LANDCOM

HILLS SHOWGROUND STATION PRECINCT

UTILITY SERVICING IMPACT ASSESSMENT

OCTOBER 2019

wsp

Question today
Imagine tomorrow
Create for the future

Hills Showground Station Precinct - Utility Services Impact Assessment

Landcom

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

REV	DATE	DETAILS
2	29/10/2019	Final Utility Servicing Impact Assessment

	NAME	DATE	SIGNATURE
Prepared by:	Patrick Vega	04/10/2019	
Reviewed by:	Jake Matuzic	29/10/2019	
Approved by:	Paul Wehbe	29/10/2019	

TABLE OF CONTENTS

GLOSSARY

ADMD	After Diversity Maximum Demand
ADWF	Average Dry Weather Flow
Aeff	Effective Area
CIBSE	Chartered Institution of Building Services Engineers
DBYD	Dial Before You Dig
DPE	Department of Planning and Environment
EP	Equivalent Person
GFA	Gross Floor Area
GJ p.a	Giga Joules per annum
OF	Optic Fibre
MVA	Mega Volt Amp
SMNW	Sydney Metro Northwest
SSDA	State Significant Development Application
SWC	Sydney Water Corporation
WSA	Water Supply code of Australia

EXECUTIVE SUMMARY

A Utility Impact Assessment has been prepared for the Hills Showground Station Precinct (the Precinct) to assess how future development options for the Precinct would function in terms of existing utility infrastructure and future utility needs. The following utilities were reviewed:

- power
- water
- sewer
- gas
- telecommunications.

The Strategy concludes that the Precinct is generally well serviced by existing utility infrastructure, except for sewer.

Power is provided by Endeavour Energy, and the current available capacity of their network can support future development demands being considered.

Gas is provided by Jemena, which has adequate current capacity to support future development demands. The gas mains are located adjacent to each of the three precinct sites which provides good opportunity to connect future developments to the gas network.

Telecommunications including the NBN is readily available and can be accessed by customers as development progresses.

The water network provided by Sydney Water provides adequate connectivity to the Precinct sites. This system has sufficient capacity to meet future demands based on the size of the water mains present by Sydney Water.

The Sydney Water sewer network however, is not connected to Hills Showground Station Precinct West or Doran Drive Precinct. Upgrades to the existing sewer network will be required to enable the future development.

Strategic options for sewer upgrades have been considered to determine general feasibility of the concept plan and approvals with Sydney Water and other relevant authorities. The strategic options will be further developed by the future developers of the site and an appropriate solution will form part of the future detailed development application for their final development proposals. Detailed utility investigation and further discussions with the relevant authorities will occur at the time per standard process.

1 INTRODUCTION

1.1 OVERVIEW

This report has been prepared for Landcom on behalf of Sydney Metro to support a Concept development application (DA) under Section 4.22 of the *Environmental Planning and Assessment Act 1979 (EP&A Act).*

The concept for which approval is sought (the 'Concept Proposal') is for a high-density mixed-use precinct with a new public park and plaza, and associated facilities on land located within the Hills Showground Station Precinct (the 'Site') on development lots (Lot 53, Lot 55 and 56 in DP 1253217) (the 'DA Area') (Refer Table 1-1).

The Concept Proposal comprises residential and non-residential land uses and building envelopes of varying heights from four (13m) to up to twenty storeys (68m). The proposal also includes a new road, landscaping, services and the provision of publicly accessible open space in the form of Doran Drive Plaza and a park. Concept Proposal comprises a total gross floor area (GFA) of 175,796m2 across all three development lots.

The Concept Proposal meets the criteria to be declared a State Significant Development (SSD) under State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP).

1.2 SITE DESCRIPTION

1.2.1 HILLS SHOWGROUND STATION PRECINCT

The term 'the Site' reflects the Hills Showground Station Precinct boundary identified in the SRDP SEPP and includes the areas detailed in Table 1-1 **a**nd illustrated in Figure 1-1. The Site has a total area of 8.4 hectares.

Table 1-1 Hills Showground Station Precinct

Existing use	**Legal description**	**Address**
Sydney Metro commuter carpark and plaza	Lot 52 1253217	3 De Clambe Drive, Castle Hill
Development Lot – Hills Showground Precinct West	Lot 53 DP 1253217	5 De Clambe Drive, Castle Hill
Development Lot – Doran Drive Precinct	Lot 55 DP 1253217	2 Mandala Parade Castle Hill
Development Lot – Hills Showground Precinct East	Lot 56 DP 1253217	3 Andalusian Way, Castle Hill
Hills Showground Station Box and service facility boxes	Lot 54 & Lot 50 1253217	1 Mandala Parade, Castle Hill
Mandala Parade, De Clambe Drive, Doran Drive, Andalusian Way	N/A	N/A

Figure 1-1 The Hills Showground Station Precinct (The Site)

Source: Cox Architecture 2019

The eastern part of the Site (Hills Showground Precinct East – Lot 56 DP 1253217) currently contains the former Council administration building and associated parking and landscaping. It was being used as a Sydney Metro's construction site office but is proposed to be demolished by way of a separate DA (304/2020/LA) currently under consideration by Council.

The western part of the Site contains the recently opened Hills Showground Metro Station, plaza and commuter car park. The remainder was cleared to create the two development lots (Lots 53 and Lot 55 DP 1253217) and the roads listed in the table above.

Former development on the western part of the Site consisted of The Hills Entertainment Centre which included an Auditorium and Council's works depot that were demolished to make way for the metro.

The Site is bordered by the following:

- North and northwest – De Clambe Drive with a drainage basin and the Castle Hill Showground further north
- West – De Clambe Drive and Cattai Creek riparian zone with commercial/industrial warehouses further west
- South to southeast – Carrington Road across which are low density residential developments, a child care and medical/physiotherapy
- East – Showground Road across which are low density residential development.

1.2.2 HILLS SHOWGROUND STATION DEVELOPMENT LOTS (DA AREA)

The Concept Proposal relates to the three development lots detailed in Figure 1-1 and Table 1-2 and referred to herein as the 'DA Area'. This land is currently owned by Sydney Metro.

Table 1-2 Hills Showground Station Precincts

Precinct Name	Legal Description	Address	Description of existing development	Precinct Area (m^2)
Hills Showground Precinct West	Lot 53 DP 1253217	5 De Clambe Drive, Castle Hill	L shaped vacant lot with existing stormwater drainage easement on the portion adjacent to De Clambe Drive.	3,293
Doran Drive Precinct	Lot 55 DP 1253217	2 Mandala Parade, Castle Hill	Rectangular vacant lot with no vegetation.	7,969
Hills Showground Precinct East	Lot 56 DP 1253217	3 Andalusian Way, Castle Hill	Former two storey Council administration building and associated parking and landscaping.	28,226

1.3 PLANNING CONTEXT

The Site is located in The Hills Shire local government area (LGA), 25km north-west of the Sydney CBD and in proximity to the following centres in the region accessible along the North West Metro: Castle Hill, Norwest Business Park and Rouse Hill Town Centre.

The Site forms part of the broader Showground Station Precinct (figures below) covering 271 hectares, rezoned in 2017 as part of the Department of Planning, Infrastructure and Environment's (The Department) priority precinct program. The rezoning of the Precinct, along with changes to height, density, and lot size controls, as well as other supporting controls will:

- transform the area around the new Hills Showground Station into a vibrant urban centre
- provide for a maximum of 5,000 new dwellings and 2,300 new jobs over 20 years
- deliver nearly two hectares of parks and new open space
- provide community facilities, recreation areas and a mix of housing choice for people at all life stages.

This rezoning of the broader precinct followed the finalisation of the North Rail Link Corridor Strategy in September 2013 by the Department and Transport for NSW (TfNSW) to guide planning and development along the rail corridor, with a Structure Plan prepared for each of the new eight stations. Subsequently, the Hills Shire Council (Council) unanimously voted to nominate the Showground Station Precinct, along with the Bella Vista Station and Kellyville Station Precincts, as Priority Precincts. These precincts were subsequently announced by the NSW Government in August 2014 as a means of implementing the Corridor Strategy and the Council's own corridor strategy known as 'The Hills Corridor Strategy adopted in November 2015'.

The planning controls for the Site and the broader Showground Station Precinct are set out in The Hills Local Environmental Plan 2012 (THLEP) and supported by site specific controls in The Hills Development Control Plan 2012 (THDCP).

