



DRAINAGE STRATEGY – Rev. A

SIMPLY UK

COLDHARBOUR ROAD, GRAVESEND

9360:
MARCH 2024

INNOVATION IN THOUGHT AND STRUCTURE



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COLDHARBOUR ROAD, GRAVESEND, KENT
PROPOSED DEVELOPMENT
DRAINAGE STRATEGY

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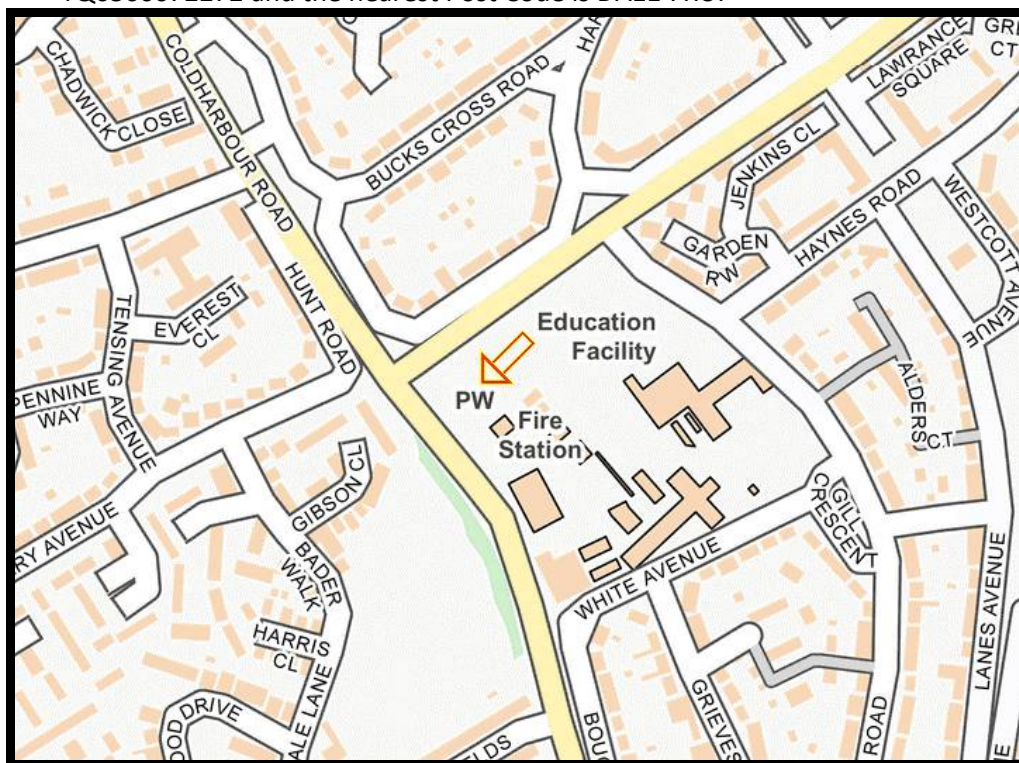
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1.0 INTRODUCTION

1.1 General

1.1.1 Charles Scott & Partners have been commissioned by Simply UK to assist with investigations and reporting on a proposed development for the Planning Application. This is in relation to any potential existing drainage and flooding issues to the proposed residential care home development near ColdHarbour Road, Gravesend, Kent, DA11 7JL. We are to provide the comments within the body of an updated drainage strategy report to accompany Planning comments for the proposed facility.

1.1.2 The site is located at 8 Coldharbour Road, Gravesend, Kent, approximately 2km southwest of Gravesend town centre in northwest Kent. The Ordnance Survey grid reference for the centre of the site is 563660, 172272 as shown on the Site Location Plan in Appendix A. the National Grid Reference for the site is TQ636722 / TQ6366072272 and the nearest Post Code is DA11 7RU.



The site is bounded by Coldharbour Road to the southwest and New House Lane to the northwest. An open school field is situated to the northeast of the site and residential properties along the southeast boundary.

- 1.1.3 The proposal involves a new development of 3 storey, 65-bedroom care home with associated facilities.
- 1.1.4 Development plans are shown in Appendix B. The proposed layout is shown on the enclosed Architectural Drawing, which is appended to this report – see Appendix B.
- 1.1.5 At the time of writing, an application has been sent to Southern Water for a Pre-planning development enquiry.

1.2 Objectives

- 1.2.1 The object of this report is to inform the client and the Local Authority of any key drainage and other issues which may influence the development process. The report has been produced in accordance with the guidance detailed in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance (PPG). Reference has also been made to the CIRIA SUDS manual (C753), The Kent County Council – Thameside Surface Water Management Plan & Thameside Water Cycle Management Strategy, Standards and Information including Strategic Flood Risk Assessment (SFRA) Council SuDS Design Guide.
- 1.2.2 The report will describe the existing surface water and foul drainage systems, how they may be affected and dealt with as part of the development.

1.3 Water Regulatory Bodies

- 1.3.1 The water regulatory process in the UK involves 3 agencies: -
 - i) Local Lead Flood Authority – in this case Kent County Council
 - ii) Southern Water – Sewerage – adopted foul and surface water sewers fall within their control, for this site.
 - iii) The Environment Agency (EA) control the discharge of surface water (and other drainage discharges) to water courses.

1.4 Sources of Information

- 1.4.1 This report has been correlated from information gathered existing information and drawings, meetings/discussions with consultants, Southern Water, and other bodies. Information given by these bodies is referred to and reported within the body of this report.
- 1.4.2 Geotechnical & Environmental investigations have been undertaken on the site on behalf of our client. This can be forwarded if required.
- 1.4.3 We have had sight of most of the services locations, but still await clarification of some of the utilities.

- 1.4.4 We have yet to carry out a full and detailed intrusive investigation of the drainage system for the site. We would recommend that our first investigation is supplemented with an additional comprehensive investigation to confirm condition and position of the existing and proposed connections prior to construction works commencing.

1.5 Terminology

1.5.1 The following terminology has been used in this report: -

“Sewer” refers to a pipe which has been adopted by Southern Water

“Drain” refers to a private or un-adopted pipe

“Chamber” refers to a manhole or other access point to the drainage or sewer system

“Connection Chamber” refers to a manhole, usually within the edge of the site, which is adopted by Southern Water and allows the connections of the drain

“Combined Sewer” is an adopted pipe which carries both foul and surface water

“Controlled Water” – river or water course which falls within the protection of the Environment Agency, which applies to all open water courses.

1.6 Assumptions

1.6.1 It should be noted that areas stated in this document are indicative only and are based on the current information we have for the site.

1.6.2 This report will also discuss in detail the temporary situation, i.e. during the construction of the new development, which may have implications on the foul and surface water drainage that will be addressed. Observations based on current available information have been made.

1.6.3 The contributing areas for treatment and attenuation have been based on the areas found in the architectural layouts and the redline boundary for the site.

1.6.4 It is our client’s intention for the surface and foul water drainage within the site boundary to be vested prior to the connections to the sewers vested by Southern Water. It should be noted that the proposals are to use any existing sewer connections that already serve the functioning nearby infrastructure.

1.6.5 Finally, it is assumed that the proposed at source SUDS features will be acceptable to the approving bodies so long as they do not fall within 5m of any domestic dwelling.

2.0 EXISTING CONDITIONS

2.1 Existing Topography

2.1.1 A topographical survey has been carried out and the site generally falls from the west to east, falling from 42.28mAOD down to 39.50m AOD. The development is approximately 2.2km south of the river Thames.

- Access is gained to the site via Coldharbour Road to the west of the site
- The postal address for the nearest site is ColdHarbour Road, Gravesend, Kent, DA11 7RU
- The site is centred on approximately OS Grid Ref. TQ636722 / TQ6366072272
- The coordinates for the site are Eastings 563660, Northings 172272
- The Existing site comprises a disused parcel of land. The northern margin and eastern half of the site comprises surfacing with asphalt hardstanding whilst overgrown vegetation was present across the remainder of the site.

The site is bounded by:

- To the North – New House Lane
- To the East – Playing Fields & Grass
- To the South – Residential housing & Church
- To the West – Coldharbour Road & Residential developments

We have appended a site Location Plan in Appendix A.

We have appended the topographical drawing in Appendix C.

2.2 Existing Geology

- 2.2.1 Applied Geology carried out a Desktop study and Site Investigations in 2021 & December 2023 for the site. Their investigations showed the following ground conditions -

Stratum	Depth to Top of Strata (m bgl)	Thickness (range) (m)	Comments
Hardstanding	GL	0.10 to 0.20	Encountered across the north-western, northern and eastern regions of the site.
Made Ground	GL	0.15 to 2.30	Encountered in all exploratory holes across the site. Greater thicknesses of Made Ground present within the central regions of the site, in the footprint of the former Public House.
Head Deposits	0.50	2.00	Encountered in the north-western corner of the site in BH1 only.
Thanet Sand Formation	0.15 to 2.20	Proven to the full depth of the investigation (12.45m bgl)	Encountered in all exploratory holes across the site.

The Made Ground generally comprised horizons of brown sandy slightly silty/clayey gravels and/ or brown slightly gravelly silty/clayey fine to medium sands, locally, horizons of soft brown slightly gravelly sandy clays were encountered. Collectively, the gravel content generally comprised fine to coarse subangular to subrounded quartzite, chalk, sandstone, asphalt, clinker, brick and concrete.

The Head Deposits comprised soft becoming firm brown mottled grey sandy clay, with fine to coarse subangular to subrounded quartzite gravel.

The Thanet Sand stratum generally comprised medium dense becoming dense (light) brown slightly clayey/silty, slightly gravelly fine to medium sand. Locally, nominal horizons of firm becoming stiff orangish brown slightly sandy, slightly gravelly clay/silt were recorded. Collectively, the gravel content comprised fine to coarse subangular to subrounded flint gravel.

Soakaway tests results are summarised in the table below:

Test ID	Stratum	Test results (m/s)
TP6	Thanet Sand Formation	1.10×10^{-5}
TP7		4.70×10^{-6}
SA1 (Fill 1)	Thanet Sand Formation	1.10×10^{-5}
SA1 (Fill 2)		5.70×10^{-6}
SA1 (Fill 3)		3.30×10^{-6}
SA2 (Fill 1)	Thanet Sand Formation	1.20×10^{-6}
SA2 (Fill 2)		1.00×10^{-6}
SA2 (Fill 3)		9.80×10^{-7}

2.3 Existing Foul Sewerage

2.3.1 A sewer is a pipe that collects drainage from more than one property and is normally vested by the local water board. Our investigation identified the following in relation to the sewer: –

- Foul water sewer within the playing of the adjacent school to the east of the site
- Foul sewer adjacent to the Ambulance Station which is located south of the site along Coldharbour Road.
- Foul sewers noted to north and west within residential back gardens

We have appended the existing drainage services in Appendix D.

2.3.2 This is a Brownfield redevelopment - It used to be a pub called 'Battle of Britain'. The existing building has already been demolished and the site is vacant. However, the discharge loads for the former pub site is based on the occupancy and use of the development as set out in the British Water Code of Practice: Flows and Loads 4 (BW COP:18.11/13):

SOURCE OF WASTE Flow litre / DAY							
Description	No of People	Occupancy	No	Reduction Factor	Reduced No	Daily Flow	TOTAL
Hotels Pubs & Clubs	50	1	50	0	0	20	1000
Total loads							1000 l/day 1 m ³ /day

Note: Occupancy figures are as set out in BW COP: 18.11/13.

Table 1

2.3.3 The existing site currently contains the remains of the demolished Battle of Britain Pub and that indications of previous on-site foul water connection(s) are 100mm diameter pipework that was removed during demolition. A 100mm diameter connection point, likely to connect with the demolished pub, has been observed in an adjacent residential property, rear garden, inspection chamber. The response to the developer enquiry sent to Southern Water to enquire about the capacity within the network to take the required flows has been received. After a capacity review Southern Water have confirmed that there is currently sufficient capacity in the works to accommodate a foul flow of 0.79 l/s for the above development at manhole reference TQ63727301.

2.4 Existing Foul Drainage

- 2.4.1 No pipes other than described above are shown on the services drawings running through the proposed development. Further investigations would be required to establish any existing foul drainage of the former Public house development.

2.5 Existing Surface Water Sewerage and Drainage

2.5.1 We would recommend that further intrusive drainage investigations be undertaken on the site to confirm the presence of any drainage, its size and its route through the site. There are no adopted surface water sewers in the area, and as such it is assumed that the site currently drains via infiltration. Coldharbour Road does appear to have at least one road gully on the tarmac road. There are no obvious manholes or road gullies in road surrounding the site development.

2.5.2 Our review shows the following –

- No Surface water sewers noted in the site or surrounding roads from Utility Records
- GPRS survey shows possible Surface water manholes in the site, however, they are noted as blocked and unable to survey
- Road gully evident on Coldharbour Road to the west

We have appended the existing drainage services & GPR survey in Appendix D.

2.5.3 We would recommend further intrusive drainage investigations to confirm the status of any surface water pipes in or on the vicinity of the site at a later date.

2.5.4 We have reviewed the site plans to establish the area of the site contributing to the surface water discharge from the site.

The existing surface water contributing areas are as follows: -

• Total Site Area	=	4,765 m ²	or	0.48 ha
• Impermeable Area	=	1,515 m ²	or	0.15 ha
• Permeable Area	=	3,250 m ²	or	0.33 ha

We then adopting the criteria set by BS EN 752 – 4: 1996 to determine the theoretical levels of surface water discharge contribution from the site.

Key Coefficients

$$Q = \psi I A$$

where

$$\psi = 0.3 \text{ and } 1.0 - \text{coefficients}$$

$$i = 50\text{mm/hr} = 0.0138$$

The following calculations have been defined: -

Impermeable	=	1.0 x 0.0138 x 0.15 ha	=	21	l/sec
Permeable	=	0.3 x 0.0138 x 0.33 ha	=	14	l/sec
Q Total	=		=	35	l/sec

- 2.5.5 These values are the equivalent to a 1:2-year return for the site as existing on the basis that the site has no form of treatment, storage, or attenuation. We would recommend that this figure be used as the limiting value for the design of the SUDS to accommodate the proposed care home.

2.6 Existing Water Supply

- 2.6.1 The Services drawings show the following pipes near the development-
- A water supply pipe with a Customer Meter is indicated on the drawing from the development site but no details are provided on the drawings
 - 4" CI pipe running from St Clements Close into Coldharbour Road to the west in a northern direction
 - Water supply pipe in Newhouse lane to the north of the site
- 2.6.2 Based on the existing infrastructure – Plans show there is water supply pipes in Coldharbour Road to the west and north that serve the existing former Pub development in the vicinity. See Appendix D for details.
- 2.6.3 As part of the investigation works, we would recommend that the exact location and size of the below ground water pipes serving the existing infrastructure be investigated prior to commencement of any construction works.

3.0 PROPOSED DEVELOPMENT

3.1 Proposed Foul Drainage and Sewerage

3.1.1 The Current proposed Architects drawing included with Appendix B demonstrates the proposed layout of the development. The proposal for the existing site is to construct a care home with a proposed occupancy up to 75 individual room care in the first phase during 2024.

3.1.2 The discharge loads for the proposed new residential development are based on the occupancy and use of the development as set out in the British Water Code of Practice: Flows and Loads 4 (BW COP:18.11/13):

SOURCE OF WASTE Flow litre / DAY							
Description	No of bedrooms	Occupancy	No	Reduction Factor	Reduced No	Daily Flow	TOTAL
Care Home	75	1	75	0.8	60	350	21000
Full time staff			15			90	1350
Total loads							22,350 l/day
							22.35m ³ /day

Note: Occupancy figures are as set out in BW COP: 18.11/13.

Table 2

Estimated foul flow based on a peak flow factor of 6 plus 10% (6DWF) =

$$Q_F = (22350 \times 6 \times 1.1) / (24 \times 3600)$$

$$Q_F = 1.71 \text{ l/s}$$

The estimated total foul discharge for the proposed development equates to 1.71 l/s. This represents the maximum peak flow for the new development proposed.

The existing sewer near the site should be confirmed and verified to ensure it has the capacity to accommodate this additional load.

3.1.3 It is proposed that during the development of the property for care home use that the site will drain to the existing foul connections that run next to the site. This is likely to be an off site connection. We have shown our drainage connection to the playing fields to the east of the development. This has received approval from Southern Water.

3.1.4 It is proposed that a new separate drainage system will be installed within the proposed site. The new drainage system will be designed and installed in accordance with the relevant British Standards, current guidance, and best practice.

See Appendix E for drawing 9360 / C002/C004 showing outline proposals for the drainage network.

3.1.5 The proposed development will increase the foul flow rates to the drainage network. After a capacity review Southern Water have confirmed that there is currently sufficient capacity in the works to accommodate a foul flow of 0.79 l/s.

3.1.6 Foul drainage and sewerage should be installed in accordance with the Sewers for Adoption, the Building Regulations, and the relevant British Standards.

3.2 Proposed Surface Water Drainage

3.2.1 It is proposed to discharge all surface water into the closest connections after adequately sized and located treatment and attenuation.

3.2.2 This will be subject to approval from the vesting authority of the sewer at the point of connection. The principals of the design are to reuse any existing sewer connections and not increase the flow rate currently discharging to them but to provide a betterment.

3.2.3 Following the proposed redevelopment of the site the surface water contributing areas for the residential development are estimated as follows: -

• Total Site Area	=	4,765 m ²	or	0.48 ha
• Impermeable Area	=	3,500 m ²	or	0.25 ha
• Permeable Area	=	1,265 m ²	or	0.23 ha

We are adopting the criteria set by BS EN 752 – 4: 1996 to determine the theoretical 1 in 2-year greenfield levels of surface water discharge contribution from the site.

Key Coefficients

$$Q = \psi I A$$

where

$$\psi = 0.3 \text{ and } 1.0 - \text{coefficients}$$

$$i = 50\text{mm/hr} = 0.01389$$

The following calculations have been defined: -

Impermeable	=	1.0 x 0.0138 x 0.25 ha	=	35 l/sec
Permeable	=	0.3 x 0.0138 x 0.23 ha	=	10 <u>l/sec</u>
Q Total	=			45 l/sec

3.2.4 It is proposed that a new separate drainage system will be installed within the proposed redevelopment site. The new separate drainage system will be designed and installed in accordance with the relevant British Standards, current guidance, and best practice. See Appendix E for drawing 9360 / C002 / C004 showing outline proposals for the drainage network.

- 3.2.5 The proposed development to the care home has an estimated theoretical unattenuated surface water flow that is slightly higher than the existing unattenuated surface water discharge. This results in a net increase in the surface water discharge.
- 3.2.6 The proposals are increasing the site in terms of impermeable area. Attenuation and treatment is required in accordance with Sustainable Urban Drainage Systems (SUDS).
- 3.2.7 The proposal would be to limit the discharge of the proposed surface water drainage network on the site development and attenuation or infiltration adopted for the drainage features.

