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ENGINEERING REPORT
PROPOSED WOOLWORTHS
11-13 PERCY STREET, AUBURN, NSW

State Significant Development Application

Revision 03
DECEMBER 2020

Our Job No. 19513

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1. INTRODUCTION

1.1. General

This report has been prepared in response to the Secretary's Environmental Requirements (SEARs) in relation to flooding and stormwater drainage for the proposed development.

The report will address the issues raised in item number 08 under Soil and Water works of the SEARS.

The issues related to drainage include:

- measures to minimize operational water quality;
- methods of drainage without impacting on the downstream properties;
- impacts on the development on water quality and on hydrology.

The subject site is located within the Haslams Creek catchment which runs along the eastern boundary of the site. The locality sketch of the site is shown in Figure 1 below.

Figure 1 - Locality sketch

The proposed site infrastructure works, including hardstand pavement areas and stormwater drainage, will be designed to comply with the principles outlined in Council's guidelines.

The following items have been addressed in this report;

- Stormwater management design
- Stormwater quality and quantity
- Stormwater quality units' maintenance schedule
- Sediment and erosion control
- Site water balance
- Site bulk earthworks

The purpose of this report is to provide an overview of the various Engineering issues that relate to the site and how these issues have been addressed. The main aim of the attached documentation is to demonstrate the intent of the proposed development in terms of design proposals.

A set of Civil drawings for DA approval are intended to be read in conjunction with this report to demonstrate the design intents outlined below.

1.2. Engineering objectives

The engineering objectives are to provide an engineering design which is compliant with the operational requirements of the facility whilst maintaining adequate stormwater quantity and quality controls in accordance with Council's requirements.

1.3. Engineering principles

The following principles have been adopted as part of the design process:

- Consideration of design intent in relation to functionality and expectations and requirements of end user
- Compliance with relevant Council and authority standards and policies
- Design coordination with consultant team
- A design philosophy sympathetic to the terrain and landform
- Consideration of impact on existing infrastructure in terms of available capacity

1.4. The site and its context

The existing site is located in the Sydney metropolitan suburb of Auburn and is approximately 3.5ha in area. It is bounded by Percy Street along the north-western boundary, it is surrounded by commercial and industrial premises along the north-eastern and south-western sides, while the south-eastern side is bounded by the Haslams Creek.

The site is currently mostly impervious and occupied by an industrial development; it appears as though there are no water quality or quantity measures provided for the existing development. Most of the site is occupied by buildings and the surrounding concrete carpark and driveways, at exception of a small strip of landscape along the north-western boundary. The surface of the site generally falls from west to east, from RL 7.50 to RL 4.20 at approximately 1.2%. A valley runs through the middle section of the site, acting as a waterway conveying the overland flood water from upstream towards Haslams Creek.

2. SITE WORKS

2.1. Bulk Earthworks

The site will be subject to fill by approximately 600mm in order to raise the floor level of the building to FFL7.80 and the surrounding slab to achieve the proposed levels. Refer to figure 2 for the bulk earthworks plan.

Detailed Bulk Earthworks calculations have been undertaken as part of the DA design phase. The documentation has been incorporated as part of the DA submission by showing the proposed finished surface design levels shown on the Civil Engineering plans. These submitted plans and levels were used as the basis for the bulk earthworks calculations. The calculations undertaken revealed that for this site, there is a requirement to import approximately 4328m³ of fill. Refer to figure 3, 4 and 5 for bulk earthworks plan, quantities and section taken from drawings 19513_DA_BE01-BE03.

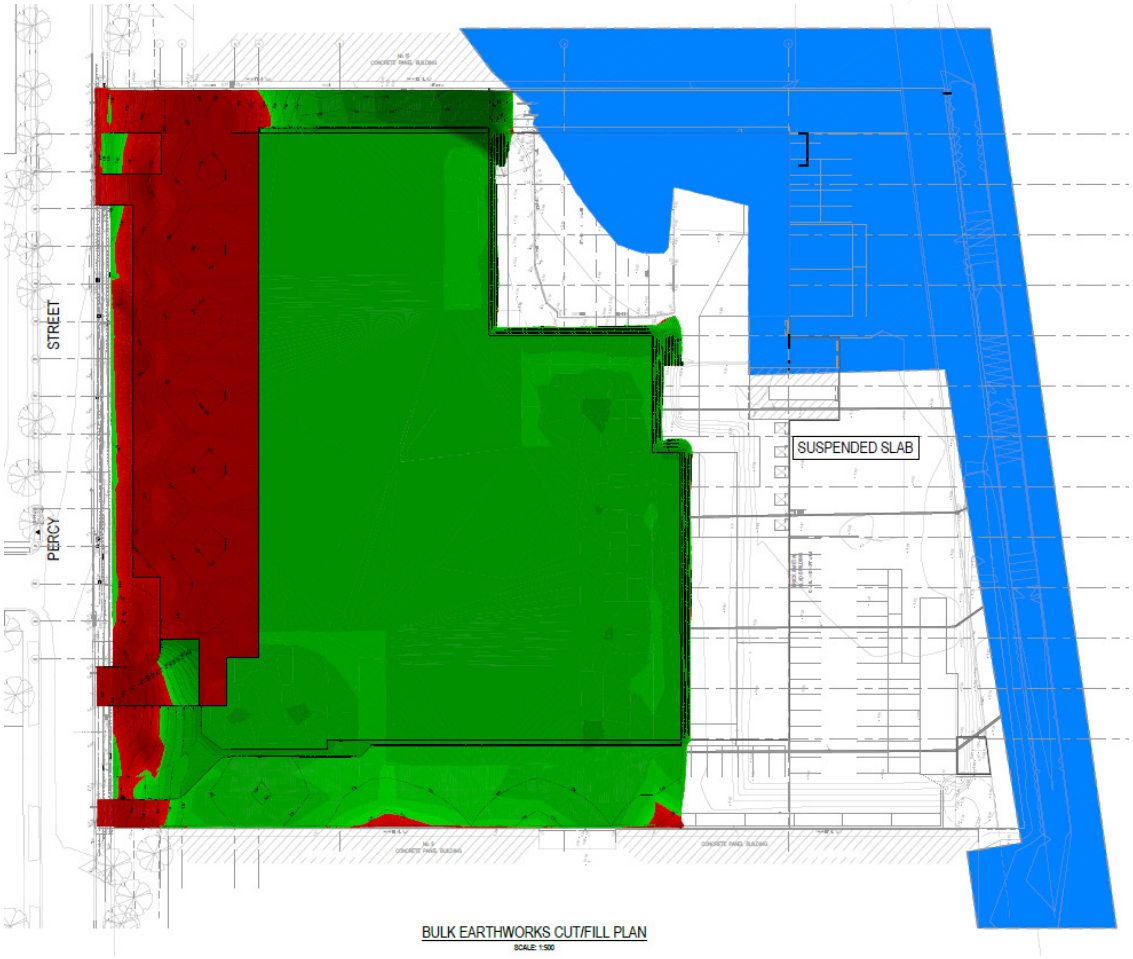


Figure 2 - Bulk Earthworks plan

BULK EARTHWORKS QUANTITIES		
TOTAL AREA (19,045m²)		
CUT	1,892	m³
FILL	6,220	m³
EXCESS OF FILL OVER CUT	4,328	m³
EXCAVATION FOR SERVICE TRENCHES NOT INCLUDED IN CALCULATION		
EXCAVATION FOR RETAINING WALL FOOTINGS NOT INCLUDED IN CALCULATION		
THE VOLUME SHOWN ABOVE HAS BEEN CALCULATED AFTER STRIPPING THE TOP SOIL AND EXISTING CONCRETE AND PAVEMENT AREAS OFF THE EXISTING SURFACE. STRIPPING HAS BEEN ASSUMED AT 150mm FOR TOPSOIL AND LIGHT DUTY PAVEMENT/HARDSTAND. 250mm HAS BEEN REMOVED FROM THE CALCULATIONS FOR THE EXISTING BUILDING SLAB.		

PAVEMENT THICKNESS "INCLUDING BEDDING THICKNESS"		
CARPARK	300	mm
BUILDING	300	mm
FOOTPATHS/HARDSTAND AREAS	150	mm
LANDSCAPING/BATTER AREAS	100	mm

Figure 3 – Bulk earthworks quantities

Figure 4 – Bulk earthworks section

A retaining wall is proposed along approximately half of the northern boundary, where the existing ground level falls down and the proposed slab levels are raised. The wall is proposed to be located 500mm offset from the boundary and be approximately 2m in height.
No batter or retaining walls are proposed within the 20m setback from the stormwater channel at the back of the building.

2.2. Embankment Stability

To assist in maintaining embankment stability (both temporary basin and permanent), batter slopes will be no steeper than 1 vertical to 4 horizontal. Permanent batters are proposed at the edge between the suspended slab and slab on ground for the site.

2.3. Supervision of Earthworks

All geotechnical testing and supervision during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

3. STORMWATER MANAGEMENT

3.1. Introduction

3.1.1. Background

Stormwater controls will be implemented to ensure that the proposed development does not adversely impact on stormwater flows and water quality of the stormwater system downstream of the site.