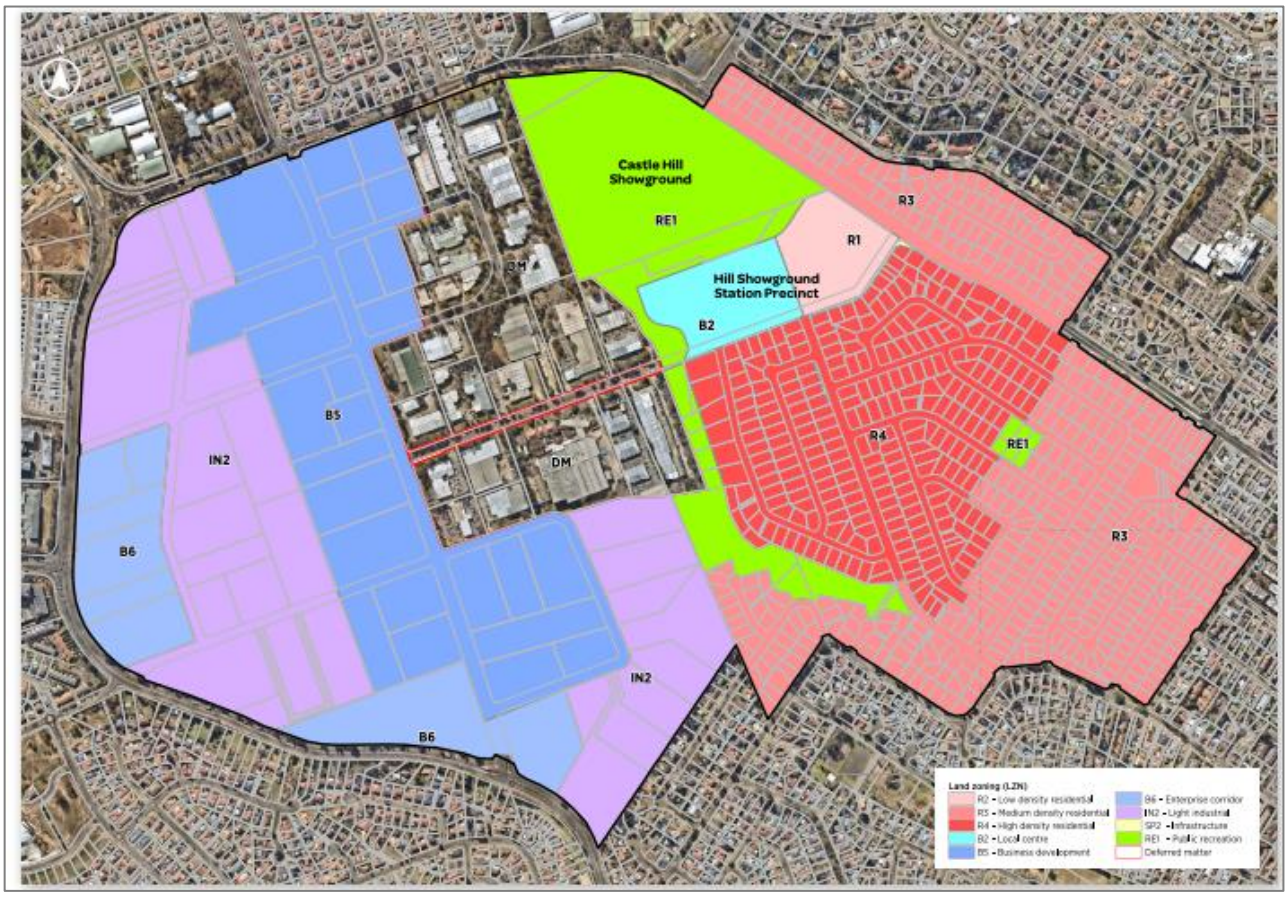
The Site is envisaged to be developed to accommodate a high-density mixed-use precinct in line with the planning controls:

- Hills Showground Precinct West (Lot 53 DP 1253217) is zoned B2 Local Centre with maximum height of 68m (20 storeys) and Floor Space Ratio (FSR) of 5:1)
- Doran Drive Precinct (Lot 55 DP 1253217) is zoned B2 Local Centre with maximum height of 68m (20 storeys) and FSR of 4:1

- Hills Showground Precinct East (Lot 56 DP 1253217) is zoned R1 General Residential with a maximum building height of 52m (16 storeys) and FSR of 3:1.

An excerpt of the zoning of the Site and broader Showground Precinct is provided in Figure 1-2.

Figure 1-2 Zoning of the broader Showground Station Precinct



Source: Department of Planning, Infrastructure and Environment 2019

1.4 CONCEPT PROPOSAL

The DA will specifically seek approval for a Concept Proposal comprising:

- A maximum gross floor area (GFA) of 175,796 m^2 equating to up to approximately 1,900 dwellings including affordable housing
- A maximum GFA of 13,600m^2 for non-residential development (commercial, retail and community facilities)
- Building envelopes, and allocation of 175,796 m^2 GFA to the three precincts
- Landscape concept for the public domain detailing the extent of public domain including streets, pedestrian pathways, provision of Doran Drive Plaza to be a minimum of 1,400m^2 and a new Park on Precinct East to be a minimum of 3,500m^2
- Provision or car parking and bicycle parking
- Strategies for utilities and services provision, managing stormwater and drainage, achievement of ecologically sustainable development (ESD) and design excellence
- Staging plan addressing the timing of future subdivision, construction, release and development of land

- Concept principal subdivision of development Lot 56 DP 1253217 into future major lots, public domain areas and roads.

Refer Figure 1-3 for excerpt of the Concept Proposal Reference Scheme and Figure 1-4 for an excerpt of the Height Plan.

No building or construction works are proposed to be undertaken as part of this Concept Proposal. Once the SSDA is approved, the successful purchasers of the development precincts and/or lots from Sydney Metro, will be responsible for submitting subsequent DAs for the design and construction of the buildings and public domain areas in accordance with the approved Concept Proposal.

Figure 1-3 Concept Proposal Reference Scheme

Source: Cox Architecture 2019

Figure 1-4 Height plan

Source: Cox Architecture 2019

1.5 SCHEDULE OF ACCOMMODATION

Table 1-3 summarises the combined schedule of accommodation for the three development lots, including total number of dwellings, gross floor area estimates and parking spaces for which Landcom is seeking consent.

Table 1-3 – Summary of schedule of accommodation

	GFA (m^2)	**Dwellings (Total Number)**
Residential	162,761	1,809
Retail	8,450	-
Commercial	4,610	-
Community	540	-
Carparking	-	2,630

An alternative schedule of accommodation with 1,885 dwellings and 6,700m^2 of Retail GFA was also tested which resulted in similar recommendations. Refer to Appendix A for calculations and recommendations.

1.6 UTILITIES DESKTOP REVIEW

To determine the utilities that may be affected by the proposed development, a desktop review of relevant available utility infrastructure data, collected from Dial Before You Dig (DBYD) investigations and As Constructed Plans from Sydney Metro, was completed. The DBYD information was compared to the Sydney Metro as Constructed drawings to ensure new assets delivered as part of the Sydney Metro Northwest were considered. Table 1-4 summarises the utility services within the Precinct and their respective utility providers.

Table 1-4 Utility infrastructure and providers across Hills Showground Station Precinct

Utility Type	Utility Provider
ELECTRICAL	Endeavour Energy
GAS	Jemena
TELECOMMUNICATIONS	NBNCo Nextgen Optus PIPE Networks Telstra Vocus
WATER AND WASTEWATER	Sydney Water

To determine the capacity of the existing utilities infrastructure, additional information was requested from each of the utility providers. Where this information was not provided, the current capacity was calculated using a desk-top analysis informed by attribute data of the utility assets identified.

Based on the schedule of accommodation for the development option, future utility demands were calculated to determine if the existing utility infrastructure could cater for the proposed growth. Where utility infrastructure was deemed to be insufficient, potential strategies to meet future needs have been proposed.

1.7 STUDY LIMITATIONS AND ASSUMPTIONS

- At the time of writing this report, the current capacity of Sydney Water's sewer and water networks have been determined as having sufficient in size to cater for the proposed development however the flow capacity has not been disclosed.
- Available capacity from utility providers is not reserved until formal load applications are received from future development proposals.
- Existing utility information is based on Dial Before You Dig searches completed on 13/06/2019 and Work As Executed drawings received from Sydney Metro on 03/07/2019.
- The strategic options considered for the extension of the sewer network are strategic routes. These have not been space-proofed therefore their feasibility will need to be confirmed through a detailed design process.
- The assessed demand basis is conservative and may be excessive depending on utility authorities' respective methods. Further review and refinement of these demands including benchmarking against similar developments and consultation with relevant utility authorities is recommended.

2 POWER

2.1 EXISTING POWER INFRASTRUCTURE

Endeavour Energy operates and maintains the power supply network in the Precinct. Per the provided DBYD authority records, the existing electrical distribution network within the site consists mainly underground assets that are inclusive of both low and high voltage infrastructure, supplying multiple distribution substations located within the precinct. Figure 2.1 shows the existing electrical conduits and substations.

