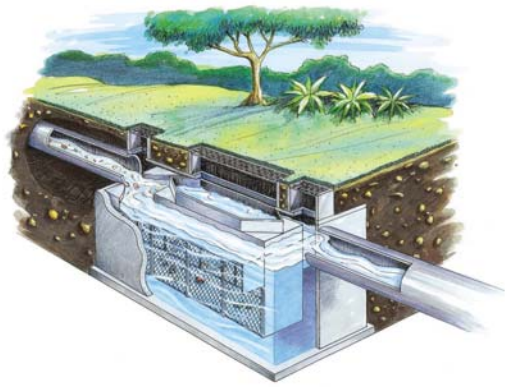
INTEGRATION OF ECOSOL RSF 4000 GROSS POLLUTANT TRAPS WITH THE MUSIC CATCHMENT PACKAGE

INTRODUCTION TO MUSIC

MUSIC is an acronym for Modelling Software for Urban Stormwater Improvement Conceptualisation. It is a product of the Cooperative Research Centre for Catchment Hydrology and the licensor is Monash University (www.toolkit.net.au).



MUSIC provides a user-friendly interface to allow complex stormwater management scenarios to be quickly and efficiently created and the results to be viewed using a range of graphical and tabular formats. This reduces the uncertainty surrounding the planning of stormwater management strategies, and may generate substantial cost-savings.

PURPOSE

MUSIC is designed to simulate urban stormwater systems operating at a range of temporal and spatial scales for catchments from 0.01 km^2 to 100km^2 and modelling time steps ranging from six minutes to 24 hours to match the catchment scale.

TARGET USER GROUP

MUSIC is designed for urban stormwater engineers, planners, policy staff, consultants as well as state, regional, and local government authorities.

APPLICATION OF MUSIC TO MODELLING GPTS

Double clicking a GPT icon within MUSIC produces a popup window that requires the following data to be input:

1) low flow bypass;

2) high flow bypass; and

3) piecewise-linear user-definable transfer functions for the GPT performance in capturing Gross Pollutants (GP), Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN). In each case the independent variable is input concentration (mg/l or kg/MI) and the dependent variable is the output concentration.

The GPT inputs are independent of the flow rate, except that there are underflow and overflow limits. Flow below the underflow limit, and flow above the overflow limit, passes through with no change of concentration.

IMPORTANT CONSIDERATIONS FOR MUSIC USERS

The validity of the predictions is only as good as the validity of the input data. All GPT performance predictions are subject to uncertainty owing to the stochastic nature of environmental processes, with quantities varying chaotically with time and location. The difficulty in making repeatable measurements is illustrated in the wide range of published test results.

This is not surprising considering that there can be significant differences, for example, in the:

- catchment type and hydrology;
- weather conditions and events during the testing period;
- sampling regimes – frequency, timing, and location;
- composition of pollutant load;
- nutrient transport mechanisms;
- level of bonding of nutrients to suspended solids
- degradation of accumulated pollutants;
- suspended solid particle size distribution (PSD); and the
- size and state of the unit (i.e. how well it has been cleaned and maintained).

Consequently, when comparing different GPTs, it is important to understand that the results may have been derived in conditions that may vary significantly. There is no industry-wide standard for determining the input values required by MUSIC.

CAPTURE EFFICIENCY OF NUTRIENTS (TP AND TN)

GPTs are designed primarily to capture solid particles but, because they attach to these particles, nutrients are also captured. This is measured in terms of TSS capture efficiency. It follows then that GPTs with the same TSS performance will remove the same level of nutrients as long as all other conditions are the same.

The most comprehensive measurement of GPT nutrient capture in Australia was reported in Walker et. al. 1991, a document referenced in Appendix C3 of the MUSIC development team, CRC for Catchment Hydrology (revised February 2005 for MUSIC v2.1). This document quotes "approximately 30%" TP removal and also found that although TN removal was erratic during storm events, there was "consistent removal of approximately 13% of TN during dry weather flow conditions".

Figure 1 below shows the PSD of an accumulated sediment sample taken from the unit tested by Walker et al 1999 and of six samples taken from several, different **Ecosol RSF 4000** units. As expected, the results vary significantly but do suggest that these units have similar accumulated sediment capture rates and, hence, similar nutrient removal capabilities.

