Beatty's Cottage
Lucan Co. Dublin

StormWater Management Plan Report

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2405

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1 Introduction

1.1 General

This report addresses the storm water management for the proposed refurbishment of the Group of Agricultural Buildings known as Beatty's Cottage at the site adjacent to the Grand Canal near the 12th Lock.

A description of the proposed development is as follows:

- The refurbishment of a group of existing protected structures to provide a mixed use including a childcare facility, café, events space, artists studios and clubhouse.
- A redevelopment of the external ground areas and courtyard space.
- All associated site work.

The site is currently occupied by the buildings and an impermeable courtyard area.

1.2 Proposed Stormwater Management Plan Summary

In order to comply with modern standards, stormwater shall be treated using nature based solutions as far as possible in line with the SDCC Development Plan.

For this development a series of nature based solutions shall be implemented including, planters, tree pits, filter strips and stormwater swales.

2 Stormwater Management Plan

2.1.1 Existing Site

The site is occupied by a number of protected structures surrounding a fully impermeable courtyard.

2.1.2 Proposed StormWater Management.

The proposed new development shall incorporate Nature based solutions for the treatment of stormwater and all stormwater shall be contained within the site.

Sedum/ Blue Roofs

The existing buildings on the site are protected structures and shall be refurbished within the same footprint. The buildings have pitched or barrel type roofs and therefore are not suitable for sedum or blue roofs.

Planters

Stormwater discharge from the roofs shall be connected to new feature planters in the refurbished buildings along with an overflow to the ground system within the development.

External Area – Permeable Finishes and Soft Landscaping.

There is a substantial area of the site overed with impermeable concrete yard. The design intent is to soften this external yard, however given the substantial area involved the full area shall not be broken up and all the concrete removed off site as there would be a significant cost in disposal along with a significant carbon footprint (embodied and operational) in removing the concrete, so a substantial portion shall be retained on site.

Therefore the external areas shall be modified to include a combination of permeable paving and the original hard concrete surfacing. Filter strips shall be formed at the interface between the original yard areas the new permeable paving systems which shall intercept the run-off from the hard paving. Tree pits shall also be introduced within the hard yard areas further softening the courtyards

Storm Water Swales

The filter strips shall convey run-off from the roofs and hard paving to a series of stormwater swales or wetlands within the existing soft landscaping systems at the edges of the site. There are substantial areas available within the soft landscaping to deal with all stormwater run-off from the site.

Details of the stormwater management are shown on CORA drawings 2405/C0003

2.1.3 Conclusion of Stormwater Management Plan

The above stormwater management plan proposes *nature based solutions* to treat stormwater on the site. All suite of measures included in the proposed development shall make a significant improvement to the current situation where all stormwater is directed to the public combined sewers.

Appendix A – Stormwater Swale Calculations

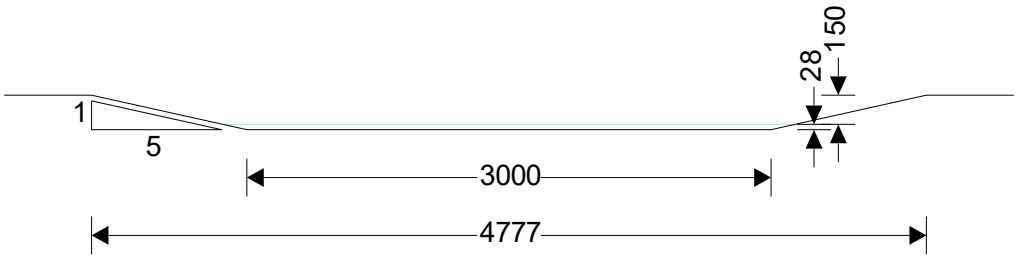
SWALE AND FILTER STRIP DESIGN

In accordance with CIRIA publication C753 - The SUDS Manual

Tedds calculation version 2.0.03

Swale details

Width of swale base	w = **3.000** m
Longitudinal gradient of swale	S = **0.020**
Side slope gradient of swale	s = **0.200**
Manning number	n = **0.25**
Length of swale	L = **25** m



Cross section of swale

Design rainfall intensity

Location of catchment area	Dublin
Storm duration	D = **30** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.300**
5-year return period rainfall of 60 minutes duration	M5_60min = **17.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.77**
Rainfall for 30min storm with 5 year return period	$M5\_30min_i$ = Z1 × M5_60min = **13.1** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.98**
Rainfall for 30min storm with 100 year return period	M100_30min = Z2 × $M5\_30min_i$ = **25.9** mm
Design rainfall intensity	I_{max} = M100_30min / D = **51.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **300** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **4.3** l/s

Calculate depth of flow using iteration of Manning's formula

Minimum depth of flow	x = **28** mm

Depth of flow is less than or equal to 100 mm so filtration is effective (cl.17.4)

Area of flow	A = (w + x / s) × x = **0.087** m^2
Perimeter of flow	P = w + 2 × $\sqrt{(x^2 + (x / s)^2)}$ = **3.283** m
Hydraulic radius	R = A / P = **0.027** m
Check flow using Manning equation	Q_{check} = A × $(R / 1\ m)^{2/3}$ × $S^{1/2}$ × 1 m/s / n = **4.4** l/s
Maximum velocity of flow	V_{max} = Q_{max} / A = **0.050** m/s

PASS - velocity is small enough to encourage settlement and prevent erosion (cl.17.4.1)

Minimum width

Freeboard	d_{free} = **150** mm

Minimum required swale width $w_{total,min} = 2 \times (x + d_{free}) / s + w = \mathbf{4.777}$ m