Warren Smith & Partners

DEVELOPMENT APPLICATION REPORT

ROYAL NORTH SHORE PRIVATE HOSPITAL, ST LEONARDS

MAY 2016

DOCUMENT INFORMATION

Client:	Dexus Property Group c/o Donald Cant Watts Corke (DCWC)
Project:	Royal North Shore Private Hospital, St Leonards
Document Ref:	5320001_Royal North Shore Private Hospital_DA Report_Rev A.docx
Job No.:	5320001

CONSULTANT INFORMATION

Warren Smith & Partners Pty Limited
Consulting Civil, Hydraulic & Fire Protection Engineers

Level 1, 123 Clarence St
Sydney NSW 2000

Ph: +61 2 9299 1312
Fax: +61 2 9290 1295
Email: wsp@warrensmith.com.au
Web: www.warrensmith.com.au

DOCUMENT CONTROL

A	9th – May – 2016	Issue for Development Application
Rev	**Date**	**Description of Change**

APPROVALS

A	L. Shaughnessy *Civil Engineer*	M. Cahalane *Director - Civil & Water Engineering*
Rev	**Author**	**Reviewer**

TABLE OF CONTENTS

1. INTRODUCTION 2
1.1 BACKGROUND 2
2. EXISTING STORMWATER DRAINAGE 3
2.1 EXISTING DRAINAGE INFRASTRUCTURE 3
3. AUTHORITY AND REGULATORY REQUIREMENTS 4
3.1 WILLOUGHBY CITY COUNCIL 4
4. PROPOSED STORMWATER SYSTEM 5
4.1 PROPOSED DRAINAGE SYSTEM 5
4.2 ON-SITE DETENTION & PERMISSIBLE SITE DISCHARGE 6
4.3 CONNECTION TO EXISTING DRAINAGE 7
5. WATER QUALITY MANAGEMENT 8
5.1 POTENTIAL POLLUTANTS GENERATED 8
5.2 RAINFALL 8
5.3 RAINFALL RUNOFF PROPERTIES 9
5.4 MUSIC MODEL CATCHMENT AREA 10
5.5 RAINWATER TREATMENT PLAN 11
5.6 MUSIC RESULTS 12
6. SEDIMENT & EROSION CONTROL 13
6.1 SITE PROTECTION MEASURES 13
6.2 TEMPORARY STORMWATER SYSTEM (WHERE REQUIRED) 14

SCHEDULES

Schedule 1 Willoughby City Council OSD Checklist
Schedule 2 MUSIC Results

1. INTRODUCTION

Warren Smith and Partners (WS+P) has been engaged by Donald Cant Watts Corke (DCWC) to prepare a development application report for the Royal North Shore Private Hospital development. This report outlines a stormwater strategy plan associated with the proposed development at St Leonards. This report aims to address the following:-

- Proposed On-site Detention (OSD) and stormwater drainage works;
- Existing and proposed connections to Council drainage;
- Water quality requirements and proposed treatment system, and;
- Sediment and erosion control.

1.1 BACKGROUND

The existing site is located at 1 Westbourne Street, St Leonards, NSW, approximately 8km north of the Sydney CBD. The development site is bound by Westbourne Street to the south, Reserve Road to the west, Frederick Street to the north and commercial properties to the east. Please refer to Figure 1 below which shows the extent of the development site area in which the proposed works will be carried out.

