SYD 1 Stage 2

SEARs Infrastructure Requirements Report

GreenSquareDC

Reference: P529297

Revision: 2

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Document control record

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Document control		aurecon				
Report title		SEARs Infrastructure Requirements Report				
Document code			**Project number**		P529297	
File path		Https://aurecongroup.sharepoint.com/sites/529297/5_WorkingFiles/01 - Combined - Cross Disciplines/New SSDA/Infrastructure Requirements and Utilities/GreenSquare SYD1- Stage 2- Infrastructure Requirements and Utilities.docx				
Client		GreenSquareDC				
Client contact		Josh Martens	**Client reference**		Technical Director	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
1	2025-12-09	Test of Adequacy Submission	AS/ JN/ EP/AF	SK		KS
2	2026-05-22	SSDA Submission	AS/ JN/ EP/AF	SK		KS
Current revision		**2**				

Approval			
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1 Preface

1.1 Executive Summary

This 3 Brookhollow Avenue Infrastructure Report has been prepared by Aurecon on behalf of GreenSquareDC to accompany a detailed State Significant Development Application (SSDA) for the proposed data centre development located at 3 Brookhollow Avenue, Norwest (Lot 2021 DP 831173), within the Hills Local Government Area (LGA).

The site is situated in the Norwest locality, which features a mix of commercial, retail, and residential developments. Surrounding land uses include commercial office buildings, educational and residential facilities to the north; commercial and light industrial development to the east; commercial and medium-density residential areas to the south; and retail, transport, and mixed-use developments to the west, including the Norwest Marketown shopping centre and Norwest Metro Station.

The site is well connected by public transport, serviced by both bus routes and the Sydney Metro network, providing convenient access to Tallawong, Parramatta, Rouse Hill, Seven Hills, and the Sydney CBD. It is also in proximity to Strangers Creek, Brookhollow Reserve, and Norwest Lake, contributing to the area's established urban and landscape character.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and concludes that the proposed data centre development at 3 Brookhollow Avenue is appropriate for the site and warrants approval, subject to the implementation of the recommended mitigation measures outlined herein.

- Fuel tanks designed to comply with AS1940.
- Rainwater harvesting tanks and filtration to be implemented to supplement the site industrial water system.
- On-site fire water storage will be implemented to supplement the Sydney Water supply and ensure sufficient water is available for the fire suppression systems.

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

The proposed data centre is a mission-critical facility, and as such, it necessitates redundancy for its utility services, including electrical generation, water storage, and alternate routes for telecommunication conduits. The construction of the data centre will be carried out in stages to align with market demand.

The power supply arrangement will be from the new 132kV/33kV 120MVA substation. The substation is planned to be located within site in the eastern corner of the site. The substation will be fed from 132kV feeders.

The 33kV electrical supply will be distributed throughout the buildings within the site via client's own electrical infrastructure. Main 33kV switchgears will be provided in stages for efficient controls and protections.

Back up electrical supply comprises low voltage 2.5MW and 1.0MW standby generators. Each generator will be accommodated in a containerised generator enclosure with noise attenuation. The fuel storage will be deployed in stages, designed to comply with AS1940, and is sized to provide 24 hours of backup power.

The site's fire protection system includes a combined fire sprinkler and hydrant system, as well as fire detection and alarm systems throughout the building. The building will be provided with dedicated main fire panels equipped with alarm signalling equipment that transmits signals to a monitoring service, which in turn notifies Fire and Rescue NSW (FRNSW).

The fire suppression infrastructure, including on-site storage tanks, fire pumps, and booster assemblies, is centralised and designed to supply the entire site via a fire ring main network.

The fire water demand for the site has been calculated based on the most demanding fire scenario. The current fire suppression demand is met by the full-capacity on-site storage tanks, with the sprinkler and hydrant components supported by a minimum tank capacity of two 25,000 L tanks, each provided with an adequate automatic inflow from Sydney Water.

Considering the use of lithium-ion (Li-ion) batteries, an enhanced water supply has been incorporated into the design. The overall fire protection system strategy will be reviewed and endorsed by Fire and Rescue NSW (FRNSW).

The Telecommunications Pathways servicing the site consists of 5 main Points of Entry (PoE's), in Five physically diverse locations to provide maximum separation between adjacent pathways. Each of these external pathways provide capacity for 20 x P100 Conduits per pathway to provide adequate capacity to service all development stages. Internal Perimeter communications conduit pathways have 20 x P100 Conduits to provide pathways for all Lead-In and direct to riser communications cabling. Facilities Telecommunications pathways are provided within the internal perimeter of the site, consisting of 2 x P100 Conduits, paired with a equivalent quantity of LV conduits for power provisions.

1.2 Abbreviations and Glossary

Abbreviation	Definition
BCA	Building Code of Australia Certifier
BYDA	Before You Dig Australia
CFD	Computational fluid dynamics
DICL	Ductile Iron Concrete Lined Pipe
DN	Diameter Nominal
DtS	Deemed to Satisfy
FOC	Fibre Optic Cable
FoH	Front of House
FRNSW	Fire and Rescue New South Wales
HV	High voltage (66kV and above)
IT	Information Technology equipment, the payload
kL	Kilolitre
kPa	Kilopascal
kW	Kilo Watts
L	Litre
LV	Low voltage (415 volt)
MMR	Meet-Me-Room
MV	Medium Voltage (1kV to 66kV)
MVA	Mega Volt Ampere

Abbreviation	Definition
MW	Mega Watt
NCC	National Construction Code
no.	Number of
NY	Polyamide (Nylon) Pipe
PF	Power Factor
PUE	Power Usage Effectiveness $\frac{POWER_{total\ building}}{POWER_{IT}} = \frac{POWER_{IT} + POWER_{non-IT}}{POWER_{IT}}$
TSP	Total Service Plan
UG	Underground
UPS	Uninterruptable Power System
VC	Vitrified Clay Pipe

2 Introduction

2.1 Purpose of this Report

This report has been prepared on behalf of Project Garden 1 Pty Ltd as trustee for the Norwest Property Trust (the applicant) in support of a State Significant Development Application (SSDA) submitted to the Department of Planning, Housing and Infrastructure (DPHI) under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The SSDA seeks development consent for the construction and operation of a data centre, with a total power consumption of approximately 120MVA. The proposal will form part of a state-of-the-art data centre campus operated by GreenSquareDC, equipped to cater for growing data storage needs within Australia and the emergence of artificial intelligence (AI).

This report provides an assessment of infrastructure requirements and utilities and respond to the Secretary's Environmental Assessment Requirements (SEARs) issued by DPHI on 8 April 2025 in relation to the project. The SEARs requires the following in relation to the assessment of Infrastructure Requirements and Utilities.

Table 2-1 - SEARs Requirements

Item	Description of Requirement	Section Reference (this Report)
22. Infrastructure Requirements and Utilities	In consultation with relevant service providers: • Assess the impacts of the development on existing utility infrastructure and service provider assets surrounding the site. • Identify any infrastructure required on-site and off-site to facilitate the development and any arrangements to ensure that the upgrades will be implemented on time and be maintained. • Provide an infrastructure delivery and staging plan, including a description of how infrastructure requirements would be co-ordinated, funded and delivered to facilitate the development.	Existing Environment Servicing Strategies Section 7 Assessment of Potential Construction Impacts 8 Assessment of Potential Operational Impacts 9

This report will outline the technical impacts of the proposal on the existing public utilities within the proposal boundary and describes the proposed servicing strategy for the data centre. To satisfy the Secretary's Environmental Assessment Requirements (SEARs), this report contains the following information:

- Overview of existing utility services within the proposal boundary, including necessary protection measures.
- Estimated demand assessment for the proposed services.
- Description of infrastructure staging and delivery.
- Summary of any consultations undertaken with each service provider.
- Description of the proposed servicing strategy for each service.

3 The Site

3.1 Site Context

The site is known as 3 Brookhollow Avenue, Norwest and is in the Norwest locality, which forms part of the Hills Local Government Area (LGA). Development surrounding the site comprises of a mix of commercial, retail and residential land uses as described below:

- To the north of the site is Norwest Boulevard, commercial office buildings, an early learning centre, 'Castle Pines' retirement community and Castle Hill Country Club Golf Course;
- To the east of the site is Windsor Road, commercial office buildings, small pockets of residential development and industrial development;
- To the south of the site is Brookhollow Avenue, commercial developments, a hotel and medium density residential development; and
- To the west of the site is commercial development, including a shopping centre (Norwest Marketown), various retail offerings and the Norwest Metro Station.

The site is well serviced by public transport including bus and Metro. Norwest Metro Station provides connections to Tallawong in the northwest and Sydney CBD to the southeast. Bus stops along Norwest Boulevard provide connections through to Parramatta, Seven Hills and Rouse Hill.

As shown in the below mapping, the site is in proximity to Strangers Creek and Brookhollow Reserve, located at the site's southwestern border. Norwest Lake is located approximately 90m northwest of the site.

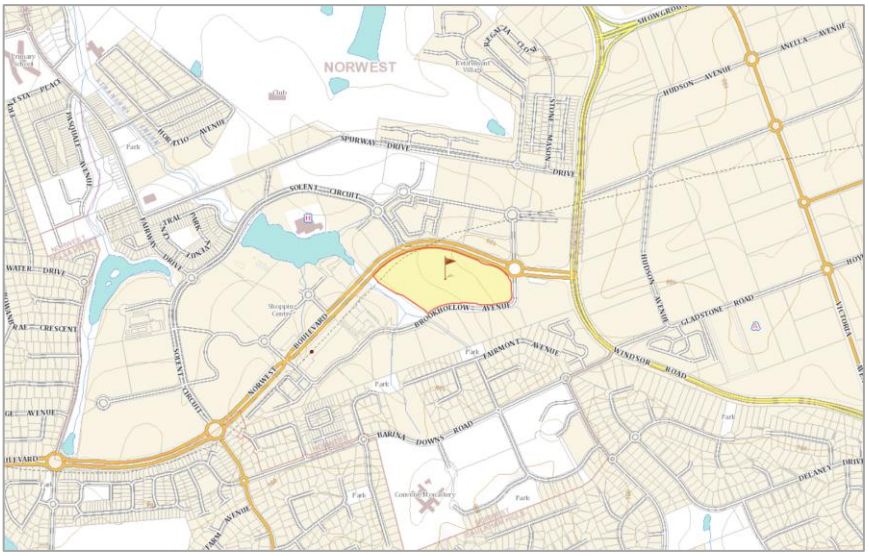


Figure 3-1 - Site context map

3.2 Site Description

The subject site is legally described as Lot 2021 of Deposited Plan (DP) 831173. The site can be described as irregularly shaped and has a total land area of approximately 51,867sqm. A portion of the site currently comprises an existing 4MW data centre that was approved under D93/318, dated 21 June 1993.

The site is bound by Brookhollow Avenue to the south and east, Brookhollow Reserve and the Hills Corporate Centre to the west and Norwest Boulevard to the North. The primary frontage of the site is to Brookhollow Avenue, where vehicular access is provided.

Based on a review of topographical mapping, the site appears to fall from east to west from a maximum height of RL104 in the northeastern corner of the site to RL82m along the western portion of the site.

The site is located approximately 500m to the east of the Norwest Metro station, with the metro line running under the north / northwest boundary of the site.

The site is heavily vegetated, however, none of the vegetation is mapped on the biodiversity values mapping prepared under the *Biodiversity Conservation Act 2016* (BC Act).

Refer to aerials of the site at Figure 3-2 below.

Figure 3-2 - Aerial of the site

3.3 Relevant approvals

There are several development approvals of relevance to the SSDA including:

- Complying Development Certificate (CDC): Certificate No. 25/250218-01 which provided consent for partial demolition of the existing data centre. The CDC was issued on 9 September 2025.
- Development Application for alterations and additions to existing data centre campus (1382/2025/JP) was approved by Council on 4 September 2025.
- Development Application for substation and bulk earthworks currently being prepared for submission to Council and expected for approval by June 2026.

3.4 CDC (certificate no. 25/250218-01) – demolition of existing internal structures

On 9 September 2025, a CDC, Certificate No. 25/250218-01, Council Reference 239/2026/PC was issued by Certatude, which provided consent for the partial demolition of the existing data centre. Specifically, the proposed works included the demolition of internal walls, access floors, slabs and roof, across Levels 1 to 4 of the existing data centre. The demolition works were required in order to facilitate the future Stage 1 development (1382/2025/JP).

The works have since been completed.

3.5 Stage 1 development application

Stage 1 approval was obtained from the Regional Planning Panel on 4 September 2025 under DA1382/2025/JP.

Stage 1 involves significant upgrades and refurbishment of an existing data centre facility that occupies the site previously operated by IBM. The works enable the repositioning of the existing dilapidated facility to be fit-for purpose and responsive to the evolving data storage demands of the market.

3.6 Substation and early works development application

A planning application is currently being prepared, which will seek approval for on-site power infrastructure, including a substation that will transform utility power supplied via a high voltage (132 kilovolts) line to medium voltage (33 kilovolts). The substation will comprise two main structures, a control building and two power transformers.

The substation is proposed to service Stage 1 (SYD01), with the intent to expand to Stage 2. Ahead of the construction of the substation, the intent is to connect Stage 1 to the 11 kv power supply before creating a new point of connection from the proposed substation, which will be established once constructed.

Supply infrastructure will be provided from an Endeavour substation located nearby and will be delivered to the site under Part 5 powers held by Endeavour as an Electricity Supply Authority.

3.7 Project Summary

This SSDA seeks development consent for the construction and operation of a data centre, with a total power consumption of approximately 96MW (IT load). The proposal will form part of a broader state-of-the-art data centre campus, equipped to cater for growing data storage needs within Australia and the emergence of artificial intelligence (AI).

In summary, approval for the following is sought:

- Minor excavation works beyond earthworks intended to be undertake under the separate Substation Development Application under assessment by The Hills Shire Council;
- Civil earthworks and the installation of relevant servicing infrastructure and utilities;
- Construction of a four (4) storey data centre with roof top plant, equating to an RL 130 and Gross Floor Area (GFA) of 16,191m2;
- Installation of 77 x diesel fuel generators and associated storage
- Provision of on-site car parking for approximately 25 spaces; and
- Landscaping, tree removal and offset tree planting.

The proposed development is depicted in the figure below, with full architectural details provided within the EIS, of which this report also forms an Appendix.

4 Policy and Planning Context

This chapter presents the relevant regulation, legislation, and policy governing the management of public utilities as it relates to the proposal.

4.1 Legislative Context

4.1.1 Commonwealth Legislation

- Telecommunications Act 1997
- Security of Critical Infrastructure Act 2018

4.1.2 New South Wales Legislation

- State Environmental Planning Policy (Transport and Infrastructure) 2021
- Protection of the Environment Operations Act 1997
- National Construction Code (NCC)
- Australian Standards
- Electricity Supply Act 1995
- Gas Supply Act 1996
- Water Management Act 2000

4.1.3 Guidelines

- Building over and adjacent to pipe assets, Sydney Water 2015
- Fire Safety guideline, access for fire brigade vehicles and firefighters, Fire and Rescue NSW (FRNSW) v05.01, November 2020
- Local council standards as applicable.

5 Methodology

This Chapter outlines the methodology used to define the baseline and undertake the environmental assessment of potential impacts of the proposal on public utilities including definition of the study area used as the basis of the assessment.

5.1 Study Area

The assessment area will be limited to the subject site (including site boundary).

5.2 Method of Assessment

To address the project SEARs as well as any points raised by the public utilities, the following methodology was used.

- Collate and review the latest Before You Dig Australia (BYDA) information, as well as any other publicly available utility data.
- Assess proposed site layout against any public utility infrastructure within the proposal boundary and identify any necessary diversion or protection works.
- Undertake demand assessments for each core utility serving the data centre.
- Develop a site plan considering the key on-site utility infrastructure required to service the data centre, including identifying potential easements and rights of way.

6 Existing Environment

6.1 Electrical Services

Existing MV underground ducts serve the existing building at the west of the site. The ducts traverse the site from north-west to south-east. This reticulation and its associated easement are being decommissioned and extinguished. The MV reticulation to the existing building will be upgraded and re-run as part of that project.

There is a small easement at the northern side of the site which houses a small kiosk substation serving the area outside the site, for street lighting and similar local loads.

There is an additional local substation at the south of the site, outside the site boundary.

