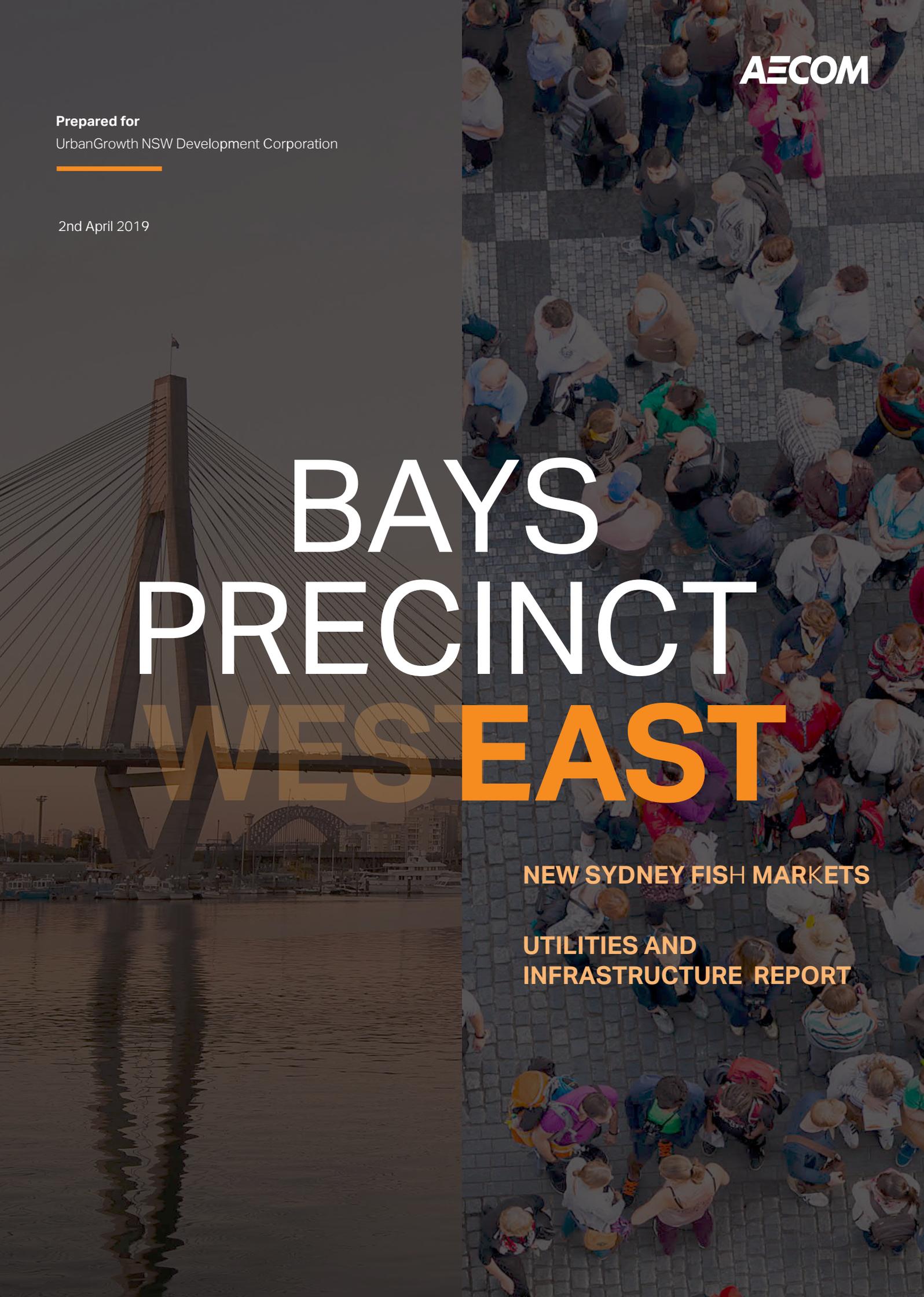


Prepared for
UrbanGrowth NSW Development Corporation

2nd April 2019

The background of the cover is a composite image. The left side shows a large cable-stayed bridge over a body of water, with a smaller bridge visible in the distance. The right side shows a high-angle view of a dense crowd of people walking on a paved area. The title text is overlaid on this background.

BAYS PRECINCT WEST EAST

NEW SYDNEY FISH MARKETS

**UTILITIES AND
INFRASTRUCTURE REPORT**

The new Sydney Fish Market

Utilities and Infrastructure Report

Client: UrbanGrowth NSW Development Corporation

ABN: 41 163 782 371

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 92520 093 846 925

02-Apr-2019

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Quality Information

Document The new Sydney Fish Market

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Reviewed by Daniel Fettell

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Executive Summary

The NSW Government is currently developing the Bays Precinct new Sydney Fish Markets to be located at the head of Blackwattle Bay, adjacent to the existing fish market. Key stakeholders UrbanGrowth NSW Development Corporation (UrbanGrowth NSW) and the Sydney Fish Market Pty Ltd (SFM) have been working with the design team (3XN, BVN and Aspect Studios) to develop design for the new Sydney Fish Market.

In order to successfully deliver this new development and support timely commencement of works in late 2018, a number of development applications require approval. Key to this is the need to address the Secretary's Environmental Assessment requirements (SEAR's) section 18. *Utilities and infrastructure* clause.

To support compliance to this requirement, AECOM is engaged to provide an Infrastructure Servicing Strategy for the development. This comprises of proposed upgrades to utilities and infrastructure and servicing options considered, including wastewater and stormwater recycling for non-potable use, and alternative water and energy supply. An infrastructure staging plan is also prepared to support civil works.

Preliminary calculations were undertaken for this report to inform infrastructure upgrade requirements, as the design of the development continue it is likely that these demands will alter and evolve. Initial results indicate the new development site may require:

- A Average Daily Demand (Potable Water) of approximately 820 – 1110 kL / day;
- A Average Dry Weather Flow (Wastewater) of approximately 705-950 kL /day;
- An electrical load requirement of 11.5 MVA ;
- A gas load requirement of 491m³/hr; and
- Associated telecommunications infrastructure.

Based on a preliminary review of the existing utility infrastructure and proposed works, the majority of services may have the capacity to service the development however further consultation with utility authorities is required. In particular potential upgrade works include:

- Potable Water upgrades on Bridge Road;
- Wastewater upgrades on Bridge Road; and
- Potential new feeder cables from the Camperdown Zone Substation.

1.0 Introduction and Overview

1.1 Background

Sydney Fish Market is the largest of its kind in the Southern Hemisphere and among the three largest seafood markets in terms of variety in the world. The market sources product both nationally and internationally and trades approximately 14,500 tonnes of seafood annually with up to one hundred sustainable seafood species traded every day and approximately 500 species traded annually. The site attracts over 3 million visits each year. In November 2016 the NSW Premier announced a new Sydney Fish Market would be built at the head of Blackwattle Bay, adjacent to the existing fish market. In June 2017 the Premier of NSW announced the appointment of Danish architects 3XN to lead the design team that includes Sydney firms BVN and Aspect Studios. They have been working with key stakeholders, including UrbanGrowth NSW Development Corporation (UrbanGrowth NSW) and Sydney Fish Market Pty Ltd (SFM), to develop the design for the new Sydney Fish Market. As announced by the NSW Premier, works are planned to commence in 2019.

1.2 Site and context

The site is located at the head of Blackwattle Bay between the Pymont Peninsula and the foreshore of Glebe, situated less than 2km west of Sydney's CBD and is partially within the City of Sydney Local Government Area.

The land to which the development application relates comprises Lots 3 - 5 in DP 1064339 part of lot 107 in DP 1076596 and part Lot 1 in DP835794. Works to connect to the existing waterfront promenade to the west of the site are located on Lot 3 in DP1018801. The development footprint is irregular in shape and has an area of approximately 36,800m². The site is partly on land above mean high water mark and partly on water below mean high water mark.

The site has a frontage to Bridge Road to the south and Blackwattle Bay to the north. Pymont Bridge Road is an arterial road that links to the Anzac Bridge to the north west of the site. Sydney Secondary College Blackwattle Bay Campus is immediately south west of the site and the existing fish market immediately north east. Located directly opposite the site to the south is Wentworth Park, separated by Bridge Road.

Located approximately 400m walking distance from the site are the Fish Market, Wentworth Park, and Glebe Light Rail stops which are serviced by the Dulwich Hill Line which is a 23 stop, 12.8-kilometre route running from Dulwich Hill to Central station via Pymont.

The site contains one heritage item being the heritage stormwater culvert. The site is also near a number of heritage items.

The site's current uses include a concrete batching plant at the Western end and concrete hardstand and wharf area at the Eastern end, which is currently vacant. The site includes wharves and land-based structures. Part of the site is the water of Blackwattle Bay. Works will be undertaken on Bridge Road and its intersections with Wattle Street and Wentworth Park Road.

1.3 Approval Strategy

Pursuant to the provisions of the *Environmental Planning and Assessment Act 1979* and *State Environmental Planning Policy (State and Regional Development) 2011* ("SEPP SRD") the new Sydney Fish Market development is State Significant Development and the Minister for Planning is the consent authority.

To deliver the new Sydney Fish Market, the following applications will be lodged:

1. A concept development application seeking approval for concept proposals for the new Sydney Fish Market. This is to meet the requirements for a master plan contained in clause 40 of SREP26. This concept development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall;

2. A development application for the construction of the new Sydney Fish Market;
3. An application to amend the planning controls applying to the site to enable the proposed development to be a permissible use on all of the site. This is to be achieved by an amendment to *Sydney Regional Environmental Plan No 26—City West* (“SREP26”).

These applications are lodged concurrently.

1.4 Summary of the development

The proposal is to build a new Sydney Fish Market with a contemporary urban design, provide unique experiences for visitors and world-class auction and wholesale facilities. The new facility will be set within an improved public domain including the creation of a waterfront promenade with improved access to Blackwattle Bay and linking to surrounding areas and to public transport.

The development will expand and improve the functions of the existing in a new setting designed to achieve design excellence, functional performance and environmental sustainability.

The new Sydney Fish Market will include retail and food and beverage premises, wholesale facilities and auction rooms, offices and commercial space, Sydney Seafood Schools, back-of-house facilities and car, truck and coach parking spaces. The new facility is to include a new foreshore promenade and wharves. The new Sydney Fish Market will be purpose built and will be supported by a state of the art back-of-house plant and recycling/waste management facilities.

1.4.1 Concept Development Application

The Concept development application seeks approval for:

1. the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
2. a gross floor area of up to 30,000m² contained within a defined building envelope;
3. waterfront structures such as wharves;
4. concepts for improvements to the public domain including promenades, access to Blackwattle Bay and landscaping;
5. pedestrian cycle and road access and circulation principles;
6. principles for infrastructure provision and waste management.

This concept development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall, and related services relocations.

1.4.2 Main Works Development Application

The Main Works development application seeks approval for:

1. the construction of a new Sydney Fish Market including land and water-based structures.
2. the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
3. a gross floor area of approximately 26,000m² as calculated according to the definition of GFA under SREP 26 (approximately 25,600m² as calculated according to the definition of GFA under the Standard Instrument).
4. public domain works including promenades access to Blackwattle Bay and landscaping;
5. pedestrian, cycle and road access and circulation;
6. infrastructure provision and waste management;

7. associated works as required.

The proposed uses comprise:

Below Ground Level

- Parking for service and delivery, and private vehicles up to approximately 417 vehicles;
- Plant and storage;
- Waste Management facilities; and
- End of journey facilities.

Ground Level - Outside of Building Envelope

- Up to three operational wharves for fishing fleet servicing and product unloading/loading, multi-purpose wharf space, private-operated ferry stop, recreational vehicles and the like;
- Vehicular access driveways; and
- Publicly accessible promenade.

Ground Level - Within Building Envelope

- Wholesale services space including product storage and processing; and
- Auction floor and associated refrigeration and handling space.
- Loading dock including time-limited delivery and service vehicle parking area;
- Waste management facilities;
- Office space including buyers room;
- Staff amenities, plant and storage.

Upper Ground Level (L1)

- Retail premises including fresh food retail, food and drink premises including harbourside dining;
- External/shared dining space;
- Ancillary back of house space and staff amenities; and
- Circulation areas.

Upper Level 2 (Mezzanine)

- Catering space;
- The Sydney Seafood School;
- Tenant and subtenant office space; and
- Plant and storage space.

1.5 Purpose of this Report

The purpose of this report is to address the SEARs: *18. Utilities and Infrastructure:*

- *Address the existing capacity and any required upgrades of utilities and infrastructure including staging of infrastructure.*

2.0 Methodology

The methodology for the information contained within this report is outlined in the sections below.

2.1 Information Gathering

The information gathering methodology undertaken is detailed below:

- Briefing from the design team regarding the aspirations and goals for the precinct as this will inform the physical inspections and assessments carried out on site;
- Sourcing and procuring available existing information regarding the existing precinct. This will include existing drawings, condition reports and master planning schemes etc. to inform us of the critical re-inspection requirements where there may be significant gaps;
- Summarising utility services infrastructure implications and constraints based on existing data and reports; and
- Assessment of the existing infrastructure capacities against the service authority's criterion.

2.2 Determine the Demand for Services

The demand assessment methodology undertaken is summarised below:

- Creation of yield estimates for water, sewer, power, gas, telecommunications based on the Gross Floor Area for retail and commercial development;
- Development of a sensitivity analysis on the service demand profiles by considering a demand range;
- Incorporation of authority unit rates, applicable diversity rates and identification of potential alternative supply sources/sustainability initiatives that may impact demand; and

2.3 Preliminary Infrastructure Assessment

The infrastructure assessment methodology undertaken is summarised below:

- Mapping the strategic infrastructure servicing the corridor;
- Preliminary investigation of the existing system capacities;
- Initial identification of potential constraints;
- Identify servicing options including potential ESD initiatives;
- Liaison with utility authorities; and
- Feedback on potential future infrastructure requirements.

3.0 Information Gathering

3.1 Gathering Existing Utility Information

The preliminary information gathering considered data from a range of sources. Primarily these were obtained from Dial Before You Dig (DBYD) requests, authority infrastructure reports and master plans.

3.2 Dial Before You Dig Plans

Dial Before You Dig requests were undertaken for the Bays Market District. These identified a number of services as outlined below in Table 1.

