

21st October 2024

13508 – Havant Phase 2: - Response to Lead Local Flood Authority comments

Application Summary: -

Reference: APP/24/00274

The County Council has reviewed the following documents relating to the above application:

- 13508 – Havant Phase 2: - Response to Lead Local Flood Authority comments – Baynham Meikle - 4th September 2024

In order for us to provide a substantive response, the following information is required:

The outline drainage strategy was agreed for the wider development. The development discharge rates which were approved have been satisfactorily explained. Due to the method of calculation of discharge rate, the LLFA requires assurance that the development will not increase the downstream flood risk. The existing site appears to have more than one surface water drainage discharge point, where the outline planning development drainage strategy is to discharge phases 1 and 2 (formerly 3A and 3B) to a single outfall, the total discharge rate from phase 1 and 2 was determined by the capacity of the proposed discharge location (existing 375mm private drain). The strategy is acceptable providing the downstream network has sufficient capacity to convey the design flow. An assessment is required of the capacity of the private network downstream to ensure this will not be exceeded and not increase flood risk downstream of the site.

The drainage strategy has been amended to relocate the outfall to the existing 375mm dia storm sewer located to the west of the boundary as per the approved FRA. It is proposed that the proposed drainage will connect to the existing manhole via a downstream defender at the agreed restricted rate of 19.1 l/s.

The Drainage plan is appended to this note.

There does not appear to be an adequate level of treatment of surface water runoff evidenced in the submitted documents. The proposed drainage strategy design drawing shows, for example, the service yard, understood to be concrete paved, with one stage of treatment in a full retention separator, it also shows access roads understood to be macadam paved, with no apparent treatment. Each area of the site should be reviewed to ensure the appropriate level of treatment is achieved. The pollution control simple index approach summary submitted, requires further detail. The mitigation index used for each treatment stage should be included in the table to show how the total mitigation index has been calculated. The drainage strategy report should specify any proprietary treatment systems and include manufacturers data sheets to show how the pollution mitigation index is derived. It is noted that previously submitted datasheet for Psel ESR Puraceptor does not meet total stated mitigation index unless combined with another treatment stage. If different levels of treatment are proposed for different areas of the site, then this should be reflected in the table.

The proposed drainage strategy has been amended to include a downstream defender and a by-pass separator.

In summary, the drainage strategy for the development includes green roofs to the office space, permeable paving to the car parking bays, flows from the access road will go through a by-pass separator, flows from the service yards will go through the full retention separators and finally the surface flows will go through the downstream defender before discharging into the existing 375mm dia private storm sewer.

The Simple index approach has been updated to suit the following:

	Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
Pervious Pavement	0.7	0.6	0.7
Full Retention Separator	0.8	0.6	0.9
Downstream Defender (Vortex Plus)	0.5	0.4	0.5

The pollution mitigation indices for the Land Use type are as follow:

Suspended Solids: 0.8

Metals: 0.8

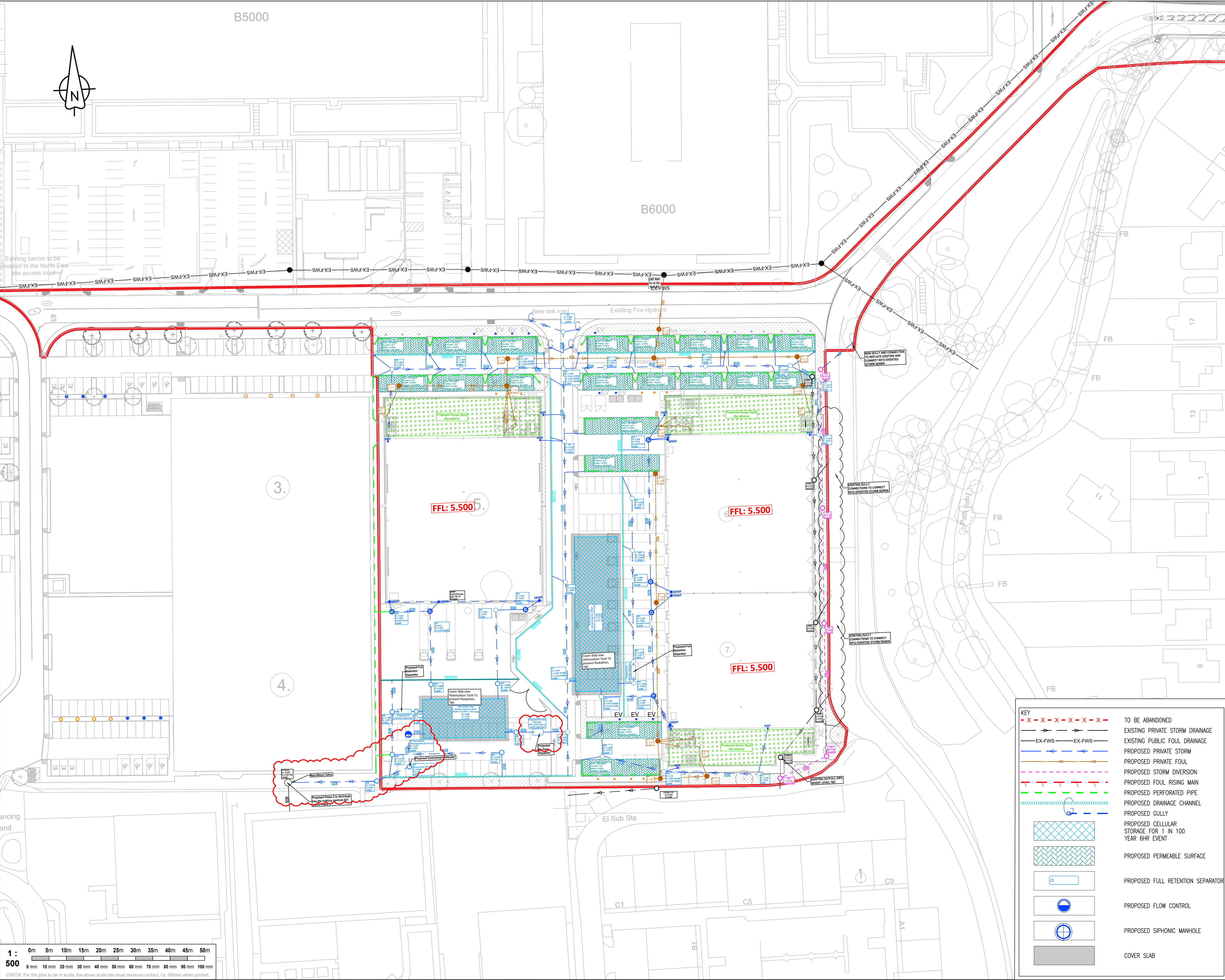
Hydrocarbons: 0.9

As shown within the summary, the combined pollution mitigation indices are higher and therefore sufficient.

The Drainage plan and Simple Index Summary, can be found appended to this note.

The proprietary treatment systems should be included in the maintenance schedule.

The SuDS Maintenance Plan has been updated and can be found appended to this note.



Notes

1. Topographical Survey carried out by Greenhatch, Drawing No.: 38869_T - Topographical Survey Plan (Dated Jan 2023).

2. Proposed Site Layout taken from PRC, Drawing No.: 11629_TE 10-102B - Proposed Site Plan (Dated MARCH 2024).

3. Do not scale from this drawing. All dimensions must be checked & verified on-site. If in doubt ask.

4. The Contractor is to check & verify all dimensions & levels before any work is started on-site.

5. Existing site survey works have been carried out by others & no guarantee can be given by Baynham Meikle for their accuracy.

6. Any discrepancies noted on-site are to be reported to Baynham Meikle immediately.

7. This drawing is to be read in conjunction with all relevant Architects', Engineers' and other Specialists' drawings & specifications.

8. For existing ground conditions, refer to Site Investigation reports.

9. The drainage installation is to be compliant with Building Regs. (Part H).

10. All adoptable drainage works shall comply with "Water UK - Design and Construction Guide".

11. The following pipe strengths shall be adopted (unless noted otherwise):

- Pipes up to and including 150mm Ø to be PVC-U to BS-EN 1329, or Clayware to BS-EN 295 Class 160.
- Pipes 150mm Ø up to and including 225mm Ø to be Clayware to BS-EN 295 Class 160.
- Pipes 300mm Ø to be Clay to BS-EN 295 Class 160 or Concrete to BS 5911 Class M.
- Pipes over 300mm Ø to be Concrete to BS 5911 Class M.

12. All pipe runs to be laid with flexible joints.

13. All pipes entering and exiting manholes are to be connected to pipe soffits level unless noted otherwise.

14. Pipe Bedding and surround to be as follows:

Location:	Cover to Soffit:	Pipe Bedding:	
Roads.	Clay / Conc	Flexible	
	>1.2m	>0.9m	Class S
Hard and Soft Landscaping.	<1.2m	<0.9m	Class Z
	>0.6m	<0.6m	Class S
	<0.6m	<0.6m	Class Z

15. The following Conc. mixes are to be used (in accordance with BS 8500):

Location:	Mix Reference:
Concrete Surround to Pipes	ST4
Concrete Base and Surround to Manholes	ST4

16. All precast-concrete products (i.e. pipes, manhole rings, etc.) shall be of suitable Concrete mix to cater for Class 2 Sulphates.

17. Pre-formed channels are to be used in manholes where applicable.

18. Granolithic Concrete benching to be steel trowelled to a dense smooth face neatly shaped and finished to all branch connections and laid in accordance with the Specification.

19. All connections to be turned in direction of flow using pipe bends.

20. Manhole covers and frames to be Ductile Iron Medium Duty grade B125 rectangular to BS-EN 124 positions outside vehicular-trafficked areas, and Heavy Duty grade D400 in vehicular-trafficked areas.

21. Manhole covers and frames to be Ductile Iron Medium Duty grade A15 covers in Soft Landscaping.

22. First flexible joint in pipes adjacent to a manhole shall be a maximum of 600mm from inside face of manhole, connecting to rocker pipe.

