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CONCEPT WATER CYCLE MANAGEMENT REPORT

for

Proposed Industrial Development

at

21 TATHRA STREET, WEST GOSFORD

Job No: NL182999
Revision: B
Date: 08/08/19

	BY	DATE
Prepared	RS	18/06/19
Checked	DH	21/06/19
Admin		

1. INTRODUCTION

Northrop Consulting Engineers Pty Ltd has been engaged to undertake conceptual stormwater management design for the proposed development at 21 Tathra Street, West Gosford (Lot 2 in DP809109).

The purpose of this report is to summarise the proposed design solutions for the stormwater management for a Development Application submission to Central Coast Council. The proposed design has been considered with regard to Central Coast Council's DCP (Gosford 2013), in particular Chapter 6.7 – Water Cycle Management, Water Cycle Management Guidelines as well as industry best practice.

We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions commensurate with a conceptual design suitable for Development Application assessment. This report should be read in conjunction with the concept engineering plans NL182999_C1.1 to C10.1.

2. SITE DESCRIPTION

The site is bound by Tathra Street to the north, industrial developments to the south and to the east, and undeveloped land to the west. Figure 1 shows an aerial image of the site reflecting its current state.

Figure 1: Aerial Image of Site Location

The site is currently in an undeveloped state consisting of sparse vegetation. The topography of the site has a significant slope from the south towards the Tathra St road frontage. Levels on site range from RL20.5 to RL2.8 AHD with surface grades in the order of 3% to 50%.

3. PROPOSED DEVELOPMENT

The proposed development comprises of a number of site facilities with hardstand and circulation areas which occupy the majority of the site footprint. The development of the site generally comprises of the following:

- Site office, amenity facilities and storage sheds;
- Hardstand storage areas with a circulation ring road.
- 12 carparking spaces including a single disabled parking space & shared zone.

The layout of the proposed development has been illustrated in the concept engineering plans appended to the rear of this report.

4. PROPOSED STORMWATER MANAGEMENT STRATEGY

4.1 GENERAL STRATEGY

The onsite stormwater management system has been designed to replicate the processes which would occur naturally on site. The proposed development will incorporate a number of devices and measures aimed at providing adequate and responsible management of stormwater runoff for minor and major storm events.

In line with Chapter 6.7 of Central Coast Council DCP (Gosford 2013), the conceptual stormwater management strategy has considered the following items which will be discussed in the following sections of this report:

- Minor/Major stormwater disposal;
- Water conservation;
- Stormwater retention;
- Site Water Balance;
- Stormwater quality;
- Onsite detention;
- Local overland drainage;
- Flooding.

4.2 MINOR/MAJOR STORMWATER DISPOSAL

Concept stormwater management plans have been prepared for the proposed development and are appended to the rear of this report. The design comprises of a pit and pipe network designed to convey stormwater runoff for storm events up to the 5% AEP with the provision to convey runoff for up to the 1% AEP as overland flow.

The site was separated into two catchments for drainage purposes. The upstream catchment which is non-operational for the facility consists of pervious landscaping batters which will be intercepted and conveyed to the drainage outlet, bypassing the on-site detention facility & treatment devices. The second catchment which is operational for the facility, comprising of the impervious areas of the development will be captured and conveyed to the on-site detention tank via water quality treatment devices to achieve improved treatment efficiency.

Overland flow paths have been provided to convey runoff for major events down the centre of the access road & via the upstream bypass channels along the eastern and western boundaries towards to the Tathra St road frontage. Conceptual layout of the stormwater system is shown on the engineering plans appended to the rear of this report. Detailed design of the stormwater drainage system will be provided prior to Construction Certificate.

