REGIMENT MIXED-USE REDEVELOPMENT

Infrastructure Management Plan and Integrated Water Management Plan

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Document Control Sheet

Title	Infrastructure Management Plan and Integrated Water Management Plan
Project	Regiment Mixed Use Re-development
Description	Infrastructure and Water Management Plans
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Prepared By

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	DATE	16-02-17							
	REV								
	DATE								

1. Executive Summary

JHA Consulting Engineers have been engaged to undertake the services design for the proposed Regiment Mixed Use Re-development located at the intersection of Darlington Road and King Street, Darlington

The infrastructure for the development requires the following amplification or alterations for the various services:

Potable Water Supply	No action required
Fire Services Water Supply	No action required for the combined Fire Sprinklers or Fire Hydrants
Sewer Drainage	No action required
Gas Service	No action required
Stormwater Drainage	Refer to Civil Engineer Report
Power	Requires 2x1000kVa kiosk substations (section 1.1)
Communications	Requires lead-in service from University network (section 1.5)

The development has an integrated water management plan consisting of:

- Rainwater collection reuse from non-trafficable roof areas to a storage tank
- Pump, filters and disinfection assembly to provide the rainwater to all water closet cistern in eth development
- Surcharge of the rainwater storage tank into the stormwater system
- Stormwater system directing all rainfall from the site to and On Site Detention System with the restricted discharge directed to the kerb and gutter – Refer to Civil Engineer Report for full details

2. Infrastructure Management Plan

We have investigated the requirements for the proposed development site in relation to the existing infrastructure and set out below the existing services and status and what, if any, amplification or alterations are required for the various services.

1.1 Site Power Supply

The site power supply will be provided by 2x1000kVA Kiosk Substations located along City Road. These Kiosks will be supplied from Ausgrid's HV network. Ausgrid will advise on one of the following three connection points shown in the image below:

- Option 1: South-East side of King St/City Rd (directly in front of site)
- Option 2: Corner of Carillion Ave (approx. 80m route)
- Option 3. Corner of Forbes St & Place (approx. 200m route)

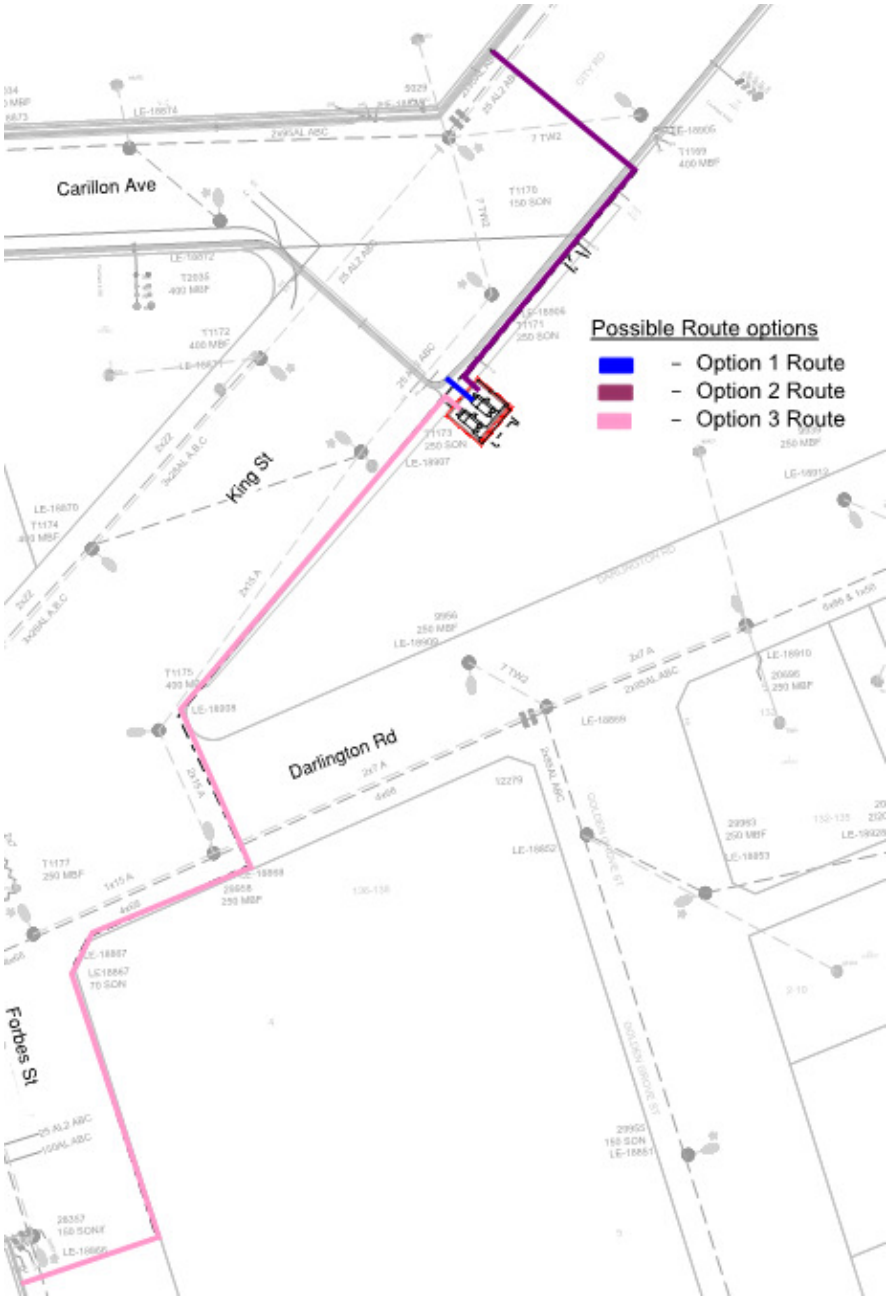


Figure 1 - Incoming HV feed options

The Kiosk substations supply power to two Main Switchboards (MSBs) located in a Main Switchroom (MSR) located in the basement.

