Campbelltown Sports and Health Centre of Excellence

Stormwater Management Report

Civil Engineering

Prepared for: Campbelltown City Council

Date: 20 Feb 2020

Prepared by: Ian Harris

Ref: 33963-CI-RE_002

WOOD & GRIEVE ENGINEERS

NOW PART OF

Stantec

Revision

Site Address:	183 Narellan Road, Campbelltown, NSW 2560
Real Property Description:	Part Lot 4099, DP1206283
Proposed Development:	Sporting & Health Facility
Client:	Campbelltown City Council
Local Authority	Campbelltown City Council
Authority Reference #:	N/A
Wood & Grieve Reference:	33963-CI-RE_002

Ian Harris

BEng (Hons)

For and on behalf of

Wood & Grieve Engineers

Revision	Date	Comment	Prepared By	Approved By
A	26.04.18	DA Issue	IH	
B	25.05.18	DA Issue	IH	
C	05.03.20	DA Issue	IH	

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1. Introduction

Wood & Grieve Engineers have been commissioned by Campbelltown City Council to prepare this Stormwater Management Plan (SMP) in support of the Development Application for the proposed development on part of 183 Narellan Road, Campbelltown. The sites real address is Part Lot 4099, DP1206283

This SMP outlines the conceptual DA level stormwater design for the proposed development of a sporting and health centre development on the site.

This SMP discusses the flood impact on the development and the impact of he development on existing flood waters. The report also demonstrates the application of Water Sensitive Urban Design (WSUD) principles and illustrates that the proposed development complies with the Campbelltown City Council Standards and Guidelines for stormwater, Australian Rainfall and Runoff, Australian Standards and best engineering practise.

The purpose of this SMP is to evaluate the quantity and quality of stormwater associated with the proposed development plan so as to demonstrate to Council that an appropriate stormwater management strategy has been adopted.

The SMP specifically addresses the following items for both the construction and operational phases of the development:

- Flood Impact;
- Stormwater conveyance;
- Stormwater quality treatment measures (Stormwater Quality);
- Erosion and Sedimentation Control.

The following will be achieved with the correct application of this SMP report:

- Flood mitigation measures;
- Appropriate standards to be maintained on all aspects of stormwater within the site,
- Pollution control to be maintained,
- Establishment of a unified, clear and concise stormwater management strategy.

2. Existing Site Characteristics

2.1 Property Detail

Address:	Part of 183 Narellan Road, Campbelltown
Real Property Description:	Part Lot 4099, DP1206283
Development Site Area:	13,038m² (1.3Ha)

The proposed development can be seen on the concept design drawings in Appendix A of this report.

The proposed development will consist of a new sporting facility, access driveway and associated car parking.

As can be seen in the site location aerial photo below, the site is located south of Goldsmith Avenue and north of the T8 South rail line.

The site is currently developed with a disused building structure and on grade car parking.

Figure 1: Site Location Plan (Source: Nearmaps 2015)

2.2 Topography

The existing site topography will be amended during an early works project being completed by UrbanGrowth. Upon completion of the early works project a bulk earthworks pad will be provided for the development to suit the levels of the developments design.

The building is proposed to be constructed at RL80.26m AHD with the car park at RL80.00 - RL78.50m AHD. The existing levels of Goldsmith Avenue at the location of the site is around RL84.80m AHD.

The proposed playing fields adjacent to the site will be located at RL77.00m AHD to the west of the site and RL76.50m AHD to the east.

2.3 Existing Stormwater Discharge

Visual inspection of the site indicates that currently drainage from both the building and the car park discharge directly to the ground with runoff either absorbed into the ground or running as overland flow to the south into the existing lower grassland areas.

3. Local Authority Requirements

Campbelltown City Council set the design requirements for any new stormwater management system associated with new development in their Engineering Design for Development. A summary of the key requirements for the development of the Stormwater management system for this development are summarized below.

3.1 On Site Detention Requirements

Campbelltown City Council do not have a formal On Site Detention Policy however the site is located directly adjacent to the regional stormwater basins for the area. As a result there will be no stormwater detention requirements for the development.

3.1 Water Pollutant Reduction Targets

From Council's Guidelines:

"Stormwater quality objectives are to be met by the installation of water quality treatment devices and natural systems for all of the following developments:

- Any industrial development ≥ 2500 m
- Any commercial development ≥ 2500 m
- Residential development ≥ 10 lots; and
- Any development adjoining a watercourse will require special treatment, however each application will be assessed on merit.

In general local stormwater quality objectives are set in Campbelltown City Council's Stormwater Management Plans. More general objectives are found in the following references.

NSW Department of Environment and Climate Change (DECC) is currently revising the Managing Urban Stormwater suite of documents. Draft and final documents have been released: these documents are to be followed;

- WSUD in the Sydney Region;
- WSUD Technical Guidelines for Western Sydney;
- Australian Runoff Quality;
- Council's Stormwater Management Plan/s; and
- NSW Water Quality and River Flow Objectives for the Georges River
- Hawkesbury Nepean Catchment Action Plan Objectives.

Where specific advice cannot be found relating to a site or the environment management objectives of downstream receiving waters, adopting 80%, 45% and 45% reduction in TSS, TP and TN loads respectively for new development will apply. This is the least preferred approach, as its use does not reflect the needs of different receiving environments."

4. Flood Impact Assessment

When considering a new development it is important to assess the impact of existing flooding on the proposed development and also the impact of the proposed development on existing or potential flooding both upstream and downstream of the development.

4.1 Existing Flooding

Flood modelling for the region has been undertaken by Catchment Simulation Solutions on behalf of Campbelltown City Council.

The existing regional basin arrangement includes two separate storage areas split with an earthworks bund forming a weir between the two.

The basins have been sized to ensure that during a 100 year flood the water level will not reach the crest of the weir which will be constructed at RL80.00m AHD during the bulk earthworks project

During PMF flood events water will overtop the weir to allow the eastern basin to fill more quickly and flood storage to be provided for the region earlier.

Flood modelling indicates that in the existing scenario the 100 year flood level through the site will be FL79.20m AHD and the PMF flood level will be FL80.84m AHD.

4.2 Flood Impact

Council have engaged Catchment Simulation Solutions to assess the impact of the proposed development on the existing flood extents.

As the proposed building will be partially located over the weir between the basins the development will reduce the capacity of the weir. This will not be an issue during a 100 Year flood event as the weir will not be activated however it will have an impact on the PMF flooding through the regional basin area.

Flood modelling has indicated that the development of the sports facility will have an impact on flood levels within the regional basins during a PMF flood event with the maximum water level in the western basin increasing by 350mm.

Catchment Simulation Solutions have however looked at what the impact of this water level increase will have on adjacent properties and infrastructure.

