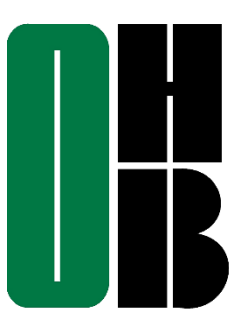


# SURFACE WATER DRAINAGE VERIFICATION REPORT

PLANNING CONDITION 8 DISCHARGE REPORT



**O'HALLORAN & O'BRIEN LTD**

**BUILDING CONTRACTORS  
CIVIL ENGINEERS AND  
CONCRETE STRUCTURES**

**Project:** Land at Dalefield Way West

**Client:** O'Halloran & O'Brien LTD

**Report Title:** Surface Water Drainage Verification Report

**Planning Condition:** Condition 8

**Prepared by:** Alex Jalea

**Date:** 28/05/2026

**Revision:** 03

**Status:** For Issue

| Revision | Date       | Status    | Prepared By | Checked By       | Notes                                                                         |
|----------|------------|-----------|-------------|------------------|-------------------------------------------------------------------------------|
| 01       | 08/05/2026 | Draft     | Alex Jalea  |                  | Initial draft issue                                                           |
| 02       | 11/05/2026 | For Issue | Alex Jalea  | Aaron Mc Connell | Updated to include installed flow control and additional progress photographs |
| 03       | 28/05/2026 | For Issue | Alex Jalea  | Aaron Mc Connell | Final Touch-ups and corrections, as built survey update                       |
|          |            |           |             |                  |                                                                               |

## TABLE OF CONTENTS

|                                                                           |    |
|---------------------------------------------------------------------------|----|
| 1.0 Introduction.....                                                     | 3  |
| 2.0 Planning Condition 8 .....                                            | 3  |
| 3.0 Report Scope .....                                                    | 3  |
| 4.0 Reference Documents .....                                             | 4  |
| 5.0 Approved Drainage Strategy Summary .....                              | 5  |
| 6.0 Installed Drainage System .....                                       | 5  |
| 6.1 Permeable Pavement / Open Graded Sub-Base.....                        | 5  |
| 6.2 Peravoid Diffuser Unit Outlet .....                                   | 6  |
| 6.3 Hydrobrake Flow Control .....                                         | 6  |
| 6.4 Kingspan / Klargestor NSFA030 Full Retention Fuel/Oil Separator ..... | 6  |
| 6.5 Final Outfall / Receiving Drainage System .....                       | 7  |
| 7.0 As-Built Drainage Arrangement .....                                   | 7  |
| 8.0 As-Built Variation / Clarification .....                              | 7  |
| 8.1 Hydrobrake Location .....                                             | 7  |
| 9.0 Photographic Verification .....                                       | 8  |
| 10.0 Critical Drainage Assets .....                                       | 8  |
| 11.0 Operation and Maintenance Manual.....                                | 9  |
| 11.1 Responsible Party .....                                              | 9  |
| 11.2 General Maintenance Requirements.....                                | 9  |
| 11.3 Permeable Pavement Maintenance .....                                 | 10 |
| 11.4 Peravoid Diffuser Unit Maintenance .....                             | 10 |
| 11.5 Hydrobrake Flow Control Maintenance .....                            | 11 |
| 11.6 Kingspan / Klargestor NSFA030 Separator Maintenance .....            | 11 |
| 11.7 Final Outfall / Receiving Drain Maintenance .....                    | 12 |
| 12.0 Emergency / Spill Response .....                                     | 13 |
| 13.0 Verification Statement.....                                          | 13 |
| 14.0 Conclusion .....                                                     | 14 |
| Appendixes .....                                                          | 15 |
| Appendix A – As-Built Drawings and Working Drawings.....                  | 15 |
| Appendix B – Photographic Schedule .....                                  | 19 |
| Appendix C – Product Information .....                                    | 38 |
| Appendix D – Maintenance Log Template.....                                | 58 |

## 1.0 INTRODUCTION

This Surface Water Drainage Verification Report has been prepared to support the discharge of **Planning Condition 8** for the development at **Land at Dalefield Way – WEST**.

Condition 8 requires a Verification Report to be submitted to and approved by the Local Planning Authority following approval of the details submitted under Condition 7. The report must demonstrate that the surface water drainage system has been constructed consistently with the approved drainage details and must include information and evidence of inlets, outlets, control structures, landscape plans, as-built drawings, critical drainage assets, and operation and maintenance arrangements.

This report provides:

- a summary of the approved surface water drainage strategy;
- a description of the installed drainage system;
- confirmation of the as-built drainage arrangement;
- photographic evidence of the installed system;
- details of the as-built Hydrobrake / flow control installation;
- product and maintenance information for the principal drainage assets;
- an operation and maintenance manual for the constructed surface water drainage system.

## 2.0 PLANNING CONDITION 8

Condition 8 states:

*Within one month of the date of approval of the details submitted under Condition 7, a Verification Report, pertaining to the surface water drainage system and prepared by a suitably competent person, shall be submitted to and approved by the Local Planning Authority. The Report shall demonstrate that the drainage system constructed is consistent with that which was approved. The Report shall contain information and evidence (including photographs) of details and locations of inlets, outlets and control structures; landscape plans; full as built drawings; information pertinent to the installation of those items identified on the critical drainage assets drawing; and the submission of an operation and maintenance manual for the sustainable drainage scheme as constructed.*

*The reason for the condition is to ensure that flood risks from the development to future users of the land, neighbouring land, controlled waters, property and ecological systems are minimised, and that the development is constructed and maintained in accordance with paragraph 182 of the National Planning Policy Framework 2024.*

## 3.0 REPORT SCOPE

This report relates to the installed surface water drainage system serving the permeable hardstanding area at the site.

The drainage arrangement comprises:

- permeable pavement surface;

- 400 mm thick 4–20 mm open graded crushed rock sub-base;
- Peravoid diffuser unit outlet from the permeable paving;
- Hydrobrake flow control restricting surface water discharge to **3.75 l/s**;
- Kingspan / Klargester NSFA030 full retention fuel/oil separator;
- final discharge to the receiving drainage system / drain via the outfall arrangement.

The technical layout identifies the permeable pavement construction, diffuser unit outlet, Hydrobrake, petrol interceptor and restricted discharge rate of **3.75 l/s**.

The landscape proposals identify the permeable hardstanding area with associated planting and landscape buffer areas shown around the site.

The wider site layout identifies the broader hardstanding area and the permeable hardstanding zone.

#### 4.0 REFERENCE DOCUMENTS

| Ref | Document                                          | Drawing / Document No.      | Revision | Status                |
|-----|---------------------------------------------------|-----------------------------|----------|-----------------------|
| 1   | Landscape Proposals                               | MTC191P01                   | Rev 02   | Planning              |
| 2   | Technical Layout                                  | 24054-MAN-00-DR-PL-00-00353 | C1       | For Information       |
| 3   | Site Layout West                                  | 0-3-00                      | P2       | For Information       |
| 4   | As-Built Drainage Survey                          | 5107-0-1-00                 | R2       | As-Built              |
| 5   | Site Photographic Record                          | Appendix B                  | N/A      | Verification Evidence |
| 6   | Kingspan / Klargester NSFA030 Product Information | Manufacturer Data           | N/A      | O&M Reference         |
| 7   | Hydrobrake Flow Control Product Information       | Manufacturer Data           | N/A      | O&M Reference         |
| 8   | Peravoid Diffuser Unit Product Information        | Manufacturer Data           | N/A      | O&M Reference         |

## 5.0 APPROVED DRAINAGE STRATEGY SUMMARY

The approved surface water drainage strategy provides a controlled discharge arrangement for the permeable hardstanding area.

Surface water runoff is managed through a permeable pavement system, with open graded stone sub-base storage and conveyance. Surface water is collected and discharged via a Peravoid diffuser unit outlet arrangement. Flow from the system is restricted by a Hydrobrake flow control device to 3.75 l/s, prior to passing through the Kingspan / Klargester NSFA030 full retention fuel/oil separator and discharging to the receiving drainage system.

The drainage strategy therefore provides:

- source control through permeable pavement;
- sub-base attenuation and conveyance;
- controlled discharge via Hydrobrake flow control;
- hydrocarbon treatment via full retention separator;
- controlled final discharge to the receiving drainage system.

## 6.0 INSTALLED DRAINAGE SYSTEM

The installed surface water drainage system has been visually inspected and photographed during construction.

The photographic record confirms installation of the principal drainage components, including:

- permeable pavement sub-base construction;
- geotextile / separation layer;
- open graded stone sub-base;
- pipework and connector installation;
- Peravoid diffuser unit;
- Hydrobrake flow control within chamber;
- Kingspan / Klargester NSFA030 interceptor;
- associated chamber works and access provision.

### 6.1 PERMEABLE PAVEMENT / OPEN GRADED SUB-BASE

The permeable pavement area has been formed with an open graded stone sub-base to receive, store and convey surface water runoff. The technical layout identifies the permeable pavement construction as 400 mm thick 4–20 mm open graded crushed rock sub-base.

The additional progress photographs show placement and spreading of open graded stone across the permeable pavement area, including visible geotextile/separation layer and stone build-up. The photographs also show depth checks being undertaken, supporting verification of the drainage construction build-up.

## 6.2 PERAVOID DIFFUSER UNIT OUTLET

The drainage layout identifies a **Peravoid diffuser unit outlet from permeable paving**.

The diffuser unit is installed within the permeable pavement drainage layer and connects to the downstream drainage pipework. The additional photographs show the diffuser unit installed within the open graded stone, with pipe connection and measured dimensions recorded on site.

Manufacturer information for the Peravoid diffuser unit states that it is used for efficient diffusion of collected surface water runoff into or out of permeable aggregates. The product information also confirms use with permeable pavement systems and standard pipework connections.

The installed arrangement is therefore consistent with the approved drainage principle, providing distribution and collection of flows within the permeable pavement sub-base before conveyance downstream.

## 6.3 HYDROBRAKE FLOW CONTROL

The drainage layout identifies a **Hydrobrake restricting surface water flows to 3.75 l/s**.

The Hydrobrake / flow control has been installed within the chamber. The photographs show the flow control plate and associated mechanism fixed within the chamber, with access provision being formed above.

## 6.4 KINGSPAN / KLARGESTER NSFA030 FULL RETENTION FUEL/OIL SEPARATOR

The drainage layout identifies a **Kingspan / Klargest NSFA030 full retention fuel/oil separator**.

