

Civil Engineering REF Report

Tamworth Hospital Mental Health Unit
Civil Engineering

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Prepared For:

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Executive Summary

Bonacci Group have been commissioned by Health Infrastructure NSW to provide the civil and structural engineering services for the development of a new mental health services unit at Tamworth Hospital.

This report addresses the proposed site civil and structural works, including earthworks, stormwater management, roadworks, and the building structure.

1.1 Civil

This report addresses the following Civil Engineering items:

- Development areas for new hospital building including carpark and landscape areas (5,500sqm), four (4) carpark zones and extensions (5,700sqm).
- Demolition of existing structures and relocation of existing services.
- Stormwater management strategies which include stormwater pits and pipes, trench drains, swales and roof water tank.
- Dedicated On-site Detention tank for each site.
- Water quality strategies including treatment chambers and cartridges based on Water Sensitive Urban Design (WSUD) principles and MUSIC modelling.

1.2 Referenced Documentation

The following relevant documentation has been referenced in the report:

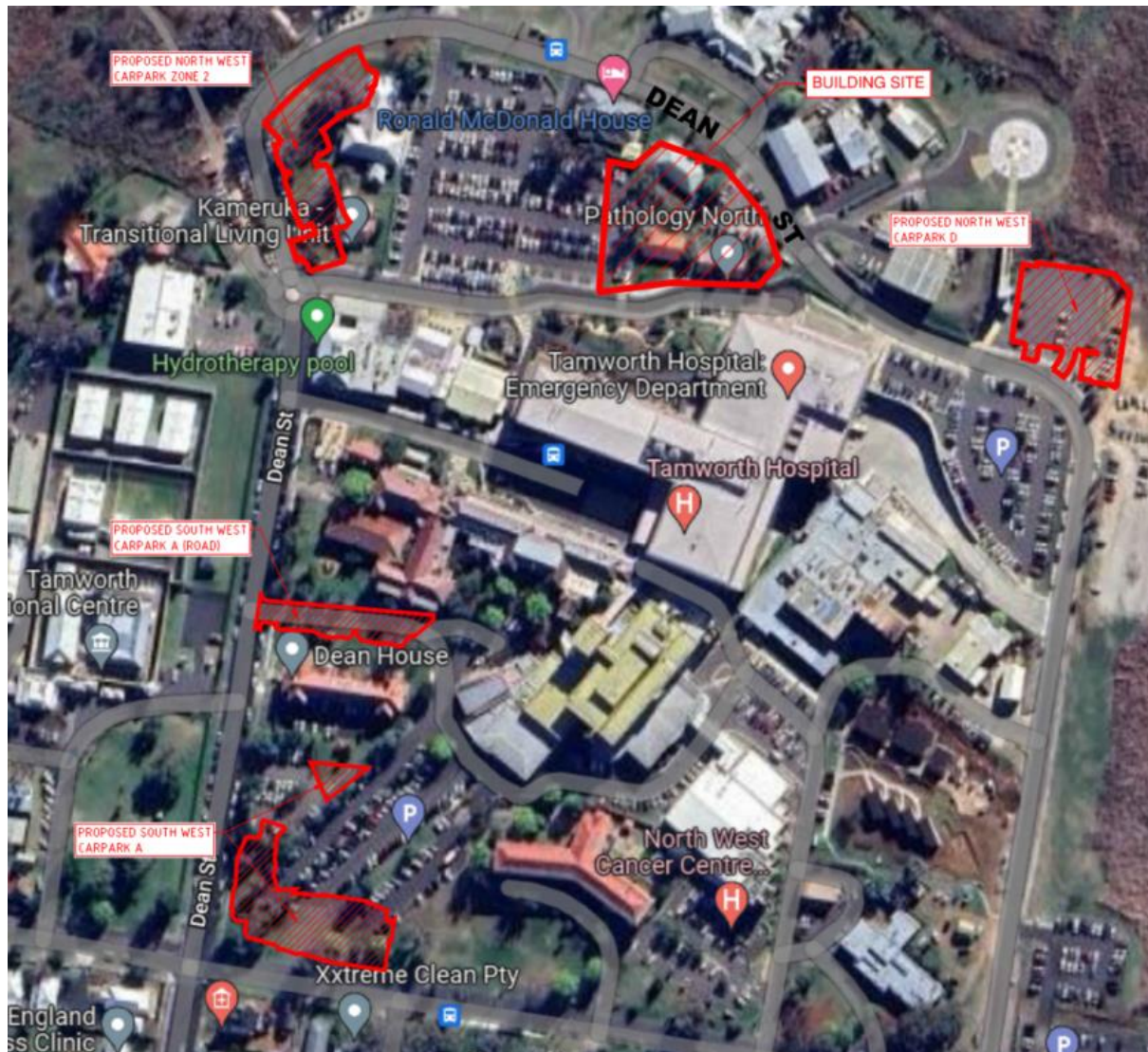
- Architectural drawings by Silver Thomas Hanley dated October 2022.
- Geotechnical Assessment (Report No. RGS32576.1-AS) dated 24 October 2022
- Geotechnical Report by Regional Geotechnical Solutions (Ref: RGS32576.1 - AE) dated 17th March 2021 Preliminary Site Contamination Assessment A2 Banksia Unit, Tamworth Hospital.
- Geotechnical Report by Regional Geotechnical Solutions (Ref: RGS32576.1 - AH) dated 31st March 2021 Detailed Geotechnical Assessment A2 Banksia Unit, Tamworth Hospital.
- Geotechnical Report by Regional Geotechnical Solutions (Ref: RGS32576.1 - AK) dated 22nd November 2021 Proposed Carpark Lot 2 & 3 DP1181268 Tamworth Hospital Stage 1 & Stage 2 Site Contamination Assessment.
- 75735_Root Partnerships_Tamworth_V1 QL-B Utility Investigation dated 17th February 2021.
- Topographical Survey by Brown & Krippner Surveying (ref: 1761C0402-A_signed) dated 8th February 2021.
- Area 10 Carpark Survey by Brown & Krippner Surveying (ref: 1761C0401-B_signed) dated 16th December 2020.
- Area 10 Carpark proposed carpark extension concept markup (ref: 3910-1010 Area 10 Extension V3)
- Area 10 Carpark topographical & detail survey (ref: 21380 Rev A) dated 8th November 2021.