The existing substations serving the site vary in type, and the total capacity of the substations is currently unknown. These substations are incorporated into the building structure or externally located from the buildings, by way of pad mount substations. These are generally sized with level of contingency, as to avoid any future overloading. This contingency would vary across the distribution stations and would be subject to a detailed review as to acquire an understanding of any available capacity.

It is evident from the DBYD records that there is electrical supply to the Sydney Metro Hill Showground Station with its own supply of electrical conduits and substation. The Sydney Metro infrastructure is not available to supply any development options.

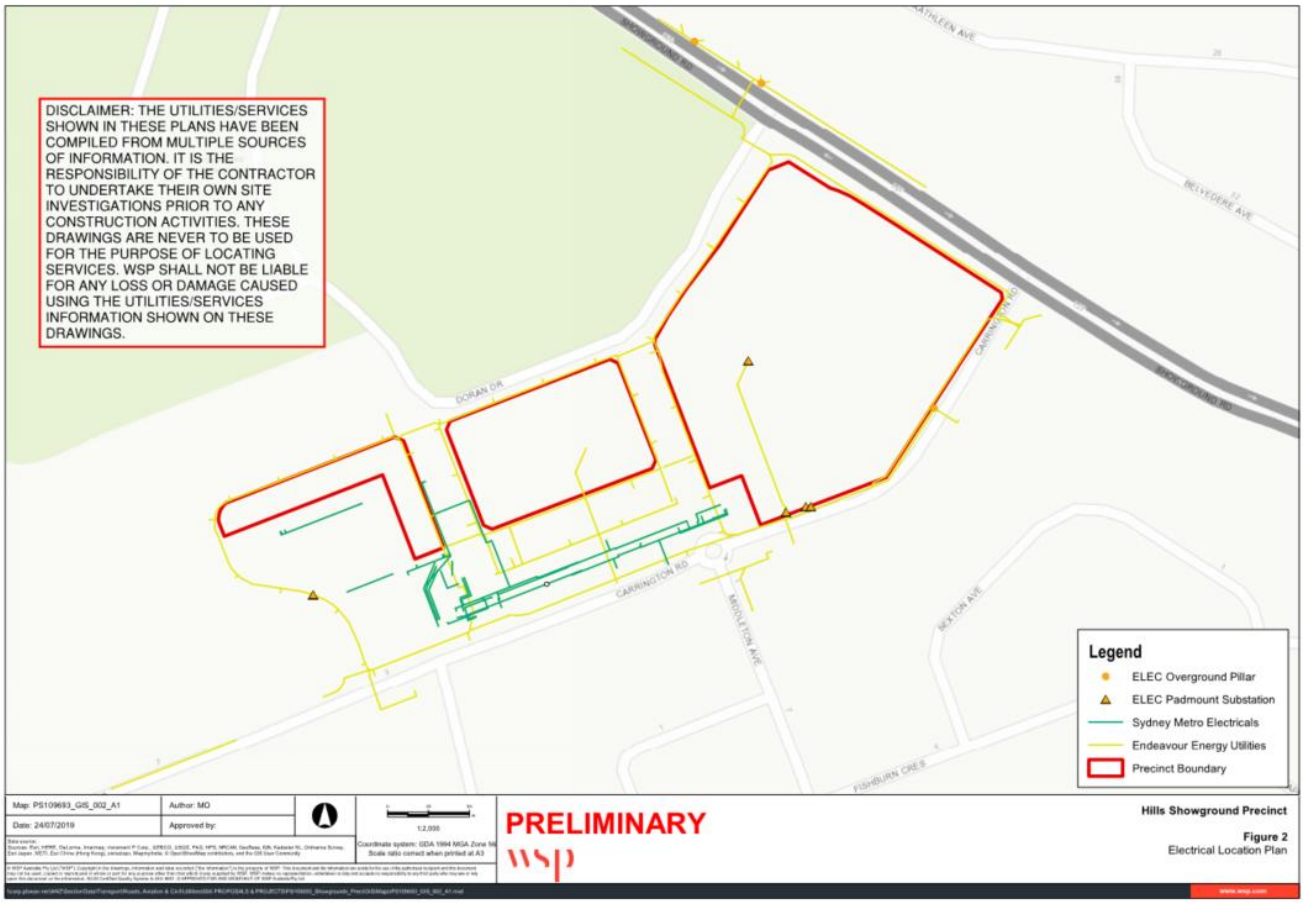


Figure 2-1: Existing Power Infrastructure Indicative Layout

2.1.1 ENDEAVOUR ENERGY EXISTING CAPACITY

A technical enquiry was submitted to Endeavour Energy on 17/06/19 requesting information on the available capacity of the existing network servicing the Precinct. Endeavour Energy's response provided information about the current

electrical loading around the Precinct, including the available feeders to supply the Precinct. The available feeders along Carrington Road and Showground Road are presented in Figure 2-2

Based on Endeavour Energy's advice, the current capacity of the electrical supply network to the Hills Showground Station Precinct as follows:

- 4 x 11kV feeders in the vicinity of the intersection of Carrington Road and Showground Road
- Feeders CJ1127 & CJ1282 each have an available capacity of 4.5MVA (represented by the green lines in Figure 2-2)
- Combined, there is a total of 9MVA capacity available between feeders CJ1127 and CJ1282.

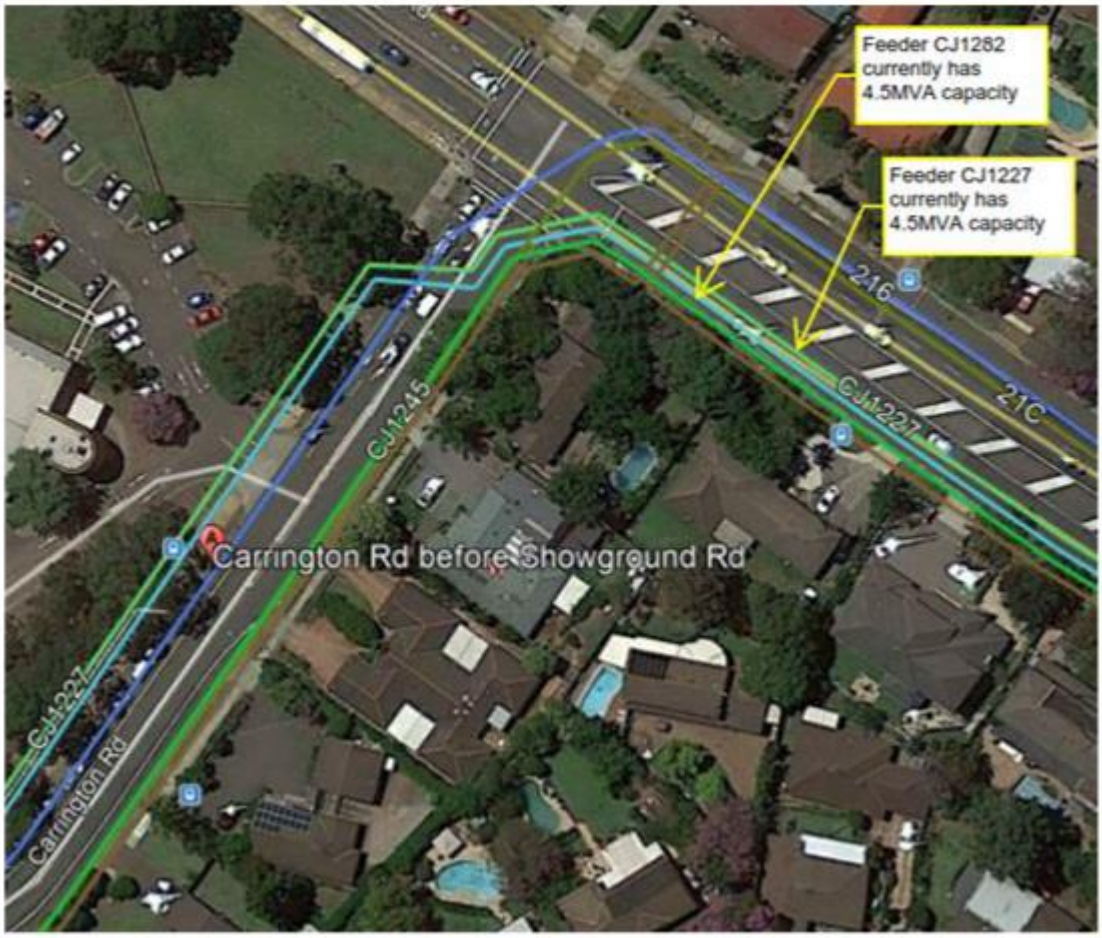


Figure 2-2: Feeders in the vicinity of Carrington Road and Showground Road

2.2 REQUIRED POWER INFRASTRUCTURE

While exact future load estimates are not known, estimated future load requirements have been determined based on the schedule of accommodation provided, as summarised in Table 2-1.