The photographic record confirms installation of the separator, including the GRP tank, inlet/outlet connections, access shafts and surrounding support/formation works.

Product information for the NSFA030 identifies the unit as a full retention separator with:

| Parameter             | NSFA030 Value        |
|-----------------------|----------------------|
| Flow rating           | 30 l/s               |
| Typical Drainage area | 1,670 m <sup>2</sup> |
| Silt capacity         | 3,000 litres         |
| Oil capacity          | 300 litres           |
| Length                | Approx. 3,915 mm     |

| Parameter | NSFA030 Value    |
|-----------|------------------|
| Diameter  | Approx. 2,010 mm |

Standard pipework diameter 315 mm

These values align with published NSFA030 technical specification information.

## 6.5 FINAL OUTFALL / RECEIVING DRAINAGE SYSTEM

The drainage layout shows the drainage route passing from the permeable pavement / diffuser arrangement through the flow control and separator before discharging to the receiving drainage system / swale.

The final discharge point is in construction at the writing of this document.

## 7.0 AS-BUILT DRAINAGE ARRANGEMENT

The as-built drainage arrangement has been reviewed against the approved drainage layout.

The installed system follows the approved drainage principle:

1. surface water runoff is collected from the permeable hardstanding area;
2. runoff is managed through the permeable pavement / open graded sub-base;
3. flows are distributed/collected through the Peravoid diffuser unit outlet;
4. discharge is restricted by the Hydrobrake flow control to **3.75 l/s**;
5. flows pass through the Kingspan / Klargestor NSFA030 full retention fuel/oil separator;
6. treated and controlled flows discharge to the receiving drainage system.

## 8.0 AS-BUILT VARIATION / CLARIFICATION

### 8.1 HYDROBRAKE LOCATION

The approved drainage layout identified the Hydrobrake downstream of the permeable pavement / diffuser outlet arrangement and upstream of the final discharge route, restricting surface water flows to **3.75 l/s**.

As constructed, the Hydrobrake has been installed approximately **10 m downstream/below the interceptor** from the originally indicated position and closer to the interceptor.

This as-built adjustment does not alter the drainage principle, treatment provision, receiving drainage system, final outfall, or approved discharge restriction. The installed Hydrobrake remains the flow control device for the system and restricts discharge to **3.75 l/s**.

The as-built location is shown on the appended as-built survey and is supported by the photographic evidence included in Appendix B.

## 9.0 PHOTOGRAPHIC VERIFICATION

The photographic record included in Appendix B provides evidence of the constructed drainage system.

The photographs confirm:

- excavation and formation works;
- installation of the interceptor;
- installation of pipework and granular bedding/surround;
- installation of chambers and access units;
- installation of the Peravoid diffuser unit;
- placement of open graded sub-base material;
- installation of the Hydrobrake / flow control within chamber;
- construction of access chamber brickwork above the flow control chamber;
- ongoing construction of the permeable pavement drainage build-up.

## 10.0 CRITICAL DRAINAGE ASSETS

| Asset                                       | Function                                                                  | Verification Evidence                                   | Maintenance Requirement                                                                         |
|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Permeable pavement / permeable hardstanding | Receives surface water runoff and allows water into the drainage sub-base | Layout drawing, landscape drawing, progress photographs | Regular inspection, cleaning and prevention of clogging                                         |
| 400 mm open graded sub-base                 | Provides storage and conveyance below permeable pavement                  | Technical layout and progress photographs               | Maintain permeable surface and prevent fines entering system                                    |
| Geotextile / separation layer               | Separates drainage aggregate from surrounding material                    | Progress photographs                                    | Protect during construction; no routine maintenance once buried                                 |
| Peravoid diffuser unit                      | Distributes/collects surface water within permeable aggregate             | Technical layout and photographs                        | Protect during construction; Inspect for blockage, siltation or reduced flow prior to covering. |

| Asset                                   | Function                                            | Verification Evidence                                    | Maintenance Requirement                                        |
|-----------------------------------------|-----------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------|
| Hydrobrake flow control                 | Restricts discharge to 3.75 l/s                     | Technical layout, as-built survey and latest photographs | Inspect chamber, clear debris/silt, check for damage           |
| Kingspan / Klargester NSFA030 separator | Retains silt/oil and treats runoff before discharge | Technical layout, product information and photographs    | Inspect, empty, clean alarm probe and maintain coalescer media |
| Final outfall / receiving drain         | Receives controlled treated discharge               | Technical layout and as-built survey                     | Inspect for obstruction, erosion or damage                     |

## 11.0 OPERATION AND MAINTENANCE MANUAL

### 11.1 RESPONSIBLE PARTY

The drainage system shall be maintained by the site owner, operator, tenant, management company or appointed maintenance contractor.

**Responsible organisation:** O'Halloran & O'Brien LTD

**Contact:** Piotr Kramarski - [Piotr@ohob.co.uk](mailto:Piotr@ohob.co.uk)

**Emergency contact:** Matt Fox - [M.Fox@bandtplanthire.co.uk](mailto:M.Fox@bandtplanthire.co.uk)

Maintenance shall be undertaken by suitably competent persons. Specialist maintenance, emptying and waste removal associated with the separator shall be undertaken by competent and appropriately licensed contractors.

### 11.2 GENERAL MAINTENANCE REQUIREMENTS

The drainage system shall be inspected and maintained to ensure it continues to function as designed.

The following records shall be retained within the site O&M file:

- inspection logs;
- maintenance logs;
- waste transfer notes;
- separator emptying records;
- alarm testing records;
- flow control inspection records;
- repair records;
- updated as-built information, where applicable.

### 11.3 PERMEABLE PAVEMENT MAINTENANCE

The permeable pavement surface shall be maintained to prevent clogging and preserve infiltration / conveyance capacity.

Maintenance requirements:

- inspect for ponding, rutting, settlement or surface damage;
- inspect for silt, mud, debris, vegetation or fines build-up;
- remove litter and loose debris;
- sweep using suitable mechanical brushing / vacuum sweeping methods where required / jetting;
- prevent storage of loose soils, fines, sands, cementitious materials or contaminated materials on the permeable surface;
- inspect after significant storm events for standing water or evidence of surcharge;
- repair damaged areas using compatible permeable pavement materials.

| Activity                                    | Frequency                 |
|---------------------------------------------|---------------------------|
| Visual inspection                           | Monthly                   |
| Inspection after major storm events         | As required               |
| Surface sweeping / debris removal / Jetting | Quarterly, or as required |
| Full condition review                       | Annually                  |

### 11.4 PERAVOID DIFFUSER UNIT MAINTENANCE

The Peravoid diffuser unit shall be inspected through the associated access points and drainage system.

Maintenance requirements:

- inspect adjacent chambers and visible pipe connections;
- check for silt build-up, blockage or reduced flow;
- remove debris from accessible points;
- check for settlement or erosion around the diffuser/outlet zone;
- investigate any persistent ponding or backing-up within the permeable pavement system.

| Activity                            | Frequency   |
|-------------------------------------|-------------|
| Visual inspection via access points | Six-monthly |
| Inspection after major storm events | As required |
| Silt/debris removal                 | As required |
| Detailed inspection                 | Annually    |

#### 11.5 HYDROBRAKE FLOW CONTROL MAINTENANCE

The Hydrobrake shall be inspected to ensure it remains unobstructed and continues to restrict discharge in accordance with the design.

The Hydro-Brake Optimum product literature states that the device requires no power and has no moving parts, reducing routine maintenance requirements.

Maintenance requirements:

- inspect the chamber containing the Hydrobrake;
- check the inlet and outlet openings for debris, silt or obstruction;
- remove debris, leaves, silt or foreign objects;
- check for physical damage, displacement or corrosion;
- confirm no unauthorised alteration has been made to the flow control;
- inspect after major storm events where surcharge, flooding or backing-up has occurred.

| Activity                            | Frequency   |
|-------------------------------------|-------------|
| Visual inspection                   | Six-monthly |
| Inspection after major storm events | As required |
| Debris/silt removal                 | As required |
| Full condition review               | Annually    |

#### 11.6 KINGSPAN / KLARGESTER NSFA030 SEPARATOR MAINTENANCE

The Kingspan / Klargestester NSFA030 full retention separator shall be maintained in accordance with the manufacturer's guidance.

The NSFA030 has a published flow rating of **30 l/s**, silt capacity of **3,000 litres** and oil capacity of **300 litres**.

Maintenance requirements:

- inspect separator at initial 3-month and 6-month intervals after installation/use;
- establish site-specific oil and silt accumulation rates;
- inspect at least every six months thereafter;
- remove retained oil and silt using a competent/licensed waste contractor;
- retain waste transfer notes;
- clean the alarm probe after emptying;
- test alarm operation;
- inspect coalescer media and clean/replace where required;
- refill the separator with clean water to outlet level following emptying;
- record all inspection, cleaning and emptying activities.

| Activity             | Frequency                                                               |
|----------------------|-------------------------------------------------------------------------|
| Initial inspection   | 3 months after installation/use                                         |
| Second inspection    | 6 months after installation/use                                         |
| Routine inspection   | Six-monthly minimum                                                     |
| Emptying             | When oil/silt capacity requires, or as advised by specialist contractor |
| Alarm test           | Six-monthly and after emptying                                          |
| Coalescer inspection | Six-monthly                                                             |
| Full service         | Annually or as advised by manufacturer/specialist contractor            |

## 11.7 FINAL OUTFALL / RECEIVING DRAIN MAINTENANCE

The final outfall / receiving drainage connection shall be inspected to confirm unobstructed discharge.

Maintenance requirements:

- inspect outfall/headwall where safely accessible;
- check for blockage, siltation or debris;
- check for erosion, undermining or scour;
- clear vegetation obstructing flow;

- inspect after major storm events.

| Activity                            | Frequency   |
|-------------------------------------|-------------|
| Visual inspection                   | Six-monthly |
| Inspection after major storm events | As required |
| Vegetation/debris clearance         | As required |
| Full condition review               | Annually    |

## 12.0 EMERGENCY / SPILL RESPONSE

In the event of a fuel, oil or chemical spill within the drainage catchment:

1. stop the source of the spill where safe to do so;
2. prevent further entry into the drainage system where practicable;
3. deploy spill kits / absorbent materials;
4. notify the responsible site manager/operator;
5. inspect the separator;
6. arrange removal of contaminated material by a competent/licensed waste contractor;
7. retain waste transfer documentation;
8. inspect and test the separator alarm after the event;
9. notify the relevant environmental authority where required by the site environmental emergency procedure.

