

**LEGEND**  
Water Depth (m)

Lightest Blue	0.1 to 0.2
Light Blue	0.2 to 0.4
Medium Light Blue	0.4 to 0.6
Medium Blue	0.6 to 0.8
Dark Blue	0.8 to 1.0
Very Dark Blue	1.0 to 1.5
Dark Blue	1.5 to 2.0
Black	> 2.0

0 400 800  
metres

**NORTH**

LGA Boundary



Job No: J1609  
File: Fig9\_MP\_ExgPMF\_02  
Date: 4 May 10

City of Ryde - Macquarie Park Floodplain Risk Management Study and Plan

**Figure 9**  
**Simulation of PMF Flood**

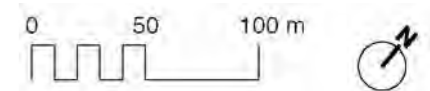
# 5. Compliance



Culvert ID	Top Water Level - Culverts (mAHD)							
	Existing				Post Development			
	No blockage		50% blockage		No blockage		50% blockage	
	1 yr ARI	5 yr ARI	100 yr ARI	100 yr ARI	1 yr ARI	5 yr ARI	100 yr ARI	100 yr ARI
C1	69.56	69.99	70.94	64.47	69.33	69.54	69.72	70.77
C2	63.10	63.48	64.07	61.56	63.025	63.42	63.95	64.32
C3	58.52	58.98	60.15	60.06	58.44	58.89	60.09	59.98
C4	55.66	56.08	56.64	57.44	55.58	56.02	56.56	57.26
C5	53.62	53.82	54.02	54.47	53.58	53.80	54.00	54.47
C6	40.61	40.88	41.32	45.59	40.46	40.84	41.13	45.84

Figure 49 100 Year ARI Design Flood Event, Existing Catchment Peak Flood Extent

Table G: Top Water Levels in 30 minute storm events



# Appendix B – Hydraulic Services



## Utilities Report

<b>Company</b> : Taylor Thompson Whitting (NSW) Pty. Ltd.	<b>Date</b> : 17 July 2015
<b>Attention</b> : Stephen Brain	<b>From</b> : Len Hutton
<b>Project</b> : Macquarie University Masterplanning to 2065	<b>Sent</b> : By email
<b>Subject</b> : Utilities Report for Hydraulic Services	<b>File</b> : 3020

## Introduction

This report has been prepared to satisfy Condition 4 of the Macquarie University Concept Plan which requires a Utilities Management Plan to be put in place as contained in this document.

The existing Macquarie University site has no stand alone hydraulic services and relies entirely upon external authority infrastructure as its source of basic services. The authorities responsible for delivering these services have over the past several years been apprized of Macquarie University's expansion plans going forward and have augmented and or planned to augment their infrastructure to cater for the anticipated demands. Feasibility studies have been carried out to validate the assumptions made in projected loads.

The services covered by this study are potable water and natural gas supplies. Each of these services is described as follows.

## Potable Water & Fire Hydrant Services

### Existing Services

Water supply is provided to the site by water mains surrounding the site which are controlled by Sydney Water. Previous studies have indicated that these mains are capable of supporting the proposed developments with some off site augmentation being required by Sydney Water to meet demand. This augmentation requirement is particularly relevant to the North Western segment of the core campus where this off site augmentation will need to have been completed prior to development.

The existing core campus site at Macquarie University has two connections to this Sydney Water infrastructure located within Balaclava Road (Figure 1) and Culloden Roads (Figure 2). These two points feed the privately owned internal water services infrastructure / ring mains that serve the internal development zones within the site. The layout of the existing Macquarie University potable water network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

- 2976 MU Potable Cold Water & Fire Hydrants H-000 to H-020

The cover page of the Potable Cold Water & Fire Hydrants document set is displayed as Figure 3.