	Dwellings/GFA (m^2)	Estimated Elect. Load (MVA)
Residential	1809 dwellings	5.365
Retail	8,450 GFA	0.946
Commercial	4,610 GFA	0.516

Community	540 GFA	0.06
Carpark	2,630 spaces	1.25
Total Load		8.44

Table 2-1 - Estimated additional electrical loading based on proposed development

DEMAND CALCULATION ASSUMPTIONS:

- Maximum demand for the apartments are considered as per MDI0030 ADMD Schedule
- For car parking, 6m long and 2.3m width is assumed for each parking space as per AS2890. The maximum demand is calculated as per AS-NZS3000-2018
- For car parks, EV charging (VA 20/m^2) is assumed
- Retail allocated VA/m2 is assumed to be 140 as per AS-NZS3000-2018
- The max demand for the commercial, community and the non-residential types are assumed same as retail shop.
- A total of 10 lifts were assumed for residential development, with an approximate total load of 0.3 MVA. Actual load may vary based on the number and type of lifts installed, but this loading would not materially impact the overall capacity of the existing system and its ability to service the proposed developments.
- An additional loading of 0.3MVA has been added to the total load to account for street lighting in Precinct East. This is a typical load for street lighting of this scale. Actual load may vary based on the amount of street lighting installed, but this would not materially impact the overall capacity of the existing system and its ability to service the proposed developments.
- No allowance has been made for public domain facilities. Overall loading for any public domain facilities are assumed not to have a material impact on the capacity of the existing system.
- A diversity factor of 0.8 was applied, to account for the diversity in the occurrence of the load in the system since the maximum demands within the proposed development do not occur simultaneously.

2.3 RECOMMENDATIONS

As advised by Endeavour Energy, feeders CJ1227 and CJ1282 each have an available capacity of 4.5 MVA, with a total capacity of 9 MVA.

Future demand calculations estimated a total demand of 8.44 MVA. This is below the available existing 9MVA capacity, therefore there is sufficient current capacity to supply the demand for the development option being considered.

Note however, capacity is not reserved for this development and further consultation with Endeavour Energy will be required at the time of considering a development proposal.

It is noted the future demand calculations are an estimate based on the provided schedule of accommodation and the listed assumptions. The future developers of the site will calculate the final demand requirements as part of the detailed DA process.

3 WATER

3.1 EXISTING WATER INFRASTRUCTURE

Sydney Water owns and operates the water supply network in the Precinct. Per the DBYD records, the area is supplied primarily from a looped network of DN200 DICL mains and a DN150 CICL main along Carrington Rd. These connect from a DN300 DICL main along Showgrounds Rd. Existing service locations and metering arrangements have not been confirmed or assessed.

3.1.1 EXISTING WATER CAPACITY

Sydney Water were contacted on the 11/06/2019 regarding information about water network capacity around the Precinct. A feasibility application to Sydney Water was submitted on 04/07/2019 requesting information about the available capacity of the existing network servicing the Hills Showground Station Precinct. A response letter on 23/09/2019 confirms that the existing DN200 DICL water main has adequate capacity to accommodate the proposed development. There was no mention of the capabilities of the DN150 CICL water main to be used in the development of this precinct.

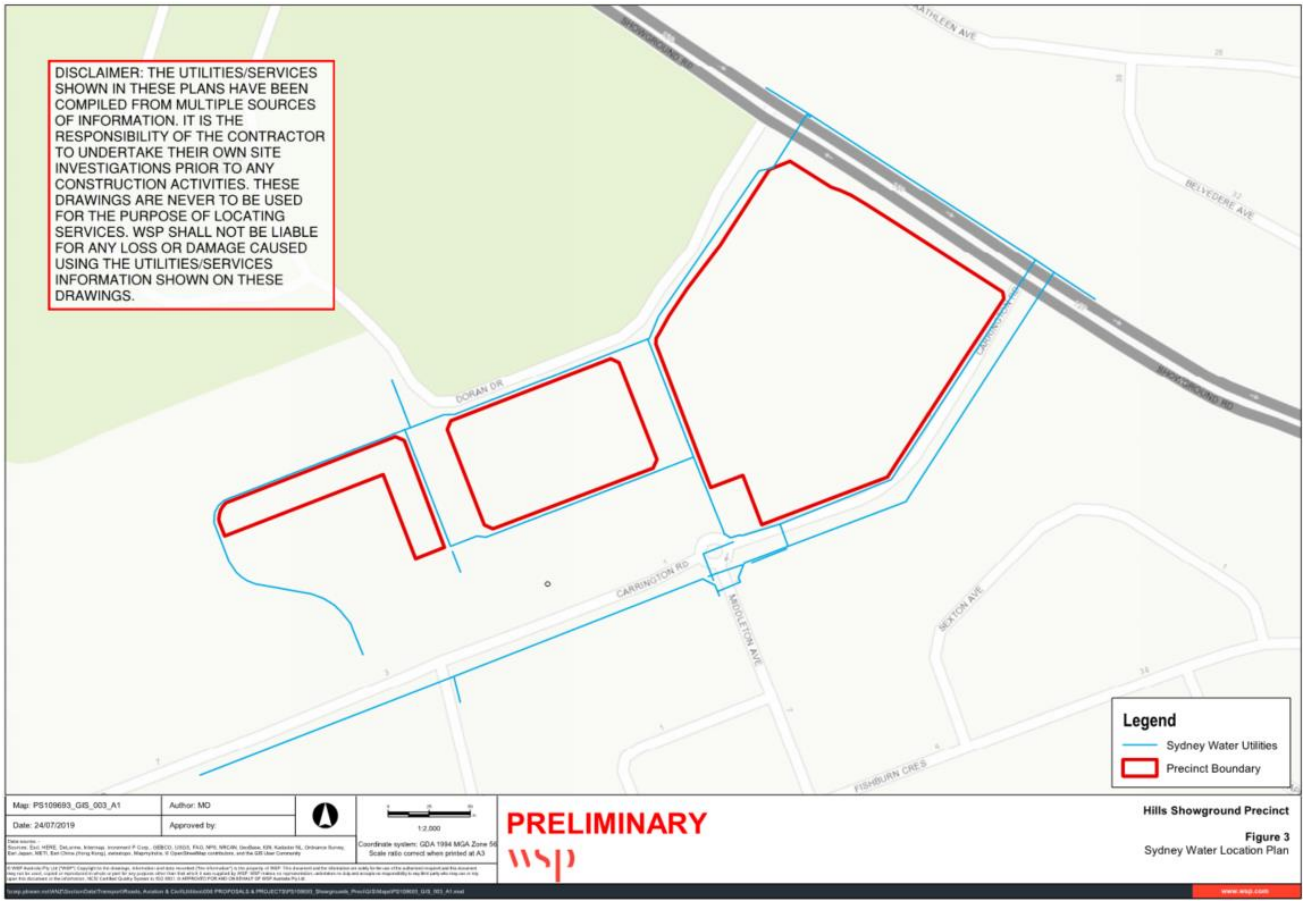


Figure 3-1: Existing Water Infrastructure Indicative Layout

3.2 REQUIRED WATER INFRASTRUCTURE

The Sydney Water edition of the Water Supply Code of Australia (WSA 03-2011 Version 3.1) was used to calculate the future demand and constraints for the water supply. This was applied to the schedule of accommodation, as summarised in Table 3-1.

	Capita	Peak Hours demand (l/s)
Residential	1809 dwellings	35.61
Retail	8,450 m^2 GFA	0.99
Commercial	4,610 m^2 GFA	0.54
Community	540 m^2 GFA	0.06
Total Load		37.19

Table 3-1 - Water demand

DEMAND CALCULATION ASSUMPTIONS:

- Max. day and max/peak hour demand was determined referencing Sydney Water's Water System Planning Guideline Version 1 September 2015.
- Retail, commercial and community assumed as suburban commercial - demand based on gross floor area

3.3 WATER RECOMMENDATIONS

As confirmed by Sydney Water the Looped DN200 mains will have adequate hydraulic capacity for this type of development and network upgrades are unlikely to be required. As there are several DN200 mains adjacent to each lot, there is likely to be some flexibility to locate service connections to suit the proposed architectural and internal building servicing design.

It is recommended that the DN150 CICL main in Carrington Rd is not used for servicing the development due to its smaller size. No comment was made on the DN150mm CICL water main by Sydney Water on its adequacy to be used in the development of this precinct.

It is noted the future demand calculation is an estimate based on the schedule of accommodation and listed assumptions. If the total load increases in the future, further consultation with Sydney Water will be required by the future developer.

