



Servicing Report

Wollongong University

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Document Status

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Approval for Issue

Name	Signature	Date
Ian Murphy		16 June 2015

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Terms & Abbreviations

Abbreviation	Meaning
AHD	Australian Height Datum
SWC	Sydney Water Corporation
RL	Reduced Level
RPS	RPS Australia East Pty Ltd
UOW	University of Wollongong

I.0 Executive Summary

RPS Australia East Pty Ltd has been engaged by McCallum Plumbing & Fire Consultants Australia on behalf of University of Wollongong (UOW) to prepare a water and sewer servicing report for the University site. This report addresses the provision of water & sewer services to the existing campus area and proposed development of the site over the next 25 years.

The existing UOW water system is connected to the SWC reticulated water system in seven different locations which provides high levels of redundancy in the system.

Additional cross connections within the site have been recommended to improve internal redundancy and assist in achieving discrete shutdown zones.

Seven shutdown zones have been determined that will assist in minimising the extent of the site that loses water services during water service failures or programmed maintenance.

The fact that there are six connections to the one main in Northfields Avenue is problematic as it means if the SWC main in Northfields Avenue fails the majority of the site is out of water. To minimise the impact of the failure of the main in Northfields Avenue and additional connection to the SWC system in Robsons Road is recommended. In addition to the additional connection to the SWC system it is also recommended that a cross connection between Zones 3 & 4 is completed.

Recommended works are outlined below.

- Link from existing service at Robsons Rd via the Western carpark – 374m x 100mm
- Cross connection between Zone 3 & Zone 4 – 166m x 100mm
- Relocation of SWC connection in Northfields Ave Zone 1 – 189m x 100mm
- Alternate connection in Zone 2 – 31m x 40mm
- Additional stop valves 5 & 6 in Zone 3.

No augmentation works are required for the existing sewer system.

The existing sewer system servicing UOW is made up of a network of 150mm and 225mm diameter mains connecting to the SWC sewer system at numerous locations. Information in the Water Services Association of Australia (WSAA) Sewerage Code of Australia indicates that 150mm mains have a maximum capacity of 21 l/s and 225mm mains have a maximum capacity of 51 l/s. Peak future sewer loadings for the site have been determined at 7.4 l/s

2.0 Introduction

RPS Australia East Pty Ltd has been engaged by McCallum Plumbing & Fire Consultants Australia on behalf of University of Wollongong (UOW) to prepare a water and sewer servicing report for the University site. This report addresses the provision of water & sewer services to the existing campus area and proposed development of the site over the next 25 years.

2.1 Location

The University of Wollongong occupies a site bounded by The Princes Motorway (M1), Northfields Avenue and Robsons Road.

The site is currently connected to the reticulated water and sewer networks owned and operated by the Sydney Water Corporation (SWC).

2.2 Methodology

Consultation has been undertaken with SWC to determine the capacity and adequacy of the existing reticulated water and sewer systems to service development proposed by UOW over the next 25 years.

The existing UOW water and sewer systems have been reviewed and analysed to determine what augmentation may be required to meet the future development programme for the site.

Meetings with UOW staff have been undertaken to gain insights into the practical operation of the existing systems. UOW staff have also outlined their requirements to improve operation and maintenance of the existing systems.

3.0 Water

3.1 Summary

The existing UOW water system is connected to the SWC reticulated water system in seven different locations, however the main section of the campus (90%+) is serviced by two (2) supplies, with one (1) as a standby. The main connection points are to the watermain in Northfields Avenue which raises a concern about redundancy within the system.

Enquiries with SWC indicate that the existing reticulation system has adequate capacity to service future development of the campus.

A copy of the SWC advice is attached at **Appendix 1**.

Computer modelling of the system indicates that water pressure throughout the site exceeds statutory requirements under both existing and proposed conditions.

Additional cross connections within the site have been recommended to improve internal redundancy and assist in achieving discrete shutdown zones.

Seven shutdown zones have been determined that will assist in minimising the extent of the site that loses water services during water service failures or programmed maintenance.

3.2 Water Supply System

The existing UOW water supply system is currently connected to the SWC reticulated water system in seven locations. Six (6) of these connections are in Northfields Avenue with one (1) in Robsons Road.

The fact that there are six connections to the one main in Northfields Avenue is problematic as it means if the SWC main in Northfields Avenue fails the majority of the site is out of water. To minimise the impact of the failure of the main in Northfields Avenue and additional connection to the SWC system in Robsons Road is recommended. In addition to the additional connection to the SWC system it is also recommended that a cross connection between Zones 3 & 4 is completed.

The water supply system currently consists of a number of different pipe materials – copper, cast iron cement lined (CICL), poly and PVC. It is recommended that the use of a single material be adopted for any future works, either polyethylene or HDuPVC (blue brute).

There is some evidence that the existing CICL pipes are beginning to fail. Under normal conditions CICL watermains would be expected to perform satisfactorily for up to 100 years. Wholesale replacement of the CICL mains is not recommended but where failure of CICL pipe occurs it is recommended to replace as much of the main as feasible during the repair.

Recommended works are outlined below.

- Link from existing service at Robsons Rd via the Western carpark – 374m x 100mm
- Cross connection between Zone 3 & Zone 4 – 166m x 100mm
- Relocation of SWC connection in Northfields Ave Zone 1 – 189m x 100mm
- Alternate connection in Zone 2 – 31m x 40mm
- Additional stop valves 5 & 6 in Zone 3.

A plan detailing the existing water systems and the recommended upgrades is attached as **Appendix 3**.

It should be noted that all the nominated proposed pipe sizes are internal diameters.

3.3 Computer Modelling

Pipe sizing has been confirmed with computer modelling using 'EPANET 2.0'. The EPANET software has been developed by the Water Supply & Water Resources Division in the National Risk Management Research Laboratory of the US Environmental Protection Agency

SWC has provided Hydraulic Grade Line (HGL) data for the identified connection points which have been used in the model. They are listed in **Table 1** below.

Table 1 Watermain Pressure

Location	Maximum Pressure (m)	Minimum Pressure (m)
150mm main Northfields Ave	123	101

The minimum pressure has been used in computer modelling to confirm pipe sizes and water pressures on site.

Water demands have been calculated for the proposed expansion of the site on a linear basis. Existing demands and campus population were used to determine future water demands based on an increase of campus population to 30,000 students and teachers.

The peak future water demand has been calculated at 12.6 l/s. This flow has been applied to computer modelling of the water system.

Water demand calculations are attached at **Appendix 11**.

In summary the minimum pressure achieved on the site is 44m which occurs on the highest point of the campus which has been determined to have an elevation of RL 55m AHD.

Detailed computer modelling data is attached at **Appendix 2**.

3.4 Shutdown Plan

The water system servicing the campus has been divided into seven separate zones to assist during shutdown periods to repair failures and for programmed maintenance. Each of the zones can be shutdown with only minimal valve operations. For ease of identification each of the zone valves have been identified and are shown on the attached plan.

Operation required to shutdown each of the zones individually are detailed below.

3.4.1 Shutdown Zone 1

To shutdown Zone 1 the valve (MSV1) at the connection to the SWC main and Valve 1 need to be closed.

3.4.2 Shutdown Zone 2

Shutdown of Zone 2 requires the valve (MSV 2) at the connection to the SWC main and Valves 1, 2 & 3 to be closed.

3.4.3 Shutdown Zone 3

Shutdown of Zone 3 requires Valves 2, 3, 5 & 6 to be closed.

3.4.4 Shutdown Zone 4

Shutdown of Zone 4 requires Valves 4 & 5 to be closed.

3.4.5 Shutdown Zone 5

To shutdown Zone 5 the valve (MSV 7) at the connection to the SWC main and Valve 6 need to be closed.

3.4.6 Shutdown Zone 6

To shutdown Zone 6 the valves (MSV 4, 5 & 6) at the connection to the SWC main needs to be closed. Zone 6 is a discreet zone and its shutdown does not affect any other parts of campus.

