Griffith Base Hospital Redevelopment

Civil SSDA Design Report

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Bonacci Group (NSW) Pty Ltd
ABN 29 102 716 352
Level 6, 37 York Street
SYDNEY NSW 2000
Tel: +61 2 8247 8400
www.bonaccigroup.com

Report Amendment Register

Rev. No.	Issue/Amendment	Author/Initials	Reviewer/Initials	Date
1	SSDA	DW	SN	27/5/2020
2	SSDA	GK	RG	9/11/2020
3	SSDA	GK	RG	15/12/2020
4	SSDA	GK	RG	18/01/2021
5	SSDA	GK	GK	30/03/2021
6	SSDA	GK	GK	30/03/2021

Table of Contents

List of Figures

1. INTRODUCTION

This report has been prepared by Bonacci Group (NSW) Pty Ltd to describe the civil works including the stormwater strategy associated with the Griffith Base Hospital Redevelopment. Report addresses all "policies and guidelines" listed in the SEARs for SEARs Requirements 16, 17, 18.

This SSDA report incorporates the following:

- Demolition of Building 25,
- Construction of new Clinical Services Building,
- Construction of new western car park,
- Demolition of Buildings 1, 2, 6, 15, 16, 17, 19, 20, 22, 28, 29, 31, 35,
- Landscaping works,
- Construction of new main car park,
- Demolition of temporary car par.

This report addresses the redirected, upgraded and proposed new stormwater drainage networks related to the redevelopment works, new carparks and access roads and driveways, construction of carparks and footpath pavement, and bulk earthworks associated with the development. This design report also incorporates the Water Sensitive Urban Design measures which have been incorporated into the design to address the quality of stormwater discharge. This includes construction of grassed open drains/swales allowing cleansing and infiltration of stormwater runoff.

The site is not shown to be flood affected in Griffith City Council's flood mapping. However, areas downstream of the site (to the south) are flood affected. It is crucial that the pre-development and post development stormwater runoff from the site is maintained, at least, at the same rates, or where possible, the post development runoff reduced.

Earthworks have been adjusted to institute a balanced earthworks approach for the site. Compliance with strict dust and soil and water management plans will ensure there are no adverse impacts on the surrounding community.

High strength rock exists at sometimes very shallow depth across the site. JK Geotechnical Report, dated Nov 2019, states that this high strength rock will be able to support vertical cut faces in trenches. Vertically cut trench faces will reduce the amount of spoil material removed during trench installation, vastly reducing the footprint and impact of trenches for stormwater drainage pipes.

The evolution of temporary stormwater drainage diversions and protection measures will need to be coordinated closely on-site during demolition and construction. A soil and water management plan will evolve with the project to ensure rainwater is adequately conveyed from the site during construction. The plan will include installation of sediment fences, construction of a sediment basin or basins, catch drains, temporary site exit, setting up areas for the construction materials stockpiles. The contractor shall ensure that all water draining offsite meets the strict water quality measures instituted by authorities.

As the site is sloped at a reasonable grade, care has been taken to ensure pedestrian links are accessible to all. Carpark and vehicular access input from the traffic consultant has shaped the location and size of any new parking areas. A Disability Discrimination Act (DDA) compliant access has been achieved adjacent to the access road to the front of the new hospital and for footpath accesses to the carpark from Warrambool Street.

1.1. Objectives

The objectives of this report is to demonstrate compliance with all the requirements of *Griffith City Council Engineering Guidelines for Subdivisions and Development Standards, Griffith City Council Onsite Detention Policy* are following:

- To design of the stormwater drainage system for the site, including underground pipe networks and surface flow paths, is to accommodate the stormwater runoff up to and including 100 year ARI storm events without having adverse impact to the adjoining properties,
- To provide stormwater diversion system to accommodate peak flows up to including 100 year ARI storm events for better management of the stormwater runoff both construction and fully established periods for the proposed site,
- To maintain the permissible site discharge (peak flows from existing site) for the site due to development from 5year ARI (minor storm events) up to and including 100year ARI (major storm events) storm events, and
- To provide a functional Water Sensitive Urban Design (WSUD) measures for the site to improve the water quality system overall.
- Detail measures to minimise and manage the generation and off-site transmission of sediment, dust, and fine particles.

1.2. Secretary's Environmental Assessment Requirements (SEARs)

The table below responds to the Secretary's Environmental Assessment Requirements (SEARs) issued for the project:

SEARs	Response – reference section / Appendix
1. Environmental risk assessment to identify the potential impacts associated with the development.	Refer Section 5.0 of this Report
2. Integrated water management plan (SEARs 7) - Stormwater Drainage (SEARs Requirement 16) - Flooding (SEARs Requirement 17)	Refer Section 4.0 of this Report
3. Details of measures to minimise operational water quality impacts on surface waters and ground water.	Refer Section 4.5 of this Report
3. Detail measures to minimise and manage the generation and off-site transmission of sediment, dust, and fine particles. - Sediment and erosion control plan (SEARs Requirement 18)	Refer Section 6.0 of this Report

2. SITE DESCRIPTION

2.1. Location

The hospital is located at 1 Noorebar Avenue, Griffith NSW 2680. Noorebar Avenue is to the south west and south of the site, Animoo Avenue is to the west and north of the site and Warrambool Street is to the east of the site. These roads encircle the Hospital which is located adjacent St. Vincent Private Community hospital (to the north). A shared access from Animoo Avenue serves St Vincent Private Community Hospital and Griffith Base Hospital.

The proposed site is located within Griffith City Council Local Government Area (LGA). The locality map of the site is shown in *Figure 1* below.

