



WATER SENSITIVE URBAN DESIGN REPORT

Prepared for MINTUS Pty Ltd

for 90 to 98 Glenmore ridge Drive, GLENMORE PARK, NSW 2745
(Lot 1700, DP 1166371)

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Document Control

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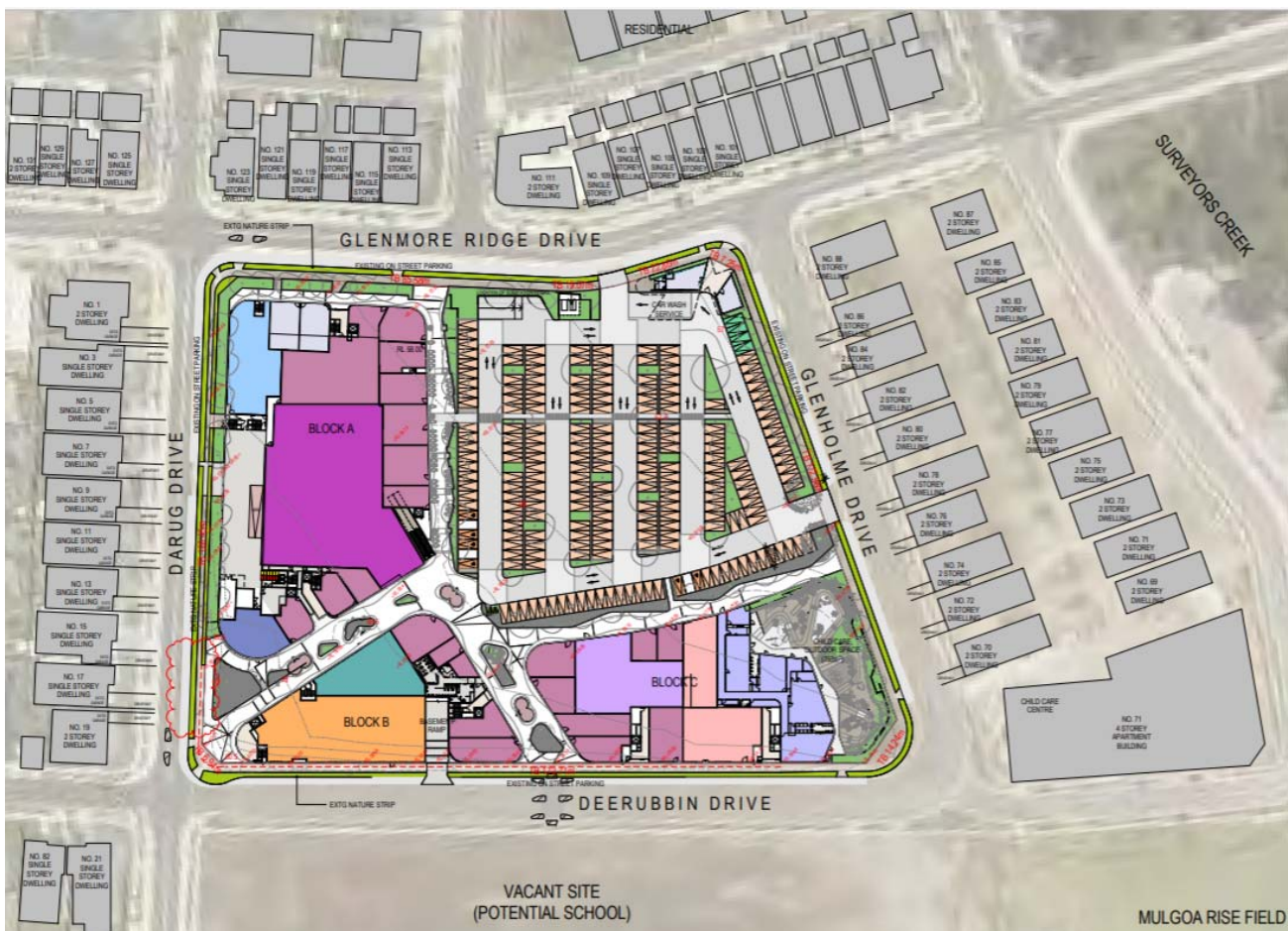
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1 Introduction

This document outlines the Water Sensitive Urban Design (WSUD) Strategy for the proposed Neighbourhood Shopping Centre and Shop Top Housing Development located at 90 to 98 Glenmore Ridge Drive, Glenmore Park NSW 2745. This strategy looks at the principles, objectives and targets for WSUD, the opportunities and constraints to the implementation of WSUD, as well as the proposed WSUD measures to be implemented as part of the proposed works.

The site is legally described as Lot 1700 DP 1166371. MINTUS Pty Ltd is proposing a Neighbourhood Shopping Centre and Shop Top Housing.

The Concept Plans prepared by CD Architects show the Neighbourhood Shopping Centre and Shop Top Housing, and associated car parking facilities. The proposed development is illustrated in Figure 1.1 below.



2 Water Sensitive Urban Design

2.1 Principles, Objectives and Targets

Penrith City Council has implemented a Water Sensitive Urban Design Policy in 2013. The aim of this policy is to respond to the growth of developable land within the Penrith Local Government Area (LGA) and improve the water conservation, and the quality and quantity of stormwater runoff from both new land development, and redevelopment of existing properties as they are developed.

The Policy is used to provide guidance for engineers and architects to ensure that developments mitigate their stormwater impacts on the natural environment.

Water Conservation aims to reduce the demand for potable water. This initiative was developed by the NSW State Government. The main tool for reducing such a demand for potable water is the BASIX scheme.

Urban development increases the pollutant load of stormwater to the receiving water bodies. Stormwater Quality controls have been derived to reduce the impact of this increased loading on the environment. Penrith City Council has set targets for stormwater treatment trains to meet on a per site basis.

The targets that Council has set as part of the Water Sensitive Urban Design policy 2013 are as follows:

- 90% reduction of mean annual load of total gross pollutants
- 85% reduction of mean annual load of Total Suspended Solids (TSS)
- 60% reduction of mean annual load of Total Phosphorus (TP)
- 45% reduction of mean annual load of Total Nitrogen (TN)

Stormwater runoff modelling is carried out using the software called MUSIC (Model for Urban Stormwater Improvement Conceptualisation) using data from Council's WSUD Technical Guidelines.

Following on from Council's comments on WSUD dated 5 May 2020 (see Appendix C), the comments were taken on board, a telephone discussion was carried out between Council's Mr Tim Gowing and ING Consulting Engineer's Mr Kenneth Ng on 28 May 2020, whereby it was clarified that vegetated treatment measures though encouraged and were subsequently explored, and due to the site and proposed finished level constraints, this

option was not feasible as it would then compromise on the optimal functioning of the on-site detention system.

