WOOD & GRIEVE ENGINEERS

Allambie Heights Village – Project 2

Prepared for:

Allambie Heights Village Pty Ltd

Date:
18 June 2018

Prepared by:

Ian Harris
Project No.38509-CI-RE_001
P:\38509\PROJECT DOCUMENTATION\CIVIL\DOCUMENTS & REPORTS\38509-CI-RE_001.DOCX

Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
T: (02) 8484 7000 **F:** (02) 8484 7100 **E:** sydney@wge.com.au **W:** www.wge.com.au

Revision

Site Address:	181 Allambie Road, Allambie Heights, NSW
Real Property Description:	Lot 2615 DP752038
Proposed Development:	Aged Care Development
Client:	Allambie Heights Village Pty Ltd
Local Authority	Northern Beaches Council
Authority Reference #:	N/A
Wood & Grieve Reference:	38509-CI-RE_001

Ian Harris BEng (Hons)
For and on behalf of
Wood & Grieve Engineers

REVISION	DATE	COMMENT	APPROVED BY
A	01.06.18	DA Issue	**IH**
B	18.06.18	DA Issue	**IH**

Contents

1. Introduction

Wood & Grieve Engineers have been commissioned by Allambie Heights Village Pty Ltd to prepare this Stormwater Management Plan (SMP) in support of the Development Application for the proposed development at 181 Allambie Road, Allambie Heights, NSW. The sites real address is Lot 2615 DP752038.

This SMP outlines the conceptual DA level stormwater design for the proposed development of an aged care development on the site.

This SMP demonstrates the application of Water Sensitive Urban Design (WSUD) principles and illustrates that the proposed development complies with the Mid-Coast 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:

- Stormwater runoff volumes and detention (Stormwater Quantity);
- Stormwater quality treatment measures (Stormwater Quality);
- Erosion and Sedimentation Control.

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

- 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:	181 Allambie Road, Allambie Heights, NSW
Real Property Description:	Lot 2615 DP752038
Total Site Area:	37,176m² (3.718Ha)

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

The proposed development will consist of an aged care development including residences and a pool building.

As can be seen in the site location aerial photo below, the site is located west of Allambie Road and north of Martin Luther Place.

The area of the site to be developed is currently undeveloped. There are existing aged care buildings to the east of the development area within the extent of the site.

Figure 1: Site Location Plan (Source: Nearmaps 2018)

Existing Site Characteristics

2.2 Topography

The area in consideration is currently undeveloped and is currently vegetated over its majority. There is a current bitumen road intersecting the development area. Topographic survey confirms the site falls from the north to south from approximately RL130m AHD to RL120m AHD.

Figure 2: Site Topography (Source: CMS Surveyors 2017)

2.3 Existing Stormwater Discharge

Visual inspection of the site and the detailed site topographic survey confirm that there is currently no in ground drainage infrastructure on the area of the site being considered for development. Stormwater runoff from this area of the site runs as overland flow towards the northern edge of the bitumen road where it is collected and conveyed towards a headwall and culvert running under the road. This headwall discharges into a vegetated swale which conveys flows towards the southern boundary of the site.

There is an existing waterway running north to south through the site to the west of the proposed development area. This waterway will not be impacted by the proposed development.

There is evidence of in ground drainage for the existing buildings located on the eastern portion of the site. This stormwater network appears to drain towards Allambie Road.

3. Local Authority Requirements

Northern Beaches Council set the design requirements for any new stormwater management system associated with new development in their Water Management Policy PL850. 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

Council's policy states:

(a) OSD is required for the following developments:

i. single residential dwellings where the total existing and proposed impervious areas exceed 40% of the total site area (OSD will not be required for alterations and additions or where the total site area is 450m^2 or less)

ii. new residential flat buildings/multi-residential unit dwellings

iii. commercial developments

iv. industrial developments

v. subdivisions resulting in the creation of three (3) lots or more

vi. subdivisions resulting in the creation of two (2) lots or more, OSD will be required where the post developed impervious area of the new lots exceed 40% of the site area of the new lots. This requirement also applies to newly created lots with existing dwellings to be retained

vii. Alterations and additions to existing residential flat buildings/multi-residential unit dwellings, commercial developments and industrial developments, OSD is applicable to the extent of the new works only.

(b) Development requiring OSD must comply with Council's Onsite Stormwater Detention Technical Specification.

(c) A positive covenant and Restriction As to User must be registered on the title for the OSD system to ensure regular maintenance and operation.

(d) Council will not permit the use of "Drainage Cell" type products for onsite detention storage as access for maintenance or removal of silt/debris is limited.

(e) Council will allow the volume of rainwater reuse in single residential dwellings to be credited against the calculated OSD storage volume as determined by Council's Onsite Stormwater Detention Technical Specification.

Reference to the Onsite Stormwater Detention Technical Specification states:

"The general requirement of Council's OSD Specification is to ensure that the site's stormwater runoff after any development does not exceed the runoff prior to the development"

The specification continues to state:

> The post-development runoff is to be determined based on the post-development impervious area for all storm durations for the 5 year, 20 year, and 100 year ARI storm events. The OSD system(s) must be designed to restrict these flows to the calculated pre-development discharge rates. Hence the 5 year ARI post-development runoff must not exceed the 5 year ARI pre-development discharge, the 20 year ARI post-development runoff must not exceed the 20 year ARI pre-development discharge, and the 100 year ARI post-development runoff must not exceed the 100 year ARI pre-development discharge.

3.2 Discharge

For site which cannot directly connect to council drainage infrastructure council set discharge requirements in their Stormwater Drainage From Low Level Properties Technical Specification document.

This document states that direct connection to watercourses should be avoided and On-Site Absorption should be considered. The specification gives the following advice on the design of On-site Absorption.

“The absorption pit is to be designed for an Average Recurrence Interval (ARI) storm of 50 years using DRAINS computer software based on the infiltration rate that can be maintained in the long term. An overflow mechanism in the form of a level spreader must be provided for all storms greater than the 50 year ARI storm, up to and including the 100 year ARI storm. The overflow mechanism is required to minimise overland flow disturbance to the lower property.”

3.3 Water Pollutant Reduction Targets

Council's Water Management Policy states "Stormwater treatment measures are required to ensure the development does not impact on the receiving waters."

The policy outlines the following requirements for water quality treatment.

Table 4 – General Stormwater Quality Requirements

Pollutant	Performance Requirements
Total Phosphorous	65% reduction in the post development mean annual load[1]
Total Nitrogen	45% reduction in the post development mean annual load[1]
Total Suspended Solids	85% reduction in the post development mean annual load[1]
Gross Pollutants	90% reduction in the post development mean annual load[1] (for pollutants greater than 5mm in diameter)
pH	6.5 - 8.5
Hydrology	The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 2 year ARI

Note:

[1]The percentage reduction in the post development mean annual loads are relative to the loads from the proposed development without treatment applied.

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

Referring to Council's online flood mapping indicates that the site is not affected by flooding.

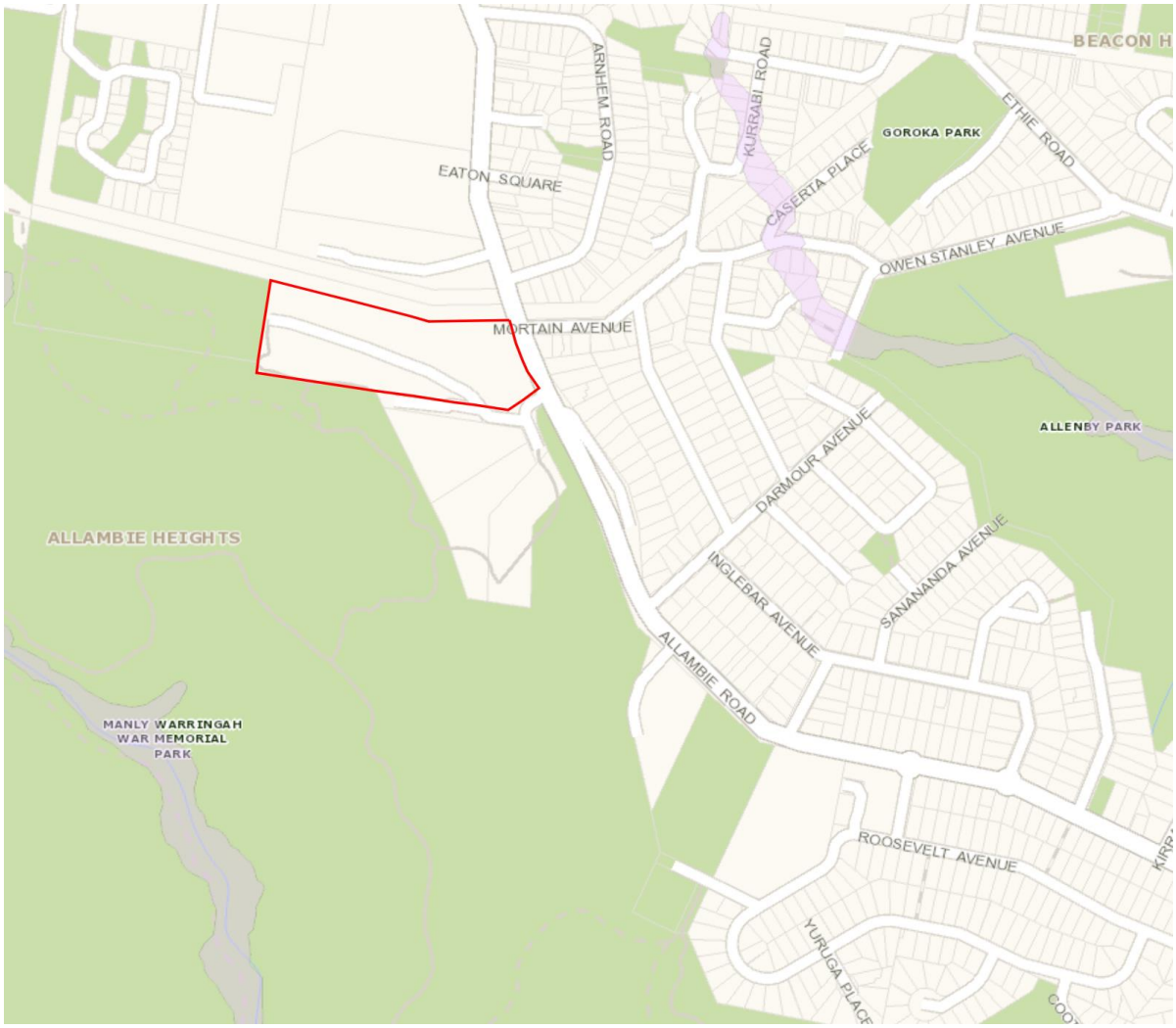


Figure 3: Low Flood Risk Planning Precinct (Source: Northern Beaches Planning Maps, 2018)

4.1.1 Flood Impacts

As the site is not affected by regional flooding no flood mitigation measures are proposed to deal with regional flooding. Measures will however be incorporated into the design to minimise the risk of local or nuisance flooding to or because of the development. These will include grading external areas to ensure positive stormwater runoff in a controlled manner and the provision of on-site detention to ensure there are no adverse downstream impacts caused by the development.