2 Existing Conditions

2.1 Existing Site

The site is located within the Tamworth Regional Council (LGA). The proposed building site is located between Dean Street to the north and east, and the new Acute Service Building & Road to the south and Ronald McDonald House and Carpark to the west.

Proposed Carpark D is located farther east of building site, with Dean Street to its south and existing helipad to the north. Proposed Carpark B is located northwest of the site, with hospital road to its northwest, council road to its southwest, and existing building to its east. Carpark A zones are located southwest of the site. Refer to the site locality map below.



Existing Site Aerial (Source: Google Maps)

2.2 Existing Buildings

There are three existing single storey masonry buildings located on the site. There is also a gravel carpark on the west. Images of the existing buildings are shown below:



Single Storey Masonry Structure located on the southern side of the proposed development.



Single Storey Masonry Structure located on the north-west of the proposed development.



Left: Single Storey Masonry Structure located on the south-west of the proposed development.
Right: Acute Services Building located south of the proposed building.



Left: Single Storey Masonry Structure located northwest of the proposed building
Right: Ronald McDonald House located west of the proposed building

2.3 Topography

The main site is located within undulating residual topography on the mid-slope of a south facing hill. The surrounding slopes generally grade down to the south at 5-8 degrees. Images of the site are shown below:



*Left: Looking East from the top of Dean St.
Right: Looking South from the top of Dean St.*

Figure 2-1 – Site Photos



Left: Looking West from the top of Dean St.

Right: Looking North from the carpark on the West

Figure 2-2 – Site Photos (cont.)

2.4 Geotechnical

A geotechnical investigation was undertaken by Regional Geotechnical Solutions (Ref: RGS32576.1) dated 31st March 2021. During their investigation eleven (11) borehole samples were taken across the site from depths ranging between 2.3-6.0m.

It was found that the site typically consists of a residual soil at the surface overlain by a layer of gravelly clay to depths typically ranging between 1.3m to 5.5m below existing ground level. The silty-clay layer is underlain by extremely weathered siltstone/sandstone of very low strength underlain by highly/moderately weathered rock.

2.5 Existing Stormwater System

The existing Tamworth hospital main site is comprised of a predominantly impervious surface including bitumen carparks, footpaths, and the hospital roof area. The flows produced from the roof area is discharged through a series of downpipes and connected to underground drainage system. Existing stormwater drainage, within the Development Area, includes stormwater drainage pits and underground drainage system.

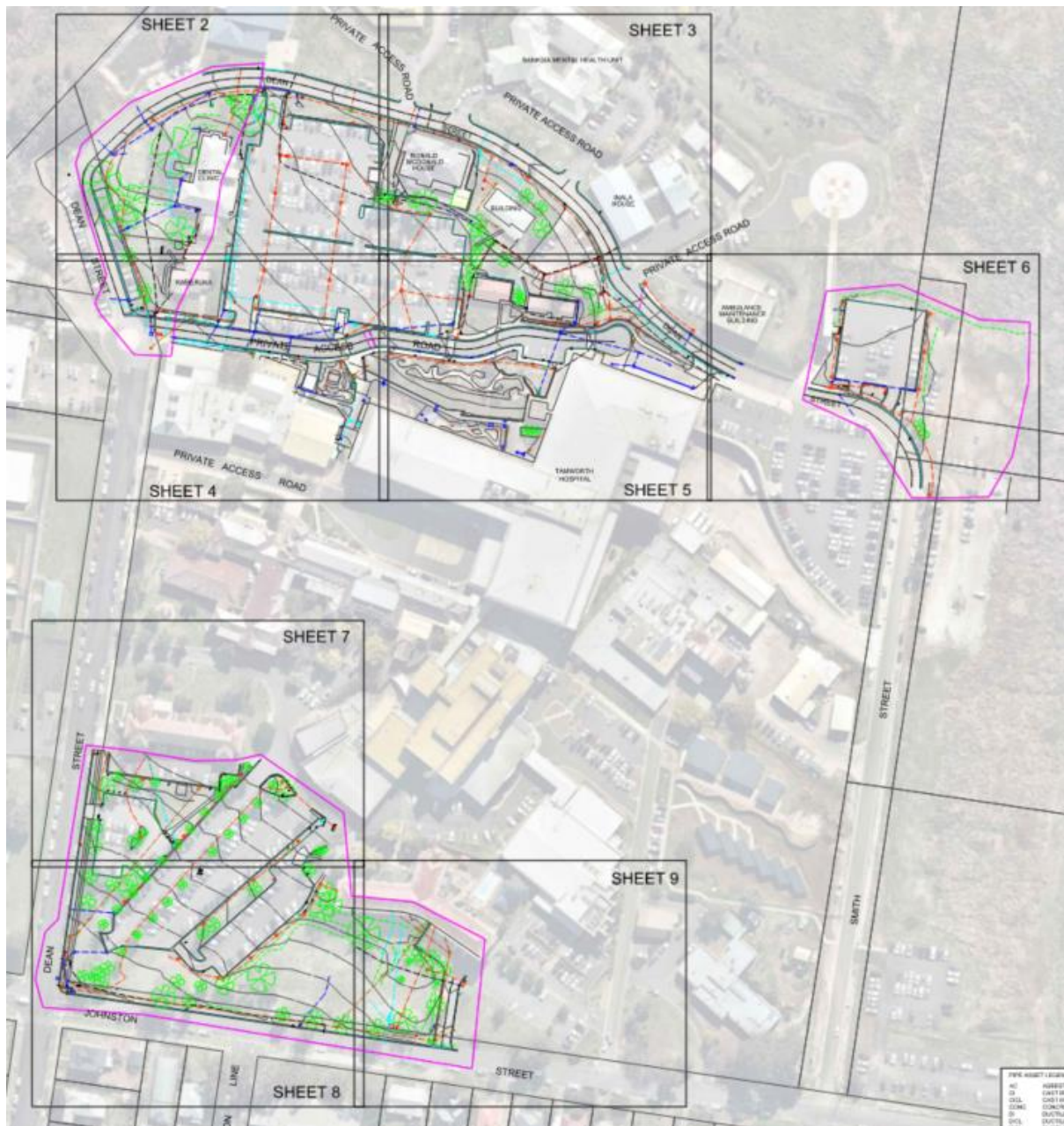


Figure 2-3 – Existing Utility Services including Stormwater Drainage dated 28th Oct 2022

