Costin Roe Consulting

Value in Engineering and Management

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22 October 2012

Goodman Property Services Aust Pty Ltd
Attention: Mr Khalid Hourani
GPO Box 4703
SYDNEY NSW 2001

Dear Sir

Re: Project Mustang/ Metcash Expansion
Concept Stormwater Management

We hereby provide a summary of the stormwater management in support of a development application for a proposed building expansion and truck trailer parking area at the recently completed distribution facility for Metcash at Brabham Drive, Huntingwood.

Introduction

Goodman proposes to construct additional warehouse space and a truck trailer parking area at the recently completed distribution facility for Metcash at Brabham Drive, Huntingwood. The building expansion is proposed on the southern end of Building 1 extending between the existing warehouse and service road on the southern boundary. The proposed trailer parking area is located on the northern side of Warehouse 2 between the multi-level car park and Warehouse 2.

Allowance for the proposed building expansion was made during the original design for the facility and minimal works to the existing site are required to facilitate the expansion. Some adjustments to the levels of existing external pavements and adjustment to kerb lines will however be required to facilitate the proposed architectural layout.

Existing Site Stormwater Quality Management

The existing site occupies an approximate area of 18Ha and is bounded by to the north, Brabham Drive to the east, the M4 Western Motorway to the south and proposed Lots 1 & 2 of the Bungarribee Industrial Estate to the west. Access to the development is made via the future Huntingwood Drive extension on the north-western corner of the site.

The stormwater management for the Metcash Site and its integration within the Burgarribee Estate is set out in a report by Costin Roe Consulting, Ref: Co9628.01-04b.rpt dated 12 August 2011 and this is enclosed. The integration of the site within the overall Bungarribee Strategy is further discussed in a letter by GHD in Appendix B of the above report.

The quality of stormwater runoff within the Bungarribee Industrial Estate is managed and improved by proven processes used throughout the industry. The constructed water quality treatment train is a combination of site level primary treatment (by gross pollutant trap) and estate level tertiary treatment (by bio-retention, wetland, vegetated swales and sediment basins. The combined system has been modelled with MUSIC software tool and it was predicted that the overall pollutant reduction objectives for phosphorous, suspended solids (sediments), heavy metals and other key pollutants, generally satisfy Part R of Blacktown Councils Development Control Plan 2006.

In accordance with the approved Estate Stormwater Management Strategy the minimum site level treatment for paved areas is to be treated via a gross pollutant trap. All stormwater from the Metcash site passes through an End-Of-Line Ecosol RSF4000 Solid Pollutant Filter/ Oil and Grease Arrestor. An Ecosol unit is located at each of the two discharge points of the site.

The existing piped stormwater system comprises a minor (piped)/ major (overland) flow system. The minor (piped) system is sized for a 1 in 20 year ARI storm and allows for the proposed expansion of Warehouse 1 in the design.

Existing Site Stormwater Quantity (on-site detention) Management

The quantity of stormwater runoff for all sites within the Bungarribee Industrial Estate is managed by an estate level detention basin which is integrated with the stormwater quality wetlands/ bio-retention basins. As such no individual on-site detention is required for development site within the Bungarribee Industrial Estate.

Management of Proposed Expansion Runoff

Drawing Co9628.03-DA40 shows the proposed arrangement for the collection of stormwater runoff from the building expansion. Management of runoff from the new roof and trailer parking area will generally remain consistent with the system approved for the Metcash Development under NSW Department of Planning (DA10_0140 Metcash).

The existing stormwater system allows for the increased runoff from the Warehouse 1 expansion roof. Downpipes will be connected to the existing piped drainage network provided during the original development. Adjustment to existing hardstand levels will be done such that stormwater runoff will be directed to existing and/or adjusted inlet pits.

Runoff from the proposed trailer parking area will be directed to the existing inlet pits which have been sized to account for this stormwater runoff.

We also confirm that the existing Ecosol RSF4000 Solid Pollutant Filter/ Oil and Grease Arrestor units were also sized to account for the proposed building expansion and no adjustment to this system is proposed.

Non-Potable Water Reuse

Non-potable water reuse is provided for the Metcash facility under the original approval. As part of this development approval, estimates of reuse demands were provided based on building populations and irrigation requirements.

It is proposed to supplement non-potable water use for the new amenities with rainwater reuse provided as part of the original development. It has been confirmed that, due to the automated stacking system proposed in the building, there will be no change in building population in conjunction with the additional building space; hence there will be no change in the predicted water demand for the facility. As such no additional rainwater reuse tanks are proposed for the current development.

Conclusion

A summary of the stormwater management for a proposed building expansion and truck trailer parking area has been provided in support of a Development Application at the recently constructed Metcash facility, Huntingwood.

Stormwater quantity and quality are managed at an estate level and the existing site stormwater system allows for the proposed expansion works. Stormwater connections to convey runoff from the new roof, truck hardstand and truck trailer parking area will be made which are generally in accordance with the overall property stormwater management strategy.

We trust that the above information satisfies your current requirements and you are welcome to contact the undersigned if further information is required.

Yours faithfully,
COSTIN ROE CONSULTING PTY LTD

MARK WILSON
Senior Design Engineer

Encl. Metcash Stormwater Management Report, Ref: Co9628.01-04b.rpt dated 12 August 2011.

Costin Roe Consulting

Value in Engineering and Management

Stormwater Management Plan

Metcash Distribution Centre
Bungarribee Industrial Estate
HUNTINGWOOD NSW

Prepared For:
Hansen Yunken Pty Ltd
Level 6, 15 Bourke Road
MASCOT NSW 2020

Prepared by:
Costin Roe Consulting
55 Harrington Street
The Rocks, Sydney NSW 2000

Date: **12 August 2011**
Revision: **B**

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1 INTRODUCTION

Hansen Yunken Pty Ltd, on behalf of Goodman, proposes to construct a distribution facility for Metcash consisting of a two large single level warehouses with ancillary offices, truck hardstand areas and car parking on a site located in the Bungarribee Industrial Estate at Huntingwood.

1.1 Background

The site occupies an approximate area of 18Ha and is bounded by to the north, Brabham Drive to the east, the M4 Western Motorway to the south and proposed Lots 1 & 2 of the Bungarribee Industrial Estate to the west. Access to the development will be made via the future Huntingwood Drive extension on the north-western corner of the site.

The proposed development comprises two large single level warehouses which run in a north-south direction. Car parking is provided as a multi-level structure on the northwest corner of the site. Truck hardstand is located between the two warehouses and on the eastern side of Warehouse 1.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Hansen Yunken Pty Ltd to prepare this report in support of the development of the site.

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

1.3 Authority Jurisdiction

The site falls within the boundaries of Blacktown City Council however as a state significant development the authority responsible for the development is the New South Wales Department of Planning.

1.4 Discharge from Development Sites

All sites within the Bungarribee Industrial Estate discharge stormwater to the stormwater drainage system designed and documented by GHD Consulting Engineers. The stormwater is then conveyed to the estate wetlands prior to discharge into Eastern Creek. The estate wetlands will be provided as part of the estate development works for the purpose of achieving the required pollution reduction criteria of Blacktown City Council stormwater quality control policy.

Stormwater runoff from the site is split into two catchments which flow to the north and south of the site to a pit and pipe network and channel which form part of the estate drainage. The catchment split for the site is defined by preliminary plans over the site performed by GHD Consulting Engineers as 7.0Ha to the north (northern catchment) and 11.0Ha to the south (southern catchment). This catchment breakup has been adopted for the Metcash site drainage system and the layout of the stormwater drainage can be seen on drawings **Co9628.01-C41 & C42**.

1.5 Stormwater Harvesting (Rainwater Re-use) System

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas only, or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the non-potable water demand for the development by up to 80%.

Due consideration to the NSW Department of Environment and Conservation document *Managing Urban Stormwater – Harvesting and Reuse* has been made in the design of the rainwater harvesting system. In general terms the rainwater harvesting system will comprise a number of in-line tanks for the collection and storage of 250kL of rainwater (Refer to drawings **Co9628.01-C41 & C42** for locations). At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

Rainwater falling on roofs is soft, clear and generally low in microbial and chemical contamination. Any contamination of rainwater generally occurs

during collection and storage. The use of simple and cost effective rainwater collection and treatment systems ensures reliable operation and water quality for non-potable use. The proposed rainwater treatment will be a first flush diverter in accordance with council engineering guidelines.

A water balance model was developed by the Hydraulic Engineering Consultant in order to assess the resource potential of rainwater harvesting and determine the total storage (250kL) requirements for the development. The water balance model was developed utilising the methods presented in the document *Water Sensitive Urban Design – "Technical Guidelines for Western Sydney"*. Calculations for the total storage requirement were based on estimated base water demands and statistical rainfall data from nearby meteorological stations.

2 HYDROLOGY

2.1 General Design Principles

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

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

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

2.2 Minor/ Major System Design

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

2.3 On-site Detention/ Estate Drainage

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

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

2.4 Runoff Models

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

3 HYDRAULICS

3.1 General Requirements

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

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

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

Table 1: DRAINS Parameters

3.2 Freeboard

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

3.3 Public Safety

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

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

3.4 Roadway Drainage

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

A layout of piped stormwater drainage for the site has been prepared and is included in the **Appendix A** to this report (Drawing **Co9628.01-C41 & C42**).

