



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

**Surface Water Drainage Strategy
&
Flood Risk Assessment
for
Construction of 5 no. Residential
Dwellings
at
Land To The Rear Of Bethel Bethesda
Residential Home, Equity Road East, Earl
Shilton, Leicester, LE9 7FY
Date: July 2025**

Status:

Final Report

Reference:

3975D - Earl Shilton

Date:

06/07/2025

EXECUTIVE SUMMARY

Castledine Environmental has been instructed by Cooper Residential Homes Ltd to prepare a site-specific Surface Water Drainage Strategy and Flood Risk Assessment for the proposed development at Land To The Rear Of Bethel Bethesda Residential Home, Equity Road East, Earl Shilton, Leicester, LE9 7FY. This assessment is based on the proposal for the construction of five residential dwellings and associated works on greenfield land.

The proposed impermeable site area would be approximately 0.112ha, therefore runoff generated on-site would increase as a result of the proposed development.

The Environment Agency (EA) mapping for Flood Risk, shows the site located within Flood Zone 1 (low risk of fluvial or tidal flooding). Flood zone 1 is described as land having a less than 1 in 1,000 annual probability of river or sea flooding.

The EA Long Term Flood risk online service states that the site address is at a 'High' risk of surface water flooding, indicating that parts of the site would experience surface water flooding during a 1 in 30-year pluvial storm event.

Analysis of other sources of flooding, including sewer, groundwater or reservoir failure, the risks to the proposed development are negligible.

As such, the main risk of flooding to the site would be from surface waters. The proposed SuDS drainage scheme presented in this report would reduce significantly the surface water flood risk on site and to others.

Infiltration testing at the site indicated a very poor infiltration capacity of the superficial geology, with no measurable infiltration observed during the test period. At the time of writing, no soil descriptions from the trial pits were available.

Runoff rates from the proposed development should be directed to the surface water sewer in Coniston Close via an existing shared/public surface water drain network.

Currently the proposed drainage scheme is for the use of permeable paving in all proposed hardstanding areas, filter drains, a swales and a 20mm orifice plate flow control to limit discharges to the surface water sewer.

Hydraulic calculations indicate that approximately 95m³ of attenuation storage would be required on-site if outflow rates to the sewer are limited to 0.6 l/s (Greenfield Q_{BAR}).

Specialist surface water treatment devices are not necessary as the proposed SuDS devices would provide adequate surface water treatment to runoff generated on car trafficked areas.

In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction. The owner/s of the proposed residential units will be responsible for the management and maintenance of SuDS devices, in accordance with the manufacturer's recommendations of each drainage component.

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1.0 QUALITY ASSURANCE

Castledine Environmental confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental has been instructed by Cooper Residential Homes Ltd to prepare a site-specific Surface Water Drainage Strategy and Flood Risk Assessment for the development at Land To The Rear Of Bethel Bethesda Residential Home, Equity Road East, Earl Shilton, Leicester, LE9 7FY.

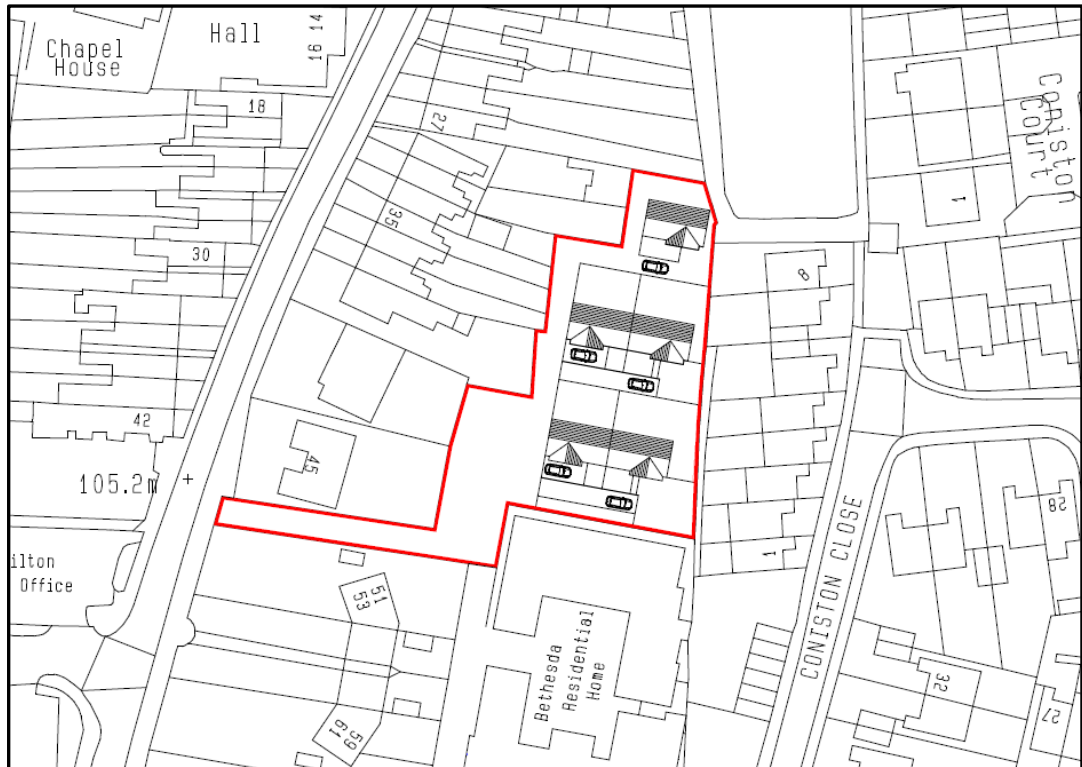


Figure 1: Site Plan (Source: Client)

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Cooper Residential Homes Ltd and associated appointees for the purpose of ensuring compliance with:

- ⇒ National Planning Policy Framework
- ⇒ Hinckley and Bosworth Borough Council Strategic Flood Risk Assessment (SFRA) 2025
- ⇒ Leicestershire County Council SuDS Guidelines
- ⇒ DEFRA Sustainable drainage systems: non-statutory technical standards
- ⇒ CIRIA SuDS Manual C753

5.0 DEVELOPMENT PROPOSALS

This assessment is based on the proposal for the construction of five residential dwellings and ancillary works (see Appendix A). The site is currently greenfield and has a redline area of approximately 0.187ha.

The proposed impermeable site area would be approximately 0.112ha, therefore runoff generated on-site would increase as a result of the proposed development.

It is understood that a development of this nature has a design life of approximately 100 years.

5.1 EXISTING DRAINAGE NETWORKS AND WATERCOURSES

The proposed redline site area is greenfield and therefore no drainage infrastructure is present. According to the client, a surface water drain is located at the south of the site within the property (Bethel & Bethesda Residential Home).

Analysis of the sewer asset plan provided by Severn Trent (see Appendix A) and drainage plan provided by the client, the surface water drains south of the site likely discharge to the public surface water sewer in Coniston Close.

The nearest watercourse to the site is an unnamed local watercourse located at approximately 650m to the southeast from the site.

5.2 TOPOGRAPHY

According to 1m LiDAR remotely sensed topography site levels vary between approximately 105.5m AOD to the north and 104.0m AOD toward the south of the site.

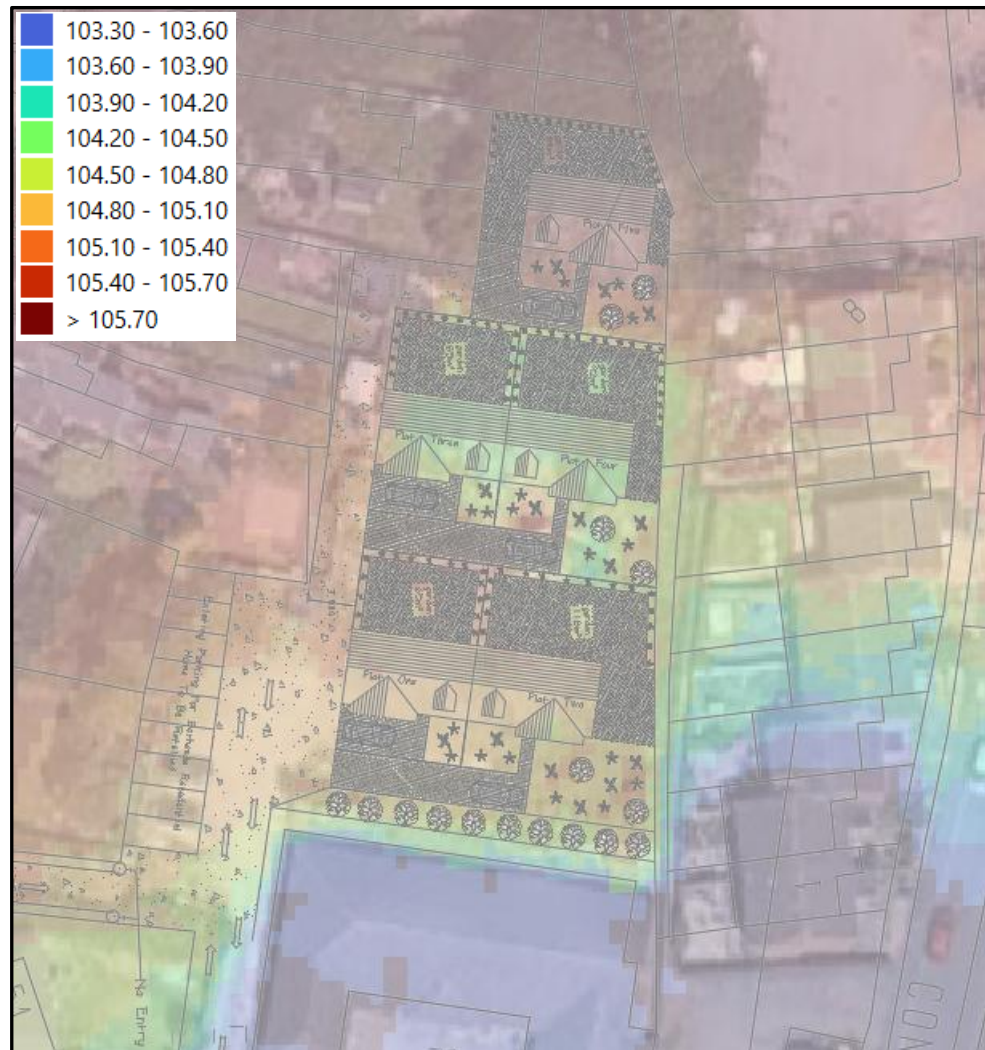


Figure 2 - LiDAR Topography (Source: DEFRA)

5.3 GEOLOGY, INFILTRATION POTENTIAL AND GROUNDWATER

The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is Edwalton Member comprised of mudstone (Source: BGS). No information is available on the BGS viewer regarding the superficial deposits.

The Soilscales online geology dataset describes the superficial geology in the wider site region as '*Freely draining slightly acid loamy soils*'.

Infiltration testing at the site (see Appendix A) indicated a very poor infiltration capacity of the superficial geology, with no measurable infiltration observed during the test period. At the time of writing, no soil descriptions from the trial pits were available.

Infiltrating SuDS devices, such as permeable paving, should be allowed to infiltrate to promote groundwater recharge and vegetation growth. No rates have been assumed in calculations.

6.0 FLOOD RISK ASSESSMENT

6.1 FUVIAL AND TIDAL FLOOD RISK VULNERABILITY

This FRA has been undertaken with due regard to the statutory requirements of the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA aims to ensure that flood risk is taken into account and to avoid inappropriate development in areas potentially at risk of flooding.

The EA have designated different areas of the UK based on specific risk to assist and steer developments; these are:

- ⇒ Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%)
- ⇒ Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year
- ⇒ Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Flood Zone 3b is land having greater than a 1 in 20 annual probability of flooding (the functional flood plain)

The Environment Agency (EA) flood map for planning shows the site located within Flood Zone 1 (Figure 4). Flood zone 1 is described as land having a less than 1 in 1,000 annual probability of river or sea flooding.

Following the published Flood Risk and Coastal Change Planning Policy Guidance (PPG) Table 2 and NPPF guidelines, the proposed development is classed as 'More Vulnerable' development due to its residential use.

The NPPF Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table is reproduced below;

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Zone 3b	Exception Test Required	✓	✗	✗	✗

Table 1 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; ✗ means the development should not be permitted.



Figure 3 - Extract EA Flood Maps for Planning

6.2 PLUVIAL FLOOD RISK VULNERABILITY

The EA Long Term Flood risk online service states that the site address is at a 'High' risk of surface water flooding, indicating that the site would experience flooding during a 1 in 30 year storm event.

The EA's RoFWS surface water flood map (Figure 4) shows the 0.2m and 0.3m flood depth band for a variety of storm events, ranging from 'High' likelihood (<1 in 30 year storm) to 'Low' probability storms (>1 in 100 but less than a 1 in 1000 storm event).

Some small site areas would experience up to 0.3m of flooding during a 1 in 30 storm event. The respective flooded areas become larger during more intense rainfall events, primarily for those exceeding the 1 in 100-year probability of occurrence.

Flooding depths exceeding 0.3m would not occur within the redline site area, according to the EA's RoFWS surface water flood maps.

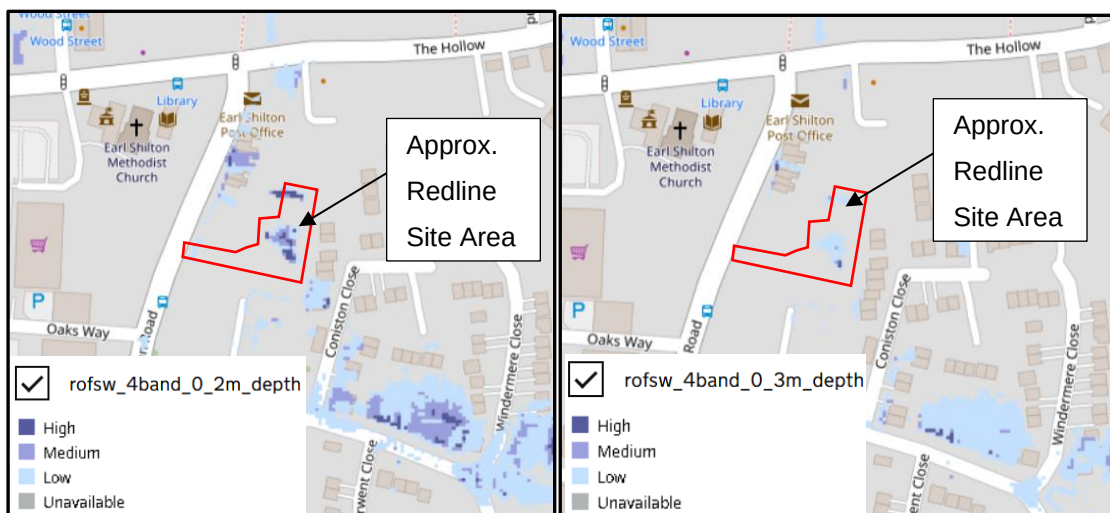


Figure 4 – Surface Water Flood Depth Map (Source: EA)

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

CLIMATE CHANGE ALLOWANCES

Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere.

Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances.

The data published on the DEFRA database shows the site located within the Soar Management Catchment and for residential development (lifespan 100yrs) an upper end allowance of 40% should be applied to rainfall events as the climate change allowance within this region.

6.3 GROUNDWATER FLOOD RISK VULNERABILITY

Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:

- ⇒ abnormally high groundwater heads or flows;
- ⇒ the introduction of an obstruction to groundwater flow; or
- ⇒ the rebound of previously depressed groundwater levels.

Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.

The Hinckley and Bosworth Borough Council SFRA, *Groundwater Emergence Map* shows the likelihood of groundwater to raise to a

particular depth from ground levels. The map (Figure 5) indicates that the development is predominantly at no risk of groundwater flooding and possibly could rise between 0.5-5m below the surface toward the northern site boundary.

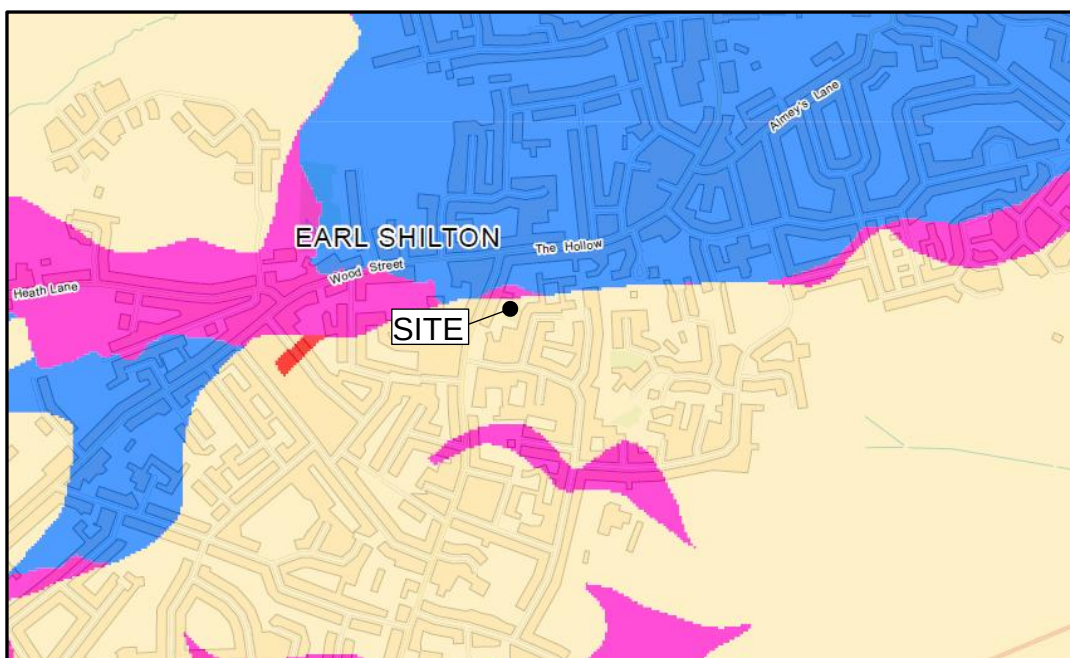


Figure 5 – Hinckley and Bosworth Borough Council SFRA – Groundwater Emergence Map

6.4 SEWER FLOOD RISK VULNERABILITY

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels.

Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur. Infiltration or entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system, is another cause of sewer flooding. Infiltration is often related to shallow groundwater, and may cause high flows for prolonged periods of time.

According to Hinckley and Bosworth Borough Council (SFRA), there have been 24 sewer flooding incidents recorded in the LE9 7 post-code area. No sewer flooding incidents have been recorded at the site or in its close proximity.

6.5 RESERVOIR FLOOD RISK VULNERABILITY

According to the EA Long Term Flood Risk online mapping tool indicating the extent of a potential reservoir flooding event in the wider site area, the proposed development would not be affected by this potential flood source only during a 'Wet Day' scenario, even when a potential reservoir breach would coincide with a fluvial flooding event.

According to the EA there has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the enforcement authority for the Reservoirs Act 1975 in England. The EA are responsible to ensure that reservoirs are inspected regularly, and essential safety work carried out.

7.0 SUSTAINABLE URBAN DRAINAGE (SUDS) ASSESSMENT

In accordance with the SuDS management train approach of Leicestershire County Council SuDS Guidelines, the use of various SuDS measures is required to reduce and control surface water flows have been considered in detail for the development.

The management of surface water has been considered in respect to the SuDS hierarchy below as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3:

Suds Drainage Hierarchy				
			Suitability	Comment
	1.	Store rainwater for later use	✓	Rainwater harvesting, such as water butts, should be provided, if possible, and the water used in gardening activities.
	2.	Use infiltration techniques, such as porous surfaces in non-clay areas	x	Partial or full infiltration SuDS would not be viable for the site as a main method for runoff discharge due to the superficial soil deposits at the site with very poor infiltration capacity.
	3.	Attenuate rainwater in ponds or open water features for gradual release	x	Detention basins and swales are proposed in the vegetated site areas.

4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	Below-ground attenuation is proposed in permeable paving and filter drains.
5.	Discharge rainwater to a watercourse	x	No watercourses are located in close proximity to the site.
6.	Discharge rainwater to a surface water sewer/drain	✓	Discharges to the surface water sewer in Coniston Close via an existing shared surface water drainage network at the south of the site.
7.	Discharge rainwater to combined sewer	x	

Table 2 - SuDS Drainage Hierarchy

The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as follows in Table 3, below.

Suitability Of SuDS Components		
SuDS Component	Comment	Suitability
Permeable Pavement	Pervious surfaces can be used in combination with aggregate sub-base and/or geocellular/modular storage to attenuate and/or infiltrate runoff from surrounding surfaces and roofs. Liners can be used where ground conditions are not suitable for infiltration. Permeable paving is recommended to be installed in all proposed hardstanding areas.	✓
Green / Blue Roofs	Green Roofs provide areas of visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff. They are generally more costly to install and maintain than conventional roofs but can provide many long-term benefits and reduce the on-site storage volumes. Not feasible due to the pitched roof type proposed.	x
Rainwater Harvesting	Rainwater Harvesting is the collection of rainwater runoff for use. It can be collected from roofs or other impermeable area, stored, treated (where required) and then used as a supply of water for domestic, commercial and industrial properties. Water butts should be provided to rainwater downpipes where possible and collected rainwater used in gardening activities.	✓
Swales	Swales are designed to convey, treat and attenuate surface water runoff and provide aesthetic and biodiversity benefits. They can	x

	replace conventional pipework as a means of conveying runoff, however space constraints of some sites can make it difficult incorporating them into the design. A swale should be provided to the south of the site to supplement the attenuation storage capacity and provide additional runoff treatment.	
Rills and Channels	Rills and Channels keep runoff on the surface and convey runoff along the surface to downstream SuDS components. They can be incorporated into the design to provide a visually appealing method of conveyance, they also provide effectiveness in pre-treatment removal of silts. This SuDS feature would provide little benefit to the overall drainage scheme.	x
Bioretention Systems	Bioretention systems can reduce runoff rates and volumes and treat pollution through the use of engineer soils and vegetation. They are particularly effective in delivering interception, but can also be an attractive landscape feature whilst providing habitat and biodiversity. This SuDS feature would provide little benefit to the overall drainage scheme.	x
Retention Ponds and Wetlands	Ponds and Wetlands are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff. They enhance treatment processes and have great amenity and biodiversity benefits. Often a flow control system at the outfall controls the rates of discharge for a range of water levels during storm events. This SuDS feature would provide little benefit to the overall drainage scheme.	x
Detention Basins	Detention Basins are landscaped depressions that are usually dry except during and immediately following storm events, and can be used as a recreational or other amenity facility. Detention basins (topographic depressions) should be provided in all gardens by lowering the existing site levels by 150mm.	x
Geocellular Systems	Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release or use. The inherent flexibility in size and shape	x

	means they can be tailored to suit the specific characteristics and requirements of any site. This SuDS feature would provide little benefit to the overall drainage scheme.	
Proprietary Treatment Systems	Proprietary treatment systems are manufactured products that remove specific pollutants from surface water runoff. They are especially useful where site constraints preclude the use of other methods and can be useful in reducing the maintenance requirements of downstream SuDS. Roof runoff from roofs and paths is considered to be largely uncontaminated. External hardstanding areas would be treated by the permeable paving, filter drains and swale to the adequate treatment level.	x
Filter Drains and Filter Strips	Filter drains are shallow trenches filled with stone, gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. Filter strips are uniformly graded and gently sloping strips of grass or dense vegetation, designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration and infiltration. Filter drains should be provided on the perimeter of the permeable paving and dwellings primarily for runoff conveyance and interception. The filter drains would also provide attenuation storage capacity.	x

Table 3 - Suitability of SuDS Components

8.0 SURFACE WATER DRAINAGE STRATEGY

In accordance with Leicestershire County Council SuDS Guidelines, developments are required to use SuDS to reduce both the volume and runoff rates to the drainage system.

WCC guidance states that the peak runoff rate post-development must be as close to the respective greenfield runoff rates from the hardstanding site areas.

The proposed drainage strategy is to manage runoff in permeable paving (Type B), filter drains, swale and offsite outflow rates by an 20mm diameter orifice plate flow control.

Proposed Surface water discharge rates have been calculated below and supporting calculations are included in Appendix B.

Surface Water Discharge Rates Summary					
	Area (ha)	Discharge Rates (l/s)			
		1 year	$Q_{BAR}/$ 2 year	30 year	100 year
Greenfield Runoff Rates	0.112	0.5	0.6	1.2	1.6
Proposed Runoff Rates + 40%CC	0.112	-	0.3	0.5	0.6

Table 4 - Runoff rates

Hydraulic calculations show that an attenuation storage of approximately 95m³ would be required to limit the peak runoff rate for the 100-year storm event + 40% climate change to a rate of 0.6 l/s from the respective catchment (0.112ha).

The total attenuation storage provided in the permeable paving SuDS element would be approximately 70.8m³.

The proposed swale and filter drain base would provide a total of 21.4m³ of attenuation storage capacity.

The filter drains surrounding the proposed dwellings would provide a total of approximately 4m³ of attenuation storage capacity.

The total footprint area of the five dwellings is approximately 315m² and assuming conservatively that they would be located entirely across the 0.3m flood depth areas, they could displace approximately 94.5m³ (315 x 0.3) of floodwaters elsewhere.

To ensure that no surface water flooding is displaced elsewhere, increasing the flood risk to others as a result, it is proposed to provide approximately 95m³ of attenuation storage capacity in detention basins (topographic depressions) by lowering the garden areas (635m²) by 150mm.

Proposed drainage calculations based on FEH22 rainfall model, Cv factors of 1.0 and 40% climate change allowance are included in Appendix B. A

proposed storm drainage strategy plan layout and indicative construction details are included in Appendix C.

9.0 WATER QUALITY

Runoff from the roofs and the untrafficked paved areas is largely considered to be uncontaminated.

The Pollution Hazard Indices are summarised in Table 5 – Summary of Pollution Hazard Indices for different Land Use below (based on Table 26.2 of The SuDS Manual):

Pollution Hazard Indices for Different Land Use Classifications				
LAND USE	Pollution Hazard Level	TSS	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Residential Car Parking	Medium	0.7	0.6	0.7

Table 5 - Summary of Pollution Hazard Indices for different Land Use

The Mitigation Indices of the proposed SuDS techniques are summarised in Table 6 below.

Indicative SuDS Mitigation Indices for Discharges to Surface Water			
SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6

Table 6 - Indicative SuDS Mitigation Indices.

It can be seen that the Total SuDS Mitigation Index $\geq$ Pollution Hazard Index therefore the water treatment provided by this SuDS train is enough to remove the potential pollutants generated on the car access and parking areas.

10.0 SCHEDULE OF MAINTENANCE

All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be agreed with the individual owner/s of the proposed residential units before adoption.

In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

The individual site owners will be jointly responsible for the management and maintenance of SuDS devices.

General maintenance of key SuDS components are provided below.

Maintenance for the specialist SuDS devices (ie permeable paving, orifice plates etc) are to be in accordance with manufacturer's recommendations.

Proposed Schedule of Maintenance for Below Ground Drainage				
Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Catchpits	1 year	1 year	N/A	Cleansing to be carried as necessary

Table 7 – General Drainage Elements Schedule of Maintenance

Maintenance schedule	Required action	Typical 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-specific observations of clogging or manufacturer's recommendations – 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 sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate 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 substructure 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, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 8 - Permeable Paving Maintenance

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect the orifice plate chamber and surroundings for blockages, sediment build-up, or structural damage. Ensure inlet and outlet are free from obstructions.	Annually
	Remove debris, sediment, or blockages within the orifice plate chamber and associated pipework to ensure efficient operation.	Annually, or as needed based on inspection
Occasional Maintenance	Conduct a thorough check to ensure the orifice plate functions as designed. This may include flow rate testing and visual inspections.	Every 3-5 years
Remedial Actions	Repair or replace any damaged components of the orifice plate, chamber, or associated pipework. Ensure repairs meet original design specifications.	As needed based on inspection findings
Monitoring	Inspect the orifice plate after major storms to ensure it is not damaged or blocked by debris. Perform necessary cleaning or repairs.	After major storm events or heavy rainfall
	Monitor and manage sediment and debris within the orifice plate chamber and upstream catchment areas.	Annually or as indicated by inspections