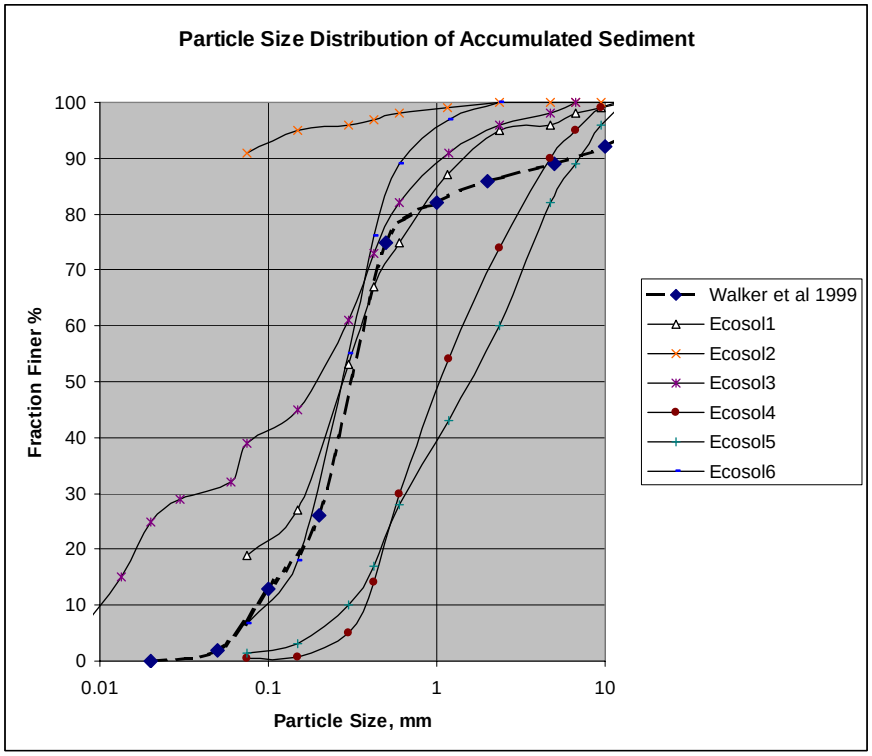


Figure 1

The MUSIC input data must be viewed as an overall long-term average – in the short term there are simply too many fluctuations making any conclusions largely meaningless. The long-term pollutant capture performance depends not only on the make and type of GPT but how it is managed and maintained.

It is important to note that the cleaning method used for GPTs can have a significant effect on the TSS capture efficiency. For example, if a removable basket is used, much of the captured TSS is returned to the GPT because the basket must be drained of excess water over the GPT prior to removal of the gross pollutants. This process can take more than an hour and all this time the finer sediment particles fall back into the GPT. Furthermore, when the basket is removed from the GPT, some sediment is remobilised and is lost.

TSS capture rates of proprietary devices cleaned in this way are better described as having a Gross TSS Removal rate, which is the TSS initially removed from the GPT prior to draining, and a Net TSS Removal Rate, which is the TSS remaining after draining is complete. The Net TSS must be less than the Gross TSS but usually, and for obvious reasons, most manufacturers of devices with removable baskets, or those cleaned by clamshell, prefer not to make any distinction between the two removal rates. To enable valid comparisons to be made between different proprietary devices, it is important that the Net TSS Removal Rate is used.

As Ecosol units are cleaned by vacuum, which removes **ALL** pollutants, the Gross and Net TSS Removal Rates are the same. Ecosol believes strongly that the only effective way to clean GPTs is by vacuum.

RECOMMENDATIONS FOR MUSIC INPUT VALUES FOR THE RANGE OF ECOSOL RSF 4000 GROSS POLLUTANT TRAPS

ECOSOL RSF 4000 SOLID POLLUTANT FILTER/OIL AND GREASE ARRESTER		
Item	**Capture Efficiency (CE)**	**Input Values**
Low flow by-pass (In-line GPT)	-	0
Low flow by-pass (Off-line GPT with sold weir)	-	0
High flow by-pass	This value should be set to the Treatable Flow Rate (TFR) of the particular unit	
Gross Pollutants (GP)	Typically 98%	(0,0) and (1000,20)[1,5]
	Worst case 95%	(0,0) and (1000,50)[1]
Total Suspended Solids (TSS)	91%	(0,0) and (1000,90)[1, 2]
Total Phosphorous (TP)	30%	(0,0) and (1000, 700) [1,3]
Total Nitrogen (TN)	13%	(0,0) and (1000, 870) [1,3,4]

[1] The value 1000 is arbitrary, to ensure that the full input range is encompassed. E.g. (100, x) would suffice if the concentration never exceeds 100

[2] Avocet Consulting Pty Ltd Report 23/04/2006 "Recommendations for integration of Ecosol RSF 4000 GPTs with the MUSIC catchment package"

[3] See explanatory text in this document

[4] Dry weather flows

[5] Engtest (University of Adelaide) Report 4/5/2001 "RSF 4000 Stormwater Filter Performance Testing"

Other Reference

T. A. Walker, R. A. Allison, T. H. F. Wong, R. M. Wootton CRCCH Feb 1999, REMOVAL OF SUSPENDED SOLIDS AND ASSOCIATED POLLUTANTS BY A CDS GROSS POLLUTANT TRAP