UTILITIES AND INFRASTRUCTURE SERVICING REPORT

APPENDIX P

Sydney Metro City & Southwest: Waterloo Over Station Development

Utilities and Infrastructure Servicing Report

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Table of Contents

1.0 Introduction 4
1.1 Purpose of this report 4
1.2 Overview of the Sydney Metro in its context 5
1.3 Nominated State Significant Precinct - Waterloo 7
1.4 Planning relationship between Waterloo Station and the OSD 8
1.5 The site 10
1.5.1 Location 10
1.5.2 Site context 11
1.6 Overview of the proposed development 14
1.7 Staging and framework for managing environmental impacts 17
2.0 Scope of assessment 19
3.0 Baseline Investigations 23
3.1 Gathering Existing Utility Information 23
3.2 Dial Before You Dig Plans 23
3.3 Utility Reports 23
3.4 Development Context 25
3.5 Combined Services Plan 25
3.6 Demand Assessment Yields 26
4.0 Potable Water 27
4.1 Background 27
4.2 Demand Assessment 28
4.3 Forecast Demand 28
4.4 On-Site Utility Infrastructure 29
4.5 Potential ESD Initiatives 30
4.6 Coordination with Other Services 32
4.7 Approvals and Next Steps 33
5.0 Wastewater 35
5.1 Background 35
5.2 Demand Assessment 36
5.3 Forecast Demand 36
5.4 On-Site Utility Infrastructure 37
5.5 Potential ESD Initiatives 37
5.6 Coordination with Other Services 39
5.7 Approvals and Next Steps 40
6.0 Electrical 41
6.1 Background 41
6.2 Demand Assessment 41
6.3 Forecast Demand 42

6.4 On-Site Utility Infrastructure 43
6.5 Undergrounding of Existing Electrical 45
6.6 Potential ESD Initiatives 46
6.7 Coordination with Other Services 48
6.8 Approvals and Next Steps 48
7.0 Gas 49
7.1 Background 49
7.2 Demand Assessment 49
7.3 Forecast Demand 49
7.4 Existing On-Site Utility Infrastructure 50
7.5 Potential ESD Initiatives 50
7.6 Coordination with Other Services 52
7.7 Approvals and Next Steps 52
8.0 Data and Communication 53
8.1 Background 53
8.2 Demand Assessment 53
8.3 On-Site Utility Infrastructure 53
8.4 Coordination with Other Services 56
8.5 Approvals and Next Steps 56
9.0 Utility Service Corridors 58
9.1 Streets Opening Conference Service Corridors 58
10.0 Conclusion 61
11.0 Assessment 62

1.0 Introduction

1.1 Purpose of this report

This report accompanies a concept State Significant Development Application (concept SSD Application) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The concept SSD Application is made under Section 4.22 of the EP&A Act.

This report should be read in conjunction with the Nominated State Significant Precinct (SSP) Study – Waterloo, submitted to the Minister for Planning (The Minister) in July 2018. That study proposes new planning controls to facilitate the development proposed.

Sydney Metro is seeking to secure concept approval for over station development (OSD) above and adjacent to Waterloo Station comprising a podium and three taller buildings which include commercial, residential, and community land uses. The concept SSD Application seeks consent for a building envelope and use for residential, retail, commercial, entertainment, community and recreational purposes, maximum building height, maximum gross floor area (GFA), pedestrian and vehicular access, circulation arrangements and associated car parking and the strategies and design parameters for the future detailed design of development.

Sydney Metro proposes to procure the construction of the OSD as part of an integrated station development package, which would result in the combined delivery of the station, OSD and public domain improvements. The station and its public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPE on 9 January 2017.

As the development is within a rail corridor, is associated with railway infrastructure and is for "commercial premises or residential accommodation" with a Capital Investment Value of more than $30 million, the project is identified as State Significant Development (SSD) pursuant to Schedule 1, 19(2)(a) of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

This report has been prepared to outline the Utilities and Infrastructure Servicing impacts and specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application on 29th June 2018 which states that the Environmental Impact Statement (EIS) is to address the following requirements:

Reference	SEARs Requirement	Where Addressed in Report
18.0 Utilities	The EIS shall identify the existing capacity of the site to service the development proposed and any augmentation requirements for utilities, including arrangements for electrical network requirements, drinking water, waste water and recycled water.	*Section 3.0, 4.0, 5.0, 6.0, 7.0 and 8.0*

1.2 Overview of the Sydney Metro in its context

Sydney Metro is Australia's biggest public transport project. A new standalone metro railway system, this 21st century network will deliver 31 metro stations and 66km of new metro rail for Australia's biggest city — revolutionising the way Sydney travels. Services start in the first half of 2019 on Australia's first fully-automated railway.

Sydney Metro was identified in *Sydney's Rail Future*, as an integral component of the *NSW Long Term Transport Master Plan*, a plan to transform and modernise Sydney's rail network so it can grow with the city's population and meet the future needs of customers. In early 2018, *the Future Transport Strategy 2056* was released as an update to *the NSW Long Term Transport Master Plan* and *Sydney's Rail Future*. Sydney Metro City & Southwest is identified as a committed initiative in the *Future Transport Strategy 2056*.

Sydney Metro is comprised of three projects (refer to Figure 1):

Sydney Metro Northwest — formerly the 36km North West Rail Link. This $8.3 billion project is now under construction and will open in the first half of 2019 with a metro train every four minutes in the peak.

Sydney Metro City & Southwest — a new 30km metro line extending the new metro network from the end of Sydney Metro Northwest at Chatswood, under Sydney Harbour, through the CBD and south west to Bankstown. It is due to open in 2024 with an ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro West – a new underground railway connecting the Parramatta and Sydney central business districts. This once-in-a-century infrastructure investment will double the rail capacity of the Parramatta to Sydney CBD corridor and will establish future capacity for Sydney's fast growing west. Sydney Metro West will serve five key precincts at Westmead, Parramatta, Sydney Olympic Park, The Bays and the Sydney CBD. The project will also provide an interchange with the T1 Northern Line to allow faster connections for customers from the Central Coast and Sydney's north to Parramatta and the Sydney CBD.

Sydney's new metro, together with signalling and infrastructure upgrades across the existing Sydney suburban rail network, will increase the capacity of train services entering the Sydney CBD – from about 120 an hour currently to up to 200 services beyond 2024. That's an increase of up to 60 per cent capacity across the network to meet demand.

Figure 1: Sydney Metro alignment map

Sydney Metro City & Southwest includes the construction and operation of a new metro rail line from Chatswood, under Sydney Harbour through Sydney's CBD to Sydenham and on to Bankstown through the conversion of the existing line to metro standards.

The project also involves the delivery of six (6) new metro stations, including at Waterloo, together with new underground platforms at Central. Once completed, Sydney Metro will have the ultimate capacity for a train every two minutes through the CBD in each direction - a level of service never seen before in Sydney.

On 9 January 2017, the Minister approved the Sydney Metro City & Southwest - Chatswood to Sydenham application lodged by TfNSW as a CSSI project (reference SSI 15_7400).

The CSSI Approval includes all physical work required to construct the CSSI, including the demolition of existing buildings and structures on each site. Importantly, the CSSI Approval also includes provision for the construction of below and above ground structures and other components of future OSD (including building infrastructure and space for future lift cores, plant rooms, access, parking and building services, as relevant to each site). The rationale for this delivery approach, as identified within the CSSI application is to enable the OSDs to be more efficiently built and appropriately integrated into the metro station structures.

The EIS for the Chatswood to Sydenham alignment of the City & Southwest project identified that the OSD would be subject to a separate assessment process.

Since the CSSI Approval was issued, Sydney Metro has lodged four modification applications to amend the CSSI Approval as outlined below:

- Modification 1 - Victoria Cross and Artarmon Substation which involves relocation of the Victoria Cross northern services building from 194-196A Miller Street to 50 McLaren Street together with inclusion of a new station entrance at this location referred to as Victoria Cross North. The modification also involves the relocation of the substation at Artarmon from Butchers Lane to 98 – 104 Reserve Road. This modification application was approved on 18 October 2017.
- Modification 2 - Central Walk which involves additional works at Central Railway Station including construction of a new eastern concourse, a new eastern entry, and upgrades to suburban platforms. This modification application was approved on 21 December 2017.
- Modification 3 - Martin Place Station which involves changes to the Sydney Metro Martin Place Station to align with the Unsolicited Proposal by Macquarie Group Limited (Macquarie) for the development of the station precinct. The proposed modification involves a larger reconfigured station layout, provision of a new unpaid concourse link and retention of the existing MLC pedestrian link and works to connect into the Sydney Metro Martin Place Station. It is noted that if the Macquarie proposal does not proceed, the original station design remains approved. This modification application was approved on 22 March 2018.
- Modification 4 - Sydenham Station and Sydney Metro Trains Facility South which incorporated Sydenham Station and precinct works, the Sydney Metro Trains Facility South, works to Sydney Water's Sydenham Pit and Drainage Pumping Station and ancillary infrastructure and track and signalling works into the approved project. This modification application was approved on 13 December 2017.

The CSSI Approval as modified allows for all works to deliver Sydney Metro between Chatswood and Sydenham Stations and also includes upgrade of Sydenham Station.

The remainder of the City & Southwest alignment (Sydenham to Bankstown) proposes the conversion of the existing heavy rail line from west of Sydenham Station to Bankstown to metro standards. This part of the project, referred to as the Sydenham to Bankstown upgrade, is the subject of a separate CSSI Application (Application No. SSI 17_8256) for which an EIS was exhibited between September and November 2017. A Response to Submissions and Preferred Infrastructure Report was submitted to DPE in June 2018 for further exhibition and assessment. This application is subject to assessment and determination by DPE, taking into consideration a further Response to Submissions Report which was submitted to DPE in September 2018.

1.3 Nominated State Significant Precinct - Waterloo

Following the decision to locate a metro station in Waterloo, the Minister determined that parts of Waterloo are of State planning significance which should be investigated for urban

renewal through the SSP process. Study requirements for such investigations were issued by the Minister on 19 May 2017.

Investigation of the Precinct is being undertaken by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW), in partnership with Sydney Metro and the Land and Housing Corporation (LAHC). The outcome of the SSP process will be new planning controls that will enable future development applications for renewal of the Precinct.

The Precinct includes two separate but contiguous and inter-related parts:

- The Waterloo Metro Quarter (the Metro Quarter)
- The Waterloo Estate (the Estate)

A separate SSP Study for the Metro Quarter was lodged in July 2018 in advance of the SSP Study for the Estate to provide a planning framework for the construction of OSD within the Metro Quarter. The staged submission of the Metro Quarter SSP Study also facilitates the proposed development to be delivered concurrently with the metro station, as an integrated station development.

As this concept SSD Application relies upon the planning framework proposed in the Metro Quarter SSP Study, it is anticipated that the SSP Study and EIS for the SSD Application will be exhibited concurrently.

1.4 Planning relationship between Waterloo Station and the OSD

While Waterloo Station and the OSD will form an integrated station development, the planning pathways defined under the EP&A Act require separate approval for each component of the development. In this regard, the approved station works (CSSI Approval) are subject to the provisions of Part 5.1 of the EP&A Act (now referred to as Division 5.2) and the OSD component is subject to the provisions of Part 4 of the EP&A Act.

For clarity, the approved station works under the CSSI Approval included the construction of below and above ground structures necessary for delivering the station and also enabling construction of the integrated OSD. This includes but is not limited to:

- demolition of existing development
- excavation
- integrated station and OSD structure (including concourse and platforms)
- lobbies
- retail spaces within the station building
- public domain improvements associated with the station
- access arrangements including vertical transport such as escalators and lifts
- space provisioning and service elements necessary to enable the future development of the OSD, such as lift cores, plant rooms, access, parking, retail, utilities connections and building services.

The vertical extent of the approved station works above ground level is defined by the 'transfer level' level (which for Waterloo is defined by approximately RL 33.1 over the northern station box and RL 35.1 over the southern station box), above which would sit the OSD. An example of this delineation is illustrated in Figure 2.

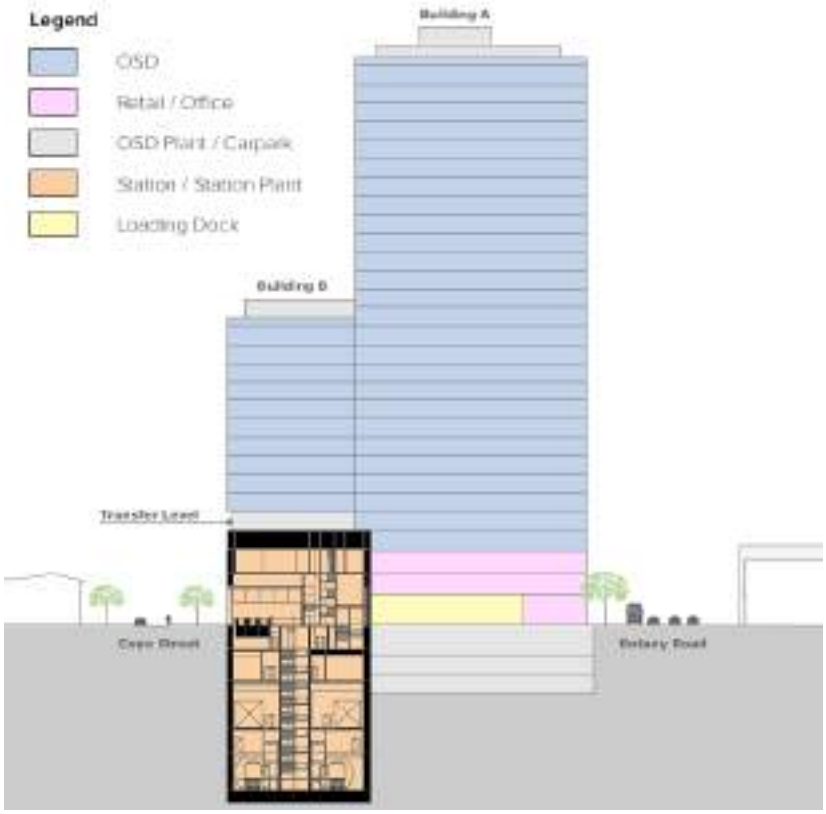

Figure 2: Delineation between the Metro station and OSD

It is noted that the structural and service requirements and space provisioning to support OSD vary from station to station. For example, based on the current level of design, Waterloo Station is not expected to provide for OSD lobbies, end of trip facilities and plant rooms. However, the detailed design may be amended to incorporate these elements as part of the integrated station development.

