



TECHNICAL NOTE

PROJECT	:	Land adjacent Sefter School House, Sefter Road, Pagham
NOTE REF.	:	Acl640/21023/TN
NOTE TITLE	:	Additional Information requested by the LLFA
AUTHOR	:	Tafari Lewis
APPROVED	:	Tafari Lewis
DATE	:	11 th March 2022

1.0 Introduction

This file note has been produced to provide additional information to Arun District Council (ADC) as lead local flood authority (LLFA) on drainage and flood risk for the proposed development of land adjacent Sefter School House, Sefter Road in Pagham.

A Drainage Strategy and SuDS Statement (DS) was produced by Adama Consulting Limited (ACL) in October 2021 (report ref; Acl598/21023/DS Issue 5) which was submitted supplementary to a discharge of conditions application to ADC under reference P/15/22/DOC.

Following a review of the report, ADC raised an objection to the application requesting additional information as highlighted within the statutory consultee response in **Appendix A**.

The purpose of this file note is to provide clarification of the information requested by the LLFA by reviewing each point raised and responding accordingly.

2.0 Additional Information

Condition 9

Comment:

"No winter groundwater monitoring has been completed. Observed perched groundwater at 1m depth in August is noted within the report. This is not winter groundwater monitoring. Even when infiltration is not deemed suitable, we require on site winter groundwater monitoring to establish peak seasonal groundwater levels and ensure that attenuation design appropriately considers and resists flotation. Please complete and supply winter groundwater monitoring ."

Response:

Ashdown Site Investigation Limited undertook In Situ Infiltration testing and groundwater monitoring between November 2020 and March 2021.

Adama Consulting Limited, Unit 34 The Enterprise Centre, Cranborne Road, Potters Bar, Hertfordshire, EN6 5DO.

The conclusions drawn from the monitoring visits which were provided in graph format and showed groundwater fluctuations between 0.8m below ground level (bgl) to near surface level.

A copy of Ashdown Site Investigation reports inclusive winter groundwater monitoring is annexed within **Appendix B**.

Comment:

"No winter infiltration testing has been completed. It is considered that infiltration is unlikely to work here, however this should be supported by on site infiltration testing."

Response:

Refer to Ashdown Site Investigations Ltd infiltration testing report in **Appendix B**.

Comment:

"The catchment area diagram in Appendix F has been cut and does not show the full extents of this plan. Please provide the full plan."

Response:

The full plan has been provided within **Appendix C**.

Comment:

"FSR rainfall has been used in design calculations, please use FEH 2013 data."

Response:

FEH 2013 data has been obtained and a revised greenfield run-off assessment undertaken to assess the implications on the as designed discharge rate for the site.

Findings are based upon an ReFH2 assessment utilizing the FEH 2013 catchment data and inputting the sites gross area of 0.267ha for both summer and winter seasons and are summarized in table 1 below.

Event	Winter Flow (l/s)	Summer Flow (l/s)
1 in 1 year	0.4	0.6
1 in 2 year	0.4	0.7
1 in 30 years	0.9	1.6
1 in 100 years	1.2	2.0

Table 1: Summary of FEH 2013 Greenfield runoff rates

The findings summarised above confirm runoff from the site to be negligible. The summer 100 year run-off rate corresponds to the 'as designed discharge rate'

Whilst there are a limited number of available flow control devices on the market which provide flow rates off less than 2.0l/s, these have a high risk of blockage. In order to future proof the proposed drainage network and to minimise flood risk the flow rate of 2.0l/s has been retained.

A copy of the updated greenfield calculations has been included within **Appendix D**.

Comment:

"Please model a surcharged outfall, with a surcharged water level set to equal top of bank level".

Response:

The hydraulic simulations of the proposed surface water network have now been updated and remodeled with a surcharged outfall and updated FEH 2013 catchment data and included within **Appendix D**.

Comment:

"Please detail if an urbanisation allowance has been applied to impermeable areas."

Response:

A 10% increase to impermeable catchment areas has been included within the revised hydraulic model to allow for urban creep.

Comment:

"We note that the levels of the ditch are shown to drop away sharply nearly the point of proposed connection. Please check all ditch levels on site. Please also provide downstream culvert invert levels, as well as soft and hard bed levels of the watercourse. An extended outfall pipe is proposed to get the discharge to the area where the watercourse is deeper. However, it may be that soft bed levels are shown upstream and that a discharge point closer to the hydrobrake, and drainage features is actually achievable with necessary maintenance completed to the watercourse."

Response:

At the time of this response additional topographic data was unavailable to check ditch levels on site together with the downstream culvert. The drainage scheme has therefore been based on the Medlams Surveys limited Topographic survey conducted in December 2019 (reproduced within **Appendix E**).

The additional survey information has been requested from the developer and once received shall be checked accordingly.

The current design which is based upon available stream levels has therefore been re-submitted and shall be reviewed once the additional survey requested has been provided for us to review.

Comment:

"The proposed invert levels of outfalls are not clear (please clearly define them on plan), however upstream manhole inverts show that outfalls will not meet our minimum requirement for clearance between bed level and invert level of outfall pipes. As an absolute minimum we require 150mm".

Response:

Noted. The outfall bed level is 2.93m aod which means the minimum permitted connection would be 3.08m at the outfall location. The designed network has been adjusted accordingly.

Comment:

"Finish and formation level of permeable paving must be labelled on layout plan".

Response:

Finished and formation levels for the main access permeable paving have now been included on the updated drainage layout plan.

For clarification on the proposed finished levels for the scheme an external levels layout has also been included.

The updated drainage and external levels have been included within **Appendix F**.

Comment:

"All pipes must be labelled with diameter and fall".

Response:

Noted. Now illustrated on the Below Ground Drainage Layout in Appendix F.

Comment:

"Please label gully cover levels on plan".

Response:

Noted. Updated accordingly

Comment:

"Hydrobrake unit reference must be stated on plan".

Response:

Noted. Updated accordingly

Comment:

"Please show connections from permeable paving areas to the piped network."

Response:

Noted. Updated accordingly

Comment:

"Exceedance flow plan has been cropped, please supply the full plan."

Response:

This has been reproduced and annexed in **Appendix G**.

Comment:

"Please supply site specific construction detail drawings of permeable paving, pipe bed and surround, gullies, manholes, catchpits, attenuation pond (a minimum of two perpendicular cross sections), attenuation tank, headwalls to basin, hydrobrake, outfalls to watercourse, etc."

Response:

A full set of site specific drainage construction details has been included within **Appendix H**.

Comment:

"Flotation calculations for the basin and tank will be required."

Response:

Noted. Pond flotation calculations have been included within **Appendix G**. In regard to the cellular storage tank, these details are pending manufacturer design and shall be forwarded under separate cover once received.

Comment:

"We note that a foul treatment plant is proposed on site, it is a shame that development in the area has not been considered more broadly as the large sites nearby will shortly mean a foul sewer is provided within close proximity. Discharge to a foul sewer would be preferred to the use of a treatment plant and discharge to watercourse."

Response:

Noted. Unfortunately, at the time of design, there were no Southern Water assets within the vicinity of the site. The developer there has no other feasible solution for the discharge of foul wastewater from this scheme

Condition 10

Comment:

"Please supply evidence of ordinary watercourse land drainage consent for both the surface water and foul water connections."

Response:

The developer has not yet made applications for land drainage consent noting that approval on the drainage scheme as part of condition 9 would be required in the first instance.

This file note therefore only seeks to provide additional information in respects to conditions 9 and 11.

Condition 11

Comment:

"Please detail how maintenance will be funded, i.e., will a charge be levied on residents?"

Response:

This query has been raised with the developer who shall respond under separate cover.

Comments:

- *"Please add to maintenance of ponds- annual removal of tree saplings.*
- *Please detail inspection and replacement of liners.*

- *Please detail inspection, greasing and movement of bypass door on hydrobrake and frequency of this.*
- *Please include maintenance of gullys and pipes.*
- *Please include maintenance of ordinary watercourse for which the development will have riparian responsibility for. Please include a layout plan which clearly defines the watercourse extents."*

Response:

Noted. The updated maintenance management schedule incorporating the above comments has been annexed within **Appendix I**.

3.0 Conclusion

The findings within this technical conclude sufficient information has now been provided to address the points raised by the LLFA in respects to conditions 9 and 11.

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Appendix B	Soakaway Assessment and Winter Groundwater Monitoring
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Appendix I	Maintenance and Management

Appendix A

LLFA Consultee Response

Appendix A

LLFA Consultee Response

Arun District Council, Civic Centre, Maltravers Rd, Littlehampton, West Sussex, BN17 5LF

To register to receive notification of planning applications in your area please go to
<https://www1.arun.gov.uk/planning-application-finder>

Sign up to our newsletter [here](#)



From: Laura Gibbons <Laura.Gibbons@arun.gov.uk>
Sent: 01 March 2022 11:46
To: Planning.Responses <Planning.Responses@arun.gov.uk>
Cc: Simon Davis <Simon.Davis@arun.gov.uk>
Subject: RE: Planning Consultation on: P/15/22/DOC

Engineers Comments Regarding Surface Water Drainage

We note that construction appears to have commenced on site. The pre-commencement conditions have not been discharged, and therefore construction should cease immediately.

We have the following comments on the drainage conditions.

Condition 9

1. No winter groundwater monitoring has been completed. Observed perched groundwater at 1m depth in August is noted within the report. This is not winter groundwater monitoring. Even when infiltration is not deemed suitable we require on site winter groundwater monitoring to establish peak seasonal groundwater levels and ensure that attenuation design appropriately considers and resists flotation. Please complete and supply winter groundwater monitoring.
2. No winter infiltration testing has been completed. It is considered that infiltration is unlikely to work here, however this should be supported by on site infiltration testing.
3. The catchment area diagram in Appendix F has been cut and does not show the full extents of this plan. Please provide the full plan.
4. FSR rainfall has been used in design calculations, please use FEH 2013 data.

5. Please model a surcharged outfall, with a surcharged water level set to equal top of bank level.
6. Please detail if an urbanisation allowance has been applied to impermeable areas.
7. We note that the levels of the ditch are shown to drop away sharply nearly the point of proposed connection. Please check all ditch levels on site. Please also provide downstream culvert invert levels, as well as soft and hard bed levels of the watercourse. An extended outfall pipe is proposed to get the discharge to the area where the watercourse is deeper. However, it may be that soft bed levels are shown upstream and that a discharge point closer to the hydrobrake and drainage features is actually achievable with necessary maintenance completed to the watercourse.
8. The proposed invert levels of outfalls are not clear (please clearly define them on plan), however upstream manhole inverts show that outfalls will not meet our minimum requirement for clearance between bed level and invert level of outfall pipes. As an absolute minimum we require 150mm.
9. Finish and formation level of permeable paving must be labelled on layout plan.
10. All pipes must be labelled with diameter and fall.
11. Please label gully cover levels on plan.
12. Hydrobrake unit reference must be stated on plan.
13. Please show connections from permeable paving areas to the piped network.
14. Exceedance flow plan has been cropped, please supply the full plan.
15. Please supply site specific construction detail drawings of permeable paving, pipe bed and surround, gullies, manholes, catchpits, attenuation pond (a minimum of two perpendicular cross sections), attenuation tank, headwalls to basin, hydrobrake, outfalls to watercourse, etc.
16. Flotation calculations for the basin and tank will be required.
17. We note that a foul treatment plant is proposed on site, it is a shame that development in the area has not been considered more broadly as the large sites nearby will shortly mean a foul sewer is provided within close proximity. Discharge to a foul sewer would be preferred to the use of a treatment plant and discharge to watercourse.

Condition 10

Please supply evidence of ordinary watercourse land drainage consent for both the surface water and foul water connections.

Condition 11

It is not suitable to fully review the maintenance manual at this time before design has been agreed. However, we have the following initial comments:

1. Please detail how maintenance will be funded, i.e. will a charge be levied on residents?
2. Please add to maintenance of ponds- annual removal of tree saplings.
3. Please detail inspection and replacement of liners.
4. Please detail inspection, greasing and movement of bypass door on hydrobrake and frequency of this.

5. Please include maintenance of gullies and pipes.
6. Please include maintenance of ordinary watercourse for which the development will have riparian responsibility for. Please include a layout plan which clearly defines the watercourse extents.

Given the extent of information which is missing, including a lack of winter groundwater monitoring results, we would support a refusal of this application at this time.

We would recommend that the applicant refers to our guidance notes and checklist for further information on our requirements for a discharge of conditions application. These documents can be found here: [Drainage Planning Consultations | Arun District Council](#) on Arun District Councils website.

Kind regards,

Laura Gibbons

Drainage Engineer

Engineering Services

Please note that I work Tuesdays 08:00-16:00 for Arun only.



T: 01903 221374

E: laura.gibbons@arun.gov.uk

Arun District Council, Civic Centre, Maltravers Rd, Littlehampton, West Sussex, BN17 5LF

From: Planning.Responses <Planning.Responses@arun.gov.uk>

Sent: 17 February 2022 10:19

To: Land Drainage <land.Drainage@arun.gov.uk>

Subject: Planning Consultation on: P/15/22/DOC

To: **Engineers (Drainage)**

NOTIFICATION FROM ARUN DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT 1990

Application No: P/15/22/DOC

Registered: 9th February 2022

Site Address: Land adjacent to Sefter School House Sefter Road Bognor Regis PO21 3EE

Description of Works: Approval of details reserved by condition imposed under ref P/116/19/OUT relating to Condition Nos 9 - surface water drainage, 10 - discharge flows to

watercourses, 11 - maintenance & management of surface water drainage, 12 - foul drainage assessment, 13 - contamination, 14 - Construction Management Plan and 15 - Arboricultural Impact Assessment.

The Council have received the above application to discharge conditions. I shall be pleased to receive any observations you may wish to make in respect of those conditions relating to your field of expertise.

[Click here to view the Discharge of Condition application](#)

[Click here to view conditions on original application - click on decision tab](#)

Should you wish to make any comments click on the link www.arun.gov.uk/planning and click into ?Enter Comment? or if this is not possible email your response to planning.responses@arun.gov.uk by **3rd March 2022**.

Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.

In the absence of a reply within the period stated, I shall assume that you have no observations to make.

Yours sincerely

Mr S Davis

Planning Case Officer- Arun District Council

Telephone: 01903 737874

Email: Simon.Davis@arun.gov.uk

PLANNING (000) 2022

Appendix B

Soakaway Assessment and

Winter Groundwater Monitoring



**Sefter Road
Pagham
West Sussex**

In Situ Infiltration Test Report

Report Beneficiary:

Basing Partners Ltd
Basing Park
Privett
Alton
Hampshire
GU34 3NS

Project Reference: P14913

Report Reference: R14572

Document Control			
Issue No.	Status	Issue Date	Notes
1	Final	11 th March 2021	
Report Section		Prepared By	Approved By
In Situ Infiltration Testing		Rebecca Webb BSc FGS	Steven McSwiney BA mod Geol MSc FGS

Head Office
Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG

Limitations

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1. INTRODUCTION

Ashdown Site Investigation Ltd was requested to undertake in situ infiltration testing and groundwater monitoring at Sefter Road, Pagham, West Sussex to assist others with the design of a sustainable drainage system (SuDS) for the proposed development.

The specific objectives of the works were to:

- a) Establish the expected geology and hydrogeology at the site;
- b) Investigate the shallow ground and groundwater conditions at the test locations; and
- c) Undertake in situ soakage testing and provide infiltration rates to assist others in undertaking design of SuDS.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q10314Rev1, dated 24th November 2020. The instruction to proceed was received on behalf of the client.

2. SITE CONTEXT

2.1 Site Details

The site comprises an irregular shaped plot of land located at Sefter Road, Pagham, West Sussex, and is centred on the approximate Ordnance Survey national grid reference SZ 8953 9949. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively.

2.2 Geological and Hydrogeological Information

2.2.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Superficial	Raised Beach Deposits	Secondary A Aquifer
	River Terrace Deposits	Secondary A Aquifer
Bedrock	London Clay Formation	Unproductive Strata

The Raised Beach Deposits consist of marine sand, silt, and pebbly sand, with sandy gravel and 'clean' flint shingle. For the most part the deposit is either bedded or chaotic and may be in the form of dunes, sheets or banks. These deposits are above the level of the present shoreline as a result of earth movement or a general fall in sea level.

The River Terrace Deposits generally comprise well graded sandy fine to coarse gravel. Locally sand or gravel strata may predominate. Lenses of clay, silt and localised peat may be present. Gravels normally include a high proportion of subangular flint and chert and Lower Greensand rock types.

The London Clay Formation comprises a blue grey silty clay, which tends to weather to brown near to the upper surface. With depth, the clay becomes very stiff/hard, is frequently fissured and can contain some inclusions and beds of weak mudstone and siltstone.

2.2.2 Groundwater Source Protection Zones

The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

3. SITE WORKS

Three trial pits, designated TP01 to TP03, were excavated by hand to a depth of 0.80m below ground level. In addition, a dynamic sampler borehole, denoted WS01, was drilled to a depth of 5.00m to facilitate installation of a groundwater monitoring standpipe. The fieldwork was carried out on 27th November 2020 and 22nd February 2021. The exploratory hole locations, specified by others, are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions encountered at the test pit positions are shown in the exploratory hole records given in the appendices, together with notes to assist in their interpretation.

Falling head soakage testing was undertaken in the trial pits in general accordance with BRE guidance¹. The pits were backfilled with single size gravel to maintain pit stability during testing and the fall in water level during the tests was recorded using data loggers placed in standpipes installed in the pits. The pits were filled with water on three separate occasions.

The results of the groundwater monitoring from the datalogger installed within borehole WS01 on 27th November 2020 will be issued under separate cover on completion of the monitoring period: this is due to complete at the end of March 2021.

¹ Section 3.2.3 of Building Research Establishment (BRE) Digest 365, 2016.
Sefter Road, Pagham, West Sussex

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 *Surface Covering*

No specific surface materials were recorded within the exploratory holes.

4.1.2 *Made Ground*

Made ground, generally comprising clayey sandy gravel and /or gravelly sandy silty clay, was recorded to depths of between 0.20m and 0.60 below ground level at the trial pit positions, and to a depth of 0.90m at the borehole. The gravel fraction comprised variable quantities of brick, concrete, flint, wood, plastic, metal, tile, slate and charcoal-like material.

4.1.3 *River Terrace Deposits*

Underlying the made ground, the exploratory holes progressed into undisturbed slightly gravelly sandy clays with subordinate horizons of gravelly sands.

These soils, considered to represent the River Terrace Deposits indicated on the published geological map, were recorded to the full depth of the exploratory holes.

4.2 Stability

The shallow trial pits remained dry during excavation, however borehole WS01 was noted to be unstable during drilling and temporary steel casing was installed to maintain hole stability.

4.3 Groundwater Conditions and Stability

Groundwater was recorded at a depth of 0.61m on completion of the standpipe installation within borehole WS01 in November 2020. The results of the on-going groundwater monitoring will be issued under separate cover.