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 50 year design storm runoff from the roof to the proposed in ground drainage network. 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 in a controlled manner.

5.2 Infiltration Discharge

Discharge from the site will be via infiltration into the ground water. The base of the raingardens will allow runoff to discharge into the ground. Geotechnical investigations have been undertaken for the site and confirm that the existing geology on the site would allow for an infiltration rate of 0.01mm/hr, this rate has been used to calculate the area required to allow the runoff to discharge.

The infiltration system has been designed to discharge runoff occurring from a 100 year design storm, a peak discharge flow of 283L/s.

6. Stormwater Attenuation

Stormwater detention for the site will be provided to attenuate the post development discharge rates back to the pre-development rates. A DRAINS model has been produced to assess the volume of storage required for the development. This model confirms that 100m³ is required to attenuate the discharge flows.

The stormwater detention will be achieved by providing an underground tank situated below the proposed community building. The location and arrangement of the tank is indicated in the concept drawing in Appendix A of this report.

Discharge rates will be attenuated by providing an orifice plate over the discharge pipe which will restrict the flows discharging to the legal point of discharge. The sizing of this orifice plate has been undertaken using the DRAINS model for the development. The model has confirmed that the orifice plate will have a diameter of 190mm.

The table below summarises the discharge flows from the site.

Development Scenario	% Impermeable	Discharge Flow Rates (L/s)		
		5 Year Design Storm	20 Year Design Storm	100 Year Design Storm
Pre-Development	10	328	463	595
Post – Development	60	278	359	584

Table 1: Site Discharge Flows

Output from the DRAINS model is included in Appendix B of this report.

7. Water Quality Treatment

As discussed in section 3.2 of this report Northern Beaches 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.

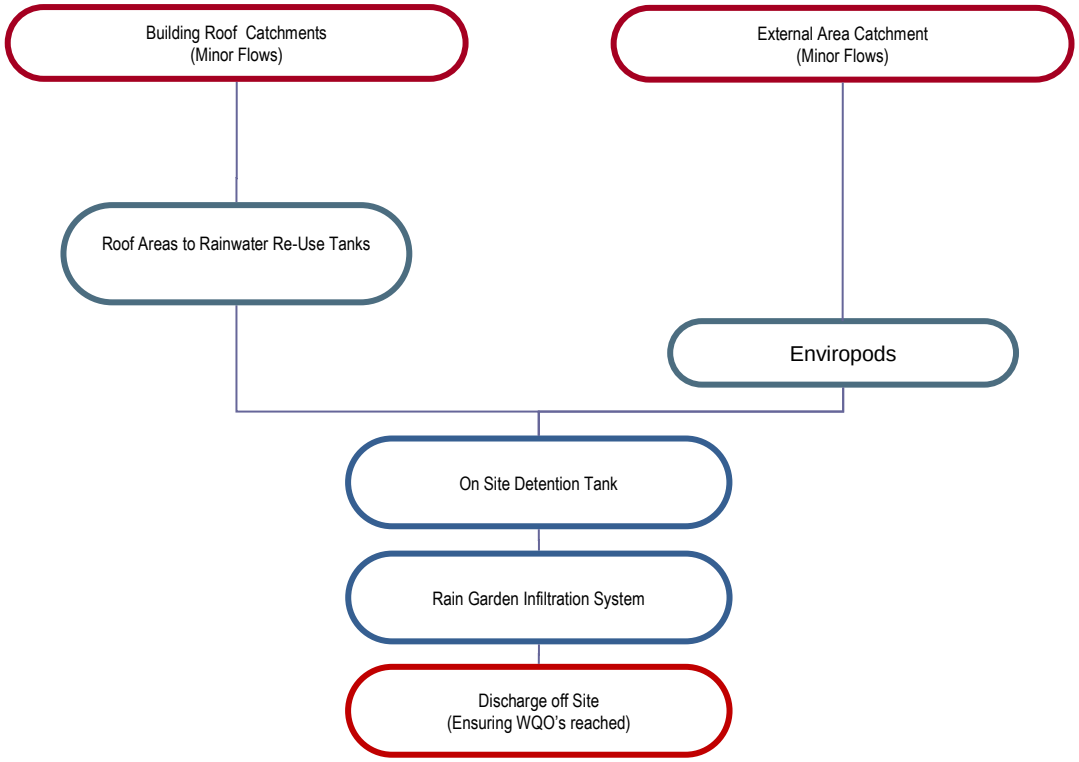


Figure 4: Proposed Water Quality Treatment Train

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

7.2.1 Rainwater Tanks

As shown in the proposed treatment train, the roof water from the building will drain to rainwater tanks and will be used for irrigation. The use of rainwater tanks will allow for a reduction of TSS by the settling of particles over time and through the screening of water before it enters the tank.

A 130Kl tank is proposed for the development.

7.2.2 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 5: EnviroPod Pit Inlet Trap (Source: Stormwater 360)

7.2.3 Rain Garden

Bio-retention systems are vegetated areas where stormwater is passed through densely planted filter media (loamy sand) allowing the plants to absorb the collected and stored nutrients. Bio-retention basins utilise temporary ponding above the vegetated surface to increase the volume of stored water for treatment. Bio-retention systems can take a number of forms but all have common features including the extended detention depth above the media surface, the filter media and a low level drainage media and subsoil system. These are shown in the figure below.

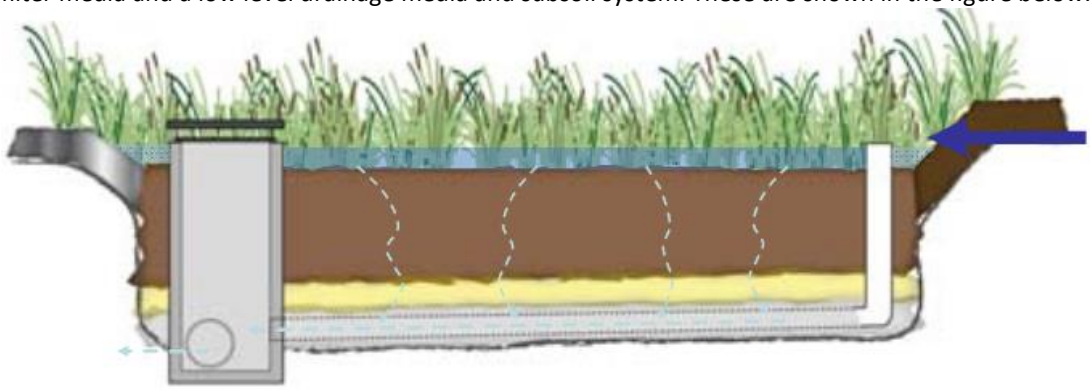


Figure 6: Typical Section of a generic Bio-retention system (Source: Water by Design)

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 2: MUSIC modelling parameters

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

Table 3: Catchment modelling parameters

Node Description	**Area (Ha)**	**Percentage Impervious (%) / Area Impervious (Ha)**		**Land Use Rainfall and Pollutant Parameters**
Building Roof Catchment	0.364	100	0.364	Urban Residential
External Areas	0.160	100	0.160	Urban Residential
Bypass Area	0.243	0	0	Revegitated
	Total: 0.767Ha	Effective FI 68%		