The CSSI Approval also establishes the general concept for the ground plane of Waterloo Station including access strategies for commuters, pedestrians and workers. In this regard, the main pedestrian access to the station would be via an entry located at the corner of Raglan and Cope Streets. The station design has continued to be developed having regard to its integration with the Metro Quarter OSD, and as a result, a second entrance to the station is to be provided from a proposed public plaza adjacent to Cope Street. Retail uses (approved under the CSSI Approval) would be located on the ground floor of the station development along the Cope Street frontage of the site.

Since the issue of the CSSI Approval, Sydney Metro has design work to determine the technical requirements for the structural integration of the OSD with the station. This level of design work, together with the planning and design undertaken for the remainder of the

Metro Quarter has informed the concept proposal for the OSD. It is noted that ongoing design development of the works to be delivered under the CSSI Approval would continue with a view to developing an Interchange Access Plan (IAP) and Station Design Precinct Plan (SDPP) for Waterloo Station to satisfy Conditions E92 and E101 of the CSSI Approval. The detailed design for the Metro Quarter would continue to evolve having regard to the IAP and SDPP.

Public domain improvement works immediately adjacent to Waterloo Station would be delivered as part of the CSSI Approval to support pedestrian movements between transport modes (including to new and relocated bus stops, bike parking on Cope Street, and taxi and kiss-and-ride bays on Cope Street), while other public domain works within the Metro Quarter are proposed as part of the OSD. Final details of public domain works for the OSD will be provided with the detailed SSD Application(s) following finalisation of the SDPP and IAP for the CSSI Approval.

1.5 The site

1.5.1 Location

The site is located within the City of Sydney Local Government Area (LGA).

The Metro Quarter comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street. The heritage listed Waterloo Congregational Church located at 103–105 Botany Road is within this block but is not part of the site.

The site has an approximate area of 1.287 hectares (refer to Figure 3).

Figure 3: Waterloo Station location plan

1.5.2 Site context

The Metro Quarter is located in Redfern Street Village (see Figure 4) in the City of Sydney LGA approximately 3.3 kilometres south of Sydney CBD, 1 kilometre north of Green Square and less than 1 kilometre south of Redfern Station.

Directly east is the Waterloo Estate (see Figure 5), which is owned by the NSW Government and is under the management of NSW LAHC. The Waterloo Estate comprises 2,012 social housing dwellings and a small number of private dwellings in medium and high density forms, ranging from single storey attached dwellings to apartment buildings of up to thirty storeys.

The Metro Quarter is less than 1 kilometre south-east of the Australian Technology Park (ATP), a technology micro-cluster that currently contains around 3,000 – 3,500 workers with a range of businesses in technology and creative industries; and a start-up/business incubator hub. It is set to grow into a business park that will soon accommodate new premises currently under construction (i.e. Commonwealth Bank Australia (CBA) has committed to two major office towers).

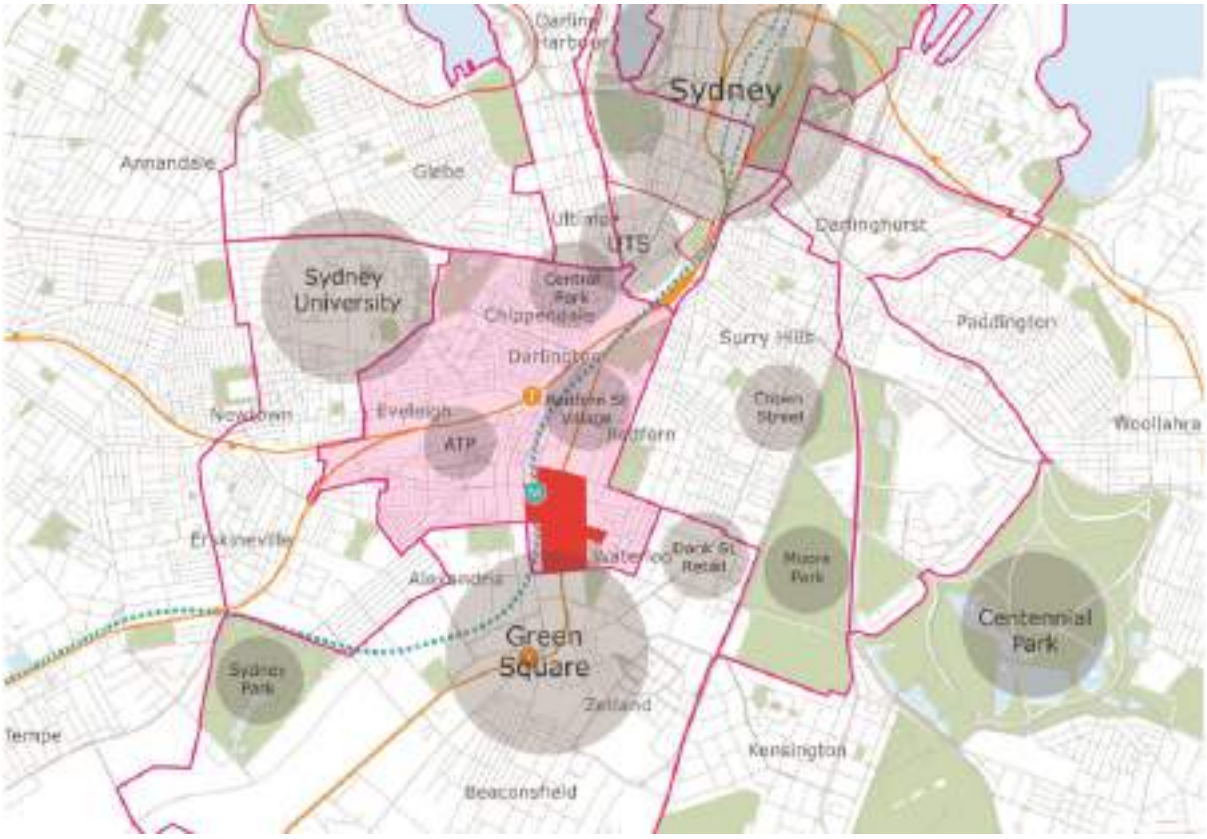

Figure 4 Location and site plan of the Waterloo State Significant Precinct (in red) and Redfern Street Village (in pink)

Figure 5 Nominated State Significant Precinct - Waterloo

The site comprises the following properties:

- 136B Raglan Street — Lot 4 DP 215751
- 59 Botany Road — Lot 5 DP 215751
- 65 Botany Road — Lot 1 DP814205
- 67 Botany Road — Lot 1 DP228641
- 124-128 Cope Street — Lot 2 DP228641
- 69-83 Botany Road — SP75492
- 130-134 Cope Street — Lot 12 DP399757
- 136-144 Cope Street — Lots A-E DP108312
- 85 Botany Road — Lot 1 DP27454
- 87 Botany Road — Lot 2 DP27454
- 89-91 Botany Road — Lot 1 DP996765
- 93-101 Botany Road — Lot 1 DP433969 & Lot 1 DP738891
- 156-160 Cope Street — Lot 31 DP805384
- 107-117A Botany Road — Lot 32 DP805384 & Lot A DP408116
- 119-121 Botany Road — Lot 1 DP205942 & Lot 1 DP436831
- 170-174 Cope Street — Lot 2 DP205942

The buildings and structures on the site are now demolished in accordance with the CSSI Approval with the exception of one building which is being used to support construction.

1.6 Overview of the proposed development

This concept SSD Application follows the submission of a SSP Study which supports a proposal to amend existing controls to facilitate the proposed development. The concept SSD Application will in turn comprises the first stage of seeking SSD development consent for the Waterloo OSD project. It will be followed by a future detailed SSD Application(s) for the design and construction of the OSD built form.

This concept SSD Application seeks approval for the planning and development framework and strategies to inform the future detailed design of the OSD. It specifically seeks approval for:

- maximum building envelopes, including maximum building heights, street-wall heights and ground and upper level setbacks
- a maximum gross floor area (GFA) of 68,750 square metres, comprising:
  - approximately 56,200 square metres GFA of residential accommodation, providing for approximately 700 dwellings, including 5 to 10 percent affordable housing and 70 social housing dwellings

  - approximately 3,905 square metres GFA of retail premises and entertainment facilities
  - approximately 8,645 square metres GFA for business and commercial premises and community, health service and recreational facilities (indoor), including at least 2,000 square metres of floor space for community uses
- a three storey podium and a free standing building located within a public plaza, accommodating non-residential land uses.
- residential uses above podium level in various building forms including three taller buildings of 23, 25 and 29 storeys (Reduced Level (RL) 96.9, 104.2 and 116.9 metres AHD respectively)
- use of OSD space provisioning within the footprint of the CSSI Approval
- public domain works, including open spaces, through-site links, footpaths, provision for cycle facilities and enhanced pedestrian crossings and roads.
- car parking for up to 427 vehicles
- cycle parking to support residential and non-residential land uses and visitors to the Metro Quarter. Approval is also being sought for space within the future basement for a bike hub which would also support future bike parking for Waterloo Station
- loading, vehicular and pedestrian access arrangements
- strategies for utilities and services provision
- strategies for managing stormwater and drainage
- a strategy for the achievement of ecologically sustainable development
- a public art strategy
- provision for future signage zones
- a design excellence framework
- the future subdivision of parts of the OSD footprint (if required).

It is noted that the Sydney Metro comprises GFA of approximately 8,415 square metres on the site, approved under CSSI Approval. The total GFA for the integrated station development, including the station GFA is approximately 77,165 square metres, which is equivalent to an FSR of approximately 6:1.

Key parameters of the concept proposal based on the current level of design development are indicated at Figure 6 and Figure 7.

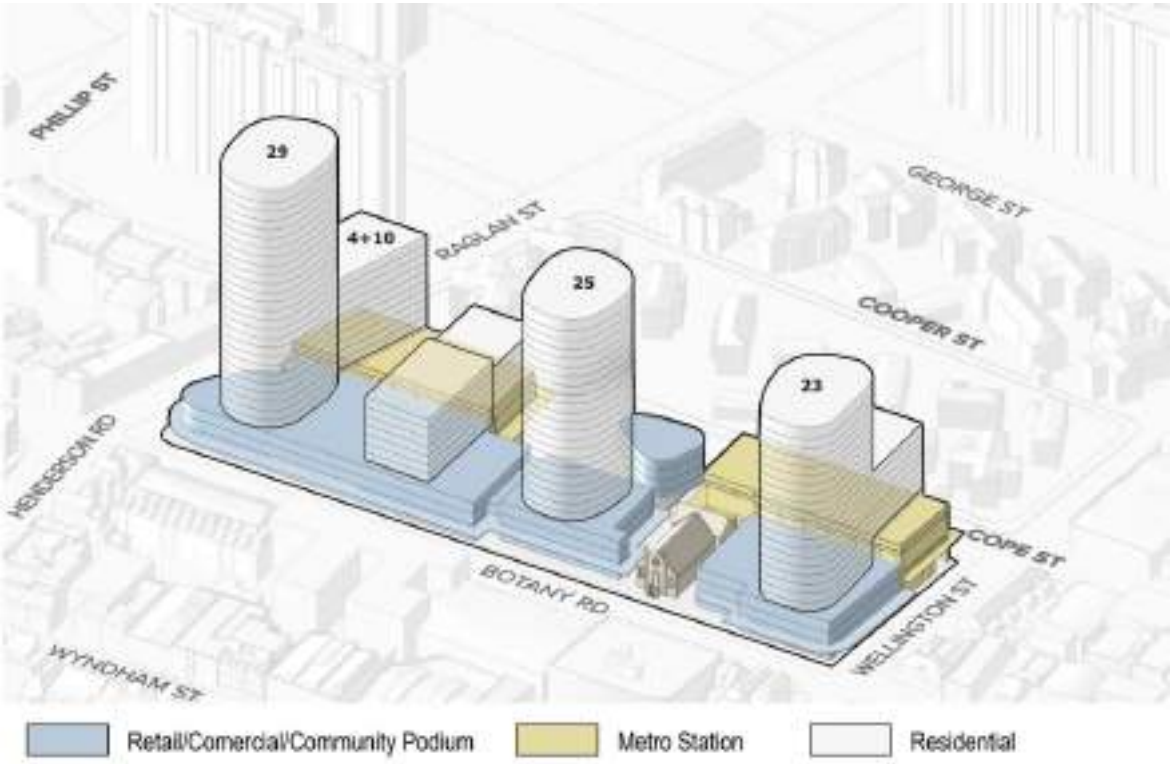

Figure 6 Proposed massing, viewed from the west

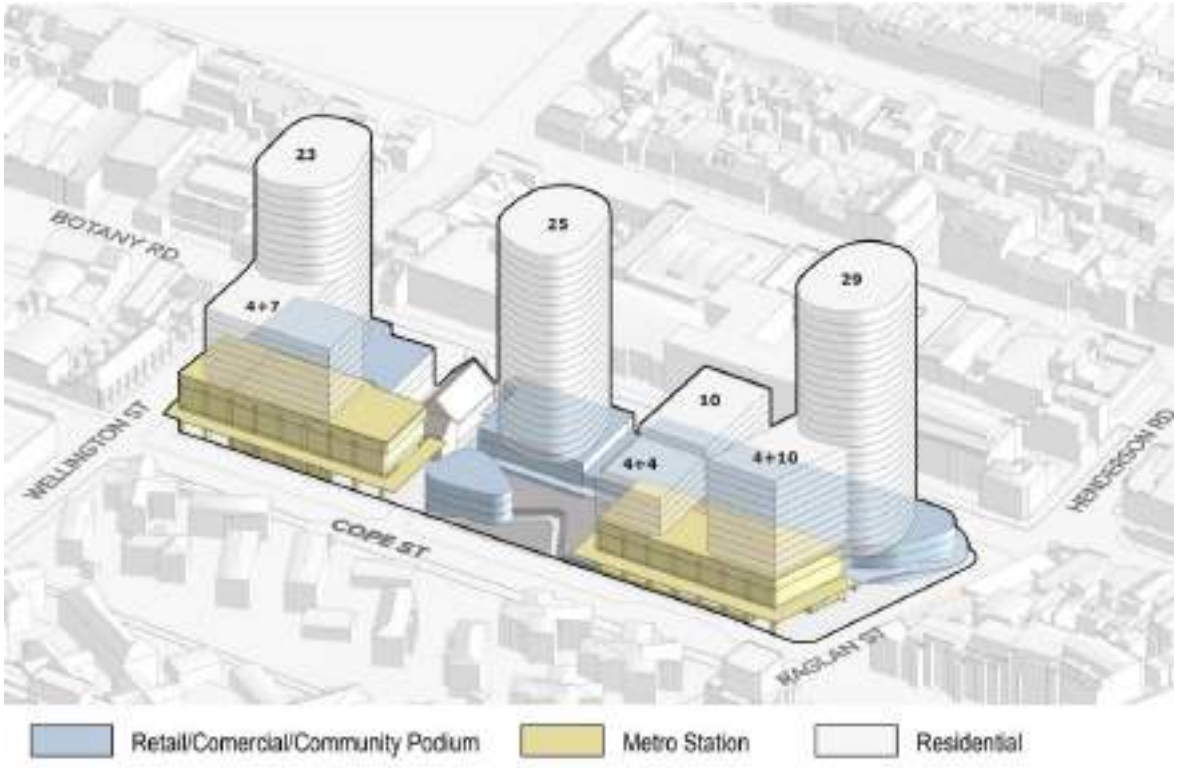

Figure 7 Proposed massing, viewed from the east

The proposal is a significant opportunity to contribute to the urban renewal process for the Waterloo SSP. The objective to deliver the Metro Quarter project as soon as reasonably possible after completion of the Sydney Metro works (earmarked to open 2024) would ensure buildings within the Metro Quarter are occupied to support maximum patronage of the proposed metro station.

