

Drainage Maintenance Plan

Courtlands Riding Centre, Todds Green

Prepared for
S J M & Co.

Project Number: 21100
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Rev	Issue Purpose	Author	Checked	Approved	Date
P01	Issued for information	DR	CR	DR	06.06.23
P02	Issued for information	DR	CR	DR	12.04.24

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1. Introduction

- 1.1 The purpose of this document is to outline the proposed maintenance schedule for the drainage system and all SuDS features for the proposed development at Courtlands Riding Centre, Todds Green, SG1 2JE.
- 1.2 The maintenance schedule set out here complies with the CIRIA SuDS Manual (C753), which is identified as providing current best practice in the industry. The report does not replace manufacturers' requirements, and these should be followed for each product in addition to the information in this document.
- 1.3 For the proposed extents of SuDS features on a plan drawing, please refer to the separate drainage layout plan – drawing **21100-FCE-XX-XX-DR-D-0500** in **Appendix A**.

2. Organisation Responsible

- 2.1 As the sustainable drainage network includes rain gardens and permeable paving, it is unlikely that the on-site drainage will be adopted by Thames Water.
- 2.2 Therefore, the developer/landlord will set up a Site Management Team/ company to maintain the surface water drainage network, in addition to the communal parking areas and bin store. The management company could be financed by a yearly maintenance fee chargeable to residents. The name of the Management Company is to be advised.

3. Conventional Drainage Systems

Gullies, Silt Traps, Manholes, Catchpits & Pipework

- 3.1 On completion of construction, the internal surfaces of the sewers and manholes shall be thoroughly cleansed to remove all deleterious matter, without such matter being passed forward into the existing sewers.
- 3.2 All trapped gullies, silt traps, manholes and catchpits are to be regularly inspected every three months and cleared out on a regular frequency for the first nine months. After this period, the frequency can be reduced to every six months.
- 3.3 All drainage runs will be inspected once a year. The system is to be jetted clear if/when necessary.

Flow controls (including Hydro-Brakes)

- 3.4 The manhole containing the flow control is to be regularly inspected once a year and any debris and silt are to be removed from the sump and manhole.
- 3.5 Hydro-Brakes / vortex flow controls should be maintained in accordance with the manufacturer's requirements.

4. SuDS Features

Introduction

- 4.1 During the first year of the operation of all types of SuDS should be inspected at least monthly and after significant storm events to ensure that the system is functioning as designed and that no damage or faults are evident.
- 4.2 It is recommended that a report on the condition of the SuDS is undertaken further to an inspection at least once annually.

Permeable pavements

- 4.3 The pavement should be inspected regularly for clogging, litter, weeds and water ponding, preferably during and after heavy rainfall to check effective operation. Permeable pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. The SuDS Manual indicates that sweeping once per year is sufficient for most sites, however the sweeping frequency should be adjusted to suit site specific conditions and should also be informed by annual inspection reports.
- 4.4 Care should be taken in adjusting vacuuming equipment to avoid removal of joining material. Any lost material should be replaced.
- 4.5 Table 2 outlines the proposed operation and maintenance regime for permeable pavements. This is adapted from The SuDS Manual (C753).

Table 1: Operation and maintenance requirements for permeable pavements

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall or reduced frequency as required, based on site- specification observations of clogging - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediments
Occasional maintenance	Stabilise and mow contributing and advancement areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required –once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper structure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth- if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Swales

- 4.6 Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff. Swales will require ongoing regular maintenance to ensure continuing operation to design performance standards, particularly for providing treatment.
- 4.7 Maintenance of swales is relatively straightforward for landscape contractors, and typically there should only be a small amount of extra work (if any) required for a SuDS detention basin over and above what is necessary for standard public open space.
- 4.8 Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.
- 4.9 The major maintenance requirement for swales is usually mowing. Mowing should ideally retain grass lengths of 75-150 mm across the main "treatment" surface to assist in filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events. Grass clippings should be disposed of off-site or outside the area of the swale to remove nutrients and pollutants.
- 4.10 Occasionally sediment will need to be removed. Sediments excavated from ponds or forebays that receive runoff from residential or standard road and roof areas should be safely disposed of in accordance with current waste management legislation. However, consultation should take place with the environmental regulator to confirm appropriate protocols. In the majority of cases on low-risk sites with source control and a Management Train, it will be acceptable to distribute the sediment on site, if there is an appropriate safe and acceptable location to do so.
- 4.11 **Error! Reference source not found.** outlines the proposed operation and maintenance regime for swales. This is adapted from The SuDS Manual (C753).

Table 2: Operation and maintenance requirements for swales

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Detention Basin

- 4.12 Detention basins are landscaped depressions that are normally dry except during and immediately following storm events. Detention basins will require ongoing regular maintenance to ensure continuing operation to design performance standards. Maintenance of detention basins is relatively straightforward for landscape contractors, and typically there should only be a small amount of extra work (if any) required for a SuDS detention basin over and above what is necessary for standard public open space.
- 4.13 Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.
- 4.14 The major maintenance requirement for detention basins is usually mowing. Regular mowing in and around detention basins is only required along maintenance access routes, amenity areas (eg footpaths), across any embankment and across the main storage area. The remaining areas can be managed as "meadow", unless additional management is required for landscape/amenity/recreational or aesthetic reasons.
- 4.15 Mowing should ideally retain grass lengths of 75-150 mm across the main "treatment" surface to assist in filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events.
- 4.16 Shorter lengths of grass may be required when recreational facilities form part of the basin, but in this case the basin will be dealing with exceedance flows only and not treatment.
- 4.17 Grass clippings should be disposed of off-site or outside the detention basin area to remove nutrients and pollutants.
- 4.18 Where a detention basin has a small permanent pool at the outlet, its submerged and emergent aquatic vegetation should be managed as for ponds or wetlands (refer to Section **Error! Reference source not found.**).
- 4.19 Very occasionally sediment will need to be removed (eg once deposits exceed 25 mm in depth). Sediments excavated from ponds or forebays that receive runoff from residential or standard road and roof areas should be safely disposed of in accordance with current waste management legislation. However, consultation should take place with the environmental regulator to confirm appropriate protocols. In the majority of cases on low-risk sites with source control and a Management Train, it will be acceptable to distribute the sediment on site, if there is an appropriate safe and acceptable location to do so.

Table 3: Operation and maintenance requirements for detention basin

Maintenance Schedule	Required action	Frequency
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass - for spillways and access routes	Monthly (during growing season), or as required
	Cut grass - meadow in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	As required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Re-level uneven surfaces and reinstate design levels	As required

Soakaway

- 4.20 The useful life and effective operation of an infiltration component is related to the frequency of maintenance and the risk of sediment being introduced into the system.
- 4.21 Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/ debris removal for large systems. If maintenance is not undertaken for long periods, deposits can become hard-packed and require considerable effort to remove.
- 4.22 Replacement of the aggregate or geocellular units will be necessary if the system becomes blocked with silt. Effective monitoring will give information on changes in infiltration rate and provide a warning of potential failure in the long term.
- 4.23 Roads and/or parking areas draining to infiltration components should be regularly swept to prevent silt being washed off the surface. This will minimise the need for maintenance.
- 4.24 Table 4 outlines the proposed operation and maintenance regime for soakaways. This is adapted from The SuDS Manual (C753).

Table 4: Operation and maintenance requirements for soakaway

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

5. SuDS Programme

- 5.1 The proposed SuDS for the site will come online approximately Summer 2023.
- 5.2 The contractor should ensure that during the construction phase (or in any other phasing associated with the site coming online) that SuDS are not damaged by construction works.
- 5.3 Prior to construction, the Contractor will ensure that consultation with the local sewerage undertakers and the relevant environmental agencies has been undertaken to ensure that all necessary permissions / discharge consents are obtained prior to works commencing.
- 5.4 A methodology for surface water management and groundwater protection during construction will be developed by the contractor and detailed in the Construction Environmental Management Plan (CEMP). At this stage it is expected that the CEMP will include provisions such as:
 - New temporary and /or permanent drainage ditches to prevent uncontrolled surface runoff of contaminated water.
 - Silt traps within drainage ditches to reduce the flow of suspended solids from site.
 - Suitable layout of the construction site and application of suitable management techniques to prevent runoff from stockpiles directly into watercourses/groundwater.
 - All fuel bowsers will be bunded to 110% of their capacity; all re-fuelling will be undertaken at a designated location on site and services of mobile plant will only be permitted on site in exceptional circumstances.

6. Operation and Maintenance Manual Records

Documents to be handed over

- 6.1 This document should be provided to the construction contractor, and Site Management Team for inclusion within the site's Operation and Maintenance Manual.
- 6.2 The client will have copies of the drainage design drawings which show locations of the proposed SuDS and any 'as-builts' provided by the contractor.

Maintenance Records

- 6.3 This report includes the standard Maintenance proforma based on best practice from CIRIA document C753 The SuDS Manual to enable the Site Management Team to record the outcomes of inspections.

APPENDIX A – SITE PLANS & DRAINAGE INFORMATION

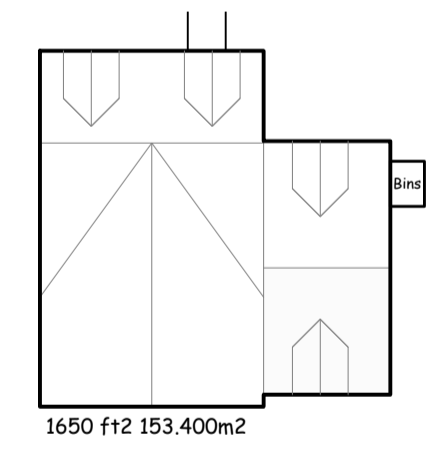
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A 602

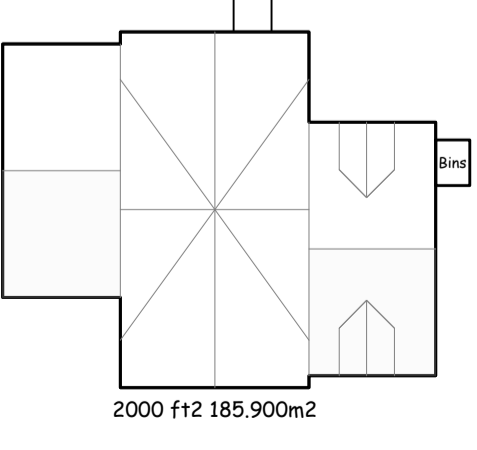


notes:
 any discrepancies should be reported immediately
 all dimensions should be checked on site prior to commencement of work
 site/survey based on ordnance survey information provided by prodact systems plc, (www.promap.co.uk) prodact does not guarantee that all past or current uses or features will be identified in the product
 the product does not give details about the actual state or condition of the site nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the site for any particular purpose, or relied upon for determining salability or value, or used as a substitute for any physical investigation or inspection.
 drawings to be read in accordance with the dwelling emission rate (der/ter) calculation. the building must be built 'as designed' meeting the criteria set for air permeability.
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note
 when printing off pdf's
 it is the responsibility of the user to verify that the resulting prints are to scale on the appropriate sized sheet.
 also that the scale bars on the plan measure correctly.



