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RIDBC SERVICES RPT

DESIGN | PROJECT MANAGEMENT | CIVIL | WATER | INFRASTRUCTURE | HYDRAULIC | FIRE | TECHNICAL ADVICE

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ROYAL INSTITUTE FOR DEAF & BLIND CHILDREN
MACQUARIE UNIVERSITY, SYDNEY

INFRASTRUCTURE MANAGEMENT PLAN

Revision No.	Status	Issue Date	Prepared By	Reviewed By	Approved By
A	Coordination	27/09/2020	LP / WW	LP	
B	For Client Review	02/10/2020	LP	LP	
C	For Client Review	8/10/2020	LP	LP	
D	SSDA Issue	11/11/20	LP	LP	LP

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1.0 INTRODUCTION AND OVERVIEW

The RIDBC is Australia's largest non-government not-for-profit provider of therapy, education and cochlear implant services for children and adults with vision or hearing loss. Established in 1861 as a school with residential facilities, the RIDBC moved to North Rocks in 1961, where the main campus is still located. The RIDBC Mission is to provide quality and innovative services, to achieve the best outcomes for current and future generations of Australians with vision and/or hearing loss.

RIDBC provides a broad range of specialist services which include :-

- Early Intervention;
- Allied Health & Therapy;
- Cochlear Implant Program;
- Schools (pre-school, primary to secondary programs);
- Research & Professional Education;
- School support; and
- Paediatric Audiology

The services provided are delivered by a broad group of professionals including: teachers, speech pathologists, occupational therapists, audiologists, orthoptists, psychologists, social workers, technology consultants, physiotherapists, Ear, Nose and Throat (ENT) surgeons and more.

As part of the RIDBC's 2016-2020 Strategic Intent it will relocate its school and clinical services activities from North Rocks to a purpose-built centre at Macquarie University (MQU). The new Centre of Excellence will further strengthen the relationship between MQU and the RIDBC, benefit the Australian Hearing Hub, and reinforce the cluster of research, audiology, and healthcare which already exists on the campus, which also includes the Cochlear Global headquarters.

The Centre of Excellence will serve a diverse range of employees, students, users and visitors who will visit the centre for diagnostic services, therapy and rehabilitation, research, education, and co-related services. The centre will provide an intricate design response to the needs of the users, in particular children and adults with vision and hearing loss and other cognitive impairments.

The proposed development generally seeks consent for the construction and operation of the new purpose-built 1-3 storey (including basement level) Centre of Excellence across two interconnected pavilions at the corner of Culloden and Gymnasium Road within the MQU Campus. The development includes :-

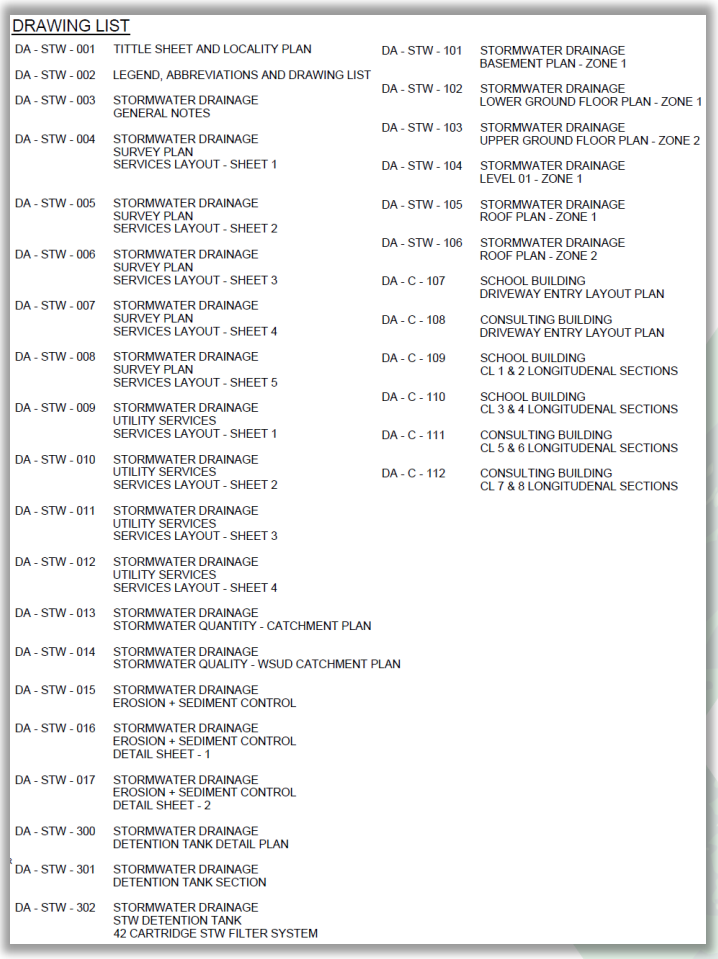
- Pre-School and School accommodation for up to 80 pre-school children and up to 120 school children in a single storey pavilion addressing Culloden Road; and
- The main RIDBC building (accommodating approximately 260 staff) of up to three storeys, including basement level :-

- Public areas for staff and visitors;
- RIDBC Renwick Centre classrooms (doubling also as conferencing facilities) and a business hub;
- Medical Facility for various clinical services; and
- RIDBC Renwick Centre resource centre; use between RIDBC Renwick Centre staff, clinicians and pre-school / primary school teaching staff.

In accordance with Schedule 1 (clause 15(1)) of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), the development qualifies as State Significant Development (SSD) as it is a development for the purpose of a new school (regardless of the capital investment value). The Secretary's Environmental Assessment Requirements (SEARs) for the development were issued on 6 May 2020 setting out the documentary and reporting requirements for the preparation of the EIS / DA.

This report discusses the treatment and location of internal site services for the proposed development and the management of external overland flows generated by land and roadways sloping towards the development from the west and northwest.

The following engineering drawings have been prepared by LP Consulting Australia (LPCA) in support of the architectural drawings prepared by Architects, WMK Architecture : -



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DA - STW - 003	STORMWATER DRAINAGE GENERAL NOTES
DA - STW - 004	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 1
DA - STW - 005	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 2
DA - STW - 006	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 3
DA - STW - 007	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 4
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Figure 1 Drawing List

This report addresses the following key areas:-

1. Sears Conditions 14, 16, 17 and 20
2. Flood effects and overland flow paths relevant to the development location that are to be considered.
3. Controlled discharge of the developed site runoff is to be applied with a stormwater detention system in accordance with City of Ryde Council requirements.
4. Runoff from ground surface areas of the development is to be collected by the site stormwater drainage and directed to the underground detention storage tank (and eventually into Mars Creek) located to the east of the development
5. The roof drainage system is to be reticulated separately to an underground retention storage tank to be utilised for landscape irrigation to Council requirements.
6. Treatment of site stormwater and disposal point of stormwater volumes shall be connected to existing University Street system kerb inlet pit.
7. During construction the control of soil movement and erosion is to be carried out by temporary measures such as sediment fencing and a gravel layer positioned at the vehicular access point to the site.
8. External site infrastructure services shall be documented. These services shall include Sydney Water, Jemena, Ausgrid and NBN.
9. Site vehicular access and parking shall be documented to accommodate the required vehicle use for the facility and as required by Council.
10. Wet fire services as highlighted as fire sprinklers, fire hydrants and fire hose reels.
11. Internal building potable hot, warm and cold water services shall be connected to existing Authority infrastructure.

2.0 ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Reference is made the Planning Secretary's Environmental Assessment Requirements, appended below :-

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979*
Schedule 2 of the Environmental Planning and Assessment Regulation 2000

Application Number	SSD-10451
Project Name	RIDBC Centre for Excellence
Location	Culloden Road, Macquarie University
Applicant	Royal Institute For Deaf And Blind Children
Date of Issue	6 May 2020
General Requirements	The environmental impact statement (EIS) must be prepared in accordance with, and meet the minimum requirements of clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (the Regulation). Notwithstanding the key issues specified below, the EIS must include an environmental risk assessment to identify the potential environmental impacts associated with the development.

14. Utilities

- Prepare an Infrastructure Management Plan in consultation with relevant agencies, detailing information on the existing capacity and any augmentation and easement requirements of the development for the provision of utilities including staging of infrastructure.
- Prepare an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design.

16. Drainage

- Detail measures to minimise operational water quality impacts on surface waters and groundwater.
- Stormwater plans detailing the proposed methods of drainage without impacting on the downstream properties.
- The Stormwater Management Plan is to be prepared in accordance to the provisions contained in Part 8.2 - Stormwater and Floodplain Management and the associated Technical Manual contained in Council's Development Control Plan 2014 and having regard to the controls related to OSD and WSUD which are applicable to the site.
- Detail on site water capture and re-use opportunities for both sewer and rainwater to minimise discharge and maximise retention.

17. Flooding

Identify flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (DIPNR, 2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation.

20. Sediment, Erosion and Dust Controls

- Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles.
- Map the following features relevant to water and soils:
  - acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map).
  - rivers, streams, wetlands, estuaries (as described in s4.2 of the BAM).
  - wetlands as described in s4.2 of the BAM.
  - groundwater.
  - groundwater dependent ecosystems.
  - proposed intake and discharge locations.

Relevant Policies and Guidelines:

- Managing Urban Stormwater - Soils & Construction Volume 1 2004 (Landcom).
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2017 (EPA).
- Guidelines for development adjoining land managed by the Office of Environment and Heritage (OEH, 2013).

Figure 2-Sear Conditions

3.0 THE RIDBC SITE LOCATION AND TOPOGRAPHY

The RIDBC site is located within the Macquarie University campus generally as depicted in the image below.

Figure 3-Site location

The subject site is located south of Gymnasium Road, east of Culloden Road and west of West Precinct Road. The proposed development is an educational building with an upper ground floor level of 78.50m AHD which front Culloden Road and consulting building fronting Gymnasium Road at FFL 76.50m AHD

The survey of the existing site for the development is shown in the plan image below : -

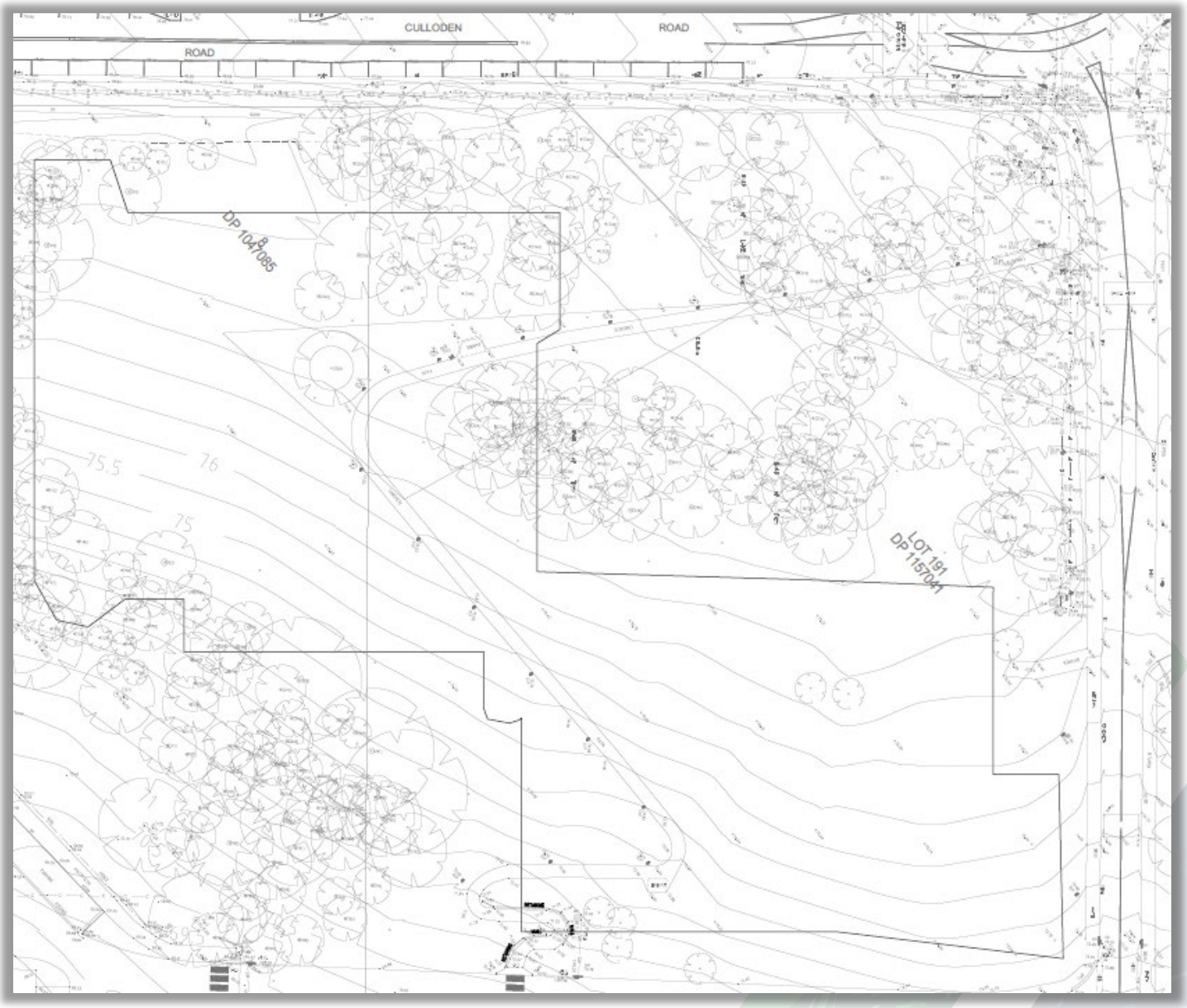


Figure 4-Site survey of Proposed development site Location

The existing topography in and around the property generally directs stormwater runoff in an easterly direction.

The site falls to the east at a grade of approximately 4.50 %.

The attached Survey plan outlines the location and type of existing Authority services in Culloden Road and Gymnasium Road.