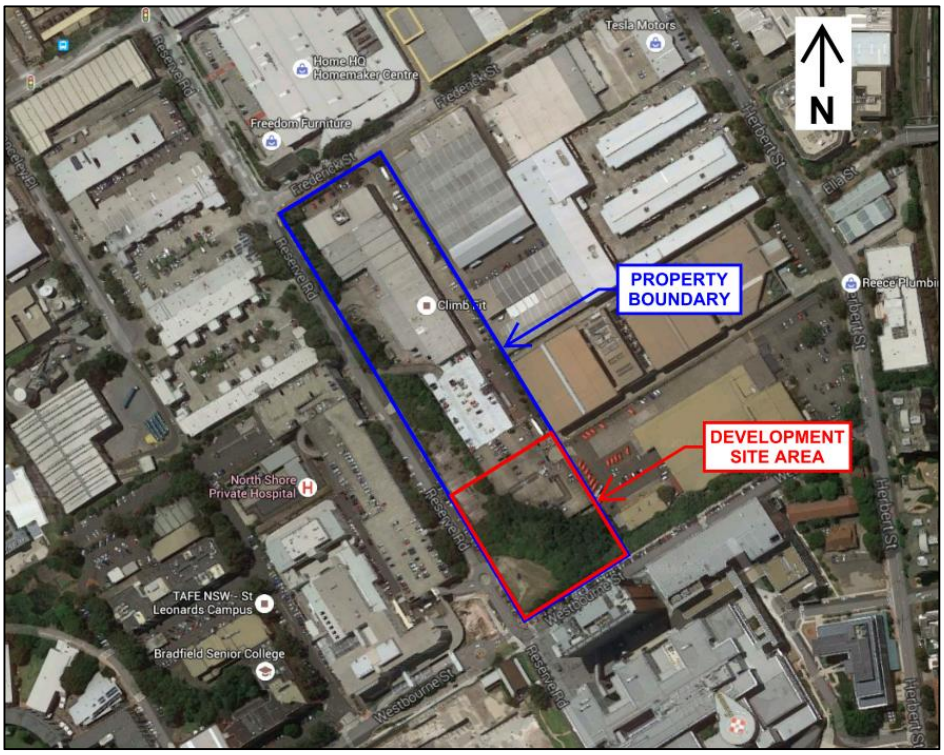


Figure 1: Aerial View of Development Site Area (Source: Google Earth)

The proposed development involves the construction of a private hospital within the development site area.

2. EXISTING STORMWATER DRAINAGE

2.1 EXISTING DRAINAGE INFRASTRUCTURE

A site inspection was carried out in order to determine the existing drainage infrastructure within the development site. The inspection revealed the following:-

- The development area grades in a northerly direction. The southern section of the development area grades at approximately 8.8% towards an embankment which grades towards the existing warehouse building at a steeper grade of approximately 54%.
- An existing drainage channel runs along the south of the warehouse in an east to west direction. This channel has a number of existing stormwater pits which reticulate from the western corner of the development area in a north westerly direction to connect into the existing stormwater system in Frederick Street.
- Another existing pit and pipe system also runs from the northern corner of the development area in a north westerly direction to connect into the existing stormwater system in Frederick Street.

Please refer to Figure 2 below for an illustration of the site grading and the location of the existing stormwater infrastructure.

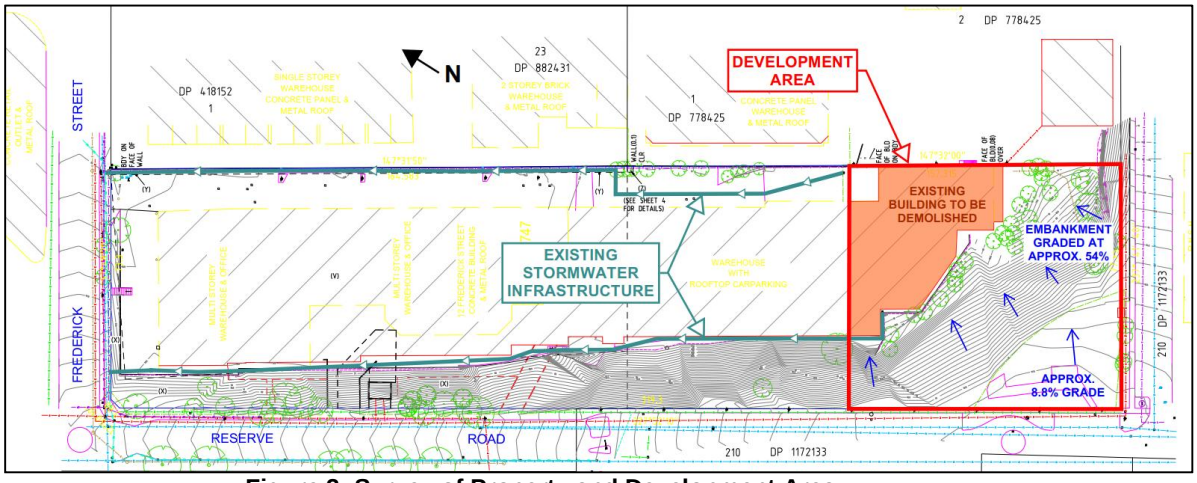


Figure 2: Survey of Property and Development Area

3. AUTHORITY AND REGULATORY REQUIREMENTS

3.1 WILLOUGHBY CITY COUNCIL

With reference to *the Willoughby City Council Development Control Plan (DCP), dated 21 August 2006*, the council requirements are as follows:-

3.1.1 STORMWATER DRAINAGE AND ON-SITE DETENTION REQUIREMENTS

- All stormwater drainage pipe systems must be designed in accordance with the Willoughby City Council DCP *Attachment 19 Stormwater Design Elements*.

- OSD and permissible site discharge (PSD) calculations shall be in accordance with Table 1 and Table 2 from the Willoughby City Council DCP *Attachment 20 On-Site Detention Technical Standard No. 1*.

- An overland flow route shall be provided and must be capable of carrying flows for a 1 in 100 year ARI storm event.

- A minimum freeboard of 300mm must be provided to all habitable floor levels above the maximum design storage water surface level.

