



# D-Rainclean Filter Media

Engineered bio-remediation soil for sustainable drainage systems

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## Engineered bio-remediation soil for sustainable drainage systems



Product part number DRFC006

Recent changes in UK legislation and the implementation of the European Water Framework Directive (WFD), make it essential for developers to improve water quality discharged from development sites. The proven and versatile D-Rainclean Filter Media allows engineers to design source control and infiltration systems that will give a known quality output based on independent testing and approval, coupled with many years of installed service throughout Europe.

D-Rainclean Filter Media is a natural engineered bio-remediation soil meeting the 0.8+ Mitigation Indices as detailed in C753 The SuDS Manual. It captures suspended solids and adsorbs dissolved heavy metals whilst helping to break down hydrocarbons. It can be used as the treatment medium in a wide range of soft or hard engineered sustainable drainage systems.

### Key benefits

- ◆ Available in bulk bags (1.5m<sup>3</sup>) code DRFC006
- ◆ Forms part of a SuDS solution
- ◆ Excellent hydraulic capacity
- ◆ Long service life 10-20 years – years before media replacement
- ◆ Excellent solids retention
- ◆ Unique filter media – optimised grain size lowers clogging risk
- ◆ Adsorber agents provide a high retention of dissolved pollutants
- ◆ Active soil microbiology, gives a vitalised soil
- ◆ Helps decomposition of organic pollutants
- ◆ Resistant to de-icing salt
- ◆ Simple replacement of filter-media in the event of accidental spillage (e.g. oil spillage)
- ◆ Filter media can be used for other applications (e.g. ponds, swales)
- ◆ Meets the 0.8+ Mitigation Indices in C753 The SuDS Manual



## Flooding and pollution

### The problem

Flooding is an issue that needs no introduction in the UK.

Pluvial flooding has become a regular occurrence as our drainage networks become incapable of coping with increased urbanisation combined with climate change.

Since the turn of the millennium, the construction industry has sought to tackle the problems associated with more intensive rainfall, and in particular the volumes of water generated.

This culminated in the Flood and Water Management Act 2010, which sets out the responsibilities for the design, construction, and maintenance of sustainable drainage systems.

What is perhaps less well known is that, enshrined in this legislation, is the requirement to address surface water quality leaving development sites in order to comply with the Water Framework Directive.



Geocellular tank infill



Infiltration basin



Vegetated infiltration basin



Bio-retention basin



Rain gardens



Bio-retention ponds

Much of the onus to comply with the FWM Act falls on Local Authorities whose role it is to mitigate and minimise both flood and pollution risk by ensuring that hard-landscaping design and installation ‘design-out’ and ‘build-out’ both flood risk and pollution risk, usually by employing SuDs techniques.

### The solution

Stormwater Management Limited offer the highly innovative and proven bio-remediation filter media system that treats the priority pollutants identified by the regulatory authorities (Environment Agency and Highways Authority), principally total suspended solids (TSS) and dissolved heavy metals such as copper and zinc – meeting both these key requirements within a single solution.

### The Water Framework Directive 2015

The Water Framework Directive 2015 has identified 44 chemicals, 16 of which are deemed as hazardous and 8 that are bio accumulative. On heavily trafficked roads and parking areas, heavy metal waste water reaches critical concentrations and regularly exceeds the threshold values for pollution run off. Heavy metal pollution increases the toxicity of river water that can be damaging to aquatic life, reduces the quality of crops and plant life and ultimately this can be damaging to human life.



# D-Rainclean Filter Media bio-remediation soil

D-Rainclean Filter Media engineered bio-remediation soil is a unique and versatile combination of soil and filter.

It performs a range of functions across a wide spectrum of applications in order to clean surface water runoff using the processes of filtration, adsorption, ion exchange, phosphate and retention.

Product part number DRFC006



Unique D-Rainclean Filter Media can be used in a range of SuDs applications including:

- ♦ Bio-retention ponds
- ♦ Infiltration basins
- ♦ Swales
- ♦ Rain gardens.
- ♦ Geocellular tank infill



- Absorption area/exchanger **A**
- Water storage/filter **B**
- Organic matrix/settlement area **C**
- pH-buffer area/acid limiter **D**

Components pictured schematically – grain size not to scale.