4 SEWER

4.1 EXISTING SEWER INFRASTRUCTURE

Sydney Water owns and operates the sewer network in the Precinct. Per the DBYD search, the Precinct is located at the boundary between two wastewater catchments. One catchment drains south via a DN300 PVC gravity sewer in Carrington Rd, then to the north parallel to the creek. The other catchment (potentially only servicing several residential lots east of Carrington Rd) drains north via a DN150 VC sewer across Showgrounds Rd.

As shown in Figure 4-1, existing sewers assets identified are limited to the area around Carrington Rd and there is no sewer connection to the north of the proposed development sites.

4.1.1 SEWER EXISTING CAPACITY

Sydney Water was contacted on the 11/06/2019 regarding information about the sewer network capacity around the Precinct. A feasibility application was submitted to Sydney Water on 04/07/2019 requesting information about the available capacity of the existing network servicing the Hills Showground Station Precinct. A response letter on 23/09/2019 confirms that the existing DN300 PVC sewer mains have adequate capacity to accommodate the proposed development.

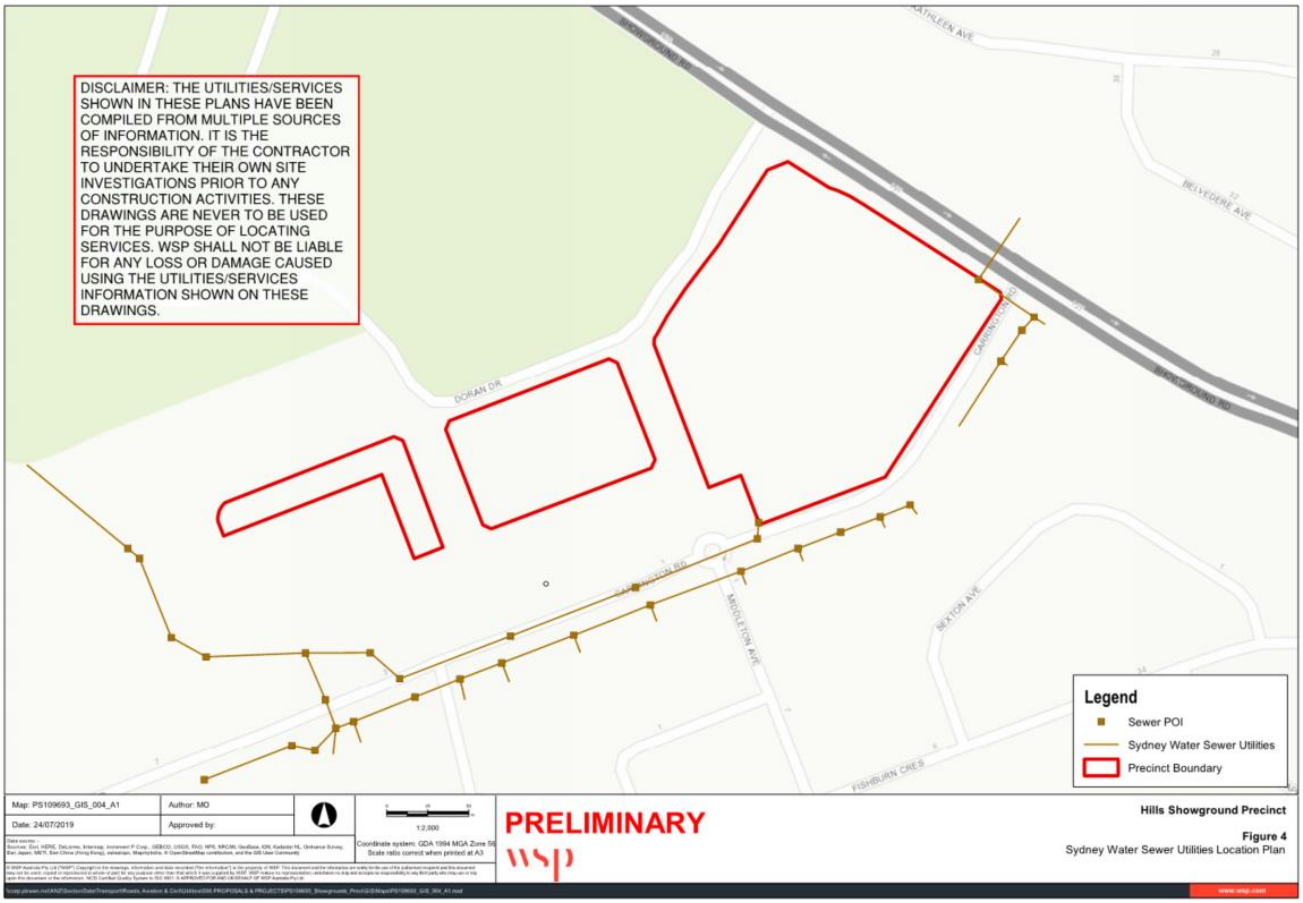


Figure 4-1: Existing Sewer Infrastructure Indicative Layout

4.2 REQUIRED SEWER INFRASTRUCTURE

Sewer servicing of the site will be influenced by topography, which, in general, slopes steeply west towards the creek. The eastern lot is generally flatter with the eastern part sloping away from the creek. Future sewer demand was calculated on a lot by lot basis with relation to its topography.

The Sydney Water edition of the Sewerage Code of Australia (WSA 02-2002-2.2) and schedule of accommodation was used to calculate the sewer flows and constraints, as summarised in Table 4-1.

	Area (ha)	**Peak Hours demand (l/s)**
Hills Showground precinct East	2.6928	17.41
Doran Drive Precinct	0.3195	7.86
Hills Showground precinct West	0.8179	12.71
Total Load		28.32

Table 4-1 Sewer Demand

DEMAND CALCULATION ASSUMPTIONS:

- EP calculations based on conventional approach - taken from section WSA Code Section A2.1 and A2.2
- ADWF is 0.0017 L/s/EP based on SW's WSA Appendix B
- EP/ha for commercial is assumed as 550 -Refer to WSA02 Table A-1 - high dens commercial. In absence of a better fitting category in this standard
- Assumed portion wet (of groundwater) assumed = 1 (worst case)
- Aeff calculations based on residential and >150EP/ha
- C assumed as 1 due to absence of data which is slightly higher than median (min=0.4, max=1.6)
- Catchment area for each lot taken as Gross Plan Area (lot area), measured from CAD drawing

4.3 SEWER RECOMMENDATION

Sewage connection points are required for Hills Showground East Precinct, Doran Drive Precinct and Hills Showground West Precinct.

Hills Showground East Precinct has two existing connection points, one along Showground Road and one along Carrington Road. Connection to Showground Road is via a 150VC pipe uphill, while the connection to Carrington Road is via a 300PVC concrete encased pipe. It is recommended that 300PVC concrete encased pipe is used to service Hills Showground East Precinct due to its larger capacity and location which is topographically lower, allowing a gravity fed system to be utilised.

Currently there is no direct sewer connections for the proposed Doran Drive Precinct and Hills Showground West Precinct. Two strategic options are suggested to service these two areas:

- **Option A** – Construct a DN150 sewer pipe along the eastern side of De Clambe Drive with connections from Hills Showground West precinct and Doran Drive precinct. This connection will go to the main adjacent Cattai Creek. There are limited clashes with existing services along De Clambe Drive, however the connection to the manhole

would require the new sewer to cross Cattai Creek. This would require appropriate approvals from both Sydney Water and environmental authorities and poses a credible risk to the feasibility of this option. This option will flow via a gravity fed system.

- **Option B** – Construct a DN150 sewer pipe along the southern side of Doran Drive with connections from Hills Showground West Precinct and Doran Drive Precinct. This will connect to the manhole at the intersection of Doran Drive and Carrington Road. This option will require detailed investigation and co-ordination with services running along Carrington Road and Doran Drive. The new Metro station area is highly congested area and at this location on the line is quite shallow to the road surface. As a direct result this option carries with it the risk that it may not be possible to undertake this route at a grade that would be suitable sewer mains. WSP notes that further investigation into the possibility of this option is not possible through desktop analysis and that more data is required through survey and consultation with Sydney Metro. This option will flow via a gravity fed system.

