Costin Roe Consulting

Value in Engineering and Management

Stormwater Management Plan

Proposed K Mart Facility
Lot 2, DP 1149138
Eastern Creek Business Park – Stage 3
Proposed Road 4, Eastern Creek

Prepared For:
Australand Commercial & Industrial Division
Level 3, 1c Homebush Bay Drive
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1 INTRODUCTION

Australand Holding Ltd proposes to erect an industrial warehouse facility for K Mart consisting of a large single level warehouse and ancillary offices on a site located adjacent to Proposed Access Road 4, in the Eastern Creek Business Park - Stage 3, Eastern Creek.

1.1 Background

The site occupies an approximate area of 10 hectares and is bounded by the Access Road 4 to the west, the Access Road 1 to the north-east, and currently undeveloped lots to the north, east and south. Currently stormwater runoff from the site flows in two main directions towards temporary basins in the east and west of the site.

The proposed development comprises of one large single level warehouse. Truck hardstand is located to the north, east, south and west of the warehouse, with car parking located to the west of the warehouses.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Australand Commercial & Industrial Division Pty Ltd to prepare this report in support of a proposed Application for Development to be lodged over the site.

The report provides a summary of the design principles and planning objectives for stormwater management for the project. It should be noted that drawings developed for this report are conceptual only, and not a detailed design. Details provided are subject to adjustment as the design is developed to completion.

1.3 Authority Jurisdiction

The site falls within the boundaries of Blacktown City Council and are therefore is the authority responsible for the processing of development applications.

1.4 Discharge from Development Sites

All sites within Stage 3 of the Eastern Creek Business Park (Stage 3 Estate) discharge stormwater to the in-ground stormwater drainage system designed and documented by Henry & Hymas Consulting Engineers. The stormwater is then conveyed to the estate detention/bio-retention basins which have been provided as part of the estate development works.

For this purpose, all sites have been provided with stormwater connection points. This allows all sites to discharge directly to the underground system.

2 HYDROLOGY

2.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Blacktown City Council Engineering Guide for Development, Blacktown City Council Stormwater Quality Control Policy and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1987 Edition), Volumes 1 and 2 (AR&R).

2.2 Major System Design

The piped stormwater drainage system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths which will convey all stormwater runoff up to and including the Q100 event have been provided which will limit major property damage and any risk to the public.

2.3 On-site Detention/ Estate Drainage

Blacktown City Council, in common with many other local authorities in the Sydney region, limit the runoff discharged from private property into the underground piped drainage system.

As part of the development of the Stage 3 Estate two trunk detention basins have been provided such that the runoff from all lots within the Stage 3 Estate are attenuated to less than the pre-development flows. Accordingly these detention basins result in no on-site detention systems being required for individual sites within the Stage 3 Estate, therefore no on-site detention is proposed for this building development.

The proposed development involves the consolidation a number of proposed sites of the approved Stage 3 Estate subdivision. The proposed concept for this development remains consistent with the approved concept with 40% of the site being drained to the east, discharging into Basin 1 and 60% of the site discharging to Basin 2.

2.4 Runoff Models

In accordance with the recommendations and standards of Blacktown City Council, the calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS.

3 HYDRAULICS

3.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

The design parameters for the DRAINS model are to be based on the recommendations as defined by Blacktown City Councils Engineering Guide for Development 2005 and are as follows:

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 1: DRAINS Parameters

3.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground level, for the peak runoff from the Major System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

3.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

3.4 Roadway Drainage

The spacing of inlets along the roads will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the roadway kerb (150mm above gutter invert).

A preliminary layout of piped stormwater drainage for the site has been prepared and is included in the Appendix C to this report (Drawing CO10726.01-C40 to CO10726.01-C45).

3.5 Overland Flow

The piped system has been designed to convey all storms up to and including the 20-year ARI. Dedicated flow paths have been shown which will convey stormwater from the site to the estate road system and to the trunk detention basins.

4 WATER QUALITY CONTROLS

4.1 Regional Parameters

There is a need to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by the Blacktown City Council Stormwater Quality Control Policy (BCCSQCP).

The development type can be classed as Industrial/Commercial, this results in the following treatment priority and retention criteria as per the BCCSQCP.

Priority	Pollutant	Description	Retention Criteria for Development Site
1	Fine Sediment	Contaminant particles 0.1mm or less	50% of the total annual load
2	Hydrocarbons, Motor oils & grease		Whichever is greater: 1. 90% of the total annual load; or 2. Total discharge from site of total Petroleum Hydrocarbons (TPH) <10mg/L at all times.
3	Gross Pollutants	Trash litter and vegetation larger than 5mm	90% of the total annual load
4	Coarse Sediment	Contaminant particles between 0.1mm and 5mm	80% of the total annual load
5	Nutrients	Total phosphorous and total nitrogen	45% of the total annual load for each nutrient

Table 4.1: Pollution Retention Criteria

As the development is more than 5 hectares, therefore all objectives are required to be treated to the standards as cited above as per the BCCSQCP.