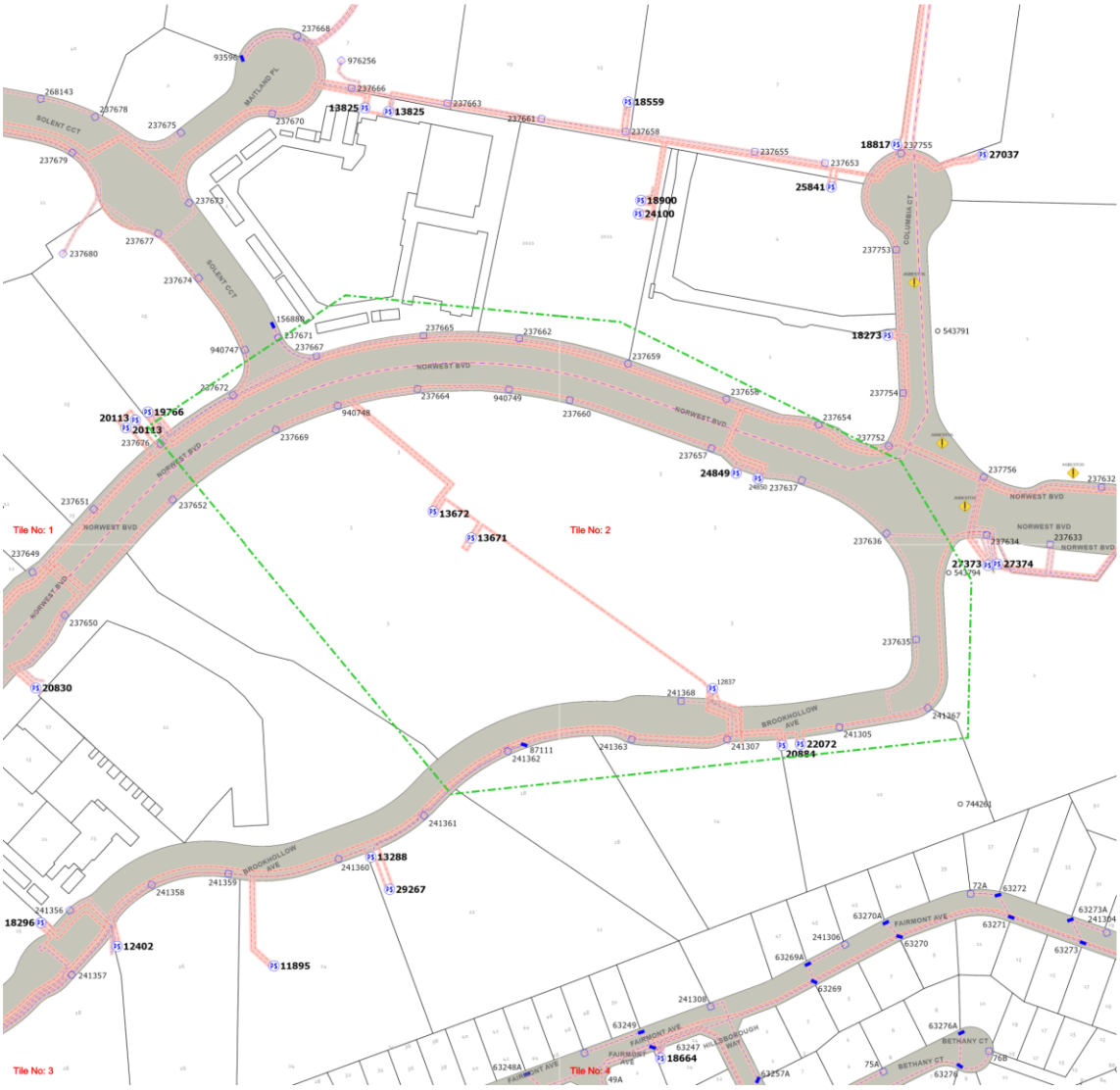


Figure 6-1 - Before You Dig Australia Plan for Site - Electrical

6.2 Water Services – Sydney Water

Our assessment of the current information from Sydney Water indicates a 250mm DICL existing potable water main runs along the Norwest Boulevard on the northern side of the project site, while a 150mm DICL existing potable water main exists within Brookhollow Avenue on southern side of the site, intersecting with the 250mm main at the eastern boundary.

The project site has existing water connection from Brookhollow Avenue for Stage 1 building.

The image below indicates the location of the existing Sydney Water asset. Pending Sydney Water consultation, connection into Sydney Water main will occur within Norwest Boulevard.

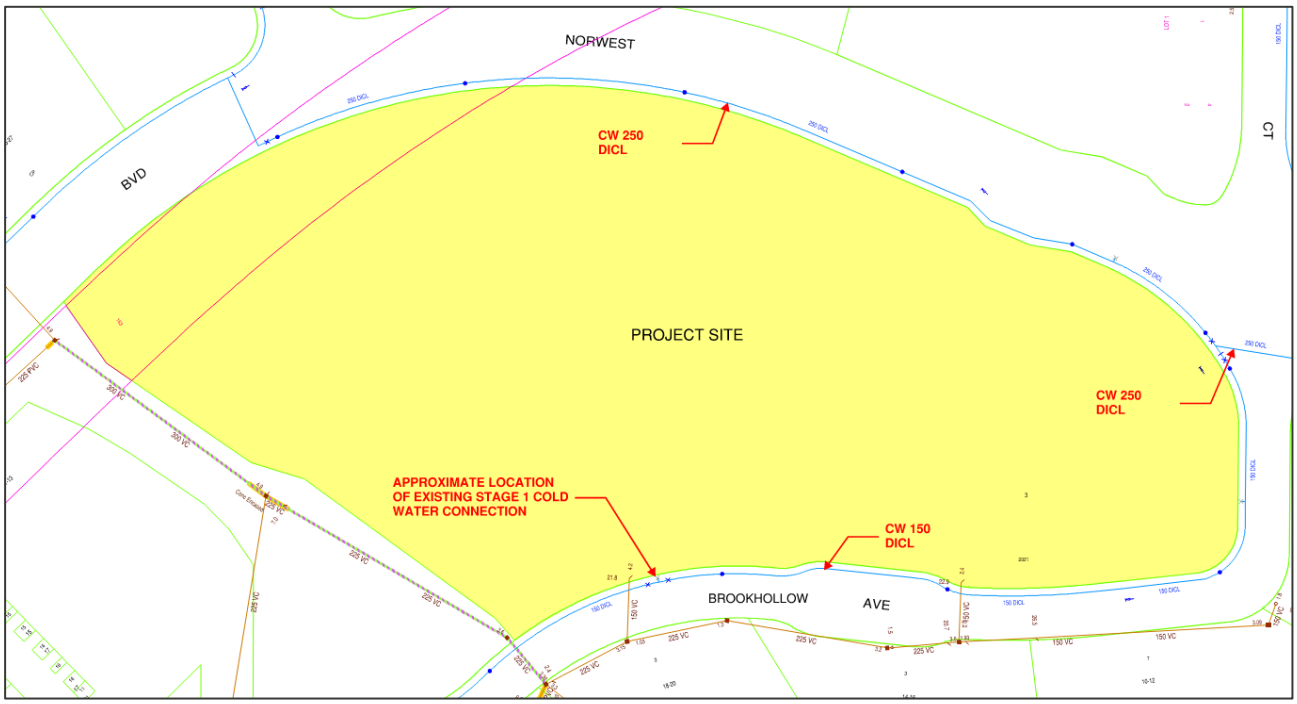


Figure 6-2 - Water assets in proximity to the site (Sydney Water BYDA plan)

6.3 Sewer Services – Sydney Water

Our assessment of the current information from Sydney Water indicates a 150mm VC existing gravity sewer main connection provision is located within the site, discharging into a 225mm VC gravity sewer main downstream within Brookhollow Avenue.

The project site has an existing sewer connection from Brookhollow Avenue for the Stage 1 building.

The image below details the location of the existing Sydney Water sewer asset. Subject to consultation with Sydney Water, the connection to the main for Stage 2 will be made at the provided sewer main connection within the Stage 2 area of the project site.

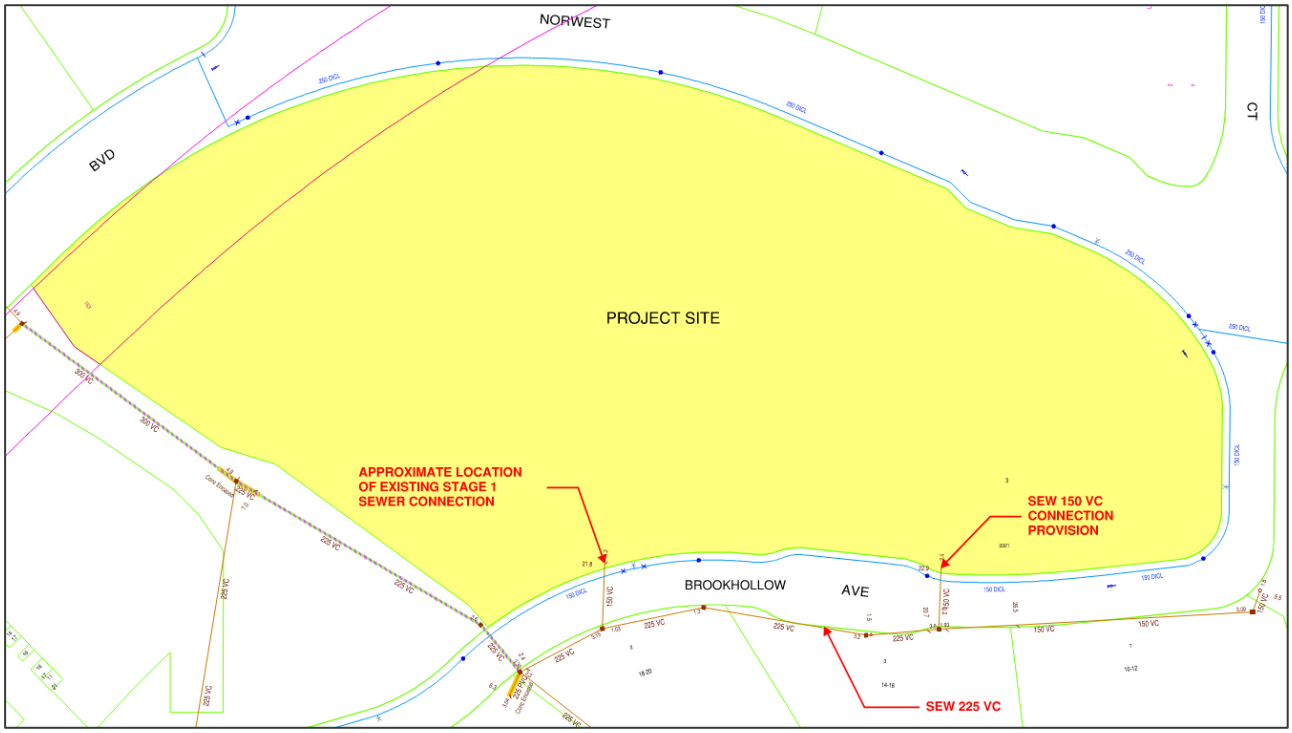


Figure 6-3 - Sewer Assets in proximity to the site (Sydney Water BYDA plan)

6.4 Communications Services

The existing site has Telecommunications Carrier pathways along the two surrounding streets, services identified within these adjacent streets are provided below.

Norwest Blvd: Based on BYDA documents received, it appears that the TSP has their Fiber Optic Cables (FOC) runs along the southern side of Norwest Blvd, which wraps around the north of the property boundary. This is shown on the following utilities:

- NBN
- Optus – with existing lead in pathways shown into building A.
- Telstra – with existing lead in pathways shown into building A
- TPG Telecom
- Vocus

Brookhollow Ave: Based on BYDA documents received, it appears that the TSP has their FOC runs along the Northern side of Brookhollow Avenue, which wraps around the south and east side of the property boundary. Brookhollow tracks north, these runs transition to the opposite side of Brookhollow Avenue. This is shown for the following utilities:

- NBN
- Optus - with existing lead in pathways shown into building A.
- Telstra – with existing lead in pathways shown into building A
- TPG Telecom – South East Corner only.
- Vocus

6.5 Gas Services

BYDA information received from Jemena shows a medium pressure gas pipeline (50 NY @250kPa expanding to 160 NY@250kPa) running along the Brookhollow Avenue approximate 13m away from the

northern site boundary, while 150PE @ 250kPa running shallow within Norwest Boulevard This pipes are approximately 23m away from the southern site boundary.

The site does not propose to utilise gas and as such will not be connecting to the gas main.

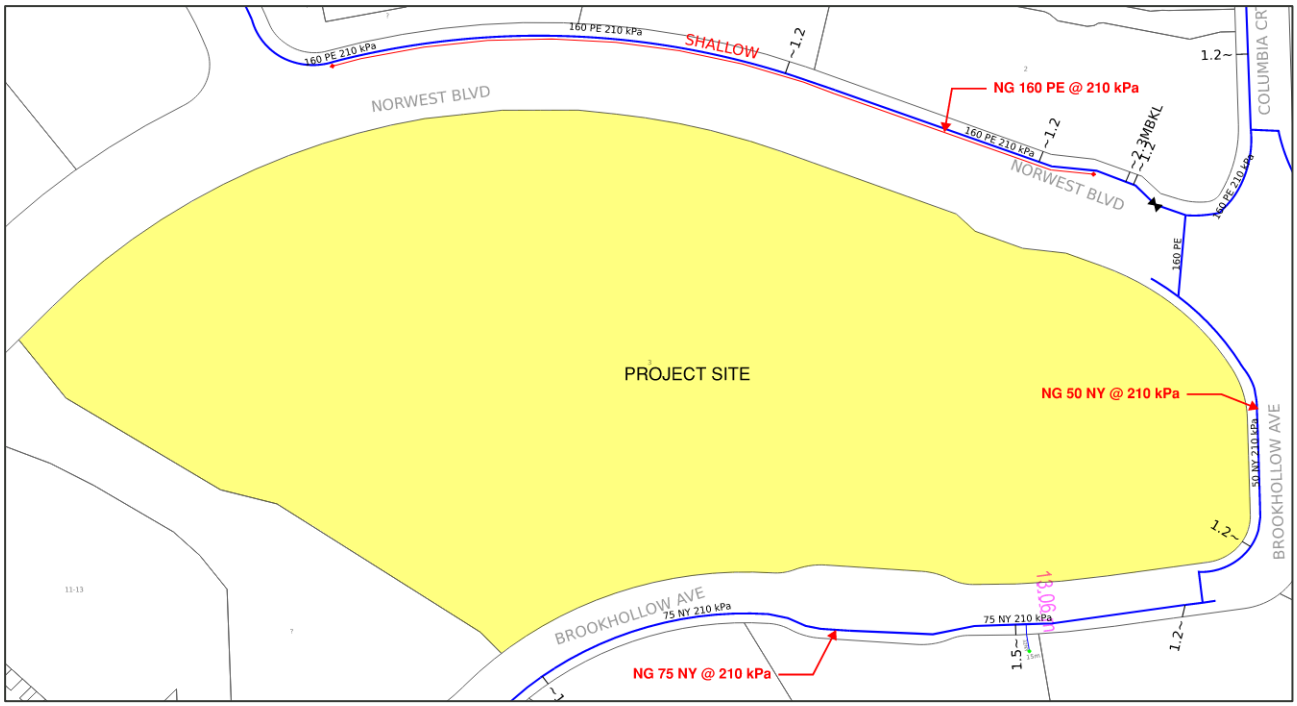


Figure 6-4 - Natural Gas Assets in proximity to the site (Jemena BYDA plan)

6.6 Existing Stormwater Assets

There are no existing stormwater assets identified on site.

6.7 Traffic Signals

Refer to the Traffic Report for information regarding Traffic Signals.

6.8 Backup Power Services

Selected Power Generation Technology

The Proponent has opted for reciprocating diesel-generator sets for the backup power source for the proposed site. This is based on being the most appropriate technology for a mission critical data centre and the market readiness for this technology in New South Wales. Alternatives have been considered for this site, but none are considered viable except for alternative fuel for the generator engines.

Alternatives Considered

Aurecon has previously investigated several options for backup power supply technologies for data centre applications in terms of suitability for deployment in data centres, technological maturity in Australia, and viability for the site (Aurecon, 2022).

Potentially Suitable for Deployment

This sectionTable 6-1 describes the potential backup supply technologies, rates their technology maturity, and provides a recommendation on their suitability for data centres.

As outlined in the table, the following technologies were recommended as potentially suitable for deployment as long duration backup supply in data centres:

- Lithium-ion batteries
- Vanadium redox flow batteries
- Diesel generators with renewable diesel (HVO) as a fuel
- Open Cycle Gas Turbines (OCGT) or Reciprocating Engines with natural gas as a fuel
- Hydrogen Fuel Generators

Table 6-1 - Backup Power Options Analysis Summary

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
Lithium-ion battery	• Lithium-ion batteries uses a cathode (positive electrode), an anode (negative electrode) and electrolyte as conductor. Li-ion battery cells come in many varieties – but all use lithium ions. During charging the lithium ions flow from the cathode to the anode through the electrolyte and separator. When discharging the flow of ions reverses from the anode to the cathode.	• **High** - Lithium-ion batteries have been widely deployed in electric vehicles and are increasingly being deployed as stationary storage for grid applications.	• **Potentially suitable** - The high energy and power density, proven performance and declining costs of lithium-ion batteries make it an attractive option as a backup energy source. • Required physical footprint, standby power consumption and fire risk management to be considered. Fire prevention and protection requirements shall be in accordance with the regulatory requirements at the design time. Possible risk assessment might also be required because of the Li-ion batteries.	• Capex costs drop per MWh to levels in line with alternatives • Space requirements reduce (unlikely for this tech)	Due to the spatial requirements of Lithium-ion batteries for both fire-separation, fuel separation, and general safety requirements, it is difficult to provide enough battery storage to the site for a medium-term power failure. The current provision for battery storage on site is for short-term supply and energy storage only, to facilitate the switch between utility supply and the backup power supply if interruption to utility occurs (up to 5 minutes only). Thus, this technology is **not viable** be used as a standalone backup power supply for this site.
Vanadium redox flow battery	• Flow batteries store energy in electrolytes in electrolyte tanks. The active material of flow batteries comprises of	• **Low / Moderate** – Limited number of vanadium redox flow batteries in commercial	• **Potentially suitable** – Vanadium redox flow batteries are well suited to long duration storage	• Capex costs drop per MWh to levels in line with alternatives	**Not viable** for this site due to commercial availability and scale required to achieve energy autonomy on site during utility failure.

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	electrolyte solutions that are stored in tanks. The electrolyte is pumped through a reaction stack of electrochemical cells, in which charge, and discharge reactions take place at electrode surfaces. • Vanadium redox is the leading flow battery technology in terms of technical and commercial readiness.	deployment. Most deployments are currently 10-20MWh in energy storage capacity. One 800MWh project is planned is under construction in China.	(4+hrs) by increasing the size of the electrolyte tanks. Cost per MWh expected to decrease as storage duration increases. • Higher costs and bigger physical footprint required compared to lithium-ion batteries.	• Space requirements reduce (unlikely for this tech) but potential to stack to reduce m2 requirements, potentially advantageous over lithium ion batteries	
HVO renewable diesel fuel	• Biodiesel is produced from a diverse mix of resources including vegetable oils (corn, soybeans, rapeseed, palm etc.), animal fats (beef tallow, pork lard etc.), and recycled cooking oil. • Conventionally feedstock goes to a transesterification process and becomes biodiesel, which can be blended with petroleum diesel. • Advanced methods such as hydrotreatment, gasification, and pyrolysis can be used to produce 'drop in' biofuels. These biofuels are chemically the same as petroleum diesel	• **Moderate** – The biodiesel supply chain is still a localised industry, with some regions having higher biodiesel availability due to access to feedstock, or government mandates. No large scale HVO supply chain or policy support exists yet in Australia. ~440ML of biodiesel produced p.a. (not all are HVO)	• **Potentially most suitable short-term solution** – Biodiesel blends and renewable diesel that are compatible with the existing diesel generator infrastructure. • Biodiesel has lower emissions compared to petroleum diesel. Full lifecycle emissions are dependent on the feedstock source.	• Supply chain readiness in Sydney & AU around HVOs • Confirm high volume of diesel tanker trucks are possible to site for refills	• **Moderate viability** - This site is proposed to use diesel generators and HVO renewable diesel fuel could be used in lieu of standard diesel fuel subject to local supply chain availability.