3.5 Overland Flow

The piped system has been designed to convey all storms up to and including the 20-year ARI. Dedicated flow paths have been shown which will convey stormwater from the site to the piped estate road system (northern catchment) in the Huntingwood Drive extension and to the trunk drainage channel (southern catchment) on the southern boundary.

4 WATER QUALITY CONTROLS

4.1 Regional Parameters

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

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

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

Table 4.1: Pollution Retention Criteria

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

4.2 Proposed Stormwater Treatment Measures & Expected Treatment

As has previously been discussed, the catchment of this site within the Bungarribee Industrial Estate drainage system is serviced by a detention basin and wetland system. The purpose of this system is to attenuate the flow from the developed estate to that which is equal to or less than the pre-developed flow and to provide treatment of the stormwater which includes removal of suspended solids, nutrients and heavy metals prior to discharge into Eastern Crrek.

The Stormwater Management Strategy for the Metcash site in terms of the overall estate is documented in a letter from GHD dated 6 September 2010 (**Refer Appendix B**) and has been based on the precinct wide stormwater strategy prepared by EDAW dated October 2009. We note that the construction of the Metcash site will be completed prior to that of the overall estate and therefore only a proportion (as noted below) of the estate wetland will be completed at this time.

A summary of the water quality controls, the majority of which will provided by construction of a portion of the precinct scale wetland, for the Metcash site is as follows:

- Constructed wetland (9,000sqm of the total 16,600sqm);
- Southern inlet zone sediment basin;
- Southern channel;
- Northern inlet zone sediment basin; and
- Temporary wetland bypass channel.

Additional to the precinct wide controls, pre-treatment of site stormwater drainage will be provided by end-of –line gross pollutant tanks prior to discharge into the estate stormwater systems. The proposed devises are based on the RSF4000 Solid Pollutant Filter/ Oil & Grease Arrestor series unit produced by Ecosol Pty Ltd.

Through the use of the above STM's in the treatment train the following pollution load reduction for the site is able to be achieved on an overall site basis:

- 85 percent pollution load reduction in Total Suspended Solids (TSS)
- 65 percent pollution load reduction in Total Phosphorous (TP)
- 45 percent pollution load reduction in Total Nitrogen (TN)

4.3 Maintenance And Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, a maintenance schedule has been prepared (below) to assist in the effective operation and maintenance of the various water quality components.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
RAINWATER TANK			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any	Six monthly	Maintenance	Leaves and debris

clogging and blockage of the tank inlet - leaf/litter screen		Contractor	to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
"ECOSOL RSF4000 END OF LINE GPT's"			
Refer to manufacturer's O&M manual attached in Appendix D of this report	Refer to manufacturer's O&M manual attached in Appendix D of this report	Refer to manufacturer's O&M manual attached in Appendix D of this report	Refer to manufacturer's O&M manual attached in Appendix D of this report
INLET & JUNCTION PITS			
Inside Pit	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of Pit	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.

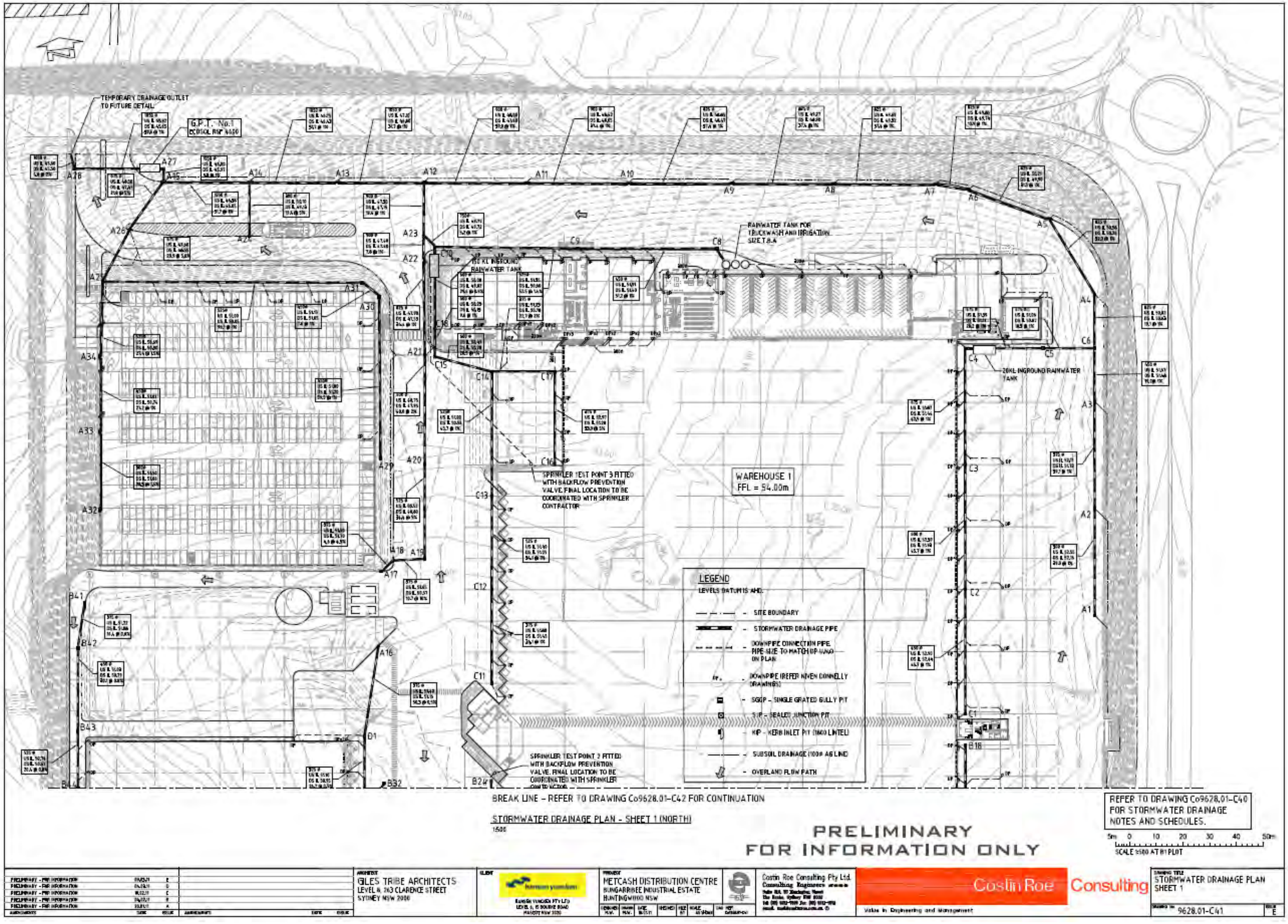
5 REFERENCES

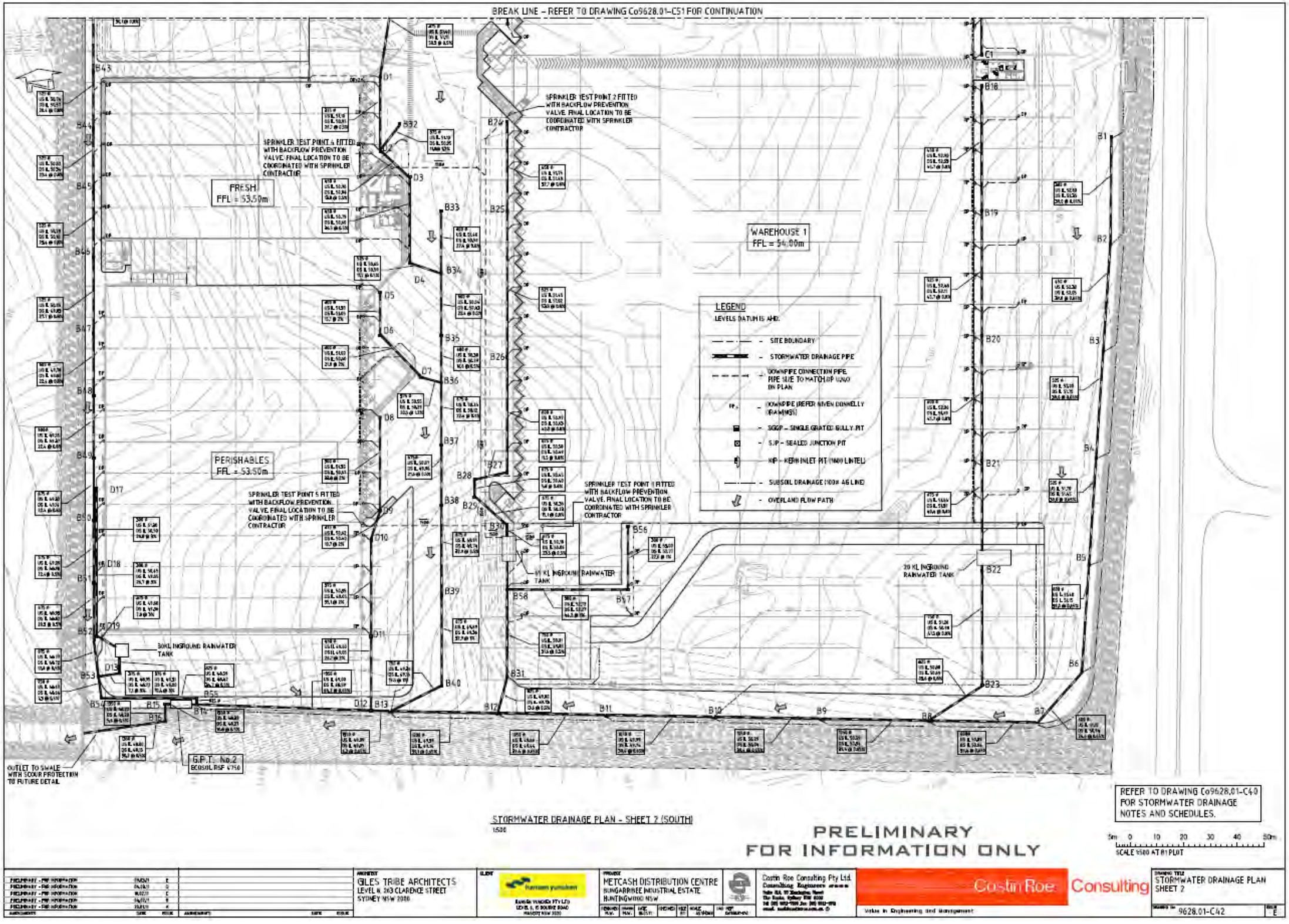
- Blacktown City Council– "Engineering Guide for Development",
- Blacktown City Council– "Stormwater Quality Control Policy", current version.
- Blacktown City Council– "Soil Erosion and Sediment Control Guideline",
- Water Sensitive Urban Design – "Technical Guidelines for Western Sydney" by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

