NORTHROP

CIVIL ENGINEERING REPORT:
WATER SENSITIVE URBAN DESIGN

DHA Academy Close
Block 3 Section 65, Campbell

PREPARED FOR
Defence Housing Australia
Level 2, 287 Elizabeth St
Sydney NSW

Ref: CR172699-EC04
Rev: 1
Date: 14.05.2020

Civil Engineering Report:

Water Sensitive Urban Design

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
14.05.2020	1	Works Approval Application	WB	DF

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1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Defence Housing Australia (DHA) to assess the Water Sensitive Urban Design (WSUD) requirements in support of a Works Approval (WA) for the proposed redevelopment at Block 3, Section 65 Campbell.

The WSUD requirements outlined in this report are based on the current Site + Context Plan drawing NCA-002 Revision 3 issued by AMC Architecture (AMC).

1.2 Site Context and Existing Characteristics

The subject site is described as Block 3, Section 65 Campbell and is located at the corner of Truscott Street and Fairbairn Avenue. The existing site characteristics of Block 3 can be summarised as:

- The site has a total area of approximately 25,354m^2.
- The block is primarily underdeveloped and is grassed with numerous trees across the site approximately 90% if the site. Approximately 10% of the site is composed of impervious area (existing Academy Close roadway).
- The site slopes to the Northeast at an average grade of 6%.
- The block is registered as DES: Designated as per the ACT Government Territory Plan.
- The site is located with Designated National Capital Authority land known as the “Australian Defence Force Academy, Royal Military College Duntroon, and Campbell Park Precinct”. The WSUD requirements of this precinct are not explicitly mentioned; as such the requirements fall back to the NCA Plan which notes that they should be met by adhering to the TCCS specifications. The WSUD requirements for the proposed development have been assessed using the Waterways: Water Sensitive Urban Design General Code (21 February 2020)

The site locality of Block 3 is presented in Figure 1.

Figure 1 - Aerial Photography of Proposed Site (ACTMapi, May 2020)

1.3 Proposed Development

Northrop understands that the proposed redevelopment was proposed to be a Defence Housing Site and will deliver 30 dwellings. Figure 2 is an extract from the architectural site plan.

Figure 2 – Site Layout (AMC Architecture, 3 December 2019)

The current architectural site plan shows that the proposed development will have the following properties:

- The site is proposed to have a pervious area (gardens, lawns, open spaces etc) of approximately 57%.
- The site is proposed to have an impervious area (roof and pavement areas) of approximately 43%.
- The roof area is approximately 6,400m^2.

2. WSUD Management

2.1 WSUD Requirements

The WSUD requirements for the proposed development have been assessed using the Waterways: Water Sensitive Urban Design General Code (21 February 2020).

The Waterways: Water Sensitive Urban Design General Code applies to development and redevelopment on sites across all zones of the Territory Plan that:

- Are currently connected to or are intended to be connected to the mains water supply; or
- Are likely to alter the stormwater regime of the site;

However, the code does not apply to the following:

- Single dwellings and secondary residences subject to the single dwelling housing development code; and
- As excepted within the provisions of this code.

2.2 Element 1: Mains Water Use Reduction

2.2.1 R1

2.2.1.1 Rule

This rule applies to all development currently connected or intended to be connected to mains water supply except any of the following:

a) development subject to the estate development code

b) development for minor alterations or extensions involving 50% or less of the existing floor area.

Development achieves a minimum 40% reduction in mains water consumption compared to an equivalent development constructed in 2003.

2.2.1.2 Compliance

In summary to comply with this rule the proposed development requires:

- 3-Star Shower Fittings and Dishwasher Fittings;
- 4-Star Toilets and Clothes Washing Machines fittings; and
- A combined capacity of 200kL of rainwater and retention storage collecting from at least 2,400m^2 of the roof area to be used for all gardens across all 30 of the proposed dwellings.

Refer to Appendix A for the full Water Reduction Spreadsheet showing the required 40% reduction in water mains consumption.