11 x 1650 Sq ft's
 6 x 2000 Sq ft's



1:2500	0	1	50m	100m	200m
1:1250	0	5m	10m	20m	40m
1:500	0	1m	2m	4m	8m
1:250	0	0.5m	1m	2m	4m

Site Plan 1:500 Scale

Aug	road width	DR
Aug	jump added / centre line rev	JMMP
Aug	all detached	K
Date	Description	Rev

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 Hertford, Herts SG14 1HH
 Tel: 01992 552173 Fax: 01992 587643
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 www.hertfordplanning.co.uk



Description	
Project	Courtlands Stevenage SG1 2JE
Drawing	Site Plan

Date	23/08/2021
Scale	1:500
Sheet size	A1
Drawn	mRn

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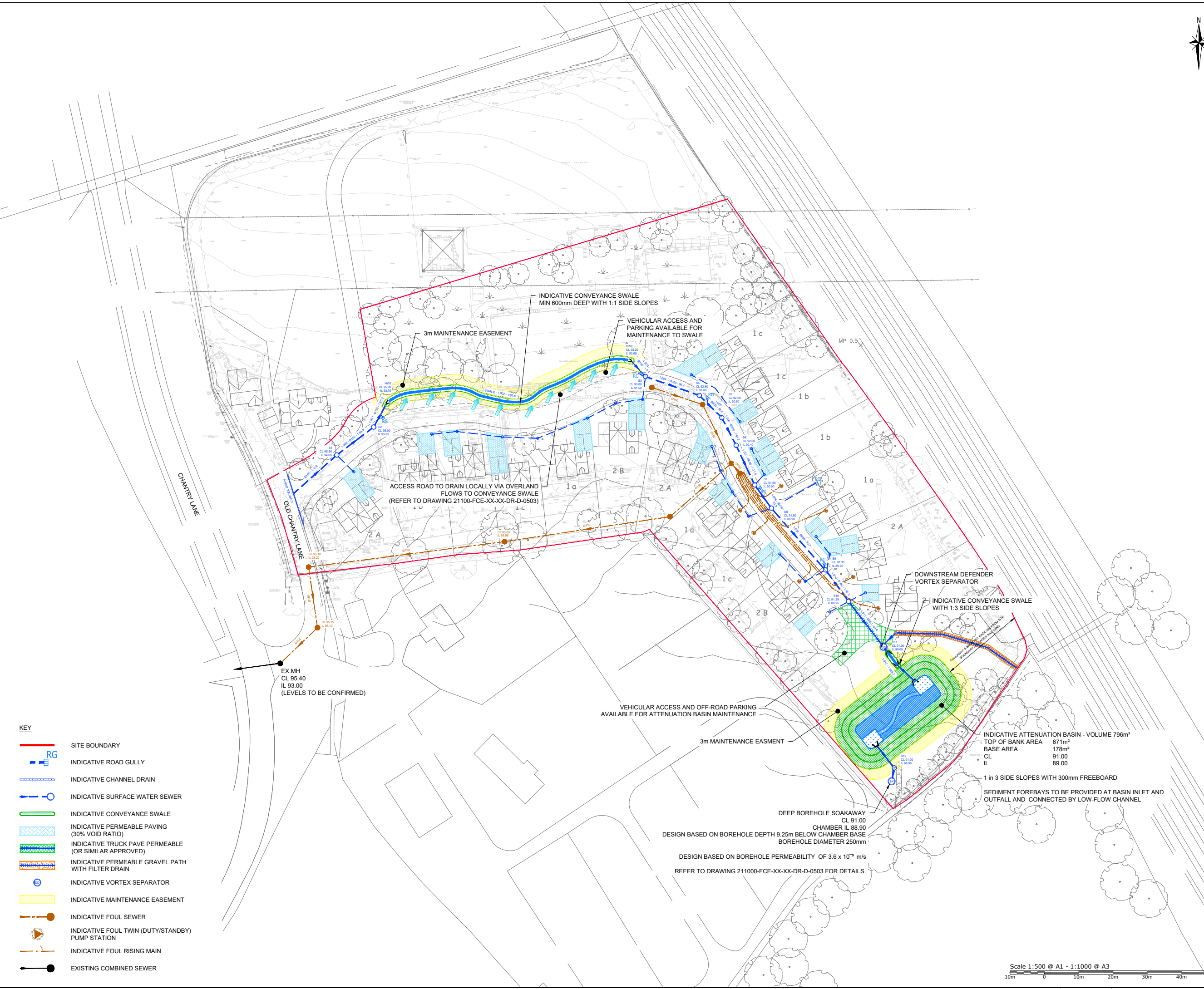


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 - DESIGN BASED ON TOPOGRAPHICAL SURVEY BY KEMPSTON SURVEYS LTD, DATED 23.03.2020.
 - DESIGN BASED ON "17 UNIT SCHEME" DRAWING REV Q, BY HERTFORD PLANNING SERVICE, DATED 20.08.2021.

CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

- WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
- WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
- HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
- THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.



- KEY**
- SITE BOUNDARY
 - INDICATIVE ROAD GULLY
 - INDICATIVE CHANNEL DRAIN
 - INDICATIVE SURFACE WATER SEWER
 - INDICATIVE CONVEYANCE SWALE
 - INDICATIVE PERMEABLE PAVING (30% VOID RATIO)
 - INDICATIVE TRUCK PAVE PERMEABLE (OR SIMILAR APPROVED)
 - INDICATIVE PERMEABLE GRAVEL PATH WITH FILTER DRAIN
 - INDICATIVE VORTEX SEPARATOR
 - INDICATIVE MAINTENANCE EASEMENT
 - INDICATIVE FOUL SEWER
 - INDICATIVE FOUL TWIN (DUTY/STANDBY) PUMP STATION
 - INDICATIVE FOUL RISING MAIN
 - EXISTING COMBINED SEWER

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P05	FOR INFORMATION	DR	CR	DR	12.04.24
P04	FOR INFORMATION - BASIN & SOAKAWAY REVISED	DR	CR	DR	13.06.23
P03	FOR INFORMATION	DR	CR	DR	06.06.23
P02	FOR INFORMATION	DR	CR	DR	18.10.22
P01.2	FOR COORDINATION	DR	CR	DR	07.10.22
P01.1	FOR INFORMATION	DR	CR	DR	31.08.21
P01.2	FOR COORDINATION	DR	CR	DR	25.08.21
P01.1	FOR COORDINATION	DR	CR	DR	23.08.21

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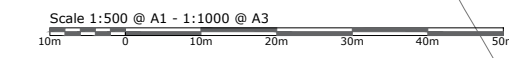
Client: **S J M & CO**

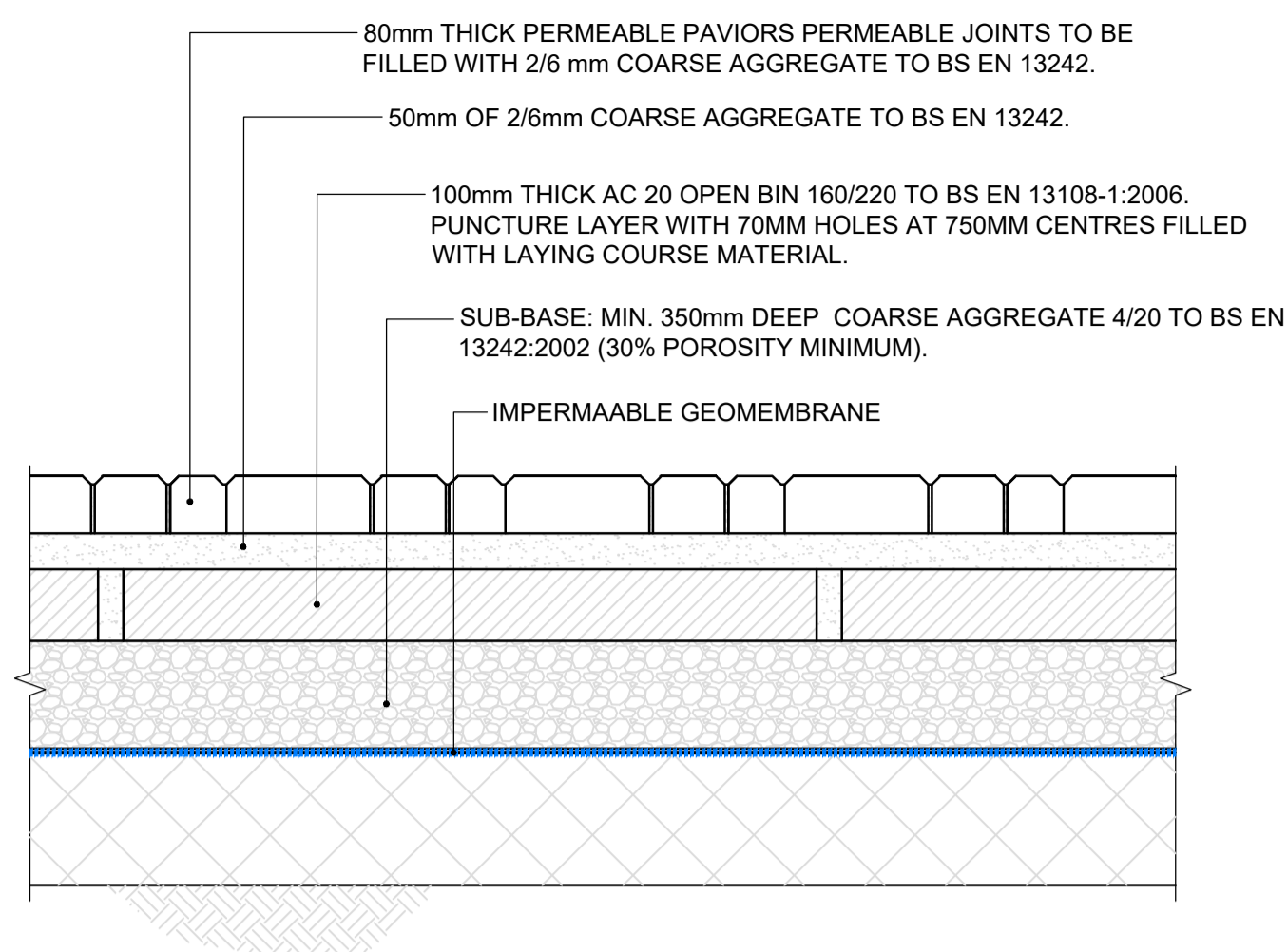
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Drawing Title: **PROPOSED DRAINAGE STRATEGY**

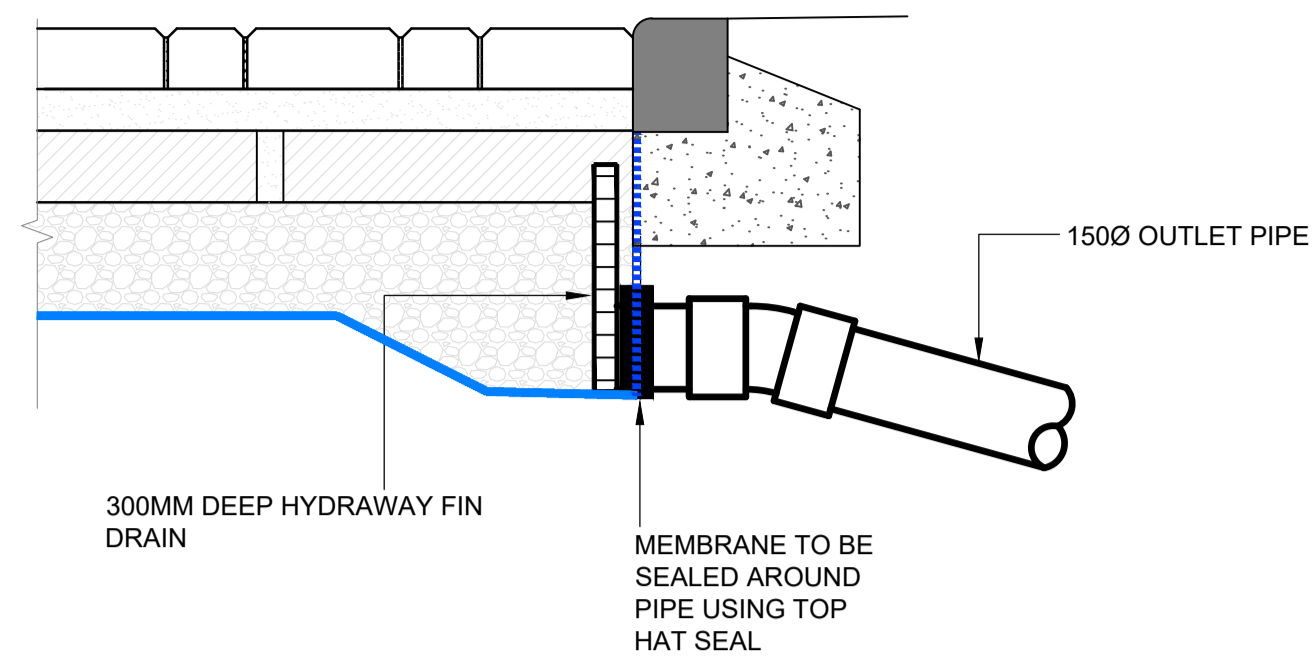
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Drawn by: DR	Checked by: CR	Approved by: DR