The principles and operations of the proposed stormwater system for the development, including water quality measures and the components of the internal road drainage system, are detailed on the Development Application Drawings included in Appendix A.

3.1.2. Key Issues

The key issues and the proposed mitigation measures to be implemented as part of the proposed development are:

- **Stormwater Quantity** - The increased impervious surfaces (such as roads, roofs, driveways, etc) associated with the development will result in an increase in peak stormwater flows from the site during storm events. On-site Stormwater Detention (OSD) will be proposed for the development to ensure that runoff from the development is appropriately managed in accordance with Council's requirements. The site stormwater system has been designed to safely convey the flows through the site and within the capacity of the downstream system. The design and operation of the proposed stormwater system is described in Section 3.2 below.

- **Water Quality** - Urban developments have the potential to increase gross pollutants, sediments, hydrocarbons and nutrient concentrations in stormwater runoff. To limit impact on the downstream water quality, water quality measures at source and end of line treatments will be provided. Section 3.3 further describes the specific implementation of these measures for the proposed development.

3.2. Stormwater Quantity

3.2.1. Catchment Description

The subject site is located within the Haslams Creek catchment which runs along the eastern boundary of the site and is approximately 17 square kilometres in area. The land use of the catchment is mainly residential with isolated industrial and commercial land use. Rookwood Cemetery (located on the south eastern side of the catchment) also forms part of Haslams Creek catchment, and divides the Cooks River and Haslams Creek catchments.

Upon development of the subject land, a portion of the catchment will be transformed into relatively flat land and a large portion of the site will have a high imperviousness ratio.
The site is affected by flooding and flood levels have been obtained from Cumberland Council. Refer to the Flood Report for further information.

3.2.2. Existing drainage system

It appears as though the existing development on the subject site does not provide any stormwater quality or quantity (retention) measures. From the information available on the site survey, it is assumed that the front portion of the site is connected via an existing Ø450 pipe and an existing Ø300 pipe that connect into the stormwater system along Percy Street. The remaining back portion of the site discharges to Harlams Creek through a total of five (5) stormwater pipes.

3.2.3. Proposed site drainage system

The drainage system for the proposed industrial development has been designed to collect all concentrated flows from the proposed impervious areas such as roof, forecourt area and car parking areas. The pipe network has been designed to cater for the 20yr ARI storm event. The system has also been designed in such a way that the 100yr ARI will be conveyed via a combination of piped network and overland flow paths. In the event of a total system blockage/failure, site grading is such that overland flow will be directed towards the southern boundary adjacent to the creek. The overland flow paths are shown on the civil drawing in Appendix A.

Even though the site has been found to be flood-affected, an On-Site Detention (OSD) system will still be required for the entire site.
The proposed OSD has been designed to re-use the existing Ø750 pipe as outlet pipe and connection to Harlams Creek in the eastern corner of the site.
In accordance with the site storage requirements outlined in the Auburn DCP, the site is located in Zone 4, hence the permissible site discharge (PSD) and the site storage requirement (SSR) are as per the table below.

	MINIMUM REQUIREMENT
PSD	150 L/s/ha
SSR	325 m³/ha

The proposal is for the site to discharge to one unified (1) detention tank (OSD) located at the back of the site, away from the flood affected zone.

The OSD has been sized based on the Upper Parramatta River Catchment On-site Detention Handbook Third revision, but with the PSD and SSR rates as per Auburn Stormwater Drainage DCP (Zone 4) indicate in the table above. A result of the spreadsheet can be seen in Appendix C.

The total catchment draining to the OSD is 2.8273ha (87.1%), implying that the OSD bypass has been maintained as less than the maximum allowed 15%.
The total area that is proposed to bypass the OSD is 4204m² (13% of the total area). The majority of the bypass area (55%) is made of landscape, while the remaining bypass is made of part of the recessed loading dock at the back of the site and part of the uncovered parking at the front of the building. These areas have been designed to discharge

independently into Harlams Creek via the existing Ø750 pipe in the east corner of the site, and another existing Ø225 pipe upstream along the creek. Refer to the stormwater plans C101 to C104 in Appendix A.

Based on the total area draining to the OSD and the adjustment due to the site bypass, the spreadsheet results in a required OSD volume of 1088m³, with a Ø385mm orifice.

Overall, all the surface water from the site will be discharged in Haslams Creek through two (2) existing outlet pipes.

The proposed OSD plan, sections and details are provided on drawing 19513_DA_C201.

3.3. Stormwater Quality

3.3.1. General

As previously stated, urban developments have the potential to increase gross pollutants, sediments, hydrocarbons and nutrient concentrations in stormwater runoff. To limit impact on the downstream water quality, water quality measures at source and end of line treatments will be provided. This section describes the specific implementation of these measures for the proposed development.
Water quality measures will be implemented for the site are described in Section 3.2.1 of this report. This will be to ensure that stormwater runoff is treated sufficiently prior to discharge to the downstream stormwater system.

The water quality modelling software program MUSIC has been used to establish the effectiveness of the water quality treatment proposal. MUSIC has been developed by the Cooperative Research Centre for Catchment Hydrology, and is designed as a planning tool for water quality treatment trains for catchment runoff. The model provided for submission and approval is:

- *19513 MUSIC CDS Rev.08*

The program MUSIC is able to model pollutant loads present in stormwater runoff from a catchment and assess the effectiveness of different treatment devices in terms of pollutant load reduction. It also models water reuse via a rainwater tank.

3.3.2. Pollutant loading

The post developed condition of the lots will be industrial as the site is intended to be fully developed. The pollutant load values outlined in the table on the following page were used in the model.

	Roof Areas	Road Areas	Other Impervious	Pervious Area
Impervious Area Properties				
Rainfall Threshold (mm)	1.4	1.4	1.4	1.4
Pervious Area Properties				
Soil Storage Capacity (mm)	170	170	170	170
Initial Storage (% of Capacity)	30	30	30	30
Field Capacity (mm)	70	70	70	70
Infiltration Capacity Coefficient a	210	210	210	210
Infiltration Capacity Coefficient b	4.7	4.7	4.7	4.7
Groundwater properties				
Initial Depth (mm)	10	10	10	10
Daily Recharge Rate (%)	50	50	50	50
Daily Baseflow Rate (%)	4	4	4	4
Daily Seepage Rate (%)	0	0	0	0
Total Suspended Solids Baseflow Concentrations				
Mean (log mg/L)	1.2	1.2	1.2	1.2
Std Dev (log mg/L)	0.17	0.17	0.17	0.17
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	1.3	2.43	2.15	1.3
Std Dev (log mg/L)	0.32	0.32	0.32	0.32
Serial Correlation (R squared)	0	0	0	0
Total Phosphorus Baseflow Concentrations				
Mean (log mg/L)	-0.85	-0.85	-0.85	-0.85
Std Dev (log mg/L)	0.19	0.19	0.19	0.19
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	-0.89	-0.3	-0.6	-0.6
Std Dev (log mg/L)	0.25	0.25	0.25	0.25
Serial Correlation (R squared)	0	0	0	0
Total Nitrogen Baseflow Concentrations				
Mean (log mg/L)	0.11	0.11	0.11	0.11
Std Dev (log mg/L)	0.12	0.12	0.12	0.12
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	0.3	0.34	0.3	0.3
Std Dev (log mg/L)	0.19	0.19	0.19	0.19
Serial Correlation (R squared)	0	0	0	0

3.3.3. Water quality treatment proposal

Stormwater carries pollutants that it has picked up from the surfaces it has come into contact with. This creates a risk of contamination to downstream habitats. A treatment train can be implemented to protect against this risk of contamination. A treatment train consists of more than one mechanism that removes pollution; in our case a series of treatment devices are used. The treatment train is effective because the different treatment devices in series overlap in the pollutants they remove thus providing a more thorough treatment with redundancies along the treatment train.

It has been proposed that there will be three four (4) methods of treatment within the treatment train of the proposed development: a 50kL rainwater tank, a total of 12 pit baskets, a total of 39 filter cartridges and 2 gross pollutant trap (GPT).

The water quality treatment train has been designed to ensure that pollutant removal rates satisfy the requirements in the Cumberland City Council Development Control Plan.
The required percentage reductions are as per the table below:

Pollutant	% TARGET REDUCTION
Gross Pollutants	70
Total Suspended Solids	80
Total Phosphorous	45
Total Nitrogen	45

3.3.4. Rainwater tank

The use of a rainwater tank is an important part of the overall water quality treatment train for the site. It is proposed that a 50kL tank will be supplied to store runoff from various roof areas. An appropriately sized first flush and overflow system will need to be designed and detailed by the hydraulic consultant at CC stage.

3.3.5. Pit baskets

It is proposed to provide pit baskets such as Oceanguard pit baskets or an approved equivalent for some selected grated gully pits within the development. These pit baskets will assist in the water quality treatment for the site by capturing a large portion or gross pollutants, large sediment particles and organic matter that may also contain nutrients.

3.3.6. Filter cartridges

It is proposed to provide Stormfilter cartirdges to improve the quality of stormwater runoff by removing non-point source pollutants, including sediment, oil and grease, soluble metals, nutrients, organics, and trash and debris.