23. The length of Rocker Pipe is as follows:

Pipe Diameter:	Length of Rocker Pipe:
150mm - 600mm	600mm
675mm - 750mm	1000mm
825mm & Over	1250mm

24. Manholes with outgoing pipes greater than 600mm Ø shall be fitted with guard bars, safety chains or other safety devices.

25. The Principle Contractor shall be responsible for checking the existing line and invert levels of any connection points for both the Foul and Surface Water systems, prior to undertaking installation of any new drainage works. Any deviation to the levels and positions indicated on the drawing should be brought to the attention of the Engineer.

26. All invert levels specified are outgoing (except Backdrop connections).

27. All foul connections to be 150mm Ø laid at a minimum gradient of 1/40 unless noted otherwise. Surface Water pipe sizes are as indicated.

28. Foul pipes to be externally vented (SVP) at head of run.

29. For location of internal SVP, SS, etc., refer to Architect's latest layouts.

30. Internal Foul drainage connections / positions and setting-out information to be confirmed by the M&E Consultant / Architect.

KEY

- - - - -

TO BE ABANDONED

EXISTING PRIVATE STORM DRAINAGE

EXISTING PUBLIC FOUL DRAINAGE

PROPOSED PRIVATE STORM

PROPOSED PRIVATE FOUL

PROPOSED STORM DIVERSION

PROPOSED FOUL RISING MAIN

PROPOSED PERFORATED PIPE

PROPOSED DRAINAGE CHANNEL

PROPOSED GULLY

PROPOSED CELLULAR STORAGE FOR 1 IN 100 YEAR 6HR EVENT

PROPOSED PERMEABLE SURFACE

PROPOSED FULL RETENTION SEPARATOR

PROPOSED FLOW CONTROL

PROPOSED SIPHONIC MANHOLE

COVER SLAB

T05	17/10/2024	Drainage revised to suit LLFA comments	A.B.	A.B.
T04	04/04/2024	Updated in response to PRC comments	L.M.	M.R.
T03	28/03/2024	Updated To Suit Latest Site Layout	J.T.	A.B.
P03	20/03/2024	Updated To Suit Latest Site Layout	R.B.	A.B.
T02	08/03/2024	Updated To Suit Latest Site Layout	R.B.	A.B.
T01	23/02/2024	Tender Issue	R.B.	A.B.
P02	05/12/2023	Planning Issue	R.B.	A.B.
P01	17/11/2023	For information	R.B.	A.B.
Rev	Date	Description	By	Chkd

Revision Schedule

Drawing Status

For Tender

Project Title

Langstone Technology Park Phase 2 Havant

Drawing Title

Proposed Drainage Plan

Drawing Number

13508_121

Revision

T05

BM Ref

13508

Scale @ A1

1 : 500

Drawn by

R.B.

Checked by

A.B.

Project Eng

G.L.

BAYNHAM MEIKLE

Consulting Civil & Structural Engineers

0121 434 4100

admin@baynhammeikle.co.uk

www.baynhammeikle.co.uk

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Pollution Hazard Level Pollution Hazard Indices TSS Metals Hydrocarbons	Other industrial site area High 0.8 0.8 0.9	These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
SuDS components proposed					
Component 1	Pervious pavement (where the pavement is not designed as an infiltration component)	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx . See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx .	
Component 2	Full Retention Separator				
Component 3	Downstream Defender Vortex Plus				
SuDS Pollution Mitigation Indices TSS Metals Hydrocarbons	>0.95 >0.95 >0.95				
Groundwater protection type Groundwater protection Pollution Mitigation Indices TSS Metals Hydrocarbons	None 0 0 0				
Combined Pollution Mitigation Indices TSS Metals Hydrocarbons Acceptability of Pollution Mitigation TSS Metals Hydrocarbons	>0.95 >0.95 >0.95 Sufficient Sufficient Sufficient	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			

Havant Phase 2

Langstone Technology
Park

SUDS Maintenance Plan

Project Ref: **AB/13508**

Issue: Second Issue

October 2024

Client

XLB Limited

SUSTAINABLE DRAINAGE AND LANDSCAPE MANAGEMENT PLAN FOR HAVANT PHASE 2.

An introduction to sustainable drainage systems or SuDS

- SuDS are a new environmentally friendly approach to managing rainfall that use landscape features to deal with surface water. SuDS aim to:
 - Control the flow, volume and frequency of water leaving a development area
 - Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
 - Provide attractive surroundings for the community
 - Create opportunities for wildlife

1 SuDS Drainage Strategy

The proposed SuDS are designed to prevent flooding and control the flow of surface water using attractive landscape features.

It is proposed that drainage strategy incorporates cellular storage within service yard areas. This feature is the primary source of surface water storage for the site.

In addition to the cellular, storage is also provided by the use of porous car parking.

2 SuDS Management

The proposed SuDS measures, have been designed with easy maintenance in mind. Maintenance will generally fall into one of the three following categories:

- **Regular day to day care** - litter collection, grass cutting and checking the inlets and outlets where water enters or leaves a SuDS feature
- **Occasional tasks** - managing vegetation and removing any silt that builds up in the SuDS features also after flooding events.
- **Remedial work** - repairing damage where necessary

3 SuDS Maintenance – Summary

		Frequency	Unit Rate	Total
	REGULAR MAINTENANCE			
1.	LITTER MANAGEMENT			
1.1	Pick up all litter in SuDs and Landscape areas and removed from	12 visits monthly		
2	GRASS MAINTENANCE – all cutting to wildlife piles			
2.1	Mow all grass verges, paths and amenity at 35-60mm with 75mm max. Leaving grass in situ	As required or monthly		
4	HARD SERVICES			
4.1	Sweep all paving regularly. Sweep and suction brush. Permeable paving in autumn after leaf fall	1 visit		
	OCCASIONAL TASKS			
6	SILT MANAGEMENT			
6.1	Remove / clear out silt from silt collection traps in linear drainage channels	As required / after flood event.		
7	REMEDIAL WORK			
7.1	Inspect SuDs system regularly to check for damage or failure.	As required / after flood event.		

SuDS Features:

SuDS techniques include attenuation structures which assist in managing discharge of water from the site.

Cellular Tanks / Soakaways are used to manage and control surface runoff. Also, they are used to store surface water on site under the ground to slow discharge before it is discharge offsite.

Permeable surfaces as permeable asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc.

Inspection Chambers and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

Overflows can be below ground through gratings and chambers or over grass weirs in the open. They must be kept clear at all times to protect areas from flooding.

Flood routes (exceedance routes) allow water volumes exceeding the capacity of the SUDS system to escape from the site without causing damage to property. This route must be clear of obstructions at all times.

Green Roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuation peak flows.

Sustainable Drainage Maintenance Specification

1.0 GENERAL REQUIREMENTS

Maintenance activities comprise: • Regular Maintenance • Occasional Task • Remedial Work	Frequency
Generally Litter Collect all litter or other debris and remove from site at each site visit	Monthly

- **Avoid** use of weed killers and pesticides to prevent chemical pollution
- **Avoid** de-icing agents wherever possible to allow bio-remediation of pollutants in permeable surfaces.
- **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

Exclusions:

- Maintenance of rainwater harvesting chambers, pumps, etc.

2.0 INLETS, OUTLETS, CONTROLS, AND INSPECTION CHAMBERS

- **Inlets and outlets structures** may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.
- **SuDS flow control structures** can be protected orifices, slots weirs or other controls at or near the surface to be accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly Monthly
Inspection chambers and below ground control chambers	

Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	Frequency
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
Repair physical damage if necessary.	As required

3.0 OVERFLOWS AND FLOOD ROUTES

- **Overflows** are overland across weirs, through gratings or within chambers and must be kept clear at all times to protect areas from flooding. They allow onward flow when part of the SuDS system is blocked.
- **Flood routes (exceedance routes)** allow water volumes that exceed the capacity of the SuDS system to pass through or round the site without causing damage to property. These routes must be clear of obstructions at all times.

OVERFLOWS AND FLOOD ROUTES	
Regular Maintenance	Frequency
Overflows. Jet pipes leading from overflow structures annually and check by running water through the overflow. Check free flow at next SUDS feature – inlet to basin or chamber.	Annually
Overflows. Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
Flood Routes. Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	Monthly
Remedial	Frequency
Overflows. If overflow is not clear then dismantle structure and reassemble to design detail.	As required

4.0 Cellular Storage

Cellular Storage	
Regular Maintenance	Frequency
Inspect inlets, outlets and control structures and remove obstructions and silt as necessary.	Monthly
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional Maintenance	
Remove silt from catchpits and cellular storage	As necessary
Remedial work	Frequency
Repair inlet/outlet, if necessary, removal of silt build up	As required
Repair physical damage if necessary.	As required

5.0 PERMEABLE SURFACES

- **Permeable surfaces** including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving can be cleaned by suction brushing.

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Cleaning Brush regularly and remove sweeping from all hard surface	Monthly
Occasional Tasks	Frequency
Permeable Tasks Brush and vacuum surface once and year to prevent still blockage and enhance design life	Annually
Remedial Work	Frequency
Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise client of possible need for reinstatement of top layers or specialist cleaning. Recent experience suggest jet washing and suction cleaning will substantially reinstate pavement to 90% efficiently	As required
After Flood Event	Frequency
Brush and vacuum surface to remove silt / debris. If water still does not infiltrate immediately advise client of possible need of reinstatement of top layers or specialist cleaning. Check perforated pipework and outlet sumps.	After the flooding has subsided and is safe to undertake.

6.0 GREEN ROOFS

The amount of maintenance required will depend on the type of green roof installed.