Table 1 Summary of Existing Services

| Authority Name | Phone | Utility Type |
|-------------------------------------|------------|------------------------------|
| AAPT / PowerTel, NSW | 1800786306 | Data and Telecommunications |
| Nextgen, NCC - NSW | 1800032532 | Data and Telecommunications |
| Optus and/or Uecomm, Nsw | 1800505777 | Data and Telecommunications |
| PIPE Networks, Nsw | 1800201100 | Data and Telecommunications |
| Telstra NSW, Central | 1800653935 | Data and Telecommunications |
| Verizon Business (Nsw) ¹ | 294345000 | Data and Telecommunications |
| Vocus Fibre Pty Ltd (NSW) | 731770796 | Data and Telecommunications |
| Ausgrid | 249510899 | Electricity |
| Jemena Gas South | 1300880906 | Gas |
| City of Sydney (IMS) | 292659819 | Other |
| RailCorp Central | 297528682 | Other |
| Roads and Maritime Services | 288370285 | Other |
| Sydney Water | 132092 | Potable Water and Wastewater |

The plans provided from these DBYD requests were assessed as a part of our condition and capacity review.

3.3 Utility Reports

A number of authority infrastructure reports and master plans that have relevance to the study area were reviewed.

- Draft Metropolitan Strategy for Sydney To 2031, NSW Government, 2014
- A Plan for Growing Sydney, NSW Government, 2014
- NSW Long Term Transport Master Plan, NSW Government, 2014
- Distribution and Transmission Annual Planning Report, Ausgrid, 2014
- Distribution and Transmission Annual Planning Report, Ausgrid, 2013

¹ Verizon has indicated no assets in the Wentworth Park area.

- Growth Servicing Plan July 2014 to June 2019, Sydney Water, 2014
- Growth Servicing Strategy Wastewater Network Bondi System, Sydney Water, 2014
- Water Savings Action Plan (WSAP), Leichhardt Municipal Council, 2012
- Wastewater Systems, Sydney Water, 2014
- NSW Transmission Annual Planning Report, TransGrid, 2014
- NSW Transmission Annual Planning Report, TransGrid, 2013
- BASIX Water Savings Monitoring – Sydney Water, 2009
- BASIX Monitoring Report - Electricity Consumptions for 2007-2009, NSW Department of Planning, 2010

3.4 Utility Connection Plans

Utility connection plans have been developed for the proposed New Sydney Fish Markets development, identifying existing utility service routes throughout the precinct with consideration for the following:

- Connection to existing utility infrastructure;
- Potential building connection details;
- Coordination between services; and
- Provision of servicing options for water, wastewater, electrical, gas and telecommunications.

All services are shown schematically and are subject to changes during further design stages and input from the relevant utility authorities. Schematic layouts for each utility service are presented in the individual sections within this report.

3.5 Land Use

The development footprint is irregular in shape and has an area of approximately 36,800m² and a gross floor area of approximately 26,000m² contained within a defined building envelope

The New Sydney Fish Market will include retail and food and beverage premises, wholesale facilities and auction rooms, offices and commercial space, Sydney Seafood Schools, back-of-house facilities and car, truck and coach parking spaces. The new facility is to include a new foreshore promenade and wharves. The New Sydney Fish Market will be purpose built and will be supported by a state of the art back-of-house plant and recycling/waste management facilities.

Detailed design calculations are still being undertaken however initial calculations have been undertaken based on utility authority rates to generation yield estimates for the development.

3.6 Consultation with Utility Authorities

As a part of the overall Bays East Masterplanning process which includes the New Sydney Fish Market, preliminary consultation has been undertaken with the following authorities:

- City of Sydney;
- Ausgrid;
- Jemena; and
- Sydney Water.

Feasibility applications have been submitted to Ausgrid and coordination meetings held with the City of Sydney and Sydney Water. As a part of the detailed design applications to connect will be made to Ausgrid allow with formal applications to Sydney Water, Jemena and NBN Co.

4.0 Potable Water

4.1 Background

Sydney Water supplies potable water to the proposed New Sydney Fish Markets from the Prospect and Kurnell Systems as shown below in Figure 1.

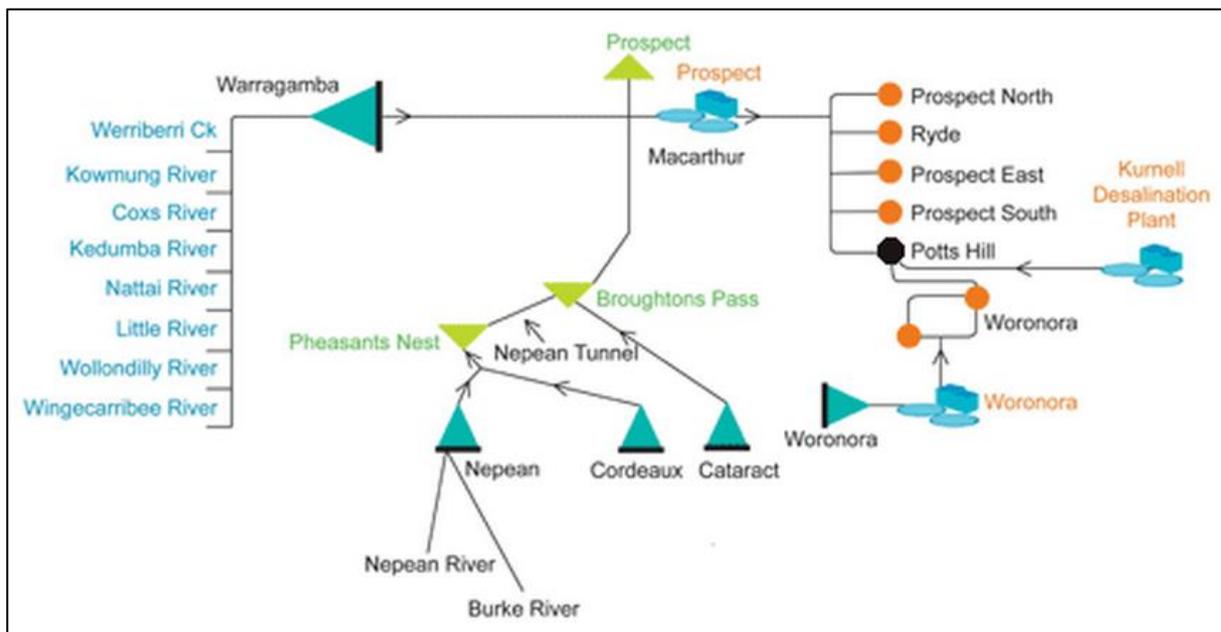


Figure 1: Potable Water Supply (Sydney Water Corporation, 2015)

This water is supplied via the Potts Hill Trunk Delivery System incorporating the Potts Hill Reservoirs and Crown Street Reservoir. There is one potable water pumping station within the system:

- John Street, WP0336 (Carmichael Park)

There are a substantial number of trunk water mains and carrier water pipes within the vicinity of the proposed development. There is significant variation in the age, type and condition of these pipes. A plan showing these mains and pump station are shown at the end of this section.

4.2 Existing On-Site Utility Infrastructure

The existing Sydney Water potable water network adjacent to the New Sydney Fish Market site has been identified based on Dial Before You Dig (DBYD) records. These records indicate the presence of numerous potable water mains adjacent to the development boundary.

Key existing potable network infrastructure includes:

- A DN200mm DICL main along Pyrmont Bridge Road parallel to the site;
- A DN150 CICL on Wentworth Park Road; and
- A DN200 CICIL on Wattle Street;

The depths and position of the existing reticulation mains are unknown, further consultation with Sydney Water is required to determine the exact existing layout and potential impacts of the design on the existing network.

The main trunk mains adjacent to the development site are:

- A DN600mm CICL trunk main running along Bulwarra Road; and
- A DN300mm CICL trunk main at the intersection of Bridge Road and Glebe Point Road.

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 identified on any reviewed plans.

4.3 Demand Assessment

The projected water demand for the development has been assessed based on each water consuming fixture within the site to deduce a daily usage rate. This takes into account different rates of consumption for amenities as well as retail, catering, wholesale and operational spaces. Note that only potable water has been considered in these calculations to inform planned future infrastructure requirements; but it is likely that these demands will change as the design of the site is ongoing.

Calculations indicate that the Average Daily Demand (ADD) to be approximately 805 kL/h which equates to approximately **966 kL/day**. It is worth noting that this does not include peaking factors which may increase the daily demand.

Considering a $\pm 15\%$ range in development yields, the estimated ADD for potable water could vary between **820 – 1110 kL/day**.

Please note that these demands are for infrastructure capacity assessments and does not currently include ESD targets for reduction in potable water use. These are being incorporated as part of the detailed design and will be coordinated with Sydney Water.

While treated non-potable water will be used where applicable (e.g. toilet flushing) via rainwater harvesting, to maintain compliance with food preparation standards treated non-potable water will not be supplied to areas requiring the manufacture of ice or preparation of food.

4.4 Preliminary Infrastructure Assessment

The preliminary infrastructure assessment has been based on a number of Sydney Water supply system elements, these include:

- Dams;
- Water filtration plants; and
- Customer supply systems.

4.4.1 Dams

Seven major dams store the majority of Sydney's potable water. Secondary storage dams also hold water that can be transferred to the major dams. Storing water in dams allows time for many of the contaminants that may be in the water as it runs through the catchments to settle out. The Sydney Catchment Authority is responsible for the catchments and dams.

Warragamba dam supplies water to the proposed New Sydney Fish Markets site; while no capacity assessment has been performed it is assumed that there is sufficient capacity within the dam to service the future growth.

4.4.2 Water Filtration Plant

Water from the dams is treated at one of nine water filtration plants. The plants are designed to remove any remaining contaminants.

The Prospect Water Filtration Plant services the proposed development and is one of the world's largest water filtration plants, with a capacity to provide reliable and safe drinking water for up to 85% of Sydney's population. Similar to Warragamba dam it has been assumed that there is sufficient capacity within the filtration plant.

4.4.3 Customer Supply Systems

The Potts Hill Delivery Water System distributes potable water to the New Sydney Fish Markets site and its surrounds via the Eastern Suburb Water Distribution System. The Potts Hill Water System Growth Servicing Strategy (2014) has indicated servicing new developments adjacent to Fish Market site including:

- Barangaroo (Darling Harbour East);
- Sydney Convention Precinct;
- Glebe Redevelopment Project; and
- Former Rozelle Tram Sheds (Harold Park Paceway).

The impact of these developments is not expected to constrain the capacity of the existing local network however this will be discussed with Sydney Water as a part of the detailed design connection applications.

While the reports indicate that the trunk delivery system may have spare capacity to service growth until 2036, carrier pipes running from the trunk system to each precinct will likely require upgrades. This will be confirmed with Sydney Water during further stakeholder engagement.

Plans of the existing potable water network are shown at the end of this section.

4.5 Potential On-site Infrastructure Layouts

The scope of external infrastructure upgrades are to be confirmed based on hydraulic modelling to be undertaken during detailed design.

Potential potable water reticulation for the Fish Market site includes:

- A single point of connection to the fish market site adjacent to the proposed driveway on Bridge Road; and
- Connection to the DN200 CICAL main along Pyrmont Bridge Road.

The proposed potable water infrastructure for each potential development strategy is shown in Figure 3. Diversion works are required for Bridge Road to ensure sufficient cover of existing potable water infrastructure.

As the current site is anticipated to have sufficient potable water capacity to service the required demand, it is assumed that major upgrades to the local potable water network are not required however this is being confirmed with Sydney Water and may change as the other adjacent developments come on line. It is possible that some amplification of existing mains on Bridge Road may be required.

It is noted that Sydney Water generally does not provide a lot connection until an application is made by that developer for a service. Where road crossings will be required it is recommended that oversized pipes /conduits be provided to minimise disturbance to completed works as part of building construction.

4.6 Flooding and Water Quality Assessment and Ecologically Sustainable Development (ESD)

Flooding and Water Quality and ESD have been explored within standalone reports which should be referred to for integration with the utilities infrastructure. Refer to *Flooding and Water Quality Assessment* (Cardno, 2018) and *Ecological Sustainable Development Report* (Wood and Grieves, 2018) for proposed potable water initiatives to be undertaken.