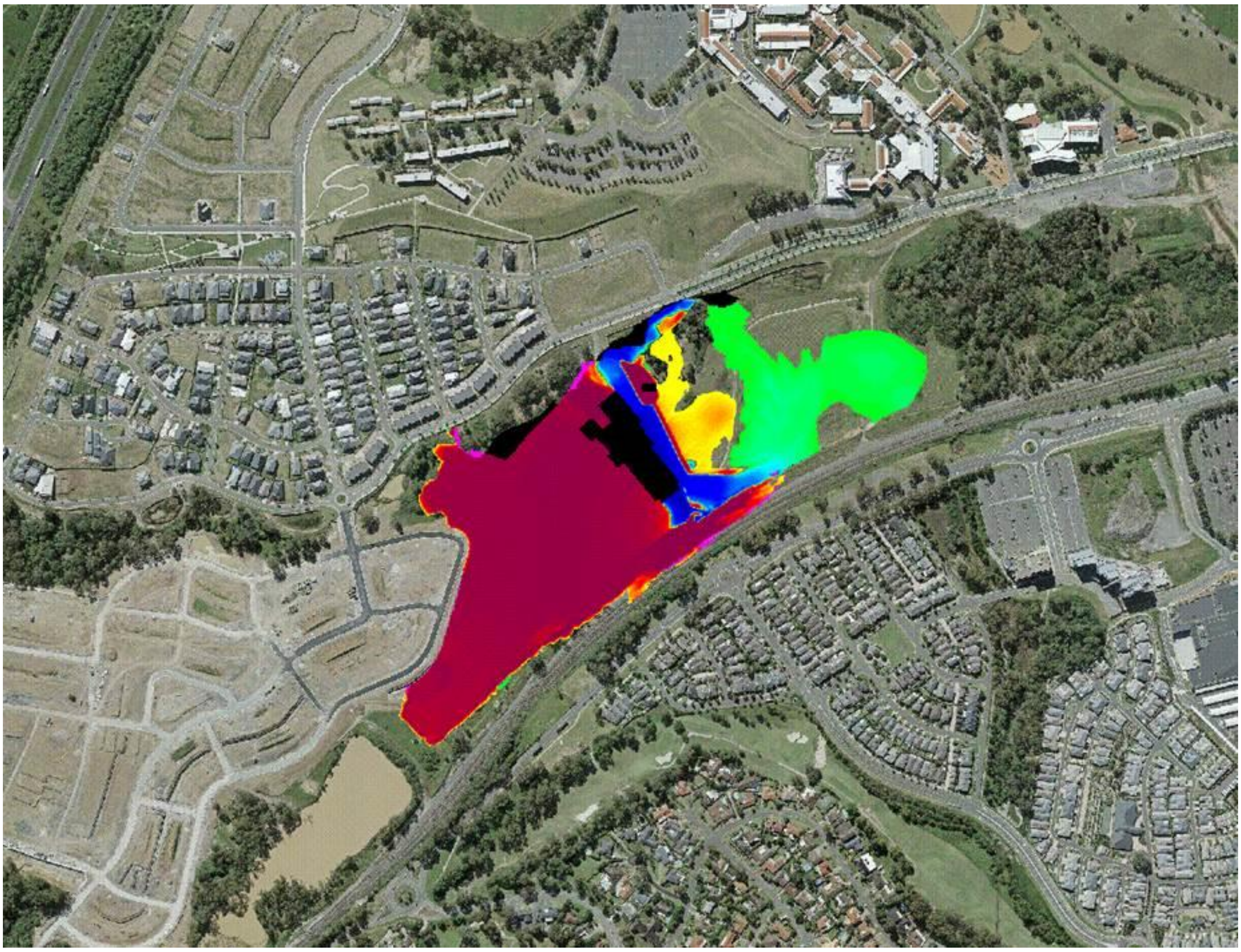


Figure 2: PMF Flood Depth Impact due to Development (Source: Catchment Simulation Solutions)

Modelling indicates that this level increase will have no impact on adjacent buildings, as they are located higher than

the revised PMF flood level. The modelling does indicate that there will be an increased impact on the rail line, however in the existing case the rail line will not be passable during a PMF flood event so raising the flood level will not alter the usability of the rail line.

The modelling indicates that during a 100 year flood event the maximum water level in the regional basins will be RL79.76m AHD and the PMF flood level will be RL81.19m AHD.

4.3 Flood Mitigation Measures

Discussion has been held at various levels within council to ascertain the best flood planning level for the development. The outcome of this discussion is that the flood planning levels for the building will be set at 500mm freeboard above the 100 year flood level or RL80.26m AHD. This will provide protection against flooding for the vast majority of flood events.

In the event of a PMF flood it has been accepted within council that the building will be subject to up to 930mm depth of flood water. Council have stated that due to the nature of the building and the necessity to have the building interface directly with the surrounding sporting facilities there will be no mitigation measures taken to prevent damage from PMF flood waters. In the event of a PMF flood the building will need to be repaired following flood damage.

5. Stormwater Conveyance

This section of the report discusses the systems proposed to allow for stormwater to be conveyed across the site to the legal point of discharge.

5.1 Roof Drainage

All roof areas will be drained through a conventional downpipe system. The drainage system will be designed in accordance with AS3500.3:2003 to convey the 100 year design storm runoff from the roof to the legal point of discharge. Flows in excess of the design flows will surcharge the roof drainage system and discharge onto the surrounding ground where it will then be conveyed overland to the legal point of discharge.

5.2 Legal Point of Discharge

The legal point of discharge for the site will be via a headwall discharge into the western regional basin.

6. Stormwater Attenuation

Due to the buildings location directly adjacent to the regional basins there will be no On Site Detention proposed for the development. Stormwater will discharge directly to the western regional basin.

7. Water Quality Treatment

As discussed in section 3.2 of this report Campbelltown City Council have set targets for the reduction of water borne pollution being conveyed from the site through the stormwater drainage system.

This section of the report demonstrates the Stormwater Quality Improvement Devices (SQID's) to be implemented and the Pollutant Export Modelling undertaken to demonstrate the effectiveness of the treatment system in achieving the reduction targets set by council.

7.1 Potential Pollutants

There are a wide range of potential stormwater pollutant sources which occur from urbanised catchments, many which can be managed through appropriate stormwater quality treatment. Typical urban pollutants may include:

- Atmospheric deposition
- Erosion (including that from subdivision and building activities)
- Litter and debris
- Traffic emissions and vehicle wear
- Animal droppings
- Pesticides and fertilisers
- Application, storage and wash-off of car oil, detergents and other household and commercial solvents and chemicals
- Solids accumulation and growth in stormwater systems
- Weathering of buildings

These pollutants in urban stormwater can be placed into various categories as follows. The pollutants underlined below are able to be readily modelled:

- Suspended Solids
- Litter
- Nutrients such as Nitrogen and Phosphorous
- Biological oxygen demand (BOD) and chemical oxygen demand (COD) materials
- Micro-organisms
- Toxic organics
- Trace metals
- Oils and surfactants

While only the key pollutants underlined above will be examined within the modelling, the stormwater Quality Improvement Devices implemented are expected to assist in reducing a wide range of pollutants. For example, heavy metals are commonly associated with, and bound to fine sediments. Thus reducing the discharge of fine sediment during the construction and operational phases will also reduce the discharge of heavy metals to existing stormwater systems.

7.2 Pollutant Reduction System

In order to achieve the pollutant reduction targets specified in section 3.3 of this report a series of treatment devices are proposed with together form a treatment train. The diagram below shows the proposed treatment train for this development.