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Table 2 – Required Water Quality Reductions

Pollutant Criteria	Required Reduction Target (%)
Total Suspended Solids (TSS)	80
Total Phosphorous (TP)	45
Total Nitrogen (TN)	45
Gross Pollutants	90

The performance of the proposed stormwater management strategy was assessed against these targets using the conceptual design software MUSIC (Version 6). The MUSIC model was developed using parameters recommended in the document "NSW MUSIC Modelling Guidelines" (WBM, 2015) and Central Coast Council MUSIC Link.

The total catchment area was split into sub-catchments representing the areas draining to the different treatment devices. A schematic of the MUSIC model is provided in Figure 2.

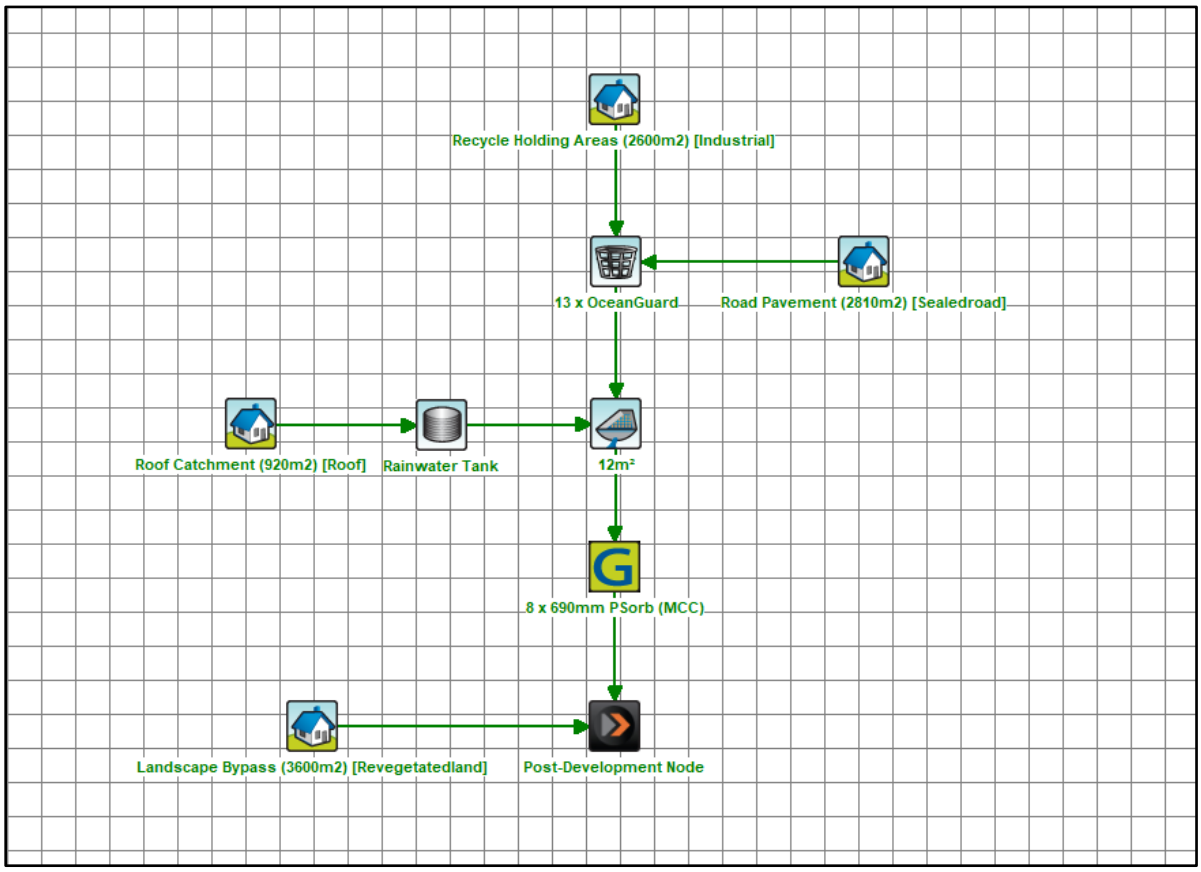

Figure 2 – MUSIC Model Schematic

A number of factors were identified in order to select the most appropriate stormwater quality improvement devices (SQUIDs). The proposed development footprint and usage was considered especially significant to this design which eliminated a number of effective treatment options. In addition to the practical constraints, the maintenance, operability and aesthetics were also considered.