The proposed development is comprised of a three-storey building located north of the new Acute Services Building. The site is constrained by Dean Street to the north and east and the existing carpark and Ronald McDonald House to the west. The proposed mental health building is approximately 3,714 square metres and includes clinical support services for youth, vulnerable and older persons.

The Architectural drawing for Level 2 (ref: A2B-STH-DRW-ARC-A20-200) is shown below:

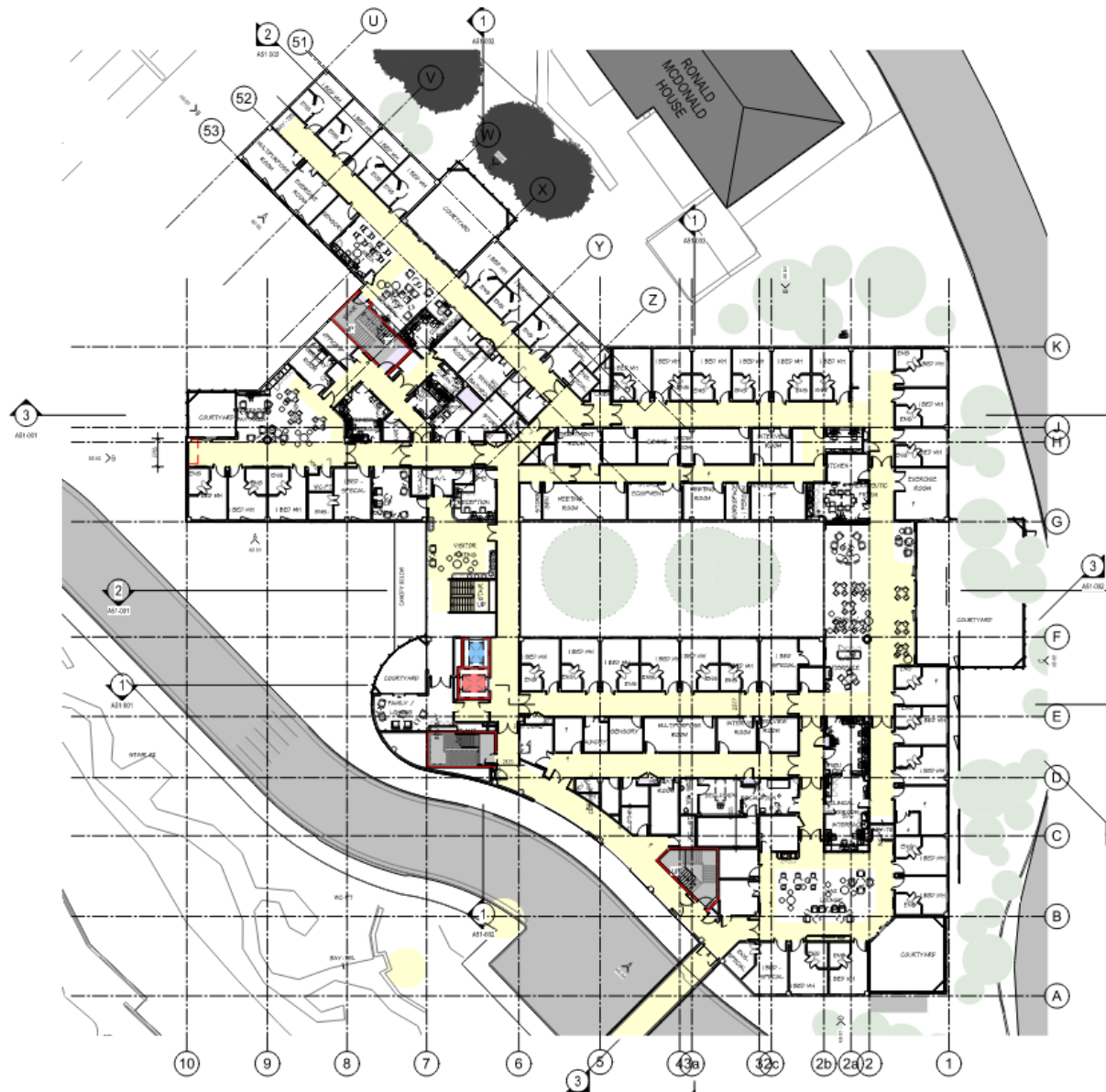


Figure 4a – Main Building Extract from Architectural Drawings A20-200

The development also includes 4 carpark zones (new and extensions of existing carparks). See Figure 4b for overall site layout.