3.1.2 WATER SENSITIVE URBAN DESIGN (WSUD) REQUIREMENTS

The stormwater treatment objectives set out in the Willoughby City Council DCP *Attachment 24 Water Quality Technical Standard No. 5* are presented in Table 1 below.

Table 1: Water Quality Requirements

Pollutant Type	Target Reduction Percentage (%)
Gross Pollutants	70%
Total Suspended Solids	80%
Total Phosphorus	45%
Total Nitrogen	45%

4. PROPOSED STORMWATER SYSTEM

The development site has a total catchment area of approximately 6,194 m². The breakdown of the proposed catchment is presented in Table 2 below.

Table 2: Breakdown of Total Site Catchment

Catchment Areas	Area (m²)	Percentage of Total Area (%)
Roof	4,243	68.5
Impervious	1,839	29.7
Pervious	112	1.8
Total	**6,194**	**100**

4.1 PROPOSED DRAINAGE SYSTEM

It is proposed that a total area of 5,968m² will capture rainfall and reticulate to the OSD tank located below the lower ground carpark LG3. This area includes the roof, driveway and southern garden beds.

The remaining area totalling 226m², located along the western side of the proposed development, will bypass the stormwater drainage and OSD system and discharge on to Reserve Road. The bypass are amounts to 3.65% of the total development area which is classed as minimal.

It is proposed that the OSD tank will have a total volume capacity of 236kL. The stormwater drainage and OSD systems have been designed in accordance with AS3500 and the Willoughby City Council requirements.

4.2 ON-SITE DETENTION & PERMISSIBLE SITE DISCHARGE

The required on-site detention (OSD) volume and permissible site discharge (PSD) have been calculated in accordance with the Willoughby City Council's DCP, August 2006, *Attachment 20, OSD Technical Standard No.1*. Please refer to *Schedule 1* for the Willoughby City Council OSD Checklist.

4.2.1 OSD CALCULATION

The proposed development area has a total site area of approximately 6,194 m².

The volume of OSD storage has been calculated to be approximately 236 m³ and is in accordance with the OSD Technical Standard, *Table 1 – Site Storage Requirements per impervious area*. Please refer to Table 3 below for a summary of the OSD calculation.

Table 3: Option A - OSD Calculations

Zone	Volume of Storage Required per Cubic Metre (m³/100m²)	Area of Site (m²)	OSD Volume Required (m³)
3	3.8	6,194	235.37

4.2.2 PSD CALCULATION

The PSD has been calculated to be approximately 111 L/sec and is in accordance with the OSD Technical Standard, *Table 2 – Permissible Site Discharge per impervious area*. Please refer to Table 4 below for a summary of the PSD calculation.

Table 4: Option A - PSD Calculations

Zone	Permissible Site Discharge per Cubic Metre (L/sec/Ha)	Area of Site (Ha)	Maximum PSD (L/sec)
3	180	0.6194	111.49

The proposed OSD tank will be constructed with a sediment sump and a trash screen located immediately upstream of the outlet pipe. It is proposed that a minimum area of 0.60m x 0.60m and a minimum depth of 0.2m below the invert level of the outlet pipe will be provided for the sediment sump.

4.3 CONNECTION TO EXISTING DRAINAGE

It is proposed that stormwater will be discharged from the OSD tank, via a 168mm diameter orifice. The orifice size was calculated using the following equation.

Orifice Dia. (mm) = 21.8 x √ (PSD / (√ Head of Water (m) over the centreline of the orifice))

Orifice Dia. (mm) = 21.8 x √ (111 / (√ 3.466))

Orifice Dia. (mm) = 168

The discharge released through the orifice plate will reticulate via a new pit and pipe system connecting into an existing pit located at the norther eastern corner of the development area. This existing pit reticulates to the existing Council drainage infrastructure in Frederick Street via a pit and pipe system which runs along the eastern side of the property. Please refer to the WS+P DA Drawing Package for further details.

5. WATER QUALITY MANAGEMENT

In order to follow Willoughby City Council requirements for the adequate treatment of stormwater runoff, treatment solutions have been provided to remove suspended solids and nutrients prior to being discharged from site.

5.1 POTENTIAL POLLUTANTS GENERATED

The pollutants that could be potentially generated as a result of the development use are as follows:-

- Litter;
- Sediment; and,
- Nutrients (Nitrogen and Phosphorus)

The development has been modelled to demonstrate the performance of the stormwater treatment system utilising a program called MUSIC (Model for Urban Stormwater Improvements Conceptualisation). MUSIC models the proposed stormwater treatment devices and estimates their respective performance against the performance targets of the project. The pollutants modelled in MUSIC are Gross Pollutants, Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

5.2 RAINFALL

The rainfall data used in the MUSIC model was based on the Bureau of Meteorology data and is presented in Table 5 below.