The Metro Quarter would contain a mix of uses including residential, commercial, retail, community facilities and services and cultural opportunities sufficient for daily life to be provided for within the wider neighbourhood and to support the activation of the precinct. This would help make Waterloo one of the most connected and attractive inner-city places to live, work and visit.

1.7 Staging and framework for managing environmental impacts

Sydney Metro proposes to procure the delivery of the Waterloo integrated station development in one single package, which would entail the following works:

- station structure fit-out, including mechanical and electrical
- OSD structure fit-out, including mechanical and electrical.

Separate delivery packages are also proposed by Sydney Metro to deliver the excavation of the station boxes/shafts ahead of the integrated station development delivery package, and linewide systems (e.g. track, power, ventilation) and operational readiness works prior to the Sydney Metro City & Southwest metro system being able to operate.

For the purposes of considering construction related impacts, three possible staging scenarios have been identified for delivery of the integrated station development:

1. Scenario 1 – the station and OSD are constructed concurrently by constructing the transfer slab first and then building in both directions. Both the station and OSD would be completed in 2024.
2. Scenario 2 – the station is constructed first and ready for operation in 2024. OSD construction may still be incomplete or soon ready to commence after station construction is completed. This means that some or all OSD construction is likely to still be underway upon opening of the station in 2024.
3. Scenario 3 – the station is constructed first and ready for operation in 2024. The OSD is built at a later stage, with timing yet to be determined. This creates two distinct construction periods for the station and OSD.

The final staging for the delivery of the OSD would be resolved as part of the detailed SSD Application(s).

For the purposes of providing a high level assessment of the potential environmental impacts associated with construction, the following have been considered:

- Impacts directly associated with the OSD, the subject of this SSD Application

- Cumulative impacts of the construction of the OSD at the same time as the station works (subject of the CSSI Approval).

Given the integration of the delivery of the Sydney Metro City & Southwest metro station with an OSD development, Sydney Metro proposes the framework detailed in Figure 8 to manage the design and environmental impacts, in relation to Utilities and Infrastructure Servicing, consistent with the framework adopted for the CSSI Approval.

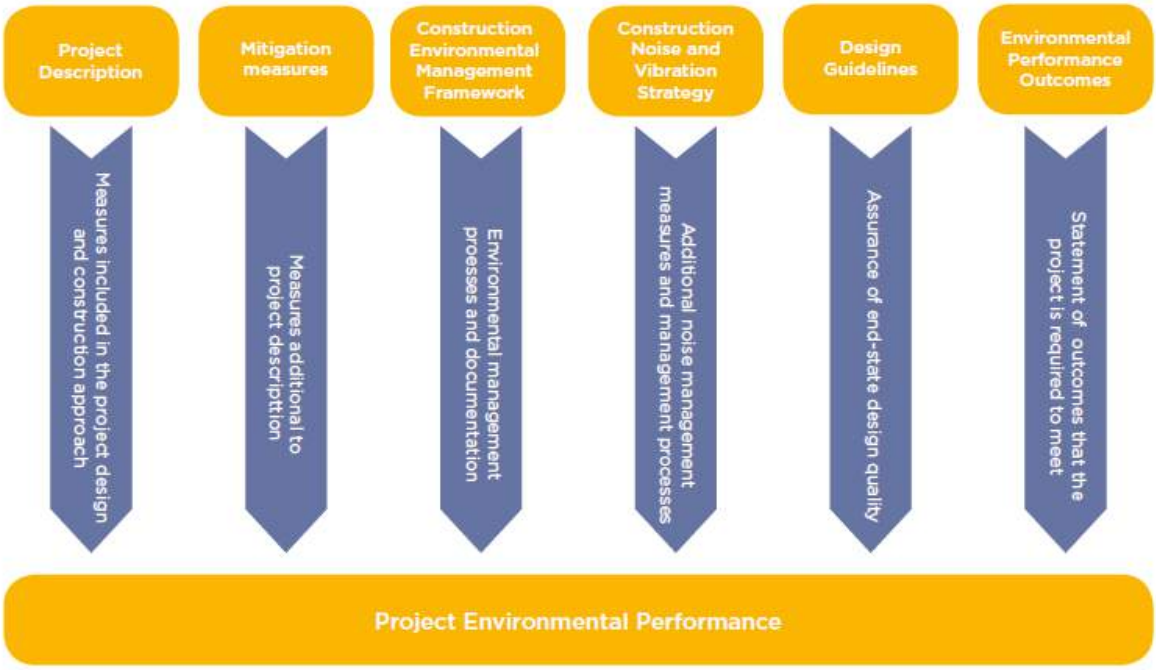

Figure 8 Project approach to environmental mitigation and management

This approach would be implemented until such time as completion of the station works (i.e. works under the CSSI Approval) is achieved. Beyond that point, standard construction environmental management practices would be implemented by the OSD developer in accordance with relevant guidelines and any conditions of approval.

2.0 Scope of assessment

The scope of this Utilities and Infrastructure Servicing assessment is to identify existing utility infrastructure and consider any upgrades or new utility infrastructure that may be required. In doing so, this report addresses Section 9 and Section 16.4 of the Metro Quarter SEARs.

There are a number of existing utility services in close proximity to the Metro Quarter and existing servicing arrangements are summarised below:

- **Potable Water:** Drinking water is provided by Sydney Water (SWC) from the Prospect and/or Kurnell Systems via the Potts Hill Trunk Delivery System incorporating the Potts Hill Reservoirs and Crown Street Reservoir;
- **Waste Water:** Waste water facilities servicing is provided by Sydney Water through the Malabar Sewage Treatment Plant network;
- **Electrical:** Electricity servicing to the Waterloo Precinct is provided by Ausgrid via cables from the Zetland Zone Substation;
- **Gas:** Jemena currently supplies gas to the area through existing gas mains;
- **Telecommunications:** A number of different telecommunications providers currently service the site, including NBN, Nextgen, Optus, Telstra, Verizon and Vocus Fibre; and

The locations of these respective services are indicated in the existing combined services plan as show in Figure 9. It is noted that within this report individual utility connections have been shown to each building to allow flexibility on the eventual building ownerships. Should the site proceed as one lot or as an integrated building then typically utility authorities would only provide one point of connection per lot.

As a part of this Utilities and Infrastructure Servicing Study, the following authority consultation has been undertaken:

- Formal feasibility applications as a part of the previous Central to Eveleigh Infrastructure Servicing Strategy;
- Attendance of utility authorities at Metro Quarter project working groups;
- Review of Stage 1 reports by utility authorities; and
- Ongoing coordination meetings.

Indicative building service loads are summarised below; however, it is noted that these are provided to inform lead-in infrastructure requirements only and are subject to change as part of design development:

- **Potable Water:** 590 ±15% kL/day (Maximum Daily Demand);
- **Waste Water:** 3.6 ±15% L/s (Average Dry Weather Flow);
- **Electrical:** 8.6 +15% MVA (Peak Demand);
- **Gas:** 1,700 ±15% m^3/day (Daily Demand, residential usage only included);
- **Telecommunications:** Unable to be calculated as per other services; and

Based on the investigations undertaken within this report, Section 18 of the SEARs has been satisfied with appropriate future investigations recommended for further development applications relating to detailed design.

Servicing constraints affecting the Metro Quarter site:

- Increased development will increase the demand for utility services infrastructure;
- Existing trunk services infrastructure will constrain the ability to make adjustments to existing road corridors and potentially limit the type and location of any new trees. Key trunk services that form constraints include:
    - A number of existing electrical High Voltage Transmission lines on Wellington Street and Cope Street.
    - A 2.5m wide potable water Pressure Tunnel and Shaft that exits adjacent the site (noting that this shaft is deep underground);
    - A number of large potable water services on McEvoy, Cope and George Streets;
    - A major Optus fibre cable route that runs along George Street;
    - Large concentrations of services within footpaths that may need to be relocated;
    - Aboveground powerlines that may need to be relocated underground; and
- Existing Heritage listed Congregation Church located on 103-105 Botany Road, Waterloo that may limit the internal reticulation of services between towers if the site were consolidated into one lot.

Servicing opportunities and needs to support the precinct:

- The site is currently well serviced by existing utility infrastructure;
- Trunk services may have excess capacity to service the initial phases of the new development, however local amplifications are likely and new electrical feeder cables will likely be required;
- There may be the opportunity to re-use or remove redundant electrical utility routes for new infrastructure;
- Areas such as the Australian Technology Park (ATP) or Green Square Town Centre may enable the sharing of sustainable utility infrastructure and potential recycled water networks; and
- Required lead-in utility works may be shared with the new Sydney Metro Station, in particular shared trenches may reduce capital costs.

These constraints and opportunities are show in Figure 10.

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AARNET
- EXISTING COMMUNICATIONS - AAYOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VODUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE

NOTES:

1. ALL UTILITY SERVICES LAYOUTS ARE INDICATIVE ONLY BASED ONE DIAL BEFORE YOU DIG (DBYD) RECORDS. SITE INVESTIGATIONS ARE REQUIRED TO CONFIRM LOCATIONS. SURVEY MAY INDICATE ADDITIONAL EXISTING MAINS REQUIRING DIVERSION TO AVOID IMPACTING THE PROPOSED DEVELOPMENT FOOTPRINTS
2. PROPOSED UTILITY SERVICES WILL REQUIRE FURTHER DETAILED DESIGN AND COORDINATION WITH UTILITY AUTHORITIES TO DETERMINE FINAL LAYOUTS AND EASEMENTS. THE PROPOSED WORKS PRESENTED IN THE DRAWING HAVE NOT BEEN REVIEWED WITH THE UTILITY AUTHORITIES.
3. SCOPE OF INFRASTRUCTURE WORKS SHOULD BE CONSIDERED IN PARALLEL WITH DIVERSION REQUIREMENTS FOR DELIVERY OF THE PROPOSED STATION AND ANY ROAD UPGRADES WHICH HAVE NOT BEEN IDENTIFIED AT THIS STAGE.
4. NO ASSESSMENT ANALYSIS HAS BEEN UNDERTAKEN TO REVIEW POTENTIAL UPGRADES OF EXISTING MAINS. SCOPE OF POTENTIAL CONNECTION POINTS PRESENTED IN THIS DRAWING HAVE BEEN BASED ON PREVIOUS EXPERIENCE WITH SIMILAR SCALES OF REDEVELOPMENT.
5. NO MANHOLE SURVEYING HAS BEEN UNDERTAKEN TO CONFIRM GRADES AND THEREFORE CONNECTIVITY OF GRAVITY INFRASTRUCTURE
6. INDICATIVE BUILDING LAYOUTS ONLY. MULTIPLE CONNECTIONS ALLOWED FOR, IF CONSOLIDATED TO ONE LOT, CONNECTIONS CAN BE RATIONALISED

Figure 9: Existing Combined Services Plan

The drawings contained herein are for use for the purpose of the project. The signing of the title block confirms the design and drafting of the project has been prepared and checked in accordance with the AECOM quality assurance system (ISO 9001:2008).

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PROJECT MANAGEMENT INITIALS

DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

IN	DATE	DESCRIPTION

PROJECT NUMBER
60648169

SHEET TITLE
WATERLOO METRO QUARTER
SHARED SERVICING AREA
COMBINED SERVICES PLAN

SHEET NUMBER
60648169-SKE-00-0080-CI-0016

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AARNET
- EXISTING COMMUNICATIONS - AMCOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VOCUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE

NOTES:

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3. SCOPE OF INFRASTRUCTURE WORKS SHOULD BE CONSIDERED IN PARALLEL WITH DIVERSION REQUIREMENTS FOR DELIVERY OF THE PROPOSED STATION AND ANY ROAD UPGRADES WHICH HAVE NOT BEEN IDENTIFIED AT THIS STAGE.
4. NO ASSESSMENT ANALYSIS HAS BEEN UNDERTAKEN TO INFORM POTENTIAL UPGRADES OF EXISTING MAINS. SCOPE OF POTENTIAL CONNECTION POINTS PROVIDED IN THIS DRAWING HAVE BEEN BASED ON PREVIOUS EXPERIENCE WITH SIMILAR SCALES OF REDEVELOPMENT.
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Figure 10: Constraints and Opportunities

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REGISTRATION

PROJECT MANAGEMENT INITIALS

DESIGNED	CHECKED	APPROVED

ISSUE/REVISION

NO	DATE	DESCRIPTION

PROJECT NUMBER
60548168

SHEET TITLE
WATERLOO METRO QUARTER
SHARED SERVICING AREA
CONSTRAINTS AND OPPORTUNITIES

SHEET NUMBER
60548168-SKE-00-0006-CI-8017

3.0 Baseline Investigations

3.1 Gathering Existing Utility Information

The preliminary information data was gathered from a range of sources. These include Dial Before You Dig (DBYD) requests, master plans, existing drawings and previous experience with the area.