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	fuel and is compatible with existing infrastructure designed around petroleum.				
Natural gas fuel	• Natural gas as a fuel source, can be used as a backup power source through gas turbines generators. • Gas turbine generators draw air into the engine and combusts the fuel to produce a high-pressure gas. This gas expands and rotates the turbines to produce electricity. • Can also be used as fuel in fuel cells (e.g. Bloom Energy)	• **High/ Moderate -** Natural gas has a mature global supply chain, with gas turbines widely deployed in electricity grids around the world.	• **Potentially suitable** - Gas turbines are a proven technology. Fuel delivery can be through existing gas pipelines. • Natural gas has slightly lower emissions compared to petroleum diesel • Fire detection and suppression requirements as a standalone infrastructure will need to be considered to suit the NG turbine plans.	• Environmental approvals possible: depends on exact technology selected, expected usage, emissions profile, noise outputs, etc • Pipeline capacity confirmed as feasible, impacting transmission throughout Sydney / Newcastle given other gas plants planned for the area	• **Not viable** – the technology requires more space than is currently possible on site compared to other solutions due to increased cooling/ventilation requirements. The impact of a 500MW gas turbine on existing natural gas pipelines may require significant upgrades in the area.
Hydrogen fuel	• Hydrogen can be used as a fuel sourcewhen using fuel cells. A fuel cell consists of a negative electrode (anode) and a positive electrode (cathode) sandwiched around an electrolyte. • A catalyst at the anode separates hydrogen molecules into protons and	• Moderate – The hydrogen production, delivery and storage supply chain are still immature, but progress is accelerating. One data centre owner is trailing a 3MW hydrogen fuel cell.	• Potentially suitable - Highly dependent on further cost reductions and the emergence of an established supply chain • Hydrogen storage and delivery requires detailed planning to	• Safety exclusion zones for storage addressed – large site required • H2 supply chain established, including market to contract supply • H2 pipeline established,	• **Not Viable** – significant spatial requirements of industrial tanks for 24-48 hours of hydrogen fuel on site. No current hydrogen pipeline would be possible within site development timeframe. Additional safety requirements for hydrogen usage on site. Safety

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	electrons, which then flow to the cathode through different paths. The electrons go through an external circuit, creating a flow of electricity. The protons migrate through the electrolyte to the cathode, where they unite with oxygen and the electrons to produce water and heat.		ensure safety and reliability • Case-by-case fire and risk assessment studies need to be considered. • Storage likely to trigger Major Hazard Facility requirements	including safety and operational concerns addressed • Capex costs drop per MWh to levels in line with alternatives	considerations for nearby residential areas.

7 Servicing Strategies

This chapter provides details on the service requirements and outlines the proposed servicing strategies for the development.

The proposed development is a data centre which necessitates a controlled system where temperature environment can be optimised to ensure the safe functioning of the highly loaded equipment within data halls. Consequently, there is a high demand for both electrical and water resources, with fluctuations throughout the year depending on ambient temperatures.

Additionally, the substantial telecommunication infrastructure including cable pulling pits and underground conduits is required for effective operation of such development.

These additional demands can be met by either upgrading the existing utility infrastructure or adding dedicated infrastructure connected to the main utility source. Further details are described in the next sections.

Major on-site infrastructure required to serve the data centre includes:

- Back-up electrical generators
- Mechanical makeup water storage tanks and pumps
- Fire water storage tanks and pumps
- Connection points to estate and precinct infrastructure

7.1 Electrical Infrastructure and Back-Up Generators

The site is to be serviced by dedicated feeders from Endeavour Energy's network. These feeders will be owned and operated by Endeavour Energy. They will be designed and constructed through the NSW Contestable Works framework and fall under Endeavour Energy's Part 5 assessment obligations. The two feeders will originate at the Rouse Hill switching station and the West Castle Hill zone substation. The feeders reticulate to the site through a combination of overhead and underground cable paths routed through existing electrical easements.

See Figure 7-1 for routing details of the feeders.

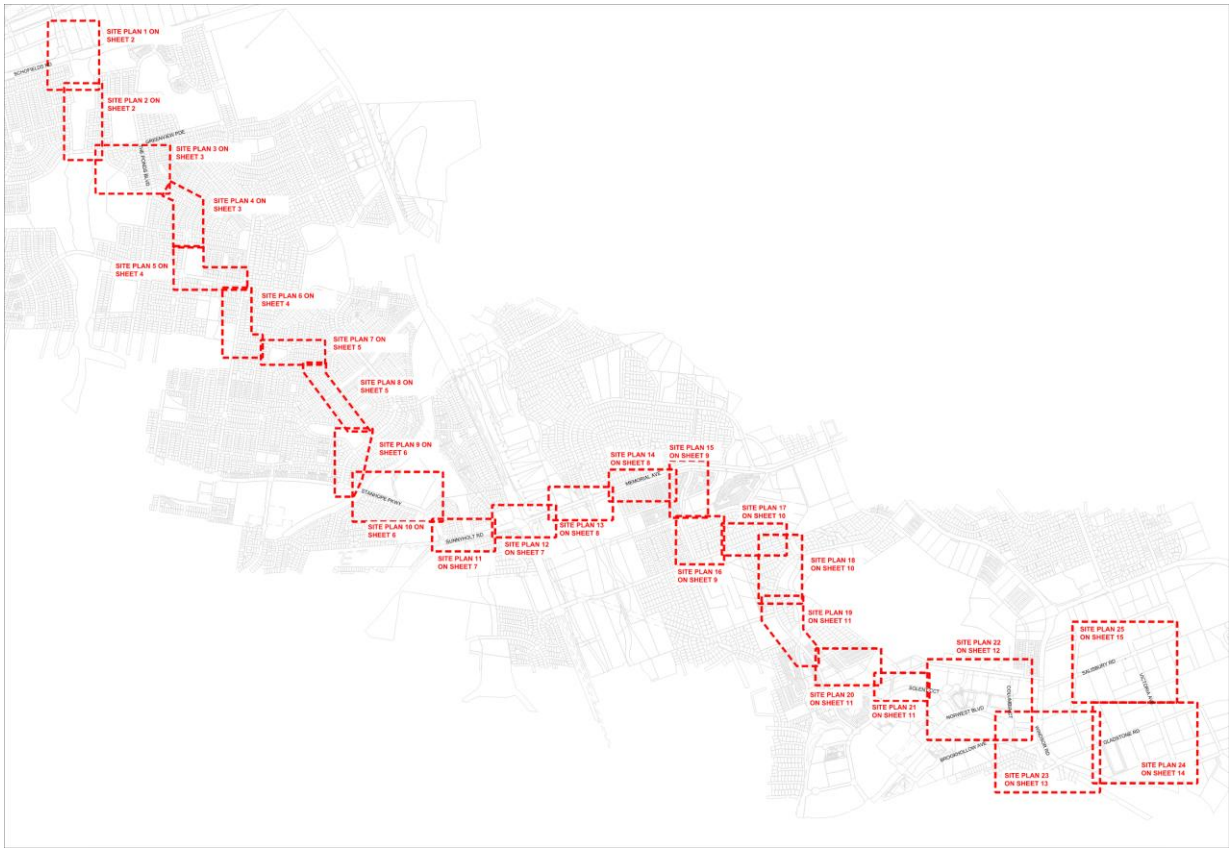


Figure 7-1 - 132kV Feeder Routes

The new development is proposed to be supplied by a new site-dedicated 132kV/33kV substation. The power supply will be distributed within the site via the client's own underground electrical infrastructure. See Figure 7-2.

The substation is subjected to a separate development consent.

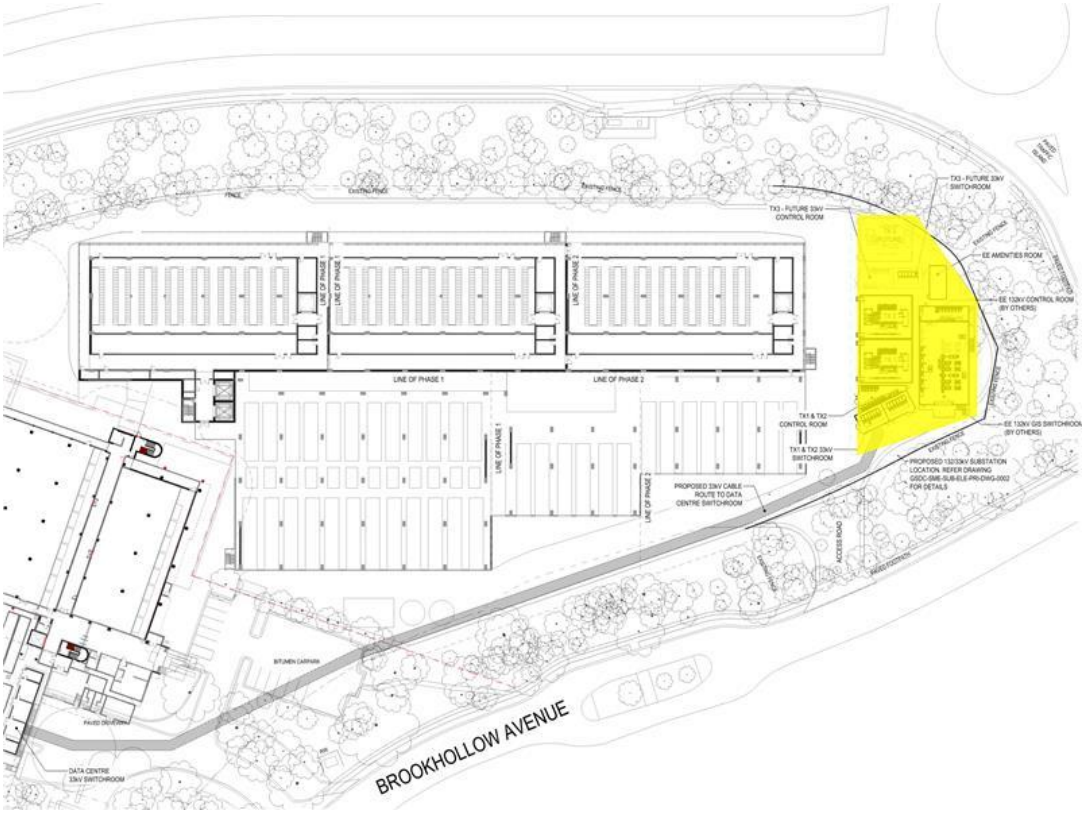


Figure 7-2 - Location of Dedicated Substation (Yellow) within Site

The development comprises one new building to be constructed in three phases. Substation will be built in preparation for Phase 1 construction work.

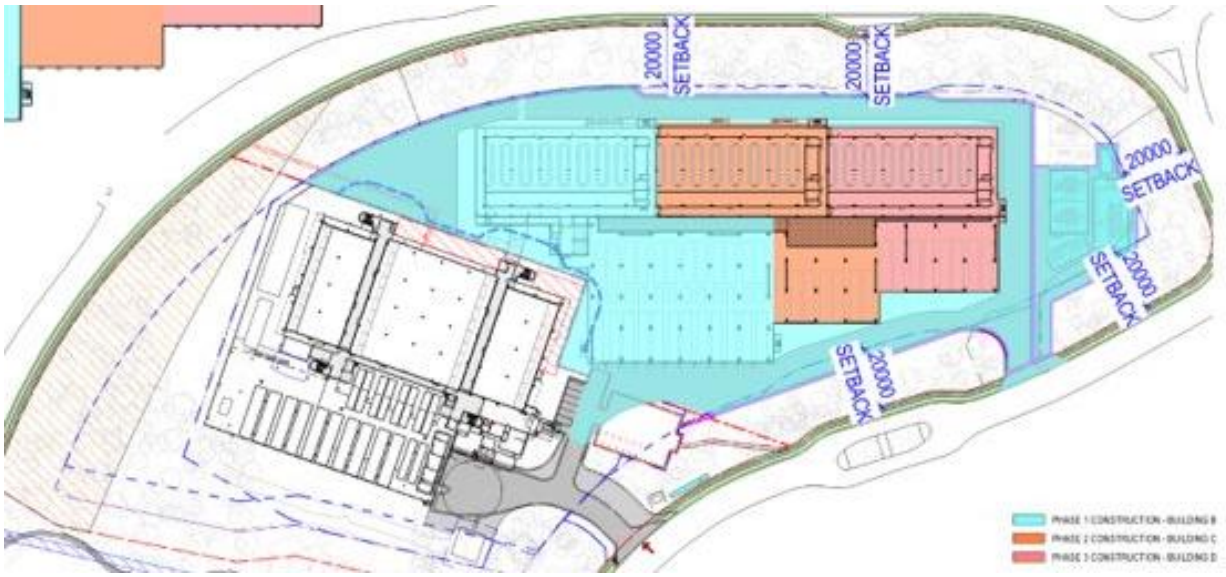


Figure 7-3 - Site Plan Showing the Construction Phasing

The data centre is a mission critical facility and therefore requires back up generation. Each building will be provided with diesel-generators and uninterrupted power supply (UPS) systems.

All generators will be housed in a prefabricated, acoustic rated, generator enclosure with fuel day-tanks. All the generator enclosures will be free-standing on the external gantry area. UPSs are proposed to be accommodated within prefabricated electrical switch rooms, also containing the batteries, and located on the external gantry area. Bulk fuel storage will be in tanks in dedicated rooms at the lowest level of the building.

Details of the proposed backup generation system is described in Section 7.1.5.

7.1.1 Demand Estimate

The power supply requirements of the Facility are dictated by the power loads:

- Building B: 4x 8MW (max) IT data halls and Front of House
- Building C: 4x 8MW (max) IT data halls
- Building D: 3x 10MW (max) IT data halls

In addition to the IT loads driving the demand, there will be additional load to cool the facility, proportional to the IT loads. Base building services will be generally independent of IT loading.

The preliminary maximum demand calculation is provided in the table below.

Table 7-1 - Preliminary Site Electrical Maximum Demand Calculation

	MW	PF	MVA
Front of House	0.3	0.98	0.3
Building B	40.0	0.98	40.8
Building C	40.0	0.98	40.8
Building D	38.0	0.99	38.3
Total	**118.3**		**120.2**

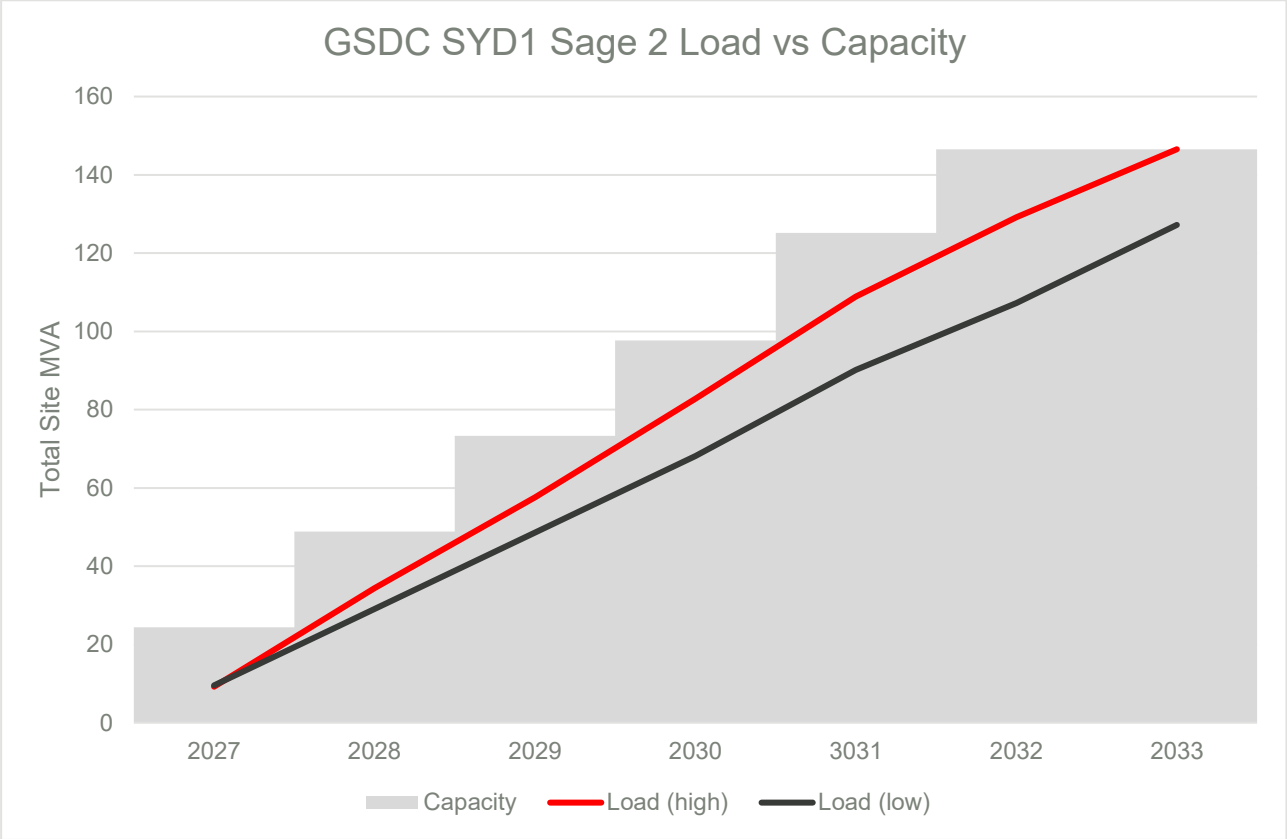


Figure 7-4 - Load Growth Projection

7.1.2 On Site Electrical Infrastructure

The electrical infrastructure for the proposed development is to be delivered in a stages approach, by the establishment of a new 132kV/33kV substation.