## Filtration

Many contaminants attach themselves to sediment particles. The smaller the particle, the higher its pollutant concentration. D-Rainclean Filter Media bio-remediation soil retains these sediments by depth filtration, ensuring they are retained in the upper 5-10cm of the filter media. This significantly reduces the risk of surface clogging (colmatage) and ponding, particularly in extreme events, something which some surface filtration systems, such as permeable paving are prone to.

## Heavy metal absorption/desorption and precipitation

D-Rainclean Filter Media bio-remediation soil uses a number of processes to remove dissolved heavy metals:

- Nickel – sorption
- Lead, cadmium, copper and zinc – sorption, precipitation and PH balancing
- Chromium – ion exchange

## Water retention

Soil microbiology performs a valuable degradation role, particularly during periods of warmer weather. As such, D-Rainclean Filter Media bio-remediation soil retains moisture to allow this degradation process to occur. When used with the D-Rainclean channel system, large pore spaces within strata of the media combined with organic substances and the design of the channel allow 3.0 litres per linear metre to be stored to ensure that this optimised process can occur.

## Soil Testing Values\*

Arsenic (As)	10 µg/l
Lead (Pb)	25 µg/l
Cadmium (Cd)	5 µg/l
Chromium (Cr)	50 µg/l
Copper (Cu)	50 µg/l
Nickel (Ni)	50 µg/l
Mercury (Hg)	1 µg/l

Zinc (Zn) 500 µg/l

\* Ground Water according to German Federal Soil Conservation Law (Bundesbodenschutzgesetz)

## Laboratory testing

Tested independently and compared with natural 'good soil', D-Rainclean Filter Media has considerably better adsorption properties. On average: 99% adsorption of zinc and 99% of copper based on a 10 years total load input (source: DIBt test report).

## Hydraulic capacity

D-Rainclean Filter Media has a water permeability coefficient of  $9 \times 10^{-4}$  m/s, the secret to this high permeability rate is due to the graduated grain sizing within the media that produces a widely spaced distribution curve. The coefficient has been derived by testing which allows sufficient detention time for adsorption to occur.

## Harmful organic materials

D-Rainclean Filter Media uses an organic matrix and a specific activated carbon that supports bonding and degradation of organic pollutants, as such D-Rainclean Filter Media degrades mineral oils from impermeable trafficked areas such as car parks.

## De-icing salts

The use of de-icing salts can block adsorption and reverse the adsorption of already captured hazardous material.

The performance of the D-Rainclean Filter Media is not adversely affected by sodium chloride even in shock loads. However frequency and concentration of de-icing will have an effect on overall service life – see Design life on page 5.

## Oil bonding and degradation

The large void space within D-Rainclean Filter Media allows oil to lose its fluidity and cover the pore space where micro organisms can degrade it.

## Phosphate bonding

The enhanced adsorption capacity within D-Rainclean Filter Media is crucial to maintaining clean water courses.



### pH Value

The carbonate buffer range of the media is above pH 7.2

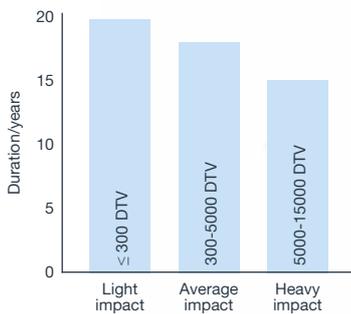
### Cation exchange capacity

D-Rainclean Filter Media acts as an ion exchanger using zeolites and adsorptive elements that ensure bonding with heavy metal ions.

### Design life

The design life of D-Rainclean Filter Media is a function of its daily use. D-Rainclean Filter Media has been tested to DIBt standard approval and based on applications since 2002. Depending on the traffic load D-Rainclean Filter Media has a service life of between 10 and 20 years.

#### Design life of D-Rainclean Filter Media\*\*



\*\* DTV = average daily traffic volume

### Disposal

D-Rainclean Filter Media should be removed and disposed in line with local authority and regulatory guidelines.

