

Stormwater Maintenance Management Plan

Industrial Subdivision – 84-160 Christensen Road South, Stapylton

within
City of Gold Coast

for

***Burnside Developments P/L & Yellowstone Investments P/L
c/- MS Projects***

Project 17-209



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c o n s u l t i n g



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STATEMENT OF LIMITATION

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1. Introduction

1.1 Background

i³ consulting was commissioned by Burnside Developments P/L & Yellowstone Investments P/L c/- MS Projects to undertake the stormwater quality maintenance management documentation for the constructed wetland system. The wetland system treats the stormwater for the industrial subdivision at 84-160 Christensen Road South, Stapylton (Lot 334 SP193431). This report covers the stormwater quality for the operational works approval. The proposed development is shown on drawing 17-209-C103-04 in Appendix A.

1.2 Objectives

This report has been compiled to address the stormwater maintenance requirements of the City of Gold Coast and Water by Design Technical Guidelines.

1.3 Scope

The scope of this report encompasses in detail the maintenance procedures of the constructed wetland system.



2. Water Quality

The Performance Criteria as outlined in the *Stormwater Management Plan* prepared by *icubed consulting* submitted with the Realignment of Lots Approval (ROL201800026) is as follows, with the ultimate stage results output.

Table 1: Stormwater Quality Objectives for the Site (Operational Stage)

Pollutant	Pre Treatment Load	Post Treatment Load	Water Quality Objective	Reduction in Pollutant
TSS	7750 kg/yr	1210 kg/yr	80 %	84.4 %
TP	21.0 kg/yr	7.26 kg/yr	60 %	65.5 %
TN	164 kg/yr	87.5 kg/yr	45 %	46.6 %
GP	1650 kg/yr	0 kg/yr	90 %	100 %

The treatment measures and assumptions adopted in the approved *Stormwater Management Plan* are as follows:

- Existing GPT
- Wetlands – 5500 sq.m

3. Maintenance

The following maintenance protocols have been adapted from City of Gold Coast's City Plan and Water by Design's *Maintaining Vegetated Stormwater Assets* document. They should generally be adopted as standard maintenance procedures upon the installation and or construction of a Wetland System.

7.1 Wetlands

Wetland systems require on-going maintenance to ensure there are adequate flow conditions and healthy vegetation. Separate tasks are to be performed on the inlet (Sediment Basin) and the remainder of the wetland.

The main maintenance tasks for the overall Wetland system, including the Sediment Basin, are as follows:

- Desilting of the Sediment Basin inlet zone after the construction has been completed;
- Routine inspections of the wetland system to identify any damage to vegetation, scouring, formation of isolated pools, litter and debris build up or excessive mosquitoes;
- Routine inspection of all inlets and outlets to identify any areas of scour, litter build up and blockages;
- Removal of litter and debris in and around the wetland system;
- Removal and management of invasive weeds;
- Prevention of the formation of isolated pools by repairing the wetland profile;
- Periodic draining and desilting of the inlet pond – usually occurring every 5 years;
- Regular watering of vegetation during plant establishment;
- Control of the water level during plant establishment – usually takes 2 years to fully establish;
- Managing excessive algae;
- Replacement of plants that have died with plants of equivalent size and species as detailed in the planting schedule;
- Vegetation pest monitoring and control.

The maintenance procedures detailed above are to be carried out in a frequency that is in accordance with Table 2 and the checklists attached in the appendix. Appendix B details the Sediment Basin requirements, while Appendix C includes the wetlands requirements. If the asset is not meeting the performance indicators in the checklists, a decision on whether maintenance will be sufficient to resolve the issue, or rectification is needed.

Table 2: Maintenance Frequency of Inspections

Wet Season	Dry Season
2 months	3 months

It is, however, recommended that inspections of the wetlands take place after large storm events (more than 50mm/day of rainfall) to check for scouring and damage to the system.

7.2 Maintenance Activity Safety Measures

Due care must always be taken when working on or near any stormwater treatment devices, as they generally have polluted water, large sloped batters, confined spaces or are located adjacent to roadways.

Safe Work Method Statements are recommended to be completed by the personnel completing the maintenance activities to identify any potential issues that may arise.



4. Life Cycle Cost Analysis

A life cycle cost analysis was carried out on the design treatment nodes using MUSIC, for the wetland system.

The life cycle costing values used were MUSIC's default values where available.

