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# St Aloysius' College, Kirribilli (Junior Campus)

## Civil

## Stormwater Management Report

**Prepared for:**

Bloompark Consulting  
Pty Ltd

**Prepared by:**

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Project No. 33964

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**Date:**  
16<sup>th</sup> March 2018

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# Revision

**Site Address:** 29 Burton St, Kirribilli  
**Real Property Description:** Lot 1 in DP830667  
**Proposed Development:** Educational Development

**Client:** Bloompark Consulting Pty Ltd  
**Local Authority:** North Sydney Council  
**Authority Reference #:** N/A  
**Wood & Grieve Reference:** 33964(C)-SYD-C-R-SMP



**Tim Fitzhardinge**  
For and on behalf of  
**Wood & Grieve Engineers**

REVISION	DATE	COMMENT	APPROVED BY
A	06.02.18	SSDA Issue	TIF
B	16.03.18	SSDA Issue	TIF

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REVISION

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# 1. Introduction

Wood & Grieve Engineers have been commissioned by Bloompark Consulting PTY LTD to prepare this Stormwater Management Plan (SMP) in support of the Site Significant Development Application for the proposed development at 29 Burton St, Kirribilli. The sites real address is Lot 1 in DP830667.

This SMP outlines the conceptual DA level stormwater design for the proposed development of the future development lots on the site.

This SMP illustrates that the proposed development complies with the North Sydney Council's Engineering Guide for Development, 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,
- Establishment of a unified, clear and concise stormwater management strategy.

## 2. Existing Site Characteristics

### 2.1 Property Detail

Address: 29 Burton, Kirribilli  
Real Property Description: Lot 1 in DP830667  
Total Site Area: 4325m<sup>2</sup> (0.4325Ha)

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

The proposed development is situated within North Sydney Council. The proposed redevelopment will consist of refurbishment of the existing educational facility.

The site is bounded by:

- Burton to the north
- Crescent Place to the east
- Bligh Street to the south
- Humphrey Place to the west

Refer to locality plan in figure 1.



Figure 1: Site Location Plan (Source: Nearmaps 2016)

### 2.2 Topography

The high point of the site is located along the southern boundary of the site with the low point located along the northern boundary at Burton Street.

## 2.3 Stormwater Catchments

The surrounding area has been investigated to determine the likely impact of existing external stormwater catchments on the proposed site.