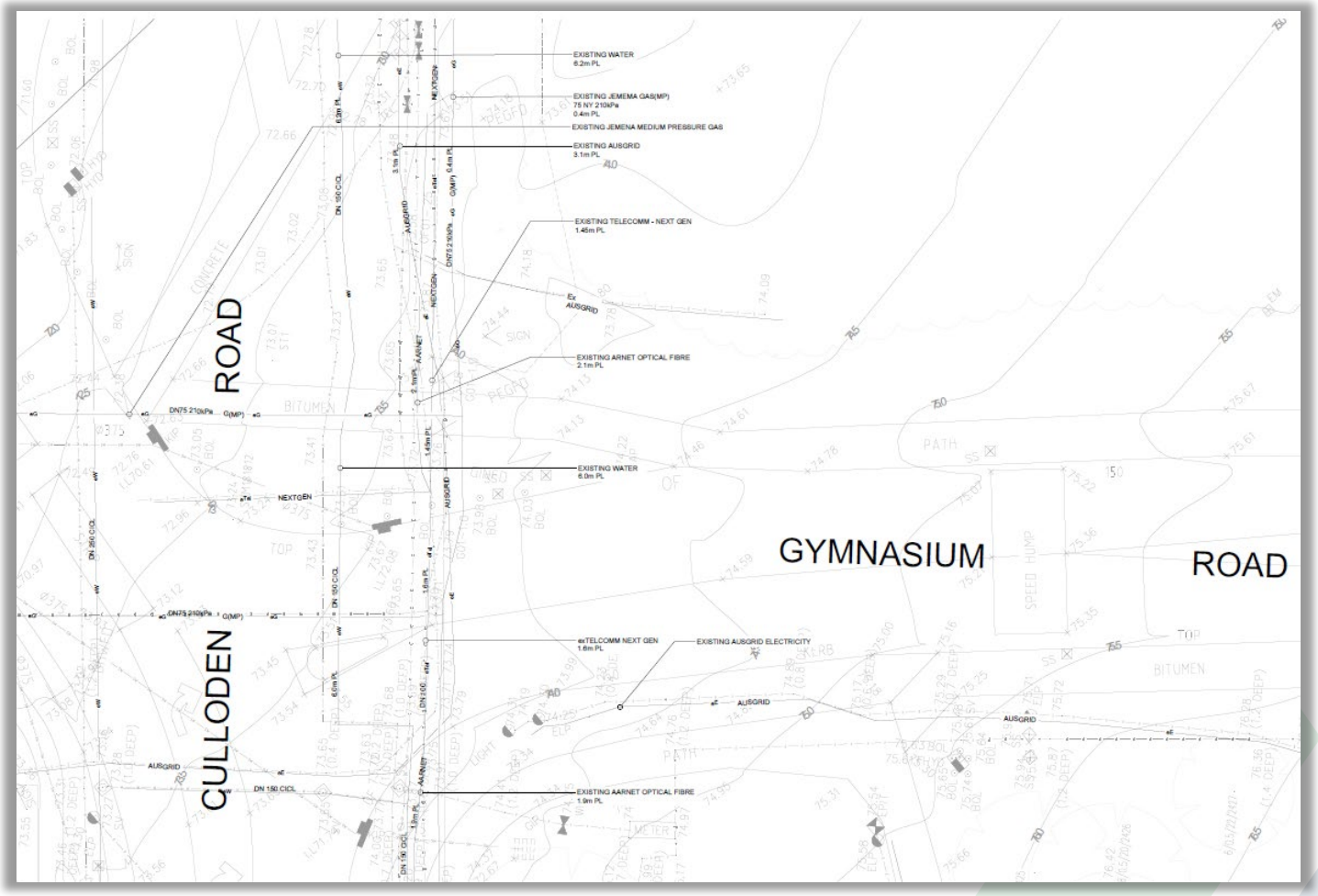


Figure 5-Existing Survey & Location of existing Authority Services

4.0 ARCHITECURAL DA SCHEME

Figure 6-Proposed Architectural design

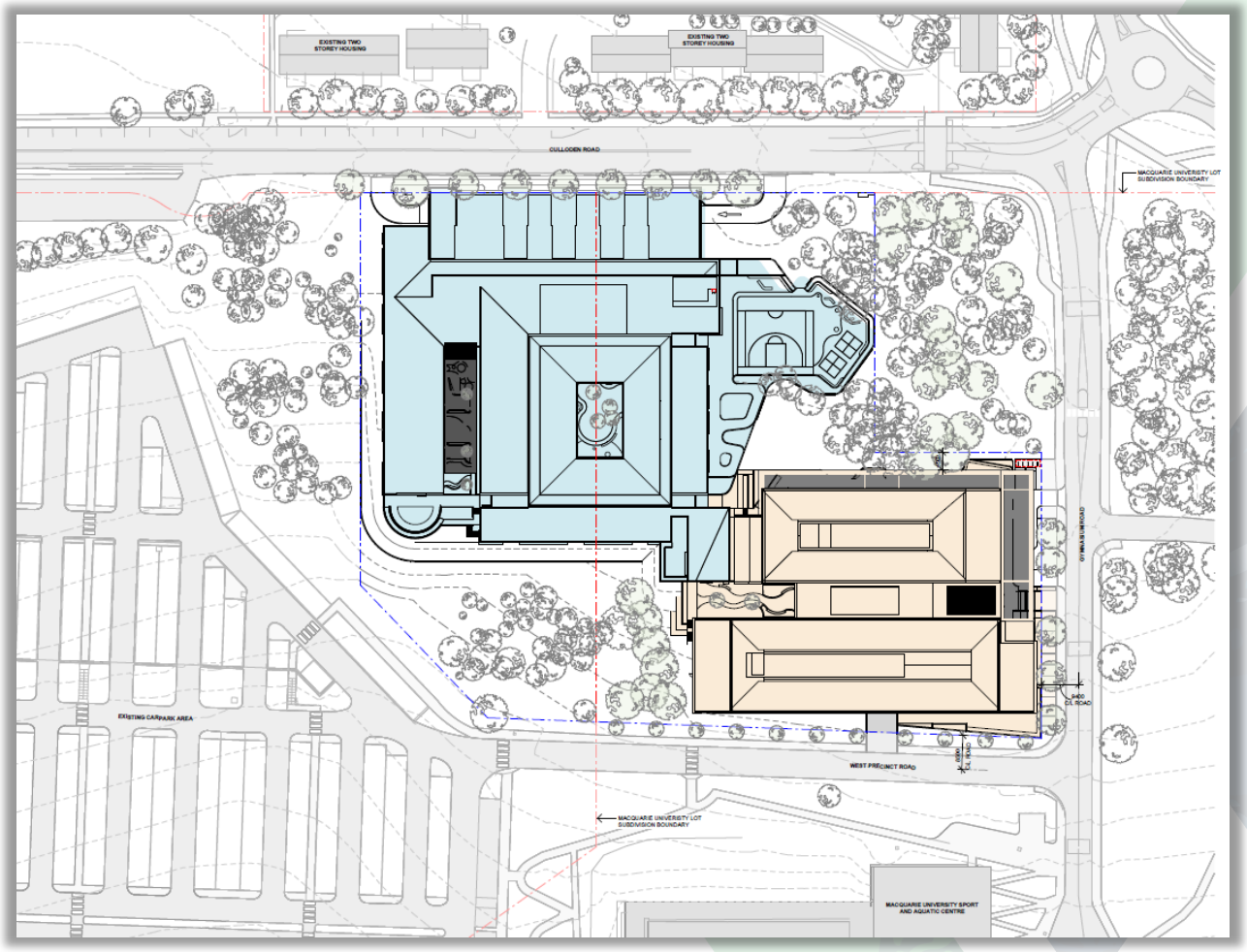


Figure 7-Site Plan

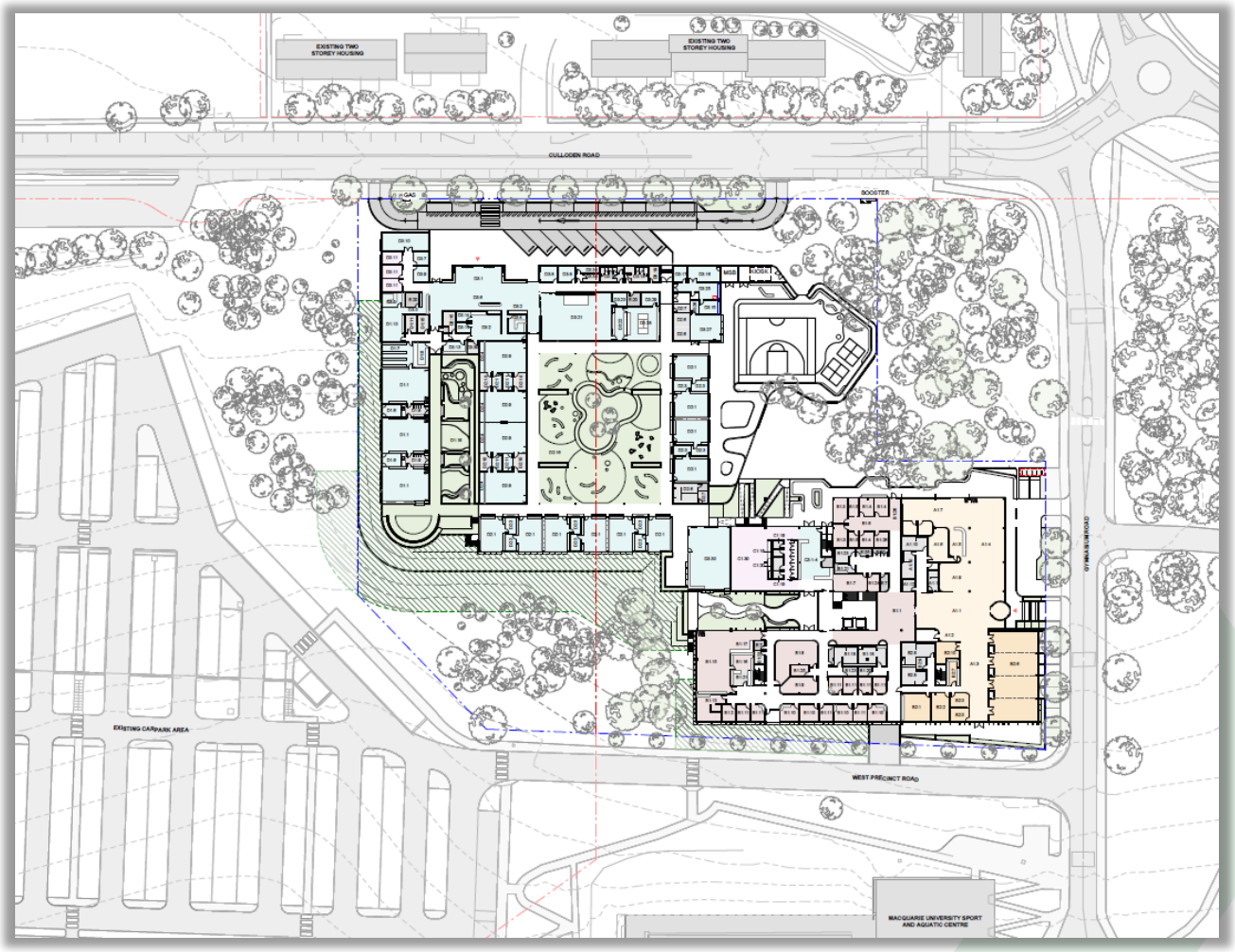


Figure 8-Upper and Lower Ground Floor

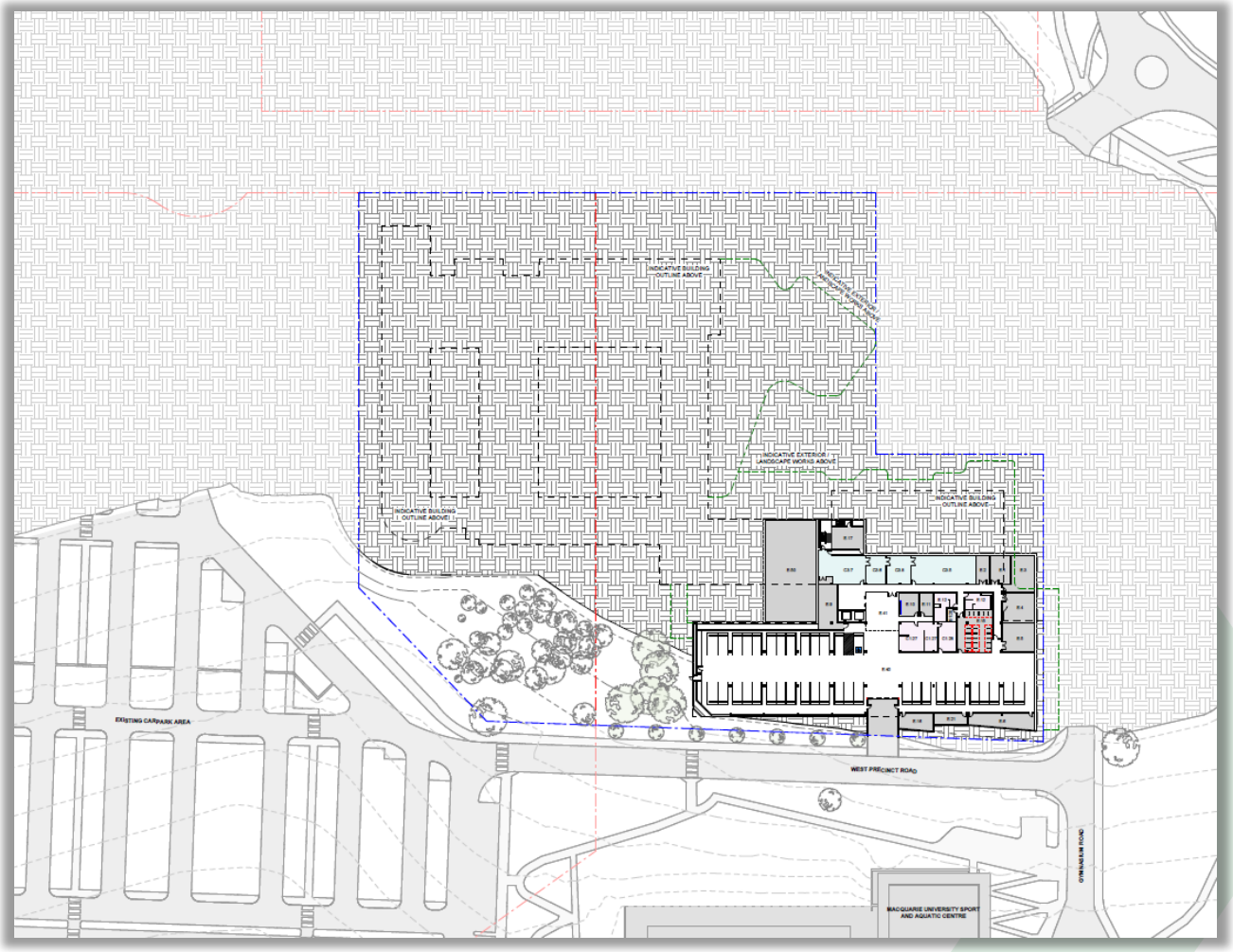


Figure 9-Basement Carpark

The proposed development is an Educational Facility over three levels.

The upper ground level contains Administration, and schooling for primary school aged students.

Lower ground level contains Teacher Services and schooling for infants aged students.

The Basement level contains vehicle parking for over forty cars.

5.0 FLOOD EFFECTS AND OVERLAND FLOW

The Image below is an extract taken from the report by Bewsher Consulting Pty Ltd, dated February 2011.

The subject site is located approximately 200m west of the Mars Creek catchment and flood corridor. We understand from real survey that the 1% AEP flood level is approximately

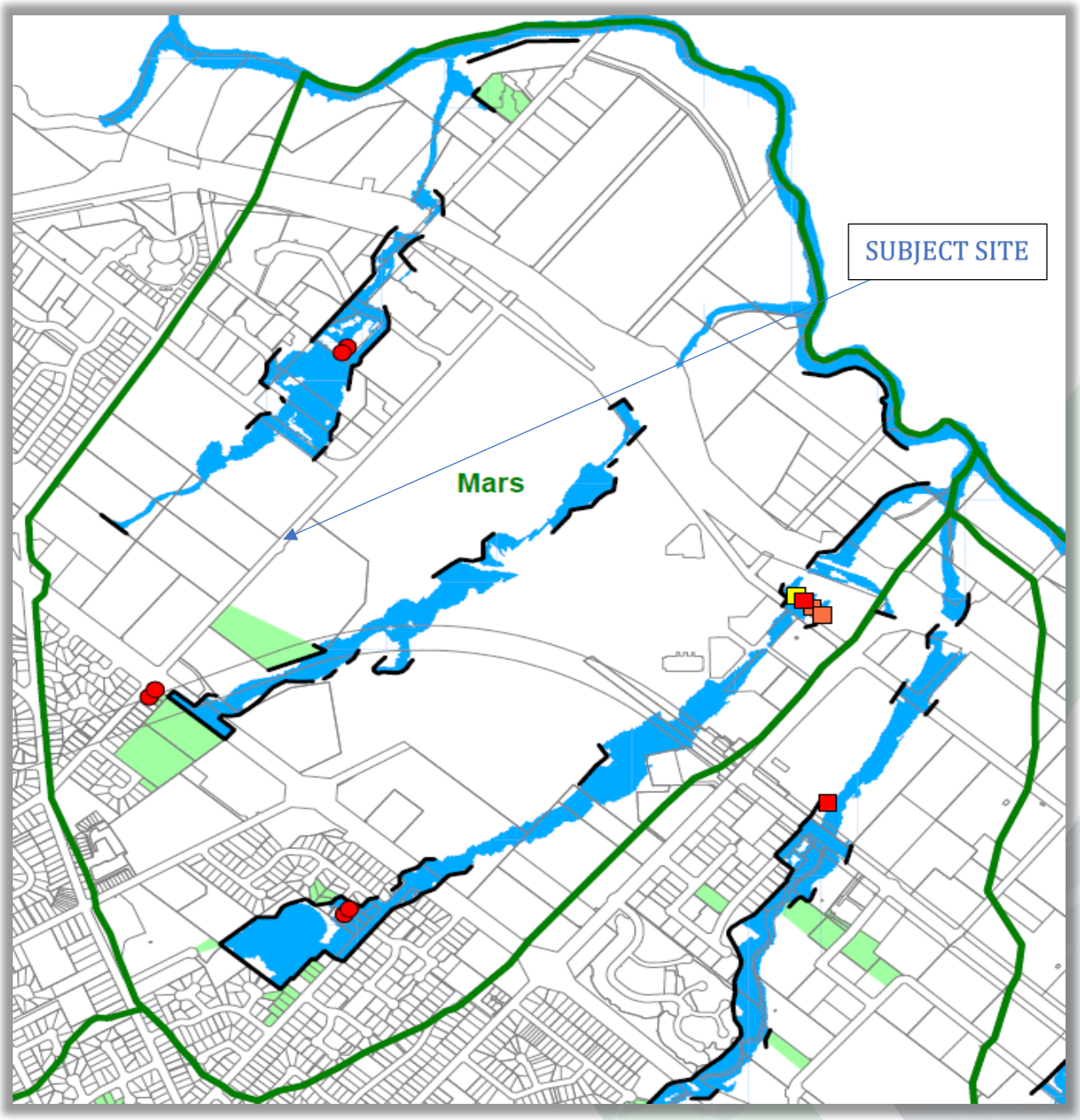


Figure 10-100 Year Flood Event from report edited by Bewsher Consulting Pty Ltd - February 2011

The site is not flood affected and the flood planning level adjacent to the our site is not higher than FL 58.00m AHD

6.0 ON-SITE DETENTION STORAGE - HYUDROLIC AND HYDRAULIC ANALSYS

On Site Stormwater Detention is required to be provided in accordance with Ryde City Council, Water Sensitive Urban Design Guidelines, rainwater shall be collected from roof structures via downpipes and piped to a rainwater storage tank for reuse as site irrigation.

In heavy rain events, overflows from the rainwater tank will be directed to on site detention tanks and ultimately to the existing Macquarie University stormwater infrastructure.

Ground surface rainwater and stormwater will be collected by surface stormwater pits and piped to an underground detention tank. The stormwater detention tank will be sized in accordance with Ryde Council Detention Policy.

1.4 Onsite Stormwater Detention (OSD) Systems

An onsite detention (OSD) system seeks to mitigate the increasing rate of stormwater runoff generated by ongoing development in the City of Ryde catchment area.

OSD systems are designed to counteract the effect of each development within a catchment by restricting the rate of stormwater runoff discharged during large storm events. This restricted discharge rate requires a "buffer" storage tank/ basin to detain stormwater before slowly releasing it to the public drainage system. Typical OSD systems are shown in Figure 1-6 and Figure 1-7.

1.4.2 General OSD Design Requirements

The following general requirements apply in the design of OSD systems.

a) The OSD system should be located prior to the point of discharge, generally in the lowest point of the site and located in a common area to facilitate access. This can possibly include a car park, open space area or even roof top areas where no underground storage is possible.
b) As much as possible of the site area is to drain through to the OSD system(s). A portion of the impervious area may discharge directly to Council's system if it cannot be drained to the storage facility, provided the PSD is reduced and SRR increased to compensate for the smaller catchment.
c) The maximum desirable extent of impervious surfaces bypassing the OSD system is 25% of the total impervious site area.
d) Where is it proposed for the site to discharge to the kerb and gutter, the PSD shall be restricted to 30L/s.
e) A positive covenant must be executed and registered against the title of the lots containing OSD systems to require maintenance of the system. This positive covenant must be on any linen plans for subdivision of the development. If no subdivision is proposed, the covenant shall be prepared prior to finalisation of the development.

1.4.4 OSD Design - Detailed Method

The detailed method must be used in the following circumstances;

- Where the development does not satisfy the requirements for the simplified method above.
- Where Council considers the nature of the receiving system is too sensitive to warrant the simplified approach.
- Where the site conditions vary from those given in the simplified method.

The OSD must be designed to ensure the level of stormwater runoff discharged from the area of development must not to exceed the peak stormwater discharge arising from the post-developed works, during a 5 year ARI storm event.

CRITICAL OSD REQUIREMENT

To restrict post development flows to pre-development levels a detention basin for the design storms will be required to be modelled. Computational methods based on the approximate triangular method or the rational methods are not acceptable. It is recommended that a program in accordance with Section 3.1 is used.

In cases where the site proposes discharge to the kerb and gutter, the point of discharge is to be limited to 30L/s in accordance with Section 1.3.1.

If the rate of discharge from the outlet of the OSD system is affected by tail water conditions from the receiving system, for example where the invert level of the orifice is lower than the surface level at the point of connection into the existing drainage system, then full hydraulic calculations will be required in accordance with Section 5 of this Manual.

Figure 11-Ryde Council On Site Detention General requirements

As the site exceeds 3000m2 the Detailed method has been adopted and the requirement for flow attenuation of peak discharges for all events upto the 1% AEP storm are limited to the 20% AEP for the development site with no OSD attenuation.

For the purposes of this analysis the applicable catchment area is presented below in Figure 11.