A summary of sewer servicing options are presented in Figure 4-2

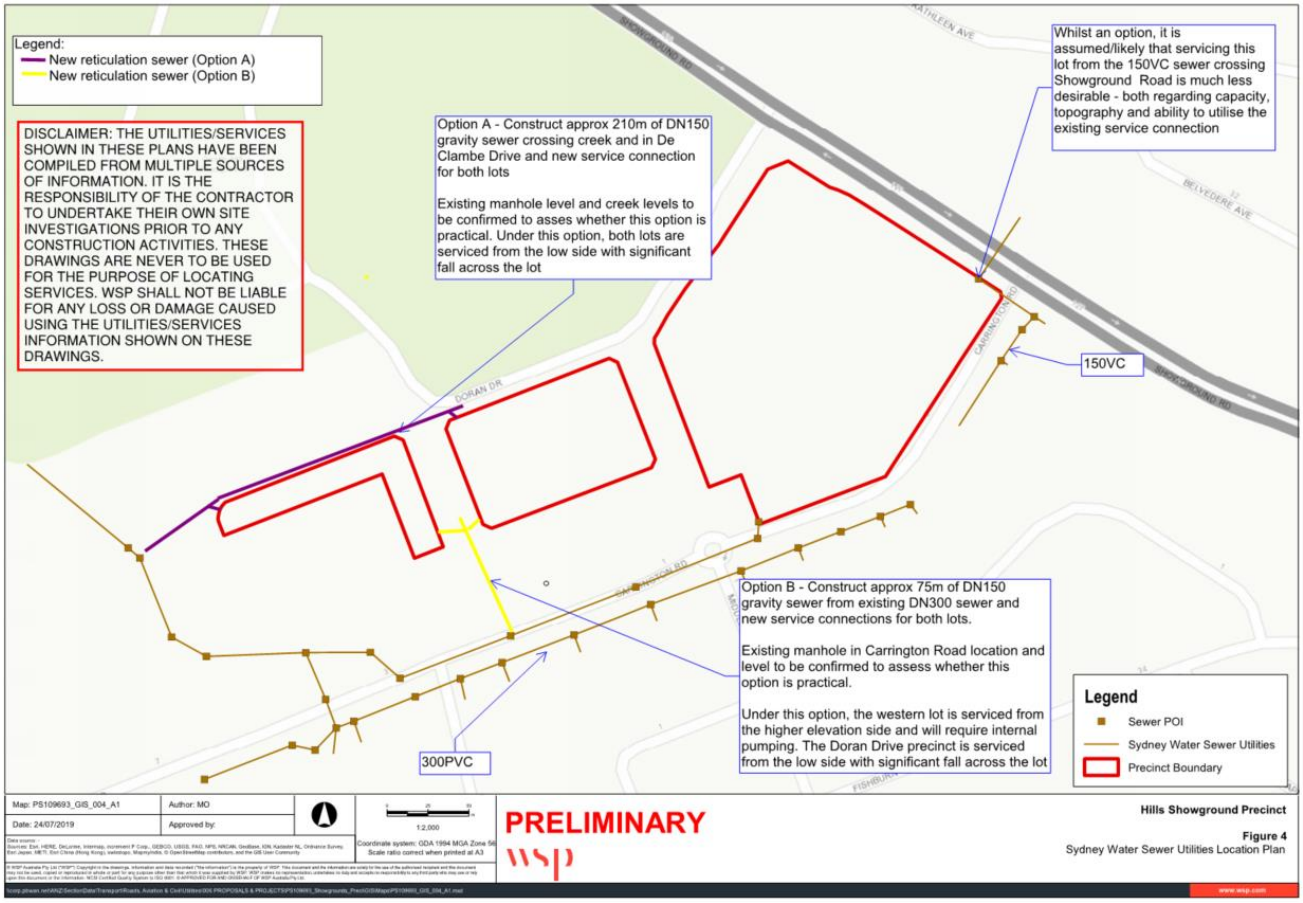


Figure 4-2 Proposed Sewer Infrastructure Options

If the total load increases in the future, further consultation with Sydney Water will be required by the future developer. WSP notes that the current desktop feasibility study undertaken is not adequate to fully determine the complete viability of some of the options shown and as such would recommend a detailed feasibility study to further investigate the risk and its mitigation. All options presented have varying levels of risk associated with the installation and final design locations which WSP strongly recommends be considered in the decision on these options chosen.

5 GAS

5.1 EXISTING GAS INFRASTRUCTURE

Jemena owns and operates the natural gas supply network in the Precinct. Based on DBYD records, the area is currently supplied by 1050kpa (high pressure) infrastructure along Showground Road and Gilbert Avenue.

The high-pressure mains are then reduced in pressure to 210kPa to supply the local network as shown in Figure 5-1 below.

5.1.1 JEMENA EXISTING CAPACITY

A request was sent to Jemena on 11/06/2019 requesting information about gas capacity around the Precinct. Jemena responded to this request on 20/06/2019, noting that the 210 kPa gas main along Carrington Road should be sufficient for the proposal.

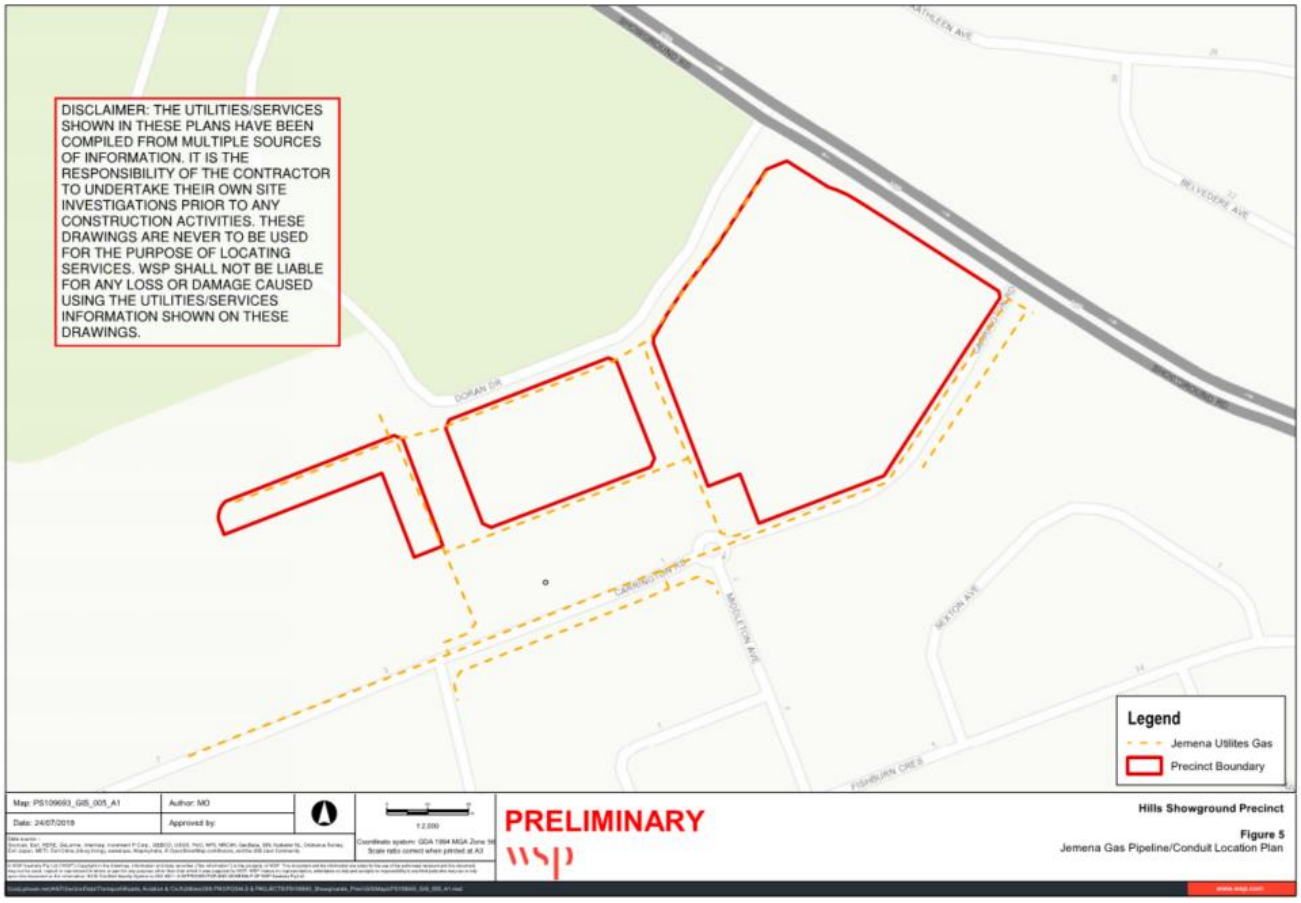


Figure 5-1: Existing Gas Infrastructure Indicative Layout

5.2 REQUIRED GAS INFRASTRUCTURE

Estimated future load requirements have been determined based on the schedule of accommodation as summarised in Table 5-1.

