-54	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - CLINICAL SERVICES UPS SYSTEM
RCR-AEC-EL-50-DWG-B2-XX-55	ELECTRICAL SERVICES - ASB POWER SINGLE LINE DIAGRAMS - GENERATOR SWITCHBOARD
RCR-AEC-EL-50-DWG-B2-XX-56	ELECTRICAL SERVICES - ASB SINGLE LINE DIAGRAM - TELECOMMUNICATION SERVICE
RCR-AEC-EL-50-DWG-B2-XX-57	ELECTRICAL SERVICES - ASB SINGLE LINE DIAGRAM - SECURITY