3.3 Infiltration

- 3.3.1 As the site has been identified to be underlain by sand, it may be suitable for infiltration structures. Infiltration testing was carried out by Applied Geology in December 2023. The following results were recorded –

Test ID	Stratum	Test results (m/s)
TP6	Thanet Sand Formation	1.10×10^{-5}
TP7		4.70×10^{-6}
SA1 (Fill 1)	Thanet Sand Formation	1.10×10^{-5}
SA1 (Fill 2)		5.70×10^{-6}
SA1 (Fill 3)		3.30×10^{-6}
SA2 (Fill 1)	Thanet Sand Formation	1.20×10^{-6}
SA2 (Fill 2)		1.00×10^{-6}
SA2 (Fill 3)		9.80×10^{-7}

- 3.3.2 We have based our drainage design on using infiltration structures with the above values. We have used the SA2 fill 3 value as this is closest to the SUDS features and is worst case scenario. This converts to 0.00353 m/hr and is used in calculations.

3.4 Sustainable Urban Drainage Systems - SUDS

- 3.4.1 Our investigations have been unable to ascertain if there are any existing SUDS on the property in the form of attenuation and/or treatment. The site is presently derelict ground with grassed and paved areas. The topographical survey shows derelict ground with concrete and unmade ground. It is unlikely that any SUDS features do exist.

3.4.2 The proposals to convert part of the site from its current use as brownfield to residential results in a net increase in impermeable area. This is as a result of larger hardstanding areas being included in the proposals. As a result of this net increase, attenuation and treatment is required in accordance with Sustainable Urban Drainage Systems (C753 – SUDS Manual).

3.4.3 Treatment is an Environment Agency & Local Authority requirement in accordance with their current policies for the regulation of urban drainage: -

“Promote the use of sustainable urban drainage systems as the preferred solution for drainage of surface water run-off, including roof water, for all proposed developments”

“SUDS can be designed to provide considerable flood attenuation capacity, which provides the benefit of:

- *Flood/Flow control; and/or*
- *Reducing the load in the sewerage network where discharges are made to sewer...”*

3.4.4 SUDS should be designed in accordance with “Sustainable Urban Drainage Systems, Design Manual - C753”. An initial assessment of the scope of SUDS required as follows:

3.4.5 The following factors need to be taken into consideration when assessing the type of SUDS features which are proposed.

3.4.6 In accordance with the SUDS design manual, a combination of source and site control measures may be implemented to create a treatment train. The following measures have been identified as being appropriate for application on this site. A selection from, and/or combination of these measures should meet the Environment Agency treatment requirements.

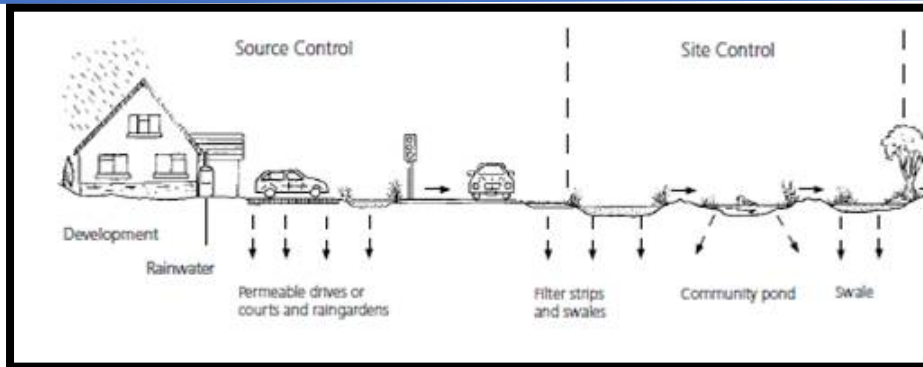
3.4.7 *Prevention:*

Areas where there is a high risk of surface water becoming contaminated (i.e. re-use collection areas, delivery areas) should be minimised and drainage separately to the foul system, via appropriate interceptors.

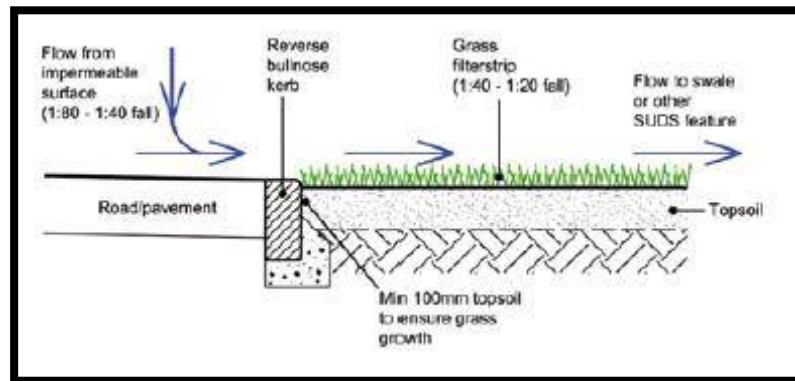
3.4.8 *Source Control*

Source control for the site features may include: -

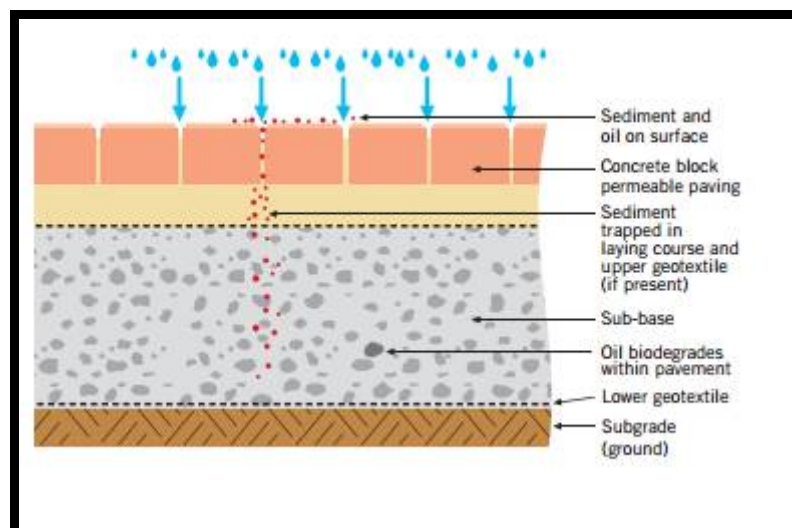
- Filter drains
- Permeable pavement
- Swales
- Ponds/Basin



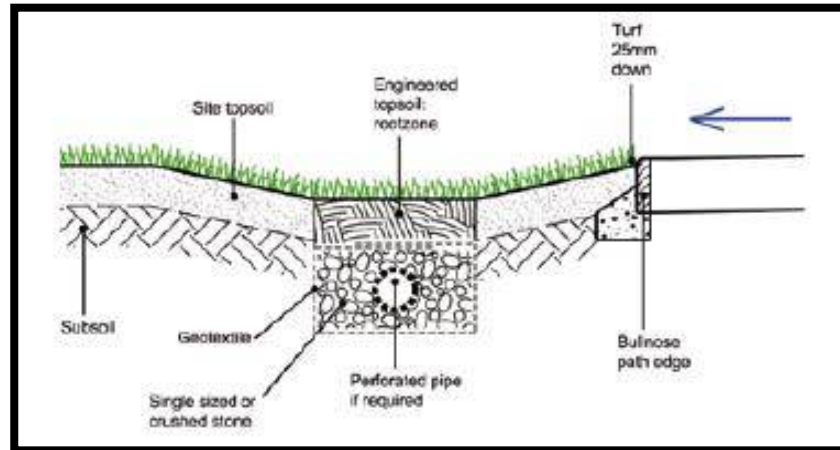
- 3.4.9 Filter drains are gravel filled trenches with a perforated pipe. They are typically 1.2-1.5m deep and connected positively to the drainage system. They provide local collection, storage, and treatment through filtration.



- 3.4.10 Permeable paving is used to minimise the run-off from car park or other hard surfaced areas. Permeable surfacing may include gravel, stone, clay or concrete paviours, or permeable bituminous construction.



- 3.4.11 Swales are shallow vegetated channels designed to convey road runoff and treat pollutants



- 3.4.12 Run-off from hard surfaced areas could be directed to filter drains. Swales or Filter drains may also be used to control run-off from landscape and other areas, which might detrimentally affect developed parts of the site.

3.4.13 *Site Control:*

Site Control features may include: -

- Detention Pond/Basin
- Swales
- Porous Pavement
- Filter trenches

The above features will be specified upon nearer the completion of the design stage.

3.4.14 *Maintenance:*

The above SUDS features all have specific maintenance requirements, which should be identified in the maintenance manual for the common areas of the site and the specific at source areas of the development.

3.4.15 *Topography:*

Refer to 2.1.1 in this report. The proposed topography discussed would tend to favour the use of a site feature located near the eastern boundary of the property, prior to discharge to the existing Surface water network within the site. We are of the opinion that infiltration techniques have been used.

3.4.16 *Geology:*

A full site investigation will be carried out for the proposed development, which allows us to be more definitive in terms of drainage design and the soils infiltration characteristics.

The British Geological Society mapping identifies the area as having an underlying bedrock geology of the Thanet Formation with no superficial deposits. The geotechnical assessment shows that there is sand and sandstone to at least 12m depth, with made ground present across the site.

Infiltration testing undertaken in 2021 indicates that soakaways are likely feasible on site but may be very large due to the low rates observed.

Based on the potentially poor ground conditions we have adopted for the purpose of the drainage calculations -

- a soil value of 0.15
- a SAAR value of 571mm

We have analysed the Coldharbour Road Gravesend Care home site through the “Micro-drainage design suite” and for the purposes of calculation we have adopted the following values for this particular site –

- M5-60 figure of 20.00
- ‘r’ ratio of 0.418
- Infiltration rate of 0.0035532 m/hr (9.8×10^{-7} m/s at SA2)

Based on the above all SUDs will be lined with an impermeable liner to prevent infiltration or softening of any cohesive subsoils.

Soakaway results gave a rate of 9.8×10^{-7} m/s at SA2, and 3.3×10^{-6} m/s at SA1.

3.5 Surface Water Treatment

- 3.5.1 As detailed in 3.2 above, all surface water within the site will be required to be treated prior to discharge, during and after the redevelopment. It is proposed that the new drainage will connect and re-use any existing drainage connections within the development.
- 3.5.2 For the purpose of this report we have developed the required SUDS. It is likely that source control could be adopted within the new carparking areas in the form of porous pavement. A site control method for attenuation and treatment could be in the form of cellular storage using infiltration to store the surface water prior to the existing storm water drainage network at the existing site. This will be subject to Southern Water and the Local Authority Approval – in this case Kent County Council.

3.6 Surface Water Attenuation

- 3.6.1 Attenuation is a local Authority and Environment Agency requirement in accordance with their requirement to control flooding.
- 3.6.2 As this site discharges to ground, Southern Water and Kent County Council stipulate that the surface water discharge from the post-development site is to be attenuated to provide a betterment to the existing site.
- We have calculated the greenfield run off value for Surface Water discharge from the impermeable areas to be 0.3 litres per second. This would include all events up to and including a 1 in 100 year plus climate change rainfall event. This will require confirmation with Kent County Council. The total discharge from the site should aim to mimic greenfield rates. The discharge from the site should be restricted to the theoretical greenfield runoff rates for each of the 1-, 30- and 100-year return period storms. Kent County Council guidance notes that when greenfield rates calculations result in a total discharge from the site of less than 5 litres/second, a rate of 2 litres/second may be used.
 - The provision of attenuation and storage design of SUDs features. This is to include all storm events up to and including the 1 in 100-year storm event plus 45% allowance for climate change.
 - An indicative 240m² attenuation area is shown which would provide the necessary attenuation volume based upon using 1.05m depth and 95% void space aquacell units using infiltration solely

This will have to be agreed with Kent County Council, Southern Water, and the Environment Agency.

- 3.6.3 SUDS guidelines and Kent County Council SFRA indicate that full attenuation would be required up to and including the 1 in 100-year return period storm plus 45% climate change. This will also include a 200-year return period check to ensure

overland flows will not cause damage to properties, within or out with the proposed development area.

The 1 in 100-year attenuation requirement with an infiltration rate of 0.003528 m/hr has been calculated as:

- 280 m³ for the 1:100 yr. storm storage (+45% climate change) – this is based on entire impermeable area of 0.25 hectares and is worst case scenario.
- Porous Carpark volume of 8m³ in base of carpark based on 1:100year storm (+45% climate change) – based on draining carpark area of 0.040 hectares

We have appended our MicroDrainage Source control calculations in Appendix F. This includes –

- 1 in 2 year Greenfield run off values
- Cellular Storage calculations for 1 in 100-year storm + 45% CC – 9.8 x10⁻⁷ m/s at SA2 or 0.003528 m/hr infiltration rate
- Porous Car park Calculations for 1 in 100-year storm + 45% CC
- Simulation Results are shown for the 1 in 100yr storm + 45% CC

3.7 Surface Water Treatment

- 3.7.1 We have calculated the overall combined treatment and attenuation volumes required for the surface water inclusive of porous pavement and cellular storage. Based on the full 1:100-year storm including 45% climate change being attenuated within the site for the entire impermeable area – this will incorporate an attenuation volume of 280m³ storm storage based on roof and hardstanding impermeable area of 0.25 hectares. This will be incorporated into an end-of-line feature before outfall to the existing storm water drainage network in the site.
- 3.7.2 Note that attenuation features have to be deep enough to avoid localised flooding on the site itself without detriment to the properties.
- 3.7.3 A minimum freeboard of 300mm must be provided above the attenuation level for landscaping areas within the site and a freeboard of 600mm provided to ground floor level of the buildings.
- 3.7.4 The size of associated pipes/manholes and connections will be confirmed once the contributing areas and attenuation/treatment sizes are confirmed and full detailed design is completed. The SUDS Features will be designed in compliance with Ciria-C753.

3.8 Water Resources

3.8.1 It is likely that water supply and water resources will require to be of efficient design. Specific water efficiency measures that can be considered (should the client wish to consider) include: -

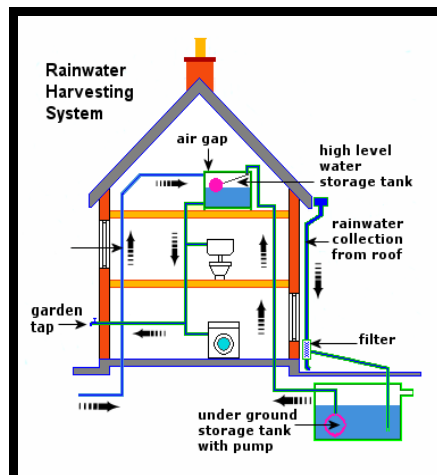
- Water Efficient Appliances
- Rainwater and Grey Water Storage & Re-cycling

3.8.2 The local authority will require to be consulted on these matters in accordance with their Development and Site Allocations Plan. It is likely that the client will not consider all these options due to the nature of property – Care Home for elderly.

3.8.3 In accordance with the revised SUDS Manual, C753 - Direct collection of rainwater to use for domestic and other purposes saves water, and potentially provides essential irrigation resources and long-term viability for amenity trees, vegetation, and crops. The first consideration in designing the SUDS Management Train for a site should be the delivery of Interception for each impermeable area, wherever possible. Interception is delivered where SUDS components are an integral part of the runoff surface or collection method (e.g. permeable pavements, green roofs, water butts and rainwater harvesting systems), and in such scenarios, the surface may also be able to provide Interception for adjacent runoff surfaces.

3.8.4. The design of rainwater harvesting systems for surface water management such as Rainwater storage tanks can be included on roof space (blue roofs), within roof space, above ground within property curtilage, or below car parking areas. Rainwater harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial, industrial, and/or institutional properties. RWH systems have many key benefits:

- They can meet some of the building's water demand, delivering sustainability and climate resilience benefits.
- They can help reduce the volume of runoff from a site.
- They can help reduce the volume of attenuation storage required on the site.



3.8.5 Table 11.1 summarises the different possible objectives for RWH systems and the implications for their design. There are three main types of RWH system:

- gravity-based systems
- pumped systems
- composite systems

In all cases there is a need to ensure that, if the store of non-potable water is depleted, an appropriate alternative supply of water is available for the relevant appliances.

TABLE 11.1	RWH objectives and design implications
	RWH for water conservation (supply) only
	The RWH system is designed to supply water to the building that it serves. The storage provided is sized to capture and retain an appropriate volume of runoff from the contributing surface (the yield) to meet the projected building use requirements (the demand).
	Although a proportion of the runoff from large events will normally be captured, the performance of such systems to manage extreme events cannot be relied upon, and therefore any potential contribution to surface water management should not be allowed as part of the design.
	RWH for water conservation (supply) and surface water management, passive systems
	The tanks for these systems are sized to accommodate the storage required for water supply plus the storage required to manage a specific depth of rainfall during a large event.
	The term "passive" refers to the fact that the space available in the tank to store surface water runoff at any particular time is entirely dependent on the balance between the demand and supply, and the water level is not "managed" in an "active" way.
	Where RWH systems are implemented for individual residential properties, surface water control for the design rainfall event is unlikely to be achieved for every property, and an average level of compliance will need to be assumed. Where groups of properties share a tank, or where consistent demand in commercial buildings is more likely, performance of the system is more certain.
	RWH for water conservation (supply) and surface water management, active systems
	If the water storage in a tank is actively managed, then all properties can be designed to comply with surface water management objectives, irrespective of the relative levels of demand and supply, provided the system is managed so that no runoff (of any significance) occurs for any event up to the design rainfall depth. There are two mechanisms available to ensure that sufficient tank volume is available to manage the design storm depth. These are:
	▪ forecasting that a large event is approaching (days or hours ahead) and pumping the stored water away, or ▪ pumping out the stored water down to a set level whenever a threshold is exceeded.
	The first option requires communication to rainfall event forecasting information. The second requires a timer delay so that water is pumped away at a set time after the event has passed.

Table 3 – Extract from C753 SUDS Manual

3.9 Maintenance

3.9.1 A Maintenance Plan will be required to ensure that the SuDS incorporated at the site remain functional for the lifetime of the development. This will ensure a continued reduction in local flood risk through the attenuation of surface water run-off on site. It is proposed to provide underground attenuation tanks capable of storing the hardstanding impermeable area of approx. 260m³ at the site. These measures have been shown to reduce surface water run-off rates to greenfield rates. This plan demonstrates that the maintenance and operation requirements of the SuDS are economically proportionate to the development. The below table highlights typical maintenance requirements for the elements.

Type of SuDS	Illustration	Maintenance required	Regularity
Underground attenuation tank	Underground plastic geocellular/modular systems can be used to create a below ground storage structure. Due to the modular nature of the systems, they can be tailored to suit the specific requirements of any site. Water can be attenuated on site, before discharging at a controlled rate to a watercourse or other drainage system.	Cleaning inlets/ outlets, manholes, associated pipework, and silt traps	Annual Inspection, or as required
Porous Pavement	Pervious surfaces provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into underlying layers. The water can be temporarily stored before infiltration to the ground, reused, or discharged to a watercourse or other drainage system. Surfaces with an aggregate sub-base can provide good water quality treatment.	Brushing and vacuuming (standard cosmetic sweep over whole surface area) attention should be taken where water runs from impermeable areas as this is most likely to accumulate silt.	BI-Annual cleaning and Inspections as required

Table 4 – Extract from C753 SUDS Manual

- 3.9.2 All maintenance carried out will require to be recorded to ensure that maintenance is being managed and performed to continue the life expectancy of the SUDS systems. This will require to be upheld with any successor/ title holder of the property. The applicant or any successor in title must maintain yearly logs of maintenance which should be carried out in accordance with the approved Maintenance Plan. Please see Appendix G for a typical maintenance log sheet.
- 3.9.3 The contractor will require to liaise with the client to update the Maintenance Plan in accordance with the regime in accordance with table 4 and appendix G. The contractor/client should take cognisance of the drainage drawing the drainage strategy maintenance plan and the maintenance log sheet as shown in appendix G.