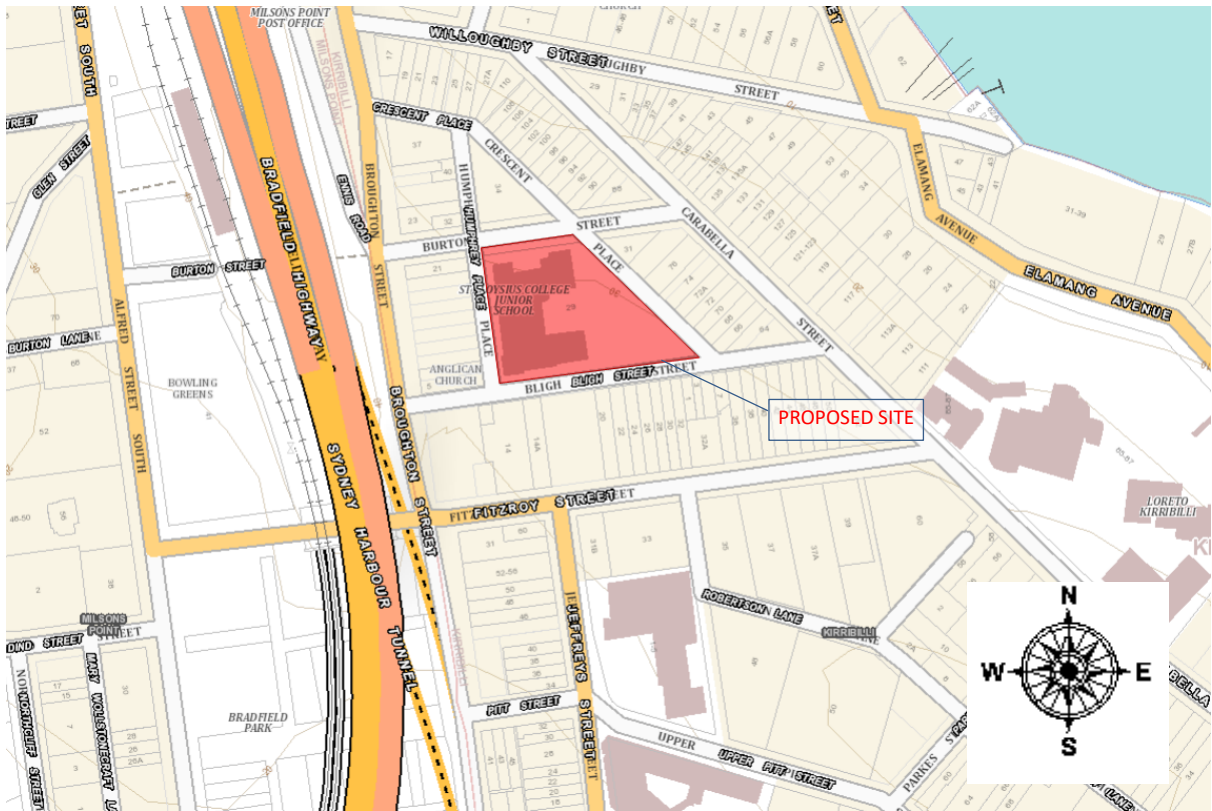


Figure 2: Upstream Catchment Plan

(Source: SIX VIEWER 2017 – Department of Land and Property Information NSW)

The site is situated near the top of the catchment. No upstream catchment overflows will impact the proposed development.

## 2.4 Existing Stormwater Discharge

The site contains existing stormwater pit and pipe networks. The existing drainage network discharges via Council's drainage infrastructure; through an existing kerb inlet pit with a concrete lintel located along Burton Street.

## 3. Local Authority Requirements

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

### 3.1 Stormwater Conveyance Requirements

Council's Engineering Guide for Development states that the following design storm Average Recurrence Intervals ARI's should be allowed for when designing the Stormwater runoff conveyance systems for the development.

**Table 1: Stormwater Drainage Serviceability**

Design Parameter	Design Storm ARI (Years)	Conveyance Method
Minor Drainage System	20	In Ground (Piped)
Major Drainage System	100	Overland

### 3.2 On Site Detention Requirements

Section 18.1.1 of North Sydney Council's DCP states "To mimic pre-development or natural drainage system as much as possible". This condition implies that On-site detention requirements are to limit post development runoff to the pre-development runoff. Both pre-development and post development areas will remain unchanged, thus no on-site detention is required.

### 3.3 Stormwater Quality Treatment

Council's DCP States that " All developments with a gross floor area greater than 2000m<sup>2</sup> are to undertake a stormwater quality assessment to demonstrate that the development will achieve the post-development pollutant load standards indicated below: "

- a) Litter and vegetation larger than 5mm: 90% reduction on the Baseline Annual Pollutant Load;
- b) Total Suspended Solids: 85% reduction on the Baseline Annual Pollutant Load;
- c) Total Phosphorous: 65% reduction on the Baseline Annual Pollutant Load;
- d) Total Nitrogen: 45% reduction on the Baseline Annual Pollutant Load.

## 4. Flood Impact Assessment

When considering a new development, it is necessary to assess the impact of existing flooding on the proposed development and the potential flooding impact of the proposed development upon existing developments located upstream and downstream of the site.

### 4.1 Existing Flooding

#### 4.1.1 Flood Related Development Controls

Wood and Grieve have reviewed Council's LEP documentation and Council's Flood Studies North Sydney LGA Flood Study (February 2017) and the site is not located within Council's 1% AEP Flood extent. From Figure 3 below, the proposed development is not impacted during the 1% AEP.



**Figure 3: Peak Flood Depth and Flood Level Contours 1% AEP**  
(Source: North Sydney LGA Flood Study WMA water – February 2017)

#### 4.1.2 Local Flooding

Local or Nuisance flooding describes flooding occurring due to site specific constraints. Local flooding is often caused by local topographical constraints and stormwater drainage system capacity restrictions.