During the trial pitting works groundwater was noted at a depth of 0.72m within trial pit TP02. However, during the soakage testing this trial pit was noted to have drained dry between each fill and on completion.

Both trial pits TP01 and TP03 were dry on completion of excavation, although during the soakage testing the water level within trial pit TP01 never fell to the base of the pit which may be due to slow draining soils or a high water table.

It is noted that groundwater levels should be expected to fluctuate seasonally.

5. STORMWATER INFILTRATION SYSTEMS

In-situ infiltration testing² was carried out in each of the trial pits.

For the majority of the tests the soil infiltration rate (f) was calculated by dividing the volume of water lost between 75% and 25% of the initial test depth (H₀) by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period, and its base area. This figure was then divided by the test duration (time taken for the water level to fall between 75% and 25% of the initial test depth) to give the soil infiltration rate in metres per second.

However, during the first two tests performed within trial pit TP01 the water level within the test pit did not fall below 25% of the initial test depth (H₀) prior to refilling, due to the slow draining soils encountered. Therefore, for these tests the soil infiltration rate has been calculated by dividing the volume of water lost during the test by the product of the average surface area of the trial pit in contact with water during the test period and the test duration in seconds.

The infiltration rates derived from the tests are summarised in the following table.

Table 2. Calculated Infiltration Rates

Exploratory Hole	Test Response Zone Depth (m)		Stratum	Infiltration Rate (f) (m/sec)	Head of Water (% of H ₀)
	Top	Bottom			
TP01 Test 1	0.10	0.80	Made Ground and River Terrace Deposits	2.8×10^{-7}	100-31
TP01 Test 2	0.12	0.80	Made Ground and River Terrace Deposits	2.6×10^{-7}	100-30
TP01 Test 3	0.13	0.80	Made Ground and River Terrace Deposits	8.5×10^{-8}	75-25
TP02 Test 1	0.10	0.80	Made Ground and River Terrace Deposits	3.1×10^{-6}	75-25
TP02 Test 2	0.10	0.80	Made Ground and River Terrace Deposits	3.9×10^{-6}	75-25
TP02 Test 3	0.23	0.80	Made Ground and River Terrace Deposits	4.5×10^{-6}	75-25
TP03 Test 1	0.28	0.80	Made Ground and River Terrace Deposits	1.1×10^{-5}	75-25
TP03 Test 2	0.14	0.80	Made Ground and River Terrace Deposits	8.9×10^{-6}	75-25
TP03 Test 3	0.12	0.80	Made Ground and River Terrace Deposits	9.4×10^{-6}	75-25

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

The results from the infiltration tests indicate that the Made Ground and River Terrace Deposits soils possess negligible to poor infiltration characteristics. The results from the infiltration tests should be provided to engineers responsible for the design of the drainage system.

² Conducted in general accordance with the requirements of BRE 365, Soakaway Design.

R14572

To comply with building regulations³, point discharging infiltration systems (conventional ring or trench soakaways) are required to be constructed a minimum of 5.0m away from proposed or existing buildings.

Ashdown Site Investigation Ltd.

³ The Building Regulations 2010; Part H; Drainage and Waste Disposal
Sefter Road, Pagham, West Sussex

FIGURES AND APPENDICES

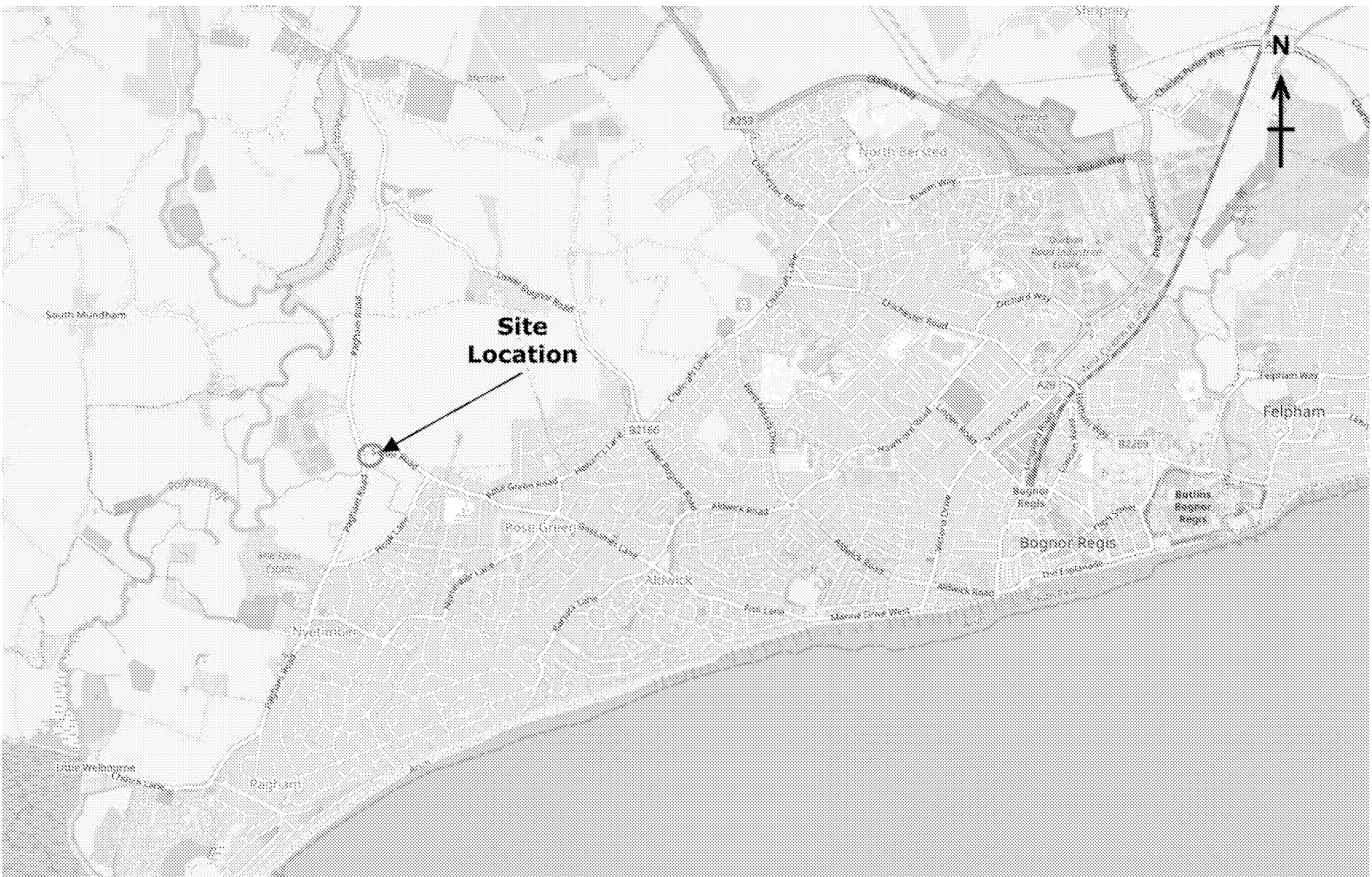
Figure 1 Site Location Plan

Figure 2 Site Plan

Exploratory Hole Notes

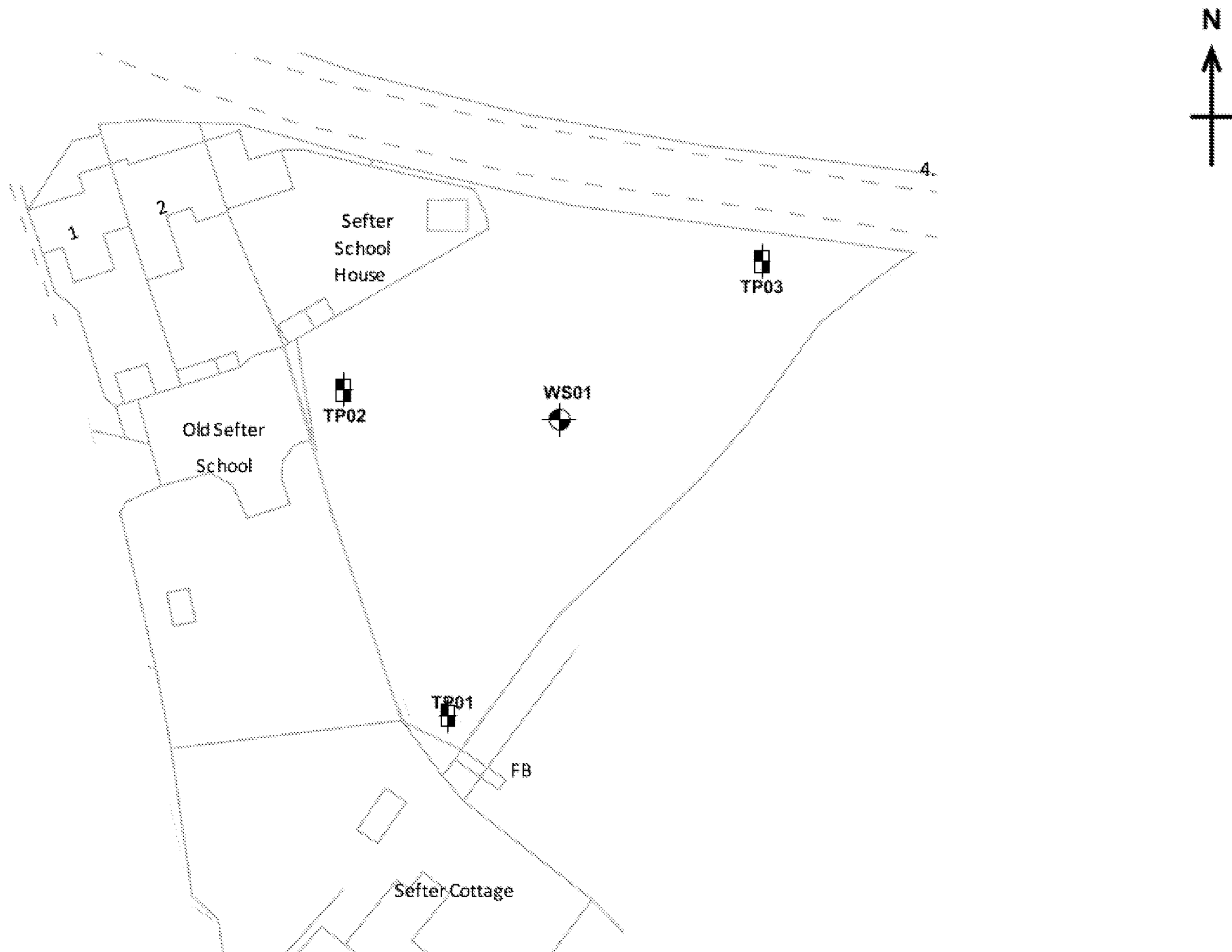
Exploratory Hole Records

Summary of Trial Pit Falling Head Soakage Test Results



© OpenStreetMap contributors, CC BY-SA

ASHDOWN SITE INVESTIGATION LIMITED 2006 Site Location Plan	Site Name	Figure No.	Project Reference
	Sefter Road, Pagham, West Sussex	1	P14913



ASHDOWN SITE INVESTIGATION 2/DOC L I M I T E D	Site Plan	Site Name	Figure No.	Project Reference
		Sefter Road, Pagham, West Sussex	2	P14913

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: ~ 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
U _o	Sample not obtained
U*	Full penetration of sample not obtained
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample
R	Root Sample
B	Bulk Disturbed Sample
W	Water Sample
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
Vi	Vial Sample

In situ Testing

S	Standard penetration test (SPT): Using the split spoon sampler.
C	Standard Penetration Test (SPT): using a solid cone instead of the sampler - conducted usually in coarse grained soils or weak rocks.
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP	Cable Percussion Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

4 Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

ASHDOWN SITE INVESTIGATION L I M I T E D		Site Name: Sefter Road, Pagham, West sussex			
		Job Number: P14913			
		Start Date: 22/02/2021 End Date: 22/02/2021		Trial Pit Number: TP01	
		Sheet 1 of 1			

Samples and In Situ Testing			Legend	Height/ Reduced Level	Stratum Description
Sample/Test Type	Depth from (m)	Depth (m)			
D	0.10			0.00	MADE GROUND: Brown slightly gravelly slightly sandy silty clay Gravel is angular to subrounded flint and charcoal-like material.
				0.20	
D	0.50				Light brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse flint. (River Terrace Deposits)
				0.80	
					End of trial pit at 0.80m

Remarks Groundwater: Trial pit dry on completion. Stability: Trial pit stable on completion. Notes: n/a		Excavation Method: TP
		Pit Length: 0.90m
		Pit Width: 0.30m
		Made By: KS

ASHDOWN SITE INVESTIGATION L I M I T E D		Site Name: Sefter Road, Pagham, West sussex			
		Job Number: P14913			
		Start Date: 22/02/2021 End Date: 22/02/2021		Trial Pit Number: TP02	
		Sheet 1 of 1			

Sample/Test Type	Depth from (m)	Depth (m)	Test Result	Legend	Height/ Reduced Level	Stratum Description
D	0.20				0.00	MADE GROUND: Brown gravelly slightly sandy clay. Gravel is angular to subrounded fine to coarse flint, brick, concrete, wood, plastic, metal and charcoal-like material.
D	0.60				0.55	Light brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. (River Terrace Deposits)
					0.80	End of trial pit at 0.80m

Remarks Groundwater: Groundwater noted at 0.72m depth on completion. Trial pit noted as dry on completion of the soakage testing. Stability: Trial pit stable on completion. Notes: n/a		Excavation Method: TP
		Pit Length: 1.00m
		Pit Width: 0.30m
		Made By: KS

Site Name: Sefton Road, Pagham, West Sussex

Job Number: P14913

Start Date: 22/02/2021

End Date: 22/02/2021

Trial Pit Number: **TP03**

Sheet 1 of 1

Samples and In Situ Testing				Legend	Height/ Reduced Level	Stratum Description
Sample/Test Type	Depth from (m)	Depth (m)	Test Result			
D	0.30				0.00	MADE GROUND: Brown gravelly sandy clay. Gravel is angular to subrounded fine to coarse flint, brick, tile, slate, concrete, plastic and charcoal-like material.
D	0.70				0.60	Light brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. (River Terrace Deposits)
					0.80	End of trial pit at 0.80m