3.10 Approvals

- 3.10.1 Formal approval of the SUDS and attenuation detailed design will be required from Kent County Council, Southern Water, and the Environment Agency.

3.11 Adoption

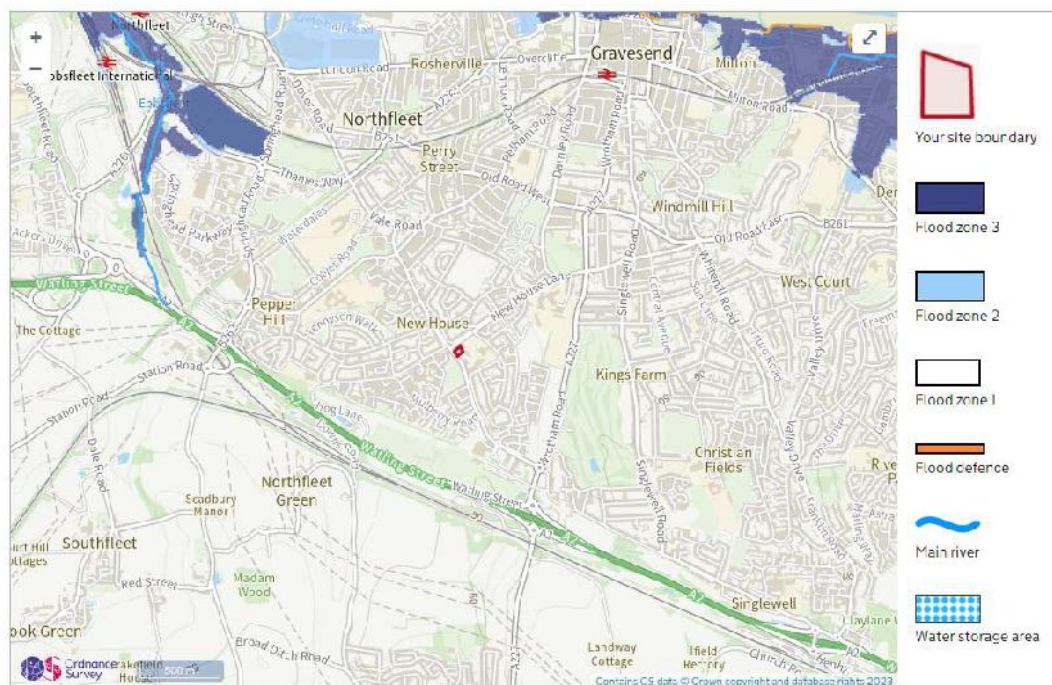
- 3.11.1 As the site will be under a single ownership, for this particular project it is expected that the drainage and SUDS systems will remain private. Maintenance of these systems will therefore be required to be undertaken by the client. The contractor will also be required to liaise with the client with relation to maintenance logs and plans. As shown in drainage drawing 9360/ C002/C004.
- 3.11.2 Adoption of any road drainage has still to be confirmed upon discussions with Kent County Council. However, our initial design criteria would highlight that the roads drainage should connect to the proposed surface water drain within the site.

4.0 Flood Risk Assessment

- 4.1 We have reviewed the initial data and information for the site. We have also reviewed the Environment Agency website for details relating to the Flood Maps. See Appendix H for details from the Environment Agency website.
- 4.2 The following have been noted as potential sources of flood risk:
Fluvial flood risk relates to flood water from a watercourse/river or Sea. From the surrounding features it is predicted that the site is at low risk from Flooding by Rivers or Sea due to its topography and location to the proposed site.

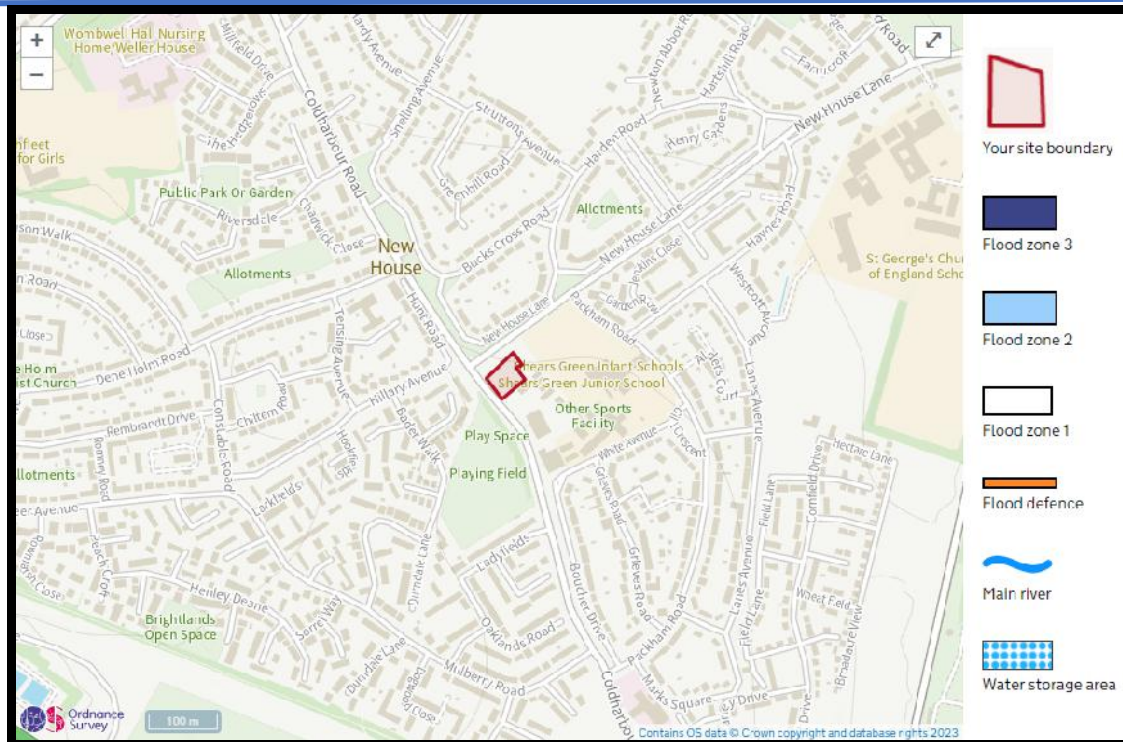
Flood map showing the flood zone your site is in

The map shows the flood risk to your site and the surrounding area.



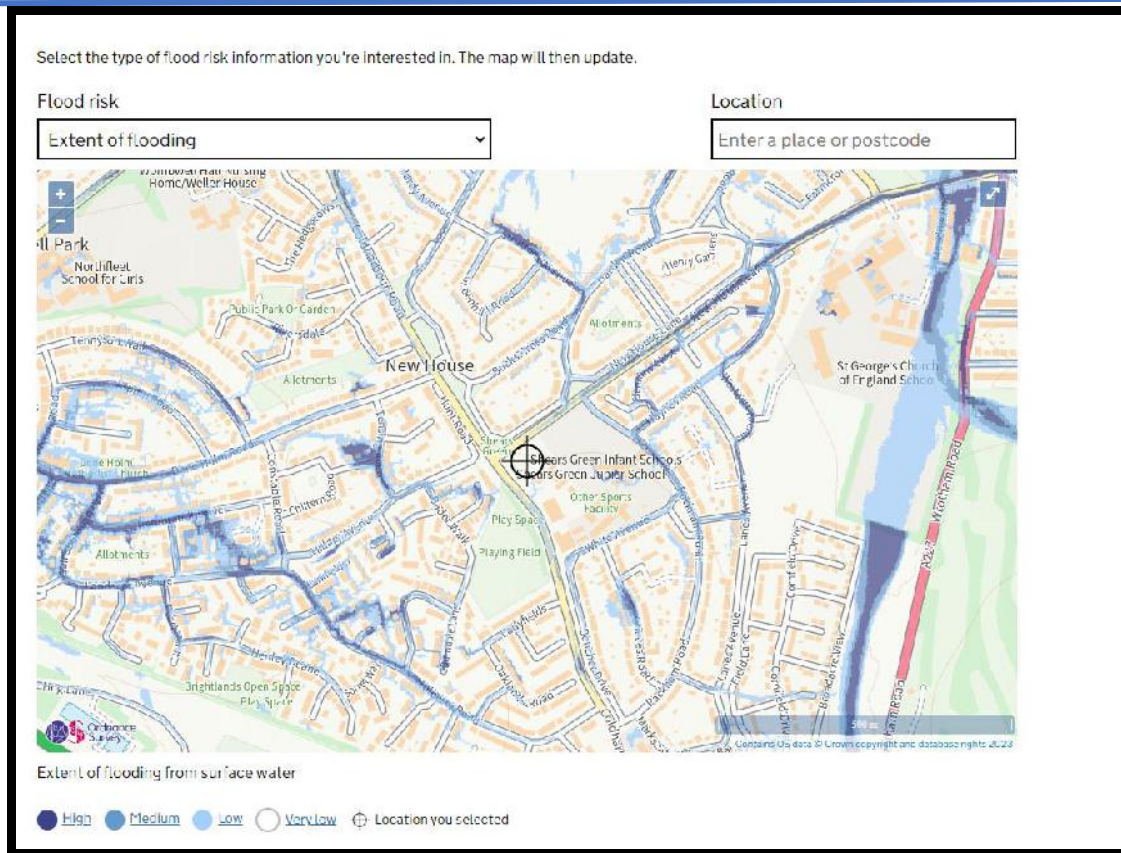
▼ What the flood map shows

Extract from Env. Agency Flood Maps – Location Plan of Flood Zone 1



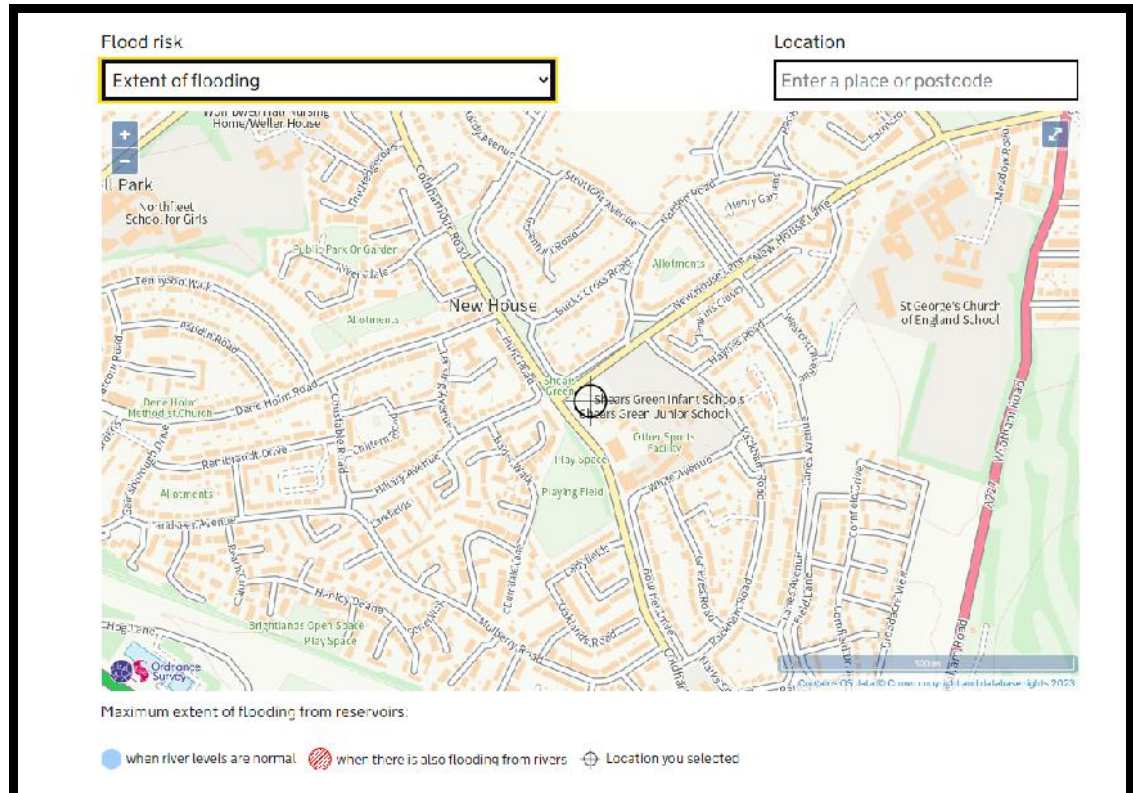
Extract from Env. Agency Flood Maps – Very Low Risk of Rivers of Sea flooding – Flood zone 1

- 4.3 Pluvial flooding relates to flood risk direct from rainfall or surface water. Flood water from storm events greater than 1 in 100 year event will be directed away from the development to ensure the safe management of flood risk. The topography will also dictate that flood water is directed away from the development. Detailed Drainage Design will provide proposed drainage to serve the development.



Extract from Env. Agency Flood Maps – Very Low risk of Surface water flooding

- 4.4 Flood risk from overland flows relates to the migration of surface water along topographical channels due to a pluvial storm event. Through a review of the development topography, it is considered that the site is at very Low risk from pluvial flooding. With regards to the proposed drainage strategy, the development will in fact look to improve the discharge characteristics of the development by reducing the existing peak run off to provide a betterment to the pre-development run off rate as agreed with the local authority and Southern Water. Detailed Drainage Design will provide proposed drainage to serve the development.



Extract from Env. Agency Flood Maps – Very Low Risk of flooding from Reservoirs

- 4.5 The requirement to maintain access and egress for extreme storm events is an intrinsic element of Planning Guidance. Although it is proposed to manage surface water through a combination of above and below ground storage, the following parameters should be noted:
- Maximum depth of above ground storage should be limited to 300mm. This is generally accepted as a maximum depth, which would still allow safe access for a fire tender, etc.
 - Safe pedestrian access and egress should be guaranteed for the 100-year return period.
 - Finished Floor Level of the proposed development must be at least 100mm above the 1 in 100-year surface water flood depth
 - A Flood Management/Evacuation Plan must be considered. This will be provided by the Client in accordance with General Fire/Flood Evacuation Safety Procedures.
- 4.6 Mitigation of Flood Risk - It has been identified that the site is likely to be at risk from fluvial, pluvial and overland flow flooding. It is also considered that in developing the site appropriate measures should be implemented to remove any possible future flood risk from the development site itself. For more extreme flood events, overland flood paths will also be considered and identified allowing the proposed development to drain safely.

- 4.7 Following review of the Environment Agency Flood Risk mapping the site lies within Flood Zone 1. We are of the opinion that the development is at very low risk from fluvial and pluvial flooding. The maps also show risk in relation to Reservoir Flooding. It is also understood that the operational development area is less than 1Ha in size for Phase 1 purposes. The Environment Flood Agency shows that the development is in flood zone 1. This means it has a low probability of flooding from rivers and the sea. We have appended extracts from the Environment Agency Flood Map in Appendix H.
- 4.8 The Environment Agency Flood maps show that a Flood Risk Assessment would be required for the following conditions –
- Development bigger than 1 hectare (ha)
 - in an area with critical drainage problems as notified by the Environment Agency
 - identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
 - at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Further to the above, we do not require a Flood Risk Assessment. See Appendix H for details from the Environment Agency for the proposed development.

5.0 CONCLUSIONS

- 5.1 It is proposed to construct a new drainage scheme for the development of the proposed care home at Coldharbour Road, Gravesend, Kent, DA11 7 RU.
- 5.2 It is proposed to discharge foul into the existing network in Packham Road. This is calculated as a DFR of 0.25 l/sec and a 6DWF of 1.62 l/sec. Southern Water have confirmed that the drainage network has sufficient capacity for the proposed development to accommodate a flow of 0.79 l/s. It is proposed to connect to an off site drainage connection near the playing fields to the east of the proposed development.
- 5.3 It is proposed to discharge surface water into the existing surface water drainage network within the site. Proposed unattenuated surface water flows are estimated to be greater than existing unattenuated flows, because of a larger impermeable hardstanding area. Therefore, the site will require a level of attenuation storage and source control limitation measures prior to discharge to the storm water drainage network. This will be required to be vetted by Southern Water and the local Authorities.
- 5.5 Due to underlying permeability based upon geological mapping, and potential release of contaminants, roof discharge will be using infiltration. Drainage design schemes will require approval from the Local Authorities, Southern Water, and the Environment Agency.
- 5.6 The new development flow rate would be restricted to Greenfield run off for all storm events up to and including the 1 in 100-year rate plus an allowance for 45% climate change. This will be providing an betterment to the surface water discharge of the existing site.
- 5.7 Calculations for the proposed development show sizes of SUDS schemes to be capable of infiltrating to ground :-
 - 280 m³ storage space required for 1 in 100-year event incorporating cellular storage. This is based on using infiltration for the entire site impermeable area as worst-case scenario.
 - Additional 25m³ storage space required for 1 in 100-year event incorporating cellular storage at north of site at low point
 - An overland flow check will be required for the 1 in 200-year events inclusive of climate control.
 - Porous Carpark volume of 8m³ in base of carpark
- 5.8 Treatment and attenuation size for the proposed SUDS for the development will likely take the form of a series of measures or treatment train for the site. The full extent of these measures will be dependent on the outcome of the drainage inspections and the site investigation for the site. However, we have designed a

robust drainage proposal for the proposed new Care Home. A copy of these proposals is incorporated with Appendix E of this report.

Irrespective of these investigations it is likely that the proposed development will make use of the following forms of SUDS on the site to ensure that the surface water from the site is adequately treated and attenuated prior to discharge to the existing drainage connections.

The SUDS feature to be utilised on this site will be as follows:-

- Permeable pavement/Porous carparking
- Underground cellular storage

The use of these features will be incorporated with the detailed design and submitted to various statutory bodies for approval prior to being implemented on the site.

5.9 Maintenance plan and details are described as in section 3.8 of this report, it is also shown our drawings 9360 / C002 / C003. Client/ contractor will be required to upkeep the drainage maintenance in accordance with this strategy, a typical maintenance log sheet is attached in appendix G for each SUDS feature.

5.10 According to the EA database mapping, the development is situated within Flood Zone 1. This relates to Areas deemed to be in flood zone 1 have been shown to be at less than 0.1% chance of flooding in any year, this is sometimes known as having a 1:1000 year chance.

Access and egress will have to be maintained for both vehicle and pedestrians during the 1 in 200-year storm event.

