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STORMWATER QUALITY REPORT

LOCATION: 17-23 Goulburn Street, Liverpool, NSW

Prepared for:
Gus Fares Architects Pty Ltd

Local Authority: Liverpool City Council
Report Number: 150937.SQR
Date Prepared: November 2015
Application No:

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TABLE OF CONTENTS

1.0	INTRODUCTION	4
1.1	Overview	4
1.2	Available Information	4
1.3	The Proposal	4
1.4	Scope of this Report	5
2.0	SITE CHARACTERISTICS	5
2.1	Site Description	5
2.2	Existing Land Use	5
2.3	Existing Stormwater Discharge	5
3.0	STORMWATER QUANTITY ASSESSMENT	6
3.1	On-site Detention Parameters	6
3.2	Detention Design Calculations	Error! Bookmark not defined.
3.3	OSD Design Results	Error! Bookmark not defined.
4.0	STORMWATER QUALITY ASSESSMENT	8
4.1	Aims and Objectives	8
4.2	Site Analysis and Design Strategy	8
4.3	Proposed Development Hydraulic Assessment	9
5.0	MUSIC MODELLING	10
5.1	Rainfall Data & Modelling Parameters	10
5.2	Stormwater Quality Management Strategy	10
5.3	MUSIC Model Node Details	11
5.4	MUSIC Model Output	15
6.0	CONCLUSIONS	16
7.0	REFERENCES	16

1.0 INTRODUCTION

1.1 Overview

ACE Pty. Ltd. has been commissioned by **Gus Fares Architects Pty Ltd** to prepare this Stormwater Quantity and Quality Report for the proposed development at 17-23 Goulburn Street, Liverpool, NSW. This report will form part of the development application which will be submitted to Liverpool City Council as supporting documentation for the development approval process.

It is proposed to construct residential units, upper and lower basement car park and associated works which will cover the site, with the remainder being landscaped areas. The total site area is approximately 2872 m².

1.2 Available Information

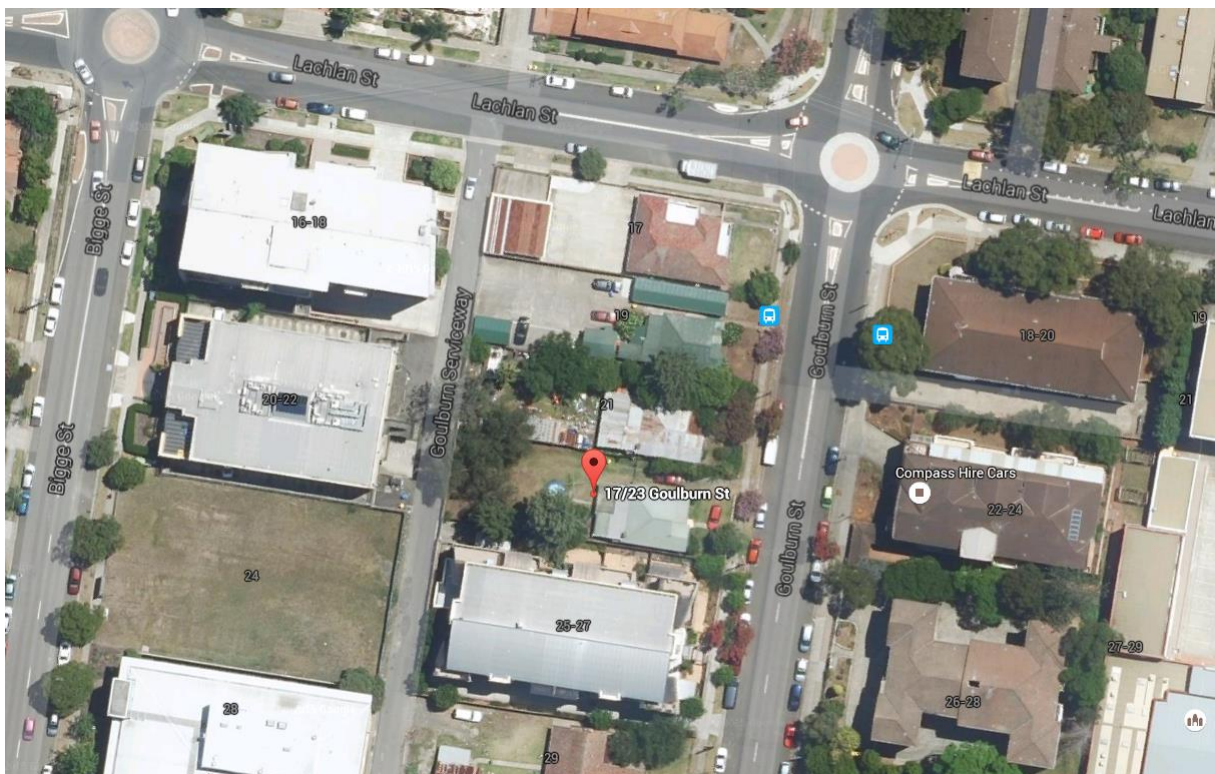
Architectural drawings prepared by Gus Fares Architects Project No.: 2015-24