3.2 Dial Before You Dig Plans

DBYD requests were submitted for the site area. The DBYD report identified a range of services present in the Metro Quarter as summarised in Table 1.

Table 1: Summary of Existing Services

Authority Name	Phone	Utility Type
AAPT / PowerTel, NSW	1800786306	Communications
AARNet Pty Ltd, Nsw	1300275662	Communications
Airport Rail Link	0298489578 / 0413006517	Electricity
Ausgrid	0249510899	Electricity
City of Sydney (IMS)	0292659819	Council/Shire
Jemena Gas South	1300880906	Gas & Petroleum
Luminet Pty Ltd	1300586463	Communications
NBN Co, NswAct	1800626762	Communications
Nextgen, NCC - NSW	1800032532	Communications
Optus and/or Uecomm, Nsw	1800505777	Communications
PIPE Networks, Nsw	1800201100	Communications
Primus Telecom, Nsw	0294232568	Communications
RailCorp Central	0298489578 / 0413006517	Electricity
Roads and Maritime Services	0288370285	Electricity
Specialty Fashion Group	0283039855	Communications
Sydney Water	132092	Water
Telstra NSW, Central	1800653935	Communications
TransGrid	0296200422	Electricity
Verizon Business (Nsw)	0294345000	Communications
Vocus Communications	0892446114	Communications

The plans provided from these DBYD reports were assessed as a component of our capacity review.

3.3 Utility Reports

An Infrastructure and Servicing Strategy Report (2015) was developed for UrbanGrowth NSW Development Corporation (UGDC), this included an assessment of the Waterloo Precinct. The results of that investigation and strategy including authority correspondence have been used in developing this Utilities and Infrastructure Servicing Study.

Additionally, a number of annual reports and master plans have been prepared by stakeholders providing information relevant to the Metro Quarter. Below is the list of reports used in this preliminary infrastructure assessment:

- A Plan for Growing Sydney, NSW Government, 2014;
- BASIX Monitoring Report - Electricity Consumptions for 2007-2009, NSW Department of Planning, 2010;
- BASIX Water Savings Monitoring – Sydney Water, 2009;
- Better Practice for Public Place Recycling DECC 2005;
- Better Practice Guide for Multi-Unit Dwellings provides waste management strategies for multi-unit residential developments DECC 2008;
- Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities EPA December 2012;
- Central to Eveleigh Global Precinct Opportunity, NSW Now, 2013;
- Decentralised Energy – Advanced Waste Treatment Master Plan, City of Sydney, 2014;
- Decentralised Energy – Renewable Master Plan, City of Sydney, 2013;
- Decentralised Energy – Trigeneration Master Plan, City of Sydney, 2013;
- Decentralised Water - Master Plan, City of Sydney, 2012;
- Development Control Plan - Ashmore Precinct Urban Design, City of Sydney, 2006;
- Development Control Plan - Green Square Urban Design, City of Sydney, 2006;
- Distribution and Transmission Annual Planning Report, Ausgrid, 2014;
- Distribution and Transmission Annual Planning Report, Ausgrid, 2013;
- Draft Metropolitan Strategy for Sydney To 2031, NSW Government, 2014;
- Energy Efficiency Master Plan 2015-2030, City of Sydney, 2015;
- Environmental Action 2016 – 2021 Strategy and Action Plan, City of Sydney, 2017;
- Final Report, Projected Distribution System Limitations in the Southern Zetland Load Area, Ausgrid, 2012;
- Growth Servicing Plan July 2014 to June 2019, Sydney Water, 2014;
- Growth Servicing Strategy Wastewater Network Bondi System, Sydney Water, 2014;
- North Eveleigh Concept Plan - Department of Planning, 2008;
- NSW Long Term Transport Master Plan, NSW Government, 2014;
- NSW Transmission Annual Planning Report, TransGrid, 2013;
- NSW Transmission Annual Planning Report, TransGrid, 2014;
- Sustainable Sydney 2030 Community Strategic Plan 2014;
- Sydney Local Environmental Plan 2012;
- Sydney Street Code 2013;
- Waste Not Development Control Plan Guidelines EPA 2008; and

- Wastewater Systems, Sydney Water, 2014.

3.4 Development Context

The proposed Waterloo Precinct forms part of the larger Redfern-Waterloo Growth Centre, this growth centre includes:

- Redfern;
- North Eveleigh;
- South Eveleigh; and
- The Waterloo Precinct.

Other adjacent developments that are currently taking place adjacent to the precinct include:

- Green Square;
- Epsom park;
- Lachlan and Victoria Park;
- Ashmore; and
- The Australian Technology Park (ATP).

Any required utility relocations or amplifications as a result of this project will also need to consider the ultimate design of the Alexandria to Moore Park Connectivity Upgrade which is currently being delivered by RMS.

This report only considers the serving of the proposed new retail, commercial and residential portions of the Metro Quarter, details of the servicing of the proposed Metro Station are being undertaken by Sydney Metro and coordination with this project is ongoing.

Additionally, this report only considers connections of utility servicing to the new development and does not include likely relocations of existing services as a result of changes to road widths, footpath levels, streetlighting, undergrounding of overhead power, driveway entrances, tree planting or stormwater drainage works.

3.5 Combined Services Plan

A proposed combined services plan has been developed based on DBYD information for the Metro Quarter, identifying utility service locations and routes. The plan also considers the following:

- Connection to existing utility infrastructure;
- Potential development lot connection points (assuming each tower is a separate development lot); and
- Coordination between services.

All services are shown schematically and are subject to changes during subsequent design stages and further inputs from relevant utility authorities. Schematic layouts for each existing utility service are outlined in individual sections of this report.

3.6 Demand Assessment Yields

The demand calculations were undertaken from the yields in Table 2 (UGDC, 2018).

Table 2: Demand Assessment Yields

Study Area	Timeframe	Apartments (No.)	Retail & Commercial (m2)
Metro Quarter	2019 to 2026	700	12,500m²

The community building is included as part of the 12,500m^2 retail and commercial GFA.

Please note that apartment numbers and commercial space figures are provided for the purposes of assessing required utility infrastructure upgrades and are subject to change as a part of design development.

4.0 Potable Water

4.1 Background

Potable water at the existing Metro Quarter is supplied by Sydney Water from the Prospect and/or Kurnell Systems as shown below in Figure 11.

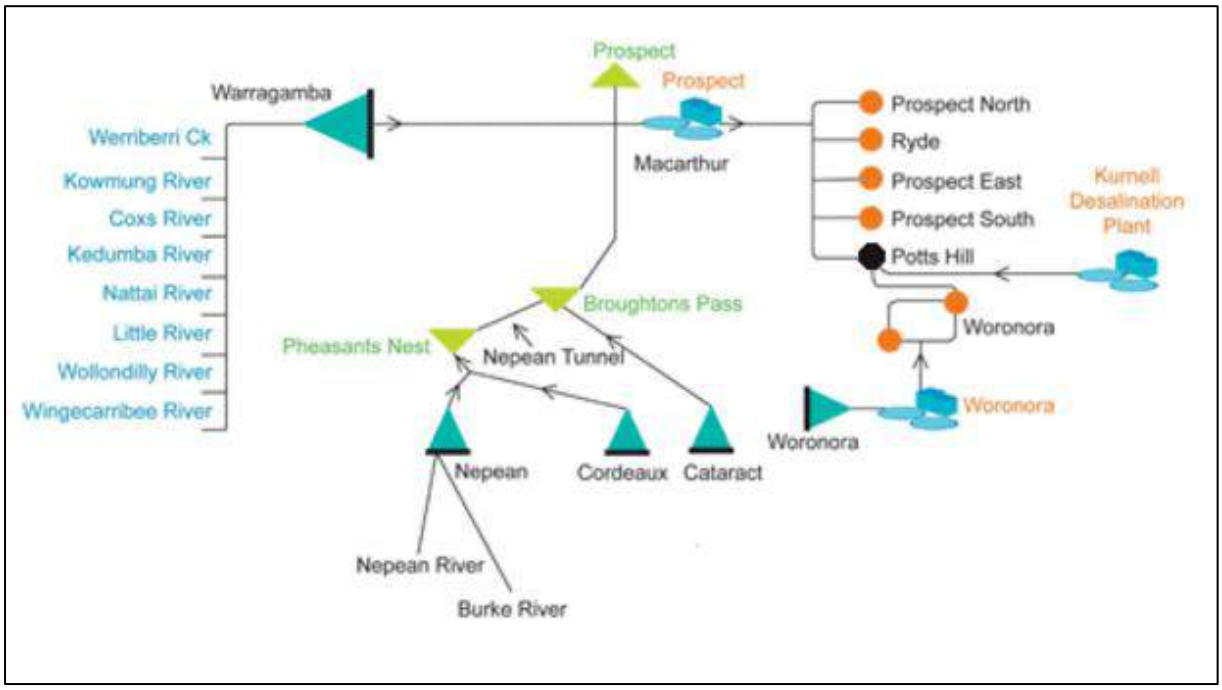

Figure 11: Potable Water Supply
(Sydney Water Corporation, 2017)

Potable Water is supplied through the Potts Hill Trunk Delivery System incorporating the Potts Hill Reservoirs and Crown Street Reservoir. Three potable water pumping stations are located within the surrounding region potentially supplying the Metro Quarter, these are:

- Crown Street WP0001;
- Waterloo WP0008; and
- Dowling Street WP0090.

Although Sydney Water does not provide recycled water to the Metro Quarter, the adjacent Green Square Town Centre does include a privately operated recycled water scheme wherein there may be opportunities to extend this system to the Metro Quarter. Future detailed development applications relating to the Metro Quarter may consider the opportunity to integrate with this scheme.

The Australian Technology Park (ATP) is an adjacent precinct which currently has recycled water infrastructure including reticulation within roads and dual pipes within buildings that could supply non-potable uses. Should the Waterloo Precinct be water positive then the ATP could serve as a potential source of recycled water demand. Future detailed development

applications for the Metro Quarter may consider the opportunity to integrate the system used in this existing scheme.

4.2 Demand Assessment

An assessment of the estimated increase in potable water demand generated from the Metro Quarter development has been conducted to determine the required infrastructure upgrades associated with the development.

Demand forecasting and profiles were developed for the study area. Individual project areas have been based on the average number of dwellings and proposed Gross Floor Area (GFA) for retail and commercial development.

Demand estimates for potable water have been calculated using the Design Criteria Guidelines Supplement for Single Reticulation System (Sydney Water, 2014) and is based on maximum daily demand. The BASIX reduction has been taken from the Building Sustainability Index targets.

A summary of the water demand unit rates is presented in Table 3. The Metro Quarter has been classified as 'multi-unit > 140 unit/net ha developments based on housing density with an equivalent potable water demand rate of 0.8 kL/unit/day. The commercial density has been estimated on an equivalent potable water demand rate of 41 kL/ha/day as shown in Table 3

In accordance to BASIX requirement, new residential developments are required to reduce mains-supplied potable water consumption by 40% (since the BASIX amendment was introduced in 2006) compared to the average NSW dwelling. Commercial demands have not had a BASIX reduction applied.

Table 3: Potable Water Demand Unit Rates

Land Use	Design Criteria	Units	Potable Water Demand	Sources
Multi- Unit (>140 unit/net/ha) 6-12 storey apartment	Max Day Demand	kL/unit/day	0.8	Water Supply Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water)
Suburban Commercial	Max Day Demand	kL/Ha/day	41	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water 2014 Edition)
BASIX Reduction		%	40	Building Sustainability Index Targets

4.3 Forecast Demand

An estimate of the future potable water demand for the Metro Quarter as a result of redevelopment has been calculated based on the development yields in Section 4.3. These figures provide information on the estimated quantity of dwellings for residential units and Gross Floor Area (GFA) for retail and commercial developments. The site has been classified as comprising of 'high density dwelling' and 'local commercial' development'.

The cumulative Maximum Daily Demand (MDD) of the Metro Quarter when assuming BASIX compliance is estimated to be approximately 387kL per day as shown below in Table 4.

Considering the ±15% range in development yields, the Maximum Day Demand (MDD) could vary from 330-450kL per day.

Table 4: Estimated Cumulative Maximum Daily Potable Water Demand

Study Area	Water Demand kL/day Cumulative (inc BASIX)				Total per Study Area (kL/day)
	0 to 5 Years		5 to 10 Years		
	Apartments	Commercial	Apartments	Commercial	
Metro Quarter	168	26	336	51	387

4.4 On-Site Utility Infrastructure

The existing Sydney Water potable water network within or adjacent the Metro Quarter has been identified based on DBYD reports. These records specify the presence of a number of Sydney Water mains located underneath and immediately adjacent to the site.

Key existing potable network infrastructure includes the following mains:

- DN500mm, DN300mm and DN100mm CICL mains run along Ragland Street;
- DN150mm and DN100mm CICL mains run along Botany Road;
- DN100mm CICL main along Wellington Street; and
- DN150 and DN100 CICL main along Cooper Street.

The depths and position of the existing reticulation mains are unknown, further investigation is required to determine the exact existing layout. Further investigation at the detailed development application phase is required to confirm the potential impacts of the design on the existing network.

The key trunk mains adjacent to the Metro Quarter:

- An existing DN1500mm SCL IBL trunk main at the intersection of Wellington Street and Elizabeth Street, which provides connection into the Potts Hill Water Distribution System (250m adjacent to the sites eastern boundary);
- An existing DN500mm CICL main running along the south side of McEvoy Street (adjacent to the sites southern boundary); and
- An existing DN450mm CICL main running along Cope Street (adjacent to the sites western boundary).