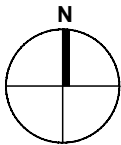
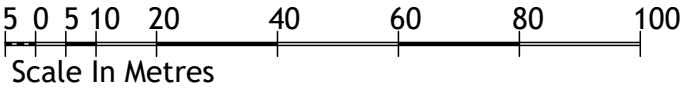
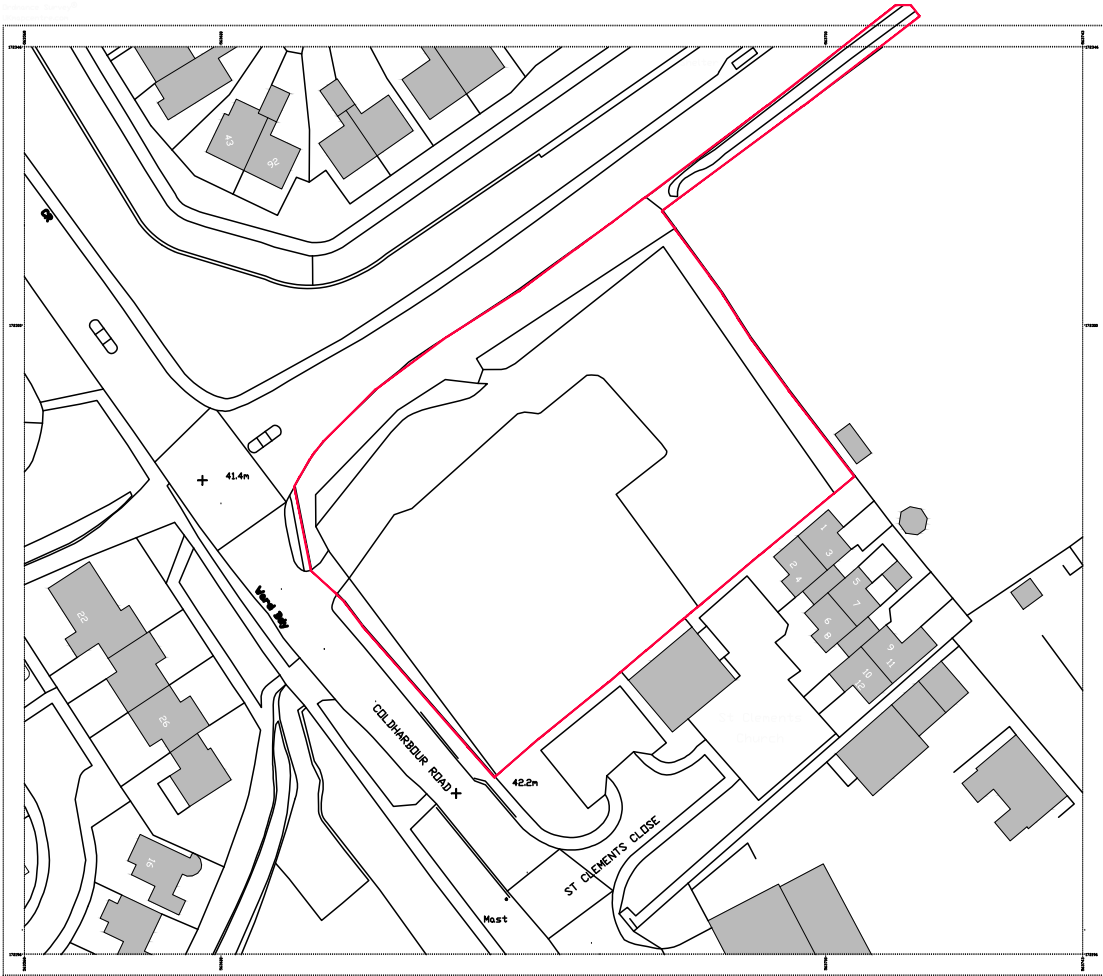
Appendix A

Site Location Plan

General Notes:

Do not scale from this drawing- refer only to stated dimensions. If in doubt request clarification from this office. This drawing, and associated copyright, is the property of Convery Prenty Shields Architects Ltd.

Revision	Initials	Date
A	BL	19.01.24
1. Construction Issue		



CONSTRUCTION

ConveryPrentyShields
ARCHITECTS

144 West George Street, Glasgow, G2 2HG www.cpsarchitects.co.uk 0141 258 3100

CLIENT	Simply Construct Ltd
PROJECT	Proposed Care Home Former Battle of Britain Site, Coldharbour Road, Northfleet, Gravesend, DA11 8NT
DRAWING	Location Plan

PAPER SIZE	SCALE	DATE
A3	1:1250	20.12.23
DRAWING NUMBER	REVISION	
2271_00_001	A	

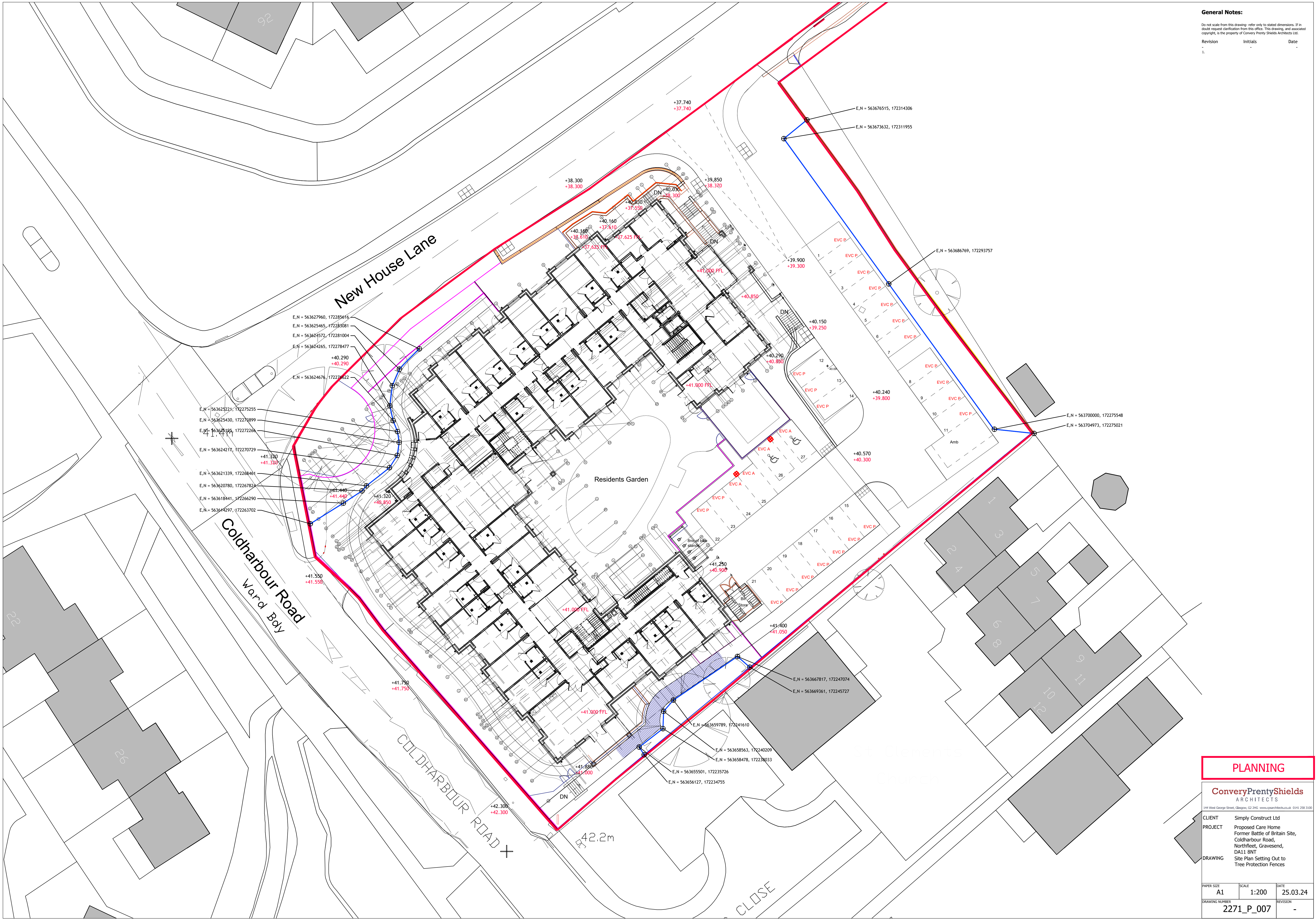
Appendix B

Architectural layout drawing

General Notes:

Do not scale from this drawing: refer only to stated dimensions. If in doubt request clarification from this office. This drawing, and associated copyright, is the property of Convery Prently Shields Architects Ltd.

Revision	Initials	Date
1.	-	-



PLANNING

ConveryPrentlyShields
ARCHITECTS

144 West George Street, Glasgow, G2 2HG www.cpsarchitects.co.uk 0141 258 3100

CLIENT	Simply Construct Ltd
PROJECT	Proposed Care Home Former Battle of Britain Site, Coldharbour Road, Northfleet, Gravesend, DA11 8NT
DRAWING	Site Plan Setting Out to Tree Protection Fences

PAPER SIZE	SCALE	DATE
A1	1:200	25.03.24
DRAWING NUMBER	REVISION	
2271_P_007	-	

Appendix C

Topographical Drawing



ADAPTIVE TISSUE STIMULI		THERMOELECTRICALLY MODULATED BUILDING SERVICES	
1	Temperature	1	Heat
2	Humidity	2	Humidity
3	Light	3	Light
4	Sound	4	Sound
5	Pressure	5	Pressure
6	Chemical	6	Chemical
7	Biological	7	Biological
8	Mechanical	8	Mechanical
9	Electrical	9	Electrical
10	Magnetic	10	Magnetic
11	Gravitational	11	Gravitational
12	Acoustic	12	Acoustic
13	Optical	13	Optical
14	Thermal	14	Thermal
15	Chemical	15	Chemical
16	Biological	16	Biological
17	Mechanical	17	Mechanical
18	Electrical	18	Electrical
19	Magnetic	19	Magnetic
20	Gravitational	20	Gravitational
21	Acoustic	21	Acoustic
22	Optical	22	Optical
23	Thermal	23	Thermal
24	Chemical	24	Chemical
25	Biological	25	Biological
26	Mechanical	26	Mechanical
27	Electrical	27	Electrical
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29	Gravitational	29	Gravitational
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31	Optical	31	Optical
32	Thermal	32	Thermal
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35	Mechanical	35	Mechanical
36	Electrical	36	Electrical
37	Magnetic	37	Magnetic
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78	Chemical	78	Chemical
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83	Gravitational	83	Gravitational
84	Acoustic	84	Acoustic
85	Optical	85	Optical
86	Thermal	86	Thermal
87	Chemical	87	Chemical
88	Biological	88	Biological
89	Mechanical	89	Mechanical
90	Electrical	90	Electrical
91	Magnetic	91	Magnetic
92	Gravitational	92	Gravitational
93	Acoustic	93	Acoustic
94	Optical	94	Optical
95	Thermal	95	Thermal
96	Chemical	96	Chemical
97	Biological	97	Biological
98	Mechanical	98	Mechanical
99	Electrical	99	Electrical
100	Magnetic	100	Magnetic

There is a link between the reported frequency of use of the following activities and the level of perceived stress (Table 1).

Table 1. Frequency of use of activities and perceived stress.

Activity	Frequency of use	Perceived stress
Walking	1-2 times a week	1.5
Walking	3-4 times a week	1.5
Walking	5-6 times a week	1.5
Walking	7-8 times a week	1.5
Walking	9-10 times a week	1.5
Walking	11-12 times a week	1.5
Walking	13-14 times a week	1.5
Walking	15-16 times a week	1.5
Walking	17-18 times a week	1.5
Walking	19-20 times a week	1.5
Walking	21-22 times a week	1.5
Walking	23-24 times a week	1.5
Walking	25-26 times a week	1.5
Walking	27-28 times a week	1.5
Walking	29-30 times a week	1.5
Walking	31-32 times a week	1.5
Walking	33-34 times a week	1.5
Walking	35-36 times a week	1.5
Walking	37-38 times a week	1.5
Walking	39-40 times a week	1.5
Walking	41-42 times a week	1.5
Walking	43-44 times a week	1.5
Walking	45-46 times a week	1.5
Walking	47-48 times a week	1.5
Walking	49-50 times a week	1.5
Walking	51-52 times a week	1.5
Walking	53-54 times a week	1.5
Walking	55-56 times a week	1.5
Walking	57-58 times a week	1.5
Walking	59-60 times a week	1.5
Walking	61-62 times a week	1.5
Walking	63-64 times a week	1.5
Walking	65-66 times a week	1.5
Walking	67-68 times a week	1.5
Walking	69-70 times a week	1.5
Walking	71-72 times a week	1.5
Walking	73-74 times a week	1.5
Walking	75-76 times a week	1.5
Walking	77-78 times a week	1.5
Walking	79-80 times a week	1.5
Walking	81-82 times a week	1.5
Walking	83-84 times a week	1.5
Walking	85-86 times a week	1.5
Walking	87-88 times a week	1.5
Walking	89-90 times a week	1.5
Walking	91-92 times a week	1.5
Walking	93-94 times a week	1.5
Walking	95-96 times a week	1.5
Walking	97-98 times a week	1.5
Walking	99-100 times a week	1.5

[illegible][illegible]

Appendix D

Southern Water Drainage Services Plan

[illegible]

Requested By:



Mr Lindsay Cunningham
Charles Scott & Partners
3F, Venlaw Building
349 Bath Street
Glasgow
G2 4AA

Your ref

Our ref
13002

Date
04 December 2023

Contact

Tel 0330 303 0119

Dear Mr Cunningham,

Application to Connect to the Public Sewerage System - Section 106.

Location: Former Battle of Britain Pub, Coldharbour Road, Gravesend, Kent, DA11 7JL.

We are pleased to advise that your Section 106 application to connect to the public foul sewer, as shown on your drawing 0500, is approved by Southern Water. Our approval means we are satisfied with your connection method.

Connections to existing/new Southern Water assets (i.e., manholes) and the arrangement of Southern Water assets (i.e., pipe junctions within manholes) should always be in accordance with the new Design and Construction Guidance manual ("the Code") and Southern Water's guidance documentation. [water.org.uk/sewerage-sector-guidance-approved-documents/](https://www.water.org.uk/sewerage-sector-guidance-approved-documents/)

This Section 106 approval does not confirm that public sewer network capacity is available at your location for the proposed development. The availability of capacity may be assessed through the Pre-Planning Enquiry process.

Please note that your connection should not proceed if:

- There are unapproved changes to your submitted plan or to the intended connection point. Any unapproved changes may lead to us disconnecting your connection under S109 of the Water Industry Act 1991.
- The relevant Planning Authority has set out conditions relating to the site's drainage and those conditions have not yet been discharged.
- You have not consulted our Health and Safety Advisory that can be viewed at the following link southernwater.co.uk/developing-building/health-and-safety

- You have not obtained the necessary Building Regulations Approvals or, if relevant, obtained a Highway Authority Road Opening License.
- Landowner consent has not been obtained where your connection is to be made through another Party's land.

What Comes Next?

To progress, select the 'Accept' option on the Get Connected customer dashboard. Or, if you have further questions, please select the 'Query' option. If you do not wish to progress with the application, then please select the 'Withdraw' option.

Now you have received our approval, you will need to arrange with your contractor to carry out your works on site to connect into our sewer. Once the connection has been made it is a mandatory requirement for the point of connection to be inspected by one of our Assistant Adoption Managers.

To arrange this inspection, please select 'Ready for Inspection' on your Get Connected customer dashboard. Once this has been selected, please contact **Sarah Simmons** our Assistant Adoption Manager for this area on **07803 259274** and request an inspection giving at least two full working days' notice.

We have prepared a site inspection checklist so that inspection of your sewer connection can be passed first time southernwater.co.uk/media/3028/ds-site-inspection-checklist.pdf

Once we are happy that your connection to the public sewer complies with our requirements and have passed our inspection, we will send you a completion letter within 7 working days. It's important to ensure your connection is inspected to prevent any risk of disconnection at a later date.

Yours sincerely,



Jade Sherwill
Application Advisor - Wastewater
Developer Services

M. 01903 272 056



Mr Lindsay Cunningham
Charles Scott & Partners
3F, Venlaw Building
349 Bath Street
Glasgow
G2 4AA

Your ref

Our ref
13002

Date
24 November 2023

Contact
Tel 0330 303 0119

Dear Mr Cunningham,

Application to Connect to the Public Sewerage System - Section 106.

Location: Former Battle of Britain Pub, Coldharbour Road, Gravesend, Kent, DA11 7JL.

Thank you for your application to connect to the public sewerage system at the above location. At this stage, we still require some information from you so that we can further progress your application.

Please can you submit:

1. The approved copy of the planning consent for this development, including details of any conditions that have been imposed by the Planning Authority.
2. Confirmation on the pipe material that will be used to connect to the public sewer.

Note that the use of plastic pipes will not be permitted to be connected to the public sewer or lateral drain all connections will need to be done with clay pipes. If the existing public pipework is plastic, then the connection can be done with plastic pipe providing it can withstand 2600 psi jetting pressure and in line with Southern Water requirements in discussion with us. Certificates of conformity (in date) will need to be provided, as will technical specification sheets demonstrating as per the new Design and Construction Guidance manual ("the Code") and Southern Water's guidance documentation, also test certificates showing it can withstand a minimum jetting pressure of 2600 psi in accordance with WIS 4- 35-01 with your application.

Relevant guidance on Design and Construction Guidance can be found in the below weblink:

[water.org.uk/sewerage-sector-guidance-approved-documents/](https://www.southernwater.org.uk/sewerage-sector-guidance-approved-documents/)

Please send this information to us by uploading the relevant files in the Get Connected customer dashboard.

When providing this information, should the files be above 50MB then please only send the information to developerservices@swsbcmail.co.uk, which is set up to receive larger files.

Until we receive the information outlined above, and you are in receipt of our written approval for your works, we would like to inform you that you do not have our permission to carry out any works upon the public sewerage system.