4.7 Coordination of Potable Water Infrastructure 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.

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 2.

| Utility (Existing or proposed service) | Minimum horizontal clearance | | Minimum vertical clearance ¹ mm |
|--|------------------------------|------------------------|---|
| | 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:

- 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.*
- Water mains includes mains supplying drinking water and non-drinking water.
- 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..*
- 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.
- 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.*
- 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.*
- 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 2: Sydney Water Clearances between Water Mains and Underground Services (WSA 03-2011-3.1, Sydney Water Edition – 2012)

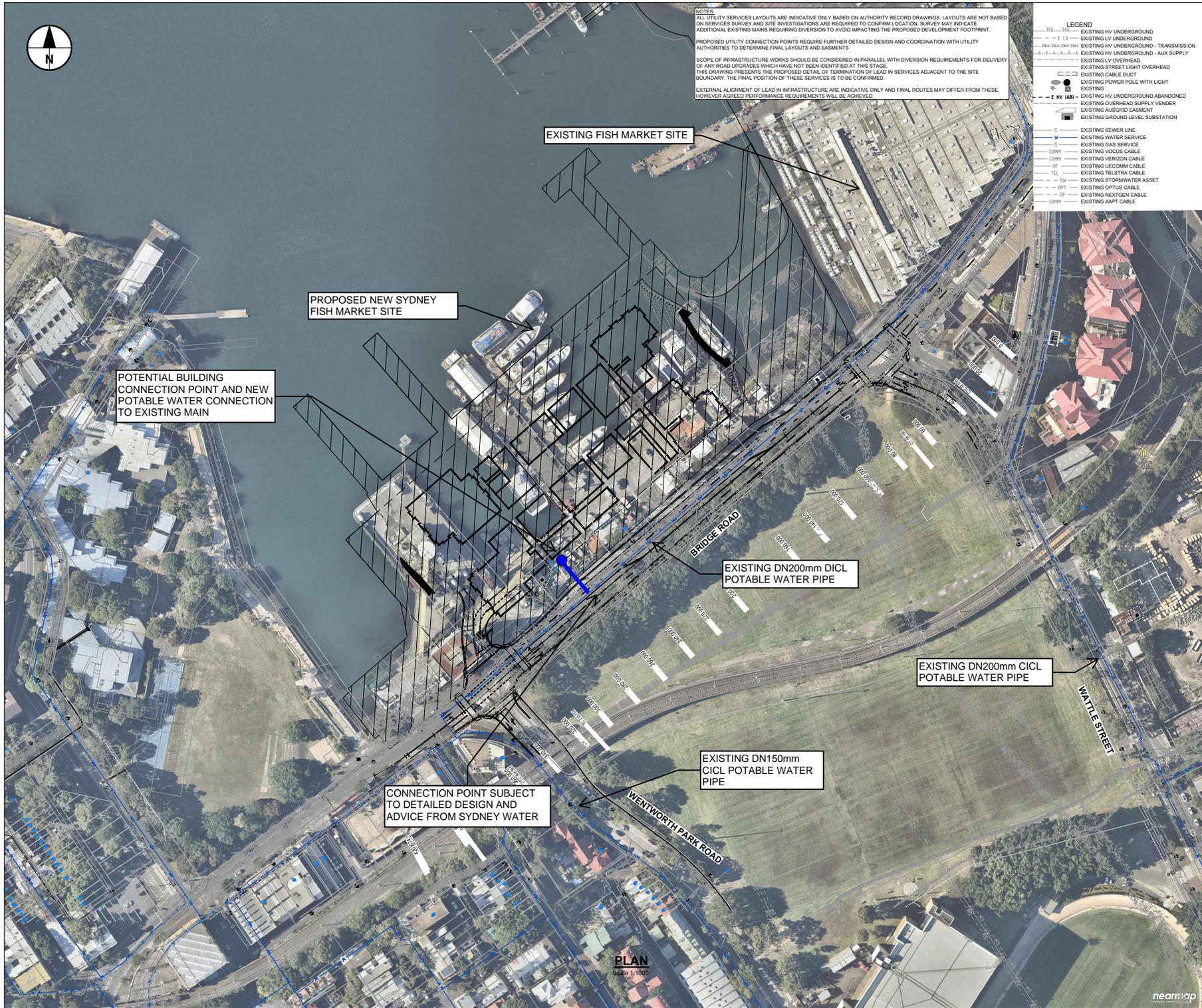
4.8 Approvals and Next Steps

Following finalisation of the concept design, Sydney Water will be contacted to assist with the planning of future infrastructure upgrades.

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:

- Undertake hydraulic modelling (if required by Sydney Water) to confirm the extent of any lead-in infrastructure upgrades required;

2. Undertake site investigations to confirm the layout and extent of existing on site infrastructure (including non-Sydney Water infrastructure);
3. Develop an overall water master plan for the development site including staging considerations and agree this with Sydney Water;
4. Develop diversion strategy (including any interim works to suit staging) and protection/build-over requirements for infrastructure that cannot be diverted;
5. Establish a Head Deed to be signed by required parties (Sydney Water, Designer, WSC, Developer, Constructor);
6. Submit application/s for individual detailed design packages to be submitted to SWC with drawing of proposed works in stages, Section 73;
7. SWC to issue of Notice of Requirements (NOR) with their requirements for water main layout, sizing and funding matters confirmed; and
8. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval.



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- LEGEND**
- HV — HV EXISTING HV UNDERGROUND
 - LV — LV EXISTING LV UNDERGROUND
 - HV — HV EXISTING HV UNDERGROUND - TRANSMISSION
 - LV — LV EXISTING LV OVERHEAD
 - HV — HV EXISTING HV UNDERGROUND - AUX SUPPLY
 - LV — LV EXISTING LV OVERHEAD
 - HV — HV EXISTING STREET LIGHT OVERHEAD
 - LV — LV EXISTING CABLE DUCT
 - HV — HV EXISTING POWER POLE WITH LIGHT
 - LV — LV EXISTING
 - HV (AB) — HV EXISTING HV UNDERGROUND ABANDONED
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 - HV — HV EXISTING GROUND LEVEL SUBSTATION
 - LV — LV EXISTING GROUND LEVEL SUBSTATION
 - S — EXISTING SEWER LINE
 - W — EXISTING WATER SERVICE
 - G — EXISTING GAS SERVICE
 - COFM — EXISTING VOCUS CABLE
 - COFM — EXISTING VERIZON CABLE
 - COFM — EXISTING UCOMB CABLE
 - TEL — EXISTING TELSTRA CABLE
 - SW — EXISTING STORMWATER ASSET
 - OF — EXISTING OPTUS CABLE
 - OF — EXISTING NEXTGEN CABLE
 - COFM — EXISTING AAPT CABLE

PROJECT MANAGEMENT INITIALS

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| AHC | D FETTELL | R MASON |
| DESIGNER | CHECKED | APPROVED |

ISSUE/REVISION

| NO | DATE | DESCRIPTION |
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| A | 21/02/2018 | ISSUED FOR REVIEW |
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KEY PLAN



5.0 Wastewater

5.1 Background

Sydney Water currently services the New Sydney Fish Market site through the Bondi Sewage Treatment Plant. The Bondi Wastewater Network System Waste Water Treatment Plant (WWTP) which services Glebe, Newton, Pyrmont, Ultimo, Haymarket, Surry Hills and Darlinghurst.

The extent of the Bondi Wastewater Network System is shown below in Figure 4.



Figure 4: Sydney Water Sewer Catchment (Sydney Water, 2015)

5.2 Existing 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 district.

Wastewater is directed toward a sewage pump station on the corner of Pyrmont Bridge Road and Wattle Street, which delivers wastewater to the Bondi Sewerage Treatment Plant.

The existing internal wastewater network primarily consists of a number of wastewater mains present along the perimeter of the site, including:

- Existing DN150mm VC and DN300mm connections from the pre-development site;
- A DN375mm CI main along Pyrmont Bridge Road from Darling Street to Wattle Street; and
- A DN450mm GRP main along Pyrmont Bridge Road between Wattle Street and Jones Street.

Similar to the potable water network, the exact depths and positions of the existing reticulation mains are unknown.

Further investigation is required to determine the exact layout and depths of these services; this should be an investigation of the levels of the existing infrastructure from manhole surveys. It is also noted that the above discussion only considers Sydney Water infrastructure.

The existing and proposed wastewater infrastructure for the development is presented in Figure 6.

5.3 Demand Assessment

The projected wastewater demand for the development has been assessed based on different rates of waste generated from sewer discharges, grease and trade waste discharge. Note that preliminary calculations were undertaken for this report to inform infrastructure upgrade requirements, as the design of the development continues, it is likely that these demands will deviate and evolve.

Calculations indicate that the wastewater Average Daily Demand to be approximately 691 kL/h which equates to approximately **829 kL/day**. It is worth noting that this does not include any peaking factors. Wastewater generated per month here is approximately 85% of total potable water used for the site.

Considering a $\pm 15\%$ range in development yields, the estimated Average Daily Demand for waste water could vary between **705-950 kL/day**.

Opportunities for recycled water treatment facilities are being examined further but are unlikely to have a major impact on the expected wastewater flows.

5.4 Preliminary Infrastructure Assessment

The preliminary capacity assessment has been based on two main system elements:

- Wastewater Treatment Plans; and
- Customer Supply Systems.

5.4.1 Wastewater Treatment Plants

The Sydney Water wastewater network consists of 30 different systems, 24,000km of pipes, 16 wastewater pumping plants and 680 pumping stations.

The New Sydney Fish Markets site is currently supplied through the Bondi Sewerage Treatment Plant. The Bondi Waste Water Treatment Plant (WWTP) currently discharges up to 126.5 ML/day as the average daily, dry weather discharge. This is projected to increase with new developments such as the Glebe Redevelopment, Barangaroo Development, Darling Harbour Precinct, Bays Precinct, and Harris Street requiring supply.

The ultimate design capacity of the Bondi WWTP is estimated to be 679.97 ML/day, the capacity of this plant to service the projected demand will be discussed with Sydney Water as a part of the feasibility applications.

5.4.2 Customer Supply Systems

Sydney Water maintains a number of trunk water mains and carrier pipes within the vicinity of the proposed redevelopment. The age, type and condition of these pipes vary significantly. A plan showing these mains and the adjacent pump station is shown at the end of this section.

It is estimated that the trunk mains have sufficient capacity to service the development; however this will be confirmed with Sydney Water during further stakeholder engagement. Similar to the potable water, carrier pipes will likely require amplification.

5.5 Potential On-site Infrastructure Layouts

The scope of external infrastructure upgrades are to be confirmed based on hydraulic modelling to be undertaken during detailed design.

It is envisioned that two connection works would be as follows:

- A new connection to the existing DN375mm CI wastewater line on Bridge Road; and
- Decommissioning of the existing DN300mm and DN150mm site connections.

The existing wastewater network currently feeds to the Sewer Pumping Station (SP0002), it is assumed that as the existing fish market site ceases operation then there will be sufficient capacity within the lines feeding the pump station, however some amplification of existing mains on Bridge Road connecting to the pump station may be required.

Additionally diversion works are required on Bridge Road to ensure sufficient cover of existing wastewater infrastructure. The exact configuration of the building connection points may change depending on concept and detailed designs. The existing and proposed wastewater connections are outlined below in Figure 6.

It is noted that Sydney Water generally does not provide a lot connection until an application is made by that developer for a service. Where road crossings will be required it is recommended that oversized pipes/conduits be provided to minimise disturbance to completed works as part of building construction.

5.6 Flooding and Water Quality Assessment and Ecologically Sustainable Development (ESD)

Flooding and Water Quality and ESD have been explored within standalone reports which should be referred to for integration with the utilities infrastructure. Refer to *Flooding and Water Quality Assessment* (Cardno, 2018) and *Ecological Sustainable Development Report* (Wood and Grieves, 2018) for proposed wastewater initiatives to be undertaken.

5.7 Coordination of Wastewater Infrastructure 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.

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 5.

| 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 \geq 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 5: Sydney Water Clearance between Sewers and Other Underground Services (WSA 02-2002-2.2, Sydney Water Edition – Version 3)

5.8 Approvals and Next Steps

Following finalisation of the concept design, Sydney Water will be contacted to assist with the planning of future infrastructure upgrades.

The sewer strategy is to be confirmed through hydraulic modelling, with separate reports outlining the modelling outcomes to be submitted to Sydney Water.

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

1. Undertake hydraulic modelling (if required by Sydney Water) to confirm extent of any lead-in infrastructure upgrades required;
2. Undertake site investigations to confirm the layout and extent of existing on site infrastructure (including non-Sydney Water infrastructure);
3. Develop a diversion strategy (including any interim works to suit staging) and protection/build-over requirements for infrastructure that cannot be diverted;
4. Establish a Head Deed to be signed by required parties (Sydney Water, Designer, WSC, Developer, Constructor);
5. Submit application/s for individual detailed design packages to be submitted to SWC with drawing of proposed works in stages, Section 73;
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| --- | EXISTING HV UNDERGROUND |
| --- | EXISTING LV UNDERGROUND |
| --- | EXISTING HV UNDERGROUND - TRANSMISSION |
| --- | EXISTING LV UNDERGROUND - AUX SUPPLY |
| --- | EXISTING STREET LIGHT OVERHEAD |
| --- | EXISTING CABLE DUCT |
| --- | EXISTING POWER POLE WITH LIGHT |
| --- | EXISTING |
| --- | EXISTING HV UNDERGROUND ABANDONED |
| --- | EXISTING OVERHEAD SUPPLY VENDOR |
| --- | EXISTING AIRSID EMBANKMENT |
| --- | EXISTING GROUND LEVEL SUBSTATION |
| --- | EXISTING SEWER LINE |
| --- | EXISTING WATER SERVICE |
| --- | EXISTING GAS SERVICE |
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AECOM
PROJECT
 The Bays Engineering
 Sydney Fish Markets

CLIENT

 Level 12, 19 Martin Place,
 Sydney, NSW 2000
 +61 2 9841 8600 tel +61 2 9209 4222 fax
 www.ugdc.nsw.gov.au

CONSULTANT
 AECOM Australia Pty Ltd
 A.B.N 20 093 846 925
 www.aecom.com

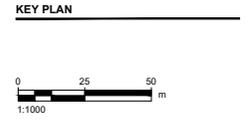
REGISTRATION

PROJECT MANAGEMENT INITIALS

| | | |
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| AHC | D FETTELL | R MASON |
| DESIGNER | CHECKED | APPROVED |

ISSUE/REVISION

| NO | DATE | DESCRIPTION |
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PROJECT NUMBER
 60554003
SHEET TITLE
 UTILITIES LAYOUT
 PLAN
 WASTEWATER
SHEET NUMBER
 CD-0000-UT-0131

This drawing is confidential and shall only be used for the purposes of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system (ISO 9001:2000).

PLAN
 Scale 1:1000



6.0 Electrical

6.1 Background

Ausgrid is the main supplier of electricity for the development as shown below in Figure 7.



Figure 7: Ausgrid Supply Network (Ausgrid, 2017)

There are four main zone substations that service the area surrounding the proposed Bays redevelopment:

- Darling Harbour ZN7481;
- Blackwattle Bay ZN711;
- Camperdown ZN384; and
- Leichhardt ZN116.

Ausgrid and Transgrid have also established an additional cable link between Beaconsfield West and Haymarket 330/132 kV Substations to meet future requirements. Electricity is distributed from the zone substations to each site through Ausgrid's extensive 11 kV network.

6.2 Existing On-Site Utility Infrastructure

The existing Ausgrid electrical infrastructure on the site has been identified based on Dial Before You Dig (DBYD) records. Electrical assets within and surrounding the Fish Market site includes the following:

- Existing LV supply for lighting on Bridge Road
- A number of High Voltage electrical cables and conduits along Bridge Road;
- A 33kV transmission line that runs parallel to the site across Wentworth Park.

The exact depths and positions of the existing reticulation mains are unknown thus further investigations are required to determine the exact existing layout.

It is expected that all existing aerial infrastructure within each development site would be abandoned or relocated underground. This will include the undergrounding of existing aerial infrastructure along Bridge Road.