The first stage of the substation will see two incoming 132kV feeders brought to site. These will terminate onto the site's 132kV switchgear, and feed into a part of 120MVA transformers which will step down the power to 33kV. 33kV switchgear will supply feeds to the data centre building, which will have internal 33kV switchboards to efficiently distribute power throughout the building.

7.1.3 Consultation

The consultation is underway. The substation is subjected to a separate development consent. It is our understanding that a meeting with Council is scheduled in this regard.

7.1.4 Connection

The 132kV supply routes are outside the subject site boundary and will be approved under the utility authority's own permitted development rights. The 132kV switchgear within the substation will belong to GrenSquareDC, and the point of connection will be at the incoming terminals of the switchgear.

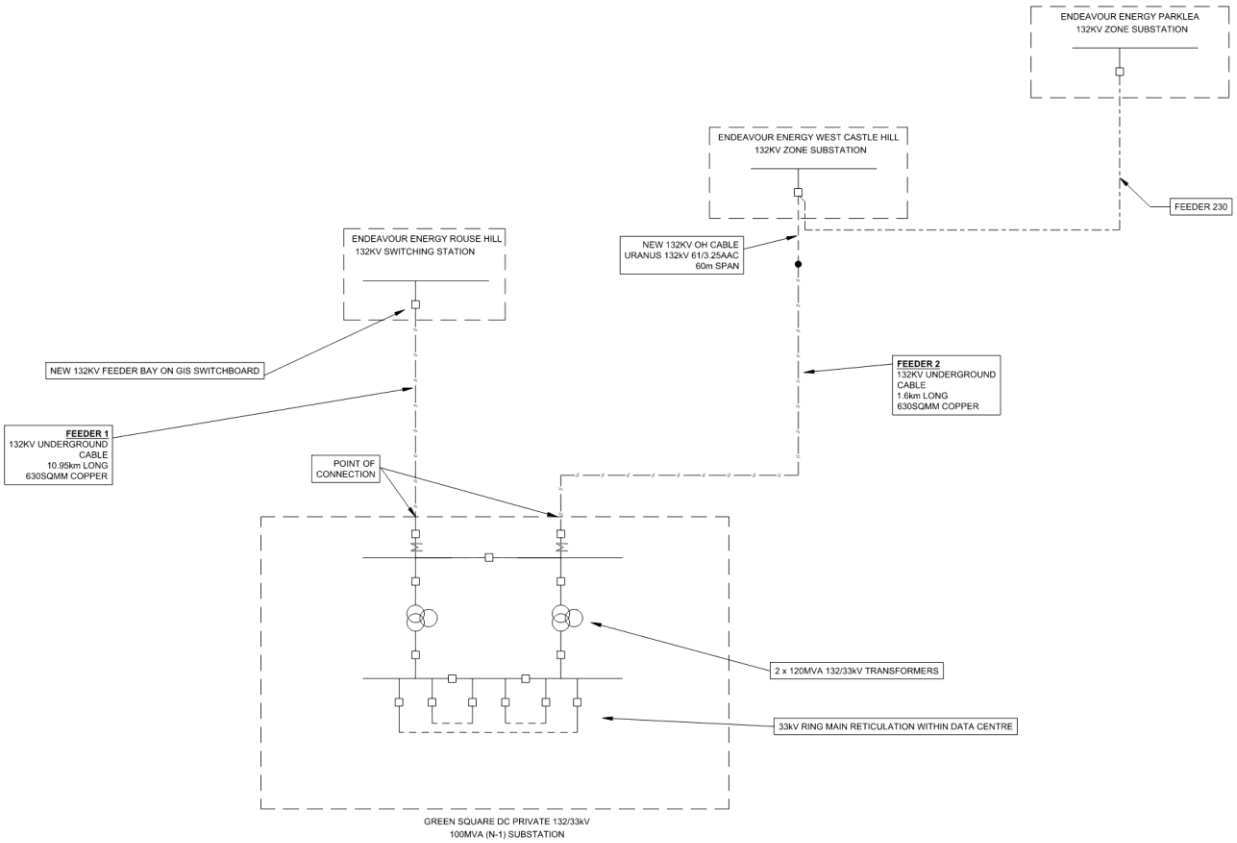


Figure 7-5 - Schematic Diagram of 132kV Feed to Site

The reticulation of the cables to the site will be through existing electrical easements. The incoming underground cables will be installed in newly created easements within the site boundary.

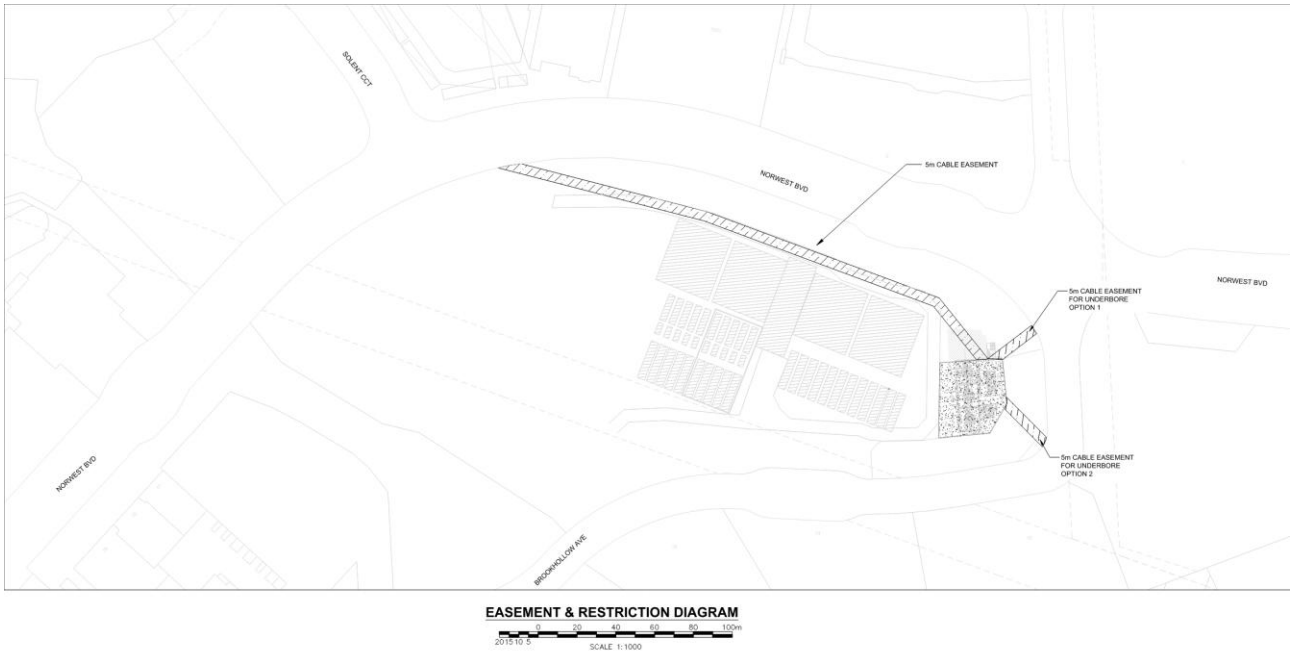


Figure 7-6 - Easement and Restriction Diagram

7.1.5 Backup Generators

Selected Power Generation Technology

The Proponent has opted for reciprocating diesel-generator sets for the backup power source for the proposed site. This is based on being the most appropriate technology for a mission critical data centre and the market readiness for this technology in New South Wales. Alternatives have been considered for this site, but none are considered viable except for alternative fuel for the generator engines.

Alternatives Considered

Aurecon has previously investigated several options for backup power supply technologies for data centre applications in terms of suitability for deployment in data centres, technological maturity in Australia, and viability for the site(Aurecon, “Low carbon Backup Options,” Aurecon, Sydney, 2022.)

Potentially Suitable for Deployment

Table 7-2 describes the potential backup supply technologies, rates their technology maturity, and provides a recommendation on their suitability for data centres.

As outlined in the table, the following technologies were recommended as potentially options for deployment as long duration backup supply in data centres:

- Lithium-ion batteries
- Vanadium redox flow batteries
- Diesel generators with renewable diesel (HVO) as a fuel
- Open Cycle Gas Turbines (OCGT) or Reciprocating Engines with natural gas as a fuel
- Hydrogen Fuel Generators

Table 7-2 - Backup Power Options Analysis Summary

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
Lithium-ion battery	• Lithium-ion batteries uses a cathode (positive electrode), an anode (negative electrode) and electrolyte as conductor. Li-ion battery cells come in many varieties – but all use lithium ions. During charging the lithium ions flow from the cathode to the anode through the electrolyte and separator. When discharging the flow of ions reverses from the anode to the cathode.	• **High** - Lithium-ion batteries have been widely deployed in electric vehicles and are increasingly being deployed as stationary storage for grid applications.	• **Potentially suitable** - The high energy and power density, proven performance and declining costs of lithium-ion batteries make it an attractive option as a backup energy source. • Required physical footprint, standby power consumption and fire risk management to be considered. Fire prevention and protection requirements shall be in accordance with the regulatory requirements at the design time. Possible risk assessment might also be required because of the Li-ion batteries.	• Capex costs drop per MWh to levels in line with alternatives • Space requirements reduce (unlikely for this tech)	Due to the spatial requirements of Lithium-ion batteries for both fire-separation, fuel separation, and general safety requirements, it is difficult to provide enough battery storage to the site for a medium-term power failure. The current provision for battery storage on site is for short-term supply and energy storage only, to facilitate the switch between utility supply and the backup power supply if interruption to utility occurs (up to 5 minutes only). Thus, this technology is **not viable** be used as a standalone backup power supply for this site.
Vanadium redox flow battery	• Flow batteries store energy in electrolytes in electrolyte tanks. The active material of flow batteries comprises of	• **Low / Moderate** – Limited number of vanadium redox flow batteries in commercial	• **Potentially suitable** – Vanadium redox flow batteries are well suited to long duration storage	• Capex costs drop per MWh to levels in line with alternatives	**Not viable** for this site due to commercial availability and scale required to achieve energy autonomy on site during utility failure.

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	electrolyte solutions that are stored in tanks. The electrolyte is pumped through a reaction stack of electrochemical cells, in which charge, and discharge reactions take place at electrode surfaces. • Vanadium redox is the leading flow battery technology in terms of technical and commercial readiness.	deployment. Most deployments are currently 10-20MWh in energy storage capacity. One 800MWh project is planned is under construction in China.	(4+hrs) by increasing the size of the electrolyte tanks. Cost per MWh expected to decrease as storage duration increases. • Higher costs and bigger physical footprint required compared to lithium-ion batteries.	• Space requirements reduce (unlikely for this tech) but potential to stack to reduce m2 requirements, potentially advantageous over lithium ion batteries	
HVO renewable diesel fuel	• Biodiesel is produced from a diverse mix of resources including vegetable oils (corn, soybeans, rapeseed, palm etc.), animal fats (beef tallow, pork lard etc.), and recycled cooking oil. • Conventionally feedstock goes to a transesterification process and becomes biodiesel, which can be blended with petroleum diesel. • Advanced methods such as hydrotreatment, gasification, and pyrolysis can be used to produce 'drop in' biofuels. These biofuels are chemically the same as petroleum diesel	• **Moderate** – The biodiesel supply chain is still a localised industry, with some regions having higher biodiesel availability due to access to feedstock, or government mandates. No large scale HVO supply chain or policy support exists yet in Australia. ~440ML of biodiesel produced p.a. (not all are HVO)	• **Potentially most suitable short-term solution** – Biodiesel blends and renewable diesel that are compatible with the existing diesel generator infrastructure. • Biodiesel has lower emissions compared to petroleum diesel. Full lifecycle emissions are dependent on the feedstock source.	• Supply chain readiness in Sydney & AU around HVOs • Confirm high volume of diesel tanker trucks are possible to site for refills	• **Moderate viability** - This site is proposed to use diesel generators and HVO renewable diesel fuel could be used in lieu of standard diesel fuel subject to local supply chain availability.

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	fuel and is compatible with existing infrastructure designed around petroleum.				
Natural gas fuel	• Natural gas as a fuel source, can be used as a backup power source through gas turbines generators. • Gas turbine generators draw air into the engine and combusts the fuel to produce a high-pressure gas. This gas expands and rotates the turbines to produce electricity. • Can also be used as fuel in fuel cells (e.g. Bloom Energy)	• **High/ Moderate -** Natural gas has a mature global supply chain, with gas turbines widely deployed in electricity grids around the world.	• **Potentially suitable** - Gas turbines are a proven technology. Fuel delivery can be through existing gas pipelines. • Natural gas has slightly lower emissions compared to petroleum diesel • Fire detection and suppression requirements as a standalone infrastructure will need to be considered to suit the NG turbine plans.	• Environmental approvals possible: depends on exact technology selected, expected usage, emissions profile, noise outputs, etc • Pipeline capacity confirmed as feasible, impacting transmission throughout Sydney / Newcastle given other gas plants planned for the area	• **Not viable** – the technology requires more space than is currently possible on site compared to other solutions due to increased cooling/ventilation requirements. The impact of a 500MW gas turbine on existing natural gas pipelines may require significant upgrades in the area.
Hydrogen fuel	• Hydrogen can be used as a fuel source to using fuel cells. A fuel cell consists of a negative electrode (anode) and a positive electrode (cathode) sandwiched around an electrolyte. • A catalyst at the anode separates hydrogen molecules into protons and	• Moderate – The hydrogen production, delivery and storage supply chain are still immature, but progress is accelerating. One data centre owner is trailing a 3MW hydrogen fuel cell.	• Potentially suitable - Highly dependent on further cost reductions and the emergence of an established supply chain • Hydrogen storage and delivery requires detailed planning to	• Safety exclusion zones for storage addressed – large site required • H2 supply chain established, including market to contract supply • H2 pipeline established,	• **Not Viable** – significant spatial requirements of industrial tanks for 24-48 hours of hydrogen fuel on site. No current hydrogen pipeline would be possible within site development timeframe. Additional safety requirements for hydrogen usage on site. Safety

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
	electrons, which then flow to the cathode through different paths. The electrons go through an external circuit, creating a flow of electricity. The protons migrate through the electrolyte to the cathode, where they unite with oxygen and the electrons to produce water and heat.		ensure safety and reliability • Case-by-case fire and risk assessment studies need to be considered. • Storage likely to trigger Major Hazard Facility requirements	including safety and operational concerns addressed • Capex costs drop per MWh to levels in line with alternatives	considerations for nearby residential areas.

Backup Power

The site will feature several containerised reciprocating internal combustion diesel generators to maintain supply to the mission critical facility. See Table 7-3 below for the breakdown of generators across each building on the site.

Table **7-3 -** Back-Up Generators on Site

	No. Generators	Accumulated No. Generators
Phase 1 – Base Building Services	2	2
Phase 1 - Building B	25	27
Phase 2 - Building C	25	52
Phase 3 - Building D	25	77

The entire facility is generator-backed.

Each backup generator is directly connected to an individual LV power stream, and transfers between utility supply and generator supply are open transition without any connection between the generators and the utility supply. Paralleling of the generators to the utility is not possible, and back feeding generator power to the grid is not supported.

Generator Enclosures

The generators will be located on the outdoor plant gantry at the south side of the site. Each generator will be individually housed in its own acoustic canopy enclosure.

Each enclosure generally includes the following:

- Generator engine set
- Fuel system, including day tank
- Control and power panels
- Acoustic attenuation for cold air intake, hot air discharge (for ventilation)
- Exhaust gas silencer and flue
- Radiator and fan

Testing Procedures

The Generators will each be tested to ensure they are functional in the event of a utility failure. Initially all generators as they are installed at the proposed site will undergo commission testing which involves several hours that the generator will run. After the generator is installed and commissioned, regular testing will occur for all generators. For a breakdown of generator testing across the site, refer to Table 7-4 below.

Table 7-4 - Summary of Stage 2 Site Generator Testing

ID	Test	Exercises per Year	Generators		Test			Total Run Time (mins)
			Overall	Per Test	No. of Tests	Run Time (mins)	Cooldown, excl. from Runtime (mins)	
1	Full Load Run	1	77	2	39	40	15	1.560
2	Start Test	11	77	2	39	10	15	4,290
3	Transformer Maintenance	0.2	77	1	77	240	15	3,840

ID	Test	Exercises per Year	Generators		Test			Total Run Time (mins)
			Overall	Per Test	No. of Tests	Run Time (mins)	Cooldown, excl. from Runtime (mins)	
	Total							9,690 minutes **161.5 hours**

In accordance with the Protection of the Environment Operations Act 1997 Clause 17(1A), the total testing time of site generators shall not exceed 200 hours. Our proposed generator testing method complies with this requirement.

Table 7-5 - Summary of Tests per Day

Test	Test Run Time (mins)	Approximate Preparation Time (mins)	Total Test Time (mins)	Simultaneous tests planned	Approximate No. of Tests Able to Be Completed in a Day
Full Load Run	40	30	70	2	12-16
Start Test	30	5	35	2	26-30
Transformer Maintenance	240	30	15	2	2

For a Full Load Run, generators are tested by connecting to a load bank (equipment that consumes electricity for testing purposes). Due to their physical location, the generators are split into a group of 47 and a group of 30. Whenever possible, two tests will be undertaken concurrently to minimise total run time. When not possible, only one test will be run. Testing is limited to 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and public holidays), subject to confirmation.

7.1.6 Uninterruptable Power Supplies

Uninterruptable power supplies (UPS) will be used to allow the facility to continue to function between any disruption to the supply of utility power and the backup generators coming online. The UPSs will use energy stored in batteries, and recharge the batteries once power supply (generator or utility) is restored.

Different portions of the facility will be supported by UPS in different ways, and some portions of the facility will not be by UPS at all.