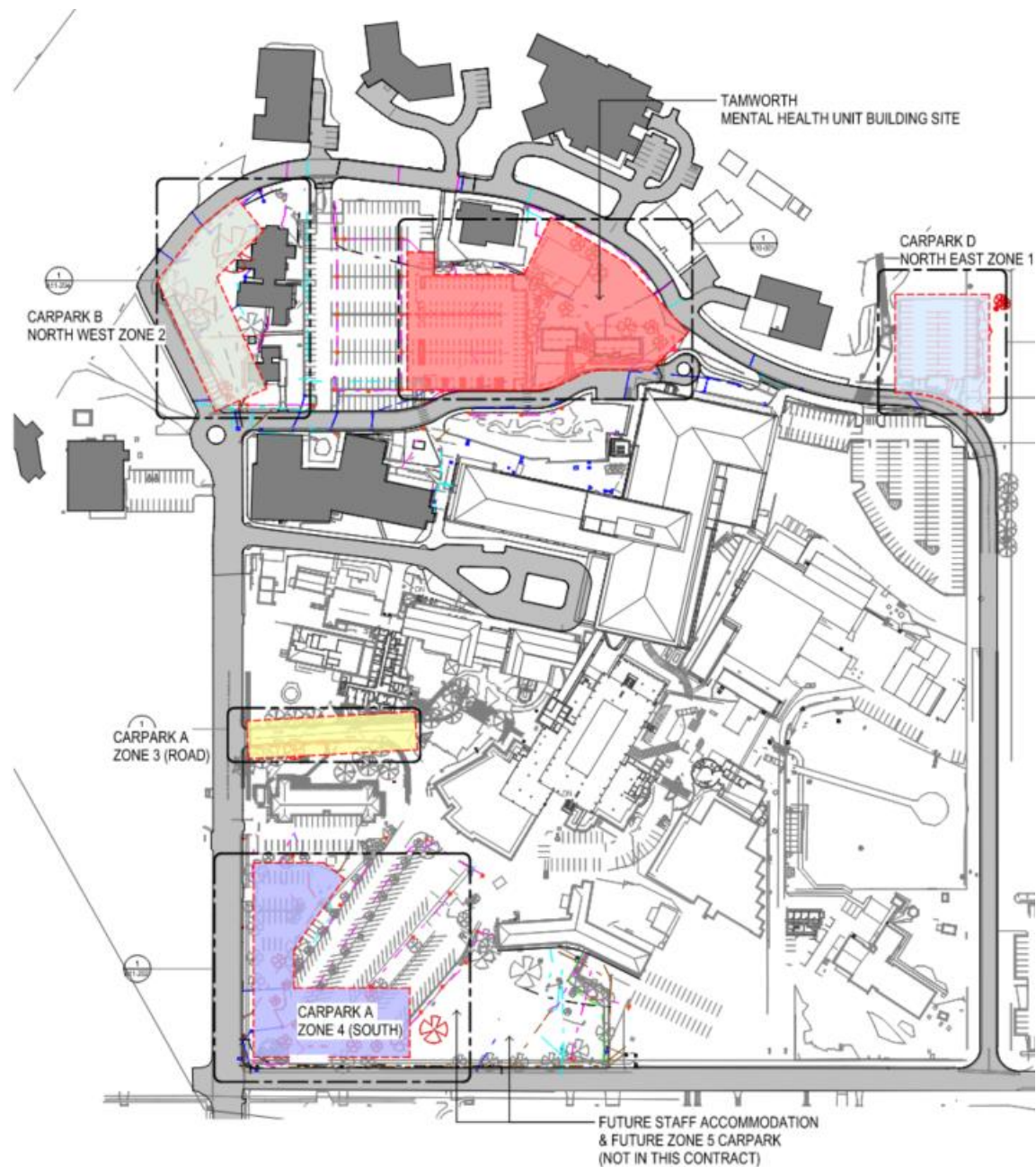


Figure 4b – Overall Site Plan Extract from Architectural Drawings A10-100

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4.1 Stormwater Drainage Concept Design

4.1.1 Stormwater Management Strategy

In accordance with the Tamworth Regional Council requirements, the design of stormwater drainage systems shall be carried out in accordance with the 2001 Release of Australian Rainfall and Runoff 1987, Australian Standard AS3500.0 – Stormwater Drainage, Australian Rainfall and Runoff 2016 (ARR 2016), CSIRO Publication “Urban Stormwater Best Practice Environmental Management Guidelines”, and the requirements of Tamworth Regional Council Minimum Standards for Stormwater Drainage.

An On-site detention (OSD) system is required for any developments with additional impervious surface areas to ensure there is no adverse impact from increased stormwater runoff on downstream properties as a result of new developments or redevelopments during all storm events up to and including the 1 in 100 years Annual Recurrence Interval (ARI) rainfall event. The OSD storages are to be designed to ensure that stormwater targets, as indicated in TRC Stormwater Drainage Standards, are achieved.

It is proposed that all flows from the new Tamworth Hospital Mental Health Unit roof will be captured by downpipes and diverted to a rainwater tank located in Level 1, which will then overflow into an underground OSD. DRAINS software has been used to model the proposed network and to correctly size the inlet pits, the network pipes and OSD tanks.

Our design has indicated an underground On-site detention (OSD) tank of approximately 120m³ for the building site and other OSDs of 135m³ maximum capacity each for the new carpark and proposed extensions, to limit the post-development flows to the pre-development conditions as outlined in TRC Stormwater Drainage Design Criteria.

In accordance with TRC Engineering Design Standards for Subdivision and Developments Part 3– Stormwater Drainage, new developments are to provide a stormwater major/minor system. The "major" system shall provide safe, well-defined overland flow paths for rare and extreme storm runoff events while the "minor" system shall be capable of carrying and controlling flows from frequent runoff events.

A major system is also required for the proposed development in the form of overland flow paths. The major system should be designed to convey flows surcharged from the underground drainage system for storm events up to 100-year ARI. The overland flow is to be directed away from the buildings and carparks and towards the public road kerb and gutter provided.

4.1.2 Stormwater Quality

To protect the existing ecology, the development will be required to satisfy the water quality requirements to maintain the long-term protection of the pre-determined Environmental Values. The Council's Water Sensitive Essentials (WSE) outlines that any development must undertake a stormwater quality assessment to demonstrate that there will be no increase in the pollutant loads, in stormwater flows, discharged from site after development.

Proprietary water quality treatment products including storm filter cartridges within the OSD tank are proposed for the site as water quality treatment devices. For the benefit of reducing the demand on water supply, a rainwater harvesting system can be proposed onsite via the provision of a rainwater tank. Treating and reducing pollutant load from stormwater runoff has multiple environmental benefits including improving urban amenity, reducing pollutant loadings downstream in receiving waters, retarding peak stormwater flow rates and reducing irrigation demands from potable water supply.

