

Drainage Maintenance Manual



Project	Manor Nursery, Angmering, West Sussex
Project Number	22995

By Steve Burgess

Date 15 January 2021

1 Schedule of Maintenance

- 1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of Water Pollution from Construction Sites, provides further guidance on this.
- 1.2 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site.
- 1.3 Upon completion of the development the management of the shared drainage facilities will be passed on to a Management Company who will be appointed by the developer on behalf of the new residents.
- 1.4 The regular and corrective maintenance of all shared elements of the drainage system beneath the road, including highway soakaways will be managed by the Management Company on behalf of the residents.
- 1.5 Regular maintenance of all private drainage, channels, gutters, rainwater pipes and connections will be the responsibility of the individual homeowner and should be undertaken every 3 months.
- 1.6 Provisions will be made to replace any infrastructure that has reached the end of its serviceable design life and will be replaced on a like for like basis as far as reasonably practicable.
- 1.7 The Downstream Defender Vortex Separators will be maintained in accordance with the 'Hydro International - Operation and Maintenance Manual', which is attached to the rear of this document.
- 1.8 Drawing 120 shows the drainage ownership responsibilities, which is attached to the rear of this document.



Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from silt trap chambers, gullies traps, channel drains and inlet chambers	3 monthly
	Litter and debris removal – catch pits	Monthly or as required
	Surface and foul water pipework – jetting / rodding	Every 2 years or as required
	Vortex Separators inspected. (A log should be maintained detailing the depth of oil found any oil volume removed, and any silt removal or cleaning carried out)	Regularly during first year of installation then every 6 months after the first year of installation
	Remove sediment, oil and suspended solids from the Vortex Separators	Once per year, or following a spill in the drainage area
	Manage other vegetation and remove nuisance plants – aesthetics	As required
	Inspect for sediment and debris in pre-treatment components and floor of soakaway inspection tubes or chambers and inside of concrete manhole rings.	Annually
	Cleaning of gutters and any filters on down pipes.	Annually (or as required based on inspection)
	Trim any roots that may be cause blockages to the system.	Annually (or as required)
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of soakaway inspection tubes or chambers and inside of concrete manhole rings.	As required based on inspections
Corrective Maintenance	Repairs to access chambers / manhole covers	As required
	Remove debris / blockages to silt traps / channel drains	As required
	Surface remedial works to any depressions or rutting	As required
	Inspect inlet, outlet from downpipes, channel drains and gullies for blockages, standing water and clear	As required
	Alarm probes should be removed and cleaned with water	Whenever waste material is removed from the separator
	Reconstruct soakaway and / or replace or clean void fill if performance deteriorates or failure occurs	As required
	Replacement of defective geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note the rate sediment has accumulated	Monthly in the first year and then annually
	Inspect soakaway to ensure it is fully emptying	Annually

Table 1: Schedule of Regular and Corrective Maintenance

- 1.9 Any parts, materials or products that require replacement or come to the end of the manufactures recommended design life will be replaced by the Management Company or individual homeowner as required.