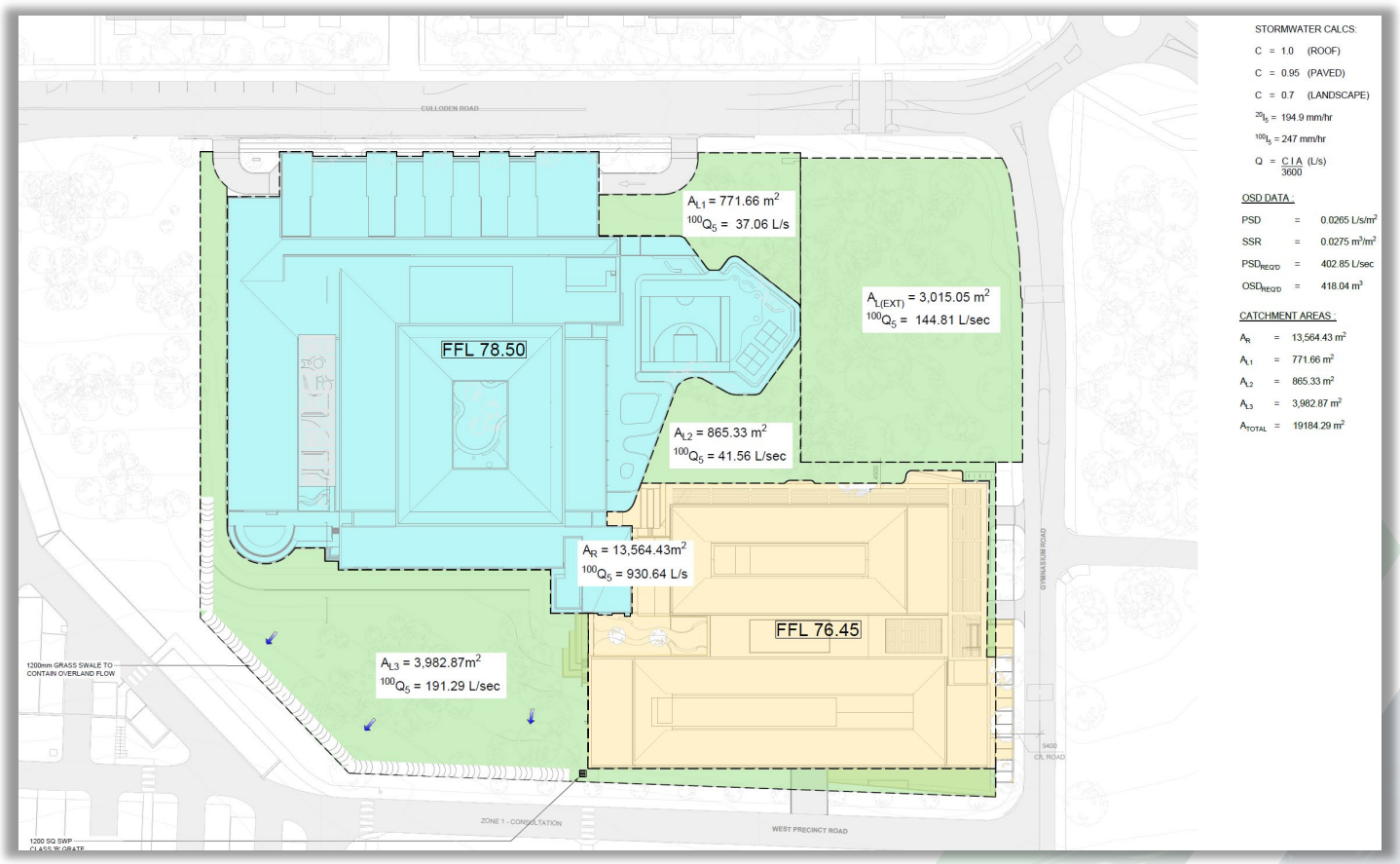


Figure 12-Stormwater Quantity Catchment Plan

A DRAINS model was created for the site catchment based on real survey. The DRAINS model for the developed site condition was analysed for the 5,20 and 100 Year ARI Storm event. The following characteristic factor values were used in the model: :-

- Paved area depression storage 1mm
- Grassed area depression storage 5mm
- Soil Type 3
- Antecedent Moisture Content (AMC) 3

The times of concentration were calculated using the Kinematic Wave Equation by the DRAINS software. Flow length, slope of the catchment, impervious and pervious percentage and roughness were input into each catchment node to determine the time of concentration for each sub-catchment. The DRAINS model node diagram and results are shown in Appendix B

Overflow and tank discharge will be directed and connected to the existing Macquarie University kerb inlet pit systems located on the western kerbline within West Precinct Road which are located downhill of the Consulting building.

The full results of the analysis are attached in Appendix 2 and the results are appended below:-

The model was run to simulate the 20% AEP storm event across all durations. The resulting peak discharge is presented below in Figure 13 and equals 0.57 cumecs.

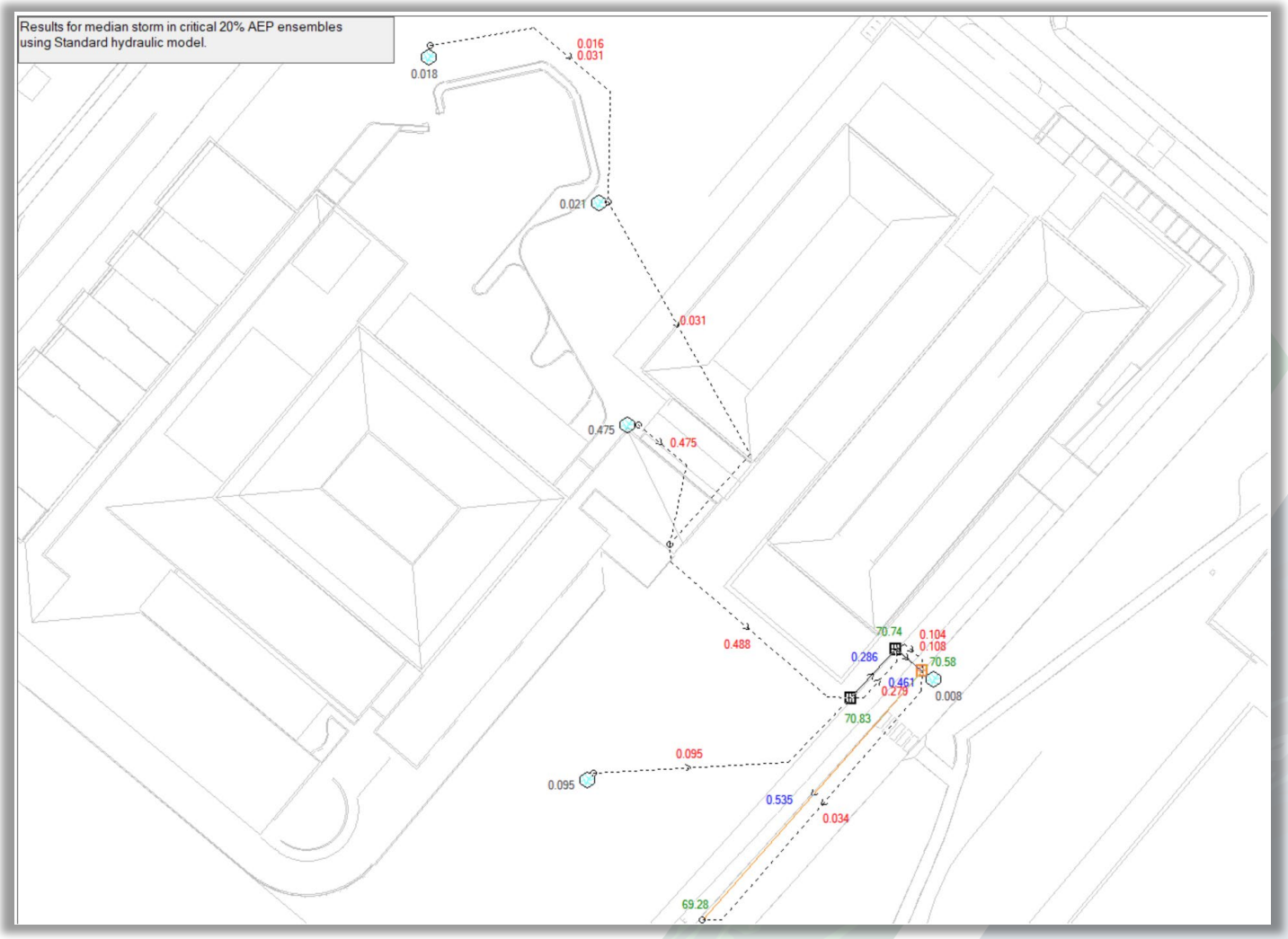


Figure13-Results diagram for 20% AEP storm peak discharges (N0 OsD)

A post development model was setup to reticulate the 1% AEP development site flows and provide a compliant OSD system that was capable of attenuating peak discharges to the 20% AEP discharge with NO OSD. The resultant peak discharge is presented below in Figure 14 and equals 0.57 cumecs.

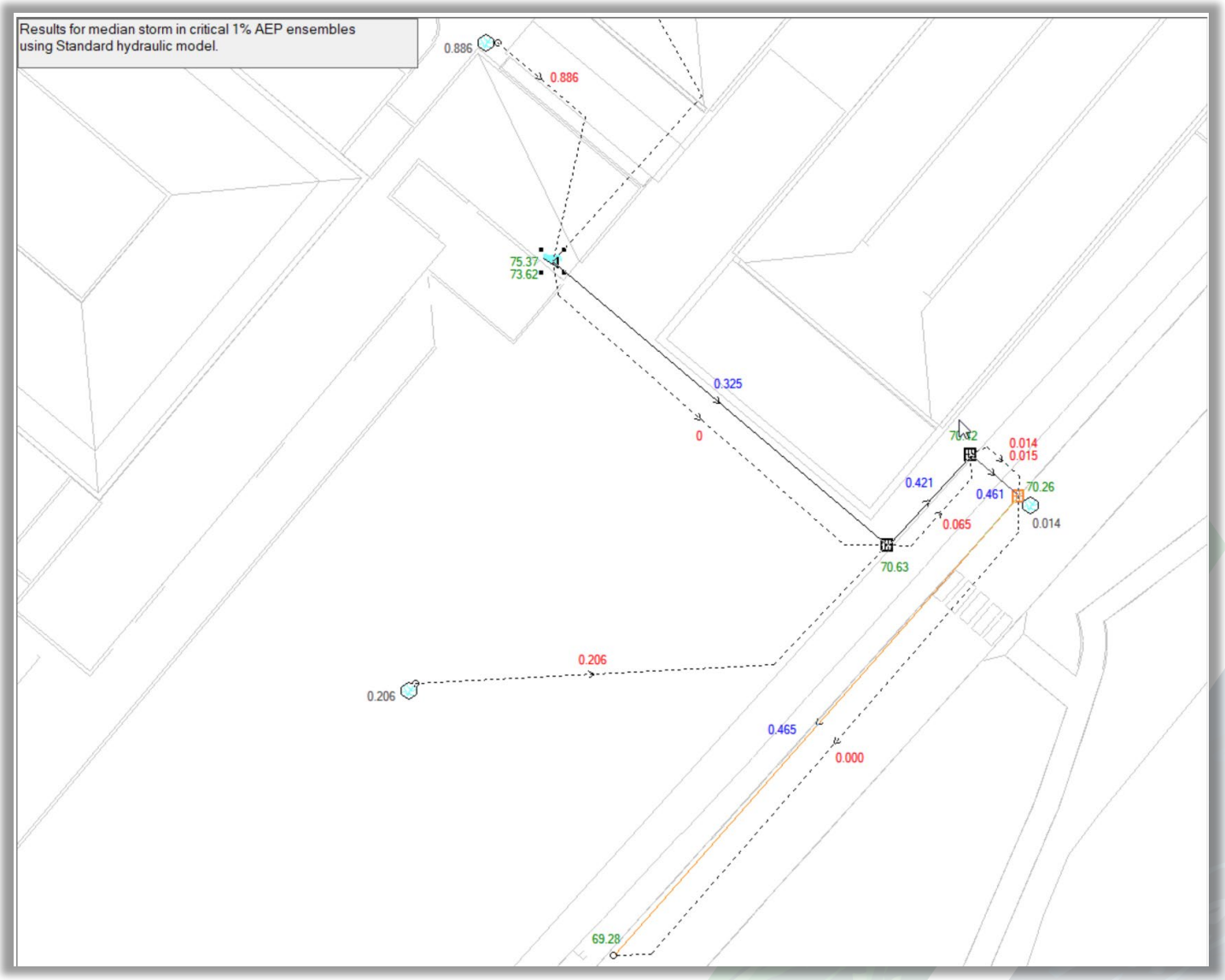


Figure 14- Results diagram for 1% AEP storm peak discharges with OSD

As a result of the detailed analysis the model has computed a storage volume of 380.42 m^3.

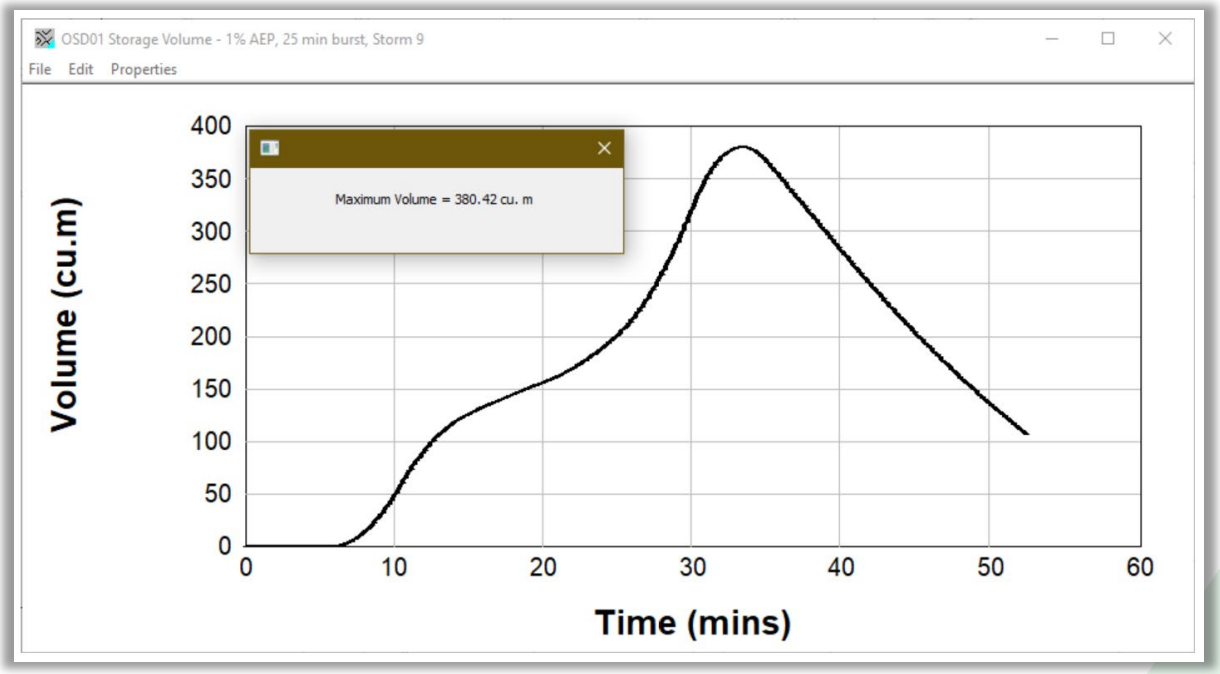


Figure 1511-OSD storage volume results and hydrograph

The resultant peak HGL within the OSD tank are presented and are the peak HGL equals 75.37m AHD. Also refer to Drawing DA-STW-301 for the elevation of the OSD tank structure.

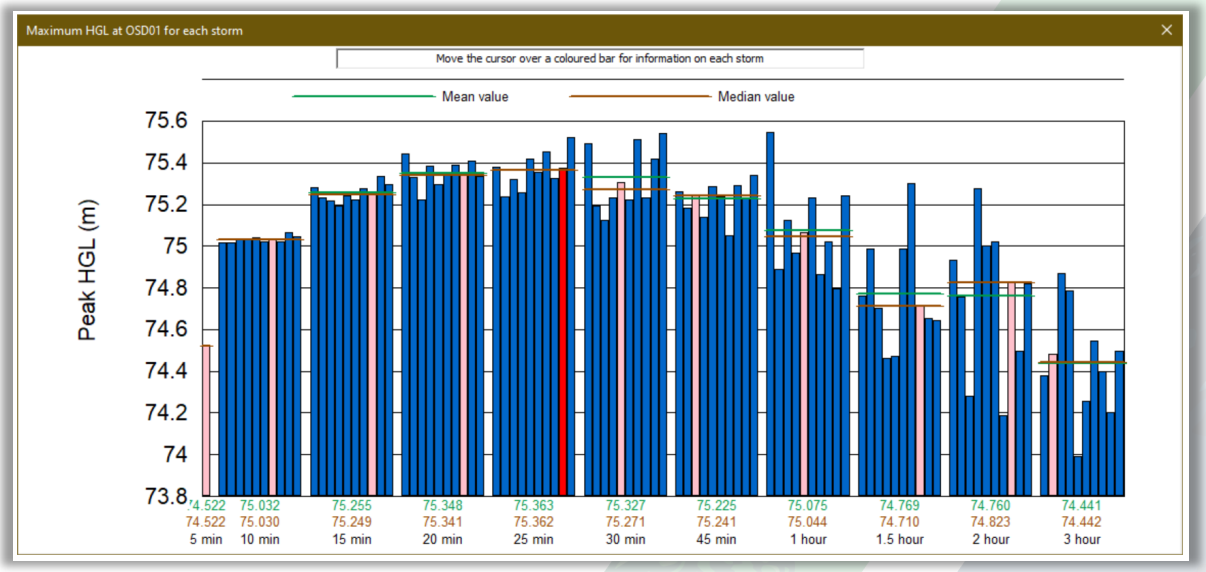


Figure 16- Resultant peak HGl within the OSD tank

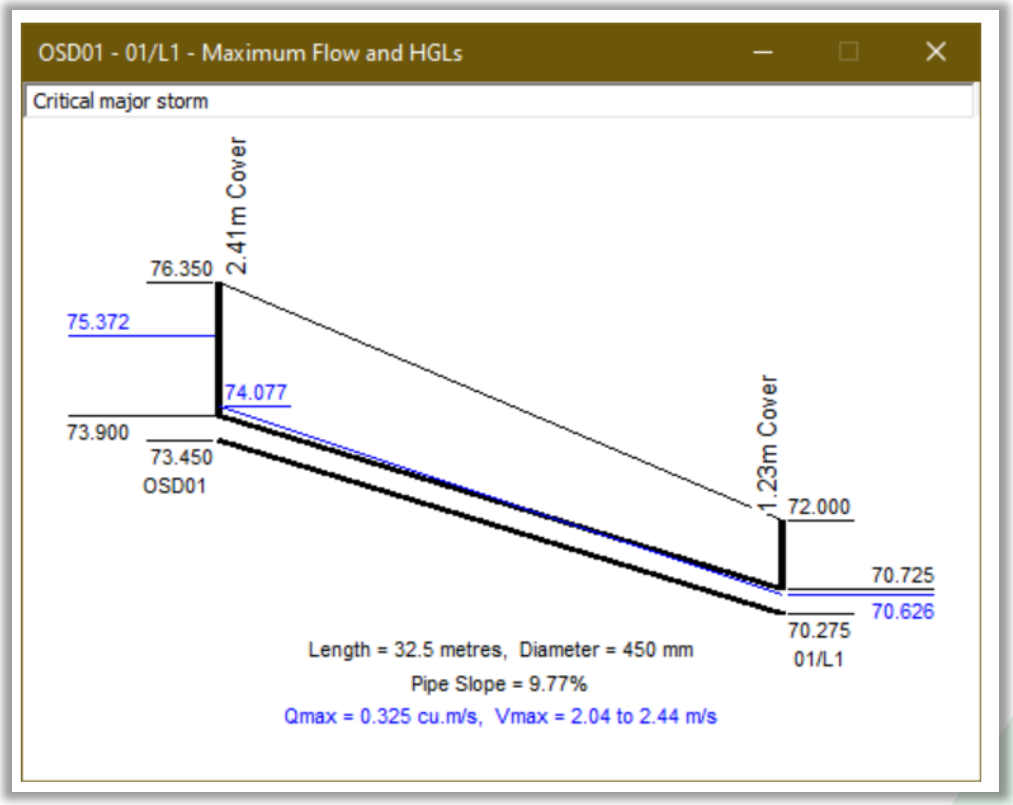


Figure 17- OSD Outflow pipe system HGL

The resultant HGL within the OSD tank results in a DN450mm outlet pipeline that does not appear to impact on the existing HGL and the water levels are contained within the pipe system.

Council permits an offset to the volume of OSD for development greater than 3000m2 on the basis of the volume of Rainwater storage provided.