GREEN ROOF	
Regular Inspection	Frequency
Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural ability	Annually and after severe storms
Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
Inspect drains inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Frequency
Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
During establishment (ie year one), replace dead plants as required.	Monthly (but usually responsibility of manufacturer)
Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
Remove fallen leaves and debris from deciduous plant foliage.	Six monthly or as required
Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	Six monthly or as required
Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
Remedial Actions	Frequency
If erosion channels are evident, these should be established with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled.	As required.
If drain inlet has settled, cracked or moved, investigate and repair as appropriate.	As required.

7.0 MANHOLES AND INSPECTION CHAMBERS

- **Manholes and Inspection Chambers** and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Manholes and Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is obstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Annually
Occasional Maintenance	Frequency
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial Work	Frequency
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary. Repair physical damage if necessary	As required

8.0 DOWNSTREAM DEFENDER

- **Downstream Defender** is an advanced hydrodynamic vortex separator that reliably captures and retains sediments, oil, trash and floatables from the surface.

DOWNSTREAM DEFENDER	
	Frequency
Inspection	- Regularly during the first year of installation. - Every 6 months after the first year if installation
	Frequency
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
	Frequency
Sediment Removal	- Once per year or as needed. - Following a spill in the drainage area

9.0 Full Retention Separators and By-Pass Separators

Maintenance and installation of the separators will be as per manufacturers detail and requirement.

10.0 SPILLAGE – EMERGENCY ACTION

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

Contact the Environment Agency immediately.

11.0 QUERIES REGARDING A DESIGN FEATURE.

In the event of a concern or failure of a SuDs design feature contact The Baynham Meikle Partnership.

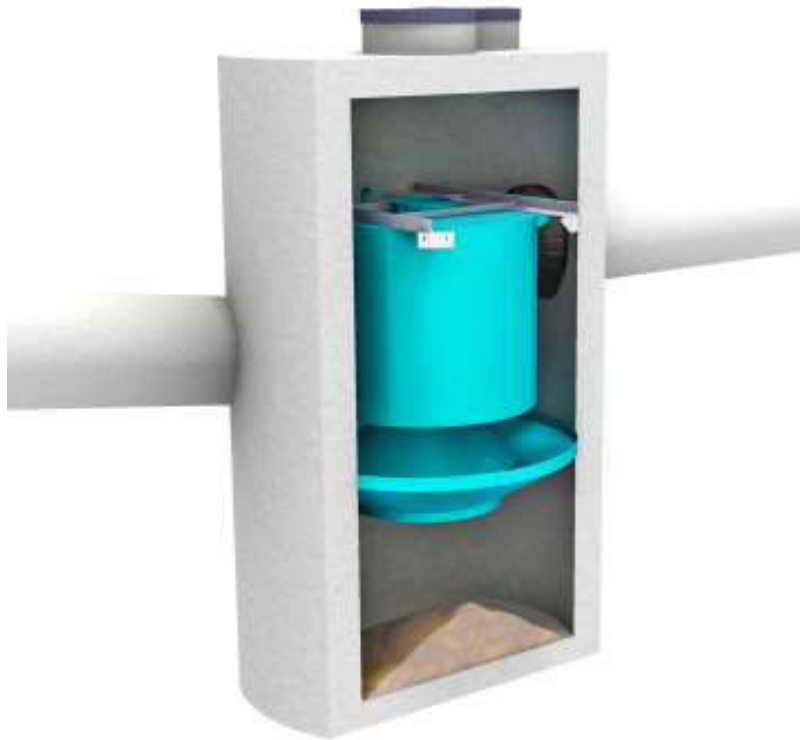
8 Meadow Road, Edgbaston, Birmingham B17 8BU

Tel: (0121) 434 4100

Email admin@bm-p.co.uk

12.0 RESPONSIBILITIES

The new on-site drainage will not be adopted, it is to remain in private ownership. The Tenant will be responsible for the maintenance and operations requirements of the SuDS features.



Operation and Maintenance Manual

Downstream Defender®

Vortex Separator for Stormwater Treatment

Turning Water Around ...®

Table of Contents

3	Downstream Defender® by Hydro International - Benefits of the Downstream Defender® - Applications - Downstream Defender® Components
4	Operation - Introduction - Pollutant Capture and Retention - Wet Sump - Blockage Protection
4	Maintenance - Overview - Determining Your Maintenance Schedule
5	Maintenance Procedures - Inspection - Floatables and Sediment Cleanout
8	Downstream Defender® Installation Log
9	Downstream Defender® Inspection and Maintenance Log

COPYRIGHT STATEMENT: The contents of this manual, including the drawings and specifications contained herein or annexed hereto, are intended for the use of the recipient to whom the document and all associated information are directed. Hydro International plc owns the copyright of this document (including any drawings or graphics), which is supplied in confidence. It must not be used for any purpose other than that for which it is supplied and must not be reproduced, in whole or in part stored in a retrieval system or transmitted in any form or by any means without prior permission in writing from Hydro International plc. Downstream Defender® is a trademarked hydrodynamic vortex separation device of Hydro International plc. A patent covering the Downstream Defender® has been granted.

DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's Downstream Defender®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc have a policy of continuous product development and reserve the right to amend specifications without notice.

Downstream Defender® by Hydro International

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator designed to provide high removal efficiencies of settleable solids and their associated pollutants, oil, and floatables over a wide range of flow rates.

The Downstream Defender® has unique, flow-modifying internal components developed from extensive full-scale testing, CFD modeling and over thirty years of hydrodynamic separation experience in wastewater, combined sewer and stormwater applications. These internal components distinguish the Downstream Defender® from simple swirl-type devices and conventional oil/grit separators by minimizing turbulence and headlosses, enhancing separation, and preventing washout of previously stored pollutants.

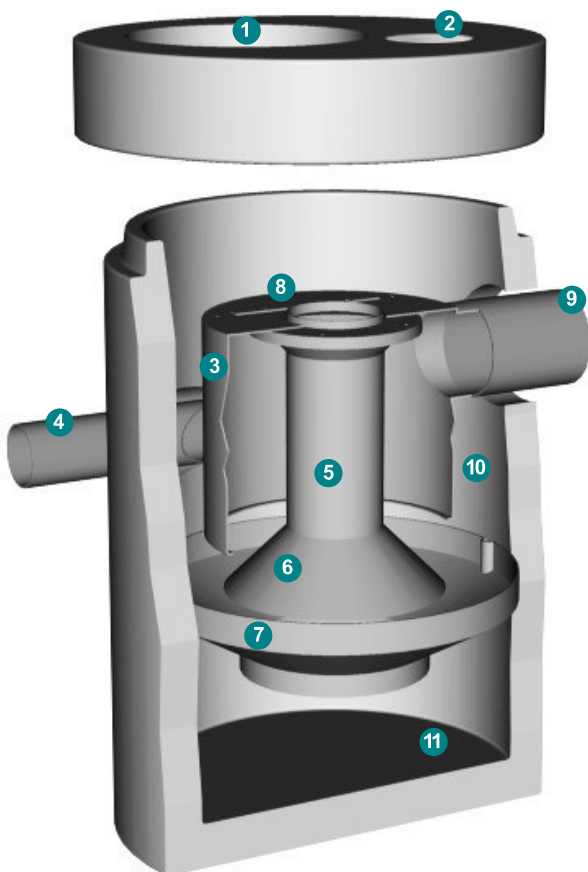
The high removal efficiencies and inherent low headlosses of the Downstream Defender® allow for a small footprint making it a compact and economical solution for the treatment of non-point source pollution.

Benefits of the Downstream Defender®

- Removes sediment, floatables, oil and grease
- No pollutant washouts
- Small footprint
- No loss of treatment capacity between clean-outs
- Low headloss
- Efficient over a wide ranges of flows
- Easy to install
- Low maintenance

Applications

- New developments and retrofits
- Utility yards
- Streets and roadways
- Parking lots
- Pre-treatment for filters, infiltration and storage
- Industrial and commercial facilities
- Wetlands protection



Downstream Defender® Components

1. Central Access Port
2. Floatables Access Port (6-ft., 8-ft. and 10-ft. models only)
3. Dip Plate
4. Tangential Inlet
5. Center Shaft
6. Center Cone
7. Benching Skirt
8. Floatables Lid
9. Outlet Pipe
10. Floatables Storage
11. Isolated Sediment Storage Zone

Operation

Introduction

The Downstream Defender® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The Downstream Defender® has been designed to allow for easy and safe access for inspection/monitoring and clean-out procedures. Entry into the unit or removal of the internal components is not necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the Downstream Defender® have been designed to protect the oil, floatables and sediment storage volumes so that separator performance is not reduced as pollutants accumulate between clean-outs. Additionally, the Downstream Defender® is designed and installed into the storm drain system so that the vessel remains wet between storm events. Oil and floatables are stored on the water surface in the outer annulus separate from the sediment storage volume in the sump of the unit providing the option for separate oil disposal, and accessories such as adsorbant pads. Since the oil/floatables and sediment storage volumes are isolated from the active separation region, the potential for re-suspension and washout of stored pollutants between clean-outs is minimized.

Wet Sump

The sump of the Downstream Defender® retains a standing water level between storm events. The water in the sump prevents stored sediment from solidifying in the base of the unit. The clean-out procedure becomes more difficult and labor intensive if the system allows fine sediment to dry-out and consolidate. Dried sediment must be manually removed by maintenance crews. This is a labor intensive operation in a hazardous environment.

Blockage Protection

The Downstream Defender® has large clear openings and no internal restrictions or weirs, minimizing the risk of blockage and hydraulic losses. In addition to increasing the system headloss, orifices and internal weirs can increase the risk of blockage within the unit.

