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Concept Stormwater Management Plan: Commercial Subdivision - 1111-1141 Elizabeth Drive, Cecil Park, NSW, Lot 2 Sec 4 DP 2954

martens consulting engineers

ENVIRONMENTAL

WATER

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PROJECT MANAGEMENT

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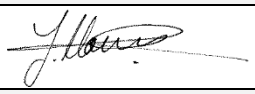
A. van Gogh	Sina Arbabzadeh	Terry Harvey	

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All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 Introduction

1.1 Overview

This report has been prepared in response to the proposed acquisition of part of the Site which will reduce the site area by 26,617 m^2. The acquisition of the area of the site proposed by TfNSW has required amendments to be made to the proposed development and development footprint which require a re-assessment of the impacts and design which responds to the new development Site.

This report has been prepared to support a state significant development application (SSDA) for a proposed commercial subdivision at 1111-1141 Elizabeth Drive, Cecil Park, NSW. It provides an assessment of the proposed development with respect to stormwater quantity and quality management.

This report is to be read in conjunction with the drawings by Martens and Associates (MA) planset P1706121PS03 which demonstrate the proposed development works and stormwater management system for the purpose of DA.

1.2 Scope

This report outlines the following:

- Evidence of compliance with Secretary's Environmental Assessment Requirements (SEARs) SSD 8859 as they relate to stormwater management and runoff.
- Documentation of results of a water quality assessment for the site.
- Treatment train specification to achieve nominated water quality objectives.
- Assessment of onsite detention (OSD) requirements for the site.

1.3 Relevant Planning Controls and Design Principles

The following planning and engineering controls and design principles have been used:

- Fairfield City Council (FSC) (2013) Fairfield City Wide DCP.
- Fairfield City Council (2017) Stormwater Management Policy.

1.4 Site Summary

A summarised site description is provided in Table 1.

Table 1: Site description summary.

Item	Description / Detail
Site address and Lot/DP	1111-1141 Elizabeth Drive, Cecil Park, NSW (Lot 2 Sec 4 DP 2954).
Approximate area	7.38 ha (Project Surveyors, 2017)
Local Government Area (LGA)	Fairfield City Council (FCC).
Current zoning and land use	The site is currently zoned as SEPP (Western Sydney Parklands) 2009. Residential accommodation is prohibited, certain commercial/educational buildings/activities are permitted and certain commercial activities requires consent.
Proposed land use	Commercial subdivision.
Site description	Rural residential lot with cleared pastoral land, dwelling and multiple sheds and stockpiles.
Surrounding land uses	Low density residential to the north, cleared pastoral land and tree cover to the east and south, new housing development being constructed to the west.
Topography	Located within slightly undulating terrain. Site elevation ranges from approximately 117 m AHD at street level on the south of the site to approximately 100 m AHD at the northern site boundary (Project Surveyors, 2017).
Expected geology	The Penrith *1:100,000 Geological Series Sheet 9030* (1991) describes site geology as Bringelly Shale consisting of shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. The NSW Environment and Heritage eSPADE website identifies the site as having soils of the Luddenham variety consisting of shallow dark podzolic soils or massive earthy clays on crests; moderately deep red podzoic soils on upper slopes; moderately deep yellow podzoic soils and praire soils on lower slopes and drainage lines.
Environmental receptors	Site drainage is via overland flow to a tributary of Ropes Creek along the north western site boundary. Ropes Creek is located approximately 3 km to the east of the site.

2 Stormwater Quality Assessment

2.1 Water Quality Objectives

Fairfield City Council stormwater retention targets (Section 6.2. of Fairfield's Stormwater Management Policy) have been adopted for the site. The following water quality objectives are to be achieved by the development when comparing the developed site with and without integration of water quality treatment measures:

- 80% reduction in total suspended solids (TSS).
- 55% reduction in total phosphorus (TP).
- 40% reduction in total nitrogen (TN).
- 90% reduction in gross pollutants (GP).

2.2 Modelling Methodology

2.2.1 Overview

The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*, Version 6.3) developed by the CRC for Catchment Hydrology was utilised to evaluate treatment train effectiveness (TTE) and post development pollutant generation from the site.

Modelling has been undertaken in accordance with Fairfield Council guidelines with the developed site based on proposed grading and subdivision layout and water quality treatment devices included to achieve adopted objectives.

The MUSIC model layout is provided in MA planset P1706121PS03 drawing PS03-E700.