Table 7-6 - UPS Support Schema

Load Category	UPS Backed (Y/N)	UPS Source
Base Building Services critical loads • Telco equipment • Building management and control systems • Security • Critical system HVAC	Y	Base Building Services UPS

Load Category	UPS Backed (Y/N)	UPS Source
Base Building Services general loads • Light and power • External lighting • Fuel delivery • General HVAC	N	N/A
Data hall IT loads	Y	Data Hall UPS
Data hall critical mechanical loads • Fan wall units • Cooling distribution units	Y	Data Hall UPS
Data hall non-critical loads • Outside air • Humidity control • General light and power	N	N/A
Central mechanical plant critical loads • Chiller controls • Chiller pumps	Y	Central Mechanical UPS
Central mechanical plant non-critical loads • Chiller compressors • Chiller fans	N	N/A

These different UPS sources are distributed throughout the facility. Each type of UPS has an individual capacity which has been tailored to the loads supported, which in turn drives the quantity of batteries required.

Table 7-7 - UPS and Battery Requirements

UPS Type	UPS Capacity (kW)	UPS Quantity Building B	UPS Quantity Building C	UPS Quantity Building D	UPS Quantity Total	Battery Cabinets Per UPS	Battery Cabinet Quantity Total
Base Building Services	500	2	0	0	2	2	4
Data Hall	2500	20	20	20	60	8	480
Central Mechanical	250	5	5	5	15	1	15
Total		27	25	25	77		499

Battery cabinet quantities have been based on the assumption of a battery chemistry of $LiFePO_4$, with 12 battery modules per cabinet. This configuration has been selected because of its availability in the market, and for its energy density and small footprint, ability to supply high levels of power, and the availability of

cabinets with significant internal monitoring to provide early warning of potential malfunction and thereby reduce the likelihood of fire.

7.2 Cooling System

Various cooling technologies were considered for the project. These included cooling towers paired with water-cooled chillers, high-efficiency air-cooled chillers and air-cooled evaporative chillers. These options were evaluated in terms of energy efficiency, water efficiency, acoustics and simplicity of plant, in order to identify the best solution for this particular project. The below table summarises the top three options considered.

Table 7-8 Cooling Technology Comparison

Technology	Energy Efficiency	Water Efficiency	Acoustic Performance	Simplicity of Plant Arrangement
Cooling towers with water-cooled chillers	**Highest/best:** Coupling a water-cooled chiller with an open-loop cooling tower system offers the highest annual energy efficiency. Heat from the field is absorbed by the water-cooled chillers and rejected via cooling towers by means of sensible and latent (evaporative) heat transfer.	**Lowest/worse:** Since the cooling towers operate for the majority of the year, evaporation of water occurs for most of the operational period. Therefore, the cooling towers consume large volumes of water annually.	**Highest/best:** Due to the construction of the cooling towers and use of both sensible and latent heat transfer mechanisms, coupled with water-cooled chillers that can be fully acoustically contained, this concept has superior acoustic performance.	**Most complex:** The concept requires a more involved mechanical plant, with greater on-site assembly and construction requirements.
High-efficiency air-cooled chillers	**Lowest:** Although modern air-cooled chillers have seen significant innovation and improvement in energy efficiency, they still rely on sensible heat transfer only. Heat is absorbed by the chiller and rejected directly to atmosphere via condenser fans; therefore, they remain less efficient than water-cooled systems.	**Highest:** Air-cooled chillers require no water to provide cooling and are therefore the most water efficient option.	**Lowest/worse:** Since the heat transfer mechanism is sensible, the chiller's condenser fans discharge high volumes of air. This results in high noise output. In addition, the chiller cannot be acoustically enclosed due to airflow requirements, limiting noise attenuation measures.	**Simplest:** The chillers are self-contained and require the least amount of on-site assembly and construction.
Evaporative air-cooled chillers	**High:** Evaporative chillers can be selected to switch-over from dry to wet mode at specific ambient conditions. Heat is therefore absorbed from the field and rejected directly via the chiller, using either a dry mode or evaporation (adiabatic) above specified conditions. The result is that peak power use is curtailed, and annualised energy efficiency is improved compared to conventional high-efficiency air-cooled chillers.	**High:** Since water is only used when ambient conditions exceed pre-defined set-points, and balance can be found between energy and water efficiency. Capitalising on dry cooling during colder months of the year, and latent (evaporative) cooling during peak ambient conditions.	**Moderate to high:** Although the chillers still require high airflow rates and cannot be enclosed, the latent cooling effect reduces compressor and condenser fan duty points during high ambient conditions, therefore curtailing noise emissions.	**Simple:** The chillers are fully self-contained, only requiring the addition of make-up water when compared with conventional high-efficiency air-cooled chillers.

Evaporative air-cooled chillers were selected for this project, due to the increased water efficiency over a water-cooled system, coupled with increased energy efficiency over air-cooled chillers. In addition, this technology offered a simple plant configuration whilst providing an increase in acoustic performance over air-cooled chillers.

In order to accommodate the airflow rates of the chillers, the chillers will be located on the building roof on a steel plant deck and will discharge heat vertically. This will assist in projecting heat away from the site, air intakes, openings and occupied spaces, as well as surrounding properties.

Each chiller will be paired with a dedicated thermal energy storage tank to facilitate uninterrupted cooling during a generator start-up sequence in the event of a site power failure.

Table **7-9 -** Air-**C**ooled Evaporative Chillers

	Chiller Capacity	No. Duty Chillers	No. Standby Chillers
Building B	1330 kW	28	4
Building C	1330 kW	28	4
Building D	1330 kW	28	4

Standby chillers, as detailed in Table 7-9 , are incorporated to maintain operational continuity during scheduled maintenance, testing, or component replacement.

To support a staged delivery of the facility, each building will be served by its own dedicated plant. Furthermore, each plant is subdivided into two equally sized cooling blocks consisting of 16 chillers, providing flexibility to accommodate load ramp-up, end-user requirements, and evolving technology.

The cooling water reticulation network has been designed to support a range of data hall cooling technologies, including both air-based and liquid-based heat rejection systems. The final configuration will be tailored to suit customer requirements. For higher air-based cooling requirements, more fan wall units may be deployed. Conversely, direct to chip liquid heat rejection concepts can be deployed to suit a higher liquid cooling requirement.

7.3 Domestic Cold Water

A dual 150mm potable cold water supply will be connected to the Sydney Water infrastructure via a proposed potable cold water connection on the Northern side of the project site. This connection will include an authority water meter assembly that reticulates water to stage 2 building domestic water system, fire water storage tanks and mechanical make up water storage tanks supplying industrial water for mechanical cooling.

A metered potable cold water supply will extend to all building sanitary fixtures for domestic use as well as to the rainwater reuse system for back up supply during dry season. All water system will be designed in accordance with AS 3500.1 and 4. All domestic water usage will be monitored by sub meters. These meters will be located at each building and at high water use systems.

The expected occupancy for the Stage 2 building is minimal, with a maximum of up to 20 people at any one time. The building features a Front of House area and an End of Trip facility. Each building includes one flexible space per level, with a limited number of sanitary fixtures anticipated. All required areas and fixtures will be provided with a water supply.

Based on this high-level assessment, the domestic water demand for Stage 2 is estimated to be no more than 2 L/s, with a peak daily consumption of approximately 800 L.

All taps and fixtures will have a minimum working pressure of 150kPa and a maximum operating pressure of 500kPa. Velocities will not exceed the limitation specified in AS 3500.1 and 4.

Each bathroom group will have individual cold water and rainwater reuse isolation valves. Water minimisation strategies will be incorporated to reduce the facility's environmental footprint, including self-

regulating flow controls for individual fixtures. The project will also include water-efficient sanitary fittings and fixtures throughout.

7.4 Industrial Water

Potable water will be used in industrial process during warmer weather.

Proposed building water demand is as below:

Table **7-10 - Industrial water peak flow demand**

Peak flow demand		
Per building	**6.5**	L/s
Stage 2 Sydney Water incoming peak demand (with 3 buildings in total)	**19.5**	L/s

Note: Peak flow demand has been itemised into 2 categories. Per building and stage 2 peak Sydney Water incoming supply demand.

Table **7-11 - Industrial water average flow demand**

Average flow demand				
Building	**Average peak flow rate**		**24 hrs Demand**	
B	10.51	L/s	908,219.52	L
C	10.51	L/s	908,219.52	L
D	10.51	L/s	908,219.52	L
Total	**31.54**	L/s	**2,724,658.56**	L

Note: The average flow demand has been based on the peak 24hour water demand which comprises the mechanical chiller plant water consumption during a peak 24hour period.

Table 7-12 - Industrial water storage tank

Effective tank capacity		
Building	**Total tank capacity**	
B	1,200,000	L
C	1,200,000	L
D	1,200,000	L
Redundant	1,200,000	L
Total	**4,800,000**	L

Note: The tank capacity has been designed to allow for the building and final Stage 2 peak water usage. The incoming water supply flow rate is based on the tanks storage capacity over the 13 hour period.

A stage 2 centralised water storage tank room will equip 8 x 600kL water storage tanks with a combined effective capacity of 4,800kL, designed to supply 24 hours storage of 3,600kL for all stage 2 buildings, plus an additional 1,200kL reserved as redundancy to meet the mechanical cooling demand of the buildings B, C and D. This redundant capacity allow for the tanks to be services and maintained without the need to introduce a higher demand flow rate from Sydney water.

Both potable cold water and recycled water supplies will top up the mechanical make-up water storage tanks, with a dedicated booster pump set distributing water from the tanks to the chiller plants. The system includes a rainwater reuse top-up supply, employing harvested rainwater for mechanical cooling to enhance sustainability and reduce potable water consumption.

Each water supply source to the tanks will be metered individually, allowing monitoring and management of water consumption for operational efficiency. Mechanical cooling water usage will be monitored by pulse output water meters and at high water use items connecting to a monitoring system. The building sewer

discharge will be equipped with a flow meter to monitor the volume of wastewater discharged into the authority's sewer system.

Table **7-13 - Wastewater peak discharge**

Peak discharge		
Per building	**0.25**	L/s
Stage 2 (final)	**0.74**	L/s

7.5 Recycled Water Provision

A 150mm provision has also been made for recycled water reticulation to mechanical make-up water storage tanks with utility connection point with an isolation valve on Northern side of the project site near Norwest Boulevard, allowing for future connection to a recycled water utility if it becomes available.

7.6 Fire Water

Currently there are 2 Sydney Water assets near the proposed development, below are the Sydney Water assets pressure and flow results:

Table 7-14 - Sydney Water assets near to the site

Location	Size	Performance
Brookhollow Avenue	150 mm DN	Maximum permissible flow = 67 L/sec at 401kPa Flow and pressure at 95% of the time is 60 L/sec at 441kPa
Norwest Boulevard	250 mm DN	Maximum permissible flow = 120 L/sec at 509kPa Flow and pressure at 95% of the time is 60 L/sec at 558kPa

The Sydney Water 150 mm diameter main in Brookhollow Avenue does not provide sufficient pressure and flow rate. In contrast, the Sydney Water 250 mm diameter main in Norwest Boulevard has adequate flow capacity. However, the vehicular access for Fire and Rescue NSW (FRNSW) and the fire protection infrastructure is only available via Brookhollow Avenue. Therefore, it is appropriate to establish the fire water connection from the Brookhollow Avenue main.

Based on our initial assessment, the proposed development has an effective height greater than 25 m. In accordance with the National Construction Code (NCC) and relevant Australian Standards, the Deemed-to-Satisfy (DtS) fire water supply requirement for buildings of this height is a dual water supply. The building's effective height is subject to confirmation by the BCA Certifier.

To achieve compliance with fire water supply requirements, the proposed strategy includes the provision of on-site fire water storage tanks. The firefighting water supply will be provided by fire water storage tank (steel panel tank with 2 partitions) with no direct connection to the town's main. Each partition of the tank will have an effective capacity of 245 kL.

The total capacity has been determined based on:

- The worst-case demand for the fire sprinkler system with a duration of one hour; and;
- The fire hydrant system requirement, incorporating a reduced tank storage of 25 kL (included within each 245 kL tank) plus an automatic inflow of 1,800 L/min for a required duration of four hours, supplied from 150 mm Sydney Water main on Brookhollow Avenue.

This approach aligns with the enhanced water supply strategy recommended by Fire and Rescue NSW.

As the on-site fire water storage tanks will serve as the primary water supply for the firefighting systems, large-bore suction connections are provided for the combined fire sprinkler and hydrant system at the booster assemblies.

Fire hydrants are strategically located throughout the site to provide immediate access for the fire brigade in the event of a fire. These hydrants are directly connected to the site's dedicated fire hydrant and sprinkler ring main, ensuring a reliable and continuous water supply. The ring main is designed to maintain adequate pressure and flow, allowing fire brigade operations to be conducted efficiently across all areas of the site.

The proposed location of the booster assemblies with large-bore suction connections is adjacent to the entrance access road to the site. However, coordination will be required with Council and the landscape architect, as the location is near a vegetated area with a wide footpath and parking provisions. Refer to the figure 7-3 and 7-4.

Figure 7-7 - Proposed location of booster assembly for Stage 2

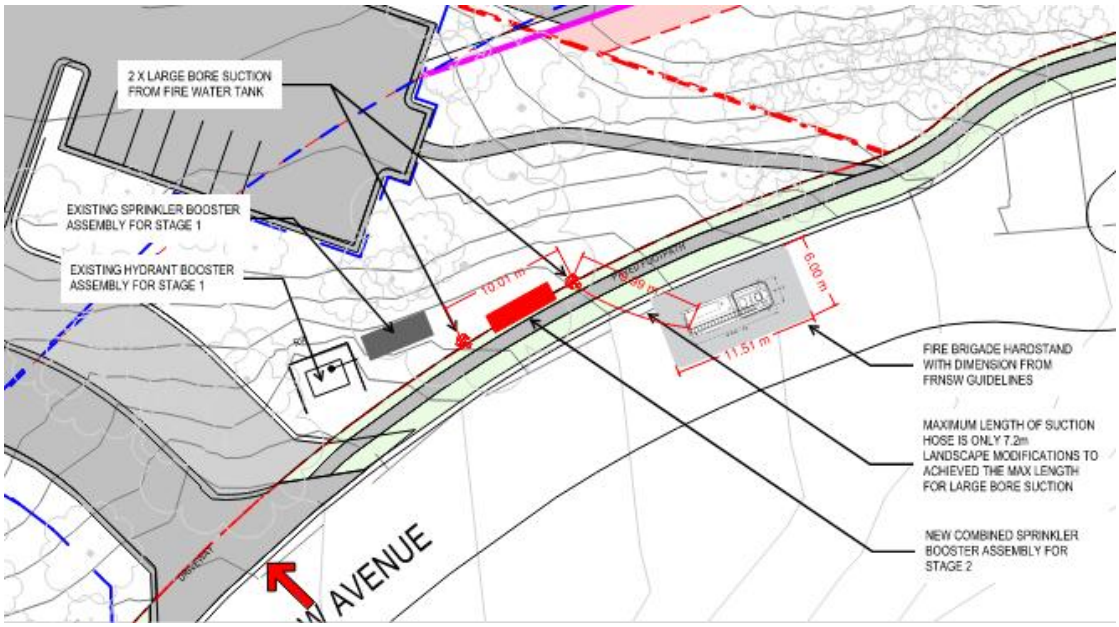


Figure 7-8 - Floor Plan Showing Booster Assembly and Hardstand Requirements

It is noted that the maximum hose length for large-bore suction, as per Fire and Rescue NSW, is 7.2 m. Therefore, modifications to the footpath may be required and are subject to FRNSW review and approval.

The overall fire protection strategy, including the fire water storage tanks and associated infrastructure, will require review and endorsement by Fire and Rescue NSW.

7.7 Sanitary Drainage

The sanitary drainage system for the site will be connected to the Sydney Water infrastructure, with an existing 150mm sewer mains connection provision available near the southern boundary of the site, adjacent

to Brookhollow Avenue. The site will generally be drained by a gravity sewer system; however, where gravity drainage is not feasible, a sewer/wastewater pump station will be installed. The sanitary drainage system will be designed in accordance with AS 3500.2. The soil waste discharge from the building will be minimal due to low number of staff occupied at the facility.

An independent fire water drainage system has been proposed to capture sprinkler runoff, which will discharge into a 300,000L fire water containment tank for testing before manual removal from the site. Floor wastes and trench grates will serve as drain outlets to collect sprinkler runoff from rooms contain lithium-ion batteries in the event of sprinkler system activation.

7.8 Rainwater Reuse

The Stage 2 will be equipped with three inground rainwater harvesting tanks, each with a capacity of 50,000L providing a total storage capacity of 150,000L. These tanks will be connected to a centralised filtration system to support the rainwater reuse system. This system is designed to supply rainwater for toilet flushing, landscape irrigation, and topping up the mechanical make-up water storage tanks.

Rainwater will be collected from the main building's roof runoff and stored in the harvesting tanks. The collected rainwater will then be pumped from the tank and be treated through a series of filtration processes to ensure its suitability for reuse. Additionally, the rainwater outlets on the gantry roof and all overflow from the harvesting tanks will be connected to the in-ground civil stormwater system.

7.9 Telecommunications

7.9.1 External Site Telecommunications

The proposed site is currently designed to be serviced by 5 main Telecommunications Points-of-Entry for network carriers and hyperscale clients. Three manholes will sit on the north end of the site perimeter, along Norwest Boulevard, and the remaining two along Brookhollow Avenue on the southbound end of the site perimeter. Together, these 5 POE's will provide diverse pathways into the new site – as illustrated below.

