



**CIVIL AND ENVIRONMENTAL  
CONSULTING ENGINEERS**

## **STORMWATER DRAINAGE AND WATER QUALITY REPORT**

for

**RESIDENTIAL APARTMENT DEVELOPMENT**

at

**LOT 50 DP705739**

**30 FAIRLIGHT STREET, FAIRLIGHT NSW**

Our reference: 19068\_STW01

Issue 01, 24 January 2020

Prepared for: Castle Pty Ltd

Novati Consulting Engineers is a civil and environmental consulting engineering firm with a team of professional civil and environmental engineers and designers competent in providing cost-effective solutions catered for each individual project. NCE has sound experience in dealing with catchment authorities and understanding government regulations when it comes to Water Sensitive Urban Design and the modelling of stormwater quantity and quality.

This report has been developed based on agreed requirements as understood by NCE at the time of investigation and it applies only to this proposed development. Other interpretations should not be made, including changes in scale or application to other projects.

Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

Claudia Novati  
 Director/ Senior Civil Engineer  
 BE (Civil & Enviro.) MIEAust

**NOVATI CONSULTING ENGINEERS**

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## 1 INTRODUCTION

To assess whether this development will satisfy Council's stormwater management requirements, we have prepared this report to accompany the development application.

This report contains:

- Site and development details (Section 2)
- Proposed stormwater drainage and water quality measures (Section 3)
- Assessment of measures to satisfy Council water quality reduction targets (Section 4)

This report takes into account the existing stormwater conditions and the likely impacts of the development on the surrounding lands (Section 2). The most important component of this report for the developer is Section 3, it contains a series of measures to be implemented as part of the development that will offset any potential problems that might be caused by the development and addresses any existing issues. In most cases, the planned measures in Section 3 of this report will become "conditions of consent" if the development application is approved.

## 2 SITE AND DEVELOPMENT DETAILS

### 2.1 Site Details

The site is located at Lot 50 DP705739, 30 Fairlight Street, Fairlight, refer to Figure 1. The total site area is approximately 861.7m<sup>2</sup> and is currently used for residential purposes. There is an existing multi-unit development on the site at the moment. With majority of the site impervious due to the development, refer to Image 1 and Image 2.