The proposed treatment train incorporates:

- Primary treatment via a rainwater harvesting tank and proprietary pit filter inserts; and
- Secondary treatment via a proprietary filter cartridge device.

The following is a summary of the water quality treatment devices that have been utilised in the proposed treatment train. The modelling parameters used can be found in the MUSIC Link report appended to the rear of this report.

- **Rainwater Harvesting Tank** – Runoff from roof areas is to be directed to an above-ground rainwater harvesting tank. The tank is to be fitted with a proprietary first-flush device which will effectively remove dead insects, bird and animal droppings and concentrated tannic acids from the stormwater system. The rainwater tank will also provide secondary treatment by acting as an initial sediment trap, collecting suspended solids and nutrients attached to those sediments. The volume collected in the harvesting tank is to be reused as described previously in this report.
- **OceanGuard Pit Insert –** Pit filter inserts are proposed to provide primary treatment for the hardstand and carparking areas. The filter inserts will prevent ingress of gross pollutants into the stormwater system.
- **StormFilter Cartridge** – The inlet to the below ground detention storage will connect to a treatment chamber fitted with Stormfilter cartridges. These filters are designed to remove hydrocarbons, fine suspended solids and nutrients from entering downstream waterways.

Source node have been adopted from the NSW MUSIC Modelling Guideline (BMT WBM, 2015) along with Appendix D - Water Sensitive Urban Design – Concept Design Tools from the Central Coast Councils Civil Works Design Guidelines. Treatment nodes have been adopted from Ocean Protect. The MUSIC modelling results for the above-mentioned treatment strategy are shown below in Table 3.

Table 3 – MUSIC Modelling Results

Pollutant Criteria	Reduction Target (%)	Sources (kg/yr)	Residual Load (kg/yr)	Achieved Reduction (%)
Total Suspended Solids (TSS)	80	1760	229	87
Total Phosphorous (TP)	45	3.07	1.02	66.7
Total Nitrogen (TN)	45	17.9	9.59	46.4
Gross Pollutants	90	170	0	100

Note: The MUSIC model can be provided to Council upon request.

Table 3 shows that the proposed stormwater quality management strategy will achieve the required load reduction targets. A copy of the MUSIC Link report has been appended to the rear of this report.

4.7 ONSITE DETENTION

In accordance with Central Coast Council Civil Design Guidelines, on-site detention will be required to limit post development flows from the proposed development site to less than or equal to pre-development flows for all storm events up to and including the 1% AEP storm event. Runoff from the proposed development was modelled using the runoff routing software DRAINS incorporating an on-site detention facility. This was compared to the pre-developed site in its existing state with an impervious percentage of 0% (Greenfield site).

The ILSAX hydrological model in DRAINS was used to generate runoff hydrographs for the pre-developed and post-developed site. Data from the Bureau of Meteorology (BOM) was used to generate design storms. Runoff parameters were selected to replicate the site conditions that will be present in the post-developed case and that which currently occur in the pre-developed case. A summary of parameters used for the model are shown below:

Impervious depression storage	= 1 mm
Pervious depression storage	= 5 mm
Time of concentration (pre)	= 5 minutes
Time of concentration (post)	= 5 minutes

Soil type = 2.5

Storm durations ranging from 5 minutes to 180 minutes were investigated for each of the design storm events that were analysed for a site area of 0.95 ha. The pre-developed site was modelled as being 0% impervious, replicating the current land use conditions with the post developed site containing 57% fraction impervious area.

The post developed site was broken into multiple catchments to replicate the drainage network onsite. The size of the catchment which will be detained in a below ground tank is 5 100 m^2 with a bypass catchment of 4 400 m^2. A schematic of the DRAINS model is presented in Figure 3.