It was also noted that the 5kL rainwater tank proposed originally in BASIX for car washing and landscaping would not be adequate for a development of this scale, and that more information was required to detail water conservation measures to meet the non-potable water usage with rainwater. This has been incorporated into the updated model, and detailed in Section 2.3.

2.2 Site Analysis

The development site falls towards the street. It is proposed to drain the site in the natural direction of the runoff and make connection to the existing street kerb inlet pit.

As a result, the proposed stormwater treatment train will treat the runoff from all of the site area.

2.3 Treatment Train

The site consists of one catchment only, which has various sub-catchments that collect detrimental pollutants at various rates. The MUSIC model adopts the pollutant parameter from Council WSUD Technical Guidelines. The catchments are allocated as outlined below.

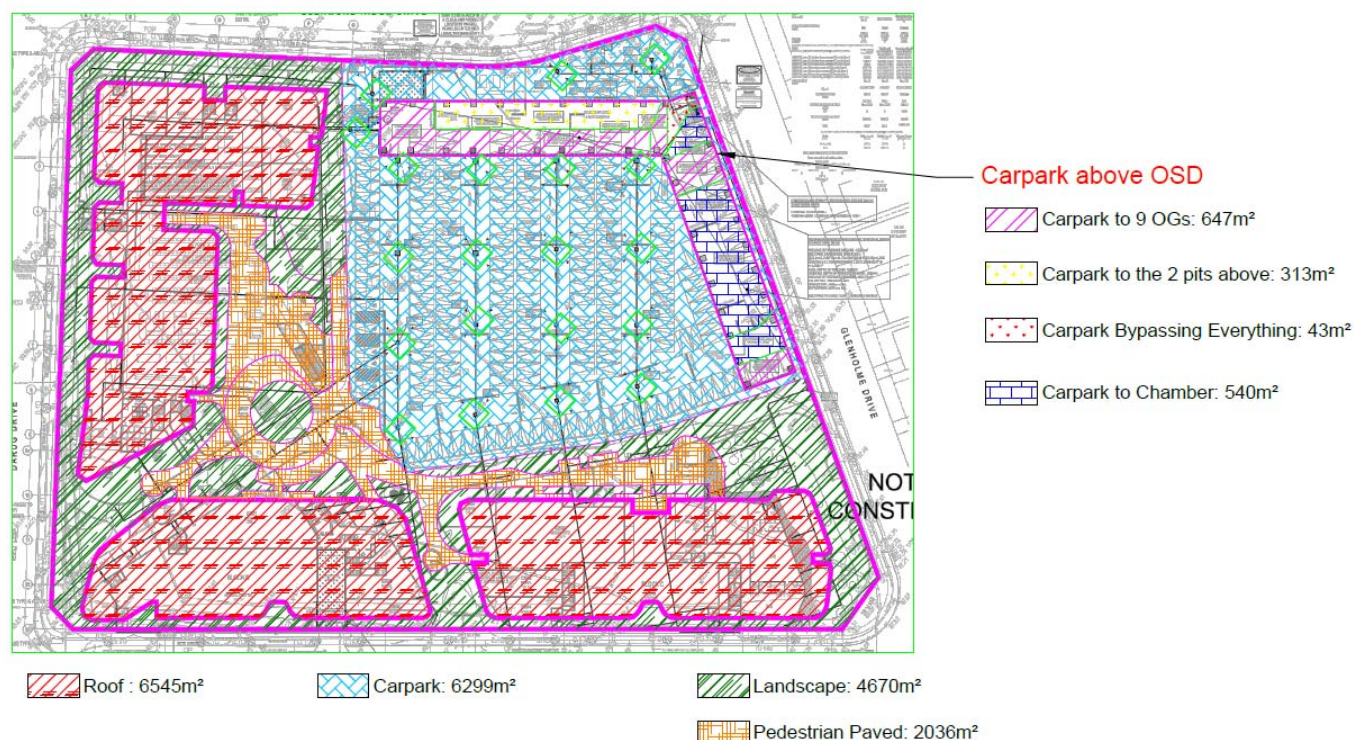


Figure 2.1 Music Model Site Area Breakup

It is proposed to meet Council's stormwater quality improvement targets outlined in this strategy with a combination of proprietary devices. The proposed stormwater quality improvement devices are outlined in the following table.

Rainwater Tank	One 40kL rainwater tank for irrigation only of the landscaping Communal Area at Level 1 (2,150m ²) in lieu of the original 5kL.
Ocean Guard (Pit Basket)	This is a proprietary pit basket from Ocean Protect. The proposed device will remove pollutants down to 200microns. The inserts are located inside the inlet pits. Twenty (20) are proposed for the pits in the driveway and nine (9) within the OSD tank at the access grates.
Stormfilter	Stormfilter is a proprietary cartridge from Ocean Protect. The device has the capacity to remove suspended solids, fine particles and other nutrients such as TSS, TP & TN. The stormfilters (26 nos.) are proposed under the car parking area of the development (within the On-site Detention Tank) in the updated water quality treatment regime as compared to 29 in the original model.

Table 2.1 Stormwater Quality Improvement Devices

MUSIC was used to model the proposed site drainage stormwater treatment train. The proposed treatment train on the development application documentation meets the objectives and targets of Penrith City Council's WSUD Policy 2013.

The following table summarises the results from the MUSIC model, with the MUSIC-link Report in Appendix 2.