Stormwater Quality Treatment will be provided by installation of Filtration system inside proposed On-site detention tanks.

The primary purpose of the storm filter cartridges is to capture and prevent pollutants from entering the waterways. It removes the most challenging target pollutants (including fine solids, soluble heavy metals, oils and soluble nutrients) using variety of media. Stormwater enters the cartridge chamber, passes through the filtration media and begins filling the cartridge centre tube. When water reaches the top of the cartridge the float valve opens, and filtered water is allowed to drain at the design flow rate. Simultaneously, a one-way check valve closes activating

a siphon that draws stormwater evenly throughout the filter media and into the centre tube. Treated stormwater is then able to discharge out of the system through the underdrain manifold pipework.

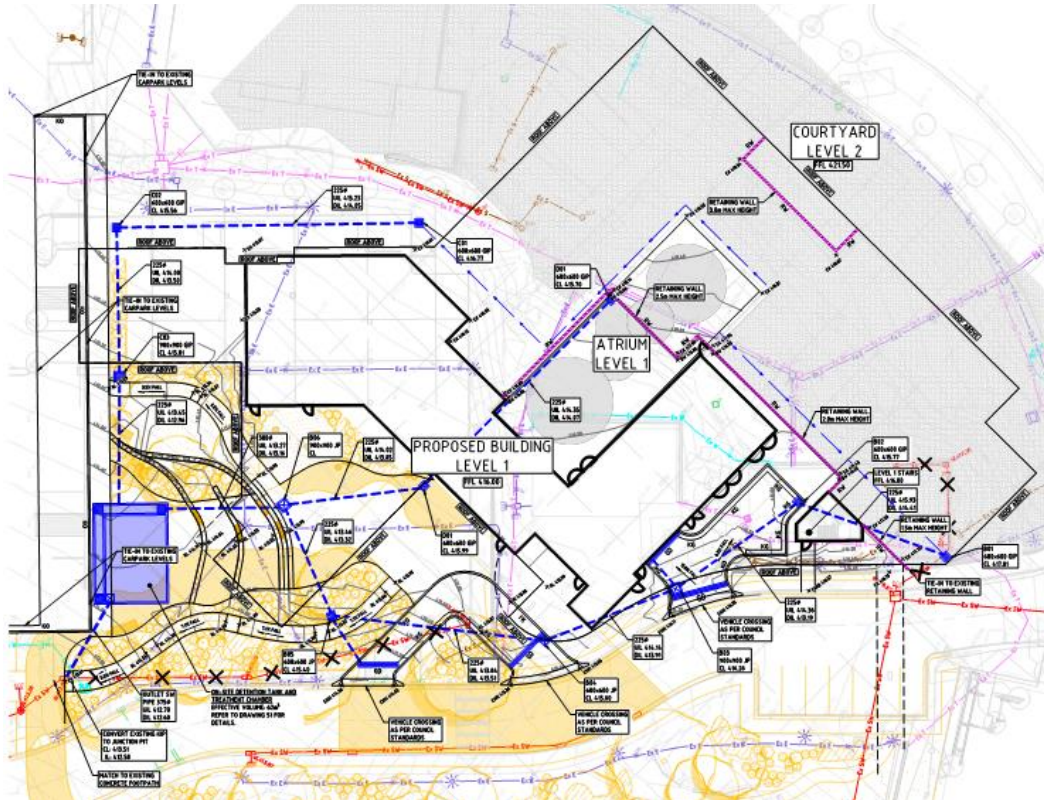


Figure 5a – Main Building Stormwater Drainage.