A summary of the Life Cycle Costing for the wetland treatment nodes is shown below:

Wetland Treatment Node:

Life Cycle (yrs)	50
Acquisition Cost	\$628,128
Annual Maintenance Cost	\$14,987
Annual Establishment Cost	\$0
Establishment Period (yrs)	0
Renewal/Adaptation Cost	\$4,190
Renewal Period (yrs)	1
Decommissioning Cost	\$344,359

Span of Analysis (yrs)	50
Real Discount Rate (%)	5.50
Annual Inflation Rate (%)	2.00
Base Year for Costing	2017
Life Cycle Cost of Wetland (\$2017)	\$976,197
Equivalent Annual Payment Cost of the Asset (\$2017/annum)	\$19,524
Equivalent Annual Payment per m ³ /s maximum flow reduction	\$6,306.13
Equivalent Annual Payment/ML flow reduction/annum	\$1,872.62
Equivalent Annual Payment/kg Total Suspended Solids/annum	\$5.84
Equivalent Annual Payment/kg Total Phosphorus/annum	\$1,369.65
Equivalent Annual Payment/kg Total Nitrogen/annum	\$254.78
Equivalent Annual Payment/kg Gross Pollutant/annum	\$78.48



5. Reference List

Water by Design, Maintaining Vegetated Stormwater Assets
Version 1.0, 2012

Water by Design, MUSIC Modelling Guidelines
Version 1.0, 2010

Water by Design, Wetland Technical Design Guidelines
May 2017

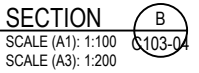
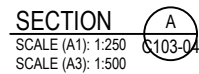
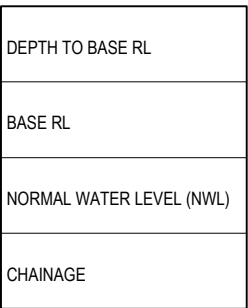
City of Gold Coast's City Plan



Appendix A – Drawings

Table 3: Drawings prepared by i3 consulting pty ltd

Drawing Number	Drawing Description
17-209-C103-04	Wetlands Layout Plan



PLANTING SCHEDULE		
LOCATION	SCIENTIFIC NAME	PLANTING DENSITY (QTY/m ²)
POOL	MYRIOPHYLLUM PAPILLOSUM	1.00
POOL	POTAMOGETON CRISPUS	1.00
POOL	RIBBONWEED	1.00
BATTER	CYPERUS POLYSTACHYOS	6-8
BATTER	LOMANDRA LONGIFOLIA VAR. LONGIFOLIA	4-6
BATTER	VIOLA HEDERACEA	2-4

GCCC REF: xxxx



Status **FOR COUNCIL APPROVAL**

Drawn K.J.L.	Date 07.12.18	Chkd T.J.S.	Date 07.12.18
Design T.J.S.	Date 07.12.18	Apprd	Date
Scale AS SHOWN	A1	Certif	Date
Project No. 17-209	Dwg. No. C103-04	Rev. B	

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Engineers Certification:

Travis Smith MIE Aust. CPEng.
RPEQ 16400

Signature: T. Sch

Date: 05 / 02 / 2019

Project
PROPOSED SUBDIVISION AT
86-160 CHRISTENSEN ROAD
SOUTH, STAPYLTON
for
BURNSIDE DEVELOPMENTS P/L &
YELLOWSTONE INVESTMENTS P/L

WETLANDS LAYOUT PLAN

B	FOR COUNCIL APPROVAL	05.02.2019	K.J.L.
A	PRELIMINARY	07.12.2018	K.J.L.
REV	DESCRIPTION	DATE	BY

Consulting Engineer:



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WETLAND NOTES

- WETLAND TO BE CONSTRUCTED AS PER WATER BY DESIGN WETLAND TECHNICAL DESIGN GUIDELINES 2017 AND IN ACCORDANCE WITH GOLD COAST CITY COUNCIL REQUIREMENTS
- BUNDS SEPARATING THE SEDIMENT POND, WETLAND AREA AND OVERFLOW CHANNEL ARE TO HAVE MAXIMUM 1:3 BATTERS. HIGH POINT OF BUNDING NOTED ON PLAN VIEW.

Appendix B – Sediment Basin Checklist

4.5 Inspection and maintenance checklist for sediment basins

This checklist is for permanent sediment basins, which are typically used upstream of wetlands or large bioretention systems as inlet ponds. It does not apply to temporary sediment basins associated with sediment control activities during construction activities.