Remarks
Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: TP

Pit Length: 0.90m

Pit Width: 0.35m

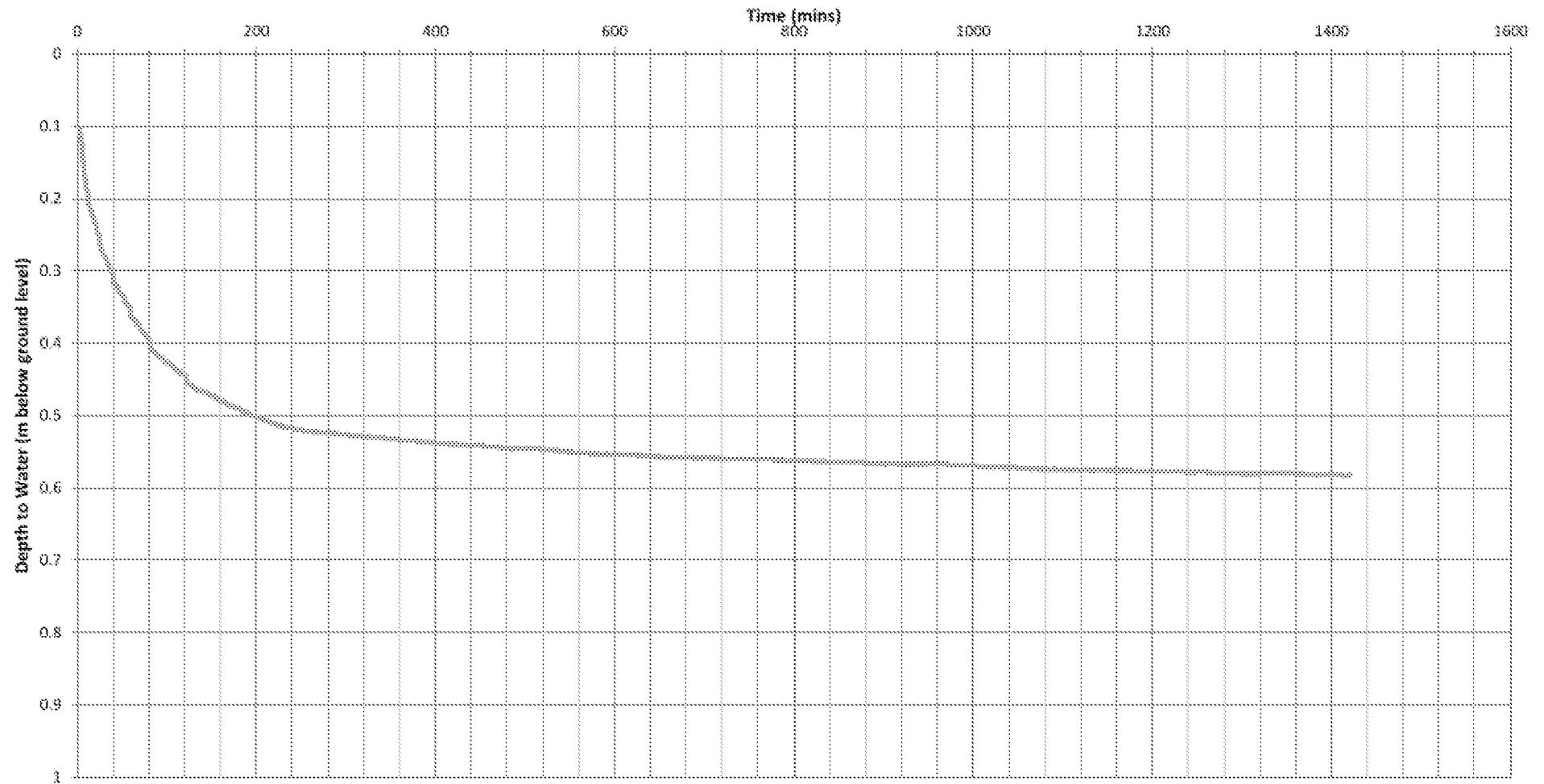
Made By: KS

Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 1

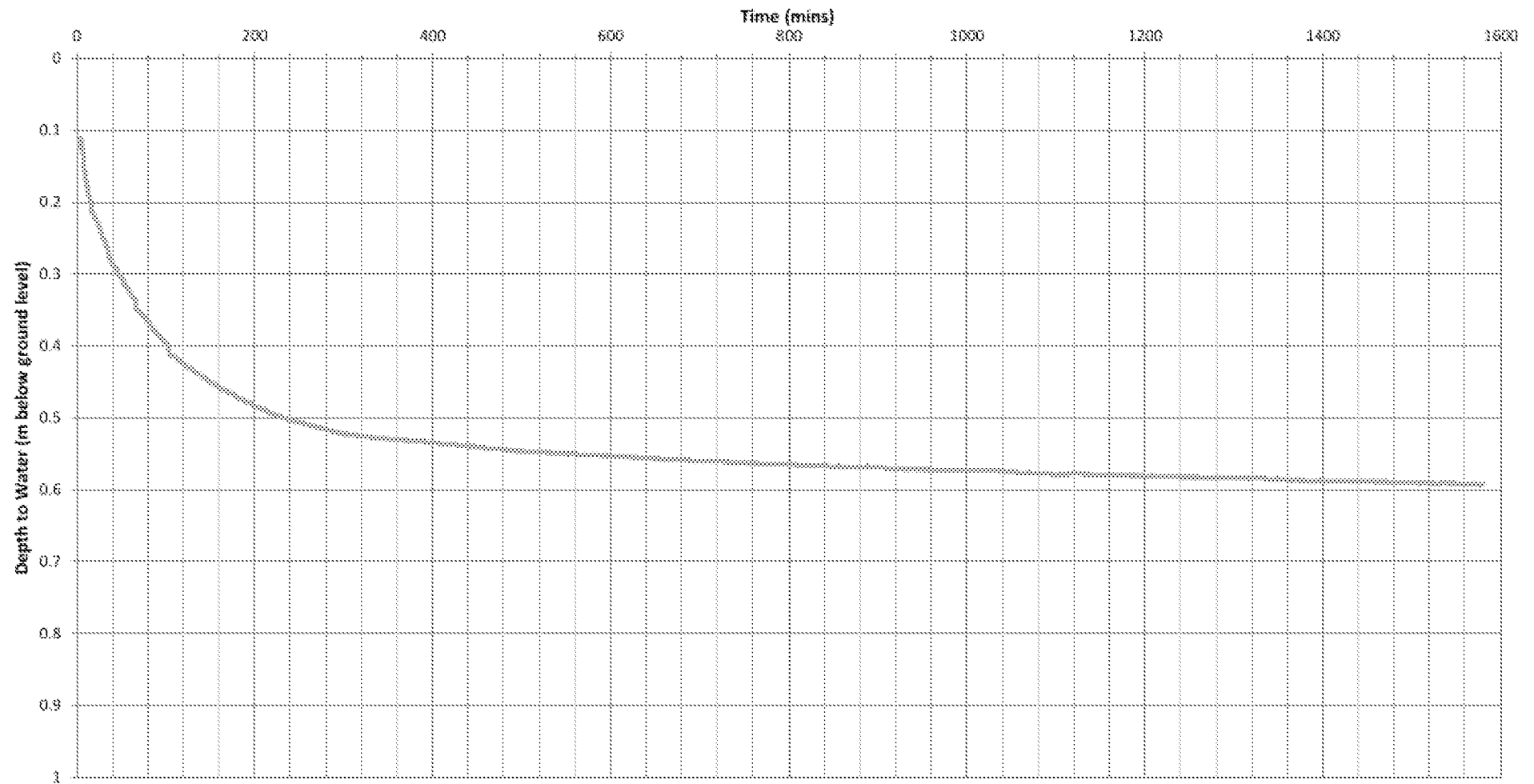


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 2

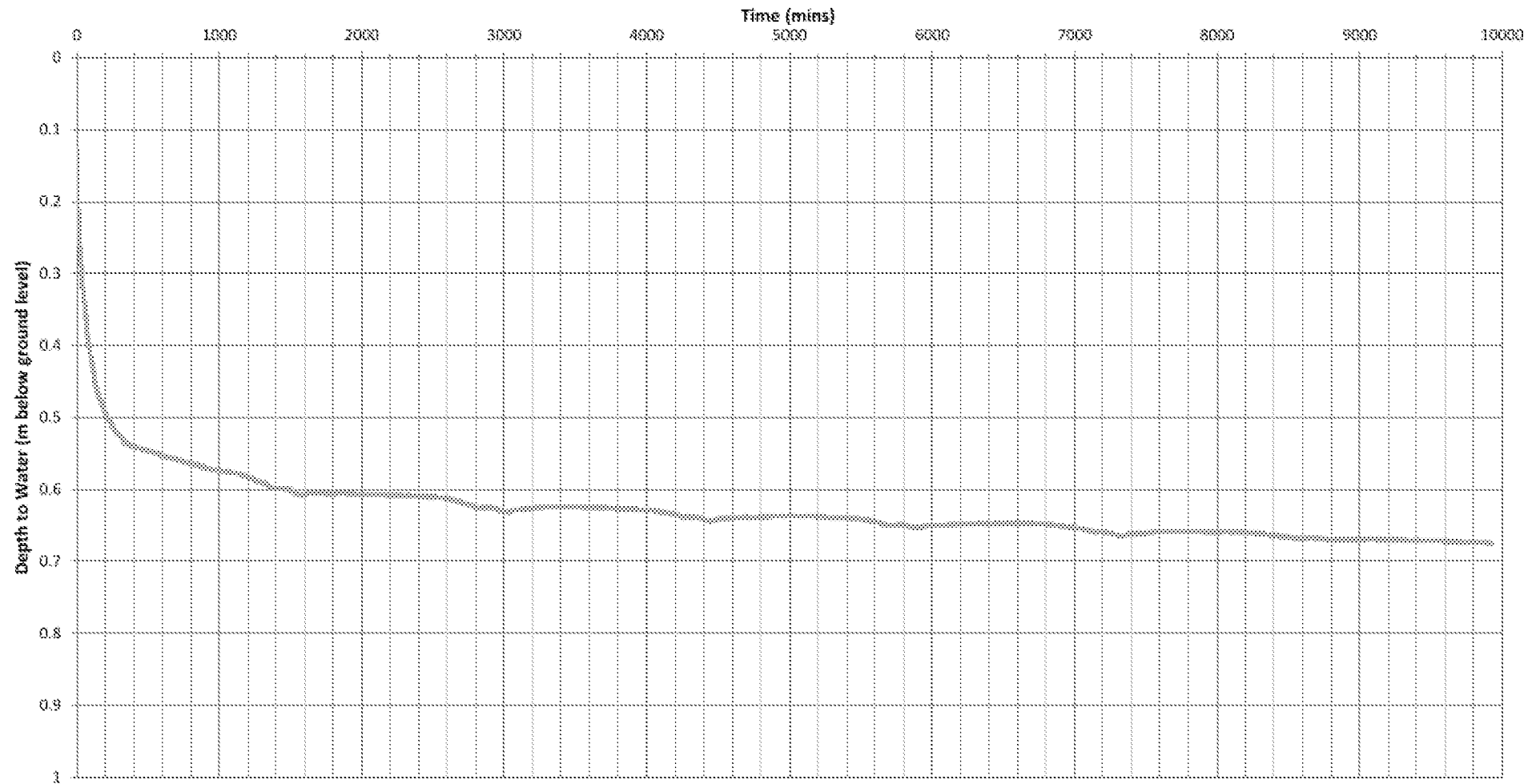


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 3

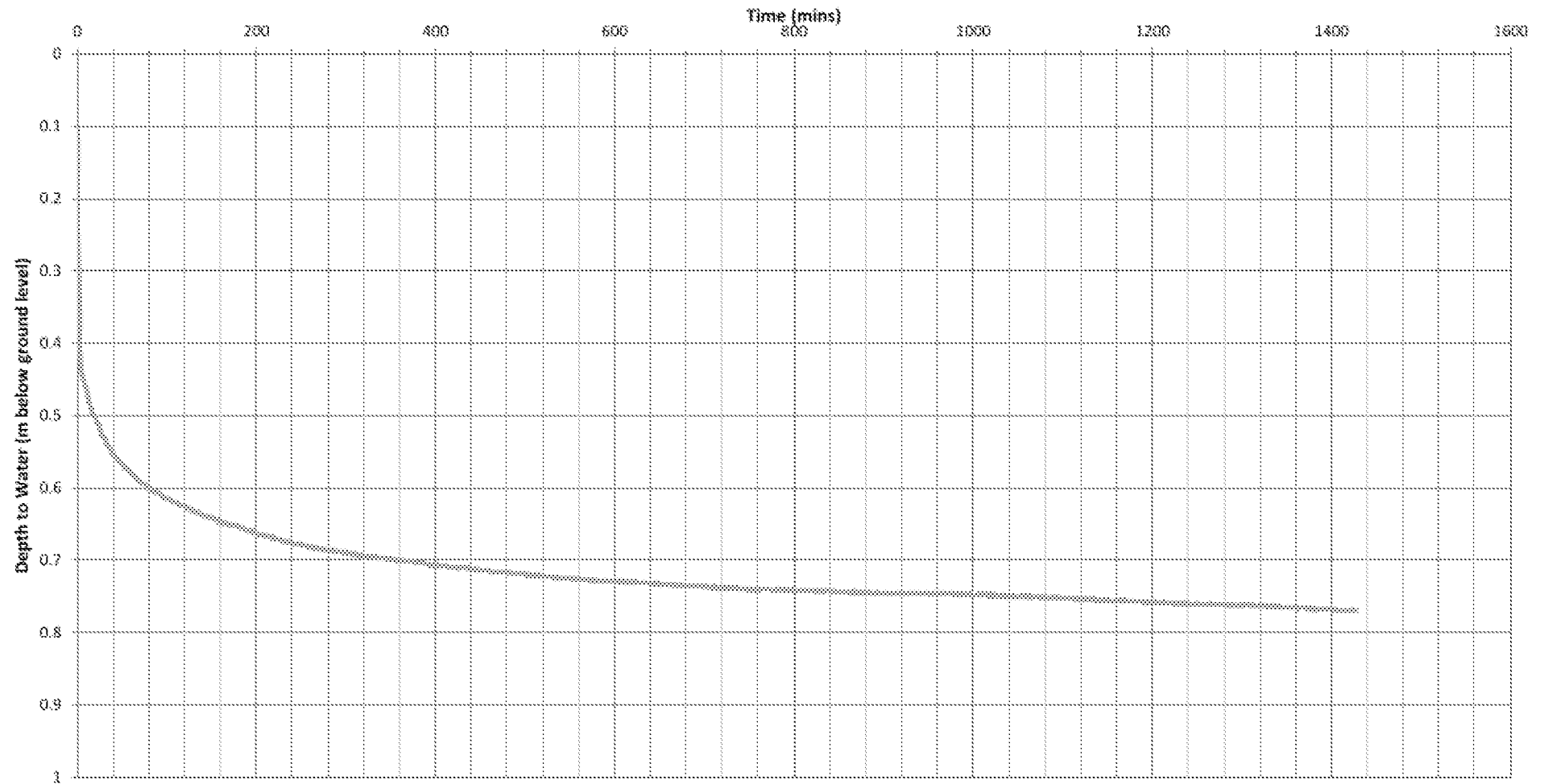


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 1

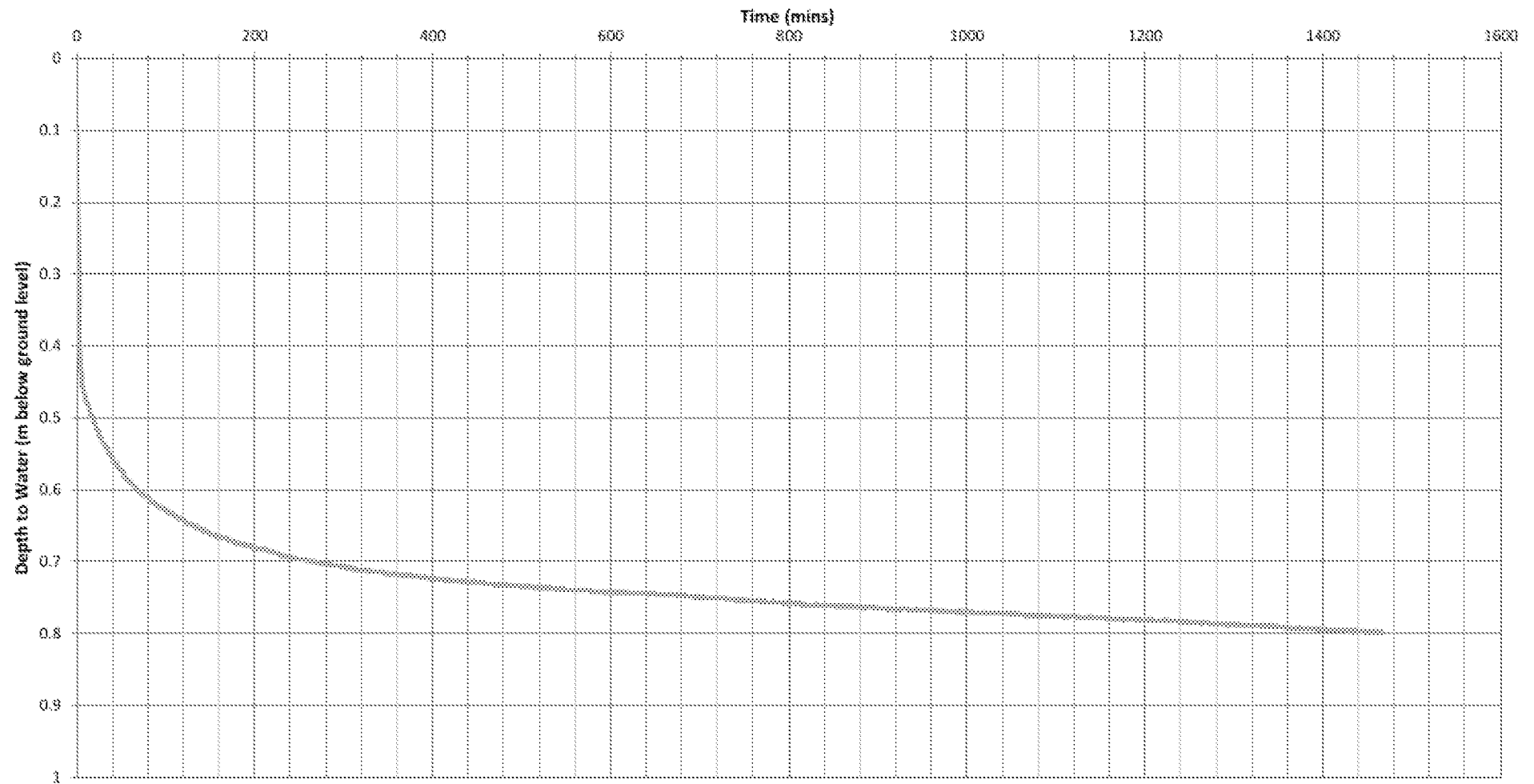


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 2

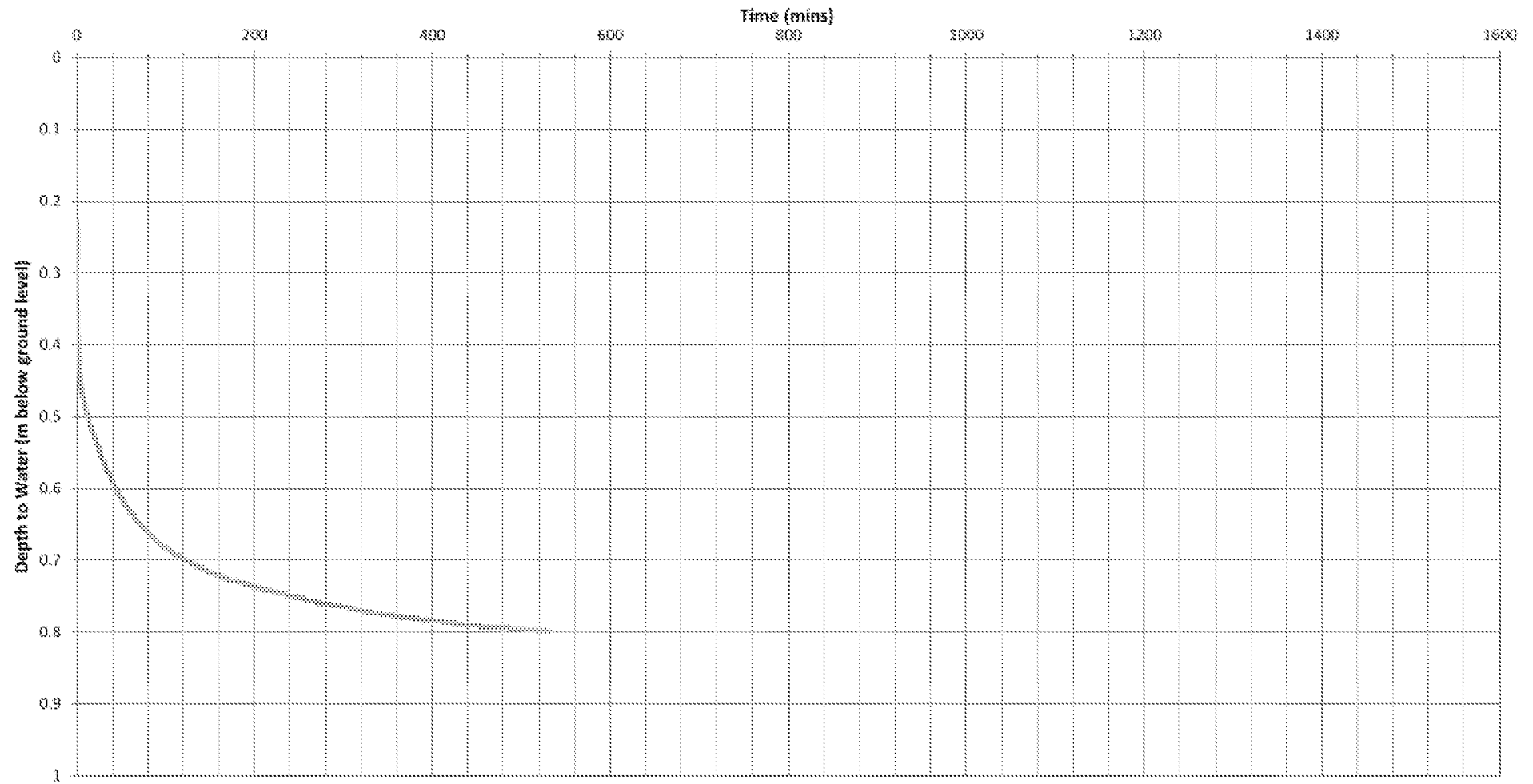


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 3

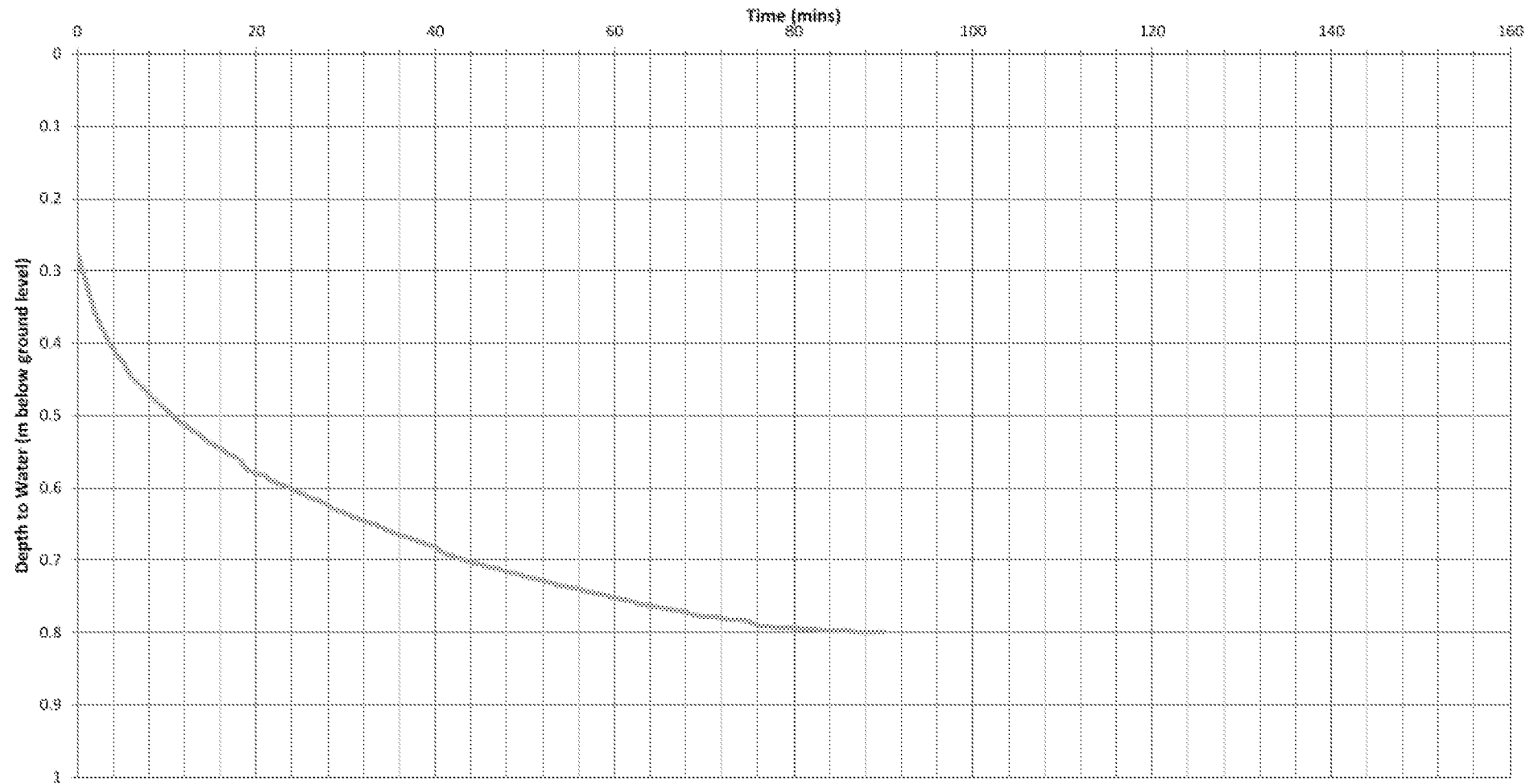


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 1

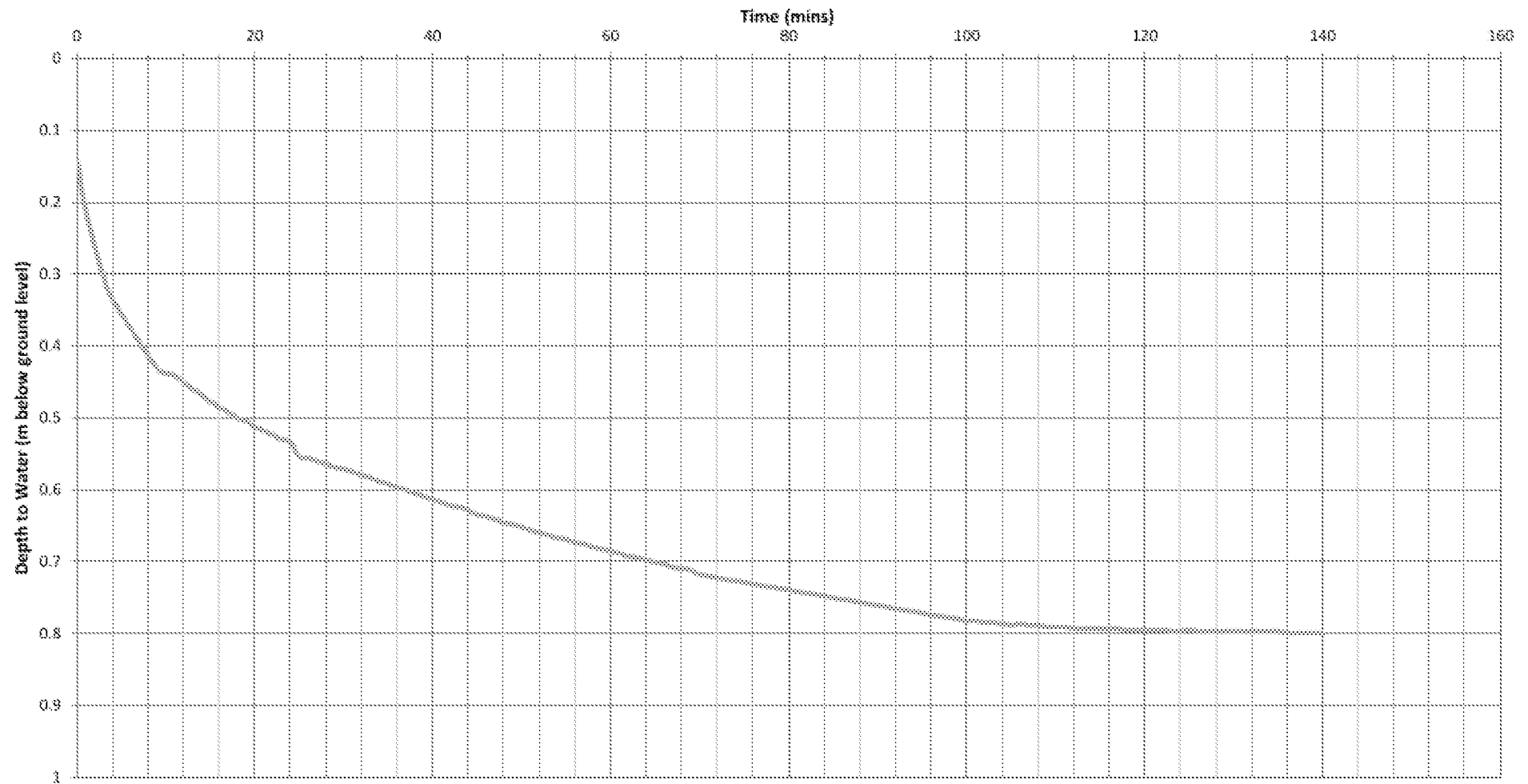


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 2

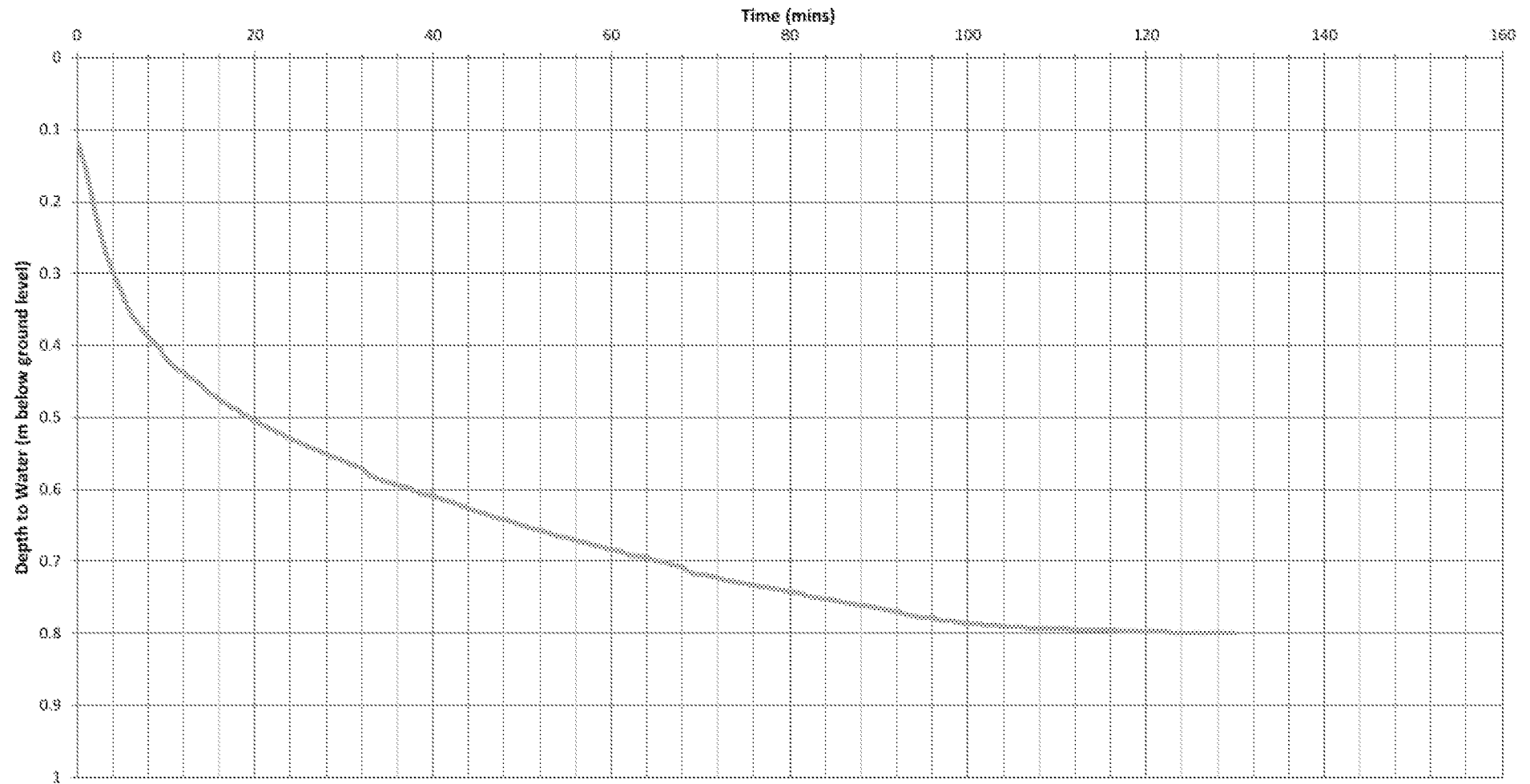


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 3

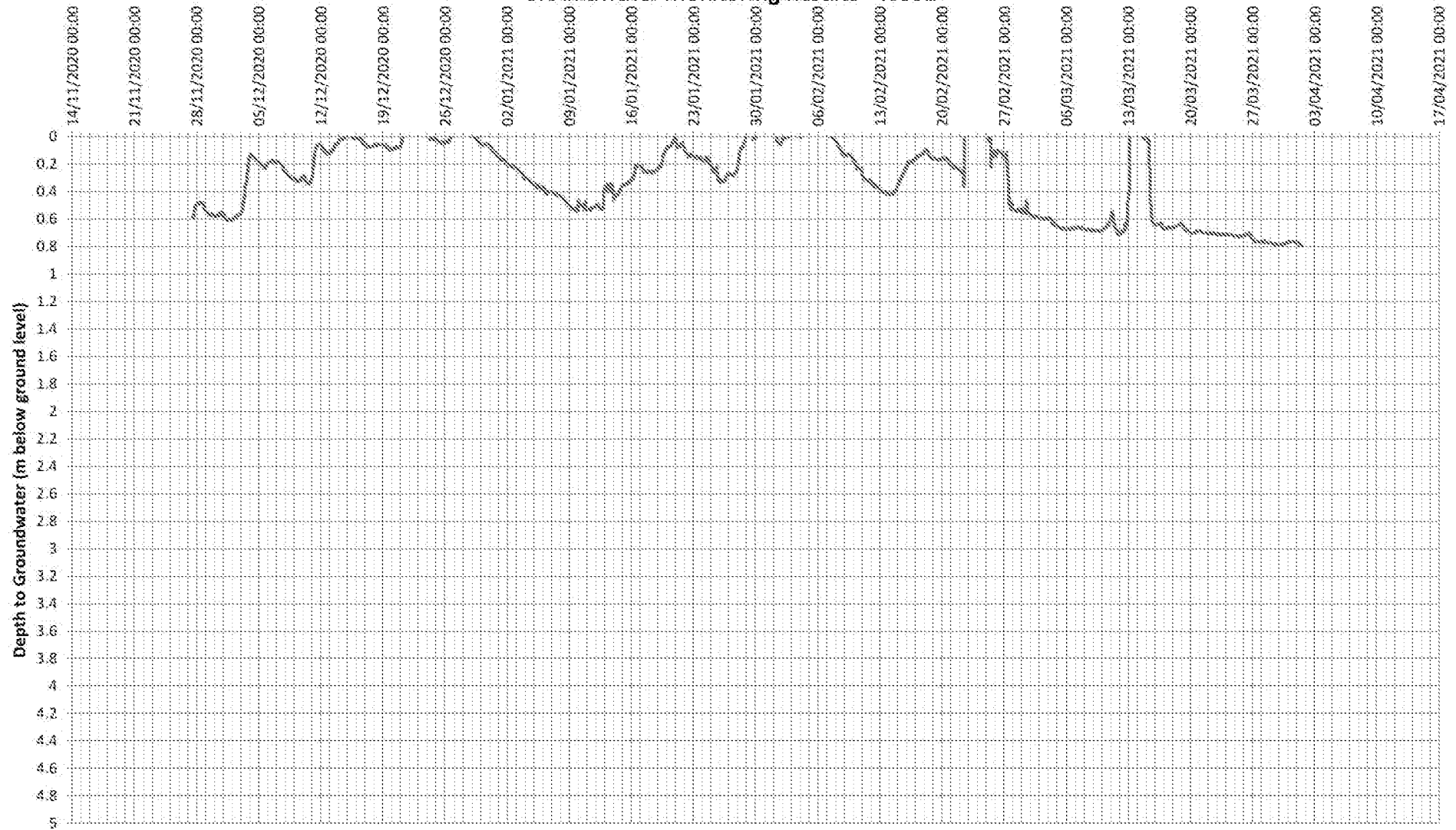


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Groundwater Monitoring Results - WS01



Appendix C

Catchment Areas



The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully consistent with the contents and of requirements the site investigation report before work starts.
The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc, whether or not specifically stated on this drawing.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspected fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

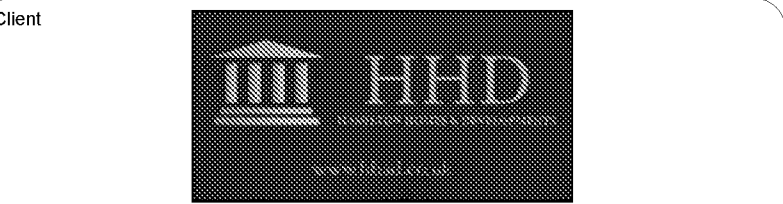
Where existing trees are shown to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

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- NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE MICRO DRAINAGE HYDRAULIC CALCULATIONS AND DRAINAGE LAYOUT DRAWING '19-001-400' AND '19-001-401'
 2. ALL LEVELS STATED ARE IN METRES ABOVE ORDNANCE DATUM.
 3. SITE PLAN BASED ON 'OSP' DRAWING '15048 SL 01 REV E' DATED 12.05.16
 4. TOPOGRAPHICAL SURVEY BASED UPON '3D SERVICES LTD' DRAWING RECEIVED IN CAD FORMAT DATED 15.02.19

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
FOR PLANNING ONLY

Rev.	Description	Dm	Ckd	Date
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Project
Land adjacent Seftor School,