## 13.0 VERIFICATION STATEMENT

Based on the reviewed drawings, as-built survey information and photographic evidence, the surface water drainage system has been constructed generally in accordance with the approved drainage strategy submitted under Condition 7.

The installed system comprises:

- permeable pavement;
- open graded sub-base storage;
- Peravoid diffuser outlet arrangement;
- Hydrobrake flow control restricting discharge to **3.75 l/s**;
- Kingspan / Klargestor NSFA030 full retention fuel/oil separator;

- final discharge to the receiving drainage system.

The site photographs confirm that the Hydrobrake / flow control unit has been installed within the chamber.

The as-built location of the Hydrobrake differs from the originally indicated position, with the Hydrobrake positioned approximately **10 m downstream/below the interceptor** and closer to the interceptor. This adjustment does not alter the drainage principle, receiving drainage system, treatment provision, approved discharge restriction or final discharge arrangement.

Subject to retention of the as-built drawing, photographic record, product information and ongoing maintenance in accordance with this report, the constructed drainage system is considered to satisfy the requirements of Planning Condition 8.

## 14.0 CONCLUSION

This report demonstrates that the constructed surface water drainage system is consistent with the approved drainage strategy, subject to the recorded as-built adjustment to the Hydrobrake location.

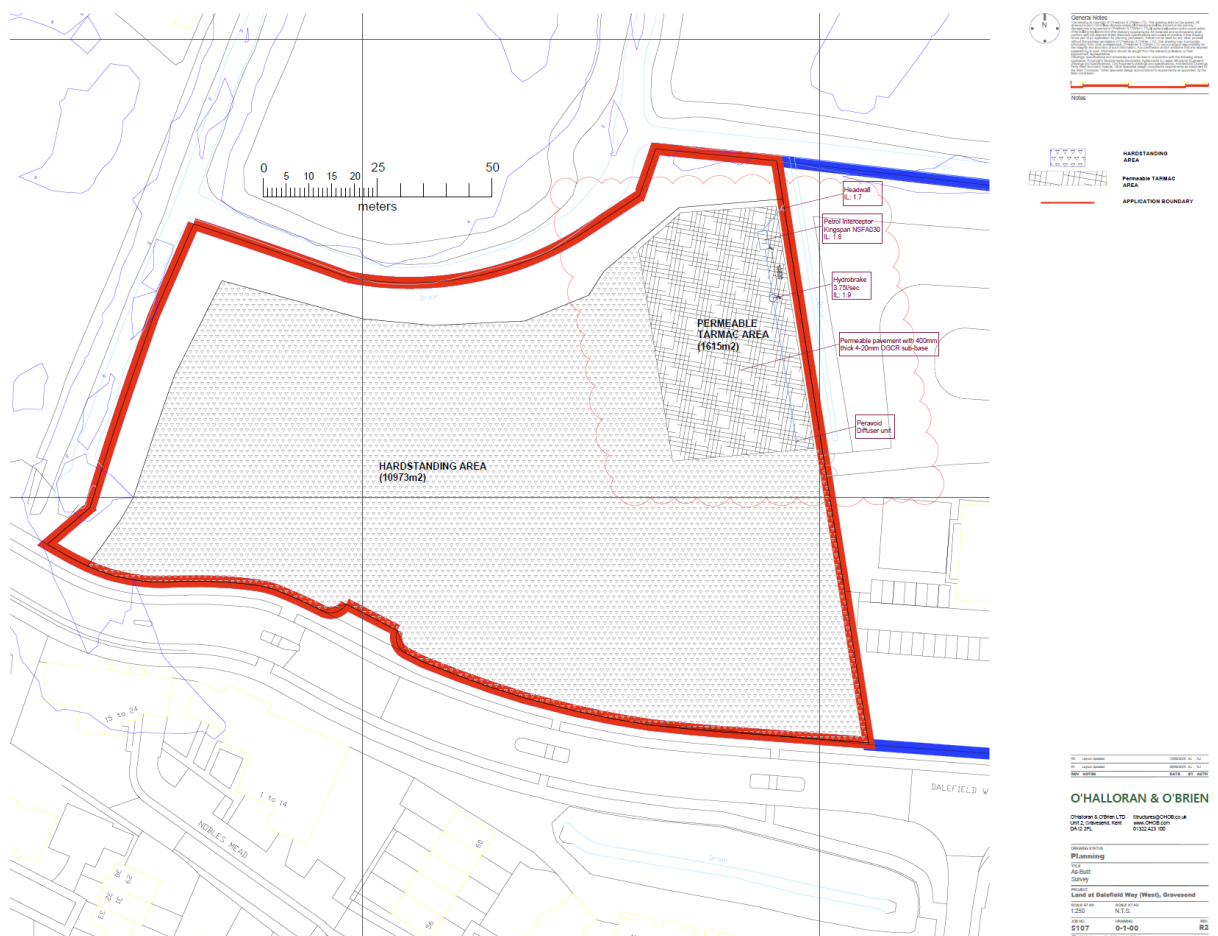
The report includes:

- details of the installed drainage system;
- evidence of inlets and control structures;
- reference to landscape and drainage drawings;
- as-built variation statement;
- product information for key drainage assets;
- operation and maintenance requirements;
- photographic verification;

## APPENDICES

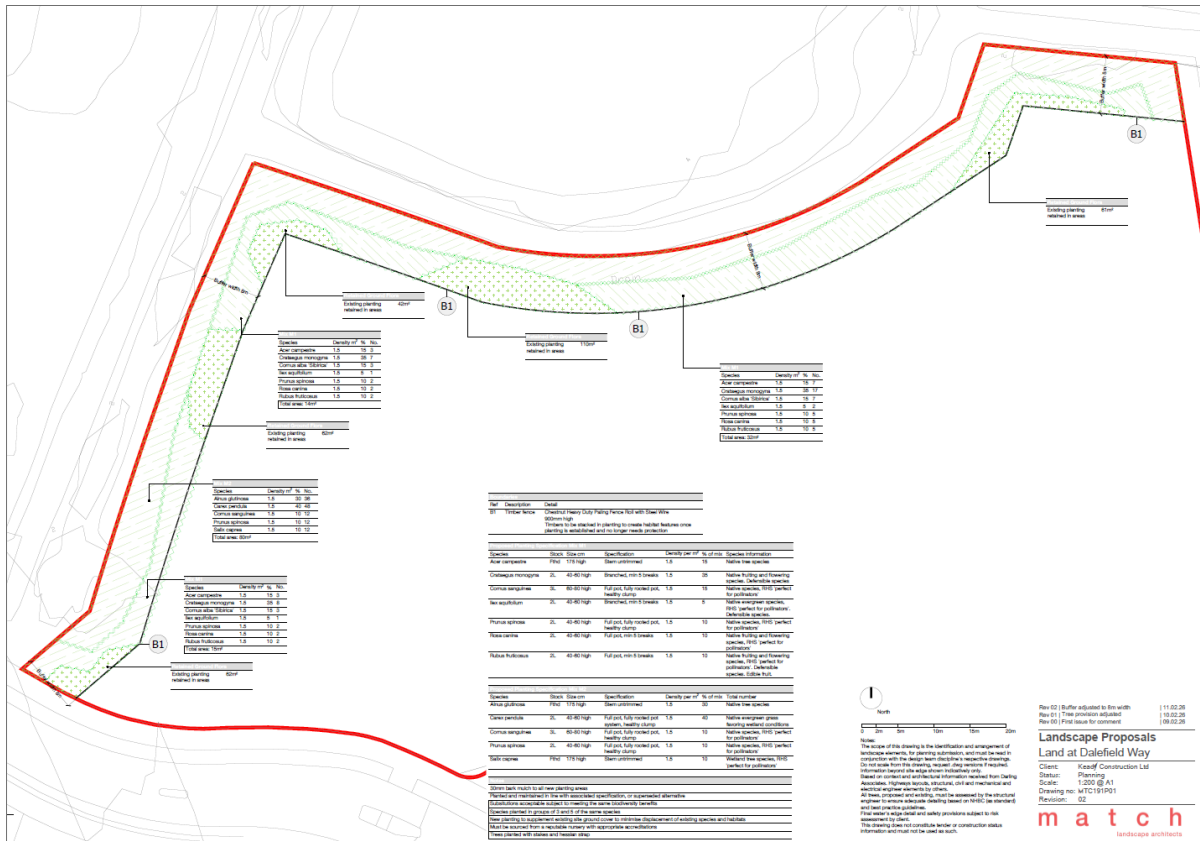
### APPENDIX A – AS-BUILT DRAWINGS AND WORKING DRAWINGS

- As-built drainage survey drawing, showing the following:
  - permeable pavement area;
  - Peravoid diffuser outlet;
  - Hydrobrake / flow control location;
  - Kingspan / Klargestor NSFA030 separator;
  - final discharge route.