Co9628.01-C41 & Co109628.01-C42


TEMPORARY DRAINAGE OUTLET TO FUTURE DETAIL
G.P.T. No.1 ECOSOL RSF 4400
RAINWATER TANK FOR TRUCKWASH AND IRRIGATION SIZE T.B.A
200 KL INGROUND RAINWATER TANK
WAREHOUSE 1 FFL = 54.00m
SPRINKLER TEST POINT 3 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
SPRINKLER TEST POINT 2 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
LEGEND
LEVELS DATUM IS AHD.
SITE BOUNDARY
STORMWATER DRAINAGE PIPE
DOWNPIPE CONNECTION PIPE. PIPE SIZE TO MATCH UP WITH ON PLAN
DP - DOWNPIPE (REFER NIVEN CONNELLY DRAWINGS)
SGGP - SINGLE GRATED GULLY PIT
SJP - SEALED JUNCTION PIT
KIP - KERB INLET PIT (1800 LINTEL)
SUBSOIL DRAINAGE (100Ø AG LINE)
OVERLAND FLOW PATH
BREAK LINE - REFER TO DRAWING Co9628.01-C42 FOR CONTINUATION
REFER TO DRAWING Co9628.01-C40 FOR STORMWATER DRAINAGE NOTES AND SCHEDULES.
5m 0 10 20 30 40 50m
SCALE 1:500 AT B1 PLOT
STORMWATER DRAINAGE PLAN - SHEET 1 (NORTH)
1:500
PRELIMINARY
FOR INFORMATION ONLY
GILES TRIBE ARCHITECTS
LEVEL 4, 263 CLARENCE STREET
SYDNEY NSW 2000
METCASH DISTRIBUTION CENTRE
BUNGARIBEE INDUSTRIAL ESTATE
HUNTINGWOOD NSW
Costin Roe Consulting Pty Ltd.
Consulting Engineers
Value in Engineering and Management
STORMWATER DRAINAGE PLAN SHEET 1
9628.01-C41
E


BREAK LINE – REFER TO DRAWING Co9628.01-C51 FOR CONTINUATION
FRESH
FFL = 53.50m
PERISHABLES
FFL = 53.50m
WAREHOUSE 1
FFL = 54.00m
SPRINKLER TEST POINT 2 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
SPRINKLER TEST POINT 4 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
SPRINKLER TEST POINT 1 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
SPRINKLER TEST POINT 5 FITTED WITH BACKFLOW PREVENTION VALVE. FINAL LOCATION TO BE COORDINATED WITH SPRINKLER CONTRACTOR
LEGEND
LEVELS DATUM IS AHD.
– SITE BOUNDARY
– STORMWATER DRAINAGE PIPE
– DOWNPIPE CONNECTION PIPE. PIPE SIZE TO MATCH DP U.N.O ON PLAN
– DOWNPIPE (REFER GIVEN DONNELLY DRAWINGS)
– SGGP – SINGLE GRATED GULLY PIT
– S.J.P – SEALED JUNCTION PIT
– KIP – KERB INLET PIT (1800 LINTEL)
– SUBSOIL DRAINAGE (100Ø AG LINE)
– OVERLAND FLOW PATH
30KL INGROUND RAINWATER TANK
30KL INGROUND RAINWATER TANK
30KL INGROUND RAINWATER TANK
G.P.T. No.2
OUTLET TO SWALE WITH SCOUR PROTECTION TO FUTURE DETAIL
REFER TO DRAWING Co9628.01-C40 FOR STORMWATER DRAINAGE NOTES AND SCHEDULES.
SCALE 1:500 AT B1 PLOT
STORMWATER DRAINAGE PLAN – SHEET 2 (SOUTH)
1:500
PRELIMINARY
FOR INFORMATION ONLY
GILES TRIBE ARCHITECTS
LEVEL 4, 263 CLARENCE STREET
SYDNEY NSW 2000
METCASH DISTRIBUTION CENTRE
SUNGARRINEE INDUSTRIAL ESTATE
HUNTINGWOOD NSW
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STORMWATER DRAINAGE PLAN SHEET 2
9628.01-C42
E

Appendix B

GHD Stormwater Management Strategy, 6 September 2010

GHD CLIENTS | PEOPLE | PERFORMANCE

06 September 2010

Goodman International
Level 10 60 Castlereagh Street
Sydney NSW 2000

Our ref: 21/18115/162340
Your ref:

Attn: Richard Seddon

Dear Richard,

Metcash Facility
Stormwater Management Strategy

1 Introduction

This letter report has been prepared as an addendum to the Water Sensitive Urban Design (WSUD) Strategy report prepared by EDAW (EDAW, October 2009). This addendum specifically considers the works proposed under the Project Application for the Metcash Facility which involves the development of the Metcash site located within the south eastern corner of Bungarribee Industrial Estate. The Metcash stormwater management strategy has been developed with due consideration to the overall WSUD Strategy for the Bungarribee Industrial Estate.

The Metcash Facility is proposed to be developed while all lots within the Bungarribee Industrial Estate to the north of the Huntingwood Drive extension remain vacant (undisturbed). However, the bulk earthworks operations required to create the building pad for Metcash will also include the earthworks for the large residue lots 1 and 2 to the west of the Metcash site. As a result, the stormwater management strategy for the Metcash site will also have to give consideration to the adjoining residue lots.

Figures 1 and 2 provides a diagrammatic representation of the proposed stormwater management strategy for the Metcash site and the residual western lots referred to in the following sections.

2 Internal Site Drainage

The Metcash site will be predominately impervious being made up of pavements, carparks, loading docks and buildings. The Metcash site is split into two main catchments (northern and southern) and the overland flow from these catchments will be directed either towards the proposed channel to the south of the site, or the proposed extension of Huntingwood Drive to the north of the site. A pit and pipe network will be designed to collect and convey stormwater runoff from the Metcash site including:

- Pipe network designed to cater for the 1 in 20 year ARI without surcharge collecting stormwater runoff from the site and rainwater tank overflows. The pipe network will direct stormwater to discharge points at the south and north western corners of site;
- Provision of GPT's at each site discharge point;
- Connection of southern catchment site stormwater system to the proposed southern channel via headwalls;

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- Connect of northern catchment site stormwater system to the future pipe network along the proposed Huntingwood Drive extension; and
- Provision for overland flow paths from the site to ensure safe conveyance of major storm events (up to 100 year ARI).

Figure 2 shows a concept pit and pipe network with associated pipe sizes. A preliminary DRAINS model has been prepared associated with the concept site drainage network.

3 Stormwater Quantity

Stormwater detention for the whole of the Bungarribee Industrial Estate is to be provided on a precinct level basis within the proposed constructed wetland and bio-retention basins, located to the west to the site adjacent to Eastern Creek (refer Figure 1). Detention will be provided for the 1.5 and 100 year ARI storm events. Stormwater detention will be provided for the Metcash site via the construction of a portion of the proposed wetland.

From the RORB hydrologic modelling performed as part of the WSUD Strategy report (EDAW, October 2009). It was found that a permissible site discharge (PSD) of 147L/s/ha for the 100-year Average Recurrence Interval (ARI) event was required to satisfy Blacktown City Council requirements for discharge to Eastern Creek. Given the PSD requirements, the storage volume required to attenuate the 100 year ARI flows from the Metcash site equates to a volume of 35,000m^3 (refer Table 1).

Table 1 Detention Parameters (100-year ARI Event)

Location	OSD (m^3)	PSD (l/s)
Metcash Facility	35,000	2,650

4 Stormwater Quality

Stormwater quality treatment for the Metcash Facility will be predominately provided via the construction a portion of the precinct scale constructed wetlands (refer Figure 1), namely:

- Constructed wetland (portion);
- Southern inlet zone sediment basin;
- Southern channel;
- Northern inlet zone sediment basin; and
- Temporary wetland bypass channel.

