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SuDS MAINTENANCE GUIDE

OWNERS MANUAL

Scheme name: 17 Branch Hill
Document reference ICS-2236.13.001

FOREWORD

This guidance provides best practice guidance on the maintenance of Sustainable Drainage Systems (SuDS) to facilitate their effective implementation within the project 17 Branch Hill

REFERENCES

Ciria documents C697 and C753

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SUDS TECHNIQUES USED ON THIS SCHEME:

- Geocellular/Modular Systems

INTRODUCTION

Unlike conventional drainage systems, SuDS features are visible and their function should be easily understood by those responsible for maintenance. When problems occur, they are generally obvious and can be remedied simply, using standard landscaping practice. If systems are properly monitored and maintained, any deterioration in performance can often be managed out.

Like any drainage system maintenance is a necessary and important consideration of SuDS design and sufficient thought should be given to long-term maintenance and its funding during feasibility and planning stages. In particular, the following requirements should be given full consideration:

OWNER'S MANUAL

SuDS are different from conventional drainage and require different maintenance regimes. This manual details the following:

- location of all SuDS techniques in a site
- brief summary of how the techniques work, their purpose and how they can be damaged
- maintenance requirements (a maintenance plan) and a maintenance record
- explanation of the consequences of not carrying out the maintenance that is specified
- identification of areas where certain activities are prohibited (for example stockpiling materials on pervious surfaces)
- an action plan for dealing with accidental spillages
- advice on what to do if alterations are to be made to a development, if service companies undertake excavations or other similar works carried out that could affect the SuDS.

LOCATION OF SuDS TECHNIQUES USED ON THE PROJECT

The location of the SuDS features are shown on drawing HRW drawing 1281-DR-050 & 1281-DR-052 attached at the back of this document.

SUMMARY OF HOW THE TECHNIQUES WORK FOR THE SCHEME

Cellular storage – The cellular storage collect runoff from the roof areas and paved areas and stores the water until it is released at a pre-determined rate using a flow control device as a restricted discharge. Roof runoff is discharged via a piped system into tanked cellular 'crates'. These crates are wrapped in a membrane to contain the water. The storage is sized to accommodate a peak storm event for a 1 in 100 year storm with an additional allowance of 40% for climate change. The piped drainage system will have silt traps to intercept suspended solids.

The tank has a permanently wet portion that is utilised for rain water harvesting

MAINTENANCE REQUIREMENTS

These are detailed in the appropriate section of this document.

AREAS WHERE ACTIVITIES ARE PROHIBITED

Heavy loads should not be allowed in areas where cellular storage are located. Failure to do so may cause structural damage and collapse of the cellular limits.

Permeable paving – No stock piling of materials should take place on areas of permeable paving as this will cause the surface to block and prevent the through flow of rainwater.

ACCIDENTAL SPILLAGES

Health and safety consideration are a priority and addressing accidental spillages should only be attempted if the nature of the spillage is known and its potential hazardous properties understood. The source of the spillage should be stopped and excess surface spillage removed by suction tank or absorption matts. Silt traps and sumps should be emptied by suction tanker. Areas of affected permeable paving should have the surface and laying course removed. The surfacing blocks

should be cleaned and relaid on new bedding material. Heavy pollution of the sub-base will require removal and replacement of the sub-base.

ALTERATIONS

If any alterations are proposed to the development, the design Engineer must be notified so that the impact/implications of the work can be assessed. Utilities should be restricted in the designated service zone areas.

OPERATION AND MAINTENANCE ACTIVITY CATEGORIES

There are likely to be three categories of maintenance activities:

1. **Regular maintenance** (including inspections and monitoring).
2. **Occasional maintenance.**
3. **Remedial maintenance.**

Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks (eg sediment removal or filter replacement). Table 1.1 summarises the likely maintenance activities required for each SuDS component and guidance on specific maintenance activities is given in the following sections.

Remedial maintenance describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design, construction and regular maintenance activities. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and so timings are difficult to predict. Remedial maintenance can comprise activities such as:

- inlet/outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter fabrics
- construction stage sediment removal (although this activity should have been undertaken before the start of the maintenance contract)
- system rehabilitation immediately following a pollution event.

It is important to note that these remedial activities will not be required for all systems, but for the purpose of estimating whole life maintenance costs, a contingency sum of 15-20% should be added to the annual regular and occasional maintenance costs to cover the risk of these activities being required.

Table 1.1 Typical key SuDS components operation and maintenance activities
For full specifications, see individual chapters.

O & M activity	SuDS component															
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter trench	Modular storage	Pervious pavement	Green roofs	Filter strip	Sand filter	Pre-treatment systems	Perforated ring soakaways	Bio retention areas	Rain gardens
Regular maintenance																
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	□	■	□	□		■	
Weed/invasive plant control	□	□	□	□		□	□		□	□	□	□	□		□	■
Shrub management	□	□	□	□					□	□	□		□		□	■
Shoreline vegetation management	■	■	□										□			
Aquatic vegetation management	■	■	□										□			
Occasional maintenance																
Sediment management (*)	■	■	■	■	■	■	■	■	■	□	■	■	■		■	■
Vegetation/plant replacement	□	□	□	□						□	□		□		□	□
Vacumn sweeping and brushing																
Remedial maintenance																
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□				□	□		□	□	□

■ Will be required

□ May be required

* Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

The maintenance regime of a site also needs to consider the response to extreme pollution events. A response action plan should be developed and communicated to all those involved in the operation of a site, so that if a spillage occurs it can be prevented from causing pollution to receiving waters.

1.9 HEALTH AND SAFETY

To comply with the Construction (Design and Management) Regulations (DETR, 1994) (see Section 2.5.10 of CIRIA C697), the designer has assessed all foreseeable risks during construction and maintenance and the risks minimised by the following (in order of preference):

1. ☐ **Avoid.**
2. ☐ **Reduce.**
3. ☐ **Identify and mitigate residual risks.**

1.10 REGULAR MAINTENANCE ACTIVITIES

1.10.1 Inspections and reporting

Regular SuDS scheme inspections will:

- help determine optimum future maintenance activities
- confirm hydraulic, water quality, amenity and ecological performance
- allow identification of potential system failures, eg blockage, poor infiltration, poor water quality etc.