Table 9 -Orifice Plate Maintenance

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

Table 10 - Swales Indicative Maintenance Requirements

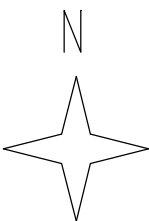
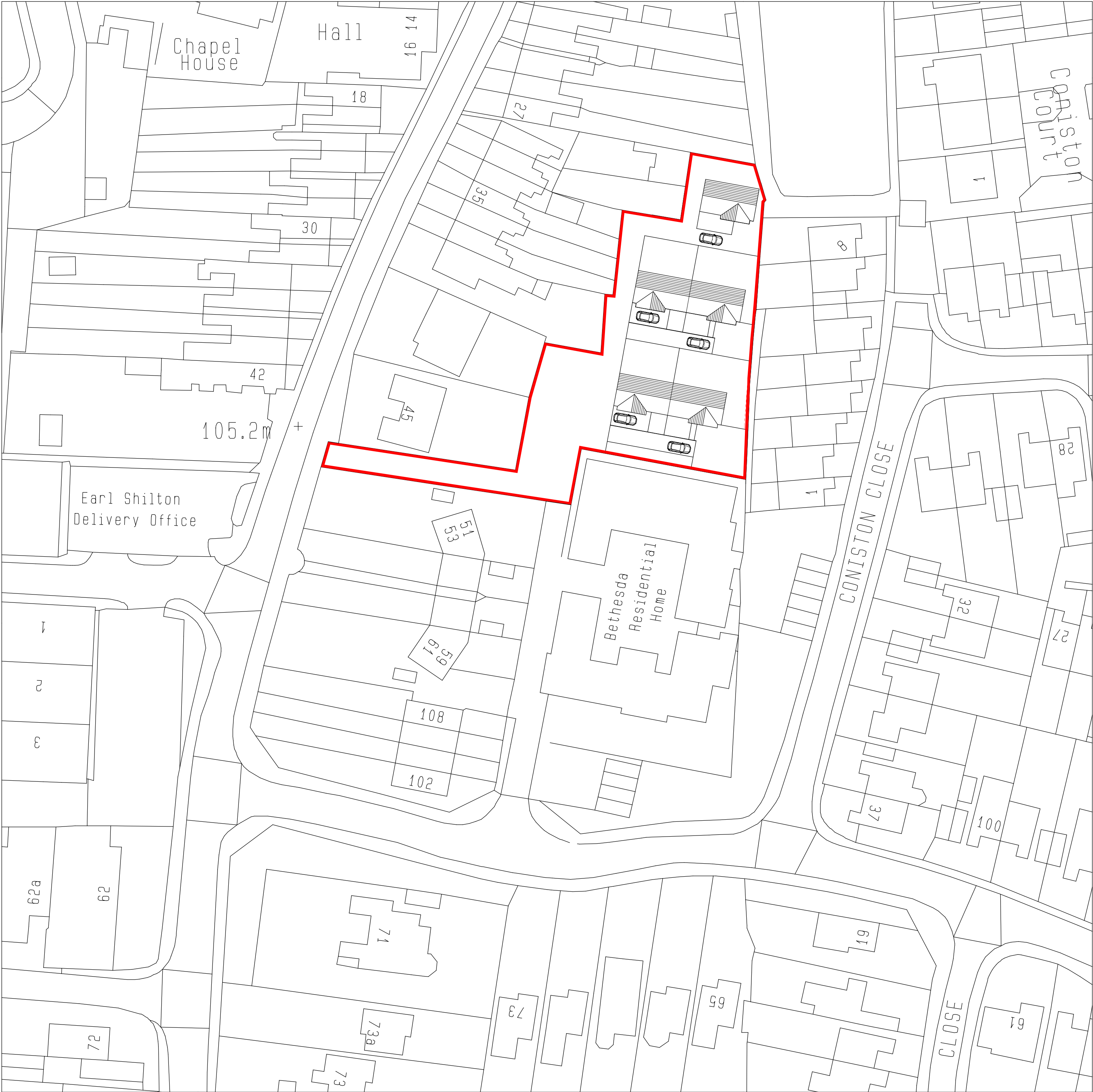
Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required

Table 11 - Filter Drains Indicative Maintenance Requirements

APPENDIX A – SITE INFORMATION

Stanfords VectorMap

Land To The Rear Of, Bethel Bethesda Residential Home, Equity Road East, Earl Shilton, Leicester, LE9 7FY
REF:0712477 Plan No 1546/BP



Scale, 1:500
Sheet, A2



Metres

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key

Area Laid To Grass

Block Paving

1.8 m close boarded fence

Concrete Paving Slabs

0.2m fence such as railings

Tarmac Road

Planted Area

CLIENT

Cooper Residential Homes Ltd

JOB TITLE

Land To The Rear Of Bethel Bethesda Residential Home Equity Road East Earl Shilton Leicester LE9 7FY

DRAWING TITLE

Four Semi Detached Bungalows And One Detached Bungalow For The Over 55s

SCALE

1:200

SHEET

A1

DATE

Mar 2022

DRAWN BY

A Moore

ANDREW MOORE

ARCHITECTURAL SERVICES

Tel: 07973997765

Email:andrewmoore@workmail.com

DWG NO

1546

SHEET NO

2



KEY

- BIG: Back Inlet Gully
IC: Foul Drain Inspection Chamber
RWP: Rain Water Downpipe
SIC: Storm Drain Inspection Chamber
--- storm drain run
- - - - - foul drain run

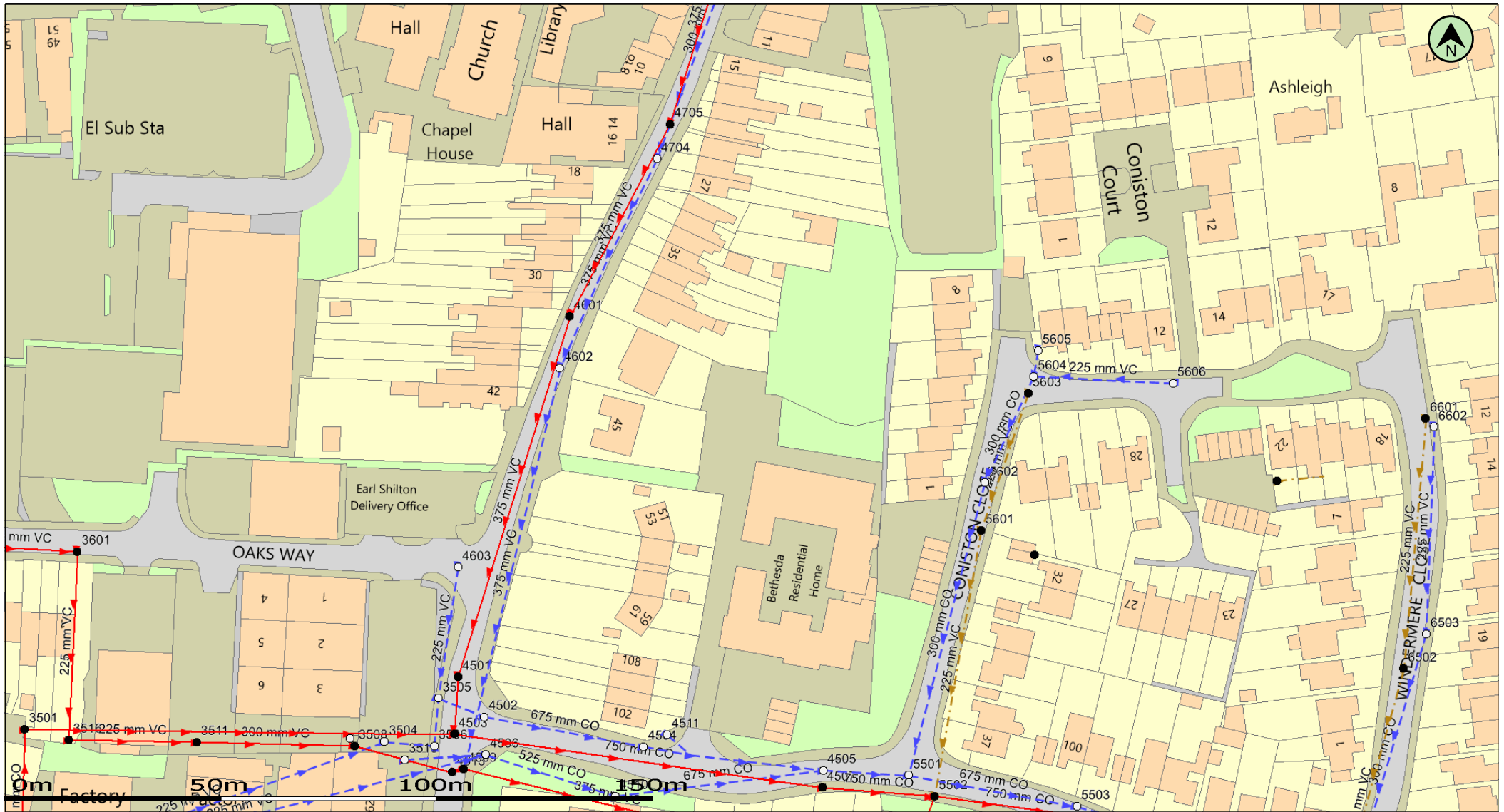
CLIENT
**Cooper Residential
Homes LTD**
JOB TITLE
**Land To The Rear Of
Bethel Bethesda
Residential Home
Equity Road East
Earl Shilton
LE9 7FY**

DRAWING TITLE
**Proposed Extension
To The Rear Of
Detached House**

SCALE	SHEET	DATE	DRAWN BY
1:50 & 1:100	A1	Oct 2018	A Moore

ANDREW MOORE
ARCHITECTURAL SERVICES
Tel: 07973397765
Email: andrewmoore@workmail.com

DRG NO	SHEET NO
1390	1



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Public Foul Gravity/Lateral Drain	→ → →	Highway Drain	→ → →	Manhole Foul	●
Public Combined Gravity/Lateral Drain	→ → →	Overflow Pipe	→ → →	Manhole Surface	○
Public Surface Water Gravity/Lateral Drain	→ → →	Disposal Pipe	→ → →	Abandoned Pipe	-----
Pressure Foul	→ → →	Culverted Water Course	→ → →	Chamber	■
Pressure Combined	→ → →	Pumping Station	▲ ▲ ▲		
Pressure Surface Water	→ → →	Fitting	■		

info@castledineenvironmental.co.uk

Earl Shilton

Earl SHILTON

///debate.dwell.flexibly

LENGTH:1.0

WIDTH: :0.3

DEPTH: 1.3

Time started 9:00

25%=1.18

0.7 bricks and made ground

0.7-1.3 natural

Minutes	Depth
---------	-------

0	0.82
---	------

1	0.82
---	------

2	0.82
---	------

3	0.82
---	------

4	0.82
---	------

5	0.82
---	------

30	0.82
----	------

1 hour	0.82
--------	------

2 hour	0.82
--------	------

3 hour	0.82
--------	------

///continues.tuned.undivided

LENGTH:1.0

WIDTH: :0.3

DEPTH: 1.0

Time started 9:15

25%=0:88

Minutes	Depth
---------	-------

0	0.50
---	------

1	0.50
---	------

2	0.50
---	------

3	0.50
---	------

4	0.50
---	------

5	0.50
---	------

10	0.50
----	------

30	0.50
----	------

1 hour	0.50
--------	------

2 hour	0.50
--------	------

3 hour	0.50
--------	------

APPENDIX B – HYDRAULIC CALCULATIONS

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		





Plot 1-4 + Access Road Permeable Paving

Type : Catchment Area

Area (ha)	0.101
-----------	-------

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100



Plot 5 PP Catchment

Type : Catchment Area

Area (ha)	0.011
-----------	-------

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations		Date: 06/07/2025			
		Designed by: SD	Checked by:		Approved By:
Report Details: Type: Junctions Storm Phase: Phase		Company Address:			

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
SWIC1 - Flow Control	Manhole	-69883.038	-4.695	106.500	0.550	105.950	Circular	0.450
SWIC2	Manhole	-69884.327	-12.734	105.500	0.700	104.800	Circular	0.450
SWIC3	Manhole	-69876.254	-14.203	105.000	1.200	103.800	Circular	0.450
SWIC4	Manhole	-69869.300	-15.488	104.500	0.700	103.800	Circular	0.450
SWIC5	Manhole	-69857.443	-17.546	104.500	0.750	103.750	Circular	0.450
SWMH1 - Flow Control	Manhole	-69850.443	-18.746	104.500	0.800	103.700	Circular	1.200
SWIC6	Manhole	-69843.220	-20.968	104.500	1.600	102.900	Circular	0.450
SWIC7 - Flow Control - Outfall	Manhole	-69838.097	6.508	104.500	1.700	102.800	Circular	0.450
Existing SW IC	Manhole	-69836.766	6.508	103.300	1.200	102.100	Circular	0.450

Name	Lock
SWIC1 - Flow Control	None
SWIC2	None
SWIC3	None
SWIC4	None
SWIC5	None
SWMH1 - Flow Control	None
SWIC6	None
SWIC7 - Flow Control - Outfall	None
Existing SW IC	None

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
SWIC1 - Flow Control	Inlet	Pipe (8)	(None)	No Restriction
SWIC2	Inlet	Pipe	(None)	No Restriction
SWIC3	Inlet	Pipe (1)	(None)	No Restriction
SWIC4	Inlet	Pipe (2)	(None)	No Restriction
SWIC5	Inlet	Pipe (3)	(None)	No Restriction
SWMH1 - Flow Control	Inlet	Pipe (4)	(None)	No Restriction
	Inlet (1)	Pipe (9)	(None)	No Restriction
SWIC6	Inlet (1)	Pipe (10)	(None)	No Restriction
SWIC7 - Flow Control - Outfall	Inlet	Pipe (6)	(None)	No Restriction
Existing SW IC	Inlet	Pipe (7)	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
SWIC1 - Flow Control	Outlet	Pipe	Orifice
	Diameter (m)	0.020	
	Coefficient of Discharge	0.600	
	Invert Level (m)	105.950	
SWIC2	Outlet	Pipe (1)	Free Discharge
SWIC3	Outlet	Pipe (2)	Free Discharge
SWIC4	Outlet	Pipe (3)	Free Discharge
SWIC5	Outlet	Pipe (4)	Free Discharge
SWMH1 - Flow Control	Outlet	Pipe (5)	Orifice
	Diameter (m)	0.060	
	Coefficient of Discharge	0.600	
	Invert Level (m)	103.700	
SWIC6	Outlet	Pipe (6)	Free Discharge
SWIC7 - Flow Control - Outfall	Outlet	Pipe (7)	Orifice
	Diameter (m)	0.020	
	Coefficient of Discharge	0.600	
	Invert Level (m)	103.900	

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Plot 5 Permeable Paving

Type : Tank

Dimensions

Exceedance Level (m)	106.500
Depth (m)	0.550
Base Level (m)	105.950
Freeboard (mm)	150
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	4.800

Depth (m)	Area (m²)	Volume (m³)
0.000	40.00	0.000
0.400	40.00	4.800

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Plot 5 PP Catchment
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (8)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	1.200

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Plot 1-4 + Access Road Permeable Paving

Type : Tank

Dimensions

Exceedance Level (m)	104.500
Depth (m)	0.650
Base Level (m)	103.850
Freeboard (mm)	150
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	70.050

Depth (m)	Area (m²)	Volume (m³)
0.000	467.00	0.000
0.500	467.00	70.050

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Plot 1-4 + Access Road Permeable Paving
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (9)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	1.794

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Swale & Filter Drain

Type : Tank

Dimensions

Exceedance Level (m)	104.500
Depth (m)	1.500
Base Level (m)	103.000
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	0.00
Total Volume (m³)	21.390

Depth (m)	Area (m²)	Volume (m³)
0.000	14.26	0.000
1.500	14.26	21.390

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (5)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (10)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	0.676