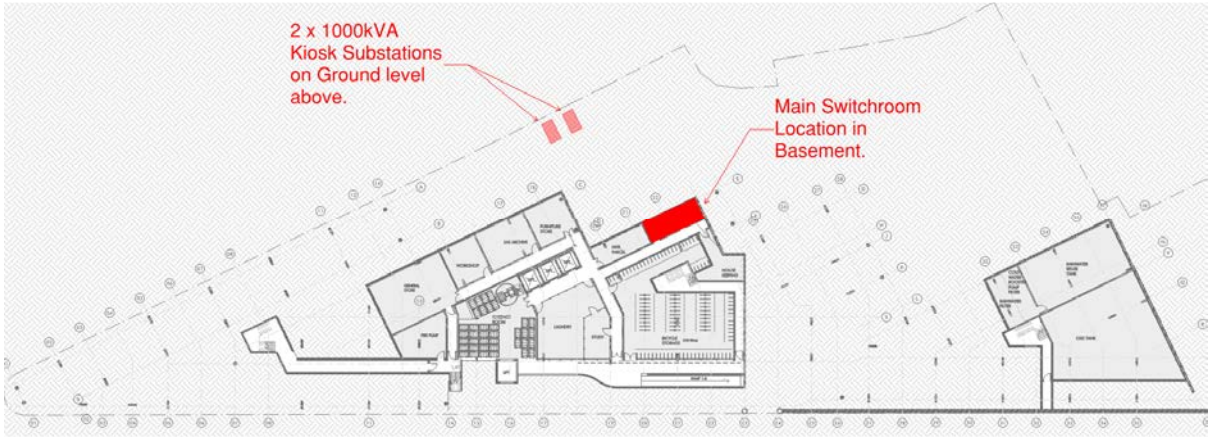


Figure 2 - Substation and switchroom locations

Generally, one MSB shall supply essential loads such as FIP/EWIS Panels, Lifts, Pumps and the like whilst the other MSB shall supply the accommodation rooms and general amenities. MSBs shall be connected to an external generator connection point.

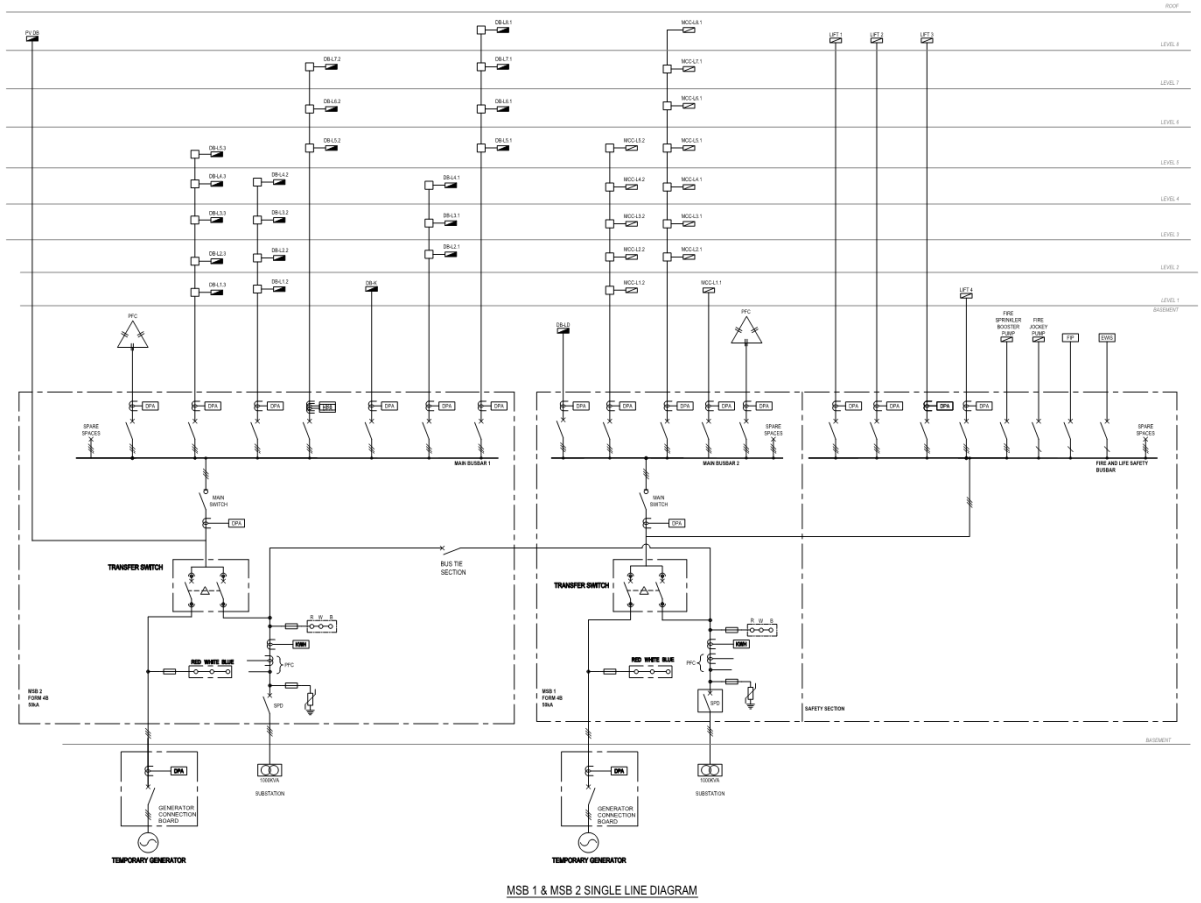


Figure 3 – Electrical single-line diagram for the development

The power shall be supplied to various floors via three risers – one on the east, one central and one on the west side of the building.