It is noted that the above discussion only considers Sydney Water infrastructure, there is the potential that private or other authority water infrastructure is present on the site however no records of this infrastructure have been made available for this study and have not been identified on the DBYD plans.

Our indicative Potable Water connection route is shown below in Figure 12, onsite utility investigations and service searches are recommended post rezoning as a part of any future development application along with future Sydney Water consultation.

4.5 Potential ESD Initiatives

This report shows “baseline” utilities responses but key Ecologically Sustainable Development (ESD) initiatives that have the potential to deduce mains potable water demand and are recommended for further investigation:

- Onsite rainwater reuse (embedded in current design);
- Green walls and green roofs (embedded in current design);
- High efficiency water fixtures (future consideration); and
- Stormwater harvesting and water recycling (future consideration).

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AARNET
- EXISTING COMMUNICATIONS - AAYOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VOCUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE
- PROPOSED POTABLE WATER

NOTES:

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Figure 12: Waterloo Metro Quarter - Potable Water Plan

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SHEET NUMBER
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4.6 Coordination with Other Services

Coordination of the proposed potable water infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards, these details are attached in Section 9.0.

In addition, Section 5.12.5.2 of the Water Services Association of Australia codes (WSA 03-2011-3.1, Sydney Water Edition – 2012) states that the clearance requirements for water mains from other service utility assets shall not be less than the minimum vertical and horizontal clearances as summarised in Figure 13.

Utility (Existing or proposed service)	Minimum horizontal clearance mm		Minimum vertical clearance[1] mm
	New main size		
	≤DN 200	>DN 200	
Water mains[2] >DN 375	600	600	300
Water mains ≤DN 375	300[3]	600	150
Gas mains	300[3]	600	150
Telecommunication conduits and cables	300[3]	600	150
Electricity conduits and cables	500	1000	225[7]
Stormwater drains	300[3]	600	150[4]
Sewers – gravity	1000[5]/600	1000[5]/600	500[4]
Sewers – pressure and vacuum	600	600	300
Kerbs	150	600[6]	150 (where possible)
NOTES – see over			

NOTES:

1 Vertical clearances apply where water mains cross one another and other utility services, except in the case of sewers where a vertical separation shall always be maintained, even when the main and sewer are parallel. *The main should always be located above the sewer to minimise the possibility of backflow contamination in the event of a main break.*

2 *Water mains includes mains supplying drinking water and non-drinking water.*

3 *Clearances can be further reduced to 150 mm for distances up to 2 m where mains are to be laid past installations such as concrete bases for poles, pits and small structures, providing the structure will not be destabilised in the process. The clearance from timber poles should be at least 200 mm and preferably 300 mm..*

4 *Water mains should always cross over sewers and stormwater drains.* For cases where there is no alternative and the main must cross under the sewer, the design shall nominate an appropriate trenchless construction technique in accordance with Clause 5.5 or other water main construction and protection treatment, effectively joint-free in the vicinity of the sewer. Refer to Standard Drawings WAT–1211-V and WAT–1255-S.

5 Where a parallel sewer is at the minimum vertical clearance lower than the water main (500 mm), maintain a minimum horizontal clearance of 1000 mm. *This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance is increased to 750 mm.*

6 Clearance from kerbs shall be measured from the nearest point of the kerb. *For water mains ≤DN 375 clearances from kerbs can be progressively reduced until the minimum of 150 mm is reached for mains ≤DN 200.*

7 An additional clearance from high voltage electrical installations should be maintained above the conduits or cables to allow for a protective barrier and marking to be provided.

Figure 13: Sydney Water Clearances between Water Mains and Underground Services

(WSA 03-2011-3.1, Sydney Water Edition – 2012)

4.7 Approvals and Next Steps

The potable water strategy is to be confirmed through hydraulic modelling, with separate reports outlining the modelling outcomes to be submitted to Sydney Water. Further discussion is also to be undertaken with Sydney Water to confirm lead-in infrastructure requirements and pressures of existing potable water services.

The key next steps in progressing the delivery of potable water infrastructure through detailed design, including the formal approval process for Sydney Water infrastructure consists of the following:

1. Undertake hydraulic modelling to confirm the extent of any lead-in infrastructure upgrades required – Post Rezoning/Development Application;
2. Undertake site investigations to confirm the layout and extent of existing on-site infrastructure (including non-Sydney Water infrastructure) – Post Rezoning/Development Application;
3. Develop an overall water master plan for the Metro Quarter including staging considerations and agree this with Sydney Water – As a part of Development Applications;
4. Develop diversion strategy (including any interim works to suit staging) and protection/build-over requirements for infrastructure that cannot be diverted - As a part of Development Applications;
5. Establish a Head Deed to be signed by required parties (Sydney Water, Designer, WSC, Developer, Constructor) – As a part of detailed design;

6. Submit application/s for individual detailed design packages to SWC with drawing of proposed works in stages, Section 73– As a part of detailed design;
7. SWC to issue of Notice of Requirements (NOR) with their requirements for water main layout, sizing and funding matters confirmed– As a part of detailed design; and
8. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval – As a part of detailed design;

It is noted that the above is for delivery of the water network through the street network, depending on the strata arrangement individual buildings will still need to make separate applications for each connection.

5.0 Wastewater

5.1 Background

Sydney Water wastewater facilities service the Metro Quarter which is processed through the Malabar Sewage treatment Plant Network (Botany) which has a capacity of 416 ML/d and services an area of 627km^2. The local sewer catchments are shown below in Figure 14.

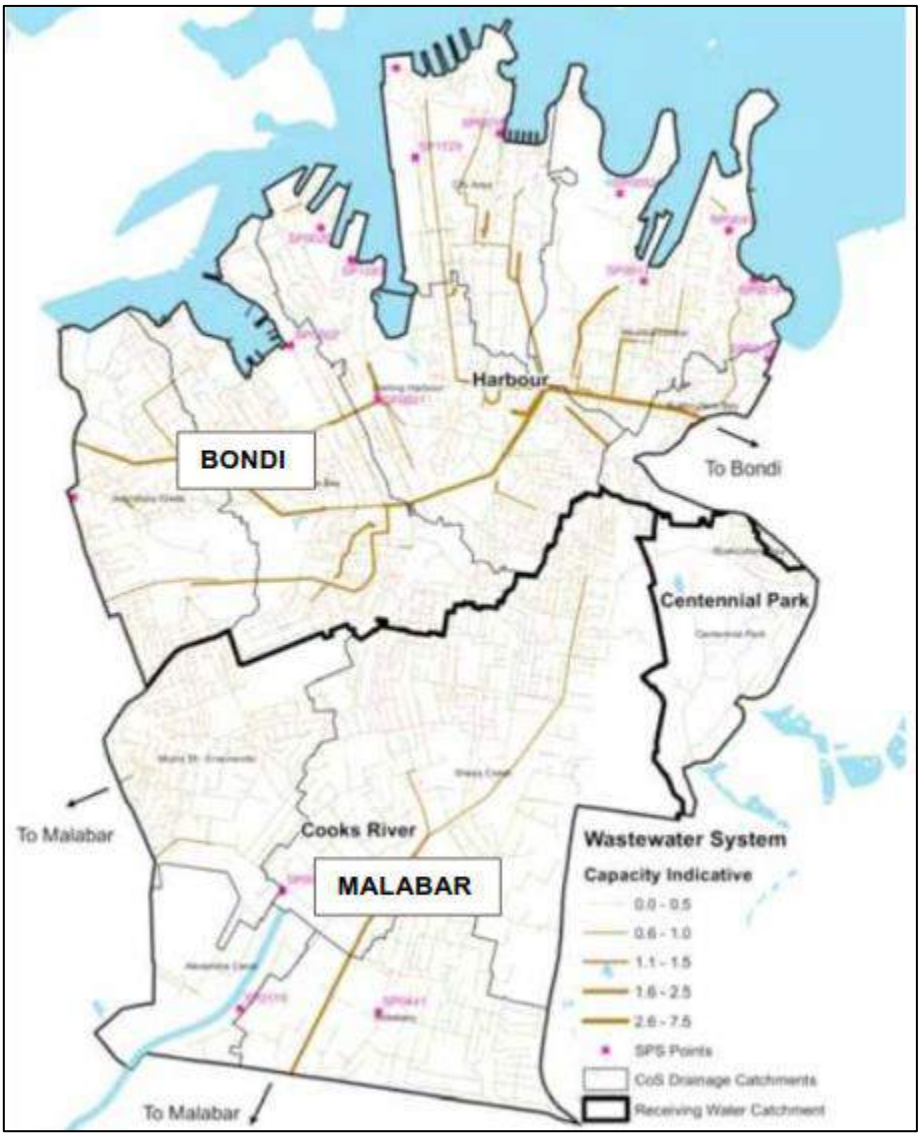

Figure 14: Sydney Water Sewer Catchment Plan
(Sydney Water, 2015)

Potential development scenarios considered within this report indicate there will be a substantial increase in sewer loading throughout the Metro Quarter.

As a part of the C2E Infrastructure Servicing Strategy (2015), Sydney Water indicated that the trunk system has the capacity to service the potential development scenarios; several carrier mains running to the trunk system from the Metro Quarter may require amplification.

5.2 Demand Assessment

An assessment of estimated sewer loading resulting from the development in the Metro Quarter has been undertaken to assist in determining the required infrastructure upgrades. Demand forecasting and profiles have been based on the average number of residential dwellings, and Gross Floor Area for retail and commercial development based on the development yields in Section 4.3

The design criteria used to forecast future sewer loading are taken from the Sydney Water Area Planning Design Criteria Guide: WSA 02-2002-3.0 (Sewer Code of Australia) and is expressed as an Equivalent Population for a particular land use. The BASIX reduction has been taken from the Building Sustainability Index targets, these are summarised below in Table 5.

In accordance with the Sydney Water criteria guide, the Metro Quarter has been classified as comprising of 'high density dwellings' and 'local commercial' development with an Equivalent Population (EP) per dwelling of 2.5 and EP/ha of 75. The Average Dry Weather Flow (ADWF) per Equivalent Population (EP) has been taken as 150 L/day or 0.0017L/s (ADWF(L/s) = 0.0017 * EP.

Under BASIX requirement, new residential developments are required to reduce wastewater loading by 40% (since the BASIX amendment was introduced in 2006) compared to the average NSW dwelling.

Table 5: Sewer Design Loading Criteria

Land Use	Units	Potable Water Demand	Sources
High Density Residential	EP/dwelling	2.5	SWC Area Planning Design Criteria Guide: WSA 02-2002-3.0 (Sewer Code of Australia)
Local Commercial	EP/ha	75	SWC Area Planning Design Criteria Guide: WSA 02-2002-3.0 (Sewer Code of Australia)
ADWF	L/s	0.0017	SWC Area Planning Design Criteria Guide: WSA 02-2002-3.0 (Sewer Code of Australia)
BASIX Reduction	%	40	Building Sustainability Index Targets

5.3 Forecast Demand

An estimate of forecasted wastewater loading has been calculated based on figures provided by UrbanGrowth NSW Development Corporation (refer Section 4.3) specifically on the number of dwellings for residential units and the Gross Floor Area for commercial areas. Under this scenario, the ADWF allowing for BASIX is calculated to be approximately 2.40L/s for the entire Metro Quarter as shown in Table 6.

Considering the ±15% in development yields, the ADWF could vary between 2.0-2.8L/s. It is noted that this cumulative demand is only for the proposed new development and does not include an assessment of the potable water usage of the existing development.

Table 6: Estimated Average Dry Weather Flow (ADWF) including BASIX (L/s)

Study Area	Wastewater ADWF (L/s) Cumulative (incl. BASIX)				Total (L/S)
	0 to 5 Years		5 to 10 Years		
	Apartments	Commercial	Apartments	Commercial	
Metro Quarter	1.1	0.10	2.21	0.20	2.41

5.4 On-Site Utility Infrastructure

The existing Sydney Water wastewater network has been identified based on Dial Before You Dig (DBYD) records. These indicate the presence of a number of existing wastewater mains throughout the Metro Quarter.

The existing internal wastewater network primarily consists of the following:

- A DN600mm VC main running along Cope Street (western boundary of the site), between Wellington Street and McEvoy Street;
- A DN450mm VC main running through the centre of George Street, between Wellington Street and McEvoy Street;
- A DN400 VC running south along Cope Street; and
- A number of smaller reticulation mains ranging in size from DN225mm to DN300mm servicing individual building lots.

As for the potable water network, the exact depths and positions of the existing reticulation mains are unknown. The existing and proposed waste water infrastructure is outlined below in Figure 15. It is important to note that wastewater is a gravity service and for the proposed servicing design to work hydraulically then the inverts of the existing and proposed services need to be checked to confirm that the falls are achievable – this should be done as part of design development.

Onsite utility investigations and service searches are recommended post rezoning as a part of any future detailed development application, including investigation for any private sewer mains. Further consultation is also required with Sydney Water to consider and lead-in infrastructure requirements.

5.5 Potential ESD Initiatives

This report shows “baseline” utilities responses but key Ecologically Sustainable Development (ESD) initiatives recommended for further investigation as a part of detailed design include:

- Onsite rainwater reuse (embedded in current design);
- Blackwater / greywater use including split system (future consideration); and
- Wastewater harvesting and water recycling (future consideration).

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AARNET
- EXISTING COMMUNICATIONS - AAYOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VOCUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE
- PROPOSED SEWER

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Figure 15: Waterloo Metro Quarter - Wastewater Plan

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REGISTRATION

PROJECT MANAGEMENT INITIALS

DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

No	DATE	DESCRIPTION

PROJECT NUMBER
60649169

SHEET TITLE
WATERLOO METRO QUARTER SHARED SERVICING AREA SEWER PLAN

SHEET NUMBER
60649169-SKE-00-0080-CI-0013

5.6 Coordination with Other Services

Coordination of Sewer Infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards, these details are attached in Section 3.13.

In addition, Section 4.4.5.2 of Water Services Association of Australia codes (WSA 02-2002-2.2, Sydney Water Edition – Version 3) states the clearance requirements for sewers in Table 4.2, as summarised below in Figure 16 which indicates existing wastewater locations and potential connection points.