From the MUSIC model prepared as part of the WSUD Strategy report (EDAW, October 2009) it was calculated that the required area of the wetlands to be constructed in order to treat stormwater flows from the Metcash site is 9,000m^2 of the proposed total of 16,600 m^2.

Construction of 9,000m^2 of the wetland basin will provide a pollutant load reduction from the Metcash site of as least:

- 85 percent pollutant load reduction in TSS;
- 65 percent pollutant load reduction in TP; and

- 45 percent pollutant load reduction in TN.

Reductions in gross pollutant and total hydrocarbons loads will be achieved via the installation of GPT's at the discharge points from the Metcash site stormwater system to the estate trunk infrastructure.

The construction of the portion of wetlands required to service the Metcash site will be staged so that vegetation is not installed until the residue lots 1 and 2 have been stabilised (vegetated) so that sediment export from these vacant sites is minimal.

To further minimise impact on the constructed wetlands by potential sediment loads, a temporary bypass will be constructed so that Lot 1 of the western residue land area does not drain through the constructed wetlands. Instead, this lot will drain to the central inlet zone sediment basin and then around the wetlands via the temporary bypass (refer Figure 1). The bypass channel will be removed once Lot 1 is developed.

5 Flooding

A flood study has been carried out as part of the Concept Plan application for the whole Bungarribee Industrial Estate by Bewsher Consulting. The Metcash facility does not lie within the 100 year or PMF flood extents of Eastern Creek.

6 Conclusion

The proposed stormwater strategy adopted for the Metcash facility site is in accordance with the overall WSUD strategy developed by EDAW for the Bungarribee Industrial Estate. The proposed stormwater management strategy is summarised as follows:

- Internal site pit and pipe network designed to cater for the 1 in 20 year ARI will direct stormwater to discharge points at the south and north western corners of site;
- Provision of GPT's at each discharge point; and
- Runoff from the site will drain to precinct level stormwater infrastructure (constructed wetlands that incorporate stormwater detention) before runoff discharges to Eastern Creek

Yours faithfully
GHD Pty Ltd

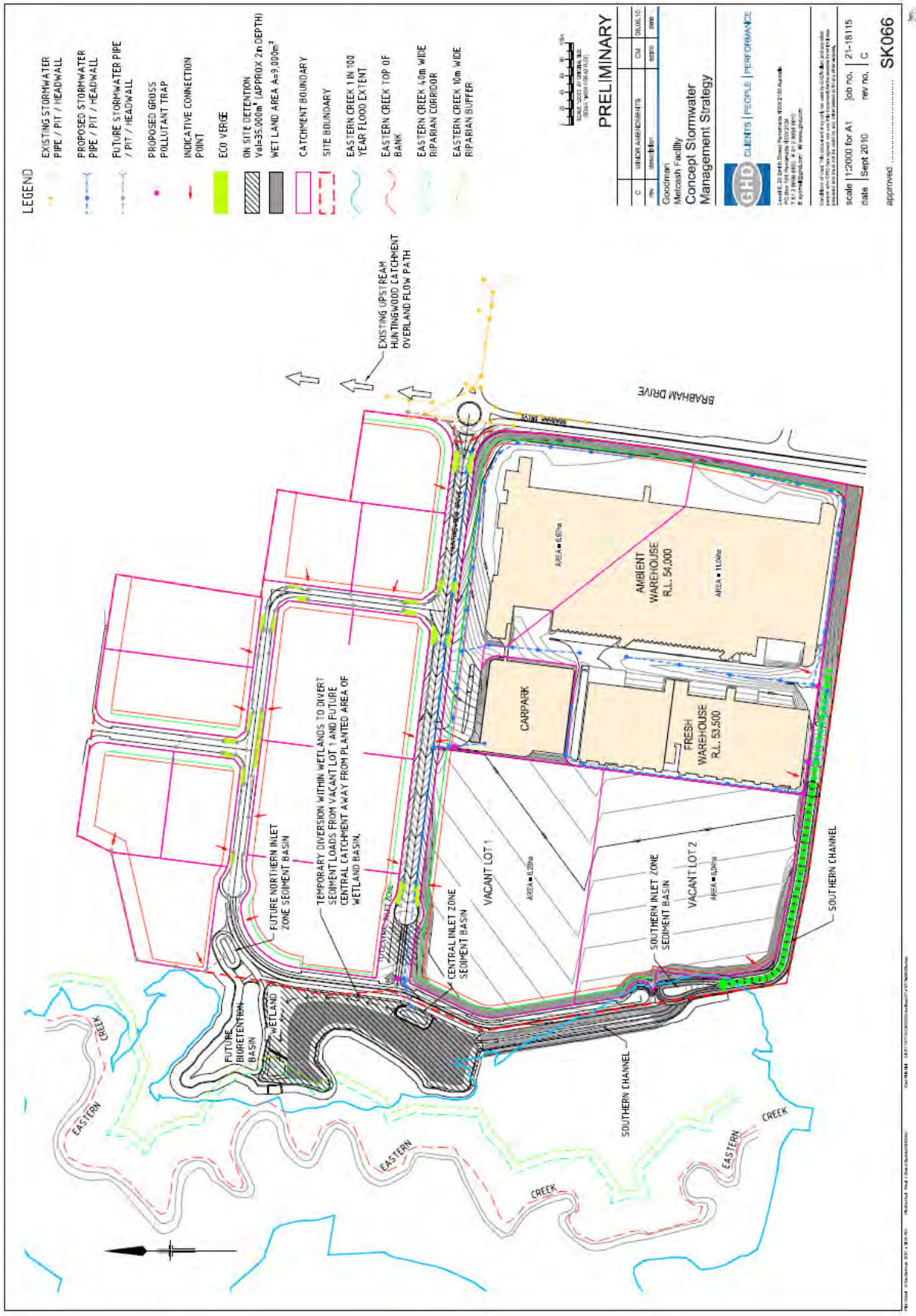
per

Frank Carrozza
Senior Civil Engineer
02 8898 8886

Attachments
1. Figure 1 - Stormwater Management Strategy
2. Figure 2 – Concept Site Drainage System

21/18115/182340

3


LEGEND
EXISTING STORMWATER PIPE / PIT / HEADWALL
PROPOSED STORMWATER PIPE / PIT / HEADWALL
FUTURE STORMWATER PIPE / PIT / HEADWALL
PROPOSED GROSS POLLUTANT TRAP
INDICATIVE CONNECTION POINT
ECO VERGE
ON SITE DETENTION Vol=35,000m³ (APPROX 2m DEPTH)
WET LAND AREA A=9,000m²
CATCHMENT BOUNDARY
SITE BOUNDARY
EASTERN CREEK 1 IN 100 YEAR FLOOD EXTENT
EASTERN CREEK TOP OF BANK
EASTERN CREEK 40m WIDE RIPARIAN CORRIDOR
EASTERN CREEK 10m WIDE RIPARIAN BUFFER
PRELIMINARY
MINOR AMENDMENTS
Goodman
Meteash Facility
Concept Stormwater Management Strategy
CLIENTS | PEOPLE | PERFORMANCE
scale 1:2000 for A1
date Sept 2010
job no. 21-18115
rev no. C
approved
SK066
EXISTING UPSTREAM HUNTINGWOOD CATCHMENT OVERLAND FLOW PATH
BRABHAM DRIVE
AMBIENT WAREHOUSE R.L. 54,000
CARPARK
FRESH WAREHOUSE R.L. 53,500
VACANT LOT 1
VACANT LOT 2
TEMPORARY DIVERSION WITHIN WETLANDS TO DIVERT SEDIMENT LOADS FROM VACANT LOT 1 AND FUTURE CENTRAL CATCHMENT AWAY FROM PLANTED AREA OF WETLAND BASIN.
FUTURE NORTHERN INLET ZONE SEDIMENT BASIN
FUTURE BIORETENTION BASIN
WETLAND
CENTRAL INLET ZONE SEDIMENT BASIN
SOUTHERN INLET ZONE SEDIMENT BASIN
SOUTHERN CHANNEL
SOUTHERN CHANNEL
EASTERN CREEK
EASTERN CREEK
EASTERN CREEK


LEGEND
PROPOSED STORMWATER PIPE / PIT / HEADWALL
PROPOSED GROSS POLLUTANT TRAP
CATCHMENT BOUNDARY
PRELIMINARY
A INITIAL ISSUE CMP 08.09.10
rev description appd date
Goodman
Metcash Facility
Concept Site
Drainage System
GHD CLIENTS | PEOPLE | PERFORMANCE
scale 1:2000 for A1 job no. 21-18115
date Sept 2010 rev no. A
approved SK072
BRAPHAM DRIVE
FUTURE HUNTINGWOOD DRIVE EXTENSION
SOUTHERN CHANNEL

Appendix C

DRAINS MODEL SCHEMATIC

Appendix D

ECOSOL RSF4000

OPERATION & MAINTENANCE MANUAL

OPERATION & MAINTENANCE MANUAL

The In-Line/End-of-Line RSF 4000 Solid Pollutant Filter/Oil & Grease Arrester










.... to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids with a range of technologies for use in the community, home, and industry ....