Table 5: Rainfall Data for MUSIC Modelling

Rainfall Station	Rainfall Period	Rainfall Period Dates	Time Step
Sydney Observatory 066062	5 Years	1 Jan 1981 – 31 Dec 1985	6 minutes

The average potential evapotranspiration (PET) data used in the MUSIC model was based on the average Sydney PET and is presented in Table 6 below.

Table 6: Evapotranspiration Data for MUSIC Modelling

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PET (mm)	180	135	128	85	58	43	43	58	88	127	152	163

5.3 RAINFALL RUNOFF PROPERTIES

In accordance with the New South Wales MUSIC Modelling Guidelines, 2010, the following Table 7 and Table 8 presents the rainfall runoff properties which have been used in the MUSIC model.

Table 7: MUSIC Rainfall Runoff Properties

Parameter	Unit	Value
Impervious Area Parameters		
Rainfall Threshold	mm	1.5 (for roads/paths etc.) 0.3 (for roofs)
Pervious Area Parameters		
Soil Storage Capacity	mm	139
Initial Storage Capacity	%	25
Field Capacity	mm	69
Infiltration Capacity co-efficient a		360
Infiltration Capacity co-efficient b		0.5
Groundwater Properties		
Initial depth	mm	10
Daily recharge rate	%	100
Daily base seepage rate	%	50
Daily seepage rate (%)	%	0

Table 8: Pollutant Concentration Parameters for MUSIC Source Nodes

Land Use Category		Concentration (mg/L-log$_{10}$)					
		Total Suspended Solids		Total Phosphorus		Total Nitrogen	
		Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow
General Urban (incl public open space)	Mean	2.43	1.20	-0.30	-0.85	0.34	0.11
	Standard Deviation	0.32	0.17	0.25	0.19	0.19	0.12
Roofs	Mean	1.30	*	-0.89	*	0.30	*
	Standard Deviation	0.32	*	0.25	*	0.19	*

*Base flows are only generated from pervious areas; therefore these parameters are not relevant to impervious areas.

5.4 MUSIC MODEL CATCHMENT AREA

The MUSIC model's total catchment area to be treated is 5,968m², with the remaining area of 226m² bypassing the treatment system. Please refer to Figure 3 below for an illustration of the extent of the MUSIC model catchment areas.

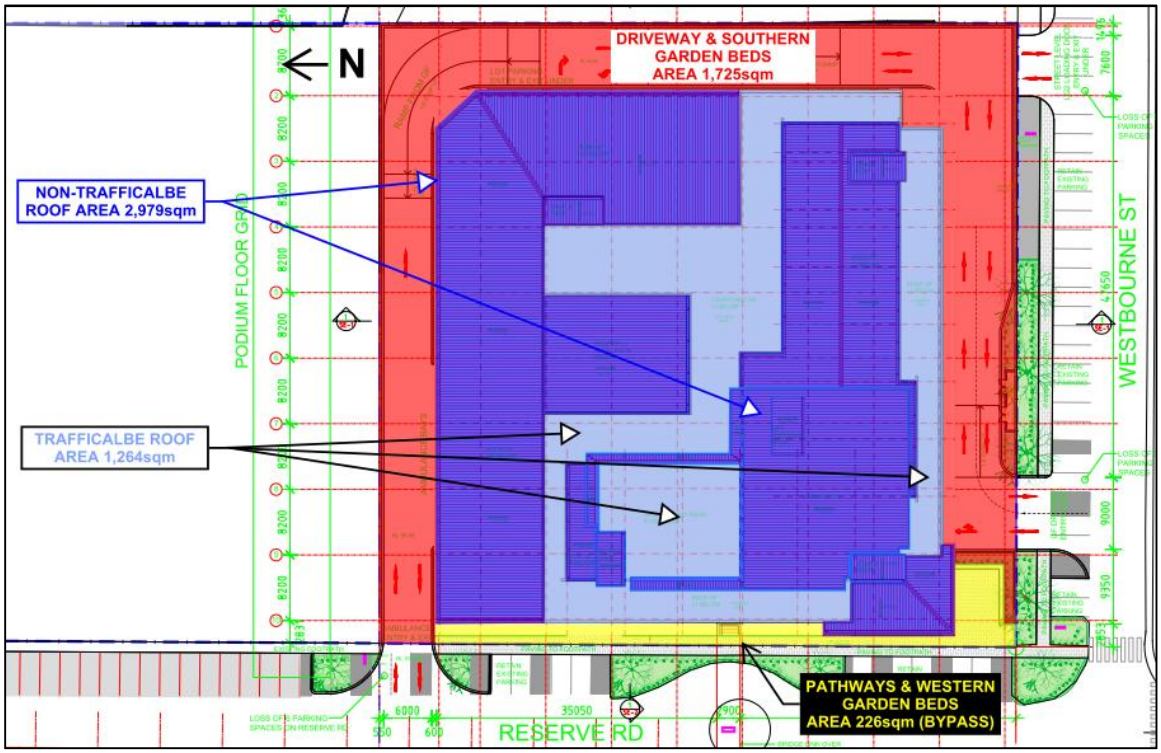


Figure 3: Extent of MUSIC Model Catchment

5.5 RAINWATER TREATMENT PLAN

It is proposed that the stormwater discharge from the development site will pass through a treatment system in order to provide treatment to the stormwater runoff prior to it entering the existing stormwater system.