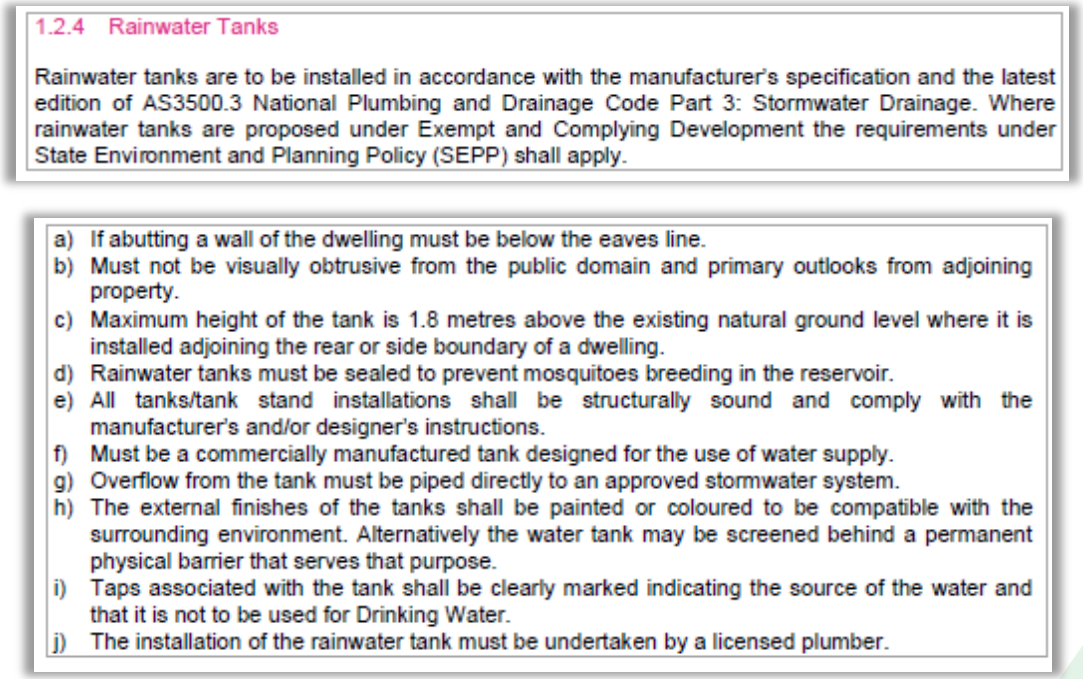
1.4.5 Rainwater Tank Offsets

Rainwater tanks do not generally substitute for the storage capacity required for on-site detention. However, where a rainwater storage tank for water efficiency is incorporated into a stormwater drainage system for a single occupancy development and the tank is connected to an internal re-use system, the volume of the required on-site detention may be reduced by an equal amount up to a volume of 5,000 litres for sites less than 3000m^2. This provision will be in addition to any BASIX requirements.

If a rainwater storage system is proposed for a larger development, some on-site stormwater detention offset may be given. The amount of offset shall be calculated from a water balance model

7.0 RAINWATER STORAGE

Rainwater reuse will be incorporated into the project in accordance with Ryde City Council, Water Sensitive Urban Design Guidelines. Rainwater shall be collected from roof structures via downpipes and piped directly to a rainwater storage tank for reuse as site irrigation.



1.2.4 Rainwater Tanks

Rainwater tanks are to be installed in accordance with the manufacturer's specification and the latest edition of AS3500.3 National Plumbing and Drainage Code Part 3: Stormwater Drainage. Where rainwater tanks are proposed under Exempt and Complying Development the requirements under State Environment and Planning Policy (SEPP) shall apply.

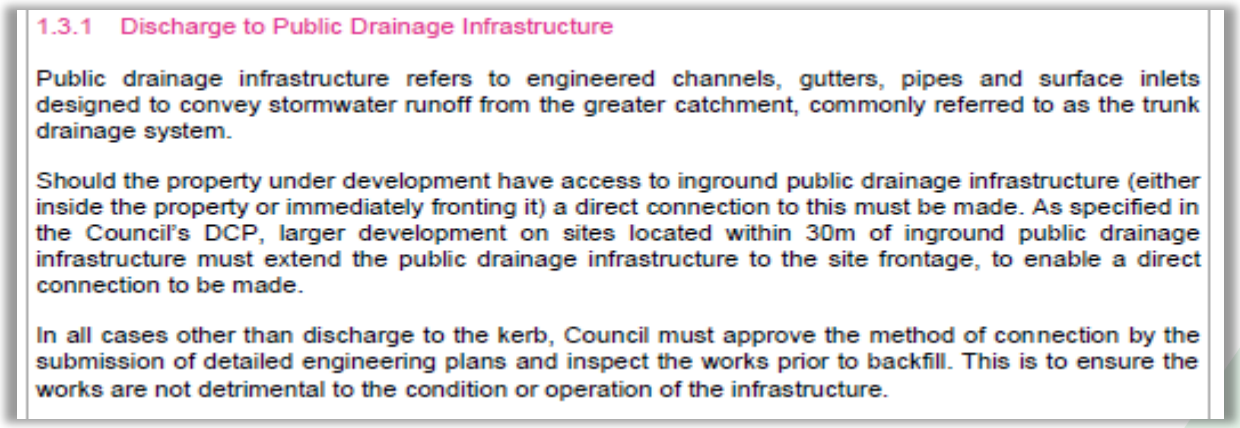
a) If abutting a wall of the dwelling must be below the eaves line.
b) Must not be visually obtrusive from the public domain and primary outlooks from adjoining property.
c) Maximum height of the tank is 1.8 metres above the existing natural ground level where it is installed adjoining the rear or side boundary of a dwelling.
d) Rainwater tanks must be sealed to prevent mosquitoes breeding in the reservoir.
e) All tanks/tank stand installations shall be structurally sound and comply with the manufacturer's and/or designer's instructions.
f) Must be a commercially manufactured tank designed for the use of water supply.
g) Overflow from the tank must be piped directly to an approved stormwater system.
h) The external finishes of the tanks shall be painted or coloured to be compatible with the surrounding environment. Alternatively the water tank may be screened behind a permanent physical barrier that serves that purpose.
i) Taps associated with the tank shall be clearly marked indicating the source of the water and that it is not to be used for Drinking Water.
j) The installation of the rainwater tank must be undertaken by a licensed plumber.

Figure 18-Ryde Council - WSUD Rainwater Tank Policy

In heavy rain events, overflows from the rainwater tank will be directed to an onsite detention tank and ultimately to the existing Macquarie University street stormwater infrastructure.

8.0 STORMWATER DISCHARGE OUTLET

Typical building developments in an urban environment direct stormwater runoff into an adjacent Council street drainage system within a public road reserve. The proposed stormwater pipe network associated with the new development works is intended to collect and convey runoff from the roof and ground surface catchments directly to the existing Macquarie University kerb inlet pit located in East Precinct Road system. This will involve a direct connection into the established University piping infrastructure.



1.3.1 Discharge to Public Drainage Infrastructure

Public drainage infrastructure refers to engineered channels, gutters, pipes and surface inlets designed to convey stormwater runoff from the greater catchment, commonly referred to as the trunk drainage system.

Should the property under development have access to inground public drainage infrastructure (either inside the property or immediately fronting it) a direct connection to this must be made. As specified in the Council's DCP, larger development on sites located within 30m of inground public drainage infrastructure must extend the public drainage infrastructure to the site frontage, to enable a direct connection to be made.

In all cases other than discharge to the kerb, Council must approve the method of connection by the submission of detailed engineering plans and inspect the works prior to backfill. This is to ensure the works are not detrimental to the condition or operation of the infrastructure.

Figure 19-Ryde Council Connection Policy

9.0 STORMWATER TREATMENT MEASURES

Ryde Council requires stormwater treatment to be provided in accordance with various priorities for particular types of development. Refer to the tabular requirements (Figure 15) below for applicable priorities.

5.1 GROSS POLLUTANT TRAPS

Gross pollutants include litter, leaves and other vegetative matter. Many gross pollutant traps (GPTs) will also capture significant loads of coarse suspended solids.

5.1.1 Location

Gross pollutant traps (GPTs) are often the first treatment measure in a treatment train, for example they can be used upstream of wetlands and other water bodies to protect them from gross pollutants. Gross pollutant capture efficiency varies between different types of GPTs, as does coarse sediment removal. Most GPTs cannot remove fine sediments, nutrients or other pollutants to any significant degree. GPTs are available in a range of different types and sizes, suitable for a wide range of applications. Figure 8 shows a range of GPTs.

5.1.2 Design Considerations

Key design considerations include:

- The size of the catchment to be treated, and the flow rate that must pass through the GPT. GPTs are normally sized to treat the 3-month to 1-year ARI flow.
- The type of waterway on which the GPT is to be installed (pipe/culvert/open channel).
- Pollutant types and loads in the catchment – for example, commercial areas are likely to generate higher loads of litter than residential areas.
- Target pollutants. For example as pre-treatment to a wetland, it is important to remove coarse sediments. However at other locations, it may be undesirable to trap sediment, in case it reduces natural sediment deposition downstream.
- The GPT's efficiency in trapping pollutants will affect the frequency and magnitude of cleanouts, and the volume of waste material that must be disposed of.
- Some GPTs store captured pollutants in a drained state, while others hold them in stagnant water.
- Anaerobic conditions in wet sumps can lead to odours, and wet pollutants may be more difficult to clean out than dry pollutants.
- Access and equipment requirements for cleanouts. Small pit insert GPTs may be cleaned out by hand, while larger GPTs may require a bobcat, excavator or crane to remove the pollutants and/or basket.
- Upstream flooding. GPT designs should ensure that there is no risk of increased flooding upstream of the GPT.
- Costs. It is important to consider the life cycle costs of GPTs, as operation and maintenance costs over the lifetime of a GPT can far outweigh the design and installation costs.

Figure 20-Ryde Council WSUD requirements

Stormwater quality improvement devices are typically selected to satisfy the relevant pollutant target performance criteria as required by Council. We have utilised the software package known as MUSIC (Model for Urban Stormwater Improvement Conceptualisation). Refer to the screenshot below (Figure 22) for MUSIC model performance characteristics.

Ground surface and roof rainwater shall be collected, detained and discharged eventually at a reduced flowrate to the Ryde Council infrastructure. The roof water will be filtered by a first flush device and gauze filters. There is no available landscaping that could be utilised to install a rain garden as the site is too steep.

The following allowances are incorporated in the treatment train and Music Model to achieve the required targets

- All landscape areas assumed to be 90% pervious and we have allowed for some footpaths etc.
- Landscape area AL1 includes a driveway allowance of 100m2.
- The driveway will drain to Ocean Guards and eventually to the Storm Filter within the OSD tank
- The RWT is 10kL. Reuse applied to irrigation of AL1, AL2 and an assumed 100m2 of planters in courtyard areas. No toilet reuse included. Rainwater tank storage collecting roof water runoff for non-potable demand and for the site it will be applied to irrigation
- Swales are as follows:
  - AL3 – 40m2 long
  - AL2 & AL1 – 8m2 long
  - 1% slope
  - 2m top width and 0.5m bottom width
  - 0.15m deep and 100mm vegetation height
  - Ocean Guard pit litter baskets collecting overflow-200 micron
- The Storm Filter details are as follows:
  - Storm filter Chamber - 24m2
  - 42 x 690Psorb cartridges
  - Chamber area 8m x 4m
  - False floor thickness of 100mm (therefore all inlet pipes to be minimum 100mm above OSD floor level minimum)
  - Total weir height 870mm (inclusive of false floor thickness)
- General MUSIC inputs for rainfall and source nodes are based on the Ryde Council MUSIC Guide.

The attached WSUD catchment plan defines the delineation of catchments as follows :-

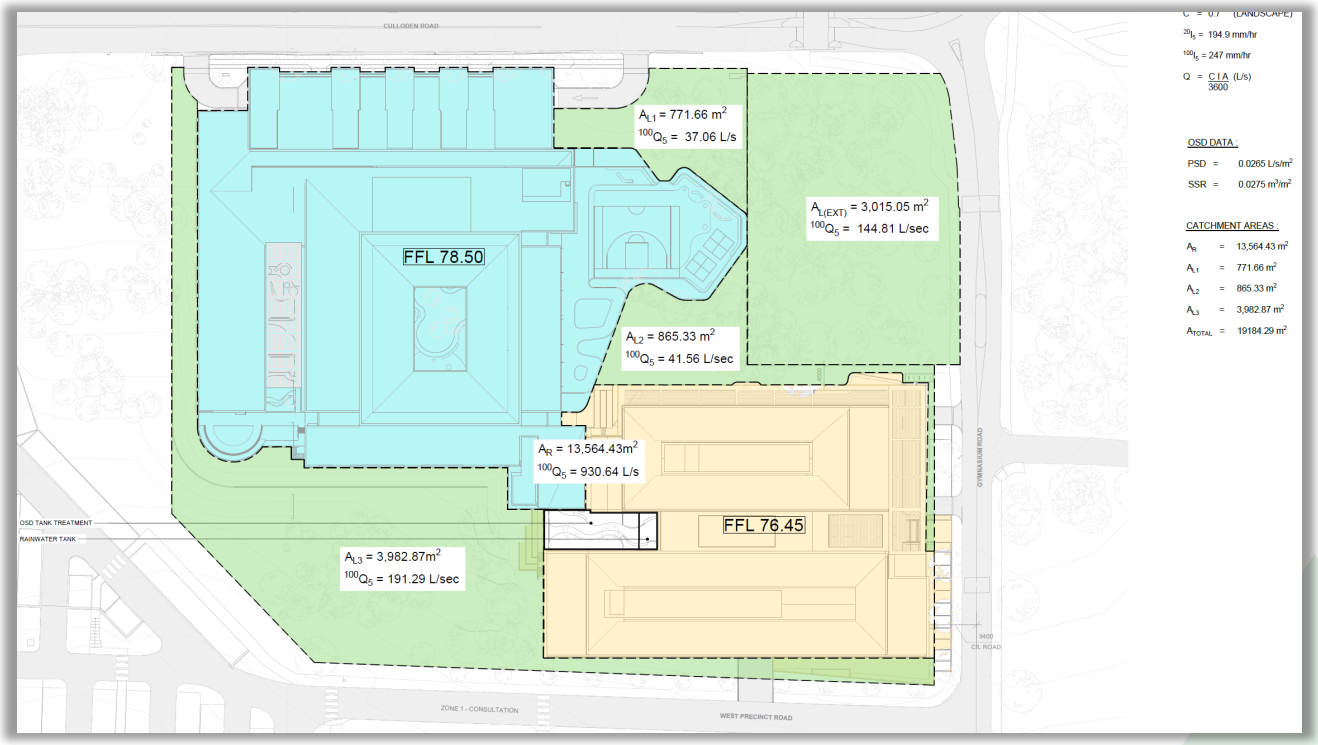


Figure 21- WSUD Catchment Plan

The effectiveness of the proposed treatment measures is summarized below.

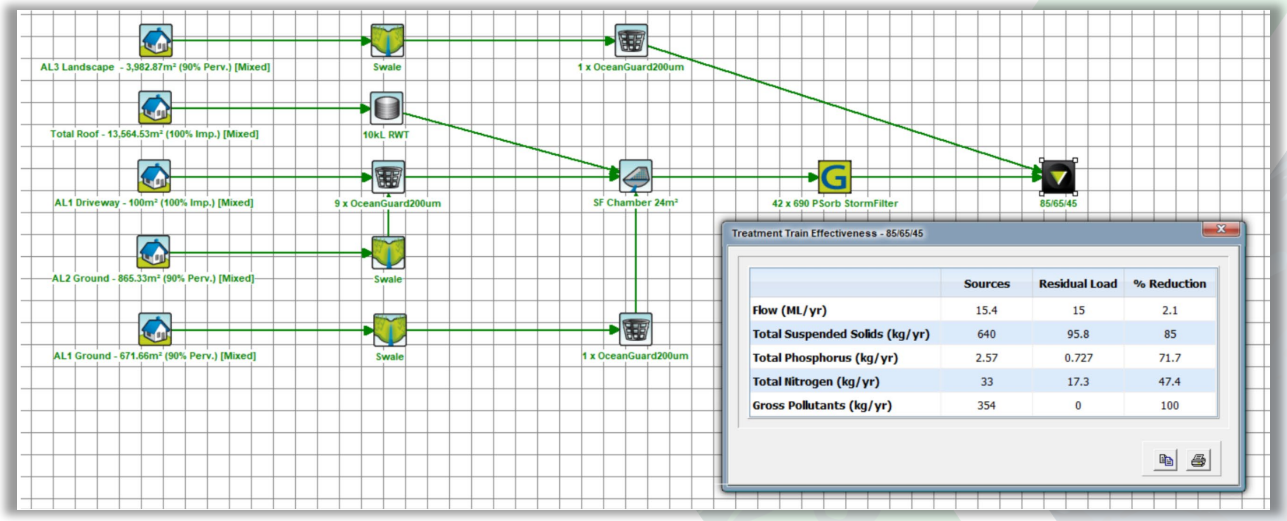


Figure22- Music Model Treatment Effectiveness

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10.0 EROSION & SEDIMENT CONTROL

7 SOIL AND WATER MANAGEMENT

7.1 Scope

This section of the Manual sets out Council's requirements for erosion and sediment control. It is in no way a comprehensive design manual and it is intended to be read in conjunction with the *Department of Environment and Conservation Guidelines, Landcom's "Managing Urban Stormwater – Soil and Conservation – Volume 1" 4th Edition 2004 (Blue Book)* and other similar recognised texts.

7.2 Aim

The aim of this section is to provide detailed guidelines for managing erosion and sediment control during the construction of developments in the City of Ryde.

7.3 General

All developments, where the site is disturbed, shall provide appropriate Erosion and Sedimentation Control measures to control runoff, mitigate soil erosion and trap pollutants before they can reach downslope lands and receiving watercourses. This is to ensure that downstream properties, Council's drainage system, natural watercourses and bushland area are protected from the adverse effects of sediment and other pollutants.

Where required, sediment ponds together with treatment trains are to be implemented on all relevant construction sites. For sites smaller than 250m^2 a small works sediment control plan is required to be submitted, while for sites with disturbances of between 250m^2 to 2500m^2 an Erosion Sediment Control Plan (ESCP) is required. For sites larger than 2500m^2 a Soil and Water Management Plan (SWMP) is required.

A small works sediment control plan will need to detail simple erosion and sediment control measures required such as silt fencing, hay bales and sand bags. Explanatory notes are to be included on the plans advising that sediment deposition on roads and into receiving waters is to be avoided.

ESCP's and SWMP's shall be designed and constructed in accordance with Landcom's "Managing Urban Stormwater – Soil and Conservation – Volume 1" 4th Edition 2004 (Blue Book).

Figure 23-Ryde Council Erosion and Sediment Control Policy

During construction works, temporary measures are to be provided to protect roads and waterways from the adverse effects of undesirable soil deposits and the uncontrolled movement of sediment from the site. This is anticipated to include:-

- Sediment fencing on the low side of earthmoving operations;
- A gravel layer at the construction vehicle access point into the area of works;
- Regular monitoring of soil movement characteristics and cleaning of sediment deposits as required during construction;
- Loading and unloading bays;
- Management of the crane;
- Sediment and settling basin

It is noted that soil and water management measures are typically utilised to protect adjacent roadways or public land from the undesirable transport or deposition of sediment, but for the situation where the intended works the distance between the earthworks and the downstream street and river system already offers a significant buffer area to arrest the motion of soil particles conveyed by the sheet flow of water across the land surface.

For this site, a sediment basin is considered necessary, due to the steep sloping site and potential for erosion and contamination of the roads and site down stream.

The drawings present the full solution of measures which are in accordance with the Landcom publication *Soils and Construction Volume 1 (4th Edition, March 2004) – Managing Urban Stormwater*, also known as "the Blue Book."

11.0 SYDNEY WATER INFASTRUCTURE

Potable Cold Water Service

The site is provided with a potable 250mm cast iron cement lined water main in Culloden Road.