3.3.7. Gross Pollutant Trap

It is proposed to provide a Gross Pollutant trap such as the CDS0506 Nipper to assist in the water quality treatment for the site by capturing gross pollutant, litter, grit, sediment and associated oils where stormwater cannot be treated by pit baskets as they cannot be fitted into pits within the structural slab.

3.3.8. Modelling results

The modelling has been completed with the intention to model the post developed water quality runoff condition and ensure that pollutant removal rates satisfy the requirements set by Cumberland City Council.
As per the water quantity management plan, the water quality follows a similar path by mostly discharging through existing stormwater pipes into Harslams Creek.

The catchment flowing into the OSD is designed to undergo treatment through the Ocean Protect stormfilter cartridges with Psorb filter media, although some pre-treatment is provided through the use of Oceanguard pit baskets or approved equivalent and the two gross pollutant traps such as CDS0506 Nipper upstream of the OSD. Refer to the stormwater plan drawings C101 to C104 in Appendix A for exact locations and details.

The building roof catchment has been modelled to go through a 50kL rainwater tank. Refer to section 3.3.9 for the water balance that has been adopted in the sizing of this tank.
The landscape within the 10m setback from the rear of the property and the landscape along the site frontage have been modelled as bypassing any water quality treatment devices but included in the overall results.
The overall results for the treatment train effectiveness inclusive of all the treatment trains and bypass areas proposed for the site is summarised in Table 1.

Table 1 – Overall site MUSIC results

Pollutant	Sources	Residual Load	Reduction %	Target Reduction %
Total Suspended Solids (kg/yr)	3710	740	80.1	80
Total Phosphorus (kg/yr)	7.43	2.78	62.6	45
Total Nitrogen (kg/yr)	51.7	28.1	45.6	45
Gross Pollutants (kg/yr)	584	0.00266	100	70

As shown by the table above, the treatment train has been successful in achieving the Council pollution retention criteria. Refer to the MUSIC screenshot below for the general treatment devices arrangement (Figure 5).

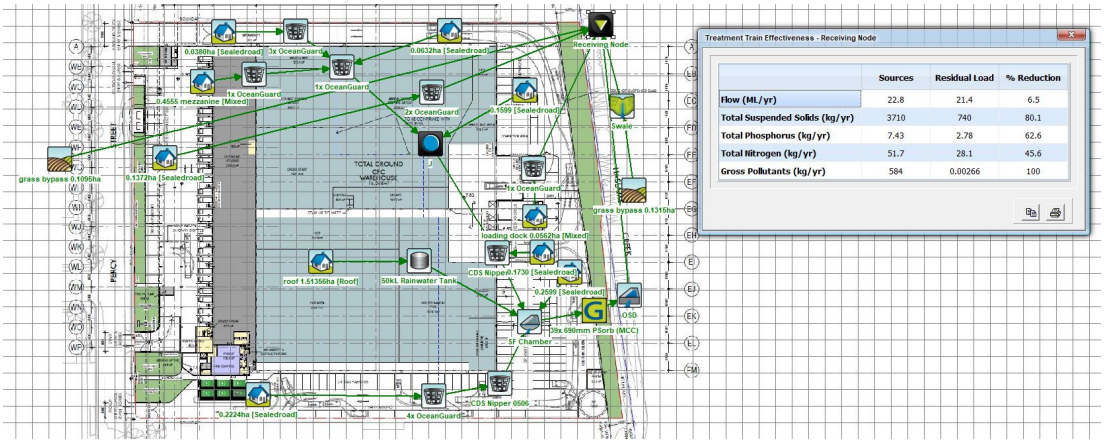


Figure 5 - MUSIC modelling results

3.3.9. NorBE Criteria

The State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (SEPP) requires proposed developments to have a neutral or beneficial effect on water quality (NorBE). To ensure that a development and its associated treatment measures have a neutral or beneficial effect on water quality the pollutant loads before and after development are compared to meet a series of criteria set by WaterNSW.

The modelling has been completed with MUSIC, with the intention to model the pre-developed water quality runoff conditions and compare it to the post-development runoff after the proposed treatment devices.
The result of the simulation proved to be positive in that, not only was there a neutral impact but beneficial, due to the fact that there is a further reduction in pollutant load runoff. Figure 6 shows the pollutants loading in the pre-development state and the table below shows how the pollutant loads in the pre and post scenarios compare to one another.

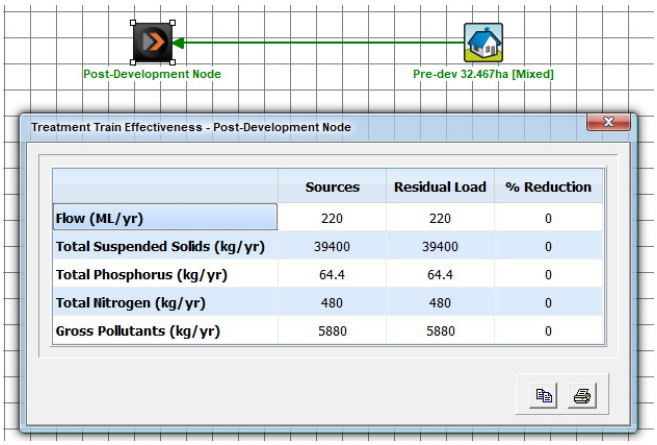


Figure 6 - Pre-development modelling result

Table 1 – Overall site MUSIC results

Pollutant	POST-Developed Residual Load	PRE-Developed Residual Load	Reduction %
Total Suspended Solids (kg/yr)	3710	39400	90.6
Total Phosphorus (kg/yr)	7.43	64.4	88.5
Total Nitrogen (kg/yr)	51.7	480	89
Gross Pollutants (kg/yr)	584	5880	90

3.3.10. Water Balance

A Water Balance is the budget of water inputs and water outputs in the specified system. In the context of this proposed development, the water balance is simplified as water inflows captured onsite from the whole roof, and the water outputs (specified as the water demands for site processes and operation).
The proposed distribution centre will be operational 24 hours a day, seven days a week. It is estimated that during 24 hours of operation more than 250 staff will be working in the facility, without including the drivers.
The rainwater tanks can cover for some of the following demand:

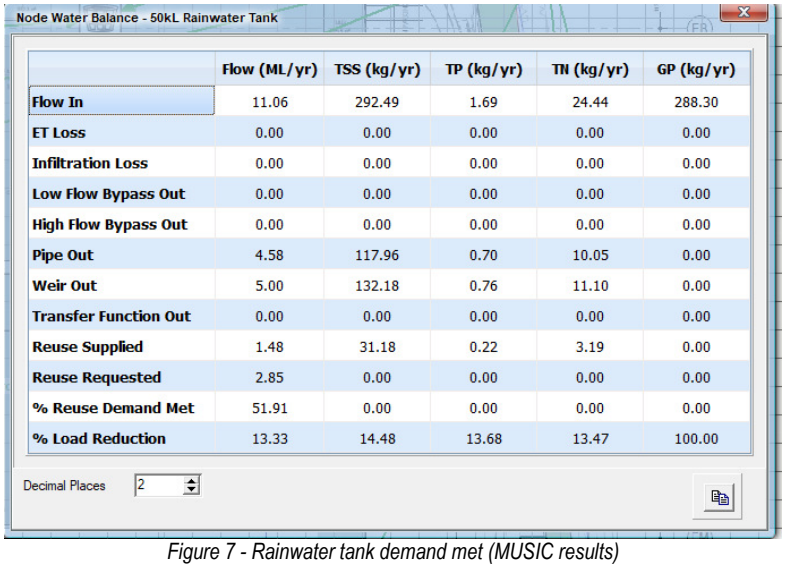
- Toilet flushing, estimated 25 WC basins and 8 urinals
- Irrigation of the landscape area along Haslams Creek (approx. 1650m²)
- Wash down area for trucks and machinery

The estimated ongoing water demand is presented in the table below.

Item	Quantity		Rate	L/day	KL/year
Toilet flushing	No of staff	250	20l/day/person	5000	-
Irrigation	Surface area	1650m2	0.4 KL/year/m2	-	660
Wash down	Estimate			1000	-
			Total	**6000**	**660**

Based on the above demands, the roof catchment area and the proposed 2 x 25kL rainwater tanks, the water balance was calculated in MUSIC. Refer to the results table in Figure 7 below.

With the proposed 50Kl of rainwater tank the reuse demand is met approx. 51.4%



	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	GP (kg/yr)
Flow In	11.06	292.49	1.69	24.44	288.30
ET Loss	0.00	0.00	0.00	0.00	0.00
Infiltration Loss	0.00	0.00	0.00	0.00	0.00
Low Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
High Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
Pipe Out	4.58	117.96	0.70	10.05	0.00
Weir Out	5.00	132.18	0.76	11.10	0.00
Transfer Function Out	0.00	0.00	0.00	0.00	0.00
Reuse Supplied	1.48	31.18	0.22	3.19	0.00
Reuse Requested	2.85	0.00	0.00	0.00	0.00
% Reuse Demand Met	51.91	0.00	0.00	0.00	0.00
% Load Reduction	13.33	14.48	13.68	13.47	100.00

Figure 7 - Rainwater tank demand met (MUSIC results)

3.3.11. Measures to minimize water use

- 6 Star WELS fittings. (Avoid waterless urinals because of maintenance).
- Proposed 50 Kl Rainwater tank for toilet flushing, irrigation and wash down
- If HVAC plant is water cooled, supplement the cooling towers with the rainwater and put an automatic switchover/mains back up for when the tank is dry.
- Fire sprinkler pump test water recycle back to the fire tank

4. EROSION AND SEDIMENTATION CONTROL MEASURES

Erosion and sedimentation control plan is prepared in accordance with Council DCP and standards outlined in Managing Urban Stormwater: Soils and Construction by the NSW department of Housing.