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations		Date: 06/07/2025			
		Designed by: SD	Checked by:		Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase		Company Address:			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Plot 1-4 + Access Road Permeable Paving	Plot 1-4 + Access Road Permeable Paving		Time of Concentration	0.101	100	0	100	0.101
Plot 5 PP Catchment	Plot 5 Permeable Paving		Time of Concentration	0.011	100	0	100	0.011
TOTAL		0.0		0.112				0.112

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025			
	Designed by: SD	Checked by:	Approved By:	
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address:			

Outfalls

Outfall	Outfall Type	Gated	Fixed Surcharged Level (m)	Level Curve
Existing SW IC	Free Discharge			

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Title: UK and Ireland Rural Runoff Calculator	Company Address:		



ICP SUDS / IH 124

Details

Method	ICP SUDS
Area (ha)	0.112
SAAR (mm)	634.0
Soil	0.53
Region	Region 4
Urban	0
Return Period (years)	0

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 4	0.6	0.6	0.5	1.2	1.6

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		





FEH: 2 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Plot 5 PP Catchment	FEH: 2 years: +40 %: 15 mins: Summer	0.01	3.2	1.389
Plot 1-4 + Access Road Permeable Paving	FEH: 2 years: +40 %: 15 mins: Summer	0.10	29.4	12.779

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

I

DRN



FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Plot 5 PP Catchment	FEH: 30 years: +40 %: 15 mins: Summer	0.01	6.8	2.931
Plot 1-4 + Access Road Permeable Paving	FEH: 30 years: +40 %: 15 mins: Summer	0.10	62.0	26.937

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

I

DRN



FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Plot 5 PP Catchment	FEH: 100 years: +40 %: 15 mins: Summer	0.01	8.5	3.684
Plot 1-4 + Access Road Permeable Paving	FEH: 100 years: +40 %: 15 mins: Summer	0.10	77.9	33.818

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FEH: 2 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SWIC1 - Flow Control	FEH: 2 years: +40 %: 180 mins: Summer	106.500	105.950	106.101	0.151	0.3	0.024	0.000	0.3	3.439	Surcharged
SWIC2	FEH: 2 years: +40 %: 180 mins: Summer	105.500	104.800	104.808	0.008	0.3	0.001	0.000	0.3	3.433	OK
SWIC3	FEH: 2 years: +40 %: 1440 mins: Winter	105.000	103.800	104.047	0.247	0.2	0.039	0.000	0.2	5.558	Surcharged
SWIC4	FEH: 2 years: +40 %: 1440 mins: Winter	104.500	103.800	104.047	0.247	0.2	0.039	0.000	0.2	5.422	Surcharged
SWIC5	FEH: 2 years: +40 %: 1440 mins: Winter	104.500	103.750	104.047	0.297	0.2	0.047	0.000	0.1	5.283	Surcharged
SWMH1 - Flow Control	FEH: 2 years: +40 %: 1440 mins: Winter	104.500	103.700	104.047	0.347	1.1	0.392	0.000	1.1	46.399	Surcharged
SWIC6	FEH: 2 years: +40 %: 1440 mins: Winter	104.500	102.900	104.045	1.145	0.3	0.182	0.000	0.3	31.580	Surcharged
SWIC7 - Flow Control - Outfall	FEH: 2 years: +40 %: 1440 mins: Winter	104.500	102.800	104.044	1.244	0.3	0.198	0.000	0.3	30.241	Surcharged
Existing SWIC	FEH: 2 years: +40 %: 1440 mins: Winter	103.300	102.100	102.105	0.005	0.3	0.000	0.000	0.3	30.234	OK

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SWIC1 - Flow Control	FEH: 30 years: +40 %: 180 mins: Summer	106.500	105.950	106.259	0.309	0.5	0.049	0.000	0.5	6.132	Flood Risk
SWIC2	FEH: 30 years: +40 %: 180 mins: Summer	105.500	104.800	104.810	0.010	0.5	0.002	0.000	0.5	6.120	OK
SWIC3	FEH: 30 years: +40 %: 960 mins: Winter	105.000	103.800	104.248	0.448	0.3	0.071	0.000	0.3	8.765	Surcharged
SWIC4	FEH: 30 years: +40 %: 960 mins: Winter	104.500	103.800	104.248	0.448	0.3	0.071	0.000	0.3	8.446	Flood Risk
SWIC5	FEH: 30 years: +40 %: 960 mins: Winter	104.500	103.750	104.248	0.498	0.3	0.079	0.000	0.3	8.129	Flood Risk
SWMH1 - Flow Control	FEH: 30 years: +40 %: 960 mins: Winter	104.500	103.700	104.248	0.548	1.8	0.620	0.000	1.6	56.820	Flood Risk
SWIC6	FEH: 30 years: +40 %: 960 mins: Winter	104.500	102.900	104.244	1.344	0.5	0.214	0.000	0.5	39.235	Flood Risk
SWIC7 - Flow Control - Outfall	FEH: 30 years: +40 %: 960 mins: Winter	104.500	102.800	104.242	1.442	0.5	0.229	0.000	0.5	37.702	Flood Risk
Existing SWIC	FEH: 30 years: +40 %: 960 mins: Winter	103.300	102.100	102.106	0.006	0.5	0.000	0.000	0.5	37.690	OK

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations	Date: 06/07/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		





FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SWIC1 - Flow Control	FEH: 100 years: +40 %: 180 mins: Summer	106.500	105.950	106.345	0.395	0.6	0.063	0.000	0.5	7.294	Flood Risk
SWIC2	FEH: 100 years: +40 %: 180 mins: Summer	105.500	104.800	104.810	0.010	0.5	0.002	0.000	0.5	7.278	OK
SWIC3	FEH: 100 years: +40 %: 960 mins: Winter	105.000	103.800	104.443	0.643	0.4	0.102	0.000	0.3	10.817	Surcharged
SWIC4	FEH: 100 years: +40 %: 960 mins: Winter	104.500	103.800	104.443	0.643	0.3	0.102	0.000	0.3	10.398	Flood Risk
SWIC5	FEH: 100 years: +40 %: 960 mins: Winter	104.500	103.750	104.443	0.693	0.3	0.110	0.000	0.3	9.982	Flood Risk
SWMH1 - Flow Control	FEH: 100 years: +40 %: 960 mins: Winter	104.500	103.700	104.443	0.743	1.7	0.840	0.000	1.5	65.658	Flood Risk
SWIC6	FEH: 100 years: +40 %: 960 mins: Winter	104.500	102.900	104.435	1.535	0.6	0.244	0.000	0.6	46.636	Flood Risk
SWIC7 - Flow Control - Outfall	FEH: 100 years: +40 %: 960 mins: Winter	104.500	102.800	104.432	1.632	0.6	0.260	0.000	0.6	45.002	Flood Risk
Existing SWIC	FEH: 100 years: +40 %: 960 mins: Winter	103.300	102.100	102.107	0.007	0.6	0.000	0.000	0.6	44.990	OK

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations		Date: 06/07/2025			
		Designed by: SD	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			



FEH: 2 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Plot 5 Permeable Paving	FEH: 2 years: +40 %: 180 mins: Summer	106.102	106.102	0.152	0.152	1.2	1.819	0.000	0.000	0.3	3.448	62.108	OK
Plot 1-4 + Access Road Permeable Paving	FEH: 2 years: +40 %: 1440 mins: Winter	104.047	104.047	0.197	0.197	1.5	27.545	0.000	0.000	1.1	41.444	60.678	OK
Swale & Filter Drain	FEH: 2 years: +40 %: 1440 mins: Winter	104.045	104.045	1.045	1.045	1.0	14.897	0.000	0.000	0.3	32.788	30.356	OK

3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations		Date: 06/07/2025			
		Designed by: SD	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			



**FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max.
Avg. Depth**

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Plot 5 Permeable Paving	FEH: 30 years: +40 %: 180 mins: Summer	106.259	106.259	0.309	0.309	2.2	3.711	0.000	0.000	0.5	6.177	22.680	OK
Plot 1-4 + Access Road Permeable Paving	FEH: 30 years: +40 %: 960 mins: Winter	104.249	104.249	0.399	0.399	3.7	55.848	0.000	0.000	1.8	49.227	20.275	OK
Swale & Filter Drain	FEH: 30 years: +40 %: 960 mins: Winter	104.244	104.244	1.244	1.244	1.5	17.736	0.000	0.000	0.5	40.633	17.081	OK

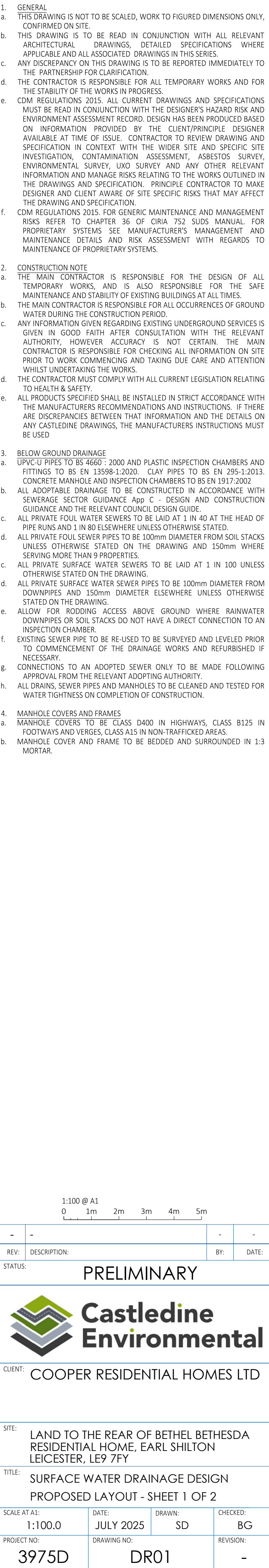
3975D SuDS Cooper Residential - Earl Shilton: Hydraulic Calculations		Date: 06/07/2025			
		Designed by: SD	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			