Utility (Existing service)	Minimum horizontal clearance mm		Minimum vertical clearance[1] mm
	New sewer size		
	≤DN 300	>DN 300	
Sewers ≤DN 300	300	600	150[2]/300
Sewers >DN 300	600	600	300
Gas mains	300[3]	600	150[2]/300
Telecommunication conduits and cables	300[3]	600	150[2]/300
Electricity conduits and cables	500	1000	225[2]/300
Drains[7]	300[3]	600	150[2 and 4]/300[4]
Water mains	1000[5]/600	1000[5]/600	500[4]
Kerbs	150	600[6]	150 (where practicable)

NOTES:

1 Vertical clearances apply when sewers cross one another, except in the case of water mains when a vertical separation shall always be maintained, even when the sewer and main are parallel. *The sewer should always be located below the main to minimise the possibility of backflow contamination in the event of a main break.*

2 A minimum vertical clearance of 300 mm applies if the size of either the existing service or proposed sewer is >DN 300.

3 *Clearances can be further reduced to 150 mm for distances up to 2 m when passing installations such as poles, pits and small structures, providing the structure is not destabilised in the process.*

4 *Sewers should always cross under water mains and stormwater drains.* If this requirement cannot be met, consult Sydney Water in respect of alternatives such as adjusting the water main or stormwater drain. Where a sewer crosses a water main at or close to 90 degrees, the vertical clearance may be reduced to not less than 200 mm provided that the sewer is concrete encased and a 50 mm compressible material is placed over the encasement. The encasement shall not have any joints within 1000 mm either side of the water main and shall conform to Drawing SEW–1205-V.

5 When the sewer is at the minimum vertical clearance below the water main (500 mm) maintain a minimum horizontal clearance of 1000 mm. *This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance increases to 750 mm.*

6 Clearance from kerbs shall be measured from the nearest point of the kerb.

7 A sewer to be constructed under an existing or proposed stormwater pipe or channel ≥DN 375 shall be concrete encased. The concrete encasement shall extend at least one metre each side of the stormwater pipe or channel. Clearances between the sewer and other services shall be measured from the outer surface of the concrete encasement.

Figure 16: Sydney Water Clearance between Sewers and Other Underground Services
(WSA 02-2002-2.2, Sydney Water Edition – Version 3)

5.7 Approvals and Next Steps

The sewer strategy is to be confirmed through hydraulic modelling, with separate reports outlining the modelling outcomes to be submitted to Sydney Water. Further discussion is also to be undertaken with Sydney Water to confirm lead-in infrastructure requirements and to check inverts of gratify pipes to ensure falls are achievable.

The key next steps in progressing the delivery of sewer infrastructure through design development, including the formal approval process for Sydney Water infrastructure, consists of the following:

1. Undertake hydraulic modelling to confirm extent of any lead-in infrastructure upgrades required – Post Rezoning/Development Application;
2. Undertake site investigations to confirm the layout and extent of existing on-site infrastructure (including non-Sydney Water infrastructure) – Post Rezoning/Development Application;
3. Develop an overall wastewater master plan for the Metro Quarter including staging considerations and agree these with Sydney Water. Being a gravity service, this will need to include consideration of the depth of the existing sewer infrastructure to be maintained and/or connected to (based on manhole survey) and proposed grading of the site - As a part of Development Applications;
4. Develop a diversion strategy (including any interim works to suit staging) and protection/build-over requirements for infrastructure that cannot be diverted - As a part of Development Applications;
5. Establish a Head Deed to be signed by required parties (Sydney Water, Designer, WSC, Developer, Constructor) – As a part of detailed design;
6. Submit application/s for individual detailed design packages to SWC with drawing of proposed works in stages, Section 73 – As a part of detailed design;
7. SWC to issue of Notice of Requirements (NOR) with their requirements for water main layout, sizing and funding matters confirmed – As a part of detailed design; and
8. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval – As a part of detailed design;

It is noted that the above is for delivery of the wastewater network through the street network, depending on the strata arrangement individual buildings will still need to make separate applications for each connection.

6.0 Electrical

6.1 Background

Electrical servicing to the Metro Quarter is provided by Ausgrid. Projections produced as part of the *C2E Infrastructure Servicing Strategy Report* (AECOM, 2015) indicate that there will be a substantial increase in electrical demand throughout the Waterloo Precinct. There may not be sufficient capacity within the local zone substation to supply the proposed demand at Waterloo.

6.2 Demand Assessment

An assessment of the estimated electrical demand for the Metro Quarter has been undertaken to assist in determining the required infrastructure upgrades. Demand forecasting and profiles were developed for the Metro Quarter based on AS3000 Table C3 rates and also Ausgrid NS109 Table B unless indicated otherwise. These are shown respectively in Table 7 and Table 8.

Table 7: AS3000:2007 - Table C3 Maximum Demand (non-domestic installations)

Type of occupancy		Energy demand	
		Range, VA/m^2	Average, VA/m^2
Offices	Light and Power	40-60	50
	Airconditioning		
	- cooling	30-40	35
	- reverse cycle	20-30	25
	- zonal reheat	40-60	50
	- variable volume	20	20
Carparks	Open air	0-10	5
	Basement	10-20	15
Retail shops	Light and power	40-100	70
	Airconditioning	20-40	30
Warehouses	Light and power	5-15	10
	Ventilation	5	5
	Special equipment	(use load details)	
Light industrial	Light and power	10-20	15
	Ventilation	10-20	15
	Airconditioning	30-50	40
	Special equipment	(use load details)	
Taverns, licensed clubs	Total	60-100	80
Theatres	Total	80-120	100

Table 8: Ausgrid NS109 - Table 4 Guide to Typical Load Densities

Type of Development		Range VA/m^2	Average VA/m^2
Offices -	- Not air-conditioned - air-conditioned - cooling only	40-60 70-100	50 85
	- reverse cycle - electrical reheat open areas - electrical reheat zonal or package units - variable volume	60-90 80-120 90-130 60-80	75 100 110 70
Car parking	- open air - ventilated	0-10 10-20	5 15
Warehousing	- unventilated - ventilated	5-15 10-20	10 15
Shops	- Not air-conditioned - air conditioned	40-100 60-140	70 100
Shopping centres (assumed air-conditioned shops)	- Not air-conditioned public areas - air conditioned public areas	60-140 80-160	100 120
Industrial	- light - if ventilated add - if air-conditioned add (see note)	10-20 10-20 30-50	15 15 40
Theatres, halls, etc	- ventilated - air-conditioned	50-70 80-120	60 100
Hotels, Taverns, Restaurants (Residential section, use Annexure C)		60-100	80

For this Waterloo Precinct we have adopted the following load ranges:

- Apartments = 5,500 VA / dwelling
- Commercial flood space = 100 VA / m2
- Retail flood space = 250 VA / m2
- Lifts = 120,000 VA / unit
- Carparking = 15 VA / m2
- Electric Car Charging = 7 kW with 60% diversity

6.3 Forecast Demand

Table 9 below summarises the total maximum electrical demand for the site, to develop this demand profile we have made the following assumptions based on the information in Section 4.3:

- Commercial space breakdown = 8,645 m^2
- Retail space breakdown = 3,905 m^2

- Assumed number of lifts = 20
- Assumed carpark space = 25,000 m^2

Table 9 Total Maximum Electrical Demand

Electrical Loads	Quantity	Unit	kVA / unit	Subtotal kVA
Apartments	700	no	4	2,800
Commercial	8,645	no	0.1	865
Retail	3,905	no	0.25	976
Lifts	20	no	80	1,440
Carparks	25,000	no	0.015	375
Electric Car Charging	10	No	4.67	47
Total kVA				**6,503**
Include 15% Future Capacity				**7478**

The overall peak electrical demand for all buildings and carparks following development has been estimated to be 6.5MVa. Considering a +15% to account for future design development, this increases to approximately 7.5MVA. It is noted that the above loads currently account for diversity.

It is noted that while a gas connection has been allowed for and indicative gas demand rates have been developed, the above table assumes that apartments use electricity rather than gas for cooktops and heating. Preliminary demand assessments indicate that adoption of gas cooktops will reduce the total electrical demand by 0.8mVA.

Transport Peak Energy Demand Requirements
They proposed Waterloo Metro Station is currently being developed by Sydney Metro and as a part of their works they are continuing to develop and refine their required electrical loads.

It is understood that Sydney Metro is bringing in separate cabling and infrastructure to support the proposed use by the transport infrastructure (including the trains) and that this would be unsuitable for the purposes of the retail and residential components of the proposed Metro Quarter.

An allowance for 10 electric charge charging points has been allowed for in the development however this is subject to further design development.

6.4 On-Site Utility Infrastructure

The existing Ausgrid electrical infrastructure on the site has been identified based on Dial Before You Dig (DBYD) records and information provided from the *Ausgrid Distribution and Transmission Annual Planning Report, 2017.* The Metro Quarter falls within the Eastern Suburbs load area and is serviced by substations and feeders as shown in Figure 17 below.

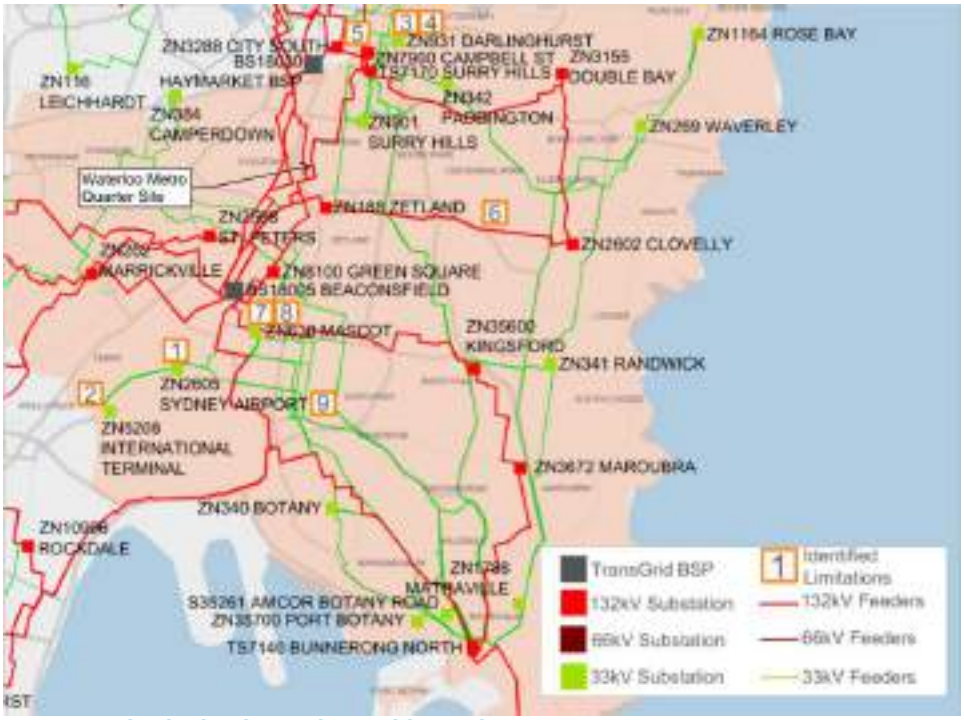

Figure 17: Eastern Suburbs load area *(Ausgrid, 2017)*

Existing electrical assets within or adjacent the Metro Quarter site boundary include:

- A large concentration of LV and HV distribution cables and conduits within George Street, McEvoy Street, Wellington Street and Elizabeth Street;
- Existing overhead power running along streets; and,
- A number of above-ground distribution substations stepping down the 11kV supply located on McEvoy Street, George Street, Cope Street, Phillip Street, Raglan Street, and Pitt Street.

The exact depths and positions of the existing reticulation mains are unknown thus further investigation as part of the detailed development application is required to determine the exact existing layout. If any new 11kV reticulation is required within 4 metres of the existing HV cables, ratings assessments to demonstrate to Ausgrid's satisfaction that there are no mutual heating issues between cables.

During consultation meetings, Ausgrid have noted that there may be supply limitations to Zetland Zone Substations, which may make a proposed connection infeasible. They have noted that for both the Metro Quarter and wider SSP, there may be capacity to provide a temporary connection to Green Square Zone Substation via 11kV feeders and that this should be considered further in conjunction with the upcoming RMS road widening project along McEvoy St.

Ausgrid further note that the future development for the adjoining Waterloo Estate (not the Metro Quarter), may potentially require a new Zone Substation site to cater for the growth in load demand. It is expected that all existing aerial infrastructure within each development

site would be abandoned or relocated underground. Furthermore, City of Sydney will likely require undergrounding of existing aerial infrastructure in the streets bounding the site.

The existing and proposed Ausgrid infrastructure is outlined in Figure 20, this plan only considers Ausgrid infrastructure and there may be private electrical infrastructure present on the site. Additionally, it shows a substation in each development tower however there may be the opportunity to centralise substations if the development was constructed as one lot.

6.5 Undergrounding of Existing Electrical

Figure 18 and Figure 19 show the existing overhead electrical infrastructure along Botany Road and Cope Street immediately adjacent to the proposed site. It is evident that undergrounding of these assets will be complex given the already spatially constrained network.

Figure 18 Botany Road (Google Maps, 2017)

Figure 19 Cope Street (Google Maps, 2017)

6.6 Potential ESD Initiatives

This report shows “baseline” utilities responses but key Ecologically Sustainable Development (ESD) initiatives recommended for further investigation as a part of detailed design include:

- Solar PV (embedded into current design);
- Building orientation (embedded into current design);
- Natural ventilation of common areas (embedded into current design);
- Electric car charging (embedded into current design);
- Centralised heat extraction system (future consideration);
- Geothermal cooling (future consideration);
- Smart metering (future consideration); and
- Glazing options to improve thermal comfort and reduce heating and cooling loads.

It is noted that these would have an impact on the final electrical peak demand and associated infrastructure upgrade requirements.

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AAPNET
- EXISTING COMMUNICATIONS - AAYOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VOCUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE
- PROPOSED ALIGNING

NOTES:

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Figure 20: Waterloo Metro Quarter - Electrical Plan

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WATERLOO METRO QUARTER SHARED SERVICING AREA ELECTRICAL PLAN

SHEET NUMBER
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6.7 Coordination with Other Services

Coordination of the proposed electrical infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards (these details are attached in Section 9.1).