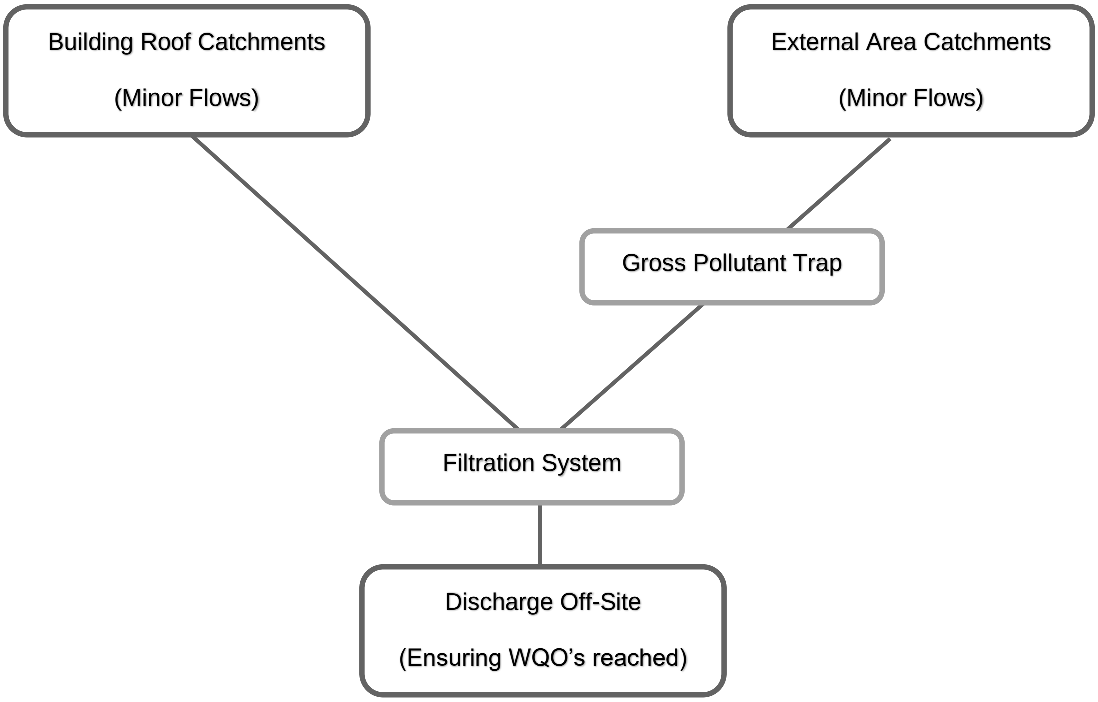


Figure 3: Proposed Water Quality Treatment Train

Further discussion on each element of this treatment train is provided below.

7.2.1 EnviroPod Pit Inlet Trap (or approved equivalent)

EnviroPod's (or other similar approved equivalents) provide effective removal of TSS and gross pollutants. EnviroPod's are a filter cage system which are inserted into roadway gully pits to filter and remove pollutants before the water enters the piped drainage system. It is proposed to placed EnviroPod filters within every pit in the roadway.

The MUSIC modelling parameters for this device are set by the manufacturer, Stormwater 360.

Parameters	TSS	TP	TN	GP
Input (mg/L)	100	10	50	14.8
Output (mg/L)	53	10	50	0
Reduction (%)	47	0	0	100

Figure 4: EnviroPod Pit Inlet Trap (Source: Stormwater 360)

7.2.2 Stormwater 360 Jellyfish

The Stormwater 360 Jellyfish filter unit used filtration cartridges to remove high levels of stormwater pollutants including:

- Total Suspended Solids (TSS), median removal efficiency of 89%, including particles down to two microns
- Total Nitrogen (TN), median removal efficiency of 55%
- Total Phosphorous (TP), median removal efficiency of 65%
- Total Copper (Cu), median removal efficiency of 61%
- Total Zinc (Zn), median removal efficiency of 91%.

Two Jellyfish JF-1200, 3 high flow cartridge, 1 draindown cartridge units has been proposed for the development.

The MUSIC modelling parameters for this device are set by the manufacturer, Stormwater 360.

Figure 5: Jellyfish infiltration Unit (Source: Stormwater 360)

7.3 Pollutant Reduction Modelling

In order to demonstrate that the proposed treatment train meets the required reduction targets, pollutant reduction modelling is proposed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Software program Version 5.0 by eWater CRC. Pollutant export rates are currently only available for Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorous (TP) and Gross Pollutants (GP). Therefore only quantitative modelling for TSS, TN, TP & GP has been undertaken using MUSIC.

Modelling has only been undertaken on the post-development proposal with SQID's installed so as to demonstrate the percentage reduction for each pollutant type.

7.3.1 MUSIC Program Setup

This section explains the setup of the MUSIC model with the detailed pollutant reduction calculations being included in the MUSIC results in Appendix C.

For Music Modelling (using MUSIC 6.2.1) the following parameters have been used:

Table 1: MUSIC modelling parameters

Model Parameters	
Meteorological Data:	Sydney
Evaporation Data:	Period: 1959
Time Step:	6 minute

Table 2: Catchment modelling parameters

Node Description	Area (Ha)	Percentage Impervious (%) / Area Impervious (Ha)		Land Use Rainfall and Pollutant Parameters
Building Roof Catchment	0.474	100	0.474	Urban Residential
Car Park Catchment	0.830	90	0.747	Urban Residential
	Total: 1.304Ha	Effective FI 94%		