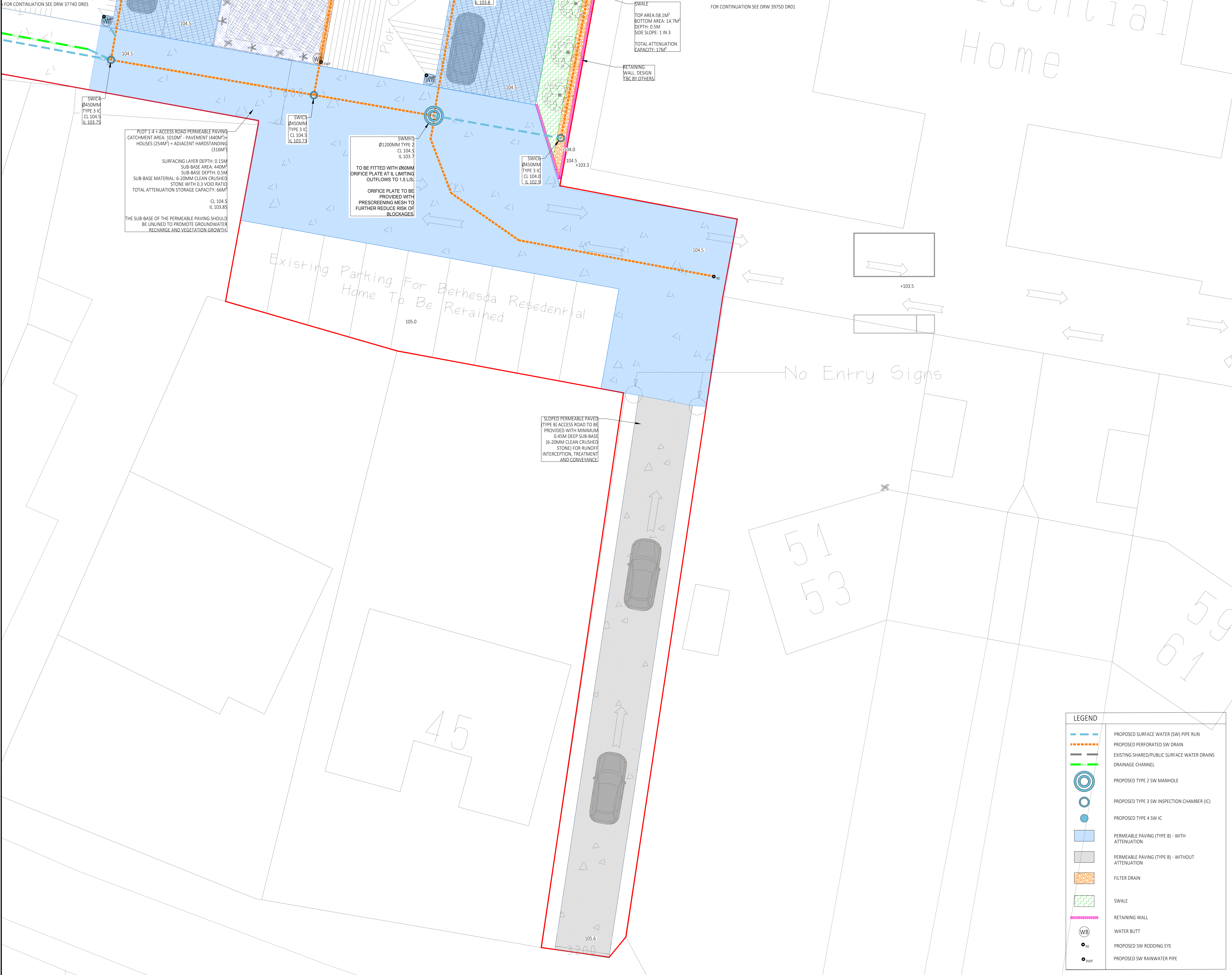


FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Avg. Depth

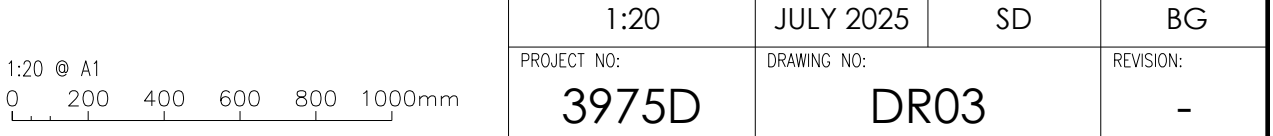
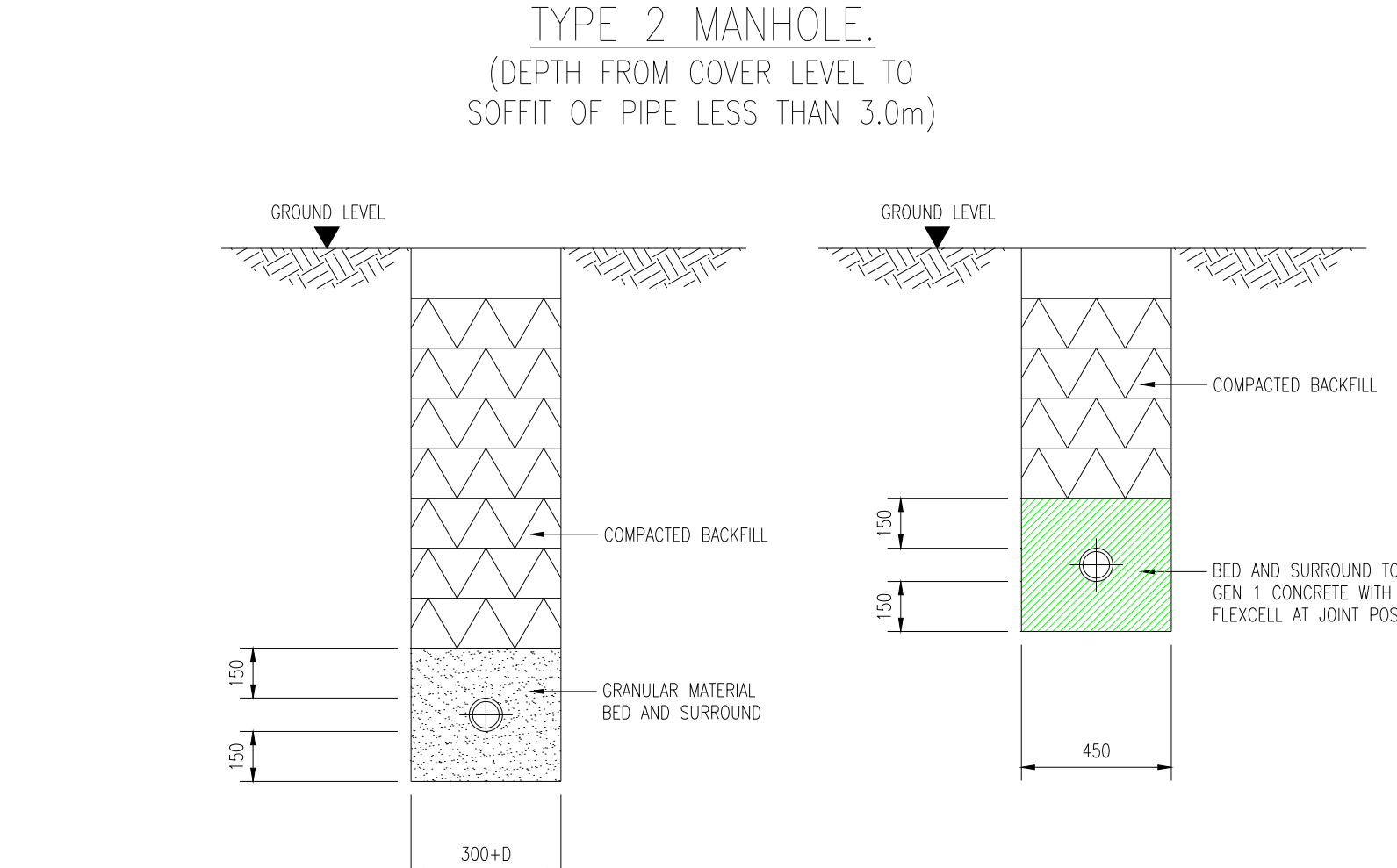
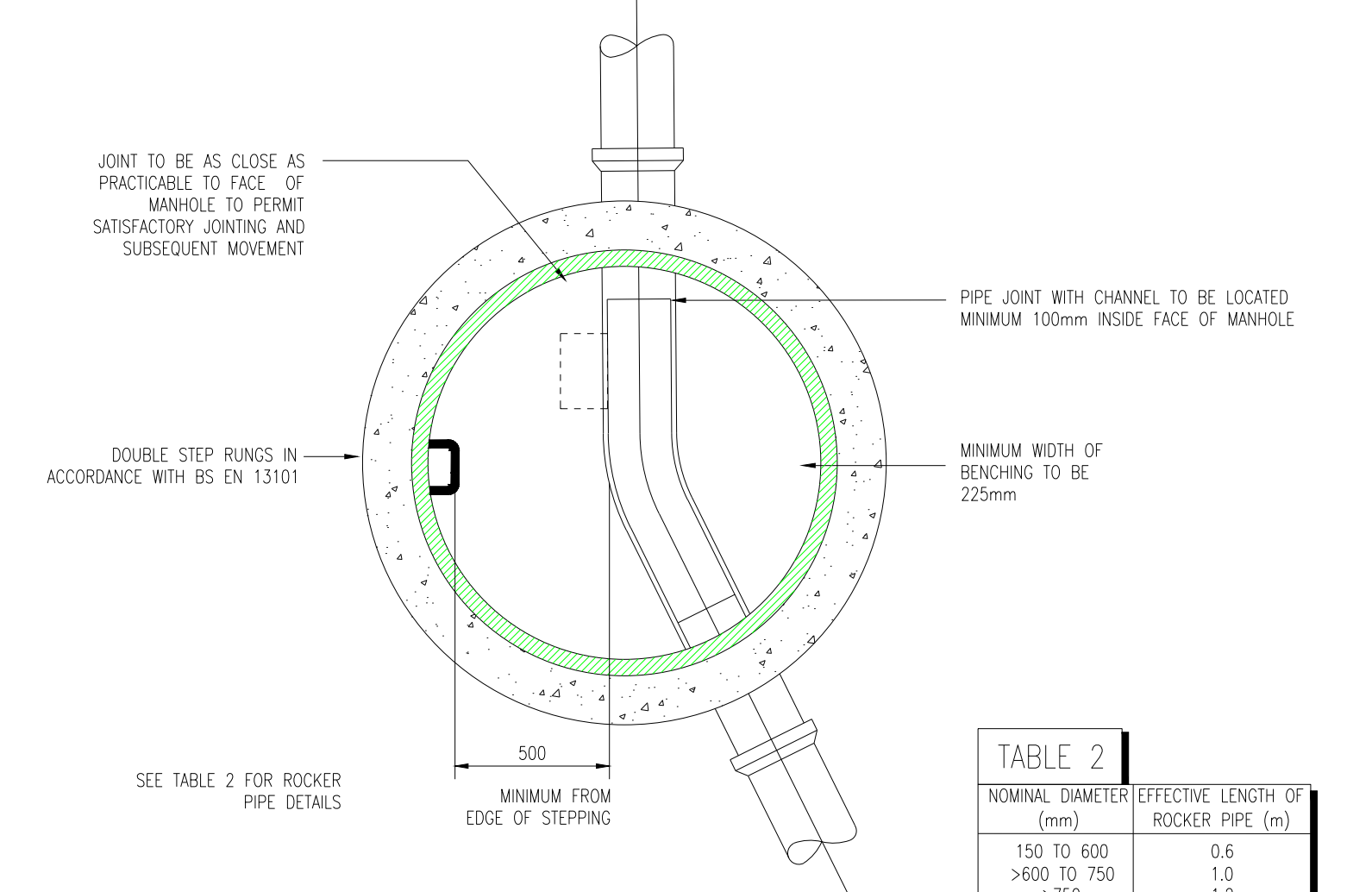
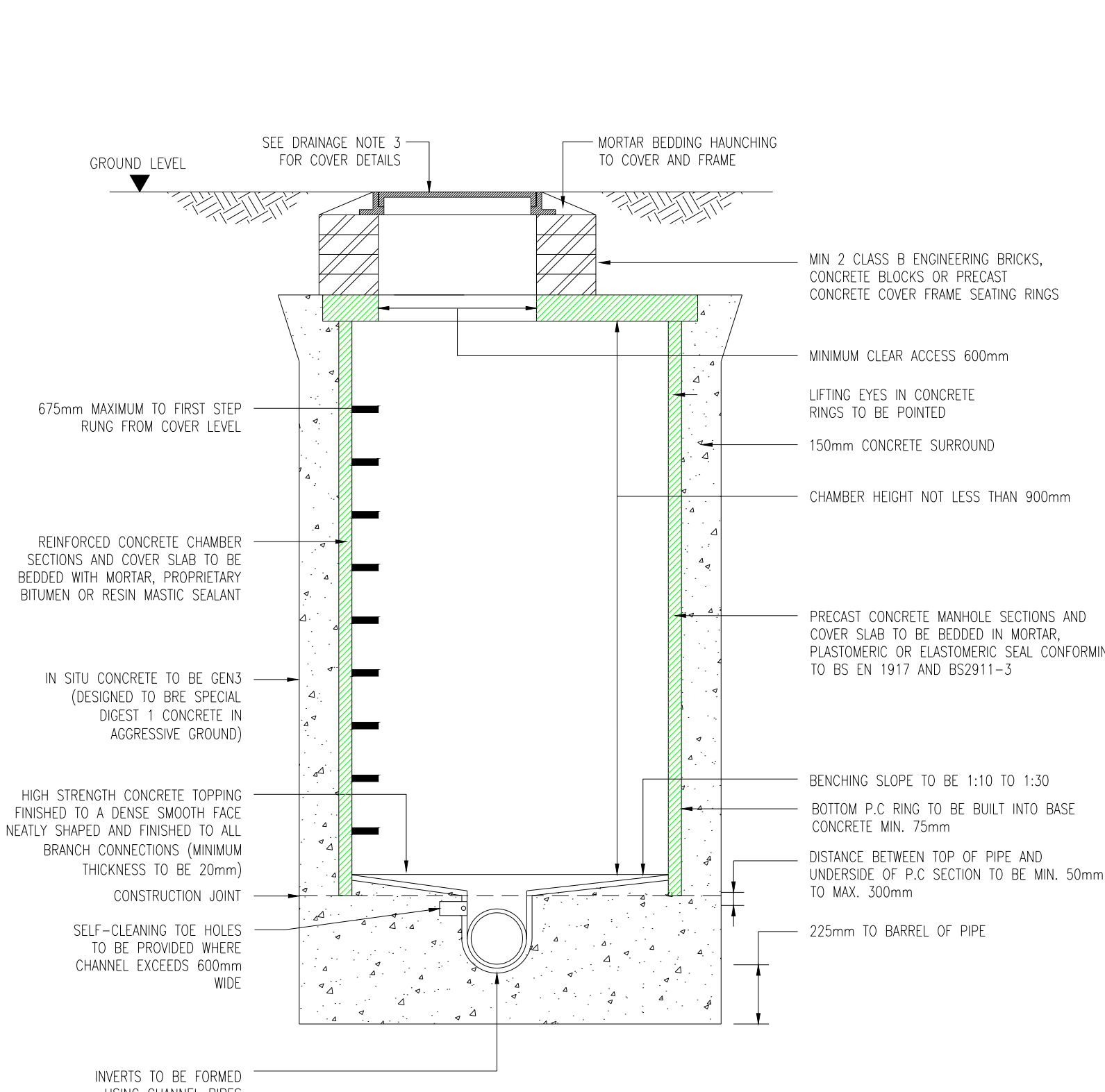
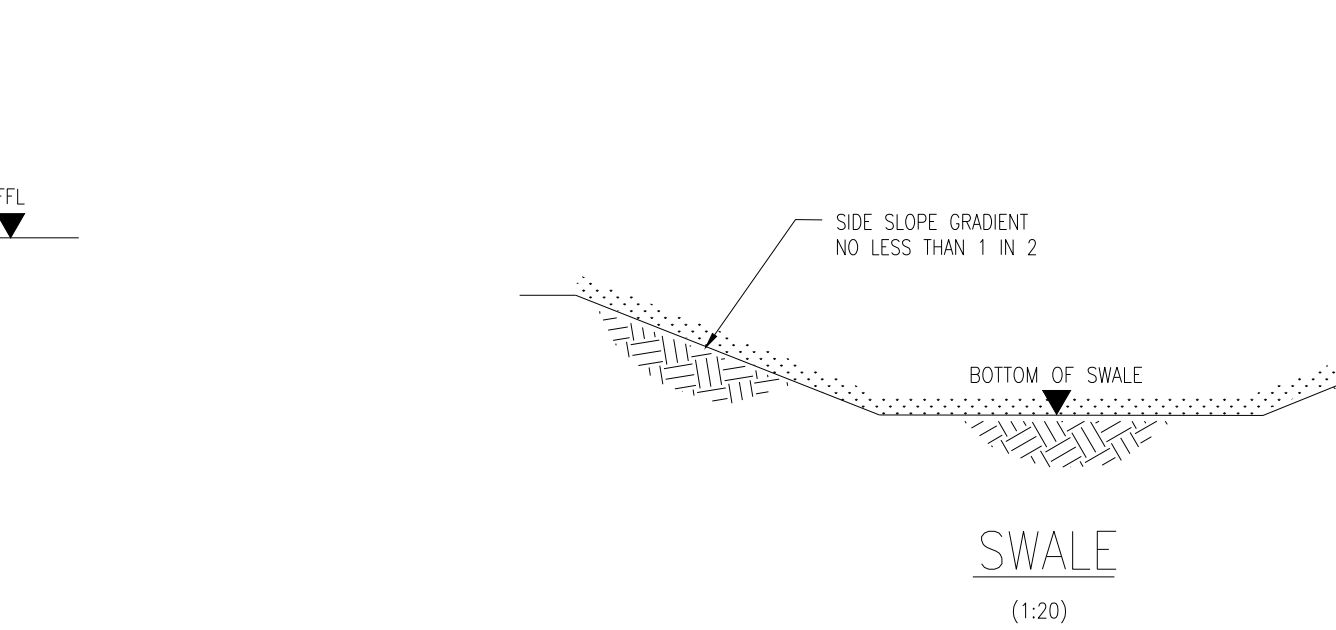
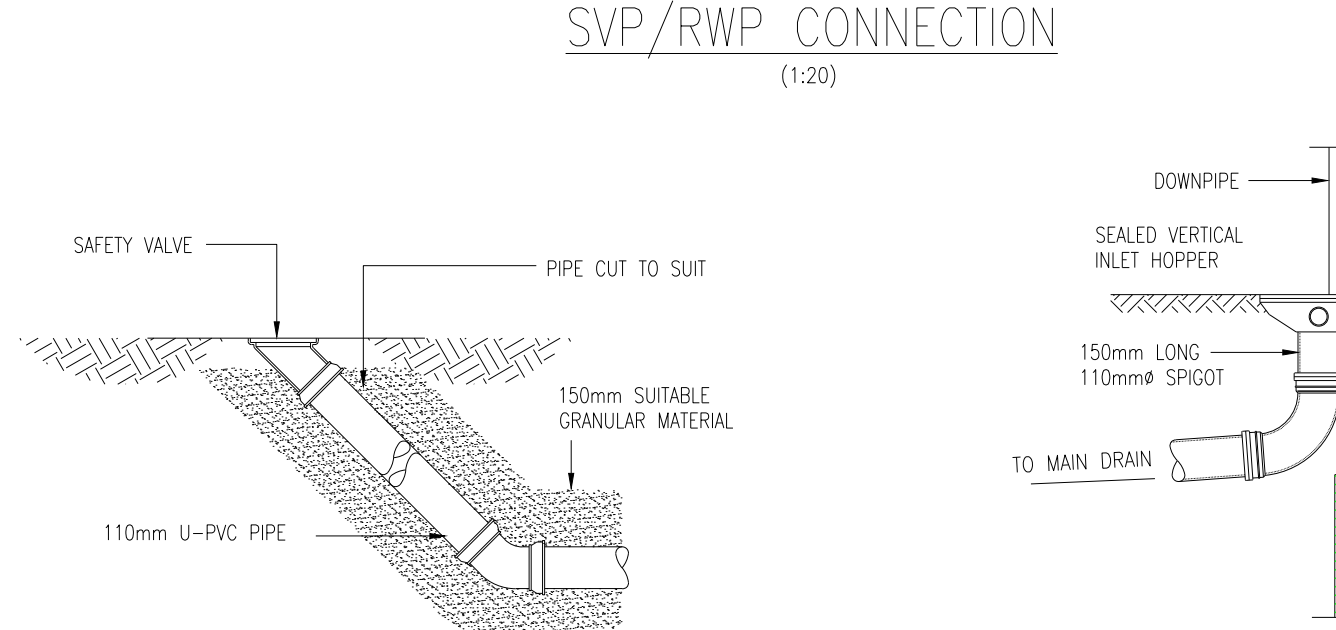
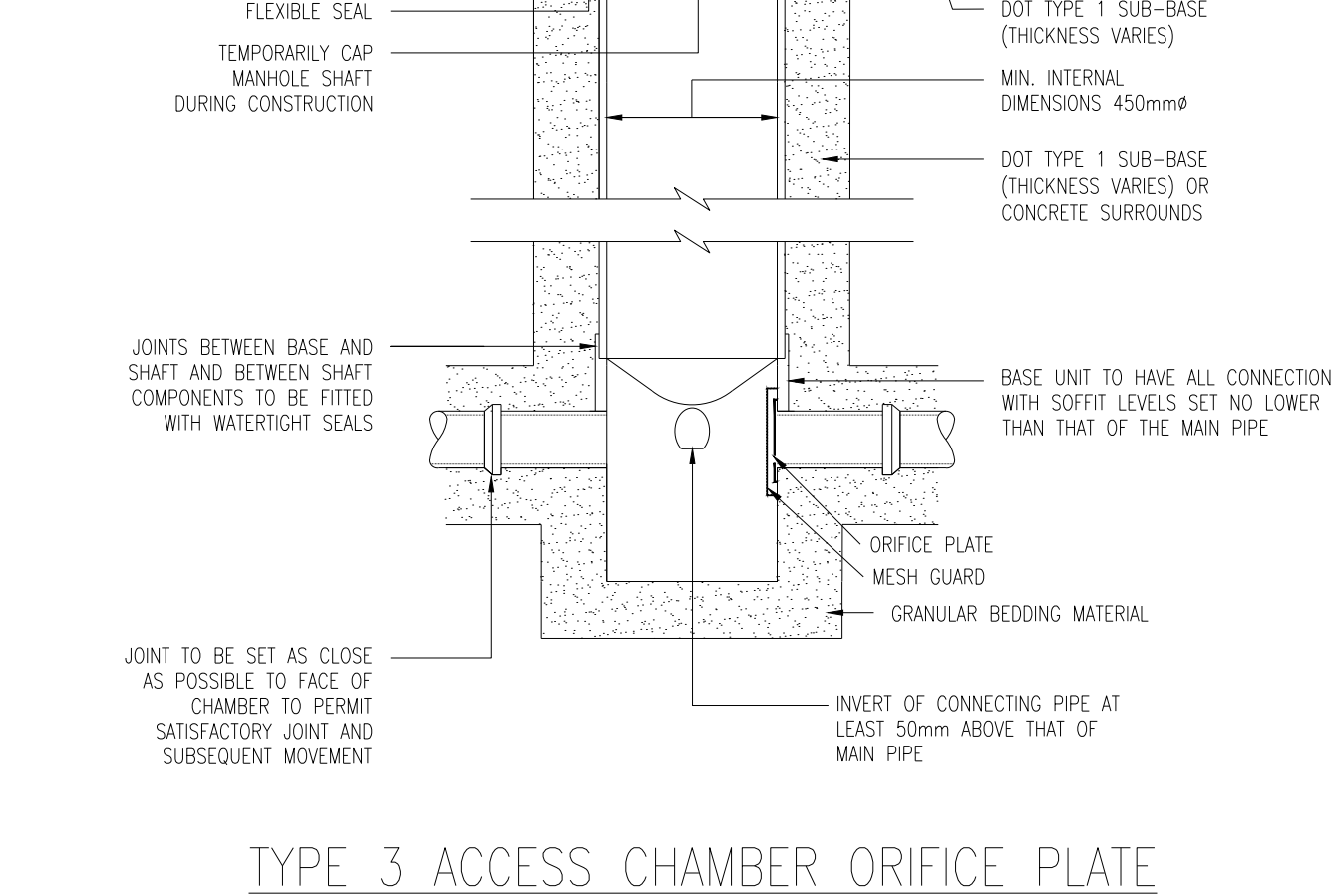
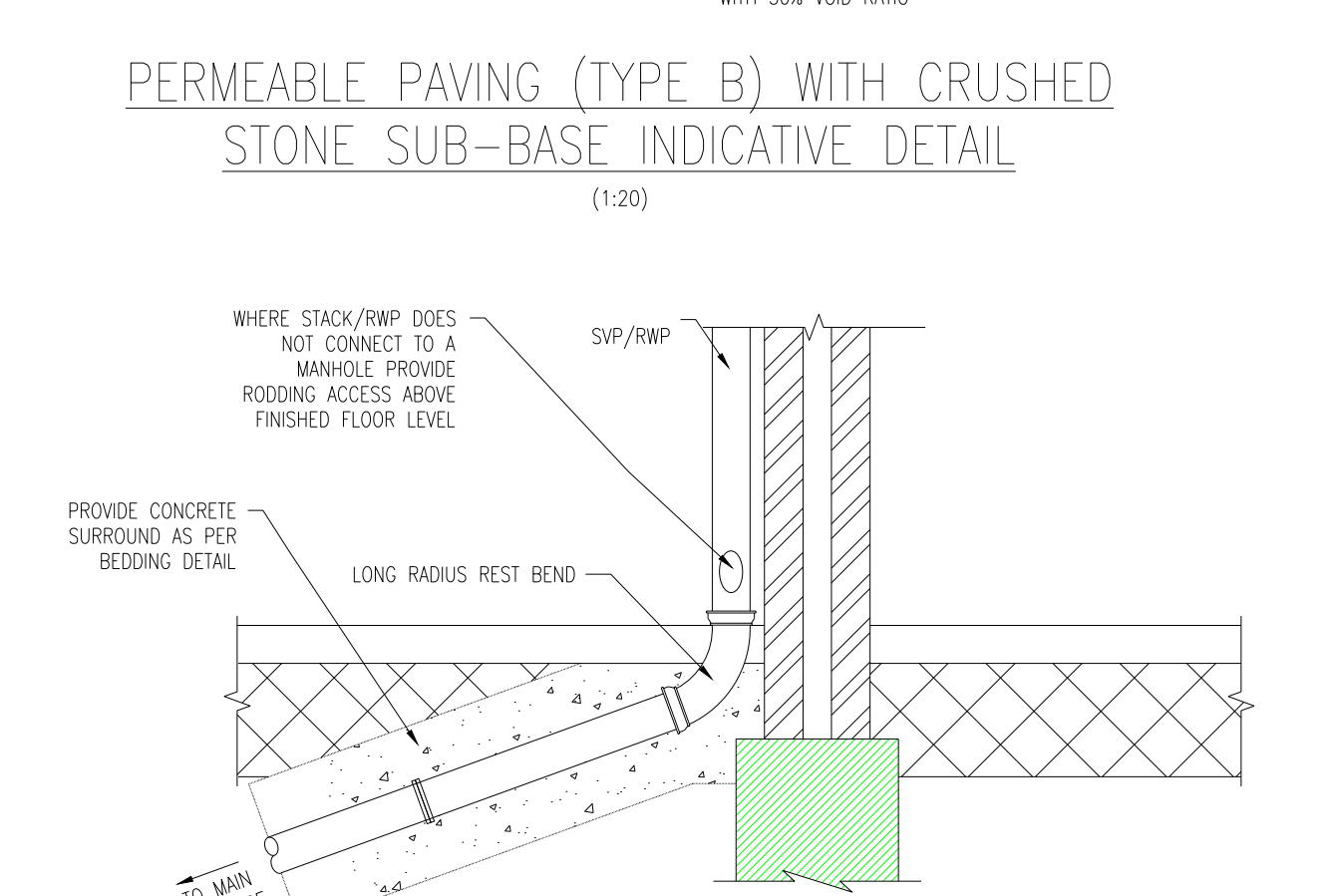
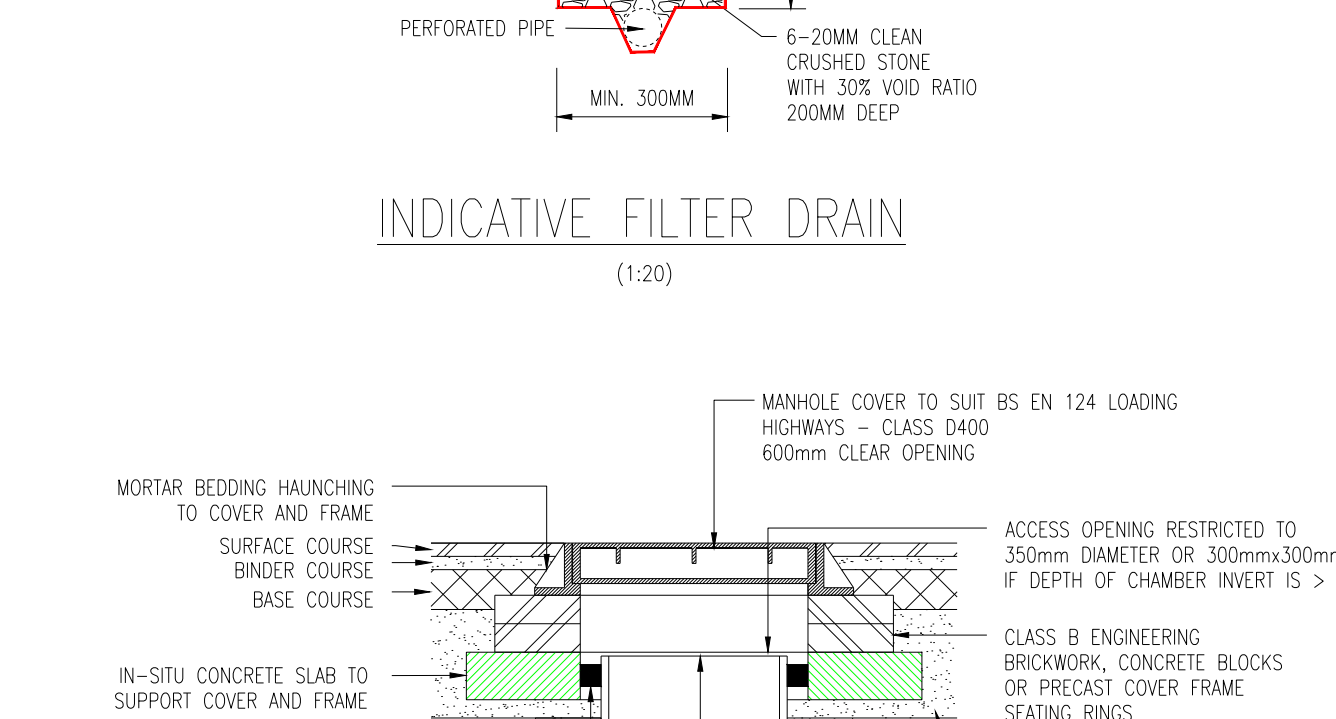
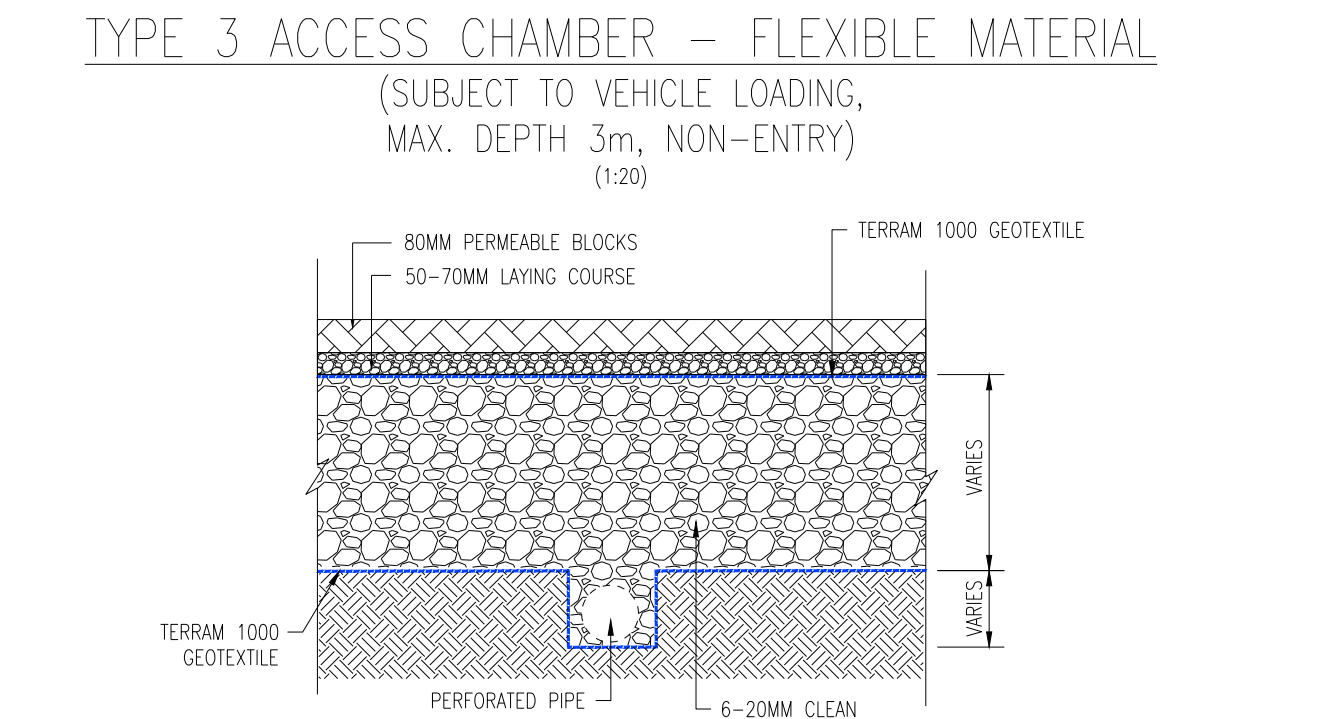
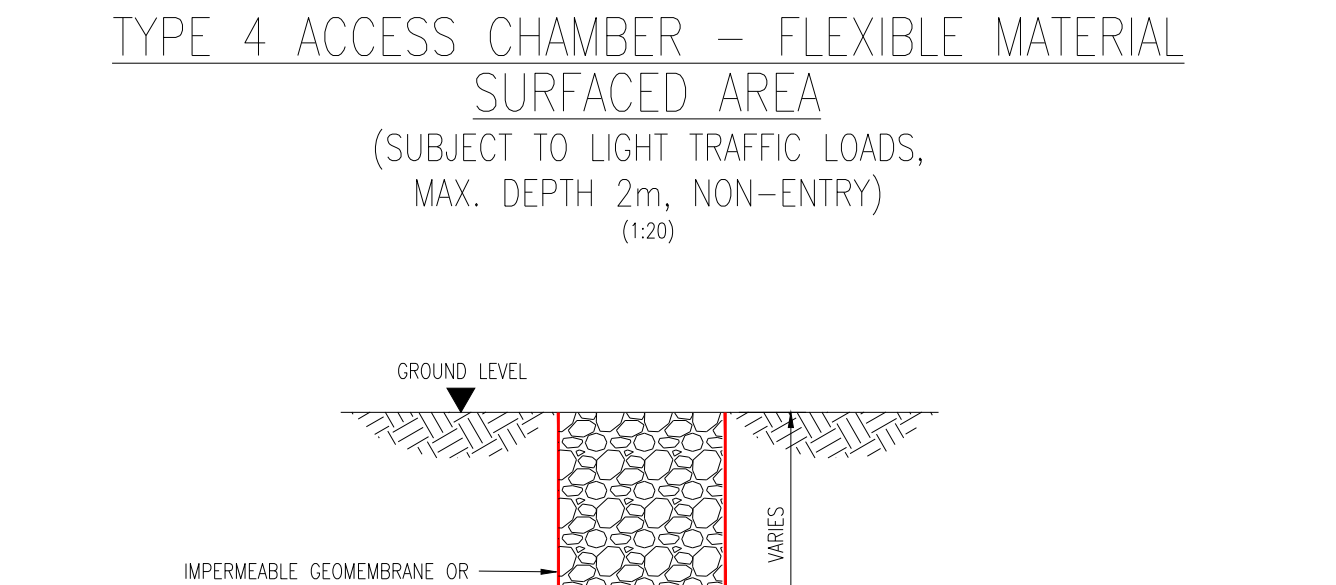
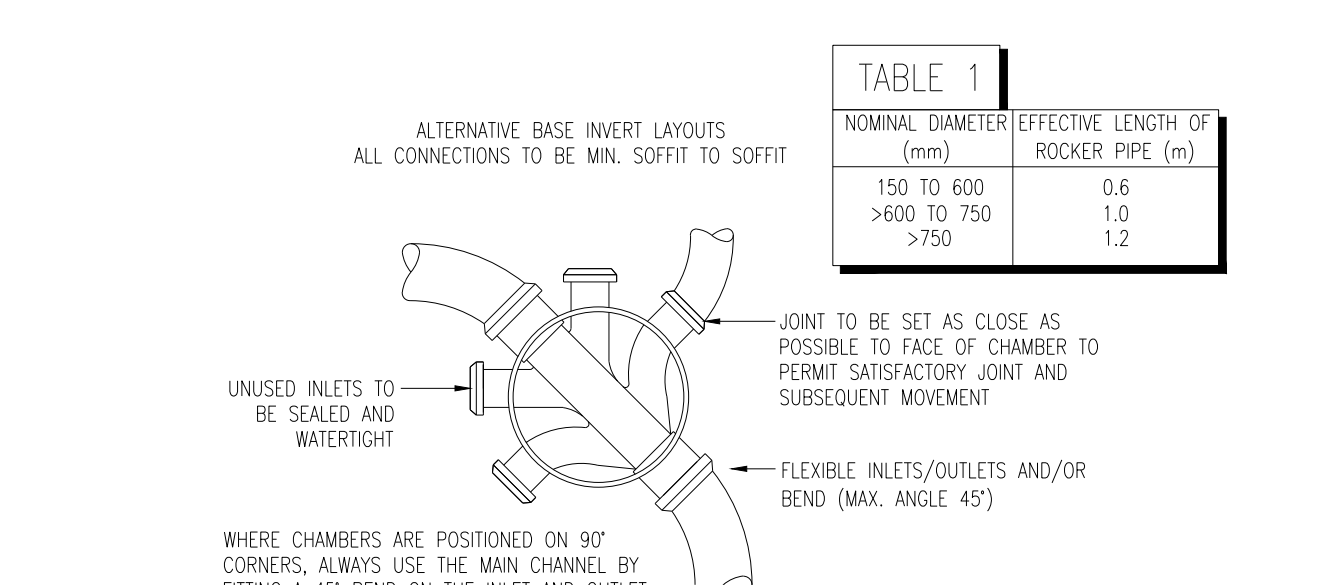