3.4.7 Shutdown Zone 7

To shutdown Zone 7 the valve (MSV 3) at the connection to the SWC main needs to be closed. Zone 6 is a discreet zone and its shutdown does not affect any other parts of campus.

It should be noted that successful operation of the shutdown zones is dependent upon the construction of watermains indicated on the plans.

Plans of the shutdown zones are attached as **Appendices 4 - 10**.

4.0 Sewer

The University of Wollongong campus is connected to the Sydney Water Corporation reticulated sewer system in a number of locations and SWC has indicated that the sewer system has adequate capacity to service proposed development of the campus.

A copy of the SWC advice is attached at **Appendix 1**.

Sewer loadings have been calculated for the proposed expansion of the site on a linear basis. Existing water demand coupled with the SWC sewer discharge factor and campus population were used to determine future sewer loadings based on an increase of campus population to 30,000 students and teachers.

The peak future sewer loading has been calculated at 7.4 l/s.

Sewer loading calculations are attached at **Appendix 11**.

The existing sewer system servicing UOW is made up of a network of 150mm and 225mm diameter mains connecting to the SWC sewer system at numerous locations. Information in the Water Services Association of Australia (WSAA) Sewerage Code of Australia indicates that 150mm mains have a maximum capacity of 21 l/s and 225mm mains have a maximum capacity of 51 l/s.

A review of the existing sewer system servicing the campus indicates that there is adequate capacity to service future development.

Discussions with University staff indicate that there have been some surcharge issues in the existing system but these were attributed to blockages caused by inappropriate matter being dumped into the system and tree root intrusion. Steps have been taken to rectify these matters and no further surcharges have occurred.

However it should be noted that the older sections of the sewer system were constructed using clay pipes. Over time these pipes are susceptible to cracking which creates additional entry ways for root intrusion into the system. The high number of trees around the campus increases the likelihood of root intrusion into the older clay pipes.

It is recommended that any sections of the sewer system that fail be replaced with uPVC pipe which will significantly reduce the risk of root intrusion.

Additionally it is recommended that aging clay pipes be replaced with uPVC pipe as budgetary constraints allow to minimise further root intrusion and thus the risk of surcharges on the site.

5.0 Conclusion

Liaison with the Sydney Water Corporation and University of Wollongong staff indicate that the existing SWC water & sewer reticulation systems and the internal UoW services have adequate capacity to service future development of the site.

The construction of the additional water services as described in this report will improve the efficiency and redundancy of the system. Water shutdowns to undertake repairs and scheduled maintenance will be able to be achieved with minimal impact on the remainder of the campus.

Replacement of aging clay pipes in the sewer system will minimise the likelihood of root intrusion and further surcharges occurring on site.

Appendix I

SWC Correspondence

7 August 2014

UNIVERSITY OF WOLLONGONG
c/- ROSE ATKINS RIMMER

FEASIBILITY LETTER

Developer: University Of Wollongong
Your reference: 31/23450
Development: Lot 2 DP252694 Northfields Ave, Wollongong
Development Description: Construct accommodation to house approximately 1050 students in 2 Stages- Stage 1 and 2.

Your application date: 28 July 2014

Dear Applicant

This Feasibility Letter (Letter) is a guide only. It provides general information about what Sydney Water's requirements could be if you applied to us for a Section 73 Certificate (Certificate) for your proposed development. **The information is accurate at today's date only.**

If you obtain development consent for that development from your consent authority (this is usually your local Council) they will require you to apply to us for a Section 73 Certificate. You will need to submit a new application (and pay another application fee) to us for that Certificate by using your current or another Water Servicing Coordinator (Coordinator).

Sydney Water will then send you either a:

- Notice of Requirements (Notice) and Developer Works Deed (Deed) or
- Certificate.

These documents will be the definitive statement of Sydney Water's requirements.

There may be changes in Sydney Water's requirements between the issue dates of this Letter and the Notice or Certificate. The changes may be:

- if you change your proposed development eg the development description or the plan/site layout, after today, the requirements in this Letter could change when you submit your new application; and

- **If you decide to do your development in stages then you must submit a new application (and pay another application fee) for each stage.**

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

What You Must Do To Get A Section 73 Certificate In The Future.

To get a Section 73 Certificate you must do the following things. You can also find out about this process by visiting www.sydneywater.com.au > Building and Developing > Developing Your Land.

1. **Obtain Development Consent from the consent authority for your development proposal.**
2. **Engage a Water Servicing Coordinator (Coordinator).**

You must engage your current or another authorised Coordinator to manage the design and construction of works that you must provide, at your cost, to service your development. If you wish to engage another Coordinator (at any point in this process) you must write and tell Sydney Water.

For a list of authorised Coordinators, either visit www.sydneywater.com.au > Building and Developing > Developing Your Land or call **13 20 92**.

The Coordinator will be your point of contact with Sydney Water. They can answer most questions that you might have about the process and developer charges and can give you a quote or information about costs for services/works (including Sydney Water costs).

3. **Developer Works Deed**

It would appear that your feasibility application is served from existing mains and does not require any works to be constructed at this time. Sydney Water will confirm this with you after you have received Development Approval from Council and your Coordinator has submitted a new Development application and Sydney Water has issued you with a formal Notice of Requirements.

4. **Water and Sewer Works**

4.1 **Water**

Your development must have a frontage to a water main that is the right size and can be used for connection.

Sydney Water has assessed your application and found that:

- The drinking water main available for connection for Stage 1 is the DN150 mm main in Northfields Ave.
- The drinking water main available for connection for Stage 2 is the DN200 mm main in Northfields Ave.

4.2 **Sewer**

Your development must have a sewer main that is the right size and can be used for

connection. That sewer must also have a connection point within your development's boundaries.

Sydney Water has assessed your application and found that:

- Stage 1 will be served by the existing DN150 mm main constructed under WO 41849.
- Stage 2 will be served by the existing DN225 mm main constructed under WO 45804.

If you choose to subdivide any of these proposed Stages an extension of the wastewater system for Stage 2 will be required from the DN225 mm main constructed under WO 45804.

The extension will need to provide a point of connection at least 1m inside all the proposed lot boundaries.

- The proposed wastewater infrastructure for this development will be sized & configured according to the Sewerage Code of Australia (Sydney Water Edition WSA 02-2002-2.2).

5. Ancillary Matters

5.1 Asset adjustments

After Sydney Water issues this Notice (and more detailed designs are available), Sydney Water may require that the water main/sewer main/stormwater located in the footway/your property needs to be adjusted/deviated. If this happens, you will need to do this work as well as the extension we have detailed above at your cost. The work must meet the conditions of this Notice and you will need to complete it **before we can issue the Certificate**. Sydney Water will need to see the completed designs for the work and we will require you to lodge a security. The security will be refunded once the work is completed.

5.2 Entry onto neighbouring property

If you need to enter a neighbouring property, you must have the written permission of the relevant property owners and tenants. You must use Sydney Water's **Permission to Enter** form(s) for this. You can get copies of these forms from your Coordinator or the Sydney Water website. Your Coordinator can also negotiate on your behalf. Please make sure that you address all the items on the form(s) including payment of compensation and whether there are other ways of designing and constructing that could avoid or reduce their impacts. You will be responsible for all costs of mediation involved in resolving any disputes. Please allow enough time for entry issues to be resolved.

OTHER THINGS YOU MAY NEED TO DO

Shown below are other things you need to do that are NOT a requirement for the Certificate. They may well be a requirement of Sydney Water in the future because of the impact of your development on our assets. You must read them before you go any further.

Stamping and approval of your building plans

Please note that the building plans must be stamped and approved when each lot is developed. This can be done at a Quick Check agency. For an agency list visit www.sydneywater.com.au > Building and Developing > Quick Check or call 13 20 92).

This is not a requirement for the Certificate but the approval is needed because the construction/building works may affect Sydney Water's assets (e.g. water, sewer and stormwater mains).

Where a Sydney Water stormwater channel, pipe or culvert is located within ten (10) metres of your development site it must be referred to Sydney Water for further assessment.