"The requirements for implementation of management practices applies to all sites (i.e. subdivision and building sites) that involve disturbing of earth irrespective of size, timing for construction and/or he approval processes which preceded the construction. The extent of the management practices required will be influenced by consideration of the risk, which will take into account the scope of the works, the timing of works and other site-specific factors".
"Construction phase water quality works relate to temporary works and management measures re quired to manage a development site during periods when the site is disturbed to minimise the potential for release of pollutants, contaminants or sediments to downstream properties and/or receiving waters".

To address the above requirements a Conceptual Erosion and Sediment Control Plan (ESCP) with sedimentation basin has been prepared for the site and is presented on drawings 19513_DA_SE01 and 19513_DA_SE01 attached in Appendix B.

5. CONCLUSIONS

Whilst it is inevitable that the development will have an impact on the existing landform and stormwater runoff characteristics due to earthworks, change of land-use and changes in impervious areas; by providing a safe and efficient design, and implementing appropriate measures during construction and operation of the development, it can be ensured that there will be minimal impact on the existing environment and no impact on the existing stormwater network as a result of the proposed development.

Appropriate stormwater management practices will be implemented that minimise the impact of the development on the existing stormwater system in terms of water quality whilst ensuring safe and efficient conveyance of stormwater.
Based on the preparation of the concept stormwater drainage plans and MUSIC modelling results, it is demonstrated that the principles of Water Sensitive Urban Design have been incorporated into the design and operation of the proposed commercial development at 11-13 Percy St, Auburn in accordance with Cumberland City Council.

By providing a design, which is in accordance with Council's policies and best practice principles, it can be ensured that there will be minimal impact on the existing environment as a result of the proposed development.

6. MAINTENANCE SCHEDULE

Proposed water quality measures:

- Stormwater pits, grated drains, pipes
- Rainwater tank
- OSD tank
- Gross pollutant trap CDS0506
- ∅690mm Psorb cartridges by Ocean Protect
- Oceanguard pit baskets by Oocean Protect

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
STORMWATER PITS, GRATED DRAINS, PIPES			
Pits, grated drains and pipes around the site	Annually	Maintenance Contractor	Check pits, grated drains and pipes for blockages. Remove debris and flush pipes if required.
Check step irons for corrosion	Annually	Maintenance Contractor	Remove grate, examine step iron and repair any corrosion or damage.
Check fixing of step irons is secure	Six monthly	Maintenance Contractor	Remove grate and ensure fixings are secure prior to placing weight on step iron.
RAINWATER TANK			
Gutters	As per supplier recommendations	As per supplier recommendations	Check the gutter and downpipes that divert water from the roof to the tank to not be blocked by leaves and sediment.
Others	As per supplier's recommendations	Maintenance Contractor	Refer to manufacturer or tank supplier's recommendations
OSD TANK			
Orifice blockages	Every 6 months	Owner	Inspect and remove any blockage from orifices by removing debris screen and inspecting the outlet orifice. Refer to the general arrangement plan for outlet location.
Orifice plate	Once a year	Owner	Check the attachment of the orifice plate to the wall of the tank/chamber/pit to ensure the plate is mounted securely. If plate is found to be loose, tighten the fixings and seal any gaps.
Orifice sharpness	Every 5 years	Owner	Measure and ensure the orifice diameter is as per work-as –executed plans. Check for the orifice to be sharp, not pitted or damaged.
Debris screen inspection	Once a year or after very heavy rain	Owner	Remove debris screen and clean from residuals. Examine the screen for rust and/or corrosion especially at the corners or welds. Ensure screen fixings to the wall/chamber/pit are secure and repair if found otherwise.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
OSD walls inspection	Once a year	Owner	Inspect tank walls inside and outside (if applicable) for cracks or spalling and repair as required. Also clear of any vegetation if present.
Outlet sump and outlet pipe	Every 6 months	Owner	Check for corrosion and remove any sediment build-up. Check the outlet pipe is clear and confirm pipe drains freely by flushing the outlet pipe.
Non-return valve blockages	Every 6 months	Owner	Inspect and remove any blockage by removing debris and inspecting the valve. Refer to the tank section for valve location.
Non-return valve	Once a year	Owner	Check the attachment of the valve to the wall of the tank/chamber/pit to ensure the valve is mounted securely. If found to be loose, tighten the fixings and seal any gaps.
GROSS POLLUTANT TRAP			
Suction Cleaning	Every 6 months or when the trap is full with sediments. Whichever occurs first	Maintenance Contractor	The Nipper is designed to be cleaned out by suction truck capable of handling 1500L, where all the water and waste water will be sucked up and collected at once. The sediments and pollutants will fill up the "sump" part of the unit to just below the bottom of the screen. A marked or measuring pole can be used to gauge the level of the pollutants by opening the lid and feeling the level of the pollutants below the water line with the pole
FILTER CARTRIDGES Design life expectancy: 25 years			
Sediment Deposition	Every 4 Months	Maintenance Contractor	When the thickness of the sediment deposit reaches 150mm on the base of the vault, remove the sediment accumulation by means of a wet or dry vacuum or a vacuum truck.
Inspection of Filter and Vault	Every 4 Months	Maintenance Contractor	Check that entry points and tank are clean. The filter should not have moved from its initial position and the outlet chamber and outlet pipe should be checked for debris and silt. Check the pipework does not have leaks or has been disconnected. Check all air release valves are functioning properly and check for any other kind of damage or blockage.
Maintenance of Filter and Vault	Every 4 Months	Maintenance Contractor	Remove covers and open all access hatches then, with a vacuum truck or dry/wet vacuum, remove any liquids or sediments reachable prior entry. Once inside, remove all liquid and sediments that have been accumulated on the base with appropriate vacuum. If possible, remove all cartridges and pipes for inspection and cleaning before reinstalling. Close all covers.
OCEAN PROTECT PIT BASKETS			

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Visual inspection	Monthly after rain	Maintenance Contractor	During each inspection and clean, details of the mass, volume and type of material observed should be recorded to provide ongoing data for future management plan revisions and the optimization of the maintenance frequency.
Emptying and maintenance	3 to 6 monthly after rain or if bag is 50% full.	Maintenance Contractor	Open gully pit. Place the lifting hooks in the lifting loops of the filter bag. For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the bag, or remove excess material using a shovel or similar piece of equipment. The use of a post hole shovel is preferable, due to the reduced strain on the back when digging and the ability of the shovel to grab material vertically. Lift the bag vertically off the supporting frame, ensuring that no undue pressure is placed on the filter bag. Lift the bag clear of the stormwater pit. Position the bag over the truck or other collection vehicle, taking hold of the loops at the base of the bag. Lift and empty the filter bag by holding the bottom lifting loops only. Completely empty the filter bag. Brush the filter bag with a stiff brush to remove bound sediment from the filter pores. Check the filter bag. Check the OceanProtect unit. Reinstate filter bag, ensuring bag is installed the correct way. Reinstate pit lids. The OceanProtect basket can alternatively be maintained using Cleaning Inductor Truck.

The Site Operator needs to prepare:

- an emergency liquids spill management procedure which includes notification of relevant agencies, including the Sydney Catchment Authority;
- records of inspections, monitoring and maintenance program, and the frequency of such activities for the forecourt area and site stormwater management system, including stormwater pits, rainwater collection and reuse system, the collection and disposal of oily liquids captured in the oil-water separator, and underground tank monitoring equipment;
- records of water quality monitoring results;
- the identification of the individuals or positions responsible for inspection, monitoring and maintenance activities including a reporting protocol and hierarchy, and procedures for managing and notification of water quality emergencies;
- check lists for recording inspections, monitoring and maintenance activities including the disposal of oil.

These reports shall be submitted for the first year with future requirements to be determined by system performance to establish clear and appropriate management processes for water quality systems that have the potential to adversely affect the environment and quality during the operational stage of the development so as to ensure a sustainable neutral and beneficial impact on water quality over the system's lifetime.