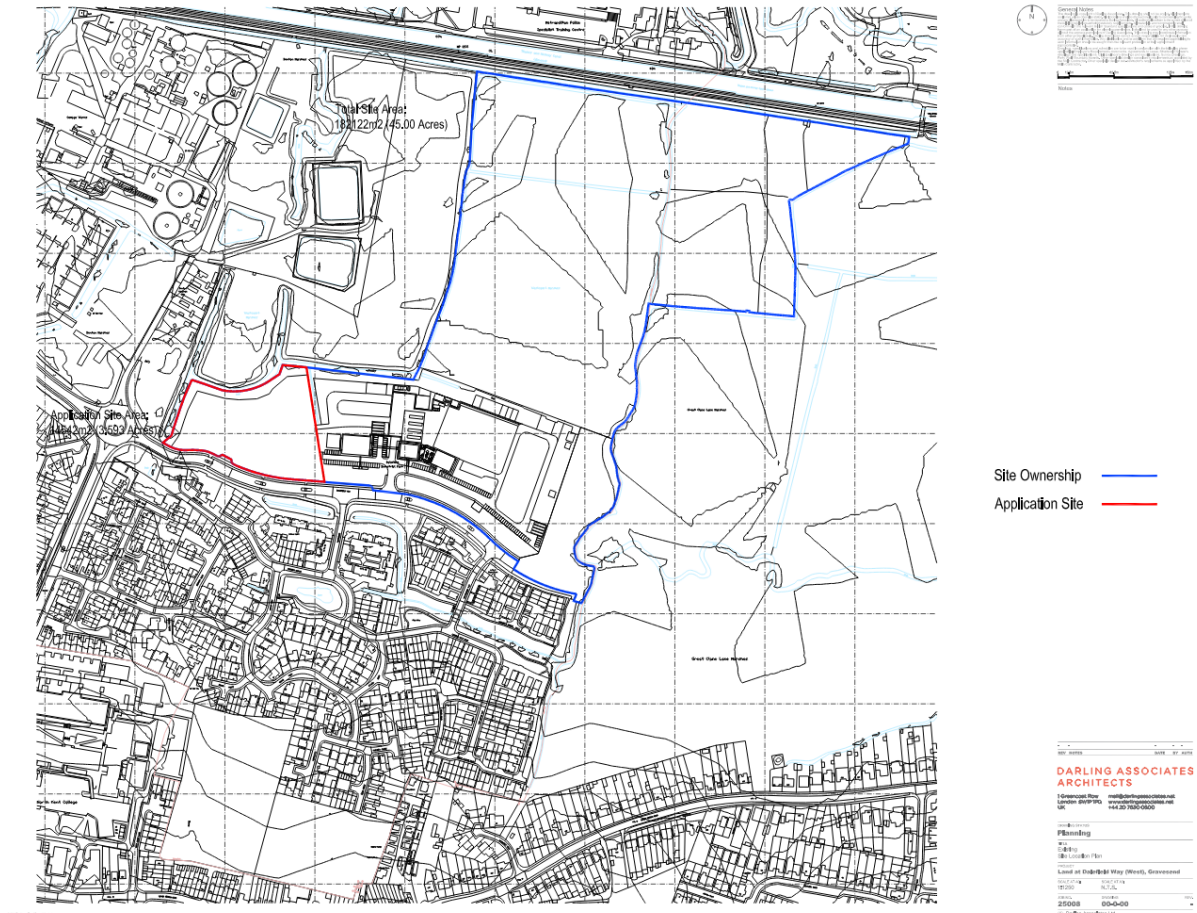


-

- Landscape plan



- Site Layout





Interceptor excavation to Formation Level.



Interceptor installation



Interceptor backfilled



Drain run from Interceptor



Drain run from interceptor to Hydrobrake – and dig to formation level.



Drainage run to Hydrobrake and Interceptor.



Hydrobrake Construction



Hydrobrake Construction



Hydrobrake installation



Drainage run from interceptor towards Peravoid / PVOD diffuser unit



Run backfilling



Peravoid / PVOD diffuser unit



Peravoid / PVOD diffuser unit



Peravoid / PVOD diffuser unit



Formation Level



Selected fill



Selected Fill



Selected fill 400mm deep

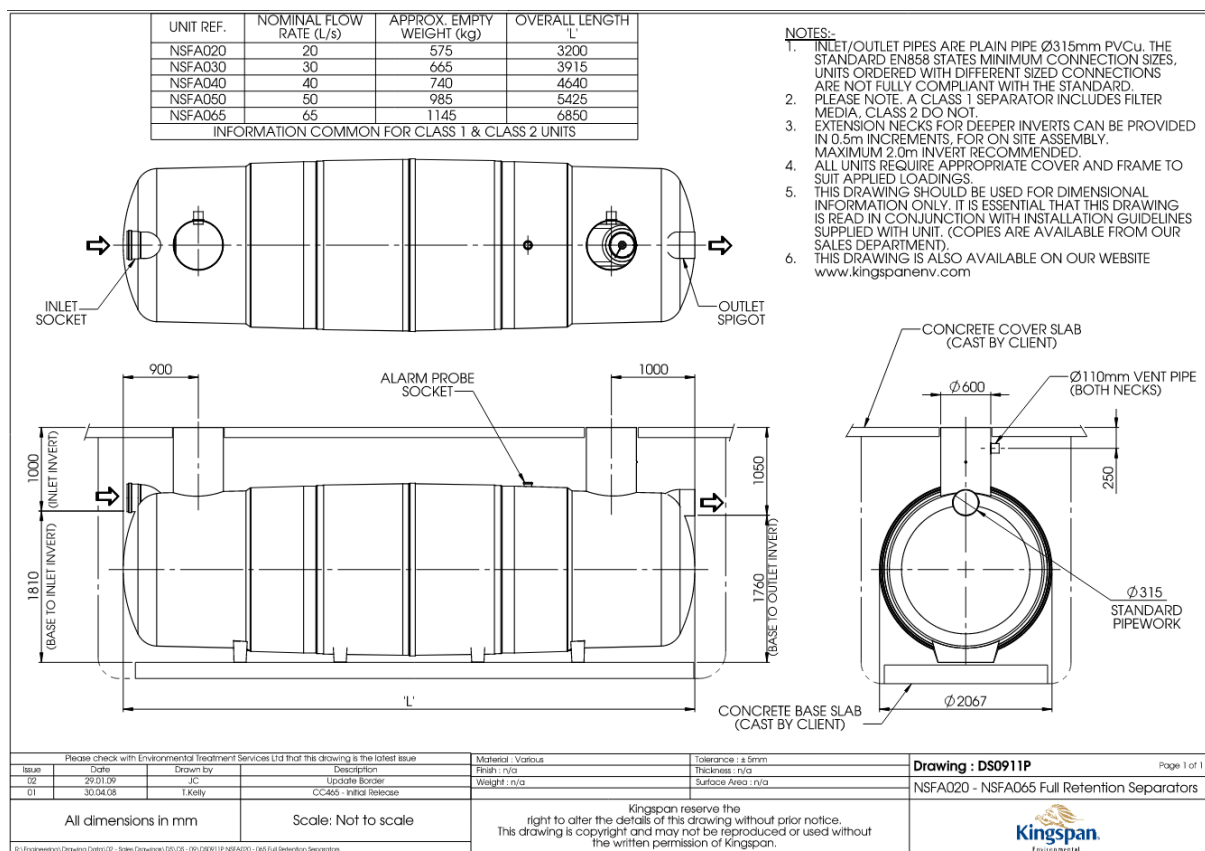


Permeable Tarmac installation

## APPENDIX C – PRODUCT INFORMATION

Insert manufacturer/product information for:

1. Kingspan / Klargestor NSFA030 full retention fuel/oil separator;



---

**011259**  
NSFA020 – NSFA065 Full Retention Separators  
Installation & Maintenance Guidelines

---



Kingspan Environmental Service Contact Numbers:

GB: 0844 846 0500

NI: 028 3025 4077

IRL: 048 3025 4077

|                             |
|-----------------------------|
| <b>Associated Documents</b> |
|-----------------------------|

|                |                                                                  |
|----------------|------------------------------------------------------------------|
| <b>DS0911P</b> | <b>NSFA020 – NSFA065 Full Retention Separators Sales Drawing</b> |
| <b>DS0859P</b> | <b>Neck &amp; Coalescer Extension Details</b>                    |
| <b>PD0323</b>  | <b>Oil Probe Fitting Details</b>                                 |

| <b>Issue</b> | <b>Description</b> | <b>Date</b>    |
|--------------|--------------------|----------------|
| 02           | CC1087             | September 2012 |

## **HEALTH & SAFETY**

**These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.**

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following these guidelines.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by a qualified electrician.

Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Access covers should be selected with reference to the location of the unit and traffic loads to be accommodated. These are not (normally) part of the Separator supply.

When covers are removed precautions must be taken against personnel falling into the unit.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

## **OIL ALARM SYSTEMS**

PPG3 recommends that the oil level alarm be fitted, tested and commissioned by a competent Installer. This is to ensure that the oil probe is calibrated correctly, raising an alarm when 90% of the oil storage volume is reached. Should the oil level alarm fail to provide an early warning, excessive oil could pass through the separator, thus polluting the environment. This could result in substantial cleanup costs and legal action being taken under the water resources act 1991.

## **MAINTENANCE**

The correct ongoing maintenance is essential for the proper operation of the equipment. Operators who rely on oil level alarms to prompt them to service separators between maintenance intervals run the risk of polluting, should the alarms not work, hence the ongoing functional assessment of the oil alarm systems is fundamental if pollution incidents are to be avoided.

The removal of sediment and retained oil/grease should be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor must refer to the guidelines in this document.



**Kingspan Environmental**  
**College Road North**  
**Aston Clinton**  
**Aylesbury**  
**Buckinghamshire**  
**HP22 5EW**

**10**

**EN 858 : Separator systems for light liquids**

**GRP Glass Reinforced Plastic Tank**

**Full Retention Separators NS003 - NS200**

**Class 1 & 2**

|                             |               |
|-----------------------------|---------------|
| <b>Watertightness</b>       | <b>Passed</b> |
| <b>Structural Testing</b>   | <b>Passed</b> |
| <b>Hydraulic efficiency</b> | <b>Passed</b> |

## CONTENTS

|                                 | Page |
|---------------------------------|------|
| Health & Safety .....           | 2    |
| 1. Introduction .....           | 4    |
| 2. Handling & Storage .....     | 4    |
| 3. Site Planning .....          | 4    |
| 4. Installation - General ..... | 5    |
| Concrete Specification .....    | 6    |
| 5. Separator Installation.....  | 6    |
| 6. Alarm Installation.....      | 7    |
| 7. Operation .....              | 8    |
| 8. Maintenance.....             | 8    |
| 9. Emergencies .....            | 10   |
| <b>Appendices</b>               |      |
| Separator Maintenance Log       |      |

## 1.0 Introduction

These Guidelines represent Best Practice for the installation of the above Full Retention Separator Units. Many years of specialist experience has led to the successful installation of thousands of separator units. It must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are appropriate for the specific ground conditions and in-service loads of each installation. Similarly, a qualified specialist (e.g. Civil engineering consultant) must verify any information or advice given by employees or agents of the company regarding the design of an installation.

For guidance of Separator selection and application, please refer to the most recent issue of Environment Agency Guidelines No.3 (PPG3) and BS EN 858. Our Units have been independently tested by BSI and are certified as meeting the standards.