1.3 The Proposal

The proposed development site is located at 17-23 Goulburn Street, Liverpool. The location of the site is shown in Figure 1.3.1 Locality Map below.

The proposed development comprises of a residential flat building, basement car park, and driveway and landscape areas. Architectural documentation of the proposed development is shown in Appendix A.

Figure 1.3.1: Locality Map



1.4 Scope of this Report

The aim of this report is to provide a conceptual plan and calculations outlining methods of containing stormwater run-off at the proposed site and disposing of it during and after a storm event to a legal point of discharge.

This report is compiled in co-ordination with the stormwater quality objectives, addressing the need for water quality control measures. The stormwater treatment train is designed using MUSIC modelling tool to achieve pollution reduction targets which identified in Liverpool City Council DCP.

2.0 SITE CHARACTERISTICS

2.1 Site Description

The site consists of two street frontages at Goulburn Street and Lachlan Street with a rear lane at Goulburn Serviceway. The site falls generally to the South Eastern corner of the site, away from Lachlan Street towards Goulburn Street.

The proposed development site consists of multi-storey building with a combined total site area of 2872m². Refer to Appendix A for a detailed site survey.

2.2 Existing Land Use

The development site consists of four lots which are all currently occupied by one storey residential buildings. The site is predominately all covered by the commercial buildings and is all paved. Refer to Appendix B for Detailed Site Survey.

2.3 Existing Stormwater Discharge

Currently, water from the site is discharged into the kerb and gutter of Goulburn Street and collected into Council's stormwater network downstream.

Based on detailed survey, and information received from council, there are no local stormwater pits or pipelines directly outside the street frontage. At the rear of the property at Goulburn Serviceway there is a stormwater pit but is located at the highest point of the site. Further down Goulburn Street at approximately 90 metres, there is a council stormwater kerb inlet pit.

Thus, the proposed works will connect into the downstream stormwater kerb inlet pit due to internal site constraints for kerb and gutter discharge.

3.0 STORMWATER QUANTITY ASSESSMENT

A conceptual plan was modelled following requirements detailed in the Liverpool Development Control Plan 2008 Part 1 and Liverpool City Council On-site Stormwater Detention Technical Specification 2003 documents to outline methods of containing stormwater run-off at the proposed site and disposing of it during and after a storm event to a legal point of discharge.

The method and calculations aimed to show that the proposed development will have no negative impact on Council's existing stormwater system or adjacent properties.

3.1 DRAINS Model Parameters

Paved (Impervious) area depression storage (mm)	1
Supplementary area depression storage (mm)	1
Grassed (Pervious) area depression storage (mm)	5

Antecedent Moisture Condition	3
-------------------------------	---

Rainfall Data acquired from B.O.M

3.2 DRAINS Model Setup

As the site is not draining into kerb and gutter, the maximum discharge is limited to the predevelopment flow.

The model was set up as per Figure 3.2.1.

For a comprehensive DRAINS readout, see Appendix C.