### Planting

D-Rainclean Filter Media contains sufficient nutrients for selected plants e.g. pachysandra, mahonia, vinca minor or cotoneaster. For further information please contact the Stormwater Management technical department.

### Swales

The construction of the swale to treat run off from a cast iron foundry included geocellular storage underneath the D-Rainclean Filter Media.

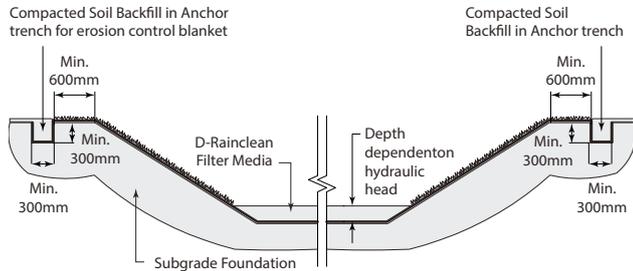
– see page 6.



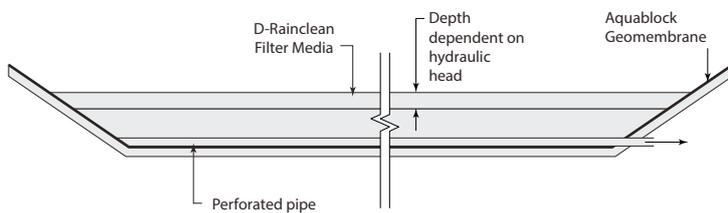
# Applications

The unique composition of D-Rainclean Filter Media engineered bio-remediation soil gives it especially varied and high performance against a range of water and pollution control criteria in extremely diverse application types.

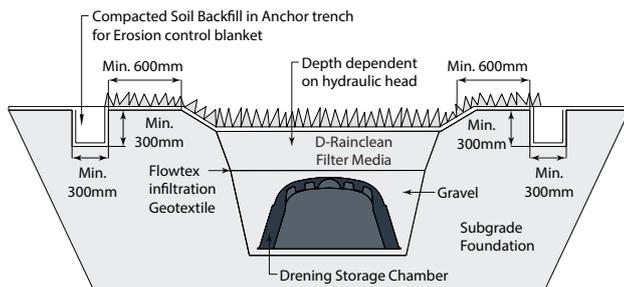
## Infiltration basins



## Swale with under drain

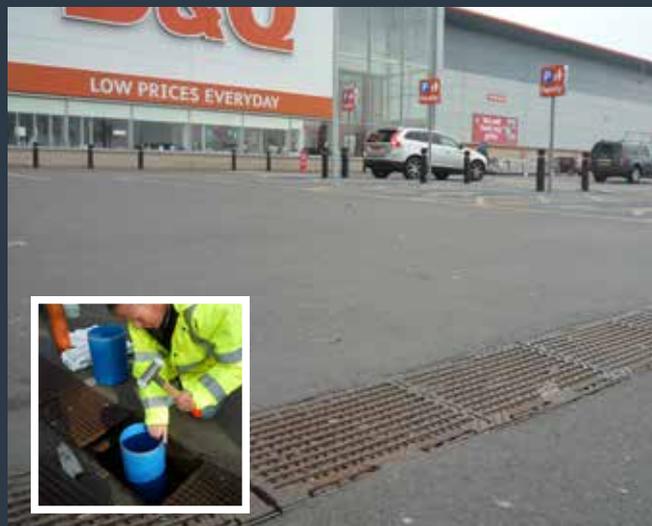


## Swales



Below, we have shown a few application scenarios, but there are many others. Please contact Stormwater Management Ltd. for further details. If known water quality outputs are required, D-Rainclean Filter Media is an ideal addition to any SuDS component including:

# Case study



The D-Rainclean Filter Media has been used as the treatment medium in a D-Rainclean porous channel system in a retail car park since 2006. Recently, tests were undertaken to ascertain how well the system had performed over the past 8 years and what its anticipated life expectancy was likely to be.

The test results were extremely positive demonstrating there was a very good correlation between laboratory testing and real life experience. The media had removed significant volumes of Total Suspended Solids (TSS), particularly sub  $63\mu\text{g}$  particles, and over 82% and 85% removal of zinc and copper respectively.