Maintenance

Overview

The Downstream Defender® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the Downstream Defender®. The Downstream Defender® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the Downstream Defender® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

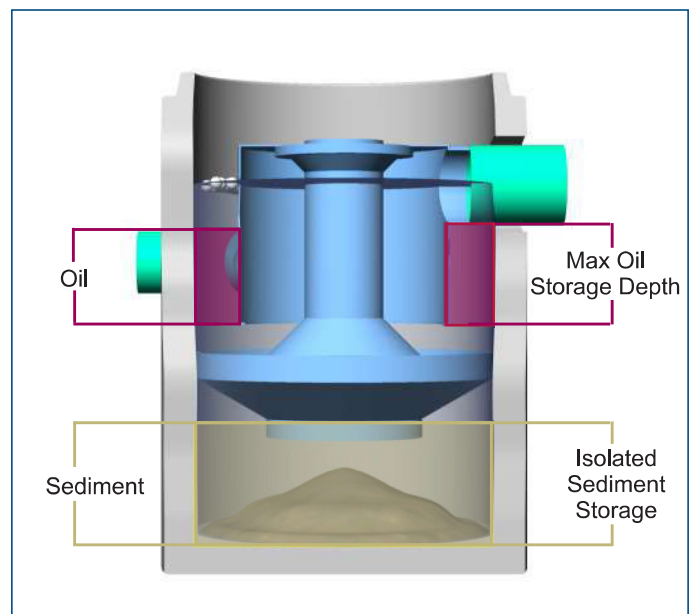


Fig.1 Pollutant storage volumes of the Downstream Defender®.

The Downstream Defender® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole. On the 6-ft, 8-ft and 10-ft units, the floatables access port is above the outlet pipe between the concrete manhole wall and the dip plate. The sediment removal access ports for all Downstream Defender® models are located directly over the hollow center shaft.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the Downstream Defender®, nor do they require the internal components of the Downstream Defender® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Determining Your Maintenance Schedule

The frequency of cleanout is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil/floatables removal, for a 6-ft Downstream Defender® typically takes less than 30 minutes and removes a combined water/oil volume of about 500 gallons.

Inspection Procedures

Inspection is a simple process that does not involve entry into the Downstream Defender®. Maintenance crews should be familiar with the Downstream Defender® and its components prior to inspection.

Scheduling

- It is important to inspect your Downstream Defender® every six months during the first year of operation to determine your site-specific rate of pollutant accumulation
- Typically, inspection may be conducted during any season of the year
- Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Trash bag for removed floatables
- Downstream Defender® Maintenance Log

Table 1. Downstream Defender® Pollutant Storage Capacities and Max. Cleanout Depths.

Unit Diameter	Total Oil Storage	Oil Clean-out Depth	Total Sediment Storage	Sediment Clean-out Depth	Max. Liquid Volume Removed
(feet)	(gallons)	(inches)	(gallons)	(inches)	(gallons)
4	70	<16	141	<18	384
6	216	<23	424	<24	1,239
8	540	<33	939	<30	2,884
10	1,050	<42	1,757	<36	5,546
12	1,770	<49	2,970	<42	9,460

NOTES

1. Refer to Downstream Defender® Clean-out Detail (Fig. 1) for measurement of depths.
2. Oil accumulation is typically less than sediment, however, removal of oil and sediment during the same service is recommended.
3. Remove floatables first, then remove sediment storage volume.
4. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.



Fig. 4



Fig. 5



Fig. 6

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the lids to the manhole (Fig. 4). NOTE: The 4-ft Downstream Defender® will only have one lid.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. See Fig. 7 and 8 for typical inspection views.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the outer annulus of the chamber.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel (Fig. 5).
6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Cleanout

Floatables cleanout is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig. 6).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanout are typically conducted once a year during any season.
- If sediment depths are greater than 75% of maximum clean-out depths stated in Table 1, sediment removal is required.
- Floatables and sump cleanout should occur as soon as possible following a spill in the contributing drainage area.



Fig. 7 View over center shaft into sediment storage zone.



Fig. 8 View of outer annulus of floatables and oil collection zone.

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (6-inch flexible hose recommended)
- Downstream Defender® Maintenance Log

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the lids to the manhole (NOTE: The 4-ft Downstream Defender® will only have one lid).
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Using the Floatables Port for access, remove oil and floatables stored on the surface of the water with the vactor hose or the skimmer net (Fig.9).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (Pg.9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump via the Central Access Port. Vactor out the sediment and gross debris off the sump floor (Fig.6).

7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
9. Securely replace the grate or lid.

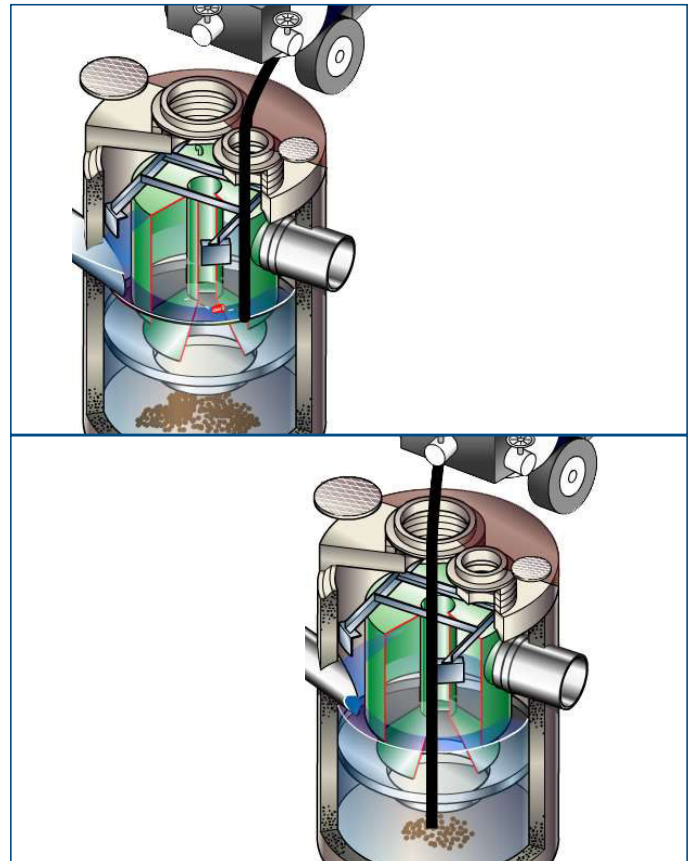


Fig.9 Floatables and sediment are removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.	



Downstream Defender® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL (CIRCLE ONE): 4-FT 6-FT 8-FT 10-FT CUSTOM



Downstream Defender® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment * Depth Measured	Volume of Sediment Removed	Site Activity and Comments

*Note: Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

Notes

DO IT RIGHT THE FIRST TIME

LEARN MORE AT HYDRO-INT.COM/SERVICE



CALL 1 (888) 382-7808 TO SCHEDULE AN INSPECTION

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200

Fax: (207) 756-6212

stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

©Hydro International DD_O+M_C1705

Downstream Defender® Select

Design Data

The Downstream Defender® Select is the **new generation of advanced hydrodynamic separator** for treatment of urban surface water runoff. Its customisable performance and extended range of chamber sizes allows engineers to tailor their drainage designs to meet specific pollutant removal standards. The Downstream Defender® Select also offers easier installation with much more flexibility of pipe sizes and connections and can accept up to three inlets.



Key Features

- » Selectable performance levels for pollutant targets and retention.
- » Extended range of chamber sizes.
- » Can accept up to three inlet pipes.
- » Can accept a range of pipe sizes.
- » No moving parts and no power requirement.
- » Available in concrete or plastic chambers.

Fig 1. Downstream Defender® Select. **Advanced Vortex** models in concrete and plastic shown with **Hydro-Logic® Smart Monitoring** and **enhanced hydrocarbon (oil) retention** options.

Targeted pollutant removal

The Downstream Defender® Select performance can be tailored to remove some or all of the following pollutants:

Sediment (Total Suspended Solids)



The Downstream Defender® Select is a highly effective sediment/TSS removal device. It can be sized in a number of ways to suit the application and level of protection required (see Table 2).

Gross Pollutants



100% removal of floatable debris, such as food wrappers, Styrofoam cups and drinks cartons.

Sediment Bound Hydrocarbons (including Polycyclic Aromatic Hydrocarbons - PAHs)



PAHs have low solubility in water and are readily adsorbed onto sediment particles. Effective removal of sediment particles will also ensure the removal of many PAHs.

Liquid Hydrocarbons (oils)



Effective spill containment device at low flow rates. Note these systems are not considered oil separators according to the BS EN 858-1 and must not be used in applications where full certification is required.

Sediment Bound Heavy Metals and Nutrients



As an efficient device for removal of fine sediment, the Downstream Defender® Select is also effective for the removal of sediment bound pollutants.

Downstream Defender® Select model options

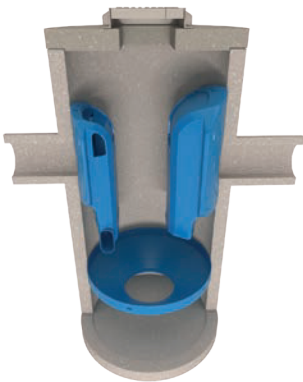
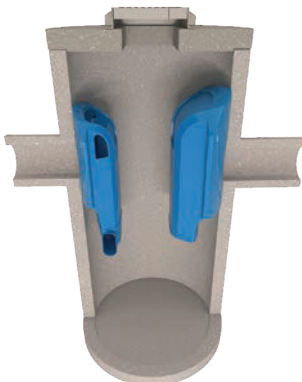
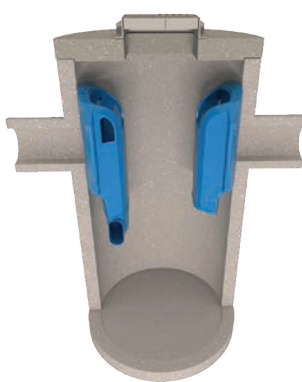
Downstream Defender® Select Model			
	Advanced Vortex Our recommended model which provides sediments, litter and hydrocarbon (oil) removal with enhanced sediment retention up to four times the treatment flow rate.	Vortex Plus Provides sediments, litter and hydrocarbon (oil) removal, with sediments retained at up to two times the treatment flow rate.	Vortex A simpler model providing removal of sediments, with retention up to two times the treatment flow rate.
			