Inspections can generally be required at monthly site visits (eg for grass cutting) for little additional cost, and should, therefore, be subsumed into regular maintenance requirements. During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning, but in practice this may be difficult or impractical to arrange.

Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required, and/or when water quality requires investigation include:

- are inlets or outlets blocked?
- does any part of the system appear to be leaking (especially ponds and wetlands)?
- is the vegetation healthy?
- is there evidence of poor water quality (eg algae, oils, milky froth, odour, unusual colourings)?
- is there evidence of sediment build-up?
- is there evidence of ponding above an infiltration surface?
- is there any evidence of structural damage that requires repair?
- are there areas of erosion or channelling over vegetated surfaces?

1.10.2 Litter/debris removal

This is an integral part of SuDS maintenance and reduces the risks of inlet and outlet blockages, retains amenity value and minimises pollution risks. High litter removal frequencies may be required at high profile commercial/retail parks where aesthetics are a major driver.

1.10.3 Grass cutting

It is recommended that grass cutting be minimised around SuDS facilities, apart from swales and filter strips and structural embankments where a height of 100–150 mm is recommended to prevent the plants falling over, or “lodging”, when water flows across the surface. In general, allowing grass to grow tends to enhance water quality performance. Short grass around a wet system such as pond or wetland provides an ideal habitat for nuisance species such as geese; allowing the grass to grow is an effective means of discouraging them. Grass around wet pond or wetland systems should not be cut to the edge of the permanent water.

Grass cutting is an activity undertaken primarily to enhance the perceived aesthetics of the facility. The frequency of cutting will tend to depend on surrounding land uses, and public requirements. Therefore, grass cutting should be done as infrequently as possible, recognising the aesthetic concerns of local residents. However, grass around inlet and outlet infrastructure should be trimmed closely to reduce risks to system performance. If a manicured, parkland effect is required, then cutting will need to be undertaken more regularly than for meadow type grass areas, which aim to maximise habitat and biodiversity potential.

1.10.4 Weed/invasive plant control

Weeds are generally defined as vegetation types that are unwanted in a particular area.

For SuDS, weeds are often alien or invasive species, which do not enhance the technical performance or aesthetic value of the system, or non-native species and the spread of which is undesirable.

In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally be required only during the first year, ie during plant establishment). However, over grassed surfaces, mowing can be an effective management measure. The use of herbicides and pesticides should be prohibited since they cause water quality deterioration. The use of fertilisers should also be limited or prohibited to minimise nutrient loadings which are damaging to water bodies.

1.10.5 Shrub management

Shrubs tend to be densely planted and are likely to require weeding at the base, especially during the first year to ensure that they get enough water. Shrubs should be selected so they can grow to their maximum natural height without pruning.

1.10.6 Management of green waste

Appropriate methods should be implemented to dispose of green waste, including:

1 The development of wildlife piles

These provide refuges, hibernation shelter, food and egg laying sites for a large number of animals. When rotted down at the end of 3–5 years they provide compost that can be used as fertiliser for planting areas outside of the SuDS system.

In general:

- wildlife piles should be located in sunny or semi-shaded areas away from direct access by people
- their bases should be constructed using substantial prunings or other branch material laid in a criss-cross pattern
- seasonal shrub and other woody prunings should be added through the winter
- non-woody and grass cuttings should be added through the summer
- wildlife piles should comprise tidy piles up to 1.2 m high
- new wildlife piles should be constructed each year and old wildlife piles should be used as compost to plant beds after 3–5 years
- wildlife piles should be located above normal flood level of watercourses and be protected by hedges or similar features.

A schematic of a typical wildlife pile structure is shown in Figure 1.1.

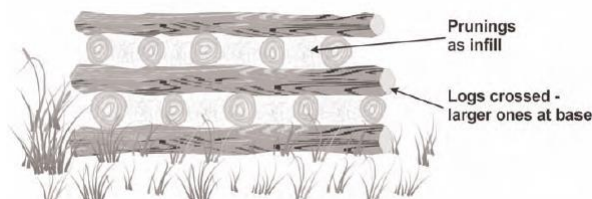


Figure 1.1 Schematic of a wildlife pile (courtesy of Steve Wilson and Robert Bray of Sustainable Drainage Associates)

2 On- or off-site composting

A compost facility allows all green waste, particularly grass cuttings and prunings to be recycled and provide compost for mulching ornamental plant beds. The following process should be followed for composting:

- shred all arisings from site
- combine all arisings in active compost bin with grass cuttings not exceeding 70%
- turn and mix active compost when bin is >50% full, at weekly intervals for at least four weeks
- turn and mix full bin every 28 days until used
- combine adjacent compost bins/bays when contents are settled to 50% volume reduction
- Use compost after 3–4 months.

A schematic/photo of a typical composting structure is given in Figure 1.2.

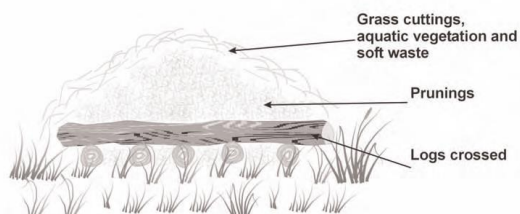


Figure 1.2 Schematic of a composting structure (courtesy Steve Wilson and Robert Bray of Sustainable Drainage Associates)

3 Disposal to landfill

As a last resort, green waste can be disposed of to some approved tips or landfill sites, although it is only accepted at certain locations.

1.10.7 Vacuum sweeping and brushing

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Advice issued with permeable pre-cast concrete paving suggests a minimum of three sweepings per year. Chapter 12 should be referred to for details of this process.