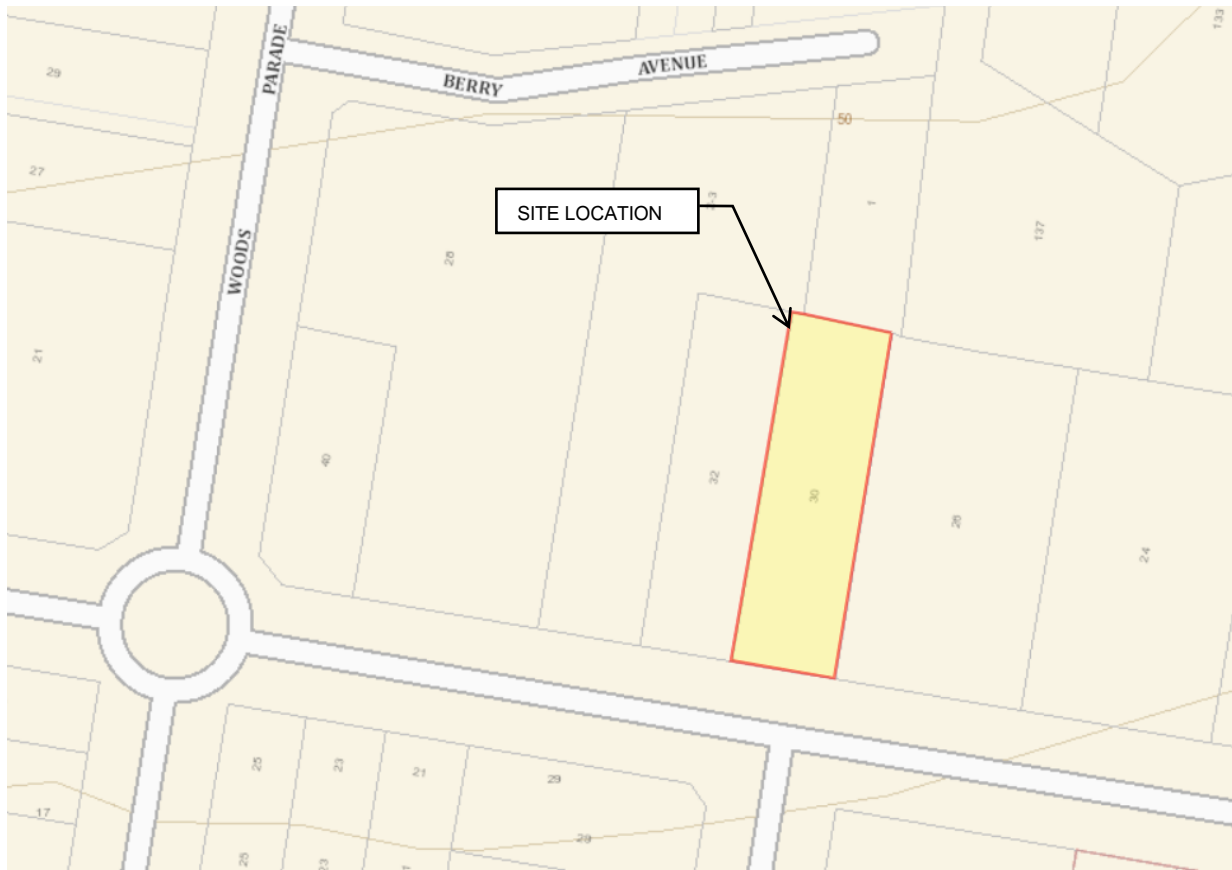


Figure 1 - Aerial image of site (image courtesy of SIX Maps)

### 2.2 Surrounding Land Use

According to Manly DCP, the site is zoned as R1 - General Residential. The neighbouring sites are also zoned as R1 - General Residential.

### 2.3 Existing Site Drainage

The site currently drains to street via a series of outlets to kerb, there is no evidence of an existing on-site stormwater detention or retention system.





Image 1 - Photo of existing development from Fairlight Street



Image 2 - Photo of existing development from Fairlight Street

## 2.4 Description of the Proposed Development

The development involves the demolition of the existing dwellings on-site and construction of a basement carpark and seven (7) individual apartments within three (3) levels. The total increase in impervious area due to the development is approximately 12m<sup>2</sup>. Refer to plans in Appendix A.

## 3 PROPOSED STORMWATER DRAINAGE AND WATER QUALITY TREATMENT MEASURES

This section of the report shall outline the proposed stormwater drainage quantity and quality is to be managed for the post-development scenario to ensure that the site meets the necessary water quantity and quality requirements. It will also identify the location of these measures and outline the treatment it provides.

### 3.1 Stormwater Drainage and Water Quality Requirements

The water quality control measures for the site have been designed to meet the stormwater quality targets as set out in the *Northern Beaches Council WSUD and MUSIC Modelling Guidelines 2016*. As per the Councils requirements, the site in the post-development scenario has been design to have a minimum percentage reduction as follows:

- Total Phosphorous 65% reduction in the post development mean annual load
- Total Nitrogen 45% reduction in the post development mean annual load
- Total Suspended Solids 85% reduction in the post development mean annual load
- Gross Pollutants 90% reduction in the post development mean annual load<sup>1</sup> (for pollutants greater than 5mm in diameter)
- pH 6.5 - 8.5
- Hydrology The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 2 year ARI

The site drainage and OSD storage/discharge requirements has been designed in accordance with *Manly Specification for On-site Stormwater Management 2003*. As per Council requirements the site falls within Zone 1. As per the Council specification, sites within Zone 1 shall require the installation of On-site Stormwater Detention (OSD) facilities to control the rate of runoff from the site, as a result of development, such that the runoff after development shall be less than the runoff prior to the development. Runoff from the developed site shall be reduced to a quantity with an impervious portion of 35% or less, refer to Table 1.

### 3.2 Proposed Stormwater Drainage System

The OSD storage and discharge required for the site was calculated using the computer program DRAINS. A summary of the catchment areas used is summarised in Table 1 and a summary of the site discharge and OSD volume requirements for various storm events are summarised in Table 2. The maximum site storage requirement was calculated to be 8.7m<sup>3</sup>. A 9,000L rainwater tank is proposed for

the site and the water is to be used for internal purposes, refer to Section 3.3.1. On this basis, it is asked if Council may permit the volume of rainwater use to be credited against the calculated OSD storage volume.

Land use/surface type	Total area (m <sup>2</sup> )	Impervious Area (m <sup>2</sup> )		Pervious Area (m <sup>2</sup> )	
		(m <sup>2</sup> )	(%)	(m <sup>2</sup> )	(%)
<b>Pre-development Scenario</b>					
Residential area	862	608	71	254	29
- Landscaped	254	0	0	254	100
- Impervious	608	608	100	0	0
<b>TOTAL (no OSD)</b>	<b>862</b>	<b>608</b>	<b>71</b>	<b>254</b>	<b>29</b>
<b>TOTAL (Zone 1: OSD Control)</b>	<b>862</b>	<b>302</b>	<b>35</b>	<b>560</b>	<b>65</b>
<b>Post-development Scenario</b>					
Residential area	597	447	75	151	25
- Landscaped	150	0	0	151	100
- Impervious	447	447	100	0	0
Roof area	265	265	100	0	0
<b>TOTAL</b>	<b>862</b>	<b>712</b>	<b>83</b>	<b>151</b>	<b>18</b>