It is proposed that twenty two (22) Psorb Stormfilter cartridges, supplied by Stormwater 360, be installed within the OSD to provide treatment to the stormwater. A Psorb Stormfilter cartridge system is provided to remove any suspended sediments and nutrients which have entered the stormwater system, please refer to Figure 4 below for an illustration of a typical Psorb Stormfilter.

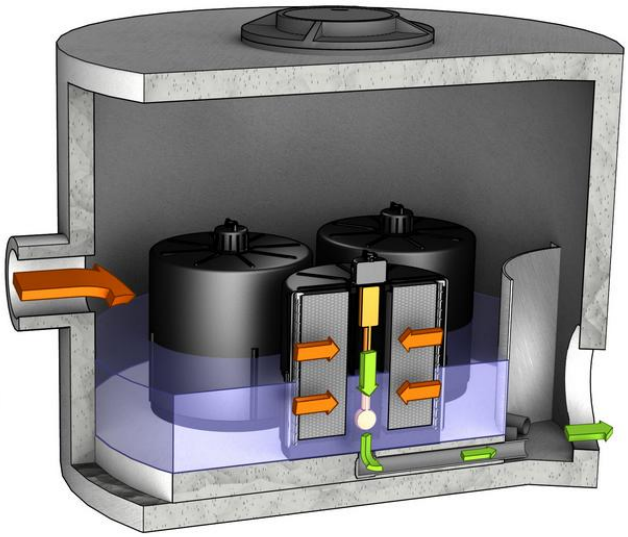


Figure 4: Typical Psorb Stormfilter

5.6 MUSIC RESULTS

The stormwater quality treatment system has been modelled using the MUSIC software, please see Figure 5 below for the treatment plan.

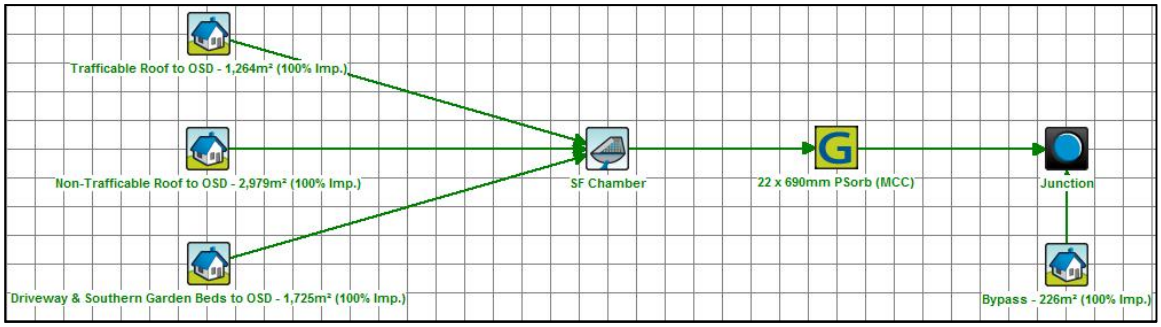


Figure 5: Treatment Plan

Please refer to *Schedule 2* for the MUSIC results and Table 9 below for a summary of the results.

Table 9: Percentages Based Load Reduction in Pollutant Results

Pollutant Type	Source (kg/yr)	Residual Load (kg/yr)	Reduction % Achieved	Willoughby City Council Target Reduction %
Gross Pollutants	175	5.26	97	90
Total Suspended Solids	1320	262	80.1	80
Total Phosphorus	2.63	0.673	74.4	60
Total Nitrogen	16.6	8.4	49.3	45

6. SEDIMENT & EROSION CONTROL

The Contractor for the works is required to provide Erosion and Sedimentation Control in accordance with the general requirements outlined below.

6.1 SITE PROTECTION MEASURES

It is proposed to provide the following in order to inhibit the movement of sediment off the site during the demolition and construction phases.

6.1.1 SITE ACCESS

Construction vehicles leaving the site shall be required to pass over a Temporary Construction Vehicle Entry consisting of a 1.5m long by 3m wide 'cattle rack'.