2.2.2 Approach

To achieve adopted objectives, an iterative approach was used for post development modelling to determine appropriate types, sizes and locations of stormwater treatment devices.

The following modelling scenarios were considered:

- Post development (untreated) – the developed site without any water quality improvement devices included.
- Post development (treated) – the developed site with water quality improvement devices included to achieve stormwater quality objectives.

At source and end-of-line treatment structures were assessed to determine the most effective treatment option.

2.2.3 Climate Data

Rainfall climate data was sourced from the Bureau of Meteorology (BOM) weather station located at the Whitlam Centre (Station No. 067035) in Liverpool. The data was run on a 6-minute timestep from 01/01/1967 – 31/12/1976.

2.2.4 Input Parameters

Refer to Attachment A for listed input parameters.

2.2.5 Model Parameters

Base and storm flow concentration inputs were adopted based on Fairfield Council guidelines.

2.2.6 Catchment Area

Post development catchment areas are provided in MA planset P1706121PS03 drawing PS03-E700. The proposed lots (excluding designated landscaping areas) were split evenly, modelled as either a commercial node or a roof node.

2.3 Treatment Train Strategy

The stormwater treatment strategy for the site aims to provide at source and end of line controls, in accordance with the principles of WSUD, to satisfy treatment objectives. Major treatment components include:

- Rainwater tanks
- Gross pollutant traps (GPTs)
- A bioretention basin

The proposed treatment train is shown schematically in MA planset P1706121PS03 drawing PS03-E700.

Individual stormwater quality improvement devices (SQIDs) included in conceptual modelling are outlined in the following sub-sections.

2.3.1 Rainwater Tanks

Rainwater tanks for each lot shall be included to capture roof water for reuse.

A minimum of 168 kL of rainwater tank volume will be required for the site (representing a rate of 10 kL/1000 m^2 of roof area) with water to be reused internally. The reuse rate applied to the rainwater tanks was 0.23 L/s/ha, this rate was determined based on values from the Water Supply Code of Australia (2002) for commercial land uses with a 50% reduction factor applied.

2.3.2 Gross Pollutant Traps (GPTs)

GPTs are devices proposed to treat and capture coarse pollutants in stormwater to prevent them from travelling further downstream. GPTs function by filtering the water as it passes through the device.

SPEL Stormsacks were modelled in MUSIC. The modelled treatment efficiency of the device is based on the manufacturer's specifications, equivalent pit inserts from other suppliers could be substituted.

2.3.3 Bioretention Basin

An end-of-line bioretention basin is proposed for the development site (to be configured with an OSD basin), allowing contaminants in stormwater runoff to be removed via settling, filtration and adsorption..

Location of the bioretention basin is shown on MA planset P1706121PS03 drawing PS03-E100 with additional details on drawing PS03-E200.

2.4 Alternate Treatment Train Strategy

An alternative treatment train was considered for the site to meet the water quality targets. The alternate design considers that the objectives may have to be met on each lot, such a scenario might occur if the development were to be constructed in stages and the end of line bioretention basin were not developed prior to some lots. Major treatment components would include:

- Rainwater tanks (as in Section 2.3.1)
- GPTs (as in Section 2.3.2)

- Ocean Protect Stormfilter cartridges. Stormfilter cartridges are proprietary devices that are designed to provide tertiary treatment of stormwater in below ground tanks. Such devices would be able to be integrated into each individual lot's drainage. Similar or equivalent devices could also be substituted.

The proposed alternate treatment train was not modelled in MUSIC and depending on staging of construction may not necessarily be required. If stormwater quality treatment devices are maintained on individual lots this will reduce the burden on the end of line bioretention basin, thus allowing a reduction in the size of the treatment device.

2.5 MUSIC Water Quality Results

Results of the post development site with no treatment devices modelled against the post development site with treatment devices are provided in MA planset P1706121PS03 drawing PS03-E700.

The results demonstrate that the pollutant reduction targets are achieved for the site. Proposed water quality controls are able to reduce the developed site pollutant loads to the treatment target objectives.

2.6 Conclusion

MUSIC modelling results indicate that post development water quality objectives will be met by the proposed stormwater treatment train. The proposed stormwater treatment train includes:

- Rainwater tanks.
- Gross pollutants traps.
- A bioretention basin.

Further refinement of the model at detailed design stage may alter the sizes and locations of proposed treatment structures; however, performance outcomes of the final design are to achieve specification provided in this report.