7.3.2 MUSIC Results & Parameters

MUSIC Model

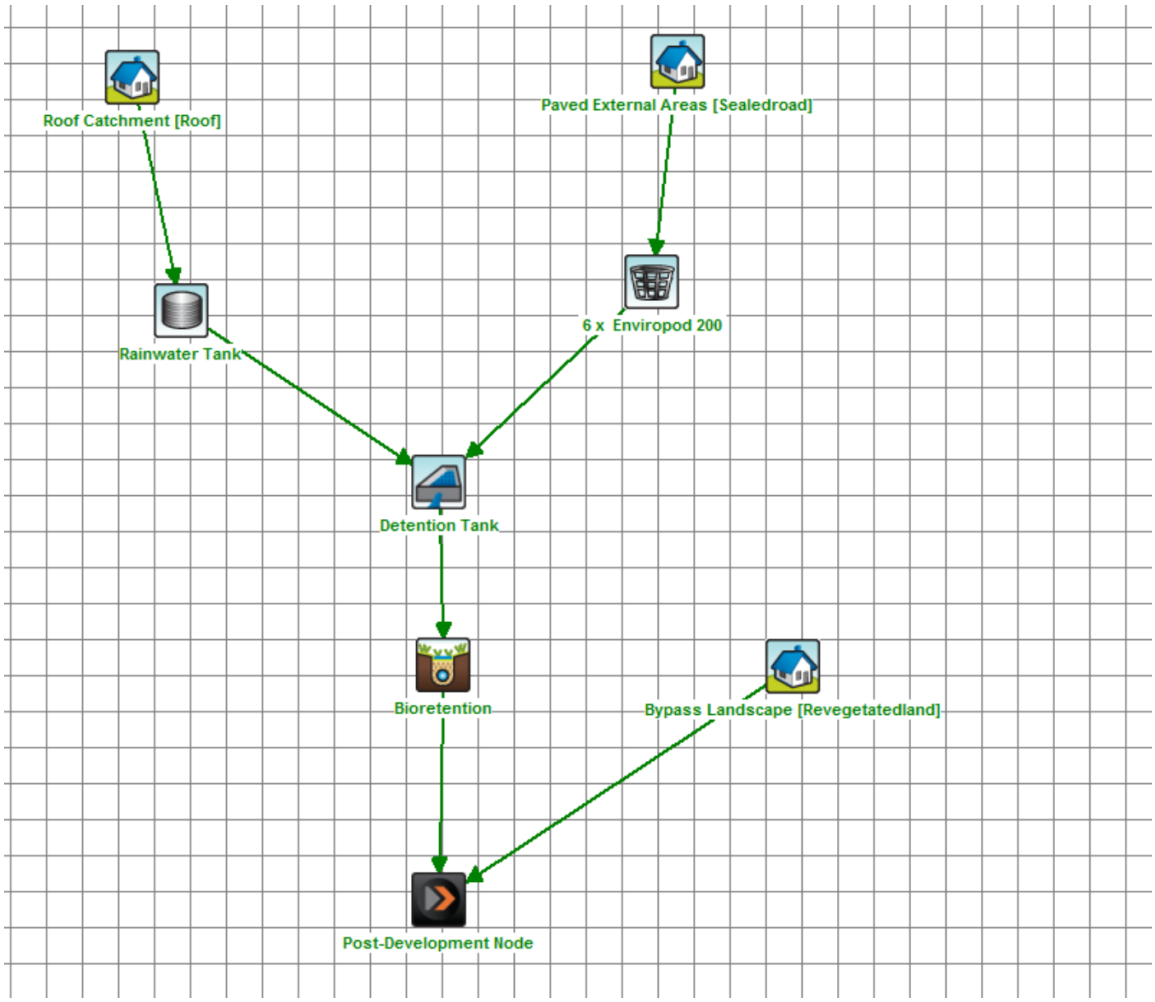


Figure 7 MUSIC Model

MUSIC Output

	Sources	Residual Load	% Reduction
Flow (ML/yr)	8.18	5.54	32.4
Total Suspended Solids (kg/yr)	956	120	87.5
Total Phosphorus (kg/yr)	2.13	0.452	78.8
Total Nitrogen (kg/yr)	17.6	6.27	64.4
Gross Pollutants (kg/yr)	171	0	100

Figure 8 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 4: 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
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Drainage Rate (%)	5
Daily Deep Seepage Rate (%)	0

MUSIC Concentration Parameters

Table 5: 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
Roof Catchment	Mean	1.1	1.3	-0.82	-0.89	0.32	0.30
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19
External Areas	Mean	1.2	2.43	-0.85	-0.3	0.11	0.34
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19
Vegetated Bypass	Mean	1.15	1.95	-1.22	-0.66	-0.05	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:

- Rainwater Tank
- Detention Tank
- Gross Pollutant Traps
- Raingarden

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 6: Treatment Train Efficiencies

Indicator	Total Site Reduction	Site Targets	Target Achieved
Gross Pollutants	100%	90%	Yes
Total Suspended Solids (TSS)	87.5%	85%	Yes
Total Phosphorus (TP)	78.8%	60%	Yes
Total Nitrogen (TN)	64.4%	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. Northern Beaches 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.

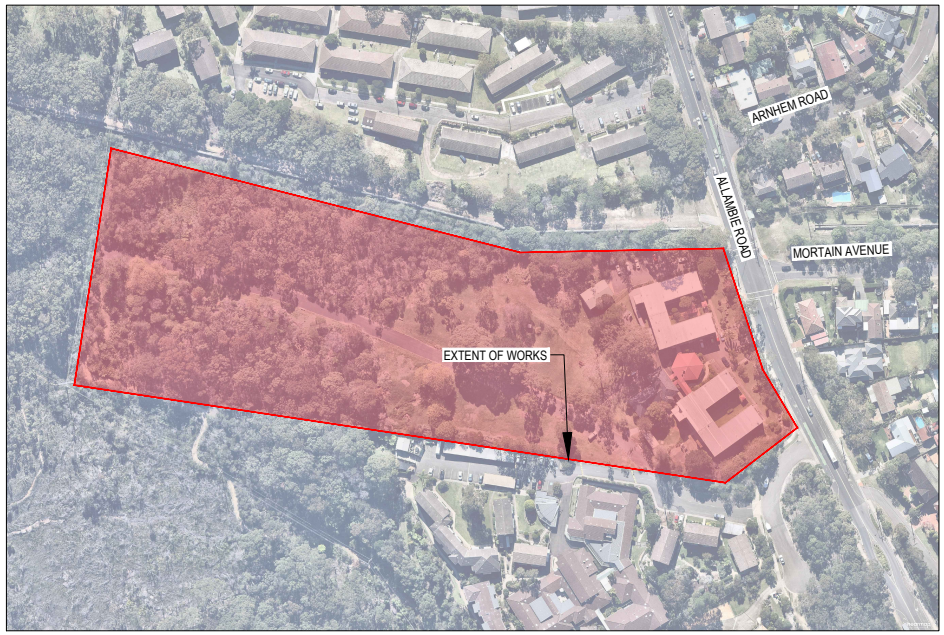
Common control measures adopted are:

- 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

CIVIL ENGINEERING WORKS



Sheet List Table	
Sheet Number	Sheet Title
CI-000-01	COVER SHEET
CI-070-01	SEDIMENTATION & EROSION CONTROL PLAN
CI-070-02	SEDIMENTATION & EROSION CONTROL DETAILS
CI-100-01	BULK EARTHWORKS PLAN
CI-520-01	STORMWATER MANAGEMENT PLAN
CI-526-01	STORMWATER MANAGEMENT DETAILS

JACKSON TEECE
Architecture

JACKSON TEECE	181 ALLAMBIE ROAD, ALAMBIE HEIGHTS	WOOD & GRIEVE ENGINEERS	38509	CI-000-01	A
CLIENT	PROJECT		PROJECT No	DRAWING No	REV

NOTE:
REFER DRAWING CI-076-01 FOR EROSION AND SEDIMENT CONTROL DETAILS

REV	DESCRIPTION	DRAWN	APPD	DATE
A	ISSUED FOR DA APPROVAL	CPO	IAH	01.06.18

DRAWN:	CPO
DESIGNED:	IAH
VERIFIED:	IAH 01.06.18
APPROVED FOR TENDER:	... JJJ..
APPROVED FOR CONSTRUCTION:	... JJJ..

JACKSON TEECE
Architecture
ARCHITECT/CLIENT

181 ALLAMBIE ROAD
ALLAMBIE HEIGHTS
NSW
PROJECT

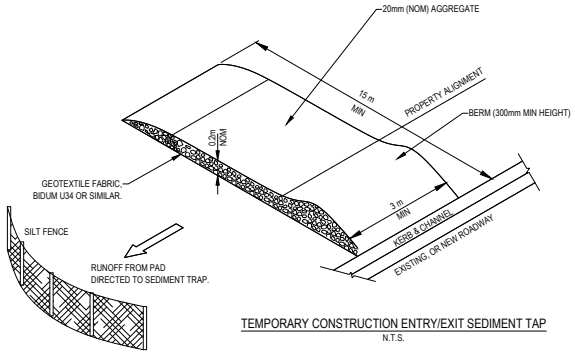
SEDIMENTATION & EROSION CONTROL PLAN
TITLE

38509-CI-070-01.dwg
1/06/2018 4:40:56 PM

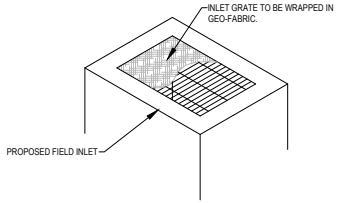
WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

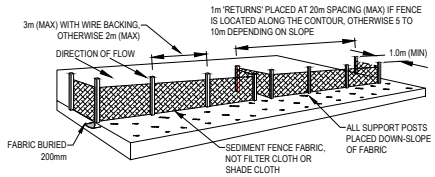
AS SHOWN	38509	CI-070-01	A
SCALE @ A1	PROJECT No	DRAWING No	REV



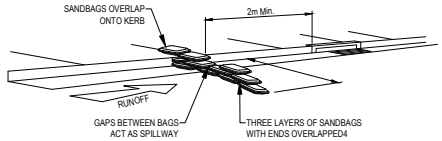
TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TAP
N.T.S.



FIELD INLET SEDIMENT CONTROL
N.T.S.



INSTALLATION OF SEDIMENT FENCE
N.T.S



SANDBAG KERB INLET SEDIMENT TRAP
N.T.S.

REV	DESCRIPTION	DRAWN	APP'D	DATE
A	ISSUED FOR DA APPROVAL	CPO	IAH	01.06.18

DRAWN:	CPO
DESIGNED:	IAH
VERIFIED:	IAH 01.06.18
APPROVED FOR TENDER:	... J.J.
APPROVED FOR CONSTRUCTION:	... J.J.