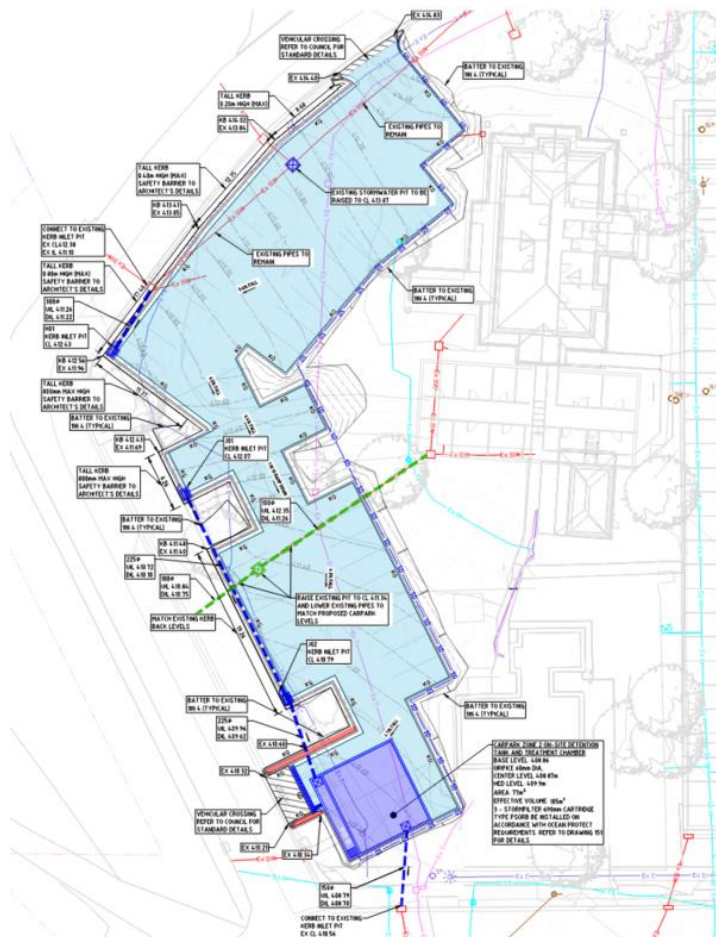
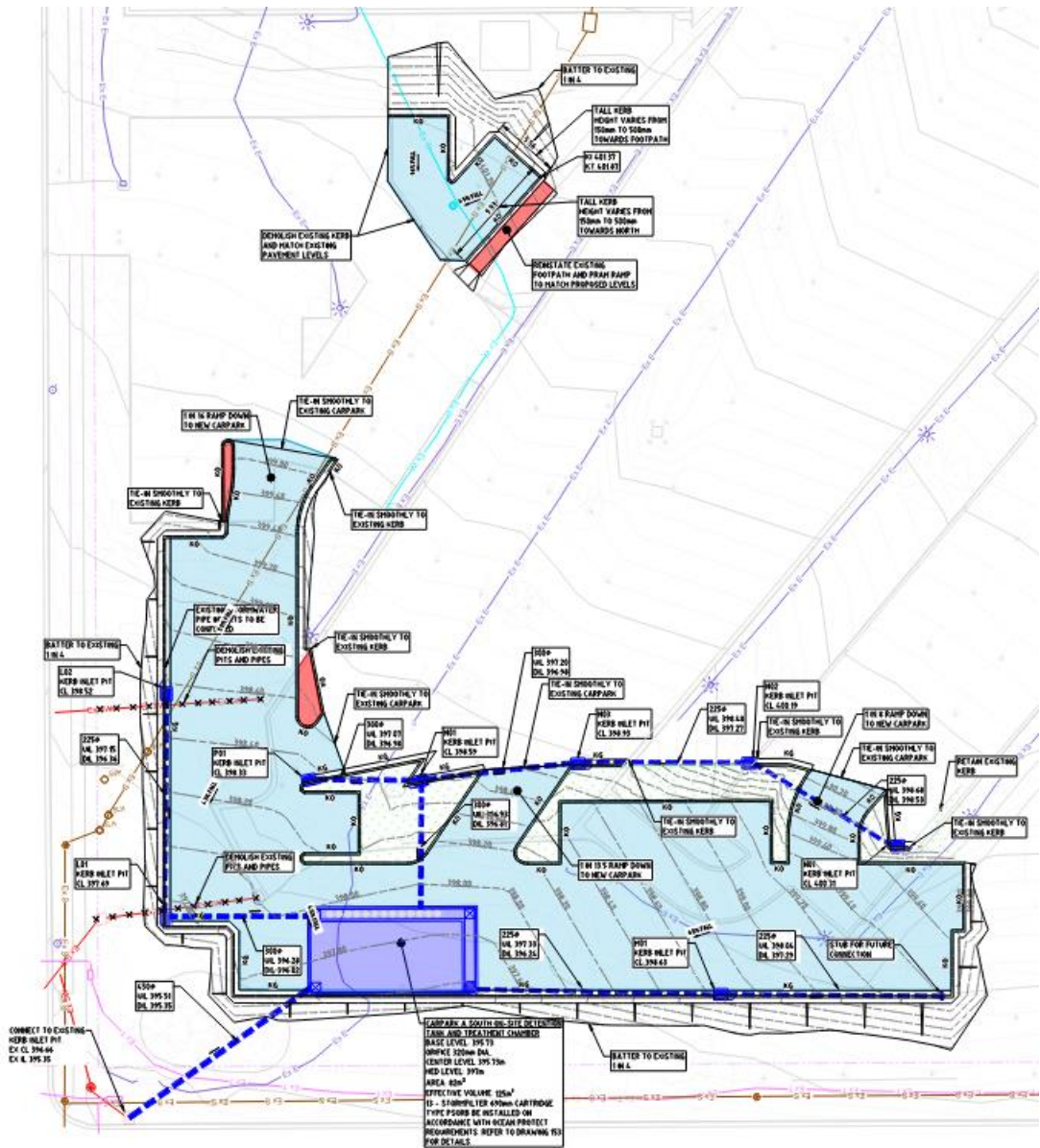


Figure 5b – Northwest Carpark Zone 2 Stormwater Drainage.





4.2 Earthworks

The earthwork quantities associated with the proposed development are provided below:

Main Building Site

- Cut – 1,590m³
- Fill – 600m³

Carparks

- Cut – 2,870m³
- Fill – 115m³

Volume calculations are combined earthworks for all carpark sites. See bulk earthworks drawings for volume breakdown of each site.

Below are the depths considered for bulk earthworks:

Main Building site

- Pavement – 590mm (as per pavement detail)
- Building slab – 300mm

Carpark sites

- Pavement – 460mm (as per pavement detail)

Temporary batters are 1 in 1 maximum.

Permanent batters are 1 in 4 maximum.