LP Consulting Australia is the appointed Water Servicing Coordinator and will make application to Sydney Water following development consent as is required by this Authority for a separate service to the RIDCB site. Servicability is not considered a risk item to the project.

Potable cold water will supply hot water plant, fire hose reels and sanitary fixtures.

House Sewer Drainage

A DN300mm vitreous clay sewer main at various depths is located to the east of the property.

Sanitary drainage piping will be connected to all sanitary fixtures.

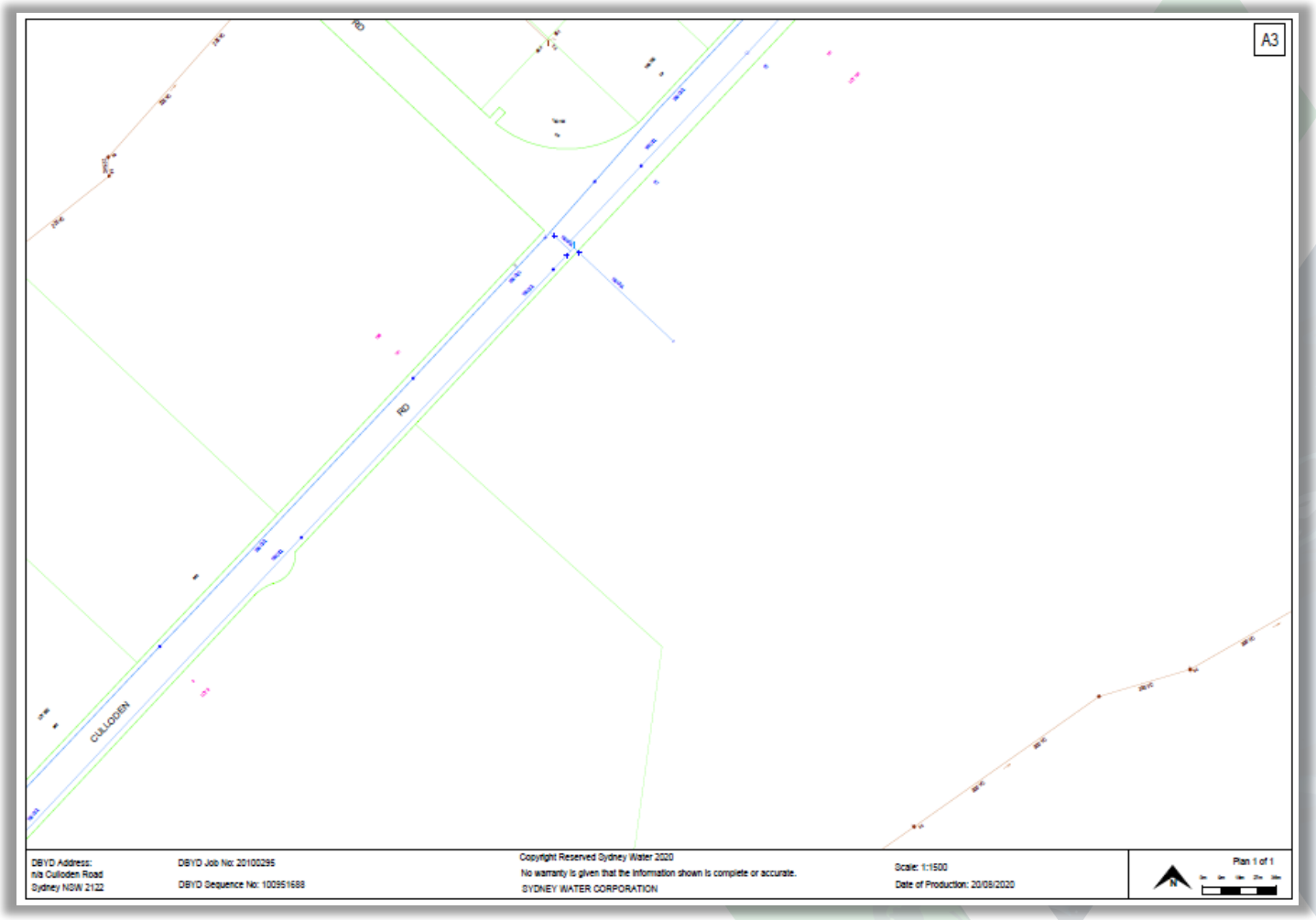


Figure 24-Sydney Water Sewer and Water Main Infrastructure

The image below present the proposed alignment for the proposed DN225mm house sewer drainage line. The discharge point is proposed adjacent to the Mars Creek carrier.

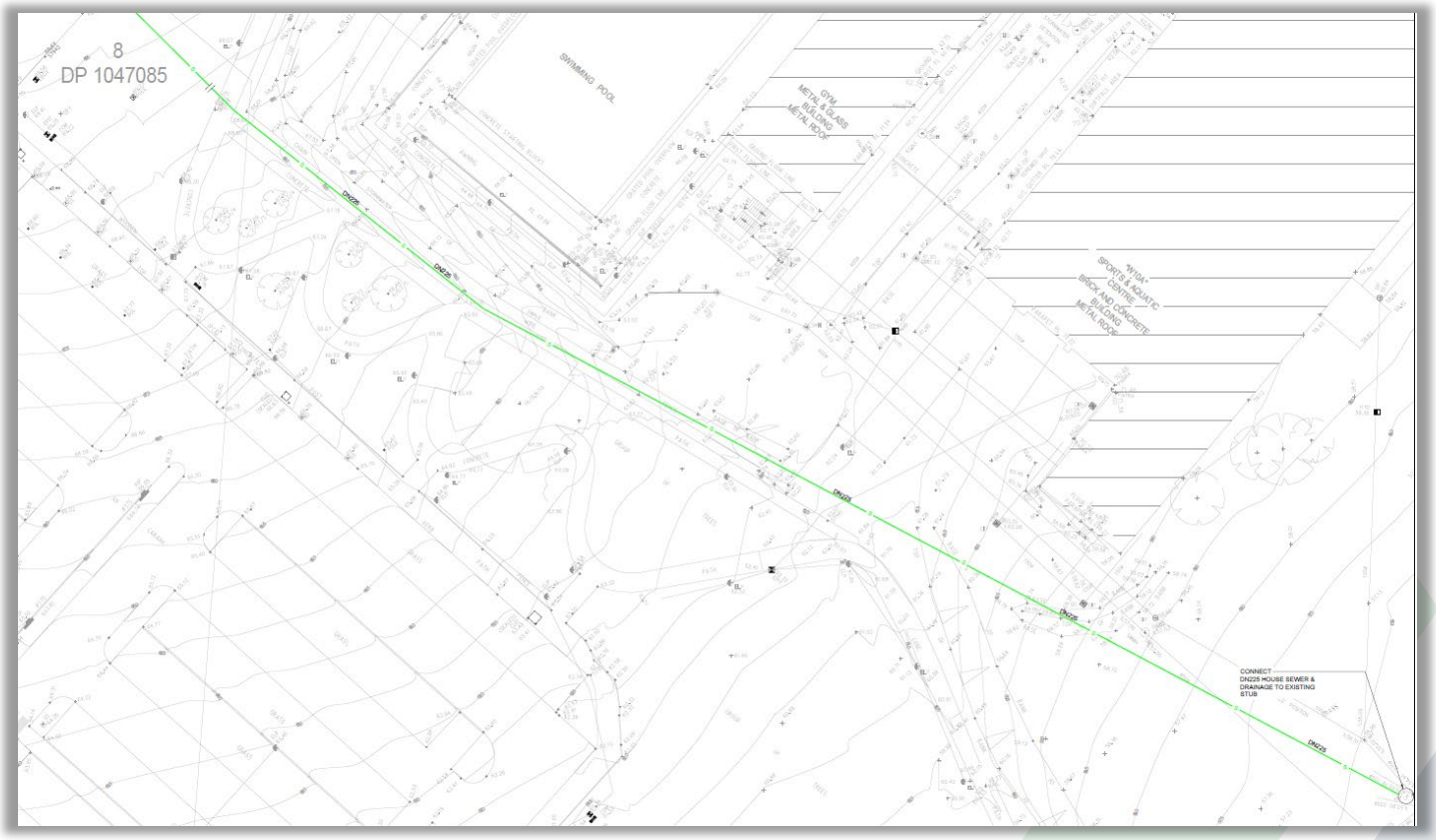


Figure 25-Image that show the proposed House sewer drainage alignment and connection to the Existing Sydney Water DN300mm sewer in the vicinity of Mars Creek

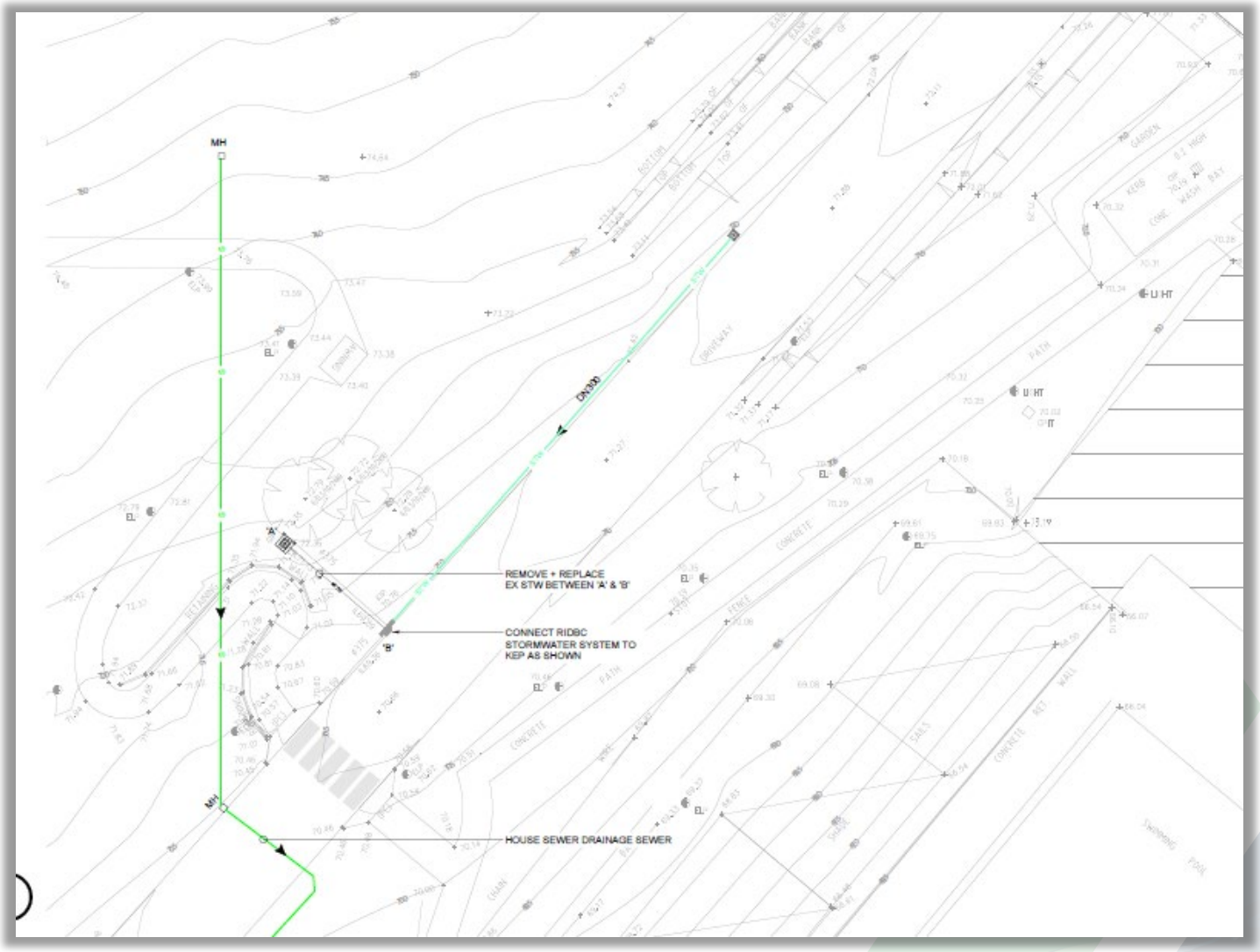


Figure 26-Image above shows the House and Stormwater alignment for pipes leaving the site

12.0 NATURAL GAS - JEMENA

The site is provided with a 210 kPa natural gas service in Culloden Road. The main is approximately 1.30 metres off the property boundary.

Natural gas will be supplied to the main hot water plant for the Consulting building whilst the School building will be supplied by a combination of .instantaneous Zip heaters and underbench electric heaters

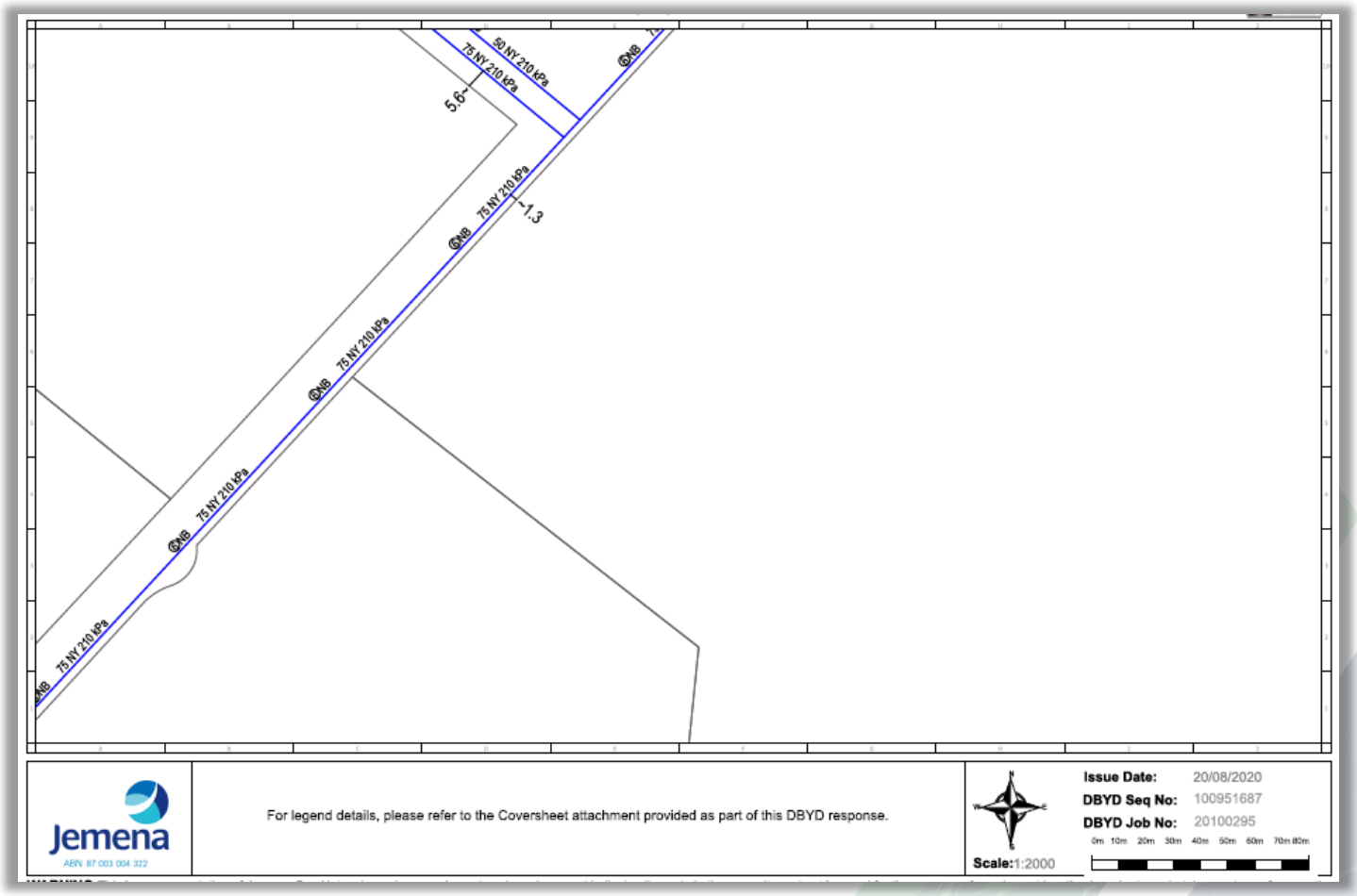


Figure 27-Natural Gas Infrastructure

13.0 AUSGRID ELECTICITY SUPPLY

The location of existing electrical infrastructure is presented in the image below.

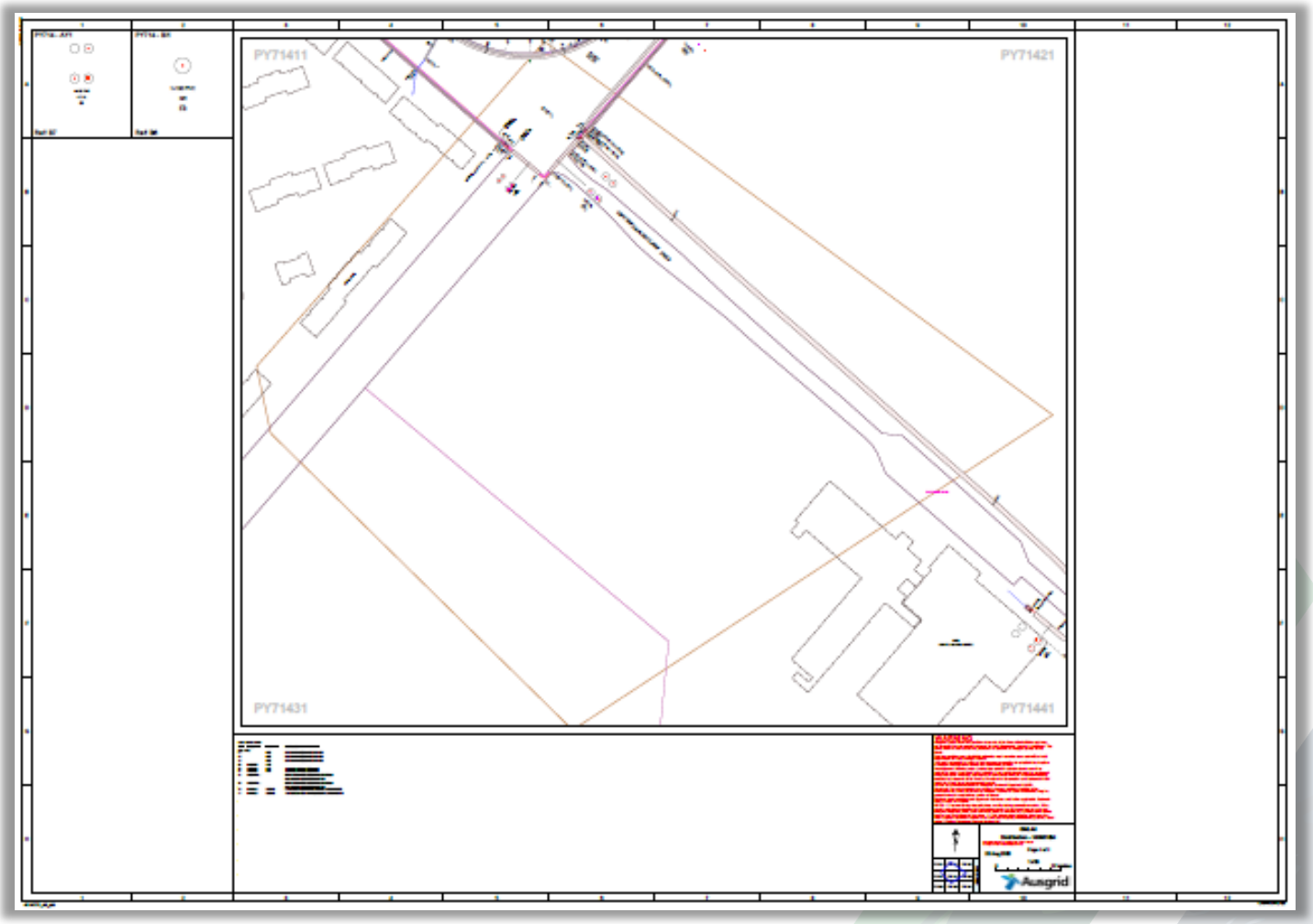


Figure 28-Ausgrid Electrical Infrastructure

Estimated Maximum Demand

The estimated maximum demand for the site can be summarised as follows :-

	Area (m²)	Amps (Estimated)
Basement – (Car Park, Storage, Plant – excluding Plant Equipment loading)	2,748	38.5
Lower Ground (Conference Hall, Board/Meeting Rooms, Seating/Foyer Area, Consultation and Offices)	3,553	403.9
Upper Ground (Education, Education/Office space, Hall)	3,083	410.2
Level 1 (Office)	3,217	405.3
Estimated Maximum Demand – Total		1,257.9 Amps (911kVA)

Proposed Low Voltage Distribution

Based on the estimated maximum demand, it is envisaged that :-

- The site will require a substation due to magnitude of the service size and nil ability of the local network to service the proposed electrical demand. A 1MVA substation capacity being considered suitable for the site (max. rated load ~1400Amps).
- The site will be supplied into a common main switch board, where reticulation will supply two distinct areas of the site, Conference/Consultation/Office area (Gymnasium Rd), and the Education area (Culloden Rd).
- The Conference building and the Education building will be individually metered

Level 3 ASP Design

The Level 3 ASP Design will be undertaken by Lehr Consultants International (Australia) Pty Ltd, inclusive of an application to the supply authority, to determine the electrical infrastructure and supply requirements, including the full documentation of the Ausgrid Substation.