7.3.2 MUSIC Results & Parameters

MUSIC Model

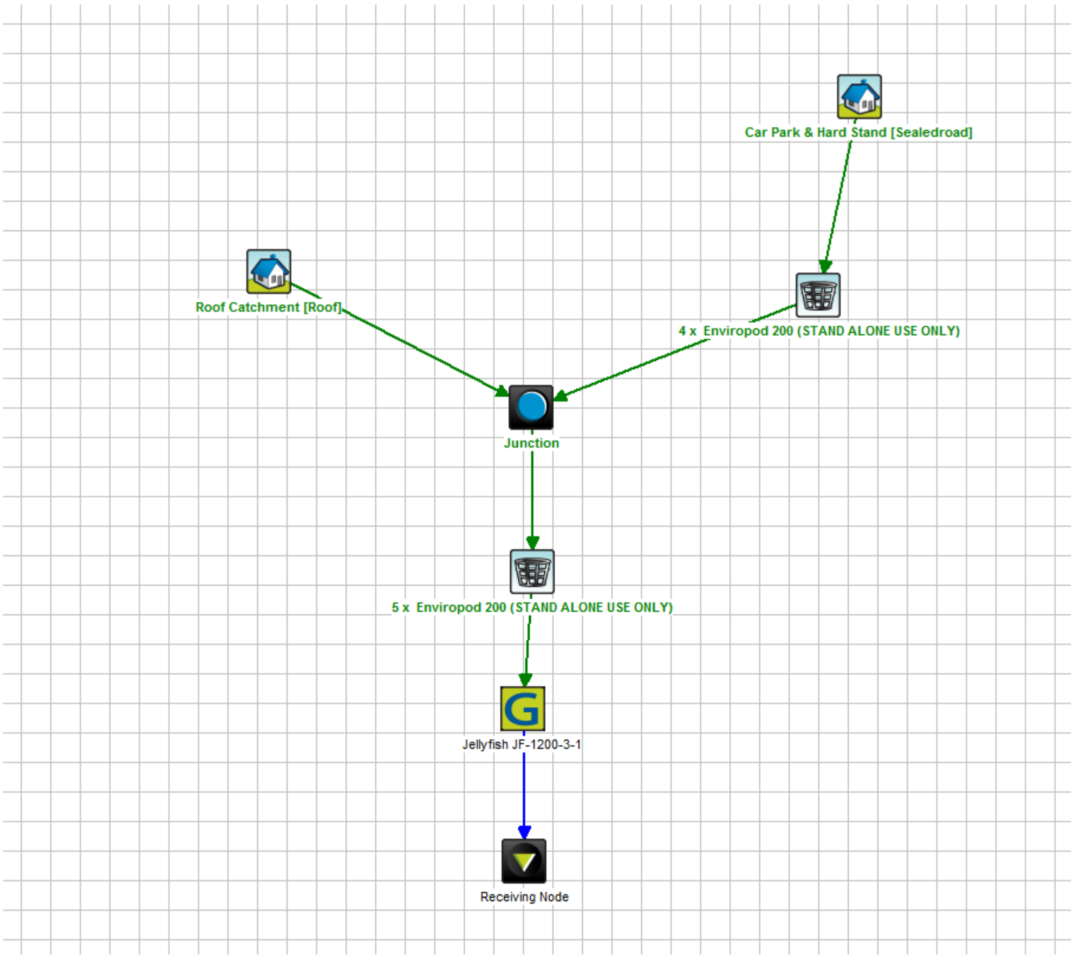


Figure 1 MUSIC Model

MUSIC Output

	Sources	Residual Load	% Reduction
Flow (ML/yr)	16.8	16.8	0
Total Suspended Solids (kg/yr)	3790	528	86.1
Total Phosphorus (kg/yr)	6.95	2.37	65.9
Total Nitrogen (kg/yr)	39.7	21.8	45.1
Gross Pollutants (kg/yr)	413	3.18	99.2

Figure 2 MUSIC Results

MUSIC Runoff Generation Parameters

The following properties have been used in the MUSIC Modelling based on the Land Use Rainfall and Pollutant Parameters.

Table 3: Recommended MUSIC Runoff Generation Parameters

Parameter	Urban Residential
Rainfall Threshold (mm)	1.0
Soil Capacity (mm)	120
Initial Storage (%)	25
Field Capacity	80
Infiltration Capacity Coefficient a	200
Infiltration Capacity Coefficient b	1.00

MUSIC Concentration Parameters

Table 4: MUSIC Concentration Parameters for Parramatta Catchments

Land-use Type	Parameters	TSS Log10 mg/L		TP Log10 mg/L		TN Log10 mg/L	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Urban Residential	Mean	1.10	1.3	-0.82	-0.89	0.32	0.30
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19

7.3.3 Pollutant Reduction Results

A number of management measures have been considered with a focus on reducing polluted runoff volumes from the site. The WSUD principals proposed for stormwater treatment includes the following SQID's:

- Gross Pollutant Trap
- Humes Jellyfish Filtration Unit

The effectiveness of the treatment devices proposed in the above section has been modelled using MUSIC with the overall treatment train efficiency results shown in Table 6 below.

Table 5: Treatment Train Efficiencies

Indicator	Total Site Reduction	Site Targets	Target Achieved
Total Suspended Solids (TSS)	86.1%	80%	Yes
Total Phosphorus (TP)	65.9%	45%	Yes
Total Nitrogen (TN)	45.1%	45%	Yes

From the results presented above it can be seen that the proposed SQID's mean that the stormwater quality treatment meets with the reduction targets set for the development.

8. Erosion & Sedimentation Control

Landcom have published a design guide entitled “Managing Urban Stormwater - Soils and Construction” which is regarded as the standard to which erosion and sedimentation control should be designed to within NSW. Campbelltown City Council specifies compliance with the Landcom design guide in there Design Guidelines Subdivision/Developments.

The control of erosion and sedimentation describes the measures incorporated during and following construction of a new development to prevent the pollution and degradation of the downstream watercourse.

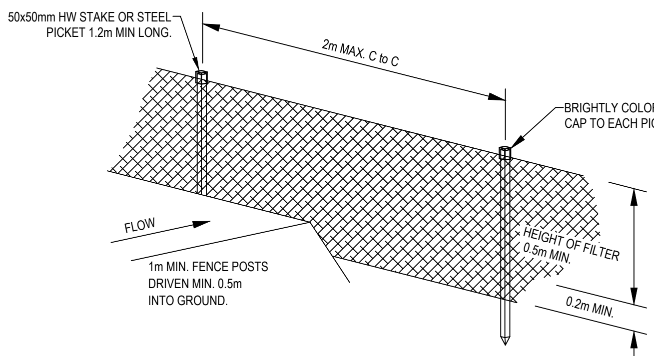
A Soil and Water Management Plan has prepared as part of the development application documentation and is included in Appendix A of this report.

Common control measures adopted are:

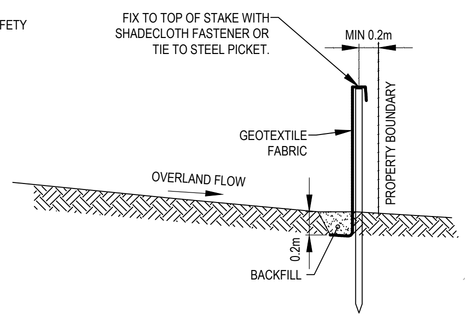
- Sedimentation fences;
- Sedimentation basins;
- Stormwater drainage inlet protection;
- Overland flow diversion swales;
- Shaker Grids and wash downs for vehicles leaving the construction site;
- Dust control measures.

The maintenance of these control measures throughout their intended lifespan will ensure that the risk of erosion and sedimentation pollution of the downstream watercourse will be minimized.