Drawing Number: **21100-FCE-XX-XX-DR-D-0500** Rev: **P05**

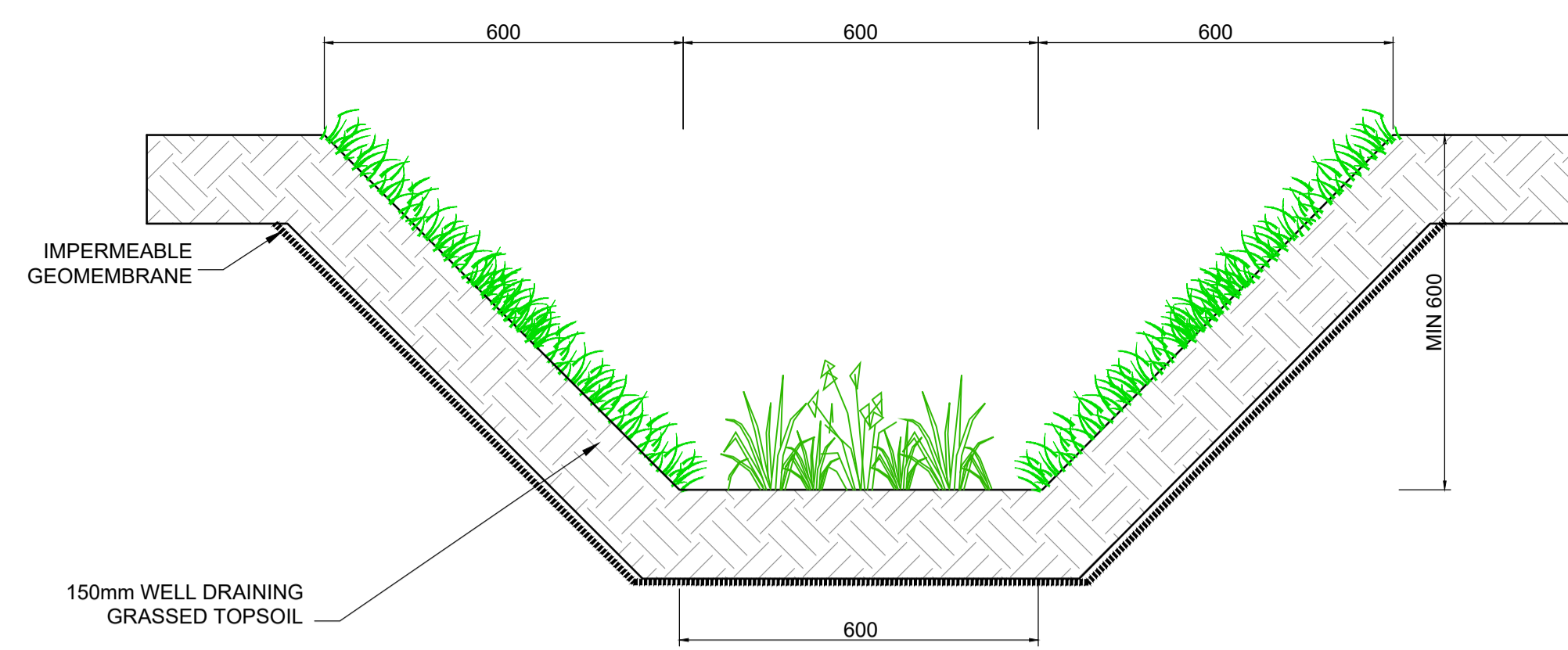




INDICATIVE LINED PERMEABLE PAVING (TYPE C) DETAIL
(SCALE 1:10)

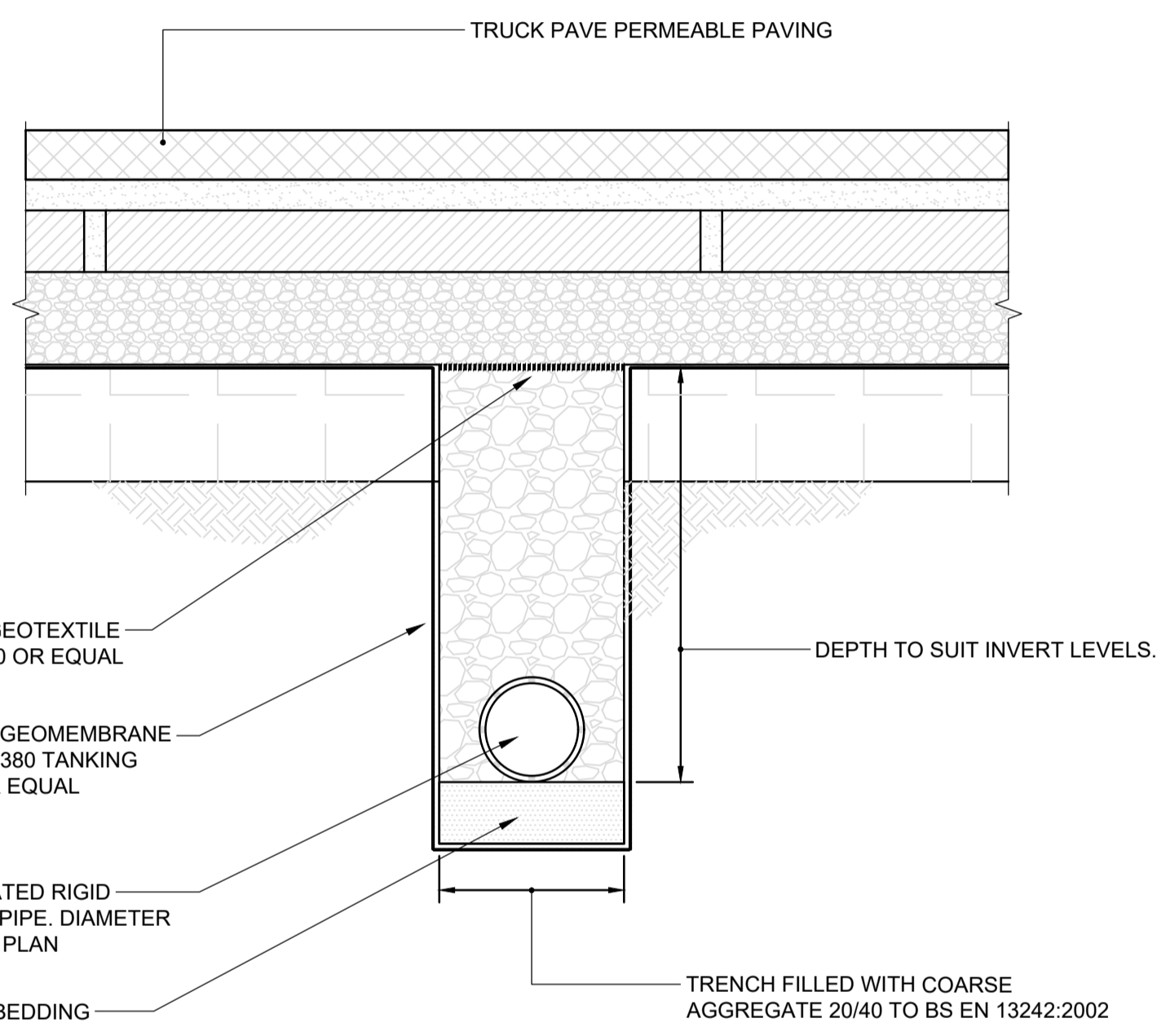


PERMEABLE PAVEMENT OUTLET PIPE DETAIL
(SCALE 1:10)

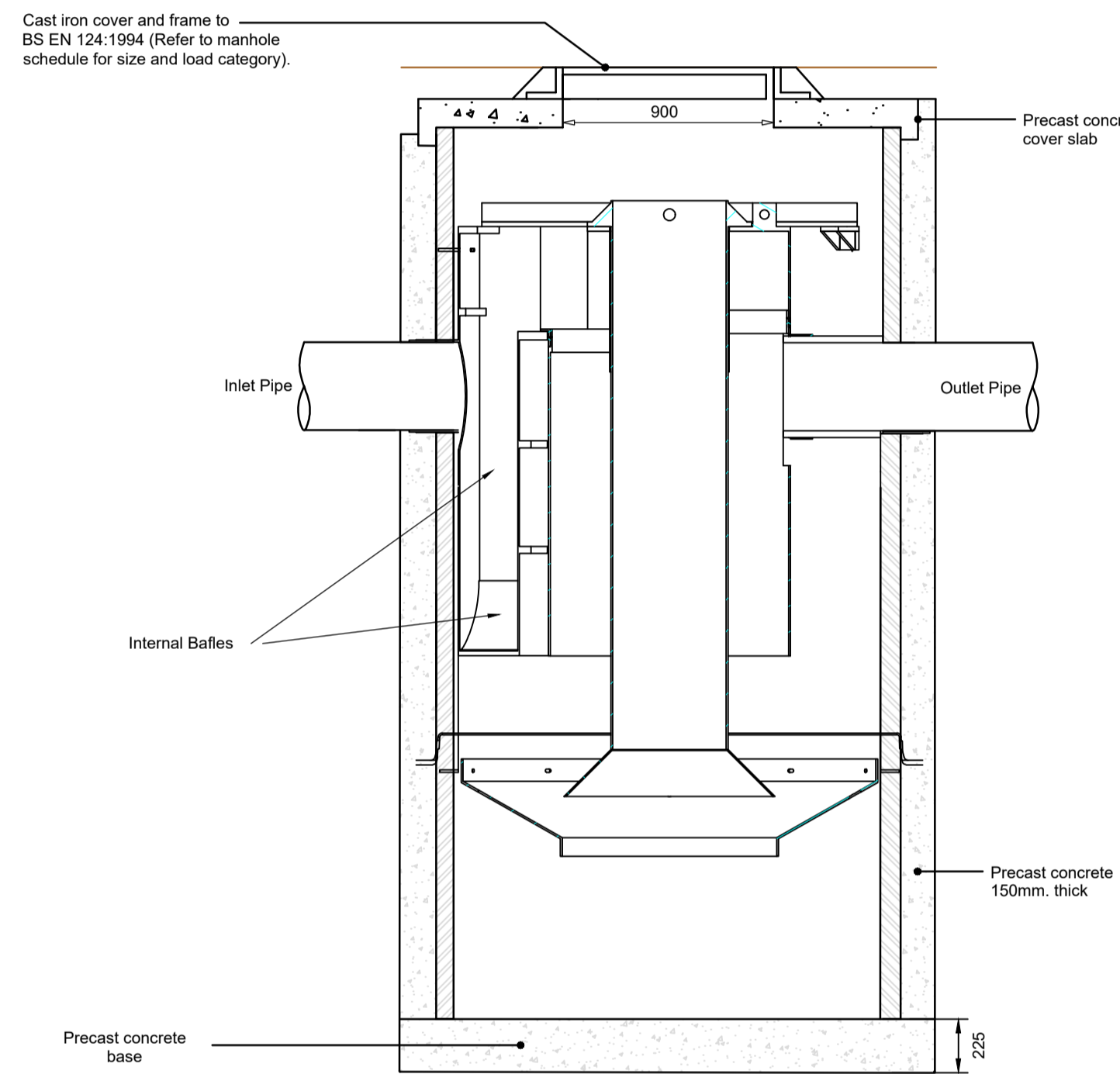


INDICATIVE CONVEYANCE SWALE
(SCALE 1:10)