6.1.2 SEDIMENT CONTROL

All exposed earth areas where it may be possible for runoff to transport silt down slope shall be protected with a sediment and erosion control silt fence generally installed along the boundaries of the site.

The fence will be constructed in accordance with details provided by the Department of Conservation and Land Management incorporating geotextile fabric which will not allow suspended particles greater than 50mg/L non-filterable solids to pass through, and as such comply with the appropriate provisions of the Clean Waters Act 1970.

The construction of the silt fence will include the following:-

- Geotextile fabric buried to a maximum of 100mm below the surface;
- Overlapping any joins in the fabric;
- Turning up on the ends for a length of 1 metre in order to prevent volumes of suspended solids escaping in a storm event;
- Any Council owned road kerb entry and or gully pits will be protected by Atlantis Filter Bales and EcoSock. Additional protection will be provided by inserting Water Clean Filter Cartridges into the gully opening, and;
- Internal site drainage pits shall be protected by Sediment Traps consisting of hay bales.

6.2 TEMPORARY STORMWATER SYSTEM (WHERE REQUIRED)

Site runoff within the zones of the excavation will be drained into a central holding well within the excavation. Runoff will be allowed to settle out suspended particles and debris and an acceptable water quality of 50mg per litre of Non Filterable Residues (NFR) is required to be achieved prior to discharge.

6.2.1 DUST CONTROL

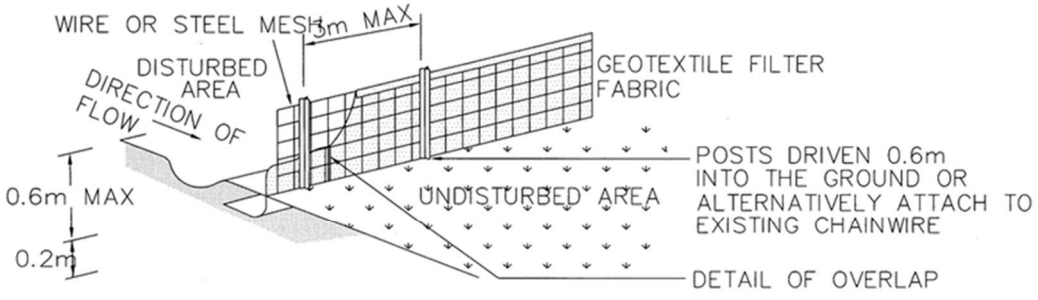
The following dust control procedures will be adhered to:

- Loose loads entering or leaving the site will be securely covered by a tarpaulin or like material in accordance with RTA and Council Guidelines.
- Soil transport vehicles will use the single main access to the site.
- There will be no burning of any materials on site.
- Water sprays will be used across the site to suppress dust. The water will be applied either by water sprinklers or water carts across ground surfaces whenever the surface has dried out and has the potential to generate visible levels of dust either by the operation of equipment over the surface or by wind. The watercraft will be equipped with a pump and sprays.
- Spraying water at the rate of not less than three (3) L/s and not less than 700kPa pressure. The area covered will be small enough that surfaces are maintained in a damp condition and large enough that runoff is not generated. The water spray equipment will be kept on site during the construction of the works.
- During excavation all trucks/machinery leaving the site will have their wheels washed and/or agitated prior to travelling on Council Roads.
- Fences will have shade cloth or similar fabric fixed to the inside of the fence.

6.2.2 MAINTENANCE

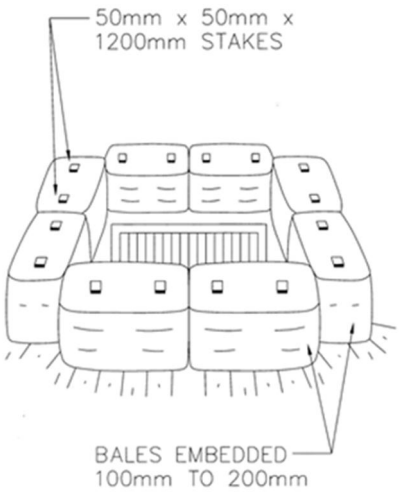
- It will be the responsibility of the site foreman for the building contractor to ensure sediment and erosion control devices on site are maintained. The devices shall be checked daily and the appropriate maintenance undertaken as necessary.
- Prior to the closing of the site each day, the road shall be swept and materials deposited back onto the site. Under no circumstances shall the laneway be washed down in order to clean or wash any materials deposited on the street.
- Gutters and roadways will be kept clean regularly to maintain them free of sediment.
- Appropriate covering techniques, such as the use of plastic sheeting will be used to cover excavation faces, stockpiles and any unsealed surfaces;
- If dust is being generated from a given surface, and water sprays fail;
- If fugitive emissions have the potential to cause the ambient as quality to foul the ambient air quality;
- The area of soils exposed at any one time will be minimised wherever possible by excavating in a localised progressive manner over the site; and,
- Materials processing equipment suitable comply with regulatory requirements. The protection will include the covering of feed openings with rubber curtains or socks.