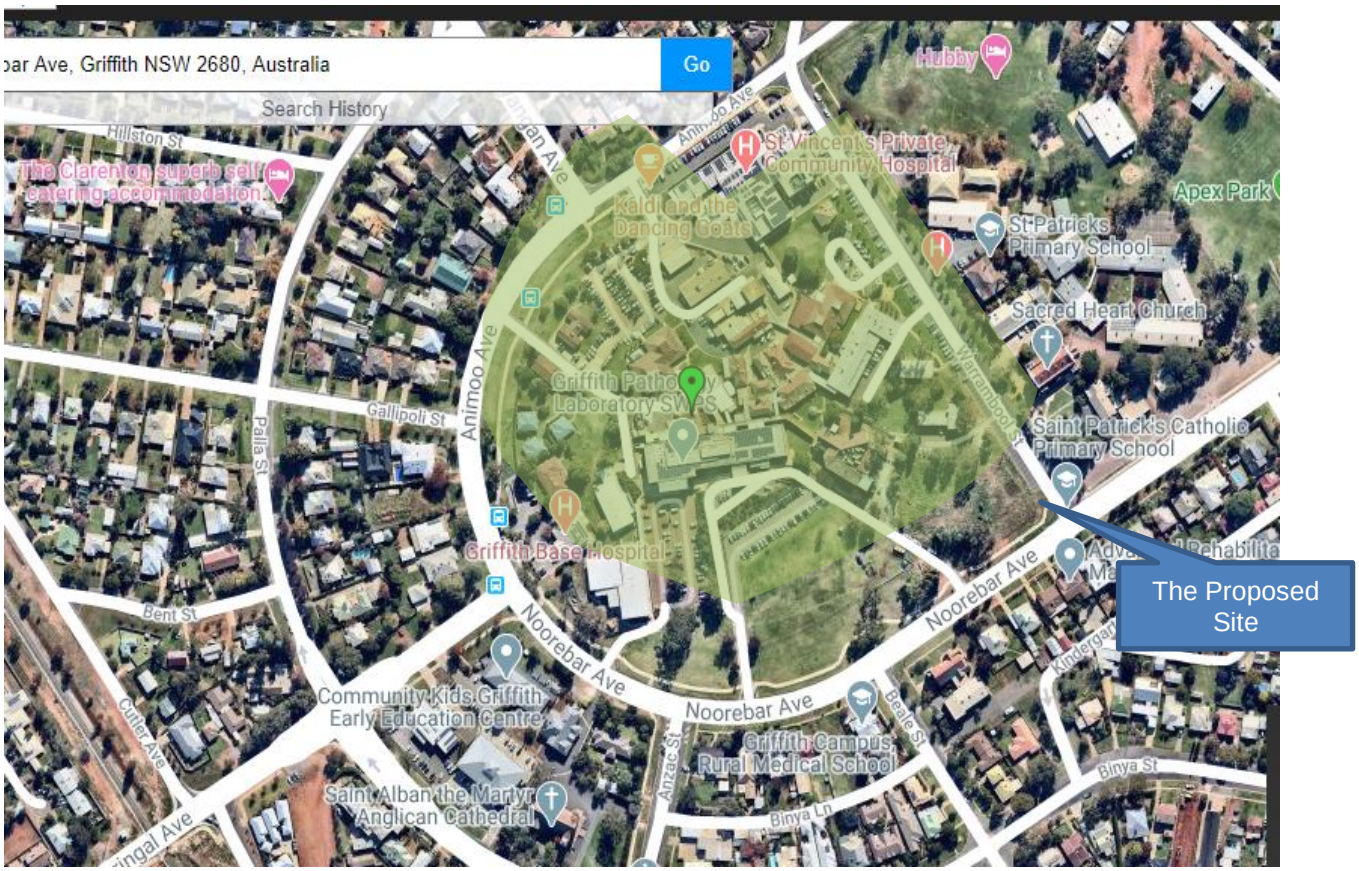


Figure 1: The Locality Map of the Site (Source: Nearmaps)

2.2. Topography

The Hospital site is located on the high side of stormwater catchment adjacent to a localised crest/top of the catchment. The site generally slopes toward the south (Noorebar Avenue), with a portion falling toward the north west corner to Animoo Avenue. There are internal overland flow paths between buildings which traverse the site, following the existing ground falls. There are existing pit and pipe stormwater network within the site that are connected to either the kerb (Animoo Avenue and Warrambool Street) or the street stormwater pit and pipe system in Noorebar Avenue.

2.3. Existing Documentation

The following, existing, documentation has been examined during the design works :

- Detail Survey by Land Data Surveys, 21st January 2018 including site topography.
- Detail Survey including in ground services by Veris, 2nd April 2020 including existing Pit Depth and Existing Stormwater Pipe dimensions.
- Geotechnical Investigation (Ref: 30991L2rpt) for Proposed early works and main Works by JK Geotechnics Pty Ltd, 15 November 2019.
- Griffith Major Overland Flow Floodplain Risk Management Study and Plan for CBD Catchments, WMA, July 2013.

3. PROPOSED DEVELOPMENT

The proposed redevelopment incorporates a new Clinical Services Building on the location of the existing western carpark, new main car park on the location of the existing main hospital building and new Western car park between hospital accommodation and new hospital main building. New ambulance bay and a new pedestrian link will be constructed to enable access from the Clinical Services Building to other hospital departments, and demolition of the majority of the existing site buildings. To ensure continuity of services, careful staging of the works and demolition are required. This has been incorporated in civil plans. The proposed site plan (at completion of works) is shown in *Figure 2.*