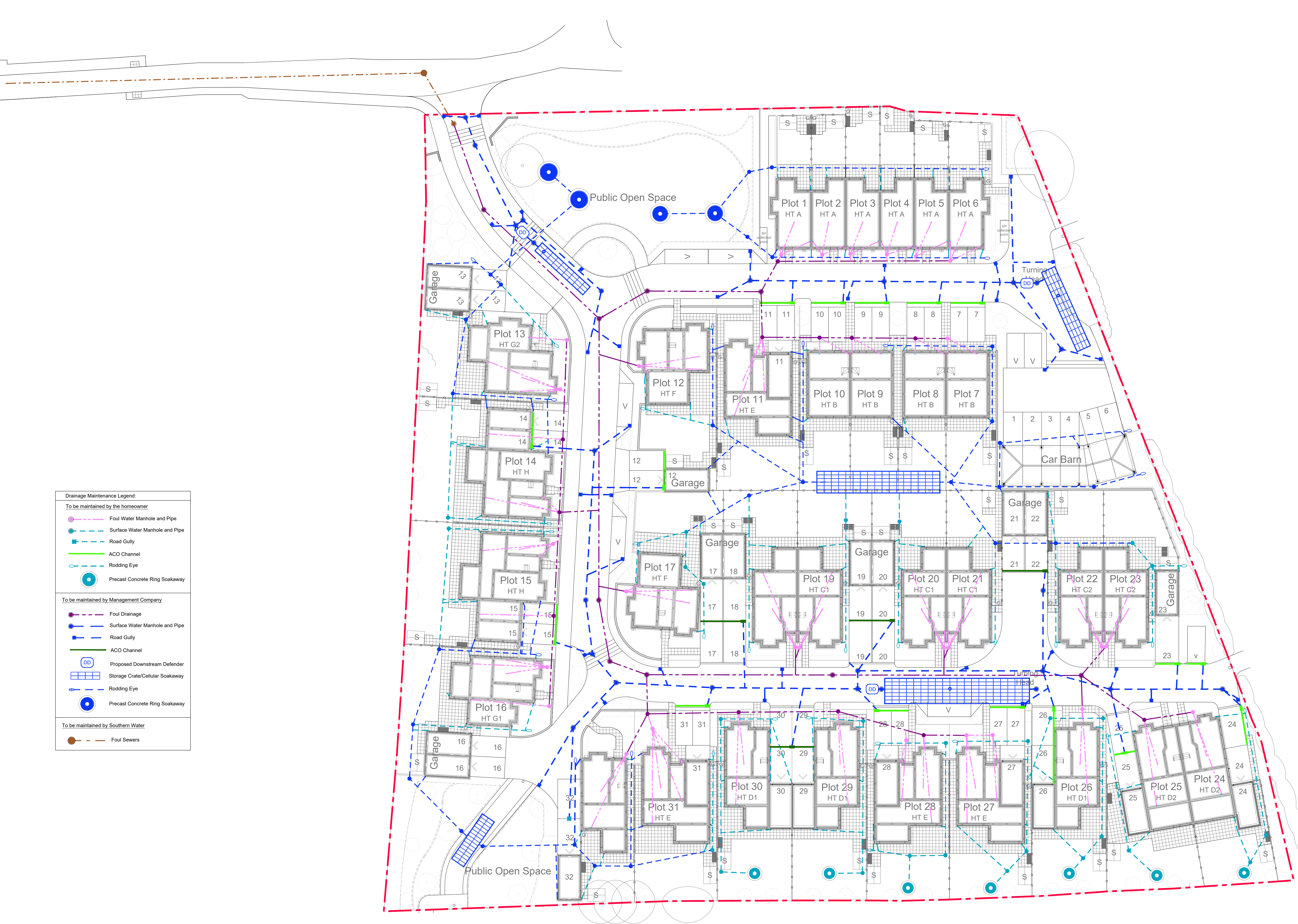
2 Financing

- 2.1 The regular maintenance of all private drainage, channels, gutters, rainwater pipes, driveways and connections will be the responsibility of the individual homeowner.
- 2.2 The regular and corrective maintenance of all shared elements of the drainage system will be managed and funded through the Management Company on behalf of the Residents who will fund the Management Company via a levied service charge.
- 2.3 In the event that the estate's Management Company becomes unable to discharge its duties within 2 years of first appointment the developer will endeavour to appoint an alternative on behalf of the Residents.

3 Maintenance Summary

Inspection / Action Required	Gullies, Channels and Gutters	Catchpits	Vortex Separators	Surface Water Pipework	Soakaways
1 Month		✓			✓
3 Months	✓	✓			
6 Months			✓		
1 Year					✓
After leaf fall in Autumn	✓	✓			
2 Years				✓	
When alarm indicates			✓		
When waste material is removed from the separator			✓		