1.11 IRREGULAR MAINTENANCE ACTIVITIES

1.11.1 Sediment removal

To ensure long-term effectiveness, the sediment that accumulates in SuDS should be removed periodically. The required frequency of sediment removal is dependent on many factors including:

- design of upstream drainage system
- type of system
- design storage volume
- characteristics of upstream catchment area (eg land use, level of imperviousness, upstream construction activities, erosion control management and effectiveness of upstream pre-treatment).

Sediment accumulation will typically be rapid for the entire construction period (including time required for the building, turfing and landscaping of all upstream development plots). Once a catchment is completely developed and all vegetation is well-established, sediment mobility and accumulation is likely to drop significantly.

1.11.2 Vegetation/plant replacement

Some replacement of plants may be required in the first 12 months after installation, especially after storm events. Dead or damaged plants should be removed and replaced to restore the prescribed number of living plants per hectare.

Inspection programmes should identify areas of filtration, or infiltration surfaces where vegetation growth is poor and likely to cause a reduced level of system performance. Such areas can then be rehabilitated and plant growth repaired.

1.12 REMEDIAL MAINTENANCE

1.12.1 Structure rehabilitation/repair

There will come a time with most SuDS techniques when a major overhaul of the system is required to remove clogged filters, geotextiles, gravel etc. This will typically be between 10 and 25 years, depending on the technique and factors such as the type of catchment and sediment load. The SuDS design allows for vehicle access to undertake this work and consider the need for the overhaul without causing major disruption. For example the use of geotextiles close to the surface in pervious surfaces traps the majority of sediment in a relatively easily accessible location. Reconstruction of the surface layer and bedding layer is all that is required, rather than reconstruction of the whole pavement depth.

Major overhaul is most likely to be required on techniques that rely on filtration through soils or aggregates, such as sand filters and infiltration devices. Other SuDS techniques are unlikely to need major overhaul if routine maintenance is undertaken as required (for example ponds and wetlands).

Rehabilitation activities for each SuDS component are described in the individual component chapters. The requirements should be identified in the owner's manual.

1.12.2 Infiltration surface rehabilitation

In the event that grassed surface permeability has reduced, there are a number of landscape techniques that can be used to open the surface to encourage infiltration.

Such activities are not commonplace and are likely to be required only in circumstances where silt has not been effectively managed upstream.

1. Scarifying to remove "thatch". Thatch is a tightly intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface. Scarifying with tractor-drawn or self-propelled equipment to a depth of at least 50 mm breaks up silt deposits, removes dead grass and other organic matter and relieves compaction of the soil surface.
2. Spiking or tining the soil, using aerating equipment to encourage water percolation. This is particularly effective if followed by top dressing with a medium to fine sand, and is best undertaken when the soil is moist. Spiking or tining with tractor drawn or self-propelled equipment penetrates and perforates soil layers to a depth of at least 100 mm (at 100 mm centres) and allows the entry of air, water, nutrients and top dressing materials.
3. As a last resort, it may be necessary to remove and replace the grass and topsoil by:
 - removing accumulated silt and (subject to a toxicity test) applying to land or dispose of to landfill
 - removing damaged turf which should be composted
 - cultivating remaining topsoil to required levels
 - re-turfing (using turf of a quality and appearance to match existing) or reseeded (to BS 7370: Part 3, Clause 12.6 (BSI, 1991) using seed to match existing turf) area to required levels. It may be necessary to supply and fix fully biodegradable coir blanket to protect seeded soil. Turf and seeded areas should be top dressed with fine sieved topsoil to BS 3882 (BSI, 1994) to achieve final design levels. Watering will be required to promote successful germination and/or establishment.

1.13 APPLICATIONS OF THE PRINCIPLES OF LANDSCAPE MAINTENANCE

In contrast to conventional drainage, which comprises mainly sub-surface pipework and associated infrastructure, SuDS are predominantly surface systems. A key feature of SuDS is their integration within the local landscape and their amenity contribution, and it is appropriate therefore that landscape maintenance practice is applied to their management.

1.13.1 Landscape maintenance documentation

Typical landscape maintenance documentation and its potential relevance to SuDS systems is summarised below:

(A) Management plan – describing the management objectives for a site over time, and the management strategies that should be employed to realise these objectives and reconcile any potential conflicts that may arise.

Management plans are most appropriate for application in major parks and open spaces, wherever there are alternative choices for future action, and potential conflicts of purpose and priorities that need to be resolved. The following extract from *A guide to management plans for parks and open spaces* (Barber, 1991) sets out the types of management plans that can be prepared:

(i) Management plan

This predicts a degree of physical change, and therefore should present design proposals in its recommendations. It puts the emphasis on the presentation of anticipated physical change with much of the documentation being in support.

(ii) Outline plan

This is generally accepted as a more appropriate title for a management plan that wishes to establish the guiding principles, without providing detailed proposals which might constrain future options for achieving the outline objectives.

(iii) Maintenance plan

This is appropriate if the principal interest is in establishing the best way of maintaining an area, or where there is a need to match maintenance aspirations to a secure financial base. Planned maintenance programmes over longer timescales can be made more secure by the more public exposure of the need and the commitment that the Maintenance Plan should be

able to guarantee. A Maintenance Plan can also establish changes in maintenance regimes that may be required to match a change in objectives e.g. the need to adapt operation and maintenance practices to accommodate specific wildlife habitats that may develop.

For a SuDS scheme, the maintenance plan will generally be the most appropriate type of management plan to use. The document should include an explanation of the function of the SuDS scheme and why it is being used on the site.

Where the drainage system has an impact on the wildlife value or public use of a site, it would be prudent to develop this simple explanation further to explain habitat enhancement goals, health and safety issues and long-term management implications.

Sites with special wildlife or amenity interest may require detailed management plans, which monitor habitat development, infrastructure changes or damage to sites and ensure rapid responses to such changes, should they occur.

It is common for smaller commercial, industrial and housing sites to have a simple maintenance statement. In this case, a single page explaining the site management (including the sustainable drainage system) would be useful for all parties involved in the care of the development.