Ecosol™
WASTEWATER FILTRATION SYSTEMS

NATURAL ECOLOGICAL SOLUTIONS

Ecosol™
WASTEWATER FILTRATION SYSTEMS

OPERATION & MAINTENANCE MANUAL
The RSF 4000 Solid Pollutant Filter

1.0 INTRODUCTION

2.0 ABOUT YOUR **RSF 4000** SOLID POLLUTANT FILTER

- 2.1 How the **RSF 4000** Operates
- 2.2 The Key **RSF 4000** Benefits
- 2.3 What Your **RSF 4000** Will Collect
- 2.4 Where the **RSF 4000** Is Installed

3.0 The **RSF 4000** SOLID POLLUTANT FILTER COMPONENTS AND WARRANTY

- 3.1 Unit Components
- 3.2 Life Expectancy
- 3.3 Warranty
- 3.4 Engineered Design Drawings

4.0 MONITORING, CLEANING, AND MAINTAINING YOUR **RSF 4000** SOLID POLLUTANT FILTER

- 4.1 Monitoring
- 4.2 Cleaning and Maintenance Procedures
- 4.3 Reporting
- 4.4 Ecosol Monitoring, Cleaning, and Maintenance Service

5.0 FREQUENTLY-ASKED QUESTIONS

6.0 CORPORATE PROFILE

7.0 CORPORATE DIRECTORY

8.0 REFERENCE MATERIAL*

MONITORING AND INSPECTION CHECKLIST

CLEANING CHECKLIST

INSPECTION FORM

* The numbered superscript references in the text refer to sources of information noted at the back of this document

AWA

Stormwater

ECAAS

ECAAS

ECAAS

Ecosol
WASTEWATER FILTRATION SYSTEMS

OPERATION & MAINTENANCE MANUAL
The RSF 4000 Solid Pollutant Filter

1.0 Introduction

Thank you for choosing to install an Ecosol **RSF 4000** Solid Pollutant Filter, the result of more than ten year's research and market experience through direct contact with you, our client.

You have chosen a quality, durable, high-performance unit that will certainly meet your needs. Ecosol's products have for years been making a significant contribution to improving the environment and, in particular, the quality of our water, one of the world's most precious commodities.

This manual provides information about the unit's operation and the cleaning and maintenance requirements.

Please read the manual carefully as it provides important guidelines on how to clean and maintain your **RSF 4000** to ensure a long life operating at optimal efficiency and effectiveness. You should keep it in a safe place because, if you need to contact us for any reason, you will need to quote the information contained in it so that we will be able to help you promptly and efficiently.

Should you require assistance please contact your nearest Ecosol office shown in Section 7.0 of this document, email us on info@ecosol.com.au, or you can visit our website at www.ecosol.com.au.

Also, please do not hesitate to contact us if you need any information about Ecosol's other award-winning[1] products, which include the at-source **RSF 100**, and the in-line/end-of line **RSF 1000** and **Net Tech**, solid pollutant filters.

Ecosol's Vision

".... to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids with a range of technologies for use in the community, home, and industry ...."

Ecosol WASTEWATER FILTRATION SYSTEMS

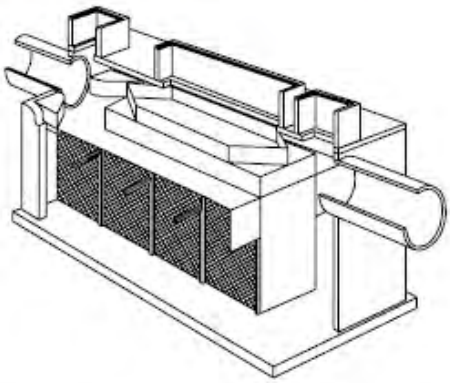
OPERATION & MAINTENANCE MANUAL
The RSF 4000 Solid Pollutant Filter

2.0 About Your **RSF 4000** Solid Pollutant Filter

The **RSF 4000** Solid Pollutant Filter, along with Ecosol's other product, has helped define, and raise, the standards for stormwater filtration. Key to its success is the patented[2] hydraulic weir that not only enhances its capture efficiency but also enables the system to by-pass excess flows, thereby eliminating the risk of flooding.

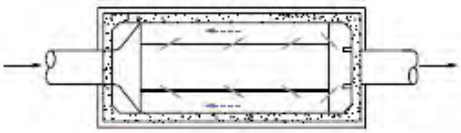
2.1 How the **RSF 4000** Operates

The Ecosol **RSF 4000** is designed for use in stormwater drains. Incoming flows enter the capture silo and pass through the filtration mesh located below invert level on both sides of the silo before entering the clean chamber and then exiting the unit. The unit separates, collects, and retains more than 98% of solid pollutants greater than 211µm and 91% of total suspended solids. It also collects 30% total phosphorous



Free oils and grease are captured in the outer channels below invert level by the use of two vertical baffles. Should an oil spill occur within the catchment, a clean of the unit should be undertaken immediately to remove these pollutants - refer to Section 4.0 for details.

The key to the **RSF 4000** success is the design that forces a proportion of the filtered water back upstream along the by-pass channels and against the main directional flow. As this water meets the flows entering the inlet to the capture silo, a unique hydraulically-driven barrier is created, ensuring all flows up to the Treatable Flow Rate (TFR) are directed into the capture silo, thereby enhancing considerably the unit's capture efficiency.



Flows circulating below invert level
Flows circulating above invert level at TFR

As flows of greater magnitude enter the unit, the hydraulic barrier gradually breaks down and in major pipe discharges, allows the excess flows to by-pass, without remobilising captured pollutants. It is important to note that the unit continues to collect and filter flows at least equivalent to the TFR, even when the pipe is in full discharge and the unit is in by-pass. Most other GPTs are unable to operate in this manner.

When the capture silo is full, the water cannot pass through the mesh and the hydraulically-driven barrier can no longer be formed. Concurrently, the pollutants form a barrier across the mouth of the filtration unit, directing the incoming water into the two overflow by-pass channels, thereby effectively eliminating the risk of flooding.

2.2 The Key **RSF 4000** Benefits

The key **RSF 4000** Solid Pollutant Filter benefits are:

- ☑ Captures more than 98% of solid pollutants > 211µm
- ☑ Captures 91% of total suspended solids
- ☑ Collects up to 97% free oils and grease at design flow
- ☑ No remobilisation or overtopping of captured pollutants
- ☑ Low headloss (k) factor
- ☑ Patented hydraulically-driven barrier reduces premature by-pass
- ☑ Designed and managed hydraulics eliminates blockage risk
- ☑ Can be sized to suit wide range of flows, gradients, & pipe sizes
- ☑ Independently tested by a NATA-approved facility
- ☑ Can be installed in one complete unit (up to **RSF 4900**)
- ☑ Shallow depth below invert reduces water table problems
- ☑ Cost-effective vacuum cleaning
- ☑ Dewatering facility ensures removal of all solids during cleaning
- ☑ Reduced costs as only solids transported to the waste facility

2.3 What Your **RSF 4000** Will Collect

The Ecosol **RSF 4000** Solid Pollutant Filter is designed to remove a range of gross pollutants from stormwater drains. The composition and quantity of pollutants captured depends heavily on the catchment size, land use, and rainfall patterns. However, with more than 6,000 units now installed throughout Australia, New Zealand, and Malaysia, Ecosol has found that the following pollutants are typically captured by the **RSF 4000**:

POLLUTANTS	POLLUTANT REMOVAL EFFICIENCY	DESCRIPTION
Gross Pollutants	98.0%	Anthropogenic materials such as cans, bottles, plastic bags, and packing materials (generally > 1.2mm in diameter)
Vegetation	98.0%	Organic material, such as leaves and grass clippings (generally >211µm)
Sediment	98.0%	Solid materials > 211µm, both mineral and organic
	90.0%	Solid materials > 152µm, both mineral and organic
	51.0%	Solid materials > 90µm, both mineral and organic
Total Suspended Solids (TSS)	91.0%	Fine inorganic solids suspended in water
Total Phosphorous (TP)	30.0%	Total phosphorous in suspended solids and organic materials
Total Nitrogen (TN)	13.0%	Total nitrogen in organic and inorganic forms
Hydrocarbons	up to 97.0%	Free floating oils that do not emulsify in aqueous solutions

2.4 Where The **RSF 4000** Is Installed

The **RSF 4000** operates in-line or end-of-line removing solid pollutants, free oils, grease, and fine sediment from stormwater. The pre-cast, modular unit can be fitted to conduits of almost any size and shape, either within the drainage network or off-line adjacent to creeks or in open channels. Its range of applications include:

- Industrial and commercial sites, such as car parks, shopping centres, and washbays;
- Residential developments; and
- Airports, freeways, civil construction projects, and wetlands.

Ecosol's range of products enables it to offer a specifically designed solution. A GPT is often the most appropriate choice but, in other situations, Ecosol's at-source filtration is the ideal solution.