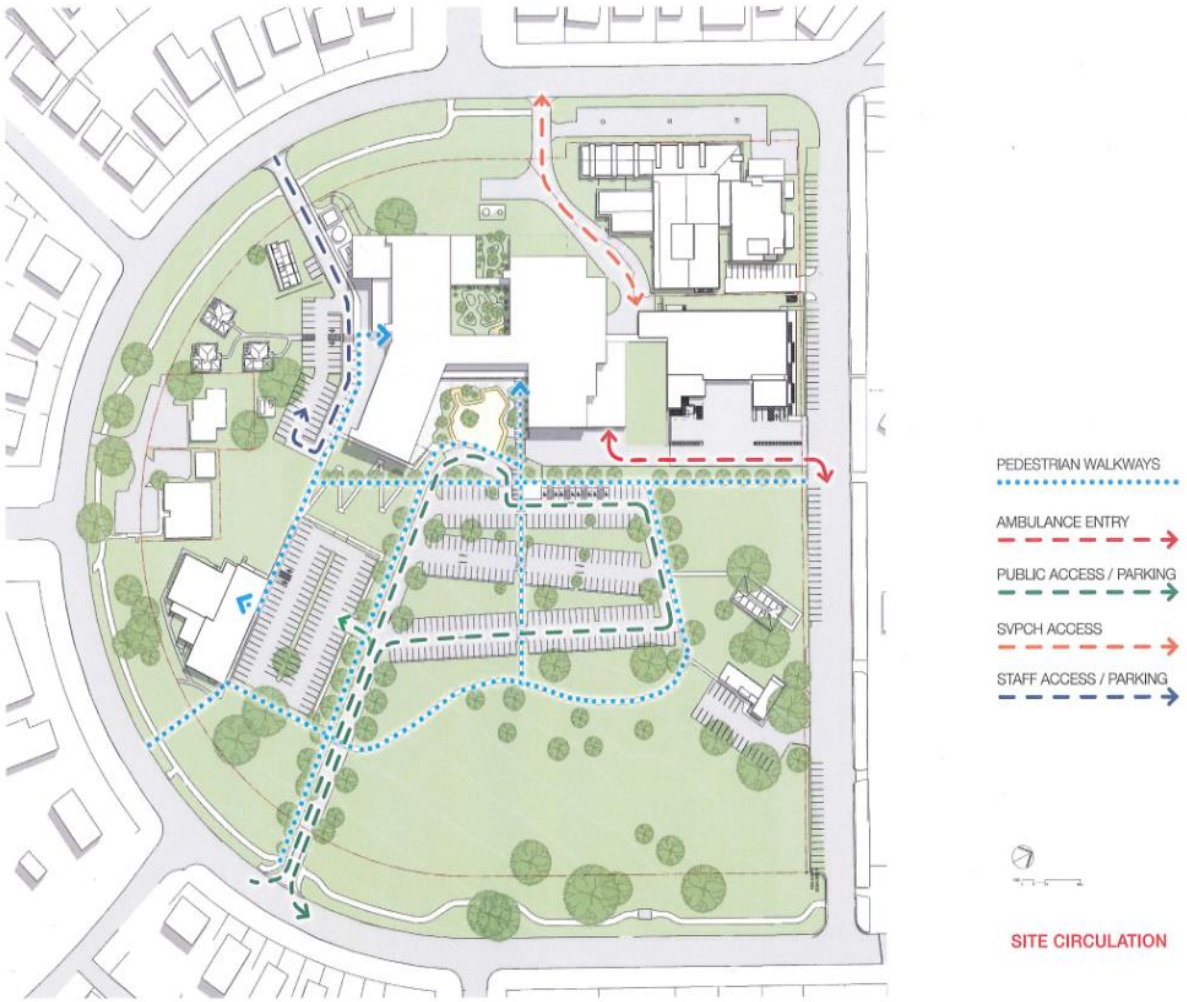


Figure 2: The Architectural Site Plan (by DJRD Architects)

4. INTEGRATED WATER MANAGEMENT PLAN (SEARS REQUIREMENT 7)

An integrated approach has been considered, in the hospital redevelopment, in water management of surface water, groundwater and stormwater.

4.1. Catchment Delineation

The Hospital site is located on the high side of stormwater catchment adjacent to a localised crest/top of the catchment. Therefore, there are no upstream/uphill areas that will drains through the site. The estimated total stormwater catchment size is approximately 2.80ha in area. The proposed catchment plan is provided in *Figure 3,* below.

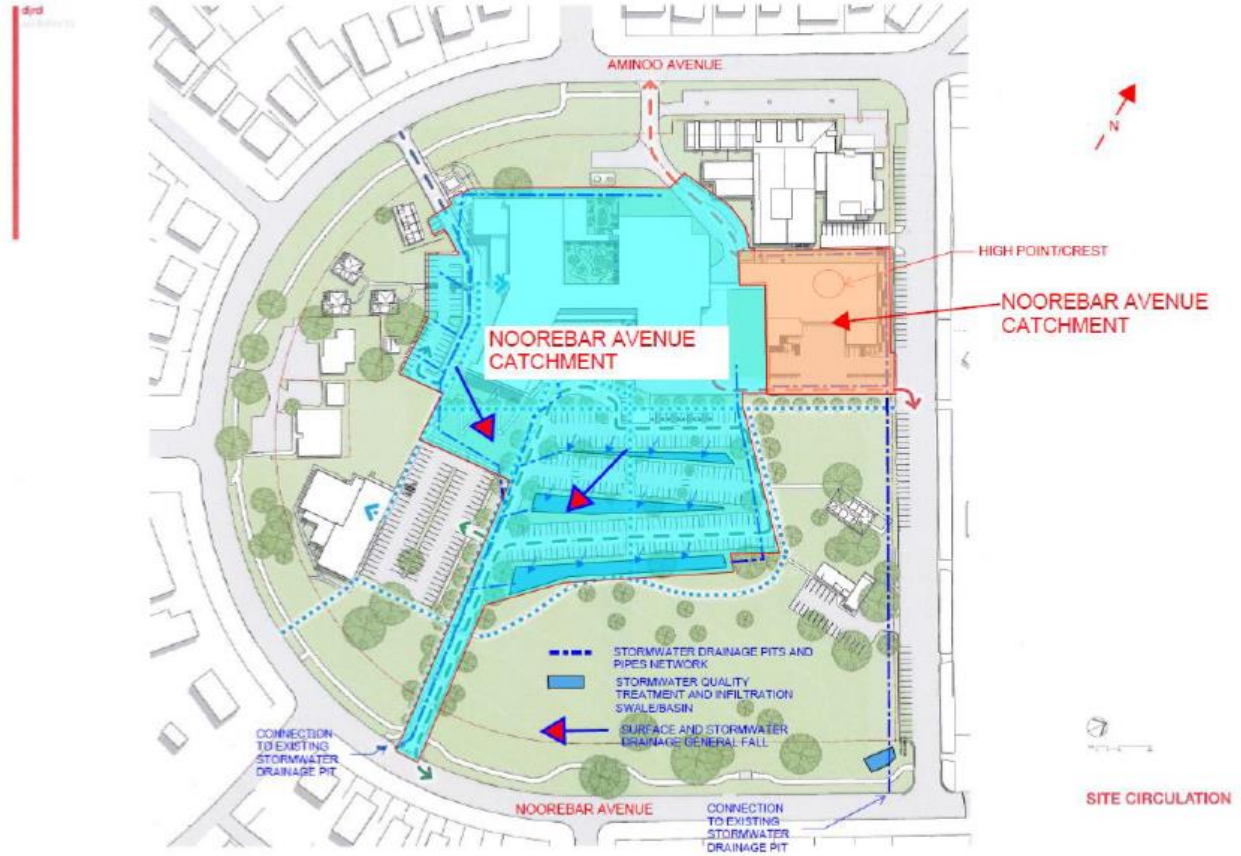


Figure 3: Stormwater Catchment

4.2. Stormwater drainage (SEARs Requirement 16)

Instances of trapped low points (that is, areas where water would pond before being able to escape via overland flow) were observed across the site. This was particularly evident on the uphill side of buildings and links. If the stormwater inlet pits or pipes in these areas block, or the capacity of the underground drainage is not sufficient to accommodate and convey stormwater flows, there is a risk of localised flooding of the buildings. Proposed

stormwater drainage system has been designed to accommodate and convey stormwater flows from buildings, car parks, internal roads and driveways, landscaped areas and to eliminate a risk of localised flooding.

Griffith City Council has a requirement that on-site detention is to be provided for all developments that drain to Council's stormwater infrastructure where peak flows are increased in relation to the predevelopment conditions. The aim of this requirement is to ensure that new developments and redevelopments do not increase peak stormwater flows in downstream areas during major storm events of up to and including the 100year ARI (1% Annual Exceedance Probability) storm event.

It has been estimated that the overall impervious areas, within the site (roofs, carparks, paved areas) will be reduced as a result of the development, by approximately 15%, and this will result in the reduction of stormwater flows. Proposed new stormwater drainage system includes construction of open drains/swales, detention basins and infiltration areas, which will result in further reduction of stormwater flows from the site. Estimated peak stormwater flows, from the site, will be less than the predevelopment flows, and on-site detention of stormwater will not be required.

Results of DRAINS computer modelling:

Pre- Development stormwater flows at the Noorebar Avenue Intersection (Site 'Discharge Point') - 376l/s for the 1 in 20 Years ARI Rainfall Event,

Post-Development stormwater flows at the Noorebar Avenue Intersection (Site 'Discharge Point') - 226l/s for the 1 in 20 Years ARI Rainfall Event,

The modelling indicates that there will be no surface stormwater flow across Noorebar Avenue during the 1 in 20 years ARI Rainfall Event.