(B) Conditions of contract – appropriate conditions will be required. Advice can be sought from the Landscape Institute. Guidance is also provided in CIRIA publication C625 (Shaffer *et al*, 2004).

(C) Specification – detailing the materials to be used and the standard of work required.

A specification, usually preceded by preliminaries, details how work shall be carried out and contains clauses that give general instructions to the contractor. Specific SuDS maintenance clauses may be included in a general specification or as a separate "Sustainable drainage maintenance specification" section.

(D) Schedule of work – itemising the tasks to be undertaken and the frequency at which they will be performed.

The tasks required to maintain the site and the frequency necessary to achieve an acceptable standard should be set out in the schedule of work.

Smaller sites will usually have simple specification notes given to a contractor as a basis for maintenance on a performance basis. Examples of performance criteria are items such as:

- length of grass
- tidiness
- extent of weed growth, etc.

This document will often form the basis of a pricing mechanism, and can also act as a checklist to ensure the work has been carried out satisfactorily.

For additional information on the development of appropriate schedules, reference should be made to *The operation and maintenance of sustainable drainage systems* (HR Wallingford, 2004).

1.14 Frequency of maintenance tasks

Landscape maintenance contract periods are usually of one or three years' duration.

The three-year period is increasingly common to ensure continuity and commitment to long-term landscape care. The frequency of regular landscape maintenance tasks in a contract period can range from daily to once in the contract period. In practice most site tasks are based on monthly or fortnightly site visits, except where grass or weed growth requires a higher frequency of work. In many cases a performance specification is used with terms such as "beds shall be maintained weed-free" or "grass shall be cut to a height of 50 mm with a minimum height of 25 mm and a maximum height of 100 mm" to obtain the required standards.

Frequency can be specified within the schedule to include irregular items such as "'meadow grass' - cut two times annually in July and September to a height of 50 mm, all arisings raked off and removed to wildlife features, compost facility or to tip", which provides flexibility for work that is not critical to the management of the site.

Maintenance tasks which suit a performance approach commonly include plant growth, grass cutting, pruning and tree maintenance. However work tasks such as sweeping paths, regular litter collection and cleaning road surfaces will require work at an agreed frequency with more specific timings such as weekly, monthly or annually.

Where the frequency and timing of tasks is critical, a mixture of performance and frequency specification is necessary to provide effective maintenance.

SuDS maintenance generally tends towards a frequency requirement to ensure a predicable standard of care which can be recorded on site and which provides a reasonable basis for pricing work. A convenient frequency for many tasks is at a monthly inspection as this is the usual minimum site attendance required in a landscape specification. The monthly frequency should provide for an inspection of all SuDS features and checking all inlets and outlets.

Certain SuDS maintenance tasks however fall outside this monthly cycle and need to be accommodated in the contract. The two most obvious are:

- wetland vegetation maintenance
- silt management.

There are other tasks associated with ensuring the long-term performance of the systems that may be more difficult to predict, and could even fall outside any contract period. It may therefore be more appropriate to review requirements for system rehabilitation at interim periods, when contracts are falling due for renewal.

GEOCELLULAR/MODULAR SYSTEMS

DESCRIPTION

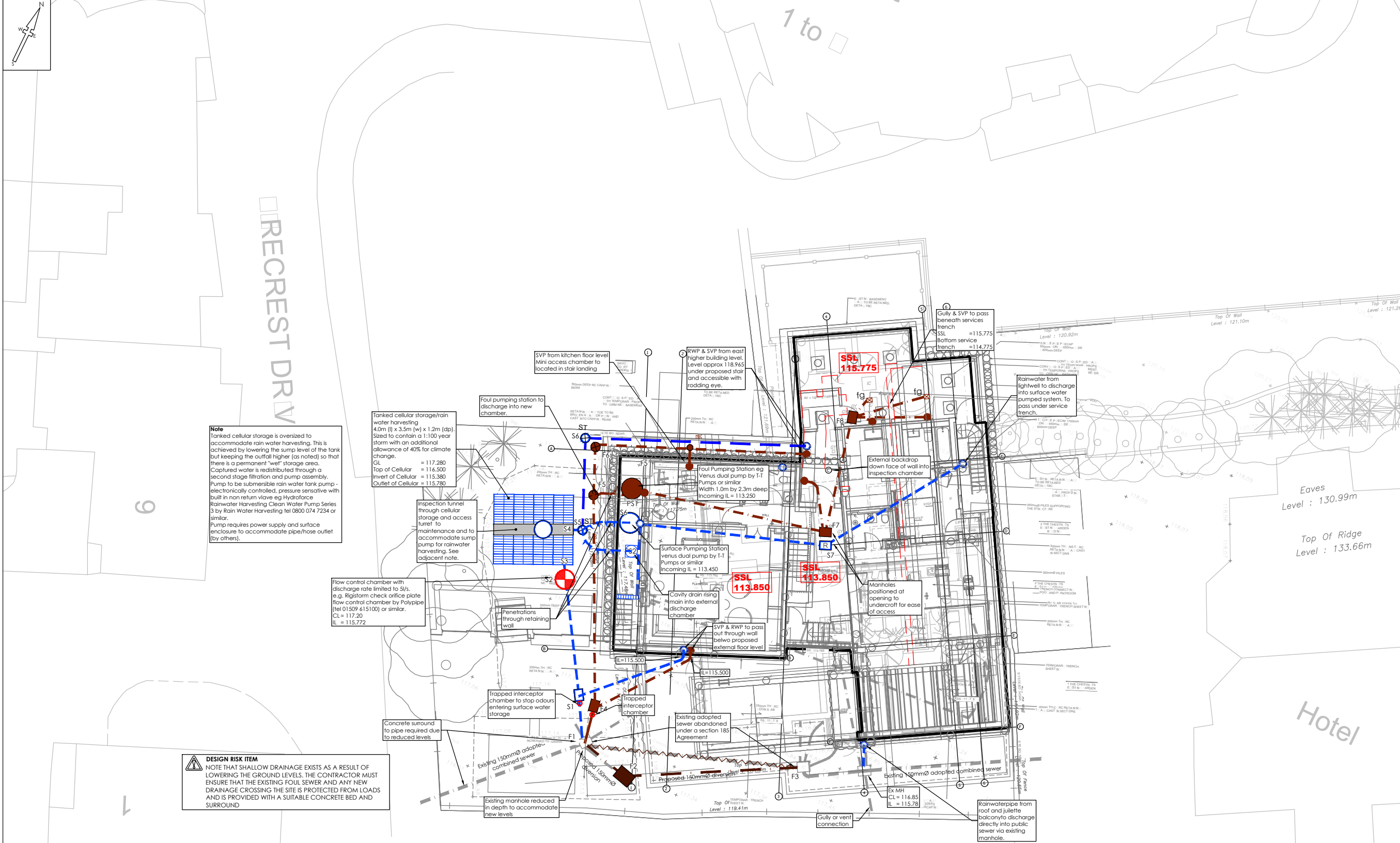
Modular plastic geocellular systems with a high void ratio, that can be used to create a below ground infiltration (soakaway) or storage structure.

OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is required to ensure the effective long-term operation of below ground modular storage systems. Maintenance responsibility for systems should be placed with a responsible organization. Maintenance requirements for modular systems are described in the table below. Maintenance plans and schedules should be developed during the design phase. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Modular systems – operation and maintenance requirements

Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms



Foul Water (F) Manhole Schedule					GRADE 1 in	PIPE Ø (mm)	INVERT DEPTH
MANHOLE REF	INVERT LEVEL	COVER LEVEL	CHAMBER TYPE	COVER TYPE			
1	115.3.0	115.20	Eisting	Eisting	0.0	150	2.5
2	115.57	115.20	Type D 600 x 675	B125 600 x 675	0.0	150	0.0
3	115.6.0	116.8.0	Eisting	Eisting			
4	115.3.0	115.20	Eisting	Eisting	0.0	100	1.5
5	115.28	115.20	600 x 50	B125 600 x 50	18	100	10.5
6	116.013	117.280	PPC	B125 4800	0.0	100	2.5
7	116.080	117.280	PPC	B125 4800			
8	116.013	117.280	600 x 50	B125 600 x 50	Rising Main	Rising Main	5.0
PS1	113.025	111.105	Pumping Station	B125	0.0	100	0.0
9	113.500	111.105	600 x 50	Recessed 600 x 50	5.6	100	6.0
10	111.575	115.775	600 x 50	Recessed 600 x 50			

Surface Water (S) Manhole Schedule					GRADE 1 in	PIPE Ø (mm)	INVERT DEPTH
MANHOLE REF	INVERT LEVEL	COVER LEVEL	CHAMBER TYPE	COVER TYPE			
1	115.28	115.2	600 x 50	B125 600 x 50	60.0	100	1.5
S1	115.503	115.2	600 x 50	B125 600 x 50	18.0	100	5.0
S2	115.772	117.20	Flow Control Chamber	T.B.A.	60.0	100	0.5
S3	115.780	117.20	Tanked Cellular Storage	N/A	60.0	100	1.0
S4	115.780	117.20	Tanked Cellular Storage	N/A	60.0	100	1.0
S5	116.000	117.20	4800 silt trap	B125 4800	Rising Main	Rising Main	1.0
PS2	113.50	111.105	Pumping Station	T.B.A.	0.0	100	0.0
S6	113.75	111.105	600 x 50	Recessed 600 x 50	0.0	100	1.0
S7	113.713	111.105	600 x 50	Recessed 600 x 50	0.0	100	1.5

NOTE:

1.DO NOT SCALE, IF IN DOUBT ASK.

2.THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEER'S DRAWINGS AND DETAILS, THE SPECIFICATION FOR THE WORKS, THE RELEVANT ARCHITECT'S DRAWINGS AND ANY OTHER SPECIALIST'S DRAWINGS.

Drainage Key

Sewers

— Foul water drain (private/non adoptable)

— Surface water drain (private/non adoptable)

— Foul water sewer (Adoptable)

— Surface water sewer (Adoptable)

— Foul rising main

— Existing combined water sewer (Adopted)

Chamber Key

FW **SW**

● Mini access chamber (mac) - 300mmØ *

● PPIC - 475mmØ *

● P.C.C. unit/brick *

● Manhole

● Depth 1.25 to 1.5m *

● Depth 1.55 to 3.0m *

* General note
(Refer to standard details & long sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

● Rain water down pipe (raddable access)

● Soil vent pipe/soil stack

— Linear drainage channel

— Cellular storage (refer to drawing for sizes)

FFL
XX.XX

Finished Floor Level (FFL)

Building Access - Primary

Rev	Date	Amendments	By	Chk'd
T02	16/01/2016	Drainage updated	NJ	DJ
T01	03/11/2016	Drainage updated to tender issue	DJ	-
P03	19/10/2016	Sewer diversion and cavity sump pump detailed	DJ	-
P02	21/09/2016	Invert levels to existing foul added	DJ	-
P01	30/06/17	Initial issue	ATD	DJ