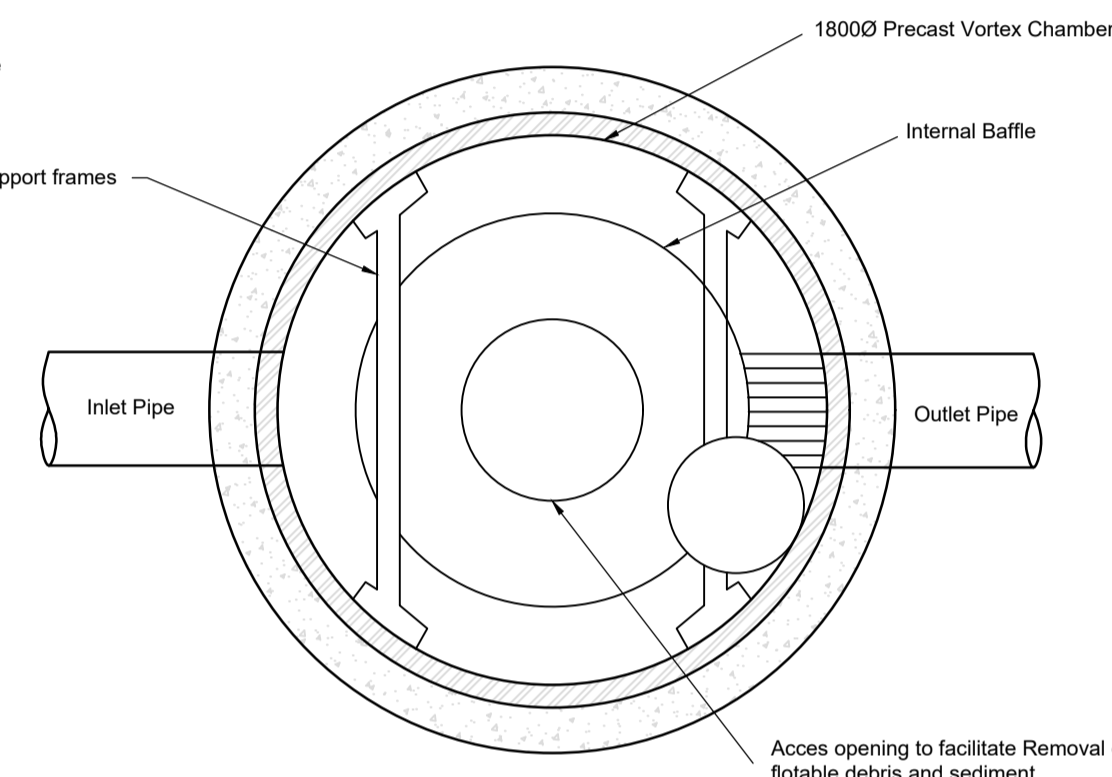
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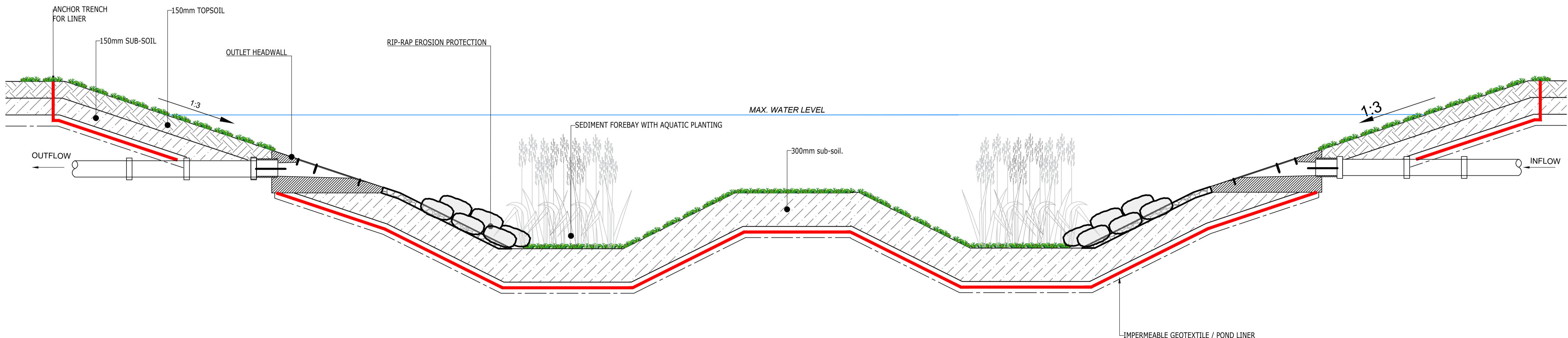
INDICATIVE TRUCKPAVE PERMEABLE PAVING WITH FILTER DRAIN
(SCALE 1:10)



DOWNSTREAM DEFENDER MANHOLE
(SCALE 1:25)



- SPECIFICATION REQUIREMENTS:**
1. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
 2. The treatment system shall remove 80% or greater of TSS at the WQF.
 3. The treatment system shall treat all flows up to PTFR without bypass or loss stored pollutants.
 4. The Max. Headloss shall not be exceeded at PTFR with max. inlet pipe diameter.
- DETAIL NOTES:**
1. A acceptable pipe coupler shall be used to connect the Downstream Defender's internal outlet stub to the storm drain.
 2. The diameter of the Downstream Defender's outlet stub is not adjustable. Any reducers required to match different storm drain diameter must occur outside of the vortex chamber.
 3. The inlet pipe diameter must not be larger than the outlet pipe diameter.
 4. The tangential inlet pipe angle is not site specific. Refer to manhole schedules drawing.



INDICATIVE ATTENUATION BASIN
(NOT TO SCALE)

FOR INFORMATION ONLY

PO2	FOR INFORMATION	DR	CR	DR	06.06.23
PO1	FOR INFORMATION	DR	CR	DR	18.10.22
Rev	Description	Drn	Chk	App	Date

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Client: **S J M & CO**

Project Title: **COURTLANDS RIDING CENTRE STEVENAGE, SG1 2JE**

Drawing Title: **DRAINAGE DETAILS - SHEET 1**

Scale at A1	Date	Designed by
AS NOTED	OCT 22	DR
Drawn by	Checked by	Approved by
DR	CR	DR

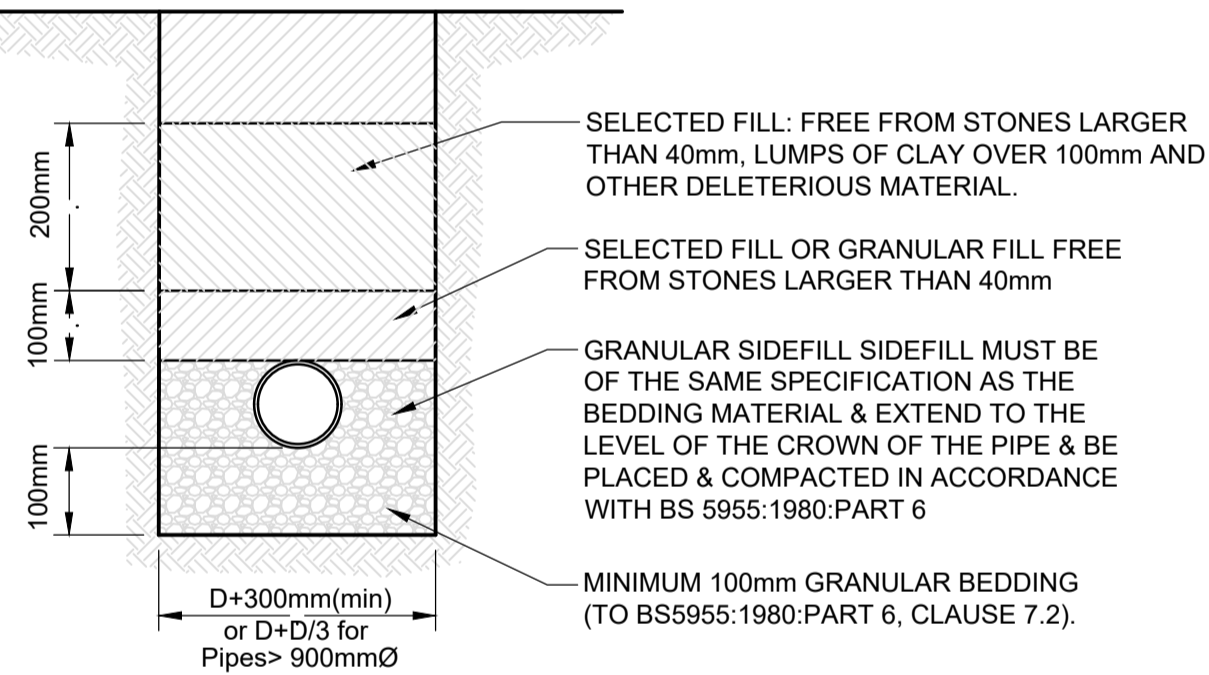
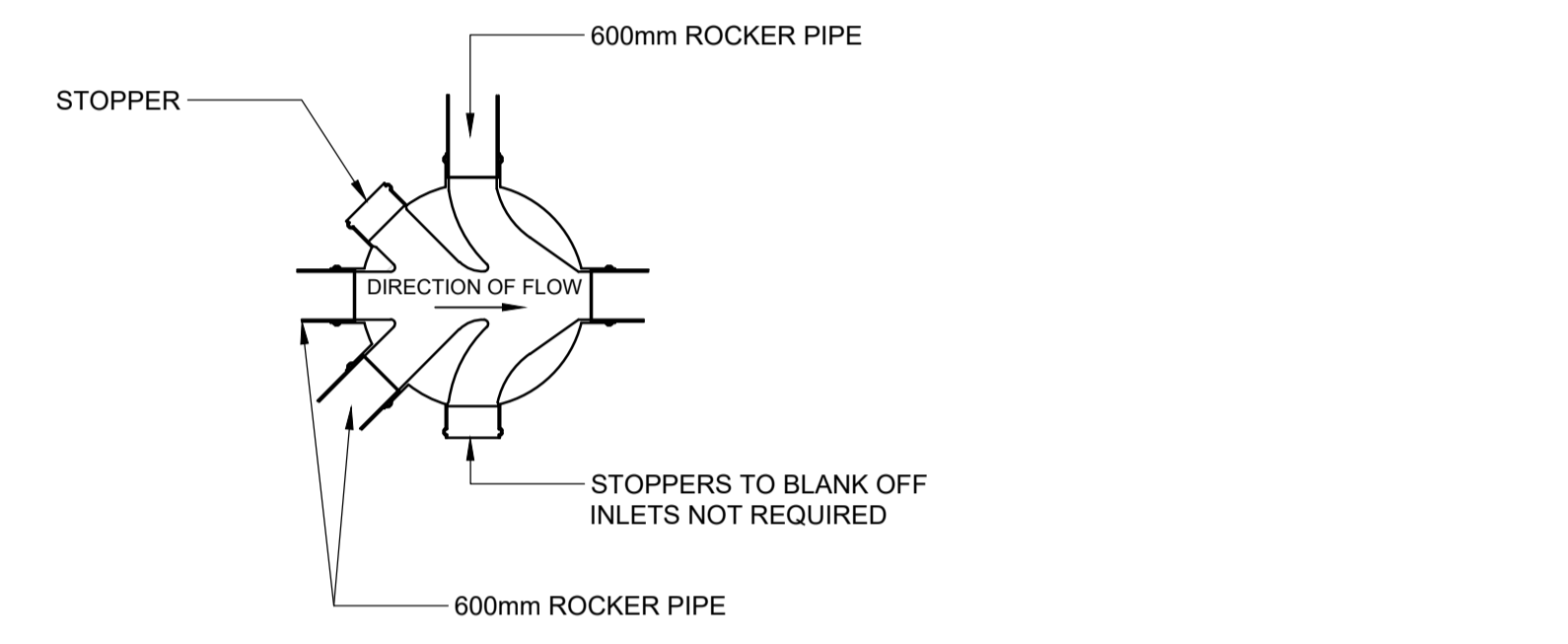
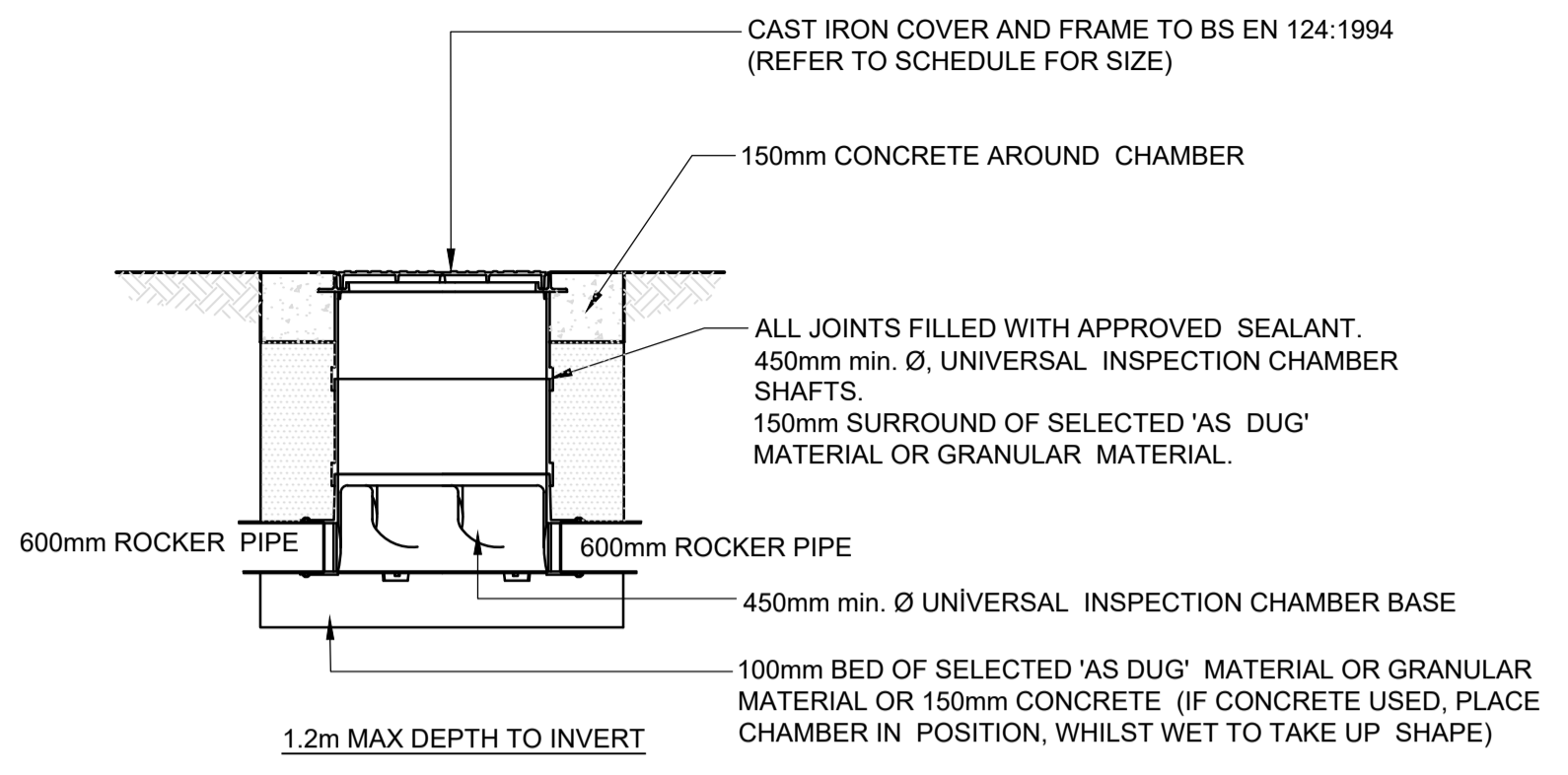
Drawing Number: **21100-FCE-XX-XX-DR-D-0501** Rev: **P02**