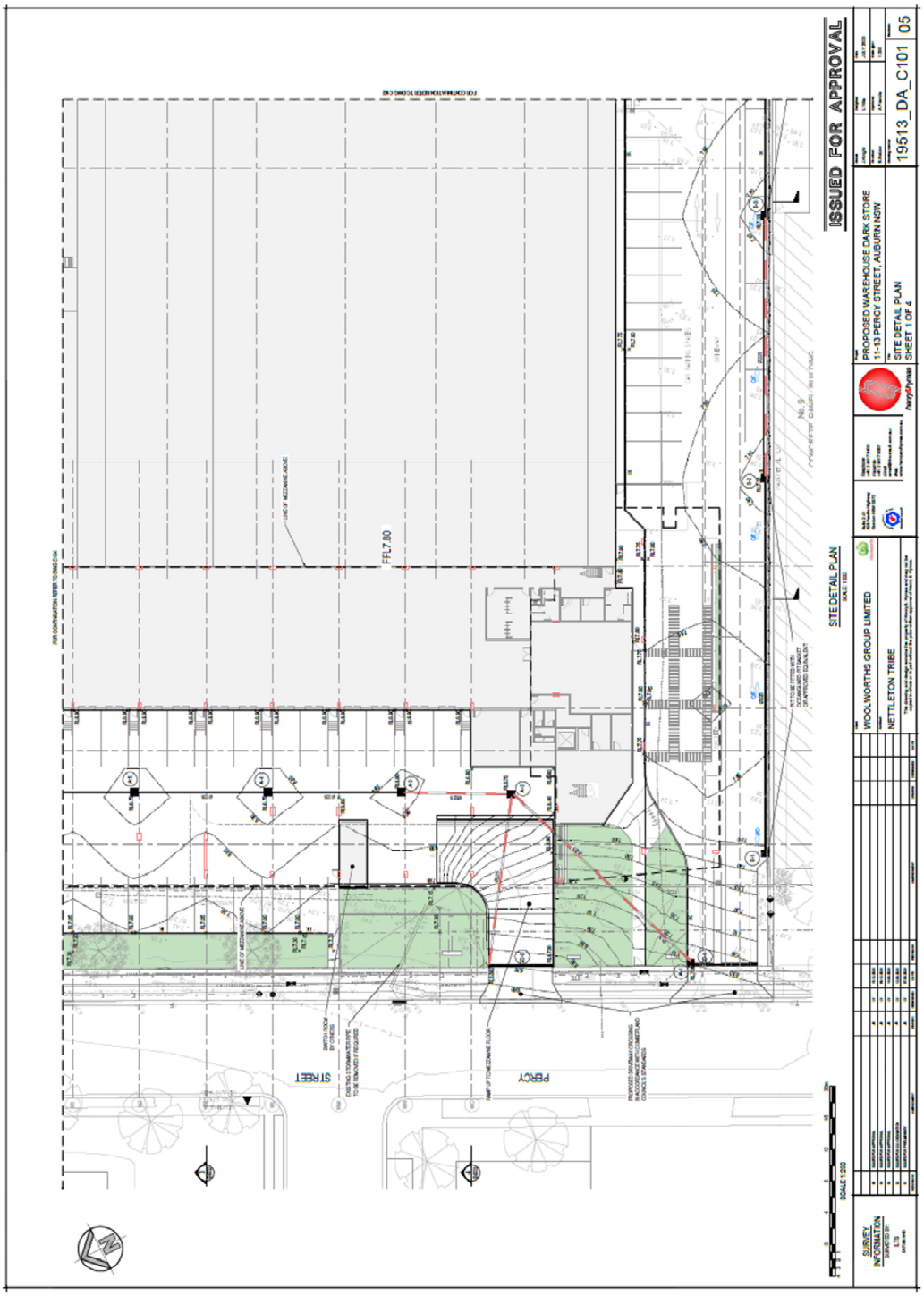
7. SEARs REQUIREMENTS

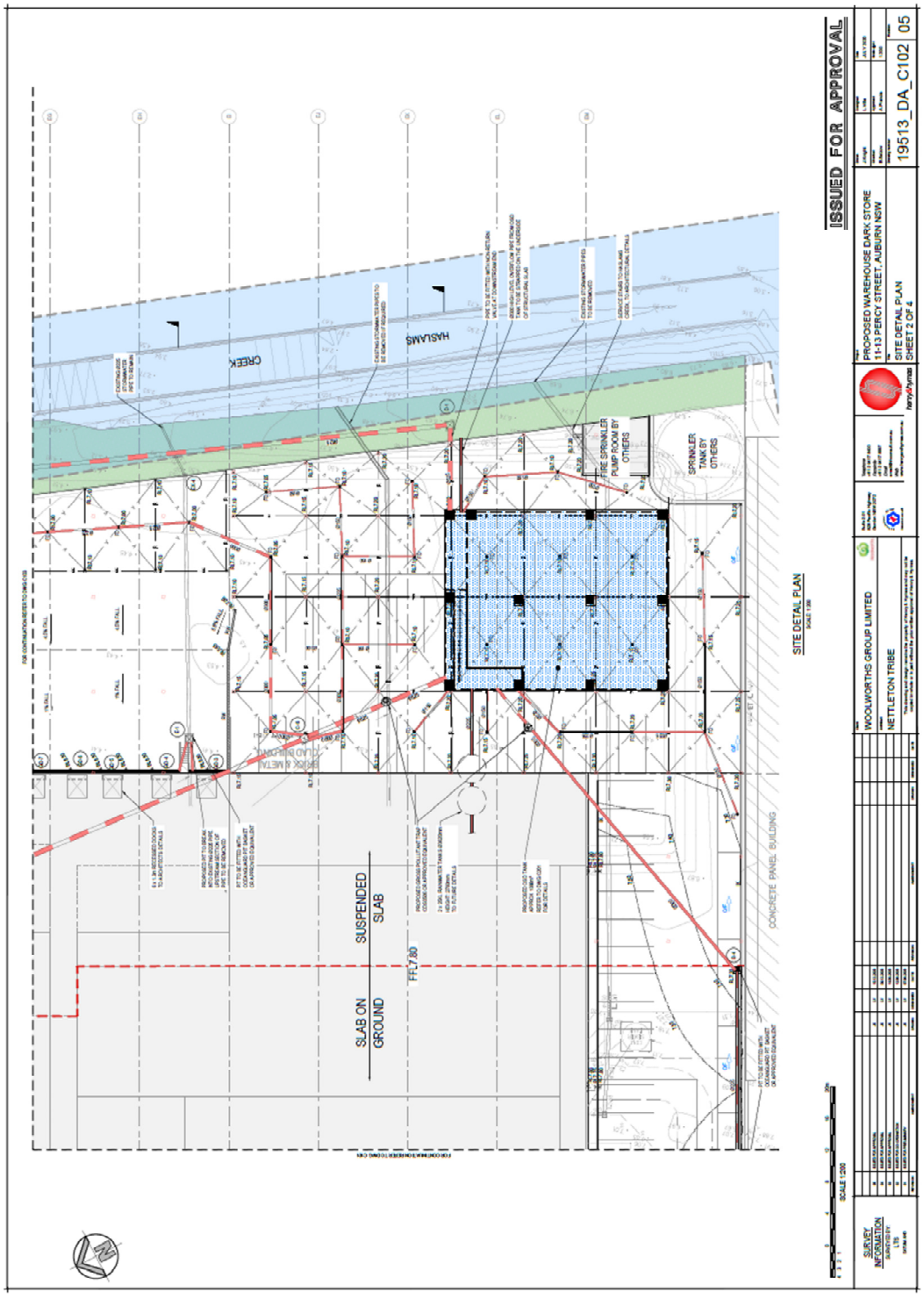
SEARs REQUIREMENTS	H&H RESPONSE
A description of the water demands and a breakdown of water supplies, including a detailed site water balance	Under section 3.3.10 Water Balance of this report
A description of the measures to minimise water use	Under section 3.3.11 Measures to minimize water use of this report
A detailed description of any cut and fill works and/or additional retaining walls required to facilitate the development	Under section 2.1 Bulk Earthworks of this report
A description of the proposed erosion and sediment controls during construction and operational phases of the development	Under chapter 4 Erosion and sedimentation control measures of this report
A description of the surface and stormwater management design, including drainage design, on site detention, and measures to treat or re-use water	Under section 3.2. Stormwater Quantity from this report
Details of impact mitigation, management and monitoring measures	Under chapter 6 Maintenance Requirements of this report No further monitoring is proposed
DPIE – NRAR & Water	
The identification of an adequate and secure water supply for the life of the project. This includes confirmation that water can be sourced from an appropriately authorised and reliable supply. This is also to include an assessment of the current market depth where water entitlement is required to be purchased.	There is no need for water during the Distribution Centre operational process and the potable water supply will be through Sydney Water, which is considered a reliable source.
A detailed and consolidated site water balance.	Under section 3.3.10 Water Balance of this report
Environment Energy and Science (EES)	
Proposed intake and discharge locations Existing surface water.	No intake is proposed for the subject site. Two (2) discharge points are proposed to the existing creek, subject to approval by Sydney Water
Water Quality Objectives (as endorsed by the NSW Government http://www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters.	Under section 3.3 Stormwater quality of this report. Refer to geotechnical engineering advice in regards to groundwater.
The nature and degree of impact on receiving waters for both surface and	The current development has no water quality treatment even though it is mostly impervious in nature. The proposed development is designed

groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.	with multiple treatment trains. Refer to section 3.3 stormwater quality of this report for details. During construction, all overland stormwater is to be directed to the proposed sedimentation basin. Refer to drawings 19513_DA_SE01 and 19513_DA_SE02 for sizes and details. Wastewater does not relate to stormwater.
Identification of proposed monitoring of water quality.	No water quality monitoring is proposed
Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.	During construction, the stormwater overland is to be managed through the proposed sediment basin. The required volume/ha has been calculated and detailed on drawings 19513_DA_SE01 and 19513_DA_SE02. No water re-use options are proposed during construction. After construction, the stormwater is managed through OSD, rainwater tank and stormwater treatment chambers. Refer to chapters 3.2 and 3.3 of this report. Wastewater does not relate to stormwater.
Identification of proposed monitoring of hydrological attributes.	Monitoring of hydrological attributes is deemed to not be appropriate for the site and therefore there are no proposed monitoring methods.
Environment Protection Authority (EPA)	
Provide an assessment of any potential impacts of the proposal on the surface and groundwater of the area, with particular focus on water quality and the community's agreed environmental values and human uses for relevant watercourses (the NSW WQO).	Surface water and water quality has been covered in sections 3.2 and 3.3 of this report
Provide a Stormwater Management Plan that outlines the general stormwater management measures for the proposal, including erosion and sediment controls, first flush systems, and the use of sustainability measures such as Water Sensitive Urban Design to create more resilient and adaptable urban environments.	Under chapter 4 Erosion and sedimentation control measures from this Report Under section 3.2 Stormwater Quantity from this Report Under 3.3 Stormwater Quality from this Report
Outline opportunities for the use of integrated water cycle management practices and principles to optimise opportunities for sustainable water	Under section 3.3 Stormwater quality of this report, in particular section 3.3.10.

supply, stormwater management across the proposal.	
Cumberland City Council	
Any batter or retaining wall shall be clear of the 20m setback from the stormwater channel. Council will consider a cantilevered portion over the additional 10m area. In the regard, the number of columns shall be minimised in this area.	No batter or Retaining walls are proposed in the 20m setback from the stormwater channel.
On-site detention facility shall be provided to comply with Council DCP requirements.	Under section 3.2 Stormwater Quantity from this Report
Stormwater runoff generated from the development hall be treated in accordance with the guidelines (MUSIC) prior to discharge to the stormwater channel.	Under 3.3 Stormwater Quality from this Report
Sydney Water approval shall be obtained for any proposed discharge of stormwater system.	There are 5-6 existing outlets along the channel. We will ask Sydney Water approval as we know the final discharge point in the channel.

APPENDIX A – CIVIL PLANS

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SITE DETAIL PLAN
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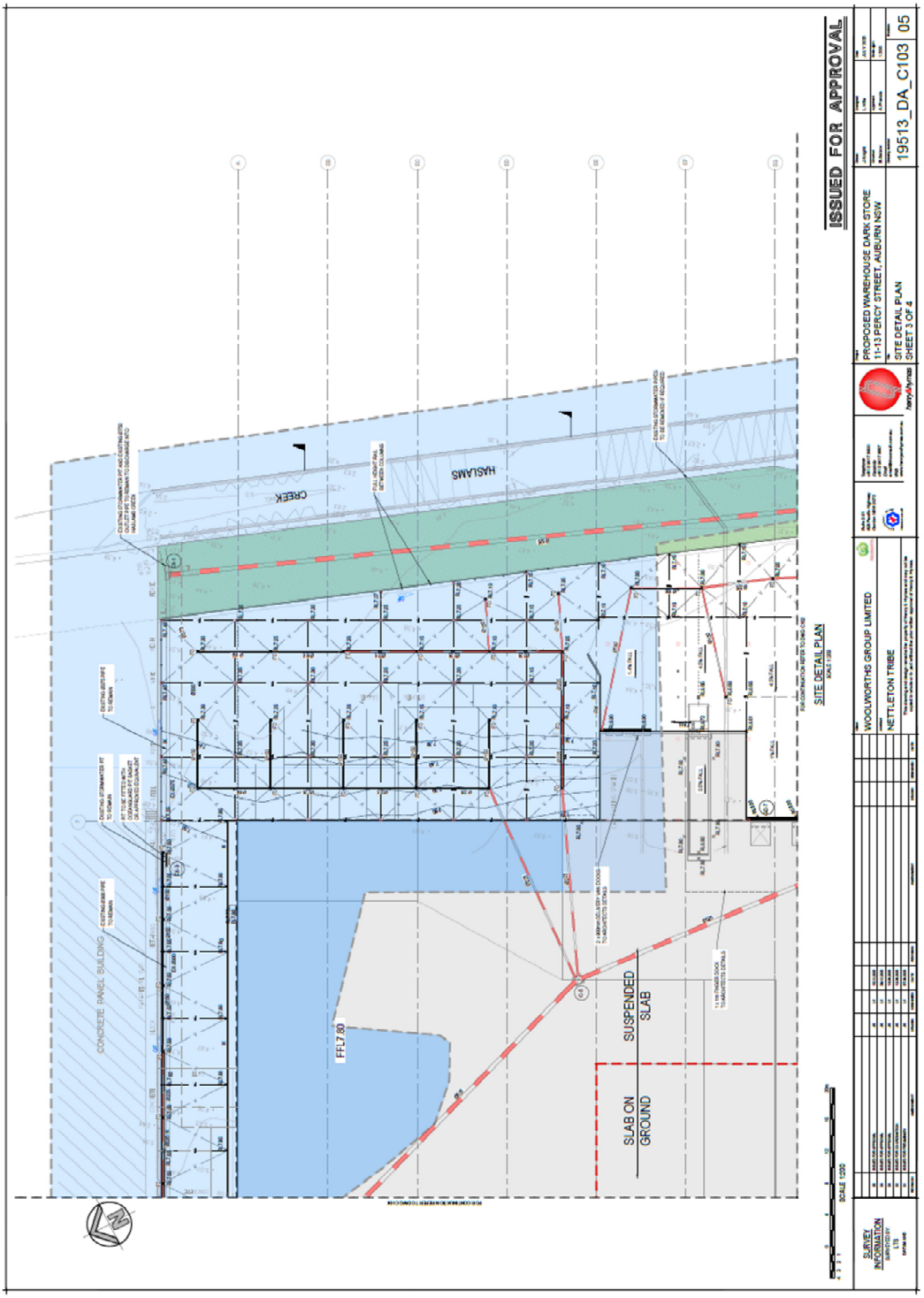
SLAB ON GROUND
FFL 7.80
CONCRETE PANEL BUILDING
FIRE SPRINKLER PUMP ROOM BY OTHERS
SPRINKLER TANK BY OTHERS
CREEK
HASLAMS
WOOLWORTHS GROUP LIMITED
NETTLETON TRIBE
PROPOSED WAREHOUSE DARK STORE
11-13 PERCY STREET, AUBURN NSW
SITE DETAIL PLAN
SHEET 2 OF 4
19513_DA_C102 05
SURVEY INFORMATION
SCALE 1:200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SITE DETAIL PLAN
HASLAMS
CREEK
CONCRETE PANEL BUILDING
SUSPENDED SLAB
SLAB ON GROUND
FFL7.80
WOOLWORTHS GROUP LIMITED
NETTLETON TRIBE
PROPOSED WAREHOUSE DARK STORE
11-13 PERCY STREET, AUBURN NSW
SITE DETAIL PLAN
SHEET 3 OF 4
19513_DA_C103 05
SURVEY INFORMATION