Key Pollutants			
Sediments	Coarse and fine	Coarse and fine	Coarse and fine
Sediment retention	Retained up to 4 x treatment flow rate	Retained up to 2 x treatment flow rate	Retained up to 2 x treatment flow rate
Litter, debris	✓	✓	✗
Liquid hydrocarbons (oils)	✓	✓	✗
Hydrocarbon (oil) retention	Option for increased retention on request	Option for increased retention on request	✗
Sediment bound metals	✓	✓	✓

Table 1 - Downstream Defender® Select pollutant removal performance

The Downstream Defender® Select may be sized for different target particle sizes and removal efficiencies – contact us for site specific design.

Enhancement Options

Make Maintenance Smart

To help with SuDS maintenance plans and to ensure that maintenance is cost-effective, add Hydro-Logic® Smart Maintenance to any model and get automated maintenance alerts.

Hydro-Logic® Smart Maintenance can also reduce risk and save costs by reducing the need for inspection visits for units installed alongside roads or rail tracks.

The Hydro-Logic® Flexi Logger and ATEX/IECEX sensors capture real-time data for flow levels and/or sediment build-up. Level monitoring will enable the detection of blockages relating to the unit, and sediment level monitoring can be set to a trigger point and self-report to the client's maintenance team when maintenance is due.

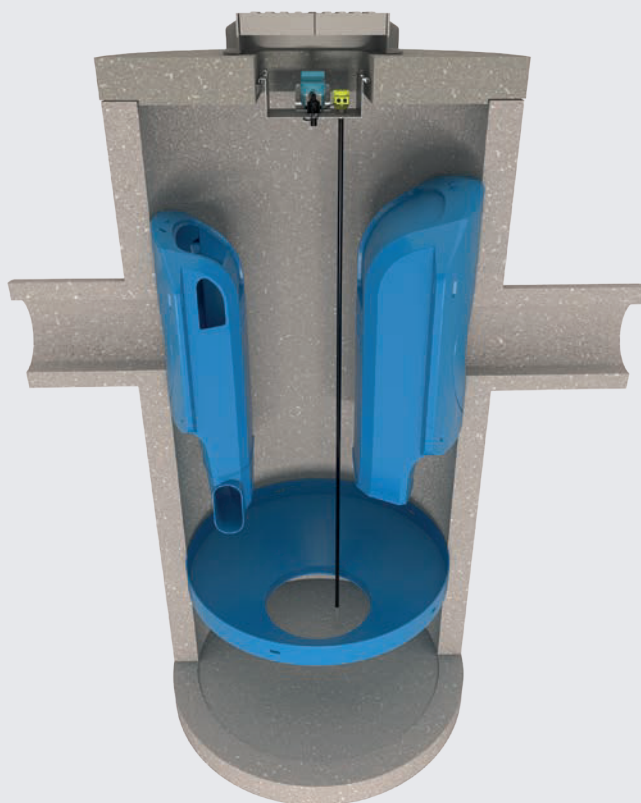


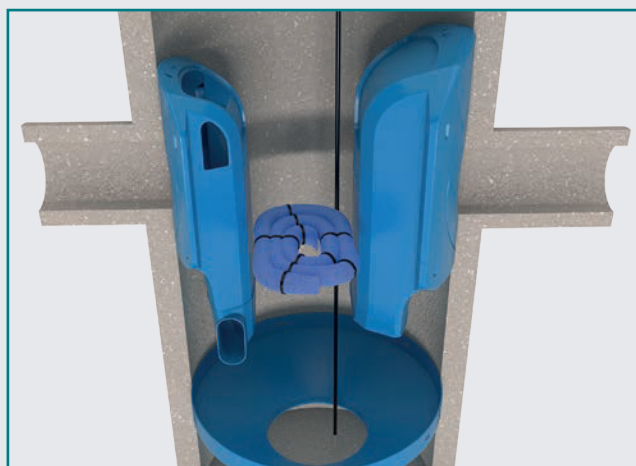
*Fig 2. Downstream Defender® Select
Hydro-Logic® Smart Maintenance.
Available for all models.*

Improve hydrocarbon retention

The option of storing hydrocarbons (oils) as solids can be added, providing increased retention, even at flow rates where the unit is bypassing.

This option is available for the [Advanced Vortex](#) and [Vortex Plus](#) models only.

Fig 3. Enhanced hydrocarbon (oil) retention option for the Downstream Defender® Select. Available for the [Advanced Vortex](#) and [Vortex Plus](#) models only.

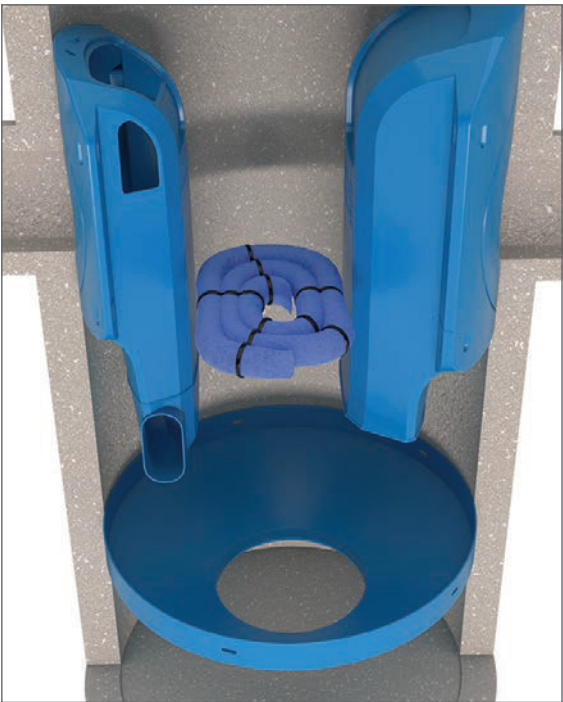


Pollutant retention

It is important to ensure that pollutants in a rainfall event are retained throughout subsequent events. The Downstream Defender® Select offers engineers the option of specifying the retention performance of sediments. The **Vortex** and **Vortex Plus** models provide sediment retention up to twice the treatment flow rate, and the **Advanced Vortex**, with its benching skirt creating a calm sediment storage zone, provides sediment retention up to four times the treatment flow rate.

An option for enhancing the retention of hydrocarbons (oils) by storing them as a solid is available, ensuring no wash out during extremely high flows. This option is only available for the **Advanced Vortex** and **Vortex Plus** models

Fig 4. Downstream Defender® Select with enhanced sediment retention and enhanced hydrocarbon (oil) retention options.



The Simple Index Approach (SIA)

The Simple Index Approach outlined in CIRIA C753 The SuDS Manual is a water quality design method for sites with a low to medium risk pollution hazard level. Sites with a high risk pollution hazard level should consider a more precautionary approach.

The approach assigns pollution hazard indices to the given land use for three pollutant groups, total suspended solids (TSS), metals and hydrocarbons. SuDS components are then selected until their combined pollution mitigation index score is greater than the pollution hazard index for each pollutant group.

Model	Downstream Defender® Select Mitigation Indices ^{(a)(b)}		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons (Oils)
Vortex	0.3	0.2	0.2
Vortex Plus	0.5	0.4	0.5
Advanced Vortex	0.5	0.4	0.5
Notes: (a) All mitigation indices supplied by Hydro International Ltd are calculated using the methods laid out in the British Water How To Guide: Applying the CIRIA SuDS Manual Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. The Advanced Vortex and Vortex Plus models have also been independently verified by the WRc, with the WRc Performance Declaration available on request. (b) Mitigation Indices quoted for the Downstream Defender® Select are valid when the unit is designed according to the Treatment Flow Rate (see Table 3).			

Table 2 - SuDS Mitigation Indices for Downstream Defender® Select

Sizing a Downstream Defender® Select

The Downstream Defender® can be sized for different treatment goals and objectives. For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

The hydraulic capacity of the selected model should be considered with respect to the peak discharge flow rate from the site.

If there is no treatment objective, just betterment, do not use a treatment flow rate and only compare the hydraulic capacity to the peak discharge flow rate.

Model diameter (m)	Treatment flow rate ^{(a)(b)} (l/s)	Hydraulic capacity ^(c) with recommended pipe size (l/s)	Hydraulic capacity ^(d) with maximum pipe size (l/s)	Maximum catchment area m ²	Maximum headloss at treatment flow rate (mm)
1.0	21	46	70	2800	160
1.2	30	84	107	4000	170
1.5	48	144	170	6400	220
1.8	69	217	278	9200	230
2.1	94	271	355	12500	240
2.4	123	422	529	16400	250
3.0	192	652	787	25600	260

Notes:

(a) The Treatment Flow Rate is based on an annualised removal efficiency of >50% of all particles up to 1000 microns with a mass-median particle size (D50) of 63 microns and a specific gravity of 2.65. The testing was conducted in line with the British Water Code of Practice.

(b) Alternative sizing based on different sediment grades available on request.

(c) Maximum flow rate that can pass through the chamber with a maximum headloss of 500mm. Figures shown are when using the recommended pipe size in Table 5.

(d) Maximum flow rate that can pass through the chamber with a maximum headloss of 500mm. Figures shown are when using the maximum pipe size in Table 5.

Table 3 - Downstream Defender® Select design information.

Model diameter (m)	Oil Storage Capacity (l)		Minimum sediment storage capacity ^(c) (m ³)
	Minimum liquid hydrocarbon (oil) storage capacity up to Treatment Flow Rate ^(a)	Solid state storage capacity with enhanced retention option ^(b)	
1.0	256	43-70	0.31
1.2	442	43-70	0.45
1.5	849	85-140	0.71
1.8	1458	85-140	1.02
2.1	2550	128-210	1.39
2.4	3586	170-280	1.81
3.0	6811	231-350	2.83

Notes:

- (a) Liquid oil storage capacity is valid up to the Treatment Flow Rate. Oil capture and retention is only available for the **Advanced Vortex** and **Vortex Plus** models only.
- (b) Permanent oil storage capacity when using the enhanced oil retention option (available for the **Advanced Vortex** and **Vortex Plus** models only).
- (c) Additional sediment storage capacity for all Downstream Defender[®] Select models (**Advanced Vortex**, **Vortex Plus** and **Vortex**) can be provided to extend maintenance intervals if required.