Type	Depth to invert from cover level (m)	Internal sizes		Cover sizes	
		Rectangular length and width	Circular diameter	Rectangular length and width	Circular diameter
Rodding Eye		As drain but min 100			Same size as pipework (1)
Access Fittings					
small	0.6 or less, except where situated in a chamber	150x100	150	150x100 (1)	Same size as access fitting
large		225x100	225	225x100 (1)	
Inspection Chamber					
Shallow	0.6 or less	225x100	190 (2)	-	190 (1)
Deep	1.2 or less	450x450	450	Min 430x430	430
	>1.2 but <3.0	450x450	450	max 300x300 (3)	Access restricted to max 350 (3)

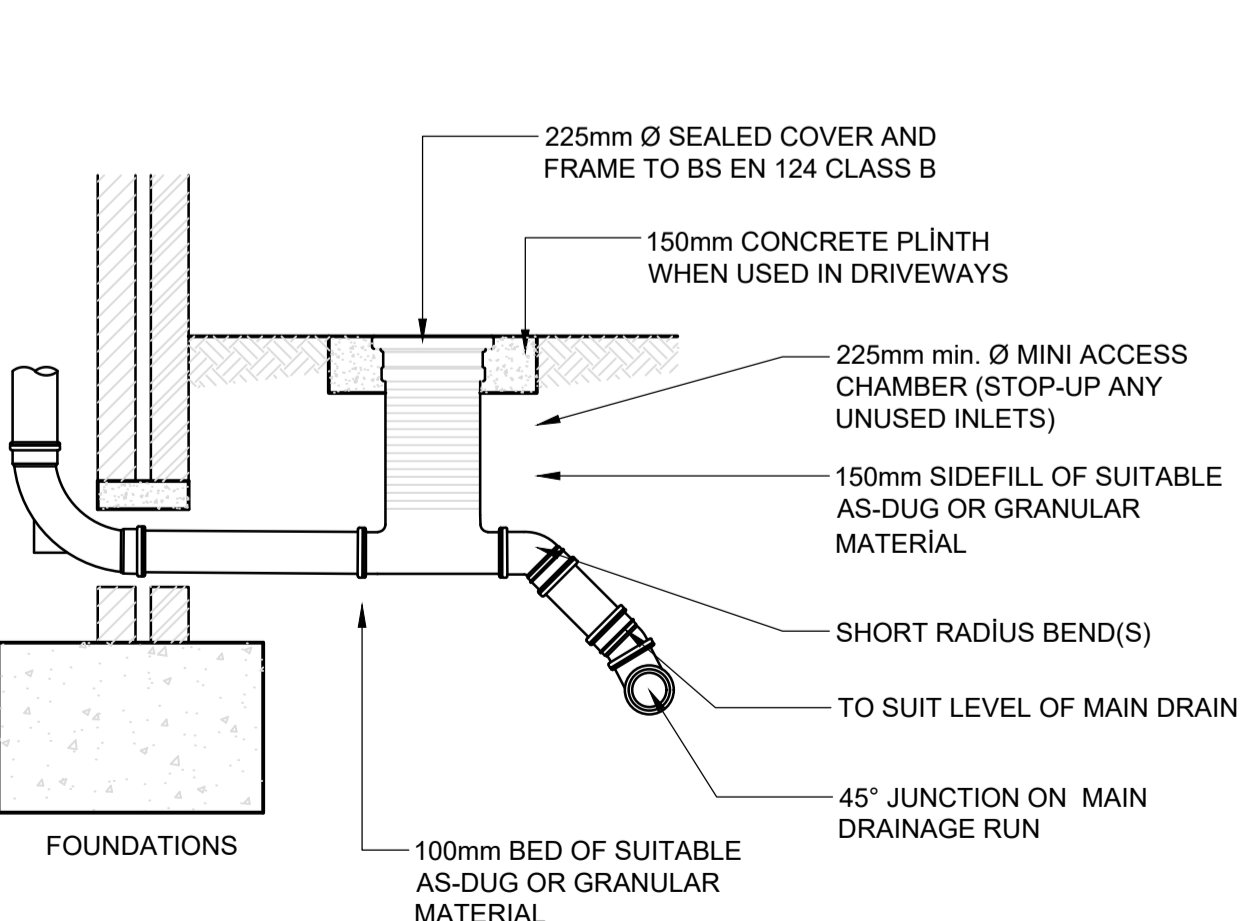
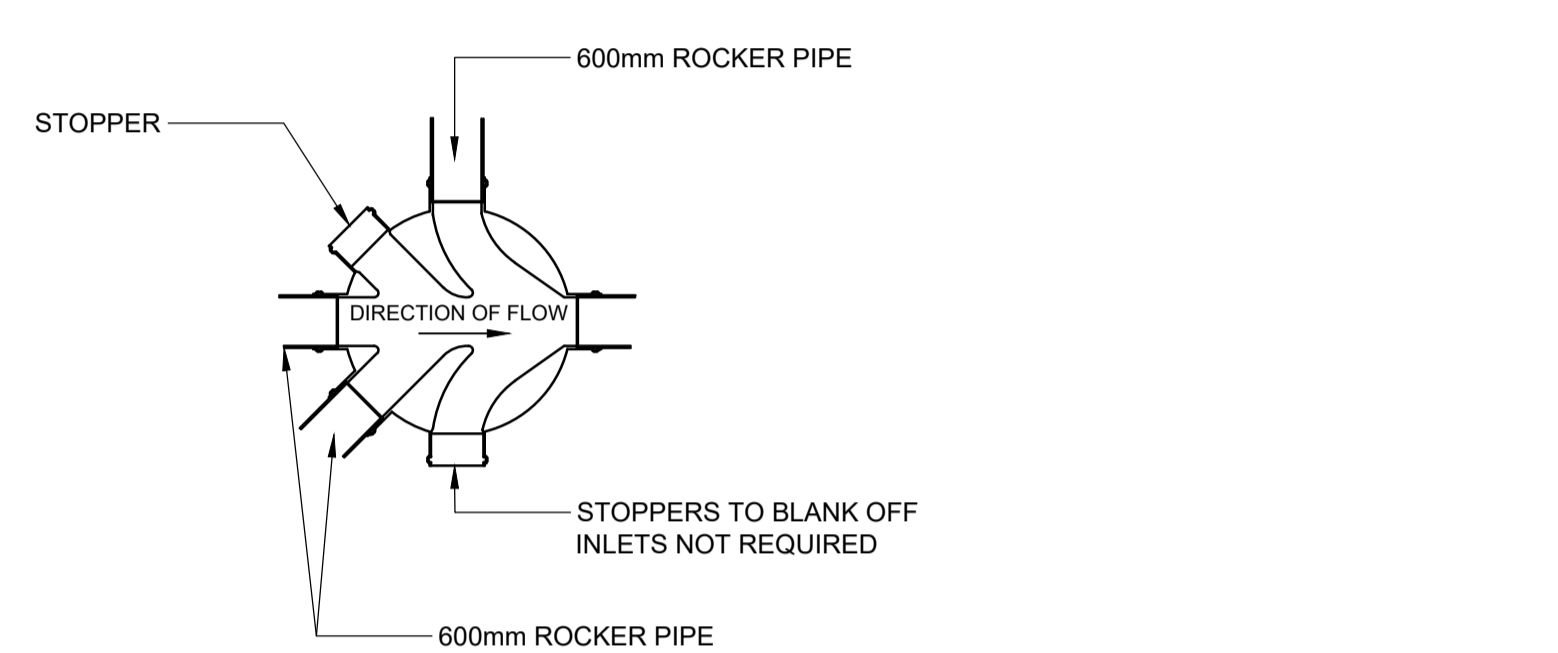
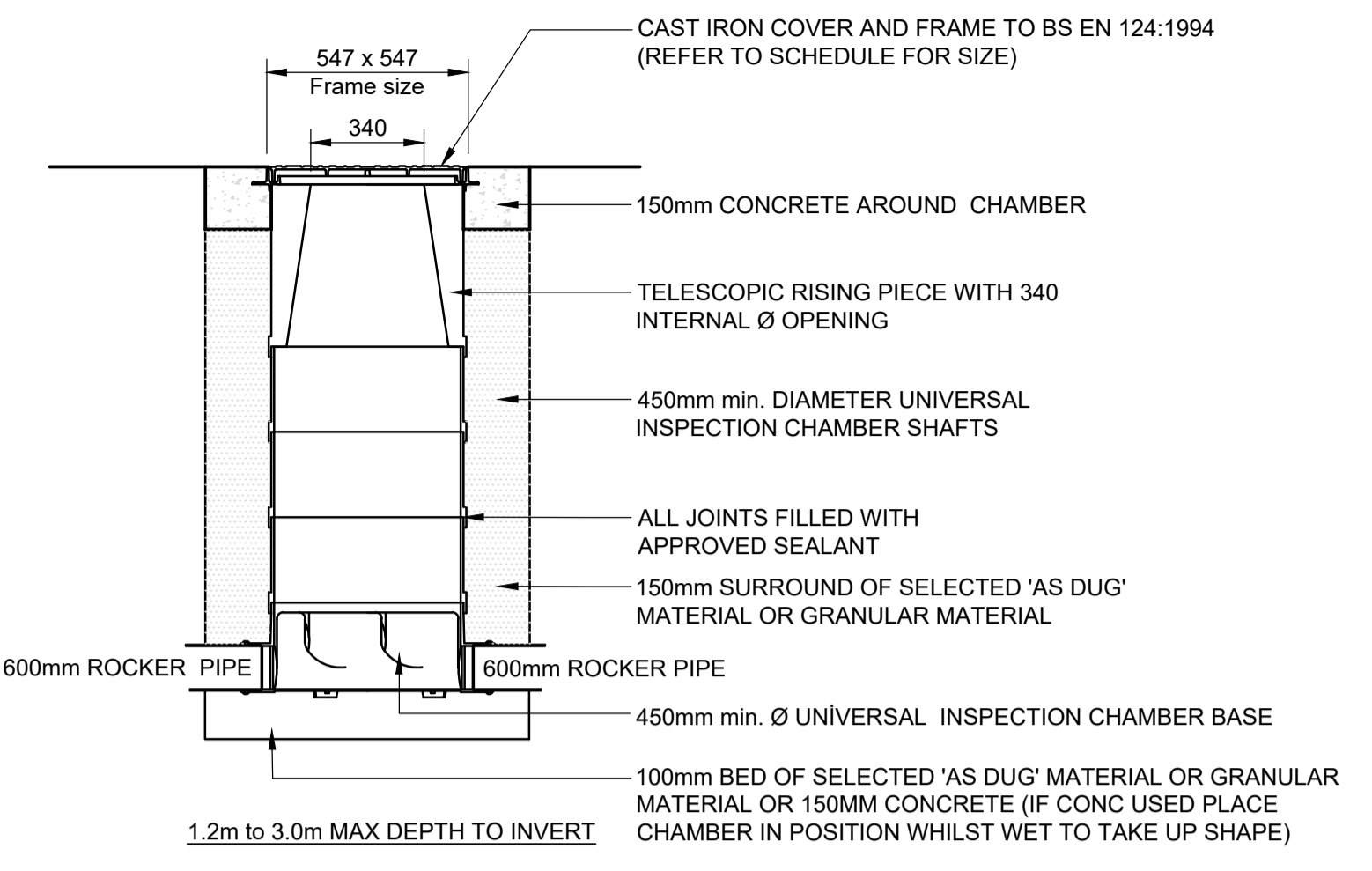
NOTES:
(1) THE CLEAR OPENING MAY BE REDUCED BY 20MM IN ORDER TO PROVIDE PROPER SUPPORT FOR THE COVER AND FRAME.
(2) DRAINS UP TO 150mm.
(3) A LARGER CLEAR OPENING MAY BE USED IN CONJUNCTION WITH A RESTRICTED ACCESS. THE SIZE IS RESTRICTED FOR HEALTH AND SAFETY REASONS TO DETER ENTRY.