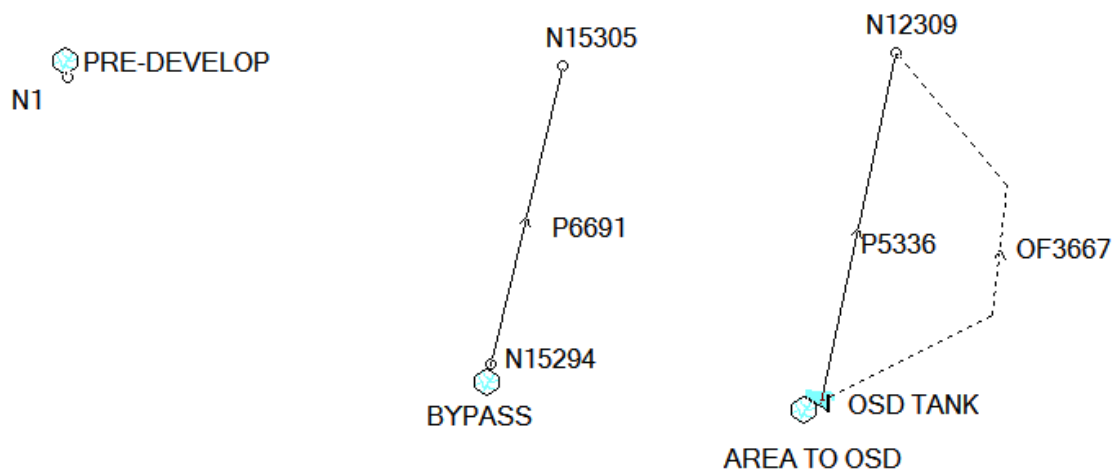


Figure 3.2.1: Drains Model- Input.
Pre-development vs Post-development (Including OSD)

3.3 Drains Model Output

The Model aimed to show that post-development will have no negative impact on Council's existing stormwater system or adjacent properties by limiting to pre-development discharge.

From Figures 3.3.2-4 below, demonstrating the minor (5 year), moderate (20 year) and major (100 year) post-developed conditions, it can be confirmed that the implementation of the OSD will contain the water on site, and release at a controlled rate into the existing stormwater network (For a comprehensive DRAINS readout, see Appendix C).