The Ecosol **RSF 4000** Solid Pollutant Filter in the field

Ecosol™ WASTEWATER FILTRATION SYSTEMS

OPERATION & MAINTENANCE MANUAL
The RSF 4000 Solid Pollutant Filter

3.0 The **RSF 4000** Solid Pollutant Filter Components and Warranty

The **RSF 4000** units is made from the strongest and most durable materials available to ensure a long life and reduced ongoing maintenance. Wherever possible, recycled materials are used.

3.1 Unit Components

Each Ecosol **RSF 4000** is constructed from a system of pre-cast concrete components that includes:

- Pit base;
- Cover slab; and
- Access risers, if required.

One of the unit's major benefits is that, for all units up to the **RSF 4900**, the internal filtration components are pre-installed and the unit is delivered in one complete piece, thereby simplifying the installation process and reducing significantly on-site time.

Larger units require the on-site fitting of internals, which can be completed quickly and efficiently by qualified personnel.

Units can be delivered with either Class B or Class D trafficable lids with a range of options including:

- Ductile iron;
- Bolt down lockable; and
- Grated.

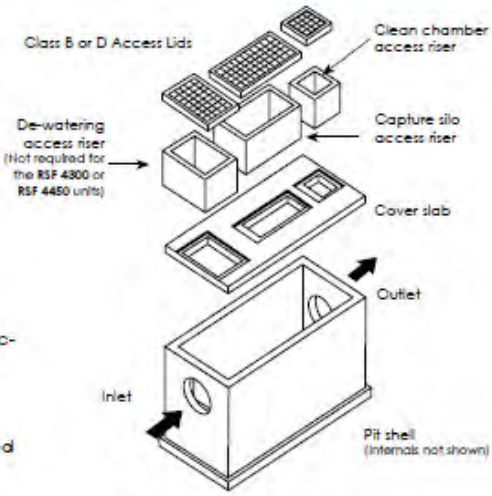
All materials and products used in the manufacture of the Ecosol **RSF 4000** Solid Pollutant Filter are constructed to the relevant Australian Standards and are specially selected for their durability.

Each unit has been engineer-designed and also meets internationally-accepted Occupational Health & Safety (OH&S) requirements.

The **RSF 4000** is made of strong, durable, and non-corrosive materials, including:

Reinforced concrete
All reinforced concrete work is designed to a minimum of 40 MPa with specific loading conditions to suit Class B and D classifications. For further details refer to AS 3996.

Steel reinforcing
All steel reinforcement used is in accordance with AS 1302 and AS 1304 for structural grade steel.



The **RSF 4000** external components

The **RSF 4000** pre-cast concrete pit showing the oil and grease baffles prior to fitting

Internals ready for factory installation into pre-cast concrete pit

3.1 The **RSF 4000** Components (cont)

Access lids

The access lids are designed specifically for use in stormwater and suit Class B or D loading capacities. Each access lid supplied is:

- Lockable and can be removed with readily-available lifters;
- Durable and suitable for use in marine environments
- Designed for a dynamic load factor of 2.0 and 1.5 ultimate LSF;
- Designed to comply with ultimate loads of Class B 8.0 tonne (80kN) to Class D 21.0 tonne (210kN);
- Can be lifted by a single person within OH&S regulations;
- Provided with a non-slip surface;
- Finished flush with FSL; and
- Manufactured in accordance with AS 3996.

The internal filtration components in each Ecosol **RSF 4000** Solid Pollutant Filter have been specifically designed and tested for the loadings and environment in which the unit is to be installed.

The internals are made from materials especially chosen for their durability:

- Stainless steel (304 or 316 grade);
- Stainless-steel, or galvanised, fasteners;
- Unimould, or stainless-steel, solid panels; and
- Polyethylene oyster mesh.

The **RSF 4000** access lids have minimal impact on the environment

3.2 Life Expectancy

The **RSF 4000** is designed to meet the strictest engineering guidelines. The reinforced concrete has an expected life span of 50 years while the internal filtration components have a life expectancy of 10 to 15 years.

3.3 Warranty

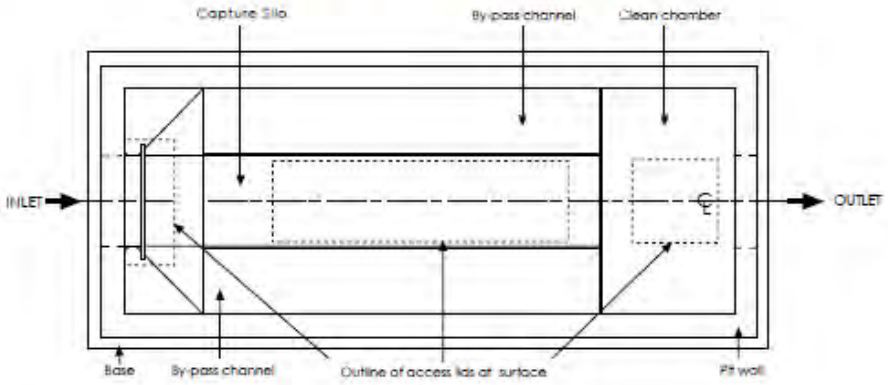
The **RSF 4000** has a one-year warranty covering all components and workmanship. Ecosol will rectify, at no charge, any problems that fall within the warranty terms. However, damage caused by vandalism and by outside parties is not covered by the warranty. This includes instances where the client cleans the unit, or employs others to do so, and damage is caused by inappropriate cleaning procedures.

The **RSF 4000** unit complete with risers and access lids ready for delivery

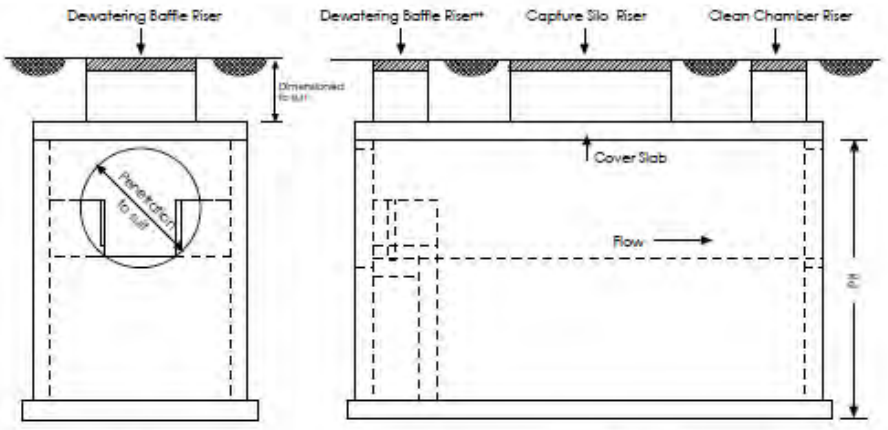
3.4 Engineered Design Drawings

The **RSF 4000** is specifically designed to simplify the manufacturing process and reduce installation time. The simple, yet effective design, shown below in different elevations, reduces significantly OH&S risks as most of the work is undertaken in a controlled factory environment. Units up to the **RSF 4900** arrive to site complete and ready for installation. The on-site installation time is much less than that for other comparable systems, an important factor given the costs associated with delays that can be caused, for example, by inclement weather.

The **RSF 4000** Solid Pollutant Filter



PIT PLAN



PIT INLET END ELEVATION **PIT SIDE ELEVATION**

** The dewatering baffle is not required on the **RSF 4300** and **RSF 4450**

Owing to transport restrictions the pit bases for the **RSF 4900B**, **RSF 41050A**, and **RSF 41050B** are manufactured in two components - larger size units can be designed to suit requirements

4.0 Monitoring, Cleaning, and Maintaining Your **RSF 4000** Solid Pollutant Filter

Cleaning the **RSF 4000** is easy and is usually done using a high-powered suction vehicle. The **RSF 4300** and **RSF 4450** can also be cleaned by most street-sweeping vehicles. Ecosol will monitor, clean, and maintain your unit as detailed below in Section 4.4 but, if you decide to undertake this work yourself, the procedures detailed in this section of the manual should be followed.

4.1 Monitoring

Under normal weather and operating conditions, your **RSF 4000** unit requires cleaning approximately every 3-4 months. However, it is important to monitor regularly the amount of material retained in the unit's capture silo.

The Inspection Form provided at the back of this document can be used to record the depths and approximate quantities of captured material together with other information relating to the unit's condition and the need for scheduling cleans and maintenance work, if required.

Initially, Ecosol recommends that monitoring is undertaken monthly. Once the unit has been in operation for an extended period of time (say, 6-9 months) the monitoring schedule can be adjusted to reflect the actual operating conditions specific to the catchment.

It is also recommended that the unit is inspected after every major storm event.