JACKSON TEECE
Architecture

ARCHITECT/CLIENT

181 ALLAMBIE ROAD
ALLAMBIE HEIGHTS
NSW

PROJECT

SEDIMENTATION & EROSION
CONTROL DETAILS

TITLE

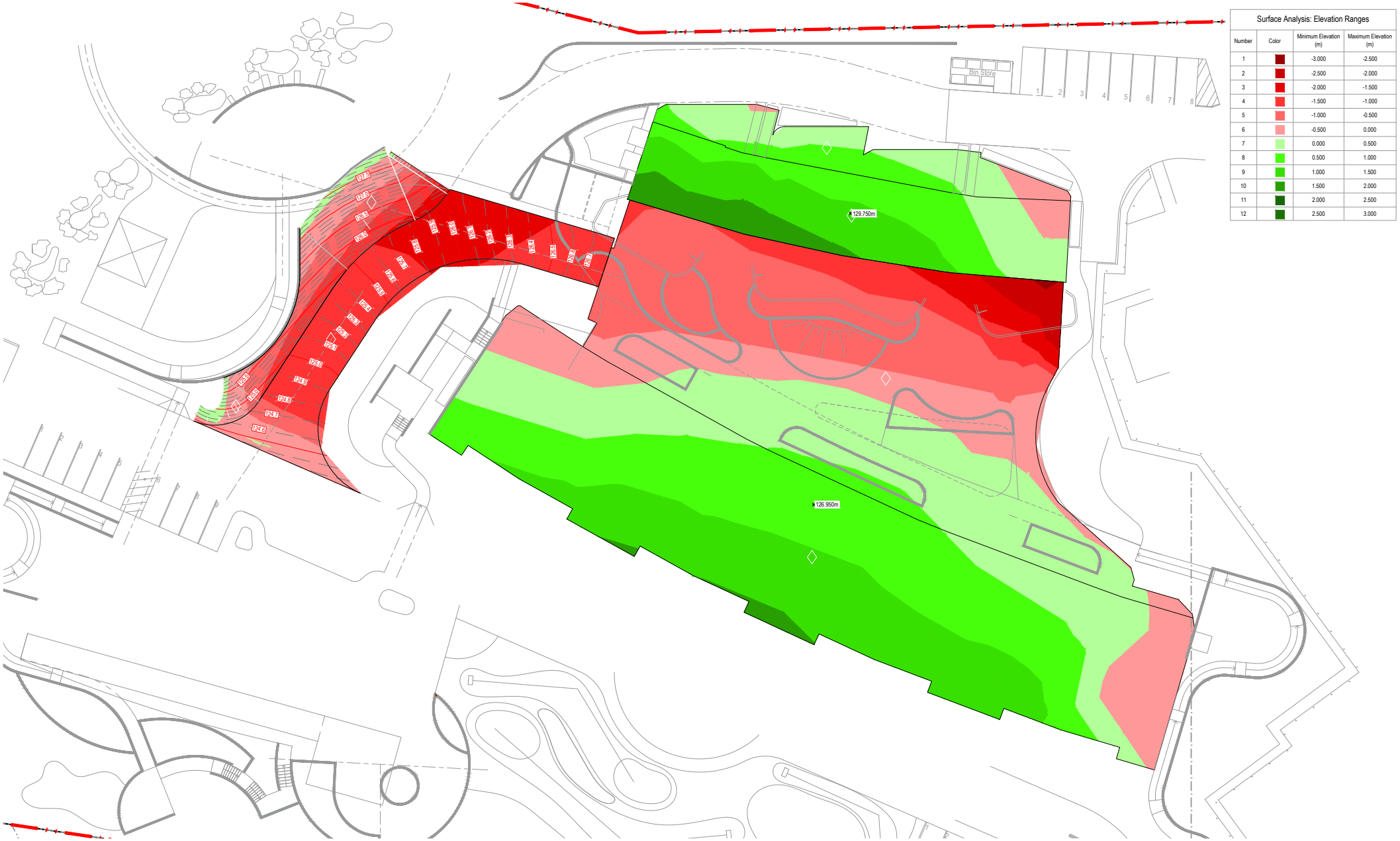
38509-CI-070-02.dwg

1/06/2018 4:41:03 PM

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

SCALE @ A1	PROJECT No	DRAWING No	REV
AS SHOWN	38509	CI-070-02	A



Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-3.000	-2.500
2		-2.500	-2.000
3		-2.000	-1.500
4		-1.500	-1.000
5		-1.000	-0.500
6		-0.500	0.000
7		0.000	0.500
8		0.500	1.000
9		1.000	1.500
10		1.500	2.000
11		2.000	2.500
12		2.500	3.000

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
BE Volumes	1.000	1.000	4068.214sq.m	1332.485 Cu. M.	1673.776 Cu. M.	341.291 Cu. M.<Fill>
Totals			4068.214sq.m	1332.485 Cu. M.	1673.776 Cu. M.	341.291 Cu. M.<Fill>

1:200 2 0 2 4 6 8 10 A1
1:400 A3

A	ISSUED FOR DA APPROVAL	CPO	IAH	01.06.18

JACKSON TEECE
Architecture

181 ALLAMBIE ROAD
ALLAMBIE HEIGHTS
NSW

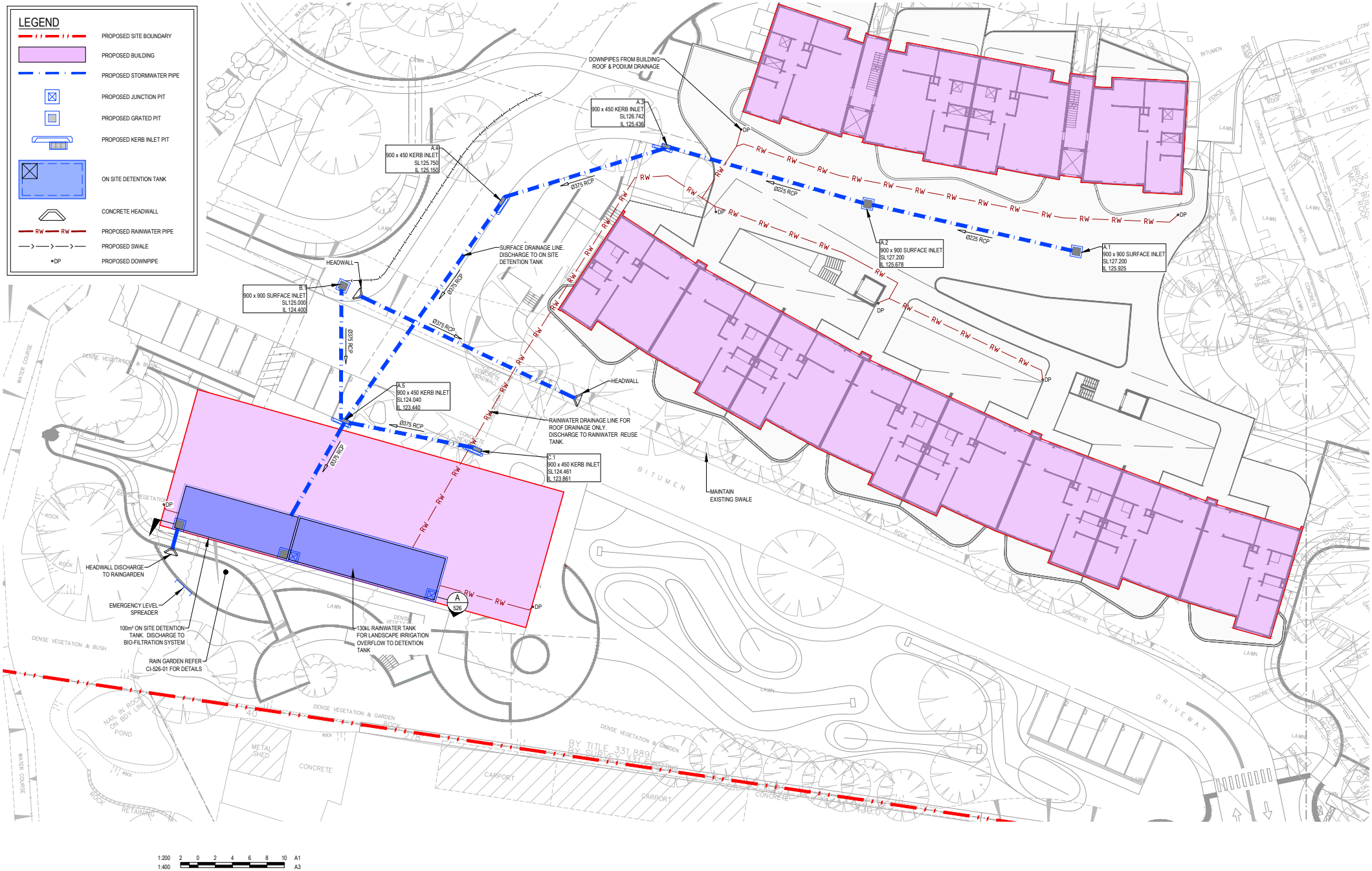
BULK EARTHWORKS PLAN

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

AS SHOWN | 38509 | CI-100-01 | A

38509-CI-Model.dwg
1/06/2018 4:41:10 PM



REV	DESCRIPTION	DRAWN	APPD	DATE
A	ISSUED FOR DA APPROVAL	CPO	IAH	01.06.18

DRAWN:	CPO
DESIGNED:	IAH
VERIFIED:	IAH 01.06.18
APPROVED FOR TENDER:	... JJJ..
APPROVED FOR CONSTRUCTION:	... JJJ..