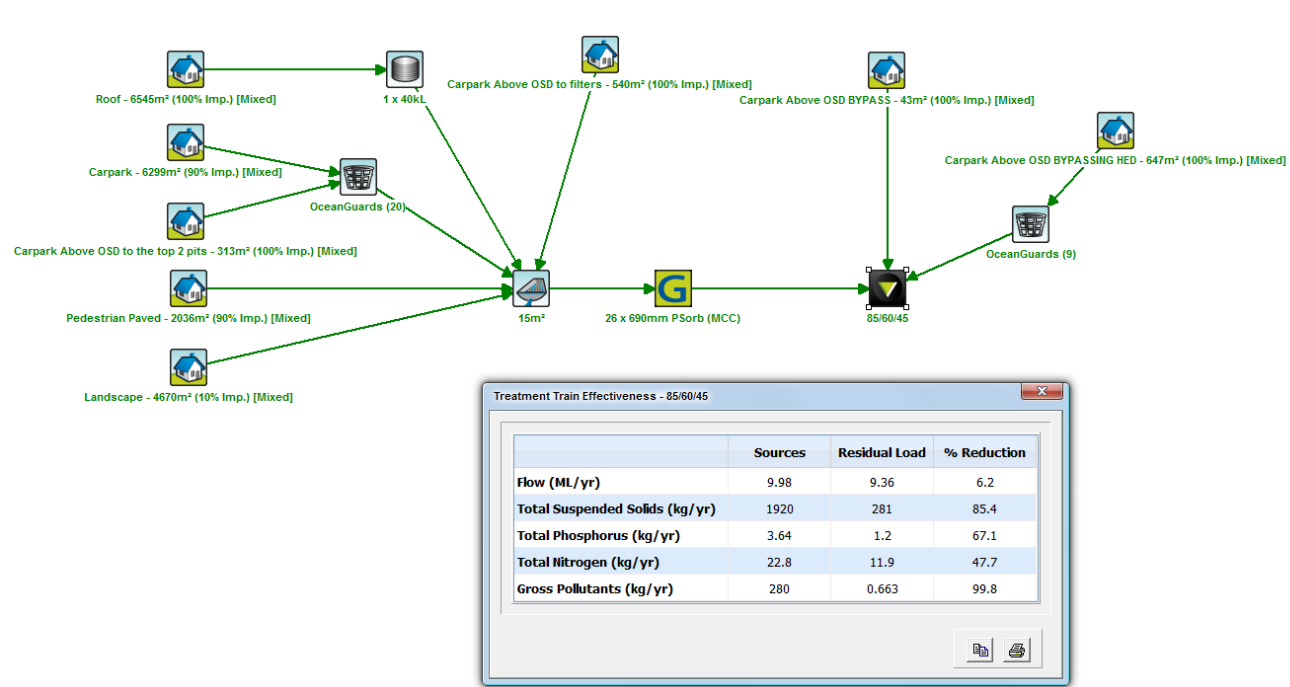


Figure 2.3 Updated MUSIC Results Summary

The results indicate that the proposed stormwater treatment train meets the requirements of the Penrith City Council Water Sensitive Urban Design Policy 2013.

To comply with Council’s water conservation measures, the non-potable water usage from an enlarged rainwater tank capacity – from 5kL to 40kL is proposed to irrigate 2,150m² of landscaped areas at Level 1 Communal Area. The % reuse from the rainwater achieved is about 73%, as shown in Figure 2.4.

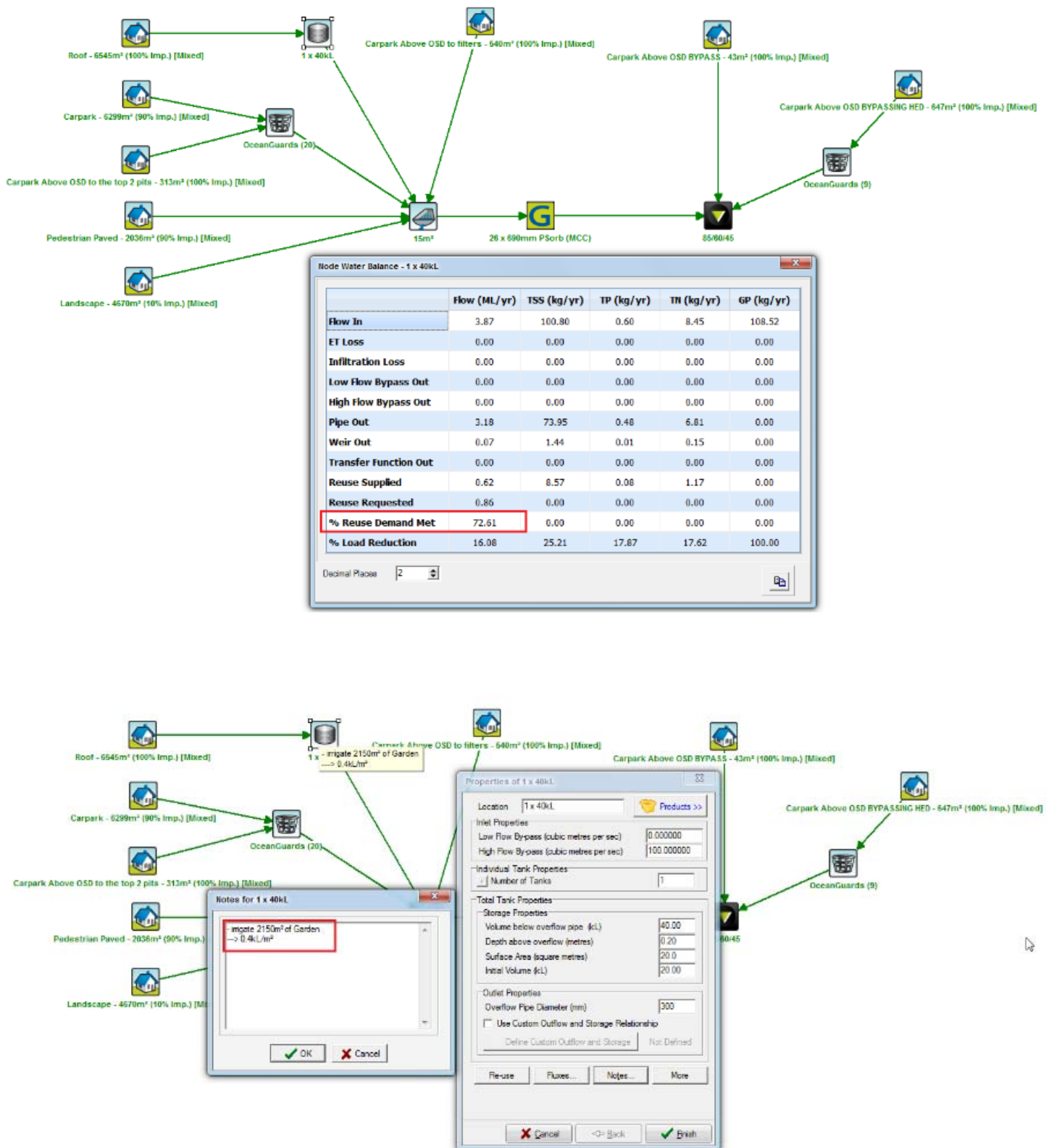


Figure 2.4 % of Non-Potable Water Usage from Rainwater Achieved

3 Draft Operations & Maintenance Schedule

3.1 General

The maintenance schedule covers all the stormwater quality measures adopted for the proposed development. The maintenance of some of these measures (proprietary products) is controlled by manufacturers' requirements for mechanical devices and industry standards for environmental measures.