Type	Size of largest pipe (DN)	Min. internal dimensions (1) Rectangular length and width	Circular diameter	Min. clear opening size (1) Rectangular length and width	Circular diameter
Manhole <1.5m deep to soffit	<= 150 225 300 >300	750 x 675 (7) 1200 x 675 1200 x 750 1800 x (DN+450)	1000 (7) 1200 1200 The larger of 1800 or (DN+450)	750 x 675 (2) 1200 x 675 (2)	na (3)
>1.5m deep to soffit	<= 225 300 375-450 >450	1200 x 1000 1200 x 1075 1350 x 1225 1800 x (DN+775)	1200 1200 1200 The larger of 1800 or (DN+775)	600 x 600	600
Manhole shaft (4)					
>3.0m deep to soffit of pipe	Steps (5) Ladder (5) Winch (6)	1050 x 800 1200 x 800 900 x 800	1050 1200 900	600 x 600 600 x 600 600 x 600	600 600 600

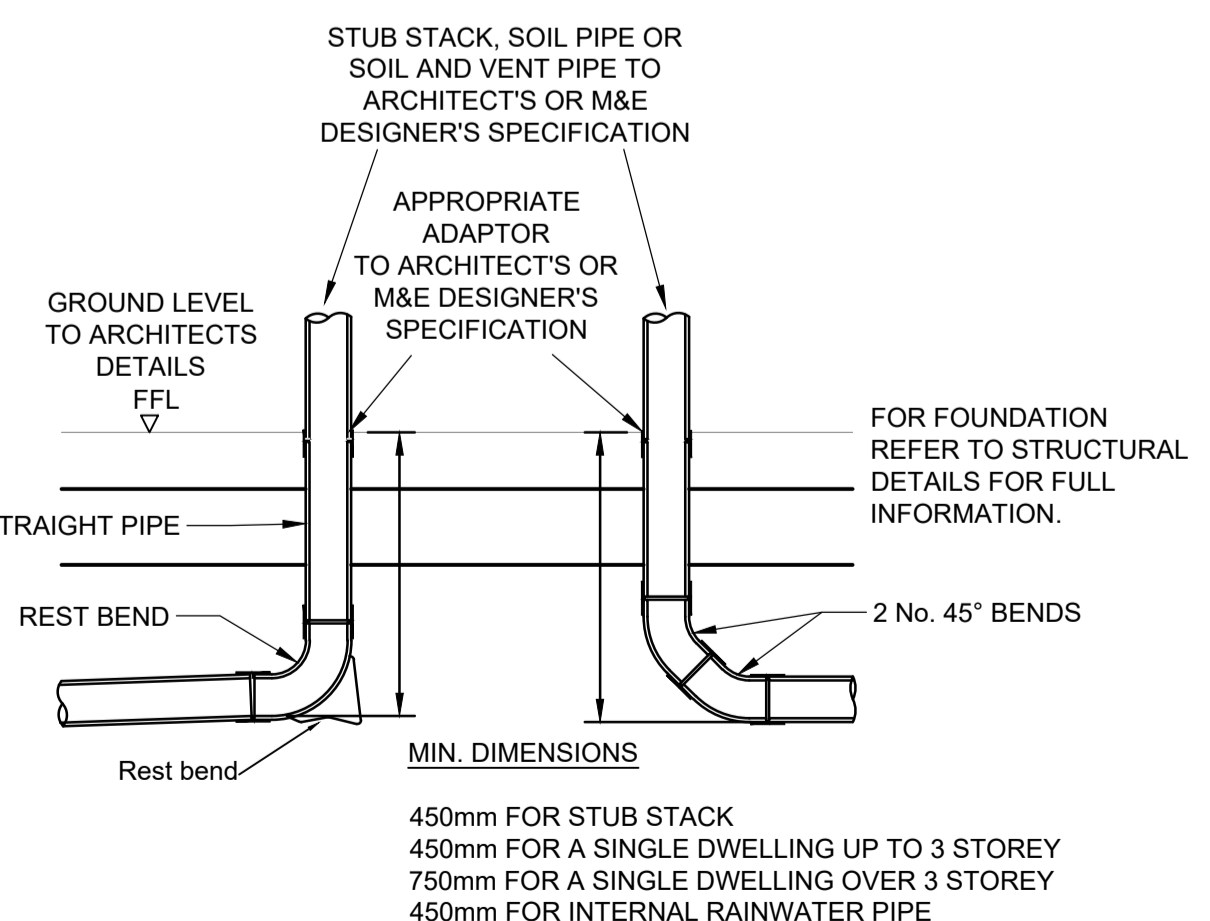
NOTES:
(1) LARGER SIZES MAY BE REQUIRED FOR MANHOLES ON BENDS OR WHERE THERE ARE JUNCTIONS.
(2) MAY BE REDUCED TO 600 BY 600 WHERE REQUIRED BY HIGHWAY LOADING CONSIDERATIONS, SUBJECT TO A SAFE SYSTEM OF WORK BEING SPECIFIED.
(3) NOT APPLICABLE DUE TO WORKING SPACE NEEDED.
(4) MINIMUM HEIGHT OF CHAMBER IN SHAFTED MANHOLE 2m FROM BENCHING TO UNDERSIDE OF REDUCING SLAB.
(5) MIN CLEAR SPACE BETWEEN LADDER OR STEPS AND THE OPPOSITE FACE OF THE SHAFT SHOULD BE APPROXIMATELY 900mm.
(6) WINCH ONLY - NO STEPS OF LADDERS, PERMANENT OR REMOVABLE.
(7) THE MINIMUM SIZE OF ANY MANHOLE SERVING A SEWER (I.E. ANY DRAIN SERVING MORE THAN ONE PROPERTY) SHOULD BE 1200x675mm RECTANGULAR OR 1200mm Ø.



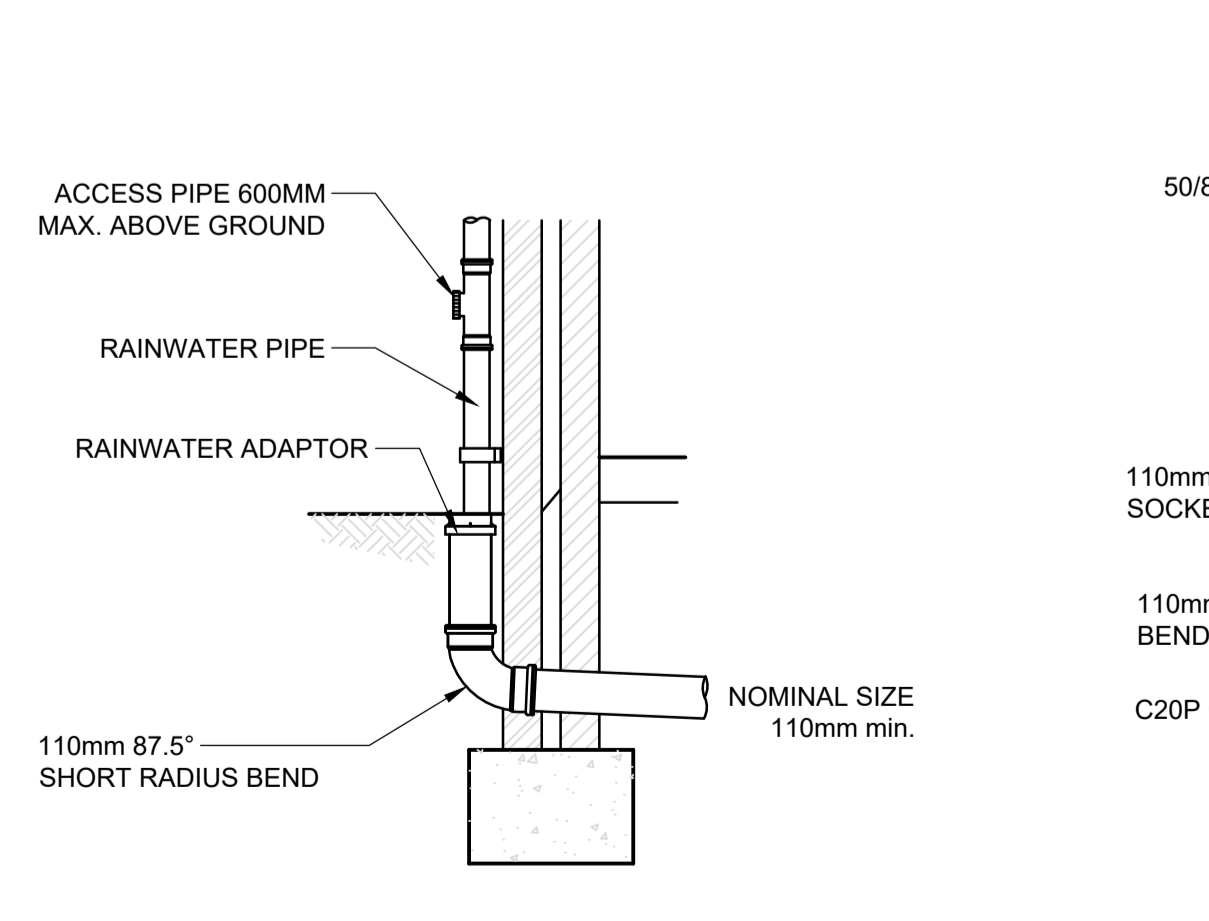
NOTE:
GRANULAR MATERIAL - GRANULAR MATERIAL SHOULD CONFORM TO BS EN 1610 ANNEX B TABLE B.15 AND SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5MM UP TO A MAXIMUM SIZE 10mm FOR 100mm PIPES, 14mm FOR 150mm PIPES, 20mm FOR PIPES FROM 150mm UP TO 600mm DIAMETER. COMPACTION FRACTION MAXIMUM 0.3 FOR CLASS N OR B AND 0.15 FOR CLASS F.