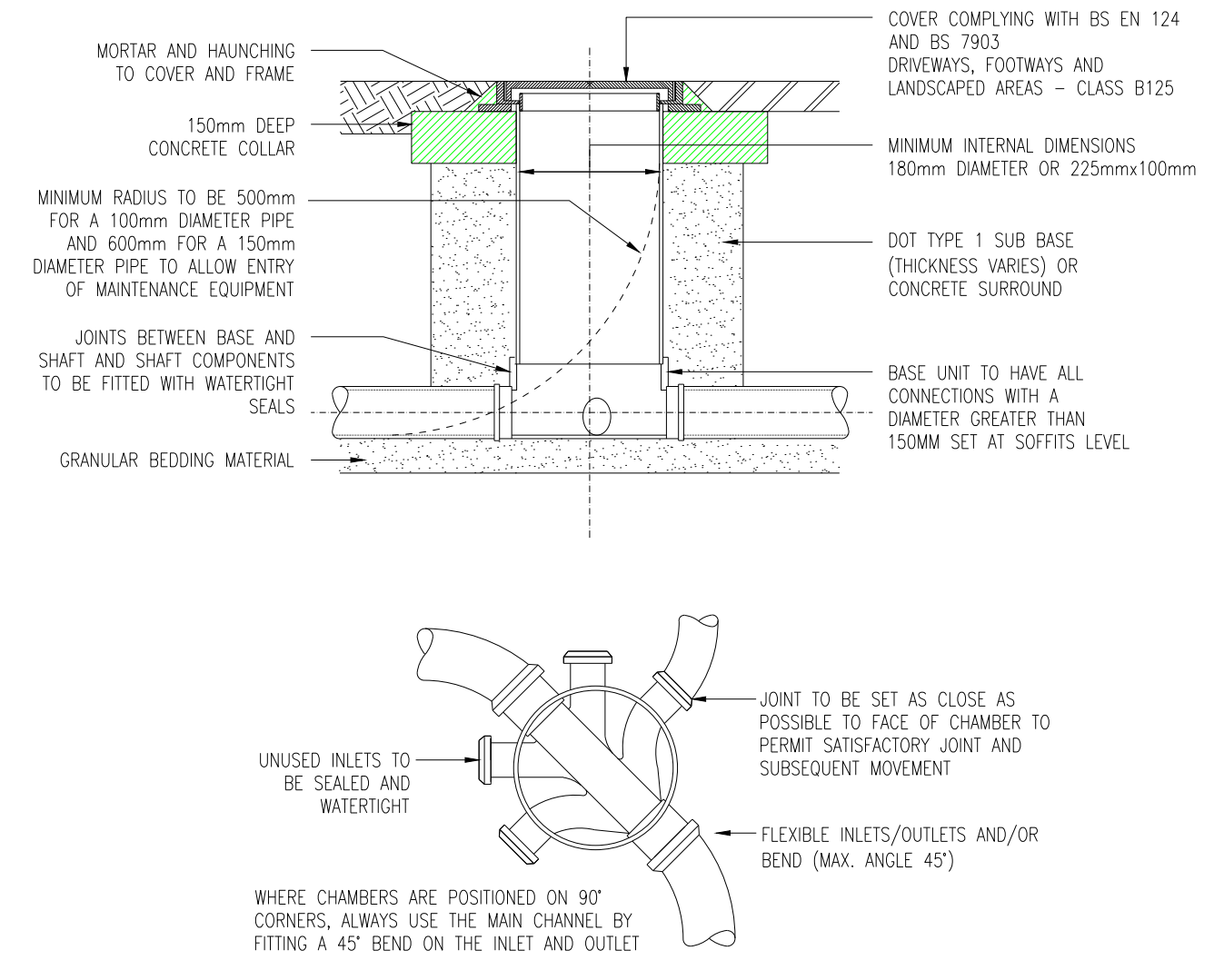
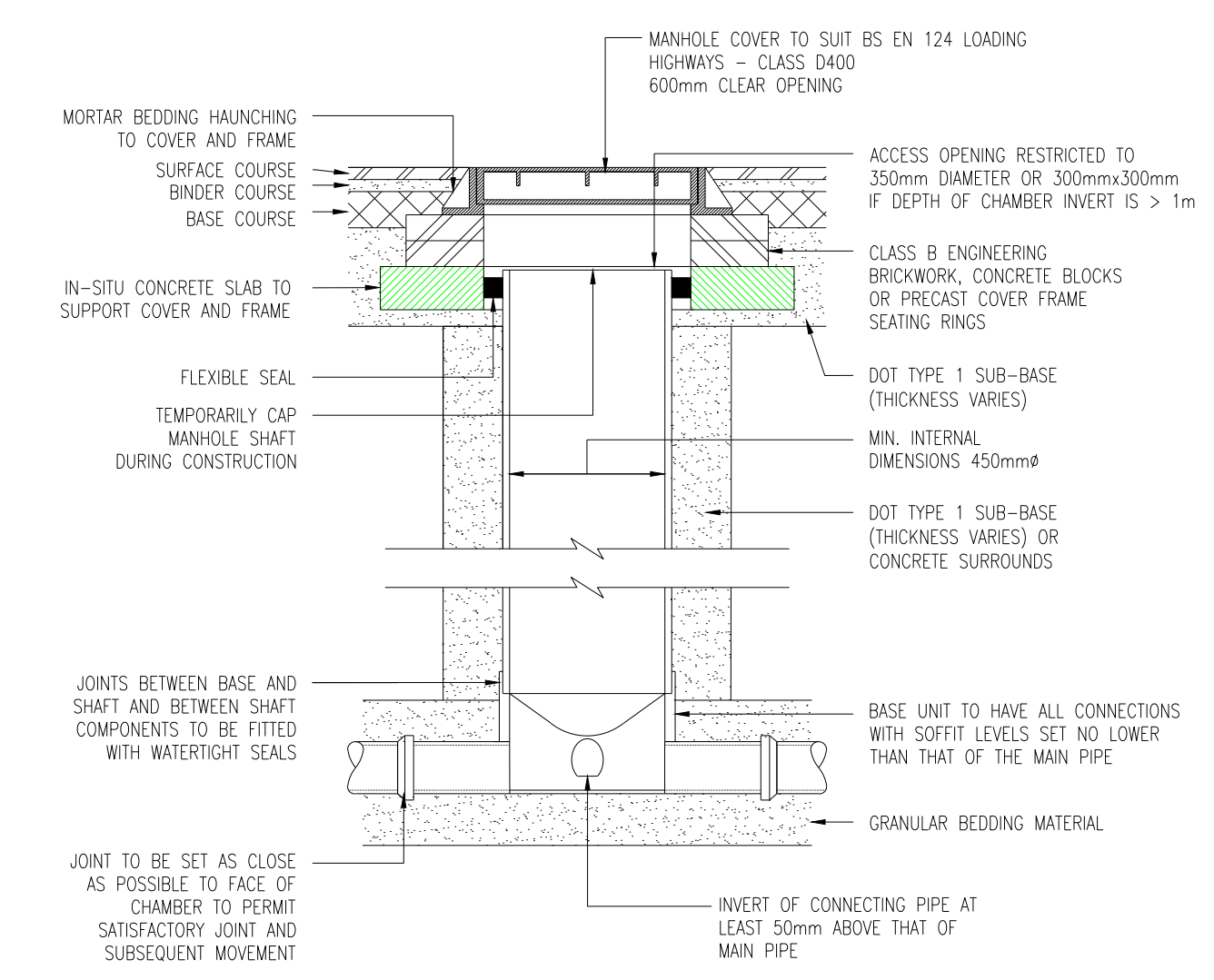
Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Plot 5 Permeable Paving	FEH: 100 years: +40 %: 180 mins: Summer	106.346	106.346	0.396	0.396	2.8	4.749	0.000	0.000	0.6	7.377	1.072	OK
Plot 1-4 + Access Road Permeable Paving	FEH: 100 years: +40 %: 960 mins: Winter	104.443	104.443	0.593	0.593	4.5	70.127	0.000	0.000	1.7	56.315	-0.109	Flood Risk
Swale & Filter Drain	FEH: 100 years: +40 %: 960 mins: Winter	104.435	104.435	1.435	1.435	1.5	20.466	0.000	0.000	0.6	48.135	4.320	OK