3.2 Silt / Oil Arrestor Device

3.2.1 Ocean Guard Inserts

The maintenance frequency of the Ocean Guards is dependent on several variables, such as catchment area, surrounding land use, vegetation type, traffic loading and rainfall patterns. It is recommended that during the first year of operation the units should be monitored monthly, with maintenance as required.

To ensure that the units perform optimally, the material collected by the filter bag should be emptied when the level of material is approximately half to two thirds of the total bag depth or when there is evidence of material overflow.

Although the bag has greater storage area, it is recommended that it is not left to fill completely prior to emptying, for the following reasons:-

- The bags are capable of retaining a heavy mass of material (in excess of 50kg); material near the top of the bag can be re-suspended during high to extreme rainfall events; and
- Blockage of the overflow sections can occur, when material is allowed to build up above the filter bag.

Maintenance frequency should be adjusted to accommodate variable rainfall patterns. Regions east of the Great Dividing Range typically are dominated by greater rainfall during summer and Autumn Months, as such more maintenance is typically required during these periods. It is recommended that biannual inspections be carried out in November and April, while quarterly inspections should be conducted in February, April, July and November.

It is also recommended that additional monitoring should be conducted following moderate to extreme rainfall events, in particular, when preceding months have had

little to no rainfall. This monitoring is considered necessary to accommodate for higher volumes of runoff generated during major rainfall events, an anticipated greater accumulation of surface contamination during low rainfall periods and to ensure that the units have not been damaged due to high pipe velocities. Table 3. below indicates the recommended inspection and maintenance frequency.

ITEM	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection - Minor Maintenance	12 monthly and after major storms	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect "Operation and Maintenance Guidelines"
Inspection - Major Maintenance	2-6 years except in case of spill	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect "Operation and Maintenance Guidelines"

Table 3.1 Ocean Guard Maintenance Frequency

Reference should be made to manufacturer's specifications for inspection procedure, OHS, grates removal, cleaning methods, disposal of material and other procedures. The specifications are included in Appendix 2 for more details.

3.2.2 Stormfilter

The recommended maintenance frequency for the Stormfilter device is included in Appendix 2, with summary on the next page.

ITEM	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection - Minor Maintenance	2 years and after major storms	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect "Operation and Maintenance Guidelines"
Inspection - Major Maintenance	2-6 years except in case of spill	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect "Operation and Maintenance Guidelines"

Table 3.2 Stormfilter Maintenance Frequency

Reference should be made to manufacturer's specifications for operation and maintenance. The specifications are included in Appendix 2 for more details.

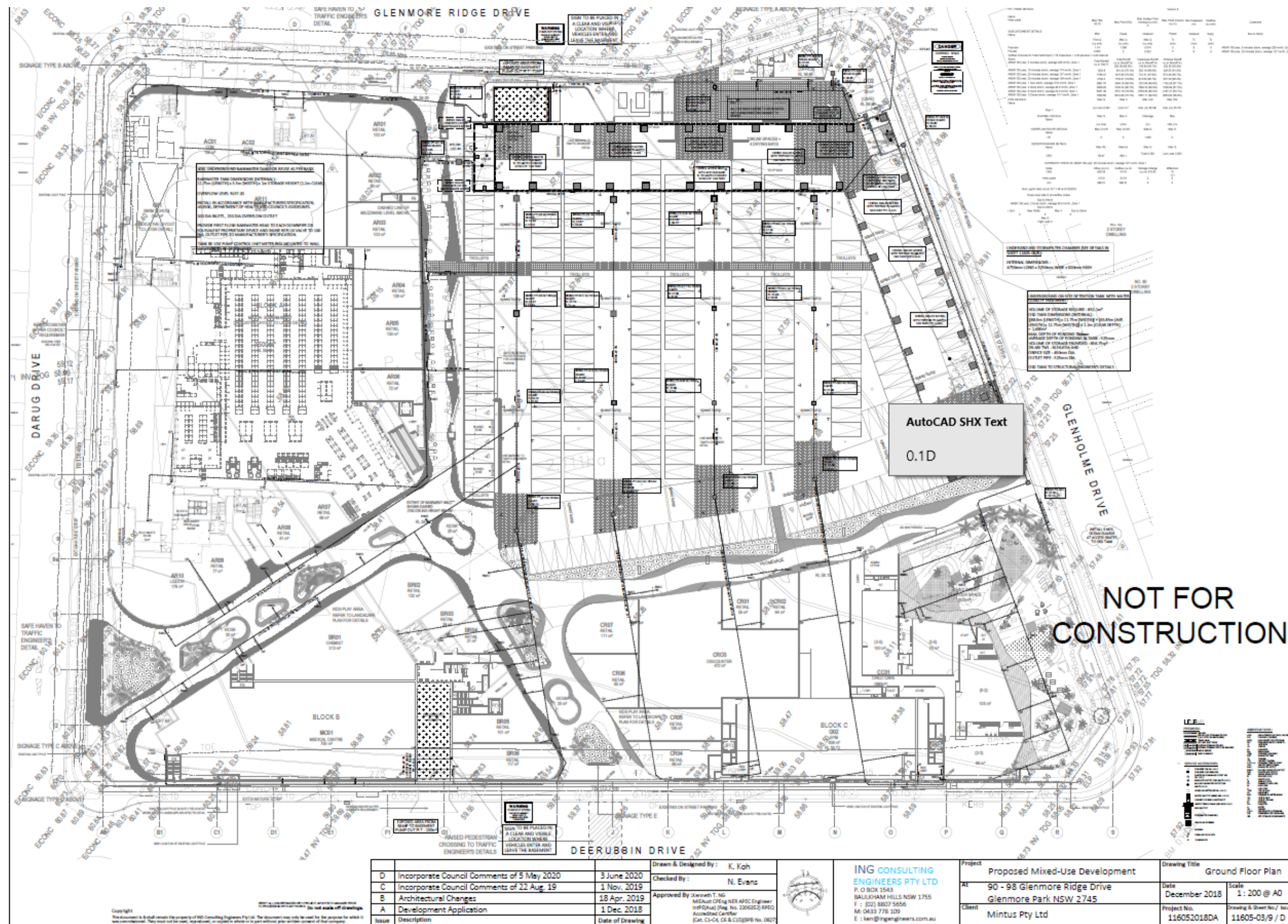
4 Conclusions

An re-investigation of the proposed site and stormwater treatment train has been undertaken for 90 to 98 Glenmore Ridge Drive, Glenmore Park NSW 2745.