Wood & Grieve have assessed the local constraints surrounding and through the site to ascertain any areas where local flooding may be an issue.

All proposed site drainage has been documented to fall towards to the proposed and existing stormwater pit and pipe system which ultimately drains to Burton Street.

## 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.

As discussed in Section 3.1 of this report Council have set minimum design parameters for the flows they require to be conveyed through the in ground drainage system and what they will allow to be conveyed in a controlled manner overland across the site.

### 5.1 Surface Drainage

The surface areas will be drained through a variety of methods, discussed below, in accordance with AS3500.3:2015 and Council's stormwater drainage guidelines.

#### 5.1.1 In-Ground Drainage

The in-ground drainage has been designed to meet the following criteria:

- In the minor design storm event (20 year) there will be no surcharging of the in ground drainage system and;
- In the major design storm event (100 year) there will be no uncontrolled discharge from the site onto the residential properties to the east of the site.

Surface runoff from the development sites will be directed to stormwater inlet structures using the design topography of these elements. The inlet structures have been designed to adequately convey the surface runoff into the in ground drainage network.

The runoff will then be conveyed underground across the site through a pit and pipe system and then to the legal point of discharge using gravity and the geometric falls of the pipe system.

### 5.2 Legal Point of Discharge

The legal point of discharge will be into Council's kerb inlet pit and street drainage network in Burton St.

## 6. Stormwater Quality

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.

### 6.1 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

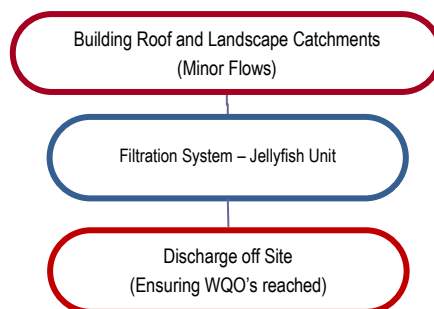
These pollutants in urban stormwater can be placed into various categories as follows. The pollutants underlined below are able to be readily modelled:

- 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 reduce the discharge of heavy metals to existing stormwater systems.

### 6.2 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, which 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.

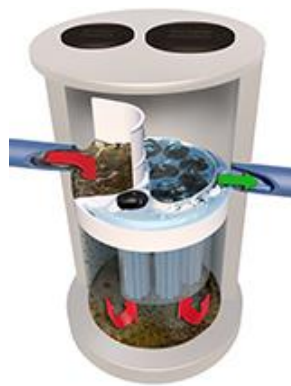
### 6.2.1 Stormwater360 Jellyfish

The Stormwater360 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%.
- Total Oil and Grease, median removal efficiency of 62%

One Jellyfish JF-1200-2-1 units has been proposed for the development.

The MUSIC modelling parameters for this device are set by the manufacturer, Stormwater360.



**Figure 5: Jellyfish infiltration Unit  
(Source: Stormwater360)**

## 6.3 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 6.1 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 SQJD's installed so as to demonstrate the percentage reduction for each pollutant type.

### 6.3.1 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 6.2.0) the following parameters have been used in accordance with North Sydney Council WSUD Reference Guideline:

**Table 2: MUSIC modelling parameters**

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

**Table 3: Recommended MUSIC Runoff Generation Parameters**

Parameter	Urban Residential
Rainfall Threshold (mm)	1.4
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 4: MUSIC Concentration Parameters for Sydney Catchment Authority**

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 Area	Mean	N/A	1.3	N/A	-0.89	N/A	0.3
	STD Dev	N/A	0.32	N/A	0.25	N/A	0.19
Residential	Mean	1.2	2.15	-0.85	-0.6	0.11	0.3
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19

**Table 5: Catchment modelling parameters**

Node Description	Area (Ha)	Percentage Impervious (%) / Area Impervious (Ha)		Land Use Rainfall and Pollutant Parameters
Site - Roof	0.129	100	0.129	Urban Roof
Mixed	0.303	69	0.209	Urban Residential
	Total: 0.432Ha			