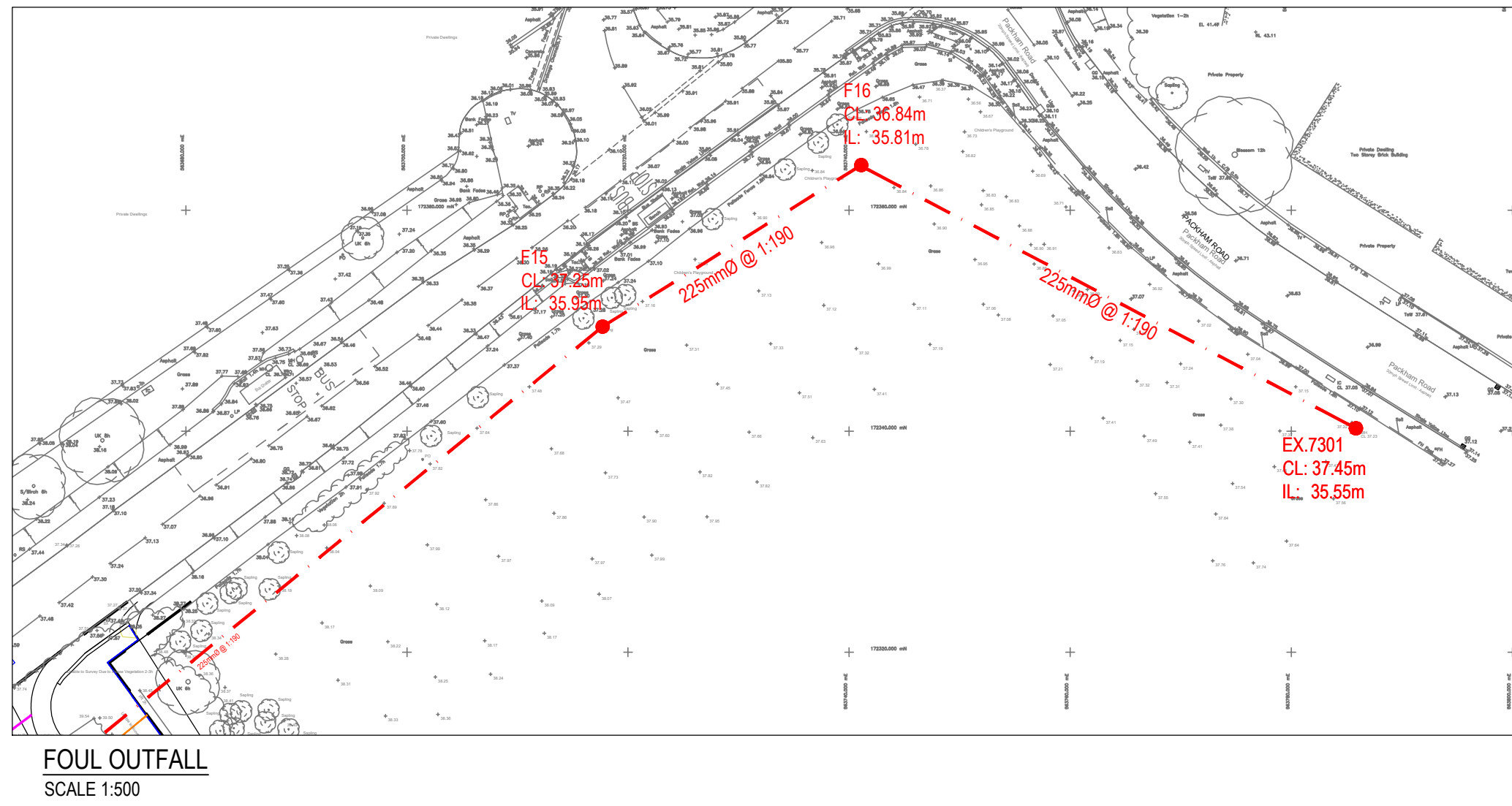
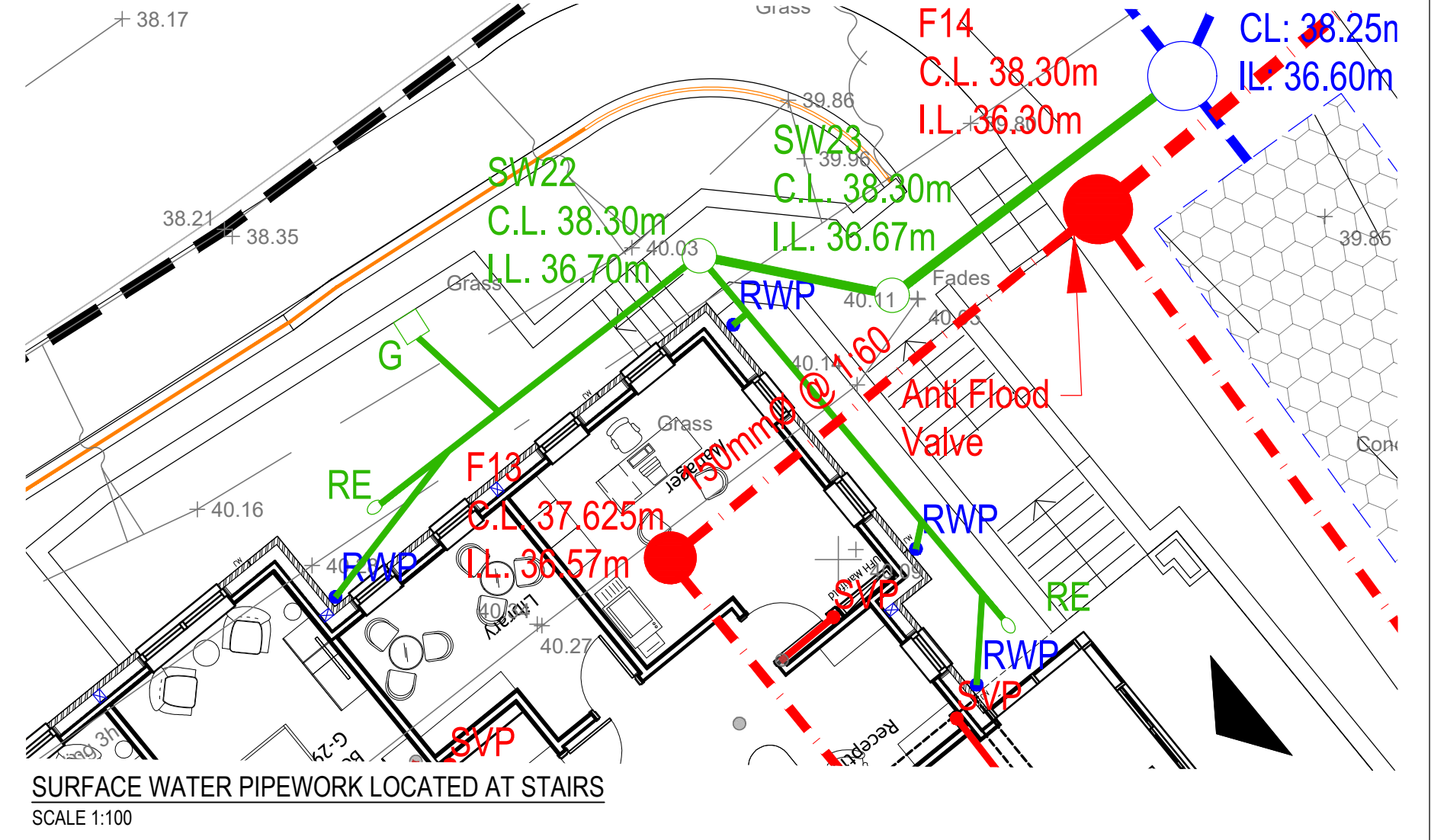
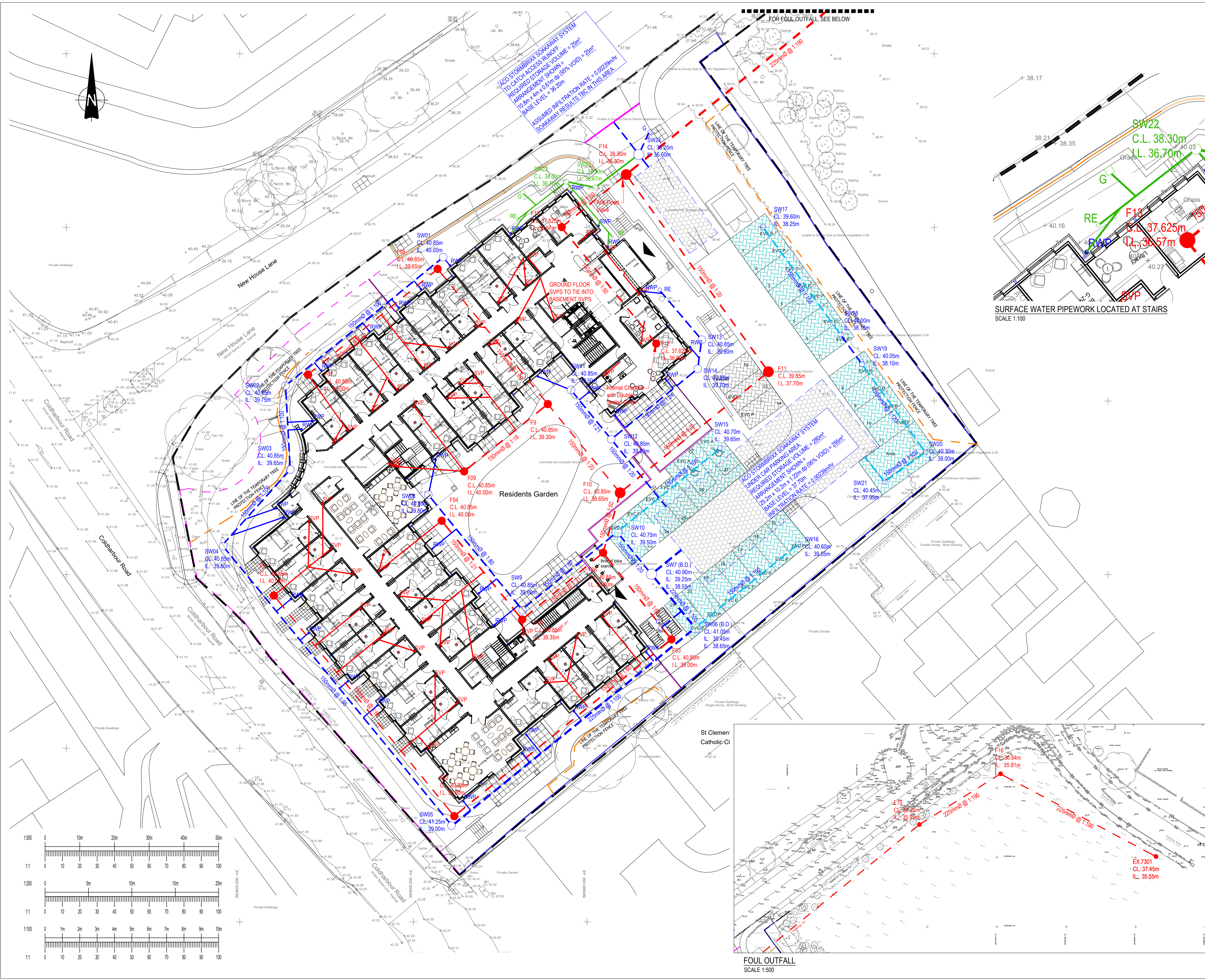
Yours sincerely,

A handwritten signature in black ink, appearing to read 'DM', followed by a small vertical line.

David Marshall
Technical Coordinator
Developer Services

Appendix E

CS&P Proposed Drainage Drawing – 9165/ C002 / C004



LEGEND:				
—	SURFACE WATER - SOLID WALL PIPEWORK			
---	SURFACE WATER - PERFORATED PIPEWORK			
---	SURFACE WATER - BASEMENT LEVEL PIPEWORK			
---	FOUL PIPEWORK			
RE	RODDING EYE			
▨	PERMEABLE BLOCK PAVING			
▨	NON-PERMEABLE BLOCK PAVING			
□	ROAD GULLY			

Rev.	Description	Date	Initials	Checked
H	COVER & INVERT LEVELS UPDATED	21.05.24	FM	
G	SHOWER GULLIES REMOVED, BASEMENT POP UP LOCATIONS REVISED	15.05.24	FM	BM
F	DRAINAGE BROUGHT WITHIN SITE	14.05.24	FM	BM
E	CARTILAGE			
E	TAILS & FOUL OUTFALL REVISED	08.05.24	FM	BM
D	SVPS REVISED	24.04.24	FM	BM
C	FOUL DRAINAGE REVISED	28.03.24	EM	FM
B	SUB-STATION REMOVED	27.03.24	FM	BM
A	SV P PIPE LOCATIONS ADDED	18.03.24	EM	FM

Client

SIMPLY UK

Location

COLDHARBOR ROAD,
NORTHFLEET, GRAVESEND,
DA11 8NT

Drawing Title

DRAINAGE LAYOUT

Date

JAN 24

Drawn by

FM

Scale

1:200

Checked

BM

Date

JAN 24

Project Ref.

9630

Dwg. No.

C002

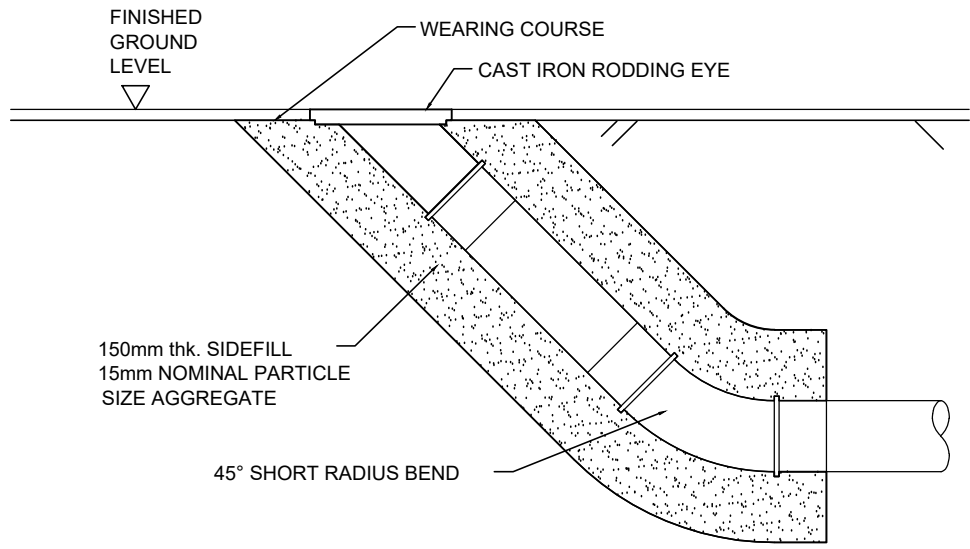
Rev.

H

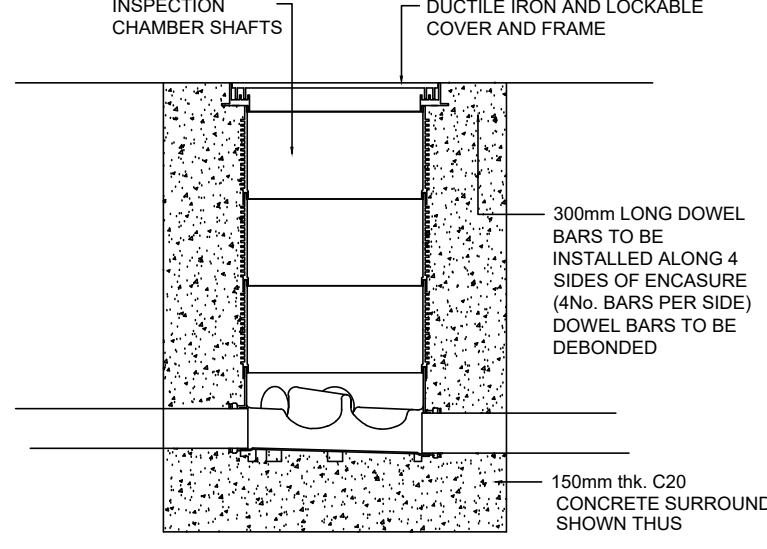
CHARLES
SCOTT
&
PARTNERS

CONSULTING ENGINEERS

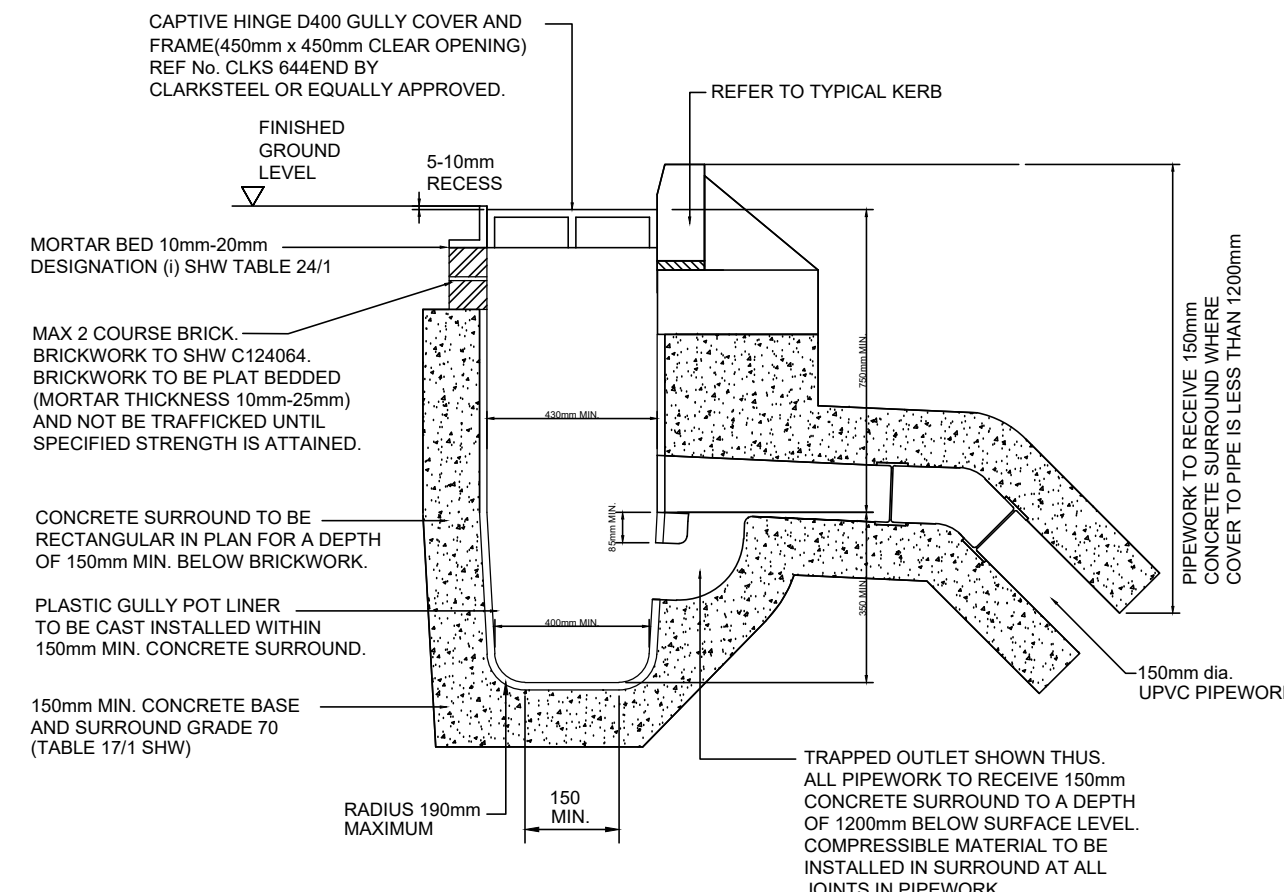
Venlaw Building
349 Bath Street
Glasgow G2 4AA
Tel : 0141-331-2454
Fax 0141-332-2873
www.csandp.co.uk