3 Stormwater Quantity Assessment

3.1 Onsite Detention Objectives

Site stormwater quantity performance objectives are consistent with the FCC Stormwater Management Policy. Objectives are to ensure the development does not increase:

- Downstream flooding
- Erosion of unstable waterways
- The reduction of the capacity of Council's drainage network.

Fairfield City Council has deemed that these objectives can be achieved by providing:

- Site storage requirement (SSR) of 4.09 m^3/100 m^2.
- High early discharge (HED) outlet control.
- Single rectangular off-line storage basin.
- OSD outlet to restrict discharge to 78 L/sec/ha.

3.2 Onsite Detention Strategy

The OSD strategy for the site aims to provide a single end of line basin to collect the flows from the majority of the development. Small areas which bypass the basin have been offset by increasing the basin size.

3.3 Alternate Onsite Detention Strategy

An alternative OSD strategy was considered for the site assuming that the OSD objectives may have to be met on each lot. This would be the case if the development was constructed in stages and some lots were developed before the end of line OSD was installed.

In such a scenario underground OSD tanks would be proposed on each lot. The OSD tanks would be configured to contain a small hydraulically linked chamber to house Stormfilter cartridges for stormwater quality treatment (see Section 2.4).

3.4 Onsite Detention Analysis

3.4.1 Catchment Areas

Catchment delineation was developed based on the proposed roadworks and earthworks. See MA planset P1706121PS03 drawing PS03-E600 for the catchment plan.

3.4.2 Onsite Detention Sizing

A summary of the site OSD analysis is provided in Table 2. For full calculations refer to MA planset P1706121PS03 drawing PS03-E600.

Table 2: Site description summary.

Total OSD Catchment (ha)	Required OSD Volume (m^3)	Permissible Site Discharge (L/s)
4.65	1953	362.7

3.5 Conclusion

Preliminary hydraulic calculations indicate that provision of storage achieves water quantity objectives. Detailed design of the site drainage system and OSD structures including sizes, locations, dimensions, outlet controls, overflow weirs and final volumes will need to be undertaken during the detailed design stage of the development.

4 References

Fairfield City Council (2013) Fairfield City Wide DCP.

Fairfield City Council (2017) Stormwater Management Policy.

Water Supply Code of Australia (2002) Part 1: Planning and Design.

5 Attachment A – MUSIC Model Inputs

Table 3: Treatment node inputs.

Element	Factor	Input	Source
Setup	Climate File	Liverpool (Whitlam Centre)	eWater
Source Nodes	Rainfall Threshold	Table 6 – Appendix O	FCC (2017) Stormwater Management Policy
	Base & Stormflow Properties	Table 5 – Appendix O	FCC (2017) Stormwater Management Policy
	Estimation Method	Stochastically generated	FCC (2017) Stormwater Management Policy
Rainwater Tanks	Low Flow By-Pass	0 m^3/s	By design
	High Flow By-Pass	100.0 m^3	No bypass
	Volume Below Overflow	134.4 kL	By design
	Surface Area	84 m^2	By design
	Overflow Pipe Diameter	90 mm	By design
	Re-use	Daily demand of 32.65 kL	By design
Gross Pollutant Traps (SPEL Stormsack)	Low Flow By-Pass	0 m^3/s	SPEL MUSIC node
	High Flow By-Pass	11 l/s (per each device)	SPEL MUSIC node, by design
	Treatment Efficiency	As per manufacturer's specification	SPEL MUSIC node
Bioretention	Low Flow By-Pass	0 m^3/s	By design
	High Flow By-Pass	100 m^3/s	No bypass
	Extended Detention Depth	0.3 m	By design
	Surface Area	260 m^2	By design
	Filter Area	260 m^2	By design
	Unlined filer media	0.01 m, nominally 0 m	By design
	Saturated Hydraulic Conductivity	100 mm/hr	FCC (2017) Stormwater Management Policy
	Filter Depth	0.4 m	FCC (2017) Stormwater Management Policy
	TN content of filter media	80 mg/kg	FCC (2017) Stormwater Management Policy
	Orthophosphate content of filter media	40 mg/kg	FCC (2017) Stormwater Management Policy
	Exfiltration rate	0 mm/hr	Base is lined
	Lined base	Yes	By design
	Vegetation properties	With effective nutrient removal plants	By design
	Overflow weir width	2.0 m	By design
	Underdrain present	Yes	By design
	Submerged zone	No	By design

6 Attachment B – Grading and Stormwater Plans