Table 2: Drainage System Maintenance Summary



- NOTES:
1. All dimensions to be checked on site. All details and dimensions relating to sub-Contractors work must be checked and agreed between the sub-Contractor or supplier and the general Contractor.
 2. This drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings and specification.
 3. The main Contractor is responsible for ensuring the stability of the structure whilst the works are in progress.
 4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority. No liability is accepted by the Consultant and the main Contractor is responsible for obtaining and checking all information and taking due care and attention whilst undertaking the works.
 5. All pipes, bends and junctions shall be vitrified clay to BS EN 295-1, with flexible joints and kitemark certified. Alternatively all pipes and fittings can be UPVC conforming to BS EN 1401-1 and shall be laid in accordance with the manufacturers specification. If UPVC pipes are to be used then the manufacturer shall be approved by the Engineer prior to construction.
 6. All Adoptable sewers shall be in strict accordance with the current edition of Sewers For Adoption. Unless otherwise stated adoptable sewers shall be 150mm diameter and shall be laid in a class S bedding. Where the depth to soffit is less than 1.2m under a public highway or 0.9m elsewhere the pipe shall be laid with a class Z bedding.
 7. All private building drainage shall be constructed in strict accordance with BS EN 752:1996. Unless otherwise specified building drainage shall be 100mm diameter and shall be laid at a minimum gradient of 1 in 40 for foul drains and 1 in 80 for surface water drains. All building drains shall be laid in class B bedding unless otherwise specified.
 8. Where the service trench is near to the foundation of any building, refer to the guidance in Approved Document H, Building Regulations Part H1.
 9. Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN 3 concrete encasement (150mm thick). In all other cases the pipes shall be bedded and surrounded with 100mm thick granular material.
 10. In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided. Compressible boards (fibreglass or polystyrene) shall be provided at a maximum of 8m centres (coinciding with pipe joints). The boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 18mm for pipes up to 450mm nominal diameter and 36mm for pipes over 450mm nominal diameter.
 11. All svps shall have rodding access plates fitted at their bases (ground floor level).
 12. Where existing pipes are to be abandoned they shall be dug out together with any abandoned manholes.

Drainage Maintenance Legend:

To be maintained by the homeowner

- Foul Water Manhole and Pipe
- Surface Water Manhole and Pipe
- Road Gully
- ACO Channel
- Rodding Eye
- Precast Concrete Ring Soakaway

To be maintained by Management Company

- Foul Drainage
- Surface Water Manhole and Pipe
- Road Gully
- ACO Channel
- Proposed Downstream Defender
- Storage Crate/Cellular Soakaway
- Rodding Eye
- Precast Concrete Ring Soakaway

To be maintained by Southern Water

- Foul Sewers

A | 15.01.21 | PR | Bypass separators replaced with Downstream Defenders. Key updated.