	Dwellings/GFA (m^2)	Estimated Gas Load (GJ p.a)
Residential	1,809 dwellings	95,525
Retail	8,450 GFA	23,575
Commercial	4,610 GFA	5,694
Community	540 GFA	963
Total Load		125,756

Table 5-1: Estimated Gas Load for the Proposed Development

DEMAND CALCULATION ASSUMPTIONS:

- 1.764 MJ/ m3.day heating/ cooling allowance
- 10MJ BBQ allowance
- CIBSE 115 L/ person.day requires 25 MJ of heating
- Cook tops 65 MJ allowance
- 141.12 heating/ cooling per 80m2 dwelling

5.3 GAS RECOMMENDATIONS

It is assumed the proposed gas load of 125,756GJ p.a can be sourced from the 210kPa Gas Main along Carrington Road. Therefore, no upgrades to the existing Jemena network is required. It is noted the future demand calculation is an estimate based on the schedule of accommodation and listed assumptions. If the total load increases in the future, further consultation with Jemena will be required.

6 TELECOMMUNICATIONS

6.1 EXISTING TELECOMMUNICATIONS INFRASTRUCTURE

The DBYD records indicated that Telstra, Optus, NBNCo, Nextgen, Pipe Networks, Vocus each have telecommunications infrastructure along Carrington Road and Showground Road as shown in

Figure 6-1. Fibre cable of varying size run along these routes through a pit and pipe system.

There are no communications towers near the Precinct.

6.1.1 EXISTING TELECOMUNNICATIONS CAPACITY

As part of the ongoing process of engaging utility providers, an inquiry was submitted to Telstra on the 11/06/2019, Optus on the 11/06/2019, NBNCo on the 24/06/2019 and Vocus on the 24/06/2019.

The following responses for each telecommunication provider as follows:

- Optus – Responded on the 20/06/2019. There is a 144 fibre and 312 fibre along Carrington Road and Showground Road.
- NBNCo – Responded on the 18/07/2019. Confirmed they have assets along Carrington Road and Showground Road. The size of these assets remain unknown.
- Vocus – Responded on the 24/06/2019. A Vocus 720 fibre (Cable ID CB25106) running along Carrington Road and a Nextgen 288 fibre (Cable ID WSYD_4001) running along Carrington Road
- Telstra has not responded to the original request regarding existing network capacity.

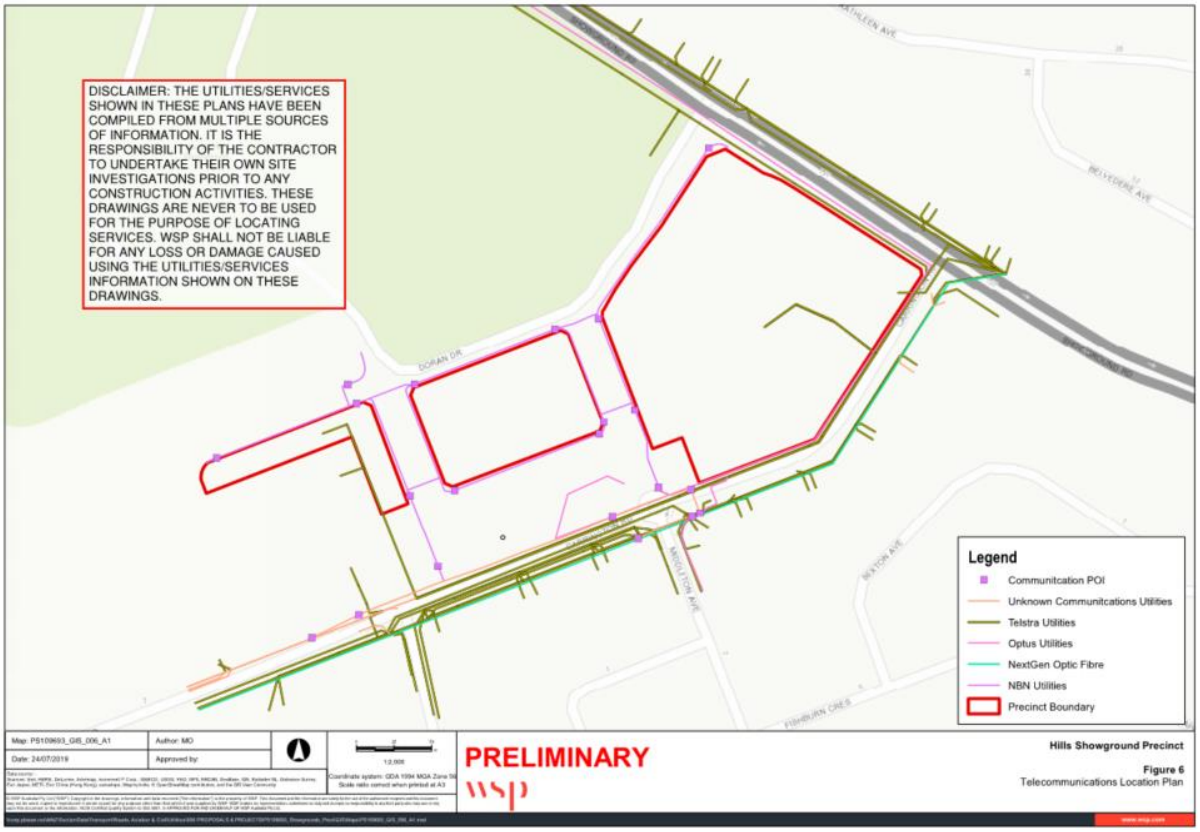


Figure 6-1: Existing telecommunications infrastructure Indicative Layout

6.2 PROPOSED TELECOMMUNICATIONS INFRASTRUCTURE

The Precinct is well serviced by telecommunications networks along Carrington Road and Showground Road. Local extensions of telecommunications networks are feasible and will be driven by consumer demand and needs.

7 SUMMARY OF FINDINGS

7.1 POWER

As advised by Endeavour Energy, there are two electrical feeders available to service the Precinct (CJ1227 and CJ1282). Each have an available capacity of 4.5 MVA, 9 MVA total.

Estimated future power demands is 8.44MVA. This calculated demand is within the available capacity. Therefore, it is determined that the current power network capacity can currently support future demand loads.

7.2 WATER

As there are several DN200 water mains adjacent to each lot, there is likely to be some flexibility to locate service connections to suit the proposed architectural and internal building servicing design. Sydney Water confirmed that this existing system has adequate capacity to accommodate the proposed development.

Note it is recommended that the DN150 CICL main in Carrington Rd is not used for servicing the development due to its smaller size.

7.3 SEWER

Sydney Water confirms that the existing DN300 PVC sewer mains in Carrington Road has adequate capacity to accommodate the proposed development.

There is no sewer connection to the Doran Drive Precinct and Hills Showground West Precinct respectively. Options have been recommended to provide sewer connection to these two sites. Each of these options will be further investigated to determine by the future developer as part of the detailed DA to confirm the feasibility and risks associated with the proposed development.

7.4 GAS

Discussions with Jemena indicate that the 210 kPa gas main located along Carrington Road should be sufficient to service the Precinct. There is a 1050 kPa gas main along Showground Road, north of the Precinct available to serve as a connection point should the 210 kPa be insufficient to service the precinct.

7.5 TELECOMMUNICATIONS

Upgrades to existing telecommunications networks are feasible and will be driven by consumer demands and needs.

APPENDIX A: ALTERNATIVE DEVELOPMENT SCENARIO

This section summarises the utility impact assessment for the alternative development scenario and should be read in conjunction with the Section 1-7 of the Utilities Servicing Impact Assessment Report.

SCHEDULE OF ACCOMMODATION

Table 0-1 summarises the alternative schedule of accommodation assessed for the three development lots, including total number of dwellings, gross floor area estimates and parking spaces. This scenario envisions lower non -residential GFA and higher retail GFA. The utility demand associated with this schedule of accommodation, and the recommendations for infrastructure required to service this demand is included in subsequent sections.

Table 0-1 Summary of schedule of accommodation

	GFA (m^2)	**Dwellings (Total Number)**
Residential	169,661	1,885
Retail	6,700	-
Commercial	-	-
Community	-	-
Carparking	-	2,653

POWER

While exact future load estimates are not known, estimated future load requirements have been determined based on the schedule of accommodation provided, as summarised in Table 0-2.