House, Seftor Road

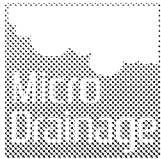
Title
Catchment Areas Plan



Scale	1:250 on A1	Drawn	JH
Date	05/10/2021	Checked	TL
File	21-0023-Acad-001	Drawing No	21-023-001
		Rev	-

Appendix D

Hydraulic Calculations and Modelling

Adama Consulting Ltd		Page 1
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Sefter Road, Pagham Greenfield - FEH 2013 winter	
Date 10/03/2022 File	Designed by TGL Checked by MTD	
Micro Drainage Source Control 2020.1		

ReFH2 Rural Runoff Peak Flows

Input

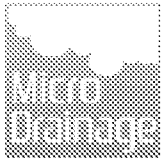
Return Period (Years)	100
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Season	Winter
Country	England/Wales/Northern Ireland
Area (ha)	0.267
SAAR (mm)	716
BFIHOST	0.696
FARL	1.000
SPRHOST	29.480
URBEXT (2000)	0.0330

Results

Return Period (Years)	Rural (l/s)	Urban (l/s)
User	1.2	1.2
Q1	0.4	0.4
Q2	0.4	0.5
Q5	0.6	0.6
Q10	0.7	0.8
Q30	0.9	1.0
Q50	1.0	1.1
Q75	1.1	1.2
Q100	1.2	1.2
Q200	1.4	1.4
Q1000	2.0	2.1

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ARUN DISTRICT COUNCIL P/70/22/DOC

Adama Consulting Ltd		Page 1
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Seftor School House Seftor Road, Pagham Storm Network - FEH 2013	
Date 10/03/2022 File 21-023 SW Strategy.MDX	Designed by TGL Checked by MTD	
Micro Drainage	Network 2020.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws

Simulation Criteria

Area Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	2	+0%				
1.001	SD1	15 Winter	2	+0%				
2.000	Re2	15 Winter	2	+0%				
2.001	SD2	15 Winter	2	+0%				
1.002	SD3	15 Winter	2	+0%				
1.003	S1	15 Winter	2	+0%	100/30 Winter			
3.000	Re3	15 Winter	2	+0%	100/15 Summer			
3.001	SD4	15 Winter	2	+0%	100/15 Summer			
3.002	SD5	15 Winter	2	+0%	100/15 Summer			
3.003	SD6	15 Winter	2	+0%	100/15 Summer			
4.000	Re4	15 Winter	2	+0%	100/15 Summer			
4.001	SD7	15 Winter	2	+0%	100/15 Summer			
5.000	Re5	15 Winter	2	+0%				
5.001	SD8	15 Winter	2	+0%				
5.002	SD9	15 Winter	2	+0%	100/15 Summer			
3.004	SD10	15 Winter	2	+0%	30/15 Summer			
3.005	SD11	15 Winter	2	+0%	100/15 Summer			
6.000	SD12	15 Winter	2	+0%	100/240 Winter			
7.000	Sg	15 Winter	2	+0%				
1.004	S2	15 Winter	2	+0%	30/60 Winter			
1.005	Pond	120 Winter	2	+0%	30/60 Winter			
8.000	CS-Tank	120 Winter	2	+0%	30/30 Summer			
1.006	S3-Ctrl	120 Winter	2	+0%	2/15 Winter			