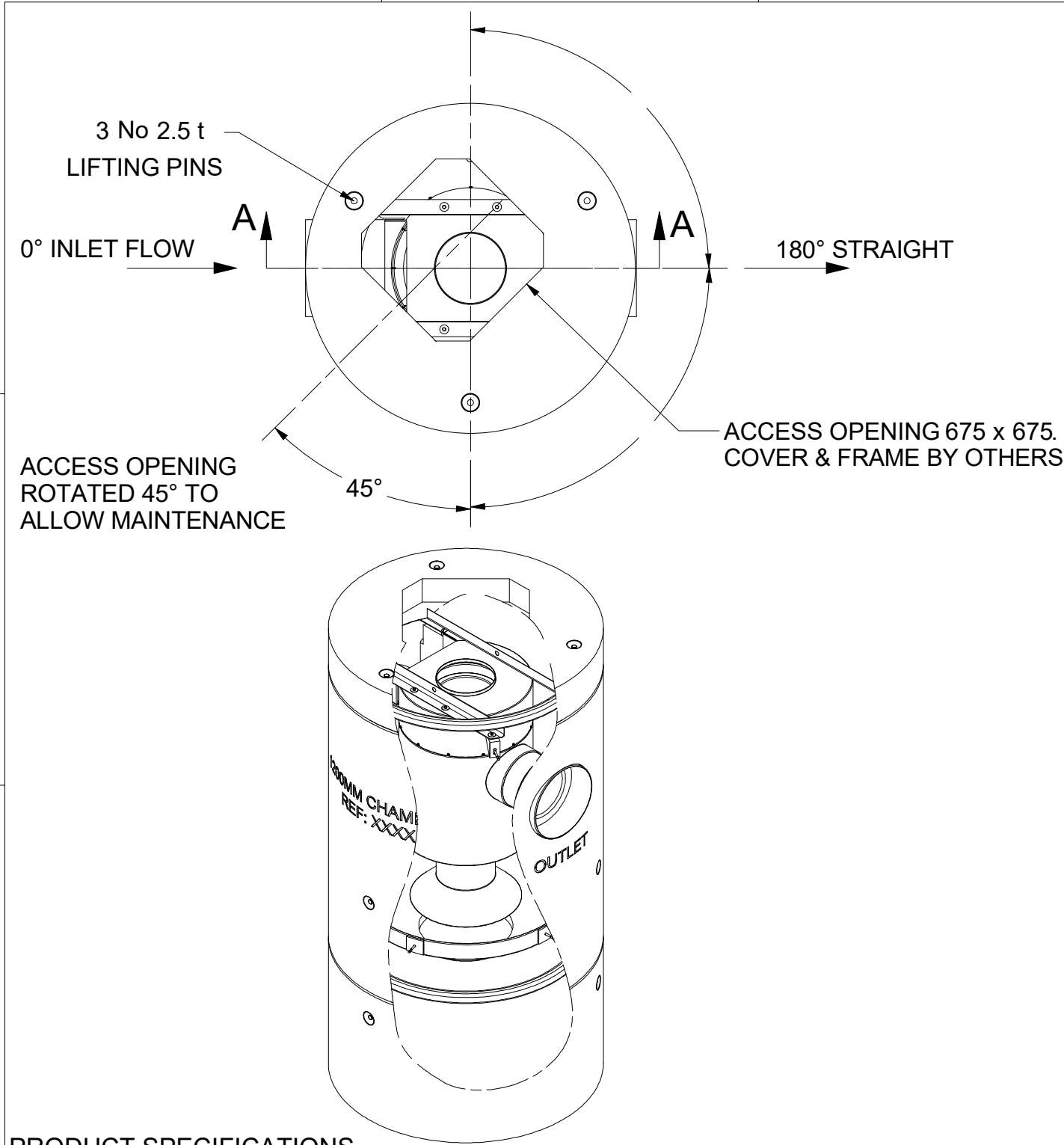
REV	DATE	INT	DESCRIPTION	CHK

Issue Status PRELIMINARY

11 Tungsten Building
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BN41 1RA
Tel: 01273 424424
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email: design@civil.co.uk

the
Civil
Engineering
practice

CLIENT	Roffey Homes Ltd		
PROJECT	Manor Nurseries Site Angmering		
TITLE	Proposed Maintenance Ownership Plan		
DRAWN	P Reynolds	DATE	Dec 2020
ENGINEER	S Burgess	CHECKED	
SCALE	1:250 @ A1		
PROJECT NO.	22995		
DWG. NO.	120		
REV.	A		