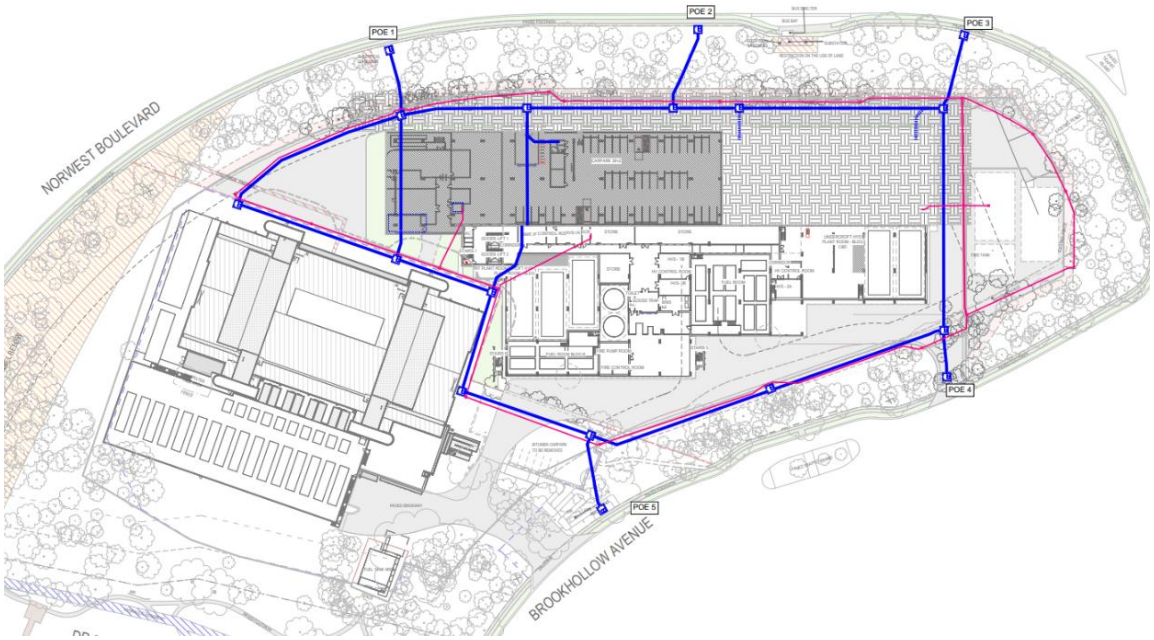


Figure 7-9 - Telecommunications POE's and Internal Interconnectivity

The Northern Telecommunications connections comprises of three (3) POE's entering the site from Norwest Boulevard. These connections extend along the site boundary through connection to a Customer Ring around the campus, which reticulates into both Meet-Me Rooms 3 and 4 from the northern side.

The Southern Telecommunications connections comprises of another two (2) POE's entering the site from Brookhollow Avenue – similarly reticulating along the site boundary through connections to a Customer Ring, which joins both Meet-Me-Rooms 3 and 4 from the southern side. This design allows for dual entries from the ring into each of the new MMRs.

7.9.2 Internal Site Reticulation

Internally within the site, all main from the POE's connecting to a customer ring around the campus each consist of a 20 x 100mm conduit bank, installed underneath roadways and paths. The customer ring along the perimeter consists of a 20 x 100mm conduit bank and strategically located pits, connecting to MMR 3 and MMR 4 via dual diverse pathways. Additional 20 x 100mm conduit connections are also provided to each ICT riser across the new buildings.

The site will be provided with connectivity in general originating from the MMR, however provisions have been made for capacity to service clients requiring their own direct cabling infrastructure.

Additionally. A combined Communications and LV facilities conduit bank will run as a separate pathway around the perimeter of the site, to connect to CCTV and facilities comms around the campus. The Facilities Telecom pathway is sized at 2 x 100mm conduits.

7.10 Gas

No gas services are required for the subject site. All services will be powered by electricity, with backup power supplied via a diesel generator. Additionally, there are no existing gas services within the site boundary. Therefore, consultation with Jemena has not been undertaken.

8 Assessment of Potential Construction Impacts

8.1 Electricity

The baseline condition is that the site contains an existing building in the western corner of the lot, with the majority of the lot unoccupied. A new electrical substation built at the eastern end of the site to power both the existing and the new building.

Electrical reticulation from the new substation to the existing building will be by underground conduit duct banks.

Electrical reticulation from the new substation to the new building will be by underground conduit banks.

All conduit banks will be installed at Day 1, with the fitout of cables achieved in three phases. Each phase will have dedicated conduit banks, to minimise the potential for interference. The phases are:

- Existing building (Building A)
- New Building (Building B)
- New Building (Building C and Building D)

Within the new building, there will be medium voltage switchboards which control and distribute power within the building itself. MV cables are to be run in dedicated cable containment at high level within the gantry structure, serving low voltage distribution transformers. Dual-ended ring topology will allow progressive roll-out of site infrastructure as needed without disruption of electrical supply to the building.

8.2 Water Supply

The site will connect to the Sydney Water main via Sydney Water contractors pending Sydney Water approval. The mains connection can be undertaken live however it is not expected that the water main will be extended for the site requirements. If these works are required will be undertaken by Sydney Water services providers and undertaken in accordance with Sydney Water requirements.

Detailed requirements will be provided following the completion and approval of the Section 73 application process, overseen by the designated Sydney Water service coordinator.

8.3 Sewerage

The site will be connected to the Sydney Water sewer main via the existing boundary trap located on site. Construction impacts are expected to be minimal, provided the existing sewer main connection is suitable and feasible for use within the project site.

Detailed requirements will be provided following the completion and approval of the Section 73 application process, overseen by the designated Sydney Water service coordinator.

8.4 Telecommunications

The existing Telecommunications infrastructure within the immediate surrounds of the proposed site will be upgraded and expanded to provide diversity and connectivity to support the site and any future expansions.

Five new points of entry, connecting to external existing carrier pathways, following the BYDA documentation, will provide diverse entry points around the site. Underground infrastructure, including pit and pipe works around the perimeter of the buildings, will be installed through the design of two new telecommunication pathway rings. All conduit banks will be installed as part of the Day 1 scope of works. Measures to avoid damage to existing telecommunications services will be implemented.

8.5 Gas

No gas services are proposed for the subject site. A medium-pressure gas main runs along both the northern and southern boundaries; however, the construction impact is expected to be minimal, as the gas main is located approximately 13 metres to the south and 23 metres to the north of the project site boundary.

There is a 50mm NY @ 210 kPa is located on the eastern side of the site. During construction, the contractor must adhere to Jemena's procedures for working near gas mains and will be responsible for compliance with following:

- Preparing a suitable plan in accordance with the Jemena guideline "Designing, Constructing and operating assets near Jemena gas pipelines" (GAS-960-GL-PL-001),
- Submissions and obtaining the necessary approvals from Jemena.
- Arranging for a pipeline operator from Jemena to be present as required by the proposed plan and approvals.

9 Assessment of Potential Operational Impacts

9.1 Electricity

Potential operational impacts of the electrical infrastructure within the subject site include:

Table 9-1 - Potential impacts of the electrical infrastructure

Potential Impact	Off-Site Impact Mitigation Strategy
High electrical demand impacting the surrounding HV distribution network	Construction of a dedicated substation
High sound levels when testing or operating back-up generators	Limitation of generator testing regime Assessment of acoustic impacts to neighbouring properties through modelling Acoustic treatment of generators
Fuel spills when delivering fuel reaching neighbouring properties	Spill containment at fuel fill points
Leaks within the fuel distribution system reaching neighbouring properties	Leak detection
Fire and explosion risks associated with the generators	Limitation of fuel storage at each generator Regular maintenance of generators Water mist fire suppression system
Fire and explosion risks associated with the batteries	Monitoring of battery condition and operating parameters Gas detection for early malfunction warning Limitation of battery quantities in a single fire compartment Sprinkler fire suppression system
Fire and explosion risks associated with the substation	Compartmentalisation of equipment
Air pollution when generators are operational	Limitation of generator testing regime Installation of dual incoming power feeds to reduce the likelihood of loss of incoming power Assessment of impact to surrounding properties through CFD modelling

9.2 Water and Sewerage

Generally, the site will not have any local impacts during operations. The Water provided to the site and the sewer being discharged from the site will be controlled by Sydney Water.

9.3 Telecommunications

The development of telecommunication inground services within the vicinity of the site should not have any impact on adjacent developments in the area. The connections to external telecommunication carriers at the boundary will be conducted by telecommunications carriers. Within the site, the key operational issue is that the facility can continue to operate in the event that one telecommunication POE is offline. To mitigate this, the facility will be serviced by 5 new POE's, to ensure path diversity.

9.4 Gas

As there is no gas services proposed for the site, and no existing gas services within the subject site boundary, there are no operational impacts envisioned for gas services.

10 Environmental Management Measures

Table 10-1 - Environmental management measures

ID	Impacts	Mitigation	Responsibility	Timing
IR1	High electrical demand impacting the surrounding HV distribution network.	Proposals are to have dedicated electrical supply. Electrical authorities have confirmed that capacity exists within the network to serve the site.	GreenSquareDC /Electrical Authority	Design
IR2	High noise levels when testing or operating back-up generators.	Generators are containerised units which include noise attenuation features. The noise level of generator testing will be assessed against NSW Noise Policy for Industry.	GreenSquareDC /GreenSquare DC/ Contractor	Design and Operation
IR3	Fuel spills when filling generators.	Fuel tanks will be designed to comply with AS 1692 and AS1940. Fuel tanks to be located in fully contained, fire rated fuel rooms designed to AS1940. Each fill point will have all ancillaries to meet requirements of AS1940.	GreenSquareDC/ Contractor	Design and Operation
IR4	Fire and explosion risks associated with the generators.	Generators will be designed in accordance with AS 1940 which defines separation between fuel storage tanks.	GreenSquare DC /Contractor	Design and Operation
IR6	Air pollution when generators are operational	Two separate mains supply routes are proposed and the probability of mains failure has been investigated for the electrical supply. Failure rates for a supply in this arrangement are extremely low meaning the generators will rarely be used. Generators will include specific emissions control measures and will be Tier 2 certified to Australian EPA requirements.	GREENSQUAREDCGreenSquareDC /Contractor	Design and Operation

11 Summary of Residual Impacts

This section provides a summary of construction risks and operational risks, both pre-mitigation as well as residual following implementation of the management measures described in earlier sections. These are summarised in the table below.

Table 11-1 - Summary of potential impacts

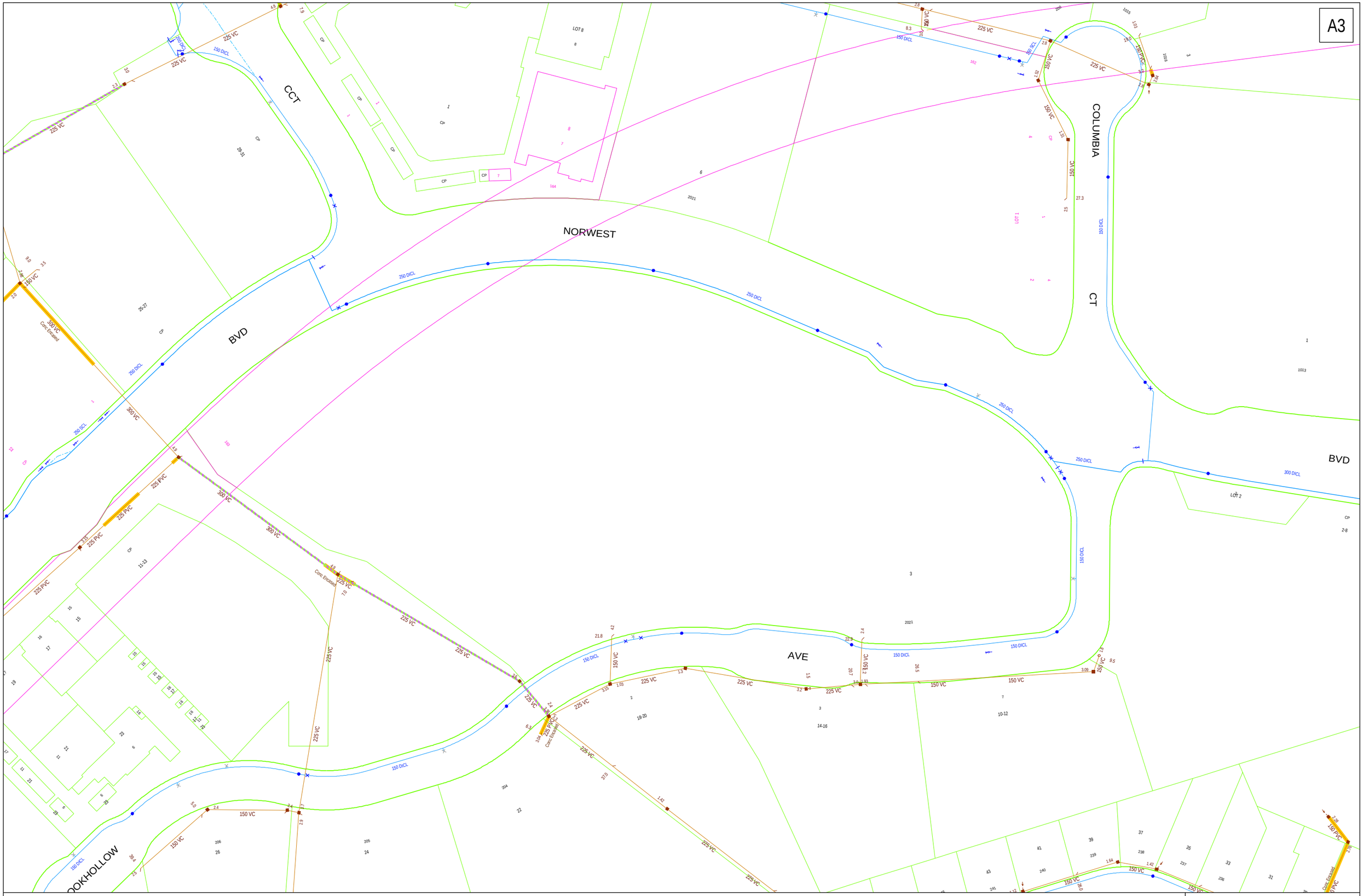
Potential Adverse Impact	Relevant Management Measures	Potential Residual Impact	Commentary around management of residual impacts
Construction			
Spills/ leakages from on-site storage of effluent during early construction phases.	On-site storage tanks such as septic tanks will be in accordance with the relevant Australian Standards	Low risk of spillage during waste loading to tanker.	Contractor to use a licensed and certified waste disposal company, as well as providing relevant SWMS for filling operations. Storage tanks to be regularly inspected during operation for damages that may cause leakage.
Damage to high pressure gas line adjacent to site	Contractor to prepare a plan in accordance with Jemena procedures for working near pipelines, and have it approved by Jemena. Contractor will arrange spotters with Jemena as necessary during construction.	Low risk of damage to pipeline by construction works.	Contractor to ensure the Jemena approved plan is followed during construction to minimise residual risk.
Operation			
High noise levels when testing or operating back-up generators.	Generators are containerised units which include noise attenuation features. Generators will only operate in the unlikely event that all electrical supplies to a building are off-line.	Potential that noise levels are high.	The noise level of generator testing will be assessed against NSW Noise Policy for Industry. Testing of generators to be undertaken during daytime periods unless otherwise required.
Fuel spills during generator refilling	Fuel tanks to be double skinned. Each fill point to have ancillaries to meet AS1940.	Risk of accidental fuel spills during refilling.	Operator to prepare a management plan detailing safe method of work for filling generators. Supplier to have spill kits available at the time of filling.

12 References

- Australian Rainfall and Runoff, 2016. Australian Rainfall and Runoff.
- Environmental Protection Authority, 1997. Managing Urban Stormwater:
- Council Handbook.
- NSW Government, 1997. Protection of the Environment Operations Act.
- NSW Government, 2021. State Environmental Planning Policy (Transport and Infrastructure).
- NSW Government, 2009. State Environmental Planning Policy (Western Sydney
- Employment Area).