## 2.0 Handling & Storage

- 2.1. Care must be taken to ensure that units are not damaged during delivery and handling on site. Please take care and place unit so that it can not fall and become damaged.
- 2.2. The design requirements of our products will frequently mean that the centre of gravity of the unit is "offset". Care must therefore be taken to ensure that the unit is stable when lifting. Rainwater may also collect inside units, particularly if they have been stored on site prior to installation, adding weight and increasing instability. Check units before lifting and pump out any excess water.
- 2.3. When lifting units, use webbing slings of a suitable specification. Do not use chains.
- 2.4. A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting separators, a spreader bar should be used where the slings would otherwise be at an angle > 30 degrees to the vertical.
- 2.5. Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.
- 2.6. We accept no responsibility for the selection of lifting equipment.
- 2.7. Whenever our units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects, which may damage the unit. The units must be placed on ground, which is flat and level to evenly support the base of the unit. Do not roll separators.

## 3.0 Site Planning

The following points should be considered before installation of the equipment:

- 3.1. The discharge must have the consent of the relevant Environmental Regulator.
- 3.2. The installation should have Planning and Building Control approval.
- 3.3. Consider installing flow cut-off valves to isolate the separator in an emergency or during site cleaning operations. See Environment Agency Guidelines PPG3.
- 3.4. We will fit a tube to receive the alarm probe. This tube provides protection and ensures that the probe is positioned at the correct level to sense the oil build up. The tube design and probe level setting assumes the use of our standard oil alarm system and may not be suitable for other alarm supplier's equipment. The probe tube may be fitted either within the neck or within the body of the unit. It should be extended to ground level when fitted in the body of the tank and you should make provision to extend the tube to the required height before backfilling. Consult the alarm supplier's instructions for their detailed fitting installation instructions.
- 3.5. Consider venting of the unit. Comply with local regulations. In the UK, comply with the following regulations, for Petrol Stations: Health and Safety Guidance Note 41 (HS(G)41), for other applications: BS8301: 1985 (obsolescent) BS EN 752 Building Drainage. Adequate ventilation should be provided to the separator. The ventilation pipe should be as short as is practicable and be terminated not less than 2.5m above paving nor less than 1m above the head of an openable window or other opening into a building within a horizontal distance of 3m. Each neck should be vented independently, we advise against joining these below ground prior to their rising as vent stacks.
- 3.6. Uncontaminated run off such as roof water should be excluded from separators. (EA Guidelines PPG3.)

- 3.7. Consider installation of a sampling point downstream of the separator as there is no suitable facility to effectively sample the waste water from inside the unit. (Suggested in EN 858 Pt 1).
- 3.8. Ground conditions and water table level should be assessed. If the water table will be above the base of the units at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill, and an appropriate installation method devised to avoid this.
- 3.9. If the discharge is to a soakaway, a porosity test should be carried out as part of the assessment of suitability for sub-soil drainage.
- 3.10. The separator must be installed at a level that will allow connection to the incoming drain and a free discharge at the system outlet.
- 3.11. Do not install the unit deeper than necessary, if required, ensure that you purchase extension necks and coalescer extensions. The minimum invert depth of the unit is shown on the customer drawing.
- 3.12. Adequate access must be provided for routine maintenance. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation.
- 3.13. There must be at least 1 metre of clear, level ground all around the access covers to allow for routine maintenance.
- 3.14. It is essential that a mains water supply is accessible for routine cleansing and refilling after removal of waste material and liquid.
- 3.15. Provide electrical supply for alarm system.
- 3.16. Installation should only be carried out by suitably qualified and experienced contractors in accordance with current Health and Safety Regulations. Electrical work should be carried out by a qualified electrician, working to the latest edition of IEE wiring regulations.
- 3.17. This unit is designed to operate with gravity in and out flows. The unit is not designed to operate with a pumped influent.

#### **4.0 Installation – General**

- 4.1. When units are installed in unstable ground conditions where movement of the surrounding material and/or unit may occur, the connecting pipework should be designed to minimise the risk of damage from differential movement of the unit(s) and/or surrounding material.
- 4.2. For separators with burial depths greater than 1000mm from cover level to the top of the unit, specific site conditions should be taken into consideration and the backfill designed to bear any loads which may be applied during and after installation to prevent the tank being subjected to these loads.
- 4.3. The excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete pads should extend a minimum of 300mm horizontally beyond the unit in all directions.
- 4.4. In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the side walls of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.
- 4.5. In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be dewatered using suitable pumping equipment and this should continue until the installation is complete.
- 4.6. During installation care must be taken to ensure that the body of any unit is uniformly supported so that point loads through the unit are avoided.
- 4.7. The Concrete Specification is not a site specific installation design.

| GENERAL CONCRETE SPECIFICATION IN ACCORDANCE WITH BS EN 206-1 (BS 8500-1)                                   |     |                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------|
| TYPE OF MIX                                                                                                 |     | (DC) DESIGN                                                                                                                    |
| PERMITTED TYPE OF CEMENT                                                                                    |     | BS 12 (OPC); BS 12 (RHPC); BS 4027 (SRPC)                                                                                      |
| PERMITTED TYPE OF AGGREGATE<br>(coarse & fine)                                                              |     | BS 882                                                                                                                         |
| NOMINAL MAXIMUM SIZE OF AGGREGATE                                                                           |     | 20 mm                                                                                                                          |
| GRADES:<br>C25 /30<br>C25 /30<br>C16 /20                                                                    |     | REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS<br>REINFORCED (EG. FOR HIGH WATER TABLE)<br>UNREINFORCED (NORMAL CONDITIONS) |
| MINIMUM CEMENT<br>CONTENT                                                                                   | C30 | 270 - 280 Kg/M <sup>3</sup>                                                                                                    |
|                                                                                                             | C20 | 220 - 230 Kg/M <sup>3</sup>                                                                                                    |
| SLUMP CLASS                                                                                                 |     | S1 (25mm)                                                                                                                      |
| RATE OF SAMPLING                                                                                            |     | READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS EN 12350-1               |
| NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER |     |                                                                                                                                |

## 5.0 Separator Installation

- 5.1. Excavate a hole of sufficient length and width to accommodate the tank and a minimum 300mm concrete surround and to a depth that allows for the burial depth of the unit plus concrete base slab.
- 5.2. Construct a suitable concrete base slab appropriate to site conditions. Ensure that the slab is flat and level.
- 5.3. When the concrete base slab has set enough to support the installed load, add a concrete haunch so as to provide even support under the unit, and then lower the unit onto the haunch using suitable webbing slings and lifting equipment.
- 5.4. Locate the float valve in the coalescer unit(s). Lift float valve and secure in the open position before filling and release when full. If the valve is not lifted during filling, it may "seat". The valve is fitted with cord to aid lifting. Add cord if extending the invert and fasten end to a convenient point.
- 5.5. Pour no more than 300mm depth of clean water into the unit, avoiding shock loads. For units with more than one chamber, add water to each chamber simultaneously. **DO NOT OVERFILL**, the unit is not designed to hold water whilst unsupported. **FILL THROUGH OUTLET AS WELL AS INLET.**
- 5.6. Place concrete backfill to approximately 300mm depth under and to the sides of the tank ensuring good compaction to remove voids. **DO NOT** use vibrating pokers. Continue adding concrete backfill, simultaneously keeping the internal water level no more than 200mm above the backfill level at all times, until the backfill is just below the underside of the outlet drain, giving sufficient room to connect the inlet and outlet pipework.
- 5.7. Connect inlet and outlet drains and vent pipes when safe access to the backfill can be gained.

### PIPEWORK CONNECTIONS

In all cases, ensure that the outlet pipework level is maintained for correct operation. (Unless specified on the order, the fall across the unit will be as per the customer drawings). Small units are generally fitted with PVCu spigots to both the outlet and the inlet. Connect using the same size PVCu socket or a suitable reducer. Larger units are generally fitted with our own GRP manufactured sockets. The connecting pipework should be pushed into the socket and a joint made to fill in the gap using rope/hemp with a cement mortar or bonding mix. Ensure that the seal is secure and watertight before backfilling the pipe. Alternatively, proprietary **flex seal couplings** can be obtained to fit over the outside of the site pipework and the outside of the GRP socket. When using this connection method, please be aware that the outside GRP laminate is not perfectly regular and that you may need to use a sealant on the outside diameter of the GRP. Take care not to over tighten the coupling when connecting to the GRP and ensure that the seal is secure before backfilling the pipe. Drawing DS0185 provides the ID of our GRP sockets. The OD is variable, as the wall thickness can be up to 15-20 mm. If purchasing a flex seal coupling for use with clay/concrete, we suggest that a size 110 mm larger than the ID is selected.

## 5.8. Oil Level Alarm Neck fitting

We will fit a tube to receive the oil alarm probe. This provides protection and ensures that the probe is positioned at the correct level to sense oil build up. See alarm supplier information and ensure that the probe is placed within the tube and can be accessed from ground level.

Continue backfilling with concrete over the tank body to the required level. Build up a shell of concrete, minimum 225mm thick, around the access shaft(s). Temporarily strut the access shaft to avoid distortion.

- 5.9. Where we supply an extension shaft to meet a deeper invert requirement, a coalescer extension is also provided when needed. If there is a coalescer, remove it from the unit before adding the extension shaft(s). It is advisable to seal the joints on the extension shafts (particularly on sites with high ground water) with proprietary sealant or by GRP lamination (if skilled operatives are available). Temporarily strut the extension neck(s) to avoid distortion during back filling. Where more than one neck section is required to suit a deep invert, consider back-filling section by section. If the extension neck is too long, it can be trimmed using a fine-toothed saw. The original fixing hole bolting the coalescer to the neck should be sealed. Ensure that the vent socket if cut out, is replaced elsewhere. The maximum recommended inlet invert is 2000mm (using 500mm long extension sections). If you are installing a unit deeper than this then you must make your own arrangements for removing and replacing the coalescer. Consideration must be given to the depth of lift involved.
- 5.10. If extending the neck, remember to add a suitable length of cord to enable the float valve to be lifted when the unit is emptied. If the valve is not raised during filling then the float valve may stick at the base.
- 5.11. Coalescer. When refitting, ensure that the core tube is correctly seated onto the base fitting.
- 5.12. Continue back-filling, ensuring minimum 225mm concrete thickness around the access shaft/ extension neck and alarm access tube (as applicable).
- 5.13. Mains powered alarm Systems. See alarm suppliers installation instructions. Lay 82mm diameter PVCu underground ducting between the alarm panel location and the alarm probe position. The ducting should be 500mm below ground level and fitted with a drawstring for later cable insertion. Any changes of direction should be by long radius bend. If necessary, drill a suitable hole in the access shaft adjacent to the alarm probe terminal box, to accept the ducting and seal.
- 5.14. In traffic areas a suitable top slab must be constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access shafts. Loads applied to covers and frames must bear on the top slab, not the access shaft.
- 5.15. The unit should be filled with clean water up to the invert level of the outlet pipe. Ensure the unit identification is placed/marked inside the neck for future information. The unit is now ready for use.