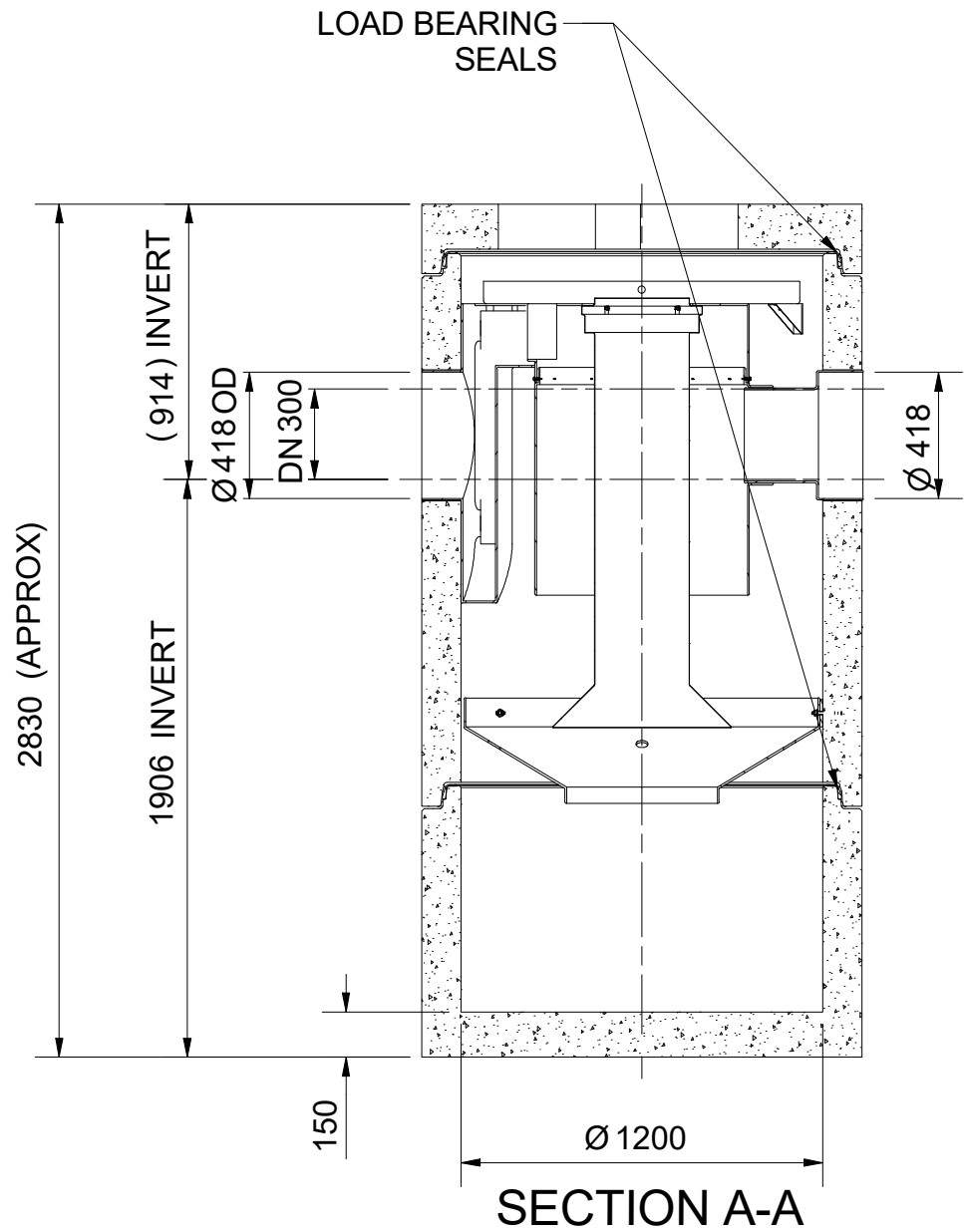


PRODUCT SPECIFICATIONS

TREATMENT FLOW - COARSE	38 l/s
TREATMENT FLOW - FINE	30 l/s
HYDRAULIC CAPACITY	120 l/s
OIL STORAGE CAPACITY	292.5 l
MIN. SEDIMENT STORAGE CAPACITY	0.39 m³