Contractor commissioned for construction works will be required to prepare a temporary stormwater diversion plan, for each stage of construction works. The plan will include location of existing stormwater drainage within or adjacent to the Construction site and proposed location of temporary stormwater drainage. Based on the assessment of the proposed staging of construction works, there will be no increase in stormwater flows from the site.

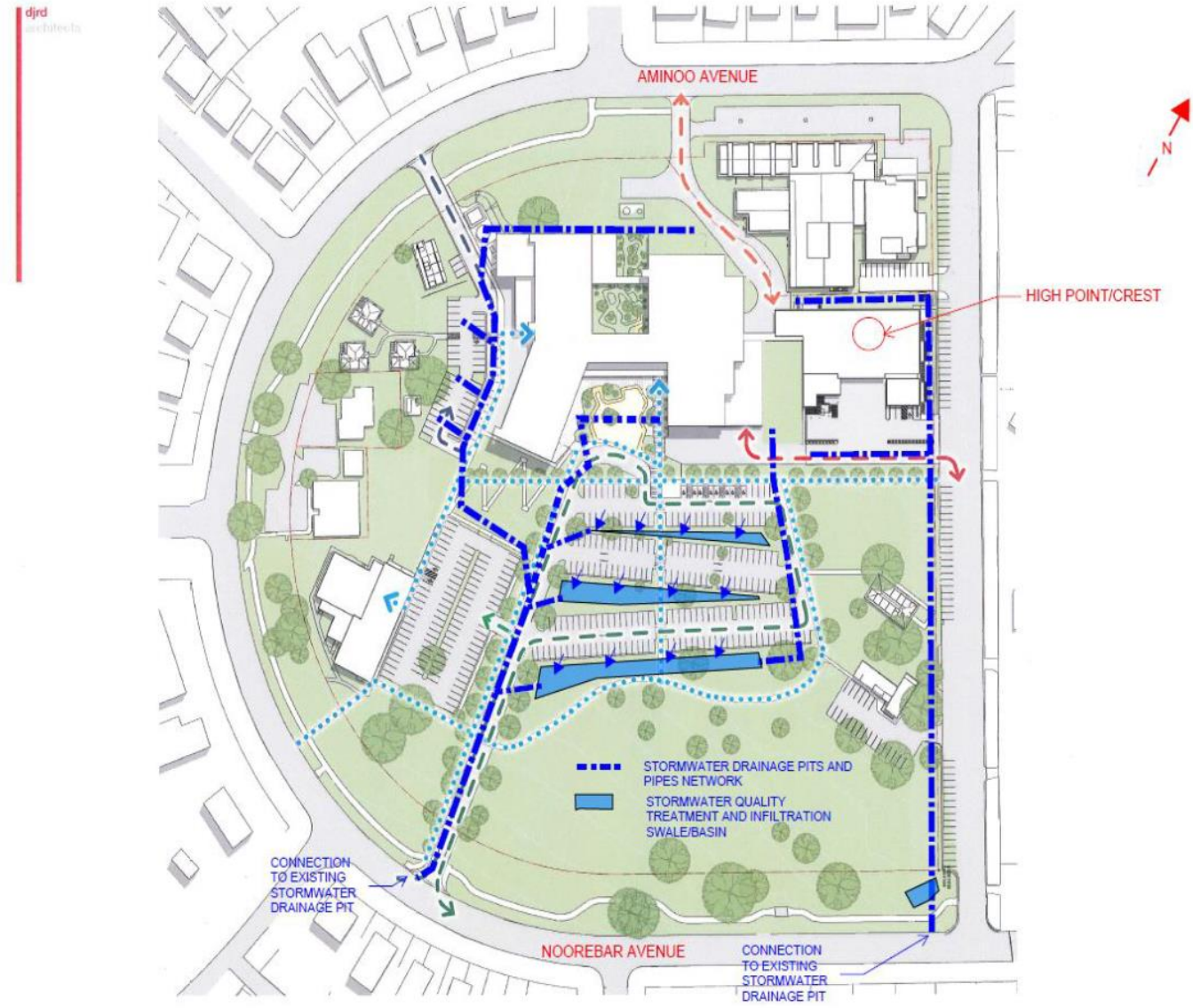


Figure 4: Stormwater Drainage System

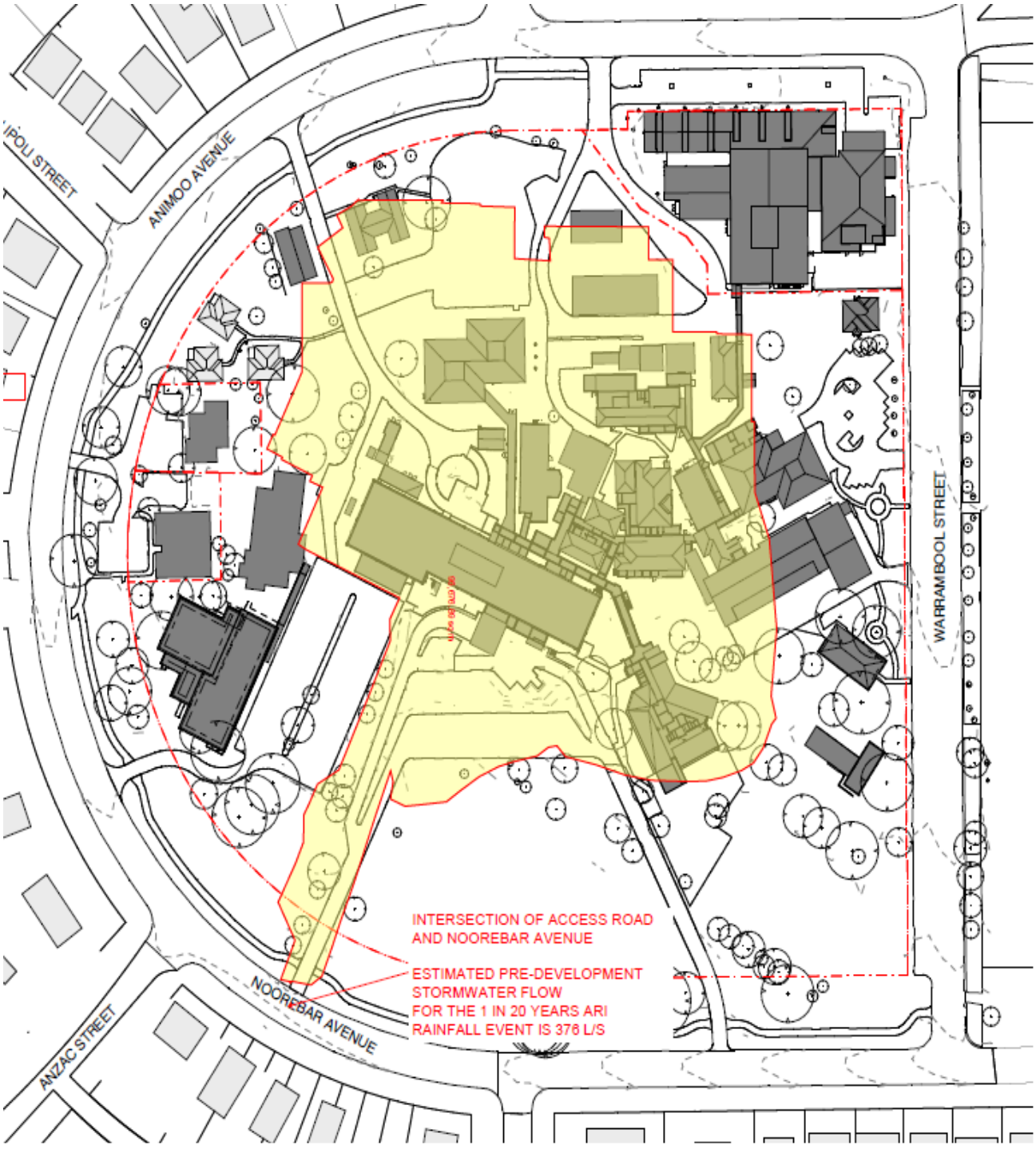


Figure 5: Stormwater Drainage Catchment and estimated Stormwater Flows Pre-Development

Figure 6: Stormwater Drainage Catchment and Estimated Stormwater Flows Post-Development