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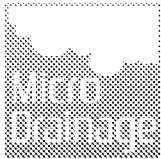
Adama Consulting Ltd									Page 2
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Strategy.MDX				Designed by TGL Checked by MTD					
Micro Drainage				Network 2020.1					
2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.802	-0.078	0.000	0.11			0.8	OK
1.001	SD1	4.539	-0.069	0.000	0.21			1.5	OK
2.000	Re2	4.873	-0.077	0.000	0.12			0.8	OK
2.001	SD2	4.695	-0.129	0.000	0.05			1.5	OK
1.002	SD3	4.351	-0.119	0.000	0.09			3.5	OK
1.003	S1	3.836	-0.258	0.000	0.05			3.5	OK
3.000	Re3	4.878	-0.072	0.000	0.17			1.2	OK
3.001	SD4	4.814	-0.061	0.000	0.32			2.3	OK
3.002	SD5	4.635	-0.110	0.000	0.16			3.4	OK
3.003	SD6	4.485	-0.110	0.000	0.16			4.1	OK
4.000	Re4	4.423	-0.127	0.000	0.06			1.2	OK
4.001	SD7	4.293	-0.115	0.000	0.12			2.3	OK
5.000	Re5	4.876	-0.074	0.000	0.15			1.0	OK
5.001	SD8	4.801	-0.074	0.000	0.15			1.8	OK
5.002	SD9	4.382	-0.118	0.000	0.10			2.8	OK
3.004	SD10	4.178	-0.060	0.000	0.66			9.3	OK
3.005	SD11	4.096	-0.092	0.000	0.32			10.0	OK
6.000	SD12	4.197	-0.134	0.000	0.03			1.0	OK
7.000	Sg	4.232	-0.123	0.000	0.07		4	2.8	OK
1.004	S2	3.752	-0.187	0.000	0.30			18.8	OK
1.005	Pond	3.746	-0.183	0.000	0.08			6.6	OK
8.000	CS-Tank	3.745	-0.088	0.000	0.01		90	1.1	OK
1.006	S3-Ctrl	3.746	0.078	0.000	0.15			2.0	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Strategy.MDX					Designed by TGL Checked by MTD					
Micro Drainage					Network 2020.1					
2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws										
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	
1.007	S4 120	Winter	2	+0%					3.469	
1.008	S5 120	Winter	2	+0%					3.241	
1.009	S6 120	Winter	2	+0%					3.153	
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded	
1.007	S4	-0.113	0.000	0.14			2.0	OK		
1.008	S5	-0.112	0.000	0.15			2.0	OK		
1.009	S6	-0.107	0.000	0.18			2.0	OK		
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013				
Date 10/03/2022 File 21-023 SW Strategy.MDX				Designed by TGL Checked by MTD				
Micro Drainage				Network 2020.1				
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws								
Simulation Criteria								
Areal Reduction Factor		1.000		Additional Flow - % of Total Flow		0.000		
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage		2.000		
Hot Start Level (mm)		0		Inlet Coefficient		0.800		
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day)		0.000		
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0		Number of Storage Structures		3		
Number of Online Controls		1		Number of Time/Area Diagrams		0		
Number of Offline Controls		0		Number of Real Time Controls		0		
Synthetic Rainfall Details								
Rainfall Model				FEH				
FEH Rainfall Version				2013				
Site Location GB 489700 99200 SZ 89700 99200								
Data Type				Catchment				
Cv (Summer)				0.750				
Cv (Winter)				0.840				
Margin for Flood Risk Warning (mm)				300.0				
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status				OFF				
DVD Status				ON				
Inertia Status				ON				
Profile(s)				Summer and Winter				
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440								
Return Period(s) (years)				2, 30, 100				
Climate Change (%)				0, 0, 40				
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	30	+0%				
1.001	SD1	15 Winter	30	+0%				
2.000	Re2	15 Winter	30	+0%				
2.001	SD2	15 Winter	30	+0%				
1.002	SD3	15 Winter	30	+0%				
1.003	S1	120 Winter	30	+0%	100/30 Winter			
3.000	Re3	15 Winter	30	+0%	100/15 Summer			
3.001	SD4	15 Winter	30	+0%	100/15 Summer			
3.002	SD5	15 Winter	30	+0%	100/15 Summer			
3.003	SD6	15 Winter	30	+0%	100/15 Summer			
4.000	Re4	15 Winter	30	+0%	100/15 Summer			
4.001	SD7	15 Winter	30	+0%	100/15 Summer			
5.000	Re5	15 Winter	30	+0%				
5.001	SD8	15 Winter	30	+0%				
5.002	SD9	15 Winter	30	+0%	100/15 Summer			
3.004	SD10	15 Winter	30	+0%	30/15 Summer			
3.005	SD11	15 Winter	30	+0%	100/15 Summer			
6.000	SD12	15 Winter	30	+0%	100/240 Winter			
7.000	Sg	15 Winter	30	+0%				
1.004	S2	120 Winter	30	+0%	30/60 Winter			
1.005	Pond	120 Winter	30	+0%	30/60 Winter			
8.000	CS-Tank	120 Winter	30	+0%	30/30 Summer			
1.006	S3-Ctrl	120 Winter	30	+0%	2/15 Winter			
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Strategy.MDX				Designed by TGL Checked by MTD					
Micro Drainage				Network 2020.1					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.813	-0.067	0.000	0.24			1.8	OK
1.001	SD1	4.559	-0.049	0.000	0.51			3.7	OK
2.000	Re2	4.884	-0.066	0.000	0.25			1.8	OK
2.001	SD2	4.708	-0.116	0.000	0.12			3.7	OK
1.002	SD3	4.368	-0.102	0.000	0.22			8.5	OK
1.003	S1	3.987	-0.107	0.000	0.04			2.7	OK
3.000	Re3	4.892	-0.058	0.000	0.37			2.5	OK
3.001	SD4	4.842	-0.033	0.000	0.78			5.6	OK
3.002	SD5	4.661	-0.084	0.000	0.40			8.6	OK
3.003	SD6	4.511	-0.084	0.000	0.40			10.5	OK
4.000	Re4	4.435	-0.115	0.000	0.13			2.5	OK
4.001	SD7	4.341	-0.067	0.000	0.29			5.4	OK
5.000	Re5	4.889	-0.061	0.000	0.32			2.2	OK
5.001	SD8	4.817	-0.058	0.000	0.36			4.4	OK
5.002	SD9	4.401	-0.099	0.000	0.25			7.1	OK
3.004	SD10	4.319	-0.081	0.000	1.63			22.8	SURCHARGED
3.005	SD11	4.140	-0.048	0.000	0.79			24.7	OK
6.000	SD12	4.204	-0.127	0.000	0.06			2.2	OK
7.000	Sg	4.248	-0.107	0.000	0.17		5	7.1	OK
1.004	S2	3.986	0.047	0.000	0.24			14.9	SURCHARGED
1.005	Pond	3.985	0.056	0.000	0.11			9.5	SURCHARGED
8.000	CS-Tank	3.989	0.156	0.000	0.02		176	1.8	SURCHARGED
1.006	S3-Ctrl	4.017	0.349	0.000	0.15			2.0	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
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Adama Consulting Ltd							Page 6		
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Strategy.MDX				Designed by TGL Checked by MTD					
Micro Drainage				Network 2020.1					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	S4 480	Summer	30	+0%					3.470
1.008	S5 480	Summer	30	+0%					3.242
1.009	S6 480	Summer	30	+0%					3.153
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	S4	-0.112	0.000	0.14			2.0	OK	
1.008	S5	-0.111	0.000	0.15			2.0	OK	
1.009	S6	-0.107	0.000	0.18			2.0	OK	
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Seftor School House Seftor Road, Pagham Storm Network - FEH 2013	
Date 10/03/2022 File 21-023 SW Strategy.MDX	Designed by TGL Checked by MTD	
Micro Drainage Network 2020.1		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws

Simulation Criteria

Area Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	100	+40%				
1.001	SD1	15 Winter	100	+40%				
2.000	Re2	15 Winter	100	+40%				
2.001	SD2	15 Winter	100	+40%				
1.002	SD3	15 Winter	100	+40%				
1.003	S1	240 Winter	100	+40%	100/30 Winter			
3.000	Re3	15 Winter	100	+40%	100/15 Summer			
3.001	SD4	15 Winter	100	+40%	100/15 Summer			
3.002	SD5	15 Winter	100	+40%	100/15 Summer			
3.003	SD6	15 Winter	100	+40%	100/15 Summer			
4.000	Re4	15 Winter	100	+40%	100/15 Summer			
4.001	SD7	15 Winter	100	+40%	100/15 Summer			
5.000	Re5	15 Winter	100	+40%				
5.001	SD8	15 Winter	100	+40%				
5.002	SD9	15 Winter	100	+40%	100/15 Summer			
3.004	SD10	15 Winter	100	+40%	30/15 Summer			
3.005	SD11	15 Winter	100	+40%	100/15 Summer			
6.000	SD12	240 Winter	100	+40%	100/240 Winter			
7.000	Sg	240 Winter	100	+40%				
1.004	S2	240 Winter	100	+40%	30/60 Winter			
1.005	Pond	240 Winter	100	+40%	30/60 Winter			
8.000	CS-Tank	240 Winter	100	+40%	30/30 Summer			
1.006	S3-Ctrl	240 Winter	100	+40%	2/15 Winter			

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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Seftor School House Seftor Road, Pagham Storm Network - FEH 2013					
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Micro Drainage				Network 2020.1					
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.825	-0.055	0.000	0.42			3.1	OK
1.001	SD1	4.583	-0.025	0.000	0.90			6.5	OK
2.000	Re2	4.897	-0.053	0.000	0.44			3.2	OK
2.001	SD2	4.720	-0.104	0.000	0.21			6.5	OK
1.002	SD3	4.385	-0.085	0.000	0.39			14.9	OK
1.003	S1	4.332	0.238	0.000	0.04			2.6	SURCHARGED
3.000	Re3	5.094	0.144	0.000	0.63			4.3	SURCHARGED
3.001	SD4	5.066	0.191	0.000	1.26			9.0	SURCHARGED
3.002	SD5	4.875	0.130	0.000	0.62			13.4	SURCHARGED
3.003	SD6	4.819	0.224	0.000	0.60			15.8	SURCHARGED
4.000	Re4	4.741	0.191	0.000	0.21			4.2	FLOOD RISK
4.001	SD7	4.727	0.319	0.000	0.47			8.6	FLOOD RISK
5.000	Re5	4.904	-0.046	0.000	0.56			3.8	OK
5.001	SD8	4.850	-0.025	0.000	0.63			7.7	OK
5.002	SD9	4.727	0.227	0.000	0.40			11.6	SURCHARGED
3.004	SD10	4.688	0.450	0.000	2.54			35.6	SURCHARGED
3.005	SD11	4.362	0.174	0.000	1.23			38.4	SURCHARGED
6.000	SD12	4.331	0.000	0.000	0.02			0.7	SURCHARGED
7.000	Sg	4.331	-0.024	0.000	0.06		51	2.5	OK
1.004	S2	4.331	0.392	0.000	0.26			16.0	SURCHARGED
1.005	Pond	4.329	0.400	0.000	0.14			11.8	FLOOD RISK
8.000	CS-Tank	4.338	0.505	0.000	0.02		409	1.7	SURCHARGED
1.006	S3-Ctrl	4.364	0.696	0.000	0.15			2.0	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Sefter Road, Pagham Storm Network - FEH 2013	
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Micro Drainage		Network 2020.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	S4	1440 Summer	100	+40%					3.470
1.008	S5	1440 Winter	100	+40%					3.242
1.009	S6	1440 Winter	100	+40%					3.153

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	S4	-0.112	0.000	0.14			2.0	OK	
1.008	S5	-0.111	0.000	0.15			2.0	OK	
1.009	S6	-0.107	0.000	0.18			2.0	OK	

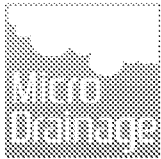
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013									
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX	Designed by TGL Checked by MTD									
Micro Drainage	Network 2020.1									
Time Area Diagram for 21-023 SW Network - Surcharged.sws <table><thead><tr><th>Time (mins)</th><th>Area (ha)</th><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.061</td><td>4-8</td><td>0.078</td></tr></tbody></table> Total Area Contributing (ha) = 0.139 Total Pipe Volume (m³) = 8.186			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.061	4-8	0.078
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.061	4-8	0.078							
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ						Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013					
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Micro Drainage						Network 2020.1					
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Network Design Table for 21-023 SW Network - Surcharged.sws</u> # - Indicates pipe length does not match coordinates « - Indicates pipe capacity < flow											
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	Auto Design
1.000	16.291	0.272	59.9	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	8.273	0.138	59.9	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	7.578	0.126	60.1	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.001	8.841	0.354	25.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	3.899	0.376	10.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	29.036	0.155	187.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	4.499	0.075	60.0	0.007	5.00	0.0	0.600	o	100	Pipe/Conduit	
3.001	7.791	0.130	59.9	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.002	7.513	0.150	50.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	13.826	0.357	38.7	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	8.565	0.142	60.3	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	13.217	0.170	77.7	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	4.499	0.075	60.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit	
5.001	7.815	0.375	20.8	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
5.002	7.548	0.262	28.8	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
<u>Network Results Table</u>											
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
1.000	50.00	5.27	4.780	0.005	0.0	0.0	0.0	1.00	7.8	0.7	
1.001	50.00	5.41	4.508	0.010	0.0	0.0	0.0	1.00	7.8	1.4	
2.000	50.00	5.13	4.850	0.005	0.0	0.0	0.0	0.99	7.8	0.7	
2.001	50.00	5.20	4.674	0.010	0.0	0.0	0.0	2.02	35.8	1.4	
1.002	50.00	5.43	4.320	0.023	0.0	0.0	0.0	3.15	55.6	3.1	
1.003	50.00	5.85	3.794	0.023	0.0	0.0	0.0	1.15	81.0	3.1	
3.000	50.00	5.08	4.850	0.007	0.0	0.0	0.0	1.00	7.8	0.9	
3.001	50.00	5.21	4.775	0.015	0.0	0.0	0.0	1.00	7.8	2.0	
3.002	50.00	5.29	4.595	0.023	0.0	0.0	0.0	1.42	25.2	3.1	
3.003	50.00	5.44	4.445	0.028	0.0	0.0	0.0	1.62	28.7	3.8	
4.000	50.00	5.11	4.400	0.007	0.0	0.0	0.0	1.30	22.9	0.9	
4.001	50.00	5.30	4.258	0.015	0.0	0.0	0.0	1.14	20.2	2.0	
5.000	50.00	5.08	4.850	0.006	0.0	0.0	0.0	1.00	7.8	0.8	
5.001	50.00	5.15	4.775	0.012	0.0	0.0	0.0	1.70	13.3	1.6	
5.002	50.00	5.22	4.350	0.019	0.0	0.0	0.0	1.88	33.3	2.6	
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Micro Drainage						Network 2020.1					
STORM SEWER DESIGN by the Modified Rational Method											
Network Design Table for 21-023 SW Network - Surcharged.sws											
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	Auto Design
3.004	2.956	0.050	59.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.005	3.137	0.249	12.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	4.792	0.392	12.2	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	4.395	0.416	10.6	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	20.374#	0.085	239.7	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	11.040#	0.036	306.7	0.003	0.00	0.0	0.600	o	375	Pipe/Conduit	
8.000	3.390	0.015	226.0	0.000	5.00	0.0	0.600	oo	300	Double Pipe	
1.006	12.824	0.086	149.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	34.284	0.229	149.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	13.961	0.093	150.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.009	4.516#	0.030	150.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
Network Results Table											
PN	Rain (mm/hr)	T.C. (mins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
3.004	50.00	5.47	4.088	0.062	0.0	0.0	0.0	1.31	23.2	8.4	
3.005	50.00	5.49	4.038	0.067	0.0	0.0	0.0	2.85	50.4	9.1	
6.000	50.00	5.03	4.181	0.006	0.0	0.0	0.0	2.90	51.2	0.8	
7.000	50.00	5.02	4.205	0.020	0.0	0.0	0.0	3.12	55.1	2.7	
1.004	50.00	6.19	3.639	0.136	0.0	0.0	0.0	1.01	71.5	18.4	
1.005	50.00	6.37	3.554	0.139	0.0	0.0	0.0	1.03	113.7	18.8	
8.000	50.00	5.05	3.683	0.000	0.0	0.0	0.0	1.04	147.3	0.0	
1.006	50.00	6.63	3.518	0.139	0.0	0.0	0.0	0.82	14.5*	18.8	
1.007	50.00	7.33	3.432	0.139	0.0	0.0	0.0	0.82	14.5*	18.8	
1.008	50.00	7.61	3.203	0.139	0.0	0.0	0.0	0.82	14.5*	18.8	
1.009	50.00	7.70	3.110	0.139	0.0	0.0	0.0	0.82	14.4*	18.8	
Surcharged Outfall Details for 21-023 SW Network - Surcharged.sws											
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)					
1.009	Watercourse	3.500	3.080	3.054	0	0					
Datum (m) 3.679 Offset (mins) 0											
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Micro Drainage				Network 2020.1							
Surcharged Outfall Details for 21-023 SW Network - Surcharged.sws											
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	0.190	21	0.190	41	0.190	61	0.190	81	0.190	101	0.190
2	0.190	22	0.190	42	0.190	62	0.190	82	0.190	102	0.190
3	0.190	23	0.190	43	0.190	63	0.190	83	0.190	103	0.190
4	0.190	24	0.190	44	0.190	64	0.190	84	0.190	104	0.190
5	0.190	25	0.190	45	0.190	65	0.190	85	0.190	105	0.190
6	0.190	26	0.190	46	0.190	66	0.190	86	0.190	106	0.190
7	0.190	27	0.190	47	0.190	67	0.190	87	0.190	107	0.190
8	0.190	28	0.190	48	0.190	68	0.190	88	0.190	108	0.190
9	0.190	29	0.190	49	0.190	69	0.190	89	0.190	109	0.190
10	0.190	30	0.190	50	0.190	70	0.190	90	0.190	110	0.190
11	0.190	31	0.190	51	0.190	71	0.190	91	0.190	111	0.190
12	0.190	32	0.190	52	0.190	72	0.190	92	0.190	112	0.190
13	0.190	33	0.190	53	0.190	73	0.190	93	0.190	113	0.190
14	0.190	34	0.190	54	0.190	74	0.190	94	0.190	114	0.190
15	0.190	35	0.190	55	0.190	75	0.190	95	0.190	115	0.190
16	0.190	36	0.190	56	0.190	76	0.190	96	0.190	116	0.190
17	0.190	37	0.190	57	0.190	77	0.190	97	0.190	117	0.190
18	0.190	38	0.190	58	0.190	78	0.190	98	0.190	118	0.190
19	0.190	39	0.190	59	0.190	79	0.190	99	0.190	119	0.190
20	0.190	40	0.190	60	0.190	80	0.190	100	0.190	120	0.190

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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Seftor School House Surcharged Outfall Storm Network - FEH 2013	
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Micro Drainage		Network 2020.1