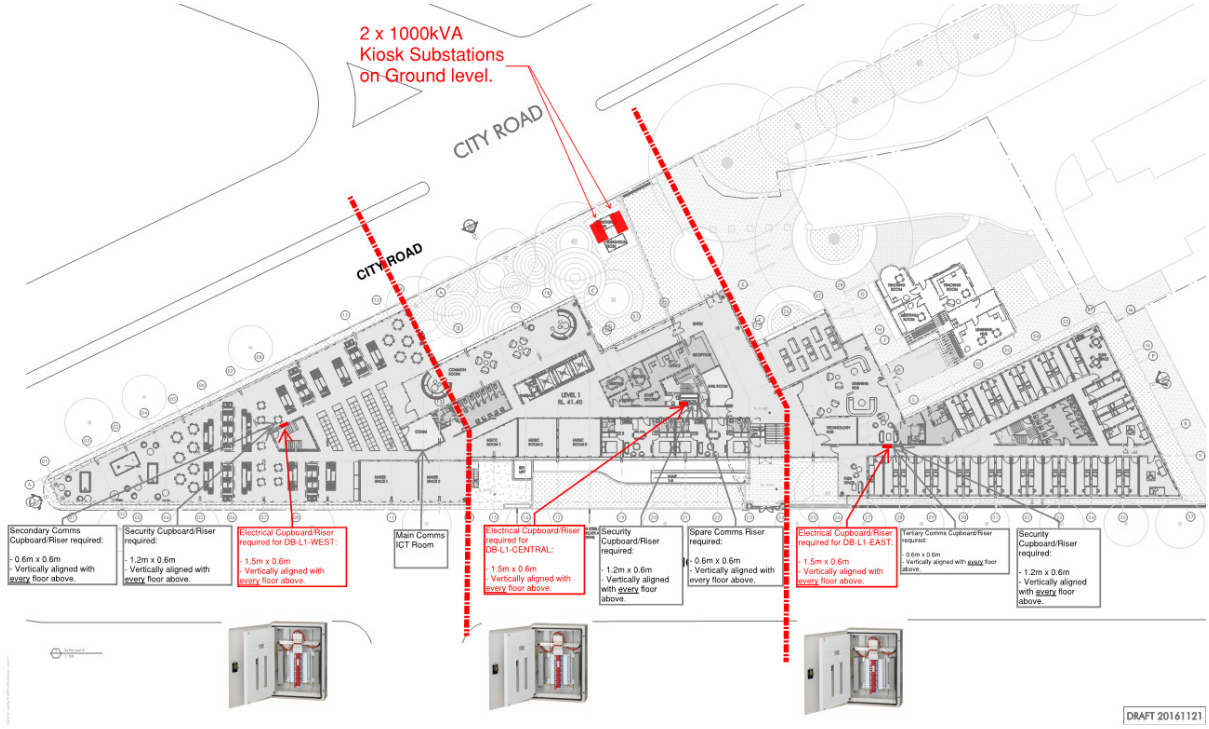


Figure 4 - Power distribution zoning and riser locations

General internal lighting shall comprise LED technology, advanced reflectors and diffusers controlled by a C-Bus system incorporating wall switches, motion sensors and timers.

Accommodation shall be furnished with 2700/3000K LED Strip Lighting, GPOs and Data outlets in accordance with the University Guidelines.

1.2 External Lighting

Lighting will be limited to the external areas for the purposes of way finding and safety in design. No flood lighting will be provided which would disrupt local Fauna.

1.3 Dark Sky Awareness

All external lighting will be shielded to avoid night sky pollution.

1.4 Safety Services

Emergency & Exit lighting will be provided in accordance with the National Construction Code (NCC) and the relevant Australian Standard.

Fire detection system will be subject to the nomination of the certifying authority.

1.5 Communications

Lead-in services to the site can originate from various entry point which are currently being finalised with the University's ICT department. The image following outlines the various options which are available:

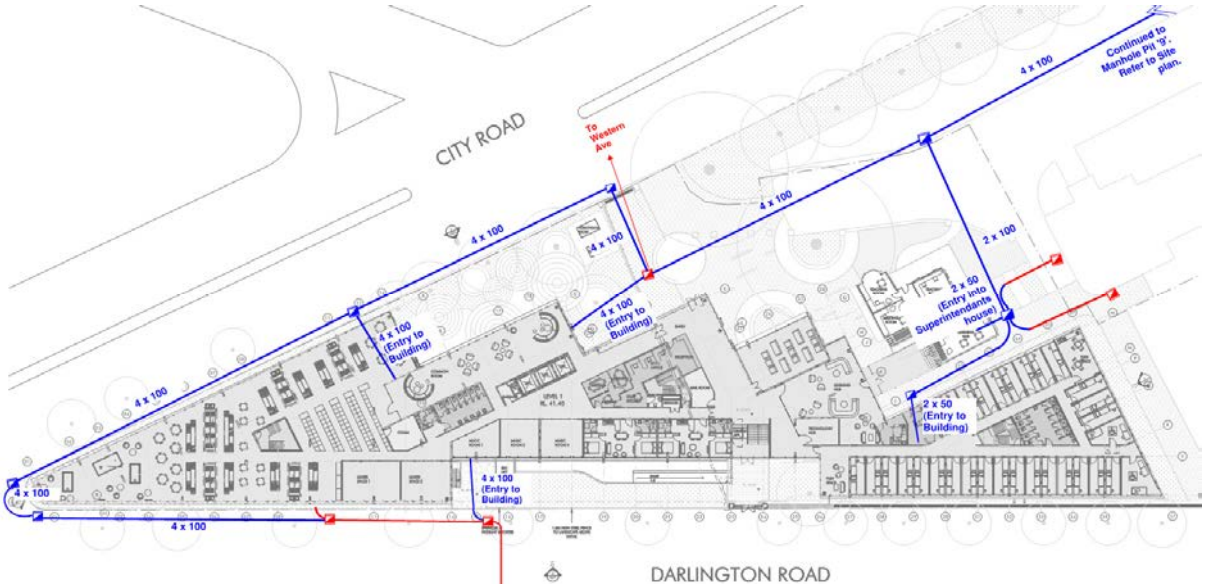


Figure 5- Incoming comms infrastructure

Fibre is reticulated through the site from the various communications rooms and risers on each floor. The following image shows the fibre distribution topology floor by floor within the three main communications risers:

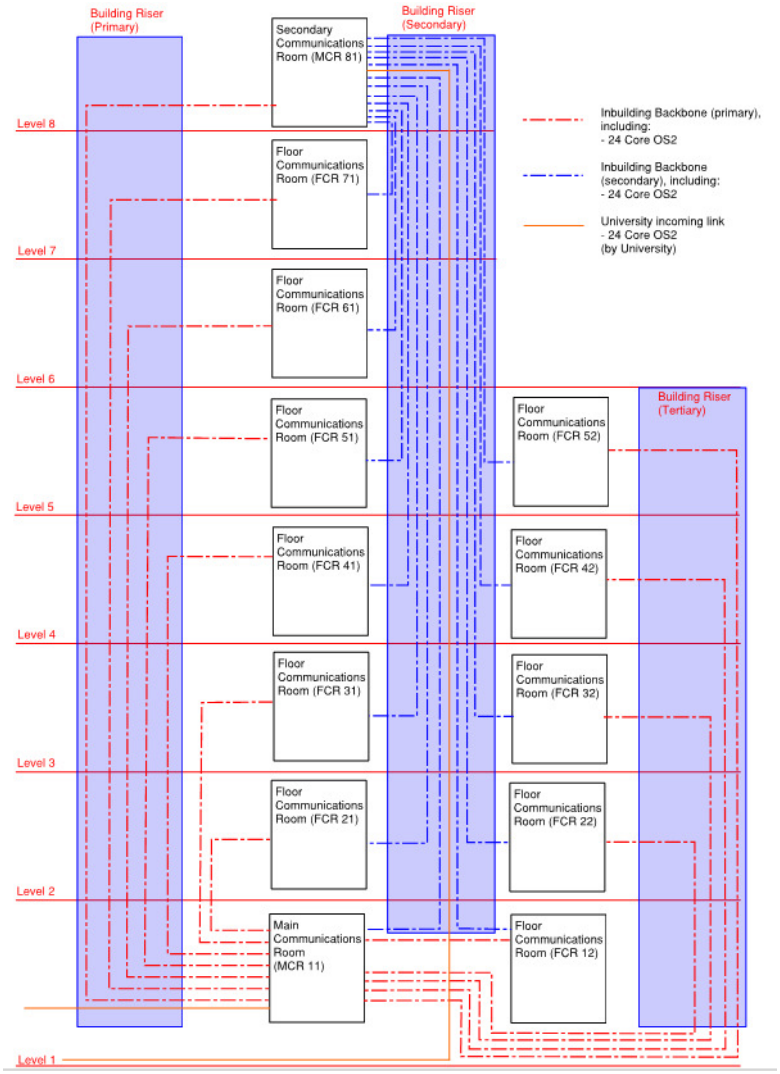


Figure 6 - Schematic diagram of internal comms reticulation

The quantity of communications racks within each communications room are as follows:

- Level 1 - Primary Communications Room (3 racks) and Communications Room 2 (2 racks)
- Levels 2-4 - Communications Room 1 (2 racks) and Communications Room 2 (2 racks)
- Levels 5 - Communications Room 1 (2 racks) and Communications Room 2 (2 racks)
- Level 6 - Communications Room 1 (2 racks) only
- Level 7 - Communications Room 1 (2 racks) only
- Level 8 - Secondary Communications Room (3 racks)

Below is a typical location layout for the communications rooms on floors with two rooms.

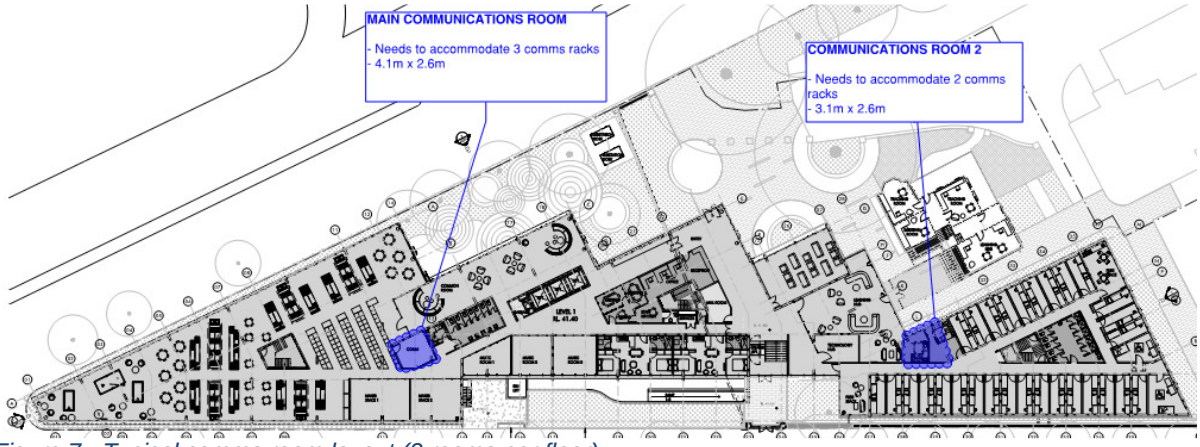
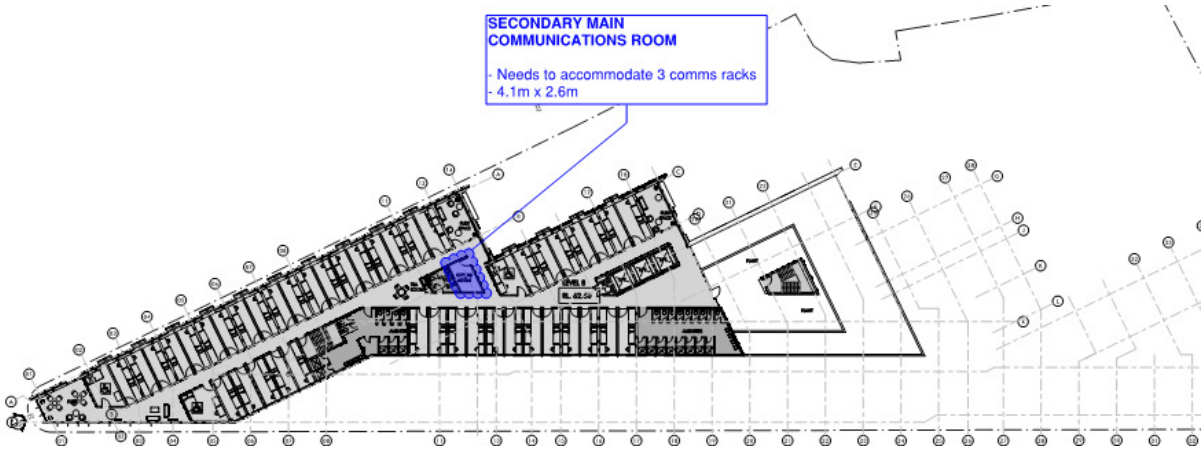


Figure 7 - Typical comms room layout (2 rooms per floor)

Below is a typical location layout for the communications rooms on floors with one room



. Figure 8 - Typical comms room layout (1 room per floor)

1.6 Access Control and CCTV Services

Accommodation rooms shall be provided with Aperio technology card readers integrated with the university's existing Gallagher system.