Table 1 – Summary of Catchment Areas for OSD

	Average Recurrence Interval (years)	
	5	100
<b>Catchment 1 - Pre-development Scenario</b>		
<b>Q<sub>pre</sub> (m<sup>3</sup>/s) - PSD</b>	<b>0.027</b>	<b>0.051</b>
<b>Catchment 2 - Post-development Scenario</b>		
Q <sub>post no OSD</sub> (m <sup>3</sup> /s)	0.034	0.057
Q <sub>post OSD 1</sub> (m <sup>3</sup> /s)	0.005	0.008
Q <sub>post OSD O/F</sub> (m <sup>3</sup> /s)	0.000	0.000
Q <sub>post By-pass</sub> (m <sup>3</sup> /s)	0.022	0.038
<b>Q<sub>post OSD</sub> (m<sup>3</sup>/s) - PSD</b>	<b>0.027</b>	<b>0.046</b>
<b>Peak OSD storage (m<sup>3</sup>) - SSR</b>	<b>4.0</b>	<b>8.7</b>

Table 2 - Summary of Site OSD Storage and Discharge Requirements



### 3.3 Proposed Stormwater Quality Treatment Measures

#### 3.3.1 *Rainwater tank*

It is a rainwater tank is provided for the development. The rainwater tank is to comply with the following:

- minimum rainwater tank capacity of 9kL;
- To be connected for internal use including toilet flushing and washing machine, and external reuse (garden irrigation);
- Be fitted with a first-flush device that causes initial rainwater run-off to bypass the tank and must drain to a landscaped area. The first flush device will not be permitted to connect to the stormwater system;
- Have a sign affixed to the tank stating the contents is rainwater;
- Be constructed or installed in a manner that prevents mosquitoes breeding, such as the use of mesh to protect inlets and overflows;
- Have its overflow connected to an existing stormwater drainage system that does not discharge to an adjoining property, or cause a nuisance to adjoining owners;
- Pumping equipment must be housed in a soundproof enclosure; and
- Where the rainwater tank is interconnected to a reticulated water supply, it must be installed in accordance with Plumbing Code of Australia, particularly backflow/cross connection prevention requirements.

#### 3.3.2 *In-pit filtration baskets*

It is proposed that the stormwater inlet pit and grated trench drain at the entry to the basement level is to be fitted with a fine mesh in-pit filtration basket such as the 'EnviroPod 200' or approved equivalent.

#### 3.3.3 *Tertiary treatment filtration device*

A stormwater filtration device is to be installed on the western front corner of the site. Two (2) Cartridge Stormfilter system 690 high by 'Ocean Project' or approved equivalent to be installed and maintained in accordance with the manufacturer's specifications. The filter is to treat stormwater run-off from balconys, planter boxes, courtyards and other areas by passing the rainwater tank.

### 3.4 Erosion and Sediment Control Measures

Appropriate erosion and sediment control measures are to be in place over the duration of the construction works. The measures shall include the following concepts as a minimum;

- i. Minimise the extent of disturbed area by fencing of 'no-go' areas;
- ii. Protect and clearly label trees to remain;

- iii. Sediment fencing is to be used downslope of any construction area until works are complete (Standard Drawing SD 6-8, Landcom, 2004);
- iv. Topsoil will be stripped from any construction areas and stockpiled following Standard Drawing SD 4-1 (Landcom, 2004) for later re-use; and
- v. Ensure work areas are sealed/rehabilitated as quickly as possible.

A concept erosion and sediment control plan is included in Appendix A.

## 4 MUSIC MODELLING INPUTS

### 4.1 Rainfall and Potential Evapotranspiration (PET) data

The modelling was undertaken using the Sydney Observatory 6 minute rainfall data as set out in Table 3 and the monthly average Sydney PET data as per Table 4

Purpose	Time step required	Rainfall Station	Modelling Period
Water quality	6 minutes	066062 Sydney Observatory	1981-1985

Table 3 - Recommended 6 minute rainfall station

Month	J	F	M	A	M	J	J	A	S	O	N	D
PET (mm)	180	135	128	85	58	43	43	58	88	127	152	163

Table 4 - Monthly PET for Sydney region

### 4.2 Modelling Assumptions, Representation and Configuration

The following modelling assumptions were done in accordance with council guidelines:

- MUSIC source nodes
- Soil properties
- Rainfall-runoff parameters for both the impervious and pervious areas
- Stormwater pollutant input parameters used for each surface type and land-use zoning

For a summary of the information above, refer to Appendix A, Stormwater Quality and 'MUSIC Model Summary Plan, 19068\_DA05.