Table 4 - Downstream Defender[®] Select capacities.

Design your own Downstream Defender[®] Select with our Online Design Tool



Register free and design your own Downstream Defender[®] Select and try out different performance objectives.

Project designs can be saved and submitted for a free review by our expert technical team if required. General arrangement drawings and quotes can also be requested from the tool for any saved design.

visit hydro-int.design

Pipe sizes

Downstream Defender® Select can accept a range of **inlet / outlet pipe** sizes, removing the need for complicated pipe connections or couplers. The inlet pipe size must always be equal to or smaller than the outlet pipe size.

Additional pipe sizes may be accommodated, please contact us for assistance.

Chamber size	1.0 m	1.2 m	1.5 m	1.8 m	2.1 m	2.4 m	3.0 m
Pipe sizes	150	150	300	375	375	500	600
	225 ^{a)}	225	375 ^{a)}	400	400	600 ^{a)}	675 ^{b)}
	300	300 ^{a)}	400	450 ^{a)}	450	675 ^{b)}	750 ^{a)}
		375	450	500	500 ^{a)}	750	900
				600	600		
					675 ^{b)}		

Notes:

a) The recommended pipe size for optimum performance.

b) 675 mm is only available for concrete chambers.

Table 5 - Downstream Defender® Select pipe sizes.

Setting out

The Downstream Defender® Select can accommodate a change in pipe direction to suit site specific requirements and accept up to three inlet pipes.

Pipe angles can be adjusted to suit. Minimum angle between inlets and outlet is 90°.

For ease of installation the Downstream Defender® Select can now accept a range of pipe sizes.

Head loss across the chamber is kept to a minimum (see Table 3). The inlet and outlet pipes should be sized in accordance with Table 5.

Inlet and outlet pipe connections are at the same invert level.

Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Fig 5. Downstream Defender® Select Advanced Vortex with *three inlet pipes*.

Dimensions and weights for concrete chambers

Material	Chamber Diameter - Internal (mm) (C)	Chamber Diameter External (mm) (includes base slab and any extrusions)	Recommended Inlet and Outlet Internal Diameter (mm) ⁽¹⁾	Minimum Depth to Invert (mm) (A) ⁽²⁾	Total Chamber Height Including cover (mm) (B) ⁽³⁾	Maximum Component Lift Weight (kg) ⁽⁴⁾
Concrete	1050	1420	225	1550	2390	2770
Concrete	1200	1460	300	1757	2831	2320
Concrete	1500	1760	375	2050	3276	3530
Concrete	1800	2160	450	2650	4090	5250
Concrete	2100	2650	500	2857	4364	6670
Concrete	2400	2950	600	3321	5375	8600
Concrete	3000	3480	750	3518	5433	14080

Notes:

- (1) Recommended inlet and outlet internal diameter. For alternative pipe sizes to allow for easier connections, please see Table 5.
- (2) Minimum depth to invert shown. Depth to invert can be increased if required.
- (3) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required. Total chamber height for concrete units **includes** the cover.
- (4) Maximum component weight is based on a single inlet and includes internal components.

Table 6 - Downstream Defender® Select dimensions and weights for concrete chambers

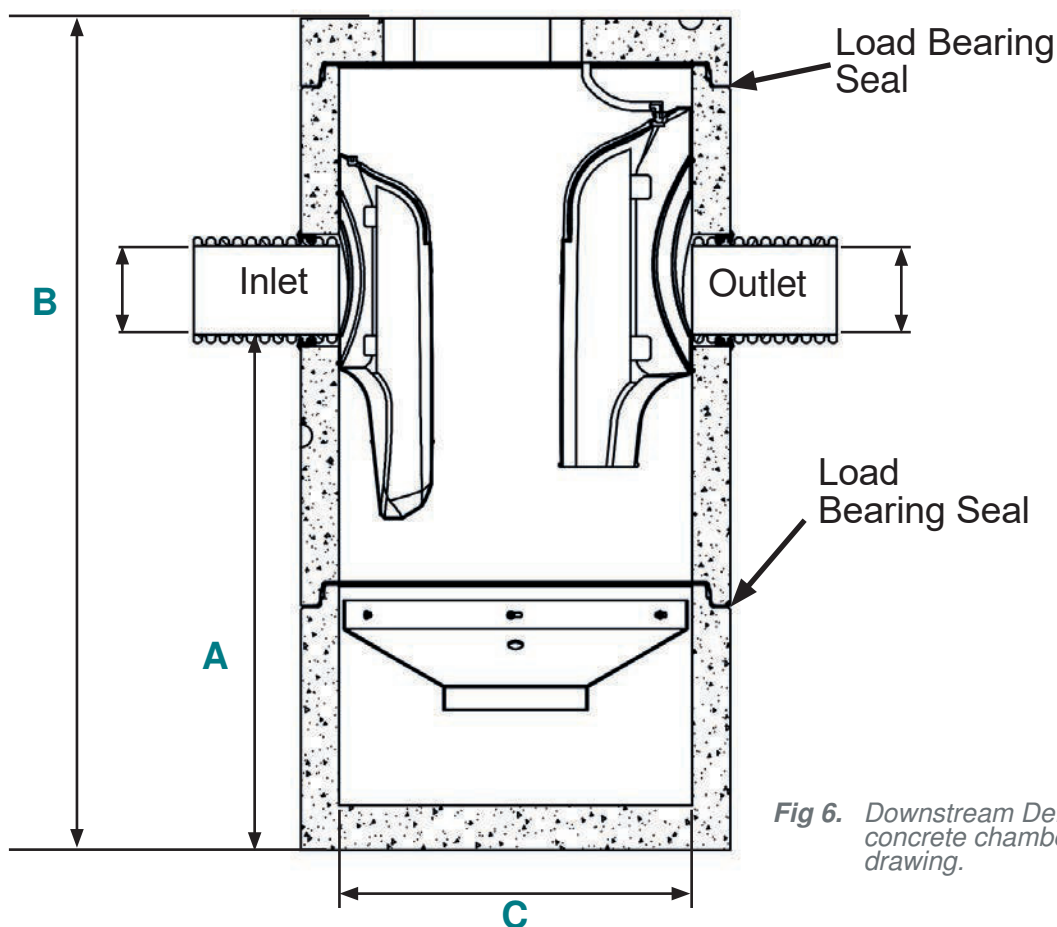


Fig 6. Downstream Defender® Select concrete chamber dimension drawing.

For General Arrangement drawings please email stormwater@hydro-int.com or submit a request at hydro-int.design

Dimensions and weights for plastic chambers

Material	Chamber Diameter - Internal (mm) (C)	Chamber Diameter External (mm) (includes base slab and any extrusions) (5)	Recommended Inlet and Outlet Internal Diameter (mm) (1)	Minimum Depth to Invert (mm) (A) (2)	Total Chamber Height Excluding Cover (mm) (B) (3)	Maximum Component Lift Weight (kg) (4)
HDPE Single Wall	1030	1282	225	1350	2012	125
HDPE Single Wall	1200	1435	300	1612	2512	170
HDPE Single Wall	1500	1735	375	1976	3012	240
HDPE Single Wall	1800	2317	450	2270	3490	410
HDPE Single Wall	2100	2630	500	2570	3920	750
HDPE Single Wall	2400	2930	600	2820	4440	950
HDPE Single Wall	3000	3530	750	3570	5270	1200

Notes:

- (1) Recommended inlet and outlet internal diameter. For alternative pipe sizes to allow for easier connections, please see Table 5.
- (2) Minimum depth to invert shown. Depth to invert can be increased if required.
- (3) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required. Total chamber height for plastic units **excludes** the cover.
- (4) Maximum component weight is based on a single inlet and includes internal components.
- (5) Maximum external diameter includes lifting lugs and base slab.

Table 7 - Downstream Defender® Select dimensions and weights for plastic chambers

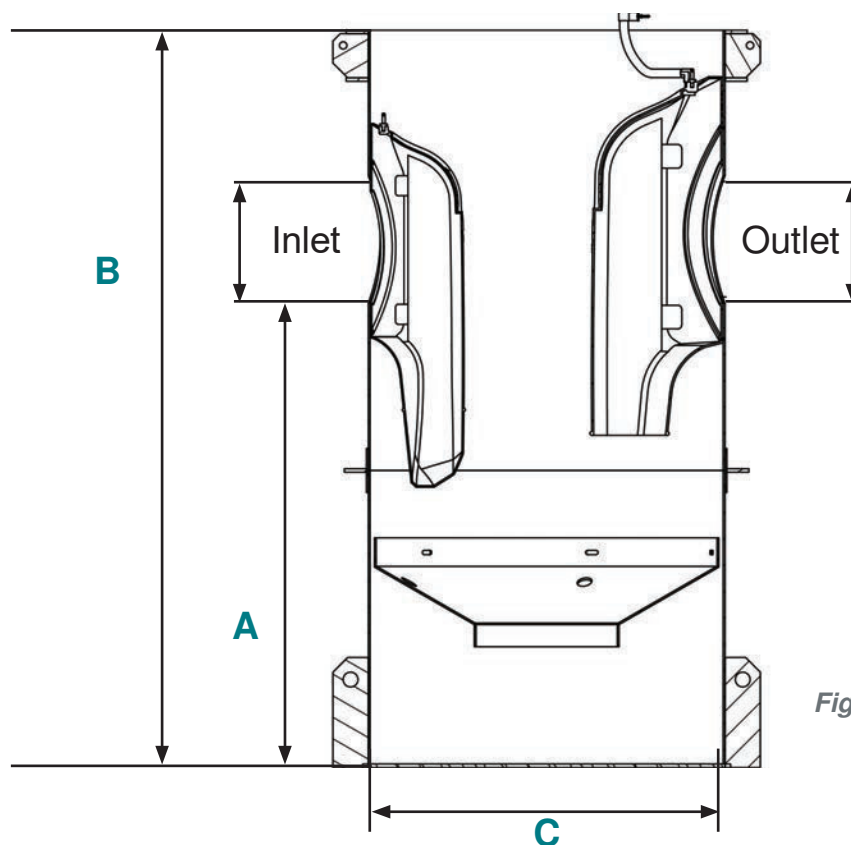


Fig 7. Downstream Defender® Select plastic chamber dimension drawing.