Ecosol staff monitoring the performance of an Ecosol unit

4.2 Cleaning and Maintenance Procedures

The steps to be followed for cleaning your **RSF 4000** Solid Pollutant Filter are as follows:

Prior to cleaning day

- Advise all concerned parties of the proposed date and time the clean is to take place
- Obtain approvals from the appropriate authorities

Site establishment

- Ensure that all access points are exposed and accessible
- Ensure barricades are provided at all working areas and that signs are in place to prevent injuries to public or staff
- Ensure all working areas are safe and all equipment, including hoses and machinery, are in place and ready for operation

Opening and testing of unit

- Open surface access lids
- Install the dewatering baffle boards and secure for dewatering (this is not required for the **RSF 4300** and **RSF 4450**)

Cleaning of an **RSF 4000** by eductor truck

4.2 Cleaning and Maintenance Procedures (cont)

Removal of floating materials, hydrocarbons, and dewatering

- Remove all hydrocarbon pollutants prior to dewatering by moving the eductor hose over the floating material at water level
- Dewater by pumping all water from the clean chamber to the upstream side of the inlet baffle board or to an approved sewer manhole

Gross pollutant removal and cleaning of internals

- When all excess water has been removed begin removing the solid pollutants using the suction hose
- Once the pollutants have been removed, clean the internal filtration screens with a high-pressure water hose

Site security

- On completion of the clean remove all baffle boards and secure the surface access lids
- Ensure the site is restored to its original condition

Pollutant disposal

- Dispose of the pollutants at an approved waste disposal facility, repeating these procedures, if necessary

Important Points to Note

1. It is important that the by-pass chambers, located on either side of the central capture silo, are inspected with each clean. Any material built up in these chambers should be removed during cleaning.
2. Access to the by-pass chambers is by the outlet access opening or removing the by-pass chamber platform boards at invert level and then lowering the eductor hose from this position.
3. Entry to the unit to remove large debris, or maintenance, should only be undertaken by appropriately trained personnel.

4.3 Reporting

After each clean it is important that all cleaning data is recorded for use in ongoing asset management activities. A cleaning report should be prepared that details as a minimum the following information:

- Site location;
- Date and time of the clean;
- Duration of the clean;
- Volume or weight of material removed;
- Composition of the captured material e.g sediment, vegetation, litter, etc; and
- Details of any remedial work undertaken or required at a later stage.

Reporting of the above information is included in the cost of any clean undertaken by Ecosol - please refer to the next section for more details.

4.4 Ecosol Monitoring, Cleaning, and Maintenance Service

Ecosol has a very competitive cleaning service using an eductor truck for dewatering and removing of all captured pollutants. After each clean we provide a full report detailing the volume and type of pollutants removed. We believe that it is in your best interests for Ecosol staff to clean and maintain the unit, not only because we are specialists, but also because proper monitoring and maintenance enhances the unit life significantly.

4.4 Ecosol Monitoring, Cleaning, and Maintenance Service (cont)

The cleaning frequency, and the cost, depend heavily on the surrounding environment, the unit's proximity to an approved waste facility, the number of units and their location, and the type of pollution collected. The advantages of using Ecosol to clean and maintain your unit are:

- regular inspections of your unit (see below for the recommended inspection schedule for first 12 months);
- comprehensive cleaning service with the removal and disposal of all captured pollutants;
- a detailed report provided on completion of each clean;
- trained and experienced staff; and
- remedial work completed, if required.

Recommended Inspection and Maintenance Schedule (for the first 12 months)

Purpose of Visit	Frequency	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Routine Inspection	Monthly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Routine Clean Out	Quarterly	✓			✓			✓			✓		

For further information about cleaning and maintaining your **RSF 4000** please contact your nearest Ecosol office.

5.0 Frequently-Asked Questions

This document aims to provide you with information about Ecosol's products and the wastewater filtration industry in general. However, clients, consulting engineers, and other interested parties often have questions and we have tried here to answer those most frequently asked.

What are the most important criteria in selecting the most appropriate pollution control device?

Ecosol believes in the treatment-train approach to pollution control. No one system can provide, in isolation, the solution to every problem. GPTs are usually the primary element of a treatment train and we believe that, often, it is important to incorporate secondary measures to achieve the optimal WQOs.

Treatment devices should be assessed firstly on their ability to treat the required volume of discharge prior to by-pass, and, secondly, on their capacity to store the volume of pollutants generated by the catchment. Some of the criteria that should be used in selecting the right proprietary stormwater treatment device for a particular site are its:

- Effectiveness in trapping the target pollutants up to TFR;
- Hydraulic impact on the drainage network;
- Whole-of-life cost and not just the capital cost;
- Compatibility with site constraints ;
- Ease of installation;
- Compliance with the local and regulatory guidelines; and
- Life expectancy.

Regular cleaning and maintenance of your unit will increase its operating life significantly

What is more important in selecting the right system to do the job, catchment area or treatable flow?

In recent years the industry has seen some proprietary GPT providers sizing their units using potential catchment pollutant loadings rather than TFR. This practice not only confuses those wishing to compare different proprietary systems but, significantly, it enables those GPT providers to provide under-sized alternatives that compromise the optimal pollutant removal efficiency.

Systems sized using catchment area invariably result in smaller units, which have a lower-designed TFR and go into by-pass prematurely. Consequently, the product does not treat the catchment's optimal pollutant loading and may even cause flooding as under-sized units usually have insufficient by-pass capacity at the designed peak discharge flows. Also, they usually have inadequate storage capacity for the expected pollutant loadings.

Ecosol always ensures that its units are appropriately sized for optimal capture efficiencies with minimal hydraulic impact at peak design discharge flows. Each product consists of different sized units with a TFR capacity that is dependent on the size and slope of the outlet pipe and the average recurrence interval (ARI).

The flow generated by any catchment is matched to the appropriately-sized unit to ensure it is treated up to the designed TFR, with flows greater than the TFR by-passing. It should be noted that the location and level of imperviousness in a catchment can greatly affect the quantity of runoff and volume of pollutants.

5.0 Frequently-Asked Questions (cont)

When comparing different proprietary units, is capital cost per cubic metre of pollutants captured a guide?

This is a mistake many clients and consulting engineers make when trying to compare the performance and cost-effectiveness of different proprietary products. There are several flaws with this approach.

Whilst the capital cost can be readily found the ongoing cleaning and maintenance costs are often not added to determine a more accurate whole of life cost.

Also, the effectiveness of the cleaning regime is a critical factor in the equation. If a unit is cleaned only once in a year, when in fact it requires cleaning, say, three times, it will obviously have been in by-pass for much of the year and so the amount of pollution collected will be less than if it had been more regularly cleaned. This would make a nonsense of any attempt to compare different units using the level of captured pollutants as a key factor. Other factors such as differences in catchment characteristics, hydrological conditions, and different methods of cleaning will also affect any comparisons.

How often do Ecosol units need to be cleaned?

This varies between the different types of units. The cleaning frequency depends heavily on weather patterns, pollutant load and activity within the catchment. Under normal operating conditions, we recommend the larger in-line/end-of-line units are cleaned every 3-4 months and the at-source units every 1-2 months.

How are Ecosol units cleaned?

All Ecosol units are designed for cleaning with little or no manual handling of captured pollutants, thereby helping ensure safe working conditions. Ecosol staff can help you not only determine how often your unit should be cleaned but also the best method, which varies with the unit. For example, the **RSF 4000** is best cleaned by vacuum, while the **RSF 100** can be cleaned by manually removing the liner bag.

Can units be cleaned by simply removing the basket rather than using suction cleaning?

Cleaning your unit is essential to ensure that it continues to capture and retain pollutants as specified and without any premature bypass.

The methods for cleaning GPTs have been widely debated for many years. The Ecosol **RSF 4000** unit has been specifically designed for cleaning by vacuum method, which we believe offers far greater benefits than, for example, a removable internal filtration basket. After many years of industry experience we have confirmed that this is the safest, most efficient, and cost-effective method, because:

- Removed pollutants are appropriately stored for transportation;
- Pollutants do not need to be manually handled and can be safely stored and transported;
- Free oils and grease (hydrocarbons) are able to be efficiently removed and stored;
- Harmful pollutants such as fine sediments, heavy metals, and nutrients are not remobilised;
- No additional machinery other than the eductor truck is required;
- The internal filtration system is unlikely to suffer any damage during the cleaning process; and
- All pollutants are removed from the capture silo, unlike alternative methods.

The Ecosol **Net Tech**, which targets gross pollutants rather than fine sediment, is, however, best cleaned by removing the filtration net using a crane truck.

6.0 Corporate Profile

Ecosol was established in February 1996 to develop and commercialise the **RSF** technology. It correctly identified that any company providing cost-effective, engineered solutions to the growing problem of water pollution would be well placed to benefit from a rapidly-growing domestic and international market.

Ecosol's products are the result of many years of work by Ecosol's innovative research and development team. Its continued commitment to product development enables the company to remain at the forefront of the environment industry.

Ecosol is making a significant contribution to the restoration of the world's waterways by providing a range of technologies for use in the community, home, and industry. It wishes to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids.

The group operates in the rapidly-expanding natural resource management industry, providing its clients with high-performance technology solutions that remove pollutants from wastewater. It also provides associated monitoring, cleaning, and maintenance services, striving at all times to create long-term relationships with not only its clients but also its sub-contractors, suppliers, and employees.

Offering a high-quality turnkey, customer-focused service from design through to commissioning, Ecosol works closely with local councils, authorities, water utilities, consulting engineers, and property developers in their choice for the most appropriate system to meet their needs.

The company is proud to be a preferred supplier to many domestic and international council authorities and bodies.

Ecosol encourages community involvement by participating in school and youth activities and actively promoting the benefits of a cleaner environment to the community.

Ecosol is accredited for quality, environment, and OH&S and supports equal employment opportunities for all employees and members of the community.