Generally, 16 Aperio doors connected to one controller 6000 with 4 Aperio doors per Aperio HUB.

T10 and T20 Gallagher readers will be specified on other doors including external entries, back of house and internal doors.

Figure 9 - Aperio and Gallagher security readers

CCTV shall be a network based HD-IP System. Avigilon cameras shall be used throughout and shall be connected to the university's existing Avigilon CCTV network.

1.7 Potable Water Supply

It is proposed that the development will be serviced by the existing water main in Darlington Road. The existing water main on the southern side is a 200mm water main Cast Iron-Cement Lined. The Pressure Flow certificate from Sydney Water indicates that although the main is capable of providing the required flow, a booster pump will be required to provide adequate pressure at the uppermost fixtures.

It is estimated that the simultaneous flow rate for the development will be 15 l/s. Warren Smith & partners refer to an expected daily water demand of 42.42 kl per day. Our estimation is 100 kl per day. We note that the WS&P data is based on a square meter rate whereas our data is based on the current proposed quantity of fixtures.

As noted above, the Sydney Water 200mm water main would have the capacity to serve the flow to the building. However, based on pressure and flow details from Sydney Water, the water service will have to be assisted with a booster pump assembly to provide water at adequate pressure for the various fixtures. It is assumed at this stage that the booster pump set will be variable speed drive units to allow for continuous pressure and flow as required and to economise of power usage as required.

Refer Appendix A for Pressure Certificate and Water Mains Plan.

Refer Figure 10 below for connection and meter locations.

1.8 Fire Services

It is proposed that the development will be serviced by the existing water main in Darlington Road.

The existing water main on the southern side is a 200mm water main Cast Iron-Cement Lined. The Pressure Flow certificate from Sydney Water indicates that the main is capable of providing the necessary flows for a combined Fire Hydrant and Fire Sprinkler system.

No water storage for fire services will be required to satisfy Code requirements.

Refer to Figure 10 below for mains connection and booster assembly location.

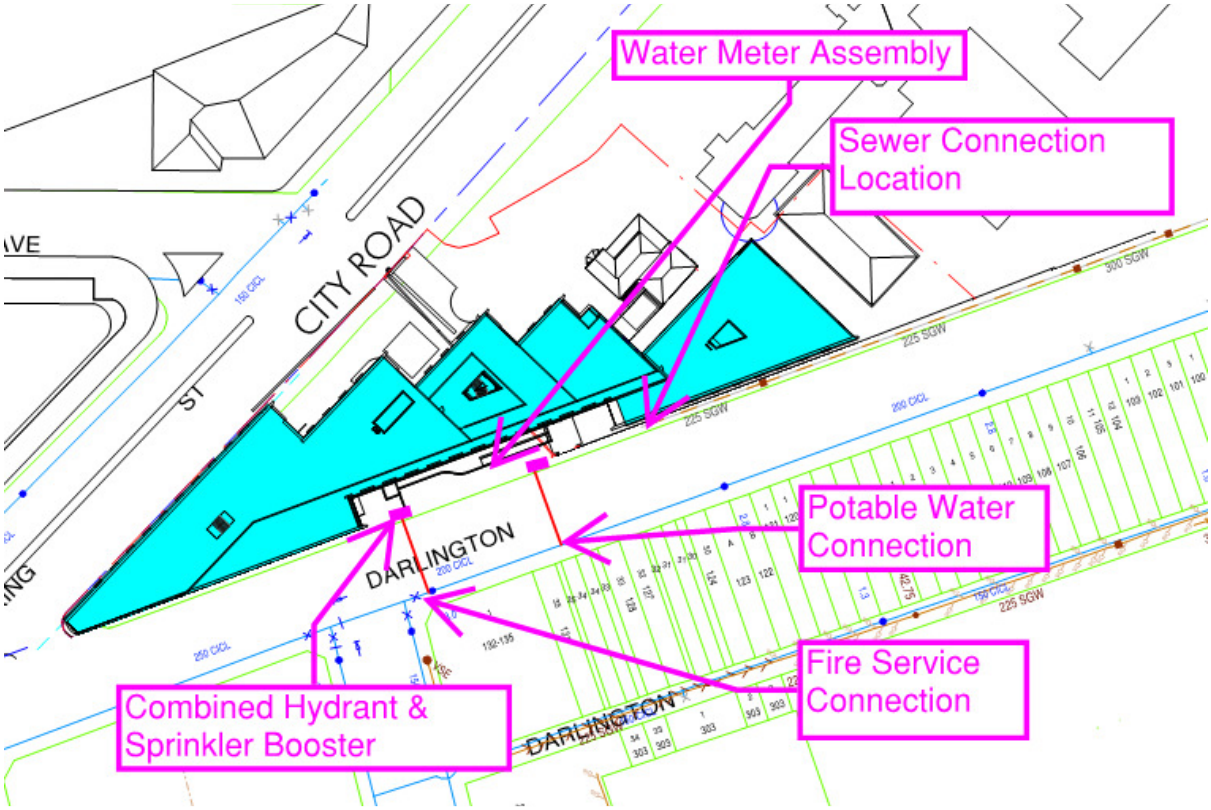


Figure 10 - Water and Sewer Mains Connections and Meter/Booster Assemblies Locations

1.9 Sewer Drainage

There is a 225mm sewer main available approximately 115m east of the intersection of King Street and Darlington Road in Darlington Road.

As per Warren Smith & Partners report on services, the main has the capacity to serve the new building and thus no upgrade of the sewer drainage is required.

Refer to Appendix A for details of the location of the sewer main.

Refer to Figure 10 above for mains connection location.