Ausgrid's specification "NS130: Specification for Laying of Underground Cables up to 22kV" does not provide specific information on clearances from other services. If the electrical services are installed within the standard allocation, the separations given by the other services provider should apply for all crossings. Where a reduced allocation is proposed, separations should be determined in consultation with Ausgrid.

In addition to the above, all works will also comply with Ausgrid Network Standards NS 156 "Working near or around underground cables".

6.8 Approvals and Next Steps

The key next steps in progressing the delivery of electrical infrastructure through detailed design including the formal Ausgrid approval process consists of the following (in conjunction with further Ausgrid coordination and consultation with Sydney Metro and RMS on coordinating lead-in infrastructure):

1. Undertake site investigations to confirm the layout and extent of existing services (including non-Ausgrid assets) – Post Rezoning/Development Application;
2. Confirm arrangements for supply and ownership of street lighting – As a part of Development Applications;
3. Confirm extent of existing infrastructure that can be abandoned and/or requires diversion - – Post Rezoning/Development Application;
4. Develop duct masterplan and make submission to set up case with Ausgrid – As a part of Development Applications;
5. Develop staged designs for delivery of the new infrastructure – As a part of detailed design;
6. Liaise with City of Sydney to confirm requirements for undergrounding of existing infrastructure – As a part of Development Applications;
7. Ausgrid to provide detailed requirements – As a part of Development Applications, As a part of detailed design;
8. Ausgrid to issue Design Information Pack (DIP), Design Contract & Deed of Agreement As a part of detailed design; and
9. Submit detailed design of individual packages for approval - As a part of detailed design;

It is noted that the above is for delivery of the duct network through the street network, it is expected that the buildings will need to make separate applications for connection, including installation of new feeders.

Additionally, further coordination with Sydney Metro is required to determine the location, conduits and lead-in for any new feeders to the Metro Quarter.

7.0 Gas

7.1 Background

Gas servicing to the Metro Quarter is provided by Jemena. Projections produced as part of the *C2E Infrastructure Servicing Strategy Report* (AECOM, 2015) indicate that there will be a substantial increase in gas demand throughout the Metro Quarter. Whilst there is a substantial distribution network in the area, it is predominately comprised of small connections providing supply at a low pressure.

As a part of the *C2E Infrastructure Servicing Strategy Report* (AECOM, 2015) Jemena indicated that although they have the ability to service the general Metro Quarter they have not confirmed whether the existing infrastructure within the Metro Quarter has sufficient capacity. Confirmation of capacity and potential required upgrades will be received when formal connection applications are received.

The following table outlined the rates used to derive the estimated gas demand within the Metro Quarter, applied to residential dwellings only.

Table 10: Gas Demand Unit Rates

Building Type	Peak Demand Rate	Unit
Residential	2.169863014	m^3/day/dwelling
BASIX Reduction	25	%

7.2 Demand Assessment

An assessment of the gas demand has been undertaken to assist in determining the required infrastructure upgrades associated with the Metro Quarter.

Jemena use an energy demand of 20 gigajoules (GJ) per year (equating to 2.17 m^3/day) to estimate the average annual domestic usage of natural gas for residential dwellings. This usage rate typically equates to a natural gas hot water tank, cook top and heating point. Peak demand and annual gas demand are also dependent on the plant supplying the project area.

Jemena have confirmed that different rates are to be used for commercial spaces however they were unable to confirm estimated rates, as such this has been excluded from this assessment. However, the demand from commercial land uses is expected to be substantially less than from residential usage. It should be noted that the gas demands do not account for alternative supply scenarios such as trigeneration.

7.3 Forecast Demand

Table 11 presents the estimated natural gas usage for the Metro Quarter, assuming supply to residential properties only. A BASIX reduction of 25% has been applied to the gas demand.

While gas usage can increase under BASIX to offset electrical demand, gas prices have a much greater effect on demand. Due to this variability, it has been assumed that there is no net increase or reduction consequent of BASIX compliant dwellings.

The average cumulative gas demand is estimated to be approximately 1,139 m^3/day as shown in Table 11. Considering a ±15% range for development yields, the gas demand could vary from approximately 968-1,310 m^3/day which includes the BASIX reduction.

Table 11: Estimated Cumulative gas demand assessment (incl. BASIX)

Study Area	Gas m^3/day Cumulative (incl. BASIX)				Total (m^3/day)
	0 to 5 Years		5 to 10 Years		
	Apartments	Commercial	Apartments	Commercial	
Metro Quarter	570	N/A	1,139	N/A	**1,139**

7.4 Existing On-Site Utility Infrastructure

There is currently an extensive network of gas mains within the Metro Quarter, in particular:

- An external secondary trunk main (1050kPa) that lies approximately 150m of the Metro Quarter's southern border at the corner of George Street and Allen Street; and
- A number of medium pressure 210kPa network mains servicing the existing buildings.

The existing and proposed services are shown below, the exact depths and positions of the existing reticulation mains have not been confirmed and further investigations will likely be required to determine the extent of diversions required.

7.5 Potential ESD Initiatives

It is noted that mains gas, while currently less carbon intensive than grid electricity per unit of energy, is still a fossil fuel and releases greenhouse gases during combustion. If the goal is to transition to a zero carbon economy by 2050, the focus naturally must be on minimising the use of energy and lowering energy emissions overall.

As a part of future design development, consideration should be given to using a sustainable electrical supply rather than gas for heating and cooking.

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

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Figure 21: Waterloo Metro Quarter - Gas Plan

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PROJECT NUMBER
60649169

SHEET TITLE
WATERLOO METRO QUARTER SHARED SERVICING AREA GAS PLAN

SHEET NUMBER
60649169-SKE-00-0080-CI-0014

7.6 Coordination with Other Services

Coordination of the proposed gas infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards (these details are attached in Section 3.13).

Jemena provide guidance on horizontal and vertical clearances, the minimum separations between electrical and natural gas mains are provided in Table 1.0 of "Natural Gas Requirements for Developer Provided Trench" as summarised in Table 12.

Table 12: Jemena minimum separation between utilities

Utility	Minimum Separation	
	Gas Mains up to 75mm diameter	Gas Mains of 110mm diameter or larger
Telecommunication cables and/or conduits	150 mm	300 mm
Protected[2] Low Voltage electricity cables	150 mm	300 mm
Protected[2] High Voltage electricity cables	300 mm	300 mm

1. *Separations relate to distances between conduits/cables peripheries*
2. *"Protected" refers to mechanical protection of the cables, which usually takes the form of either polymeric strips (at least 3 mm thick) or clay brick*
3. *The above table is considered to provide desirable minimum separations. Consideration should be given for the need to access for future maintenance of services when determining the required separations*

7.7 Approvals and Next Steps

Jemena does not have a formal approval process, with supply arrangements being confirmed by Jemena as part of their quotation for construction to be provided following submission of applications for connection.

The formal approval process for provision of Jemena infrastructure to be progressed through detailed design processes consists of the following main steps:

1. Undertake site investigations to confirm the layout and extent of existing services (including non-Jemena infrastructure) – Post Rezoning/Development Application;
2. Submit masterplan including staging of delivery to Jemena for agreement – As a part of detailed design;
3. Submit application for design to Jemena for individual detailed design packages (to include proposed alignment) – As a part of detailed design; and
4. Jemena will provide a quote for construction works – As a part of detailed design;

It is noted that the above is for delivery of the gas network through the street network, depending on the strata arrangement individual buildings will still need to make separate applications for each connection.

8.0 Data and Communication

8.1 Background

A number of communication providers have assets running adjacent to and intersecting the Metro Quarter:

- NBN Co, NswAct;
- Nextgen, NCC – NSW;
- Optus and/or Uecomm, Nsw;
- PIPE Networks, Nsw;
- Telstra NSW, Central;
- Verizon Business (Nsw); and
- Vocus Fibre Pty Ltd (NSW).

While there are numerous utility providers adjacent to the development, if a developer does not choose another developer than NBN is the infrastructure provider of last resort for developments greater than 100 units. As such this section has focused on connection to the NBN network, a map showing the current rollout of the NBN network in the area is provided below in Figure 22.

It is noted that this figure does not include backhaul costs or pulling cables and assumes that existing conduits can be linked to existing conduits and new cables can be pulled through existing ducts.

8.2 Demand Assessment

No demand has been calculated for telecommunications infrastructure as it cannot be estimated in the same way as other utilities.

8.3 On-Site Utility Infrastructure

On-site utility infrastructure for each telecommunications service is summarised below, Figure 22 shows the proposed telecommunication connection route for the Metro Quarter.

Telstra
Underground Telstra services are located in the streets forming the boundary of the site as well as servicing existing lots within the Metro Quarter. It has been assumed that the existing Telstra services will be required to be abandoned, relocated or replaced as a part of the site development, due to the fact that the existing levels are unlikely to be consistent with the proposed building locations. This assumption is to be confirmed during detailed design of the Metro Quarter.

It is also likely that City of Sydney will require any existing overhead Telstra infrastructure to be relocated underground within the site and the bounding roads.

Optus/Southern Cross

Optus has a major network critical cable located within the vicinity of the Metro Quarter but outside of the site extents. The exact location of this cable may need to be confirmed through site investigations which will determine the allowable extent of works.

Currently no connection to the Optus network is proposed as part of the Metro Quarter works. Onsite utility investigations and service searches are recommended post rezoning as a part of any future development application.

Uecomm
Uecomm has a limited number of assets present adjacent to the Metro Quarter, beginning on Wellington Street at the Pitt Street intersection, and continuing eastward. It has been assumed at this stage that existing Uecomm services are to be retained and left in their existing position. No connections to the Uecomm network have been proposed as part of the Metro Quarter works.

AAPT
AAPT has a number of assets present within the Metro Quarter. AAPT has ducts travelling on the eastern side of George Street up until the intersection with John Street, where third party ducts for AAPT assets are utilised. No connections to the AAPT network are proposed as part of the Metro Quarter works.

Nextgen
Nextgen has a number of assets in third party ducts within and adjacent to the site. The internal Nextgen asset travels up the western side of George Street, turns onto the southern kerb of Wellington Street and continues to travel up Pitt Street, adjacent to the sites eastern boundary. There is another Nextgen asset on the western kerb of Cope Street, adjacent to the sites western boundary. No connections to the Nextgen network are proposed as part of the Metro Quarter works.

Primus
Primus has limited assets within the Metro Quarter. Their asset runs along the eastern side of Cope Street, adjacent to the western boundary. No connections to the Primus network are proposed as part of the Metro Quarter works.

Note: (Indicative building layouts only)
Multiple connections allowed for, if consolidated to one lot, connections can be rationalised

LEGEND

- EXISTING BUILDING
- EXISTING COMMUNICATIONS - AARNET
- EXISTING COMMUNICATIONS - AAYOM
- EXISTING COMMUNICATIONS - NBN
- EXISTING COMMUNICATIONS - NEXTGEN
- EXISTING COMMUNICATIONS - OPTUS
- EXISTING COMMUNICATIONS - PRIMUS
- EXISTING COMMUNICATIONS - TELSTRA
- EXISTING COMMUNICATIONS - VOCUS
- EXISTING COMMUNICATIONS - PIPE NETWORK
- EXISTING GAS
- EXISTING SEWER
- EXISTING POTABLE WATER
- EXISTING DRAINAGE
- PROPOSED COMMUNICATIONS

NOTES:

1. ALL UTILITY SERVICES LAYOUTS ARE INDICATIVE ONLY BASED ONE DIAL BEFORE YOU DIG (DBYD) RECORDS. SITE INVESTIGATIONS ARE REQUIRED TO CONFIRM LOCATIONS. SURVEY MAY INDICATE ADDITIONAL EXISTING MAINS REQUIRING DIVERSION TO AVOID IMPACTING THE PROPOSED DEVELOPMENT FOOTPRINTS
2. PROPOSED UTILITY SERVICES WILL REQUIRE FURTHER DETAILED DESIGN AND COORDINATION WITH UTILITY AUTHORITIES TO DETERMINE FINAL LAYOUTS AND EASEMENTS. THE PROPOSED WORKS PRESENTED IN THIS DRAWING HAS NOT BEEN REVIEWED WITH THE UTILITY AUTHORITIES.
3. SCOPE OF INFRASTRUCTURE WORKS SHOULD BE CONSIDERED IN PARALLEL WITH DIVERSION REQUIREMENTS FOR DELIVERY OF THE PROPOSED STATION AND ANY ROAD UPGRADES AND HAVE NOT BEEN IDENTIFIED AT THIS STAGE.
4. NEW DEVELOPMENT ANALYSIS HAS BEEN UNDERTAKEN TO REVIEW POTENTIAL UPGRADES OF EXISTING MAINS. SCOPE OF POTENTIAL CONNECTION POINTS PRESENTED IN THIS DRAWING HAVE BEEN BASED ON PREVIOUS EXPERIENCE WITH SIMILAR SCALES OF REDEVELOPMENT.
5. NO MANHOLE SURVEYING HAS BEEN UNDERTAKEN TO CONFIRM GRADES AND THEREFORE CONNECTIVITY OF GRAVITY INFRASTRUCTURE
6. INDICATIVE BUILDING LAYOUTS ONLY. MULTIPLE CONNECTIONS ALLOWED FOR, IF CONSOLIDATED TO ONE LOT, CONNECTIONS CAN BE RATIONALISED

Figure 22: Waterloo Metro Quarter - Comms Plan

This drawing is confidential and shall only be used for the purpose of the project. The signing of this title block confirms the design and drafting of this project has been prepared and checked in accordance with the AECOM quality assurance system (ISO 9001:2008)

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SAFETY IN DESIGN INFORMATION
ARE THERE ANY ADDITIONAL HAZARDS / RISKS NOT NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING?
☒ NO
☐ YES

REGISTRATION

PROJECT MANAGEMENT INITIALS

DESIGNER	CHECKED	APPROVED

ISSUE/REVISION

No	DATE	DESCRIPTION

PROJECT NUMBER
60649169

SHEET TITLE
WATERLOO METRO QUARTER SHARED SERVICING AREA COMMS PLAN

SHEET NUMBER
60649169-SKE-00-0080-CI-0012

8.4 Coordination with Other Services

Coordination of the proposed communications infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards (these details are attached in Section 8).