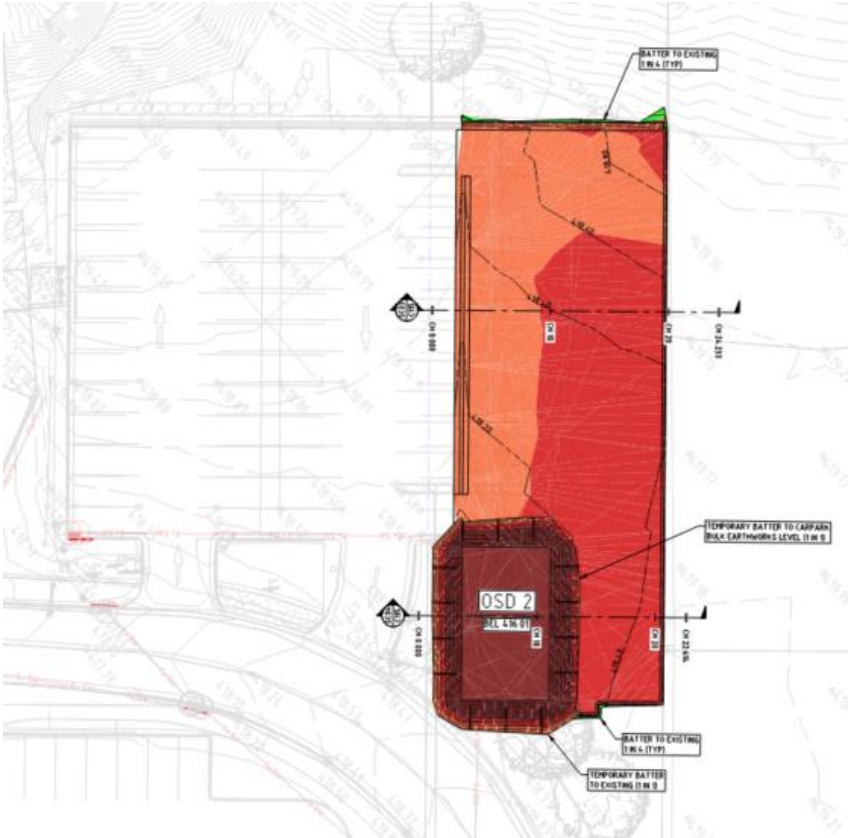


Figure 6c – Northeast Carpark D Extension Site Bulk Earthworks

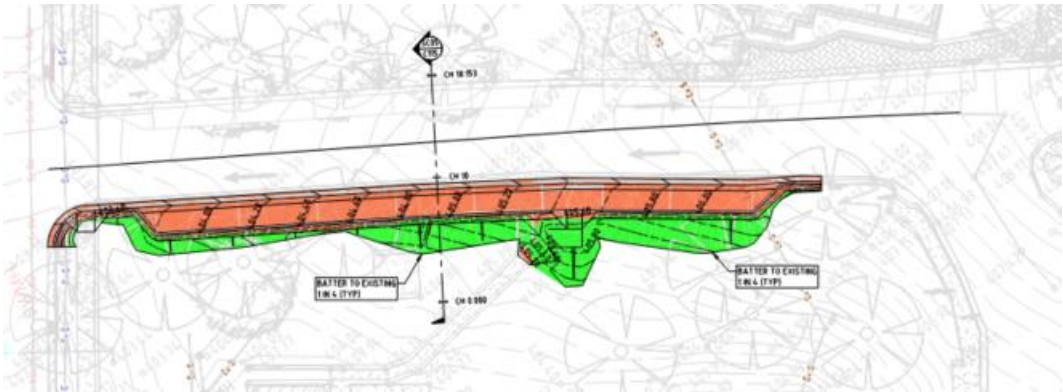
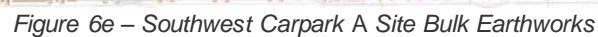


Figure 6d – Southwest Carpark A (Road) Site Bulk Earthworks



Excavation work must be undertaken in accordance with the Safe Work Australia Excavation Code of Practice (March 2015).

The erosion and sediment control measures for the site will be implemented during construction. The design of these measures is to be in accordance with the Landcom "Blue Book".

- A sediment fence
- Temporary access to site with shaker pad
- An indicative stockpile area with sediment fence around it during construction.
- Geotextile inlet pit filters or sandbags to be placed around existing stormwater pits.