JACKSON TEECE
Architecture
ARCHITECT/CLIENT

181 ALLAMBIE ROAD
ALLAMBIE HEIGHTS
NSW
PROJECT

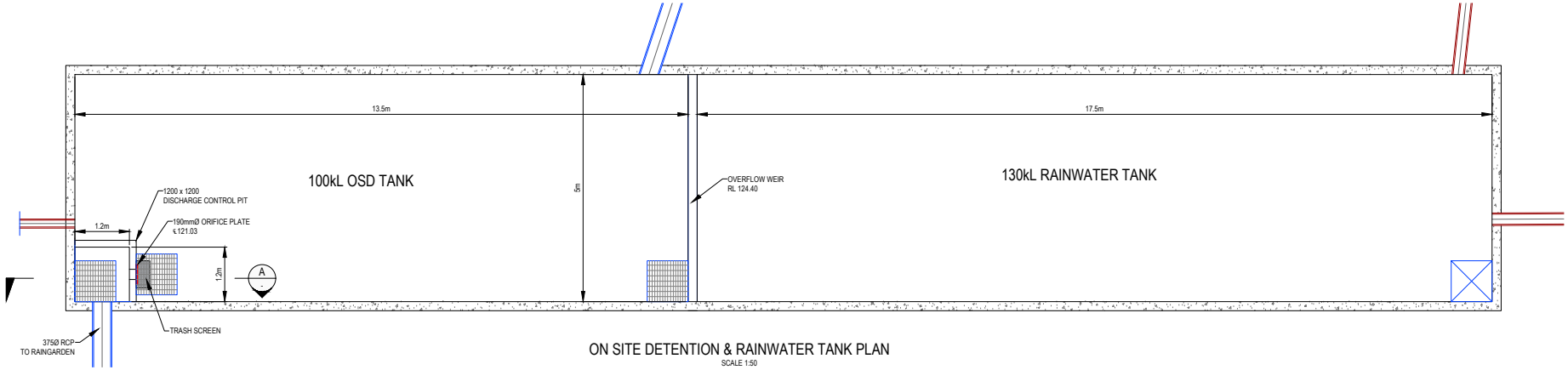
STORMWATER MANAGEMENT PLAN
TITLE

38509-CI-520-01.dwg
1/06/2018 4:41:16 PM

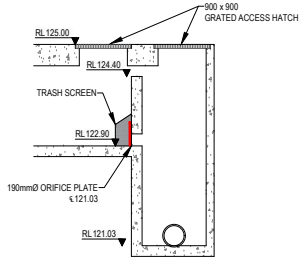
WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

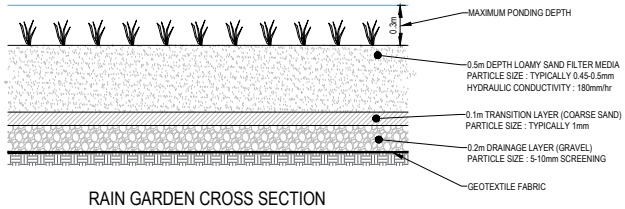
AS SHOWN	38509	CI-520-01	A
SCALE @ A1	PROJECT No	DRAWING No	REV



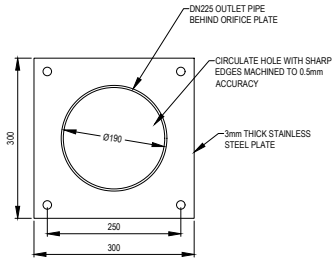
ON SITE DETENTION & RAINWATER TANK PLAN
SCALE 1:50



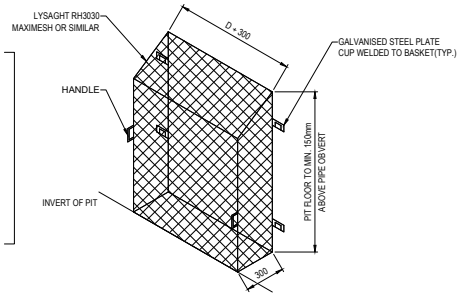
ON SITE DETENTION DISCHARGE CONTROL PIT SECTION
SCALE 1:50



RAIN GARDEN CROSS SECTION
SCALE 1:20



ORIFICE PLATE DETAIL
SCALE 1:5



SCREEN MESH DETAIL
N.T.S.

1:5 0.1 0 0.1 0.2 A1
1:10 A3

1:50 1 0.5 0 1 2 A1
1:100 A3

1:100 1 0 1 2 3 4 5 A1
1:200 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
A	ISSUED FOR DA APPROVAL	CPO	IAH	01.06.18

DRAWN:	CPO
DESIGNED:	IAH
VERIFIED:	IAH 01.06.18
APPROVED FOR TENDER:	... JJJ..
APPROVED FOR CONSTRUCTION:	... JJJ..

JACKSON TEECE
Architecture
ARCHITECT/CLIENT

181 ALLAMBIE ROAD
ALLAMBIE HEIGHTS
NSW
PROJECT

STORMWATER MANAGEMENT
DETAILS
TITLE

WOOD & GRIEVE ENGINEERS

FOR APPROVAL
NOT FOR CONSTRUCTION

AS SHOWN	38509	CI-526-01	A
SCALE @ A1	PROJECT No	DRAWING No	REV

38509-CI-526-01.dwg
1/06/2018 4:41:23 PM

Appendix B – DRAINS Output

Appendix B – DRAINS Output

5 Year Model Output

DRAINS results prepared from Version 2018.01

PIT / NODE DETAILS Version 8

Name	Max HGL	HGL	Max Pond Flow Arriving (cu.m/s)	(cu.m)	Max Surface Volume (m)	Max Pond Freeboard	Min (cu.m/s)	Overflow	Constraint
A.1	125.99	127.22	0.004	0.1	1.21	0.000	Inlet Capacity		
A.2	125.73	127.22	0.004	0.1	1.47	0.000	Inlet Capacity		
A.3	125.52		0.002		1.32	0.000	None		
A.4	124.64		0.004		1.19	0.000	None		
A.5	124.13		0.004		1.17	0.000	None		
A.6	123.46	124.56	0.004	0.2	1.08	0.000	Inlet Capacity		
Roof	124.86		0.163						
RWT	124.57		0.000						
B.1	124.16	125.04	0.032	0.5	0.84	0.000	Inlet Capacity		

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	
PreDev Catchment	0.328	0.045	0.292	5.00	8.00	8.00	AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1	
A.1 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
A.2 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
A.3 Catch	0.002	0.002	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
A.4 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
A.5 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
A.6 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
Roof Catch	0.163	0.163	0.000	5.00	6.00	6.00	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	
Bypass Catch	0.168	0.045	0.131	5.00	8.00	8.00	AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1	
B.1 Catch	0.032	0.000	0.032	5.00	8.00	8.00	AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1	

Outflow Volumes for Total Catchment (0.63 impervious + 1.48 pervious = 2.11 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 5 year, 5 minutes storm, average 162 mm/h, Zone 1	285.12	116.50 (40.9%)	78.88 (92.6%)	37.62 (18.8%)
AR&R 5 year, 10 minutes storm, average 126 mm/h, Zone 1	443.52	230.73 (52.0%)	126.20 (95.2%)	104.53 (33.6%)
AR&R 5 year, 15 minutes storm, average 107 mm/h, Zone 1	564.96	317.95 (56.3%)	162.48 (96.3%)	155.47 (39.2%)

Appendix B – DRAINS Output

AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1	661.76	386.06 (58.3%)	191.40 (96.8%)	194.65 (41.9%)
AR&R 5 year, 30 minutes storm, average 77.0 mm/h, Zone 1	813.12	469.34 (57.7%)	236.63 (97.4%)	232.72 (40.8%)
AR&R 5 year, 45 minutes storm, average 62.0 mm/h, Zone 1	982.08	573.00 (58.3%)	287.11 (97.8%)	285.90 (41.5%)
AR&R 5 year, 1 hour storm, average 54.0 mm/h, Zone 1	1140.48	672.96 (59.0%)	334.43 (98.1%)	338.53 (42.3%)
AR&R 5 year, 1.5 hours storm, average 42.2 mm/h, Zone 1	1336.90	772.76 (57.8%)	393.11 (98.4%)	379.64 (40.5%)
AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1	1499.52	861.59 (57.5%)	441.70 (98.6%)	419.89 (39.9%)

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
1.000	0.004	0.71	125.972	125.729	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
1.001	0.009	1.42	125.702	125.515	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
1.002	0.011	1.51	125.482	124.640	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
1.003	0.015	1.72	124.600	124.127	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
1.004	0.019	1.78	124.082	123.459	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
1.005	0.055	0.96	123.439	123.443	AR&R 5 year, 1.5 hours storm, average 42.2 mm/h, Zone 1
1.006	0.110	2.76	121.387	121.205	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
2.000	0.164	2.32	124.864	124.573	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
2.001	0.164	2.36	124.573	124.286	AR&R 5 year, 20 minutes storm, average 94.0 mm/h, Zone 1
3.000	0.032	2.33	124.093	123.459	AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1

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
OF2	0	0	-999.000	0	0	0	0			
OF5	0	0	0.000	0	0	0	0			
OF10	0	0	0.000	0	0	0	0			
OF21	0	0	-0.000	0	0	0	0			
OF27	0	0	0.000	0	0	0	0			
OF32	0	0	0.000	0	0	0	0			
OF36	0	0	0.000	0	0	0	0			
OF35	0	0	0.000	0	0	0	0			
OF39	0.168	0.168	0.000	0.095	0.09	5.03	0.92	AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1		
OF41	0	0	0.000	0	0	0	0			

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD Tank		123.44	38.7	0.110	0.110	0.000
Bio	120.98	0.0	0.000	0.000	0.000	

CONTINUITY CHECK for AR&R 5 year, 2 hours storm, average 35.5 mm/h, Zone 1

Node	Inflow	Outflow	Storage Change	Difference

Appendix B – DRAINS Output

	(cu.m)	(cu.m)	(cu.m)	%	
DS.1	343.38	343.38	0.00	0.0	
A.1	7.00	7.02	0.00	-0.3	
A.2	14.02	14.12	0.00	-0.7	
A.3	17.62	17.57	0.00	0.3	
A.4	24.57	24.59	0.00	-0.1	
A.5	31.59	31.61	0.00	-0.1	
A.6	68.48	68.40	0.00	0.1	
OSD Tank		323.34	323.34	0.00	-0.0
Bio	323.34	323.34	0.00	0.0	
Roof	254.80	254.92	0.00	-0.0	
RWT	254.92	254.94	0.00	-0.0	
N42	195.15	195.15	0.00	0.0	
Bypass	195.15	195.15	0.00	0.0	
B.1	29.77	29.87	0.00	-0.3	