MAXIMUM HEADLOSS AT TREATMENT
FLOW RATE - COARSE (mm) 150

PROJECT			
-	INVERT	MATERIAL	DIAMETER
COVER			
OUTLET			
INLET			



PARTS LIST	
COMPONENT	MASS
1200 PCC Cover slab	0.5 t
1200 PCC Lower Chamber	1.5 t
1200 PCC Upper Section Assembly	2.2 t
DN300 Inlet / Outlet Pipe (By Others)	N/A
Pre Installed Internal Components	N/A
ANY WARRANTY GIVEN BY HYDRO INTERNATIONAL WILL APPLY ONLY TO THOSE ITEMS SUPPLIED BY IT. ACCORDINGLY HYDRO INTERNATIONAL CANNOT ACCEPT ANY RESPONSIBILITY FOR ANY STRUCTURE, PLANT, OR EQUIPMENT, (OR THE PERFORMANCE THERE OF) DESIGNED, BUILT, MANUFACTURED, OR SUPPLIED BY ANY THIRD PARTY. HYDRO INTERNATIONAL HAVE A POLICY OF CONTINUOUS DEVELOPMENT AND RESERVE THE RIGHT TO AMEND THE SPECIFICATION. HYDRO INTERNATIONAL CANNOT ACCEPT LIABILITY FOR PERFORMANCE OF ITS EQUIPMENT, (OR ANY PART THEREOF), IF THE EQUIPMENT IS SUBJECT TO CONDITIONS OUTSIDE ANY DESIGN SPECIFICATION. HYDRO INTERNATIONAL OWNS THE COPYRIGHT OF THIS DRAWING, 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, WITHOUT PRIOR PERMISSION IN WRITING FROM HYDRO INTERNATIONAL. ©2019 HYDRO INTERNATIONAL	
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PROJECTION

COMMENTS:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT GENERAL ARRANGEMENT & DETAIL DRAWINGS.

2. ALL COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE PRODUCTION SPECIFICATION HRD-FM9/15

REVISION HISTORY			
REV	BY	DESCRIPTION	DATE
A	CRA	FIRST ISSUE	04 FEB 19

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SCALE: VARIES

DRAWN BY: DGE
CHECKED BY: CJN
APPROVED BY: WCJ

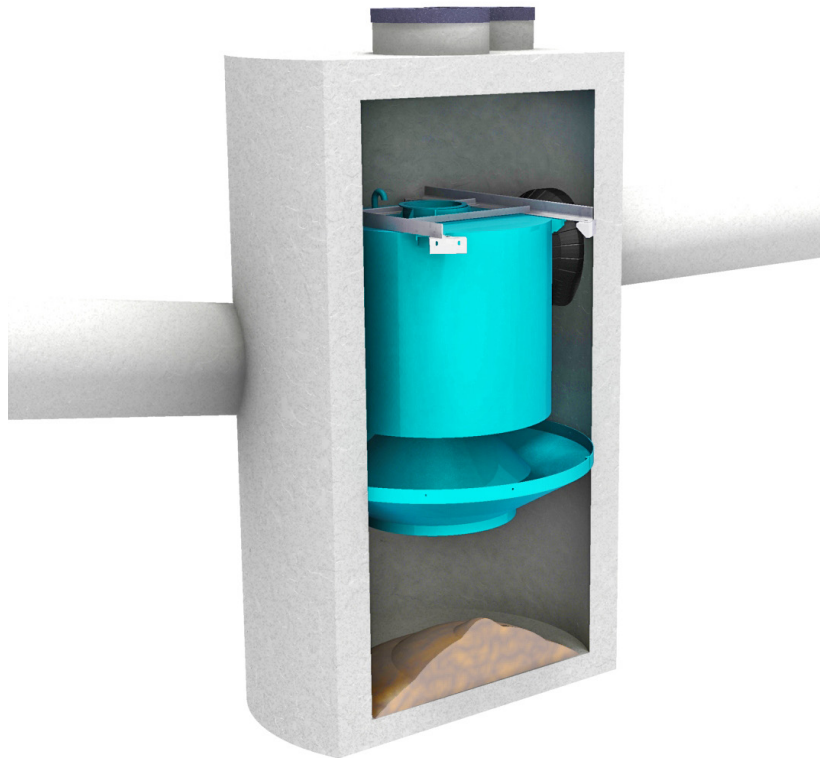
Title
**HYDRO INTERNATIONAL
DOWNSTREAM
DEFENDER®**

1200 PERFECT MANHOLE
CONCRETE CHAMBER

DESIGN DATA

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hydro-int.com

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Operation and Maintenance Manual

Downstream Defender[®]

Vortex Separator for Stormwater Treatment

Turning Water Around ...[®]

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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.