6.3 Demand Assessment

A preliminary assessment has been undertaken of the potential power demand associated with the proposed development. Demand estimates for electricity were calculated using a combination of historic metered electrical data, known demand rates and demand rates provided in AS3000. These were applied to each usage discipline as outlined in Table 2 to obtain a peak load for the site.

No BASIX reduction was applied as there is no residential component within the development site. A 10% spare capacity was also factored in to account for weather-normalised probability of exceedances.

Using the demand rates and assumptions, the peak load is estimated to be approximately **11.5 MVA** or **16.0 kilo-ampre**.

Table 2 Proposed Development Electrical Load Breakdown

| DRAFT- New SFM Load Breakdown | | |
|---|--------------------|----------------------|
| Area | Load in KVA | Load in Amps |
| Lifts + ESC | 302 | 436 |
| Hoist +Pallet Racking System+Forklift | 333 | 481 |
| Mechanical (Incl 30% Spare) | 3717 | 5365 |
| Domestic and Heating Hot Water Heat Pumps (Alternative to Gas) Carbon Neutral Solution for Base Building ONLY | 1308 | 1888 |
| Communications + Sec | 170 | 245 |
| External Fridge Containers | 288 | 416 |
| Ice Making | 110 | 159 |
| Hyd (Gas) | 333 | 481 |
| Cooking School | 185 | 267 |
| Catering | 437 | 631 |
| Wholesale | 148 | 213 |
| Non-food Retail | 140 | 202 |
| Food Retail | 478 | 690 |
| Unknown NLA | 885 | 1278 |
| Wharf and Promenade | 212 | 306 |
| Food and Bev Outdoor Terrace | 210 | 303 |
| Offices | 119 | 172 |
| Other | 1050 | 1516 |
| 10% Spare | 11468 | 16552 |
| TOTAL | | |
| Total (Amps) | | 16,552 (Amps) |
| Substation load allocations by Ausgrid | | |
| 3 x Three Transformer Substation - maximum of 16,500 Amps. | | |

Note: These figures are estimates only and are subject to ongoing design coordination. These loadings will be confirmed during the detailed design stage.

6.4 Preliminary Infrastructure Assessment

The preliminary capacity assessment has been based on a number of system elements, these include:

- Bulk Supply Points;
- Zone Substations;
- High Voltage Feeders; and
- Pole transformer and kiosk substations.

Plans of the existing Ausgrid network are shown at the end of this section.

6.4.1 Bulk Supply Points

The new Sydney Fish Markets site is supplied from the Beaconsfield and Haymarket Bulk Supply Points (BSP). These bulk supply points drop the voltage from power station switchyards to feed zone substations.

In Sydney these Bulk Supply Points are operated and managed by TransGrid while the zone substations are managed by Ausgrid and estimated to have sufficient capacity for the near future.

6.4.2 Zone Substations

The Ausgrid zone substations drop the voltage again from the BSP's and convert into lower voltage for further distribution to supply residential and commercial developments. Typically Ausgrid operates an 11kV distribution network consisting of poles, wires and underground services.

The Bays District is situated with the Camperdown & Blackwattle Bay Load Area (Ausgrid Planning Strategy, 2014).

The closest two zone substations ZN7481 (Darling Harbour) and ZN711(Blackwattle Bay) may not have capacity to service the new Sydney Fish Market. ZN711 is nearing the end of its life and is due to be decommissioned.

However ZN384 (Camperdown) and ZN116 (Leichhardt) may potentially be able to service portions of the development, ZN116 was recently refurbished to provide additional capacity. Preliminary conversations with Ausgrid have indicated that ZN384 may be the preferred point of supply however this will be subject to a formal connection application.

6.4.3 High Voltage Feeders

The current Fish Markets site is serviced by underground high voltage feeders. These transmit electricity from the zone substations to distribution substations that are typically situated on new developments.

Distribution substations include pole transformer and kiosk substations as well as substations in the basements of commercial buildings. Consultation with Ausgrid is ongoing but augmentation of the feeder network may be required to service the new development; the extent of works will be discussed with Ausgrid as a part of the stakeholder engagement process.

6.4.4 Chamber Substations

A chamber substation is a building or part of a building that contains electrical equipment connected to the underground feeder network; their role is to decrease the electricity voltage for commercial use (nominally 11kV to 415/240V). For the New Sydney Fish Markets that a 3-transformer chamber substation may be required to service the development.

6.5 Potential On-Site Infrastructure Layouts

As noted previously the scope of external infrastructure upgrades and lead-in works will be confirmed when formal Ausgrid applications are made as part of detailed design.

Connection to the existing Ausgrid HV electrical network is proposed to service the new development, this proposed network is shown below in Figure 9.

Potential electrical infrastructure for the Fish Market site includes:

- Connection to the existing HV line along Bridge Road; and
- Potential new feeders from the Camperdown Zone Substation.

If alterations are made to Bridge Road then diversion works may be required to the existing electrical infrastructure. The requirement for any new electrical feeders will be assessed as part of the formal application to Ausgrid, however we have provided an indicative feeder route in Figure 8 to assess distances between the development site and the Camperdown Substation.

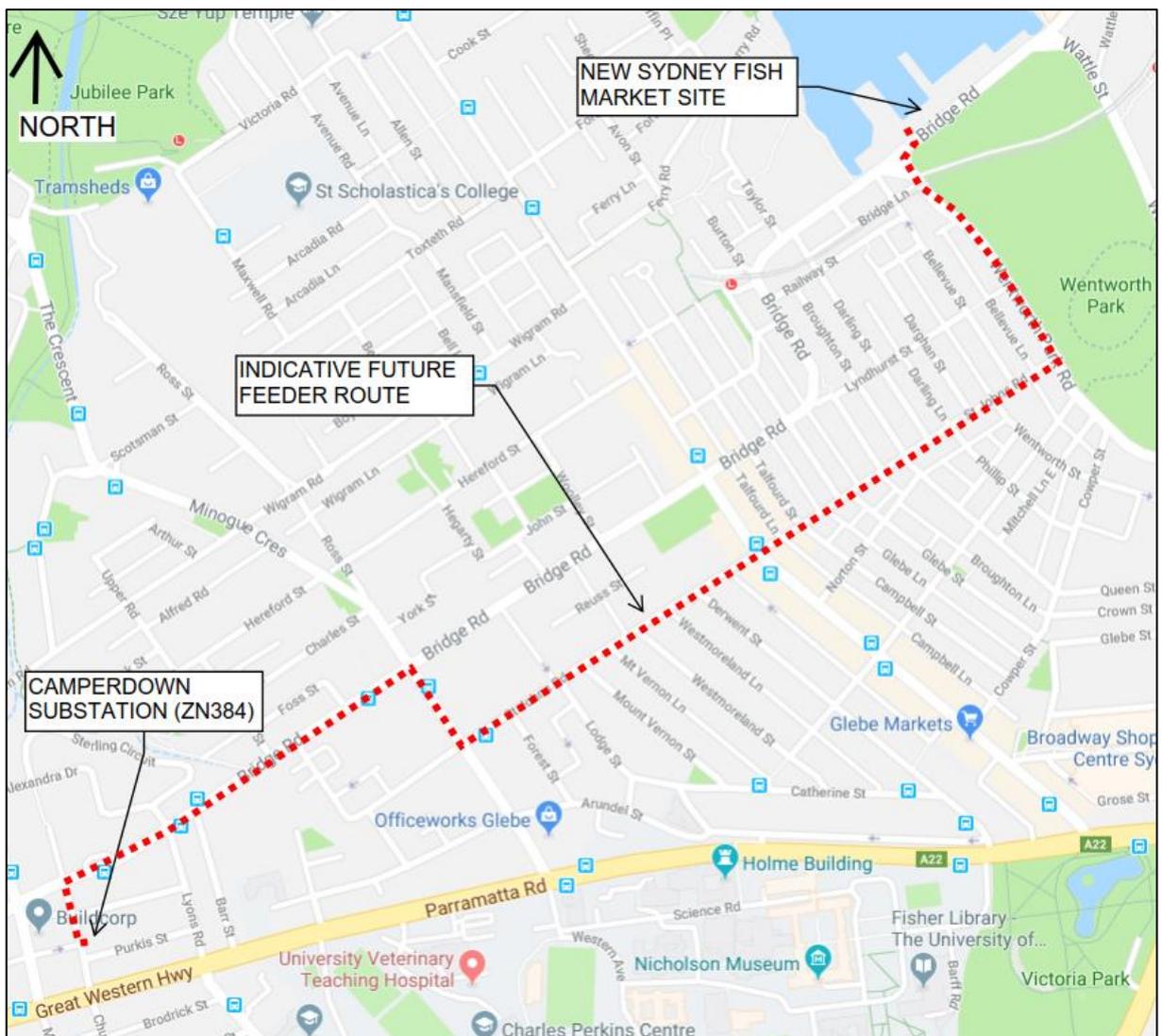


Figure 8: Indicative Feeder Route

It is assumed that the development will be supplied by a single internal chamber substation as City of Sydney has expressed a strong preference for external kiosk substations to be avoided (these cannot be located within the road reserve).

Ownership of the street lighting will need to be confirmed as part of detailed design. If Ausgrid own the assets then they would be fed by the local Ausgrid LV network and may require the proposed network shown in Figure 9 to be expanded to ensure that all road networks are covered.

Alternatively, if City of Sydney owns the lighting assets they would be fed from a private City of Sydney LV network which would take a supply from the external Ausgrid LV network. The layout of City of Sydney LV infrastructure is not included on Figure 9.

6.6 Flooding and Water Quality Assessment and Ecologically Sustainable Development (ESD)

Flooding and Water Quality and ESD have been explored within standalone reports which should be referred to for integration with the utilities infrastructure. Refer to *Flooding and Water Quality Assessment* (Cardno, 2018) and *Ecological Sustainable Development Report* (Wood and Grieves, 2018) for proposed electrical initiatives to be undertaken.

6.7 Coordination of Electrical Infrastructure with Other Services

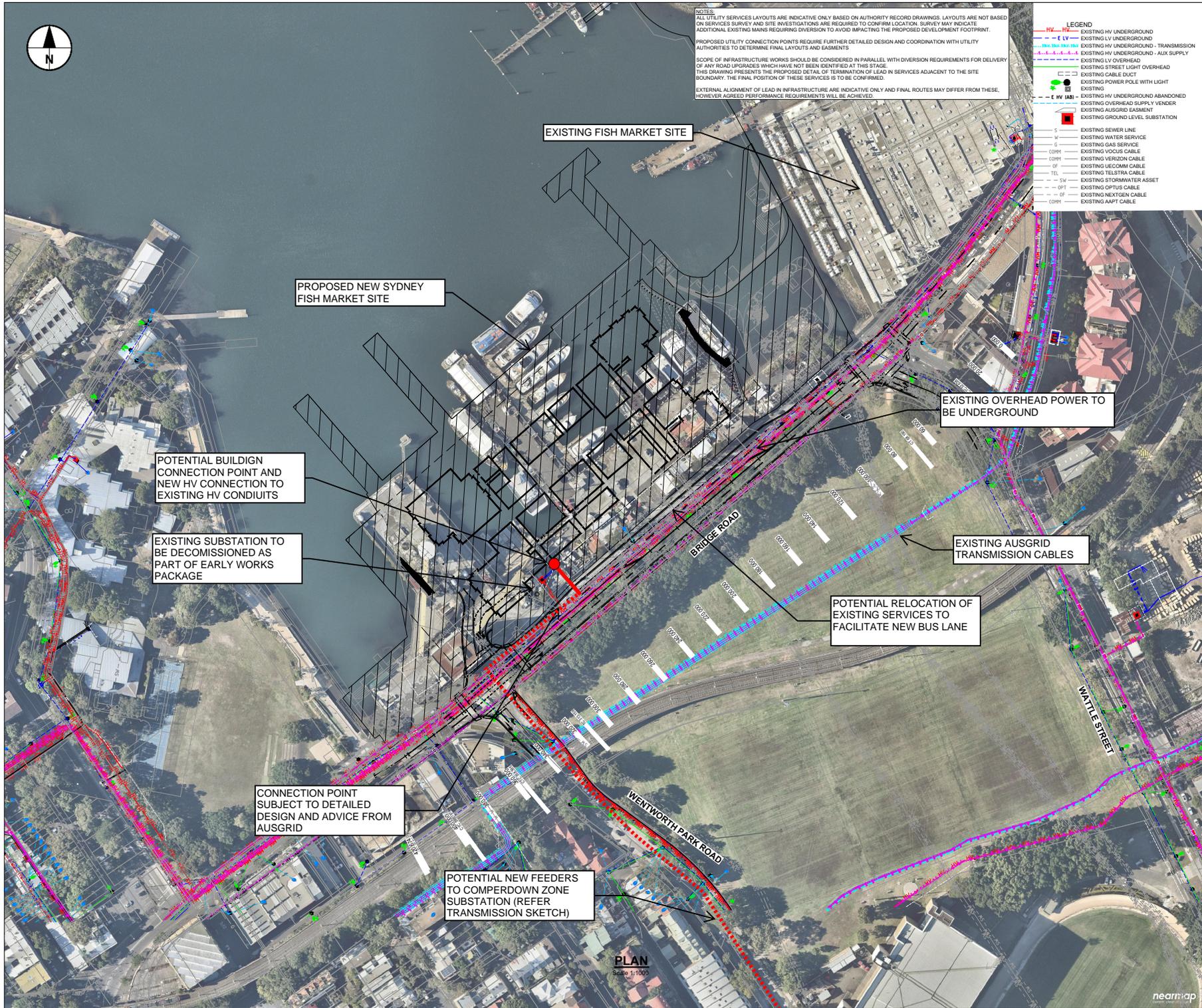
Coordination of the proposed electrical infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards.

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.

6.8 Approvals and Next Steps

Ausgrid formal approvals are usually provided for individual detailed design packages. The key next steps in progressing the delivery of electrical infrastructure through detailed design including the formal Ausgrid approval process consists of the following:

1. Undertake site investigations to confirm the layout and extent of existing services (including non-Ausgrid assets);
2. Confirm arrangements for supply and ownership of street lighting;
3. Confirm extent of existing infrastructure that can be abandoned and/or requires diversion;
4. Develop staged designs for delivery of the new infrastructure;
5. Application to Ausgrid to provide detailed requirements;
6. Ausgrid to issue Design Information Pack (DIP), ES9 and Deed; and
7. Submit detailed design of individual packages for approval.