Your Coordinator can tell you about the approval process including:

- Possible requirements;
- Costs; and
- Timeframes.

Note: You must obtain our written approval before you do any work on Sydney Water's systems. Sydney Water will take action to have work stopped on the site if you do not have that approval. We will apply Section 44 of the Sydney Water Act 1994.

Disused Sewerage Service Sealing

Please do not forget that you must pay to disconnect all disused private sewerage services and seal them at the point of connection to a Sydney Water sewer main. This work must meet Sydney Water's standards in the Plumbing Code of Australia (the Code) and be done by a licensed drainer. The licensed drainer must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Soffit Requirements

Please be aware that floor levels must be able to meet Sydney Water's soffit requirements for property connection and drainage.

Requirements for Business Customers for Commercial and Industrial Property Developments

If this property is to be developed for Industrial or Commercial operations, it may need to meet the following requirements:

Trade Wastewater Requirements

If this development is going to generate trade wastewater, the property owner must submit an application requesting permission to discharge trade wastewater to Sydney Water's sewerage system. You must wait for approval of this permit before any business activities can commence.

The permit application should be emailed to Sydney Water's [Business Customer Services](#) at

businesscustomers@sydneywater.com.au

It is illegal to discharge Trade Wastewater into the Sydney Water sewerage system without permission.

A **Boundary Trap** is required for all developments that discharge trade wastewater where arrestors and special units are installed for trade wastewater pre-treatment.

If the property development is for Industrial operations, the wastewater may discharge into a sewerage area that is subject to wastewater reuse. Find out from Business Customer Services if this is applicable to your development.

Backflow Prevention Requirements

Backflow is when there is unintentional flow of water in the wrong direction from a potentially polluted source into the drinking water supply.

All properties connected to Sydney Water's supply must install a testable **Backflow Prevention Containment Device** appropriate to the property's hazard rating. Property with a high or medium hazard rating must have the backflow prevention containment device tested annually. Properties identified as having a low hazard rating must install a non-testable device, as a minimum.

Separate hydrant and sprinkler fire services on non-residential properties, require the installation of a testable double check detector assembly. The device is to be located at the boundary of the property.

Before you install a backflow prevention device:

1. Get your hydraulic consultant or plumber to check the available water pressure versus the property's required pressure and flow requirements.
2. Conduct a site assessment to confirm the hazard rating of the property and its services. Contact PIAS at NSW Fair Trading on **1300 889 099**.

For installation you will need to engage a licensed plumber with backflow accreditation who can be found on the Sydney Water website:

<http://www.sydneywater.com.au/Plumbing/BackflowPrevention/>

Water Efficiency Recommendations

Water is our most precious resource and every customer can play a role in its conservation. By working together with Sydney Water, business customers are able to reduce their water consumption. This will help your business save money, improve productivity and protect the environment.

Some water efficiency measures that can be easily implemented in your business are:

- Install water efficiency fixtures to help increase your water efficiency, refer to WELS (Water Efficiency Labelling and Standards (WELS) Scheme, <http://www.waterrating.gov.au/>)
- Consider installing rainwater tanks to capture rainwater runoff, and reusing it, where cost

effective. Refer to <http://www.sydneywater.com.au/Water4Life/InYourBusiness/RWTCalculator.cfm>

- Install water-monitoring devices on your meter to identify water usage patterns and leaks.
- Develop a water efficiency plan for your business.

It is cheaper to install water efficiency appliances while you are developing than retrofitting them later.

Contingency Plan Recommendations

Under Sydney Water's [customer contract](#) Sydney Water aims to provide Business Customers with a continuous supply of clean water at a minimum pressure of 15meters head at the main tap. This is equivalent to 146.8kpa or 21.29psi to meet reasonable business usage needs.

Sometimes Sydney Water may need to interrupt, postpone or limit the supply of water services to your property for maintenance or other reasons. These interruptions can be planned or unplanned.

Water supply is critical to some businesses and Sydney Water will treat vulnerable customers, such as hospitals, as a high priority.

Have you thought about a **contingency plan** for your business? Your Business Customer Representative will help you to develop a plan that is tailored to your business and minimises productivity losses in the event of a water service disruption.

For further information please visit the Sydney Water website at: <http://www.sydneywater.com.au/OurSystemsandOperations/TradeWaste/> or contact Business Customer Services on **1300 985 227** or businesscustomers@sydneywater.com.au

Fire Fighting

Definition of fire fighting systems is the responsibility of the developer and is not part of the Section 73 process. It is recommended that a consultant should advise the developer regarding the fire fighting flow of the development and the ability of Sydney Water's system to provide that flow in an emergency. Sydney Water's Operating Licence directs that Sydney Water's mains are only required to provide domestic supply at a minimum pressure of 15 m head.

A report supplying modelled pressures called the Statement of Available pressure can be purchased through any Quick Check agent and may be of some assistance when defining the fire fighting system. The Statement of Available pressure, may advise flow limits that relate to system capacity or diameter of the main and pressure limits according to pressure management initiatives. If mains are required for fire-fighting purposes, the mains shall be arranged through the water main extension process and not the Section 73 process.

Large Water Service Connection

A water main is available to provide your development with a domestic supply. The size of your development means that you will need a connection larger than the standard domestic 20 mm size.

To get approval for your connection, you will need to lodge an application with a Quick Check Agent. You, or your hydraulic consultant, may need to supply the following:

- A plan of the hydraulic layout;
- A list of all the fixtures/fittings within the property;
- A copy of the fire-flow pressure inquiry issued by Sydney Water;
- A pump application form (if a pump is required);
- All pump details (if a pump is required).

You will have to pay an application fee.

Sydney Water does not consider whether a water main is adequate for fire-fighting purposes for your development. We cannot guarantee that this water supply will meet your Council's fire fighting requirements. The Council and your hydraulic consultant can help.

Disused Water Service Sealing

You must pay to disconnect all disused private water services and seal them at the point of connection to a Sydney Water water main. This work must meet Sydney Water's standards in the Plumbing Code of Australia (the Code) and be done by a licensed plumber. The licensed plumber must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Other fees and requirements

The requirements in this Notice relate to your Certificate application only. Sydney Water may be involved with other aspects of your development and there may be other fees or requirements. These include:

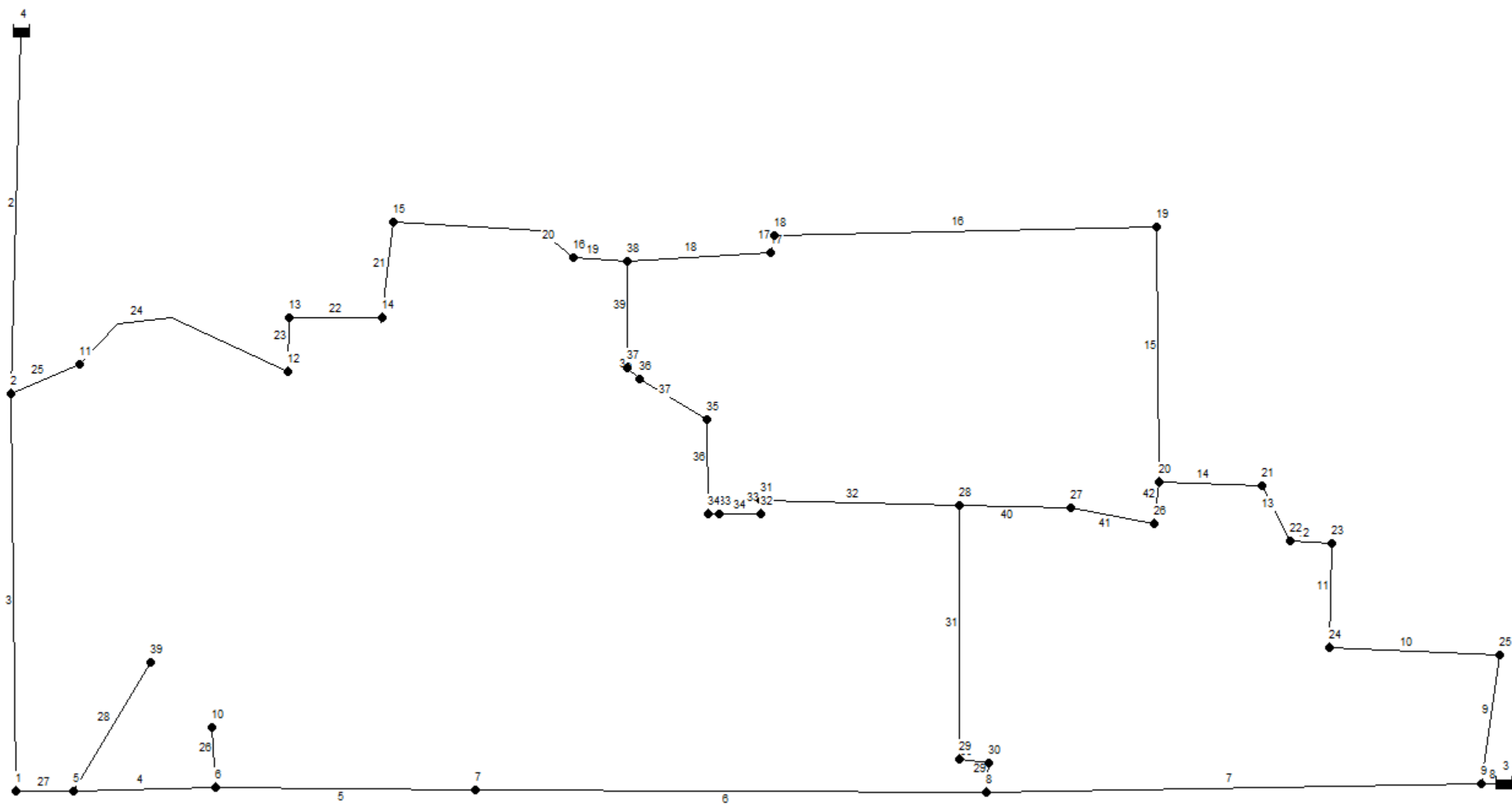
- plumbing and drainage inspection costs;
- the installation of backflow prevention devices;
- trade waste requirements;
- large water connections and
- Council fire fighting requirements. (It will help you to know what the fire fighting requirements are for your development as soon as possible. Your hydraulic consultant can help you here.)

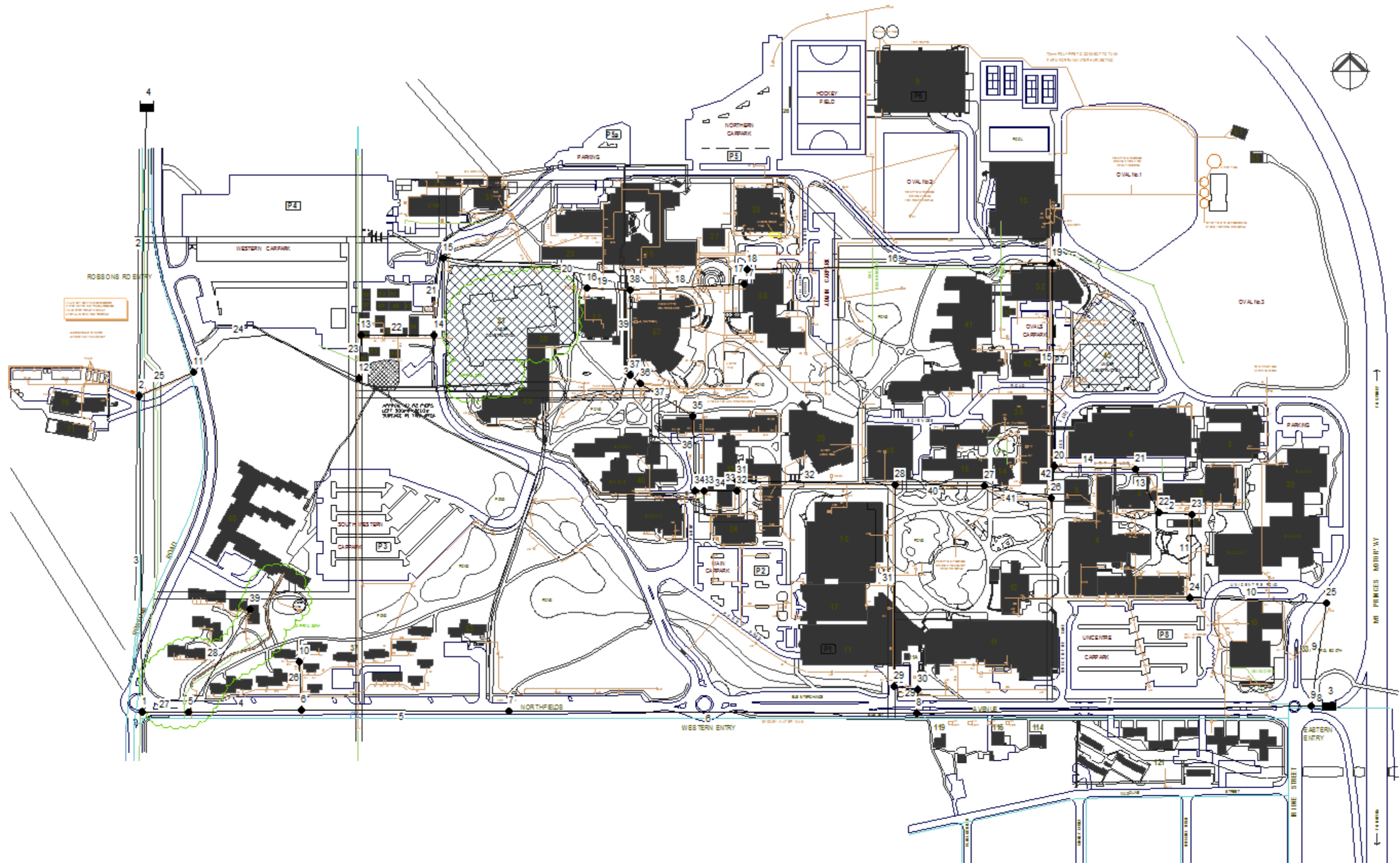
No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

END

Appendix 2

Computer Modelling Data





Peak Day

Network Table - Nodes

Node ID	Elevation m	Base Dema LPS	Head m	Pressure m
Resvr 3	101	#N/A	101	0
Resvr 4	101	#N/A	101	0
Junc 2	55	0	99.35	44.35
Junc 11	50	0	99.01	49.01
Junc 12	45	0	98.73	53.73
Junc 1	45	0	99.28	54.28
Junc 13	40	0	98.56	58.56
Junc 7	40	0	99.2	59.2
Junc 6	40	0	99.26	59.26
Junc 5	40	0	99.27	59.27
Junc 14	38	1	98.18	60.18
Junc 10	39	0.5	99.21	60.21
Junc 39	38	0.5	99.15	61.15
Junc 15	35	1	97.99	62.99
Junc 16	34	0	97.82	63.82
Junc 37	33	1	97.76	64.76
Junc 36	33	0	97.76	64.76
Junc 38	32	1	97.78	65.78
Junc 35	31	1	97.77	66.77
Junc 34	29	0	97.81	68.81
Junc 33	29	0	97.82	68.82
Junc 32	29	0	97.84	68.84
Junc 31	29	1	97.85	68.85
Junc 17	28	1	97.78	69.78
Junc 18	28	0	97.78	69.78
Junc 28	26	1	98.06	72.06
Junc 29	25	0	98.96	73.96
Junc 27	24	0	98.05	74.05
Junc 30	25	0	99.08	74.08
Junc 8	25	0	99.18	74.18
Junc 26	22	1	98.04	76.04
Junc 20	22	0	98.04	76.04
Junc 19	20	1	97.83	77.83
Junc 21	20	0	98.18	78.18
Junc 22	20	0	98.26	78.26
Junc 24	20	0	98.58	78.58
Junc 23	19	1	98.31	79.31
Junc 25	16	0	99	83
Junc 9	15	0	99.32	84.32