2.3 Element 2: Stormwater Quantity

2.3.1 R2

2.3.1.1 Rule

Development complies with at least one of the following:

a) stormwater retention management measures are provided and achieve all of the following:

i) Stormwater storage capacity of 1.4kL per 100m² of the total impervious area of the site is provided specifically to retain and reuse stormwater generated on site as a whole

ii) Retained stormwater is used on site

b) development captures, stores and uses the first 15mm of rainfall falling on the site.

For this rule, on-site stormwater retention is defined as the storage and use of stormwater on site.

2.3.1.2 Compliance

The retention storage capacity is to be at least:

$1.4kL \times 11{,}000\, m^2 \div 100m^2 = 154\text{kL}$

This retention storage is to be reused on site.

2.3.2 R3

2.3.2.1 Rule

Stormwater detention measures are provided and achieve all of the following:

a) capture and direct runoff from the entire site

b) Stormwater storage capacity of 1kL per 100m² of impervious area is provided to specifically detain stormwater generated on site

c) The detained stormwater is designed to be released over a period of 6 hours after the storm event.

For this rule on-site stormwater detention is defined as the short-term storage and release downstream of stormwater runoff.

2.3.2.2 Compliance

The detailed design is to ensure that the detention tank is capable of collecting runoff from at least 70% of the site.

As per the note included in the Waterways: Water Sensitive Urban Design General Code (21 February, 2020), as there is retention storage on the site, the size of the detention tank can be reduced by 50% of the size of the retention tank.

Therefore, the detention storage capacity is to be at least:

$1.0kL \times 11{,}000\, m^2 \div 100m^2 - 50\% \times 154kL = 33kL$

This detention is proposed to be met by the use of SPEL Stormchambers. Assuming a tank nominal water depth of 1.35m, an orifice 12mm in diameter will be required to drain the tank over a period exceeding 6 hours. During the detailed design, this will need to be reviewed should the tank depth alter.

2.3.3 R4

2.3.3.1 Rule

This rule applies to development of major roads involving sites greater than 2000m^2.

Development complies will all of the following:

a) The capacity of existing pipe (minor) stormwater connection to the site is not exceeded in the 1 in 10-year storm event

b) The capacity of the existing overland (major) stormwater system to the site is not exceeded in the 1 in 100-year storm event.

2.3.3.2 Compliance

This rule is not applicable as the development is not a major road.

2.3.4 C5

2.3.4.1 Criteria

This criterion applies to estate development plans.

Stormwater detention measures are provided and the peak rate of stormwater runoff from the estate does not exceed the peak rate of runoff from an unmitigated (rural) site of the same area for minor and major storms.

2.3.4.2 Compliance

This criterion does not apply as the development is not at an estate development scale.

2.4 Element 3: Stormwater Quality

2.4.1 R6

2.4.1.1 Rule

This rule applies to development for all of the following:

a) where the development site is greater than 2,000m^2.

b) where development involves works that have potential to alter the stormwater regime for the site.

This rule does not apply to development of major roads.

The average annual stormwater pollutant export is reduced when compared with an urban catchment of the same area with no water quality management controls for all of the following:

a) gross pollutants by at least 90%

b) suspended solids by at least 60%

c) total phosphorous by at least 45%

d) total nitrogen by at least 40%.

2.4.1.2 Compliance

The model demonstrated that when the storm chambers (or equivalent treatment device) are installed on site, the targets for pollution reduction are met. The total number of SPEL Stormchambers required

is 17, given that each chamber has a detention design storage capacity of 3.26m^3 (each chamber is nominally 1.6m x 2.6m) when installed in accordance with the manufacturers specifications. A good location for the SPEL Stormchambers is at the North eastern corner of the block near the proposed stormwater tie under the open landscaped space to avoid the existing trees. As there as there is in excess of 350m^2 available in this area the approximate space required for the tanks of 75m^2 is unlikely to be a problem when installed at this location. A diagrammatic layout of the MUSIC Model is presented in Figure 3.