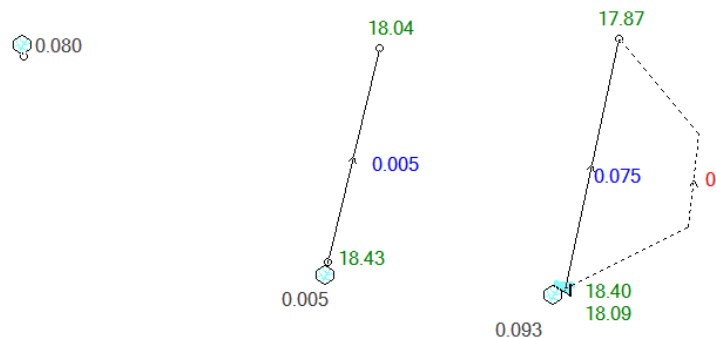


Figure 3.3.2: Drains Model- 5yr Output. Minor Event

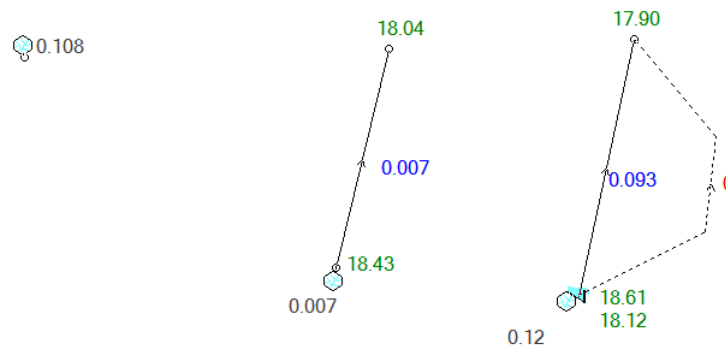


Figure 3.3.3: Drains Model- 20yr Output. Moderate Event

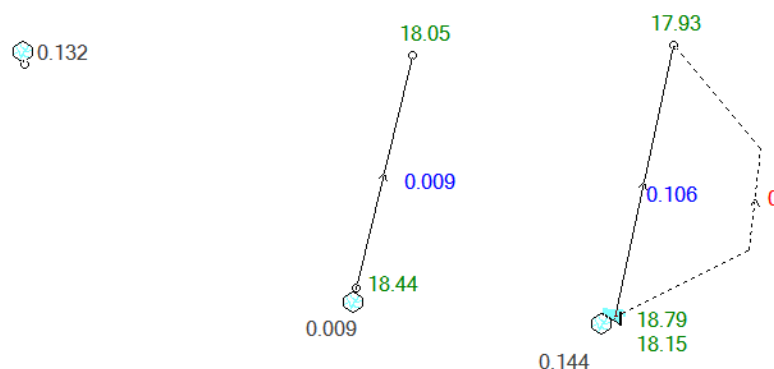


Figure 3.3.4: Drains Model- 100yr Output. Major Event

4.0 STORMWATER QUALITY ASSESSMENT

4.1 Aims and Objectives

For this development, it is necessary to identify the Water Quality Objectives (WQO's) with regards to the future stormwater discharge from the site. Based on Liverpool City Council guidelines, the removal of the following pollutants from stormwater discharge will be required to meet the current water quality objectives based on Liverpool City Council General Controls Part 1 2008.

The objective is to provide the following:

- 80% TSS (Total Suspended Solids) Reduction
- 45% TP (Total Phosphorous) Reduction
- 45% TN (Total Nitrogen) Reduction

All stormwater runoff is to be discharged to an approved MUSIC treatment device after enter the site storage systems.

Device design is to be in accordance with Industry Guidelines, Australian Runoff Quality and Liverpool City Council Guidelines.

Detailed engineering diagrams and management requirements for the proposed development are to be submitted to Liverpool City Council for approval prior to any works commencing on site with design certification prepared by a qualified stormwater engineer.

4.2 Site Analysis and Design Strategy

The proposed development offers the opportunity to provide stormwater quality treatment where none exists at present.

The proposed solution is to use PSorb Filters (or approved equivalent), Enviropod and rainwater tank reuse to treat and remove nutrient pollutants and gross pollutants from the stormwater drainage cycle from roof, hard surface and landscape.

It is proposed that approximately 93% of the site runoff will be drained directly into the existing drainage network, being treated by the PSorb Storm Filter system. The remaining 7% will bypass the system.

4.3 Proposed Development Hydraulic Assessment

A detailed assessment of the hydraulic issues associated with this site is included in the water quantity section of this document. However, a summary table of the sources of hydraulic loads along with their respective contributions is shown below:

Contributing Surface	Area (m²)
OSD Bypass Area	196
Roof Area	1418
Balcony Area	105
Ground Floor Area	830
Ground Floor to Enviropod Area	100
Driveway Area	222

Table 4.3.1: Summary table of the sources of hydraulic loads along with their respective contributions.

The proposed development does not have any impact on surrounding properties or on Council's infrastructure, provided the recommendations of the earlier part of this report are adhered to.

5.0 MUSIC MODELLING

MUSIC Version V6.0.1 was used to assess pollutants and the performance of the proposed stormwater treatment train to be adopted for this development. Modelling was undertaken in accordance with Liverpool City Council guideline and Sydney Metropolitan Catchment Authority – Music Modelling Guidelines.

5.1 Rainfall Data & Modelling Parameters

Council: Liverpool City Council

Station ID: 67035 LIVERPOOL (WHITLAM)

Modelling Period: 1967 to 1976

Time Step Adopted: 6 minutes

Catchment Properties	
Catchment Name	150937 - 17-23 Goulburn Street,
Rainfall Station	67035 LIVERPOOL (WHITLAM)
ET Station	User-defined monthly PET
Start Date	1/01/1967 12:00 AM
End Date	31/12/1976 11:54 PM
Modelling Time Step	6 Minutes
Close	

5.2 Stormwater Quality Management Strategy

The below MUSIC model seeks to meet the applicable Water Quality Objectives by selecting and testing various stormwater management methods. The adopted “stormwater treatment train” for this development is illustrated below:

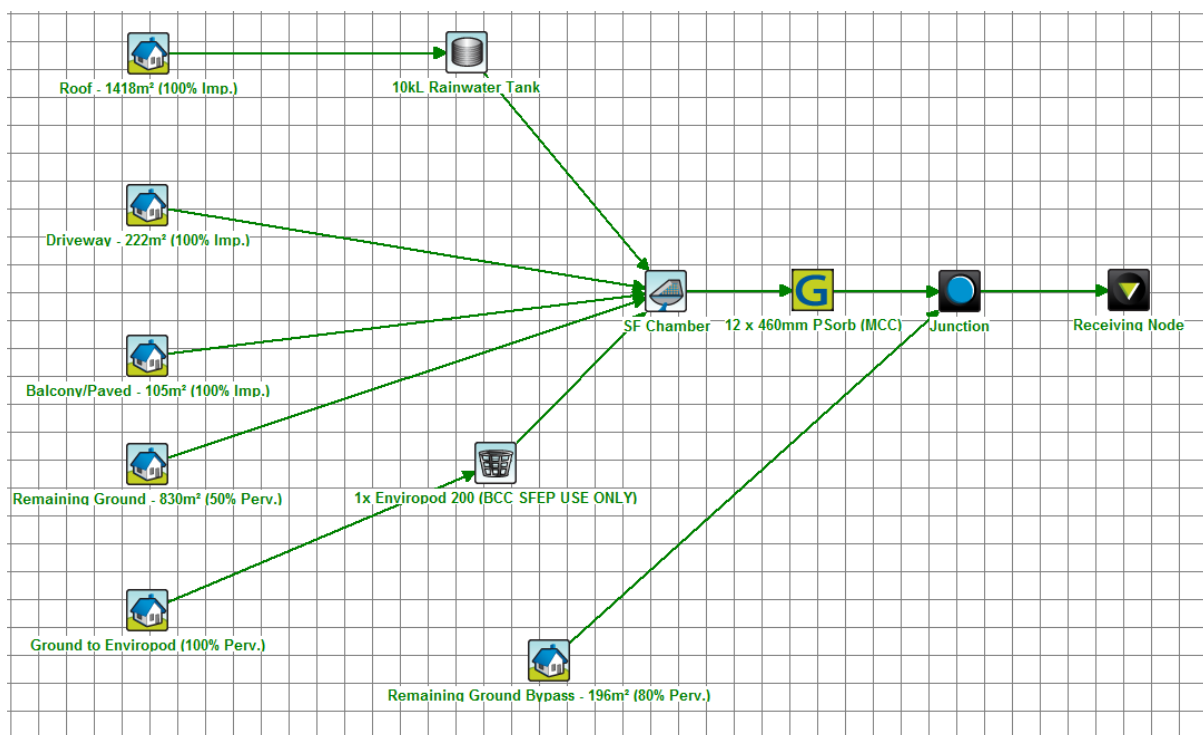


Figure 5.2.1: Proposed Stormwater Treatment Train

- All roof areas shall be captured by a series of gutters, downpipes and piped to 10kL rainwater tank for reuse in irrigation. Overflow from the RWT is to be directed to the Storm Filter Chamber (SF Chamber) in OSD.
- Balconies and driveway areas shall be fitted with floor wastes to collect all stormwater and direct flow to the SF Chamber in OSD.
- The SF Chamber within the OSD will be fitted with 12 PSorb Stormwater filters (Stormwater360), or approved equivalent for treatment, prior to discharging flow from the site

Refer to Appendix C for Proposed Stormwater Concept Plan.

5.3 MUSIC Model Node Details

Treatment nodes with the following parameters have been modelled:

Rainwater tank (10,000L)

Assumptions

Landscaping: 224 kL/year

The image shows two overlapping dialog boxes from the MUSIC Model software. The background dialog is 'Properties of 10kL Rainwater Tank' and the foreground dialog is 'Re-use for 10kL Rainwater Tank'.

Properties of 10kL Rainwater Tank

- Location:** 10kL Rainwater Tank
- Inlet Properties:**
 - Low Flow By-pass (cubic metres per sec): 0.000000
 - High Flow By-pass (cubic metres per sec): 100.000000
- Individual Tank Properties:**
 - Number of Tanks: 1
- Total Tank Properties:**
 - Storage Properties:**
 - Volume below overflow pipe (kL): 10.00
 - Depth above overflow (metres): 0.20
 - Surface Area (square metres): 10.0
 - Initial Volume (kL): 10.00
 - Outlet Properties:**
 - Overflow Pipe Diameter (mm): 300
 - ☐ Use Custom Outflow and Storage Relationship
 - ☒ Define Custom Outflow and Storage: Not Defined