6.3.2 MUSIC Results & Parameters  
MUSIC Model

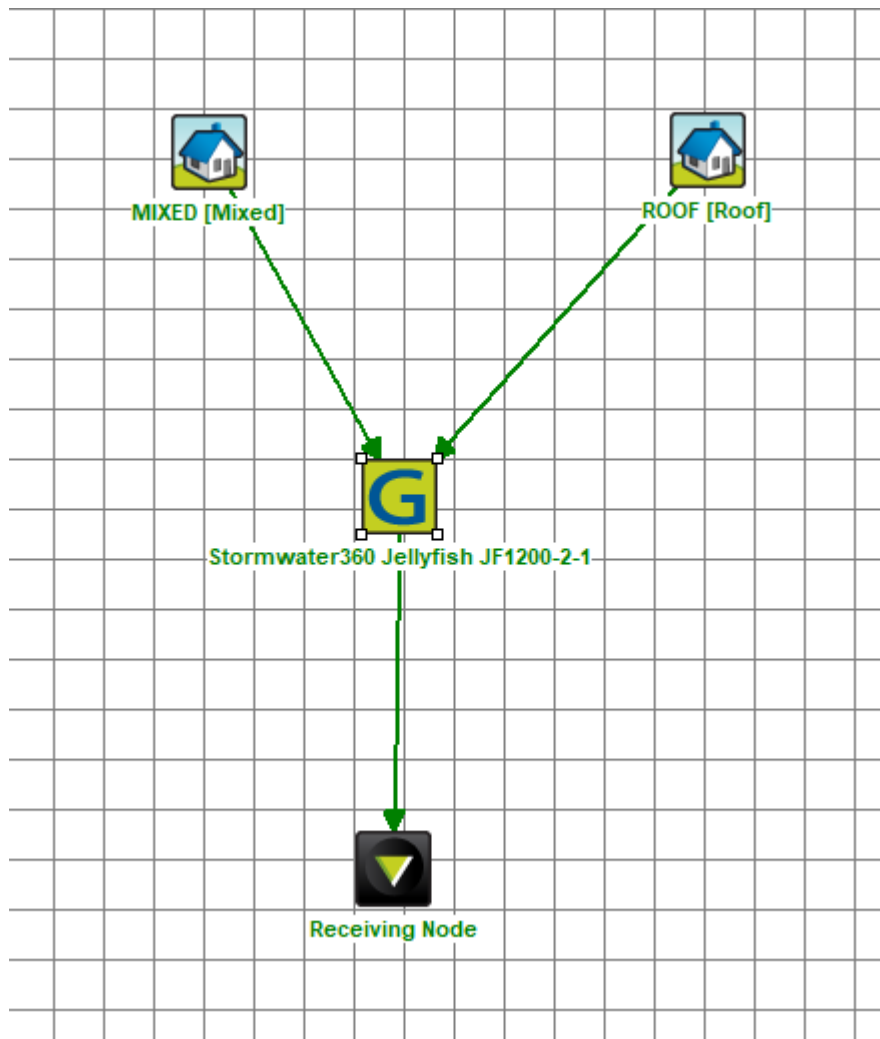


Figure 6 MUSIC Model

## MUSIC Output

	Sources	Residual Load	% Reduction
<b>Flow (ML/yr)</b>	4.99	4.99	0
<b>Total Suspended Solids (kg/yr)</b>	650	71.5	89
<b>Total Phosphorus (kg/yr)</b>	1.67	0.585	65
<b>Total Nitrogen (kg/yr)</b>	12.4	5.65	54.3
<b>Gross Pollutants (kg/yr)</b>	124	1.24	99

Figure 7 MUSIC Results

### 6.3.3 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:

- One Jellyfish Unit JF-1200-2-1

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 10 below.

Table 6: Treatment Train Efficiencies

Indicator	Total Site Reduction	Site Targets	Target Achieved
Gross Pollutants	99.0%	90%	Yes
Total Suspended Solids (TSS)	89.0%	85%	Yes
Total Phosphorus (TP)	65.0%	65%	Yes
Total Nitrogen (TN)	54.3%	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.