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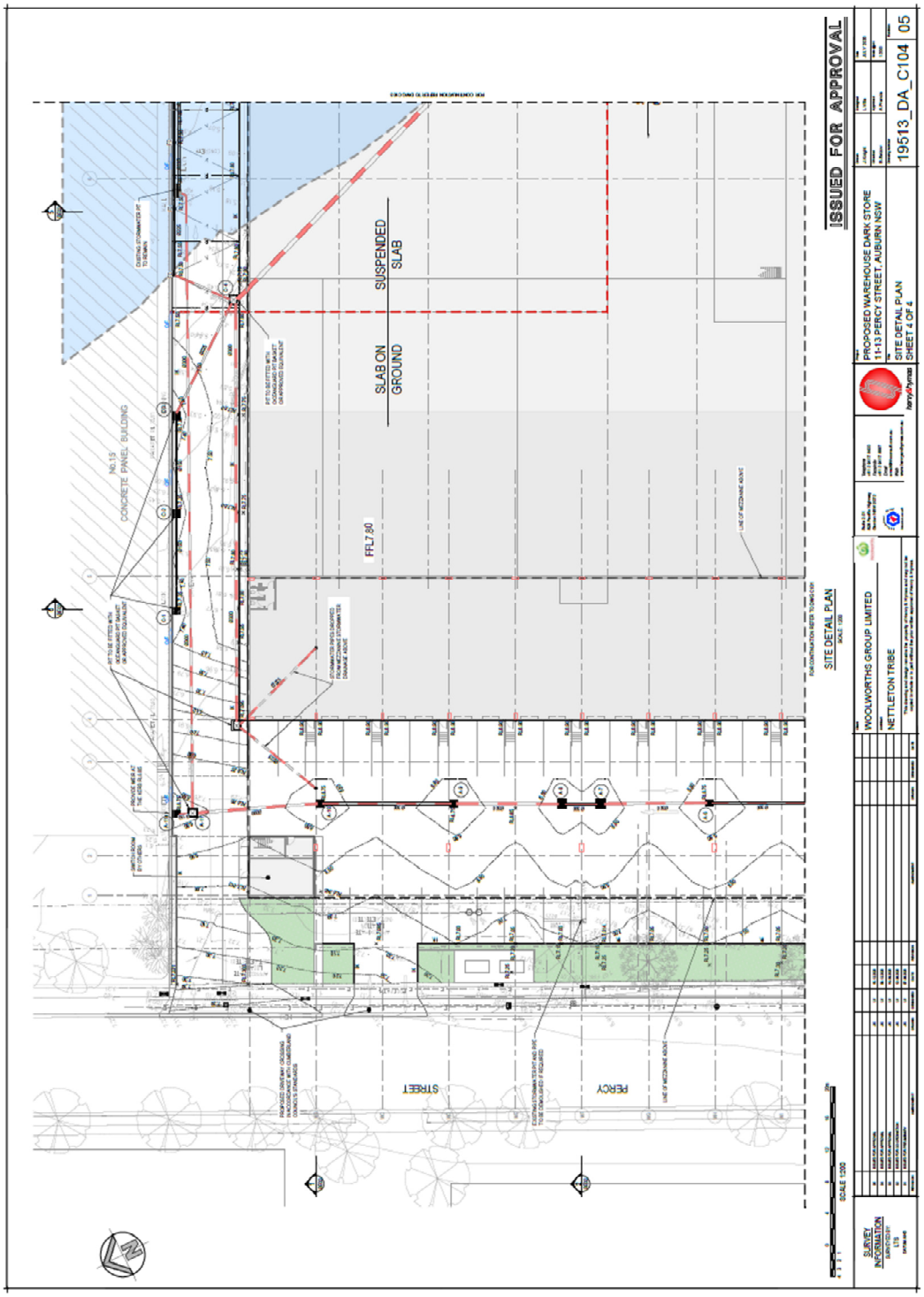
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SLAB ON GROUND
FFL7.80
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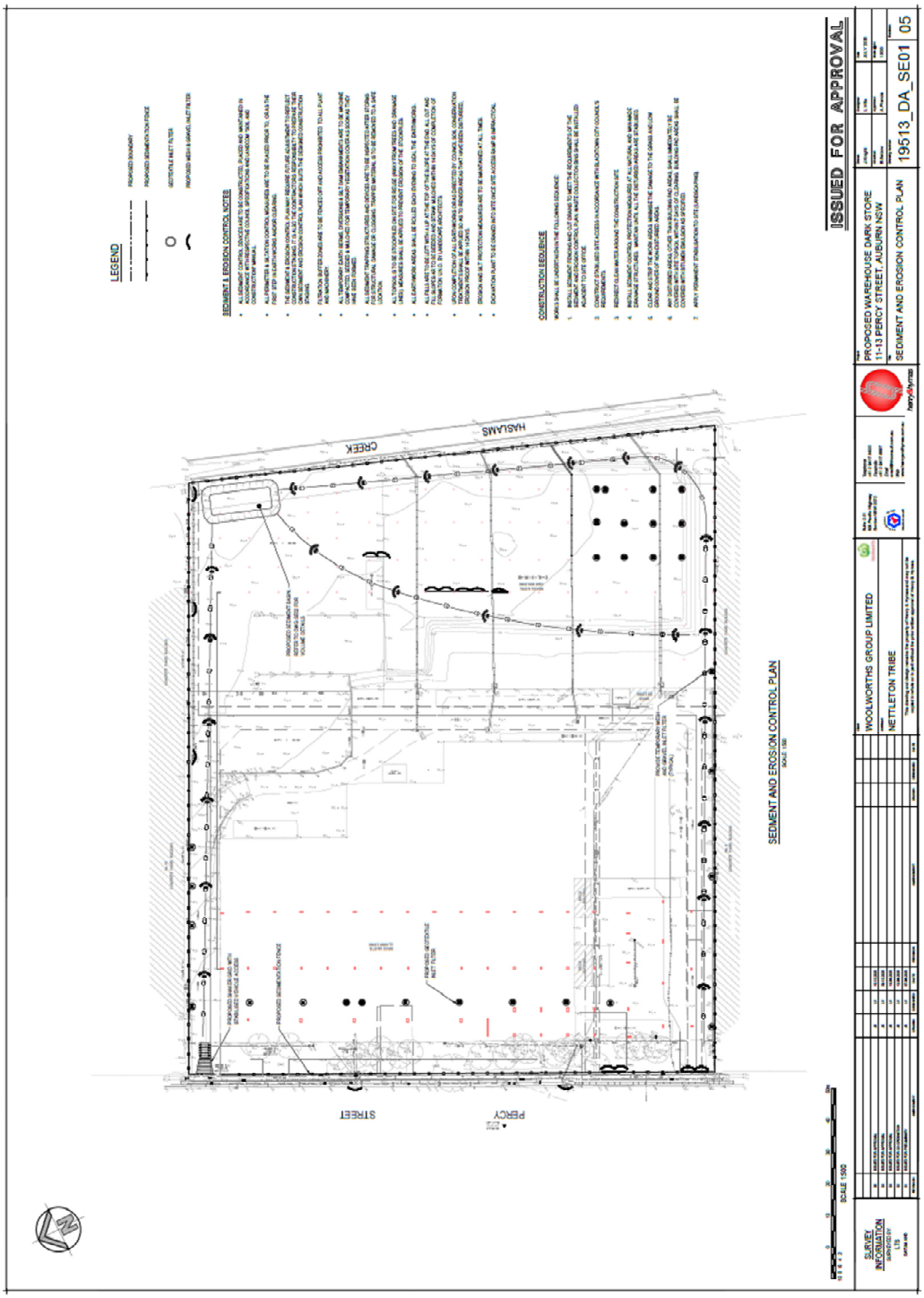
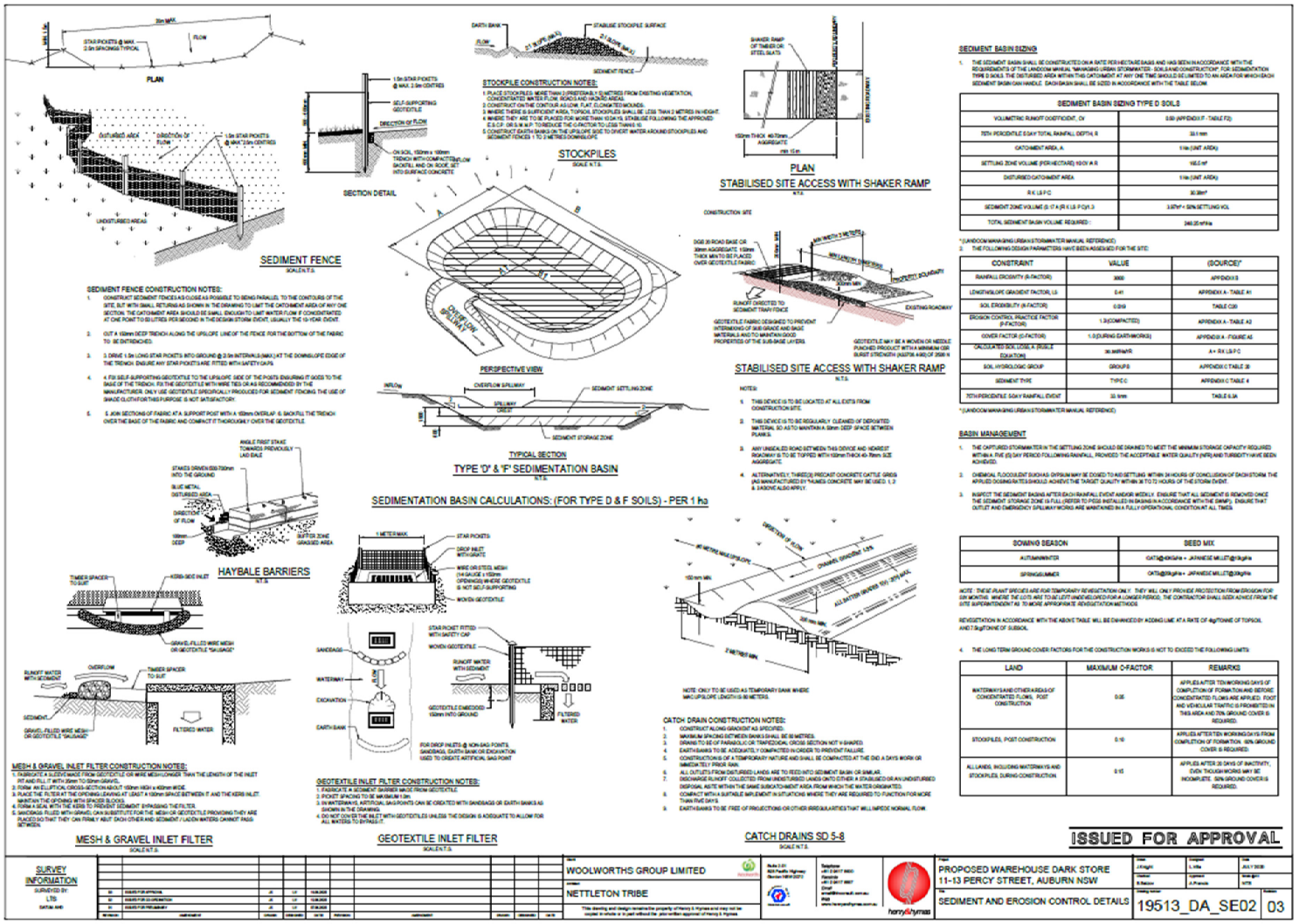
STREET
PERCY
SITE DETAIL PLAN
WOOLWORTHS GROUP LIMITED
NETTLETON TRIBE
PROPOSED WAREHOUSE DARK STORE
11-13 PERCY STREET, AUBURN NSW
SITE DETAIL PLAN
SHEET 4 OF 4
19513_DA_C104 05
SURVEY INFORMATION