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LEGEND

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| — HV — HV | EXISTING HV UNDERGROUND |
| — LV — LV | EXISTING LV UNDERGROUND |
| — HV — HV | EXISTING HV UNDERGROUND - TRANSMISSION |
| — LV — LV | EXISTING LV OVERHEAD |
| — HV — HV | EXISTING HV UNDERGROUND - AUX SUPPLY |
| — HV — HV | EXISTING STREET LIGHT OVERHEAD |
| — HV — HV | EXISTING CABLE DUCT |
| — HV — HV | EXISTING POWER POLE WITH LIGHT |
| — HV — HV | EXISTING |
| — HV (AB) — HV (AB) | EXISTING HV UNDERGROUND ABANDONED |
| — HV — HV | EXISTING OVERHEAD SUPPLY VENDOR |
| — HV — HV | EXISTING AUSGRID CABINET |
| — HV — HV | EXISTING GROUND LEVEL SUBSTATION |
| S | EXISTING SEWER LINE |
| W | EXISTING WATER SERVICE |
| G | EXISTING GAS SERVICE |
| COFM | EXISTING VOCUS CABLE |
| VF | EXISTING VERIZON CABLE |
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| TEL | EXISTING TELSTRA CABLE |
| SW | EXISTING STORMWATER ASSET |
| OP | EXISTING OPTUS CABLE |
| QF | EXISTING NEXTGEN CABLE |
| COFM | EXISTING AAPT CABLE |

PROJECT MANAGEMENT INITIALS

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|----------|-----------|----------|
| AHC | D FETTELL | R MASON |
| DESIGNER | CHECKED | APPROVED |

ISSUE/REVISION

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| A | 21/02/2018 | ISSUED FOR REVIEW |
| IR | DATE | DESCRIPTION |

KEY PLAN

7.0 Gas

7.1 Background

Gas servicing to the new Sydney Fish Market site is provided by Jemena.

7.2 Existing On-Site Utility Infrastructure

There is currently a small network of gas mains adjacent to the proposed development, in particular:

- Network mains along Bridge Road, Wattle Street and Darghan Lane

The existing and proposed services are shown below in Figure 10. 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.

7.3 Demand Assessment

Jemena generally provide their own calculations and information where it is commercially viable to supply gas and would be expected to supply the demand where required.

Preliminary demand assessments conducted by Jemena indicate that based on the tenancy spaces, a gas load of **491m³/hr** will be required. Gas can be supplied from the 110 nylon main located at the frontage of the site along Bridge Street which currently operates at **210kPa**. Jemena does not reserve capacity for future development and this will be re-assessed once a formal application for connection has been submitted. Correspondence with Jemena reflecting this information can be found in Appendix A.

As part of further stakeholder consultation we will continue to coordinate loads with Jemena, noting that the current gas infrastructure to the site is similar in size to that supplying the existing Fish Markets site.

If alternative supply scenarios such as trigeneration are part of future considerations this may also increase the overall gas demand.

7.4 Preliminary Infrastructure Assessment

Limited information is available on the capacity of Jemena to service the projected demand. Stakeholder engagement with Jemena is currently being undertaken to identify potential constraints.

It should be noted that Jemena generally provide infrastructure where it is commercially viable to do so and would be expected to supply future demand where required.

A plan showing the existing Jemena network is shown at the end of this section.

7.5 Potential On-Site Infrastructure Layouts

A new connection to the existing gas main is proposed with a connection across Bridge Road, the current connection proposal is:

- A single point of connection to the fish market site; and
- Connection to the existing 120 kPa gas main along Pyrmont Bridge Road; and
- Potential diversion of existing services to suit Bridge Road alterations.

The proposed meter room will be located internally, and as the inlet pressure is 210kPa, it must comply with Clause 5.8.3 of the 2018 Jemena Network Operator Rules which states;

- 1) The location of the Type 2 enclosure must be approved by Jemena at the building/site design stage;

- 2) The Type 2 enclosure shall be positioned on the external wall of a building at the point where the consumer service enters the building (point of entry) i.e., one (1) wall of the enclosure shall be formed by the external wall of the building;
- 3) The Type 2 enclosure may be located at ground level or one level below ground. However, it must still be positioned on the external wall of the building as per point two (2) above;
- 4) The Type 2 enclosure must meet the relevant Australian Standards and only be accessed via the external face of the customer's building;

The best strategy for supplying the development base building and retail, would be to have a Boundary regulator (BR280-210-5kPa) supply a ring main which is reticulated throughout the building to service the retail tenancies and cooking school, and a Meter set (M283 210-5kPa) to supply the base building mechanical plant and hot water unit. Drawings showing these devices are attached in Appendix B and will allow for appropriate sizing of the gas meter room.

7.6 Flooding and Water Quality Assessment Report and Ecologically Sustainable Development (ESD)

Flooding and Water Quality and ESD have been explored within standalone reports which should be referred to for integration with the utilities infrastructure. Refer to *Flooding and Water Quality Assessment* (Cardno, 2018) and *Ecological Sustainable Development Report* (Wood and Grieves, 2018) for proposed gas initiatives to be undertaken.

7.7 Required Service Clearances

Coordination of the proposed gas infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards.

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 3.

Table 3 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

7.8 Approvals and Next Steps

Jemena confirms supply arrangements as part of their quotation for construction of upgraded infrastructure 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);
2. Submit application for design to Jemena for individual detailed design packages (to include proposed alignment); and
3. Jemena will provide a quote for construction works.



NOTES:
 ALL UTILITY SERVICES LAYOUTS ARE INDICATIVE ONLY BASED ON AUTHORITY RECORD DRAWINGS. LAYOUTS ARE NOT BASED ON SERVICES SURVEY AND SITE INVESTIGATIONS ARE REQUIRED TO CONFIRM LOCATION. SURVEY MAY INDICATE ADDITIONAL EXISTING MAINS REQUIRING DIVERSION TO AVOID IMPACTING THE PROPOSED DEVELOPMENT FOOTPRINT.
 PROPOSED UTILITY CONNECTION POINTS REQUIRE FURTHER DETAILED DESIGN AND COORDINATION WITH UTILITY AUTHORITIES TO DETERMINE FINAL LAYOUTS AND DIMENSIONS.
 SCOPE OF INFRASTRUCTURE WORKS SHOULD BE CONSIDERED IN PARALLEL WITH DIVERSION REQUIREMENTS FOR DELIVERY OF ANY ROAD UPGRADES WHICH HAVE NOT BEEN IDENTIFIED AT THIS STAGE.
 THIS DRAWING PRESENTS THE PROPOSED DETAIL OF TERMINATION OF LEAD IN SERVICES ADJACENT TO THE SITE BOUNDARY. THE FINAL POSITION OF THESE SERVICES IS TO BE CONFIRMED.
 EXTERNAL ALIGNMENT OF LEAD IN INFRASTRUCTURE ARE INDICATIVE ONLY AND FINAL ROUTES MAY DIFFER FROM THESE, HOWEVER AGREED PERFORMANCE REQUIREMENTS WILL BE ACHIEVED.

LEGEND

| | |
|-------------|--|
| — HV — | EXISTING HV UNDERGROUND |
| — LV — | EXISTING LV UNDERGROUND |
| — HV — | EXISTING HV UNDERGROUND - TRANSMISSION |
| — LV — | EXISTING LV OVERHEAD |
| — HV — | EXISTING HV UNDERGROUND - AUX SUPPLY |
| — LV — | EXISTING LV OVERHEAD |
| — HV — | EXISTING STREET LIGHT OVERHEAD |
| — LV — | EXISTING STREET LIGHT OVERHEAD |
| — HV — | EXISTING CABLE DUCT |
| — LV — | EXISTING CABLE DUCT |
| — HV — | EXISTING POWER POLE WITH LIGHT |
| — LV — | EXISTING POWER POLE WITH LIGHT |
| — HV (AB) — | EXISTING HV UNDERGROUND ABANDONED |
| — LV (AB) — | EXISTING LV UNDERGROUND ABANDONED |
| — HV — | EXISTING OVERHEAD SUPPLY VENDOR |
| — LV — | EXISTING OVERHEAD SUPPLY VENDOR |
| — HV — | EXISTING AIRSIED CABINET |
| — LV — | EXISTING AIRSIED CABINET |
| — HV — | EXISTING GROUND LEVEL SUBSTATION |
| — LV — | EXISTING GROUND LEVEL SUBSTATION |
| S | EXISTING SEWER LINE |
| W | EXISTING WATER SERVICE |
| G | EXISTING GAS SERVICE |
| COFM | EXISTING VOCUS CABLE |
| COFM | EXISTING VERIZON CABLE |
| OF | EXISTING UCOMB CABLE |
| TEL | EXISTING TELSTRA CABLE |
| SW | EXISTING STORMWATER ASSET |
| OF | EXISTING OPTUS CABLE |
| OF | EXISTING NEXTGEN CABLE |
| COFM | EXISTING AAPT CABLE |

AECOM
PROJECT
 The Bays Engineering
 Sydney Fish Markets

CLIENT

 Level 12, 19 Martin Place,
 Sydney, NSW 2000
 +61 2 9841 8600 tel +61 2 9209 4222 fax
 www.ugdc.nsw.gov.au

CONSULTANT
 AECOM Australia Pty Ltd
 A.B.N 20 093 846 925
 www.aecom.com

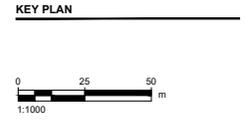
REGISTRATION

PROJECT MANAGEMENT INITIALS

| | | |
|----------|------------|----------|
| AHC | D. FETTELL | R. MASON |
| DESIGNER | CHECKED | APPROVED |

ISSUE/REVISION

| NO. | DATE | DESCRIPTION |
|-----|------------|-------------------|
| A | 21/02/2018 | ISSUED FOR REVIEW |
| 1/R | | |



PROJECT NUMBER
 60554003
SHEET TITLE
 UTILITIES LAYOUT
 PLAN
 GAS
SHEET NUMBER
 CD-0000-UT-0121

PLAN
 Scale 1:1000



8.0 Data and Telecommunications

8.1 Background

A number of communication providers have assets running adjacent to and intersecting the new Sydney Fish Market site, including:

- Vocus Fibre;
- Verizon;
- AAPT;
- Nextgen;
- Telstra; and
- Optus.

8.2 Existing Infrastructure

The new Sydney Fish Market location is in close proximity to several of the main Sydney data centres including a significant global interconnect at Ultimo. The significance of this location is that it connects international optical fibre submarine cable with:

- San Francisco;
- Hong Kong;
- Los Angeles;
- Auckland; and
- Singapore.

This enables the highest capacity links to be provided to the proposed development site at a lower capital cost for the provision of high capacity fibre.

8.2.1 NBN Co

There is substantial data and communications infrastructure present adjacent to the development site.

NBN Co is currently upgrading the existing fixed line phone and internet network infrastructure throughout the corridor. A map showing the current rollout of the NBN network in the area is shown below in Figure 11.

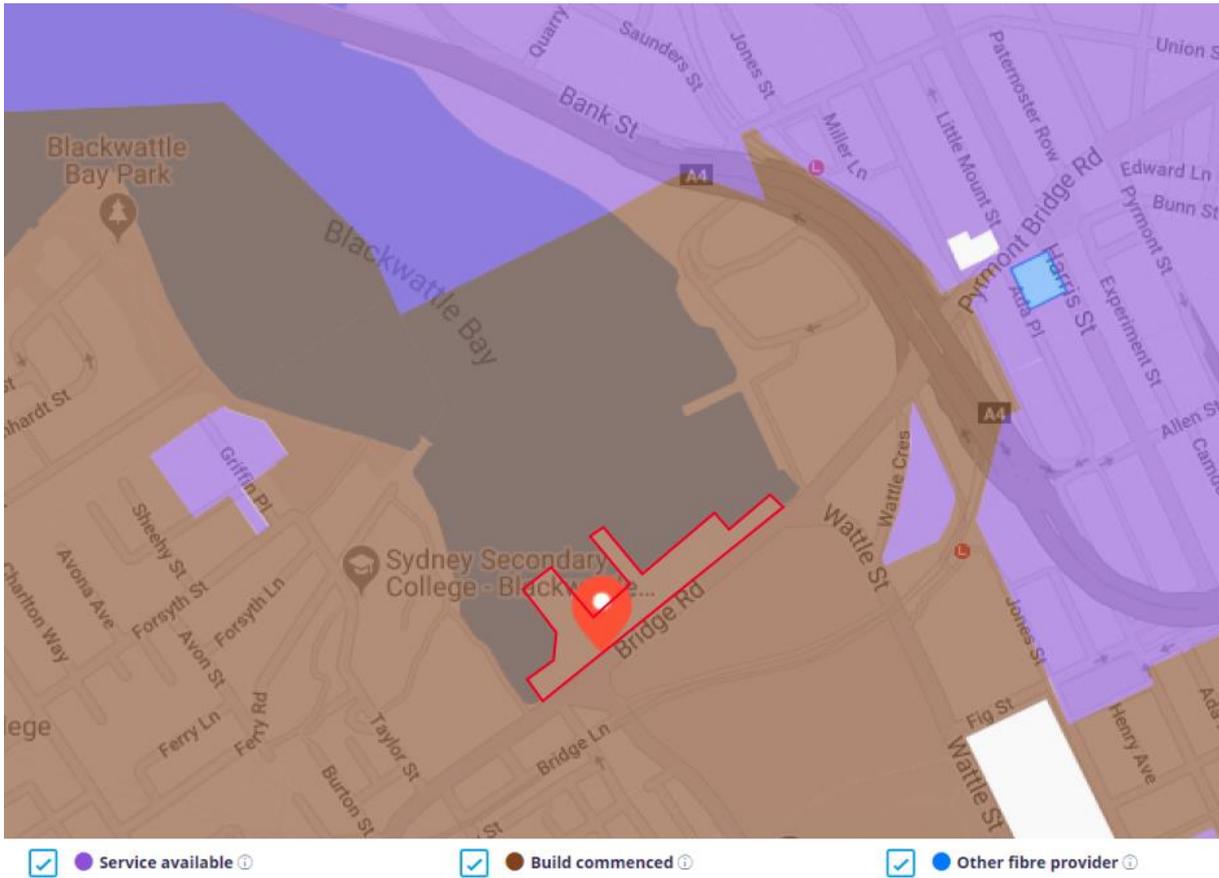


Figure 11: NBN Rollout (NBN, 2019)

No demand calculations have been provided for the telecommunications requirements as the NBN network is currently upgrading the existing fixed line phone and internet network infrastructure throughout the corridor and the increase in density will be accounted for in their internal planning.