Appendix A Civil Drawings

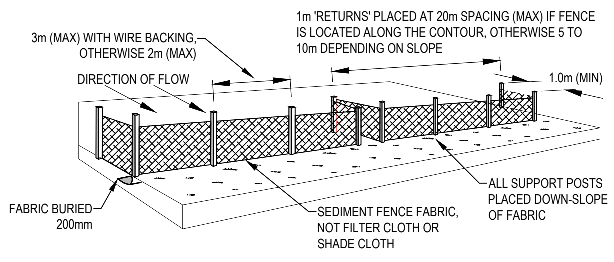


PERSPECTIVE VIEW

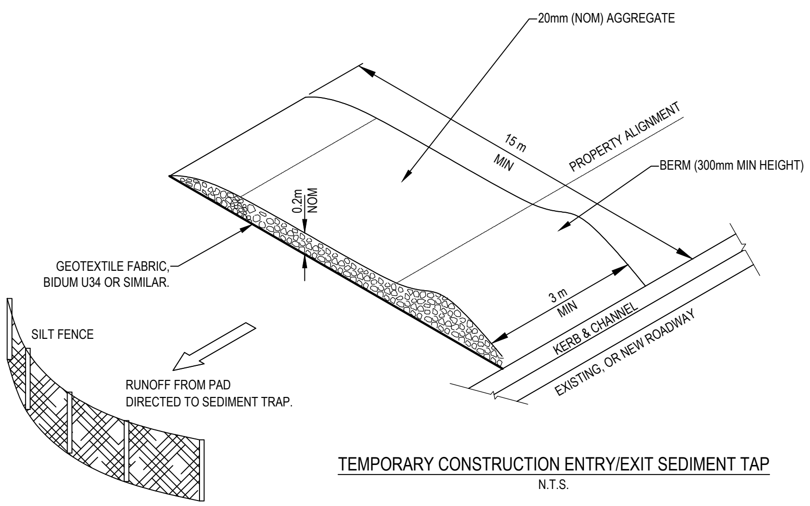


TYPICAL SECTION

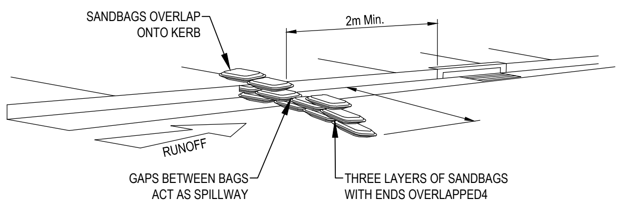
SEDIMENT FENCE DETAIL
N.T.S.



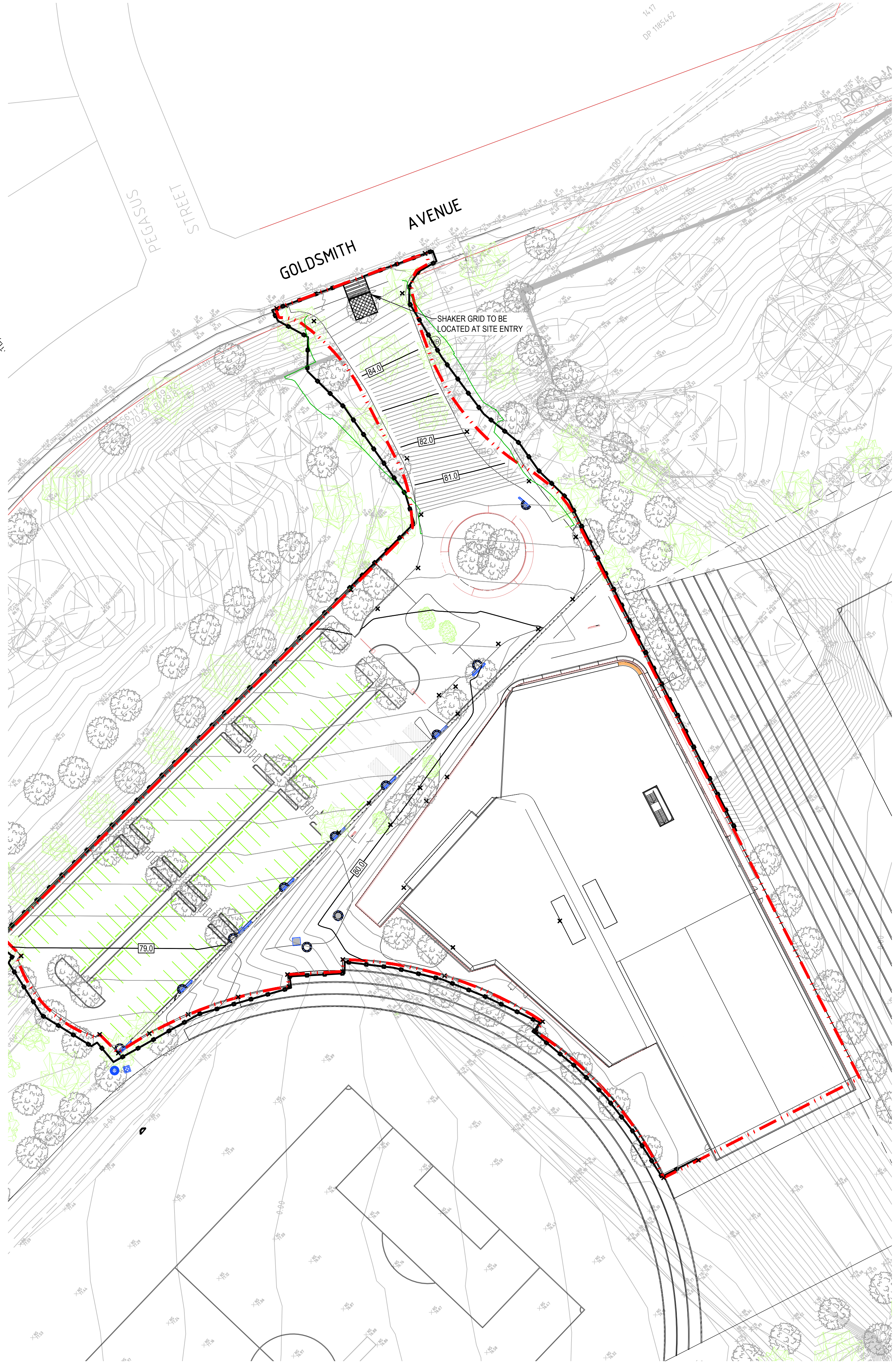
INSTALLATION OF SEDIMENT FENCE
N.T.S



TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TAP
N.T.S.



SANDBAG KERB INLET SEDIMENT TRAP
N.T.S.



LEGEND

- PROPOSED SITE BOUNDARY
- VEHICLE SHAKEDOWN DEVICE
- PROPOSED SILT FENCE

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
E	ISSUED FOR DA APPROVAL	CPO	IAH	05.03.20
D	ISSUED FOR DA APPROVAL	JDU	IAH	26.09.18
C	ISSUED FOR DA APPROVAL	CPO	IAH	21.06.18
B	ISSUED FOR DA APPROVAL	CPO	IAH	24.05.18
A	ISSUED FOR DA APPROVAL	CPO	IAH	26.04.18

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DESIGNED:	IAH
VERIFIED:	IAH 26.09.18
APPROVED FOR TENDER:	IAH 26.09.18
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PROJECT

CAMPBELLTOWN SPORTS AND HEALTH CENTRE OF EXCELLENCE

TITLE

EROSION AND SEDIMENT CONTROL PLAN AND DETAILS

FOR INFORMATION
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
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LEGEND

- PROPOSED SITE BOUNDARY
- PROPOSED BUILDING
- PROPOSED STORMWATER PIPE
- PROPOSED GRATED PIT (ENVIROPOD INSTALLED)
- PROPOSED KERB INLET PIT (ENVIROPOD INSTALLED)
- CONCRETE HEADWALL
- JELLYFISH UNIT

NOTE: FOR BUILDING DRAINAGE REFER TO HYDRAULICS PACKAGE.