APPENDIX B – SEDIMENT & EROSION CONTROL PLAN





SEDIMENT BASIN SIZING TYPE D SOILS	
VOLUMETRIC RUNOFF COEFFICIENT, Cv	0.60 (APPENDIX F - TABLE F2)
75TH PERCENTILE 5 DAY TOTAL RAINFALL DEPTH, R	33.5 mm
CATCHMENT AREA, A	1 ha (UNIT AREA)
SETTLING ZONE VOLUME (PER HECTARE) 10.0 V A R	185.0 m³
DISTURBED CATCHMENT AREA	1 ha (UNIT AREA)
R X L S P C	30.38m³
SEDIMENT ZONE VOLUME (S 17.4)(R X L S P C)/1.3	3.507m³ + 50% SETTLING VOL
TOTAL SEDIMENT BASIN VOLUME REQUIRED :	248.25 m³/ha

* (LANDCOM MANAGING URBAN STORMWATER MANUAL REFERENCE)

2. THE FOLLOWING DESIGN PARAMETERS HAVE BEEN ASSESSED FOR THE SITE:

CONSTRAINT	VALUE	(SOURCE)*
RAINFALL ERODIBILITY (R-FACTOR)	3800	APPENDIX B
LENGTH/SLOPE GRADIENT FACTOR, LS	0.41	APPENDIX A - TABLE A1
SOIL ERODIBILITY (K-FACTOR)	0.019	TABLE C20
EROSION CONTROL PRACTICE FACTOR (P-FACTOR)	1.3 (COMPACTED)	APPENDIX A - TABLE A3
COVER FACTOR (C-FACTOR)	1.0 (DURING EARTHWORKS)	APPENDIX A - FIGURE A5
CALCULATED SOIL LOSS, A (RUSLE EQUATION)	30.38TON/HA	A = R.K.LS.P.C
SOIL HYDROLOGIC GROUP	GROUP B	APPENDIX C TABLE C8
SEDIMENT TYPE	TYPE C	APPENDIX C TABLE 4
75TH PERCENTILE 5 DAY RAINFALL EVENT	33.5mm	TABLE 6.3A

* (LANDCOM MANAGING URBAN STORMWATER MANUAL REFERENCE)

1. THE CAPTURED STORMWATER IN THE SETTLING ZONE SHOULD BE DRAINED TO MEET THE MINIMUM STORAGE CAPACITY REQUIRED WITHIN A FIVE (5) DAY PERIOD FOLLOWING RAINFALL, PROVIDED THE ACCEPTABLE WATER QUALITY (NTU AND TURBIDITY) HAVE BEEN ACHIEVED.
2. CHEMICAL FLOCCULENT SUCH AS GYPSUM MAY BE DOSED TO AID SETTLING WITHIN 24 HOURS OF CONCLUSION OF EACH STORM. THE APPLIED DOSING RATES SHOULD ACHIEVE THE TARGET QUALITY WITHIN 36 TO 72 HOURS OF THE STORM EVENT.
3. INSPECT THE SEDIMENT BASINS AFTER EACH RAINFALL EVENT AND/OR WEEKLY. ENSURE THAT ALL SEDIMENT IS REMOVED ONCE THE SEDIMENT STORAGE ZONE IS FULL (REFER TO PEGS INSTALLED IN BASINS IN ACCORDANCE WITH THE SWMP). ENSURE THAT OUTLET AND EMERGENCY SPILLWAY WORKS ARE MAINTAINED IN A FULLY OPERATIONAL CONDITION AT ALL TIMES.

SOWING SEASON	SEED MIX
AUTUMN/WINTER	OATS@40Kg/Ha + JAPANESE MILLET@10kg/Ha
SPRING/SUMMER	OATS@30kg/Ha + JAPANESE MILLET@30kg/Ha

NOTE : THESE PLANT SPECIES ARE FOR TEMPORARY REVEGETATION ONLY. THEY WILL ONLY PROVIDE PROTECTION FROM EROSION FOR SIX MONTHS. WHERE THE LOTS ARE TO BE LEFT UNDEVELOPED FOR A LONGER PERIOD, THE CONTRACTOR SHALL SEEK ADVICE FROM THE SITE SUPERINTENDENT AS TO MORE APPROPRIATE REVEGETATION METHODS

REVEGETATION IN ACCORDANCE WITH THE ABOVE TABLE WILL BE ENHANCED BY ADDING LIME AT A RATE OF 4kg/TONNE OF TOPSOIL AND 1.5kg/TONNE OF SUBSOIL.

4. THE LONG TERM GROUND COVER FACTORS FOR THE CONSTRUCTION WORKS IS NOT TO EXCEED THE FOLLOWING LIMITS:

LAND	MAXIMUM C-FACTOR	REMARKS
WATERWAYS AND OTHER AREAS OF CONCENTRATED FLOWS, POST CONSTRUCTION	0.05	APPLIES AFTER TEN WORKING DAYS OF COMPLETION OF FORMATION AND BEFORE CONCENTRATED FLOWS ARE APPLIED. FOOT AND VEHICULAR TRAFFIC IS PROHIBITED IN THIS AREA AND 70% GROUND COVER IS REQUIRED.
STOCKPILES, POST CONSTRUCTION	0.10	APPLIES AFTER TEN WORKING DAYS FROM COMPLETION OF FORMATION. 60% GROUND COVER IS REQUIRED.
ALL LANDS, INCLUDING WATERWAYS AND STOCKPILES, DURING CONSTRUCTION	0.15	APPLIES AFTER 20 DAYS OF INACTIVITY, EVEN THOUGH WORKS MAY BE INCOMPLETE. 50% GROUND COVER IS REQUIRED.

APPENDIX C – SEDIMENT & EROSION CONTROL PLAN

Form B1[i] DRAINAGE DESIGN SUMMARY SUB/DA No.

Project: Sorting Facility Location: 11-13 Percy Street, Auburn NSW

Designed by: LV, BS Company: Henry & Hymas Pty Ltd Phone: 02 9417 8400

SITE AREA 3.2477 ha *See Section 3.4.3 for dual occupancy			[A]
Upstream catchment draining through site See Section 4.1.3 for assessment of external flows.	= -	ha	[AA]
Basic storage volume 325 x [A] 0.8139	= 1055.5	m^3	[B]
Basic discharge 0.15 x [A] 0.8139	= 0.487	m^3/s	[C]
Area of site drained to storage (Must be as much as possible and not be less than 85% of the total site without written Council approval).	= 2.8273	ha	[D]
[D/ [A] + [2.8273]/[3.2477] x 100	= 87.1	%	[E]
Storage per ha. of contributing area = [B]/[D]	= 373.33		[F]
Enter *volume/PSD adjustment chart* (Fig 5.1) using [F], and Read new PSD in litres/second/ha (l/s/ha).	= 124.1	l/s/ha	[G]
Determine PSD =[G] x [D] 124.1 x 2.8273	= 351	l/s	[H]
Maximum head to orifice centre	= 1.75	m	[K]
Weir flow to storage $Q^{Weir} = CL(H^{Weir})^{1.5}$ $\therefore H^{Weir}$	= 0.735	m	[I]
Selected orifice diameter: $d = (0.464 \times Q / \sqrt{h})^{0.5} = (0.464 \times [H]/\sqrt{[K]})^{0.5}$	= 385	m	[J]
Maximum discharge	= 351.1	l/s	[L]
Head for high early discharge	= 1.01	m	[M]
High early discharge {[L] x $\sqrt{[M] / [K]}$ } (min 75% of [L])	= 323	l/s	[N]
Approximate mean discharge = ([L]) + [N]) /2	= 337	l/s	[P]
Average discharge/ha = [P] / [D] = 337 / 2.8273	= 119.1	l/s/ha	[Q]
Enter *volume/P.S.D. adjustment chart* (Fig 5.1) using [Q] And read off final storage volume per hectare	= 385	m^3/ha	[R]
Determine final SSR = [R] x [D] = 385 x 2.8273	= 1087.6	m^3	[S]
Primary storage proportion = [S] x 100 %	= 1087.6	m^3	[T]
Secondary storage proportion = [S] x - %	= -	m^3	[U]
Tertiary storage proportion [S] x - %	= -	m^3	[V]
Check [T] + [U] + [V] = [S]	= 1088	m^3	