Appendix A – Before You Dig Australia (BYDA)

A3



DBYD Address:
3 Brookhollow Avenue
Norwest NSW 2153

DBYD Job No: 50695114

DBYD Sequence No: 258185413

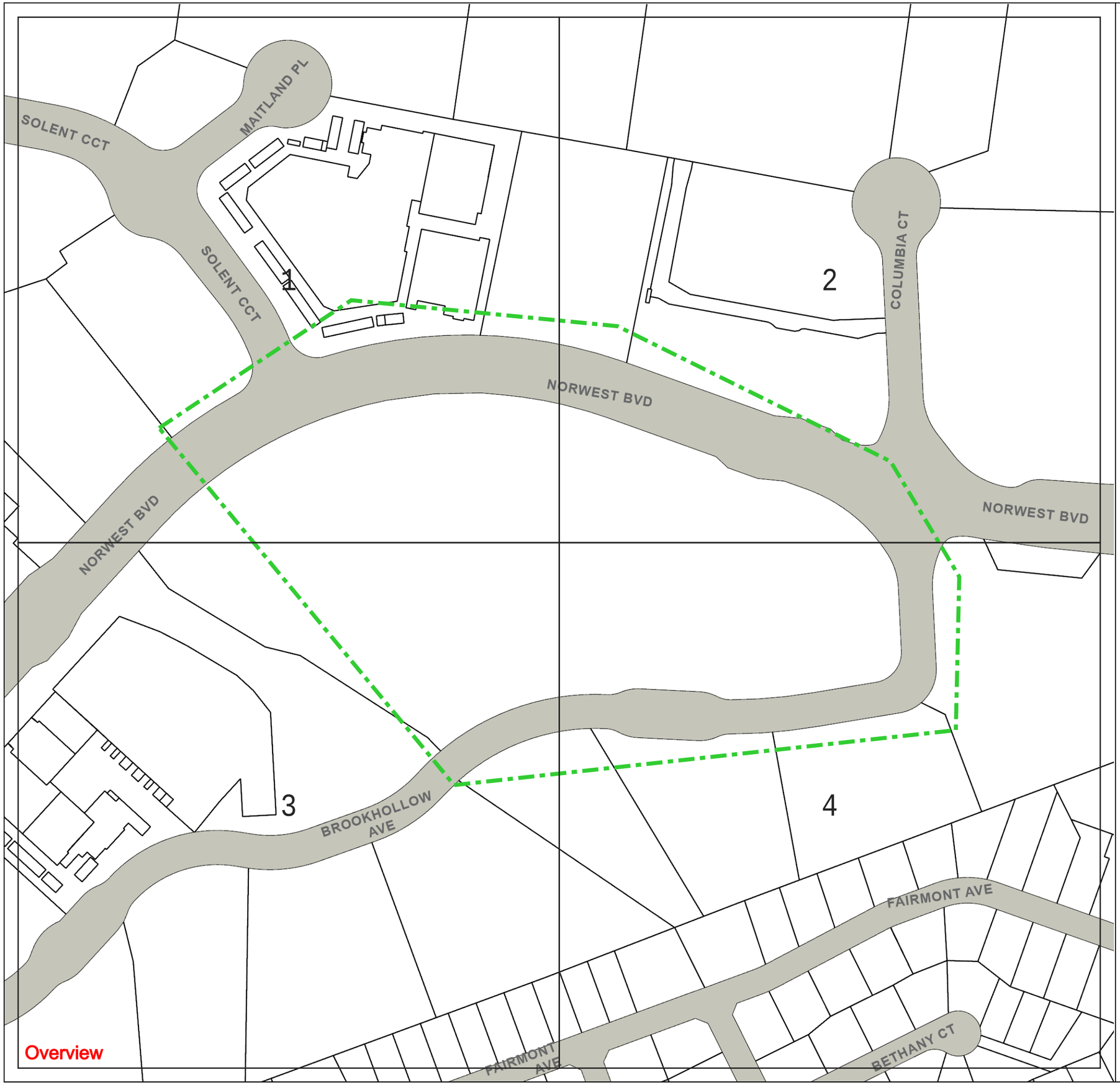
Scale: 1:1500

Date of Production: 18/07/2025

Plan 1 of 1

N

0m 9m 18m 27m 36m



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OVERVIEW ONLY
ASSETS ARE ONLY SHOWN ON DETAILED TILES (PAGES)

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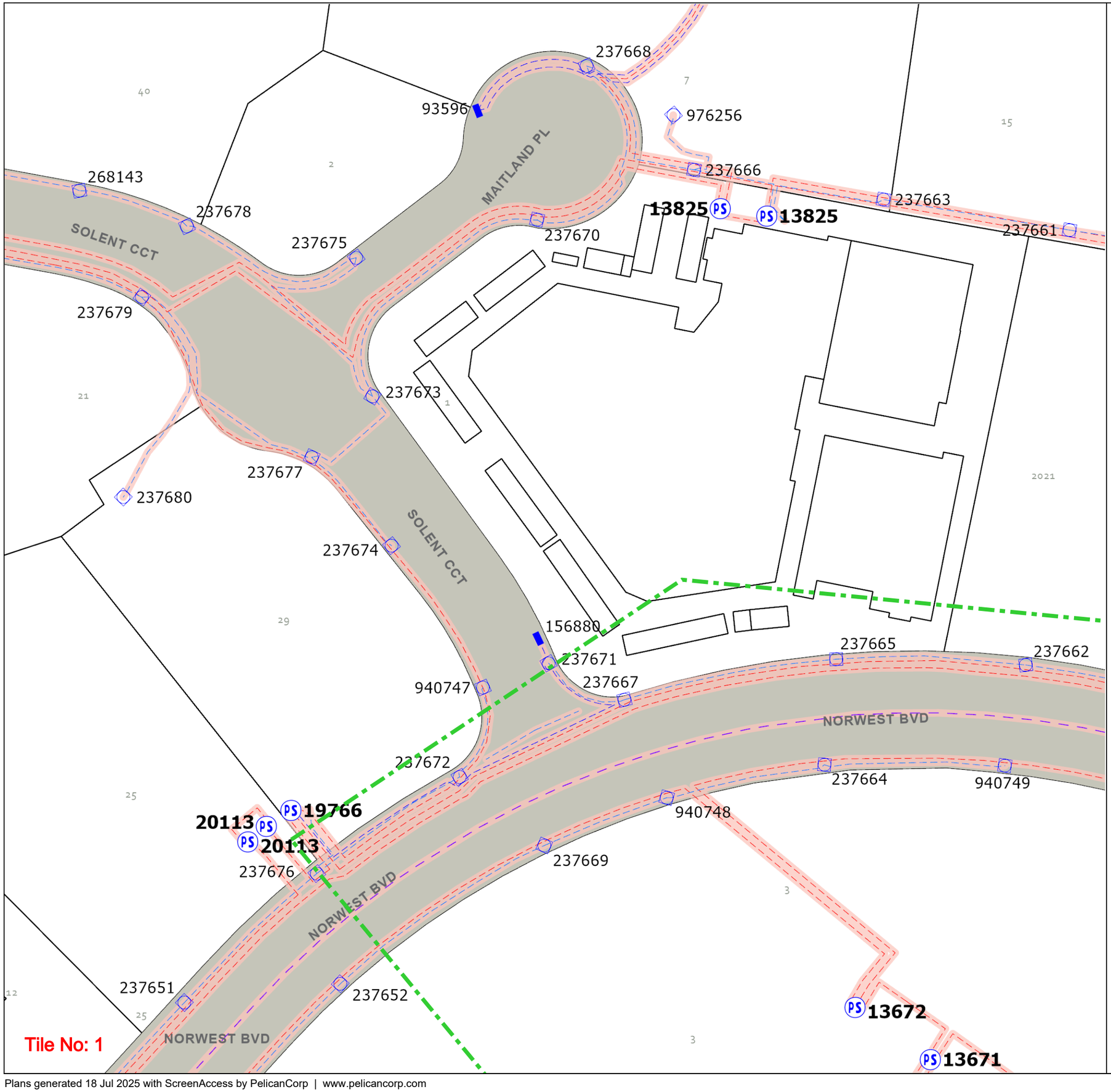
BYDA Sequence No.: 258185405

Issued Date: 18 Jul 2025

Endeavour Energy



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COMMUNICATION OR FIBRE OPTIC CABLES
PLEASE RING **9853 7121** OR **0407 468 626**
10 WORKING DAYS BEFORE COMMENCING WORK

ENDEAVOUR ENERGY MAP LEGEND

Hazard Area	Conductor	Column	Substation
Asbestos	HV, LV, SL, TR	Pole	Zone Substation
Cubicle	Pilot Cable	Pillar	
Pit	Earth Cable		

Note: Pink features may be in construction.

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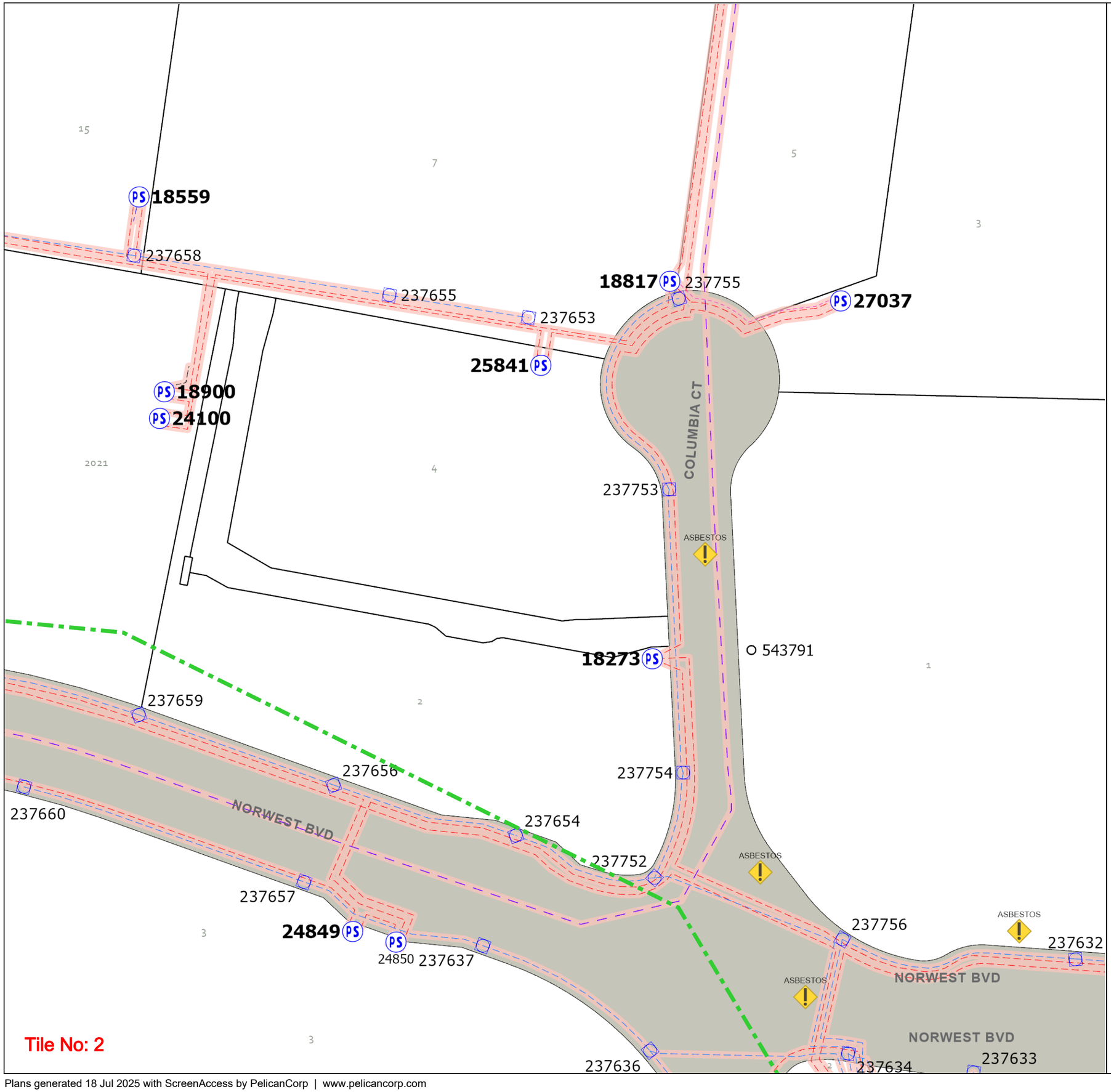

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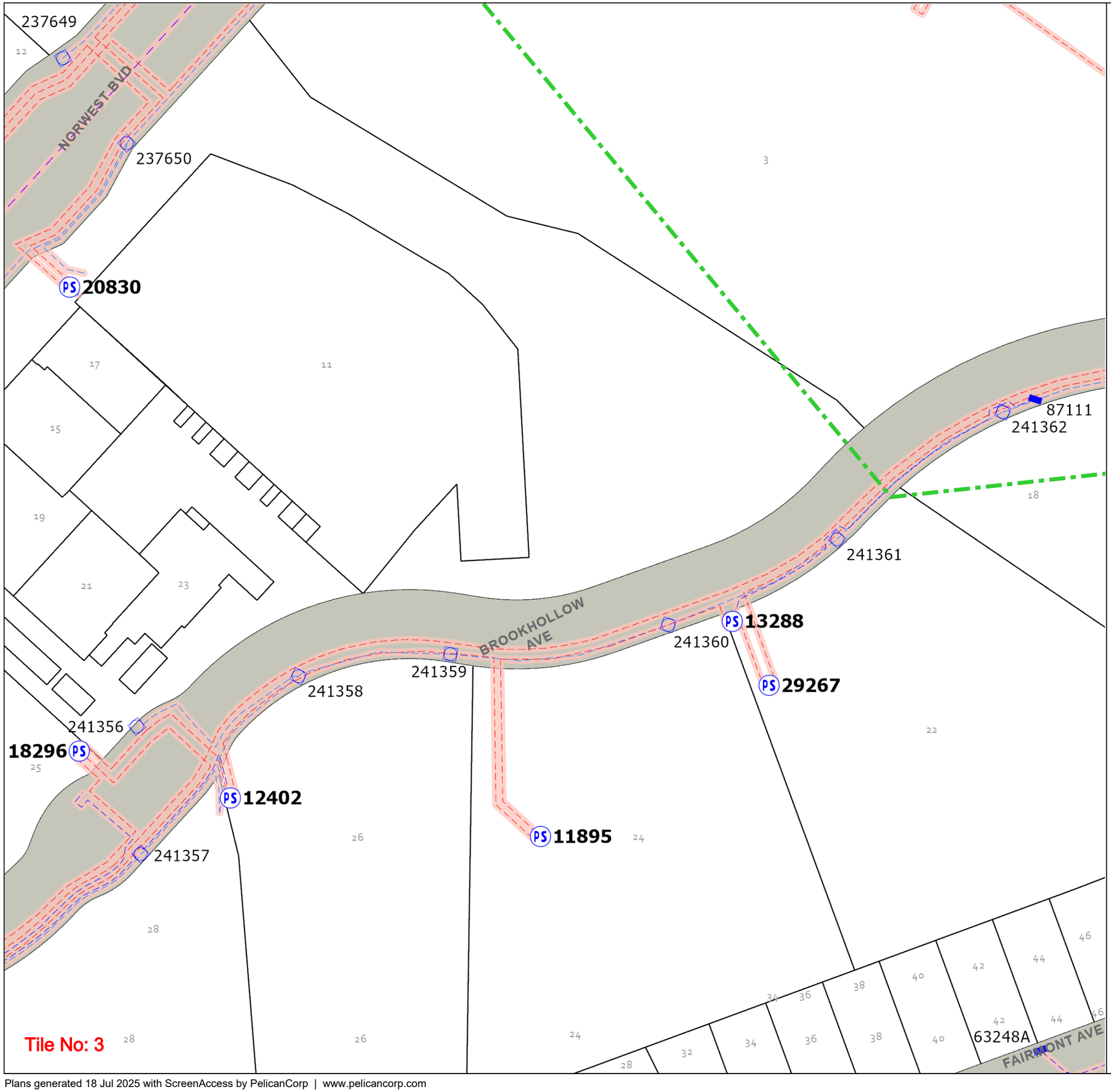

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- It should be noted that adjacent to any network operator asset, there may be multiple underground consumer mains that feed from a pillar or column. Those underground consumer mains and any other underground services will need to be positively identified prior to mechanical excavation in the vicinity. Please refer to the Work Near Underground Assets Guideline published in 2007 by the WorkCover Authority.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be made available at the worksite where excavation is to be undertaken in either printed or electronic format. If the plans are in an electronic format, they must be in a format visible on a screen size 10 inches or greater. Plans must be reviewed and understood by the crew on site prior to commencing excavation.
- Non-destructive water excavation must be operated at or below 2000PSI. Any operation exceeding 2000PSI must be classed and treated as a destructive excavation practice.

INFORMATION PROVIDED BY ENDEAVOUR ENERGY

- Any plans provided pursuant to this service are intended to show the approximate location of underground assets relative to road boundaries, property fences and other structures at the time of installation.
- Depth of underground assets may vary significantly as a result of changes to road, footpath or surface levels subsequent to installation.
- Our plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in any plan is as accurate as possible at the time of installation, the location of underground assets depicted on a plan is approximate and Endeavour Energy will accept no liability for inaccuracies in the information shown on such plans.

WARNING
THIS EXCAVATION IS IN THE VICINITY OF
ENDEAVOUR ENERGY TRANSMISSION, PILOT,
COMMUNICATION OR FIBRE OPTIC CABLES
PLEASE RING **9853 7121** OR **0407 468 626**
10 WORKING DAYS BEFORE COMMENCING WORK

ENDEAVOUR ENERGY MAP LEGEND

Hazard Area	Conductor	Column	Substation
Asbestos	HV, LV, SL, TR	Pole	Zone Substation
Cubicle	Pilot Cable	Pillar	
Pit	Earth Cable		

Note: Pink features may be in construction.