We have verbal confirmation from Sydney Water, that although the main is indicated as dotted on their reference sheets, the sewer main is a Sydney Water Asset. In reports prepared by Warren Smith & Partners, this sewer main is noted as being both a University and Sydney Water asset depending upon which report is being referred to. Based on our phone discussion with Sydney Water, we will assume that the sewer main is a Sydney Water asset.

Refer to 4596001-University of Sydney - Sewer & Water Masterplan-Rev G by Warren Smith & Partners which estimates the waste flow at 82.11 kl average daily discharge. Our assessment is estimated at 80 kl average daily discharge which is a reasonable correlation.

1.10 Gas Service

The site will be served from the gas main in Darlington Road which is a 50mm nylon pipe inserted into a 100mm metal main. The pressure is 210kPa.

The pressure and size indicates that the pipe would have the required capacity for the development.

Refer to figure 2 below for main connection and meter locations.

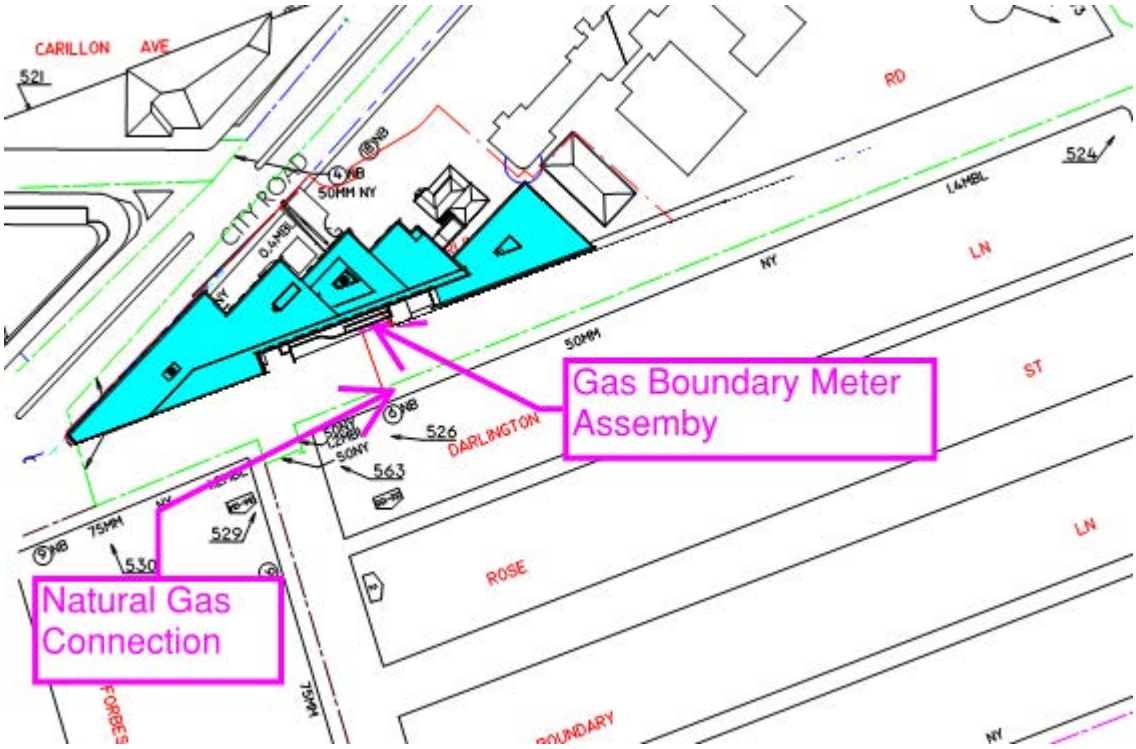


Figure 11 - Natural Gas Main Connection and Meter Location

1.11 Stormwater Drainage

The stormwater drainage is separated into two sections.

The non-trafficable roof areas will be drained to a 160,000 litre rainwater reuse storage tank. This tank then discharges directly into the stormwater On Site Detention (OSD) tank.

It is expected at this stage that the rainwater reuse stormwater drainage system from the roof areas to the storage tank will be via a system of syphonic outlets and piping. Full details will be submitted for review and acceptance prior to final design is undertaken.

All other roof and ground areas are directed as required to the OSD system. This system is described in the Civil Engineer's report.

3. Integrated Water Management Plan

The integrated water plan consist of the interconnection of the roof drainage, stormwater drainage, Rainwater reuse water storage, On Site Detention system (OSD), rainwater reuse system and potable water systems.

The non-trafficable roof areas will be drained separately to a rainwater storage tank located at the basement level adjacent to the OSD storage tank.

The roof water drainage system will be a gravity system capable of a 5 minute, 100yr ARI storm event draining to a 160,000 litre storage tank. The tank will be fitted with a first flush system sized to store the first 2 mm of rainfall. This will assist in the prevention of a significant amount of pollution entering the reuse water storage tank. The first flush system will drain to a pump out system and discharge into the OSD storage tank.

The storage tank will be fitted with high and low level access points to the side of the tank to enable maintenance and cleaning as required. These access openings will be water tight and will be fitted to ensure no leakage from the concrete tank where they are fixed.

The overflow from the rainwater reuse storage tank will be directly to the adjacent OSD storage tank.

There will be an assembly of pumps, automatic backwash filters and UV disinfection to clean the water from the reuse tank and will be piped to all cisterns, cold water to the laundry and irrigation system. There will be a backup connection from the potable water main via a backflow prevention device assembly to ensure that there is continual water supply to the systems in the event that the reuse tank does not have water available.