The clearances for NBN services from other utilities is given in Section 5.2.13 of "New Development: Deployment of the NBN Co Conduit and Pit Network – Guidelines for Developers", these requirements are presented in
Figure 23 below.

Service Item		Minimum Radial Clearances*[1]
Gas Pipe	Over 110 mm	300 mm
	110 mm or Less	150 mm
Power	High Voltage	300 mm
	Low Voltage	100 mm*[2]
Water Mains	High Pressure/Capacity	300 mm
	Local Reticulation	150 mm
Sewer	Main	300 mm
	Connection Pipe	150 mm
Other Telecommunications	100 mm*[1]	

* 1 – Reduced separation is possible where all parties (including NBN Co) are consulted and agreement is reached.

* 2 – Only where protection barriers are used, for example, conduit, bedding, marker tape and cover batten.

Figure 23: NBN Clearances from Other Carriers and Underground Services

8.5 Approvals and Next Steps

Confirmation is required from NBN Co that the site is eligible for supply from their network. Following this an initial application is required and a formal agreement entered into between NBN Co. and the developer prior to construction works commencing (this does not prevent designs from being approved).

The next steps generally consist of the following:

1. Undertake site investigations to confirm the layout and extent of existing services (including private infrastructure associated with previous land-uses) – Post Rezoning/Development Application;
2. Liaise with existing telecommunication providers to confirm the requirement for diversion and/or relocation of their existing infrastructure – Post Rezoning/Development Application;
3. Confirm proposed infrastructure master plan (including staging) and in principle supply arrangements with NBN or other provider - As a part of Development Applications;

4. Initial application submitted to NBN Co. for supply of the site from their network - As a part of Development Applications;
5. NBN Co. to confirm supply can be provided and provide draft agreement – As a part of detailed design;
6. Revisions of agreement where required – As a part of detailed design;
7. The developer to sign NBN Co. agreement – As a part of detailed design;
8. Liaise with existing telecommunication providers for quotes for diversions or abandonments including any interim works – As a part of detailed design; and
9. Submit detailed design of individual packages for approval – As a part of detailed design;

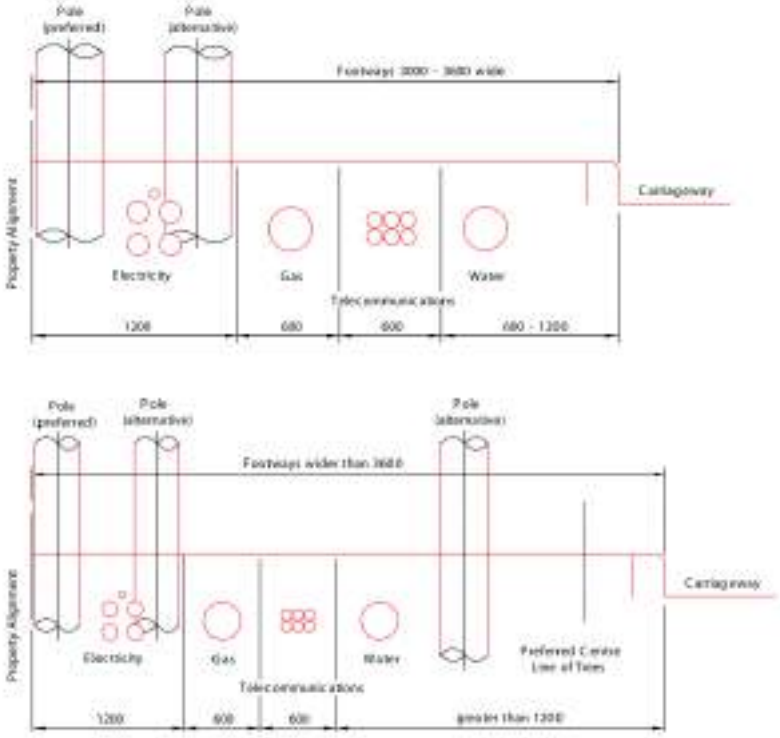
It is noted that the above is for delivery of the NBN pit and pipe network through the new street network, it is expected that the buildings will need to make separate applications for connection.

9.0 Utility Service Corridors

9.1 Streets Opening Conference Service Corridors

The “Guide to Codes and Practices for Streets Opening” by the NSW Streets Opening Conference (SOC), 2009 provides guidelines for service allocations within the footpath.

It has been assumed that the majority of new utility infrastructure for the Waterloo Site will be within new footpaths; these should follow the allocations shown below in Figure 24. However it is noted that due the density of existing services on the Metro Quarter that these allocations may not be able to be achieved. It is further noted that the City of Sydney generally requires the street lighting to be located adjacent to the kerbline, particularly if it is their asset.



Notes:

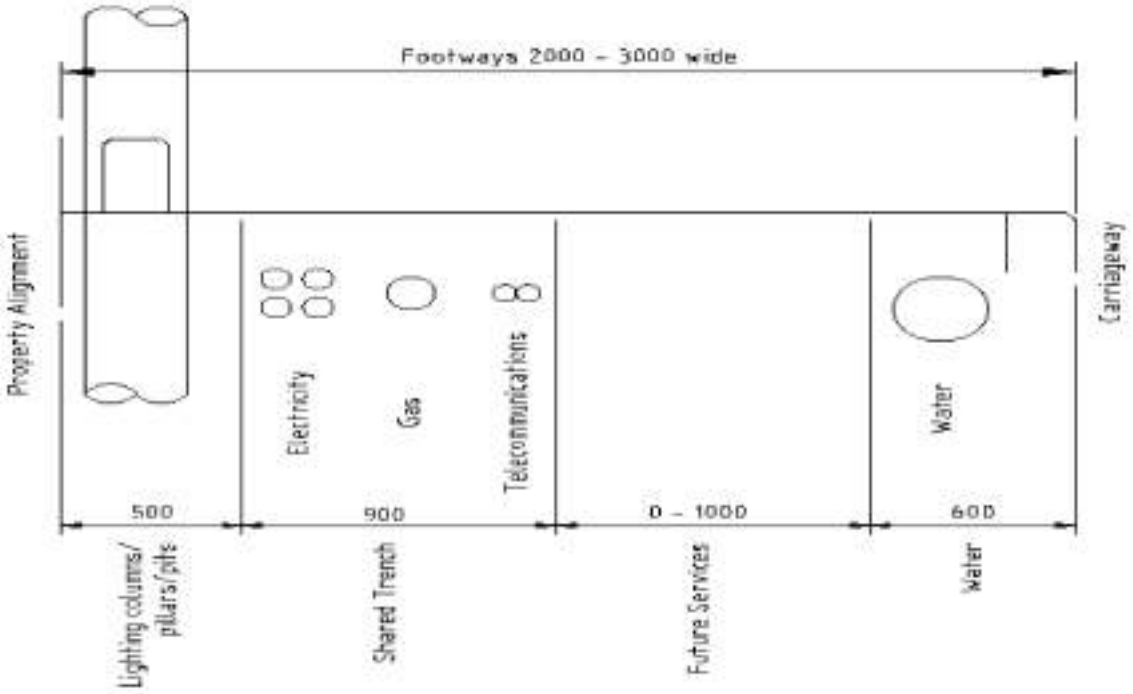
1. These allocations apply throughout NSW except where noted in Section 6.4.
2. Where a Utility/Service Provider providing underground Services wishes to encroach on space allocated to another Utility/Service Provider, it should consult and seek agreement with the other. Both Utility/Service Providers should record such encroachments on their respective mapping systems.
3. The narrower water allocation shown may not be sufficient to include recycled water mains.
4. The preferred position for poles or street lighting columns is adjacent to the property alignment. Alternative positions are shown.
5. Where the erection of power poles in the 0-1200 mm allocation is impracticable, these may be located in the water allocation by agreement with the appropriate Public Authority.
6. No specific allocation for trees can be identified for footways up to 3600 mm wide. Consultation with Utility/Service Providers is required and due regard must be given to tree species.
7. Pillars/pedestals/Service pits etc should be located in a position that is set back from street intersections.
8. See Section 6.6 for guidance on new poles and pole replacements.

Figure 24: Streets dedicated after 1 January 1991

(SOC, 2009)

Where shallow footpaths between 2-3m are required, then shared trench arrangements may be used as shown below in Figure 25.

Again, it is noted that City of Sydney generally requires the street lighting to be located adjacent to the kerbline, particularly if it is their asset.



Notes:

1. The allocation of space in narrow footways, whether new or pre-existing, was adopted for the first time in the 2002 edition of the Guide to Codes and Practices for Streets Opening.
2. Where it is intended to lay more than one type of Service, shared trenching should be used. However, this does not always allow for large structures and trunk lines.
3. Where a Utility/Service Provider providing underground Services wishes to encroach on space allocated to another Utility/Service Provider, it should consult and seek agreement with the other. Both Utility/Service Providers should record such encroachments on their respective mapping systems.
4. Footways of width less than 2000 mm require special consideration to accommodate Services. Contact the Conference Secretariat for information concerning such designs, community title situations and other special situations. Refer to clauses 3.5 and 6.6
5. The variable allocation of 0-1000 mm provides for future extensions.
6. The preferred position for poles, pillars, cabinets and street lighting columns is adjacent to the property alignment.
7. Where the erection of power poles in the 0-500 mm allocation is impracticable, these may be located in the water allocation by agreement with the appropriate Utility/Service Provider.
8. No specific allocation for trees can be identified for footways up to 2000 mm wide. Consultation with Utility/Service Providers is required and due regard must be given to tree species.
9. Pillars/pedestals/Service pits etc should be located in a position that is set back from street intersections.
10. See Section 6.6 for guidance on new poles and pole replacements.

Figure 25: Allocation of space in narrow footways

(SOC, 2009)

The shared trenching arrangement is not considered appropriated where main/trunk services are provided; this includes any potential HV electrical feeders. Furthermore, while Ausgrid has shared trench agreements with Telstra, no such agreement exists with NBN Co. therefore shared trenching is not considered desirable for the Waterloo site.

Further consultation will also be required with the City of Sydney to confirm if street lighting will be separate from the electricity supply, if so the standard allocation may require revision.

10.0 Conclusion

A number of utility constraints that affect the Metro Quarter including:

- A number of electrical HV transmission lines, particularly on Wellington, Cope, and George Street;
- The 2.5m potable water Pressure Tunnel and Shaft that bisects the site;
- A number of trunk potable water services on McEvoy, Cope and George Street;
- A major Optus fibre cable rout that runs along George Street;
- Large concentrations of services within footpaths that will potentially require relocation as a part of any footpath upgrades; and
- Aboveground powerlines that may need to be undergrounded.

Opportunities and needs to support the precinct include:

- The site is currently well serviced by utility infrastructure;
- Trunk services may have excess capacity to service the initial phases of the new development, however local amplifications are likely and new electrical feeder cables will likely be required;
- There may be the opportunity to re-use redundant electrical utility routes for new infrastructure;
- Areas such as the Australian Technology Park (ATP) or Green Square Town Centre may enable the sharing of sustainable utility infrastructure and potential recycled water networks; and
- Required lead-in utility works may be shared with the new Sydney Metro Station, in particular shared trenches may reduce capital costs.

Future work that is required to enable detailed development applications includes:

- Further coordination with utility authorities to confirm lead-in infrastructure requirements and routes;
- Further coordination with Sydney Metro to determine shared servicing options;
- Potential hydraulic modelling to confirm potable and wastewater lead-in infrastructure upgrades; and
- After further assessment of ESD options to take forward into detailed design, confirm the effects on utility supply and lead-in infrastructure requirements and routes.

11.0 Assessment

This Utilities report presents:

Table 13: SEARs Responses

Section 18. Utilities	
The EIS shall identify the existing capacity of the site to service the development proposed and any augmentation required for utilities, including arrangements for electrical network requirements, drinking water, waste water and recycled water.	• Proposed on-site generation / water recycling are listed in Section 5.5 and 7.5, more detailed analysis is considered in the ESD Report • Required capacity and augmentations needed for the proposal are contained within figures 8, 11, 16, 17 and 18. These include potential amplification of trunk lead in infrastructure. • Sustainability and climate change adaptation measures are considered in each section however more details are provided in the ESD Report • Electrical loads include air conditioning allowance to manage increasing heat, further details including the effects of changing rainfall patterns are considered within the Climate Change Report and the Flooding and Stormwater Study • AECOM employ Sydney Water accredited designers and have suitably qualified hydraulic engineers who prepared the water utilities component • AECOM employ registered Level 3 ASP personnel and suitably qualified electrical engineers prepared the power utility requirements • Development yields are contained within Section 4.2, peak demands and forecasts (including stage) are contained within each utility section • The Ausgrid requirements to service the development are contained within Section 7, these were developed through consultation with Ausgrid and include high-level impacts. Planned onsite generation is unlikely to substantially affect the peak demand even if paired with battery storage, requirements for relocation are identified but detailed analysis will form part of design development • We cannot comment on Sydney Metro loads in this document as they are still under consideration and will be supplied separately to the residential, retail and commercial components of the development. Allowances for electric car charging is included in Section 7.3 • We cannot comment on Sydney Metro loads in this document as they are still under consideration and will be supplied separately to the residential, retail and commercial components of the development. Allowances for electric car charging is included in Section 7.3 • The capacity of Sydney Water's network to service the development is considered within Sections 5 and 6. • Integrated water cycle managements and / or sustainability initiatives are contained in each section however more details are contained

Metro Quarter SEARs	Utilities and Servicing Infrastructure Response
	within the ESD Report • The location of services assets is contained within Figures 1, 2, 7, 8, 10, 11, 13, 16, 17 and 18. • Proposals to mitigate risks are contained within each utility section and Section 12 • The outcomes of ESD Study have been incorporated within each section, noting that the final selection of ESD options will be subject to design development • Current utility design standards have been complied with and are designed to be underground, it is also noted with Section 7.4 that existing overhead utilities are to be undergrounded.

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