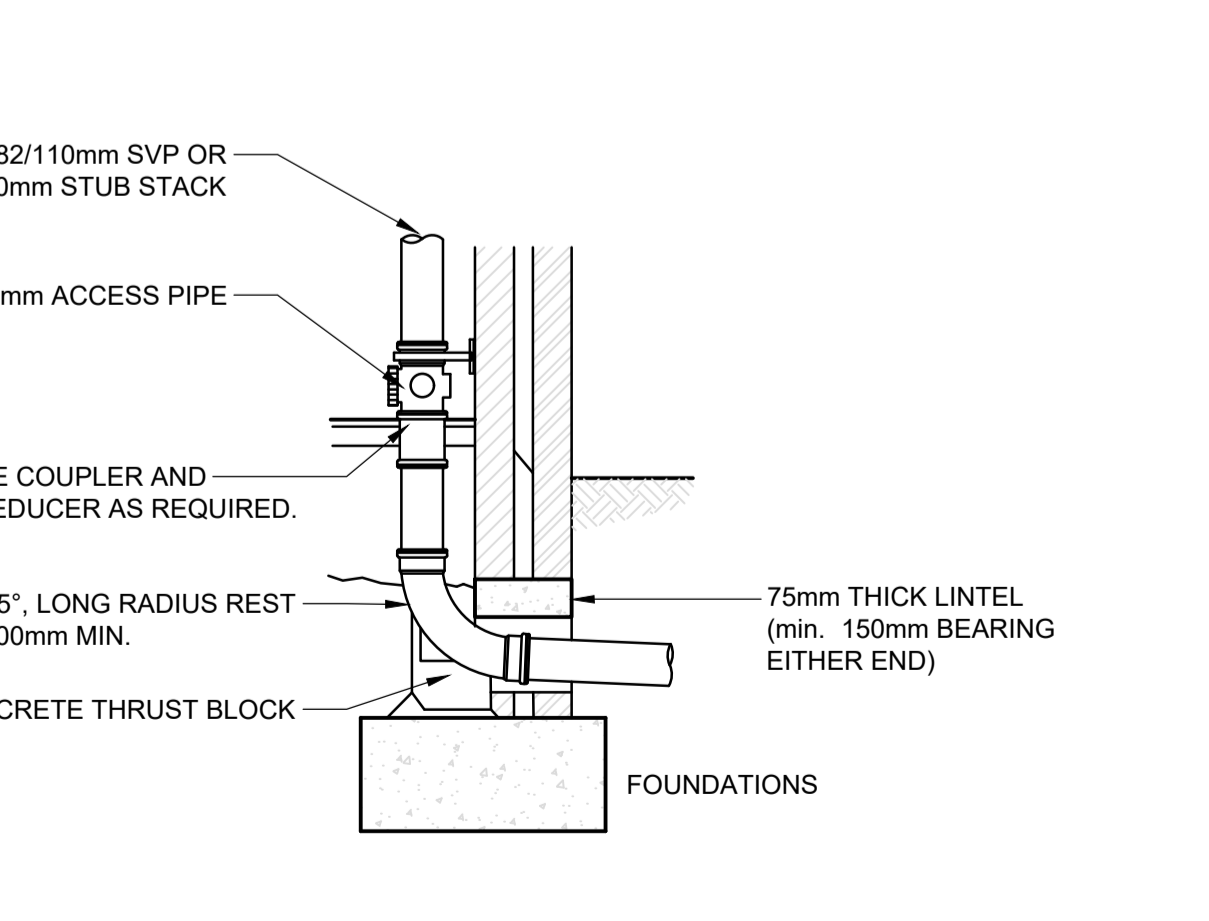
TYPICAL 250 Ø PPIC INSPECTION CHAMBER DETAIL
FOR USE IN SOFT AREAS & FOOTPATHS ONLY
SCALE 1:20



STUB STACK, SOIL VENT PIPE & INTERNAL RAINWATER PIPE DETAIL
SCALE 1:20



EXTERNAL RAINWATER PIPE TO DRAIN
SCALE 1:20

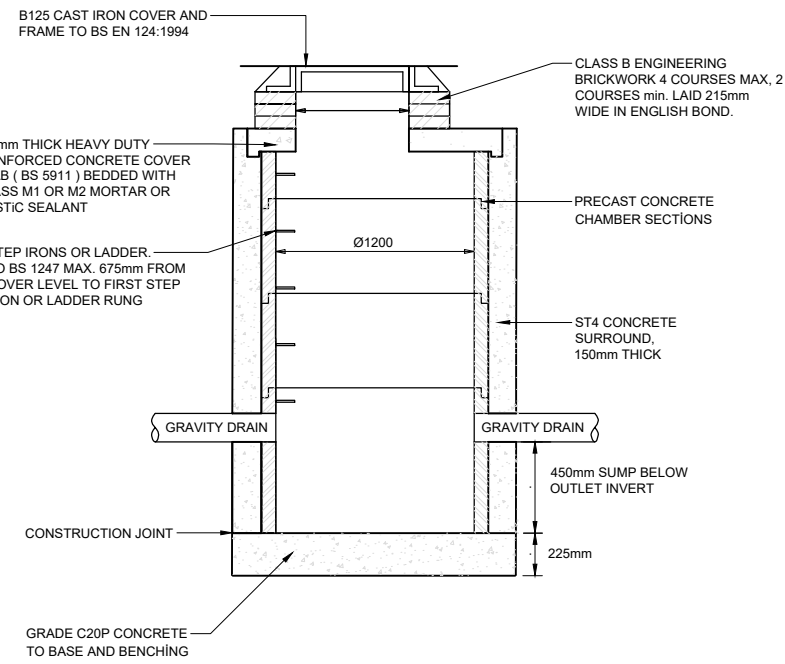


SOIL & VENT PIPE CONNECTION & STUB STACK CONNECTION
SCALE 1:20

- NOTES
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 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
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 - NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

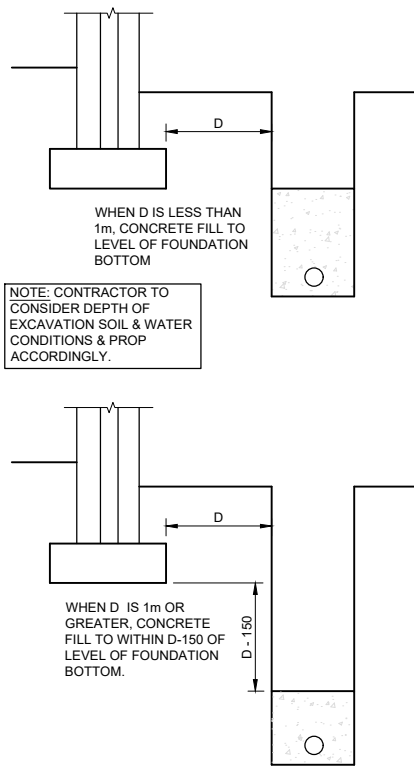
FOR INFORMATION ONLY

P01	FOR INFORMATION	DR	CR	DR	06.06.23
Rev	Description	Drn	Chk	App	Date
Fernbrook Consulting Engineers 40 Spouting Green Lane London EC1R 0NE info@fernbrook.co					
S J M & CO					
Project Title: COURTLANDS RIDING CENTRE STEVENAGE, SG1 2JE					
Drawing Title: DRAINAGE DETAILS - SHEET 2					
Scale at A1	Date	Designed by			
AS NOTED	JUN 23	DR			
Drawn by	Checked by	Approved by			
DR	CR	DR			
Drawing Number	21100-FCE-XX-DR-D-0502				Rev
					P01



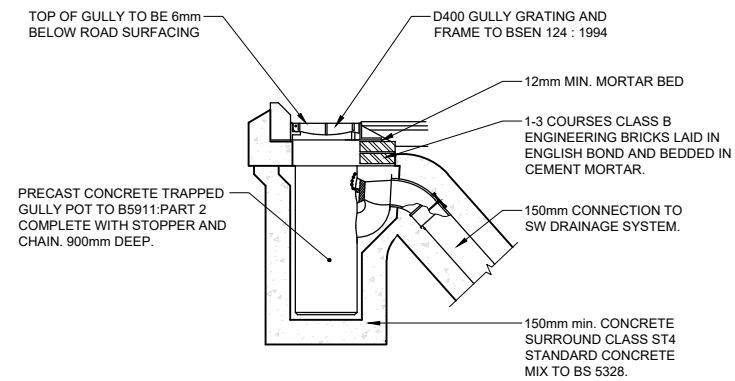
CATCHPIT MANHOLE

Scale 1:20



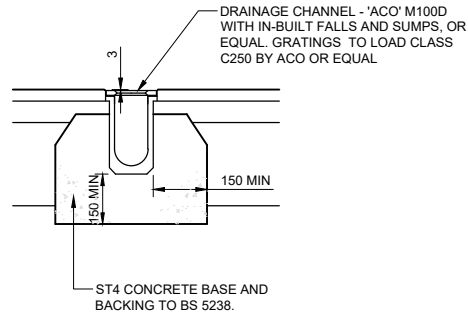
PIPES NEAR BUILDINGS

SCALE NTS



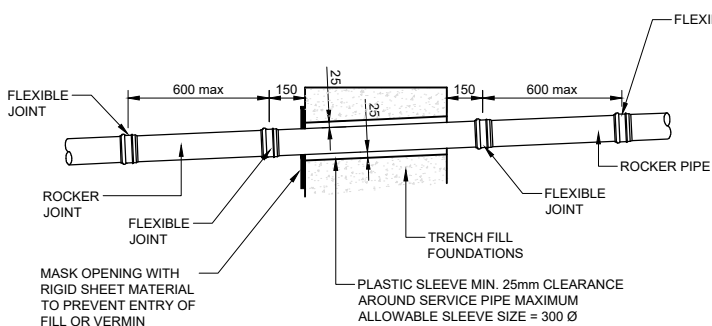
ROAD GULLY

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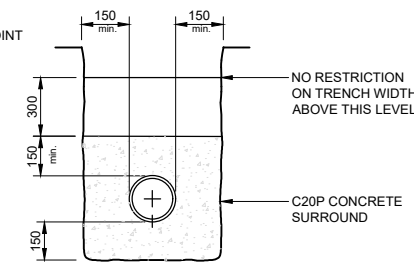
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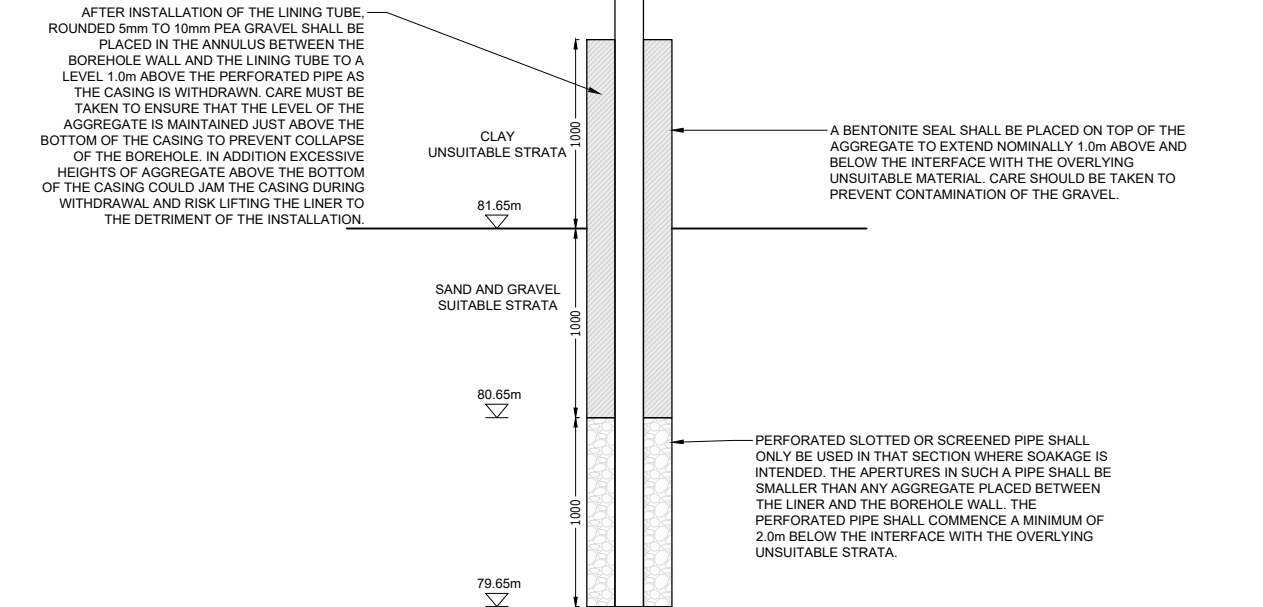
CONCRETE PROTECTION FOR PIPES