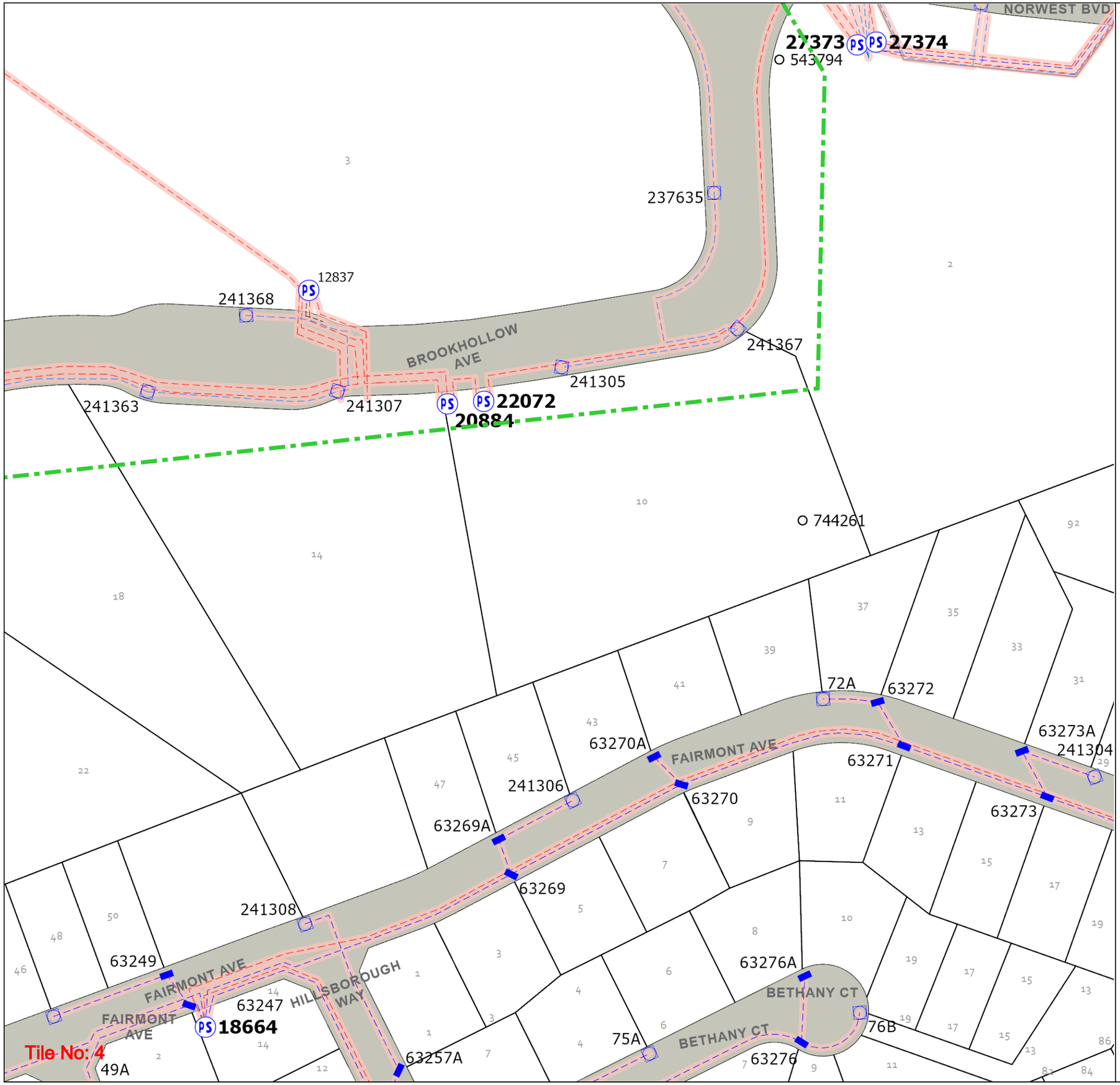
N

NOT TO SCALE

BYDA Sequence No.: 258185405

Issued Date: 18 Jul 2025

Endeavour Energy



WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- Underground assets may be congested at the approach to bridges and other structures. Typical asset depths and alignment may vary substantially, rising and falling sharply and at much shallower depths than elsewhere as they are channelled into shared allocated spaces on bridges and other structures. Additional precautions and underground asset location methods will be required in proximity to bridges and other structures.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earthing and earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
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10 WORKING DAYS BEFORE COMMENCING WORK

ENDEAVOUR ENERGY MAP LEGEND

Hazard Area	Conductor: HV, LV, SL, TR	Column	Substation
Asbestos		Pole	Zone Substation
Cubicle	Pilot Cable	Pillar	
Pit	Earth Cable	*Note: Pink features may be in construction.*	

N

NOT TO SCALE

BYDA Sequence No.: 258185405

Issued Date: 18 Jul 2025

Cable Plan

Report Damage:https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-c
Ph - 13 22 03
Email - Telstra.Plans@team.telstra.com
Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries

Sequence Number: 258185412

TELSTRA LIMITED A.C.N. 086 174 781

Generated On 18/07/2025 16:55:41

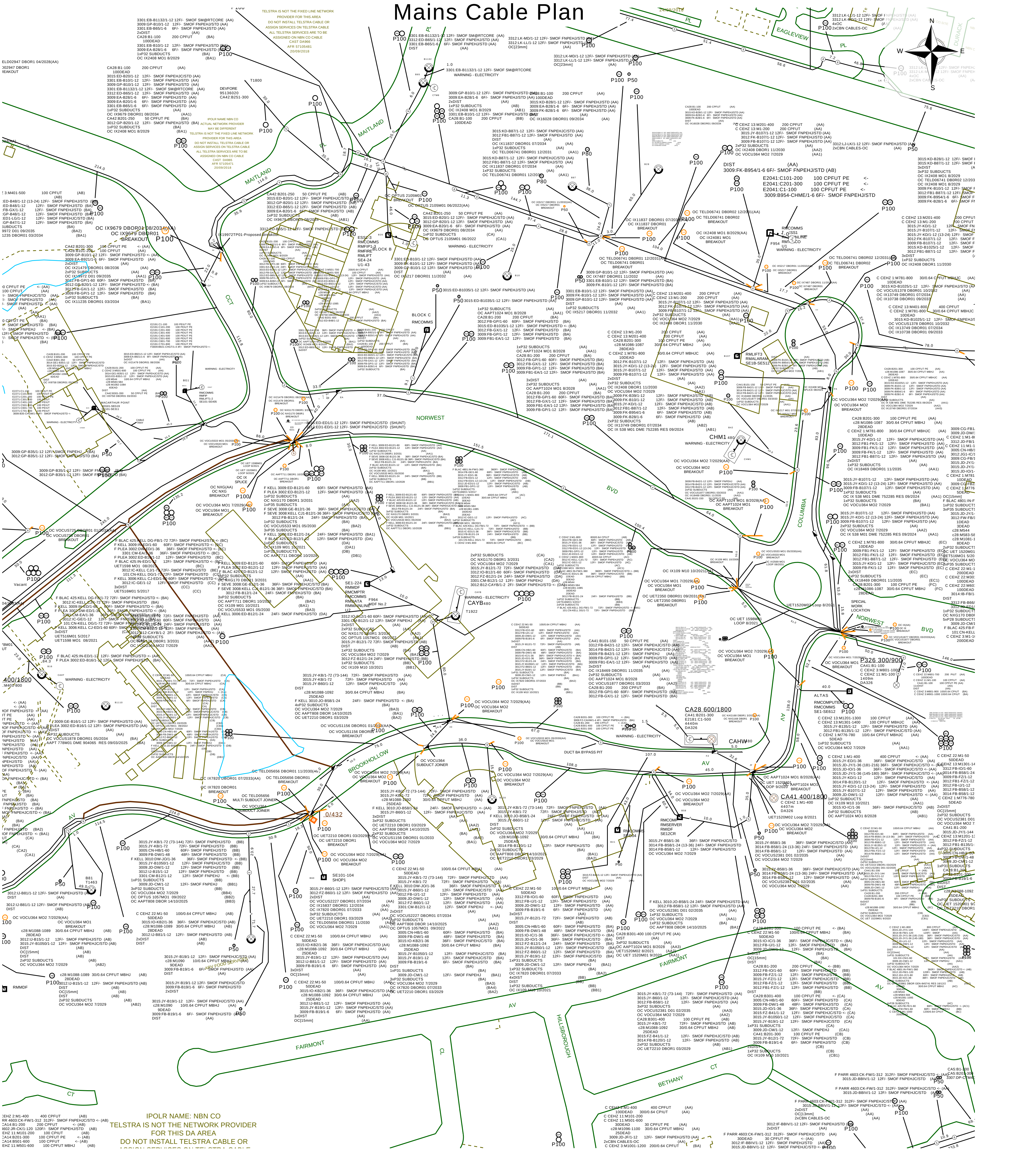
CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information.
As such,Telstra supplied location information is indicative only.Spatial accuracy is not applicable to Quality Level D.
Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it.
Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy.
Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work.
A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

See the Steps- Telstra Duty of Care that was provided in the email response.

Mains Cable Plan



Report Damage: https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-
Ph - 13 22 03
Email - Telstra.Plans@team.telstra.com
Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries

Sequence Number: 258185412

TELSTRA LIMITED A.C.N. 086 174 781

Generated On 18/07/2025 16:55:59

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
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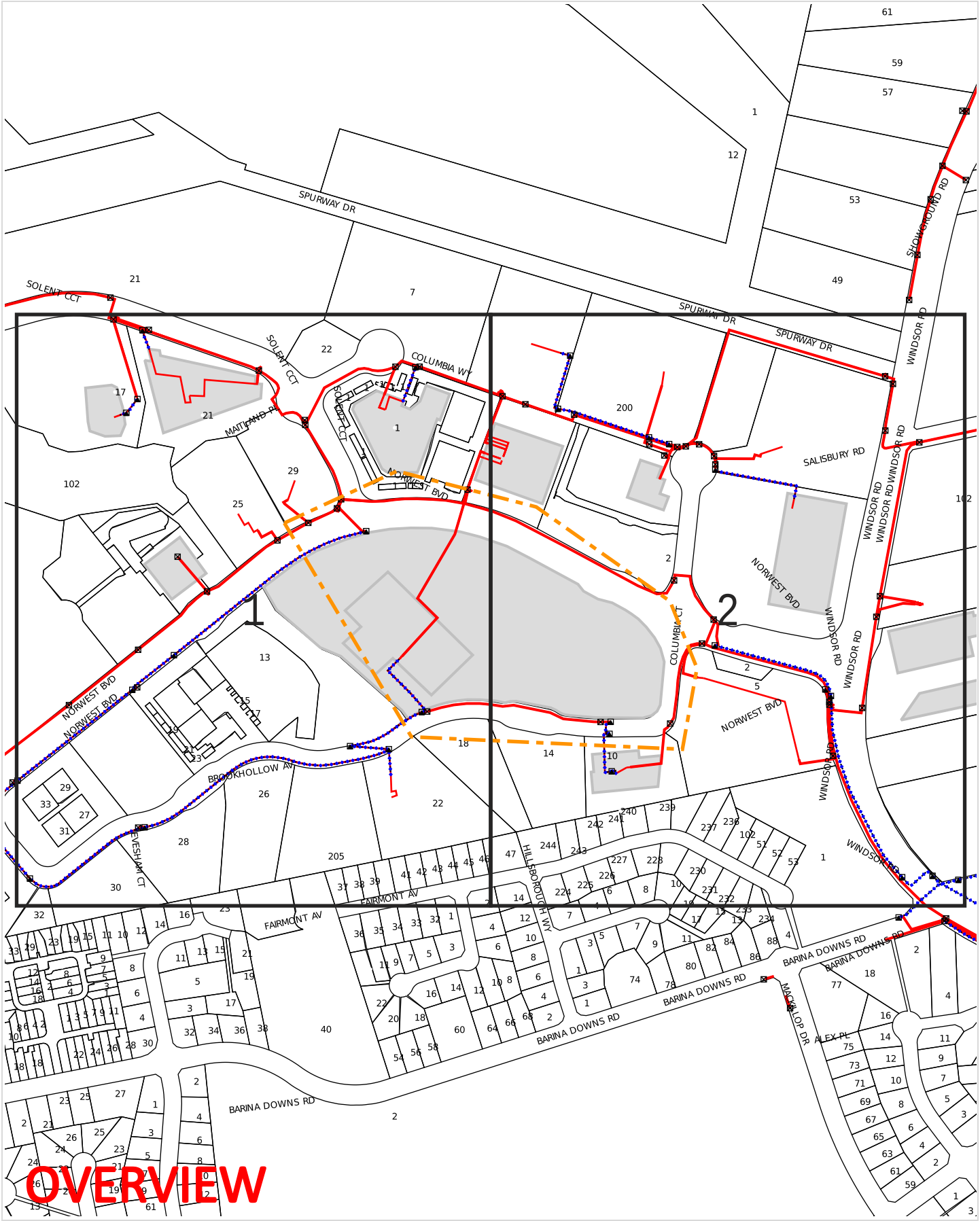
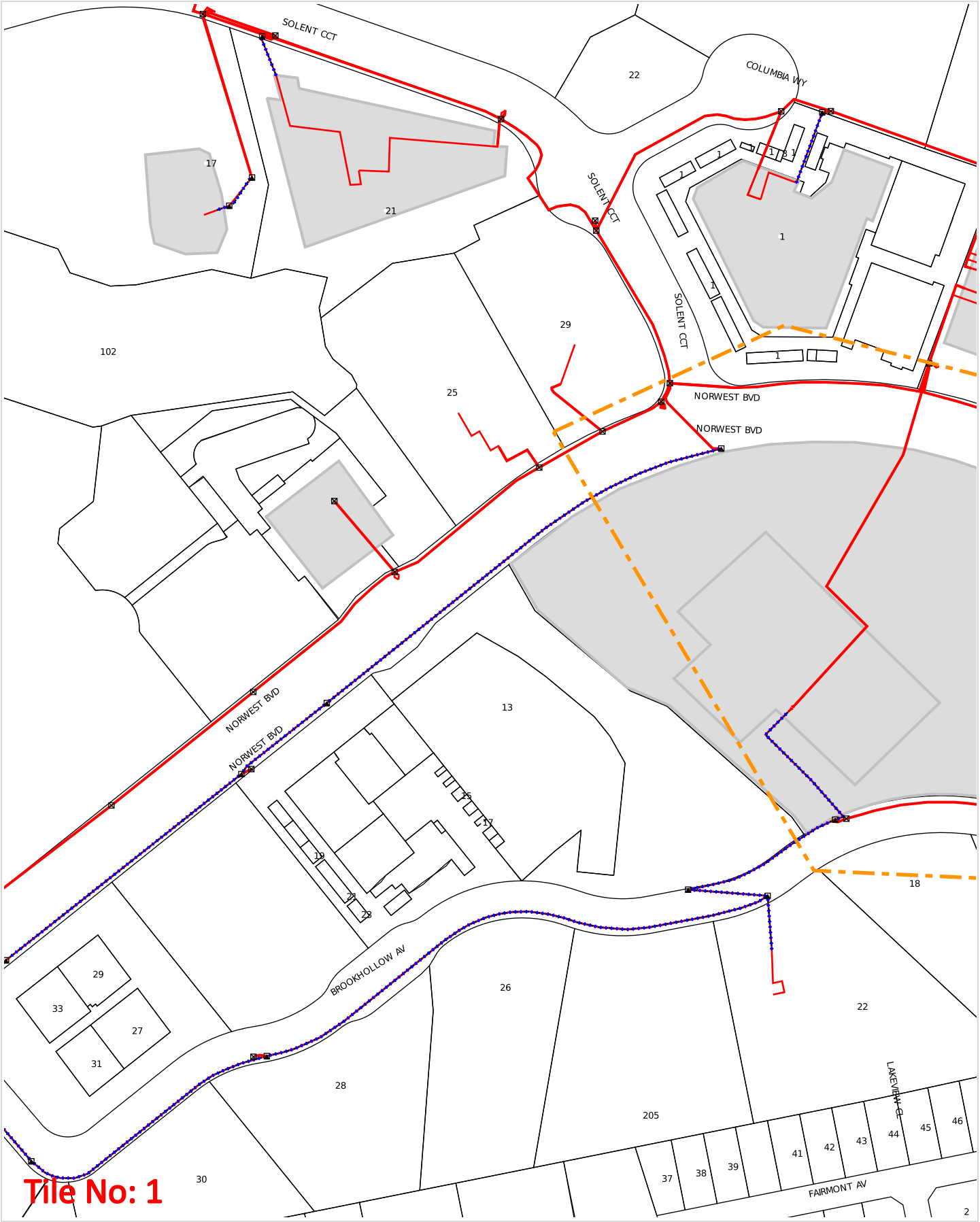


Sequence Number: 258185411

Date Generated: 18 Jul 2025

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208



Tile No: 1

Sequence Number: 258185411

Date Generated: 18 Jul 2025

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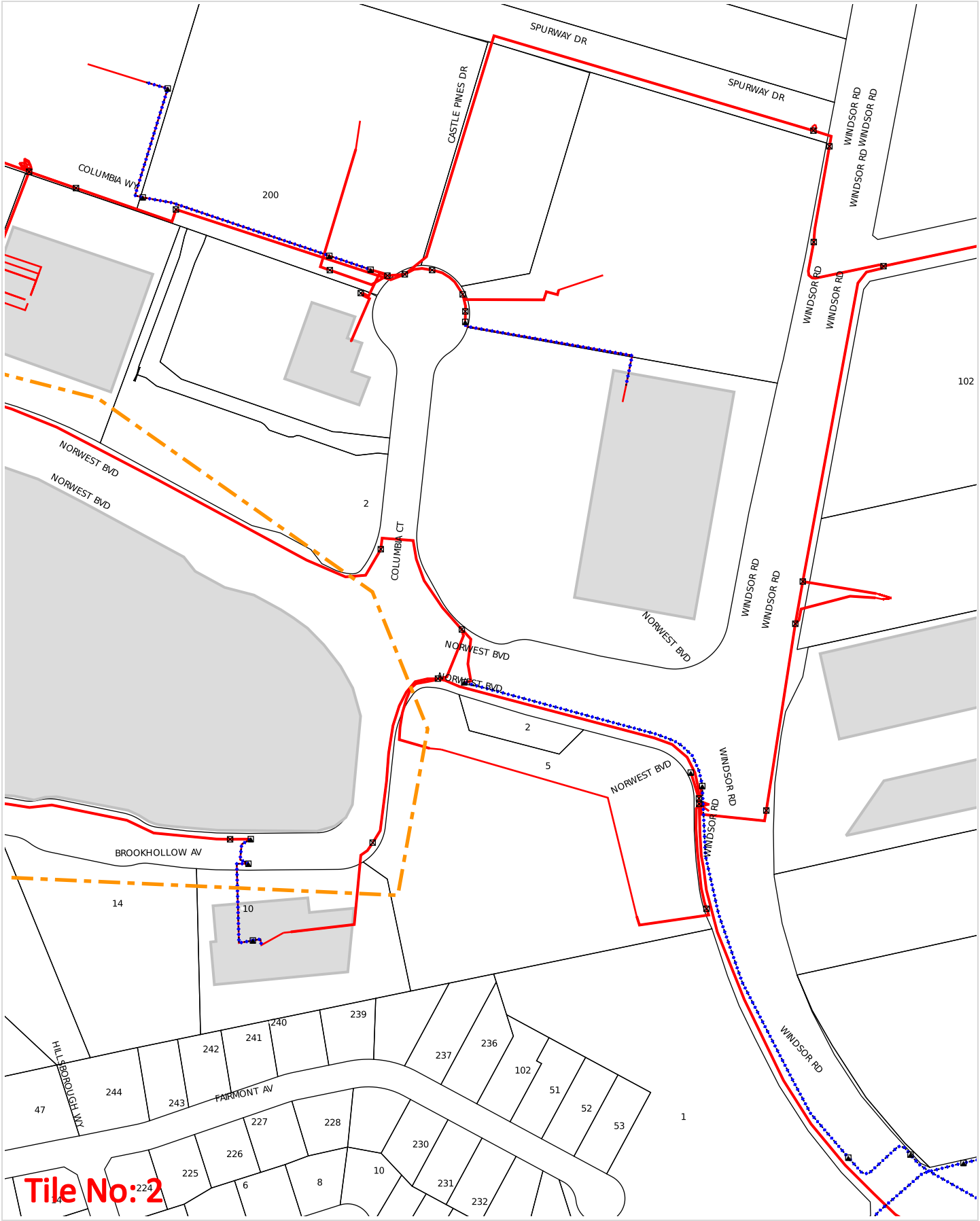

Sequence Number: 258185411

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Optus Limited ACN 052 833 208

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