A detailed MUSIC model was re-established for the site taking on board Council's comments. The updated model was based on the parameters provided within the Penrith City Council WSUD Technical Guidelines. Using a combination of proprietary devices, the proposed stormwater treatment train will meet the WSUD Targets adopted by Penrith City Council.

It is therefore recommended that Council approves the updated proposed treatment train for the Neighbourhood Shopping Centre and Shop Top Housing development.

Stormwater Layout Plan



Appendix 2

MUSIC-link Report

MUSIC-*link* Report

Project Details		Company Details	
Project:	90 - 98 Glenmore Ridge Drive, Glenmore Park	Company:	ING CONSULTING ENGINEERS PTY LTD
Report Export Date:	4/06/2020	Contact:	Kenneth Ng
Catchment Name:	11910 - 90 - 98 Glenmore Ridge Drive	Address:	NA
Catchment Area:	2.11ha	Phone:	0433 778 109
Impervious Area*:	76.18%	Email:	ken@ingengineers.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.31		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: 85/60/45	Reduction	Node Type	Number	Node Type	Number
Flow	6.24%	Sedimentation Basin Node	1	Urban Source Node	8
TSS	85.4%	Rain Water Tank Node	1		
TP	67.1%	GPT Node	2		
TN	47.7%	Generic Node	1		
GP	99.8%				

Comments

- Roof node base flow values are as per the MUSIC modelling guidelines which indicate base flow has no effect for impervious areas and therefore no value is needed.
- The 'SF Chamber' detention node (sedimentation basin) has been modified to represent a tank to hold volume for use with the Ocean Protect filter. k values has been set to 1 to prevent the tank from "treating" the flow as it would within a grassed above ground OSD.

NOTE: A successful self-validation check of your model does not constitute an approved model by Penrith City Council
MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

Passing Parameters					
Node Type	Node Name	Parameter	Min	Max	Actual
GPT	OceanGuards (20)	Hi-flow bypass rate (cum/sec)	None	99	0.4
GPT	OceanGuards (9)	Hi-flow bypass rate (cum/sec)	None	99	0.18
Receiving	85/60/45	% Load Reduction	None	None	6.24
Receiving	85/60/45	GP % Load Reduction	90	None	99.8
Receiving	85/60/45	TN % Load Reduction	45	None	47.7
Receiving	85/60/45	TP % Load Reduction	60	None	67.1
Receiving	85/60/45	TSS % Load Reduction	85	None	85.4
Sedimentation	15m	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Carpark - 6299m (90% Imp.)	Area Impervious (ha)	None	None	0.567
Urban	Carpark - 6299m (90% Imp.)	Area Pervious (ha)	None	None	0.06299999999999999
Urban	Carpark - 6299m (90% Imp.)	Total Area (ha)	None	None	0.63
Urban	Carpark Above OSD BYPASS - 43m (100% Imp.)	Area Impervious (ha)	None	None	0.004
Urban	Carpark Above OSD BYPASS - 43m (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Carpark Above OSD BYPASS - 43m (100% Imp.)	Total Area (ha)	None	None	0.004
Urban	Carpark Above OSD BYPASSING HED - 647m (100% Imp.)	Area Impervious (ha)	None	None	0.065
Urban	Carpark Above OSD BYPASSING HED - 647m (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Carpark Above OSD BYPASSING HED - 647m (100% Imp.)	Total Area (ha)	None	None	0.065
Urban	Carpark Above OSD to filters - 540m (100% Imp.)	Area Impervious (ha)	None	None	0.054
Urban	Carpark Above OSD to filters - 540m (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Carpark Above OSD to filters - 540m (100% Imp.)	Total Area (ha)	None	None	0.054
Urban	Carpark Above OSD to the top 2 pits - 313m (100% Imp.)	Area Impervious (ha)	None	None	0.031
Urban	Carpark Above OSD to the top 2 pits - 313m (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Carpark Above OSD to the top 2 pits - 313m (100% Imp.)	Total Area (ha)	None	None	0.031
Urban	Landscape - 4670m (10% Imp.)	Area Impervious (ha)	None	None	0.047
Urban	Landscape - 4670m (10% Imp.)	Area Pervious (ha)	None	None	0.419
Urban	Landscape - 4670m (10% Imp.)	Total Area (ha)	None	None	0.467
Urban	Pedestrian Paved - 2036m (90% Imp.)	Area Impervious (ha)	None	None	0.184
Urban	Pedestrian Paved - 2036m (90% Imp.)	Area Pervious (ha)	None	None	0.019
Urban	Pedestrian Paved - 2036m (90% Imp.)	Total Area (ha)	None	None	0.204
Urban	Roof - 6545m (100% Imp.)	Area Impervious (ha)	None	None	0.655
Urban	Roof - 6545m (100% Imp.)	Area Pervious (ha)	None	None	0
Urban	Roof - 6545m (100% Imp.)	Total Area (ha)	None	None	0.655

Only certain parameters are reported when they pass validation

NOTE: A successful self-validation check of your model does not constitute an approved model by Penrith City Council
MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

Failing Parameters					
Node Type	Node Name	Parameter	Min	Max	Actual
Rain	1 x 40kL	% Reuse Demand Met	80	None	72.61
Sedimentation	15m	Notional Detention Time (hrs)	8	12	0.0756
Sedimentation	15m	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	15m	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	15m	Total Suspended Solids - k (m/yr)	8000	8000	1
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.12	0.12	0
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	0
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.19	0.19	0
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	0
Urban	Roof - 6545m (100% Imp.)	Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.17	0.17	0
Only certain parameters are reported when they pass validation					

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Appendix 3

Draft Operation and Maintenance Manuals



OceanGuard™
Operations & Maintenance Manual

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Rev: 1 Last Updated: March 2019

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The OceanGuard technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of Filtration liners, designed to remove gross pollutants, total suspended solids and attached pollutants as either a standalone technology or as part of a treatment train with our StormFilter or Jellyfish Filtration products. OceanGuard pit baskets are highly effective, easy to install and simple to maintain.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the OceanGuard.