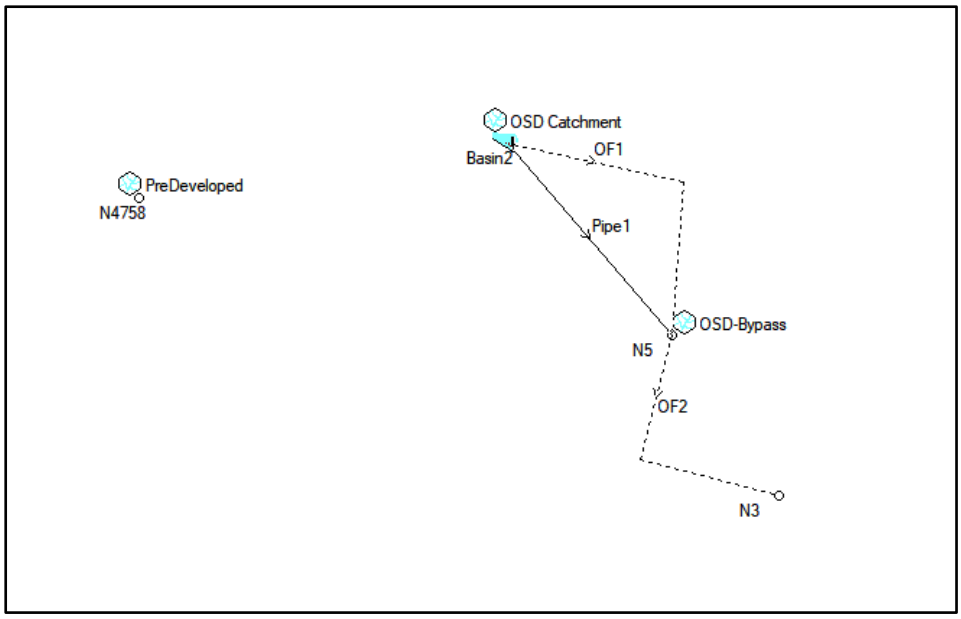

Figure 3 – DRAINS Model Schematic

It is proposed that a below ground on-site detention tank with an effective storage volume of 73m3 is provided for the development. The discharge controls consist of a 265 mm diameter orifice plate with a high-level overflow discharge chamber.

A comparison between the pre-development and post-development flows from the site for the critical storm duration for each of the design storm events, up to and including the 1% AEP is presented below in Table 4.

Table 4: DRAINS output comparing pre-development and post-development flows

AEP	Pre-Developed Peak Flow (m^3/s)	Post-Developed Peak Flow (m^3/s)
1%	0.567	0.561
2%	0.465	0.393
5%	0.386	0.306
10%	0.296	0.253
5%	0.206	0.199

As shown in Table 5, the peak post-development flows for storm events up to the 1% AEP have been detained to less than that for the pre-development site. Confirming the OSD provided will achieve the design intent to limit post-development flows to that of the pre-development state.

A copy of the DRAINS electronic data file can be made available upon request.

4.8 LOCAL OVERLAND DRAINAGE

Overland flow paths within the site will be provided along the western and eastern boundaries to convey overland from the upstream catchment towards the Tathra Street road frontage. Similarly, an overland flow path with be provided along the central circulation road to convey flows towards the Tathra Street road frontage.