## Utilities Report

### Masterplanning

Current masterplanning provides for all developments on the perimeter of the site to be supported by Sydney Water external infrastructure including the future residential expansion of residential (3,500 beds) on the western side of main campus. The masterplanning zones are shown on the accompanying drawing titled H01 Hydraulic Services Concept Plan Services Zoning (refer Appendix A).

All internal development sites will be supported by the Macquarie University internal water mains infrastructure. The internal water mains infrastructure which is monitored on behalf of the University by David Buckle & Associates (NSW) Pty. Ltd. has been interrogated by applying additional loads and has shown that the planned developments can be supported by installing the mains extensions shown on the accompanying drawing titled H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants (refer Appendix A).

This process of determining water demand analysis for each proposal and incorporating projected peak loads into the hydraulic model of the network is to be carried out for each development proposal prior to commencement to ensure that the existing campus local infrastructure is capable of supporting the projected load.

### Supply Design Principals

The design principals to be adopted for Macquarie University water infrastructure are aimed at providing a robust network with a degree of redundancy built in by the inclusion of multiple connections to Sydney Water mains and the adoption of ring mains and sub ring main loops ensuring that each significant asset is fed from a network without a single point failure. This level of redundancy will require the planned extension of Sydney Water mains in Talavera Road to avoid single point weakness. This degree of protection is provided in two levels of security. The primary level of security being provided to those services reticulated within the primary services tunnel feeding the core academic buildings where this level of security of supply already exists. The non core academic buildings are currently served from direct buried street services which currently are not provided with this level of redundancy and need extensions to perimeter mains or completion of sub loops to shore up mains stability.

The exception to this general principal is the sports field precinct which is isolated from the campus and the authority infrastructure by the M2 Motorway.

The sports field precinct varies from the main campus in that it is virtually on a peninsula and relies upon a single point of connection to Sydney Waters infrastructure via a meter and backflow prevention station located at Culloden Road Sports Precinct entrance (Figure 4).



**Figure 4.** Sports Fields Main Meter

## Utilities Report

Potable water use in this precinct is limited various showers and sanitary facilities around the sports fields and greenkeepers sheds with no significant commercial usages. The Utilities Action Plan continues to adopt this level of land use as sports fields and open parkland. The anticipated peak water demands for potable use would never exceed the current peak simultaneous demands imposed by the irrigation system requirements.

We are currently unaware of any sub-metering or monitoring of functional usages in this precinct.

The primary water usage in the sports field precinct is top up water supply to the various irrigation systems employed around the precinct. Subject to prevailing climate and drought conditions this water supply to irrigation systems can be curtailed at any time given notice by Sydney Water.

An alternative water supply suitable for use as irrigation is being researched. The source of this supply is a sewer mining system adopting a natural biological filtration bed system which we understand is still undergoing final certification processes.

It should be noted that the current irrigation systems installed have been constructed in such a manner as to be able to adopt an alternative water supply without risking back flow contamination of the potable water supply usages.

Any change of use or alternative water supply proposals proposed for this precinct will require the preparation of a demand analysis to be incorporated into the overall hydraulic model to ensure that the current infrastructure is capable of supporting the proposal.

