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CNR Bridgeman Road & Glass Parade, Hunterview Village

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1. INTRODUCTION

Northrop Consulting Engineers Pty Ltd has been engaged to undertake conceptual stormwater management design for the proposed commercial development at the corner of Bridgeman Road and Glass Parade, Wattle Ponds.

The purpose of this report is to summarise the proposed design solutions for the stormwater management for a Development Application submission to Council. The proposed design has been considered in light of Singleton Council's DCP 2014, Development Engineering Design Specifications 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.

2. SITE DESCRIPTION

The subject site is bound by Bridgeman Road to the west, Glass Parade to the south, riparian zone to the east and single residential dwelling to the north. Figure 1 below shows an aerial image of the site reflecting its recent state.



Figure 1: Aerial Image (Singleton Council 2015)

The topography of the site has a dominant gradient falling from the northern side of the site to the southern side in the order of 5%. Levels on site range from approximately RL51.0m to RL63.0m AHD.

The vegetation coverage of the site in its current state is predominantly short grass. No buildings or structures are present on the site. A series of cut off swales have been constructed by the previous land owner to manage stormwater runoff.

At the time of preparing this report, geotechnical information had not been available. However it is presumed that the subsurface profile will be dominated by a topsoil layer underlain by natural clays and isolated areas of imported fill material.

3. PROPOSED DEVELOPMENT

The proposed development footprint will occupy the majority of the site area except for a parcel at the northern end of the site. The development generally consists of:

- New Woolworths store and specialty stores;
- Loading dock on the eastern side of the site;
- On grade carparking;
- Vehicle access to/from Glass Parade and vehicle exit to Bridgeman Road.

The layout of the proposed development has been illustrated in the concept engineering plans contained in Appendix A of this report.

4. STORMWATER MANAGEMENT PHILOSOPHY

4.1 GENERAL PHILOSOPHY

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.

In line with Singleton Council DCP 2014 the conceptual stormwater management strategy has considered the following items which will be discussed in the following sections of this report:

- Water Conservation and Reuse;
- Stormwater Quality;
- Onsite Detention.

4.2 WATER CONSERVATION AND REUSE

Runoff from 1200m² of the the proposed roof will be directed to a 20kL below ground rainwater harvesting tank. Harvested rainwater will be re-used onsite for irrigation of landscape areas and hardstand wash down.

In addition to the rainwater tank, it is also proposed that the development will incorporate the following initiatives to reduce potable water demand:

- Using AAA+ efficient taps, hoses and fittings and undertaking regular maintenance of these fixtures;
- The use of 4.5/3 dual flush toilet cisterns;

- Landscaping with plant species that require minimal watering and irrigation with appropriate systems to minimise water loss and evaporation. This includes native plant species, using mulch around garden beds, avoiding watering when it's windy, watering during the coolest parts of the day and using drip irrigation.

4.3 STORMWATER QUALITY

The stormwater quality of the proposed development was modeled using MUSIC computer software. The purpose of the analysis was to confirm that the stormwater treatment devices incorporated into the development reduce pollutant load to the target levels outlined in Singleton Council DCP.

In general, treatment devices on site have been incorporated within the stormwater system such that they form a treatment train to treat stormwater runoff prior to discharge off site. Individual stormwater quality devices and mechanisms incorporated within the development will treat runoff for different pollutant types and sizes. Details of these devices are shown on the attached drawings. The input parameters for each of these devices were selected in accordance with the document 'Draft NSW MUSIC Modelling Guidelines' prepared by BMT WBM Pty Ltd and manufacturers specifications. The treatment devices designed within the development as shown on the engineering drawings are outlined below:

- Runoff from the roof of the building will be captured and directed to the internal pit and pipe stormwater drainage network;
- Surface runoff from the carpark and landscape areas will be captured and conveyed by the internal pit and pipe stormwater drainage network;
- The pit and pipe drainage network will discharge through a Humes Muliceptor device that is a hydrodynamic separator designed to treat stormwater by removing hydrocarbons and fine sediments through gravity separation and flotation;
- Discharge from the Multiceptor will be conveyed to the below ground on-site detention tank and then through a Humes Jellyfish device. The Jellyfish is a polishing device designed to capture stormwater pollutants including fine sediments, nitrogen, phosphorous copper and zinc.

A schematic layout of the MUSIC model incorporating the above mentioned treatment devices is shown below in Figure 2.



Pollutant	Target Reduction	Source Annual Load (kg/yr)	Residual Annual Load (kg/yr)	MUSIC Reduction
Total Suspended Solids	80%	2650	240	90.9%
Total Phosphorous	45%	5.15	1.82	64.7%
Total Nitrogen	45%	30.2	13.8	54.4%
Gross Pollutants	100%	331	13.4	96% ^{Note 1}

Note 1: Due to the site topography and existing road levels of Glass Parade, there is a small portion of the site at the main vehicle entry that is not captured by the internal stormwater system and therefore does not undergo water quality treatment via the proposed treatment train. This uncontrolled catchment results in the system not achieving a 100% reduction in gross pollutants as required by Singleton Council DCP. We note however that this uncontrolled area drains directly to the street drainage system that has an independent treatment system for gross pollutants, which will provide the require gross pollutant treatment for the area. On this basis we consider that the small shortfall in meeting the treatment targets to be acceptable.