Health and Safety

Access to pits containing an OceanGuard typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard pit insert, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

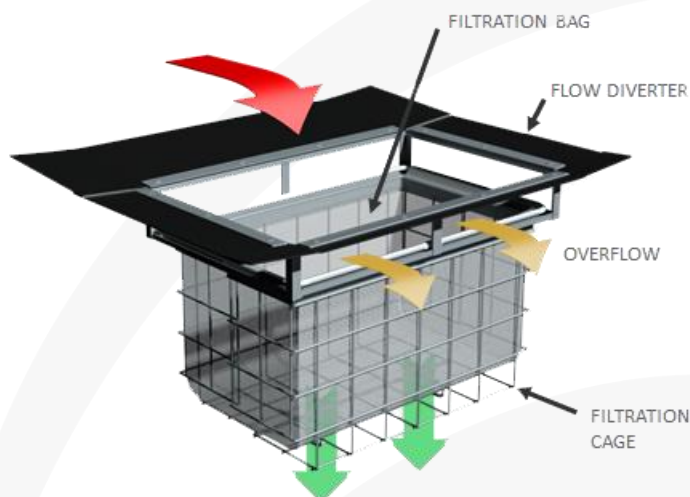
- Puncture resistant gloves
- Steel capped safety boots,
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard pit insert is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it Work?

OceanGuard is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).



During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard Filtration bag dry. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

Maintenance Procedures

To ensure that each OceanGuard pit insert achieves optimal performance, it is advisable that regular maintenance is performed. Typically the OceanGuard requires 2-4 minor services annually, pending the outcome of these inspections additional maintenance servicing may be required.

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard.

	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	2-4 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard device back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

1. Establish a safe working area around the pit insert
2. Remove access cover/grate
3. Use two lifting hooks to remove the filtration bag
4. Empty the contents of the filtration bag into a disposal container
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

1. Establish a safe working area around the pit insert
2. Remove access cover/grate
3. Vacuum captured pollutants from the filtration bag
4. Remove filtration bag
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard system, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag ^[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components ^[1]

[1] Replacement filtration bags and components are available for purchase from Ocean Protect.

Additional Reasons of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard pits that potentially received flow should be inspected and cleaned. Specifically all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuards internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. In the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

1. Inspect the OceanGuard flow diverter, ensuring that they are free of debris and pollutants
2. Perform a minor service on the OceanGuard
3. Remove the OceanGuard insert to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard pit insert after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

The accumulated pollutants found in the OceanGuard must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard system we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit www.OceanProtect.com.au



StormFilter

Operations & Maintenance Manual

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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter as recommended by the manufacturer.

The StormFilter is designed and sized to meet stringent regulatory requirements. It removes the most challenging target pollutants (including fine solids, soluble heavy metals, oil, and soluble nutrients) using a variety of media. For more than two decades, StormFilter has helped clients meet their regulatory needs and, through ongoing product enhancements, the design continues to be refined for ease of use and improved performance.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of each stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter.

Health and Safety

Access to a StormFilter unit requires removing heavy access covers/grates, and it is necessary to enter into a confined space. Pollutants collected by the StormFilter will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended:

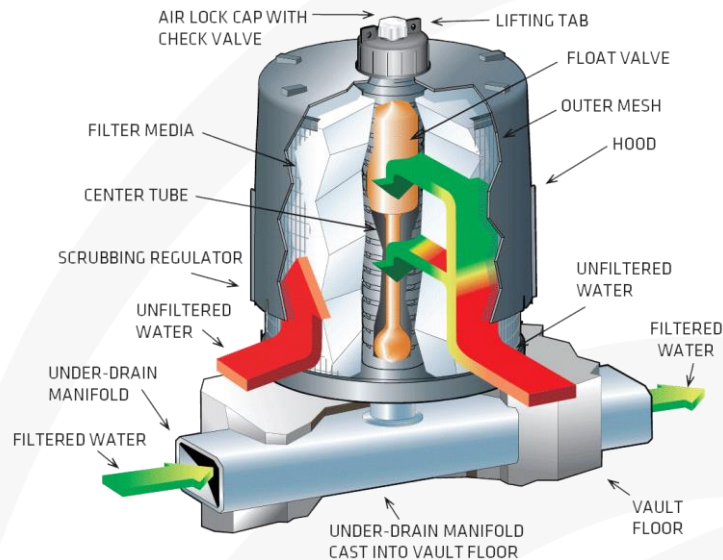
- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter maintenance can be performed from surface level, there will be a need to enter the StormFilter system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it Work?

Stormwater enters the cartridge chamber, passes through the filtration media and begins filling the cartridge center tube. When water reaches the top of the cartridge the float valve opens and filtered water is allowed to drain at the designed flow rate. Simultaneously, a one-way check valve closes activating a siphon that draws stormwater evenly throughout the filter media and into the center tube. Treated stormwater is then able to discharge out of the system through the underdrain manifold pipework.



As the rain event subsides, the water level outside the cartridge drops and approaches the bottom of the hood, air rushes through the scrubbing regulators releasing the water column and breaking the siphon. The turbulent bubbling action agitates the surface of the cartridge promoting trapped sediment to drop to the chamber floor. After a rain event, the chamber is able to drain dry by way of an imperfect seal at the base of the float valve.

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter.

	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter system is to assess the condition of the StormFilter chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter system, whilst assessing the condition of the cartridge media.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. Evaluate StormFilter cartridge media (if exhausted schedule major service within 6 months)
4. Measure and record the level of accumulated sediment in the chamber
(if sediment depth is less than 100 mm skip to step 9)
5. Remove StormFilter cartridges from the chamber
6. Use vacuum unit to removed accumulated sediment and pollutants in the chamber
7. Use high pressure water to clean StormFilter chamber
8. Re-install StormFilter cartridges
9. Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted ^[1]	Replace StormFilter cartridge media ^[2]

[1] Multiple assessment methods are available, contact Ocean Protect for assistance

[2] Replacement filter media and components are available for purchase from Ocean Protect.

This service is designed to return the StormFilter device back to optimal operating performance

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media.
4. Utilise a vacuum unit to remove exhausted media from each cartridge
5. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
6. Use high pressure water to clean StormFilter chamber
7. Inspect each empty StormFilter cartridges for any damage, rectify damage as required
8. Re-fill each cartridge with media in line with project specifications
9. Re-install replenished StormFilter cartridges
10. Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination, depending on the type of spill event it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter system the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Inspect the StormFilter unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed.

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter after a major storm event. The focus is to inspect for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our StormFilter system we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement media for cartridges.