## Natural Gas Services

### Existing Services

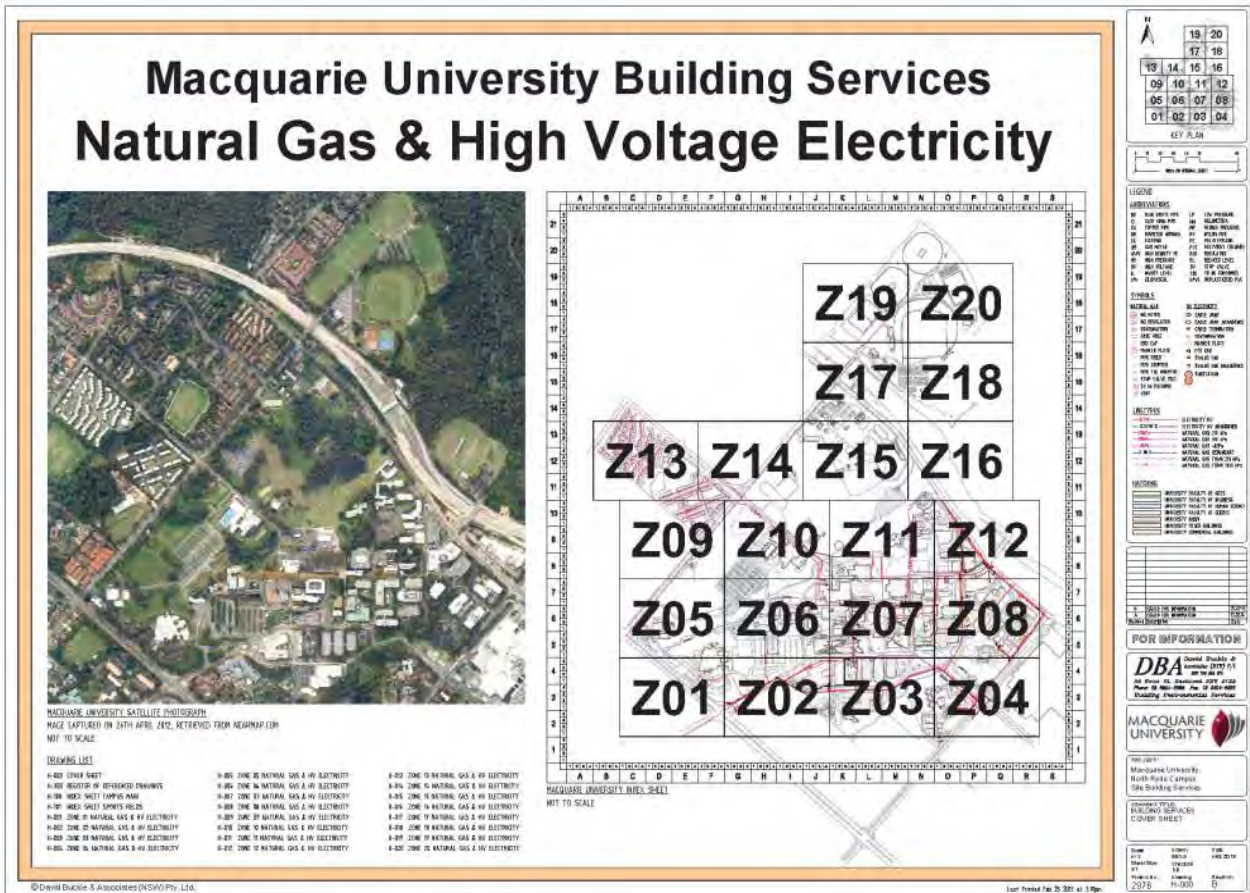
Gas infrastructure to Macquarie University is provided by Jemena. This external infrastructure has recently been upgraded and is capable of supporting current projected loads with the possible exception of any large form of alternative energy scheme such as co-generation and or fuel cell technology adoption.

The Macquarie University campus is provided currently with three independent gas services feeding the internal gas networks. These networks consist of 1 x 100kPa service and 2 x 210kPa services. The layout of the existing Macquarie University natural gas network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

- 2976 MU Natural Gas & High Voltage Electricity H-000 to H-020

The cover page of the Natural Gas & High Voltage Electricity document set is displayed as Figure 5.

**Utilities Report**



**Figure 5.** Macquarie University Natural Gas & High Voltage Electricity zone plans index page.

**Masterplanning**

The 2 x 210kPa services have adequate capacity to serve projected loads as indicated by the Macquarie University Masterplan by installing the natural gas extensions shown on the accompanying drawing titled H03 Hydraulic Services Concept Plan Natural Gas (refer Appendix A).

The 100kPa service is currently stressed and requires monitoring of future load capacity. The system is capable of being augmented by increasing pressure through the network or be distressed by load shedding proposals.

As with the water services any proposed development fronting public roads on the perimeter of the site will be served with natural gas direct from the authority mains located within the street.