engineersHRW

London 0207 407 9575 Oxford 01865 251 206 www.ehrw.co.uk

Project:
17 Branch Hill
Hampstead

Drawing title:
Proposed Drainage Plan
Lower round floor

Scale at A1:
1:100

Drawn by:
D

Date:
06/2016

Chk'd by:
DJ

TENDER

Project Number:
1281

Drawing Type:
DR

Drawing No:
050

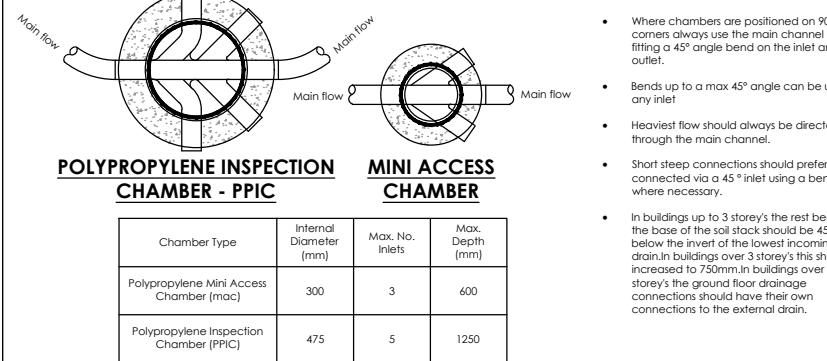
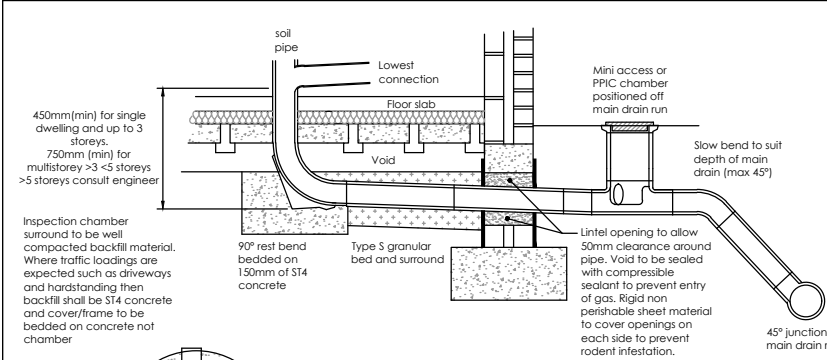
Revision:
T02

DRAINAGE NOTES

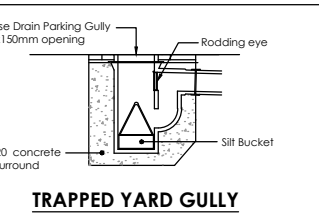
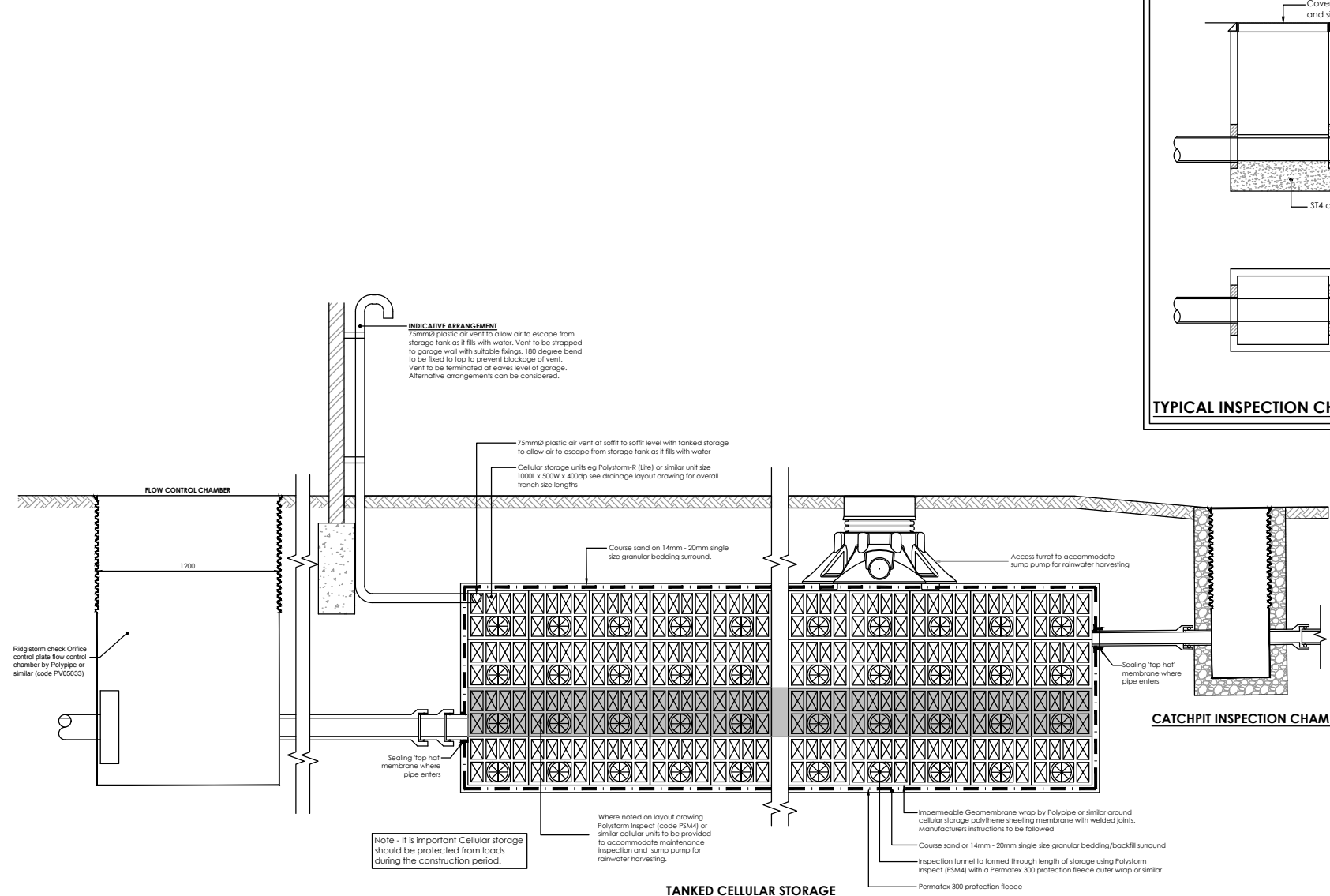
- All private drainage must comply with the current edition of DTLR Building Regulations approved document H.
- Where drainage is to be adopted it should meet with the requirements of Sewers for Adoption 7th edition.
- Drainage design to be to BS EN 752:3 1996
- Any intended changes to the drainage design must be discussed with the Engineer. If changes are made the Engineer must be supplied with as-constructed information to enable drawings to be suitably updated for the Health & safety file.
- Before works commence the contractor should satisfy themselves that the details of the drainage system to be connected into are correct i.e. cover, invert levels, line, condition and type of sewer.
- Private access chambers are to be appropriate to the depths and loadings as follows:-