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4.4 ONSITE DETENTION

In accordance with Singleton Council DCP2014, 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 durations for the 5, 20 and 100 year ARI 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 current state.

For the purpose of the model, the site was divided into 4 sub-catchments. The 4 sub-catchments that represented the site are:

- Roof area (5,400m²);
- Carpark, loading dock and landscaping areas (9,500m²);
- Bypass area for main vehicle entry and Glass parade landscape strip (2,300m²);
- Northern parcel of land not forming part of the development. Note that this area bypasses the stormwater system and does not form part of the DRAINS model.

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:

Site area	17,700m ²
Pre-developed fraction impervious	0.0
Post-developed fraction impervious	0.8
Impervious depression storage	1 mm
Pervious depression storage	5 mm
Time of concentration	6 minutes
Soil type	3
Antecedent moisture condition	3

Table 2: DRAINS input data

A schematic of the DRAINS model for the site indicating the individual catchments and OSD facility is shown below in Figure 3.

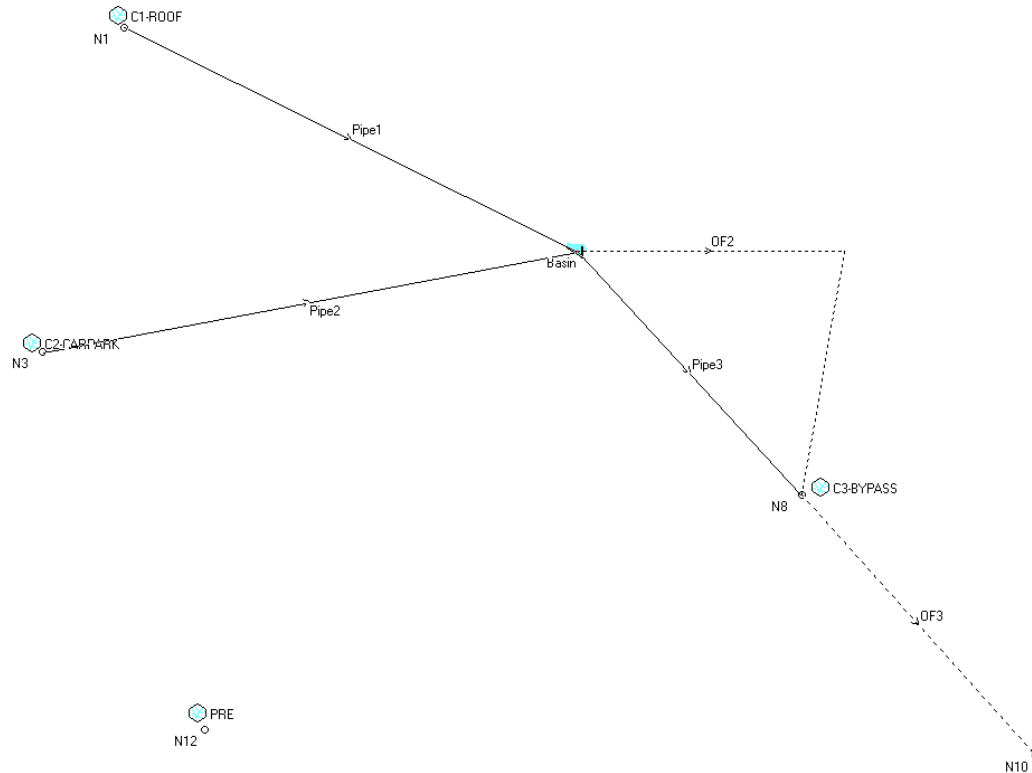


Figure 3: DRAINS model schematic

The proposed OSD facility incorporated 110m³ of below ground storage and 140m³ of above ground storage in the loading dock area.

Storm durations ranging from 5 minutes to 270 minutes were investigated for each of the design storm events that were analysed. A comparison between the pre-development and post-development flows from the site for each of the design storm events, for the 5, 20 and 100 year ARI storm incorporating is presented below in Table 3.

Storm Duration	ARI					
	5 Year		20 Year		100 Year	
	Pre (L/s)	Post (L/s)	Pre (L/s)	Post (L/s)	Pre (L/s)	Post (L/s)
5 min	162	96	283	230	535	328
10 min	241	216	451	299	699	479
15 min	282	240	544	333	802	543
20 min	335	266	547	380	770	560
25 min	391	288	624	424	766	582
30 min	351	258	563	378	709	544
45 min	265	228	433	300	608	450
1 hr	259	248	504	348	651	514
1.5 hr	400	255	550	367	697	531
2 hr	348	241	551	334	701	492
3 hr	191	188	279	247	369	320
4.5 hr	171	162	261	214	341	284

Table 3: DRAINS output comparing pre-development and post-development flows

5. CONCLUSION

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

D. Hall

References:

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Limitation Statement

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APPENDIX A – SUPPLEMENTARY INFORMATION

- Concept Sediment & Erosion Control Plan
- Concept Sediment & Erosion Control Details
- Concept Stormwater Management and Levels Plan - Sheet 1
- Concept Stormwater Management and Levels Plan - Sheet 2
- Concept Stormwater Management and Levels Plan - Sheet 2
- Civil Details - Sheet 1