Any proposed development on the site will require the preparation of a gas load analysis for inclusion in the authority and or internal mains capacity models to ensure that the existing infrastructure is capable of supporting he proposed load.

## Utilities Report

### Services Tunnels

The original Macquarie University campus site was developed around a central plant concept with central services reticulated to points of use via a tunnel system which linked all key buildings. The advantage of the tunnel concept was that all services remained accessible for servicing or connection to and rendering upgrade works easy without the need for excavation or major interruption to services. In the ensuing years and following changes in social behaviour these tunnels have been adopted by security staff as a method of discrete movement around the site and for covert building entry.

Following the early construction of buildings on the site the tunnel system of servicing buildings from central plant has lost favour and the later buildings have adopted local packaged plant and not been connected to, or the tunnels extended to cover them. The current master plan concept is to re-embrace the tunnel concept and extend the current system of tunnels to cover the future core academic structures. This concept is illustrated in the accompanying drawings titled H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants and H03 Hydraulic Services Concept Plan Natural Gas (refer Appendix A).

The adoption of the tunnel concept will enable the reticulation of central energy waste heat and cooling from any central energy plant without interruption to faculty services and render such sustainable energy projects more viable. This tunnel system is restricted to the core academic campus precinct.

In cognisance of the security staff preference for use of the tunnel system as a concealed access way we propose a change of design parameter for the tunnel system by introducing a system of building connection point alcoves whereby all valves and connection points within the tunnels will be located in gated alcoves immediately outside the tunnels leaving the spine of the system free for access.

Should you require any further information please contact the undersigned.