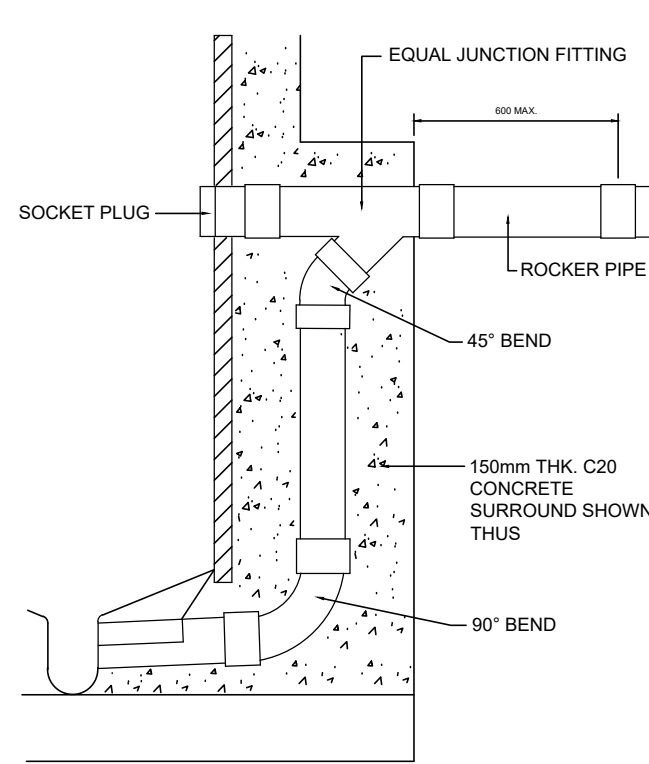
TYPICAL RODDING EYE DETAIL



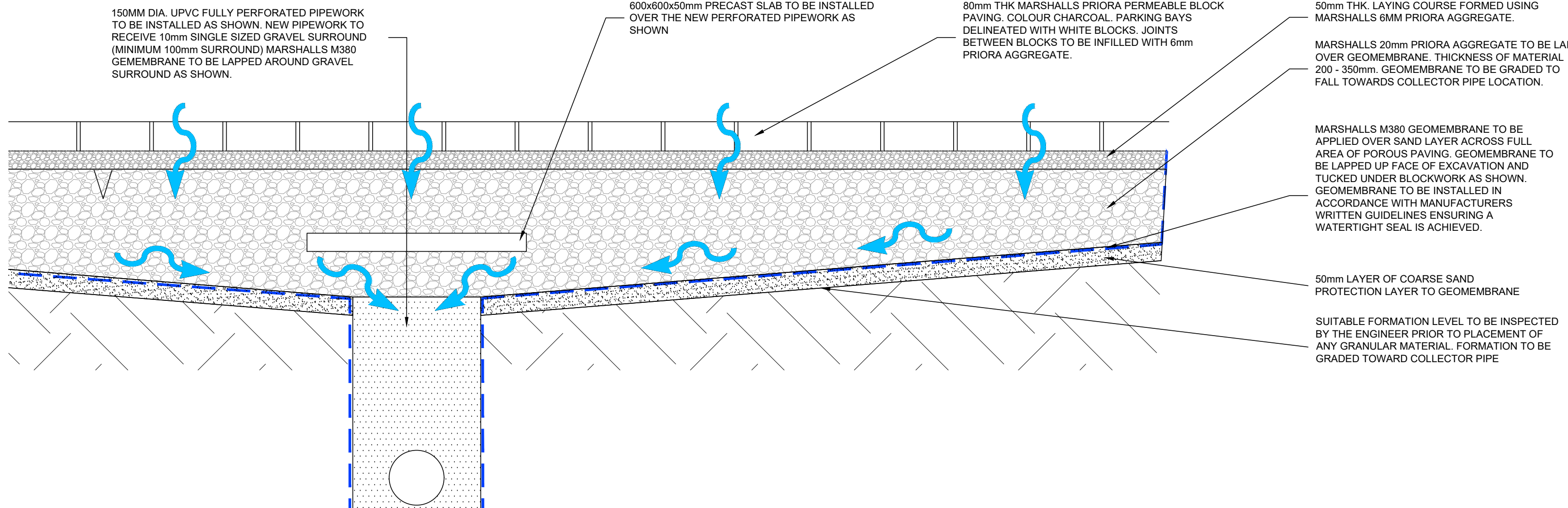
TYPICAL INSPECTION CHAMBER DETAIL



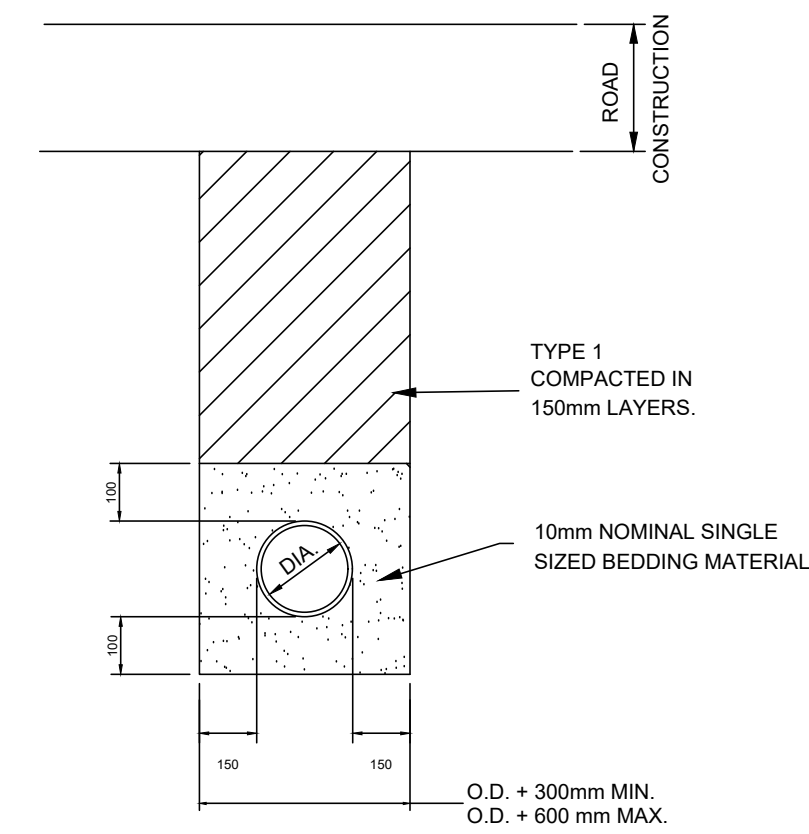
TYPICAL GULLY DETAIL



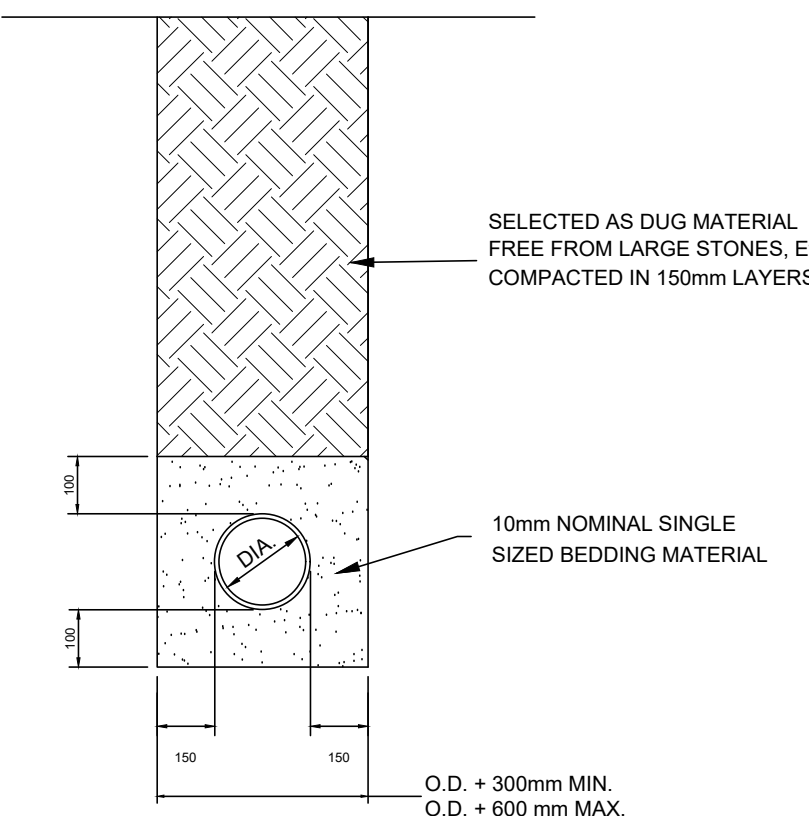
TYPICAL BACKDROP DETAIL



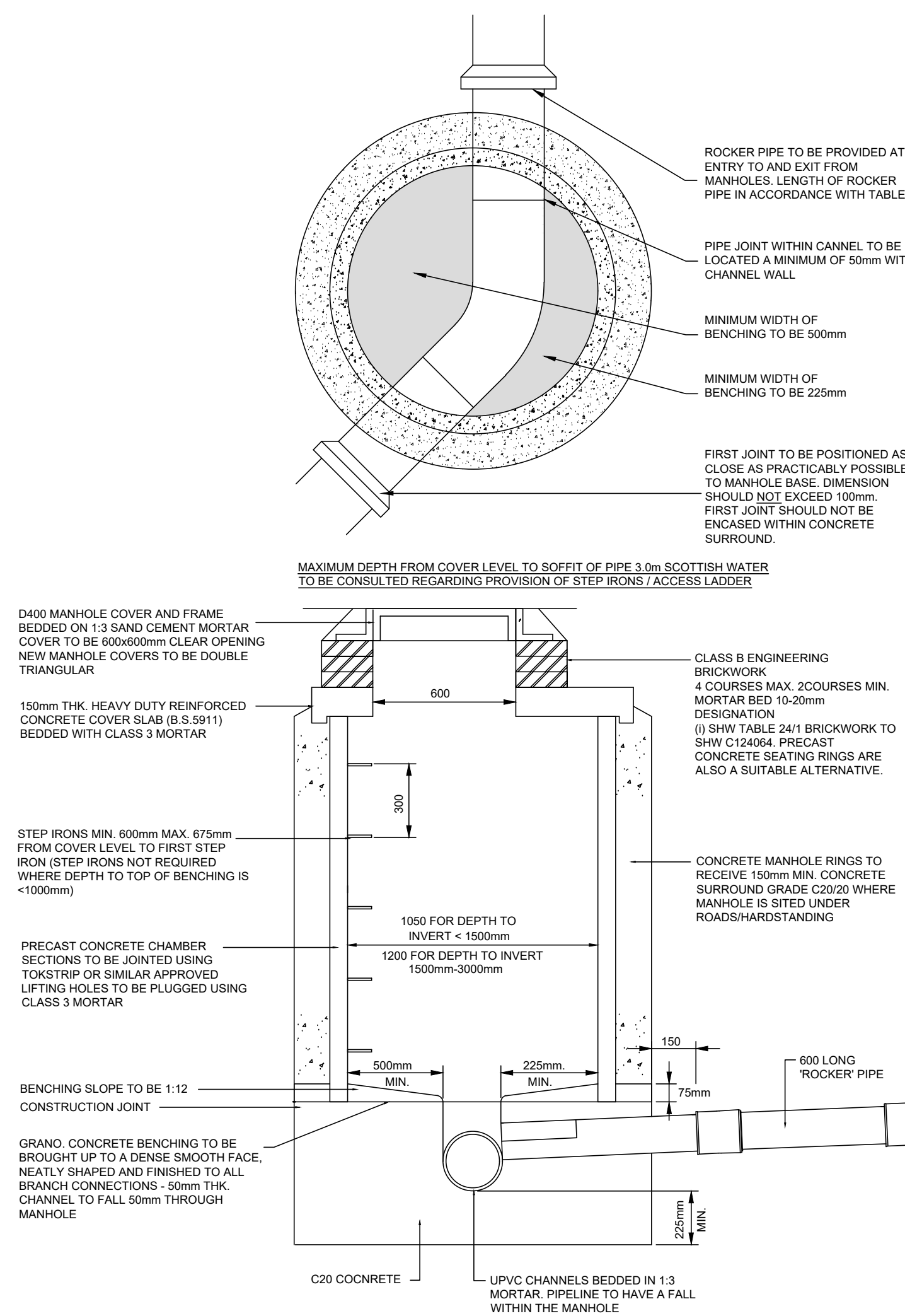
TYPICAL PERMEABLE PAVING DETAIL



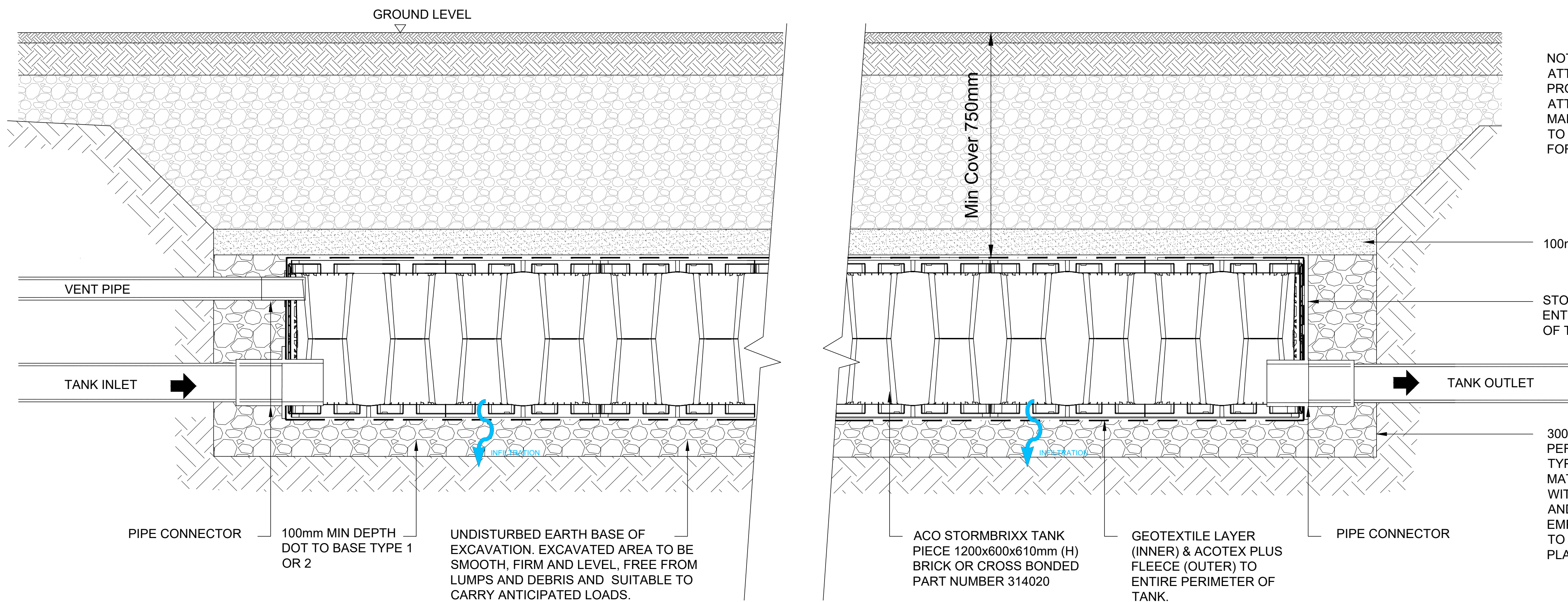
TYPICAL PIPE BEDDING DETAIL - VEHICULAR AREAS



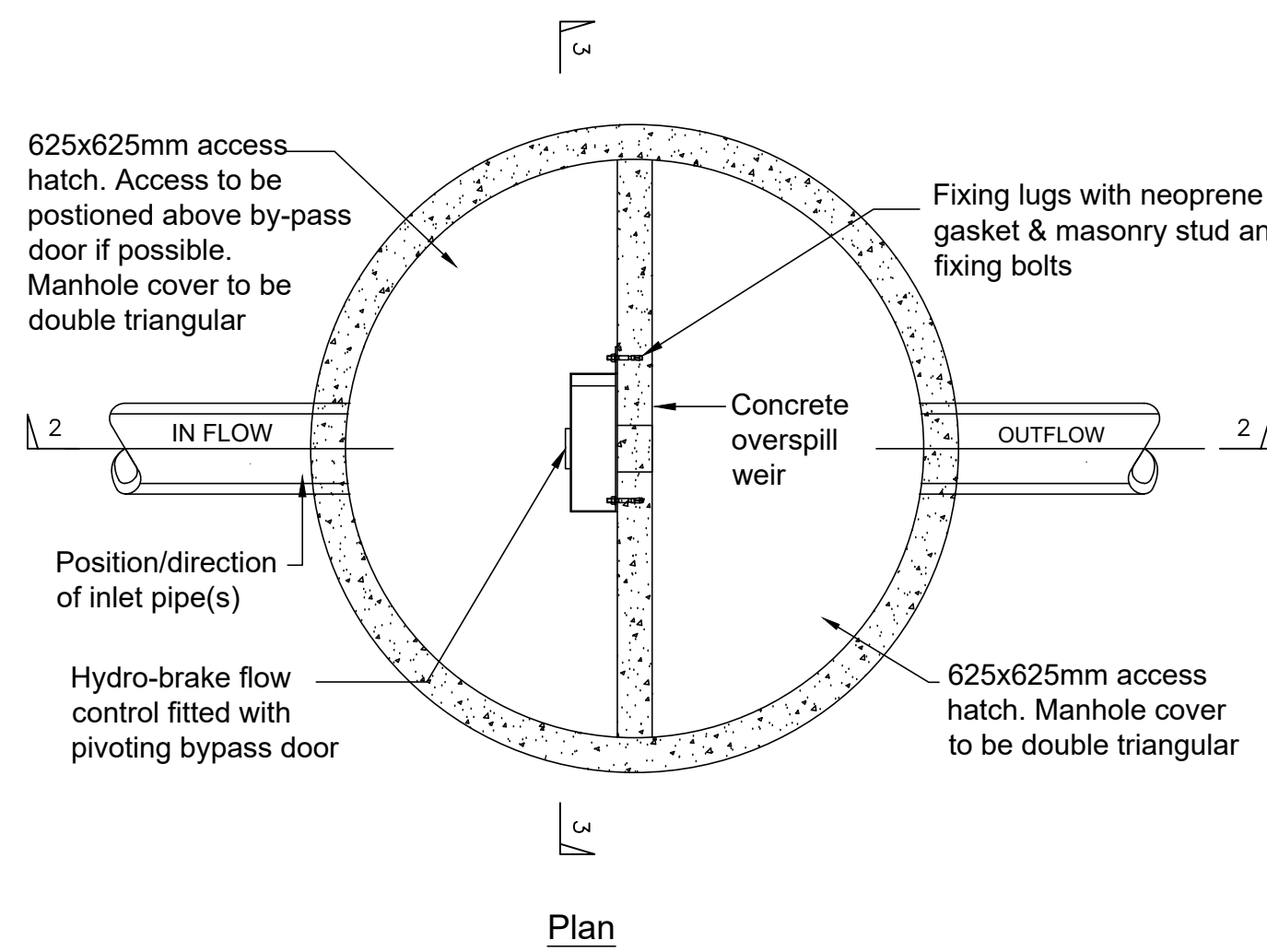
TYPICAL PIPE BEDDING DETAIL - LANDSCAPED AREAS