Incoming Infrastructure Arrangement

The proposed development site is bounded by Culloden and Gymnasium Road(s), Macquarie Park. Preliminary assessment of the Ausgrid database, confirms there is existing infrastructure by way of a number of Ausgrid 11kV High Voltage (HV) feeders that route along Waterloo Rd and Culloden Rd, to the north.
Importantly, there are no HV cables immediately adjoining the development site along the Culloden Rd frontage. In addition, there are existing HV feeder cables that run along the Gymnasium Rd frontage, from Waterloo Rd to the substation in the adjacent Sport and Aquatic Centre.

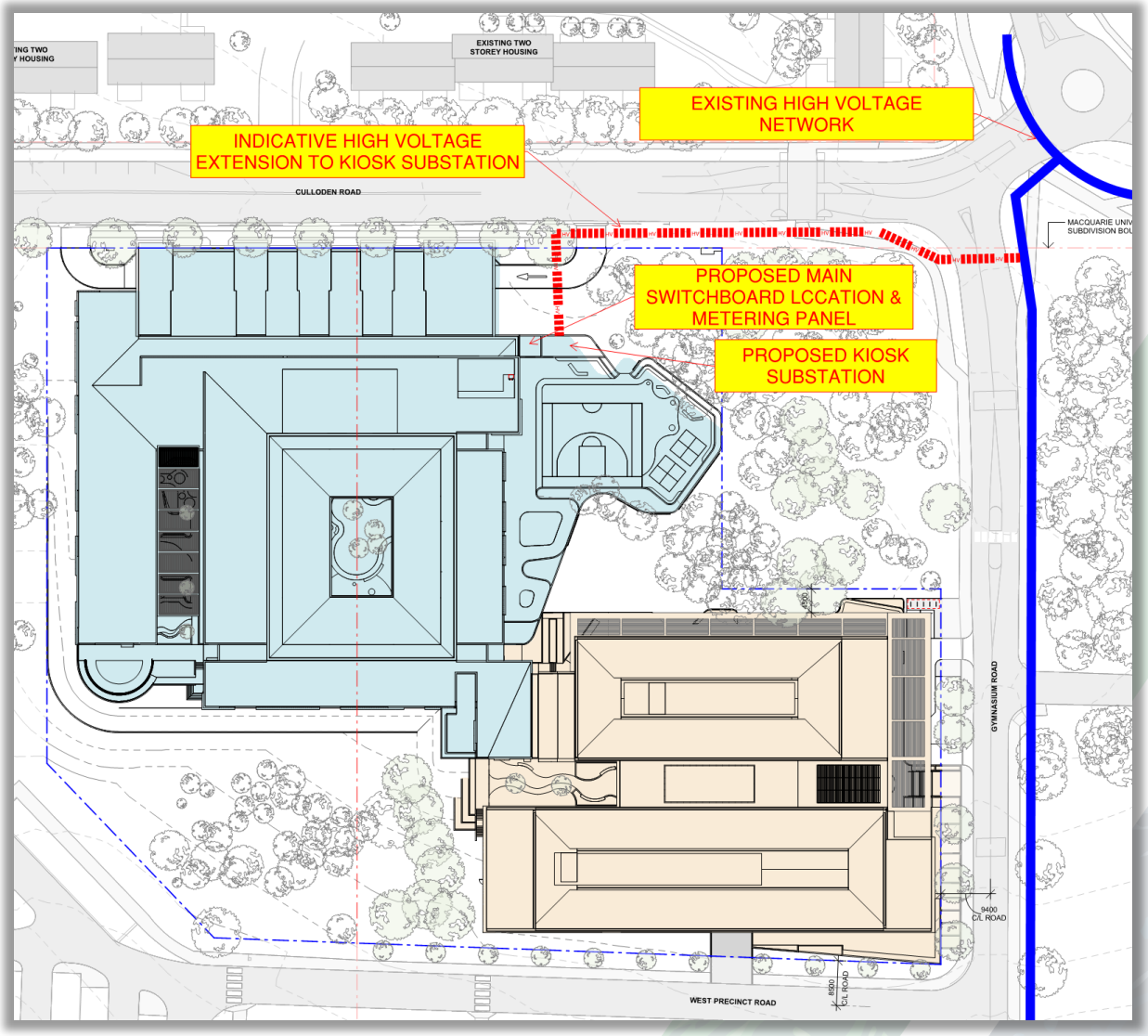


Figure 29 - Authority High Voltage & Indicative Infrastructure extension to service the site

It is proposed that the kiosk substation providing the necessary capacity will be situated on the Culloden Road frontage.

14.0 PARKING AND DRIVEWAY ACCESS

The proposed access to the Schools and Consulting Building are presented below in the attached Figures 30 and 31. The design of the driveways will provide compliant driveway gradient for Small rigid vehicles.

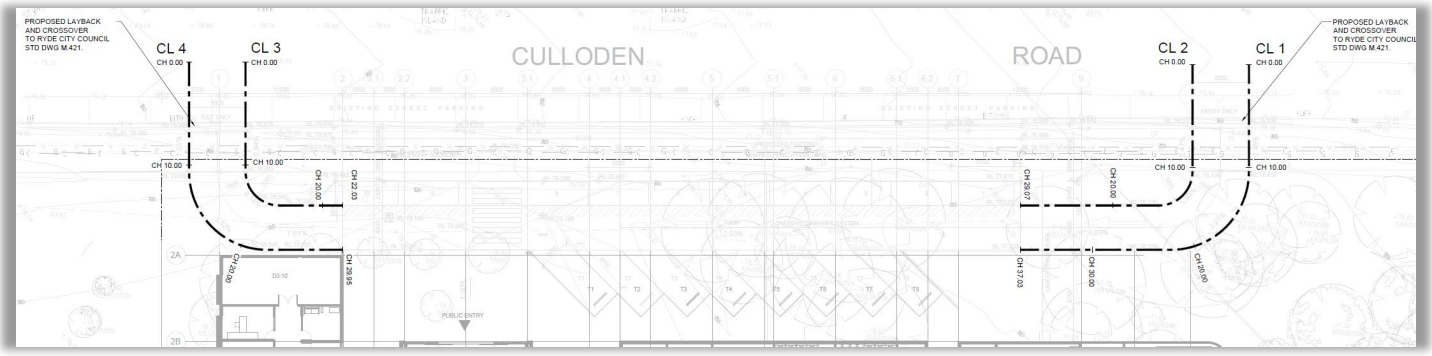


Figure 30-Colluden Road Entry and Exit Driveways

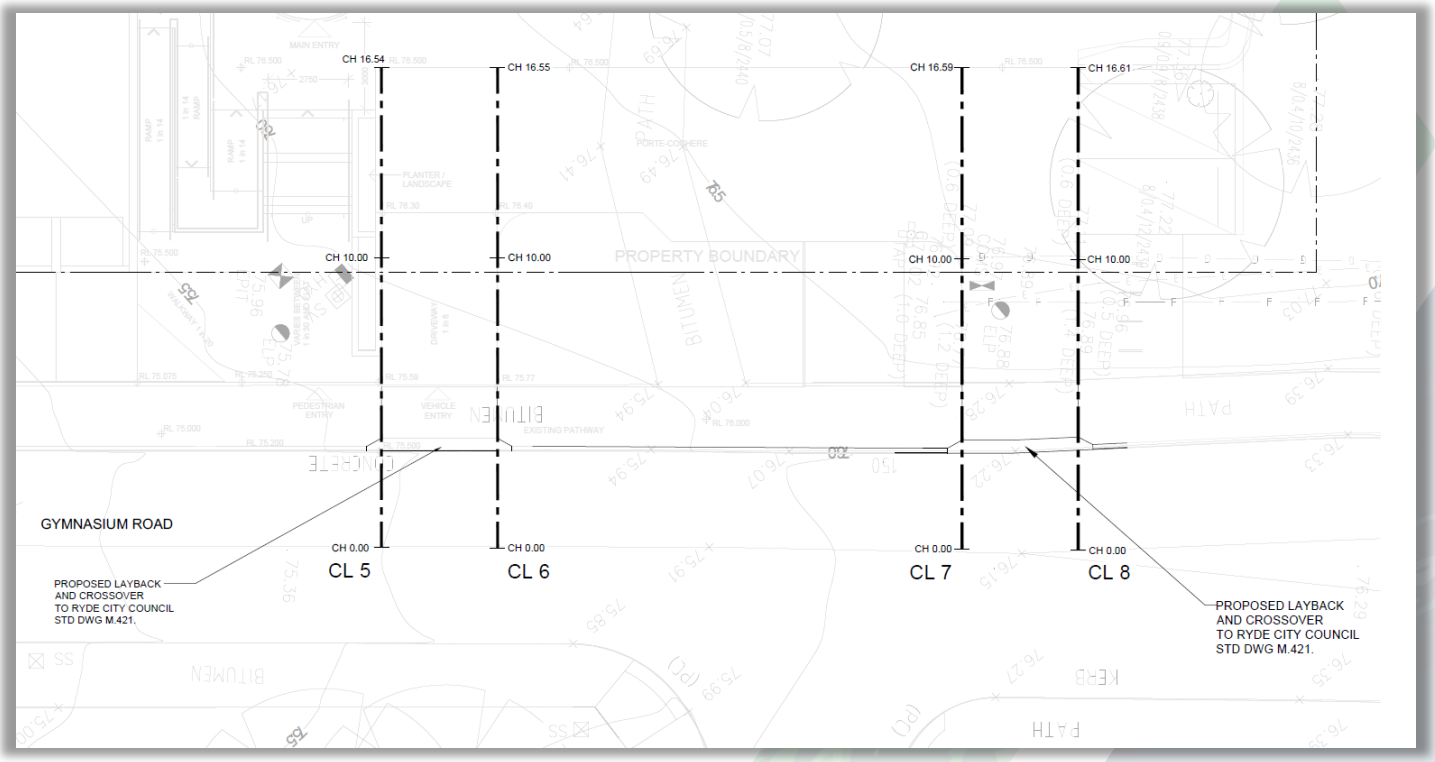


Figure 31-Gymnasium Road Entry and Exit Driveways

Parking and Driveway Access

1. The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than 300mm below the 1% AEP flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 1% AEP flood level.

2. The minimum surface level of open car parking spaces or carports shall be as high as practical, but no lower than 300mm above the 5% AEP flood level.

3. Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods to a level no lower than 150mm above the 1% AEP flood level.

   Garages that accommodate no more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods to a level no lower than 1% AEP flood level.

   Any garage or car parking that includes the provision of a lift must be protected from inundation by floods to a level no lower than 300mm above the 1% AEP flood level.

4. The driveway providing access between the road and parking spaces shall be as high as practical and generally rising in the egress direction.

5. The level of the driveway providing access between the road and the parking spaces should be as high as practical, and not lower than 0.3 metres below the 1% AEP flood level. However, Council may consider a lower level for the driveway in the following circumstances, where risk to human life is not compromised.

   (i) Where the road is lower than the parking space, no part of the driveway should be inundated to a greater depth than the roadway.
   (ii) Where the car parking space is lower than the road, the depth of inundation over the driveway must not be greater than the car park inundation depth, and the driveway must rise continuously in an egress direction.
   (iii) Where the car parking space and road are both below the 1% AEP flood level, the depth of inundation over the driveway must not be greater than the depth at either the car parking space or the road. Where feasible, the driveway should rise continuously in the egress direction.

6. Enclosed car parking and car park areas accommodating more than 3 motor vehicles, with a floor level below the 1% AEP flood level, shall have adequate warning systems, signage, exits and evacuation routes.

7. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 1% AEP flood.

Figure 32-Parking and Driveway Access

The proposed construction is of an underground 44 space carpark including disabled car spaces. Access shall be from East Pricinct Road.

The proposed basement and levels in the driveway and turning areas will be designed by a Traffic Engineer.

As notated above the driveway stormwater catchment levels will be calculated for the 100 year flood event and pumped to the detention system.

15.0 NBN AND COMMUNICATIONS

The location of existing infrasture is presented in the image below.

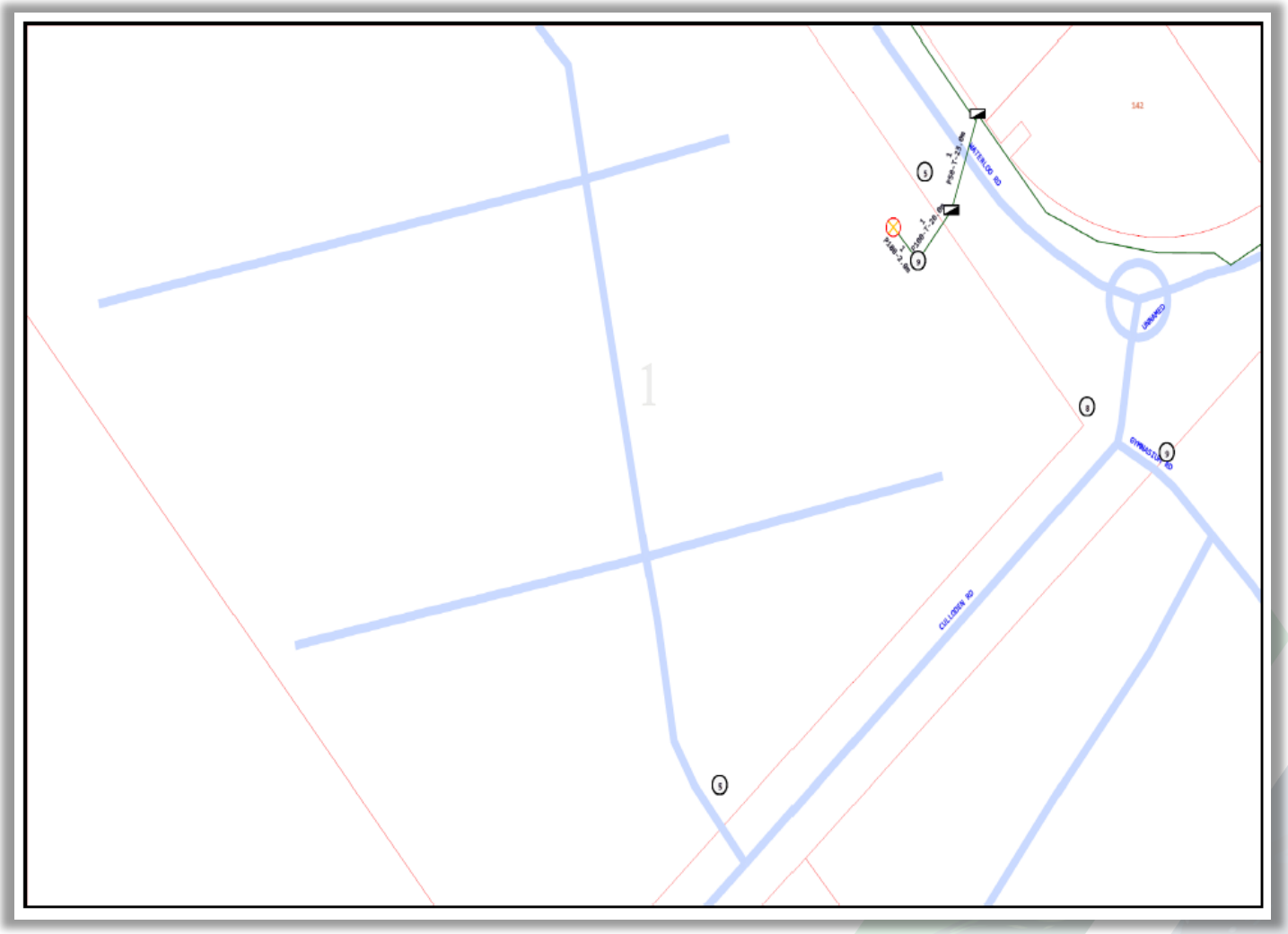


Figure 33-NBN and Communication Infrastructure

Development Main Building Distributor

The proposal for the facility is to locate a Main Building Distributor in the Consultation Building (Basement Level) of the facility, and reticulate throughout the site from this point.

Reference should also be made to WMK Architecture report Section 5.0 that outlines the layout of development infrastructure in the basement.