SCALE 1:20



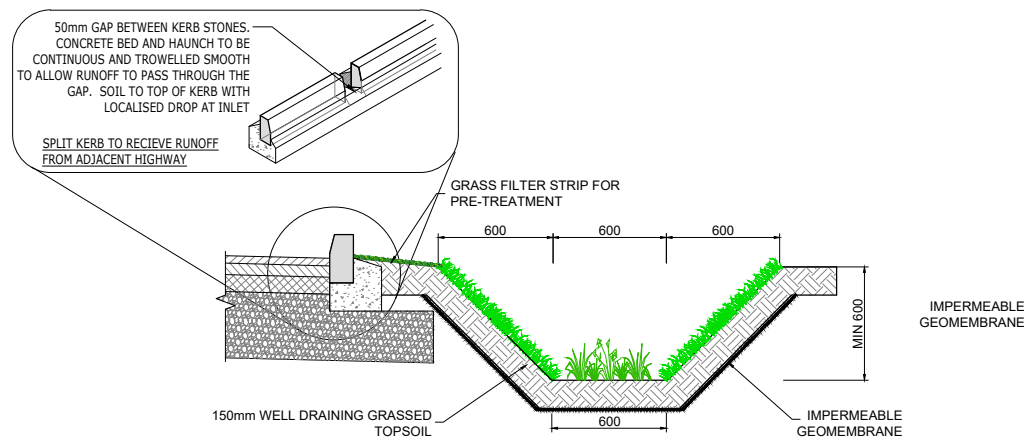
PIPE BEDDING (CLASS Z)

(FLEXIBLE JOINTS AT NOT GREATER THAN 8M CENTRES TO COINCIDE WITH OUTER FACE OF PIPE SOCKET)



TYPICAL BOREHOLE SOAKAWAY DETAIL

Scale 1:20



INDICATIVE CONVEYANCE SWALE ADJACENT TO HIGHWAY

SCALE 1:10

NOTES

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2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

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P01	FOR INFORMATION	DR	CR	DR	06.06.23
Rev	Description	Drn	Chk	App	Date



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40 Sealing Green Lane
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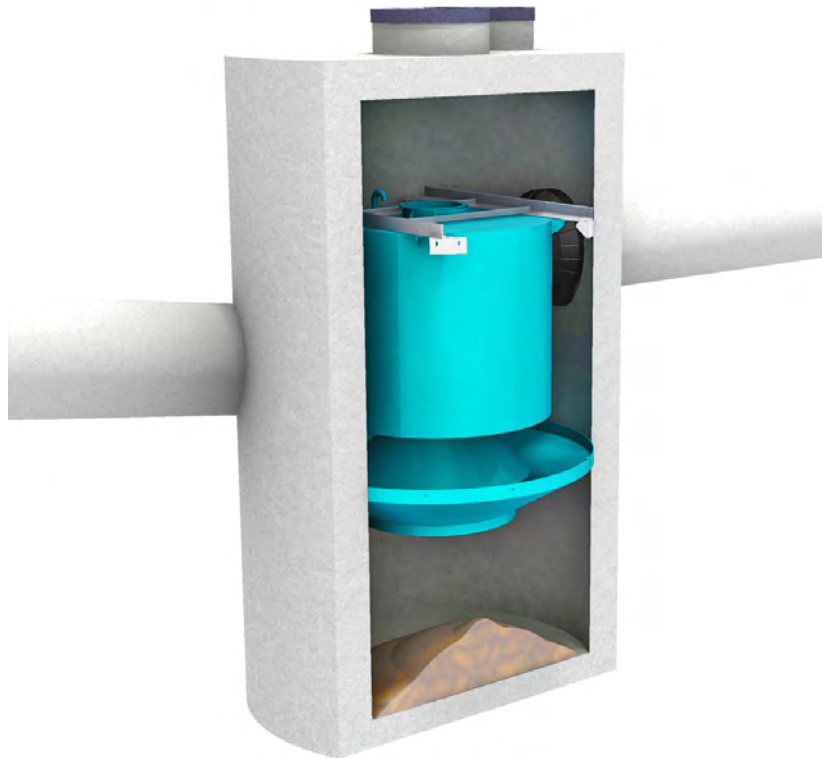
Client
S J M & CO

Project Title:
**COURTLANDS RIDING CENTRE
STEVENAGE, SG1 2JE**

Drawing Title:
DRAINAGE DETAILS - SHEET 3

Scale at A1	Date	Designed by
AS NOTED	JUN 23	DR
Drawn by	Checked by	Approved by
DR	CR	DR

Drawing Number
21100-FCE-XX-DR-D-0503



Operation and Maintenance Manual

Downstream Defender[®]

Vortex Separator for Stormwater Treatment

Turning Water Around ...[®]

Table of Contents

3	Downstream Defender® by Hydro International
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9	Downstream Defender® Inspection and Maintenance Log

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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

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®

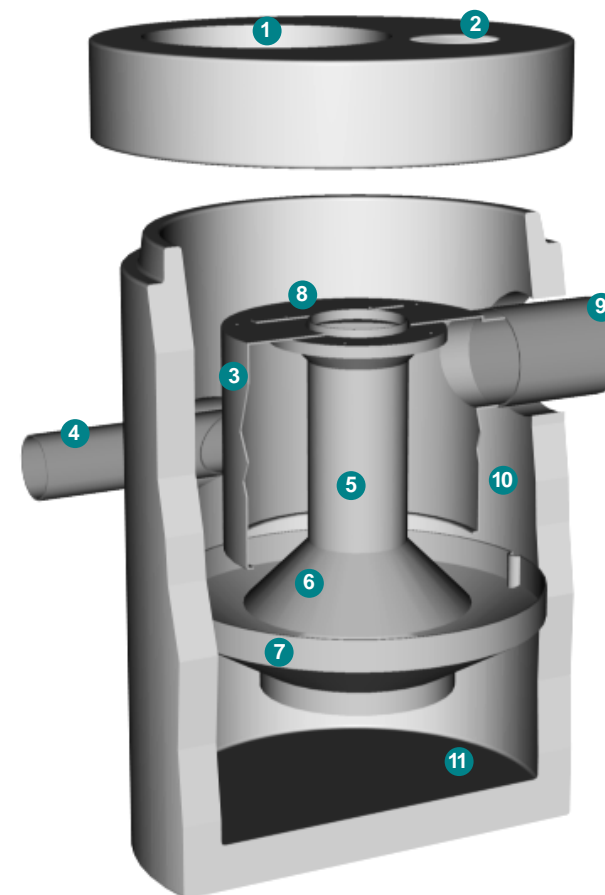
- Removes sediment, floatables, oil and greas
- No pollutant washouts
- Small footprint
- No loss of treatment capacity between clean-outs
- Low headloss
- Efficient over a wide range of flow rates
- Easy to install
- Low maintenance

Applications

- New developments and retrofit
- 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 vacor 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)



Better Tools, Better Results

Not all vacor 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 filter
- Stormwater separators
- Baffle box
- Biofilters/biorention system
- 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.

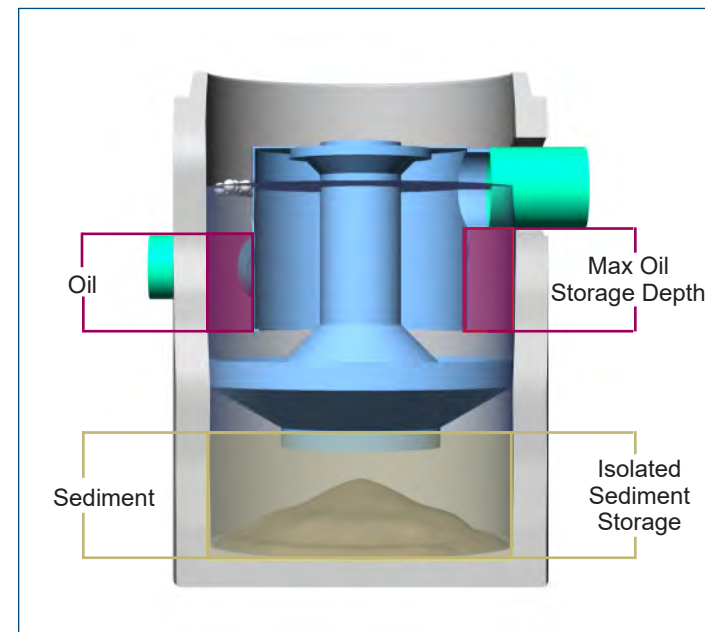


Fig.1 Pollutant storage volumes of the Downstream Defender®.

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

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.



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

Recommended Equipment

- Safety Equipment (traffic cones, et)
- 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 floatable 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.

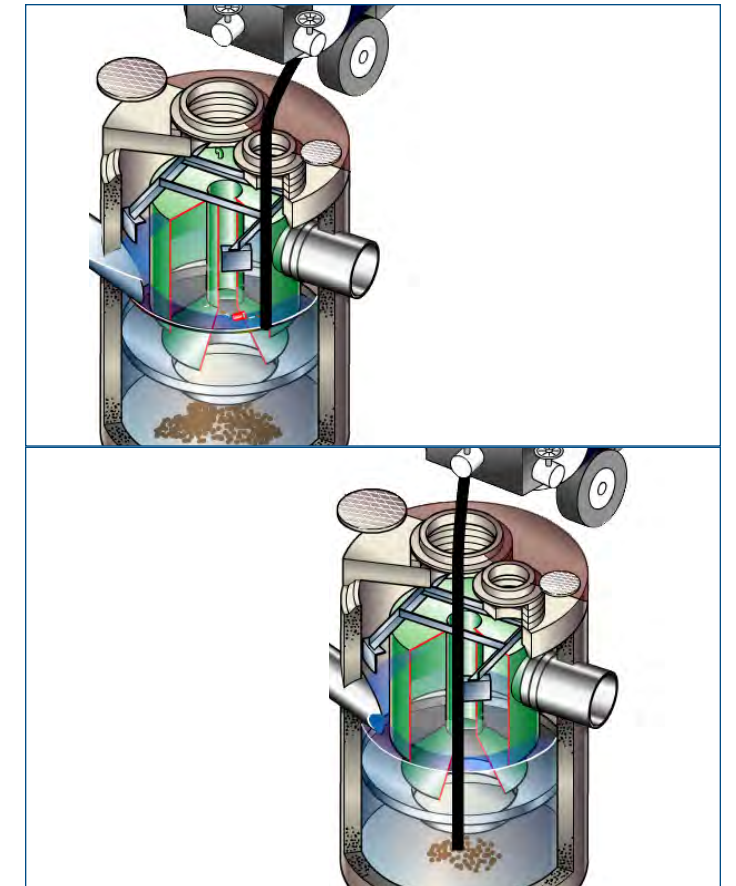


Fig. 9 Floatables and sediment are removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installatio - Every 6 months after the first year of installatio
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 require

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Portland, ME 04102

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Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

APPENDIX B – MAINTENANCE INSPECTION CHECKLIST

Sustainable Drainage System Maintenance Inspection Checklist



General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date

	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
--	---------	-----	-----------------	----------------	---------	-----	-----------------	----------------

General inspection items

Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

Silt/sediment accumulation

Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								

System blockages and litter build-up

Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								

Vegetation

Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								

Infrastructure

Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								

Other observations

Information appended (eg photos)								
----------------------------------	--	--	--	--	--	--	--	--

Suitability of current maintenance regime

Continue as current Increase maintenance Decrease maintenance								
---	--	--	--	--	--	--	--	--

Next inspection

Proposed date for next inspection								
-----------------------------------	--	--	--	--	--	--	--	--