Depth to invert	Access size
Up to 600mm	Mini access chamber 300mmØ
Up to 1200mm	Inspection chamber 475mm Ø (PPIC)
	600mmx450mm Brick/P.C.C. units
1200 to 1500mm	P.C.C. ring manhole 1050mmØ
1500 to 3000mm	P.C.C. ring manhole 1200mmØ
	(ring diameter increased if sewer greater than 475mmØ)

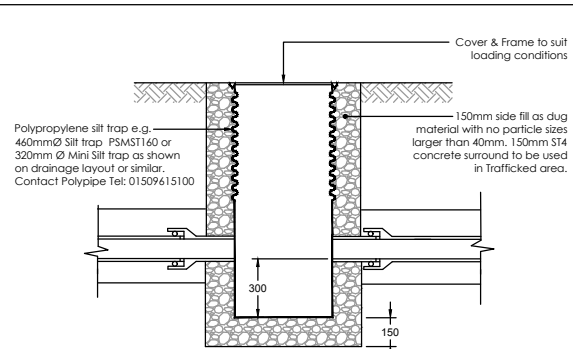
- All manholes shall have a flexible joint within 150mm of the face of the structure and a "rocker pipe" which should not exceed 600mm in length.
- Pipe materials shall be -
Vitrified clayware to BS EN 295
Cast iron to BS EN 545:2010
UPVC - BS EN 1401 PP - BS EN 1852
Structure wall BS EN 13476
- For private sewers having 900mm or less cover beneath carriageways & hardstanding or 600mm in landscape areas then they shall have concrete surround or slab protection. Slab protection to be 100mm thick C20concrete slab with mesh reinforcement and a bearing of 150mm each side of the trench. Concrete surround to be 150mm C20 with flexible joints.
- Trenches within 1.2m of load bearing walls should be filled with concrete or at least to the underside of the foundation. Where the distance is more than 1.2m from the foundations the concrete should be taken at least up to a 45degree line from the bottom of the foundations. Alternatively, the foundations could be taken to a deeper level to avoid undermining by the drainage trench (check with the Engineer where this is required).
- Pipe bed and surround to be granular Type S unless otherwise noted.
- Drains passing through walls or foundations should have either an arched or lintelled opening to give 50mm clearance around the pipe. The opening shall be masked both sides with a rigid non-perishable material, or alternatively a short length of pipe may be built in solid if it is connected within 150mm to rocker pipes (max 600mm long) with flexible joints.
- Drainage under buildings should be bedded and surrounded by at least 100mm of granular material.
- Unless otherwise stated on the drawings or in the schedules then all private drainage shall be 100mmØ.
- All road gully connections to be 150mmØ and surrounded with 150mm C20 concrete surround.
- Where schemes require soakaways they shall not be positioned closer than 5m from the nearest dwelling or structure. Where solution features can occur in the underlying strata such as chalk then this distance will need to be increased to 10m.
- New connections to existing public sewers should be carried in accordance with appropriate Section 106 (Water Industry Act) 'connection consent' and also under the supervision of the Water Authority.
- Covers shall be to B.S. EN 124:1994
Class A15 - areas where only pedestrians have access.
Class B125 - for use in car parks and pedestrian areas where occasional vehicular access is likely.
Class C250 - areas where not extending more than 500mm from kerb face into the carriageway
Class D400 - areas where cars and lorries have access including carriageways, hard shoulders.
Cover and frames to be 150mm deep except residential cul-de-sacs
- It is recommended that drainage works should be constructed from the outfall particularly where the outfall depth is relatively shallow. If it is not possible to commence works from the outfall the contractor should satisfy themselves that the invert, line, position and type of existing outfall are correct.
- Drainage works should be protected from possible damage by construction traffic loadings during the construction period. Protection may be provided by barriers. Materials should not be stored over drainage works.
- Buildings up to 3 storeys shall have a rest bend at the base of the soil stack 450mm min below the invert of the lowest incoming drain. Buildings over 3 storeys must be a minimum of 750mm below the lowest incoming drain. Buildings over 5 storeys then the ground floor drainage connections should have their own connections to the external drain.
- Where piling works are undertaken the positions of existing sewers must be accurately located before piling takes place.



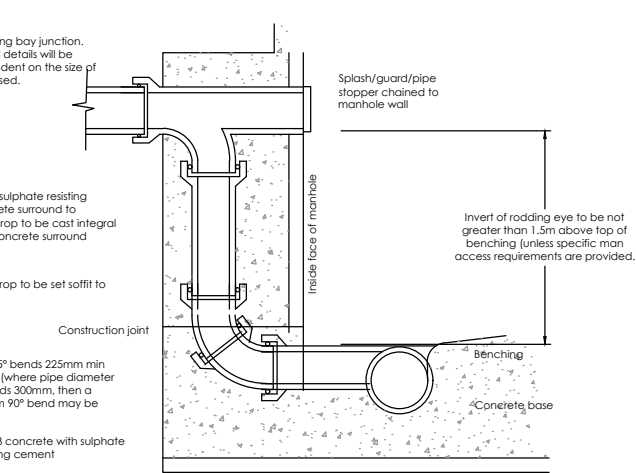
Chamber Type	Internal Diameter (mm)	Max. No. Inlets	Max. Depth (mm)
Polypropylene Mini Access Chamber (mac)	300	3	600
Polypropylene Inspection Chamber (PPIC)	475	5	1250