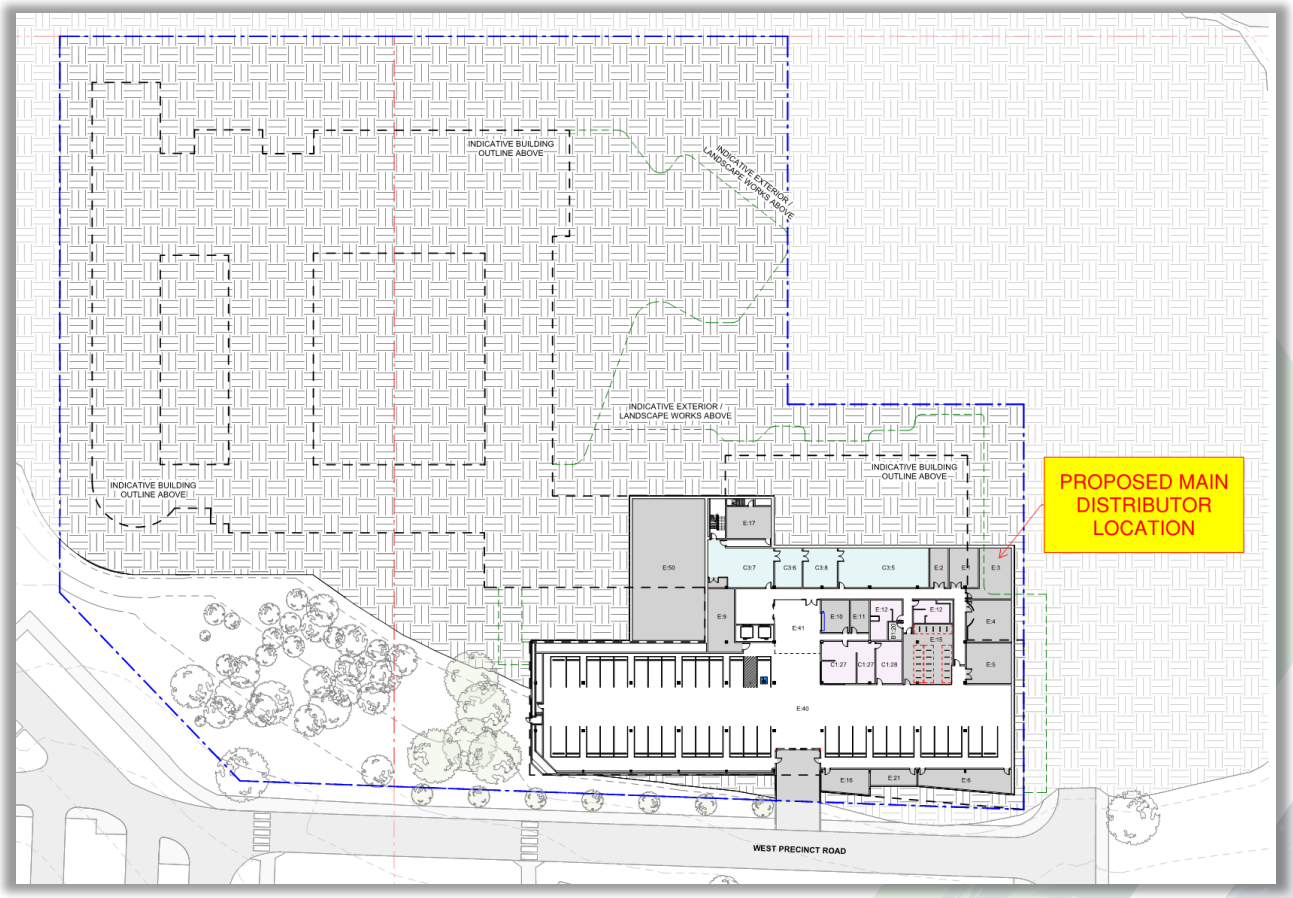


Figure 34. Site Main Distributor Location (Basement Plan)

Existing Authority Asset

Based on preliminary inquiry, we can confirm the availability of existing Communications Asset along Gymnasium Rd.

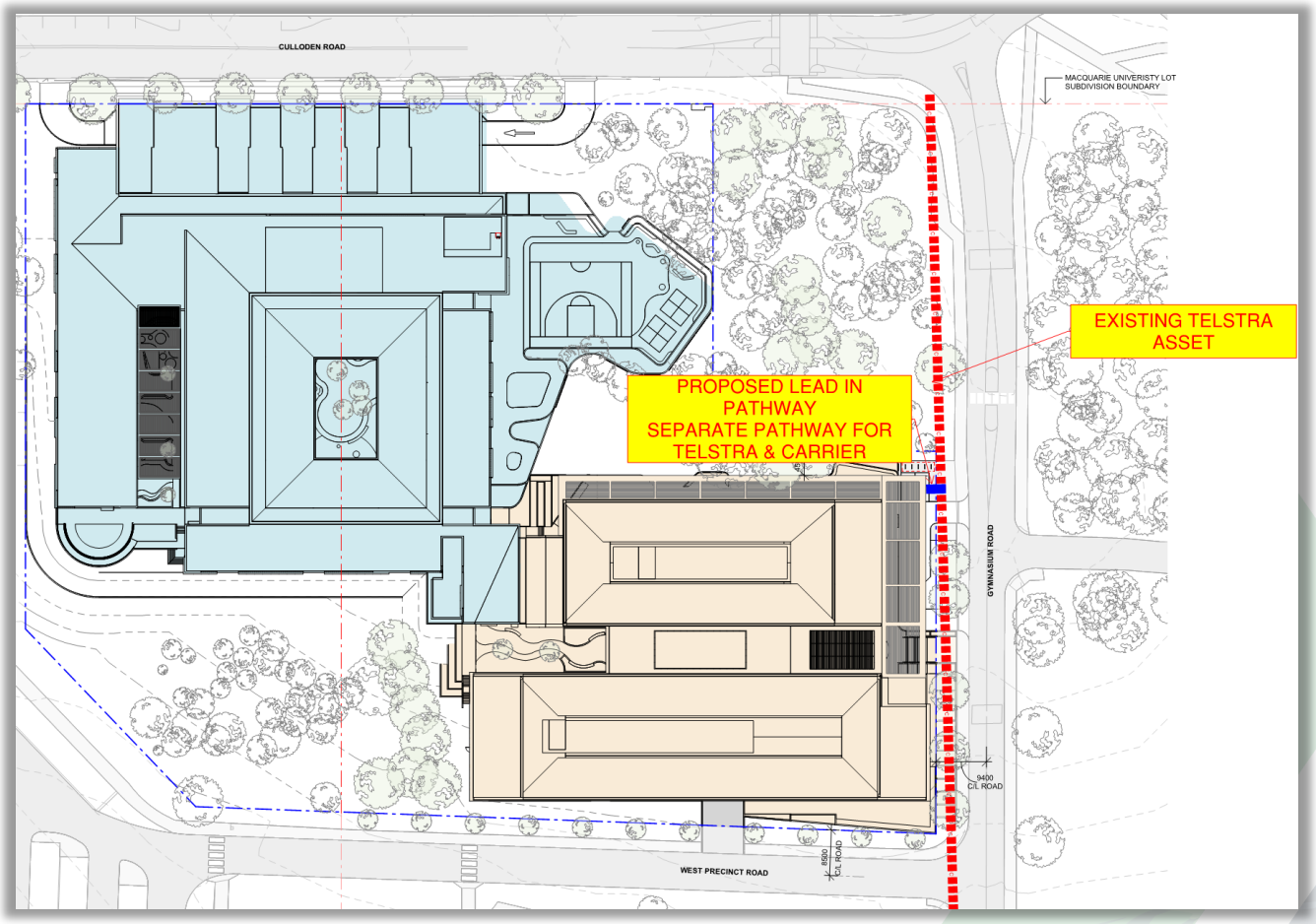


Figure35 - Existing telecommunications asset around adjoining lots

Application for connection will be sought for incoming NBN and/or Telstra lead-in to be brought into site.

16.0 SITE WET FIRE SERVICES

Wet fire services will be provided in compliance with the Building Code of Australia and shall include : -

Reference should also be made to WMK Architecture report Section 5.0 that outlines the layout of development infrastructure in the basement.

Fire Hydrants

A 150mm fire main will connect to the Sydney Water, water main in Culloden Road and extend to the site where a hydrant suction feed and booster valve will be provided for Fire NSW connection.

Internal fire hydrants will be provided to protect the building. Thirty metre fire hoses shall connect to the internal fire hydrant valves which will extend to all parts of the building floor levels.

Fire Sprinklers

The above mentioned suction valve will supply the basement carpark sprinkler service.

A sprinkler alarm valve will be provided in an alarm valve room. Fire alarms will be relayed to the fire indicator panel.

Fire Hose Reels

Administration, staff areas and car park will be protected by fire hose reels connected to the potable cold water supply.

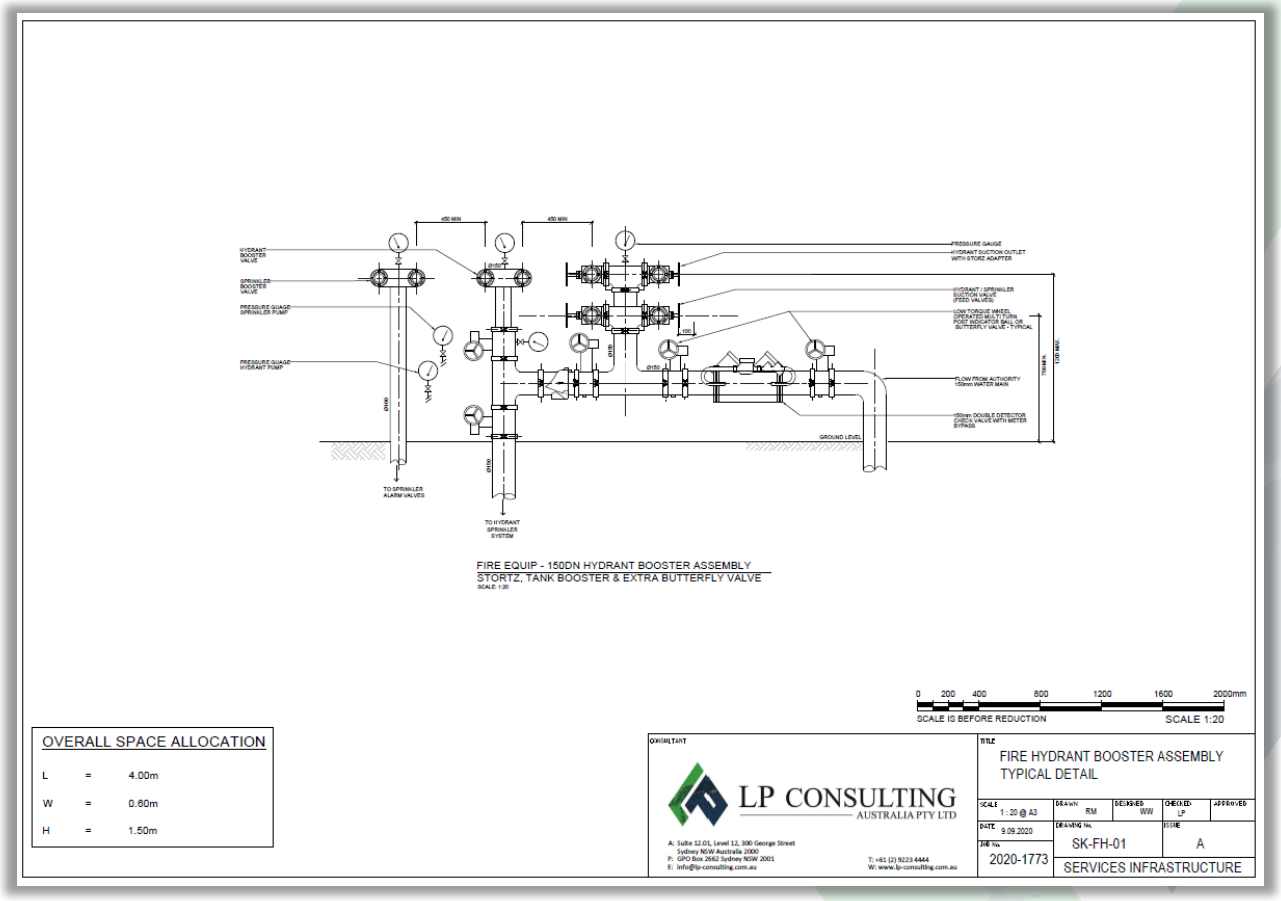


Figure 34-Space allocation for Fire Hydrant and Sprinkler booster sets

17.0 SITE POTABLE ; COLD AND HOT WATER and NATURAL GAS SERVICES

Reference should be made to WMK Architecture report Section 5.0 that outlines the layout of development infrastructure in the basement.

Potable Cold Water

The site is provided with a potable 250mm cast iron cement lined water main in Culloden Road.

LP Consulting Australia is the appointed Water Servicing Coordinator and will make application to Sydney Water following development consent as is required by this Authority for a separate service to the RIDCB site. Servicability is not considered a risk item to the project.

A site water meter will be provided at the Culloden Road boundary for connection to the main and extension to the development. Refer to the Figure below for the typical general arrangement of the metering set.

Potable cold water will supply hot water plant, fire hose reels and sanitary fixtures.

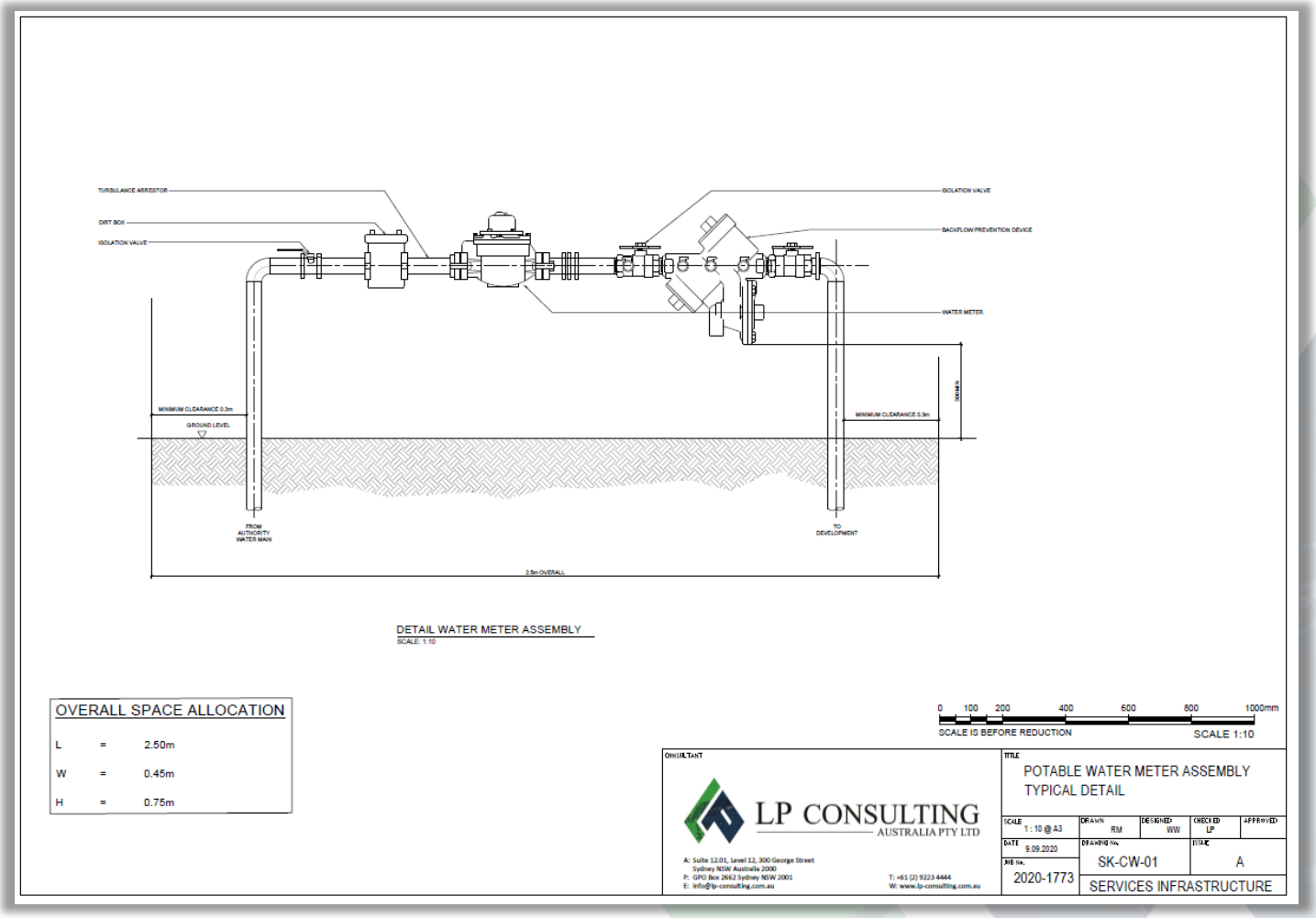


Figure 35-Cold Water Service Meter Assembly Arrangement

Potable Hot Water

A site cold water meter will be provided at the Culloden Road boundary for connection to the main and extension to the development and the hot water plant.

The hot water plant will be located in the hot water plant room. Natural gas will be provided to heat the hot water.

Potable hot water will supply all sanitary fixtures at a temperature of 50^{O}C.

All sanitary fixtures that are accessible by students will be provided with thermostatic mixing valves (TMV) which reduce hot water temperature to 45^{O}C. The TMV's will be located in stainless steel recessed wall boxes in close proximity to the basins.

Reference should also be made to WMK Architecture report Section 5.0 that outlines the layout of development infrastructure in the basement.

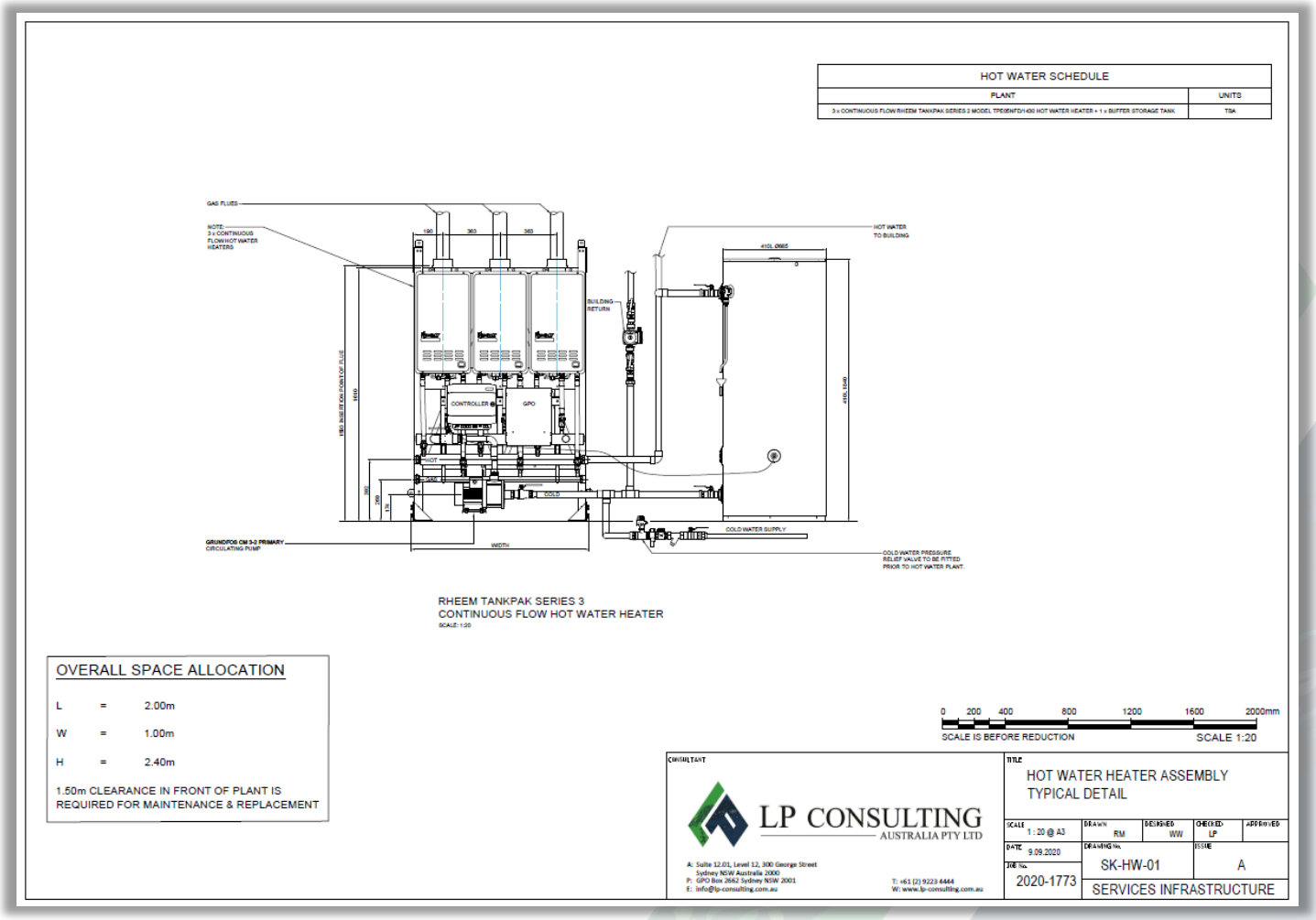


Figure 36-Hot Water Heater Assembly General Arrangement

Natural Gas Service

Natural gas will be supplied to the site. The service will be connected to the natural gas service in Colluden Road.