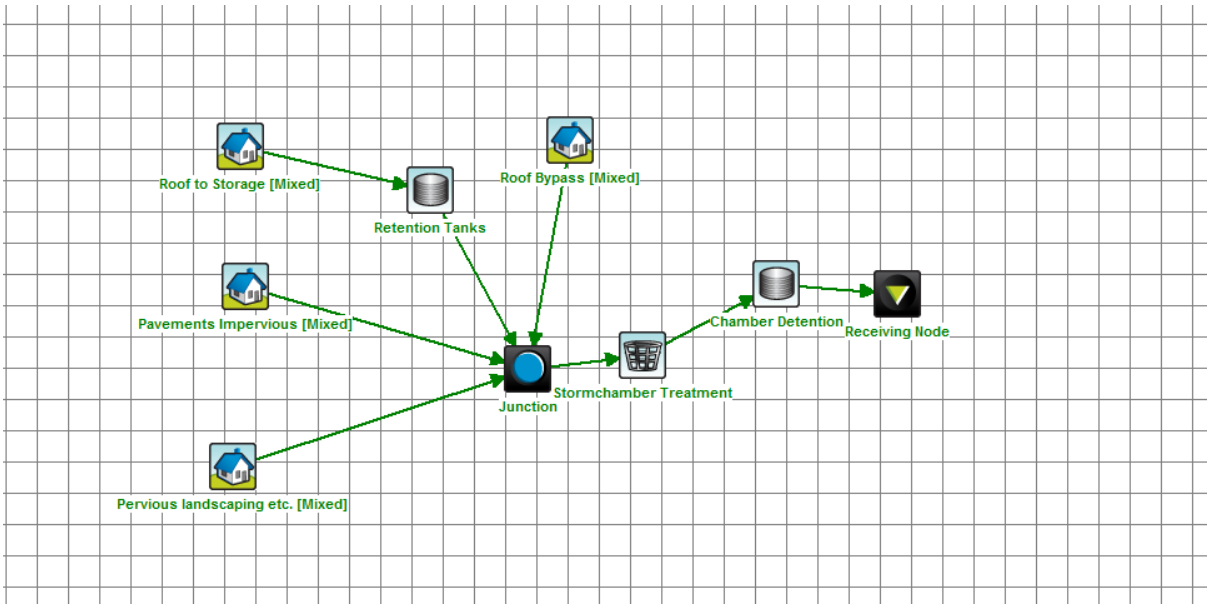

Figure 3 - MUSIC Model Configuration

The modelling results shown in Table 1 demonstrates that the treatment train will achieve the water quality targets outlined in R6 of the Water Sensitive Urban Design General Code.

Table 1 – MUSIC Model Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	8.42	7.65	9.1
Total Suspended Solids (kg/yr)	1300	109	91.6
Total Phosphorus (kg/yr)	1.88	0.757	59.8
Total Nitrogen (kg/yr)	22.4	4.66	79.2
Gross Pollutants (kg/yr)	242	0	100

2.4.2 R7

2.4.2.1 Rule

This rule applies to development of major roads, including the duplication of an existing major road in full or in part.

The average annual stormwater pollutant export is reduced when compared with a road catchment of the same area with no water quality management controls for all of the following:

a) gross pollutants by at least 90%

b) suspended solids by at least 60%

c) total phosphorous by at least 45%

d) total nitrogen by at least 40%.

2.4.2.2 Compliance

This rule is not applicable as the site is not a major road.

2.5 Climate Change Adaptation

2.5.1 C8

2.5.1.1 Criteria

This criterion applies to development on sites greater than 2,000m^2 involving works that have potential to alter the existing drainage and overland flow regime for the site.

Overland flow paths are provided and achieve all of the following:

a) accommodate overland stormwater flows up to the 1% AEP

b) reduce nuisance flooding.