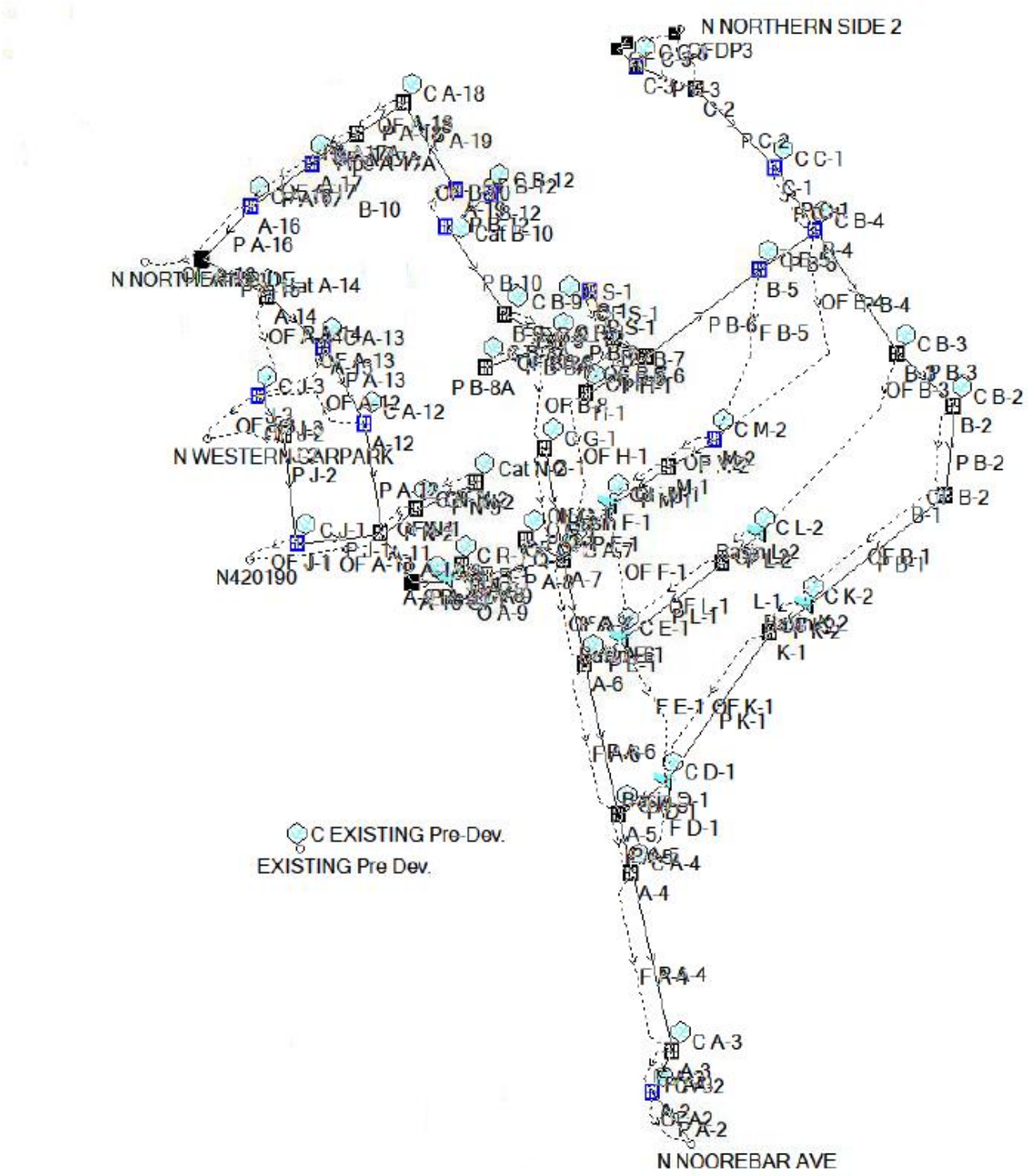


Figure 7: Stormwater Drainage DRAINS Computer Model

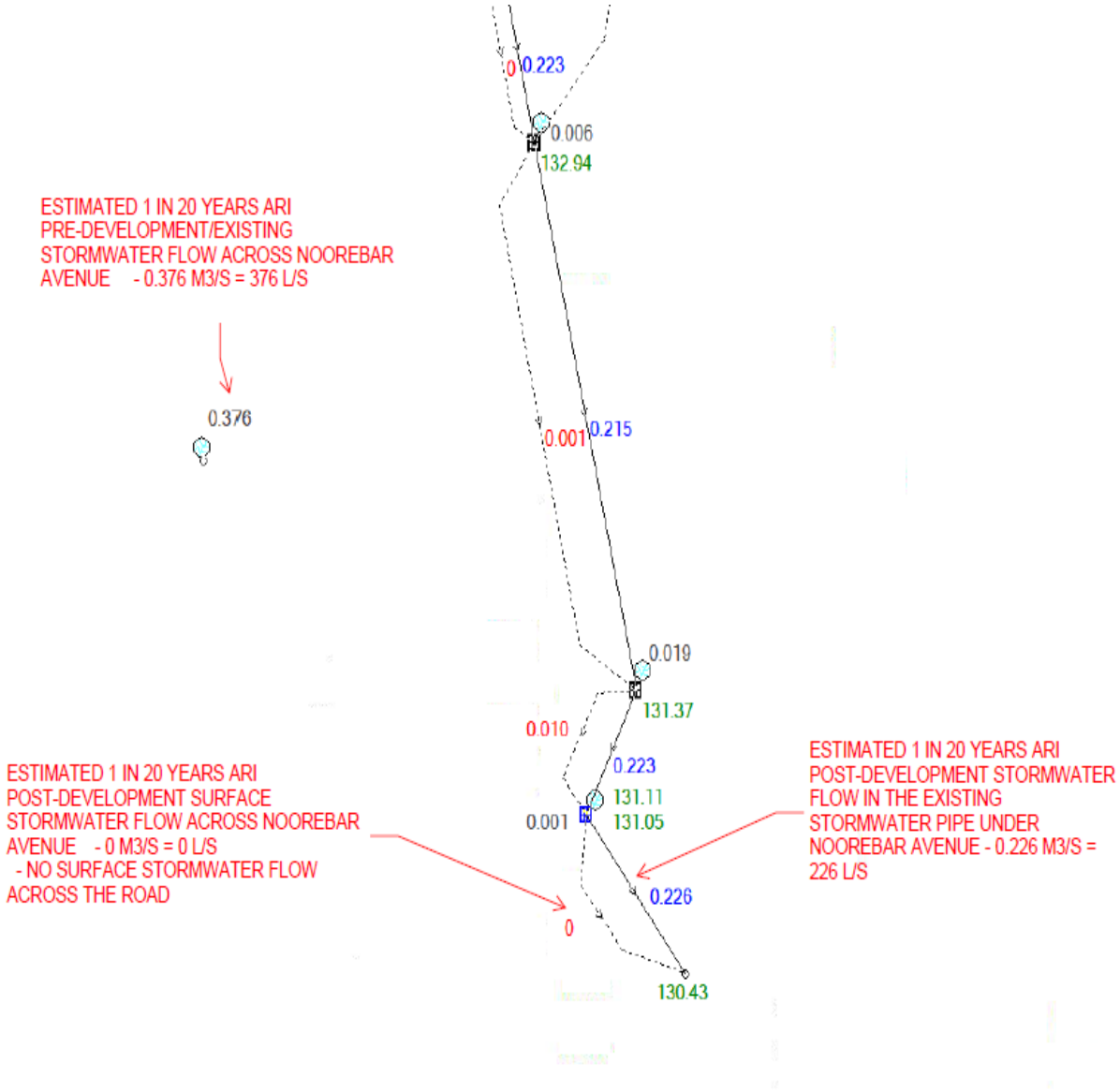


Figure 8: Results of DRAINS Computer Modelling, 1 in 20 Years ARI Rainfall Event

4.3. Flood Impact Assessment (SEARs Requirement 17)

The site is not shown to be flood affected in Councils flood mapping, refer to image below, however areas downstream of the site (to the south) are flood affected. Any redevelopment of the site that results in the increased stormwater flows from the site will, potentially, result is increasing flood levels downstream of the site. Therefore, the proposed site drainage system has been designed to make sure there is no increase in stormwater flows, from the site, after completion of the redevelopment works.

Potential impact of climate change has been evaluated. Current modelling indicates that the rainfall intensity will change approx. -5% to + 10% in 2030, and approx. -6% to + 14 % in 2070. The changes if rainfall intensity will