For General Arrangement drawings please email stormwater@hydro-int.com or submit a request at hydro-int.design

Maintenance for a Downstream Defender® Select

Periodic removal of captured pollutants is essential to the continuous, long-term functioning of your Downstream Defender® Select. The device will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the Downstream Defender® Select will no longer be able to store removed sediment and oil. Pollutant storage capacities are provided in Table 4.

If a Hydro-Logic® Smart Maintenance system is installed in the Downstream Defender® Select, when captured sediment volumes reach a predetermined level, the system will send an automated alert to request maintenance.

Maintenance events may include hydrocarbons (oils), floatables and sediment removal. These can be removed safely from the surface, no entry into the Downstream Defender® Select is required. The Hydro-Logic® Smart Maintenance system will need to be removed to allow access for the Jet Vac truck / Vacuum Tanker. This is easily done by carefully lifting the bracket holding the Hydro-Logic® Smart Maintenance package out of the unit and putting them to one side prior to inserting the Vacuum Tanker hose into the unit. The internal components of the Downstream Defender® Select do not need to be removed as the jet / vacuum hose can access the full depth of the unit through the centre of the chamber.



Determining a maintenance schedule

The frequency of clean-out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months or sooner to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump.

To enable the provision of maintenance plans for planning applications, a typical maintenance schedule for a Downstream Defender® Select would be:

Activity	Frequency
Inspection	- Regularly during first year of installation. - Every 6 months after the first year of installation
Hydrocarbons (oils) and floatables removal	- Once per year, or as needed with sediment removal. - Following a spill in the drainage area.
Sediment removal	- As and when alerted by the Hydro-Logic® Smart Maintenance system, or - At intervals as determined by the first year's inspections - Following a spill in the drainage area.
Note: For most clean-outs it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.	

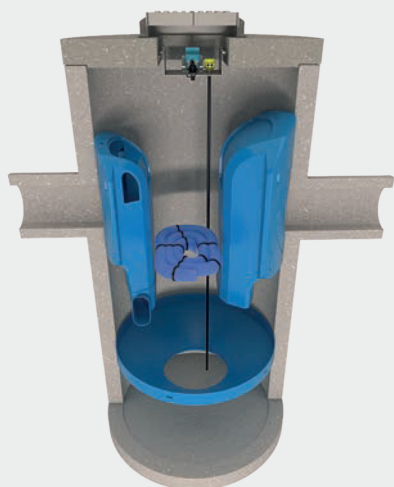
Table 8 - Typical maintenance schedule for a Downstream Defender® Select

We can provide full inspection and maintenance services for the Downstream Defender® Select, as well as for any other Sustainable Drainage Systems (SuDS) on your site - providing peace of mind and saving you time and money.

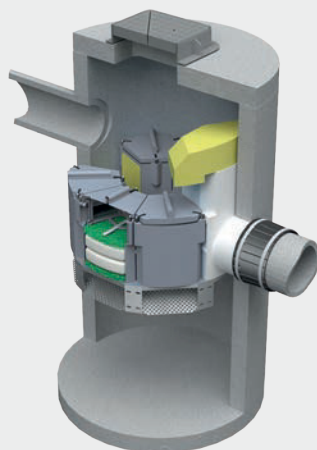
For more information, please call 01275 878371 or email sudservices@hydro-int.com

Our full range of stormwater treatment solutions

We have a range of stormwater treatment devices to treat stormwater flows of varying quality. All our solutions can work alongside, enable or enhance natural SuDS, helping to meet or improve on biodiversity and amenity targets.



Downstream Defender® Select



Up-Flo™ Filter



Hydro Biofilter™

Product		Description	Targeted pollutants						
			Sediments		Litter, debris	Liquid hydrocarbons	Sediment bound hydrocarbons, nutrients and heavy metals	Dissolved metals	Nutrients
Downstream Defender® Select	Vortex	Vortex separator	Coarse & fine	Retained up to 2 x treatment flow rate	✗	✗	✓	✗	✗
	Vortex Plus	Vortex plus separator	Coarse & fine	Retained up to 2 x treatment flow rate	✓	✓ Option for increased retention on request	✓	✗	✗
	Advanced Vortex	Advanced hydrodynamic vortex separator	Coarse & fine	Retained up to 4 x treatment flow rate	✓	✓ Option for increased retention on request	✓	✗	✗
Up-Flo™ Filter	Sand	Fluidised bed up flow filtration system with Sand media	Very fine sediment		✓	✓	✓	✗	✓
	CPZ	Fluidised bed up flow filtration system with CPZ media	Very fine sediment		✓	✓	✓	✓	✓
Hydro Biofilter™		Biofiltration system	Very fine and dissolved sediments		✓	✓	✓	✓	✓

To find out more about our range of stormwater treatment solutions visit hydro-int.com.

[Downstream Defender® Select](#)

[Up-Flo™ Filter](#)

[Hydro Biofilter™](#)

Patent: www.hydro-int.com/patents

Tel: +44 (0)1275 337937 stormwater@hydro-int.com

Hydro International
Unit 2, Rivermead Court, Kenn Business Park
Windmill Road, Kenn, Clevedon, BS21 6FT

Downstream Defender® Select Design Data E/0223

| The Water Quality SuDS Handbook

SPEL
Life in Water

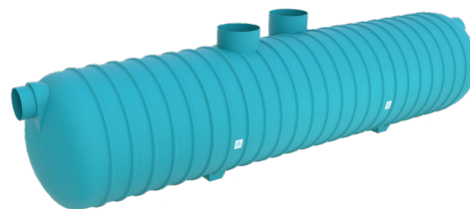


The Product Range Mitigation Index

SPEL ESR Range

Bypass Treatment System

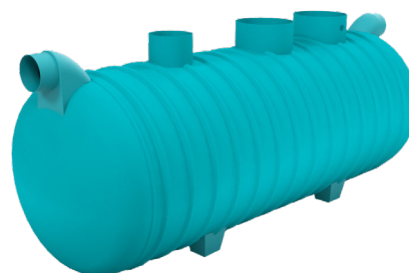
	Product Certified Mitigation Index	Covers Low Risk Pollution Index	Covers Medium Risk Pollution Index	Covers High Risk Pollution Index
TSS	0.8	0.5 ✓	0.7 ✓	0.8 ✓
Metals	0.6	0.4 ✓	0.6 ✓	0.8 ✗
Hydrocarbon	0.9	0.4 ✓	0.7 ✓	0.9 ✓



SPEL ESR Range

Full Flow Treatment System

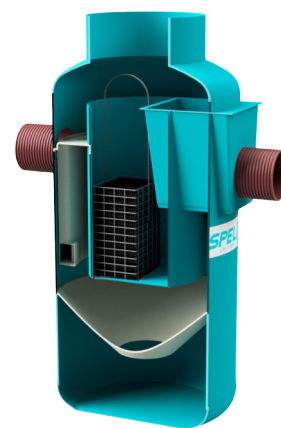
	Product Certified Mitigation Index	Covers Low Risk Pollution Index	Covers Medium Risk Pollution Index	Covers High Risk Pollution Index
TSS	0.8	0.5 ✓	0.7 ✓	0.8 ✓
Metals	0.6	0.4 ✓	0.6 ✓	0.8 ✗
Hydrocarbon	0.9	0.4 ✓	0.7 ✓	0.9 ✓



SPEL Smartceptor

Vortex Separator

	Product Certified Mitigation Index	Covers Low Risk Pollution Index	Covers Medium Risk Pollution Index
TSS	0.5	0.5 ✓	0.7 ✗
Metals	0.4	0.4 ✓	0.6 ✗
Hydrocarbon	0.5	0.4 ✓	0.7 ✗



SPELFilter

This product is not a primary hydrocarbon treatment system

	Product Certified Mitigation Index	Covers Low Risk Pollution Index	Covers Medium Risk Pollution Index	Covers High Risk Pollution Index
TSS	0.9	0.5 ✓	0.7 ✓	0.8 ✓
Metals*	0.8	0.4 ✓	0.6 ✓	0.8 ✓
Hydrocarbon	n/a	0.4 ✗	0.7 ✗	0.9 ✗

**Includes dissolved metals*



The Product Range Mitigation Index

Floating Treatment Wetlands

	Product Certified Mitigation Index	Covers Low Risk Pollution Index	Covers Medium Risk Pollution Index	Covers High Risk Pollution Index
TSS	0.7	0.5 ✓	0.7 ✓	0.8 ✗
Metals	0.7	0.4 ✓	0.6 ✓	0.8 ✗
Hydrocarbon	0.5	0.4 ✓	0.7 ✗	0.9 ✗



From the Ciria SuDs Manual (C753):