The Federal Government has determined from January 2011 that under *The Fibre in New Development* NBN Co will provide telecommunication infrastructure to new developments (NBN Co, 2015). NBN Co will be responsible for installation of the fibre network in the new development and covers the cost of installation.

Developers are required to install and fund fibre-ready pit and duct infrastructure to NBN Co's specifications. Once the developer has demonstrated to have met the specifications, the ownership of this infrastructure will be required to be transferred to NBN Co as a condition of servicing the development.

Required backhaul works and costs will be discussed with NBN during the stakeholder engagement process.

8.2.2 Telstra

There are also existing Telstra conduits adjacent to the development; these are shown in Figure 13. Subject to agreement with Telstra, the existing infrastructure already within the site may be removed during the development of the site and replaced with other provider infrastructure.

8.2.3 Optus

Optus have fibre optic cables running adjacent to the site along Bridge Road as shown in Figure 13.

8.3 Demand Assessment

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

8.4 Potential On-Site Infrastructure Layouts

As the layout of the existing assets is unlikely to provide sufficient reticulation for the proposed development or align with proposed layouts, it is proposed that existing assets will be retained, removed or replaced.

The following upgrades are proposed to service the development:

- Two points of connection to the Fish Market site;
- Connection to existing Telstra infrastructure along Bridge Road (noting that the NBN Co will likely use this for reticulation to the site); and
- Potential diversion of existing infrastructure to support Bridge Road alterations.

8.5 Required Service Clearances

Coordination of the proposed communications infrastructure with other services in the proposed street network would generally be based on the Streets Opening Conference standards.

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 12 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 12: NBN Clearances from Other Carriers and Underground Services

8.6 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 UrbanGrowth NSW Development Corporation prior to construction works commencing (this does not prevent designs from being approved).

The formal approval process for NBN Co. infrastructure to be progressed through the Phase 2 detailed design processes consists of the following main steps:

1. Undertake site investigations to confirm the layout and extent of existing services (including private infrastructure associated with previous land-uses)

2. Liaise with Telstra and Optus (and any other affected telecommunications companies) to confirm the requirement for diversion and/or relocation of their existing infrastructure
3. Confirm proposed infrastructure plan (including staging) and in principle supply arrangements with NBN or other provider
4. Initial application submitted to NBN Co. for supply of the site from their network;
5. NBN Co. to confirm supply can be provided and provide draft agreement;
6. Revisions of agreement where required;
7. UrbanGrowth NSW Development Corporation to sign NBN Co. agreement;
8. Liaise with Telstra and Optus (and any other affected telecommunications companies) for quote for diversions or abandonments including any interim works; and
9. Submit detailed design of individual packages for approval.

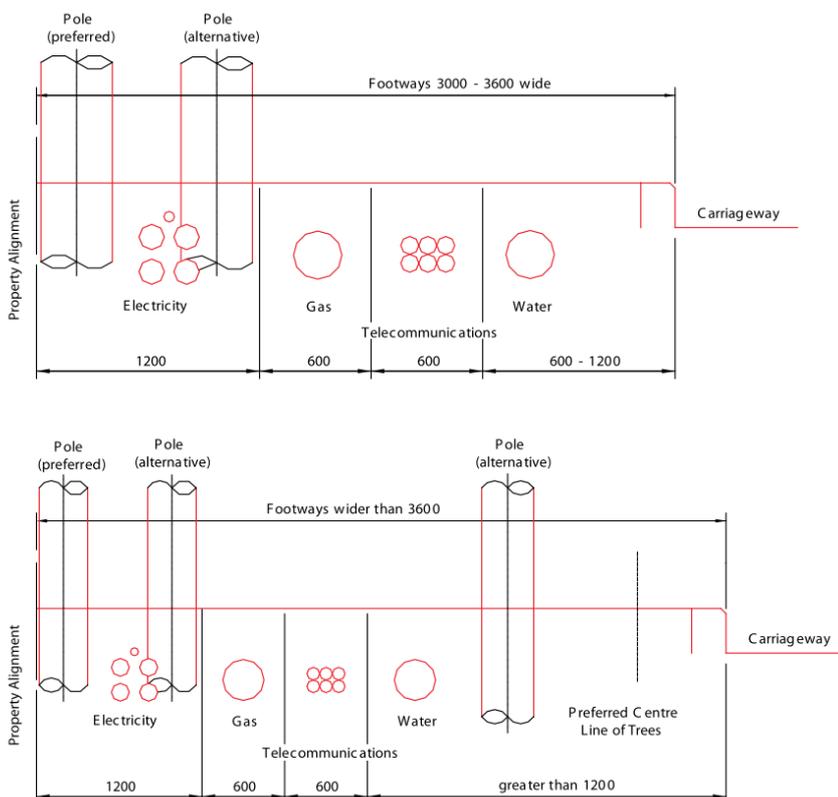
9.0 Utility Service Corridors

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 new Sydney Fish Markets site will be within new footpaths; these should follow the allocations shown below in Figure 14.

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.



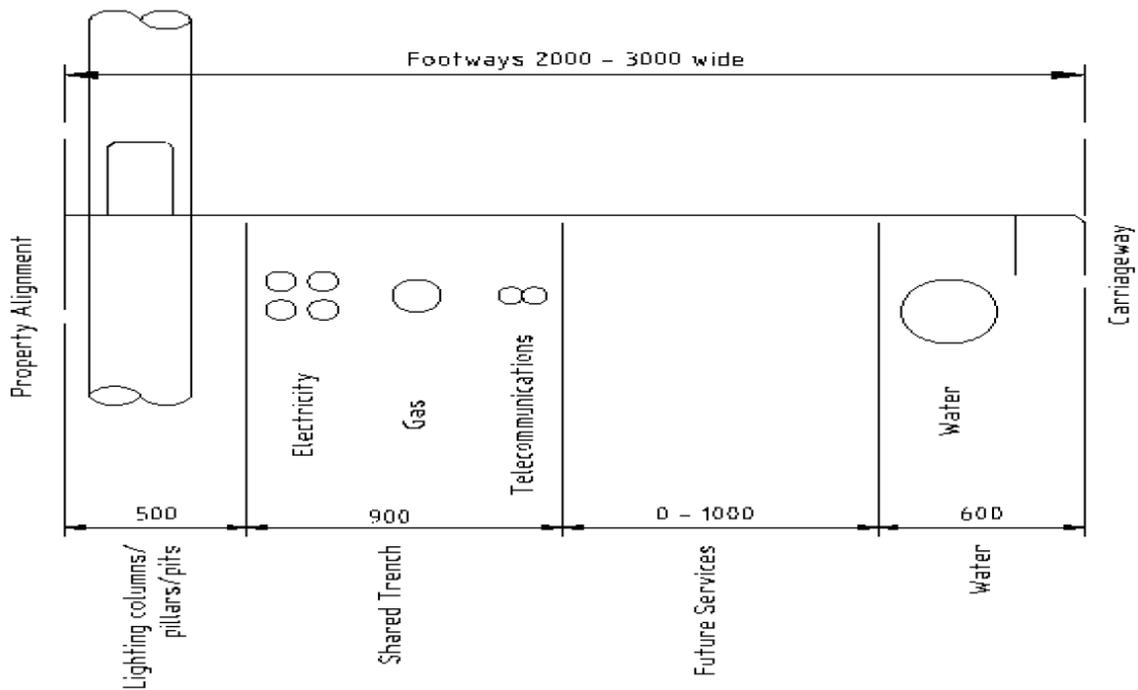
Notes:

1. 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 14: 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 15.

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 15: 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 new Sydney Fish Market 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 review.

10.0 Environmental Risk Assessment

AECOM have considered a number of environmental risks that are present due to the decommissioning, installation and civil works to be completed adjacent to the fish markets development site on Bridge Road. Potential mitigation measures for these environmental risks have also been identified in Table 4 below.

10.1 Potential Environmental Risks and Mitigation Measures

Table 4 Risks and Mitigation Measures

| Risk | Mitigation |
|---|--|
| Impacts with existing utilities in densely occupied service corridor | <ul style="list-style-type: none"> All services within the site are to be located prior to construction works. Confirm clearances between services and develop works plan. |
| Temporary traffic controls to facilitate excavation of access pits within the road reserve and as such may delay or detour vehicles along these roads | <ul style="list-style-type: none"> Implement Traffic Management plan and obtain all necessary road occupancy permits to facilitate safe access and excavation in road areas. |
| Hydrology and water quality impacts (vicinity to Harbour) Soil migration and topography disturbance Air quality | <ul style="list-style-type: none"> Capture concrete residue and prevent concrete or soil wash-down to limit impacts to water and air quality Bund and cover residue stockpiles to minimise offsite migration of material Exposed trenches and excavations should be covered to prevent water entry if they cannot be backfilled before work ceases for the day. Implement soil, erosion and sediment control plan Closely monitor stockpiles for dust generation Cease activities during exceedingly windy conditions Conduct preliminary soil testing if it is expected that site works will disturb contaminated soil and implement waste classification and appropriate waste disposal measures. |
| Decommissioning and disposal of existing utilities Disposal of site waste | <ul style="list-style-type: none"> Temporary service closures or suspensions may be required for the decommissioning of on-site utilities to prevent hazards Any soil or excavated material that cannot be used will be classified in accordance with the OEG Waste Classification Guidelines and disposed of at an appropriate OEH waste facility. |
| Impacts to ecosystems | <ul style="list-style-type: none"> Materials, plants and equipment stockpiles will not be placed within Wentworth Park or within spillage distance of the harbour |

11.0 Conclusion

AECOM has addressed existing and proposed utilities arrangements for the fish markets development site in support of the SEAR's requirement 18. *Utilities and infrastructure* requirement for State Significant Developments. A summary of the study requirements and relevant sections that have been addressed is combined below in Figure 4.

Table 5: SEARS Response Table

| Condition | Relevant Sections |
|--|--|
| Provide detail about proposed upgrades to utilities and infrastructure | <ul style="list-style-type: none"> Section 5, 6, 7, 8, 9 |
| Integrate utilities planning with the outcomes of the Integrated Water Cycle Management Study and the ESD study | <ul style="list-style-type: none"> Section 5.6, 6.6, 7.6, 8.6 |
| Prepare a utility and infrastructure servicing report outlining the development yield and staging which should include a high level assessment of the capacity of Sydney Water's network to service the development | <ul style="list-style-type: none"> Section 5, 6, 7, 8, 9 |
| Provide servicing options considered for the development, including wastewater and stormwater recycling for non-potable use, sustainability initiatives for the development, including any proposed alternative water supply, proposed end uses of drinking and non-drinking water and proposed water conservation measures. | <ul style="list-style-type: none"> Section 5, 6 |
| Prepare a staging plan for all civil infrastructure works | <ul style="list-style-type: none"> Section 5, 6, 7, 8, 9 and associated figures |

Preliminary calculations undertaken as a part of this report have indicated that the new development site will require:

- A Average Daily Demand (Potable Water) of approximately 820-1110 kL / day;
- A Average Dry Weather Flow (Wastewater) of approximately 705-950 kL /day;
- An electrical load requirement of 11.5 MVA ;
- A gas load requirement of 491m³/hr; and
- Associated telecommunications infrastructure.

Based on a preliminary review of the existing utility infrastructure and proposed works, the majority of services may have the capacity to service the development however further consultation with utility authorities is required. In particular potential upgrade works include:

- Potable Water upgrades on Bridge Road;
- Wastewater upgrades on Bridge Road; and
- Potential new feeder cables from the Camperdown Zone Substation.

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Two thin black lines intersect diagonally on the left side of the page. One line slopes upwards from left to right, and the other slopes downwards from left to right.

Appendix A

Jemena
Correspondence

DRAFT

Appendix A

From: Aaron Greaves [mailto:Aaron.Greaves@jemena.com.au]
Sent: Monday, 6 August 2018 12:06 PM
To: Caristo, Frank
Cc: Chirculescu, Andrei; Alex Raeside
Subject: RE: New Sydney Fish Markets

Hi Frank,

Thank for coming in to meet today.

In terms of the answers you are seeking see below:

- **Development Supply:**
Based on the proposed site load of 491 m³/hr, this development can be supplied from the 110 nylon main which covers the entire frontage of the site on Bridge Street. The main operates at 210kPa. Jemena does not reserve capacity for future developments and this will be re-assessed once a formal application for connection has been submitted.
- **Meter Room Location:**
As the proposed meter room will be located internally, and the inlet pressure is 210kPa, it must comply with Clause 5.8.3 of the 2018 revision of the Jemena Network Operator Rules which states:
 - 1) The location of the Type 2 enclosure must be approved by Jemena at the building/site design stage;
 - 2) The Type 2 enclosure shall be positioned on the external wall of a building at the point where the consumer service enters the building (point of entry) i.e., one (1) wall of the enclosure shall be formed by the external wall of the building;
 - 3) The Type 2 enclosure may be located at ground level or one level below ground. However, it must still be positioned on the external wall of the building as per point two (2) above;
 - 4) The Type 2 enclosure must meet the relevant Australian Standards and only be accessed via the external face of the customer's building.

And as such the location that you provided on the current plans is not compliant with these rules:

- **Metering Strategy:**
The best strategy for supplying the development base building and retails, would be to have a Boundary regulator (BR280 210-5kPa) supply a ring main which is reticulated throughout the building to supply the retail tenancies and cooking school, and a Meter set (M283 210-5kPa) to supply the base building mechanical plant and hot water unit. The drawings for these devices are attached and will allow you to appropriately size the gas meter room in which they will be located.