1:500 10 5 0 10 20 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
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-	-	-	-	-
-	-	-	-	-
E	ISSUED FOR DA APPROVAL	CPO	IAH	05.03.20
D	ISSUED FOR D&C TENDER	JDU	IAH	26.09.18
C	ISSUED FOR DA APPROVAL	CPO	IAH	21.06.18
B	ISSUED FOR DA APPROVAL	CPO	IAH	25.04.18
A	ISSUED FOR DA APPROVAL	CPO	IAH	26.04.18

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PROJECT

CAMPBELLTOWN SPORTS AND HEALTH CENTRE OF EXCELLENCE

TITLE

STORMWATER DRAINAGE PLAN

FOR INFORMATION

NOT FOR CONSTRUCTION

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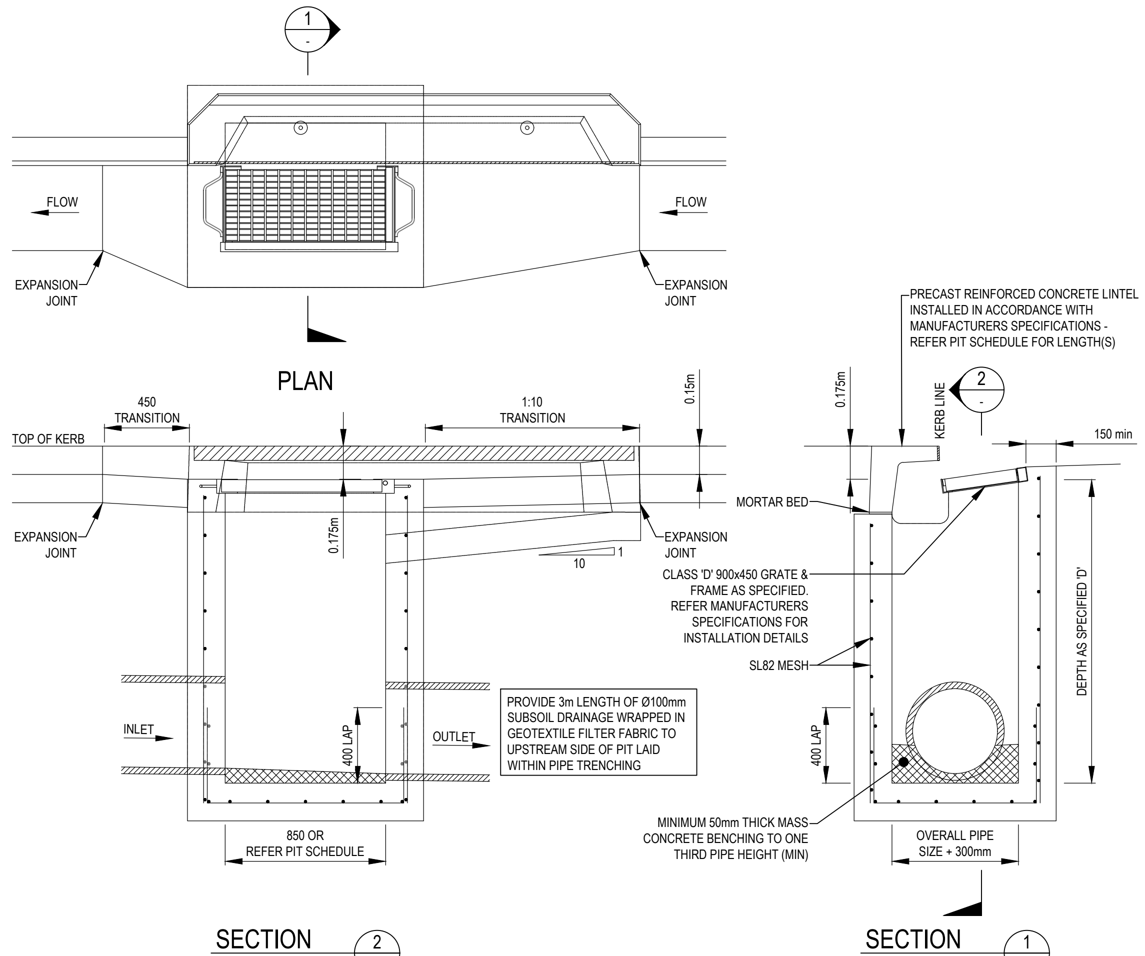
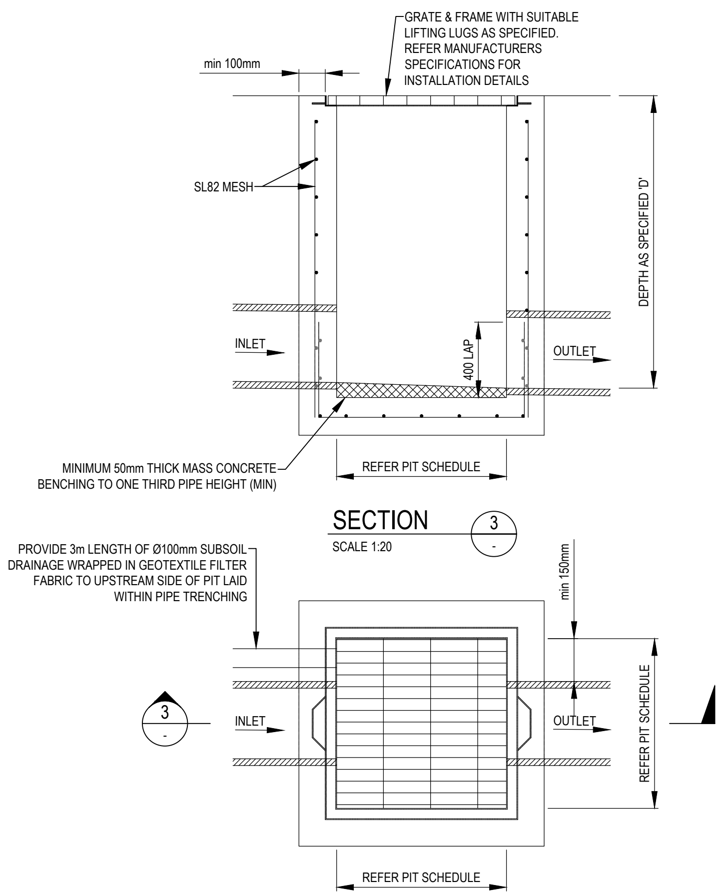
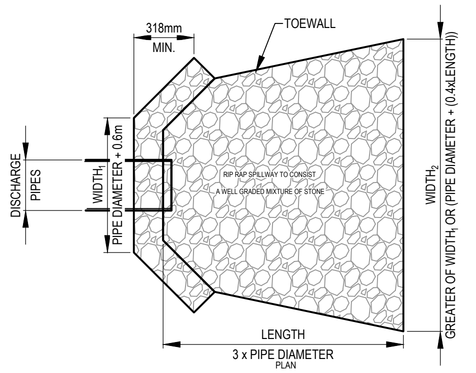