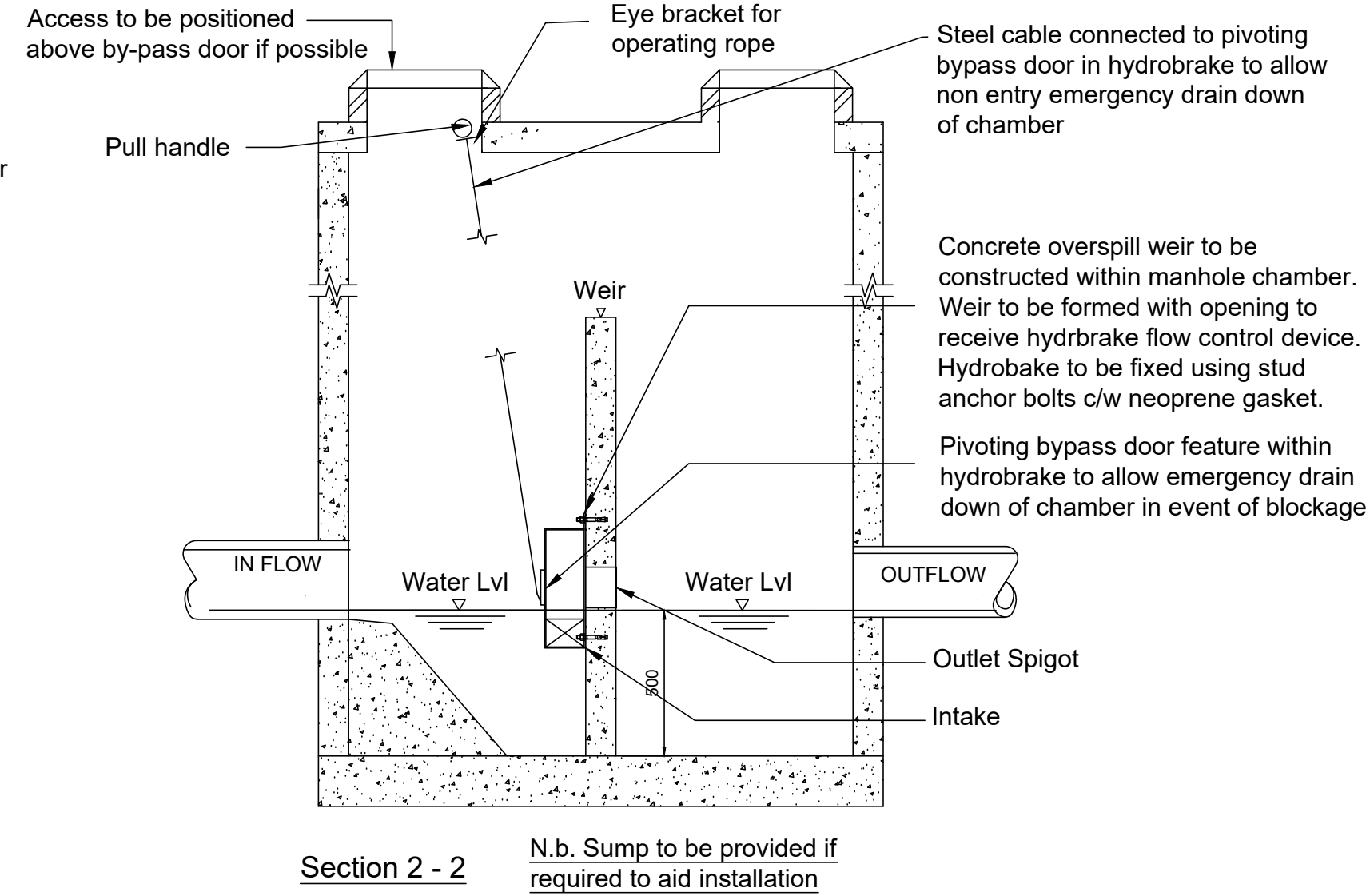
TYPICAL MANHOLE DETAIL <3m DEPTH



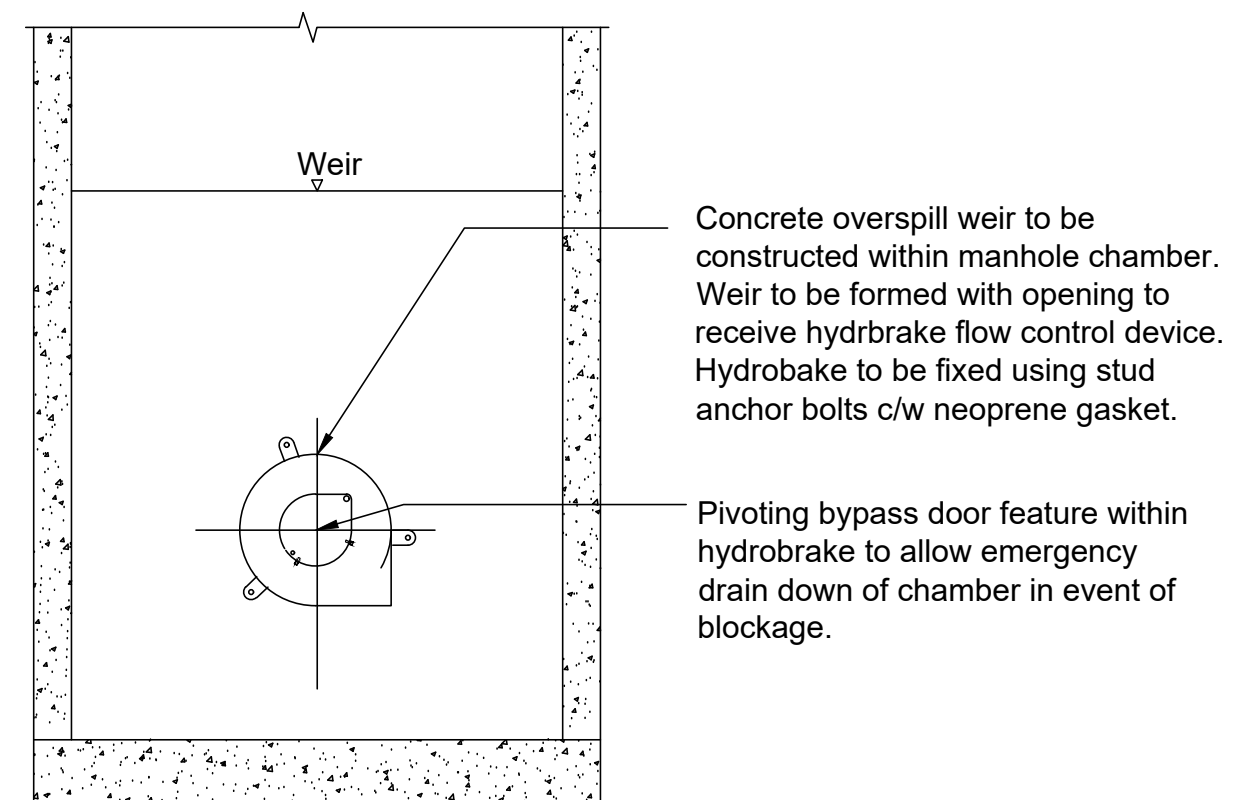
TYPICAL SOAKAWAY DETAIL



Dual entry weir wall control manhole detail
Not to Scale



Section 2 - 2
N.B. Sump to be provided if required to aid installation



Section 3 - 3

NOTE:-
ATTENUATION INSPECTION SHAFTS TO BE PROVIDED AT EITHER END OF NEW ATTENUATION SYSTEM TO ALLOW FUTURE MAINTENANCE OF UNITS. MANUFACTURER TO PROVIDE GUIDANCE ON BEST LOCATION FOR CHAMBERS.

100mm COARSE SAND

STORMBRIXX SIDE PANELS TO ENTIRE PERIMETER OF TANK PART NUMBER 314021

300mm WIDE BACKFILL AROUND SIDE PERIMETER.
TYPE 1 OR 2 OR SELECTED GRANULAR MATERIAL, COMPACTED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND TO SUIT COMPACTION PLANT EMPLOYED. (BACKFILL TO BE COMPLETE TO TOP OF UNITS PRIOR TO ANY FILL BEING PLACED TO THE TOP OF THE TANK)

INFILTRATION RATES DESIGNED IN ACCORDANCE WITH THE TRIAL PITS AND INFILTRATION TESTS/REPORT CARRIED OUT BY APPLIED GEOLOGY LTD. - WE HAVE ADOPTED AN INFILTRATION RATE OF 6.64E-07m/s (OR 0.00239m/hr) FOR DEEP SOAKAWAY DESIGN. FOR SHALLOW SOAKAWAY DESIGN (0.65m BELOW GROUND LEVEL) WE RECOMMEND AN INFILTRATION RATE OF 6.64E-07m/s IS ADOPTED AS SHOWN ON RIDGE CONSULTANT'S DRAWING NO. 5022828/0500.
THIS CONVERTS TO A RATE OF 0.00239m/hr. WE HAVE BASED OUR DESIGN ON TP3 FOR WORST CASE DESIGN.

A SOAKAWAY DETAIL REVISED		31.01.24	FM	BM
Rev.	Description	Date	Initials	Checked
INITIAL COMMENTS				
Client	SIMPLY UK			
Address	COLDHARBOUR ROAD, NORTHFLEET, GRAVESEND, DA11 8NT			
Drawing Title	DRAINAGE DETAILS			
Date	Drawn by	Drawn by	Drawn by	Drawn by
09/24	JR	LS	MD	JR
Project Ref.	9630	Proj. No.	C004	Rev.
				A

CHARLES SCOTT & PARTNERS
CONSULTING ENGINEERS

Version Building
349 Both Street
Gillingham G2 4AA
Tel: 0141 331 2454
Fax: 0141 332 2873
www.cscpe.co.uk

Appendix F

Micro-Drainage Source Control Results

Charles Scott & Partners				Page 1	
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA					
Date 19/06/2024 15:06 File Cellular Storage Soakawa...		Designed by lc Checked by			
Causeway		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Half Drain Time exceeds 7 days.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.256	0.256	0.1	68.0	O K
30 min Summer	98.333	0.333	0.1	88.6	O K
60 min Summer	98.412	0.412	0.2	109.7	O K
120 min Summer	98.493	0.493	0.2	131.0	O K
180 min Summer	98.539	0.539	0.2	143.4	O K
240 min Summer	98.571	0.571	0.2	152.0	O K
360 min Summer	98.616	0.616	0.2	164.0	O K
480 min Summer	98.650	0.650	0.2	172.9	O K
600 min Summer	98.676	0.676	0.2	179.9	O K
720 min Summer	98.698	0.698	0.2	185.6	O K
960 min Summer	98.731	0.731	0.2	194.6	O K
1440 min Summer	98.777	0.777	0.2	206.7	O K
2160 min Summer	98.818	0.818	0.2	217.7	O K
2880 min Summer	98.843	0.843	0.2	224.3	O K
4320 min Summer	98.868	0.868	0.2	230.8	O K
5760 min Summer	98.874	0.874	0.2	232.5	O K
7200 min Summer	98.870	0.870	0.2	231.5	O K
8640 min Summer	98.860	0.860	0.2	228.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	145.426	0.0	23		
30 min Summer	94.725	0.0	38		
60 min Summer	58.739	0.0	68		
120 min Summer	35.198	0.0	128		
180 min Summer	25.751	0.0	188		
240 min Summer	20.515	0.0	248		
360 min Summer	14.833	0.0	368		
480 min Summer	11.787	0.0	488		
600 min Summer	9.856	0.0	608		
720 min Summer	8.511	0.0	728		
960 min Summer	6.748	0.0	968		
1440 min Summer	4.859	0.0	1446		
2160 min Summer	3.493	0.0	2168		
2880 min Summer	2.761	0.0	2884		
4320 min Summer	1.980	0.0	4324		
5760 min Summer	1.562	0.0	5760		
7200 min Summer	1.299	0.0	7200		
8640 min Summer	1.118	0.0	8640		
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Charles Scott & Partners				Page 2	
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA					
Date 19/06/2024 15:06 File Cellular Storage Soakawa...		Designed by lc Checked by			
Causeway		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	98.846	0.846	0.2	225.0	O K
15 min Winter	98.286	0.286	0.1	76.2	O K
30 min Winter	98.373	0.373	0.1	99.2	O K
60 min Winter	98.462	0.462	0.2	122.9	O K
120 min Winter	98.552	0.552	0.2	146.9	O K
180 min Winter	98.604	0.604	0.2	160.8	O K
240 min Winter	98.641	0.641	0.2	170.4	O K
360 min Winter	98.692	0.692	0.2	184.0	O K
480 min Winter	98.730	0.730	0.2	194.1	O K
600 min Winter	98.760	0.760	0.2	202.1	O K
720 min Winter	98.784	0.784	0.2	208.6	O K
960 min Winter	98.823	0.823	0.2	218.8	O K
1440 min Winter	98.876	0.876	0.2	232.9	O K
2160 min Winter	98.925	0.925	0.2	246.0	O K
2880 min Winter	98.955	0.955	0.2	254.1	O K
4320 min Winter	98.988	0.988	0.2	262.9	O K
5760 min Winter	99.001	1.001	0.2	266.3	O K
7200 min Winter	99.003	1.003	0.2	266.8	O K
8640 min Winter	98.997	0.997	0.2	265.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
10080 min Summer	0.983	0.0	9984		
15 min Winter	145.426	0.0	23		
30 min Winter	94.725	0.0	38		
60 min Winter	58.739	0.0	68		
120 min Winter	35.198	0.0	128		
180 min Winter	25.751	0.0	186		
240 min Winter	20.515	0.0	246		
360 min Winter	14.833	0.0	364		
480 min Winter	11.787	0.0	484		
600 min Winter	9.856	0.0	602		
720 min Winter	8.511	0.0	722		
960 min Winter	6.748	0.0	958		
1440 min Winter	4.859	0.0	1432		
2160 min Winter	3.493	0.0	2144		
2880 min Winter	2.761	0.0	2852		
4320 min Winter	1.980	0.0	4240		
5760 min Winter	1.562	0.0	5648		
7200 min Winter	1.299	0.0	6992		
8640 min Winter	1.118	0.0	8376		
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Charles Scott & Partners		Page 3			
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA					
Date 19/06/2024 15:06 File Cellular Storage Soakawa...	Designed by lc Checked by				
Causeway					
Source Control 2020.1.3					
<u>Summary of Results for 100 year Return Period (+45%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	98.987	0.987	0.2	262.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
10080 min Winter	0.983	0.0	9680		
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Charles Scott & Partners		Page 4																																										
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA																																												
Date 19/06/2024 15:06 File Cellular Storage Soakawa...	Designed by lc Checked by																																											
Causeway		Source Control 2020.1.3																																										
Rainfall Details <table><tr><td>Rainfall Model</td><td>FSR</td><td>Winter Storms</td><td>Yes</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>M5-60 (mm)</td><td>20.000</td><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Ratio R</td><td>0.419</td><td>Longest Storm (mins)</td><td>10080</td></tr><tr><td>Summer Storms</td><td>Yes</td><td>Climate Change %</td><td>+45</td></tr></table> Time Area Diagram Total Area (ha) 0.250 <table><thead><tr><th colspan="3">Time (mins) Area</th><th colspan="3">Time (mins) Area</th></tr><tr><th>From:</th><th>To:</th><th>(ha)</th><th>From:</th><th>To:</th><th>(ha)</th></tr></thead><tbody><tr><td>0</td><td>4</td><td>0.100</td><td>4</td><td>8</td><td>0.150</td></tr></tbody></table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	20.000	Shortest Storm (mins)	15	Ratio R	0.419	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+45	Time (mins) Area			Time (mins) Area			From:	To:	(ha)	From:	To:	(ha)	0	4	0.100	4	8	0.150
Rainfall Model	FSR	Winter Storms	Yes																																									
Return Period (years)	100	Cv (Summer)	0.750																																									
Region	England and Wales	Cv (Winter)	0.840																																									
M5-60 (mm)	20.000	Shortest Storm (mins)	15																																									
Ratio R	0.419	Longest Storm (mins)	10080																																									
Summer Storms	Yes	Climate Change %	+45																																									
Time (mins) Area			Time (mins) Area																																									
From:	To:	(ha)	From:	To:	(ha)																																							
0	4	0.100	4	8	0.150																																							
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3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA		
Date 19/06/2024 15:06	Designed by lc	
File Cellular Storage Soakawa...	Checked by	
Causeway	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

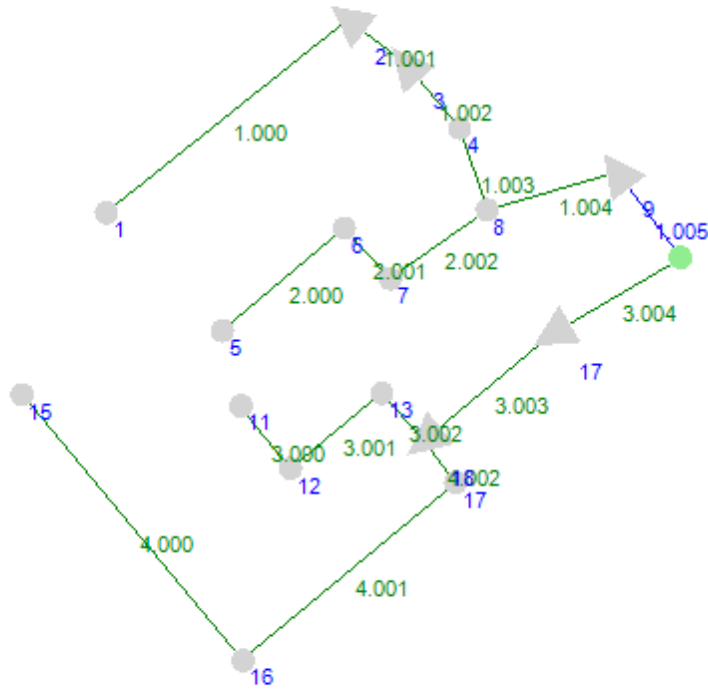
Invert Level (m) 98.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00353 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00353