For more information please visit www.OceanProtect.com.au

Appendix 4

Council's Comments of 5 May 2020 on WSUD

PENRITH CITY COUNCIL

Our Reference: DA19/0348

Contact: Kathryn Saunders

Telephone: +612 4732 8567

5 May 2020

Cd Architects
PO Box A102
SYDNEY SOUTH NSW 1235

Dear Sir/Madam

Development Application No.: DA19/0348
Proposed: Construction of a 4 Storey Mixed Use Development
Including 1 Level of Basement Parking, Commercial Tenancies to
Establish a New Town Centre, Loft with Mezzanine, Child Care Centre
for 112 Children and 3 Upper Residential Levels Containing 147
Apartments
Address: 90 - 98 Glenmore Ridge Drive GLENMORE PARK NSW 2745

A review has been undertaken of the additional plans and documents submitted 21 February 2020 in response to Council's previous letter. It is noted that some additional amendments have been made to accommodate the requirements of a major tenant, which include alterations to the waste, delivery and loading dock areas. The following matters are raised for your information and action:

1. Planning Matters

A.(a) All residential waste must be transferred from each level via a dual chute system through to the basement, then be transferred up into the ground floor loading/waste area. A bin tug device(s) will be needed and the central bin lifts will need to be larger to accommodate practical moving of the number of 1100L bins required. The caretaker for the residential apartments is to have access to the bulky waste room and access is to allow for the manoeuvring of bulky furnishings waste and the like.

(b) The use of exposed polished concrete materials (or similar) and powder coated aluminium and face masonry need to be further explained through detailing and are to be coupled with high quality under awning cladding (timber or similar). Finer grain materials are needed to break up these elements. Details or sections are to be provided with regard to how high quality concrete finishes will be obtained for exposed surfaces.

(c) Residential entry points are to be clearly discernible from commercial entry points, these may be expressed through changes in finishes, floor and awning heights, lighting, ceiling, floor or wall treatments.

(d) The location of the double substations at the Glenmore Ridge Drive main entry is to be revised. It is noted that the locations are shown differently on the larger scale site plan.

(e) The use of stairs and ramps at the Glenmore Ridge Drive main entry must be avoided. This area is to ramp back into the development to meet the street front. The street frontage is not to include ramps, steps and balustrades. Awning heights above finished floor level and awning widths are to be nominated on plans.

(f) Block A - The second lift core entry/lobby is poor in amenity and deeply

recessed (drawing 1202). This element is to be addressed. All lift cores, bike and storage areas are to be provided with level access or pram ramps where there is a level change. The Block B1 Residential waste room is to be accessed off of the adjacent service corridor as access through the accessible shared zone is restricted by the bollard.

(g) Internal sections and details at larger scales are to be provided through rear threshold and street front areas.

(h) The uses along Deerubbin Drive will result in large areas of glazing being covered and thus this area will not be activated. This matter is to be addressed.

(i) All fire hydrants are to be in cupboards and boosters are to be shown. A services report is to be provided in support.

(j) Light poles in pavements are to be relocated clear of pedestrian pavement. A concept public domain set of plans and documents will be required. The public domain set of plans shall identify the fixed furnishings such as bike parking, lighting, seating, bins and the like.

(k) The green wall at Grid 13 and C1 is positioned on slab and is south facing. The landscape consultant is to explain the sustainability of this aspect.

(l) Public art opportunities are to be nominated and details provided.

(m) The bike and residential storage area at grids A/1, B1/13, H/13 and K13 need to have the internal walls constructed of perforated screening, chain wire or other material, to allow views in and out of the area. This will increase opportunity for casual surveillance and reduce opportunity for concealment and crime.

(n) Owing to the extent and nature of the submissions received, a response to submissions document is requested to be submitted.

At grade and basement car parking

B.(a) Consideration shall be given to the provision of waste bins in the at grade car park area and around the shopping forecourt.

(b) Sight lines for the basement ramp are minimal and pedestrian safety will be impacted by the blind corner at the medical centre edge. The approach area is to be recessed and provided with a low planter or similar, as a buffer, and to increase sight lines and response times.

(c) Bicycle parking spaces need to be provided across the development at primary entry/high patronage/visibility points.

(d) The childcare centre will require 10min drop off spaces near the entry from Glenholme Drive and is to include parents with prams spaces and an accessible space.

(e) The two parallel car parking spaces in the at-grade car park are to be deleted, these areas are to be used for landscape and large canopy tree planting and/or WSUD (refer Waterways comments).

(f) The provision of 'motorcycle only' spaces is to be investigated for the at-grade parking area.

(g) The security roller doors need to be linked to the main entry door so that queuing does not occur on the basement entry ramps. The location of security swipe card readers and the like are to be noted on plans to ensure adequate area is provided for their installation.

Retail and commercial areas

C.(a) Grease traps are to be shown and spaces must be readily adaptable for retail and food and beverage uses.

(b) Retail tenancy AR11 has a street frontage to depth/width ratio which is inconsistent with the design approach for other retail shops. Further, the swim school on the corner (Darug/Glenmore Ridge) will result in full glazing coverage to the majority of the shop fronts, is there opportunity to relocate the swim school to AR11.

(c) Where are the areas for indoor/outdoor café/restaurant seating? Possible seating locations are to be shown.

(d) The basement 'child area' is to be deleted, this area is unsuitable in amenity for a child's play area.

(e) Insufficient and narrow pedestrian entry points into the shopping centre from the at grade car park are provided.

- (f) It is raised for your consideration that the childcare should have an entry from the street.
- (g) There is one major tenant and other large retailers such as the 472sqm discounter and AR11 retail space? There appears to be insufficient trolley return bays servicing the eastern edge of the car park. Are dual trolley storage spaces required? These elements are to be addressed.
- (h) The shared amenities zone appears insufficient for all of the retail and staff. A second amenities zone is required and individual amenities will need to be provided for other tenancies such as the swim school, major retailer and medical facility.
- (i) The basement pedestrian exit point for the commercial zone must be amended so that the glazing does not open straight onto the car park aisle.
- (j) The north western residential lift core location is a CPTED issue. The lift at Grid D2 has a bollard in front for the accessible space. This arrangement is impractical and will impact access to the lift, particularly as the corner of the commercial car park wall also intrudes into this space. Suggest that the two accessible spaces in the adjacent row share the one shared zone.
- (k) A centre-wide signage strategy is required to be submitted. This strategy shall identify areas for retail signage and guide retailers as to where signage can be installed and should guide tenants as to the general pallet, scale, location and design quality of future signage.

Car wash facility

- D.(a)** The location of the car wash facility is not supported. The element is in a prominent position being a corner location and is located opposite residential uses.
- (b) Should the car wash facility remain part of the proposal, a plan of operation is to be submitted which covers the activities and operational procedures associated with the car wash including waste management, staff areas, pick up and drop off management matters, expected volumes, noise and the like.
- (c) Additional information is to be provided with regard to materials and finishes, possible hours of operation, location of signage, lighting and any conflicts which may result from the manoeuvring of vehicles in the car park, and near the entry and exit points.