	Dwellings/GFA(m^2)	**Estimated Elec. Load (MVA)**
Residential	1,885 dwellings	5.578
Retail	6,700 GFA	0.75
Commercial	-	-
Community	-	-
Carpark	2653 spaces	1.263
Total Load		7.89

Table 0-2 - Estimated additional electrical loading based on proposed development

DEMAND CALCULATION ASSUMPTIONS:

- Maximum demand for the apartments are considered as per MDI0030 ADMD Schedule
- For car parking, 6m long and 2.3m width is assumed for each parking space as per AS2890. The maximum demand is calculated as per AS-NZS3000-2018
- For car parks, EV charging (VA 20/m^2) is assumed

- Retail allocated VA/m2 is assumed to be 140 as per AS-NZS3000-2018
- The max demand for the commercial, community and the non-residential types are assumed same as retail shop.
- A total of 10 lifts were assumed for residential development, with an approximate total load of 0.3 MVA. Actual load may vary based on the number and type of lifts installed, but this loading would not materially impact the overall capacity of the existing system and its ability to service the proposed developments.
- An additional loading of 0.3MVA has been added to the total load to account for street lighting in Precinct East. This is a typical load for street lighting of this scale. Actual load may vary based on the amount of street lighting installed, but this would not materially impact the overall capacity of the existing system and its ability to service the proposed developments.
- No allowance has been made for public domain facilities. Overall loading for any public domain facilities are assumed not to have a material impact on the capacity of the existing system.
- A diversity factor of 0.8 was applied, to account for the diversity in the occurrence of the load in the system since the maximum demands within the proposed development do not occur simultaneously.

RECOMMENDATIONS

As advised by Endeavour Energy, feeders CJ1227 and CJ1282 each have an available capacity of 4.5 MVA, with a total capacity of 9 MVA.

Future demand calculations estimated a total demand of 7.89 MVA. This is below the available existing 9MVA capacity, therefore there is sufficient current capacity to supply the demand for the development option being considered.

Note however, capacity is not reserved for this development and further consultation with Endeavour Energy will be required at the time of considering a development proposal.

It is noted the future demand calculations are an estimate based on the provided schedule of accommodation and the listed assumptions. The future developers of the site will calculate the final demand requirements as part of the detailed DA process.

WATER

The Sydney Water edition of the Water Supply Code of Australia (WSA 03-2011 Version 3.1) was used to calculate the future demand and constraints for the water supply. This was applied to the schedule of accommodation, as summarised in Table 0-3.

	Capita	**Peak Hours demand (l/s)**
Residential	1,885 dwellings	37.01
Retail	6,700 m^2 GFA	0.79
Commercial	-	-
Community	-	-
Total Load		37.80

Table 0-3 - Water demand

DEMAND CALCULATION ASSUMPTIONS:

- Max. day and max/peak hour demand was determined referencing Sydney Water's Water System Planning Guideline Version 1 September 2015.
- Retail, commercial and community assumed as suburban commercial - demand based on gross floor area

WATER RECOMMENDATIONS

As confirmed by Sydney Water the Looped DN200 mains will have adequate hydraulic capacity for this type of development and network upgrades are unlikely to be required. As there are several DN200 mains adjacent to each lot, there is likely to be some flexibility to locate service connections to suit the proposed architectural and internal building servicing design.

It is recommended that the DN150 CICL main in Carrington Rd is not used for servicing the development due to its smaller size. No comment was made on the DN150mm CICL water main by Sydney water on its adequacy to be used in the development of this precinct.

It is noted the future demand calculation is an estimate based on the schedule of accommodation and listed assumptions. If the total load increases in the future, further consultation with Sydney Water will be required by the future developer.

SEWER

Sewer servicing of the site will be influenced by topography, which, in general, slopes steeply west towards the creek. The eastern lot is generally flatter with the eastern part sloping away from the creek. Future sewer demand was calculated on a lot by lot basis with relation to its topography.

The Sydney Water edition of the Sewerage Code of Australia (WSA 02-2002-2.2) and schedule of accommodation was used to calculate the sewer flows and constraints, as summarised in Table 0-4.

	Area (ha)	**Peak Hours demand (l/s)**
Hills Showground precinct East	2.6928	18.21
Doran Drive Precinct	0.3195	7.66
Hills Showground precinct West	0.8179	11.44
Total Load		28.08

Table 0-4 Sewer Demand

DEMAND CALCULATION ASSUMPTIONS:

- EP calculations based on conventional approach - taken from section WSA Code Section A2.1 and A2.2
- ADWF is 0.0017 L/s/EP based on SW's WSA Appendix B
- EP/ha for commercial is assumed as 550 -Refer to WSA02 Table A-1 - high dens commercial. In absence of a better fitting category in this standard
- Assumed portion wet (of groundwater) assumed = 1 (worst case)
- Aeff calculations based on residential and >150EP/ha
- C assumed as 1 due to absence of data which is slightly higher than median (min=0.4, max=1.6)

- Catchment area for each lot taken as Gross Plan Area (lot area), measured from CAD drawing

SEWER RECOMMENDATION

Sewage connection points are required for Hills Showground East Precinct, Doran Drive Precinct and Hills Showground West Precinct.

Hills Showground East Precinct has two existing connection points, one along Showground Road and one along Carrington Road. Connection to Showground Road is via a 150VC pipe uphill, while the connection to Carrington Road is via a 300PVC concrete encased pipe. It is recommended that 300PVC concrete encased pipe is used to service Hills Showground East Precinct due to its larger capacity and location which is topographically lower, allowing a gravity fed system to be utilised.

Currently there is no direct sewer connections for the proposed Doran Drive Precinct and Hills Showground West Precinct. Two strategic options are suggested to service these two areas and are outlined in Section 4.3.

If the total load increases in the future, further consultation with Sydney Water will be required by the future developer. WSP notes that the current desktop feasibility study undertaken is not adequate to fully determine the complete viability of some of the options shown and as such would recommend a detailed feasibility study to further investigate the risk and its mitigation. All options presented have varying levels of risk associated with the installation and final design locations which WSP strongly recommends be considered in the decision on these options chosen.

GAS

Estimated future load requirements have been determined based on the schedule of accommodation as summarised in Table 0-5.

	Dwellings/GFA (m^2)	**Estimated Gas Load (GJ p.a)**
Residential	1,885 dwellings	99,538
Retail	6,700 GFA	18,693
Commercial	-	-
Community	-	-
Total Load		118,231

Table 0-5: Estimated Gas Load for the Proposed Development

DEMAND CALCULATION ASSUMPTIONS:

- 1.764 MJ/ m3.day heating/ cooling allowance
- 10MJ BBQ allowance
- CIBSE 115 L/ person.day requires 25 MJ of heating
- Cook tops 65 MJ allowance
- 141.12 heating/ cooling per 80m2 dwelling

GAS RECOMMENDATIONS

It is assumed the proposed gas load of 118,231GJ p.a can be sourced from the 210kPa Gas Main along Carrington Road. Therefore, no upgrades to the existing Jemena network is required. It is noted the future demand calculation is an estimate based on the schedule of accommodation and listed assumptions. If the total load increases in the future, further consultation with Jemena will be required.

TELECOMMUNICATIONS

The Precinct is well serviced by telecommunications networks along Carrington Road and Showground Road. Local extensions of telecommunications networks are feasible and will be driven by consumer demand and needs.

APPENDIX B: DBYD COVER SHEET

Job No 16457122

Phone: 1100
www.1100.com.au

Caller Details

Contact:	Mr Dominador Tolentino	**Caller Id:**	1941754	**Phone:**	61 429 471 200
Company:	WSP	**Mobile:**	61 429 471 200	**Fax:**	Not Supplied
Address:	Level 27 680 George Street Sydney NSW 2000	**Email:**	Dominador.Tolentino@wsp.com		

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.

User Reference: Not Supplied
Working on Behalf of: Roads and Maritime Services

Enquiry Date:	Start Date:	End Date:
13/06/2019	15/06/2019	16/06/2019

Address:
02 Doran Drive
Castle Hill NSW 2154

Job Purpose:	Onsite Activity:
Excavation	Manual Excavation
Location of Workplace:	**Location in Road:**
Both	CarriageWay,Footpath,Nature Strip

- Check the location of the dig site is correct. If not submit a new enquiry.
- If the scope of works change, or plan validity dates expire, resubmit your enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:
- CONTINUED FROM JOB: 16454939 -

Your Responsibilities and Duty of Care

- The lodgement of an enquiry does not authorise the project to commence. You must obtain all necessary information from any and all likely impacted asset owners prior to excavation.
- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at **www.1100.com.au**
- **For more information on safe excavation practices, visit www.1100.com.au**

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days.
Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
# Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
84402978	Endeavour Energy	0298534161	NOTIFIED
84402981	Jemena Gas North	1300880906	NOTIFIED
84402983	NBN Co, NswAct	1800626762	NOTIFIED
84402976	Nextgen, NCC - NSW	1800032532	NOTIFIED
84402980	Optus and/or Uecomm, Nsw	1800505777	NOTIFIED
84402977	PIPE Networks, Nsw	1800201100	NOTIFIED
84402975	Roads and Maritime Services	0288370285	NOTIFIED
84402985	Sydney Metro	0410509577	NOTIFIED
84402982	Sydney Water	132092	NOTIFIED
84402979	Telstra NSW, Central	1800653935	NOTIFIED
84402974	The Hills Shire Council #	0298430555	NOTIFIED

END OF UTILITIES LIST