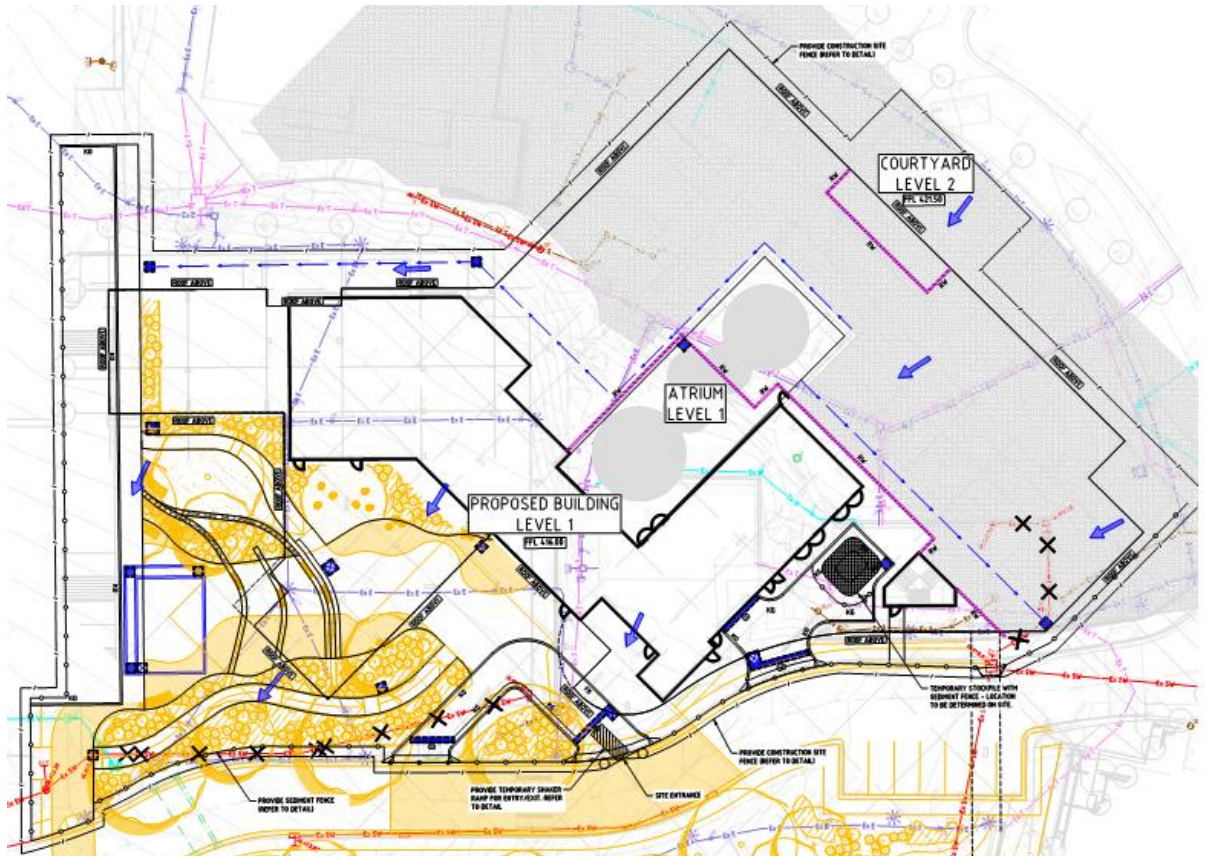


Figure 7a – Building Site Sediment and Erosion



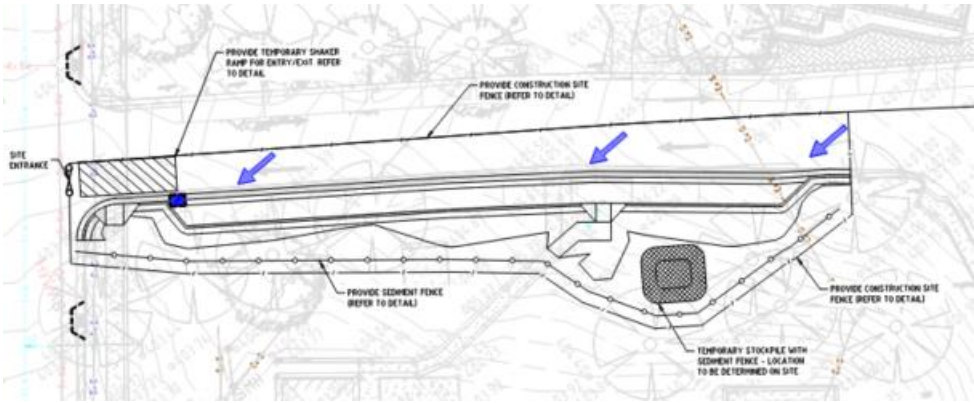


Figure 7d – Southwest Carpark A (Road) Site Sediment and Erosion

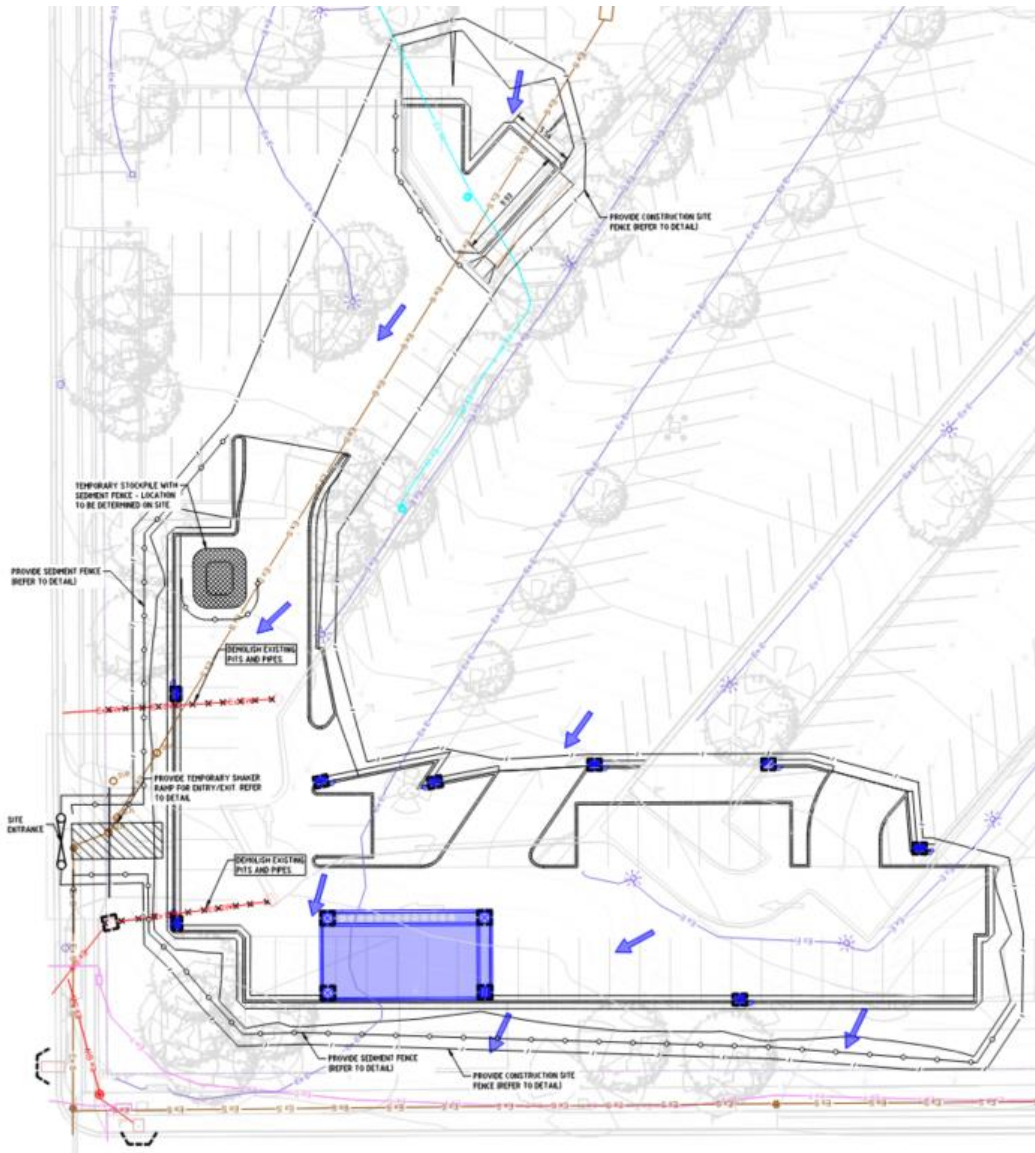


Figure 7e – Southwest Carpark A Site Sediment and Erosion

5 Summary

5.1 Civil

- Stormwater drainage design managed to retain, if not improve, existing site runoff flows in storm events up to Q100.
- Water quality strategies including filtration systems are adopted based on Water Sensitive Urban Design (WSUD) principles and MUSIC modelling.
- Development areas with a total of 11,200m² area coverage for all sites.
- Demolition of existing structures and relocation of existing services will be required.