Run Log for 38509 run at 16:34:05 on 30/5/2018
No water upwelling from any pit. Freeboard was adequate at all pits.
The maximum flow in these overflow routes is unsafe: OF39

20 Year Design Output
DRAINS results prepared from Version 2018.01

PIT / NODE DETAILS Version 8

Name	Max HGL	HGL	Max Pond Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Max Surface (m)	Freeboard	Max Pond (cu.m/s)	Min	Overflow	Constraint
A.1	126.00	127.22	0.006	0.1	1.20	0.000	Inlet Capacity			
A.2	125.74	127.22	0.006	0.1	1.46	0.000	Inlet Capacity			
A.3	125.53		0.003		1.31	0.000	None			
A.4	124.65		0.006		1.17	0.000	None			
A.5	124.14		0.006		1.16	0.000	None			
A.6	124.07	124.56	0.006	0.3	0.47	0.000	Inlet Capacity			
Roof	125.27		0.214							
RWT	124.78		0.000							
B.1	124.19	125.05	0.046	0.6	0.81	0.000	Inlet Capacity			

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		
PreDev Catchment			0.463	0.060	0.414	5.00	8.00	8.00	AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1
A.1 Catch		0.006	0.006	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	
A.2 Catch		0.006	0.006	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	
A.3 Catch		0.003	0.003	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	
A.4 Catch		0.006	0.006	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	
A.5 Catch		0.006	0.006	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	

Appendix B – DRAINS Output

A.6 Catch	0.006	0.006	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
Roof Catch	0.214	0.214	0.000	5.00	6.00	6.00	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
Bypass Catch	0.235	0.061	0.186	5.00	8.00	8.00	AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1
B.1 Catch	0.046	0.000	0.046	5.00	8.00	8.00	AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.63 impervious + 1.48 pervious = 2.11 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year, 5 minutes storm, average 208 mm/h, Zone 1	366.08	195.13 (53.3%)	103.06 (94.2%)	92.07 (35.9%)
AR&R 20 year, 10 minutes storm, average 164 mm/h, Zone 1	577.28	361.57 (62.6%)	166.16 (96.3%)	195.41 (48.3%)
AR&R 20 year, 15 minutes storm, average 139 mm/h, Zone 1	733.92	482.26 (65.7%)	212.96 (97.1%)	269.30 (52.3%)
AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1	865.92	585.53 (67.6%)	252.40 (97.6%)	333.13 (54.9%)
AR&R 20 year, 30 minutes storm, average 102 mm/h, Zone 1	1077.12	728.70 (67.7%)	315.50 (98.0%)	413.20 (54.7%)
AR&R 20 year, 45 minutes storm, average 83.0 mm/h, Zone 1	1314.72	896.76 (68.2%)	386.49 (98.4%)	510.27 (55.3%)
AR&R 20 year, 1 hour storm, average 72.0 mm/h, Zone 1	1520.64	1044.01 (68.7%)	448.01 (98.6%)	596.00 (55.9%)
AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1	1774.06	1200.35 (67.7%)	523.73 (98.8%)	676.63 (54.4%)
AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1	2002.21	1349.32 (67.4%)	591.89 (98.9%)	757.43 (53.9%)

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
1.000	0.006	0.77	125.979	125.741	AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1
1.001	0.012	1.52	125.709	125.526	AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1
1.002	0.014	1.63	125.488	124.654	AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1
1.003	0.019	1.87	124.607	124.143	AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1
1.004	0.025	1.92	124.091	124.066	AR&R 20 year, 20 minutes storm, average 123 mm/h, Zone 1
1.005	0.068	0.43	124.060	124.057	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
1.006	0.124	3.11	121.447	121.205	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
2.000	0.215	3.03	125.274	124.780	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
2.001	0.215	3.04	124.780	124.300	AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1
3.000	0.046	2.58	124.106	124.066	AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1

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
OF2	0	-999.0000	0	0	0			
OF5	0	0.000 0	0	0	0			

OF10	0	0	0.000	0	0	0	0	
OF21	0	0	-0.000	0	0	0	0	
OF27	0	0	0.000	0	0	0	0	
OF32	0	0	0.000	0	0	0	0	
OF36	0	0	0.000	0	0	0	0	
OF35	0	0	0.000	0	0	0	0	
OF39	0.235	0.235	0.000	0.105	0.10	5.80	0.99	AR&R 20 year, 2 hours storm, average 47.4 mm/h, Zone 1
OF41	0	0	0.000	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q	High Level
OSD Tank		124.06	80.2	0.124	0.124	0.000
Bio	120.98	0.0	0.000	0.000	0.000	

CONTINUITY CHECK for AR&R 20 year, 1.5 hours storm, average 56.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	%	Difference
DS.1	521.86	521.86	0.00	0.0	
A.1	8.30	8.32	0.00	-0.2	
A.2	16.62	16.64	0.00	-0.2	
A.3	20.79	20.82	0.00	-0.2	
A.4	29.12	29.15	0.00	-0.1	
A.5	37.45	37.40	0.00	0.1	
A.6	93.72	94.39	0.00	-0.7	
OSD Tank		396.63	396.62	0.00	-0.0
Bio	396.62	396.62	0.00	0.0	
Roof	302.12	302.21	0.00	-0.0	
RWT	302.21	302.24	0.00	-0.0	
N42	282.76	282.76	0.00	0.0	
Bypass	282.76	282.76	0.00	0.0	
B.1	47.97	48.03	0.00	-0.1	

Run Log for 38509 run at 16:35:07 on 30/5/2018
No water upwelling from any pit. Freeboard was adequate at all pits.
The maximum flow in these overflow routes is unsafe: OF39

100 Year Design Output
DRAINS results prepared from Version 2018.01

PIT / NODE DETAILS Version 8

Name	Max HGL	HGL	Max Pond Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Max Surface Freeboard (m)	Max Pond (cu.m/s)	Min	Overflow	Constraint
A.1	126.01	127.22	0.007	0.1	1.19	0.000	Inlet Capacity		
A.2	125.75	127.22	0.007	0.1	1.45	0.000	Inlet Capacity		
A.3	125.54		0.004		1.30	0.000	None		
A.4	124.74		0.007		1.09	0.000	None		
A.5	124.80		0.007		0.50	0.000	None		
A.6	124.69	124.69	0.007	4.1	0.00	0.000	Outlet System		
Roof	126.21		0.266						
RWT	125.48		0.000						

Appendix B – DRAINS Output

B.1	124.75	125.06	0.059	0.7	0.25	0.000	Inlet Capacity

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
PreDev Catchment		0.595	0.074	0.534	5.00	8.00	8.00 AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1
A.1 Catch	0.007	0.007	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
A.2 Catch	0.007	0.007	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
A.3 Catch	0.004	0.004	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
A.4 Catch	0.007	0.007	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
A.5 Catch	0.007	0.007	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
A.6 Catch	0.007	0.007	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
Roof Catch	0.266	0.266	0.000	5.00	6.00	6.00	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
Bypass Catch	0.301	0.075	0.239	5.00	8.00	8.00	AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1
B.1 Catch	0.059	0.000	0.059	5.00	8.00	8.00	AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.63 impervious + 1.48 pervious = 2.11 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 minutes storm, average 269 mm/h, Zone 1	473.44	300.67 (63.5%)	135.14 (95.5%)	165.53 (49.9%)
AR&R 100 year, 10 minutes storm, average 213 mm/h, Zone 1	749.76	531.43 (70.9%)	217.69 (97.2%)	313.73 (59.7%)
AR&R 100 year, 15 minutes storm, average 182 mm/h, Zone 1	960.96	704.71 (73.3%)	280.80 (97.8%)	423.92 (62.9%)
AR&R 100 year, 20 minutes storm, average 161 mm/h, Zone 1	1133.44	844.50 (74.5%)	332.33 (98.1%)	512.18 (64.4%)
AR&R 100 year, 30 minutes storm, average 134 mm/h, Zone 1	1415.04	1059.69 (74.9%)	416.46 (98.5%)	643.23 (64.8%)
AR&R 100 year, 45 minutes storm, average 111 mm/h, Zone 1	1758.22	1329.37 (75.6%)	518.99 (98.8%)	810.38 (65.7%)
AR&R 100 year, 1 hour storm, average 96.0 mm/h, Zone 1	2027.52	1540.20 (76.0%)	599.45 (99.0%)	940.75 (66.2%)
AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1	2376.00	1794.24 (75.5%)	703.57 (99.1%)	1090.67 (65.5%)
AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1	2661.16	2002.06 (75.2%)	788.76 (99.2%)	1213.30 (65.0%)

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
1.000	0.007	0.83	125.985	125.751	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1

Appendix B – DRAINS Output

1.001	0.015	1.68	125.713	125.537	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
1.002	0.017	1.75	125.494	124.736	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
1.003	0.031	0.63	124.721	124.798	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
1.004	0.037	0.34	124.796	124.690	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
1.005	0.090	0.57	125.095	125.149	AR&R 100 year, 20 minutes storm, average 161 mm/h, Zone 1
1.006	0.136	3.42	121.541	121.205	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
2.000	0.265	3.75	126.213	125.477	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
2.001	0.264	3.74	125.476	125.149	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1
3.000	0.063	0.57	124.726	124.690	AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1