It is considered that by complying with the above, appropriate levels of protection are afforded to the site and the adjacent public roads, footpaths and environment.



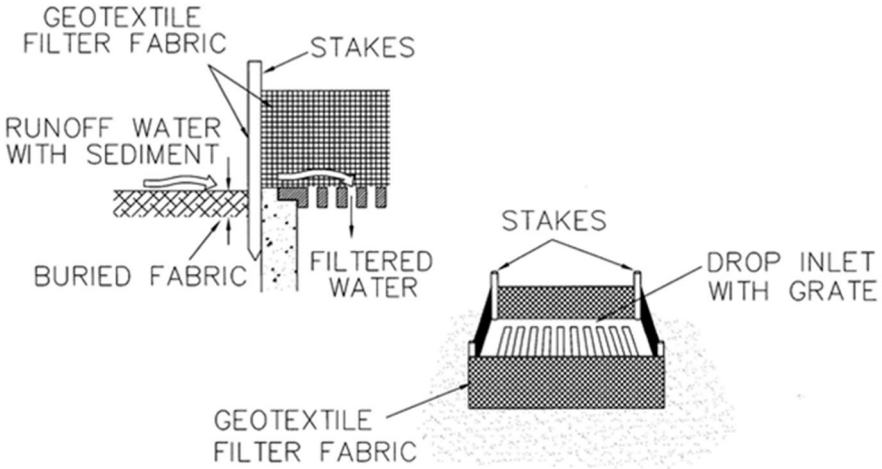
SEDIMENT CONTROL FENCE

NTS



STORMWATER PIT
SEDIMENT TRAP

NTS



GEOTEXTILE FILTER FABRIC DROP INLET
SEDIMENT TRAP

NTS

Atlantis Sediment Control Filter Bales

What are FilterBales?

Water Clean FilterBales are a unique new patented 7 stage sediment filter device developed to substantially reduce the migration of sediment and contaminants into drainage systems while allowing filtered water to easily pass through. FilterBales reduce customers' time and money by providing solutions to comply witht environmental and regulatory requirements.

Durable, Dependable, Reusable.
Replacing hay bales and other inadequate attempts to stop sediment run-off, FilterBales are durable and re-useable, effectively stopping your money from "pouring down the drain". They are also lightweight and easy to handle. Replaceable Water Clean Filter Cartridges guarantee peak performance is maintained.

Ask your local FilterBales stockist about replacement frequencies in your area. Cartridges and filter covers should be changed when the infiltration rate decreases. Water Clean FilterBales are suitable for a wide range of sediment and water management situations and can be easily secured in place for long term use. The unique multi-directional filter system allows you to position Water Clean FilterBales in any direction without reducing performance.

Water Clean FilterBales can be fixed to concrete or bitumen surfaces using an epoxy mortar-binder or fixed to earth surfaces using 6-10 mm pegs or stakes. When positioning, the side with the red reflective marker should be facing traffic.

www.atlantiscorp.com.au

1. FilterBales frames are a perforated plastic structure made from recycled wheelie bins, battery cases, milk bottles etc.

2. Filter medium (bio engineered soil media) used in the filter cartridges is made from a special blend of recycled organic (RO) materials from kerbside and vegetation drop off centres. The RO hosts enhanced naturally occurring micro-organisms. The blend also contains natural minerals to capture nutrients. The filter medium is as safe as normal soil.

3. FilterBales have a seven (7) stage filtration system:

1. In through the filter bag
2. Through the perforated plastic structure wall
3. In through the filter cartridge bag
4. Through the bio engineered filter medium
5. Out through the filter cartridge bag
6. Out through the perforated plastic structure wall
7. Out through the filter bag

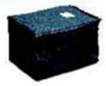
4. The filter bag is made from 300-micron (one third of a millimetre) pore size geotextile. This is the first stage that filters much of the sediment and other suspended solids from the run-off water. The geotextile is designed to stop sediment and reduce clogging but allow water to pass through easily. The filter cartridge bags are made from a similar geotextile.

5. FilterBales work effectively up to "a one-in-one-year 48 hours, 100 mm "storm events". This is the largest storm event experienced since the commercialisation of FilterBales. Having handled this easily, Filter Bales are considered capable of handling much greater "storm events'. During these storm events FilterBales were used inside gully pits in one application and on the ground surrounding the gully pit in another application.

6. EcoSocks are made from a similar geotextile to the filter cartridge bags and contain the same bio engineered soil media as the FilterBales. They appear able to stand up to as much wear and tear as a sandbag.