Online Controls for 21-023 SW Network - Surcharged.sws

Hydro-Brake® Optimum Manhole: S3-Ctrl, DS/PN: 1.006, Volume (m³): 4.3

Unit Reference	MD-SHE-0069-2000-0886-2000
Design Head (m)	0.886
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	69
Invert Level (m)	3.518
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.886	2.0
Flush-Flo™	0.271	2.0
Kick-Flo®	0.559	1.6
Mean Flow over Head Range	-	1.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	1.200	2.3	3.000	3.5	7.000	5.2
0.200	2.0	1.400	2.5	3.500	3.8	7.500	5.4
0.300	2.0	1.600	2.6	4.000	4.0	8.000	5.5
0.400	1.9	1.800	2.8	4.500	4.2	8.500	5.7
0.500	1.8	2.000	2.9	5.000	4.4	9.000	5.8
0.600	1.7	2.200	3.0	5.500	4.6	9.500	6.0
0.800	1.9	2.400	3.2	6.000	4.8		
1.000	2.1	2.600	3.3	6.500	5.0		

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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013																											
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX	Designed by TGL Checked by MTD																											
Micro Drainage Network 2020.1																												
<u>Storage Structures for 21-023 SW Network - Surcharged.sws</u> <u>Porous Car Park Manhole: Sg, DS/PN: 7.000</u> Infiltration Coefficient Base (m/hr) 0.00000 Membrane Percolation (mm/hr) 1000 Max Percolation (l/s) 49.7 Safety Factor 3.0 Porosity 0.32 Invert Level (m) 4.205 Width (m) 6.0 Length (m) 29.8 Slope (1:X) 80.0 Depression Storage (mm) 5 Evaporation (mm/day) 3 Cap Volume Depth (m) 0.350 <u>Tank or Pond Manhole: Pond, DS/PN: 1.005</u> Invert Level (m) 3.554 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>13.7</td><td>0.850</td><td>88.7</td></tr></table> <u>Cellular Storage Manhole: CS-Tank, DS/PN: 8.000</u> Invert Level (m) 3.533 Infiltration Coefficient Base (m/hr) 0.00000 Infiltration Coefficient Side (m/hr) 0.00000 Safety Factor 3.0 Porosity 0.95 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>39.5</td><td>39.5</td><td>0.801</td><td>0.0</td><td>60.1</td></tr><tr><td>0.800</td><td>39.5</td><td>60.1</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	13.7	0.850	88.7	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	39.5	39.5	0.801	0.0	60.1	0.800	39.5	60.1			
Depth (m)	Area (m²)	Depth (m)	Area (m²)																									
0.000	13.7	0.850	88.7																									
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																							
0.000	39.5	39.5	0.801	0.0	60.1																							
0.800	39.5	60.1																										
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ		Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013			
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX		Designed by TGL Checked by MTD			
Micro Drainage		Network 2020.1			
Volume Summary (Static)					
Length Calculations based on True Length					
Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	Re1	0.029	0.126	0.000	0.155
1.001	SD1	0.039	0.062	0.000	0.101
2.000	Re2	0.028	0.057	0.000	0.085
2.001	SD2	0.115	0.148	0.000	0.264
1.002	SD3	0.156	0.054	0.000	0.210
1.003	S1	1.696	1.968	0.000	3.664
3.000	Re3	0.028	0.033	0.000	0.062
3.001	SD4	0.032	0.059	0.000	0.091
3.002	SD5	0.040	0.127	0.000	0.166
3.003	SD6	0.123	0.236	0.000	0.360
4.000	Re4	0.029	0.147	0.000	0.176
4.001	SD7	0.036	0.227	0.000	0.264
5.000	Re5	0.028	0.033	0.000	0.062
5.001	SD8	0.032	0.059	0.000	0.091
5.002	SD9	0.053	0.127	0.000	0.180
3.004	SD10	0.161	0.044	0.000	0.205
3.005	SD11	0.147	0.041	0.000	0.187
6.000	SD12	0.141	0.070	0.000	0.211
7.000	Sg	0.152	0.063	20.026	20.241
1.004	S2	1.462	1.350	0.000	2.812
1.005	Pond	1.217	1.062	38.890	41.169
8.000	CS-Tank	0.230	0.341	30.033	30.604
1.006	S3-Ctrl	2.926	0.209	0.000	3.136
1.007	S4	0.251	0.598	0.000	0.849
1.008	S5	0.247	0.239	0.000	0.486
1.009	S6	0.122	0.076	0.000	0.197
Total		9.523	7.559	88.948	106.030
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ			Land adj Seftor School House Surcharged Outfall Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX			Designed by TGL Checked by MTD					
Micro Drainage			Network 2020.1					
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws</u>								
Simulation Criteria								
Areal Reduction Factor		1.000	Additional Flow - % of Total Flow		0.000			
Hot Start (mins)		0	MADD Factor * 10m³/ha Storage		2.000			
Hot Start Level (mm)		0	Inlet Coefficient		0.800			
Manhole Headloss Coeff (Global)		0.500	Flow per Person per Day (l/per/day)		0.000			
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0	Number of Storage Structures		3			
Number of Online Controls		1	Number of Time/Area Diagrams		0			
Number of Offline Controls		0	Number of Real Time Controls		0			
Synthetic Rainfall Details								
Rainfall Model			FEH					
FEH Rainfall Version			2013					
Site Location			GB 489700 99200 SZ 89700 99200					
Data Type			Catchment					
Cv (Summer)			0.750					
Cv (Winter)			0.840					
Margin for Flood Risk Warning (mm)			300.0					
Analysis Timestep			2.5 Second Increment (Extended)					
DTS Status			OFF					
DVD Status			ON					
Inertia Status			ON					
Profile(s)			Summer and Winter					
Duration(s) (mins)			15, 30, 60, 120, 240, 360, 480, 960, 1440					
Return Period(s) (years)			2, 30, 100					
Climate Change (%)			0, 0, 40					
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	2	+0%				
1.001	SD1	15 Winter	2	+0%				
2.000	Re2	15 Winter	2	+0%				
2.001	SD2	15 Winter	2	+0%				
1.002	SD3	15 Winter	2	+0%				
1.003	S1	120 Winter	2	+0%	100/30 Winter			
3.000	Re3	15 Winter	2	+0%	100/15 Summer			
3.001	SD4	15 Winter	2	+0%	100/15 Summer			
3.002	SD5	15 Winter	2	+0%	100/15 Summer			
3.003	SD6	15 Winter	2	+0%	100/15 Summer			
4.000	Re4	15 Winter	2	+0%	100/15 Summer			
4.001	SD7	15 Winter	2	+0%	100/15 Summer			
5.000	Re5	15 Winter	2	+0%				
5.001	SD8	15 Winter	2	+0%				
5.002	SD9	15 Winter	2	+0%	100/15 Summer			
3.004	SD10	15 Winter	2	+0%	30/15 Summer			
3.005	SD11	15 Winter	2	+0%	100/15 Summer			
6.000	SD12	15 Winter	2	+0%	100/120 Winter			
7.000	Sg	15 Winter	2	+0%	100/240 Winter			
1.004	S2	120 Winter	2	+0%	30/60 Summer			
1.005	Pond	120 Winter	2	+0%	30/60 Summer			
8.000	CS-Tank	120 Winter	2	+0%	2/120 Winter			
1.006	S3-Ctrl	120 Winter	2	+0%	2/15 Winter			
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX				Designed by TGL Checked by MTD					
Micro Drainage				Network 2020.1					
2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.802	-0.078	0.000	0.11			0.8	OK
1.001	SD1	4.539	-0.069	0.000	0.21			1.5	OK
2.000	Re2	4.873	-0.077	0.000	0.12			0.8	OK
2.001	SD2	4.695	-0.129	0.000	0.05			1.5	OK
1.002	SD3	4.351	-0.119	0.000	0.09			3.5	OK
1.003	S1	3.838	-0.256	0.000	0.02			1.4	OK
3.000	Re3	4.878	-0.072	0.000	0.17			1.2	OK
3.001	SD4	4.814	-0.061	0.000	0.32			2.3	OK
3.002	SD5	4.635	-0.110	0.000	0.16			3.4	OK
3.003	SD6	4.485	-0.110	0.000	0.16			4.1	OK
4.000	Re4	4.423	-0.127	0.000	0.06			1.2	OK
4.001	SD7	4.293	-0.115	0.000	0.12			2.3	OK
5.000	Re5	4.876	-0.074	0.000	0.15			1.0	OK
5.001	SD8	4.801	-0.074	0.000	0.15			1.8	OK
5.002	SD9	4.382	-0.118	0.000	0.10			2.8	OK
3.004	SD10	4.178	-0.060	0.000	0.66			9.3	OK
3.005	SD11	4.096	-0.092	0.000	0.32			10.0	OK
6.000	SD12	4.197	-0.134	0.000	0.03			1.0	OK
7.000	Sg	4.232	-0.123	0.000	0.07		4	2.8	OK
1.004	S2	3.838	-0.101	0.000	0.13			8.1	OK
1.005	Pond	3.837	-0.092	0.000	0.07			5.5	OK
8.000	CS-Tank	3.837	0.004	0.000	0.01		316	0.8	SURCHARGED
1.006	S3-Ctrl	3.837	0.169	0.000	0.13			1.8	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Surcharged Outfall Storm Network - FEH 2013						
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX				Designed by TGL Checked by MTD						
Micro Drainage				Network 2020.1						
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws</u>										
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	
1.007	S4 120	Winter	2	+0%	2/15 Summer				3.837	
1.008	S5 120	Winter	2	+0%	2/15 Summer				3.837	
1.009	S6 120	Winter	2	+0%	2/15 Summer				3.837	
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded	
1.007	S4	0.255	0.000	0.13			1.8	SURCHARGED		
1.008	S5	0.484	0.000	0.13			1.8	SURCHARGED		
1.009	S6	0.577	0.000	0.16			1.8	FLOOD RISK		
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ			Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX			Designed by TGL Checked by MTD					
Micro Drainage			Network 2020.1					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws								
Simulation Criteria								
Area Reduction Factor		1.000		Additional Flow - % of Total Flow 0.000				
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage 2.000				
Hot Start Level (mm)		0		Inlet Coefficient 0.800				
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day) 0.000				
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0		Number of Storage Structures 3				
Number of Online Controls		1		Number of Time/Area Diagrams 0				
Number of Offline Controls		0		Number of Real Time Controls 0				
Synthetic Rainfall Details								
Rainfall Model			FEH					
FEH Rainfall Version			2013					
Site Location GB 489700 99200 SZ 89700 99200								
Data Type			Catchment					
Cv (Summer)			0.750					
Cv (Winter)			0.840					
Margin for Flood Risk Warning (mm)			300.0					
Analysis Timestep			2.5 Second Increment (Extended)					
DTS Status			OFF					
DVD Status			ON					
Inertia Status			ON					
Profile(s)			Summer and Winter					
Duration(s) (mins)			15, 30, 60, 120, 240, 360, 480, 960, 1440					
Return Period(s) (years)			2, 30, 100					
Climate Change (%)			0, 0, 40					
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	30	+0%				
1.001	SD1	15 Winter	30	+0%				
2.000	Re2	15 Winter	30	+0%				
2.001	SD2	15 Winter	30	+0%				
1.002	SD3	15 Winter	30	+0%				
1.003	S1	240 Winter	30	+0%	100/30 Winter			
3.000	Re3	15 Winter	30	+0%	100/15 Summer			
3.001	SD4	15 Winter	30	+0%	100/15 Summer			
3.002	SD5	15 Winter	30	+0%	100/15 Summer			
3.003	SD6	15 Winter	30	+0%	100/15 Summer			
4.000	Re4	15 Winter	30	+0%	100/15 Summer			
4.001	SD7	15 Winter	30	+0%	100/15 Summer			
5.000	Re5	15 Winter	30	+0%				
5.001	SD8	15 Winter	30	+0%				
5.002	SD9	15 Winter	30	+0%	100/15 Summer			
3.004	SD10	15 Winter	30	+0%	30/15 Summer			
3.005	SD11	15 Winter	30	+0%	100/15 Summer			
6.000	SD12	15 Winter	30	+0%	100/120 Winter			
7.000	Sg	15 Winter	30	+0%	100/240 Winter			
1.004	S2	240 Winter	30	+0%	30/60 Summer			
1.005	Pond	240 Winter	30	+0%	30/60 Summer			
8.000	CS-Tank	240 Winter	30	+0%	2/120 Winter			
1.006	S3-Ctrl	240 Winter	30	+0%	2/15 Winter			
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX				Designed by TGL Checked by MTD					
Micro Drainage				Network 2020.1					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.813	-0.067	0.000	0.24			1.8	OK
1.001	SD1	4.559	-0.049	0.000	0.51			3.7	OK
2.000	Re2	4.884	-0.066	0.000	0.25			1.8	OK
2.001	SD2	4.708	-0.116	0.000	0.12			3.7	OK
1.002	SD3	4.368	-0.102	0.000	0.22			8.5	OK
1.003	S1	4.048	-0.046	0.000	0.02			1.6	OK
3.000	Re3	4.892	-0.058	0.000	0.37			2.5	OK
3.001	SD4	4.842	-0.033	0.000	0.78			5.6	OK
3.002	SD5	4.661	-0.084	0.000	0.40			8.6	OK
3.003	SD6	4.511	-0.084	0.000	0.40			10.5	OK
4.000	Re4	4.435	-0.115	0.000	0.13			2.5	OK
4.001	SD7	4.341	-0.067	0.000	0.29			5.4	OK
5.000	Re5	4.889	-0.061	0.000	0.32			2.2	OK
5.001	SD8	4.817	-0.058	0.000	0.36			4.4	OK
5.002	SD9	4.401	-0.099	0.000	0.25			7.1	OK
3.004	SD10	4.319	-0.081	0.000	1.63			22.8	SURCHARGED
3.005	SD11	4.140	-0.048	0.000	0.79			24.7	OK
6.000	SD12	4.204	-0.127	0.000	0.06			2.2	OK
7.000	Sg	4.248	-0.107	0.000	0.17		5	7.1	OK
1.004	S2	4.048	0.109	0.000	0.15			9.1	SURCHARGED
1.005	Pond	4.046	0.117	0.000	0.09			7.5	SURCHARGED
8.000	CS-Tank	4.053	0.220	0.000	0.02		240	1.8	SURCHARGED
1.006	S3-Ctrl	4.084	0.416	0.000	0.15			2.0	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Surcharged Outfall Storm Network - FEH 2013				
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX					Designed by TGL Checked by MTD				
Micro Drainage					Network 2020.1				
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	S4 120	Winter	30	+0%	2/15 Summer				3.891
1.008	S5 120	Winter	30	+0%	2/15 Summer				3.879
1.009	S6 120	Winter	30	+0%	2/15 Summer				3.872
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	S4	0.309	0.000	0.22			3.1	SURCHARGED	
1.008	S5	0.526	0.000	0.27			3.6	SURCHARGED	
1.009	S6	0.612	0.000	1.81			19.7	FLOOD RISK	
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Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ			Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013					
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX			Designed by TGL Checked by MTD					
Micro Drainage			Network 2020.1					
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws								
Simulation Criteria								
Area Reduction Factor		1.000		Additional Flow - % of Total Flow 0.000				
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage 2.000				
Hot Start Level (mm)		0		Inlet Coefficient 0.800				
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day) 0.000				
Foul Sewage per hectare (l/s)		0.000						
Number of Input Hydrographs		0		Number of Storage Structures 3				
Number of Online Controls		1		Number of Time/Area Diagrams 0				
Number of Offline Controls		0		Number of Real Time Controls 0				
Synthetic Rainfall Details								
Rainfall Model			FEH					
FEH Rainfall Version			2013					
Site Location			GB 489700 99200 SZ 89700 99200					
Data Type			Catchment					
Cv (Summer)			0.750					
Cv (Winter)			0.840					
Margin for Flood Risk Warning (mm)			300.0					
Analysis Timestep			2.5 Second Increment (Extended)					
DTS Status			OFF					
DVD Status			ON					
Inertia Status			ON					
Profile(s)			Summer and Winter					
Duration(s) (mins)			15, 30, 60, 120, 240, 360, 480, 960, 1440					
Return Period(s) (years)			2, 30, 100					
Climate Change (%)			0, 0, 40					
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	100	+40%				
1.001	SD1	15 Winter	100	+40%				
2.000	Re2	15 Winter	100	+40%				
2.001	SD2	15 Winter	100	+40%				
1.002	SD3	240 Winter	100	+40%				
1.003	S1	240 Winter	100	+40%	100/30	Winter		
3.000	Re3	15 Winter	100	+40%	100/15	Summer		
3.001	SD4	15 Winter	100	+40%	100/15	Summer		
3.002	SD5	15 Winter	100	+40%	100/15	Summer		
3.003	SD6	15 Winter	100	+40%	100/15	Summer		
4.000	Re4	15 Winter	100	+40%	100/15	Summer		
4.001	SD7	15 Winter	100	+40%	100/15	Summer		
5.000	Re5	15 Winter	100	+40%				
5.001	SD8	15 Winter	100	+40%				
5.002	SD9	15 Winter	100	+40%	100/15	Summer		
3.004	SD10	15 Winter	100	+40%	30/15	Summer		
3.005	SD11	240 Winter	100	+40%	100/15	Summer		
6.000	SD12	240 Winter	100	+40%	100/120	Winter		
7.000	Sg	240 Winter	100	+40%	100/240	Winter		
1.004	S2	240 Winter	100	+40%	30/60	Summer		
1.005	Pond	240 Winter	100	+40%	30/60	Summer		
8.000	CS-Tank	240 Winter	100	+40%	2/120	Winter		
1.006	S3-Ctrl	240 Winter	100	+40%	2/15	Winter		
©1982-2020 Innovyze								

Adama Consulting Ltd						Page 15			
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ			Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013						
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX			Designed by TGL Checked by MTD						
Micro Drainage			Network 2020.1						
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.825	-0.055	0.000	0.42			3.1	OK
1.001	SD1	4.583	-0.025	0.000	0.90			6.5	OK
2.000	Re2	4.897	-0.053	0.000	0.44			3.2	OK
2.001	SD2	4.720	-0.104	0.000	0.21			6.5	OK
1.002	SD3	4.395	-0.075	0.000	0.07			2.9	OK
1.003	S1	4.394	0.300	0.000	0.04			2.7	SURCHARGED
3.000	Re3	5.094	0.144	0.000	0.63			4.3	SURCHARGED
3.001	SD4	5.066	0.191	0.000	1.26			9.0	SURCHARGED
3.002	SD5	4.875	0.130	0.000	0.62			13.4	SURCHARGED
3.003	SD6	4.819	0.224	0.000	0.60			15.8	SURCHARGED
4.000	Re4	4.741	0.191	0.000	0.21			4.2	FLOOD RISK
4.001	SD7	4.727	0.319	0.000	0.47			8.6	FLOOD RISK
5.000	Re5	4.904	-0.046	0.000	0.56			3.8	OK
5.001	SD8	4.850	-0.025	0.000	0.63			7.7	OK
5.002	SD9	4.727	0.227	0.000	0.40			11.6	SURCHARGED
3.004	SD10	4.688	0.450	0.000	2.54			35.6	SURCHARGED
3.005	SD11	4.396	0.208	0.000	0.26			8.2	SURCHARGED
6.000	SD12	4.395	0.064	0.000	0.02			0.7	SURCHARGED
7.000	Sg	4.395	0.040	0.000	0.06		67	2.5	SURCHARGED
1.004	S2	4.394	0.455	0.000	0.26			16.2	SURCHARGED
1.005	Pond	4.393	0.464	0.000	0.11			9.2	FLOOD RISK
8.000	CS-Tank	4.394	0.561	0.000	0.02		453	1.6	SURCHARGED
1.006	S3-Ctrl	4.394	0.726	0.000	0.15			2.0	SURCHARGED
PN	US/MH Name	Level Exceeded							
1.000	Re1								
1.001	SD1								
2.000	Re2								
2.001	SD2								
1.002	SD3								
1.003	S1								
3.000	Re3								
3.001	SD4								
3.002	SD5								
3.003	SD6								
4.000	Re4								
4.001	SD7								
5.000	Re5								
5.001	SD8								
5.002	SD9								
3.004	SD10								
3.005	SD11								
6.000	SD12								
7.000	Sg								
1.004	S2								
1.005	Pond								
8.000	CS-Tank								
1.006	S3-Ctrl								
©1982-2020 Innovyze									