## 6.0 Alarm Installation

- 6.1 Install the alarm probe and control panel, as per the Suppliers Alarm Installation Guidelines. Ensure that the probe is positioned correctly for the required storage of oil. The table below indicates the volume of oil stored and the depth of floating oil expected in the separation chamber.

| Unit    | Recommended Maximum Oil Storage volume | Max. Depth of floating oil (100 %) (Static) |
|---------|----------------------------------------|---------------------------------------------|
| NSFA020 | 200 litres                             | 53mm                                        |
| NSFA030 | 300 litres                             | 60mm                                        |
| NSFA040 | 400 litres                             | 65mm                                        |
| NSFA050 | 500 litres                             | 70mm                                        |
| NSFA065 | 650 litres                             | 67mm                                        |

## 7.0 Operation

- 7.1 The unit is sized on treating a defined area and rainfall (50 mm/hour) EN 858 Part 1, and using the factor provided in the EA guidelines PPG 3. The entire flow up to the units listed flow rating is fully treated.
- 7.2 Class 1 units include a core tube with replaceable media. Separated Liquid enters the core tube after passing through the media, to the outlet. The coalescer media requires maintenance and replacement at intervals. See section 8.
- 7.3 Class 2 units do not include replaceable media
- 7.4 Both Class 1 and class 2 units are provided with a closure device, incorporating a float. As the level of oil builds up and forms a floating layer, so the float/closure device moves downward to prevent oily water being passed through the unit. The unit **MUST** be emptied after the closure device has operated. The coalescer media should be inspected and changed if fouled.
- 7.5 An oil probe should be positioned to detect the accumulation of oil when there is no or low flow conditions. It is a requirement to position the probe so that the alarm operates at 90% of the maximum recommended oil storage volume. **When the alarm operates, the oil should be removed. Accumulated silt should also be removed.**
- 7.6 These Separators are not effective for the removal of soluble or emulsified pollutants such as oil/detergent mixes found in vehicle wash effluents. With permission, such discharges may be drained to the foul sewer. See Environment Agency Guidelines PPG3. Or contact our Technical Sales Department for suitable alternative equipment.

## 8.0 Maintenance

Separated light liquid **must** be removed from the separator when the oil capacity has been reached.

- 8.1. An oil level alarm system is available which gives warning when the separated light liquid/water interface level reaches 90% of the maximum recommended oil storage volume.
- 8.2. Separators should be inspected at least every six months or more frequently if experience dictates. A log should be maintained detailing the depth of oil found, any volume removed and any silt removal or cleaning carried out. A specimen maintenance log is included in the appendices.
- 8.3. Every site is different, in respect to the amount and type of silt generated by the drain design and installation. Frequently, the site construction programme itself generates large and perhaps unusual quantities of silt and grit. We recommend that following the initial installation, an inspection of the separator contents be made to check that building rubble has not entered the unit. Further inspections at 3 and 6 months should be made so as to be able to assess the volumes of silt and oil accumulated. An inspection and emptying programme can then be defined following the first 6 months site experience. We recommend a maximum inspection interval of 6 months.
- 8.4. Coalescer media is a replaceable item and is available as a spare.
- 8.5. Alarm probes should be removed and cleaned with water whenever waste material is removed from the separator. Please note the alarm may alert until the liquid level is replaced. Consult the alarm supplier's literature.
- 8.6. If the unit is emptied, the float/closure device should be raised and lowered only after the unit has been refilled. ( Do not lower it into an empty unit as the closure device will self seat )
- 8.7. **Separator waste is a "special waste" under the terms of The Waste Management Code of Practice. The Code imposes a duty of care on the waste producer to ensure that the Cleansing contractor is registered with the Environment Agency and that the final disposal of the waste is to a licensed facility.**
- 8.8. You should consider the purchase of a maintenance service, from a competent installer, which includes bi-annual inspections, removal of oil and silt, cleaning of the alarm probe and cleaning or replacement of the coalescer media (where appropriate).

### Waste Removal Procedure – Oil & Silt

Oil should only be removed when there is no flow entering the unit. Isolate the unit and prevent flow from entering. Always remove the oil before attempting to remove the

011259 GL0102P-02 NSFA020 – NSFA065 Class 1 & 2 Full Retention Separators  
 coalescer. If this is not done, when the coalescer is withdrawn, any excess oil may coat the media surface and when replaced could contaminate the effluent.

- 8.9. Remove the access cover and lower the desludging hose into the separation chamber. Draw off the surface oil.
- 8.10. When removing the silt, lower the desludging hose to the base of the tank and withdraw any grit or sludge that may be present. It is not necessary to remove all the liquid unless you need to ensure the unit has been fully emptied. Ensure that you access and clean all compartments.
- 8.11. Remove the alarm probe, clean with water and replace. Ensure that it is working correctly
- 8.12. Consider the period of time that the coalescer has been installed and consider removing and inspecting (cleaning or replacing) the coalescer media. If removed, ensure that it is correctly replaced and secured into position. It is best to lower the liquid level when refitting. Replace the access covers.
- 8.13. Re-fill the separator with clean water up to the outlet level. The alarm may display an alarm condition until the separator is re-filled. Check alarm operation when unit full.
- 8.14. Check the float/closure device and raise, if it has self-seated.

#### Checking the Coalescer Assembly

- 8.15. Coalescers should be checked and cleaned regularly, also following a major incident replaced if necessary. It may be possible to squeeze/rinse out silt contamination from the media, but it is impossible to remove oil. Please contact the company if you wish to purchase replacement coalescer foam media. Identify the type and size of separator (shown on labels inside the access neck).
- 8.16. Assemblies weighing less than 25 Kg may be removed by hand. Heavier assemblies should be lifted by mechanical means. Any lifting device employed must be capable of lifting:
  - In excess of the maximum assembly weight.
  - The assembly completely out of the access shaft.
  - Giving a smooth and controlled lift.
  - Swinging the assembly to one side clear of the access shaft.

| Unit    | Dry Weight (Kg)<br>Core tube &<br>media | Wet Weight (Kg)<br>Core tube &<br>media | Silted Weight<br>(Kg) Core tube &<br>media | Replacement<br>media part no. |
|---------|-----------------------------------------|-----------------------------------------|--------------------------------------------|-------------------------------|
| NSFA020 | 27 kg                                   | 40 kg                                   | ≈ 55 kg                                    | 402733                        |
| NSFA030 | 27 kg                                   | 40 kg                                   | ≈ 55 kg                                    | 402733                        |
| NSFA040 | 27 kg                                   | 40 kg                                   | ≈ 55 kg                                    | 402733                        |
| NSFA050 | 27 kg                                   | 40 kg                                   | ≈ 55 kg                                    | 402733                        |
| NSFA065 | 27 kg                                   | 40 kg                                   | ≈ 55 kg                                    | 402733                        |

- 8.17. Ensure that the area around the access shaft is clear and that there is space to place the coalescer core tube assembly once removed. If space is not available it will be necessary to support the assembly over the access shaft e.g. by scaffold poles and platform.
- 8.18. Only remove the access cover when necessary to remove the assembly. Do not leave the access shaft uncovered and unattended.
- 8.19. It is recommended that core tubes be lifted by mechanical means, especially if it is suspected that the coalescer media be silted.
- 8.20. Removing the coalescer assembly.
- 8.21. A cut out is provided in the top of the coalescer tube to aid lifting. When the unit is installed the coalescer tube is bolted to the neck. Deeper invert units are provided with a coalescer tube extension of the appropriate length. The coalescer tube must be bolted in place during use.

- 8.22. Lift the assembly with a smooth and steady motion. Core tubes and media will become lighter as water drains from the exposed media. Allow the water to drain completely. Assemblies blocked with fine silt may be very heavy.
- 8.23. Fully extract the assembly and set it down adjacent to the access shaft. Consider cleaning or replacement of the media.
- 8.24. Cleaning the coalescer assembly /Media Replacement.**
- 8.25. Hose down the assembly using clean water at normal pressure. (You may be able to return the cleaning water into the separator, if there is sufficient separator capacity.) Do not allow untreated cleaning water to pass out of the unit. Continue hosing media until the water runs clear. If the media is heavily contaminated with oil and silt it may not be possible to clean effectively by hosing and should be replaced.
- 8.26. When replacing the media, undo the banding. Slide media off the core tube and slide new media on. Ensure all the apertures on the core tube are covered by the media. Re-secure or replace banding. Consider replacing media every two years.
- 8.27. Replacing the coalescer assembly.**
- 8.28. Position coalescer assembly over the access shaft and remove any safety coverings.
- 8.29. Lower the assembly steadily into the access shaft, orientate core tube correctly and locate over sump cone. Bolt core tube into place, check the float/closure device is free to operate.

## **9.0 Emergencies**

- 9.1. At sites where there is a high risk of spillage, spill kits containing drain seals, absorbent materials, disposal containers and other appropriate equipment should be held. In the event of a spillage on site, the material should be contained, (if a spill kit is not available, sand or soil may be used) and the Environment Agency notified immediately using the appropriate emergency hotline number listed in the Agency Guideline PPG3. Year 2012 – 0800 80 70 60

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## SEPARATOR MAINTENANCE LOG

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Site address/location .....

Separator location .....

Type of separator .....

Nominal Flow .....

Total capacity .....

| Inspection/<br>Maintenance<br>Date | Comments | Waste Volumes<br>Removed<br>(if appropriate) |
|------------------------------------|----------|----------------------------------------------|
|                                    |          |                                              |
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|                                    |          |                                              |

## 2. Hydrobrake flow control unit;



# Hydro-Brake® Optimum

Reduce Storage Needs

## Product Summary

The Hydro-Brake® Optimum Vortex Flow Control is a versatile, self-activating device with a unique geometry designed to harness the energy of vortex flow.