2.5.1.2 Compliance

Hydrological modelling of the developed site has been modelled using DRAINS to anticipate the subject site's post-development overland flow for the 1% AEP storm event. The ILSAX hydrological model was adopted as the hydrological model. The modelling completed is for the purpose of the development application criteria – the detailed design engineer is to complete an analysis with all new pipe sizes and tank outlets confirmed.

The modelling appears to show that minimal to no overland flow based on using the aforementioned retention and detention tank sizes.

2.5.2 R9

2.5.2.1 Rule

This rule applies to at least one of the following developments:

a) Development on sites greater than 2000m^2 involving works that have potential to alter the stormwater regime for the site

b) Development within existing urban areas that increase the impervious area of the site by 100m^2 or more.

Development achieves a minimum of 20% of the site area to be permeable.

2.5.2.2 Compliance

There is approximately 43% pervious area across the site. The landscape architect for the works is to ensure that there is a minimum of 20% pervious area by the completion of the works.

2.5.3 C10

2.5.3.1 Rule

This criterion applies to development that will result in municipal water sensitive urban design infrastructure being handed to the ACT Government.

An operation and maintenance plan is to be endorsed by the ACT Government for the water sensitive urban design assets that are to be handed to the ACT Government.

2.5.3.2 Compliance

As the water sensitive urban design assets are not being handed back to the ACT Government, no operation or maintenance plans have been included as part of this report.

3. Summary

The WSUD requirements have been determined using the Waterways: Water Sensitive Urban Design General Code (21 February 2020). The following WSUD measure are required for the proposed development at Block 3 Section 65, Campbell:

- 3-Star Shower Fittings and Dishwasher Fittings;
- 4-Star Toilets and Clothes Washing Machines fittings; and
- A combined capacity of 200kL of rainwater and retention storage collecting from at least 2,400m^2 of the roof area to be used for all gardens across all 30 of the proposed dwellings.
- 33kL of detention (nominally though 17 SPEL Stormchambers with water depth of 1.35m) is required and is to be fitted with a 12mm diameter orifice plate over the outlet.
- 154kL of reuse tank storage is to be provided.
- It is proposed that a SPEL Stormchambers (or equivalent) to be installed to treat all surface runoff that is not captured by the retention tanks to meet water quality compliance.
- Based on the results of the DRAINS model (which incorporates the 154kL retention and 33kL detention tanks), it is anticipated that there is minimal overland flow for the 1% AEP storm event.
- The pervious area for the block is not to decrease to less than 20% during detailed design and construction phases.

This spread sheet is an online tool for individuals, designers and developers to gauge possible methods of reducing mains water consumption on Multi-unit developments. Please enter ALL the relevant information for your development before using the reduction percentage.

Percentage Reduction =	41%

Indoor information	
Number of bedrooms in the entire complex	94
What is the water rating of the shower heads?	3 Star
What is the water rating of the clothes washing machines?	4 Star
What is the water rating of the dishwashers?	3 Star
What is the water rating of the toilets?	4 Star

Site information	
Site area (m^2)?	25,354
Total Roof area (m^2)?	6,400
Lawn area (m^2)?	3,000
Irrigated garden area (m^2)?	0
Imperveous pavement or driveway (m^2)?	4,600

Rain water tank information	
Are there going to be water tanks installed?	Yes
What is the total size of all the tanks (L)?	200,000
What is the total roof area flowing into the tanks (m^2)?	2,400
What will be the use for the water in the tanks?	Garden

Grey Water information	
What type of grey water system is installed?	None
What is the size of the grey water storage tank (L)?	0
Where will the grey water be collected from?	
What will be the use for the grey water?	

Pool, Spa or Pond information	
Is there going to be a pool, spa, or pond?	No
Is there going to be a cover on the pool or spa?	No
Average depth of the pool, spa or pond (m)?	0
Average length of the pool, spa or pond (m)?	0
Average width of the pool, spa or pond (m)?	0
The volume of the pool, spa or pond is (L) =	0