**APPENDIX C – SURFACE DRAINAGE STRATEGY LAYOUT AND
INDICATIVE CONSTRUCTION DETAILS**





- GENERAL
 - THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
 - ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
 - THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
 - CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
 - CDM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CRIA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.
- CONSTRUCTION NOTE
 - THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
 - THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
 - ANY INFORMATION GIVEN REGARDING EXISTING UNDERGROUND SERVICES IS GIVEN IN GOOD FAITH AFTER CONSULTATION WITH THE RELEVANT AUTHORITY, HOWEVER ACCURACY IS NOT CERTAIN. THE MAIN CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL INFORMATION ON SITE PRIOR TO WORK COMMENCING AND TAKING DUE CARE AND ATTENTION WHILST UNDERTAKING THE WORKS.
 - THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
 - ALL PRODUCTS SPECIFIED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS. IF THERE ARE DISCREPANCIES BETWEEN THAT INFORMATION AND THE DETAILS ON ANY CASTLEDINE DRAWINGS, THE MANUFACTURERS INSTRUCTIONS MUST BE USED.
- BELOW GROUND DRAINAGE
 - UPVC-U PIPES TO BS 4660 : 2000 AND PLASTIC INSPECTION CHAMBERS AND FITTINGS TO BS EN 13598-1:2020. CLAY PIPES TO BS EN 295-1:2013. CONCRETE MANHOLE AND INSPECTION CHAMBERS TO BS EN 1317:2002.
 - ALL ADAPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE App C - DESIGN AND CONSTRUCTION GUIDANCE AND THE RELEVANT COUNCIL DESIGN GUIDE.
 - ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
 - ALL PRIVATE FOUL SEWER PIPES TO BE 100mm DIAMETER FROM SOIL STACKS UNLESS OTHERWISE STATED ON THE DRAWING AND 150mm WHERE SERVING MORE THAN 9 PROPERTIES.
 - ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
 - ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100mm DIAMETER FROM DOWNPIPES AND 150mm DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
 - ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
 - EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
 - CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
 - ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.
- MANHOLE COVERS AND FRAMES
 - MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
 - MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.