The Hydro-Brake® Optimum is used to maximize savings on new construction projects by minimizing stormwater detention volumes. Also an economical retrofit solution, the Hydro-Brake® Optimum can be installed in over-discharging ponds and catch basins to restrict the outflow without requiring the construction of additional detention volumes.

With large openings that guard against blockages and an installation base upwards of 25,000 units, the Hydro-Brake® is a trusted and proven solution used to reduce the rate of stormwater runoff.

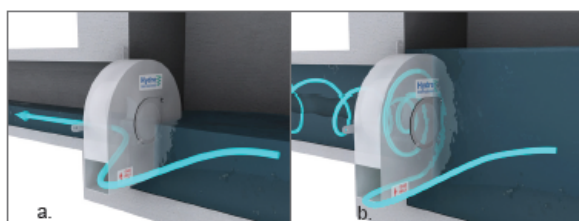


Fig.1 The Hydro-Brake® operates like (a) a large orifice under low flow conditions, and (b) a small orifice under higher flow / higher head conditions when a vortex air core forms within the device and throttles the flow.

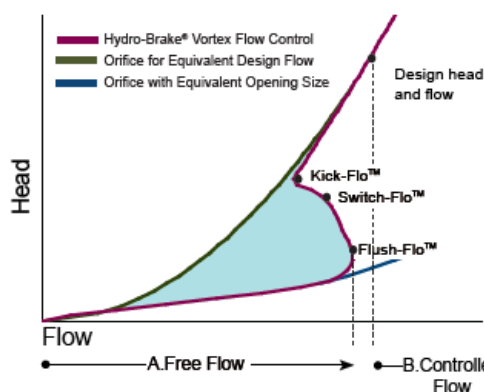


Fig.2 The characteristic of the Hydro-Brake® vs. an equivalent orifice.

The Hydro-Brake® Vortex Flow Control optimizes flow control to allow for higher discharge rates at lower heads than conventional flow control options. The head/discharge curves shown below illustrate the behavior of a Hydro-Brake® Vortex Flow Control compared to an orifice (Fig.2).

## How it Works

Reduce Storage Volumes by 40%



The Hydro-Brake® Optimum operates on simple fluid hydraulics. Flow enters the volute tangentially through the inlet. Under low flow conditions, the Hydro-Brake® Optimum acts as a large orifice and water passes directly from the inlet to the outlet (Fig.1a).

As flow increases and reaches the Flush-Flo™ point, high peripheral velocities initiate the throttling action. As head increases, the valve approaches the Switch-Flo™ and Kick-Flo™ points and an air-filled core starts to form in the volute. As head continues to increase, the air core fully stabilizes and the valve discharge is throttled to that of a smaller orifice (Fig.1b).

## Benefits

- » Reduced stormwater storage volumes by up to 40%
- » Up to 50% savings in project storage costs
- » Self-activating with no moving parts or power requirements
- » Available in wall-mounted or floor-mounted geometries
- » Area of opening is 3-6 times larger than the equivalent orifice
- » Virtually maintenance free
- » Proven performance with over 25,000 installations worldwide

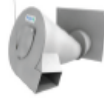


Stormwater Solutions

→ [hydro-int.com/hydro-brake](http://hydro-int.com/hydro-brake)

## Sizing & Design

Three series of Hydro-Brake® Optimum Vortex Flow Controls are available to suit various applications and design constraints. Refer to the Hydro-Brake® Optimum Design Chart for typical sizing guidelines.

| Series                  | S Series                                                                                                                                                            | V Series                                                                                                                                                  | C Series                                                                                                                                                      |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Typical Geometry        |                                                                                    |                                                                          |                                                                            |
| Models                  | SH<br>STH SXH<br>SMH SMXH                                                                                                                                           | SV<br>SXV<br>SMV                                                                                                                                          | C<br>CX<br>CH                                                                                                                                                 |
| Typical Applications    | <ul style="list-style-type: none"> <li>Flow control at the inlet of the storm drain system</li> <li>Outlet flow control for stormwater detention systems</li> </ul> | <ul style="list-style-type: none"> <li>Erosion control &amp; energy dissipation</li> <li>Roof runoff control for "Blue Roof" detention schemes</li> </ul> | <ul style="list-style-type: none"> <li>Outlet flow control for flood dams and levees</li> <li>Outlet flow control for stormwater detention systems</li> </ul> |
| Typical Mount Style     | Wall Mount                                                                                                                                                          | Downspout/Roof Mount<br>Floor Mount<br>Pipe Mount                                                                                                         | Floor Mount                                                                                                                                                   |
| Typical Diameter Range* | 2 - 16 in (5 - 41 cm)                                                                                                                                               | 2 - 16 in (5 - 41 cm)                                                                                                                                     | 3 - 20 in (7.5 - 51 cm)                                                                                                                                       |
| Typical Flow Range**    | 0.05 - 5.6 cfs (1 - 157 L/s)                                                                                                                                        | 0.05 - 6.0 cfs (1 - 174 L/s)                                                                                                                              | 0.18 - 14.3 cfs (5.3 - 405 L/s)                                                                                                                               |

\*Listed diameter ranges are typical guidelines only. Hydro-Brake® Optimum Vortex Flow Controls can be manufactured to any specified diameter up to 6'.

\*\*Flow ranges listed are for 4' - 6.5' of head.

Contact Hydro International for site-specific sizing and design requirements.

## Optional Design Accessories

### Pivoting Bypass Door



For maintenance access to the outlet pipe.

### Curved Backplate



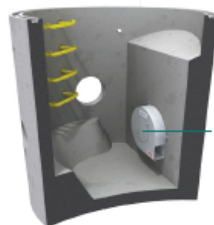
To allow for flush-mounting to the wall of a round manhole.

### Vortex Suppressor Pipe

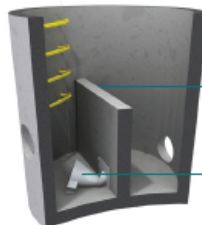


To eliminate air core for emergency bypass.

## Typical Chamber Configurations



Wall Mounted SXH Model for Catch Basin Inlet Control



Large Storm Bypass Weir  
Floor Mounted CH Model for Small Storm Flow Control



Pipe Mounted SXV Model for Energy & Velocity Dissipation



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Web: [www.hydro-int.com/hydro-brake](http://www.hydro-int.com/hydro-brake)

HB\_SS\_A\_2203

## Design Data

# Hydro-Brake® Optimum

## Vortex Flow Control



Inspired by nature and engineered to deliver the perfect curve, the Hydro-Brake® Optimum is the most advanced vortex flow control available. There is no equivalent to the Hydro-Brake® Optimum when it comes to delivering the best possible hydraulic performance with a passive flow control.

With a wide range of configurations and options available, the Hydro-Brake® Optimum is able to provide precision flow control to suit the vast majority of applications.



*Figure 1 - The Hydro-Brake® Optimum is designed and manufactured to deliver precise, repeatable flow control.*

### Precision Engineered Vortex Flow Controls

Each Hydro-Brake® Optimum is custom configured to suit the application and is manufactured under strict quality assurance procedures to deliver precise flow control to exacting requirements.

Every unit is backed by significant R&D investment to fine-tune the performance, meaning that the Hydro-Brake® Optimum is the only vortex flow control to have been independently certified by the BBA and WRc.



### Benefits

- Manufactured from high grade stainless steel.
- Future proof – adjustable or replaceable inlet plates available to alter flow rates post-installation.
- Configurations available to suit a wide variety of installations.
- Large cross sectional area at all heads.
- Simple installation.
- Self-activating.
- No moving parts or external power requirement.

### Versatile and Flexible

At Hydro International, we pride ourselves on providing solutions that meet your requirements, rather than providing a standard solution and asking you to compromise on your project needs.

The Hydro-Brake® Optimum offers designers options to precision-engineer a vortex flow control to:

- Minimise upstream storage volumes.
- Maximise internal (inlet & outlet) cross sectional areas to prevent blockages.
- Build-in a climate change factor to allow for future changes in flow rate.

Furthermore, if you need to retrofit a flow control, our dedicated team of engineers can assist with providing a customised Hydro-Brake® Optimum suitable for installation into existing drainage infrastructure.

Hydro-Brake® Flow Control Series  
Hydro-Brake® Hotline: 01275 337937  
[hydrobrake@hydro-int.com](mailto:hydrobrake@hydro-int.com)

## Design Data

### Hydro-Brake® Optimum

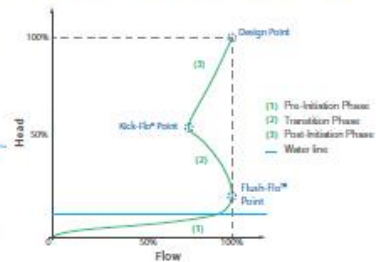
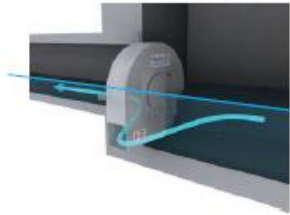
#### Vortex Flow Control

### Operating Principles

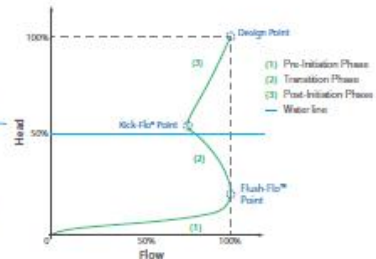
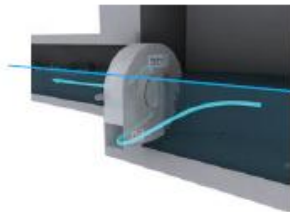
The hydraulic behaviour of the Hydro-Brake® Optimum is described by its hydraulic characteristic curve, which relates the discharge flow from the unit to the hydraulic head acting upon that unit.

The hydraulic characteristic curve consists of three distinct sections, each corresponding to a different governing flow control regime:

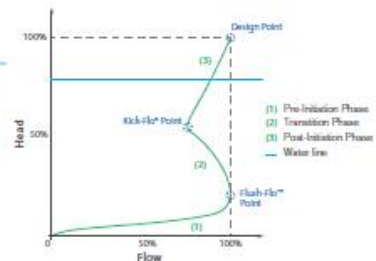
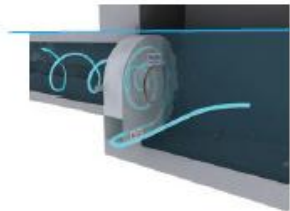
1. The pre-initiation phase – governed by orifice flow and defined on the characteristic curve as the region between the origin and the point at which the vortex begins to have a throttling effect (Flush-Flo™ point). In this region, the depth of water is below the soffit of the outlet orifice of the Hydro-Brake® Optimum.