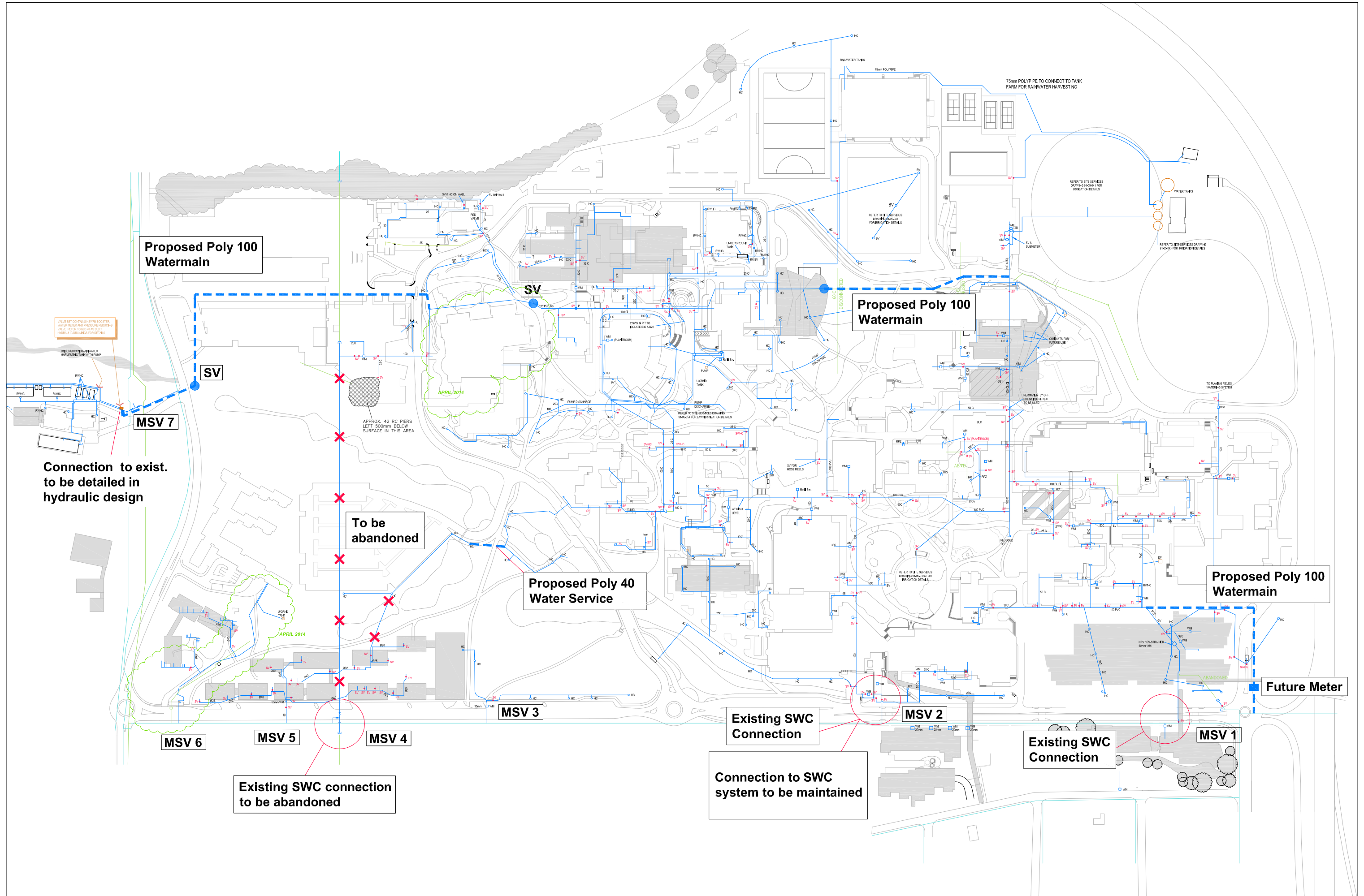
Pipe Data

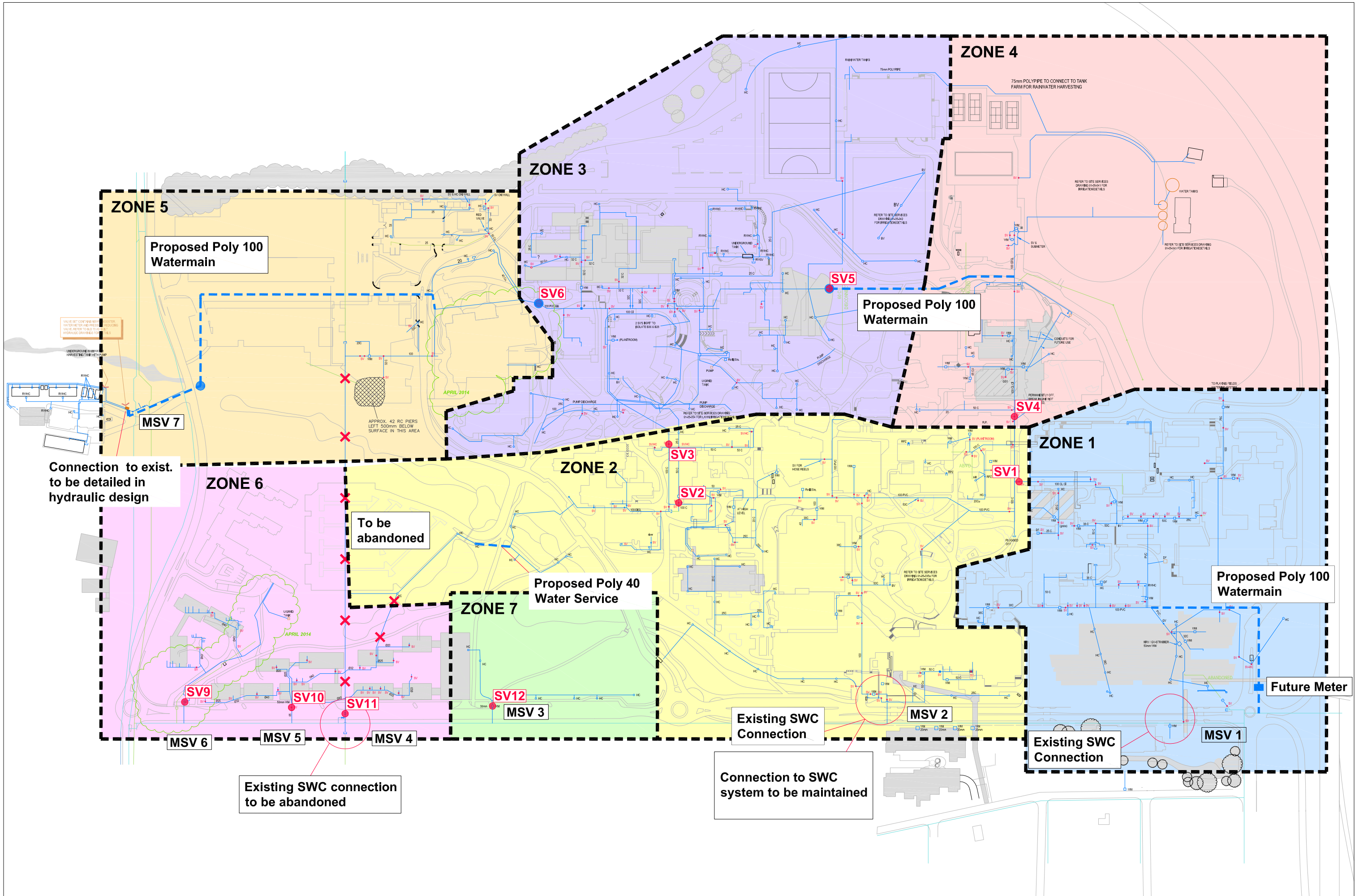
Network Table - Links

Link ID	Length m	Diameter mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe 18	133	100	-0.26	0.03	0.04
Pipe 38	10	100	0.28	0.04	0.04
Pipe 37	63	100	0.28	0.04	0.04
Pipe 6	344	150	0.99	0.06	0.06
Pipe 42	27	100	-0.47	0.06	0.11
Pipe 4	96	150	1.49	0.08	0.13
Pipe 41	60	100	0.53	0.07	0.13
Pipe 40	76	100	0.53	0.07	0.13
Pipe 3	300	150	1.99	0.11	0.22
Pipe 27	42	150	1.99	0.11	0.22
Pipe 39	85	100	-0.72	0.09	0.23
Pipe 16	183	100	0.74	0.09	0.25
Pipe 17	17	100	0.74	0.09	0.25
Pipe 7	316	150	-2.83	0.16	0.41
Pipe 5	132	100	0.99	0.13	0.43
Pipe 35	5	100	1.28	0.16	0.69
Pipe 33	5	100	1.28	0.16	0.69
Pipe 34	37	100	1.28	0.16	0.69
Pipe 36	66	100	1.28	0.16	0.69
Pipe 28	122	65	0.5	0.15	0.98
Pipe 26	50	65	0.5	0.15	0.98
Pipe 15	176	100	1.74	0.22	1.21
Pipe 19	20	100	-1.98	0.25	1.54
Pipe 20	115	100	-1.98	0.25	1.54
Pipe 2	1000	150	5.97	0.34	1.65
Pipe 8	1000	150	6.03	0.34	1.68
Pipe 14	72	100	2.21	0.28	1.89
Pipe 13	42	100	2.21	0.28	1.89