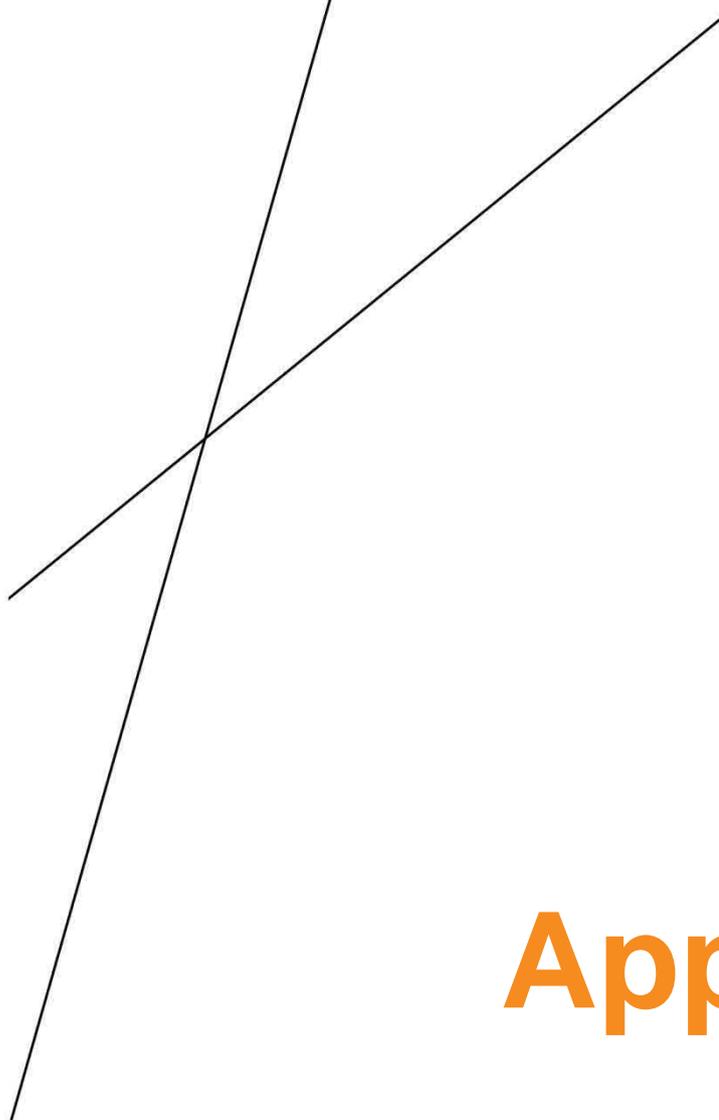
If you have any more questions please feel free to contact me.

Aaron Greaves
Network Development Manager I & C
Customer & Markets
Jemena
Level 12, 99 Walker Street, North Sydney, NSW 2060
+61 419 230 600
Aaron.Greaves@jemena.com.au | www.jemena.com.au



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Appendix B

Gas Meter Boundary Regulator

NOTES

- METER SET SHALL BE ASSEMBLED, TESTED AND PACKAGED IN ACCORDANCE TO JEMENA SPECIFICATION JAM-GEN-SPE-M-036.
- MAKE AND MODEL OF COMPONENT SPECIFIED DOES NOT EXCLUDE SUBSTITUTION WITH ALTERNATIVE PRODUCT OF EQUAL MECHANICAL/CHEMICAL PROPERTIES AND PHYSICAL DIMENSIONS. JEMENA TO APPROVE ANY SUBSTITUTION.
- IF PF VS/AM65 RELIEF VALVE IS FITTED TO SET INSTALL NPT-FXBSPST-M ADAPTOR BETWEEN ITEM 12&14.

DESIGN & OPERATING CONDITIONS:

| | |
|--------------------------------------|--|
| DESIGN CODE: | AS 4041 |
| PIPING CLASS: | 3 |
| DESIGN PRESSURE: | 400kPa |
| DESIGN TEMP. RANGE: | -10°C TO 60°C |
| HYDRO TEST PRESSURE: | 600kPa |
| NDE: | VISUAL ONLY |
| MAX. INLET PRESSURE: | 400kPa |
| MIN. INLET PRESSURE: | 70kPa |
| NORMAL DELIVERY PRESSURE: | 5kPa |
| MAX. OUTLET PRESSURE: | 12kPa |
| REGULATOR(ITEM 9) SET PRESSURE: | 5kPa |
| RELIEF SET PRESSURE: | 9kPa |
| REGULATOR(ITEM 9) DPSO SET PRESSURE: | 12kPa |
| MAX. FLOW RATE (REGULATOR): | 298 sm ³ /hr @ 70kPa INLET PRESSURE |

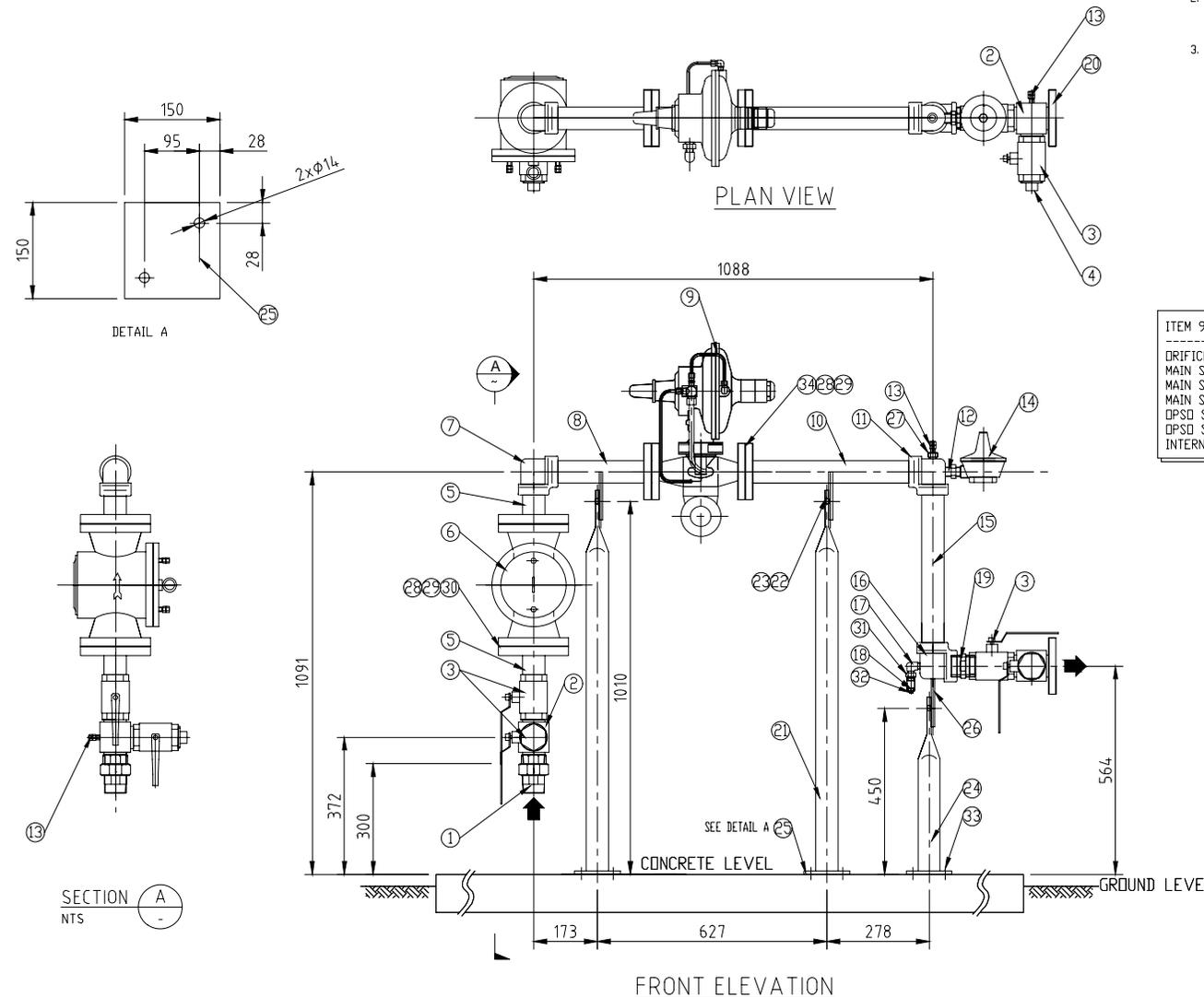
ITEM 9 (50 NB. - FISHER 299HS)

ORIFICE SIZE: 3/4"
 MAIN SPRING PNo.: 1B41372722
 MAIN SPRING COLOUR: PURPLE
 MAIN SPRING PRESSURE: 4-9.9kPa.
 DPSO SPRING PNo.: T14164T0012
 DPSO SPRING PRESSURE RANGE: 9.7-26.9kPa
 INTERNAL REGISTRATION

| Table 1: 25NB Relief Valve (Item 14 below) | | |
|--|-------------|------------|
| Make | Fisher 289L | PF VS/AM65 |
| Spring Part No. | 13A7916x012 | 644.70132 |
| Spring Range | 3-9.9kPa | 6.5-10kPa |

REFERENCE DRAWING:
 SPOOL DETAILS --- A1-MP-6114

| | | | | |
|------|--|------------------|--------------|-----------------------|
| 34 | DN50 F/F ANSI CL150 1.5mm THK. GASKET | FLEXITALL NOTE 2 | SF3300 | 2 |
| 33 | M12 DIA. MASONRY ANCHOR | ROCKET NOTE 2 | T12080 | 6 |
| 32 | DN25 BSPT MALE HEX PLUG C/W DIA HOLE THRU HEX FACE FOR JEMENA SEAL-BRASS | HOGAN ENG. | HE-50-P | 1 |
| 31 | DN25 NPT/BSPT MALE HEX. CONVERSION NIPPLE-BRASS | SWAGelok | B-16-WN | 1 |
| 30 | 5/8" DIA. FLAT WASHER-XYLAN COATED | ASTM A193 B7 | - | 32 |
| 29 | 5/8" UNC. STUD BOLTS x 95mm LONG C/W NUTS-XYLAN COATED | ASTM A193 B7 | - | 16 |
| 28 | DN80 F/F ANSI CL150 1.5mm THK. GASKET | FLEXITALL NOTE 2 | SF3300 | 2 |
| 27 | DN15 x DN8 NPT HEX. REDUCING BUSH-316SS | SWAGelok | SS-8-R8-4 | 1 |
| 26 | PIPE SUPPORT BRACKET | A4-300-315 | - | 1 |
| 25 | PIPE SUPPORT BASEPLATE | A4-300-314 | - | 3 |
| 24 | PIPE SUPPORT UPRIGHT-440 LONG TO BOLT HOLE CENTRE | A4-300-313 | - | 1 |
| 23 | M12 GALV. FLAT WESHER | AS 1237.1 | - | 12 |
| 22 | M12 GALV. HEX. HEAD BOLT x 40 LONG C/W NUT | AS 1111.1-4.6 | - | 6 |
| 21 | PIPE SUPPORT UPRIGHT-1000 LONG TO BOLT HOLE CENTRE | A4-300-313 | - | 2 |
| 20 | DN50 ASME B16.5 CL150 RF x DN50 BSPT FEMALE FLANGE | ASTM A105 | - | 1 |
| 19 | DN50 BSPT MALE HEX. NIPPLE-BRASS | HOGAN ENG. | HE-50-H | 1 |
| 18 | DN25 BSPT FEMALE BALL VALVE-BRASS | AGA APPROVED | - | 1 |
| 17 | DN25 NPT MALE/FEMALE 90 DEG. ELBOW-BRASS | SWAGelok | B-16-SE | 1 |
| 16 | DN50 BSPT FEMALE ASME B16.5 CL3000 C/W DN25 NPT TAPPING-CS | ASTM A105 | - | 1 |
| 15 | DN50 SPOOL. PIECE MARK MP-6114A | A1-MP-6114 | - | 1 |
| 14 | DN50 NPT FEMALE RELIEF VALVE GSE (SEE ABOVE) | FISHER | 289L | 1 |
| 13 | DN8 NPT MALE PIPES PLUG-316SS | TEORITONOTE 2 | - | 3 |
| 12 | DN25 NPT MALE HEX. NIPPLE-316SS | SWAGelok | SS-16-WN | 1 |
| 11 | DN50 BSPT FEMALE ASME B16.5 CL3000 C/W DN25 NPT TAPPING/BSPT TAPPING-CS | ASTM A105 | - | 1 |
| 10 | DN50 SPOOL. PIECE MARK MP-6114C | A1-MP-6114 | - | 1 |
| 9 | DN50 ASME B16.5 FF REGULATOR C/W DPSO-OUTLET RUN (SEE SPEC ABOVE) | FISHER | 299HS | 1 |
| 8 | DN50 SPOOL. PIECE MARK MP-6114B | A1-MP-6114 | - | 1 |
| 7 | DN50 BSPT FEMALE ASME B16.5 CL3000 ELBOW-CS | ASTM A105 | - | 1 |
| 6 | DN80 ASME B16.5 CL150 RF 50 NICKEN 4 BAR FILTER C/W TWO PIPES PLUGS | KROM SCHROEDER | FKR100-6-6 | 1 |
| 5 | DN80x50 SPOOL. PIECE MARK MP-6114A | A1-MP-6114 | - | 2 |
| 4 | DN50 BSPT MALE HEX PLUG C/W DIA HOLE THRU HEX FACE FOR JEMENA SEAL-BRASS | HOGAN ENG. | HE-50-P | 2 |
| 3 | DN50 BSPT FEMALE FORGED BALL VALVE-BRASS | AGA APPROVED | - | 4 |
| 2 | DN50 BSPT ALL MALE TEE-ALUMINIUM | HOGAN ENG. | HE-50-WMT-A | 2 |
| 1 | DN50 BSPT MALE/FEMALE UNION-BRASS | HOGAN ENG. | HE-50-MFU | 1 |
| ITEM | DESCRIPTION | SPECIFICATION | SUPPLIERS NO | OR SUPPLIER CODE DIFF |



STATUS:

FOR CONSTRUCTION

NOTE:

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| REV | NO | DATE | BY | CHKD | APPD | REVISION |
|-----|---|------------|----|------|------|----------|
| 2 | NEW DESIGN | 18/06/2018 | CX | AK | | |
| 1 | MODIFIED FROM HOGAN ENGINEERING MARK UP | 08/2016 | CX | AH | | |
| 0 | FOR CONSTRUCTION | 01/2016 | CX | AH | | |

| | |
|------------------|---|
| PROJECT: | MEDIUM PRESSURE BOUNDARY REGULATOR SET |
| LOCATION: | MODEL BR280 - (5.00kPa OUTLET PRESSURE) |
| DWG. TITLE: | GENERAL ARRANGEMENT |
| PROJECT No: | |
| COMP. REFERENCE: | -JUBBS/METSTANDARD/BR280 |

| | | | |
|--------------|------------|----------------------------------|---------|
| APPROVED: | AH | DRAWN: | CX |
| ENGINEER: | TB | DATE: | 11/2016 |
| CHECKED: | - | SCALE: | NTS |
| DRAWING No.: | A1-MP-0109 | DISCREP. SHEET SIZE AT REVISION: | 2 |

Two thin black lines intersect diagonally on the left side of the page. One line slopes upwards from left to right, and the other slopes downwards from left to right.