The application will be made to Jemena following development consent,

The typical meter assembly general assembly is presented below in Figure 37. Natural gas will be available to service the proposed Hot Water plant for the Consulting building and the Café.

Reference should also be made to WMK Architecture report Section 5.0 that outlines the layout of development infrastructure in the basement.

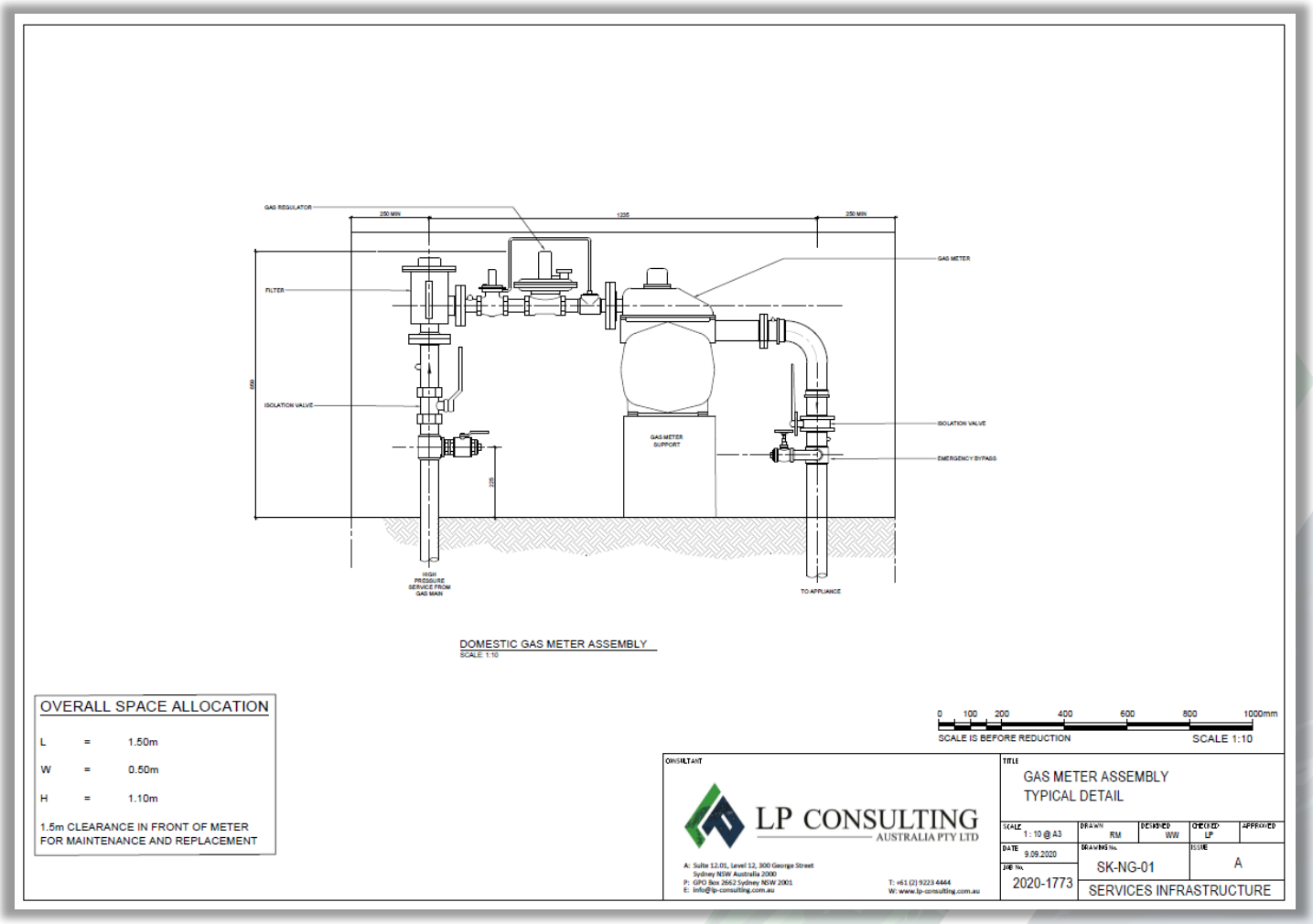


Figure 37-Natural Gas Meter Assembly General Arrangement

18.0 CONCLUSIONS

This Infrastructure Management Plan for the proposed building development identifies and addresses the following items for development assessment : -

1. The subject site fronts Culloden Road and Gymnasium Road Marsfield
2. The site is not flood affected
3. On site detention is required and is presented on the Drawings
4. Rainwater storage is required and is to be used for site irrigation and the tank storage is presented on the Drawings
5. Stormwater detention / rainwater overflow is to discharge to the existing Macquarie University stormwater Infrastructure located in East Precinct Road
6. Stormwater discharges will be treated to acceptable limits prior to discharge
7. Erosion and sediment control measures will be implemented on site to eliminate off site contamination
8. Existing Authority infrastructure is available for connection and extension to site.
9. On site parking is to be provided and appropriate driveway analysis is has been undertaken and is presented in the report
10. Wet fire services is to be provided for protection of students, staff and buildings.

APPENDIX A LP - CONSULTING AUSTRALIA DRAWINGS

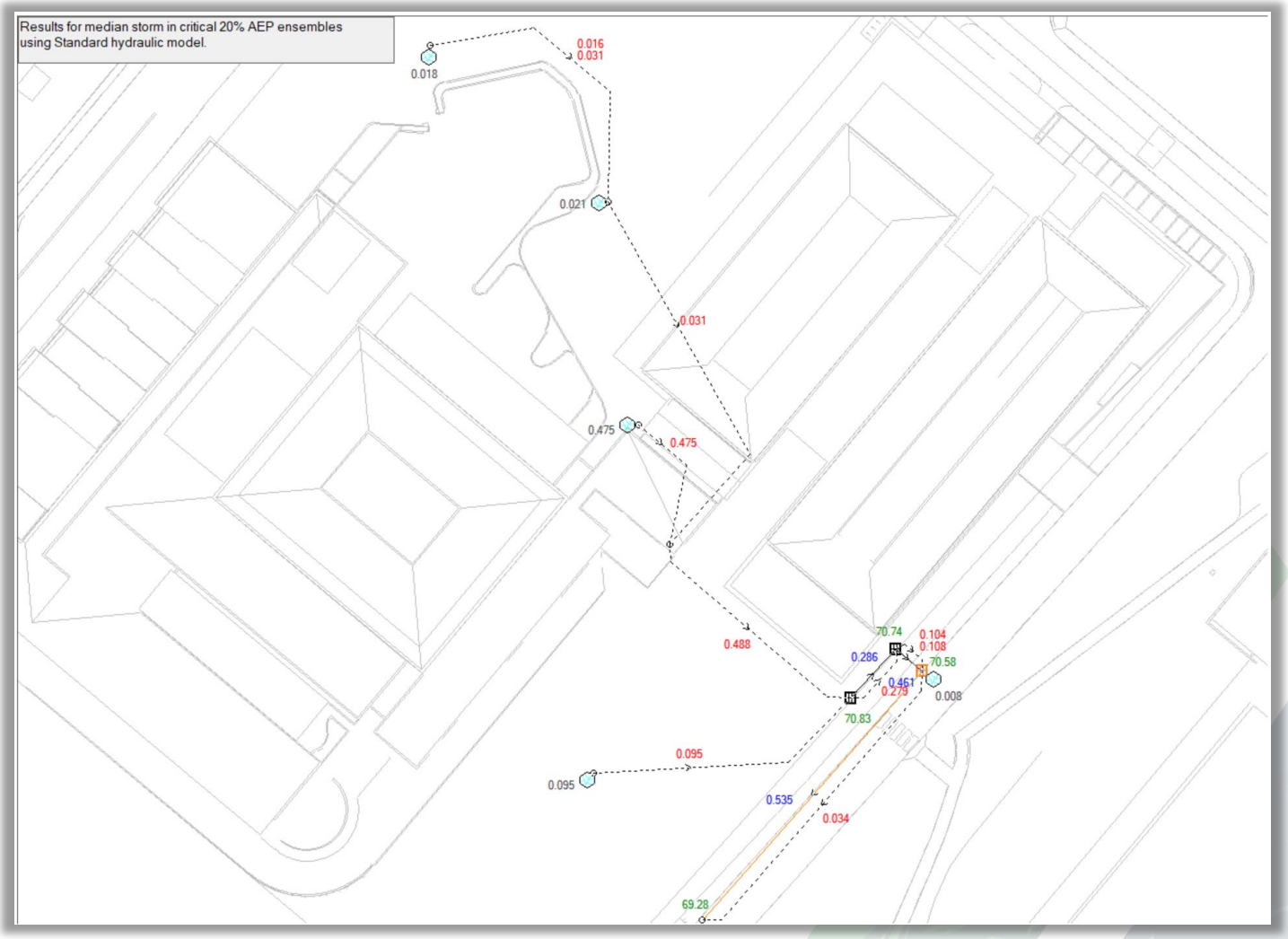
DRAWING LIST

DA - STW - 001	TITTLE SHEET AND LOCALITY PLAN
DA - STW - 002	LEGEND, ABBREVIATIONS AND DRAWING LIST
DA - STW - 003	STORMWATER DRAINAGE GENERAL NOTES
DA - STW - 004	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 1
DA - STW - 005	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 2
DA - STW - 006	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 3
DA - STW - 007	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 4
DA - STW - 008	STORMWATER DRAINAGE SURVEY PLAN SERVICES LAYOUT - SHEET 5
DA - STW - 009	STORMWATER DRAINAGE UTILITY SERVICES SERVICES LAYOUT - SHEET 1
DA - STW - 010	STORMWATER DRAINAGE UTILITY SERVICES SERVICES LAYOUT - SHEET 2
DA - STW - 011	STORMWATER DRAINAGE UTILITY SERVICES SERVICES LAYOUT - SHEET 3
DA - STW - 012	STORMWATER DRAINAGE UTILITY SERVICES SERVICES LAYOUT - SHEET 4
DA - STW - 013	STORMWATER DRAINAGE STORMWATER QUANTITY - CATCHMENT PLAN
DA - STW - 014	STORMWATER DRAINAGE STORMWATER QUALITY - WSUD CATCHMENT PLAN
DA - STW - 015	STORMWATER DRAINAGE EROSION + SEDIMENT CONTROL
DA - STW - 016	STORMWATER DRAINAGE EROSION + SEDIMENT CONTROL DETAIL SHEET - 1
DA - STW - 017	STORMWATER DRAINAGE EROSION + SEDIMENT CONTROL DETAIL SHEET - 2
DA - STW - 300	STORMWATER DRAINAGE DETENTION TANK DETAIL PLAN
DA - STW - 301	STORMWATER DRAINAGE DETENTION TANK SECTION
DA - STW - 302	STORMWATER DRAINAGE STW DETENTION TANK 42 CARTRIDGE STW FILTER SYSTEM
DA - STW - 101	STORMWATER DRAINAGE BASEMENT PLAN - ZONE 1
DA - STW - 102	STORMWATER DRAINAGE LOWER GROUND FLOOR PLAN - ZONE 1
DA - STW - 103	STORMWATER DRAINAGE UPPER GROUND FLOOR PLAN - ZONE 2
DA - STW - 104	STORMWATER DRAINAGE LEVEL 01 - ZONE 1
DA - STW - 105	STORMWATER DRAINAGE ROOF PLAN - ZONE 1
DA - STW - 106	STORMWATER DRAINAGE ROOF PLAN - ZONE 2
DA - C - 107	SCHOOL BUILDING DRIVEWAY ENTRY LAYOUT PLAN
DA - C - 108	CONSULTING BUILDING DRIVEWAY ENTRY LAYOUT PLAN
DA - C - 109	SCHOOL BUILDING CL 1 & 2 LONGITUDENAL SECTIONS
DA - C - 110	SCHOOL BUILDING CL 3 & 4 LONGITUDENAL SECTIONS
DA - C - 111	CONSULTING BUILDING CL 5 & 6 LONGITUDENAL SECTIONS
DA - C - 112	CONSULTING BUILDING CL 7 & 8 LONGITUDENAL SECTIONS

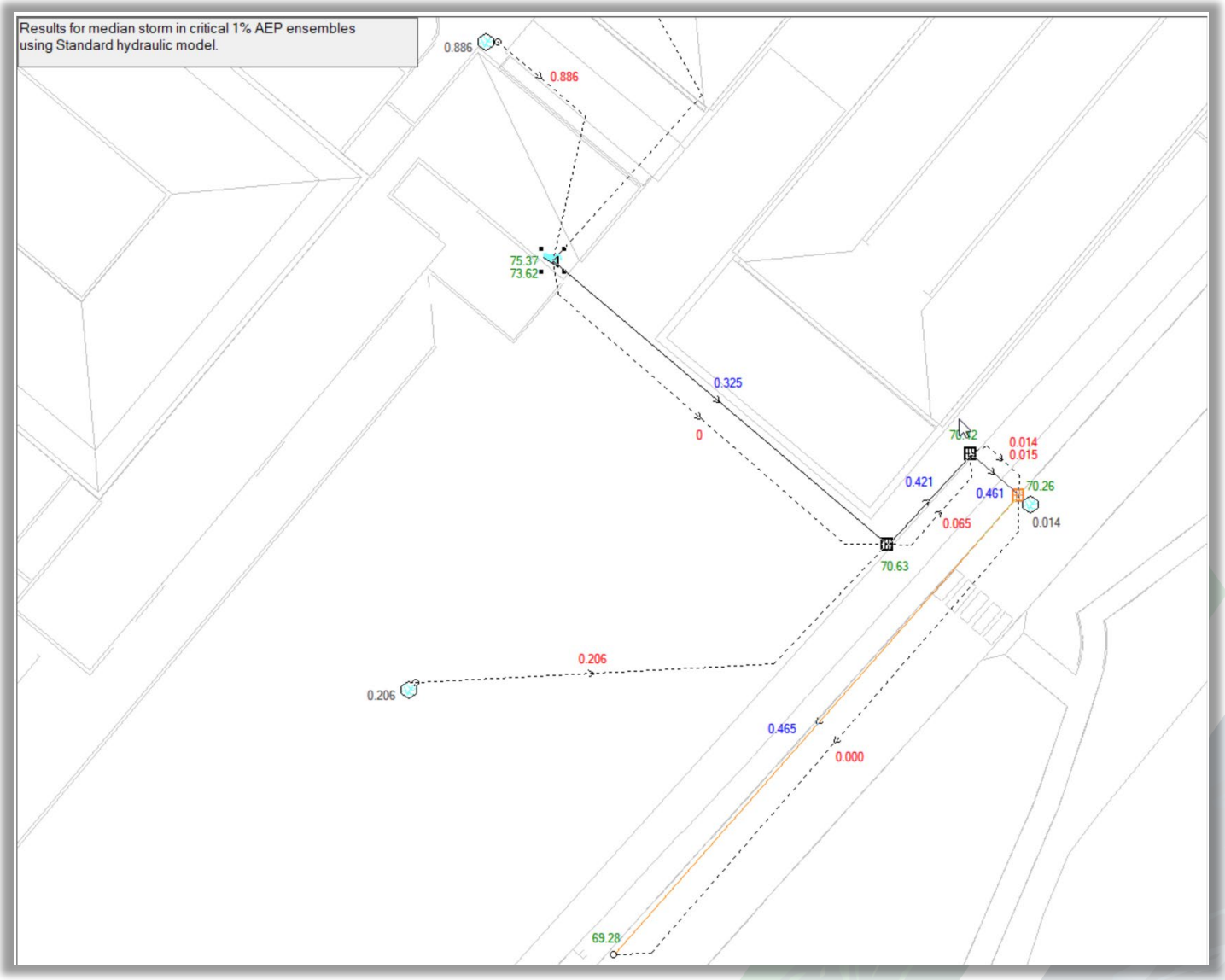
Figure 26-LPCA Stormwater and Driveway Levels drawings

APPENDIX B LP - CONSULTING AUSTRALIA DRAINS MODEL DATA AND RESULTS

- DRAINS 1 Node Diagram – 20% AEP Developed Model Peak Discharges (NO OSD)



- DRAINS 2 Node Diagram - 1% AEP Storm – Post Developed Site Condition Model Discharges with OSD



- DRAINS 3 Results Data Sheet

DRAINS results prepared from	Version 2020.043									
PIT / NODE DETAILS				Version 8						
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint			
01/L1	70.63		0.3		1.37	0.065	Inlet Capacity			
02/L1	70.42		0.115		0.61	0.014	Inlet Capacity			
02/EX1	70.26		0.026		0.5	0	None			
03/EX1	69.28		0.013							
SUB-CATCHMENT DETAILS										
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm			
Cat N01	0.04	0	0.04	0	5	0	1% AEP, 10 min burst, Storm 1			
Cat N02	0.045	0	0.045	0	5	0	1% AEP, 10 min burst, Storm 1			
Cat N03	0.886	0.886	0	5	5	0	1% AEP, 5 min burst, Storm 1			
Cat 02/EX1	0.014	0.014	0	5.49	0	0	1% AEP, 10 min burst, Storm 8			
Cat N04	0.206	0	0.206	5	5	0	1% AEP, 10 min burst, Storm 1			
PIPE DETAILS										
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm					
OSD01 - 01/L1	0.325	2.44	74.077	70.626	1% AEP, 25 min burst, Storm 9					
01/L1 - 01/EX1	0.421	3.16	70.626	70.422	1% AEP, 20 min burst, Storm 3					
02/L1 - 02/EX2	0.461	2.9	70.358	70.264	1% AEP, 20 min burst, Storm 3					
02/EX1 - Out	0.465	2.92	70.199	69.28	1% AEP, 20 min burst, Storm 3					
CHANNEL DETAILS										
Name	Max Q (cu.m/s)	Max V (m/s)			Due to Storm					
OVERFLOW ROUTE DETAILS										
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm		
OF01	0.037	0.067	0.302	0.128	0.02	4	0.15	1% AEP, 15 min burst, Storm 2		
OF02	0.067	0.067	1.388	0.031	0.03	4	1.04	1% AEP, 15 min burst, Storm 2		
OF03	0.886	0.886	1.445	0.114	0.26	4	2.24	1% AEP, 5 min burst, Storm 1		
OF04	0	0	1.336	0	0	0	0			
OF06	0.065	0.065	1.364	0.029	0.03	4	1.16	1% AEP, 10 min burst, Storm 1		
OF07	0.014	0.015	1.413	0.022	0.01	4	0.52	1% AEP, 15 min burst, Storm 10		
OF08	0	0	0.696	0	0	0	0			
OF05	0.206	0.206	1.465	0.065	0.07	4	1.04	1% AEP, 10 min burst, Storm 1		
DETENTION BASIN DETAILS										
Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level					
OSD01	75.37	380.4	0.325	0.325	0					
Run Log for 2020 run at 15:52:11 on 1/10/2020 using version 2020.043										
No water upwelling from any pit. Freeboard was adequate at all pits.										
Flows were safe in all overflow routes.										

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