Pipe 12	28	100	2.21	0.28	1.89
Pipe 32	105	100	2.28	0.29	2.01
Pipe 21	56	100	-2.98	0.38	3.29
Pipe 9	84	100	3.21	0.41	3.77
Pipe 10	110	100	3.21	0.41	3.77
Pipe 11	73	100	3.21	0.41	3.77
Pipe 29	21	100	3.81	0.49	5.2
Pipe 31	174	100	3.81	0.49	5.2
Pipe 30	22	100	3.81	0.49	5.2
Pipe 22	68	100	-3.98	0.51	5.62
Pipe 24	50	100	-3.98	0.51	5.62
Pipe 25	60	100	-3.98	0.51	5.62
Pipe 23	30	100	-3.98	0.51	5.62

Appendix 3

Water Services Plan





Appendix 4

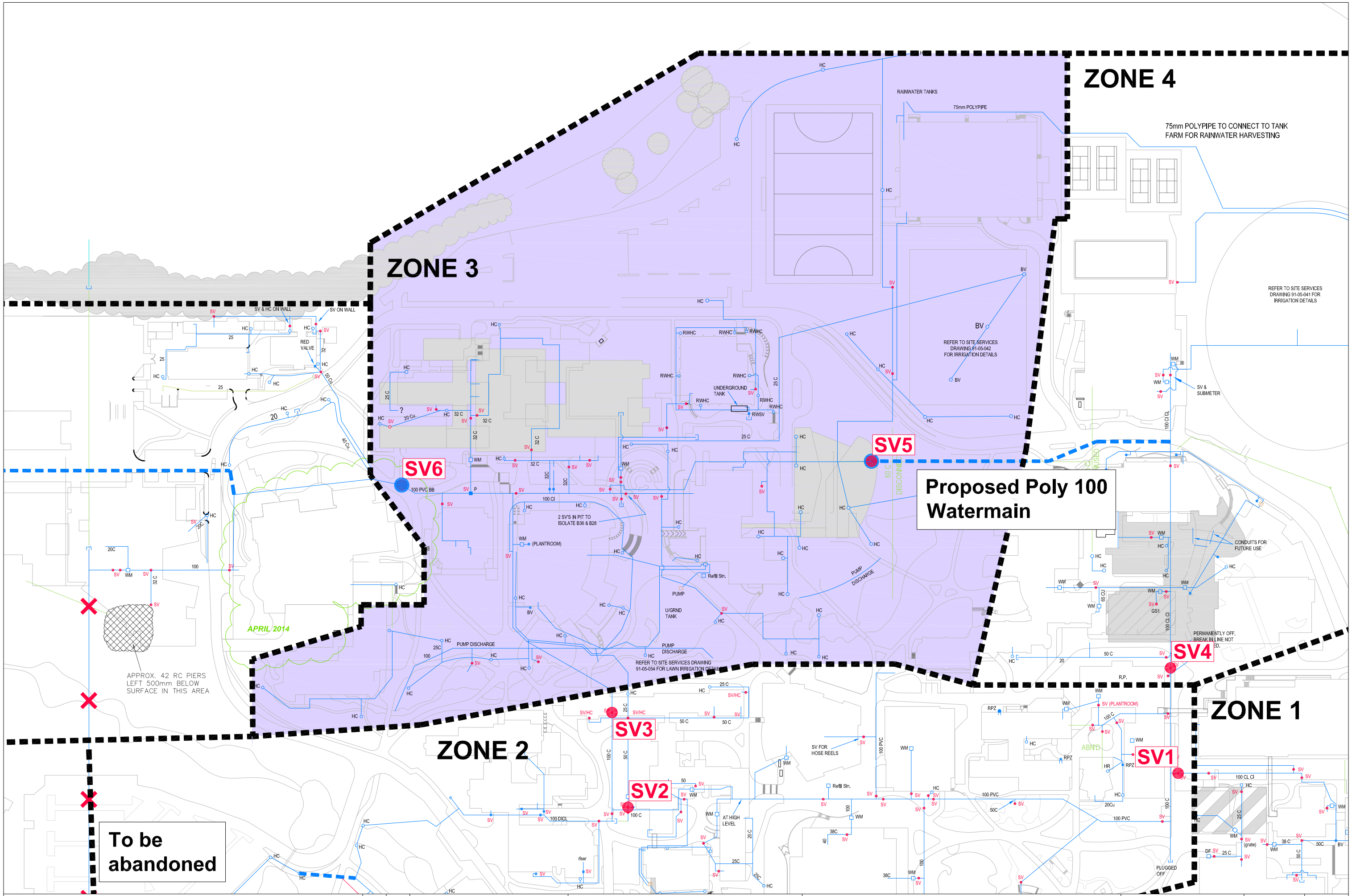
Shutdown Zone I

Appendix 5

Shutdown Zone 2

Appendix 6

Shutdown Zone 3



ISSUE	DATE	DESCRIPTION
14-A	7.4.14	REVISED AROUND BLD 68 & 21
13-A	20.06.13	REVISED AROUND ENGINEERING COURTYARD & BLD 70
12-E	12.11.12	SYDNEY WATER MAINS ADDED. LINES ADDED TO GRAD. HOUSE
12-D	03.07.12	REVISIONS AROUND MCKINNON LAWN UPGRADE

NOTE: ALL SERVICES SHOWN ARE INDICATIVE AND ARE PROVIDED FOR INFORMATION ONLY.
 PRIOR TO ANY DOCUMENTATION AND/OR SITE WORKS COMMENCING, ALL SERVICE LOCATIONS TO BE CONFIRMED IN CONSULTATION WITH THE UNIVERSITY.