The post-development scenario has been broken up into numerous catchment areas as shown in **Error! Reference source not found..** Refer to Appendix A for a detail site catchment plan.

### 4.3 MUSIC Model Layout

The data as outlined in Section 4 and the WSUD treatment measures outlined in Section 3 was modelled in MUSIC, layout is as shown in Figure 2 below.

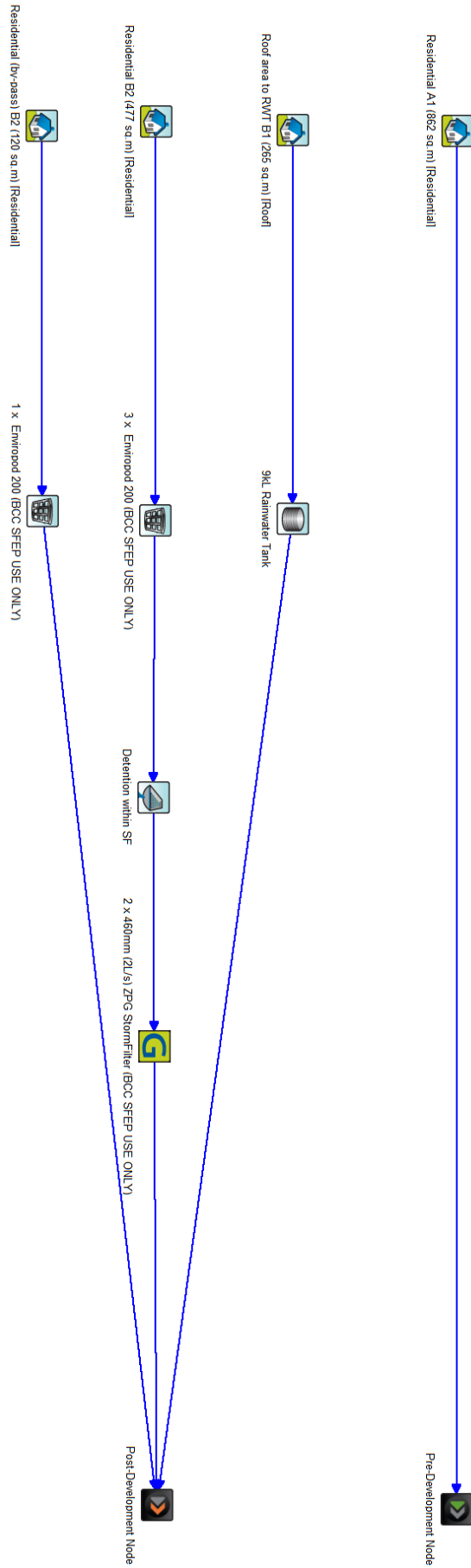


Figure 2 - Post-development MUSIC model

#### 4.4 MUSIC Model Results

A summary of the model results for the mean annual pollutant loads are presented in Table 5.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.668	0.404	39.6
Total Suspended Solids (kg/yr)	54.4	8.43	84.5
Total Phosphorus (kg/yr)	0.134	0.0413	69.2
Total Nitrogen (kg/yr)	1.36	0.507	62.6
Gross Pollutants (kg/yr)	15	0	100

Include Pre-Development

Table 5 - MUSIC Results Treatment Train Effectiveness

#### 5 CONCLUSIONS

The results of the MUSIC modelling have conceptually shown that the post-development water quality site can achieve the minimum pollution reduction targets of:

- Total Phosphorous 65% reduction in the post development mean annual load
- Total Nitrogen 45% reduction in the post development mean annual load
- Total Suspended Solids 85% reduction in the post development mean annual load
- Gross Pollutants 90% reduction in the post development mean annual load<sup>1</sup> (for pollutants greater than 5mm in diameter)
- Hydrology The post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 2 year ARI

Providing the proposed stormwater management and offset measures outlined in Section 3 are implemented; the rate of stormwater runoff (both piped and overland) from the post-developed site is designed to not exceed the rate of run-off from 35% impervious area.

Without these specific measures, the development could potentially have a negative impact on water quality. Protection and maintenance measures for the implemented system are to be provided to ensure these management measures remain effective.

#### 6 REFERENCES

Landcom (2004), *Managing Urban Stormwater: Soils and Construction*. 4<sup>th</sup> Edition, refer to as 'Blue Book' NSW Government.

Alluvium (2016), *Northern Beaches Council WSUD and MUSIC Modelling Guidelines*. Prepared by Alluvium Consulting Australia for Northern Beaches Council, Draft, June 2016.

Manly Specification for On-site Stormwater Management 2003

## **7 APPENDICES**

### **7.1 Appendix A – Concept Erosion and Sediment Control and Stormwater Drainage Plans**