Re-use for 10kL Rainwater Tank

- ☒ Use stored water for irrigation or other purpose
- Max Drawdown height (m):** 1 (Range: (0 - 1.00))
- Annual Demand:**
 - ☒ Enabled
 - Annual Demand Properties:**
 - Demand (kL/yr):** 224
 - Distribution:** PET - Rain
- Daily Demand:**
 - ☐ Enabled
- Custom Demand:**
 - ☐ Enabled

Buttons at the bottom of the 'Re-use' dialog:

Buttons at the bottom of the 'Properties' dialog:

Detention Basin

Volume Required $= 2872 \text{ m}^2 \cdot (3/1000) \text{ m}$
 $= 8.616 \text{ m}^3$

Area Required $= 8.616 \text{ m}^3 / 0.54 \text{ m}$
 $= 15.955 \text{ m}^2 = 16.0 \text{ m}^2$

Properties of SF Chamber

Location

Inlet Properties

Low Flow By-pass (cubic metres per sec)

High Flow By-pass (cubic metres per sec)

Storage Properties

Surface Area (square metres)

Extended Detention Depth (metres)

Permanent Pool Volume (cubic metres)

Initial Volume (cubic metres)

Exfiltration Rate (mm/hr)

Evaporative Loss as % of PET

Outlet Properties

Equivalent Pipe Diameter (mm)

Overflow Weir Width (metres)

Notional Detention Time (hrs)

☐ Use Custom Outflow and Storage Relationship

Not Defined

PSorb Stormfilter360 or approved equivalent

Properties of 12 x 460mm PSorb (MCC)

Location 12 x 460mm PSorb (MCC)

Inlet Properties

Low Flow By-pass (cubic metres per sec) 0.000
High Flow By-pass (cubic metres per sec) 0.006

Transfer Functions

☐ Flow (cubic metres per sec)
☒ Total Suspended Solids (mg/L)
☐ Total Phosphorus (mg/L)

☐ Total Nitrogen (mg/L)
☐ Gross Pollutants (kg/ML)

Total Suspended Solids (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
☐ Flow Based Capture Efficiency
☐ Both

Concentration Efficiency Transfer Function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Drag points on the graph to modify the transfer function

Fluxes...

Notes...

Properties of 12 x 460mm PSorb (MCC)

Location 12 x 460mm PSorb (MCC)

Inlet Properties

Low Flow By-pass (cubic metres per sec) 0.000
High Flow By-pass (cubic metres per sec) 0.006

Transfer Functions

☐ Flow (cubic metres per sec)
☐ Total Suspended Solids (mg/L)
☒ Total Phosphorus (mg/L)

☐ Total Nitrogen (mg/L)
☐ Gross Pollutants (kg/ML)

Total Nitrogen (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
☐ Flow Based Capture Efficiency
☐ Both

Concentration Efficiency Transfer Function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Drag points on the graph to modify the transfer function

Fluxes...

Notes...

Properties of 12 x 460mm PSorb (MCC)

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☐ Total Nitrogen (mg/L)
☐ Gross Pollutants (kg/ML)

Total Phosphorus (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
☐ Flow Based Capture Efficiency
☐ Both

Concentration Efficiency Transfer Function

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0.0000	100.0000
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☒ Gross Pollutants (kg/ML)

Gross Pollutants (kg/ML)

Transfer Functions

☒ Concentration Based Capture Efficiency
☐ Flow Based Capture Efficiency
☐ Both

Concentration Efficiency Transfer Function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Drag points on the graph to modify the transfer function

Fluxes...

Notes...

Enviropod or approved equivalent

Location: Enviropod 200 (@20l/sec) Products >>

Inlet Properties

Low Flow By-pass (cubic metres per sec) 0.000

High Flow By-pass (cubic metres per sec)

Transfer Functions

☐ Total Suspended Solids (mg/L)
 ☐ Total Nitrogen (mg/L)

☐ Total Phosphorus (mg/L)
 ☒ Gross Pollutants (kg/ML)

Gross Pollutants (kg/ML)

Transfer Functions

☒ Concentration Based Capture Efficiency
 ☐ Flow Based Capture Efficiency

☐ Both

Concentration Efficiency Transfer Function

Drag points on the graph to modify the transfer function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Location: Enviropod 200 (@20l/sec) Products >>

Inlet Properties

Low Flow By-pass (cubic metres per sec) 0.000

High Flow By-pass (cubic metres per sec)

Transfer Functions

☐ Total Suspended Solids (mg/L)
 ☒ Total Nitrogen (mg/L)

☐ Total Phosphorus (mg/L)
 ☐ Gross Pollutants (kg/ML)

Total Nitrogen (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
 ☐ Flow Based Capture Efficiency

☐ Both

Concentration Efficiency Transfer Function

Drag points on the graph to modify the transfer function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Fluxes... Notes...