be negligible, based on the modelling and there should be no changes, or only minimal, to the currently estimated flooding extent shown on the Council's flood maps.

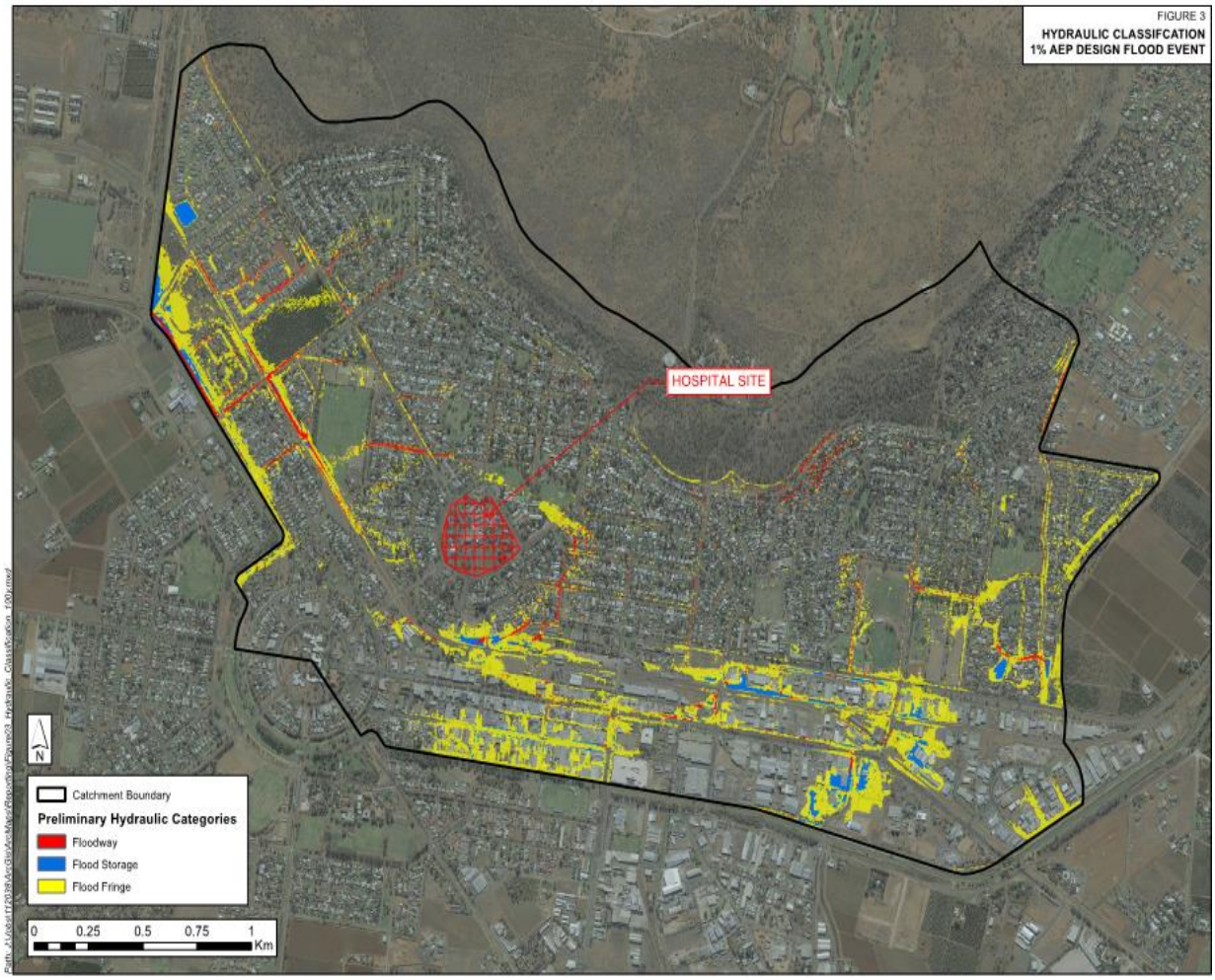


Figure 9: 1% AEP Flood Hydraulic Categorisation (Griffith Major Overland Flow Floodplain Risk Management Study and Plan for CBD Catchments, WMA, July 2013)

4.4. Ground water

Groundwater was generally not encountered in boreholes on site, during geotechnical investigation, and it is believed the groundwater level is well below the existing ground levels. One borehole did have water at the bottom after drilling, but as stated in the geotechnical report, this was likely due to the use of water as a lubricant while drilling. It was noted that the site had experienced dry conditions prior to the investigation and that groundwater conditions may vary on site.