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

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®

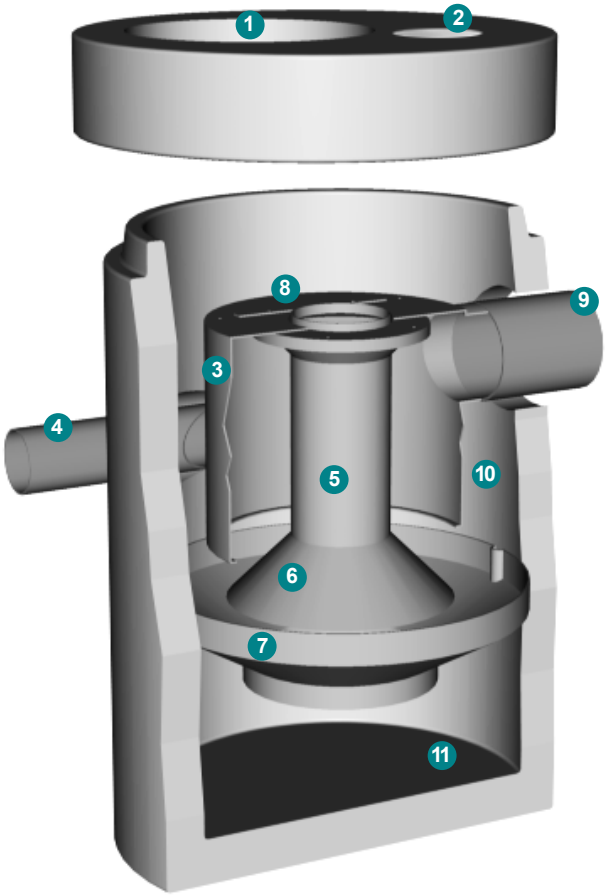
- Removes sediment, floatables, oil and grease
- No pollutant washouts
- Small footprint
- No loss of treatment capacity between clean-outs
- Low headloss
- Efficient over a wide ranges of flows
- Easy to install
- Low maintenance

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



HYDRO MAINTENANCE SERVICES

Hydro International has been engineering stormwater treatment systems for over 30 years. We understand the mechanics of removing pollutants from stormwater and how to keep systems running at an optimal level.

NOBODY KNOWS OUR SYSTEMS BETTER THAN WE DO



Avoid Service Negligence

Sanitation services providers not intimately familiar with stormwater treatment systems are at risk of the following:

- Inadvertently breaking parts or failing to clean/replace system components appropriately.
- Charging you for more frequent maintenance because they lacked the tools to service your system properly in the first place.
- Billing you for replacement parts that might have been covered under your Hydro warranty plan
- Charging for maintenance that may not yet have been required.

LEAVE THE DIRTY WORK TO US

Trash, sediment and polluted water is stored inside treatment systems until they are removed by our team with a vactor truck. Sometimes teams must physically enter the system chambers in order to prepare the system for maintenance and install any replacement parts. Services include but are not limited to:

- Solids removal
- Removal of liquid pollutants
- Replacement media installation (when applicable)



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BETTER TOOLS, BETTER RESULTS

Not all vactor trucks are created equal. Appropriate tools and suction power are needed to service stormwater systems appropriately. Companies who don't specialize in stormwater treatment won't have the tools to properly clean systems or install new parts.



SERVICE WARRANTY

Make sure you're not paying for service that is covered under your warranty plan. Only Hydro International's service teams can identify tune-ups that should be on us, not you.

TREATMENT SYSTEMS SERVICED BY HYDRO:

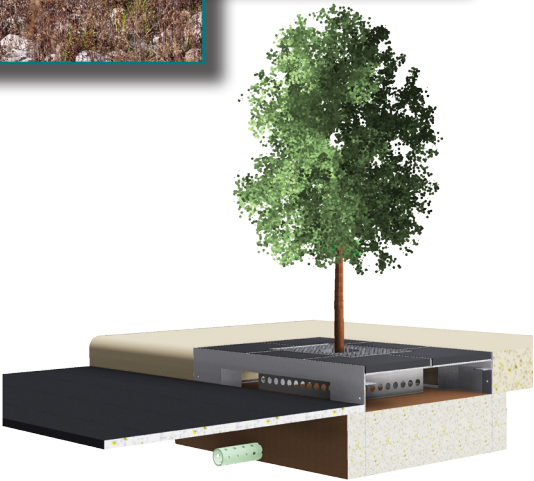
- Stormwater filters
- Stormwater separators
- Baffle boxes
- Biofilters/biorention systems
- Storage structures
- Catch basins
- Stormwater ponds
- Permeable pavement



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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.