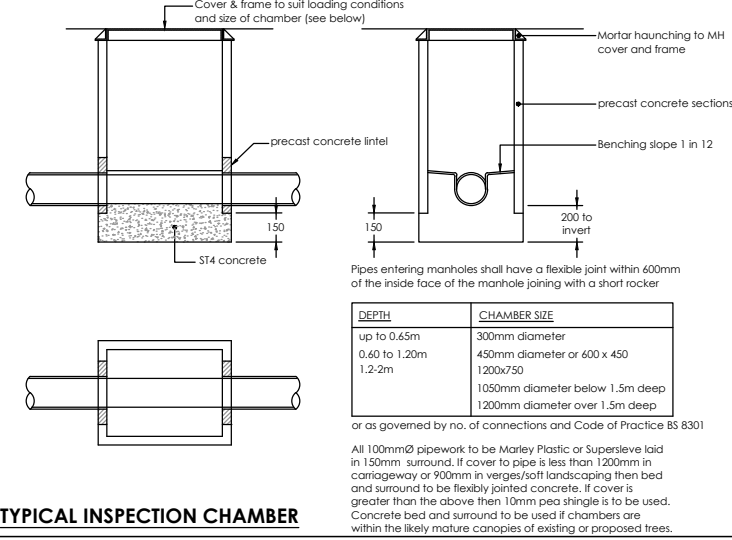
TRAPPED YARD GULLY



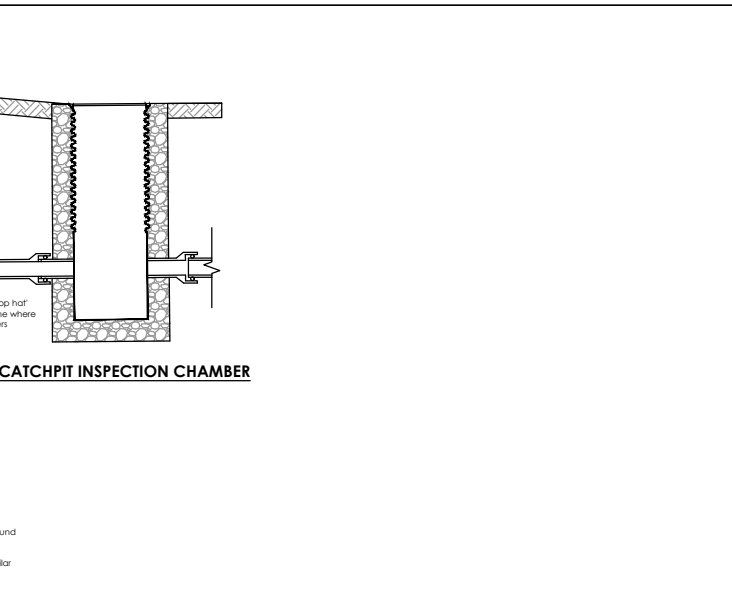
SILT-TRAP/CATCHPIT MANHOLE DETAIL



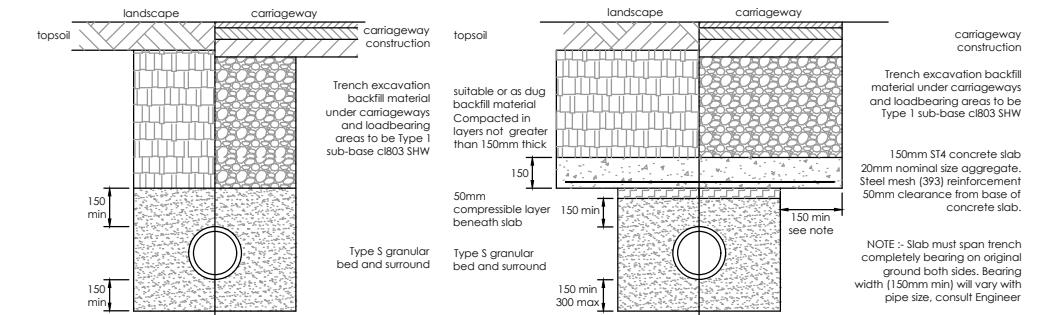
EXTERNAL VERTICAL BACKDROP DETAIL



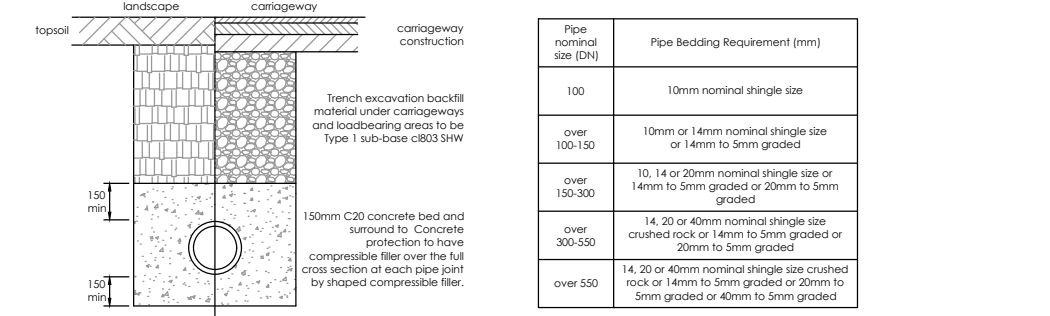
TYPICAL INSPECTION CHAMBER



CATCHPIT INSPECTION CHAMBER



TYPE S GRANULAR SURROUND BED
CONCRETE SLAB PROTECTION



TYPE Z CONCRETE BED AND SURROUND
GRANULAR BEDDING AND SIDEFILL MATERIAL GRADINGS

NOTE:
1.DO NOT SCALE, IF IN DOUBT ASK.
2.THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEER'S DRAWINGS AND DETAILS, THE SPECIFICATION FOR THE WORKS, THE RELEVANT ARCHITECT'S DRAWINGS AND ANY OTHER SPECIALIST'S DRAWINGS.

T01	03/11/16	Tender issue	NJ	DJ
Rev.	Date	Amendments	By	Chk'd

engineersHRW
London 0207 407 9575 Oxford 01865 251 206 www.ehrw.co.uk

Project:
17 Branch Hill
Hampstead

Drawing title:
Drainage Construction Details

Scale at A1:
1:20

Drawn by:
NJ

Date:
24/10/2016

Chk'd by:
DJ

TENDER

Project Number:
1281

Drawing Type:
DR

Drawing No:
052

Revision:
T01