7.0 Corporate Directory

AUSTRALIA

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HOBART
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SYDNEY
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Email: admin@ecosolnz.co.nz

MALAYSIA

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Email: info@ecosol.com.my

WEBSITE: www.ecosol.com.au

Staff at the Brisbane Office

Ecosol's Sydney Office

Ecosol's New Zealand Office

Ecosol's Malaysian Office

8.0 Reference Material

The following details refer to the numbered superscript references in the text of the main body of this document. Further details can be obtained by contacting your nearest Ecosol office:

1. 1998 AWA and 2003 Nature Foundation SA Environment Awards
2. Patented in various countries
3. University of South Australia Report dated 23 January 1998
University of Adelaide Reports dated 20 October 1998 and 4 May 2001
Avocet Consulting Pty Ltd Various Reports 1998 - 2007

Ecosol
WASTEWATER FILTRATION SYSTEMS

INSPECTION FORM

The RSF 4000 Solid Pollutant Filter

Asset Owner _____ Contact _____

Telephone _____ Fax _____

Unit Location _____ Date Commissioned _____

Unit/Structure No/Ref _____

Visual Inspection of Unit Components

	Good	Fair	Damaged	Remarks
Access cover	○	○	○	_____
Surrounding surfaces	○	○	○	_____
Capture silo	○	○	○	_____
Oil and grease baffles	○	○	○	_____
Pre-cast pit	○	○	○	_____
				_____

Visual Inspection of Composition and Percentages of Pollutants

	%	Description of pollutants and general comments
Gross pollutants	____	_____
		_____
Sediment	____	_____
		_____
Plastics, paper, etc	____	_____
		_____
Oils and grease	____	_____
		_____

Work Carried Out or Scheduled Maintenance

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Ecosol
WASTEWATER FILTRATION SYSTEMS

CLEANING CHECKLIST

The RSF 4000 Solid Pollutant Filter

Unit Location _____

Checklist Completed By _____

Date _____

Plant and Equipment Required to Complete Clean

1. Eductor truck/Wet Vac with six-inch snorkel* ☐
2. Long-handle access lifters (to remove access covers) ☐
3. Screwdriver set ☐
4. Long-handle broom ☐
5. Long-handle spade and shovel ☐
6. Cleaning report form ☐
7. Operation and maintenance manual ☐
8. Pen ☐
9. Barriers (temporary barrier fencing to be placed around access opening) ☐
10. Traffic cones to place around vehicle ☐
11. Replacement filtration baffle ☐

* Maintenance records and pre-start checklists should be available with the vehicle

Recommended Personal Protective Equipment

1. Gloves latex/nitrile
2. High-visy Vest ☐
3. Steel-capped gum boots ☐
4. Earplugs ☐
5. Safety glasses ☐
6. Sharps kit ☐
7. First aid kit ☐
8. Workwear ☐
☐

General Notes

1. Should damage to the GPT be noticed during the cleaning process then this should be recorded and your local Ecosol representative contacted. Please do not attempt to undertake repair works yourself as this may invalidate the product warranty
2. The **RSF 4000** has been designed for cleaning by vacuum from the surface. Should confined space entry be necessary during the cleaning operation to remove large debris only fully trained and accredited confined space entry and rescue personnel are to enter the unit
3. If entry is required to the unit, all confined space entry procedures must be strictly adhered to at all times

Comments

_____
_____
_____
_____
_____

Ecosol™
WASTEWATER FILTRATION SYSTEMS

INSPECTION CHECKLIST

The RSF 4000 Solid Pollutant Filter

Asset Owner _____ Asset ID _____

Unit Location _____ Ecosol Ref. **RSF** _____

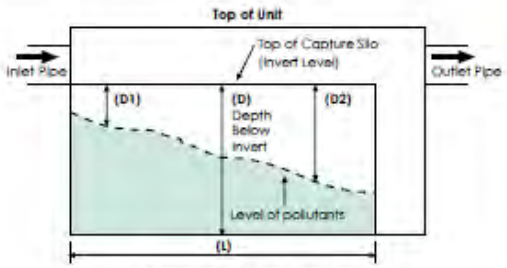
Date _____ Time _____ Unit Type _____

Inspected By _____

Visual Inspection

	Good	Fair	Damaged	Remarks
Access Lids	○	○	○	
Access Lid Surrounds	○	○	○	
Surrounding Surfaces	○	○	○	
Internal Components	○	○	○	
Other	○	○	○	
Floatables Visible?	Yes	No		

Amount of Captured Material



Elevation of Capture Silo

Capture Silo Dimensions

Unit Size	D (m)	L (m)	Width (W) (m)	Silo Vol (m^3)
4200	0.600	1.310	0.250	0.23
4300	0.600	1.500	0.300	0.32
4450	0.900	2.250	0.450	1.03
4600	1.200	3.000	0.600	2.43
4750	1.500	3.750	0.750	4.83
4900	1.800	4.500	0.900	8.30
41050	2.100	5.250	1.050	13.11
41200	2.400	6.000	1.200	19.52
41350	2.700	6.750	1.350	27.70
41500	3.000	7.500	1.500	37.94
41800	3.600	9.000	1.800	65.33

D = _____ m D1 = _____ m D2 = _____ m Dav.= (D1+D2) / 2 = _____ m

L = _____ m W = _____ m Vol = (D - Dav.) x L x W = _____ m^3

NOTE: *Cleaning to be arranged when the capture silo is approximately 60-70% full*

Work Carried Out or Scheduled Maintenance

_____

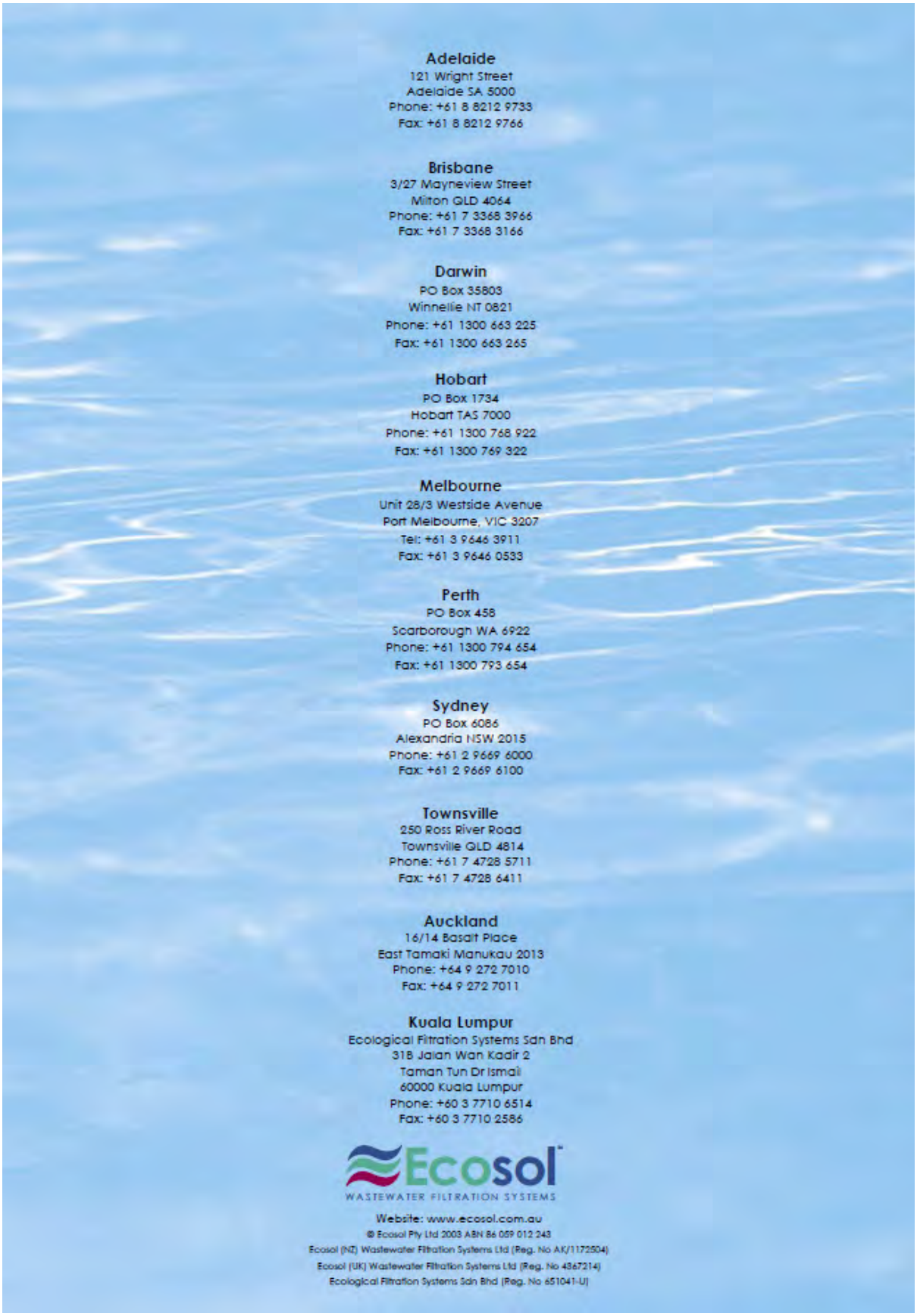
_____

_____

_____

_____

_____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