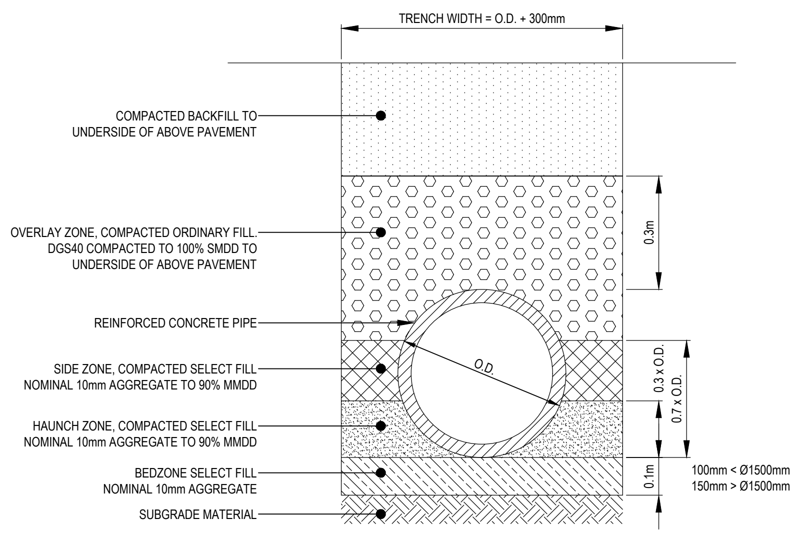
KERB INLET PIT
SCALE 1:20



GRATED PIT PLAN
SCALE 1:20



TYPICAL HEADWALL TREATMENT



TYPICAL PIPE TRENCH DETAIL
SCALE 1:10

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A	ISSUED FOR D&C TENDER	JDU	IAH	26.09.18

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PROJECT

CAMPBELLTOWN SPORTS AND HEALTH CENTRE OF EXCELLENCE

TITLE

STORMWATER DRAINAGE DETAILS

FOR INFORMATION
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	33961-1	CI-526-01	B

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Appendix B MUSIC Model Results

Source nodes
Location,Roof Catchment,Car Park & Hard Stand
ID,1,2
Node Type,UrbanSourceNode,UrbanSourceNode
Zoning Surface Type,Roof,Sealedroad
Total Area (ha),0.474,0.83
Area Impervious (ha),0.474,0.746566417910448
Area Pervious (ha),0,0.083433582089552
Field Capacity (mm),80,80
Pervious Area Infiltration Capacity coefficient - a,200,200
Pervious Area Infiltration Capacity exponent - b,1,1
Impervious Area Rainfall Threshold (mm/day),1,1
Pervious Area Soil Storage Capacity (mm),120,120
Pervious Area Soil Initial Storage (% of Capacity),25,25
Groundwater Initial Depth (mm),10,10
Groundwater Daily Recharge Rate (%),25,25
Groundwater Daily Baseflow Rate (%),5,5
Groundwater Daily Deep Seepage Rate (%),0,0
Stormflow Total Suspended Solids Mean (log mg/L),1.3,2.43
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.32,0.32
Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0,0
Stormflow Total Phosphorus Mean (log mg/L),-0.89,-0.3
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.25,0.25
Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic
Stormflow Total Phosphorus Serial Correlation,0,0
Stormflow Total Nitrogen Mean (log mg/L),0.3,0.34
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.19,0.19
Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic
Stormflow Total Nitrogen Serial Correlation,0,0
Baseflow Total Suspended Solids Mean (log mg/L),1.1,1.2
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.17,0.17
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Baseflow Total Suspended Solids Serial Correlation,0,0
Baseflow Total Phosphorus Mean (log mg/L),-0.82,-0.85
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.19,0.19
Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic
Baseflow Total Phosphorus Serial Correlation,0,0
Baseflow Total Nitrogen Mean (log mg/L),0.32,0.11
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.12,0.12
Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0
Flow based constituent generation - enabled,Off,Off
Flow based constituent generation - flow file, ,
Flow based constituent generation - base flow column, ,
Flow based constituent generation - pervious flow column, ,
Flow based constituent generation - impervious flow column, ,
Flow based constituent generation - unit, ,
OUT - Mean Annual Flow (ML/yr),6.39,10.5
OUT - TSS Mean Annual Load (kg/yr),164,3.55E3
OUT - TP Mean Annual Load (kg/yr),0.985,6.19
OUT - TN Mean Annual Load (kg/yr),14.1,25.0
OUT - Gross Pollutant Mean Annual Load (kg/yr),155,258
Rain In (ML/yr),7.06068,12.3636
ET Loss (ML/yr),0.669392,1.90924
Deep Seepage Loss (ML/yr),0,0

Baseflow Out (ML/yr),0,0.202085
Imp. Stormflow Out (ML/yr),6.39128,10.0723
Perv. Stormflow Out (ML/yr),0,0.179974
Total Stormflow Out (ML/yr),6.39128,10.2523
Total Outflow (ML/yr),6.39128,10.4544
Change in Soil Storage (ML/yr),0,-2E-6
TSS Baseflow Out (kg/yr),0,3.43998
TSS Total Stormflow Out (kg/yr),164.138,3549.87
TSS Total Outflow (kg/yr),164.138,3553.31
TP Baseflow Out (kg/yr),0,0.031401
TP Total Stormflow Out (kg/yr),0.985196,6.15985
TP Total Outflow (kg/yr),0.985196,6.19125
TN Baseflow Out (kg/yr),0,0.27059
TN Total Stormflow Out (kg/yr),14.0697,24.7397
TN Total Outflow (kg/yr),14.0697,25.0103
GP Total Outflow (kg/yr),154.656,258.155

No Imported Data Source nodes

No USTM treatment nodes

Generic treatment nodes
Location, 4 x Enviropod 200 (STAND ALONE USE ONLY),5 x Enviropod 200 (STAND ALONE USE ONLY),Jellyfish JF-1200-3-1
ID,3,5,6
Node Type,GPTNode,GPTNode,GenericNode
Lo-flow bypass rate (cum/sec),0,0,0
Hi-flow bypass rate (cum/sec),0.08,0.1,0.0175
Flow Transfer Function
Input (cum/sec),0,0,0
Output (cum/sec),0,0,0
Input (cum/sec),10,10,10
Output (cum/sec),10,10,10
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Input (cum/sec), , ,
Output (cum/sec), , ,
Gross Pollutant Transfer Function
Enabled,True,True,True
Input (kg/ML),0,0,0
Output (kg/ML),0,0,0
Input (kg/ML),14.780776740251,14.780776740251,100
Output (kg/ML),0,0,1
Input (kg/ML), , ,

Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Input (kg/ML), , ,
Output (kg/ML), , ,
Total Nitrogen Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),10,10,7
Output (mg/L),8.7,8.7,3.2
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Total Phosphorus Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),10,10,0.4
Output (mg/L),7,7,0.14
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,

Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Total Suspended Solids Transfer Function
Enabled,True,True,True
Input (mg/L),0,0,0
Output (mg/L),0,0,0
Input (mg/L),100,100,200
Output (mg/L),46,46,22
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
Input (mg/L), , ,
Output (mg/L), , ,
TSS Flow based Efficiency Enabled,Off,Off,Off
TSS Flow based Efficiency, , ,
TP Flow based Efficiency Enabled,Off,Off,Off
TP Flow based Efficiency, , ,
TN Flow based Efficiency Enabled,Off,Off,Off
TN Flow based Efficiency, , ,
GP Flow based Efficiency Enabled,Off,Off,Off
GP Flow based Efficiency, , ,
IN - Mean Annual Flow (ML/yr),10.5,16.8,16.8
IN - TSS Mean Annual Load (kg/yr),3.55E3,1.89E3,967
IN - TP Mean Annual Load (kg/yr),6.19,5.41,3.92
IN - TN Mean Annual Load (kg/yr),25.0,36.0,31.7
IN - Gross Pollutant Mean Annual Load (kg/yr),258,157,3.74
OUT - Mean Annual Flow (ML/yr),10.5,16.8,16.8
OUT - TSS Mean Annual Load (kg/yr),1.72E3,967,510
OUT - TP Mean Annual Load (kg/yr),4.42,3.92,2.45
OUT - TN Mean Annual Load (kg/yr),21.9,31.7,21.6
OUT - Gross Pollutant Mean Annual Load (kg/yr),2.50,3.74,3.18
Flow In (ML/yr),10.4537,16.8443,16.8443
ET Loss (ML/yr),0,0,0
Infiltration Loss (ML/yr),0,0,0
Low Flow Bypass Out (ML/yr),0,0,0
High Flow Bypass Out (ML/yr),0.490679,1.23096,6.6279
Orifice / Filter Out (ML/yr),0,0,0
Weir Out (ML/yr),0,0,0
Transfer Function Out (ML/yr),9.96306,15.6146,10.2166
Reuse Supplied (ML/yr),0,0,0
Reuse Requested (ML/yr),0,0,0
% Reuse Demand Met,0,0,0
% Load Reduction,2.86979E-5,-0.00752184,-0.00129421
TSS Flow In (kg/yr),3551.53,1886.96,966.487

TSS ET Loss (kg/yr),0,0,0
TSS Infiltration Loss (kg/yr),0,0,0
TSS Low Flow Bypass Out (kg/yr),0,0,0
TSS High Flow Bypass Out (kg/yr),165.193,182.455,453.105
TSS Orifice / Filter Out (kg/yr),0,0,0
TSS Weir Out (kg/yr),0,0,0
TSS Transfer Function Out (kg/yr),1557.76,784.106,56.5015
TSS Reuse Supplied (kg/yr),0,0,0
TSS Reuse Requested (kg/yr),0,0,0
TSS % Reuse Demand Met,0,0,0
TSS % Load Reduction,51.4869,48.7768,47.2723
TP Flow In (kg/yr),6.19063,5.40593,3.91645
TP ET Loss (kg/yr),0,0,0
TP Infiltration Loss (kg/yr),0,0,0
TP Low Flow Bypass Out (kg/yr),0,0,0
TP High Flow Bypass Out (kg/yr),0.292012,0.440283,1.66777
TP Orifice / Filter Out (kg/yr),0,0,0
TP Weir Out (kg/yr),0,0,0
TP Transfer Function Out (kg/yr),4.1289,3.47617,0.787085
TP Reuse Supplied (kg/yr),0,0,0
TP Reuse Requested (kg/yr),0,0,0
TP % Reuse Demand Met,0,0,0
TP % Load Reduction,28.5871,27.5526,37.3195
TN Flow In (kg/yr),25.0093,35.9985,31.7108
TN ET Loss (kg/yr),0,0,0
TN Infiltration Loss (kg/yr),0,0,0
TN Low Flow Bypass Out (kg/yr),0,0,0
TN High Flow Bypass Out (kg/yr),1.33591,3.00124,13.1046
TN Orifice / Filter Out (kg/yr),0,0,0
TN Weir Out (kg/yr),0,0,0
TN Transfer Function Out (kg/yr),20.5961,28.7095,8.50568
TN Reuse Supplied (kg/yr),0,0,0
TN Reuse Requested (kg/yr),0,0,0
TN % Reuse Demand Met,0,0,0
TN % Load Reduction,12.3046,11.9109,31.8521
GP Flow In (kg/yr),257.85,157.156,3.74426
GP ET Loss (kg/yr),0,0,0
GP Infiltration Loss (kg/yr),0,0,0
GP Low Flow Bypass Out (kg/yr),0,0,0
GP High Flow Bypass Out (kg/yr),2.49916,3.74426,3.17532
GP Orifice / Filter Out (kg/yr),0,0,0
GP Weir Out (kg/yr),0,0,0
GP Transfer Function Out (kg/yr),0,0,0.002988
GP Reuse Supplied (kg/yr),0,0,0
GP Reuse Requested (kg/yr),0,0,0
GP % Reuse Demand Met,0,0,0
GP % Load Reduction,99.0308,97.6175,15.1951

Other nodes
Location,Junction,Receiving Node
ID,4,7
Node Type,JunctionNode,ReceivingNode
IN - Mean Annual Flow (ML/yr),16.8,16.8
IN - TSS Mean Annual Load (kg/yr),1.89E3,510
IN - TP Mean Annual Load (kg/yr),5.41,2.45
IN - TN Mean Annual Load (kg/yr),36.0,21.6

IN - Gross Pollutant Mean Annual Load (kg/yr),157,3.18
OUT - Mean Annual Flow (ML/yr),16.8,16.8
OUT - TSS Mean Annual Load (kg/yr),1.89E3,510
OUT - TP Mean Annual Load (kg/yr),5.41,2.45
OUT - TN Mean Annual Load (kg/yr),36.0,21.6
OUT - Gross Pollutant Mean Annual Load (kg/yr),157,3.18
% Load Reduction,57.7E-9,198E-9
TSS % Load Reduction,49.2,86.3
TN % Load Reduction,7.88,44.7
TP % Load Reduction,24.7,65.8
GP % Load Reduction,61.9,99.2

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,2,3,1,4,5,6
Target node ID,3,4,4,5,6,7
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed
Muskingum K, , , , , ,
Muskingum theta, , , , , ,
IN - Mean Annual Flow (ML/yr),10.5,10.5,6.39,16.8,16.8,16.8
IN - TSS Mean Annual Load (kg/yr),3.55E3,1.72E3,164,1.89E3,967,510
IN - TP Mean Annual Load (kg/yr),6.19,4.42,0.985,5.41,3.92,2.45
IN - TN Mean Annual Load (kg/yr),25.0,21.9,14.1,36.0,31.7,21.6
IN - Gross Pollutant Mean Annual Load (kg/yr),258,2.50,155,157,3.74,3.18
OUT - Mean Annual Flow (ML/yr),10.5,10.5,6.39,16.8,16.8,16.8
OUT - TSS Mean Annual Load (kg/yr),3.55E3,1.72E3,164,1.89E3,967,510
OUT - TP Mean Annual Load (kg/yr),6.19,4.42,0.985,5.41,3.92,2.45
OUT - TN Mean Annual Load (kg/yr),25.0,21.9,14.1,36.0,31.7,21.6
OUT - Gross Pollutant Mean Annual Load (kg/yr),258,2.50,155,157,3.74,3.18

Catchment Details
Catchment Name,33963-CI-WSUD Model
Timestep,6 Minutes
Start Date,1/01/1959
End Date,31/12/1959 11:54:00 PM
Rainfall Station, 66062 SYDNEY
ET Station,Monthly User Defined
Mean Annual Rainfall (mm), 1490
Mean Annual ET (mm), 1260

Design with
community in mind

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