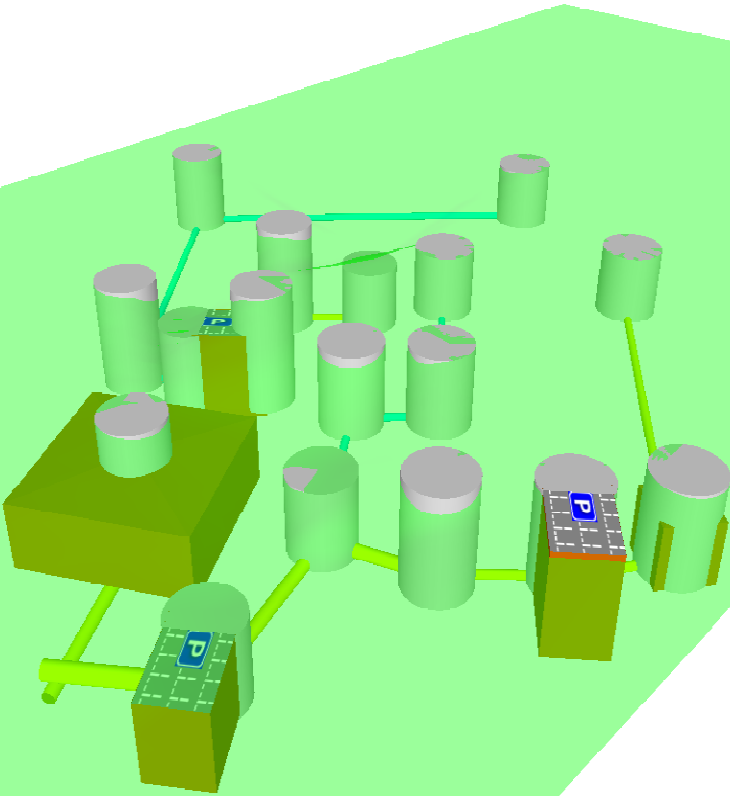
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	280.0	280.0	1.200	0.0	354.8
1.100	280.0	354.8			

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Appendix F (ii)

Simulation Results – 1 in 100yr storm + 45% CC

Charles Scott & Partners		Page 1
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA		
Date 19/06/2024 15:07	Designed by lc	
File Storm Water Network lin100yr storm.MDX	Checked by	
Causeway	Network 2020.1.3	
		
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Charles Scott & Partners		Page 1
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA		
Date 19/06/2024 15:08	Designed by lc	
File Storm Water Network 1in100yr storm.MDX	Checked by	
Causeway	Network 2020.1.3	
		
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Charles Scott & Partners		Page 1																																												
3rd Floor, Venlaw Building 349 Bath Street Glasgow G2 4AA																																														
Date 19/06/2024 15:11 File Storm Water Network lin1...	Designed by lc Checked by																																													
Causeway	Network 2020.1.3																																													
STORM SEWER DESIGN by the Modified Rational Method Design Criteria for Storm Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>2</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>20.000</td><td>Add Flow / Climate Change (%)</td><td>45</td></tr><tr><td>Ratio R</td><td>0.423</td><td>Minimum Backdrop Height (m)</td><td>0.000</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>0.000</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits Time Area Diagram for Storm at outfall (pipe 1.005) <table><tr><td>Time (mins)</td><td>Area (ha)</td><td>Time (mins)</td><td>Area (ha)</td></tr><tr><td>0-4</td><td>0.224</td><td>4-8</td><td>0.026</td></tr></table> Total Area Contributing (ha) = 0.250 Total Pipe Volume (m³) = 3.592 Time Area Diagram at outfall (pipe 3.004) <table><tr><td>Time (mins)</td><td>Area (ha)</td><td>Time (mins)</td><td>Area (ha)</td></tr><tr><td>0-4</td><td>0.221</td><td>4-8</td><td>0.031</td></tr></table> Total Area Contributing (ha) = 0.252 Total Pipe Volume (m³) = 3.534			Return Period (years)	2	PIMP (%)	100	M5-60 (mm)	20.000	Add Flow / Climate Change (%)	45	Ratio R	0.423	Minimum Backdrop Height (m)	0.000	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000	Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200	Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00	Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500	Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.224	4-8	0.026	Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.221	4-8	0.031
Return Period (years)	2	PIMP (%)	100																																											
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	45																																											
Ratio R	0.423	Minimum Backdrop Height (m)	0.000																																											
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000																																											
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200																																											
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00																																											
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																											
Time (mins)	Area (ha)	Time (mins)	Area (ha)																																											
0-4	0.224	4-8	0.026																																											
Time (mins)	Area (ha)	Time (mins)	Area (ha)																																											
0-4	0.221	4-8	0.031																																											
Network Design Table for Storm <table><tr><td>PN</td><td>Length</td><td>Fall</td><td>Slope</td><td>I.Area</td><td>T.E.</td><td>Base</td><td>k</td><td>HYD</td><td>DIA</td><td>Section</td><td>Type</td></tr><tr><td></td><td>(m)</td><td>(m)</td><td>(1:X)</td><td>(ha)</td><td>(mins)</td><td>Flow (l/s)</td><td>(mm)</td><td>SECT</td><td>(mm)</td><td></td><td></td></tr></table> Network Results Table			PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type		(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)																						
PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type																																			
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)																																					
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Glasgow G2 4AA

Date 19/06/2024 15:11
File Storm Water Network lin1...

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Causeway

Network 2020.1.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	36.133	0.361	100.0	0.020	2.00	0.0	0.600	o	150	Pipe/Conduit
1.001	8.586	0.086	100.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit
1.002	9.813	0.098	100.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit
1.003	10.033	0.084	119.4	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit
2.000	18.601	0.186	100.0	0.030	2.00	0.0	0.600	o	150	Pipe/Conduit
2.001	7.982	0.080	99.8	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit
2.002	13.899	0.139	100.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit
1.004	15.790	0.105	150.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit
1.005	12.538	0.084	149.3	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit
3.000	9.303	0.093	100.0	0.030	2.00	0.0	0.600	o	150	Pipe/Conduit
3.001	13.795	0.138	100.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit
3.002	7.453	0.062	120.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit
4.000	40.361	0.404	99.9	0.030	2.00	0.0	0.600	o	150	Pipe/Conduit
4.001	32.378	0.324	100.0	0.040	0.00	0.0	0.600	o	150	Pipe/Conduit
4.002	6.020	0.060	100.0	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	2.60	39.200	0.020	0.0	0.0	1.2	1.00	17.8	3.9
1.001	50.00	2.74	38.839	0.040	0.0	0.0	2.4	1.00	17.8	7.9
1.002	50.00	2.90	38.753	0.060	0.0	0.0	3.7	1.00	17.8	11.8
1.003	50.00	3.04	38.580	0.090	0.0	0.0	5.5	1.20	47.5	17.7
2.000	50.00	2.31	39.200	0.030	0.0	0.0	1.8	1.00	17.8	5.9
2.001	50.00	2.44	39.014	0.060	0.0	0.0	3.7	1.01	17.8	11.8
2.002	50.00	2.67	38.934	0.080	0.0	0.0	4.9	1.00	17.8	15.7
1.004	50.00	3.29	38.496	0.200	0.0	0.0	12.2	1.07	42.4	39.3
1.005	50.00	3.45	38.315	0.250	0.0	0.0	15.2	1.28	90.8	49.1
3.000	50.00	2.15	38.400	0.030	0.0	0.0	1.8	1.00	17.8	5.9
3.001	50.00	2.38	38.307	0.050	0.0	0.0	3.0	1.00	17.8	9.8
3.002	50.00	2.52	38.169	0.070	0.0	0.0	4.3	0.92	16.2	13.7
4.000	50.00	2.67	39.200	0.030	0.0	0.0	1.8	1.01	17.8	5.9
4.001	50.00	3.21	38.796	0.070	0.0	0.0	4.3	1.00	17.8	13.7
4.002	50.00	3.28	38.397	0.102	0.0	0.0	6.2	1.31	52.0	20.0

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Date 19/06/2024 15:14				Designed by lc					
File Storm Water Network lin1...				Checked by					
Causeway				Network 2020.1.3					
Summary of Results for 360 minute 100 year Winter (Storm) Margin for Flood Risk Warning (mm) 300.0 DVD Status ON Analysis Timestep Fine Inertia Status ON DTS Status ON									
		Water	Surcharged	Flooded		Half Drain	Pipe		
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
1.000	1	39.232	-0.118	0.000	0.10			1.7	OK
1.001	2	38.886	-0.102	0.000	0.22		96	3.5	OK
1.002	3	38.812	-0.091	0.000	0.33		66	5.2	OK
1.003	4	38.647	-0.158	0.000	0.20			7.7	OK
2.000	5	39.239	-0.111	0.000	0.16			2.6	OK
2.001	6	39.074	-0.090	0.000	0.34			5.2	OK
2.002	7	39.002	-0.082	0.000	0.43			6.9	OK
1.004	8	38.603	-0.118	0.000	0.46			17.3	OK
1.005	9	38.427	-0.189	0.000	0.30		42	21.6	OK
3.000	11	38.441	-0.109	0.000	0.17			2.6	OK
3.001	12	38.359	-0.098	0.000	0.27			4.3	OK
3.002	13	38.238	-0.081	0.000	0.44			6.1	OK
4.000	15	39.239	-0.111	0.000	0.15			2.6	OK
4.001	16	38.858	-0.088	0.000	0.36			6.1	OK
4.002	17	38.474	-0.148	0.000	0.26			8.9	OK
3.003	18	38.141	-0.116	0.000	0.47		72	17.5	OK
3.004	17	38.021	-0.115	0.000	0.48		84	21.8	OK
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Summary of Results for 720 minute 100 year Winter (Storm) Margin for Flood Risk Warning (mm) 300.0 DVD Status ON Analysis Timestep Fine Inertia Status ON DTS Status ON									
		Water Surcharged Flooded				Half Drain Pipe			
PN	US/MH Name	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Pipe Flow (l/s)	Status
1.000	1	39.223	-0.127	0.000	0.06			1.0	OK
1.001	2	38.874	-0.115	0.000	0.13		192	2.0	OK
1.002	3	38.797	-0.106	0.000	0.19		132	3.0	OK
1.003	4	38.630	-0.175	0.000	0.11			4.5	OK
2.000	5	39.230	-0.120	0.000	0.09			1.5	OK
2.001	6	39.059	-0.105	0.000	0.19			3.0	OK
2.002	7	38.984	-0.100	0.000	0.24			4.0	OK
1.004	8	38.574	-0.147	0.000	0.27			9.9	OK
1.005	9	38.398	-0.217	0.000	0.17		168	12.4	OK
3.000	11	38.431	-0.119	0.000	0.10			1.5	OK
3.001	12	38.346	-0.111	0.000	0.15			2.5	OK
3.002	13	38.220	-0.099	0.000	0.25			3.5	OK
4.000	15	39.230	-0.120	0.000	0.09			1.5	OK
4.001	16	38.842	-0.104	0.000	0.20			3.5	OK
4.002	17	38.454	-0.168	0.000	0.15			5.1	OK
3.003	18	38.111	-0.146	0.000	0.27		144	10.0	OK
3.004	17	37.991	-0.145	0.000	0.28		180	12.5	OK
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<u>Summary of Results for 1440 minute 100 year Winter (Storm)</u> Margin for Flood Risk Warning (mm) 300.0 DVD Status ON Analysis Timestep Fine Inertia Status ON DTS Status ON									
		Water	Surcharged	Flooded		Half Drain	Pipe		
	US/MH	Level	Depth	Volume	Flow /	Time	Flow		
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status
1.000	1	39.218	-0.132	0.000	0.03			0.6	OK
1.001	2	38.865	-0.123	0.000	0.07		384	1.1	OK
1.002	3	38.785	-0.117	0.000	0.11		264	1.7	OK
1.003	4	38.617	-0.188	0.000	0.06			2.5	OK
2.000	5	39.222	-0.128	0.000	0.05			0.9	OK
2.001	6	39.047	-0.117	0.000	0.11			1.7	OK
2.002	7	38.971	-0.113	0.000	0.14			2.3	OK
1.004	8	38.554	-0.167	0.000	0.15			5.7	OK
1.005	9	38.378	-0.237	0.000	0.10		360	7.1	OK
3.000	11	38.422	-0.128	0.000	0.05			0.9	OK
3.001	12	38.337	-0.120	0.000	0.09			1.4	OK
3.002	13	38.207	-0.113	0.000	0.14			2.0	OK
4.000	15	39.221	-0.129	0.000	0.05			0.9	OK
4.001	16	38.830	-0.116	0.000	0.12			2.0	OK
4.002	17	38.441	-0.182	0.000	0.08			2.9	OK
3.003	18	38.091	-0.166	0.000	0.15		288	5.7	OK
3.004	17	37.970	-0.166	0.000	0.16		360	7.1	OK
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Summary of Results for 10080 minute 100 year Winter (Storm) Margin for Flood Risk Warning (mm) 300.0 DVD Status ON Analysis Timestep Fine Inertia Status ON DTS Status ON								
		Water	Surcharged	Flooded		Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Time	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s) Status
1.000	1	39.205	-0.145	0.000	0.01			0.1 OK
1.001	2	38.849	-0.139	0.000	0.01		1464	0.2 OK
1.002	3	38.768	-0.135	0.000	0.02		1080	0.3 OK
1.003	4	38.594	-0.211	0.000	0.01			0.5 OK
2.000	5	39.207	-0.143	0.000	0.01			0.2 OK
2.001	6	39.029	-0.135	0.000	0.02			0.3 OK
2.002	7	38.951	-0.133	0.000	0.03			0.5 OK
1.004	8	38.521	-0.199	0.000	0.03			1.2 OK
1.005	9	38.344	-0.272	0.000	0.02		1296	1.4 OK
3.000	11	38.408	-0.142	0.000	0.01			0.2 OK
3.001	12	38.320	-0.137	0.000	0.02			0.3 OK
3.002	13	38.186	-0.133	0.000	0.03			0.4 OK
4.000	15	39.207	-0.143	0.000	0.01			0.2 OK
4.001	16	38.812	-0.134	0.000	0.02			0.4 OK
4.002	17	38.415	-0.207	0.000	0.02			0.6 OK
3.003	18	38.058	-0.199	0.000	0.03		1632	1.2 OK
3.004	17	37.937	-0.199	0.000	0.03		1800	1.4 OK
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Appendix G

Maintenance Log Sheet

MAINTENANCE LOG SHEET

SUDS Type:	HYDRO-BRAKE FLOW CONTROL		
Description:	Flow control mechanism used to restrict flow of surface water to controlled discharge limits agreed with local authority. Attenuated flows stored within underground attenuation tanks. Flow control mechanism located within underground manhole chamber.		Maintenance Required: Cleaning inlets / outlets, manhole and orifices of flow control device to ensure optimum performance of device
Period:	Inspection and removal of debris - MONTHLY	clean and removal of all sediment - ANNUALLY	

[illegible]

MAINTENANCE LOG SHEET

SUDS Type:	PERMEABLE PAVEMENT	
Description:	Permeable surfaces provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into underlying layers. The water can be temporarily stored before infiltration to the ground, reused, or discharged to a watercourse or other drainage system. Surfaces with an aggregate sub-base can provide good water quality treatment.	
Maintenance Required:	brushing and vacuuming (standard cosmetic sweep over whole surface area) attention should be taken were water runs from impermeable areas as this is most likely to accumalate silt.	Period: BI-Annual or as required

[illegible]

MAINTENANCE LOG SHEET

SUDS Type:	UNDERGROUND STORAGE	
Description:	Underground plastic geocellular/modular systems can be used to create a below ground storage structure. Due to the modular nature of the systems, they can be tailored to suit the specific requirements of any site. Water can be attenuated on site, before discharging at a controlled rate to a watercourse or other drainage system.	
Maintenance Required:	Cleaning inlets/ outlets, manholes, associated pipework, and silt traps	
Period:	Removal of Debris - Monthly	Cleaning and Removal of Sediment - Annually

[illegible]

Appendix H

Environment Agency Flood Report

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
563650/172260

Created
10 Nov 2023 15:30

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
563650/172260

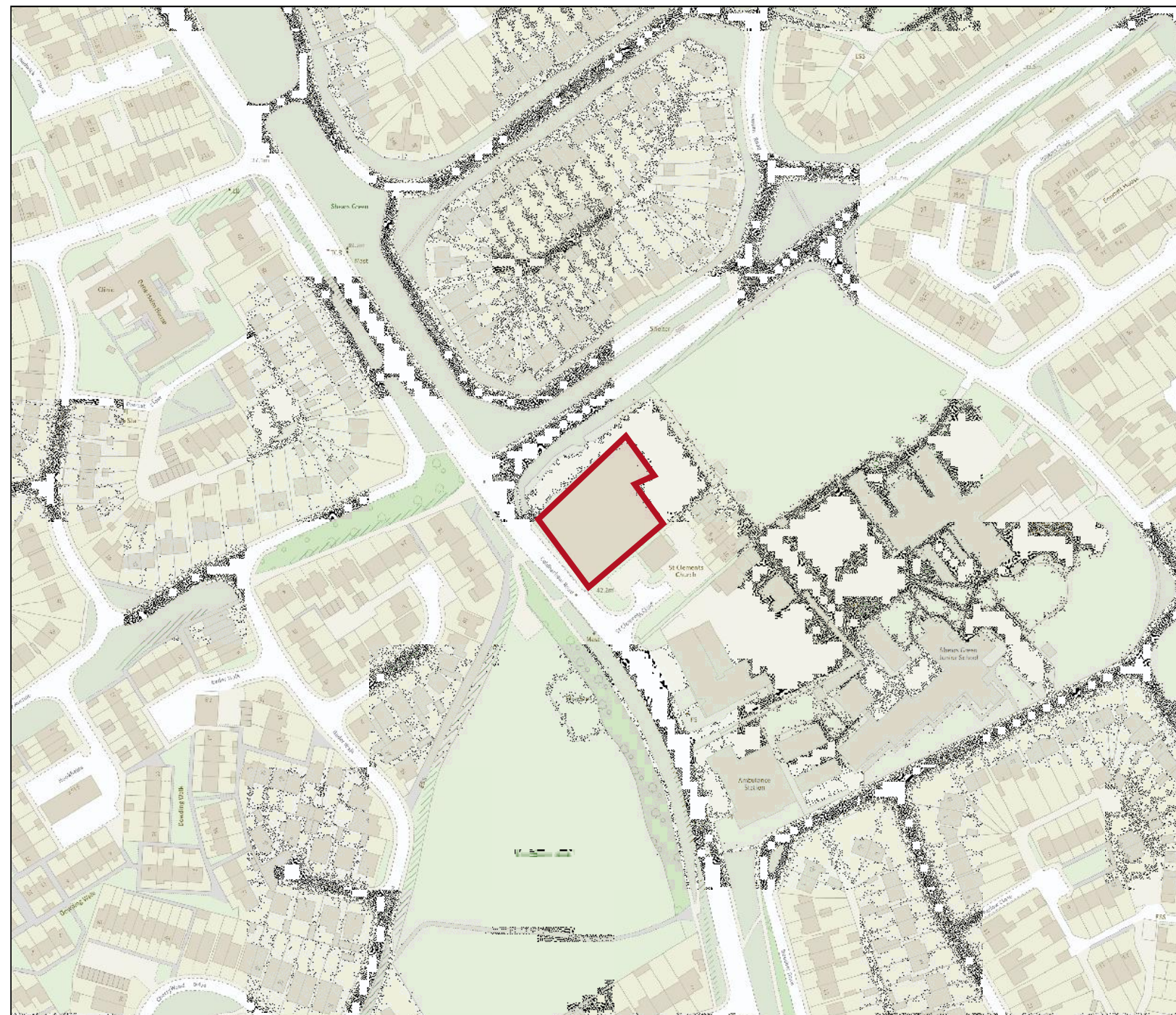
Scale
1:2500

Created
10 Nov 2023 15:30

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

Page 2 of 2





Drainage Strategy—Rev.A

SIMPLY UK

COLDHARBOUR ROAD, GRAVESEND

9360

MARCH 2024



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