4.5. Stormwater Quality

There are no specific water quality control targets specified in the Griffith Council's Engineering Guidelines. However, Council recommends incorporation of Water Sensitive Urban Design measures into the design to address the quality of stormwater discharge. These include grassed swales, bio-retention swales and basins and infiltration areas.

The site stormwater drainage strategy incorporates Water Sensitive Urban Design principles by including grassed swales, bio-retention swales and basins, infiltration trenches and areas.

Swales, bio-retention basins and infiltration areas within the main carpark allow for stormwater infiltration and removal of pollutants as presented in the computer modelling of the proposed works.

We have designed Stormwater Quality Treatment system using the MUSIC Computer model and achieved The Green Star developments Stormwater Quality Reduction targets:

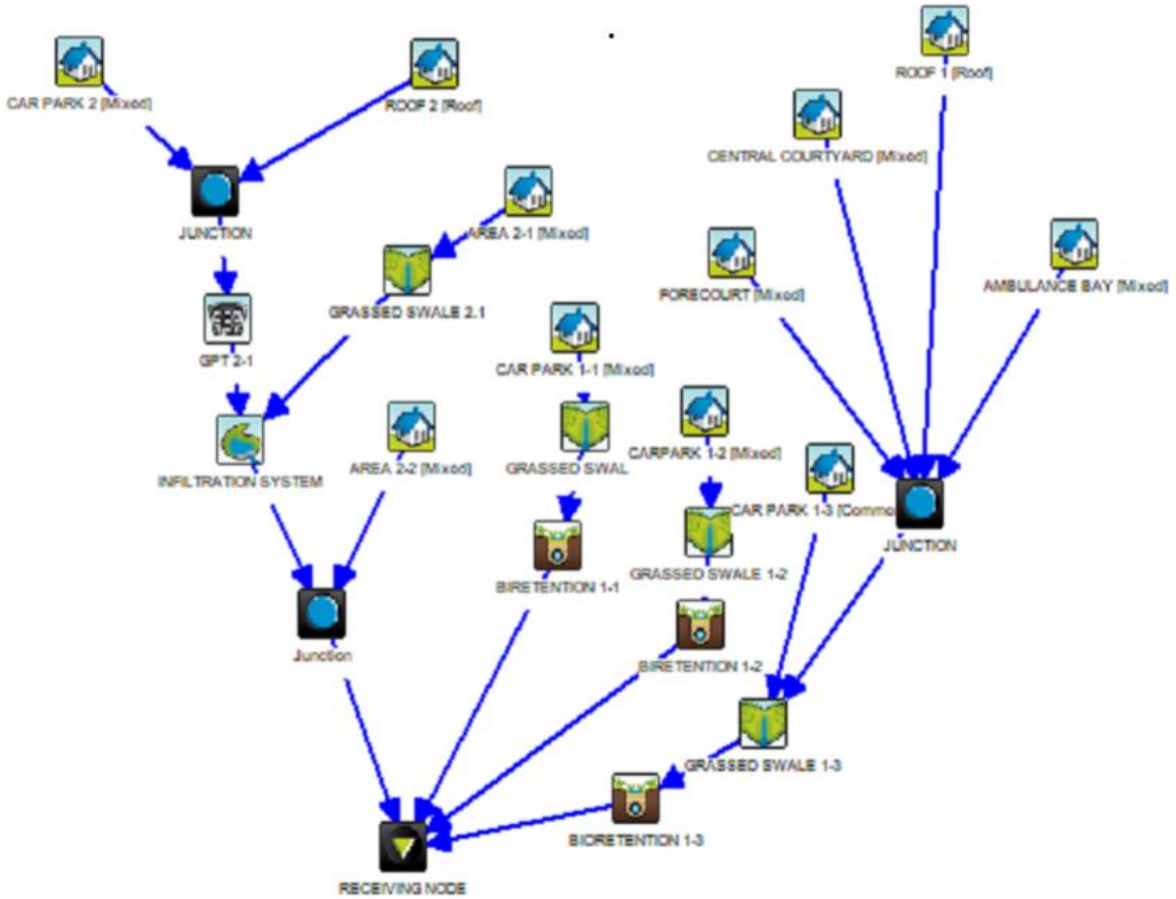
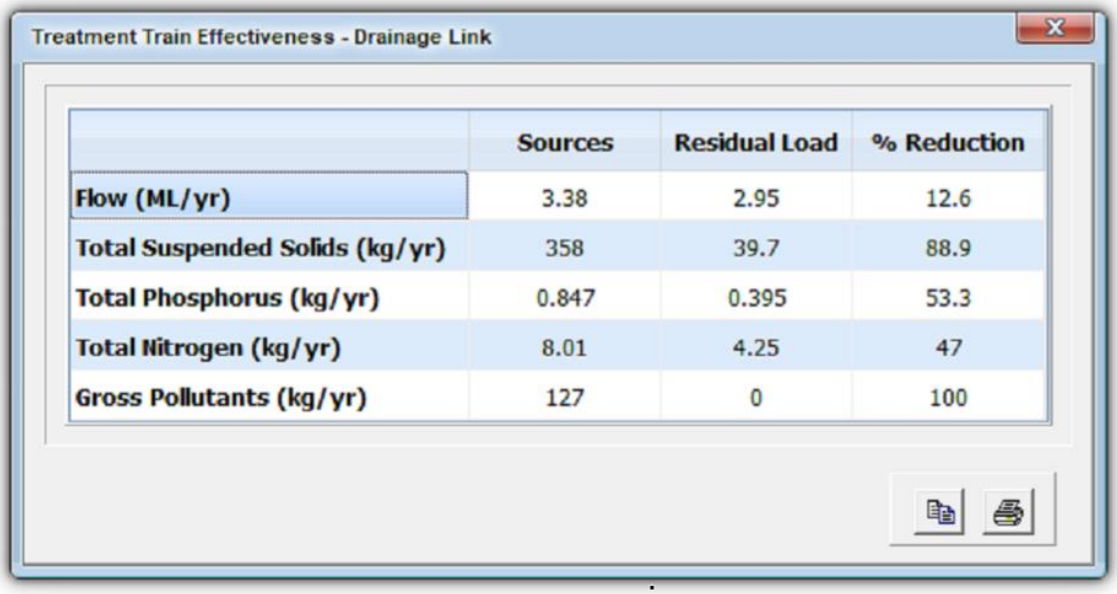


Figure 10: Stormwater Quality Treatment - MUSIC Model



	Sources	Residual Load	% Reduction
Flow (ML/yr)	3.38	2.95	12.6
Total Suspended Solids (kg/yr)	358	39.7	88.9
Total Phosphorus (kg/yr)	0.847	0.395	53.3
Total Nitrogen (kg/yr)	8.01	4.25	47
Gross Pollutants (kg/yr)	127	0	100

Figure 11: Stormwater Quality Treatment - MUSIC Modelling Results

Credit 26.2 Stormwater Pollution Targets

This is omitted from the current GS pathway but we wanted to understand if the the stormwater design can demonstrate compliance to reduction of the pollution targets as per Column A of the below table.