Rainwater Reuse Analysis Data and Outputs

Rainwater Harvest Model

Project Name :	Mixed Use H01	**Project No :**	160105
Prep. by :	Chris Harpley	**Date :**	1/12/2016
Chkd by :	Diego Montelvere	**Date :**	1/12/2016

Inputs

Rainfall data (change rainfall data on the "Rainwater data" tab)

Bureau of Meterology Weather Station:	SYDNEY (OBSERVATORY HILL), 66062
Rainfall Data Range:	01/01/1970 to 31/01/2010
Number of Years Modelled:	39.7 Years

Tank parameters

Tank Size (litres):	160000	Litres
Catchment Area (m²):	2220	m²
Runoff Co-efficient:	0.9	
First Flush (mm):	0.2	mm
Daily Rainwater Demand (L/day):	12000	Litres/Day

Cost parameters

Cost of Potable Water per kilo litre:	$2.02	per kL

Outputs

Average annual rainfall (mm/yr):	1,226
Average annual demand on rainwater tank (L/yr):	4,383,000
Average annual rainwater harvested (L/yr):	1,971,695
Average annual spill/overflow (L/yr):	418,325
Average annual potable top-up (L/yr):	2,411,305
Annual rainwater rainfall (L/yr):	2,449,676
Average Daily harvest Potential (L/day):	6,707
Overall % rainwater demand satisfied with rainwater:	45%
Rainwater overflow (%):	20%
Reduction in Stormwater runoff volume (%):	80%
Annual savings ($/yr):	$3,982.82

Figure 12 - Rainwater harvesting modelling

It is estimated that the water usage for the cisterns, laundry and irrigation is estimated at 9,000, 1500 and 50 litres per day respectively.

The reuse tank of 160,000 litres will be able to provide approximately 45% of the estimated non-potable water usage. We undertook a sensitivity analysis and consider that it was uneconomical to increase the size of the rainwater reuse storage because the benefit in storage was not significant against the additional storage volume. Refer the table below and note that even an increase to 400,000 litres only provides an increase of 6% to 51% demand being satisfied.

It has been estimated that the students will use 151 litres per day for all purposes. Thus the usage of the rainwater reuse for toilet flushing, laundry and irrigation is estimated to save approximately 1.97 mega litres.

The total water usage on the site is estimated to be 100,000 litres per day. This is for personal, laundry and cooking uses. We have not included any allowance for staff ablutions as we consider that the volume would be small enough to be included generally within the daily student allowance and the averages included therein.