2. The transition phase – governed by vortex formation and defined on the characteristic curve as the region between the Flush-Flo™ and the point at which the vortex has fully initiated (Kick-Flo® point). In this region the vortex will continually form and collapse. A trapped volume of air inside the Hydro-Brake® Optimum will exert a backpressure and cause the discharge rate to reduce even though the hydraulic head continues to increase.



3. The post-initiation phase – governed by stable vortex flow and defined on the characteristic curve as the region above the Kick-Flo® point. A stable vortex is formed and sustained. An air filled core at the centre of the vortex acts as a pseudo-physical flow restriction by reducing the cross sectional area available for the passage of water.



### Design Flexibility

It is possible for the Design Point to be achieved using a number of different flow control configurations, each with a different hydraulic response or characteristic curve.

An in-depth understanding of the flow regimes and interactions at each stage of the hydraulic characteristic curve allows custom configuration of the Hydro-Brake® Optimum to achieve the hydraulic profile best suited to the site requirements.

## Design Data

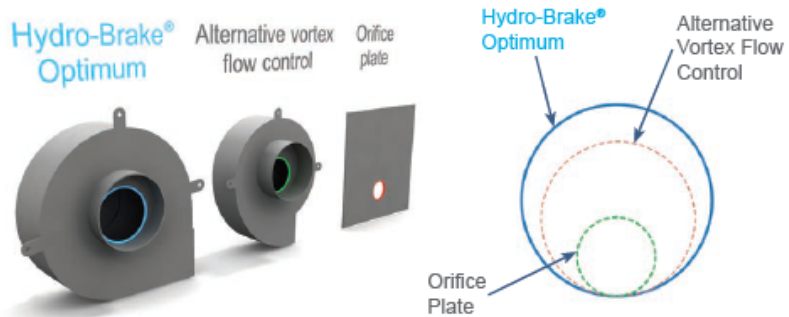
### Hydro-Brake® Optimum

#### Vortex Flow Control

#### Resilience by Design

Hydro-Brake® Optimum has outlets (clearances) up to 20% larger than competitor products to minimise the risk of blockages. All units are fitted with a pivoting bypass door to enable full access to the internal chamber and the outlet structure in the event that a blockage does occur.

All Hydro-Brake® Optimum units can also be supplied with an adjustable or replaceable inlet to future-proof the device, allowing flows to be altered post-installation, to account for site expansion or climate change.



#### Expert Design Support Services

Hydro International's professional engineers work with you to provide expert technical and aftersales support to ensure your projects meet exacting design requirements and deliver the very best hydraulic controls for your site.

With over 35 years' experience of flow control knowledge and experience, Hydro International's design support team is available to advise on any aspect of water flow management, including detailed modelling of vortex flow controls and composite outlet structures.

**Call the Hydro-Brake® Hotline on: 01275 337937 or email [hydrobrake@hydro-int.com](mailto:hydrobrake@hydro-int.com)**

#### Hydro-Brake® Optimum Design Tool

Engineers have the flexibility to try out any number of flow control iterations and explore their impact on hydraulic performance.

The Hydro-Brake® Optimum Design Tool allows you to quickly and easily compare a number of different flow control options for your site to develop the most robust and sustainable drainage solution possible.

In just 3 simple steps you can obtain:

- Detailed dimensional drawings
- Hydraulic modelling data for direct import or copy/paste into commercial hydraulic modelling software



[www.hydrobrakeoptimum.com](http://www.hydrobrakeoptimum.com)

#### Full MicroDrainage® Compatibility

Engineers can carry out sizing and flow rate calculations and conduct hydraulic modelling of drainage networks containing Hydro-Brake® Optimum units using the industry-standard MicroDrainage® modelling software.

**XP**solutions



Guides to modelling the Hydro-Brake® Optimum using the Hydro-Brake® Optimum Design Tool and MicroDrainage® are available for download at: [www.hydrobrakeoptimum.com](http://www.hydrobrakeoptimum.com)

## Design Data

### Hydro-Brake® Optimum

#### Vortex Flow Control

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#### Easy to Install

Hydro-Brake® Optimum has a range of mounting options for ease of installation or can be supplied ready fitted into a manhole chamber (with or without a weir wall) for simple plug-and-play installation. There are no set-up or commissioning requirements.



### The Hydro-Brake® Flow Control Series

As a brand leader for vortex flow controls for more than 30 years, Hydro International continues to set the standard in flow control management technologies.

At Hydro International, we pride ourselves on our engineering excellence and in developing a range of flow control solutions, we have invested in significant research & development to validate their performance.

#### Hydro-Brake® Orifice



The low-cost option for unconstrained sites (shown with optional screen).

#### Hydro-Brake® Optimum



The vortex flow control with no equivalent, delivering Nature's Perfect Curve with no moving parts and independently verified by the BBA and WRc.

#### Hydro-Brake® Agile

Precision engineered flow control for highly constrained applications.



#### Hydro-Brake® Flood Alleviation



The vortex controlled solution to watercourse flooding.

Page 4 of 4

### 3. Peravoid diffuser unit outlet;

## Peravoid Rainwater Diffuser Unit

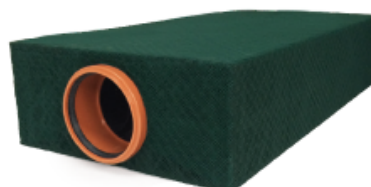
Data Sheet

### PRODUCT INFORMATION

P1

ISSUE 3 - JUNE 2018

Run-off from building roofs is collected into downpipes and flows into a back inlet gully incorporating an internal filter or catchpit inspection chambers. The back inlet gully or chamber discharges the filtered stormwater into the permeable sub-base via Peravoid Rainwater Diffuser Unit encapsulated in a 2mm mesh fabric. The run-off will then diffuse out of the Peravoid Rainwater Diffuser Unit and into the modified granular sub-base layer. The Peravoid unit is a 150mm deep modular interlocking plastic unit storage system designed for use as a combined drainage component and sub-base replacement system, ideal for shallow infiltration/attenuation.



### Peravoid Rainwater Diffuser Unit - Configuration Options

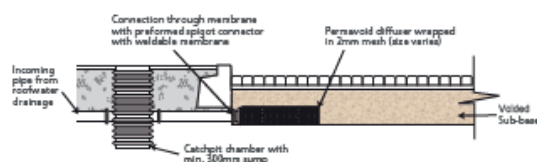
Standard sizes and performance criteria are detailed within the Diffuser Specification and Applications brochure.

You can download it here:-

<https://selsource.co.uk/pvovd-rainwater-diffuser-units>

It is recommended all diffuser unit installations have upstream protection, such as a catchpit, to intercept and prevent silts and other detritus causing a blockage and affecting performance.

### Typical Layout - Rainwater downpipe drainage into sub-base reservoir



### Technical Support

Detailed guidance and assistance is available.

For further information, please contact our Technical Team

on +44 (0) 1254 589987

or email [sales@selenvironmental.com](mailto:sales@selenvironmental.com)

or visit [www.selsource.co.uk](http://www.selsource.co.uk)

SEL Environmental Ltd  
Canal House  
Bonsall Street  
Blackburn  
BB2 4DD

| ELEMENT                                   | VALUE                                            |
|-------------------------------------------|--------------------------------------------------|
| <b>PHYSICAL PROPERTIES</b>                |                                                  |
| Weight per unit                           | 3kg                                              |
| Length                                    | 708mm                                            |
| Width                                     | 354mm                                            |
| Depth                                     | 150mm                                            |
| <b>SHORT TERM COMPRESSIVE STRENGTH</b>    |                                                  |
| Vertical                                  | 715kN/m <sup>2</sup>                             |
| Lateral                                   | 156kN/m <sup>2</sup>                             |
| <b>SHORT TERM DEFLECTION</b>              |                                                  |
| Vertical                                  | 1mm per 126kN/m <sup>2</sup>                     |
| Lateral                                   | 1mm per 15kN/m <sup>2</sup>                      |
| <b>TENSILE STRENGTH</b>                   |                                                  |
| Of a single joint                         | 42.4kN/m <sup>2</sup>                            |
| Of a single joint at (1% secant modulus)  | 18.8kN/m <sup>2</sup>                            |
| Bending resistance of unit                | 0.71kN/m                                         |
| Bending resistance of single joint        | 0.16kN/m                                         |
| <b>OTHER PROPERTIES</b>                   |                                                  |
| Volumetric void ratio                     | 95%                                              |
| Average effective perforated surface area | 52%                                              |
| Intrinsic permeability (k)                | Minimum 1.0 x 10 <sup>-5</sup>                   |
| Ancillary                                 | Peravoid Permatie<br>Peravoid Shear<br>Connector |
| Material                                  | Polypropylene (PP)                               |

|                                              |                  |
|----------------------------------------------|------------------|
| <b>HYDRAULIC PERFORMANCE</b>                 |                  |
| 3 units wide, 1 unit deep<br>(1.06m x 0.15m) |                  |
| <b>FREE DISCHARGE</b>                        |                  |
| Gradient (%)                                 | 0 1 2 3 4 5      |
| Flow rate (l/m/s)                            | 8 13 15 17 19 21 |



**Sel Environmental**  
Real Innovation.

## APPENDIX D – MAINTENANCE LOG TEMPLATE

| Date     | Asset              | Inspection / Maintenance Activity | Findings | Action Taken | Contractor / Person | Next Action Due |
|----------|--------------------|-----------------------------------|----------|--------------|---------------------|-----------------|
| [Insert] | Permeable pavement | Visual inspection                 | [Insert] | [Insert]     | [Insert]            | [Insert]        |
| [Insert] | Hydrobrake         | Chamber inspection                | [Insert] | [Insert]     | [Insert]            | [Insert]        |
| [Insert] | Separator          | Inspection / emptying             | [Insert] | [Insert]     | [Insert]            | [Insert]        |
| [Insert] | Diffuser outlet    | Inspection                        | [Insert] | [Insert]     | [Insert]            | [Insert]        |
| [Insert] | Outfall            | Inspection                        | [Insert] | [Insert]     | [Insert]            | [Insert]        |