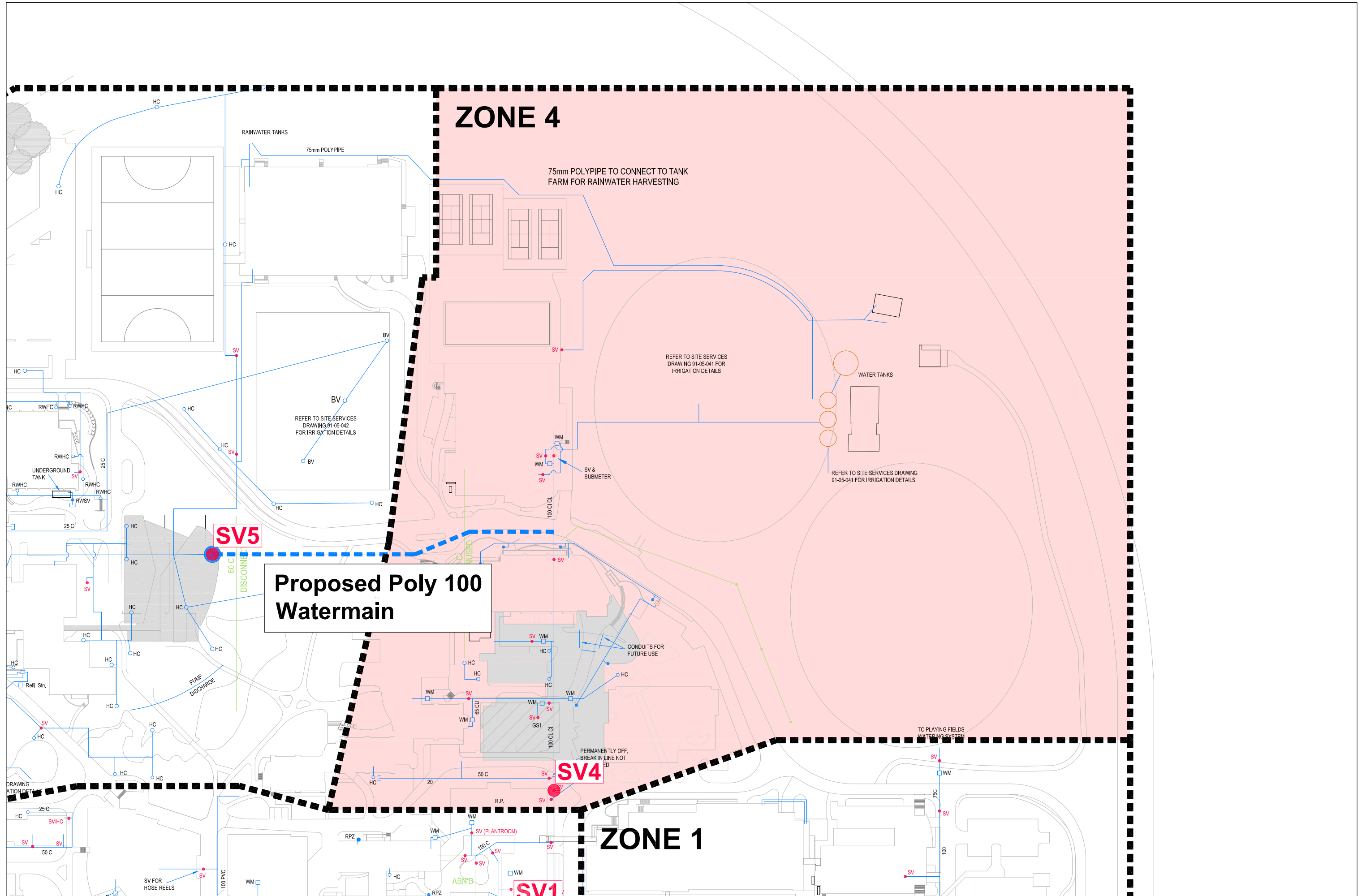
TITLE

WATER SERVICE

Scale 1:1500 (on A1 drawing)

Appendix 7

Shutdown Zone 4



Proposed Poly 100 Watermain

ZONE 4

ZONE 1

SV5

SV4

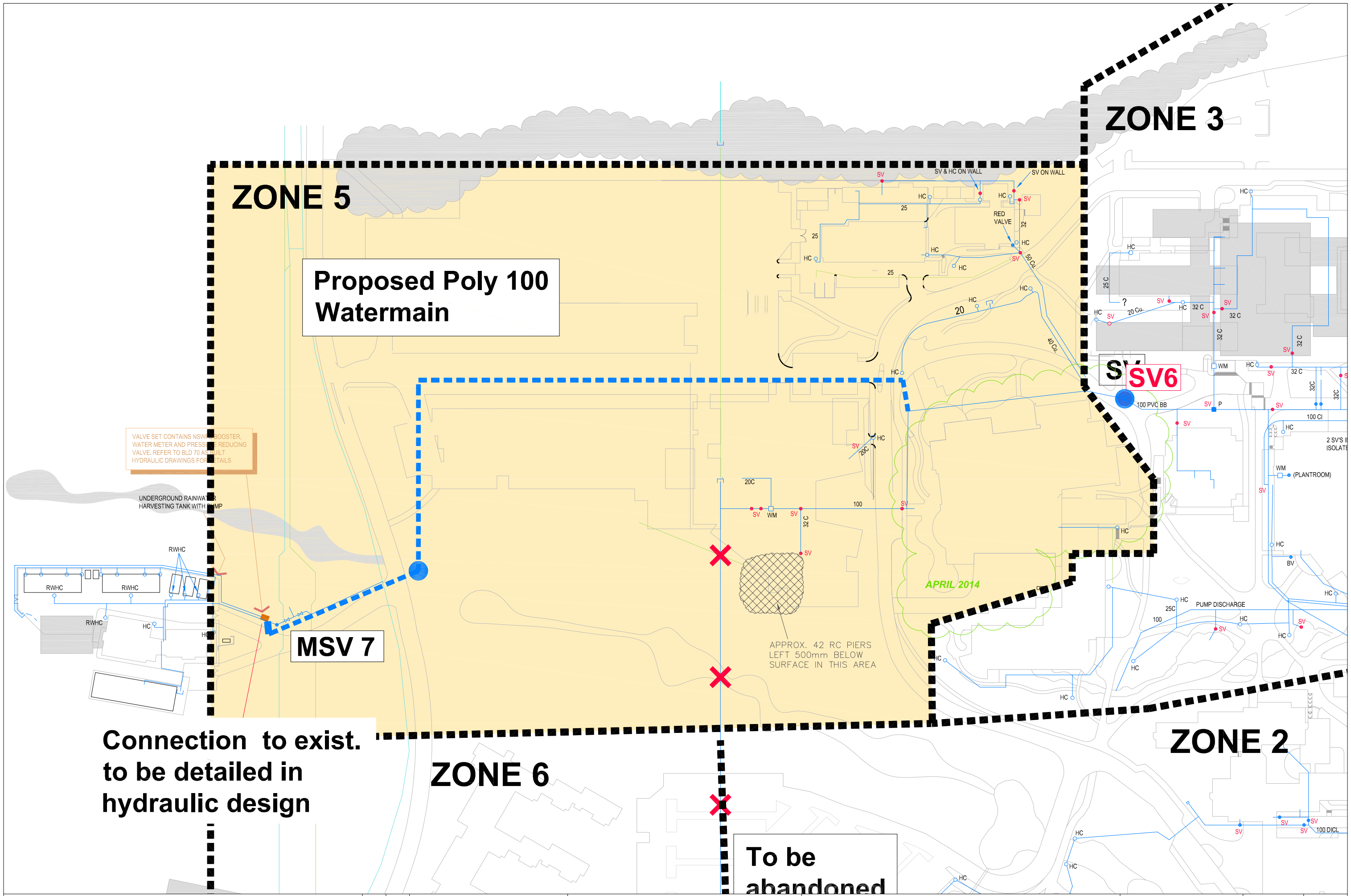
SV1

ISSUE	DATE	DESCRIPTION
14-A	7.4.14	REVISED AROUND BLD 68 & 21
13-A	20.06.13	REVISED AROUND ENGINEERING COURTYARD & BLD 70
12-E	12.11.12	SYDNEY WATER MAINS ADDED. LINES ADDED TO GRAD. HOUSE
12-D	03.07.12	REVISIONS AROUND MCKINNON LAWN UPGRADE