Yours truly,  
For David Buckle & Associates



Len Hutton



## Utilities Report

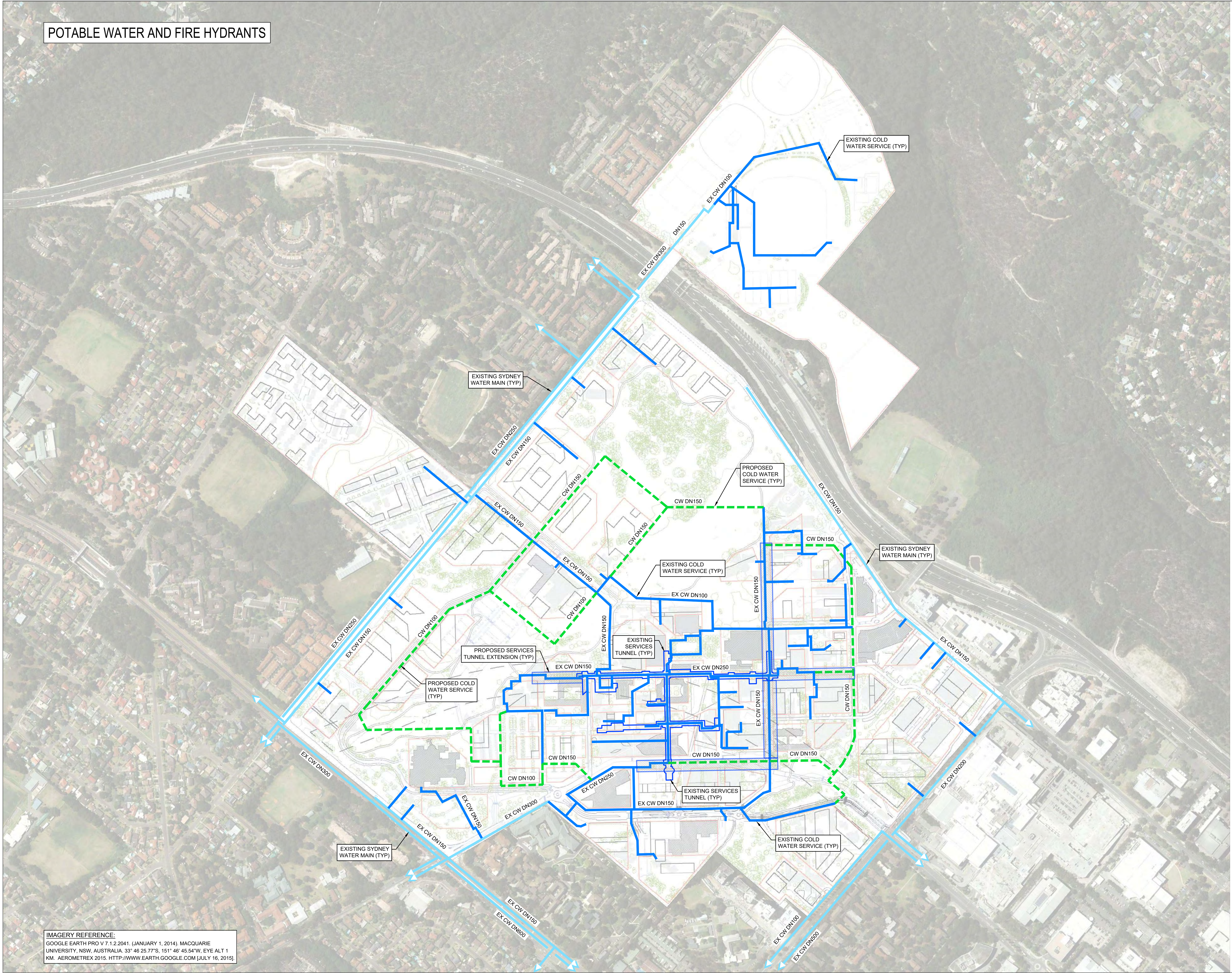
### Appendix A

The following documents are attached as Appendix A:

- H01 Hydraulic Services Concept Plan Services Zoning
- H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants
- H03 Hydraulic Services Concept Plan Natural Gas



POTABLE WATER AND FIRE HYDRANTS



IMAGERY REFERENCE:  
 GOOGLE EARTH PRO V 7.1.2.2041, (JANUARY 1, 2014), MACQUARIE UNIVERSITY, NSW, AUSTRALIA, 33° 46' 25.77" S, 151° 46' 45.54" W, EYE ALT 1 KM, AEROMETREX 2015, HTTP://WWW.EARTH.GOOGLE.COM (JULY 16, 2015)

**LEGEND:**

**LINETYPES AND HATCHING:**

- EXISTING SERVICES TUNNEL OUTLINE (TUNNEL OFFSET 4M FOR CLARITY)
- SERVICES TUNNEL EXTENSION PROPOSED
- EX WATER SERVICE
- PROPOSED WATER SERVICE
- SYDNEY WATER NETWORK

**ABBREVIATIONS:**

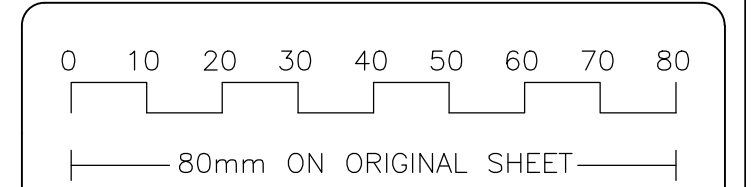
CW COLD WATER kPa KILOPASCAL  
 DN DIAMETER NOMINAL NG NATURAL GAS  
 EX EXISTING TYP TYPICAL

**SYMBOLS:**

- END CAP
- SERVICE CONTINUATION

Revision	Description	Date
P3	PRELIMINARY ISSUE FOR INFORMATION	17.07.2015
P2	PRELIMINARY ISSUE FOR INFORMATION	29.05.2015
P1	PRELIMINARY ISSUE FOR COMMENT	07.05.2015

THIS DRAWING IS TO BE REPRODUCED IN COLOUR



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**PROJECT:**  
 CAMPUS MASTER PLAN  
 HYDRAULIC SERVICES

**DRAWING TITLE:**  
 HYDRAULIC SERVICES  
 CONCEPT PLAN  
 POTABLE WATER &  
 FIRE HYDRANTS

**PRELIMINARY**

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