4.2 Proposed Stormwater Treatment Measures

As has previously been discussed the catchment of this site within the Stage 3 Estate drainage system is serviced by 2 detention basins. The purpose of these basins is to attenuate the flow from the developed estate to that which is equal to or less than the pre-developed flow.

The drainage system for the site is to be designed as a split system, that is a roof drainage system and a hardstand drainage system.

Roof water drainage will be treated through a first flush system with the first flush being defined as the first 5mm of a rainfall event. Polluted water contained in the first flush will be diverted through the first flush break-pit to a storage area which is sized appropriately for each catchment utilising a rate of 0.5L/m^2 roof area. Following the first flush rainfall, clean roof water will then discharge directly through the stormwater system to the outlet points.

Rainwater re-use will also be performed on the site with 20% of the roofwater being directed to two 100kL rainwater re-use tanks located on the eastern side of the facility. Smaller 5kL rainwater tanks will also be positioned on adjacent to receiving offices on the north-east and south-east corners of the facility.

Hardstand and car parking drainage systems are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the catchment area of the hardstand only. The STM's for the site shall be based on a treatment train approach to ensure that all of the objectives as defined above are met.

Components of the treatment train for hardstand areas are as follows:

- Pits are to have grated pit covers which will not allow large litter objects from entering the stormwater system;
- bio retention swales along the northern and southern boundaries; and
- A water quality device utilising syphon-actuated filtration system will be located in the north-eastern corner of site.

Components of the treatment train for car parking areas are as follows:

- Bio-retention swales will be located along the western boundary line.

The above noted STM's will provide treatment in the following manner:

- Grated Pit Covers - Gross pollutants and litter are trapped by the grated pit covers
- Bioswales - Gross pollutants or litter that pass through the pit covers would be trapped by the bio retention swales. The bio retention will retain gross pollutants, coarse sediments, a percentage of Hydrocarbons motor oils & grease and some fine

sediment, any dissolved nutrients, remaining coarse sediments, fine sediments and remaining Hydrocarbons motor oils & grease would be discharged to the filtration unit.

- Siphon-actuated filtration system – The filtration system is to consist of a 48 cartridge (69cm) Stormwater 360 filtration device. This system is able to be customised through the specification of its filter media to effectively target pollutants that are required to be retained. The filtration unit will mainly target fine sediments, nutrients and hydrocarbons (motor oils & grease), that is Items 1, 2 & 5 from Table 2.

Through the use of the STM's in the treatment train and the tertiary treatment action of the detention/bio-retention basin, the pollution retention criteria for the site as defined in *Table 4.1* is able to be achieved on an overall site basis.

4.3 MUSIC Modelling

Water quality modelling using the software MUSIC has been undertaken to measure the effectiveness of the STM's. A diagram of the model is located in **Appendix B**.

Pollutant loads for industrial areas are provided in BCCSQCP. This information was used to create the source nodes used in the MUSIC model for paved and hardstand areas.

Table 4.2: MUSIC analysis results

	Source (kg/yr)	Residual Load (kg/yr)	Reduction (%)	Target Reduction (%)
Total Suspended Solids (Coarse & fine sediments)	22000	1770	91.9	80
Total Phosphorus	36.9	9.43	74.4	45
Total Nitrogen	151	86	43	45
Gross Pollutants	1320	7.86	99.4	90

It can be seen from the results of the MUSIC analysis that the proposed STM's generally reduce the pollutants present in the collected run-off well below accepted reduction levels, before discharging to the estate drainage system. We note that the reduction of Total Nitrogen is slightly less than the target reduction level of 45%, however we consider that the overall water quality scheme proposed for the site to be consistent with the BCCSQCP and the difference to be marginal.

Stormwater from roofed areas will be treated through a first flush system which cannot be effectively modelled in the MUSIC model due to the continuous manner in which pollutants loads in the model are generated. Pollutant loads from a roof in the real-life

situation will be negligible following the first flush event and for this reason the roofwater has been omitted from the MUSIC model.

4.4 Maintenance And Monitoring

The STM's are to be inspected at 3 month intervals for the first year of operation and at 4 month intervals for the second year of operation, details of the type and amount of pollutants are to be logged, with the details kept on site. Upon completion of the first two years of operation a maintenance schedule will be able to be established based on the recommendations of the manufacturer and the logged data, with cleaning and removal of trapped pollutants from the devices occurring at a maximum time of 6 month intervals.

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

Co10726.01-C10 THROUGH Co10726.01-C81

Appendix B

MUSIC MODEL SCHEMATIC