Appendix C

Meter Set Drawing

NOTES

- METER SET SHALL BE ASSEMBLED, TESTED AND PACKAGED IN ACCORDANCE TO JEMENA SPECIFICATION JAM-GEN-SPE-M-036.
- MAKE AND MODEL OF COMPONENT SPECIFIED DOES NOT EXCLUDE SUBSTITUTION WITH ALTERNATIVE PRODUCT OF EQUAL MECHANICAL/CHEMICAL PROPERTIES AND PHYSICAL DIMENSIONS. JEMENA TO APPROVE ANY SUBSTITUTION.
- IF PF VS/AM65 RELIEF VALVE IS FITTED TO SET INSTALL NPT-FXBSP-T-M ADAPTOR BETWEEN ITEM 12&14.

DESIGN & OPERATING CONDITIONS:

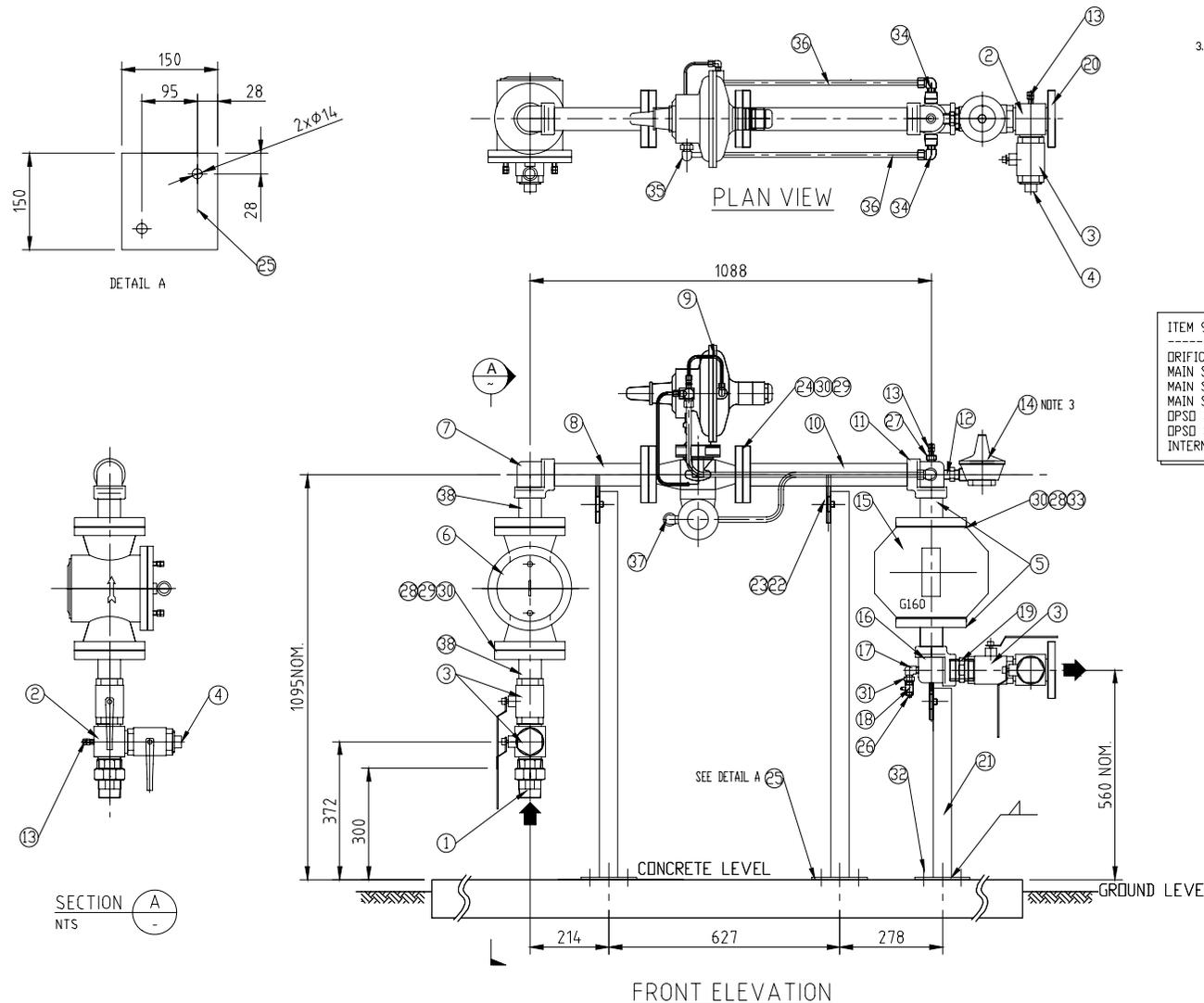
| | |
|---------------------------------------|--|
| DESIGN CODE: | AS 4041 |
| PIPING CLASS: | 3 |
| DESIGN PRESSURE: | 400kPa |
| DESIGN TEMP. RANGE: | -10°C TO 60°C |
| HYDRO TEST PRESSURE: | 600kPa |
| NDE: | VISUAL ONLY |
| MAX. INLET PRESSURE: | 400kPa |
| MIN. INLET PRESSURE: | 70kPa |
| NORMAL DELIVERY PRESSURE: | 5kPa |
| MAX. OUTLET PRESSURE: | 12kPa |
| REGULATOR (ITEM 9) SET PRESSURE: | 5kPa |
| RELIEF SET PRESSURE: | 8kPa |
| REGULATOR (ITEM 9) DPSO SET PRESSURE: | 12kPa |
| MAX. FLOW RATE (REGULATOR): | 315 sm ³ /hr @ 70kPa INLET PRESSURE |

ITEM 9 (50 NB. - FISHER 299HV)

ORIFICE SIZE: 3/4"
 MAIN SPRING PNo.: 1B413727222
 MAIN SPRING COLOUR: PURPLE
 MAIN SPRING PRESSURE: 4-9.9kPa.
 DPSO SPRING PNo.: GF02169X012
 DPSO SPRING PRESSURE RANGE: 8.8-16kPa
 INTERNAL REGISTRATION

| Table 1: 25NB Relief Valve (Item 14 below) | | |
|--|-------------|------------|
| Make | Fisher 289L | PF VS/AM65 |
| Spring Part No. | 13A7916X012 | 644.70132 |
| Spring Range | 3-9.9kPa | 6.5-10kPa |

| | | | | |
|------|--|---------------------|--------------|--------|
| 38 | DN80x50 SPOOL PIECE MARK MP-7029D | A1-MP-7029 | - | 2 |
| 37 | 1/2 IN. OD TUBE x 1/4" NPT MALE ELBOW - 316SS | SWAGelok | SS-80-2-4 | 1 |
| 36 | 1/2 IN. OD x 18 G (1.22 mm) THK SEAMLESS TUBE - 316SS | SWAGelok | - | AS REQ |
| 35 | 1/2 IN. OD TUBE x 3/4" NPT MALE ELBOW - 316SS | SWAGelok | SS-80-2-12 | 1 |
| 34 | 1/2 IN. OD TUBE x 1/2" NPT MALE ELBOW - 316SS | SWAGelok | SS-80-2-8 | 2 |
| 33 | 5/8" UNC HEX. HD. SETSCREW x 50mm LONG-XYLAN COATED | ASTM A193 B7 | - | AS REQ |
| 32 | MID DIA TRIBOLT HEX. NUT W/ASTRO ANCHOR, TYPE 10090 | RAMSET | - | AS REQ |
| 31 | DN25 NPT/BSPT MALE HEX. CONVERSION NIPPLE-BRASS | SWAGelok | B-16-IN-1/2 | 1 |
| 30 | 5/8" DIA. FLAT WASHER-XYLAN COATED | ASTM A193 B7 | - | AS REQ |
| 29 | 5/8" UNC. STUD BOLTS x 95mm LONG C/W NUTS-XYLAN COATED | ASTM A193 B7 | - | AS REQ |
| 28 | DN80 F/F ANSIC CL150 1.5mm THK. GASKET | FLEXITALLIE NOTE 2 | SF3300 | 4 |
| 27 | DN15 x DN8 NPT HEX. REDUCING BUSH-316SS | SWAGelok | SS-8-R8-4 | 1 |
| 26 | DN2 NPT MALE HEX. HD. PLUG C/W 2mm DIA HOLE THRU HEX FACE FOR JEMENA SEAL-BRASS | HOGAN ENG. | HE-25-P | 1 |
| 25 | PIPE SUPPORT BASEPLATE 150X150X10 - ALUMINIUM | AS/NZS 1734/ANZ | - | 3 |
| 24 | DN50 F/F ANSIC CL150 1.5mm THK. GASKET | FLEXITALLIE NOTE 2 | SF3300 | 2 |
| 23 | M12 GALV. FLAT WESHER | AS 1237.1 | - | AS REQ |
| 22 | M12 GALV. HEX. HEAD BOLT x 40 LONG C/W NUT | AS 1111.1 CLASS 4.6 | - | AS REQ |
| 21 | PIPE SUPPORT 100X100x2 THK VEB6.7 THK LEG PFC - ALUMINIUM (CUT TO SUIT) | AS/NZS 1866/ANZ | - | 3 |
| 20 | DN50 ASME B16.5 CL150 RF x DN50 BSPT FEMALE FLANGE | ASTM A105 | - | 1 |
| 19 | DN50 BSPT MALE HEX. NIPPLE-BRASS | HOGAN ENG. | HE-50-M | 1 |
| 18 | DN25 BSPT FEMALE BALL VALVE-BRASS | AGA APPROVED | - | 1 |
| 17 | DN25 NPT MALE/FEMALE 90 DEG. ELBOW-BRASS | SWAGelok | B-16-SE | 1 |
| 16 | DN50 BSPT F/F ELBOW - ALUMINIUM C/W DN25 NPT TAPPING-SUPPORT BRACKET | HOGAN ENG. | - | 1 |
| 15 | DN80 ASME B16.5 CL150 F/F ROTARY FLOW METER | G160 | - | 1 |
| 14 | DN25 NPT FEMALE RELIEF VALVE | SEE SPEC ABOVE | - | 1 |
| 13 | DN8 NPT MALE PETES PLUG-316SS | TEORITONITE 2 | - | 3 |
| 12 | DN25 NPT MALE HEX. NIPPLE-316SS | SWAGelok | SS-16-IN | 1 |
| 11 | DN50 BSPT F/F ELBOW - ALUMINIUM C/W DN25 NPT TAPPING (NIPPLE TAPPING three points) | HOGAN ENG. | - | 1 |
| 10 | DN50 SPOOL PIECE MARK MP-7029C | A1-MP-7029 | - | 1 |
| 9 | DN50 ASME B16.5 FF REGULATOR C/W DPSO-DUPLICATE (SEE SPEC ABOVE) | FISHER | 299V | 1 |
| 8 | DN50 SPOOL PIECE MARK MP-7029B | A1-MP-7029 | - | 1 |
| 7 | DN50 BSPT F/F ELBOW - ALUMINIUM | HOGAN ENG. | - | 1 |
| 6 | DN80 ASME B16.5 CL150 RF 50 MICROIN 6 BAR FILTER C/W TWO PETES PLUGS | KROM SCHROEDER | FK80B60-6 | 1 |
| 5 | DN80x50 SPOOL PIECE MARK MP-7029A | A1-MP-7029 | - | 2 |
| 4 | DN50 NPT MALE HEX. HD. PLUG C/W 2mm DIA HOLE THRU HEX FACE FOR JEMENA SEAL-BRASS | HOGAN ENG. | HE-50-P | 2 |
| 3 | DN50 BSPT FEMALE FORGED BALL VALVE-BRASS | AGA APPROVED | - | 4 |
| 2 | DN50 BSPT ALL MALE TEE-ALUMINIUM C/W DN25 TAPPING | HOGAN ENG. | HE-50-MHT-A | 2 |
| 1 | DN50 BSPT MALE/FEMALE UNION-BRASS | HOGAN ENG. | HE-50-MFU | 1 |
| ITEM | DESCRIPTION | SPECIFICATION | SUPPLIERS NO | CODE |
| | | | OR SUPPLIER | DIFF |



REFERENCE DRAWING:
 SPOOL DETAILS --- A1-MP-7029

FOR CONSTRUCTION

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| REV | NO | DATE | BY | CHKD | APPV | REVISION |
|-----|------------------|------|---------|------|------|----------|
| 0 | FOR CONSTRUCTION | 18 | 02/2018 | CA | HW | |
| A | FIRST DRAFT | TB | 04/2018 | CX | - | |

| PROJECT | LOCATION | DWG. TITLE | PROJECT No. | COMP. REFERENCE | DRAWING No. | DISCREPANT SHEET SIZE AT REVISION |
|---------------------------|----------|--|-------------|--------------------------|-------------|-----------------------------------|
| MEDIUM PRESSURE METER SET | | MODEL M2B3 - (5.00kPa OUTLET PRESSURE) | | -JUBBS/MET/STANDARD/M2B3 | A1-MP-7028 | 0 |
| GENERAL ARRANGEMENT | | | | | | |

| APPROVED | AK | BRNWR | CX |
|----------|----|-------|---------|
| ENGINEER | TB | DATE | 03/2018 |
| CHECKED | - | SCALE | NTS |