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
OF2	0	0	0.000	0	0	0	0			
OF5	0	0	0.000	0	0	0	0			
OF10	0	0	0.000	0	0	0	0			
OF21	0	0	0.000	0	0	0	0			
OF27	0	0	0.000	0	0	0	0			
OF32	0	0	0.000	0	0	0	0			
OF36	0.147	0.147	0.000	0.060	0.05	4.00	0.82	AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1		
OF35	0	0	0.000	0	0	0	0			
OF39	0.301	0.301	0.000	0.114	0.12	6.44	1.04	AR&R 100 year, 2 hours storm, average 63.0 mm/h, Zone 1		
OF41	0	0	0.000	0	0	0	0			

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD Tank		125.15	104.4	0.283	0.136	0.147
Bio	120.98	0.0	0.000	0.000	0.000	

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 75.0 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
DS.1	817.66	817.66	0.00	0.0
A.1	11.15	11.14	0.00	0.1
A.2	22.29	22.28	0.00	0.0
A.3	27.85	27.82	0.00	0.1
A.4	38.97	38.90	0.00	0.2
A.5	50.05	50.35	0.00	-0.6
A.6	139.05	135.35	0.00	2.7
OSD Tank		542.15	542.14	0.00	-0.0
Bio	542.14	542.14	0.00	0.0
Roof	405.86	406.28	0.00	-0.1
RWT	406.28	406.80	0.00	-0.1
N42	432.07	432.07	0.00	0.0
Bypass	432.07	432.07	0.00	0.0
B.1	77.33	77.56	0.00	-0.3

Appendix B – DRAINS Output

Run Log for 38509 run at 16:35:49 on 30/5/2018

The maximum water level in these storages exceeds the maximum elevation you specified: OSD Tank.
DRAINS has extrapolated the Elevation vs Storage table to a higher Elevation. Please provide accurate values for higher elevations.
No water upwelling from any pit.
Freeboard was less than 0.15m at A.6
Flows were safe in all overflow routes.

Appendix C – MUSIC Model Results

Appendix C – MUSIC Model Results

Source nodes
Location,Roof Catchment,Paved External Areas,Bypass Landscape
ID,1,5,8
Node Type,UrbanSourceNode,UrbanSourceNode,UrbanSourceNode
Zoning Surface Type,Roof,Sealedroad,Revegetatedland
Total Area (ha),0.364,0.16,0.243
Area Impervious (ha),0.364,0.159397014925373,0
Area Pervious (ha),0,0.000602985074626861,0.243
Field Capacity (mm),80,80,80
Pervious Area Infiltration Capacity coefficient - a,200,200,200
Pervious Area Infiltration Capacity exponent - b,1,1,1
Impervious Area Rainfall Threshold (mm/day),1,1,1
Pervious Area Soil Storage Capacity (mm),120,120,120
Pervious Area Soil Initial Storage (% of Capacity),25,25,25
Groundwater Initial Depth (mm),10,10,10
Groundwater Daily Recharge Rate (%),25,25,25
Groundwater Daily Baseflow Rate (%),5,5,5
Groundwater Daily Deep Seepage Rate (%),0,0,0
Stormflow Total Suspended Solids Mean (log mg/L),1.3,2.43,1.95
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.32,0.32,0.32
Stormflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0,0,0
Stormflow Total Phosphorus Mean (log mg/L),-0.89,-0.3,-0.66
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.25,0.25,0.25
Stormflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Phosphorus Serial Correlation,0,0,0
Stormflow Total Nitrogen Mean (log mg/L),0.3,0.34,0.3
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.19,0.19,0.19
Stormflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic
Stormflow Total Nitrogen Serial Correlation,0,0,0
Baseflow Total Suspended Solids Mean (log mg/L),1.1,1.2,1.15
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.17,0.17,0.17
Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0,0,0
Baseflow Total Phosphorus Mean (log mg/L),-0.82,-0.85,-1.22
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.19,0.19,0.19
Baseflow Total Phosphorus Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Phosphorus Serial Correlation,0,0,0
Baseflow Total Nitrogen Mean (log mg/L),0.32,0.11,-0.05
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.12,0.12,0.12
Baseflow Total Nitrogen Estimation Method,Stochastic,Stochastic,Stochastic
Baseflow Total Nitrogen Serial Correlation,0,0,0
Flow based constituent generation - enabled,Off,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),4.91,2.16,1.12
OUT - TSS Mean Annual Load (kg/yr),128,755,66.8
OUT - TP Mean Annual Load (kg/yr),0.750,1.24,0.164
OUT - TN Mean Annual Load (kg/yr),10.6,5.23,1.80
OUT - Gross Pollutant Mean Annual Load (kg/yr),119,52.2,0.00
Rain In (ML/yr),5.42212,2.38335,3.61971

Appendix C – MUSIC Model Results

ET Loss (ML/yr),0.514048,0.225955,2.50116
Deep Seepage Loss (ML/yr),0,0,0
Baseflow Out (ML/yr),0,0,0.591647
Imp. Stormflow Out (ML/yr),4.90808,2.1574,0
Perv. Stormflow Out (ML/yr),0,0,0.526913
Total Stormflow Out (ML/yr),4.90808,2.1574,0.526913
Total Outflow (ML/yr),4.90808,2.1574,1.11856
Change in Soil Storage (ML/yr),0,0,-7E-6
TSS Baseflow Out (kg/yr),0,0,9.05422
TSS Total Stormflow Out (kg/yr),127.962,755.393,57.7569
TSS Total Outflow (kg/yr),127.962,755.393,66.8111
TP Baseflow Out (kg/yr),0,0,0.039014
TP Total Stormflow Out (kg/yr),0.750111,1.24375,0.124487
TP Total Outflow (kg/yr),0.750111,1.24375,0.163501
TN Baseflow Out (kg/yr),0,0,0.54805
TN Total Stormflow Out (kg/yr),10.6426,5.23226,1.24862
TN Total Outflow (kg/yr),10.6426,5.23226,1.79667
GP Total Outflow (kg/yr),118.765,52.2044,0

No Imported Data Source nodes

USTM treatment nodes
Location,Rainwater Tank,Bioretention,Detention Tank
ID,2,4,6
Node Type,RainWaterTankNode,BioRetentionNodeV4,DetentionBasinNode
Lo-flow bypass rate (cum/sec),0,0,0
Hi-flow bypass rate (cum/sec),100,100,100
Inlet pond volume,0, ,0
Area (sqm),87.5,100,67.5
Initial Volume (m^3),0, ,
Extended detention depth (m),0.2,0.2,1.5
Number of Rainwater tanks,1, ,
Permanent Pool Volume (cubic metres),130, ,2
Proportion vegetated,0, ,0
Equivalent Pipe Diameter (mm),100, ,1
Overflow weir width (m),10,2,0.3
Notional Detention Time (hrs),0.467, ,9.86E3
Orifice Discharge Coefficient,0.6, ,0.6
Weir Coefficient,1.7,1.7,1.7
Number of CSTR Cells,2,3,1
Total Suspended Solids - k (m/yr),400,8000,8000
Total Suspended Solids - C* (mg/L),12,20,20
Total Suspended Solids - C** (mg/L),12, ,20
Total Phosphorus - k (m/yr),300,6000,6000
Total Phosphorus - C* (mg/L),0.13,0.13,0.13
Total Phosphorus - C** (mg/L),0.13, ,0.13
Total Nitrogen - k (m/yr),40,500,500
Total Nitrogen - C* (mg/L),1.4,1.4,1.4
Total Nitrogen - C** (mg/L),1.4, ,1.4
Threshold Hydraulic Loading for C** (m/yr),3500, ,3500
Horizontal Flow Coefficient, ,3,
Reuse Enabled,On,Off,Off
Max drawdown height (m),1.48571428571429, ,
Annual Demand Enabled,Off,Off,Off

Appendix C – MUSIC Model Results

Annual Demand Value (ML/year), , ,
Annual Demand Distribution, , ,
Annual Demand Monthly Distribution: Jan, , ,
Annual Demand Monthly Distribution: Feb, , ,
Annual Demand Monthly Distribution: Mar, , ,
Annual Demand Monthly Distribution: Apr, , ,
Annual Demand Monthly Distribution: May, , ,
Annual Demand Monthly Distribution: Jun, , ,
Annual Demand Monthly Distribution: Jul, , ,
Annual Demand Monthly Distribution: Aug, , ,
Annual Demand Monthly Distribution: Sep, , ,
Annual Demand Monthly Distribution: Oct, , ,
Annual Demand Monthly Distribution: Nov, , ,
Annual Demand Monthly Distribution: Dec, , ,
Daily Demand Enabled,On,Off,Off
Daily Demand Value (ML/day),0.0063, ,
Custom Demand Enabled,Off,Off,Off
Custom Demand Time Series File, , ,
Custom Demand Time Series Units, , ,
Filter area (sqm), ,100,
Filter perimeter (m), ,14,
Filter depth (m), ,0.5,
Filter Median Particle Diameter (mm), , ,
Saturated Hydraulic Conductivity (mm/hr), ,100,
Infiltration Media Porosity, ,0.35,
Length (m), , ,
Bed slope, , ,
Base Width (m), , ,
Top width (m), , ,
Vegetation height (m), , ,
Vegetation Type, ,Vegetated with Effective Nutrient Removal Plants,
Total Nitrogen Content in Filter (mg/kg), ,600,
Orthophosphate Content in Filter (mg/kg), ,30,
Is Base Lined?, ,No,
Is Underdrain Present?, ,Yes,
Is Submerged Zone Present?, ,No,
Submerged Zone Depth (m), , ,
B for Media Soil Texture,-9999,13,-9999
Proportion of upstream impervious area treated, , ,
Exfiltration Rate (mm/hr),0,0,0
Evaporative Loss as % of PET,0,100,100
Depth in metres below the drain pipe, , ,
TSS A Coefficient, , ,
TSS B Coefficient, , ,
TP A Coefficient, , ,
TP B Coefficient, , ,
TN A Coefficient, , ,
TN B Coefficient, , ,
Sfc, ,0.61,
S*, ,0.37,
Sw, ,0.11,
Sh, ,0.05,
Emax (m/day), ,0.008,
Ew (m/day), ,0.001,