Location: Enviropod 200 (@20l/sec) Products >>

Inlet Properties

Low Flow By-pass (cubic metres per sec) 0.000

High Flow By-pass (cubic metres per sec)

Transfer Functions

☐ Total Suspended Solids (mg/L)
 ☐ Total Nitrogen (mg/L)

☒ Total Phosphorus (mg/L)
 ☐ Gross Pollutants (kg/ML)

Total Phosphorus (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
 ☐ Flow Based Capture Efficiency

☐ Both

Concentration Efficiency Transfer Function

Drag points on the graph to modify the transfer function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

Location: Enviropod 200 (@20l/sec) Products >>

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Transfer Functions

☒ Total Suspended Solids (mg/L)
 ☐ Total Nitrogen (mg/L)

☐ Total Phosphorus (mg/L)
 ☐ Gross Pollutants (kg/ML)

Total Suspended Solids (mg/L)

Transfer Functions

☒ Concentration Based Capture Efficiency
 ☐ Flow Based Capture Efficiency

☐ Both

Concentration Efficiency Transfer Function

Drag points on the graph to modify the transfer function

Percentage Capture

Inflow	%
0.0000	100.0000
1.0000	100.0000

5.4 MUSIC Model Output

SUMMARY OF POLLUTION TARGETS

INDICATOR	WQO's Target	WQO's ACHIEVED	OBJECTIVES MET
TSS (Total Suspended Solids)	80%	80.1%	YES
TP (Total Phosphorus)	45%	76.0%	YES
TN (Total Nitrogen)	45%	54.4%	YES
GP (Gross Pollutants)	Not Specified	97.2%	N/A

TREATMENT TRAIN EFFECTIVENESS IN MUSIC

Treatment Train Effectiveness - Receiving Node			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.84	1.66	9.7
Total Suspended Solids (kg/yr)	173	34.3	80.1
Total Phosphorus (kg/yr)	0.414	0.0994	76
Total Nitrogen (kg/yr)	4.04	1.84	54.4
Gross Pollutants (kg/yr)	51.4	1.44	97.2

6.0 CONCLUSIONS

The OSD design and MUSIC analysis were carried out on the proposed development site to ensure the development will have no negative impact on Council's existing stormwater system or adjacent properties. The conceptual plan outlines method of containing stormwater run-off at the proposed site and disposing of it during and after a storm event to a legal point of discharge, while addressing the need for water quality control measures

The results of the models are as follows:

- A 30.0m³ OSD will contain stormwater run-off on site and disposing of it at a controlled rate with an orifice at 250mm diameter into proposed kerb inlet pit and into Council's existing drainage network.
- The Filtration Unit Compartment within the OSD will be fitted with 12 PSorb Stormwater filters (Stormwater360), or approved equivalent for treatment, prior to discharging flow from the site.
- All roof areas will be captured by a series of gutters, downpipes and pipe to the 10kL rainwater tank. Overflow from rainwater tank to be directed to the Storm Filter Chamber in OSD.
- Other roof/ Balconies and driveway areas shall be fitted with floor wastes to collect all stormwater and direct flow to the Storm Filter Chamber in OSD.

Refer to Appendix C for Proposed Stormwater Concept Plan and Refer to Appendix D for Stormfilter product maintenance procedure.

7.0 REFERENCES

1. Liverpool City Council: Liverpool Development Control Plan 2008 – Part 1 – *General Controls for all Development*
2. Draft NSW MUSIC Modelling Guidelines [2010]

APPENDIX A

(ARCHITECTURAL PLANS)
(DETAILED SITE SURVEY)

APPENDIX B

(MUSIC MODEL AREA BREAK UP)

APPENDIX C

(STORMWATER CONCEPT PLAN)

APPENDIX D

(OPERATIONS MAINTENANCE –STORMWATER 360 PRODUCTS)