Pollutant	Reduction Target (% of the typical urban annual load)		
	A	B	C
Total Suspended Solids (TSS)[1]	80%	80%	90%
Gross Pollutants	85%	90%	95%
Total Nitrogen (TN)[2]	30%	45%	60%
Total Phosphorus (TP)[2]	30%	60%	70%
Total Petroleum Hydrocarbons[3]	60%	90%	90%
Free Oils[3]	90%	90%	98%

Notes:

1 Load based on the following particulate size distribution (by mass): 20% <20 µm; 20% 20-60 µm; 20% 60-150 µm; 20% 150-400 µm; 20% 400-2000 µm.

2 Load includes particulate and dissolved fraction.

3 This requirement is not applicable where the site contains less than a total of 200m² of uncovered areas where vehicles are likely to transit and/or park e.g. roads, loading docks, refuelling bays, car parking etc.

Figure 12: Green Star Development Stormwater Pollution Removal Targets

5. ENVIRONMENTAL RISK ASSESSMENT

The assessment of Environmental risk is focused on a few key areas around the hospital redevelopment. This assessment also covers any accompanying works including any earthworks and trenching for stormwater infrastructure.

Temporary stormwater drainage diversions and temporary measures will need to be coordinated closely on site during demolition and construction. A soil and water management plan will evolve with the project to ensure rainwater runoff is adequately conveyed from the site during construction.

5.1. Geology

A geotechnical survey has been carried out on site by JK Geotechnics - REF 30991Lrpt dated 5 December 2017. It recommends that wherever possible excavation depths be limited due to the high strength of rock encountered at relatively shallow depths across the site. The report outlines a maximum allowable bearing pressure of rock to be 1000 kPa with a 150 kPa allowable bearing pressure for the stiff clays above it. Given the shallow depths of rock on site, pad footings are expected to be used or alternatively bored piers could be adopted.

The report also recommends the provision of void formers between the subgrade and any suspended slab over to reduce the risk of uplift pressures due to swelling clays.

A second geotechnical report has been carried out by GHD, REF 2127721 dated December 2018. The report states that a site classification of P will apply to part of the site where 'uncontrolled' fill or other unsuitable materials are deeper than 400mm. A site classification of M can be adopted in some areas due to the shallow depth of bedrock. Also noted is that future earthworks resulting in site regrading, placement of fill and cuts may affect the site classification. Further geotechnical investigations have been requested to confirm the level of high strength rock in the region of the proposed new building.

A third report was carried out by JK Geotechnics - REF 30991L2rpt dated 15 November 2019, which includes and expands on the information provided in two other reports listed above. This report gives positive indications of the ability to achieve vertical cuts in high strength rock. This will result in far smaller trench footprints, resulting in much lower impacts on existing trees and infrastructure.

5.2. Earthworks

The site is currently a working hospital. Adequate safety measures must be in place to protect the public and the environment during construction. As there are significant staging constraints, appropriate plant must be chosen, and care taken not to negatively impact on the operations of the existing hospital. Staging plans have been prepared by the Architects to address these issues. Extremely hard rock is at a potentially shallow depth over the whole site. This may impact services trenches and excavation works for the lower ground level of the hospital building. This rock should not have any impact on proposed roadways or carparks. As stated in the previous sub section in this report, while this hard rock may impact speed of excavation, it will also allow for significantly overall narrower trenches, reducing impacts on existing trees and infrastructure. Lesser earthworks will be required for footpaths and temporary buildings.

5.3. Roads and access

The existing, surrounding, Council road network is in relatively good condition. Existing access road, from Noorbar Avenue will require minor reconstruction to connect to the proposed new car park. It is assessed that the existing services and associated infrastructure will not have to be relocated as a part of the road reconstruction works.

New public car park is proposed to the south of the new Clinical Services Building with a new Western car park proposed to the west of the new building.

Maintaining access for St Vincent Private Community Hospital is essential both during construction, and once the new hospital is completed. There is an easement over this access area, and the proposed Clinical Services Building has been located to ensure that access is maintained.

6. EROSION AND SEDIMENT CONTROL (SEARS REQUIREMENT 18)

During construction activities, stormwater quality control will be achieved by deposition and trapping of silts and clays which often have nutrients attached to their surfaces during the construction process.

Erosion & Sediment Controls during construction activities for this development has been prepared in accordance with Landcoms Managing Urban Stormwater: Soils and Construction Volume 1 (the "Blue Book"). By the implementation of the sediment & erosion control plan for the site, a significant portion of nutrients can be removed from stormwater runoff during construction.

Following detailed measures have been proposed during the construction stage to minimise and manage the generation and off-site transmission of sediment, dust, and fine particles.

- Geotextile filter fabric drop inlet sediment traps have been incorporated at each stormwater pit inlet around the construction area - These sediment traps capture a concentrated sediment laden flow and store it under still conditions enabling the silt to deposit at the bottom of the trap.

- Sediment fence has been incorporated according to the fall of the site and the location will be altered as construction progresses and the sites drainage patterns change. This will allow for the sediments (sands and some silts) in the water to settle under gravity and filtering sediment from water as water flows through the fabric.

- Temporary sedimentation basin has been designed in the area located South of the main car park, to intercept sediment laden run-off and to trap and retain sediment. The basin should be monitored daily and maintained throughout the construction stage and shall not be removed until the 'uphill' disturbed areas are stabilised.

- Catch drains have been designed throughout the site to divert sediment laden run-off to sedimentation basins and prevents clean water from getting turbid by diverting run-off from undisturbed up-slope areas away from disturbed areas. Diversion works has been be designed in a manner that will not erode or cause erosion.

- Sandbag kerb inlet sediment traps has been incorporated around stormwater inlet pits at council roads to keep sediment out of the public stormwater network and receiving environment.

The erosion and sediment control measures have been designed to meet the requirements of the Blue Book, and the design will be modified, as necessary, to suit the construction staging.

7. SUMMARY

The proposed stormwater strategy for this State Significant Development Application (SSDA) demonstrates compliance with *Griffith City Council Engineering Guidelines for Subdivisions and Development Standards, Griffith City Council Onsite Detention Policy* requirements by limiting stormwater discharge to pre-development condition for all storm events including 100 year ARI storm events.

The proposed stormwater quality improvement measures (demonstrated in *Section 4.5*) will improve the quality of stormwater discharge from the site.

The proposed stormwater management strategy for the SSDA stated in this report improves the existing stormwater drainage system by reducing flow rates, stormwater pollution and improving the overall water quality for the site.