Appendix C – MUSIC Model Results

IN - Mean Annual Flow (ML/yr),4.91,4.64,4.82
IN - TSS Mean Annual Load (kg/yr),128,157,399
IN - TP Mean Annual Load (kg/yr),0.750,0.748,1.25
IN - TN Mean Annual Load (kg/yr),10.6,8.25,10.0
IN - Gross Pollutant Mean Annual Load (kg/yr),119,0.00,0.00
OUT - Mean Annual Flow (ML/yr),2.67,4.42,4.64
OUT - TSS Mean Annual Load (kg/yr),51.7,50.5,157
OUT - TP Mean Annual Load (kg/yr),0.378,0.298,0.748
OUT - TN Mean Annual Load (kg/yr),5.50,4.69,8.25
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00
Flow In (ML/yr),4.90804,4.64089,4.82458
ET Loss (ML/yr),0,0.221265,0.0850746
Infiltration Loss (ML/yr),0,0,0
Low Flow Bypass Out (ML/yr),0,0,0
High Flow Bypass Out (ML/yr),0,0,0
Orifice / Filter Out (ML/yr),2.13987,2.86636,0.0786461
Weir Out (ML/yr),0.527306,1.55131,4.55943
Transfer Function Out (ML/yr),0,0,0
Reuse Supplied (ML/yr),2.23943,0,0
Reuse Requested (ML/yr),2.29794,0,0
% Reuse Demand Met,97.4538,0,0
% Load Reduction,45.657,4.80989,3.8657
TSS Flow In (kg/yr),127.962,156.689,399.228
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),0,0,0
TSS Orifice / Filter Out (kg/yr),41.1785,7.39103,1.60655
TSS Weir Out (kg/yr),10.5687,43.125,155.164
TSS Transfer Function Out (kg/yr),0,0,0
TSS Reuse Supplied (kg/yr),28.9992,0,0
TSS Reuse Requested (kg/yr),0,0,0
TSS % Reuse Demand Met,0,0,0
TSS % Load Reduction,59.5605,67.7603,60.7316
TP Flow In (kg/yr),0.750111,0.748307,1.24828
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),0,0,0
TP Orifice / Filter Out (kg/yr),0.306375,0.067488,0.0103158
TP Weir Out (kg/yr),0.0712789,0.23063,0.737966
TP Transfer Function Out (kg/yr),0,0,0
TP Reuse Supplied (kg/yr),0.295559,0,0
TP Reuse Requested (kg/yr),0,0,0
TP % Reuse Demand Met,0,0,0
TP % Load Reduction,49.6536,60.161,40.055
TN Flow In (kg/yr),10.6426,8.2494,10.0477
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),0,0,0
TN Orifice / Filter Out (kg/yr),4.38103,1.84889,0.113912
TN Weir Out (kg/yr),1.11458,2.84082,8.13815
TN Transfer Function Out (kg/yr),0,0,0

Appendix C – MUSIC Model Results

TN Reuse Supplied (kg/yr),3.872,0,0
TN Reuse Requested (kg/yr),0,0,0
TN % Reuse Demand Met,0,0,0
TN % Load Reduction,48.3621,43.1509,17.8711
GP Flow In (kg/yr),118.765,0,0
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),0,0,0
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
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,100,100,100
PET Scaling Factor, ,2.1,

Generic treatment nodes
Location, 6 x Enviropod 200
ID,7
Node Type,GPTNode
Lo-flow bypass rate (cum/sec),0
Hi-flow bypass rate (cum/sec),0.12
Flow Transfer Function
Input (cum/sec),0
Output (cum/sec),0
Input (cum/sec),10
Output (cum/sec),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
Input (kg/ML),0
Output (kg/ML),0
Input (kg/ML),14.780776740251
Output (kg/ML),0
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
Input (mg/L),0
Output (mg/L),0
Input (mg/L),10
Output (mg/L),8.7
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
Input (mg/L),0
Output (mg/L),0
Input (mg/L),10
Output (mg/L),7
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
Input (mg/L),0
Output (mg/L),0
Input (mg/L),100
Output (mg/L),46
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
TSS Flow based Efficiency,
TP Flow based Efficiency Enabled,Off
TP Flow based Efficiency,
TN Flow based Efficiency Enabled,Off
TN Flow based Efficiency,
GP Flow based Efficiency Enabled,Off
GP Flow based Efficiency,
IN - Mean Annual Flow (ML/yr),2.16
IN - TSS Mean Annual Load (kg/yr),755
IN - TP Mean Annual Load (kg/yr),1.24
IN - TN Mean Annual Load (kg/yr),5.23
IN - Gross Pollutant Mean Annual Load (kg/yr),52.2
OUT - Mean Annual Flow (ML/yr),2.16
OUT - TSS Mean Annual Load (kg/yr),347
OUT - TP Mean Annual Load (kg/yr),0.871
OUT - TN Mean Annual Load (kg/yr),4.55
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
Flow In (ML/yr),2.15738
ET Loss (ML/yr),0
Infiltration Loss (ML/yr),0
Low Flow Bypass Out (ML/yr),0
High Flow Bypass Out (ML/yr),0
Orifice / Filter Out (ML/yr),0
Weir Out (ML/yr),0
Transfer Function Out (ML/yr),2.15738
Reuse Supplied (ML/yr),0
Reuse Requested (ML/yr),0
% Reuse Demand Met,0

Appendix C – MUSIC Model Results

% Load Reduction,0
TSS Flow In (kg/yr),755.392
TSS ET Loss (kg/yr),0
TSS Infiltration Loss (kg/yr),0
TSS Low Flow Bypass Out (kg/yr),0
TSS High Flow Bypass Out (kg/yr),0
TSS Orifice / Filter Out (kg/yr),0
TSS Weir Out (kg/yr),0
TSS Transfer Function Out (kg/yr),347.48
TSS Reuse Supplied (kg/yr),0
TSS Reuse Requested (kg/yr),0
TSS % Reuse Demand Met,0
TSS % Load Reduction,54
TP Flow In (kg/yr),1.24375
TP ET Loss (kg/yr),0
TP Infiltration Loss (kg/yr),0
TP Low Flow Bypass Out (kg/yr),0
TP High Flow Bypass Out (kg/yr),0
TP Orifice / Filter Out (kg/yr),0
TP Weir Out (kg/yr),0
TP Transfer Function Out (kg/yr),0.870622
TP Reuse Supplied (kg/yr),0
TP Reuse Requested (kg/yr),0
TP % Reuse Demand Met,0
TP % Load Reduction,30
TN Flow In (kg/yr),5.23226
TN ET Loss (kg/yr),0
TN Infiltration Loss (kg/yr),0
TN Low Flow Bypass Out (kg/yr),0
TN High Flow Bypass Out (kg/yr),0
TN Orifice / Filter Out (kg/yr),0
TN Weir Out (kg/yr),0
TN Transfer Function Out (kg/yr),4.55207
TN Reuse Supplied (kg/yr),0
TN Reuse Requested (kg/yr),0
TN % Reuse Demand Met,0
TN % Load Reduction,13
GP Flow In (kg/yr),52.2045
GP ET Loss (kg/yr),0
GP Infiltration Loss (kg/yr),0
GP Low Flow Bypass Out (kg/yr),0
GP High Flow Bypass Out (kg/yr),0
GP Orifice / Filter Out (kg/yr),0
GP Weir Out (kg/yr),0
GP Transfer Function Out (kg/yr),0
GP Reuse Supplied (kg/yr),0
GP Reuse Requested (kg/yr),0
GP % Reuse Demand Met,0
GP % Load Reduction,100

Other nodes
Location,Post-Development Node
ID,3
Node Type,PostDevelopmentNode

Appendix C – MUSIC Model Results

IN - Mean Annual Flow (ML/yr),5.54
IN - TSS Mean Annual Load (kg/yr),117
IN - TP Mean Annual Load (kg/yr),0.462
IN - TN Mean Annual Load (kg/yr),6.49
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),5.54
OUT - TSS Mean Annual Load (kg/yr),117
OUT - TP Mean Annual Load (kg/yr),0.462
OUT - TN Mean Annual Load (kg/yr),6.49
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00
% Load Reduction,32.4
TSS % Load Reduction,87.7
TN % Load Reduction,63.3
TP % Load Reduction,78.6
GP % Load Reduction,100

Links
Location,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link,Drainage Link
Source node ID,1,4,2,6,5,7,8
Target node ID,2,3,6,4,7,6,3
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed,Not Routed
Muskingum K, , , , , , ,
Muskingum theta, , , , , , ,
IN - Mean Annual Flow (ML/yr),4.91,4.42,2.67,4.64,2.16,2.16,1.12
IN - TSS Mean Annual Load (kg/yr),128,50.5,51.7,157,755,347,66.8
IN - TP Mean Annual Load (kg/yr),0.750,0.298,0.378,0.748,1.24,0.871,0.164
IN - TN Mean Annual Load (kg/yr),10.6,4.69,5.50,8.25,5.23,4.55,1.80
IN - Gross Pollutant Mean Annual Load (kg/yr),119,0.00,0.00,0.00,52.2,0.00,0.00
OUT - Mean Annual Flow (ML/yr),4.91,4.42,2.67,4.64,2.16,2.16,1.12
OUT - TSS Mean Annual Load (kg/yr),128,50.5,51.7,157,755,347,66.8
OUT - TP Mean Annual Load (kg/yr),0.750,0.298,0.378,0.748,1.24,0.871,0.164
OUT - TN Mean Annual Load (kg/yr),10.6,4.69,5.50,8.25,5.23,4.55,1.80
OUT - Gross Pollutant Mean Annual Load (kg/yr),119,0.00,0.00,0.00,52.2,0.00,0.00

Catchment Details
Catchment Name,38509 - ALLAMBIE HEIGHTS MUSIC
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