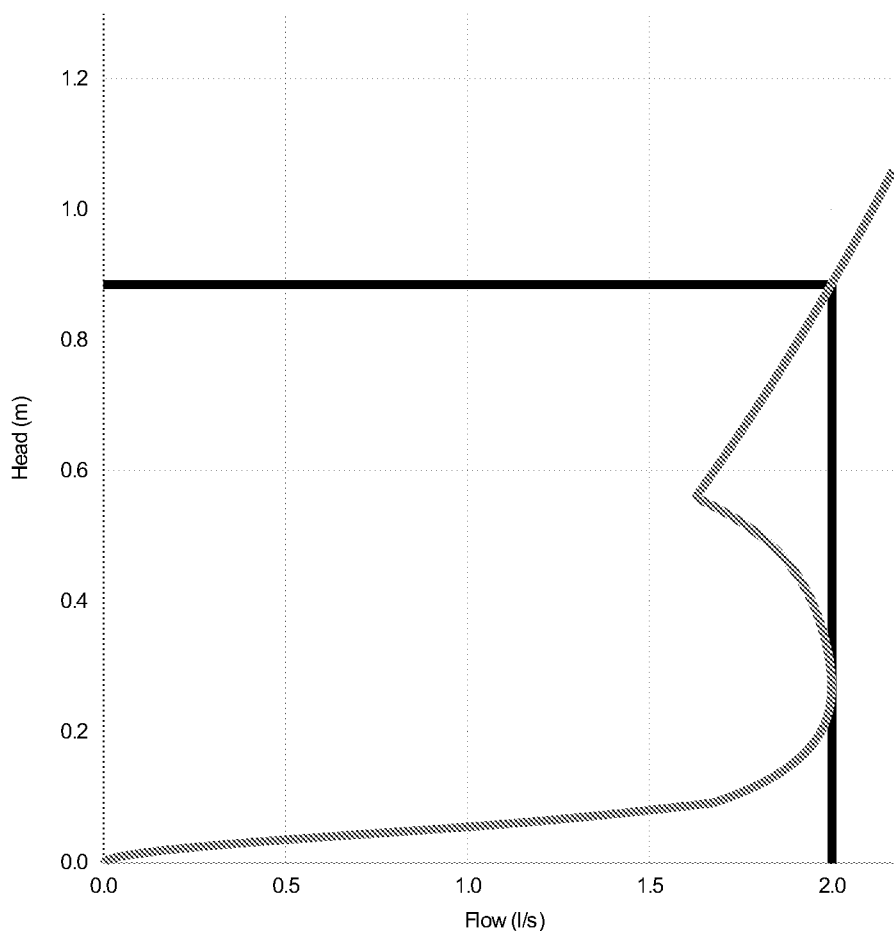
Adama Consulting Ltd							Page 16		
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefton School House Surcharged Outfall Storm Network - FEH 2013				
Date 10/03/2022 File 21-023 SW Network - Surcharged.MDX					Designed by TGL Checked by MTD				
Micro Drainage					Network 2020.1				
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	S4	60 Winter	100	+40%	2/15 Summer				3.894
1.008	S5	60 Winter	100	+40%	2/15 Summer				3.881
1.009	S6	60 Winter	100	+40%	2/15 Summer				3.873
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	S4	0.312	0.000	0.22			3.1	SURCHARGED	
1.008	S5	0.528	0.000	0.28			3.7	SURCHARGED	
1.009	S6	0.613	0.000	1.82			19.8	FLOOD RISK	
©1982-2020 Innovyze									

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.886	2.000
Flush-Flo	0.271	1.999
Kick-Flo®	0.559	1.624
Mean Flow		1.755



hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.031	0.381
0.061	1.132
0.092	1.671
0.122	1.806
0.153	1.894
0.183	1.949
0.214	1.981
0.244	1.996
0.275	1.999
0.306	1.994
0.336	1.984
0.367	1.968
0.397	1.947
0.428	1.919
0.458	1.881
0.489	1.829
0.519	1.757
0.550	1.662
0.580	1.652
0.611	1.690
0.642	1.727
0.672	1.764
0.703	1.800
0.733	1.834
0.764	1.868
0.794	1.902
0.825	1.935
0.855	1.967
0.886	1.998

DESIGN ADVICE



The head/flow characteristics of this SHE-0069-2000-0886-2000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International

DATE	10/03/2022 20:19
Site	Sefter Road, Pagham
DESIGNER	Tafari Lewis
Ref	21-023

SHE-0069-2000-0886-2000
Hydro-Brake Optimum®

Adama Consulting				CALCULATION TITLE SHEET			
Project Title		Land at Sefer Road, Pagham		Project No:		PR21-023	
Calculation Title:		Pond Flootation		Serial No:			
Project Manager		Tafari Lewis		No. of Sheets:		3 (including cover)	
Status				Prepared by:		TL	
Schematic		Preliminary		Date:		10-Mar-22	
Tender		Other (state)		Checked by:		MD	
Final for Construction		Planning Approval		Date:		10-Mar-22	
Levels of Verification				Approved by:		TL	
1 Self-check by originator and approval		3B Comparison with similar proven designs and approval		Date:		10-Mar-22	
2 Calculation Review and approval		4 External check and internal approval		Computer Analysis: Yes: ☐ No: ☒ Program(s): Hardware:			
3 Detailed check and approval		5 Other verification as stated in Management Plan					
3A Alternative calculations and approval							
Contents (continue on calculation sheet if necessary)							
1 Calculation cover sheet 2 Introduction & calculations 3 Conclusion							
							
CONTENTS AMENDMENT RECORD							
Rev	Status	Date	Description	Page	By	Chk'd	App'd
1	P	10-Mar-22	First Issue	1	TL	MD	TL

File Name:

Path:

Rev 0

Calculation Title Sheet

CALCULATION SHEET									
Calculation title: Sefter Road - Pond floatation				Created by: T. Lewis	Project code: 21-023				
				Date: 10/03/2022	Serial no:				
Subject: Introduction & Calculations				Verified by:	Sheet no: 2 of 3				
				Date:	Revision: 0				
							References / Notes		
This calculation provides the floatation of the pond under three conditions - 1 - Pond dry - average ground water level (4.35) 2 - Pond with permanent water - average ground water level (4.00) 3 - Pond with permanent water - ground water level near surface (4.35) For the liner within the pond not to float, downthrust must be greater than upthrust. Relative pressures are calculated using - $P = \rho gh$ Where $P =$ Pressure $\rho =$ Density of object (kN/m³) $g =$ Gravity (m/s²) $h =$ Head (m)							Ground water information taken from - "Groundwater information taken from Ashdown Site Investigation Report ref: R14572 & P1493"		
Condition 1									
		GL	4.404	Downthrust					
				Density -	1870	kg/m ³	Type 1	"Type 1 Material based upon aggregate industries granular sub-base compacted density for Type 1 Material - 1.87 Megagram / cu.m"	
				Head -	0.300	m			
				Gravity -	9.81	m/s ²			
				Pressure -	5503.41	N/m ²			
				Pressure -	5.50341	kN/m ²			
		Pond base	3.054						
		Groundwater	4.354						
		Pond liner	2.754	Upthrust					
				Density -	1000	kg/m ³	Water		
				Head -	1.600	m			
				Gravity -	9.81	m/s ²			
				Pressure -	15696	N/m ²			
				Pressure -	15.696	kN/m ²			
Condition 2									
		GL	4.404	Downthrust					
				Density -	1870	kg/m ³	Type 1	"Material specification based upon aggregate industries granular sub-base compacted density for Type 1 Material - 1.87 Megagram / cu.m"	
				Head -	0.300	m			
				Gravity -	9.81	m/s ²			
				Pressure -	5503.41	N/m ²			
				Pressure -	5.50341	kN/m ²			
		Permanent water	3.554						
		Pond base	3.054						
		Groundwater	4.354						
		Pond liner*	2.754						
				Density -	1000	kg/m ³	Water		
				Head -	0.500	m			
				Gravity -	9.81	m/s ²			
				Pressure -	4905	N/m ²			
				Pressure -	4.905	kN/m ²			
					Total Downthrust	10.40841	kN/m ²		
Upthrust									
				Density -	1000	kg/m ³	Water		
				Head -	1.600	m			
				Gravity -	9.81	m/s ²			
				Pressure -	15696	N/m ²			
				Pressure -	15.696	kN/m ²			

Rev 1

Calculation Sheet (Excel)

Calculation Sheet																																																																																																																													
Calculation title: Hurtsfold Farm - Pond floatation				Created by:	T. Lewis		Project No:	PR19-001																																																																																																																					
Subject: Conclusion				Date:	08/07/2019		Serial no:																																																																																																																						
				Verified by:			Sheet no:	3 of 3																																																																																																																					
				Date:			Revision:	0																																																																																																																					
References / Notes																																																																																																																													
Conclusion Calculations show that no floatation occurs in modelled condition 3 with an average ground water level of 4.35m and permanent water in the pond. The assessment is based on 1050mm thickness of stabilising material over the pond liner for this scenario. It is recognised that ground water fluctuates so the scenario for condition 3 has been assessed assuming ground water level to be at / near surface level (with permanent water in the pond).																																																																																																																													
Condition 3 <table border="1"> <thead> <tr> <th></th> <th>GL</th> <th>4.404</th> <th colspan="2">Downthrust</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="3">Type 1</td> <td>Density -</td> <td></td> <td>1370</td> <td>kg/m³</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Head -</td> <td></td> <td>1.050</td> <td>m</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gravity -</td> <td></td> <td>9.81</td> <td>m/s²</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Type 1 Material based upon aggregate industries granular sub-base compacted density for Type 1 Material - 1.87 Megagram / cu m</td> <td>Pressure -</td> <td></td> <td>19261.94</td> <td>N/m²</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pressure -</td> <td></td> <td>19.26194</td> <td>kN/m²</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pond base</td> <td>3.054</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Water</td> <td>Density -</td> <td></td> <td>1000</td> <td>kg/m³</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Head -</td> <td></td> <td>0.500</td> <td>m</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gravity -</td> <td></td> <td>9.81</td> <td>m/s²</td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Upthrust</td> <td>Pressure -</td> <td></td> <td>4905</td> <td>N/m²</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pressure -</td> <td></td> <td>4.905</td> <td>kN/m²</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Downthrust</td> <td></td> <td>24.16694</td> <td>kN/m²</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="7"> Floatation - NO Is factor of safety > 1.5? NO </td> <td colspan="3"></td> </tr> <tr> <td colspan="10"> To prevent floatation of the pond liner for the scenario of near surface ground water levels approximately 1.1m depth of stabilisation material will be required with water pressure to counteract the upthrust </td> </tr> </tbody> </table>											GL	4.404	Downthrust					Type 1	Density -		1370	kg/m³				Head -		1.050	m				Gravity -		9.81	m/s²				Type 1 Material based upon aggregate industries granular sub-base compacted density for Type 1 Material - 1.87 Megagram / cu m	Pressure -		19261.94	N/m²				Pressure -		19.26194	kN/m²				Pond base	3.054						Water	Density -		1000	kg/m³				Head -		0.500	m				Gravity -		9.81	m/s²				Upthrust	Pressure -		4905	N/m²				Pressure -		4.905	kN/m²				Total Downthrust		24.16694	kN/m²				Floatation - NO Is factor of safety > 1.5? NO										To prevent floatation of the pond liner for the scenario of near surface ground water levels approximately 1.1m depth of stabilisation material will be required with water pressure to counteract the upthrust									
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Mr Gareth Dix
Aggregate Industries UK Ltd
Bardon Hill Technical Centre
Coalville
Leicestershire, LE67 1TL



Certificate No.	A10738
Date of Issue	13 th May 2019

CERTIFICATE OF TEST FOR BULK DENSITY OF AGGREGATES

Sample Material:	Granular Sub Base Type I	Source:	Bardon Hill Quarry
Sample Ref. No:	Unknown	Date Sampled:	Unknown
Certificate of Sampling:	No	Date Received:	11/03/2019
Date Tested:	15/04/2019	Test Condition:	Dry
Test Method:	Loose: EN 1097-3 : 1998 Compacted: In house Method TI A18*		

Individual Loose Bulk Density Values (Mg/m ³)	1.71	1.71	1.70
Loose Bulk Density (Mg/m ³)	1.71		

Individual Compacted Bulk Density Values (Mg/m ³)	1.88	1.87	1.87
Compacted Bulk Density (Mg/m ³)	1.87		

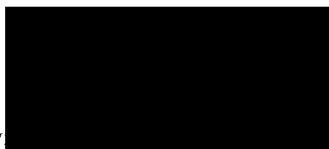
Remarks: Compaction based upon BS812: Part 2: 1995

Notes / Disclaimers:

- Results relate only to the items tested
- Sample information provided by the customer
- Sample provided by the customer, results apply to the sample as received
- Deviating sample

Yes
Yes
Yes
No

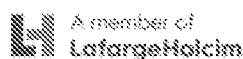
Authorised Signatory



R. Allen – Head of R&D and Technical Services



I Artamendi – Laboratory Manager

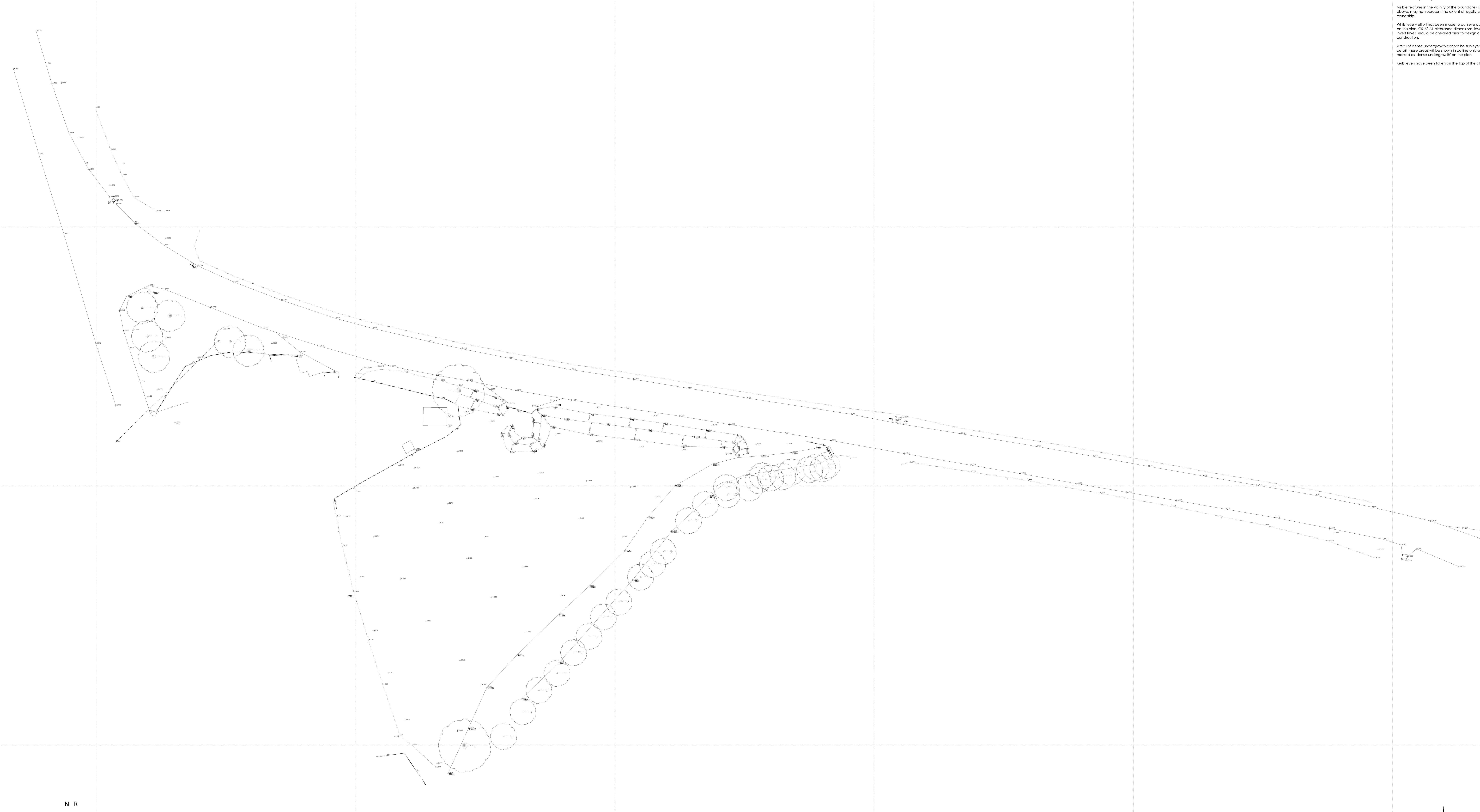


AGGREGATE INDUSTRIES UK LIMITED
Technical and Development Department



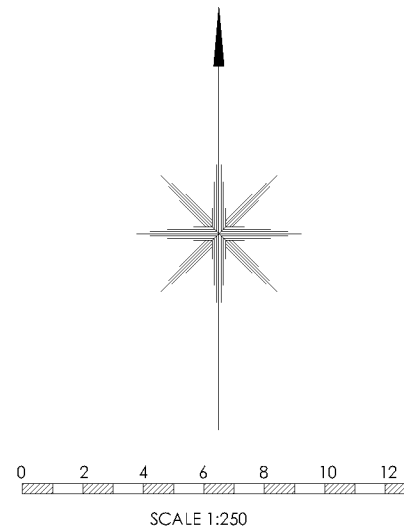
Appendix E

Topographic Survey



N R

NOTES
Survey accurate at time of site attendance. Do not scale from printed drawings except for planning purposes.
Grid is based on Ordnance Survey national grid fixed by GPS satellite active network.
Levels are related to the Ordnance Survey GPS active network and transformed using the OSGB36 & OSN15 model.
Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only.
Tree species (where shown) should be treated with caution and expert identification is advised.
Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales.
Visible features in the vicinity of the boundaries as shown above may not represent the extent of legally conveyed ownership.
Whilst every effort has been made to achieve accuracy on the plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction.
Areas of dense undergrowth cannot be surveyed in detail. These areas will be shown in outline only and marked as 'dense undergrowth' on the plan.
Kerb levels have been taken on the top of the channel.



medlams
surveys limited
www.medlams-surveys.co.uk
bmediam@medlams-surveys.co.uk
07717 205 388 01243 931482

project:		job ref:	N N
client:		scale:	N R
title:		dwg no:	N rev:
date:	N		

Appendix F

Below Ground Drainage Layout and External Levels

Foul Drainage Key:

- Foul Drain (1000 Unless Noted Otherwise)
- FW Type 3F Non-Entry Access Chamber
- FW Type 4F Non-Entry Access Chamber
- Foul Water Outlet / Soil Pipe

Storm Drainage Key:

- Private storm manhole
- Private Flow Control Chamber
- Storm Drain (1000 Unless Noted Otherwise)
- SW Type 3F Non-Entry Access Chamber
- SW Type 4F Non-Entry Access Chamber
- SW Rodding Eye
- Typical Depth to Invert 0.45-0.6m (Or as specified in schedule)
- Rainwater Pipe
- Road gully
- Sump gully (Heavy duty permeable paving outfall)
- Threshold drain
- 2500 Silt trap chamber (Wavin 6LB300) 0.475m to invert unless noted otherwise
- Outlet Permevoid (1000 outlet 0.45m to invert)
- Heavy duty Permeable Paving
- Finished level
- Formation Level
- SuDS Heavy Duty Permeable Block Paving (Type C system - 350mm attenuation sub-base 32% void ratio)
- SuDS Cellular storage tank
- SuDS Light Duty Permeable Block Paving (Type C system - Light duty)
- SuDS Attenuation pond (1 in 100 Year plus 40% CC)
- Strategic Road gully
- Rainwater Butt

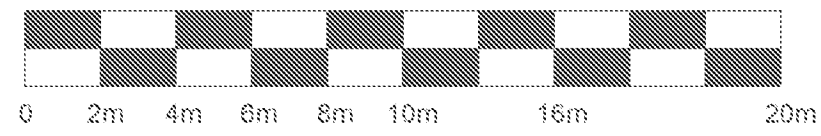
IMPORTANT NOTE ON DEEP DRAINS:

WHERE A DRAIN RUN PASSES NEAR A BUILDING WITHIN THE 45 DEGREE LOADLINE, THE DRAINAGE TRENCH SHALL BE BACKFILLED WITH CONCRETE TO THE BUILDING FOUNDATION FORMATION LEVEL.