ASSET TYPE	Sediment basin	ASSET ID
Date		
Date of last rainfall		Weather
Officer's name		

Wetland plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet and overflow and normal water level

Additional information

Time taken to complete inspection or maintenance

Photos of site (explanatory notes)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

General comments
and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. fences	No damage that poses a risk to public safety			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
BATTER SLOPES				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Depressions or mounds	No surface depressions or mounds > 100mm			
Isolated pools of water	No isolated pools/depressions that could provide mosquito habitat			
Litter	No litter			
Vegetation	Minimum 80% vegetation cover across full batter slope (minimal bare batches)			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Weeds (emergent, floating or submerged)	Average plant height > 500 mm Plants healthy and free from disease			
	No declared weeds (or declared weeds are controlled)			
	Maximum 10% cover of weeds			
OPEN WATER				
Sediment	Minimum 1 m of water above accumulated sediment			
Litter	No floating litter			
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Weeds (emergent, floating, or submerged)	Maximum 10% cover of weeds			
Algal mats	Maximum 10% cover of algal mats on two consecutive inspections			
OUTLET (OVERFLOW WEIR, PIPE OR OUTFALL)				
Erosion	Outlet is structurally sound and there is no evidence of erosion or settlement			

* 1 = PI met; 2 = PI met after maintenance activity undertaken; 3 = Additional maintenance needed; 4 = Rectification may be needed; NI = not inspected; NA = not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety risk or structural integrity			
Sediment, litter, or debris	No blockage			
Downstream outfall	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)			

* 1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

Appendix C – Constructed Wetlands Checklist

4.4 Inspection and maintenance checklist for constructed wetlands

Use the sediment basin checklist for inspecting and maintaining the inlet zone of a wetland.

ASSET TYPE	Constructed wetland	ASSET ID
Date		
Date of last rainfall		Weather
Officer's name		

Wetland plan

Insert diagram or plan of the asset showing key features e.g. locations of inlet, outlet, overflow, and normal water level

Additional information

Time taken to complete inspection or maintenance

Photos of site

(explanatory notes)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

General comments
and sketches

Officer's signature

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
SURROUNDS				
Damaged or removed structures e.g. traffic bollards	No damage that poses a risk to public safety or structural integrity			
INLET				
Erosion	Inlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
BATTER SLOPES AND BASE INVERT				
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Depressions or mounds	No surface depressions or mounds > 100mm			
Isolated pools of water	No isolated pools/depressions that could provide mosquito habitat			
Litter	Maximum 1 piece litter per 4 m2			

*1 - PI met, 2-PI met after maintenance activity undertaken 3 - Additional maintenance needed; 4 - Rectification may be needed; NI - not inspected; NA - not applicable

** Quantify where possible e.g. amount of sediment or litter removed



What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
Unusual odours, colours, or substances (e.g. oil and grease)	None detected			
Accumulated sediment**	No visible coarse sediment accumulated			
Water levels	During dry conditions, the water level is not more than 0.3m below the normal level			
Vegetation	Minimum 80% vegetation cover on batters and in water up to 300mm deep (higher if the vegetation provides a public-safety exclusion role)			
	Average plant height > 500 mm above normal water level			
	Plants healthy and free from disease			
Weeds (emergent, floating, or submerged)	No declared weeds (or declared weeds are controlled)			
	Maximum 10% cover of weeds			
Algal mats	Maximum 10% cover of algal mats on two consecutive inspections			

*1 – PI met; 2–PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

What to look for	Performance Indicator (PI)	Condition rating*	Maintenance undertaken**	Additional work needed
OUTLET (RISER OVERFLOW WEIR, PIPE OR OUTFALL)				
Erosion	Outlet is structurally sound and there is no evidence of erosion or subsidence/settlement			
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity			
Sediment, litter, or debris	No blockage			
Downstream outfall	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)			

*1 – PI met; 2 – PI met after maintenance activity undertaken; 3 – Additional maintenance needed; 4 – Rectification may be needed; NI – not inspected; NA – not applicable

** Quantify where possible e.g. amount of sediment or litter removed

*** Monitor the rate of accumulation by checking sediment levels at least once per year. This may involve establishing one or more reference points within different zones of the wetland. Where sediment depths are greater than 150 mm, a bathymetric survey of the wetland may be required to determine the full extent of accumulation.