The overall anticipated life expectancy of the media before replacement was calculated to be 18 years.

Results from testing showed a very strong correlation with the findings and approval certificate from the German DIBt (Deutsches Institut für Bautechnik). Currently this is one of the only independent testing and approvals body for such systems.

For further information and a copy of the test report please contact Stormwater Management Ltd directly on 01455 502222 or email [technical@storm-water.co.uk](mailto:technical@storm-water.co.uk)



**Bio-retention ponds**



**Geocellular tank infill**



**Rain gardens**



**Infiltration basin**

### D-Rainclean Filter Media Specification Clause



The stormwater treatment media system shall be D-Rainclean Filter Media by Stormwater Management Ltd. The system shall have been tested and approved in accordance with DIBt requirements. The depth of D-Rainclean Filter Media shall have been designed using

DWA A 138 methodology and be designed to 0.8+ Mitigation Indices.

### NBS Specification

D-Rainclean Filter Media should be specified in NBS section R17:315. Assistance in completing this clause can be found in the Stormwater Management entry in NBS Plus or a model specification can be downloaded from [www.stormwater.co.uk](http://www.stormwater.co.uk). For further assistance, please contact the Stormwater Engineering Team.

### How to size D-Rainclean Filter Media



The depth of D-Rainclean Filter Media is sized using a hydraulic sizing programme in accordance with German DWA A 138 guidelines. Please contact the Stormwater Management technical team at [technical@stormwater.co.uk](mailto:technical@stormwater.co.uk)

or ring 01455 502222 to discuss your requirements further where we will be happy to undertake the necessary calculations without obligation.

### DIBt



robust standard and testing protocol for Stormwater treatment systems.

D-Rainclean Filter Media has been approved and tested by DIBt to meet German groundwater and soil protection standards. For further information please contact Stormwater Management Ltd.

### Stormwater Management Ltd



Stormwater Management Ltd are specialists in the design, supply and install of surface water and sustainable drainage systems, whether the requirement is for landscaped, hybrid or more engineered drainage systems

Stormwater Management Ltd are able to offer a solution. Based in Hinckley, Leicestershire with a team of design and site engineers, Stormwater Management Ltd provide a wide range of drainage solutions for volume control and surface water treatment.

## Other products and applications



### D-Rainclean

D-Rainclean is a bio-remediation channel systems for surface water pollution control meeting the 0.8+ Mitigation Indices.

The system deals with surface water run-off and treats the flow at source, making it an ideal treatment component in a Sustainable Drainage (SuDs) solution.

- ♦ Controlled, pollution-free water
- ♦ Suited to a range of trafficking needs
- ♦ Low maintenance
- ♦ Long service life



### Innolet-G

Innolet-G is point drain filter cartridge and gully that treat Stormwater run-off from roads and remove priority pollutants to the 0.6+ Mitigation Indices, such as:

- ♦ Heavy metals – zinc, copper, cadmium and lead
- ♦ Hydrocarbons
- ♦ PAH
- ♦ Phosphates

## Technical Support

### Stormwater Management design service

Stormwater Management provide full technical support from design right through to installation and commissioning – from product and system selection, design calculations and CAD drawings, we aim to provide clients with all the relevant technical information.

Whether your scheme uses soft, engineered or hybrid drainage systems Stormwater Management have a range of product and system solutions to allow you to meet your objectives.

### On site support

Stormwater Management Ltd. now boasts the largest product range of its kind in the UK. Fully conversant in all D-Rainclean solutions as well as other associated products, our well- trained staff are always available to discuss the technical merits of D-Rainclean and to advise which solution would be most suited to a particular application.

**Tel** 01455 502222

**Email** [sales@storm-water.co.uk](mailto:sales@storm-water.co.uk)

### Stormwater Management Limited

Fleming Road, Harrowbrook Industrial Estate, Hinckley, Leicestershire LE10 3DU

**Tel** 01455 502222 **Fax** 01455 502223 **Email** [sales@storm-water.co.uk](mailto:sales@storm-water.co.uk) **www** [www.storm-water.co.uk](http://www.storm-water.co.uk)