7. FilterBales are much lighter (at around 15 kgs dry weight) than hay bales. This reduces exposure to Occupational Health and Safety problems

Product Range

Item No.	Description	
HFB001	**High FilterBale,** suitable for high flow situations and higher retention time applications. Contains two standard size WaterClean Filter Cartridges in upright formation to treat contaminated waters. (605mm x 485mm x 460mm)	
LFB002	**Low FilterBale,** suitable for low flow situations and kerb & gutter applications. Multi-directional module containing two standard size WaterClean Filter Cartridges. (605mm x 485mm x 220mm)	
ESF004	**Directional EcoSock,** can be used in conjunction with FilterBales to direct water. Will also provide some sediment filtration from seepage through bio-remediating media contained within the EcoSock (1135mm x 160mm x 30mm)	

Accessories

Item No.	Description	
FCR004	**WaterClean Filter Cartridges** contain a unique blend of fixating and bio-remediating products that treat common pollutants. To achieve maximum performance, each FilterBale uses two WaterClean Filter Cartridges. (440mm x 400mm x 100mm)	
HBC005 (High bale)	**Replaceable FilterBale covers,** made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	
HBC006 (Low bale)	**Replaceable FilterBale covers,** made from specially designed geotextile. FilterBale covers have a standard aperture of 300 microns.	

Atlantis Water Management Rebirth Pty Ltd trading as Atlantis Water Management
Suite 402/781 Pacific Highway Chatswood NSW, 2067 Australia
Phone • + 61 2 9419 6000 **Fax** • + 61 2 9419 6710
Email • info@atlantiscorp.com.au **Web Site** • www.atlantiscorp.com.au

Atlantis Water Management

V3-20/06/01

SCHEDULE 1 WILLOUGHBY CITY COUNCIL OSD CHECKLIST

APPENDIX F

WILLOUGHBY CITY COUNCIL

OSD DESIGN CHECKLIST

1.	Has an overland flow route been provided?	Yes/~~No~~
2.	Has the minimum freeboard been provided between habitable floor levels and the 1:100yr flood level? Refer to Section 10 of Council's Floodplain Management - Technical Standard No. 3 for information regarding freeboard requirements.	Yes/~~No~~
3.	Has a minimum of 300mm freeboard been provided between the habitable floor levels and the OSD design storage top water level?	Yes/~~No~~
4.	For above ground storage maximum depths	
	• over driveways and carparking	N/A Mm
	• over landscaping or garden areas	N/A Mm
	• minimum below ground storage	N/A cu.m
5.	Below ground OSD tanks must be accessible for maintenance purposes in accordance with AS 2865 – Safe Working in Confined Spaces.	
	• Have step irons been provided for tanks deeper than 900mm?	Yes/~~No~~
	• Have 2 x 600mm x 900mm access grates been provided?	Yes
6.	Total impervious area including driveways, carports, pathways and swimming pools not incorporating high-level overflow system.	6,194 sq.m
7.	Existing and proposed surface levels and contours have been provided (contours extend 5m beyond property boundary)	Yes/~~No~~
8.	Location of all trees has been provided.	Yes/~~No~~
9.	Calculated volume of storage according to Table 1.	235.67 cu.m
10.	Calculated permissible site discharge according to Table 2.	111.64 l/s
11.	Calculated orifice diameter (65mm minimum).	168 Mm
12.	Type of mesh screen provided?	Maxi Mesh RH3030
13.	Details of an overflow spillway and overland flowpath have been provided?	Yes/~~No~~
14.	Direct connections to Council's drainage system have been checked against backwater effect?	Yes/~~No~~
15.	Is the base of the OSD tank graded flush with the orifice invert level?	Yes/~~No~~
16.	Has a minimum 125mm x 75mm RHS been provide for discharge through the street kerb?	Yes/No N/A
15.	All levels have been given to Australian Height Datum (AHD)	Yes/~~No~~

Design *Engineer* Laura Haywood **Date** 09/05/2016

Qualifications: BEng in Civil & Transportation Engineering, 2011 and BEng in Civil Engineering, 2009. TMIEAust No. 4449809

SCHEDULE 2 MUSIC RESULTS

Junction

9/05/2016 12:12:16 PM

Treatment Train Effectiveness

	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	Gross Pollutants (kg/yr)
Sources	7.23	1.32E3	2.63	16.6	175
Residual Load	7.23	262	0.673	8.40	5.26
% Reduction	0.0	80.1	74.4	49.3	97.0

Warren Smith & Partners

WARREN SMITH & PARTNERS PTY LIMITED
CONSULTING ENGINEERS
ACN 002 197 088
1st floor, 123 Clarence Street
SYDNEY NSW 2000

EMAIL: wsp@warrensmith.com.au

TELEPHONE: 61 2 9299 1312
FACSIMILE: 61 2 9290 1295