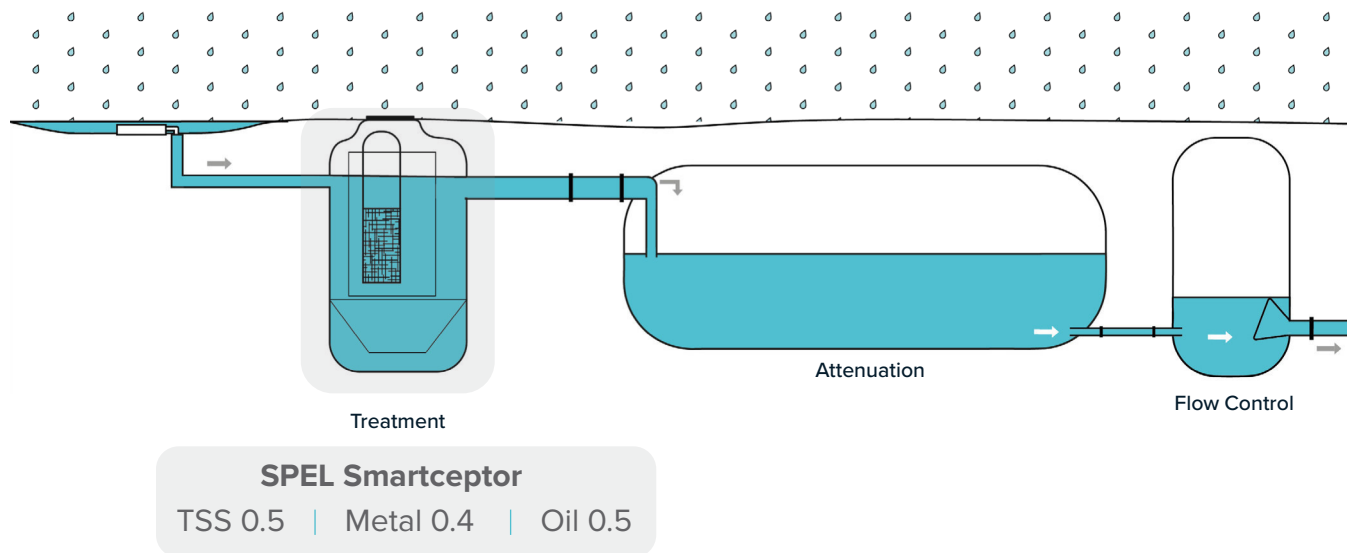
26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

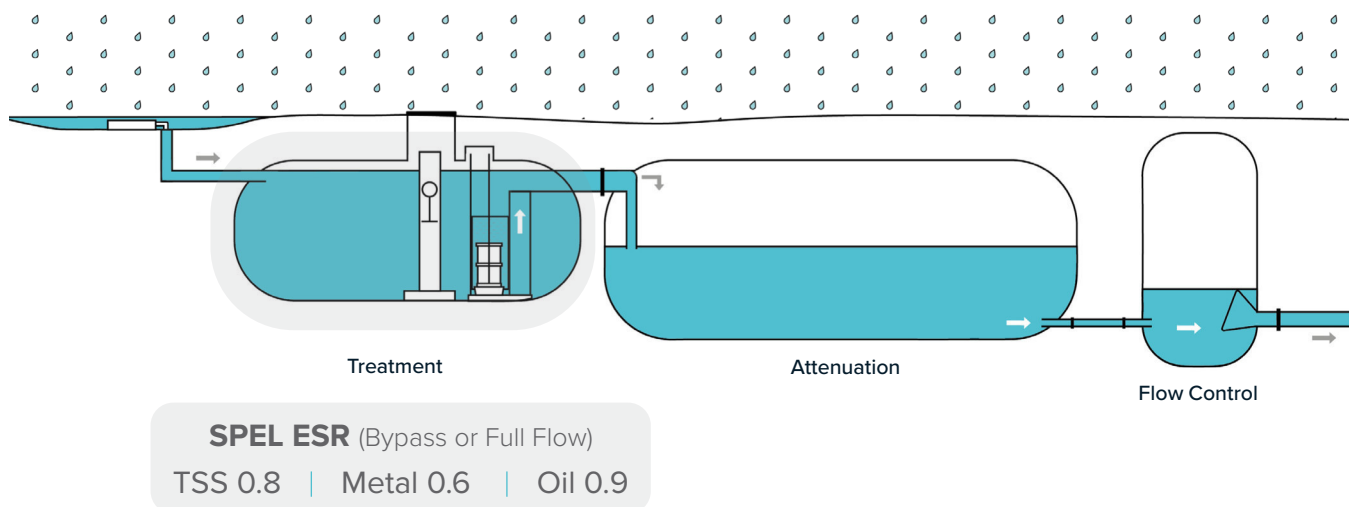
Simplifying the Simple Index Approach

Your SuDS Treatment Train with SPEL Products

Low Mitigation Index = TSS 0.5 | Metal 0.4 | Oil 0.4



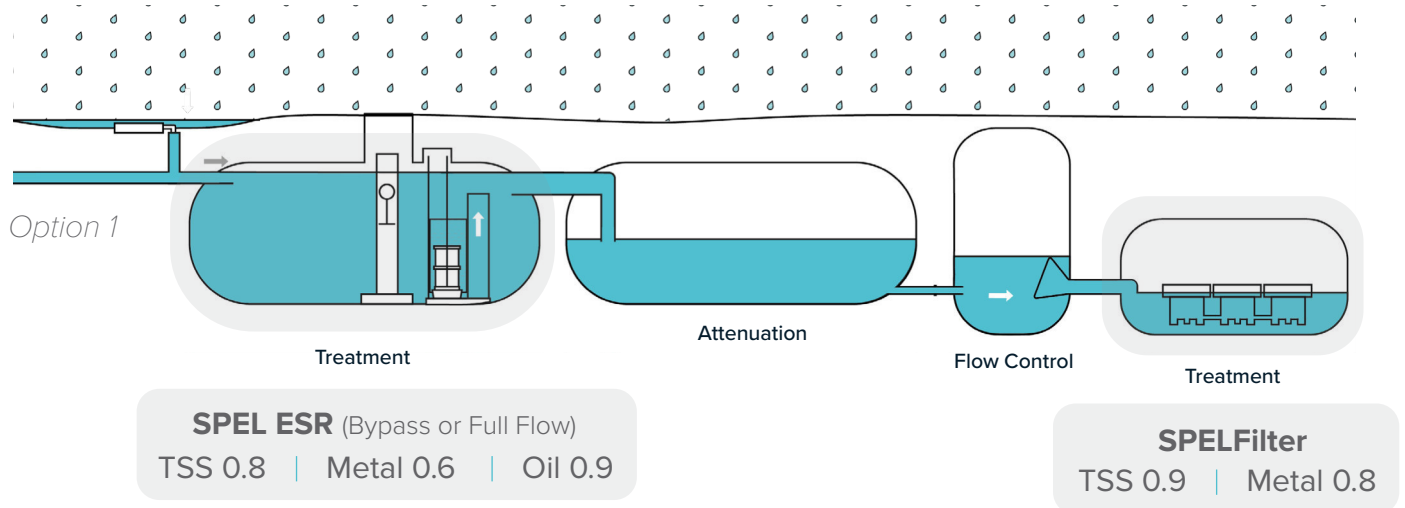
Medium Mitigation Index = TSS 0.7 | Metal 0.6 | Oil 0.7



Simplifying the Simple Index Approach

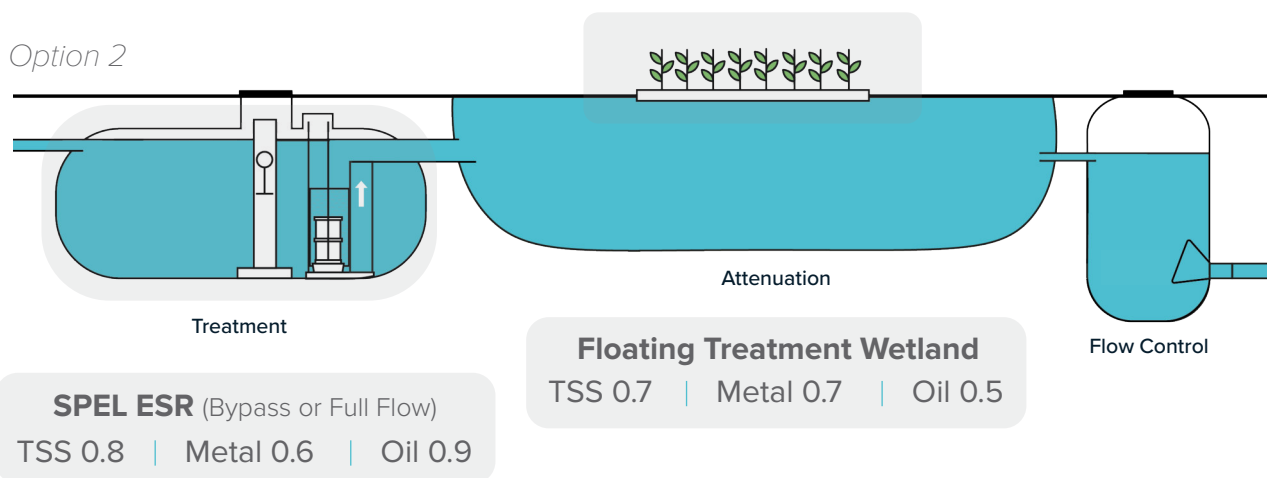
Your SuDS Treatment Train with SPEL Products

High Mitigation Index = TSS 0.8 | Metal 0.8 | Oil 0.9



SPEL ESR + 50% of SPELFilter = TSS 1.0 | Metal 1.0 | Oil 0.9

High Mitigation Index = TSS 0.8 | Metal 0.8 | Oil 0.9



SPEL ESR + 50% of FTW = TSS 1.0 | Metal 0.9 | Oil 1.0

SPEL SuDS Handbook

With SPEL Products

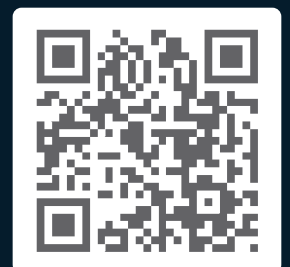
An all-in-one guide outlines the best practices, ensuring your treatment train is SuDs compliant and achieving the best results for longer.



Lancaster Road, Shrewsbury, Shropshire SY1 3NQ

Phone: +44 (0)1743 445200

Email: info@spelproducts.co.uk / sales@spelproducts.co.uk



spelproducts.co.uk