2. Traffic Engineering

- (a) Parking space dimensions, ramp and aisle widths are to be nominated on plans. Parking spaces are to be 2.5m in width to allow for full door opening. Plans indicate 2.4m widths.
- (b) One at grade parking space is to be line marked and provided for the use of Emergency Services Vehicles. This spaces is to be located closest to the medical centre.
- (c) A revised Traffic and Parking Assessment report is to be submitted in consultation with Council's Traffic Engineers (02) 4732 7777. Trip and rate calculations are to be discussed with Council's engineers and parking rates for the childcare and medical centre components are to be separated. The report shall not include on street car parking spaces as calculable parking spaces for the development. The report shall respond to the matters raised by Council's traffic engineers in Council's previous correspondence and is to include a cover letter outlining the assessment considerations and responses.
- (d) The angled and split vehicle entry/exit points onto surrounding streets will not be accepted and are unsafe for pedestrians.
- (e) The loading dock area does not accommodate 19m heavy vehicles. Plans are to be amended to include the ability to receive trucks of this size.

3. Engineering

- (a) There a number of matters which were raised in Council's previous correspondence which have not been addressed, these matters which remain outstanding and are to be resolved.
- (b) All vehicular cross overs are to be perpendicular to the kerb. The access

points on Glenmore Ridge Drive and Glenholme Drive shall be provided as combined ingress and egress driveways as the proposed 'left-in left-out' arrangement is not required.

(c) Vehicular crossovers shall be situated a minimum of 1m clear of existing kerb inlet pits. Existing pit locations shall be shown in the correct locations on the plans.

(d) The acute bend at the south-western corner of the shopping centre car park shall be redesigned to be no less than 90 degrees to avoid corner cutting by drivers.

(e) The speed humps for the shopping centre car park shall be modified to facilitate trolley access for shoppers.

(f) The loading dock entry and exit driveways shall be widened so that the design vehicles do not encroach the double-barrier centre line on Darug Avenue to enter and exit the loading dock. 'No Stopping' signage shall be provided where vehicle swept paths will conflict with on-street parking. All proposed signage is to be nominated on plans.

(g) Residential parking spaces shall be a minimum width of 2.5m to accommodate full opening of vehicle doors, in accordance with Penrith DCP and AS 2890.

(h) Swept paths shall be provided for the basement car park, including end spaces, general circulation and access for service vehicles.

(i) Operational details of the roller doors in the basement car park shall be submitted with the application. Refer also to planning comments above.

(j) The proposed pedestrian refuge islands on Glenmore Ridge Drive and Darug Avenue shall be relocated to the nearest existing pram ramps.

(k) The proposed pedestrian refuge island on Deerubbin Drive shall incorporate kerbside splitter islands and new pram ramps and shall be designed to accommodate a zebra crossing in the future (i.e. 3.6m wide walk-throughs).

(l) The plans shall show proposed regulatory signage (i.e. 'No Stopping' signs) for the proposed pedestrian refuge islands and on-street.

(m) The proposed development will have a direct nexus to the existing bus stops on Darug Avenue south of Deerubbin Drive. Bus shelter infrastructure shall be provided at the bus stops and identified on the plans.

(n) Please clarify the purpose of the concrete infill between back of kerb and footpath approximately opposite No. 17 Darug Avenue.

4. Environmental Management & Public Health

(a) The previously requested information which relates to acoustic assessment has not been provided, and is requested to be submitted.

(b) The Contamination Assessment dated 25/7/2007 and the PSI dated 25/2/2020, prepared by Geotechnique have been reviewed and are satisfactory, no further concerns are raised related to site contamination.

(c) Construction of any pool or spa is to comply with the Public Health Act 2010 and associated Regulation 2012. Toilets and change rooms (including baby change area) are to be accessible to all members of the community and provided within the tenancy.

5. Social Planning

(a) The loading dock access point along Darug Avenue is resulting in large areas of inactive facade. The western side of Darug Avenue contains a row of low density residential dwellings which will look directly onto the loading dock area. In this regard, the applicant is encouraged to better articulate this facade. The installation or incorporation of public art is encouraged.

(b) Confirmation is requested as to whether the operation of the Childcare Centre is sought as part of this application.

(c) The parents and carers room is to be designed to comply with the minimum requirements of Council's DCP, Chapter D5 Other land uses, Parent and carer friendly amenities.

6. Waterways

- (a) Council's waterways officer notes that the stormwater treatment devices include the use of Ocean Protect Filter and Protect Cartridges and it is assessed that there are opportunities to utilise vegetated treatment measures which are more in keeping with the intent of Council's WSUD Policy.
- (b) A 5kL rainwater tank is proposed with a commitment to utilise the water in the car wash and landscaping, although no information is provided in relation to how much rainwater will be re-used for meeting non-potable demands associated with the other components of the development.
- (c) There is insufficient information provided in relation to how the development will comply with the water conservation requirements outlined in Council's WSUD Policy and the following is requested: A revised strategy revised to include vegetated treatment measures in place of proprietary devices, a revised WSUD Strategy which is to include details in water conservation measures as outlines in Section 3.1 of Council's WSUD Policy will also need to be provided. This means that 80% of non-potable water usage is met with rainwater.
- (d) It is noted that an electronic version of the MUSIC model has been provided, this is to be amended and resubmitted if required to address the above.
- (e) The applicant is encouraged to review Council's WSUD Technical Guidelines which outline how to achieve compliance with the requirements of Council's WSUD Policy.

7. Waste

- (a) The chute room of Building C, Core 2 is to incorporate a set of dual doors on the northern elevation and another on the eastern elevation to assist in bin manouvering.
- (b) The chute inlets on each residential level are to be designed to be in cupboards (150mm depth max.).
- (c) The Waste Management Plan is to incorporate details of how commercial waste will be transported (including method and path of travel) to the waste storage and collection areas.
- (d) A loading dock management plan is to be provided for the service dock area.

8. Access Committee

The proposal was briefed to Council's Access Committee on 14 August 2019. The Committee raised the following matters for your information and inclusion:

- (a) Provision of suitable ambulant and accessible amenities.
- (b) Insufficient information provided in the submitted building code report, and the requirement for an Access report.

You are requested to submit the additional requested information by 26 May 2020. Please be aware that additional information may be requested as a result of the review of the submitted plans and material being considered by TfNSW (RMS), which will be forwarded on receipt. Further, Council's Urban Design Review Panel member is undertaking a review of the amended plans, the feedback from this review will be forwarded when it is made available.

Should you have any further queries on this matter, please contact me on +612 4732 8567.

Yours sincerely

Kathryn Saunders
Senior Development Assessment Planner