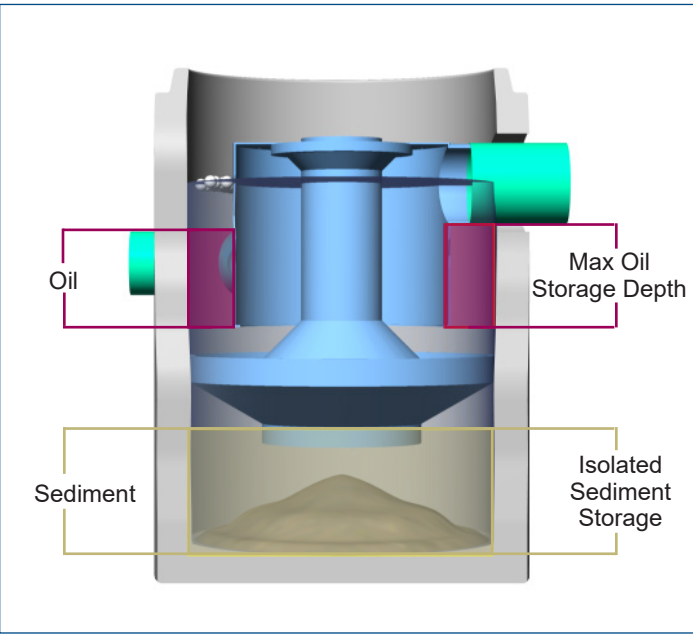


Fig.1 Pollutant storage volumes of the Downswtream Defender®.

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

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/flotables removal, for a 6-ft Downstream Defender® typically takes less than 30 minutes and removes a combined water/oil volume of about 500 gallons.

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.



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

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. 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.

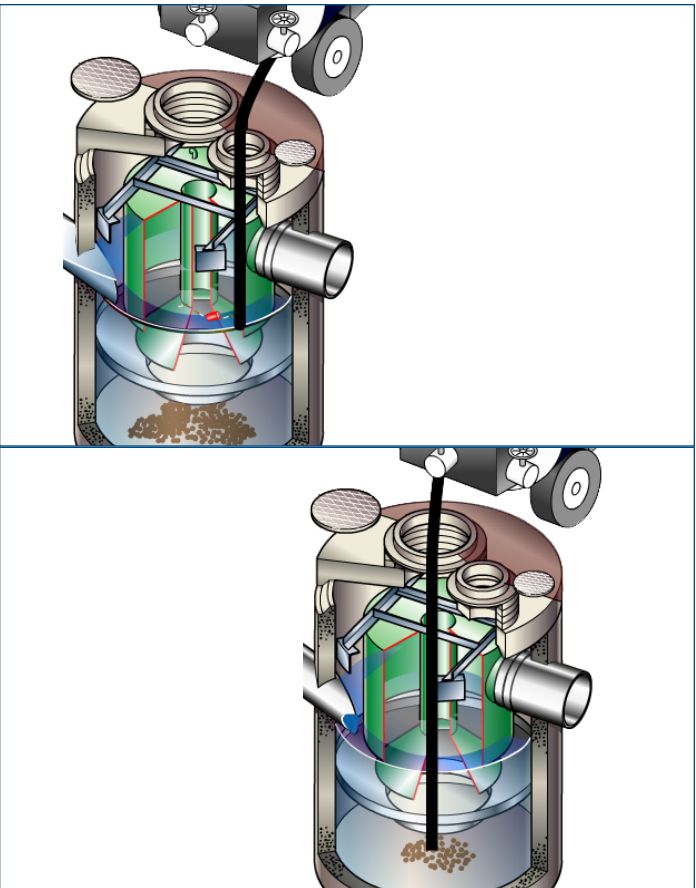


Fig. 9 Floatables and sediment are removed with a vactor hose

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.

DO IT RIGHT THE FIRST TIME

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