## 7. 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. North Sydney Council specifies compliance with the Landcom design guide in there Stormwater and Floodplain Management Technical Manual.

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.

## 8. Conclusion

The civil design in this report complies with North Sydney Council’s DCP, Australian Standards and best practice principals. The proposed development addresses (and incorporates as required) stormwater quantity, stormwater conveyance and stormwater quality treatment in accordance with Council’s Stormwater Management DCP.

# APPENDIX A Civil Drawings

# APPENDIX B Music Model Results

Source nodes

Location,ROOF,MIXED

ID,3,4

Node Type,UrbanSourceNode,UrbanSourceNode

Zoning Surface Type,Roof,Mixed

Total Area (ha),0.129,0.303

Area Impervious (ha),0.129,0.208222052238806

Area Pervious (ha),0,0.0947779477611941

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),1.3,2.2

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,-0.45

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),0.3,0.42

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),1.1,1.1

Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.17,0.17

Baseflow Total Suspended Solids Estimation Method,Stochastic,Stochastic

Baseflow Total Suspended Solids Serial Correlation,0,0

Baseflow Total Phosphorus Mean (log mg/L),-0.82,-0.82

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),0.32,0.32

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),1.74,3.25  
OUT - TSS Mean Annual Load (kg/yr),44.0,606  
OUT - TP Mean Annual Load (kg/yr),0.278,1.39  
OUT - TN Mean Annual Load (kg/yr),3.60,8.77  
OUT - Gross Pollutant Mean Annual Load (kg/yr),42.1,81.7  
Rain In (ML/yr),1.92201,4.5145  
ET Loss (ML/yr),0.182197,1.26215  
Deep Seepage Loss (ML/yr),0,0  
Baseflow Out (ML/yr),0,0.228883  
Imp. Stormflow Out (ML/yr),1.73981,2.81971  
Perv. Stormflow Out (ML/yr),0,0.203742  
Total Stormflow Out (ML/yr),1.73981,3.02346  
Total Outflow (ML/yr),1.73981,3.25234  
Change in Soil Storage (ML/yr),0,2E-6  
TSS Baseflow Out (kg/yr),0,3.12053  
TSS Total Stormflow Out (kg/yr),43.9737,603.206  
TSS Total Outflow (kg/yr),43.9737,606.326  
TP Baseflow Out (kg/yr),0,0.037578  
TP Total Stormflow Out (kg/yr),0.277968,1.35609  
TP Total Outflow (kg/yr),0.277968,1.39367  
TN Baseflow Out (kg/yr),0,0.506287  
TN Total Stormflow Out (kg/yr),3.59863,8.26086  
TN Total Outflow (kg/yr),3.59863,8.76715  
GP Total Outflow (kg/yr),42.0986,83.0127

No Imported Data Source nodes

No USTM treatment nodes

Generic treatment nodes

Location,Stormwater360 Jellyfish JF1200-2-1

ID,2

Node Type,GenericNode

Lo-flow bypass rate (cum/sec),0

Hi-flow bypass rate (cum/sec),0.0125

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),

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Output (cum/sec),  
Gross Pollutant Transfer Function  
Enabled,True  
Input (kg/ML),0  
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Input (kg/ML),100  
Output (kg/ML),1  
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Input (kg/ML),  
Output (kg/ML),  
Input (kg/ML),  
Output (kg/ML),  
Input (kg/ML),  
Output (kg/ML),  
Total Nitrogen Transfer Function  
Enabled,True  
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Output (mg/L),0  
Input (mg/L),7  
Output (mg/L),3.2  
Input (mg/L),  
Output (mg/L),  
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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),0.4  
Output (mg/L),0.14  
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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),200  
Output (mg/L),22  
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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),4.99  
IN - TSS Mean Annual Load (kg/yr),650  
IN - TP Mean Annual Load (kg/yr),1.67  
IN - TN Mean Annual Load (kg/yr),12.4  
IN - Gross Pollutant Mean Annual Load (kg/yr),124  
OUT - Mean Annual Flow (ML/yr),4.99  
OUT - TSS Mean Annual Load (kg/yr),71.5  
OUT - TP Mean Annual Load (kg/yr),0.585  
OUT - TN Mean Annual Load (kg/yr),5.65  
OUT - Gross Pollutant Mean Annual Load (kg/yr),1.24  
Flow In (ML/yr),4.99215  
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),4.99215  
Reuse Supplied (ML/yr),0  
Reuse Requested (ML/yr),0  
% Reuse Demand Met,0  
% Load Reduction,0  
TSS Flow In (kg/yr),650.299  
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),71.533  
TSS Reuse Supplied (kg/yr),0  
TSS Reuse Requested (kg/yr),0  
TSS % Reuse Demand Met,0  
TSS % Load Reduction,89  
TP Flow In (kg/yr),1.67164  
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),0.585073