4.9 FLOODING

Review of the Updated Narara Creek Flood Study (Golder,2018) identifies the hydraulic categories of the flood impact of the site and is shown in the figure below:

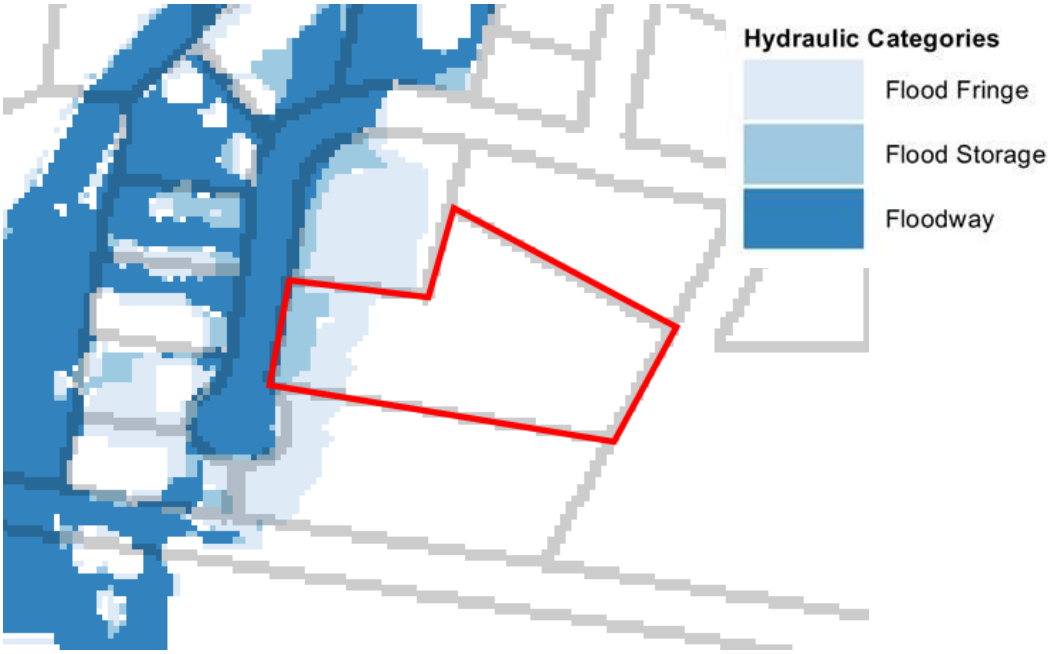

Figure 4 – Flood Categories (Golder, 2018)

A small portion of the site is proposed to be filled within the flood fringe and flood storage areas. This small amount of filling in this area is expected to have only a very minor impact on the flooding behaviour when assessed for the whole Narara Creek catchment.

The 1% AEP flood level for the site is RL3.67 AHD as advised by Central Coast Council in the Record of Pre-Development Advice (dated 12/12/18). The minimum floor level for all structures has been set to the flood planning level of RL4.17m AHD. The lowest level of the carparking areas was set to RL3.47m AHD to ensure the maximum depth does not exceed 200mm in the 1% AEP flood.

Discussions between Northrop and Council's Engineering Assessment team concluded that additional flood studies and assessment beyond that already performed were not considered necessary for the proposed development.

5. CONCLUSION

The proposed stormwater management design presented above has been prepared to comply with Central Coast DCP Chapter 6.7 as well as industry best practice. The design philosophy is based on the principle of at source treatment, to reduce conveyance infrastructure and manage water quantity and quality aspects

At a concept level the system has been designed to cater for frequent and infrequent storm events.

Based on the above, our investigation and concept designs indicate the proposed development can adequately managed and address all items surrounding stormwater runoff. Should you have any queries, please feel free to contact the undersigned on (02) 4365 1668.

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References:

Central Coast Council, Civil Works Design Guideline – Volume 1, August 2013

BMT WBM Pty Ltd, New South Wales MUSIC Modelling Guidelines, August 2015

Engineers Australia, Australian Runoff Quality – A Guide to Water Sensitive Urban Design, 2006

Central Coast Council, Water Sensitive Urban Design – Technical Guideline No 3. – Device Selection Guide, November 2010

Golder, Updated Narara Creek Flood Study - 2018

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APPENDIX A – SUPPLEMENTARY INFORMATION

- MUSIC Link Report
- Concept Engineering Plans