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- BELOW GROUND DRAINAGE
- UPVC/CLP PIPES TO BS 4566: 2000 AND PLASTIC INSPECTION CHAMBERS AND FITTINGS TO BS EN 13598-1:2020. CLAY PIPES TO BS EN 295-1:2013. CONCRETE MANHOLE AND INSPECTION CHAMBERS TO BS EN 1917:2002
- ALL ADAPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE APP C - DESIGN AND CONSTRUCTION GUIDANCE AND THE RELEVANT COUNCIL DESIGN GUIDE.
- ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
- ALL PRIVATE FOUL SEWER PIPES TO BE 100mm DIAMETER FROM SOIL STACKS UNLESS OTHERWISE STATED ON THE DRAWING AND 150mm WHERE SERVING MORE THAN 9 PROPERTIES.
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- ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
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- ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.
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- MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
- MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

-	-	-	-
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PRELIMINARY			
CLIENT: COOPER RESIDENTIAL HOMES LTD			
SITE: LAND TO THE REAR OF BETHEL BETHESDA			
TITLE: RESIDENTIAL HOME, EARL SHILTON, LE9 7FY			
TITLE: SURFACE WATER DRAINAGE DESIGN			
TITLE: DRAINAGE DETAILS - SHEET 1 OF 2			
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:20	JULY 2025	SD	BG
PROJECT NO:	DRAWING NO:	REVISION:	
3975D	DR03	-	



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TITLE: SURFACE WATER DRAINAGE DESIGN

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SCALE AT A1: 1:20

DATE: JULY 2025

DRAWN: SD

CHECKED: BG

PROJECT NO: 3975D

DRAWING NO: DR03

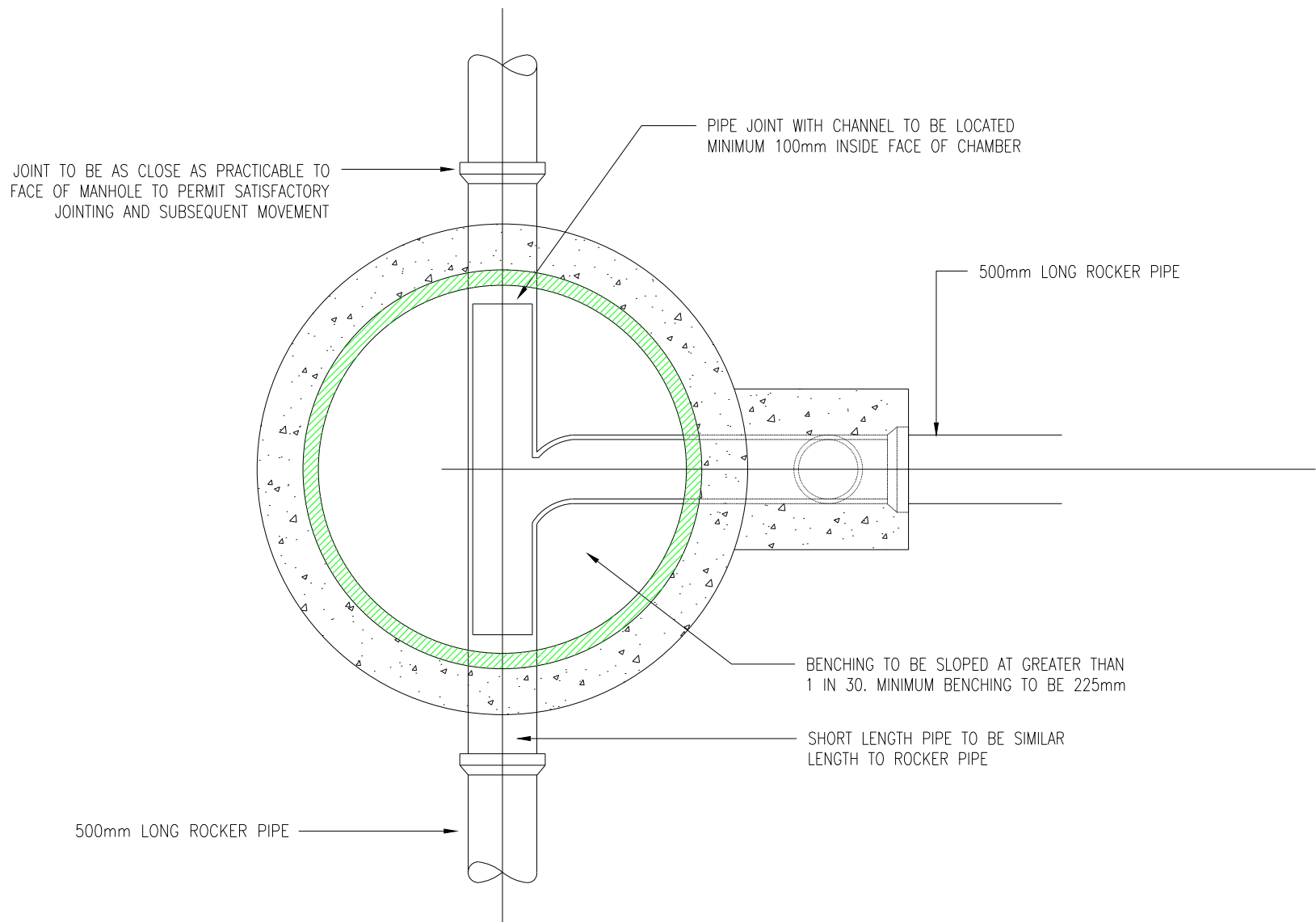
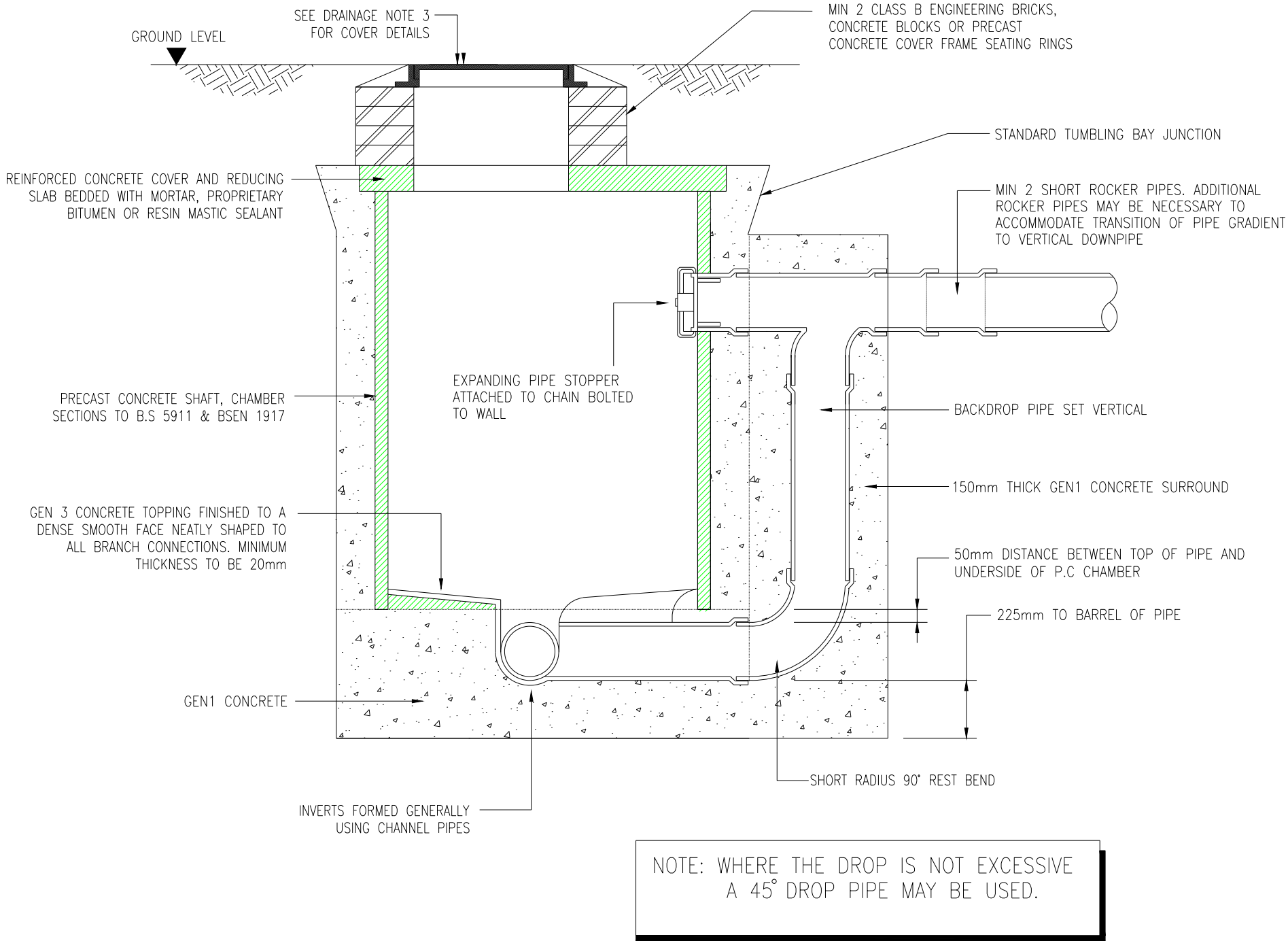
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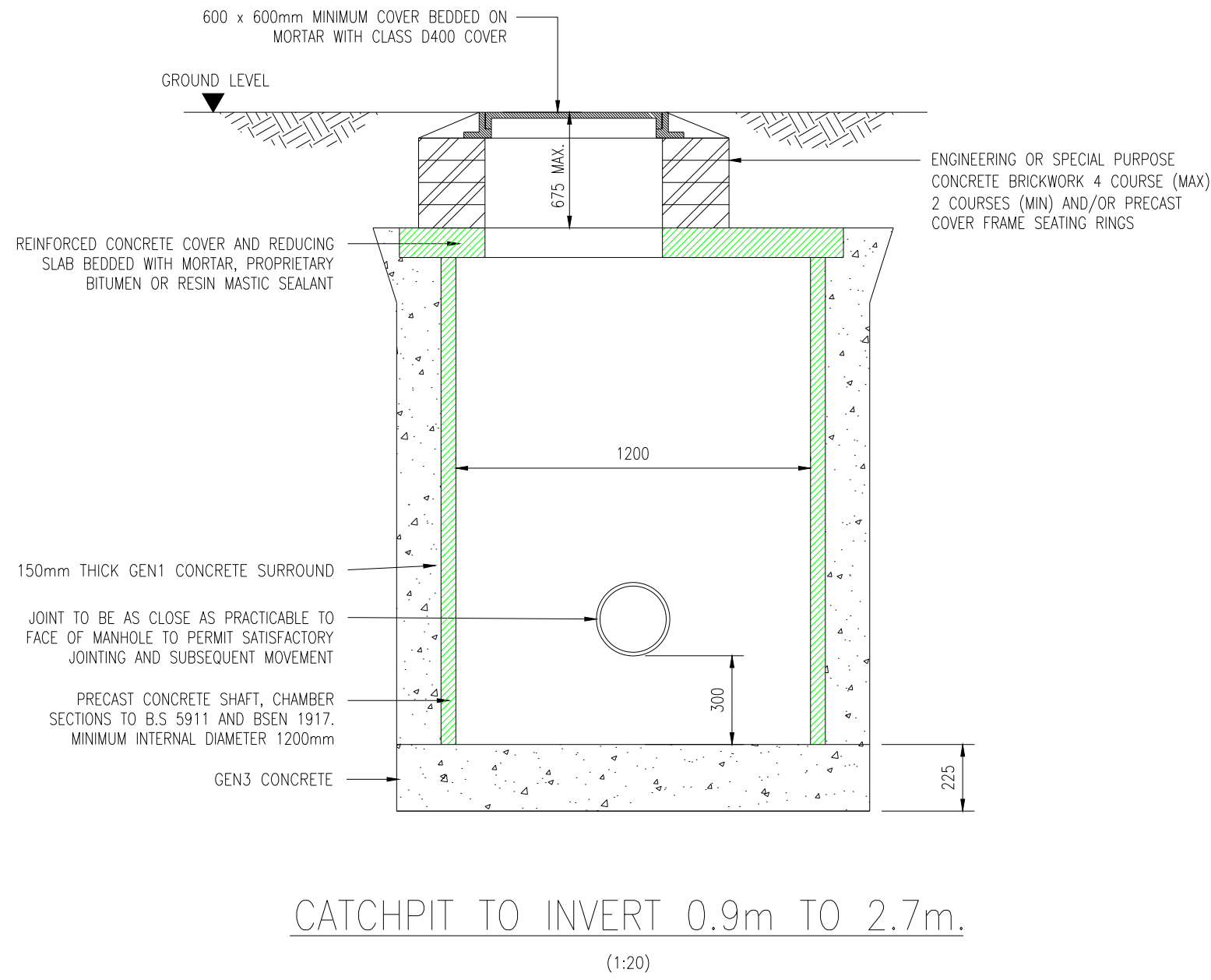
ALL BACKFILLING AND REINSTATEMENT WITHIN ROADS AND STREETS TO BE IN ACCORDANCE WITH THE HIGHWAY AUTHORITY AND HAUC SPECIFICATION.

1:20 @ A1

0 200 400 600 800 1000mm



BACKDROP MANHOLE.
LESS THAN 3.0m DEEP.
(1:20)



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e. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
f. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
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-	-	-	-
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STATUS: PRELIMINARY			
			
CLIENT: COOPER RESIDENTIAL HOMES LTD			
SITE: LAND TO THE REAR OF BETHEL BETHESDA RESIDENTIAL HOME, EARL SHILTON, LE9 7FY			
TITLE: SURFACE WATER DRAINAGE DESIGN DRAINAGE DETAILS - SHEET 2 OF 2			
SCALE AT A1: 1:20	DATE: JULY 2025	DRAWN: SD	CHECKED: BG
PROJECT NO: 3975D	DRAWING NO: DR04	REVISION: -	

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