TP Reuse Supplied (kg/yr),0  
 TP Reuse Requested (kg/yr),0  
 TP % Reuse Demand Met,0  
 TP % Load Reduction,65  
 TN Flow In (kg/yr),12.3658  
 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),5.65293  
 TN Reuse Supplied (kg/yr),0  
 TN Reuse Requested (kg/yr),0  
 TN % Reuse Demand Met,0  
 TN % Load Reduction,54.2857  
 GP Flow In (kg/yr),123.836  
 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),1.23836  
 GP Reuse Supplied (kg/yr),0  
 GP Reuse Requested (kg/yr),0  
 GP % Reuse Demand Met,0  
 GP % Load Reduction,100

Other nodes

Location,Receiving Node  
 ID,1  
 Node Type,ReceivingNode  
 IN - Mean Annual Flow (ML/yr),4.99  
 IN - TSS Mean Annual Load (kg/yr),71.5  
 IN - TP Mean Annual Load (kg/yr),0.585  
 IN - TN Mean Annual Load (kg/yr),5.65  
 IN - Gross Pollutant Mean Annual Load (kg/yr),1.24  
 OUT - Mean Annual Flow (ML/yr),4.99  
 OUT - TSS Mean Annual Load (kg/yr),71.5  
 OUT - TP Mean Annual Load (kg/yr),0.585  
 OUT - TN Mean Annual Load (kg/yr),5.65  
 OUT - Gross Pollutant Mean Annual Load (kg/yr),1.24  
 % Load Reduction,400E-9  
 TSS % Load Reduction,89.0  
 TN % Load Reduction,54.3  
 TP % Load Reduction,65.0  
 GP % Load Reduction,99.0

#### Links

Location, Drainage Link, Drainage Link, Drainage Link

Source node ID, 2, 3, 4

Target node ID, 1, 2, 2

Muskingum-Cunge Routing, Not Routed, Not Routed, Not Routed

Muskingum K, , ,

Muskingum theta, , ,

IN - Mean Annual Flow (ML/yr), 4.99, 1.74, 3.25

IN - TSS Mean Annual Load (kg/yr), 71.5, 44.0, 606

IN - TP Mean Annual Load (kg/yr), 0.585, 0.278, 1.39

IN - TN Mean Annual Load (kg/yr), 5.65, 3.60, 8.77

IN - Gross Pollutant Mean Annual Load (kg/yr), 1.24, 42.1, 81.7

OUT - Mean Annual Flow (ML/yr), 4.99, 1.74, 3.25

OUT - TSS Mean Annual Load (kg/yr), 71.5, 44.0, 606

OUT - TP Mean Annual Load (kg/yr), 0.585, 0.278, 1.39

OUT - TN Mean Annual Load (kg/yr), 5.65, 3.60, 8.77

OUT - Gross Pollutant Mean Annual Load (kg/yr), 1.24, 42.1, 81.7

#### Catchment Details

Catchment Name, 33964 - JUNIOR

Timestep, 6 Hours

Start Date, 1/01/1959

End Date, 31/12/1959 6:00:00 PM

Rainfall Station, 66062 SYDNEY

ET Station, Monthly User Defined

Mean Annual Rainfall (mm), 1490

Mean Annual ET (mm), 1260