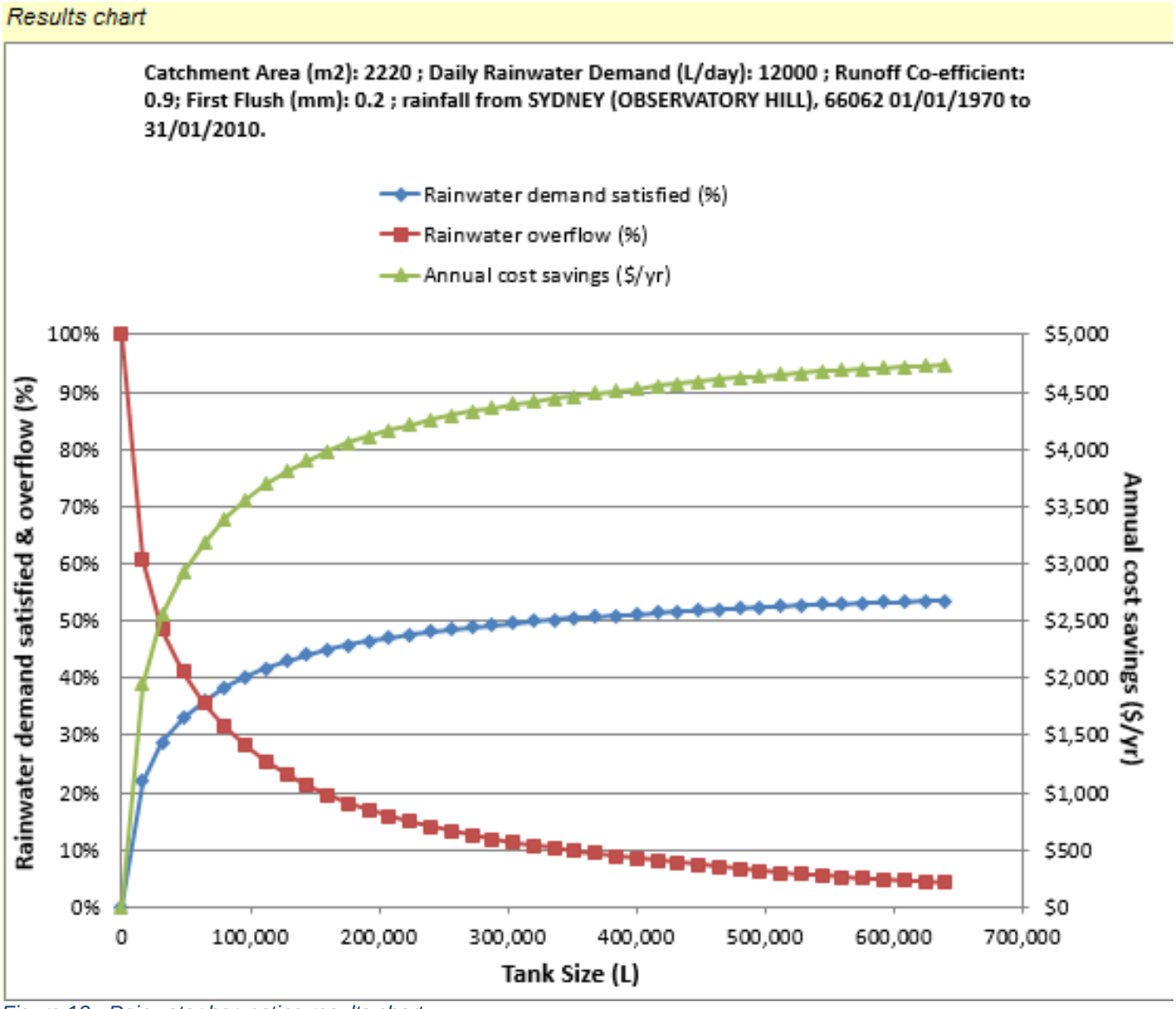


Figure 13 - Rainwater harvesting results chart

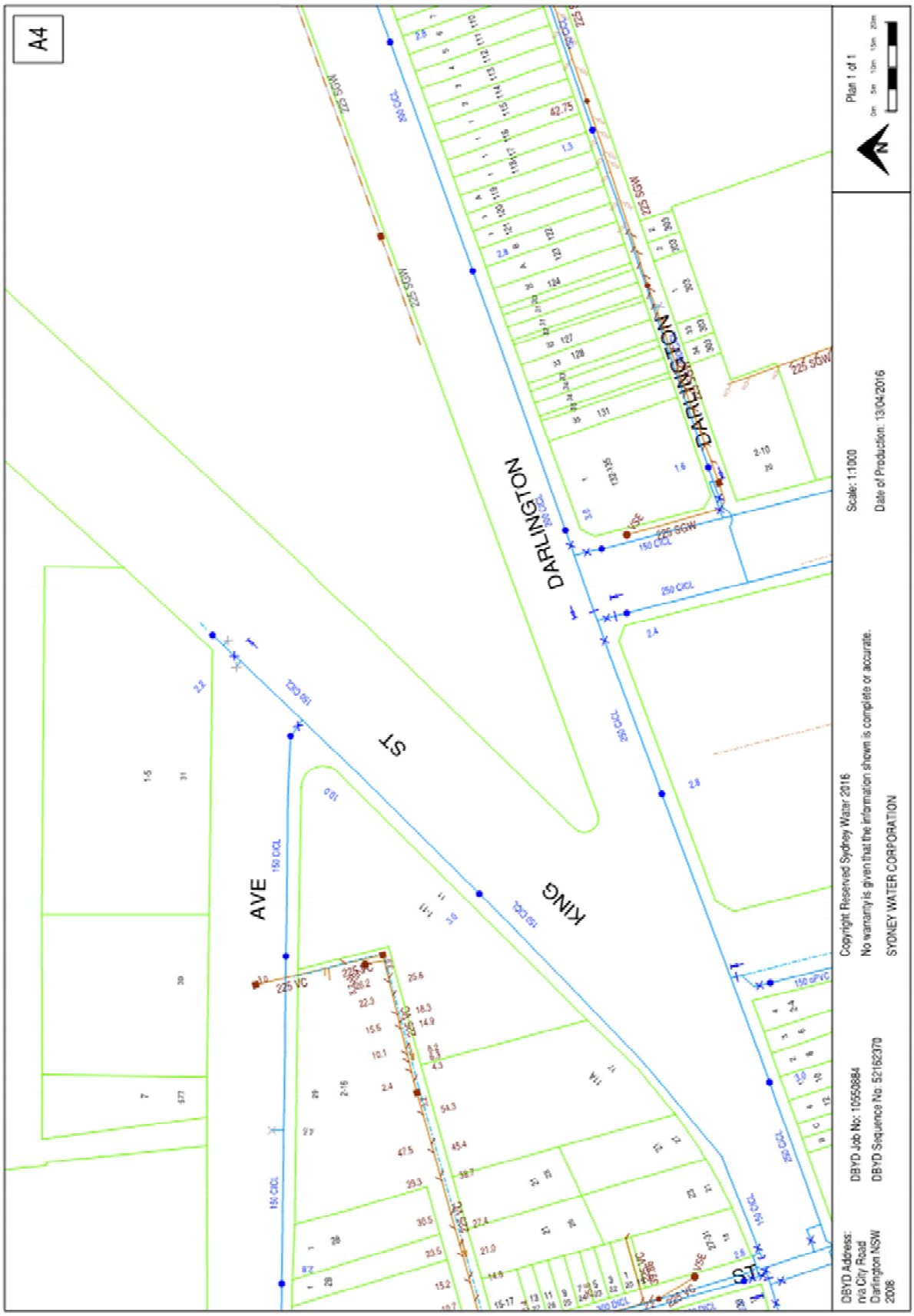
Rainwater Reuse Storage Tank Volume Sensitivity Analysis

Tank Size (L)	Rainwater demand satisfied (%)	Rainwater overflow (%)
-	0%	100%
16,000	24%	62%
32,000	32%	50%
48,000	37%	43%
64,000	40%	37%
80,000	43%	33%
96,000	45%	30%
112,000	47%	27%
128,000	48%	25%
144,000	49%	23%
160,000	50%	21%
176,000	51%	20%
192,000	52%	19%
208,000	53%	17%
224,000	53%	16%
240,000	54%	16%
256,000	54%	15%
272,000	55%	14%
288,000	55%	13%
304,000	56%	13%
320,000	56%	12%
336,000	56%	12%
352,000	57%	11%
368,000	57%	11%
384,000	57%	10%
400,000	58%	10%
416,000	58%	10%
432,000	58%	9%
448,000	58%	9%
464,000	59%	8%
480,000	59%	8%
496,000	59%	8%
512,000	59%	7%
528,000	59%	7%
544,000	60%	7%
560,000	60%	6%
576,000	60%	6%
592,000	60%	6%
608,000	60%	6%
624,000	60%	5%
640,000	61%	5%

Figure 14 - Rainwater tank storage volume sensitivity analysis chart

The stormwater system, apart from the rainwater reuse collection system, will be of a gravity system draining to the OSD storage tank. The details of this system are included in the Civil Engineers Report on stormwater drainage for the site and includes details of the collection, volume of OSD storage and outlet controls and discharge point.

4. Appendix A – Water & Sewer Main Diagram & Pressure Certificate



Statement of Available Pressure and Flow

Sydney WATER

Alex Bartley
101 Miller Street
North Sydney, 2060

Attention: Alex Bartley Date: 27/10/2016

Pressure & Flow Application Number: 130936
Your Pressure Inquiry Dated: 2016-09-21
Property Address: City Rd, Darlington 2008

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Darlington Rd	Side of Street: South
Distance & Direction from Nearest Cross Street	1 metres East from Golden Grove St
Approximate Ground Level (AHD):	41 metres
Nominal Size of Water Main (DN):	200 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	34 metre head
Minimum Pressure	28 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	28
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 15 20 26 30 40 50 99	30 30 30 29 29 29 29 28 24
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main) Maximum Permissible Flow	5 10 15 20 26 30 40 50 99	28 28 28 28 28 28 27 27 22

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

connections@sydneywater.com.au

Sydney Water Corporation ABN 49 776 225 038
1 Smith St Parramatta 2150 | PO Box 399 Parramatta 2124 | DX 14 Sydney | T 13 20 92 | www.sydneywater.com.au
Delivering essential and sustainable water services for the benefit of the community

5. Appendix B – Gas Main Diagram