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Appendix 8

Shutdown Zone 5

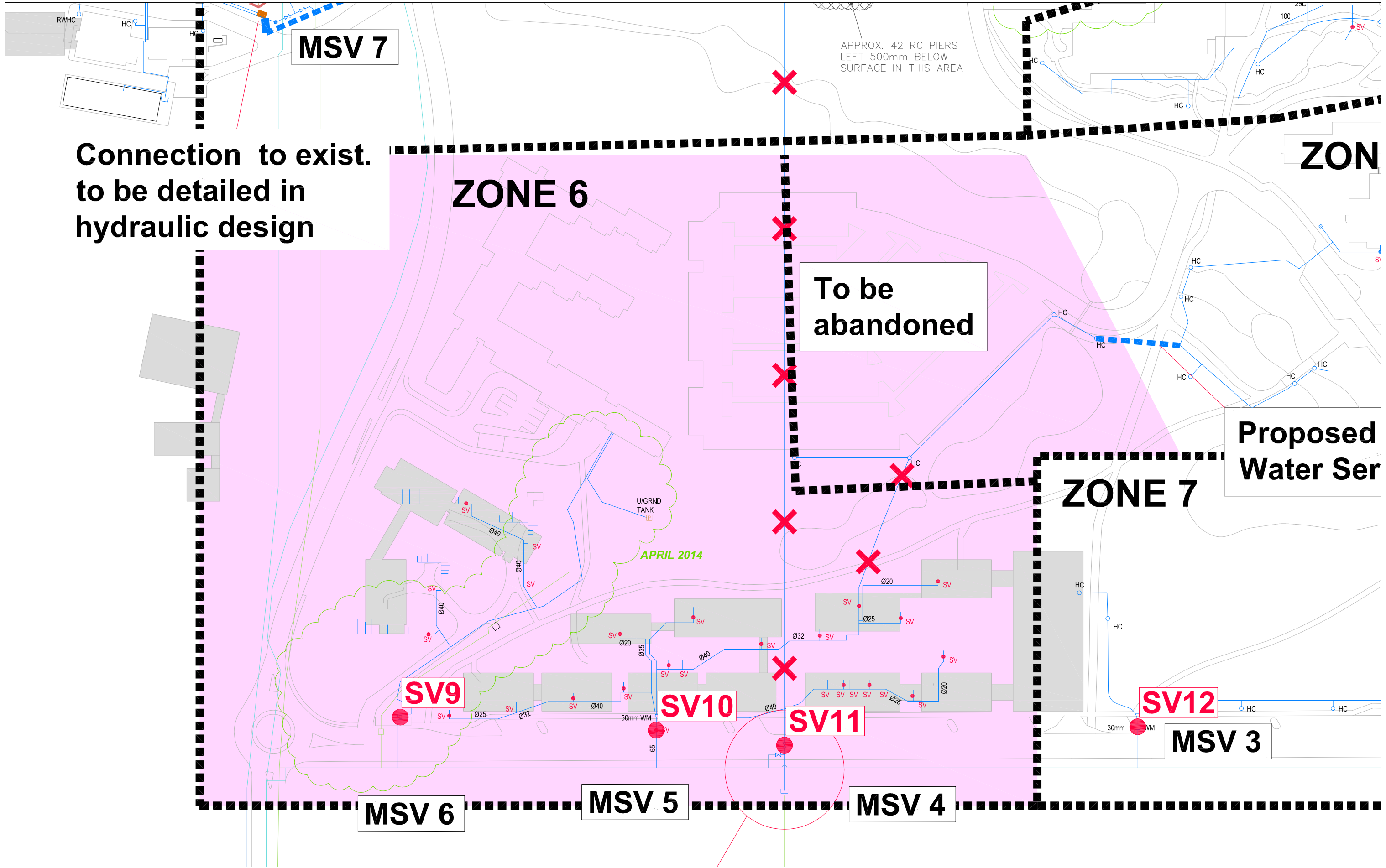


ISSUE	DATE	DESCRIPTION
14-A	7.4.14	REVISED AROUND BLD 68 & 21
13-A	20.06.13	REVISED AROUND ENGINEERING COURTYARD & BLD 70
12-E	12.11.12	SYDNEY WATER MAINS ADDED. LINES ADDED TO GRAD. HOUSE
12-D	03.07.12	REVISIONS AROUND MCKINNON LAWN UPGRADE

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Appendix 9

Shutdown Zone 6



MSV 7

Connection to exist.
to be detailed in
hydraulic design

ZONE 6

To be
abandoned

ZONE 7

Proposed
Water Ser

ZONE 7

SV9

SV10

SV11

SV12

MSV 3

MSV 6

MSV 5

MSV 4

NOTE: ALL SERVICES SHOWN ARE INDICATIVE AND ARE PROVIDED FOR INFORMATION ONLY. PRIOR TO ANY DOCUMENTATION AND/OR SITE WORKS COMMENCING, ALL SERVICE LOCATIONS TO BE CONFIRMED IN CONSULTATION WITH THE UNIVERSITY.

WATER SERVICE

Scale 1:1500 (on A1 drawing)

ISSUE **14-A** SHEET SIZE **A1**

ISSUE	DATE	DESCRIPTION
14-A	7.4.14	REVISED AROUND BLD 68 & 21
13-A	20.06.13	REVISED AROUND ENGINEERING COURTYARD & BLD 70
12-E	12.11.12	SYDNEY WATER MAINS ADDED. LINES ADDED TO GRAD. HOUSE
12-D	03.07.12	REVISIONS AROUND MCKINNON LAWN UPGRADE

Appendix 10

Shutdown Zone 7

TO be abandoned

Proposed Poly 40 Water Service

ZONE 7

SV11

SV12

MSV 3

MSV 4

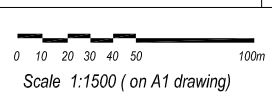
Connection

UNIVERSITY OF WOLLONGONG
 FACILITIES MANAGEMENT DIVISION
 NORTHFIELDS AVENUE, WOLLONGONG NSW 2522
 Ph. (02) 4221 3555 www.uow.edu.au

ISSUE	DATE	DESCRIPTION
14-A	7.4.14	REVISED AROUND BLD 68 & 21
13-A	20.06.13	REVISED AROUND ENGINEERING COURTYARD & BLD 70
12-E	12.11.12	SYDNEY WATER MAINS ADDED. LINES ADDED TO GRAD. HOUSE
12-D	03.07.12	REVISIONS AROUND MCKINNON LAWN UPGRADE

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TITLE
WATER SERVICE



ISSUE
14-A
 SHEET SIZE
A1

Appendix I I

Water Demand and Sewer Loading Calculations

PROJECTED WATER AND SEWER USAGE

Sydney Water Sewer Discharge 78%

Date	Water usage (Kl)	Days	Kl/Day	Sewer Discharge
3/6/13 - 1/7/13	9344	28	333.7143	260.2971
1/7/13 - 1/8/13	10387	31	335.0645	261.3503
1/8/13 - 2/9/13	13841	32	432.5313	337.3744
1/10/13 - 1/11/13	16858	31	543.8065	424.1690
1/11/13 - 2/12/13	12767	31	411.8387	321.2342
2/12/13 - 2/1/14	11508	31	371.2258	289.5561
2/1/14 - 3/2/14	11746	32	367.0625	286.3088
3/2/14 - 3/3/14	9402	28	335.7857	261.9129
3/03/14 - 1/4/14	12279	29	423.4138	330.2628
1/4/14 - 1/5/14	11536	30	384.5333	299.9360
1/5/14 - 2/6/14	14407	32	450.2188	351.1706
TOTAL	134075	335	400.2239	312.1746

Peak daily usage - 543.8 Kl

Total University occupancy

Current	20,000
Projected (15 yrs)	30,000

Average daily water use/occupant (L)		Average daily sewer discharge/occupant (L)		
Current	20.01119	Current	15.60873	0.78
Peak daily water use/occupant (L)		Peak daily sewer discharge/occupant (L)		
Current	27.19032	Current	21.20845	0.78
Projected average daily water use (Kl)	600.3358	Projected average daily sewer discharge (Kl)	468.2619	0.78
Projected peak daily water use (Kl)	815.7097	Projected peak daily sewer discharge (Kl)	636.2535	0.78
Projected average water use (l/s)	6.948331	Projected average annual sewer discharge (Kl)	93652.39	
Projected peak water use (l/s)	12.58811	Projected peak daily sewer discharge (l/s)	7.364046	