STORM CHAMBER SCHEDULES

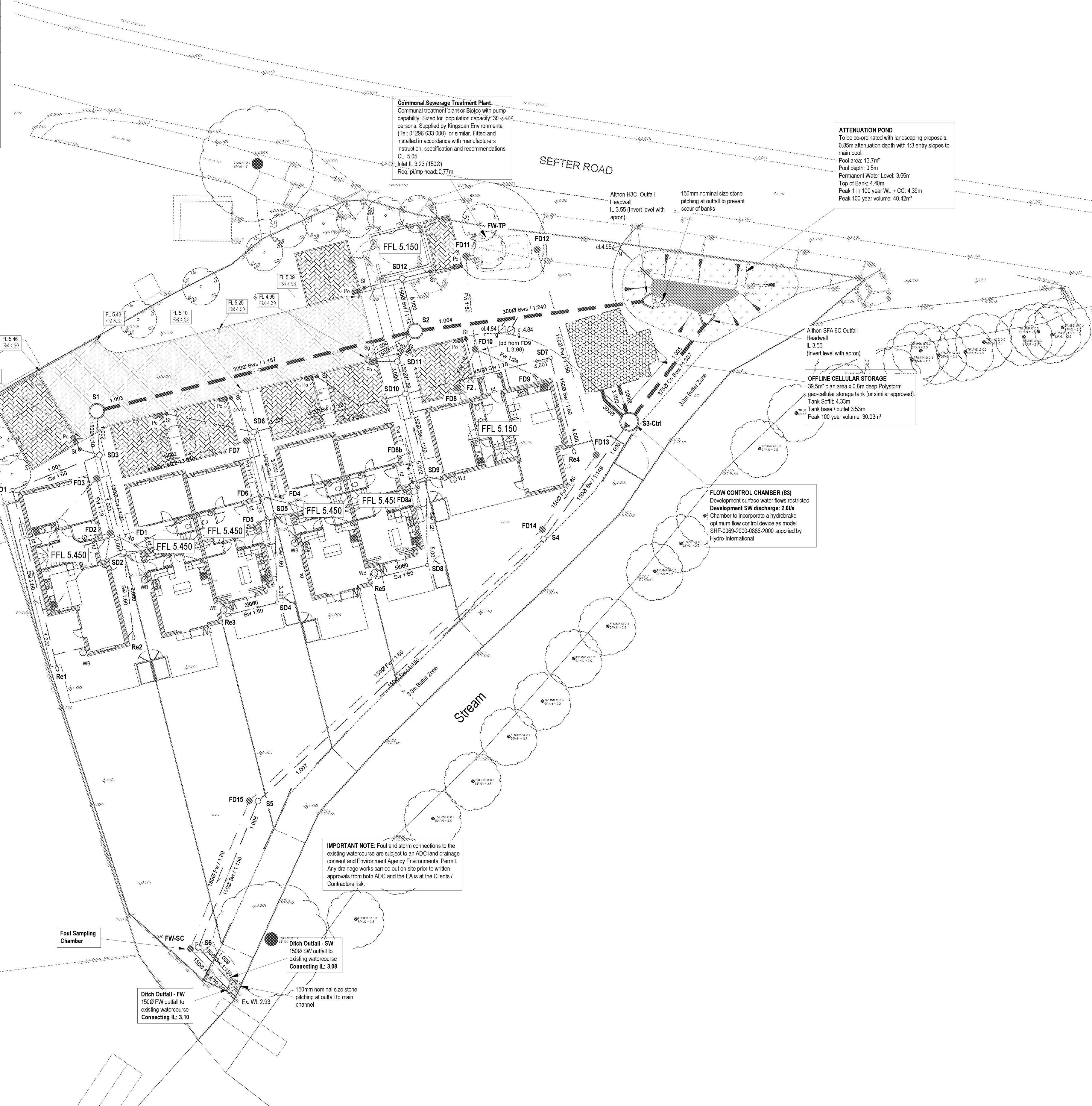
MH REF	MANHOLE TYPE	MANHOLE SIZE	COVER TYPE	COVER LEVEL	INVERT LEVEL
Re1	Rodding eye	Rodding eye	B125	5.38	4.78
SD1	4F	250	B125	5.30	4.51
Re2	Rodding eye	Rodding eye	B125	5.43	4.85
SD2	3F	450	B125	5.40	4.67
SD3	3F	450	B125	5.30	4.32
S1	MH E	1200	D400	5.29	3.79
Re3	Rodding eye	Rodding eye	B125	5.43	4.85
SD4	4F	250	B125	5.42	4.78
SD5	4F	250	B125	5.40	4.59
SD6	3F	450	B125	5.22	4.45
Re4	Rodding eye	Rodding eye	B125	5.00	4.40
SD7	4F	250	B125	5.00	4.28
Re5	Rodding eye	Rodding eye	B125	5.43	4.85
SD8	4F	250	B125	5.42	4.78
SD9	4F	250	B125	5.43	4.35
SD10	3F	450	B125	5.10	4.09
SD11	3F	450	B125	4.96	4.04
SD12	3F	450	B125	5.07	4.18
Sg	Sump gully	450 x 450	D400	4.96	4.21
S2	MH E	1200	D400	4.93	3.64
Pond	---	---	---	4.40	3.55
CS-Tank	---	---	---	4.98	3.53
S3-Cl	Control Chamber	1500	D400	5.17	3.52
S4	3F	450	B125	5.01	3.43
S5	3F	450	B125	4.76	3.20
S6	3F	450	B125	3.87	3.11
Watercourse	Outfall	Outfall	B125	3.50	3.10

SCALE 1:200



FOUL CHAMBER SCHEDULES

MH REF	MANHOLE TYPE	MANHOLE SIZE	COVER TYPE	COVER LEVEL	INVERT LEVEL
FD1	4F	250	B125	5.43	4.55
FD2	3F	450	B125	5.40	4.49
FD3	3F	450	B125	5.32	4.21
FD4	4F	250	B125	5.43	4.55
FD5	4F	250	B125	5.43	4.55
FD6	4F	250	B125	5.40	4.48
FD7	3F	450	B125	5.34	4.04
FD8a	4F	250	B125	5.43	4.63
FD8b	4F	250	B125	5.40	4.50
FD8	3F	450	B125	4.99	3.80
FD9	4F	250	B125	5.00	4.20
FD10	3F	450	B125	4.93	3.40
FD11	3F	450	B125	5.03	3.25
FW-TP	T-Plant	T.B.C	T.B.C	5.05	3.23
FD12	3F	450	B125	5.05	4.00
FD13	3F	450	B125	5.10	3.87
FD14	3F	450	B125	5.02	3.77
FD15	3F	450	B125	4.74	3.33
FW-SC	Sampling cham.	450	B125	3.90	3.15
Watercourse	Outfall	Outfall	B125	3.50	3.10



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This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspected fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any weaknesses shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

Where existing trees are shown to be retained they should be subject to a Full Arboricultural Inspection for safety. All trees are to be planted to as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

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NOTES:

Building Drainage

- Building drainage shall comply with BS 8301 1985, BS EN 752 and The Building Regulations Part H.
- All building drainage shall be 100mm diameter unless shown otherwise.
- All SW connections to adoptable sewers shall be minimum 150mm diameter.
- All building drainage shall be clayware to BS EN 295 or UPVC to BS 4566 with Class B or Class S bedding unless shown otherwise.
- All pipes under buildings without suspended floors shall have Class S bedding.
- Concrete protection shall be provided to all UPVC pipes with less than 600mm cover and to all clay pipes with less than 300mm cover.
- Where a pipe passes through a wall an opening is to be formed through the wall to give at least 50mm clearance around the pipe. Breakout over shall be supported by aintel. The opening is to be masked each side of the opening with rigid sheet material. Pipes embedded in walls shall have a joint formed within 150mm of each wall face. A ROCKER PIPE OF Maximum 600mm length shall be used to continue the pipework.
- Where a pipe trench is within 1m of a building it is to be filled with concrete up to a level below the building equal to the distance from the building less 150mm.
- Where the formation of a pipe trench is above original ground level levels are to be made up with well compacted DTP Type 2 material or better.
- All private drives which fall towards a public highway and exceed two parking bays in area are to be provided with a suitable gully or drainage channel to prevent water discharging onto the highway.
- Where a driveway falls towards a building it shall be provided with a suitable gully or drainage channel to prevent water damaging the building.
- The invert level of an access chamber on a foul drain from a building is to be set 600mm below finished ground level unless otherwise shown.
- The invert level of a rodding eye at the head of a surface water drain is to be set 450mm below finished ground level unless shown otherwise.
- Existing bank, base and water levels of the watercourse must be checked and verified by the Client / Contractor by way of topographical survey and findings presented to the engineer for checking.
- No connection works are permitted to the existing watercourse on-site until approval have been granted by the local drainage authority and environment agency for the proposed outfall from the sewerage treatment plant and stormwater network.
- Installation of the proposed biodesic to be strictly in accordance with the requirements of kingspan environmental. Client / contractor to liaise with kingspan technical on tel 01296 633 000.

CDM Notes:

- The attention of the client and the principal contractor is drawn to the following potential risks in conjunction with the proposed on-site and off-site works as designed for this project.
- Works in the vicinity of live services including gas, electricity and bit may be necessary and the advice of all statutory service companies must be sought before any works commence. Particular attention is drawn to the existing overhead electric line crossing the site. The client must ensure that this is diverted to the satisfaction of UKPN prior to any works on site.
- Works within and abutting the existing highway will entail traffic hazards and all appropriate safety measures including barriers, signs and lighting must be undertaken to the approval of the local authority, the highway authority and the police department.
- Hazardous materials including cement and bituminous materials are specified and the manufacturers advice on safe handling procedures must be obtained and made clear to all operatives.
- The contractor will be responsible for locating all existing services within the vicinity of the works hand dug and ensure these are protected throughout the duration of the works. All utility plant should be clearly marked on the ground prior to commencement of the works.
- The contractor must ensure all working areas are fully secure.

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
FOR PLANNING PURPOSES ONLY

Rev.	Description	Dm	Ckd	Date
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Project

Land adjacent Sefter School,
House, Sefter Road

Title

Below Ground
Drainage Layout



Scale	1:200 on A1	Drawn	MD
Date	10/03/2022	Checked	TL
File	21-023-Acad-400	Drawing No	21-023-400
		Rev	-

LEVELS KEY:

FFL 5.450

28.85 +
Ex.28.85 +

XXXXX XXXXX XXXXX XXXXX XXXXX
Rdpc / Tank

2C

450Rw

450gp

Direction of fall to driveway
Landscaped banking / terracing (Max 1:3)
Access / garden gradients

Denotes requirement for steps
with No of risers:
280mm tread / 150mm risings

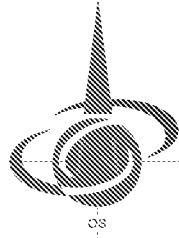
PART M LEVEL THRESHOLD TO
ALL ENTRANCES / ACCESS TO
DWELLINGS.

KERB TYPES:

- EF EF Edging laid flush
- BN Bullnozed kerbs with 25mm upstand.
Reduced to 10mm at entrance paths to plots
- HB Half Batter kerbs with 125mm upstand
- Drop kerb
- CK Channel kerb laid flush with carriageway surface

SCALE 1:200

0 2m 4m 6m 8m 10m 12m 14m 16m 18m 20m



The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully consistent with the contents and of requirements the site investigation report before work starts.
The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc., whether or not specifically stated on this drawing.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspected fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

Where existing trees are shown to be retained they should be subject to a Full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

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NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. ALL LEVELS STATED ARE IN METRES ABOVE ORDNANCE DATUM.
3. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
4. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
5. ALL MATERIALS AND WORKMANSHIP RELATING TO REINSTATEMENT OR REPAIRS TO EXISTING/PARTIALLY CONSTRUCTED ADOPTABLE HIGHWAY SHALL COMPLY FULLY WITH VOLUME ONE SPECIFICATION FOR HIGHWAY WORKS AND THE GLOUCESTERSHIRE COUNTY COUNCIL MANUAL FOR GLOUCESTERSHIRE STREETS 14th EDITION, PUBLISHED 1 APRIL 2016.
6. THE CONTRACTOR SHALL UNDERTAKE SUCH MATERIALS TESTING AS INDICATED IN THE SPECIFICATIONS AND SHALL INCLUDE THE COST OF TESTING IN THE TENDER.
7. UNLESS STATED OTHERWISE, ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF AT AN APPROVED TIP OFF-SITE.
8. THE PUBLIC HIGHWAY AND WORKS WILL BE KEPT CLEAN AND FREE OF DEBRIS BY USE OF WHEEL WASHING FACILITIES AND ROAD SWEEPERS TO THE COUNCIL'S SATISFACTION.
9. UPON COMPLETION OF THE WORKS, THE CONTRACTOR SHALL UNDERTAKE ALL NECESSARY MAINTENANCE REPAIRS TO RETURN THE HIGHWAY TO ITS FORMER CONDITION.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE LOCAL AUTHORITY PRIOR TO COMMENCING WORKS ON EXISTING OR PARTLY CONSTRUCTED ADOPTABLE HIGHWAY.
11. ALL EXISTING LEVELS, GRADIENTS, DEPTHS ETC. TO BE CHECKED ON SITE PRIOR TO CONSTRUCTION AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
12. THE CONTRACTOR SHALL CONTACT ALL OF THE APPROPRIATE STATUTORY UNDERTAKERS AND ESTABLISH THE EXACT LOCATION OF ALL SERVICES PRIOR TO THE COMMENCEMENT OF THE WORKS, BY HAND DUG TRIAL PITS.
13. ALL CONCRETE AND CONCRETE PRODUCTS BELOW GROUND LEVEL SHALL BE SULPHATE RESISTING PORTLAND CEMENT.

CDM NOTES:

1. THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT.
2. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT MAY BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE. PARTICULAR ATTENTION IS DRAWN TO THE EXISTING OVERHEAD ELECTRIC LINE CROSSING THE SITE. THE CLIENT MUST ENSURE THAT THIS IS DELETED TO THE SATISFACTION OF UKPN PRIOR TO ANY WORKS ON SITE.
3. WORKS WITHIN AND ADJUTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
4. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
5. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS AND DURING THE WORKS THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
6. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

PRELIMINARY DRAWING
NOT FOR TENDER OR CONSTRUCTION
FOR PLANNING PURPOSES ONLY

Rev.	Description	Dm	Ckd	Date
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Client



Project

Land adjacent Sefton School,
House, Sefton Road

Title

External Levels Layout



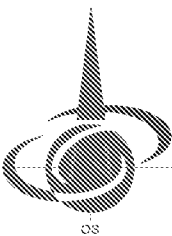
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Date	19/03/2019	Checked	TL
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File	21-023-Acad-500	Drawing No	21-023-500	Rev	-
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Appendix G

Exceedance Flow Paths



The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully consistent with the contents and of requirements the site investigation report before work starts. The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc, whether or not specifically stated on this drawing.

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Where existing trees are shown to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A Foundation is to be provided to accommodate the proposed tree planting, where applicable.

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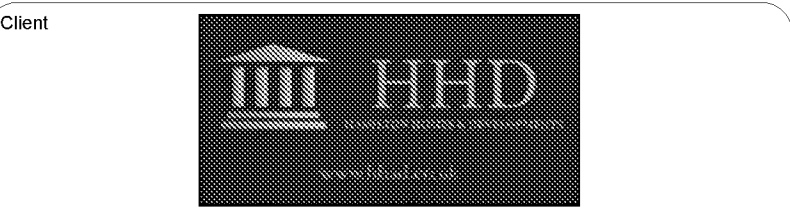
NOTES:

1. Do not scale from this drawing. Written dimensions are to be used.
2. Site and OS plan based on Above Architecture Block Plan as Proposed drawing P003 Rev D. Topographical survey based on Medlime Surveys Limited drawing EX01 (December 2019).
3. For planning and discussion purposes only. Not to be used for tender or construction.
4. To be read in conjunction with the Micro Drainage simulations.

Exceedance Flow Path

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
FOR PLANNING PURPOSES ONLY

A	Finished floor levels updated plots 2/3 at Architects request	JH	TL	24.01.2022
Rev.	Description	Dm	Ckd	Date



Project
**Land adjacent Sefton School,
House, Sefton Road**

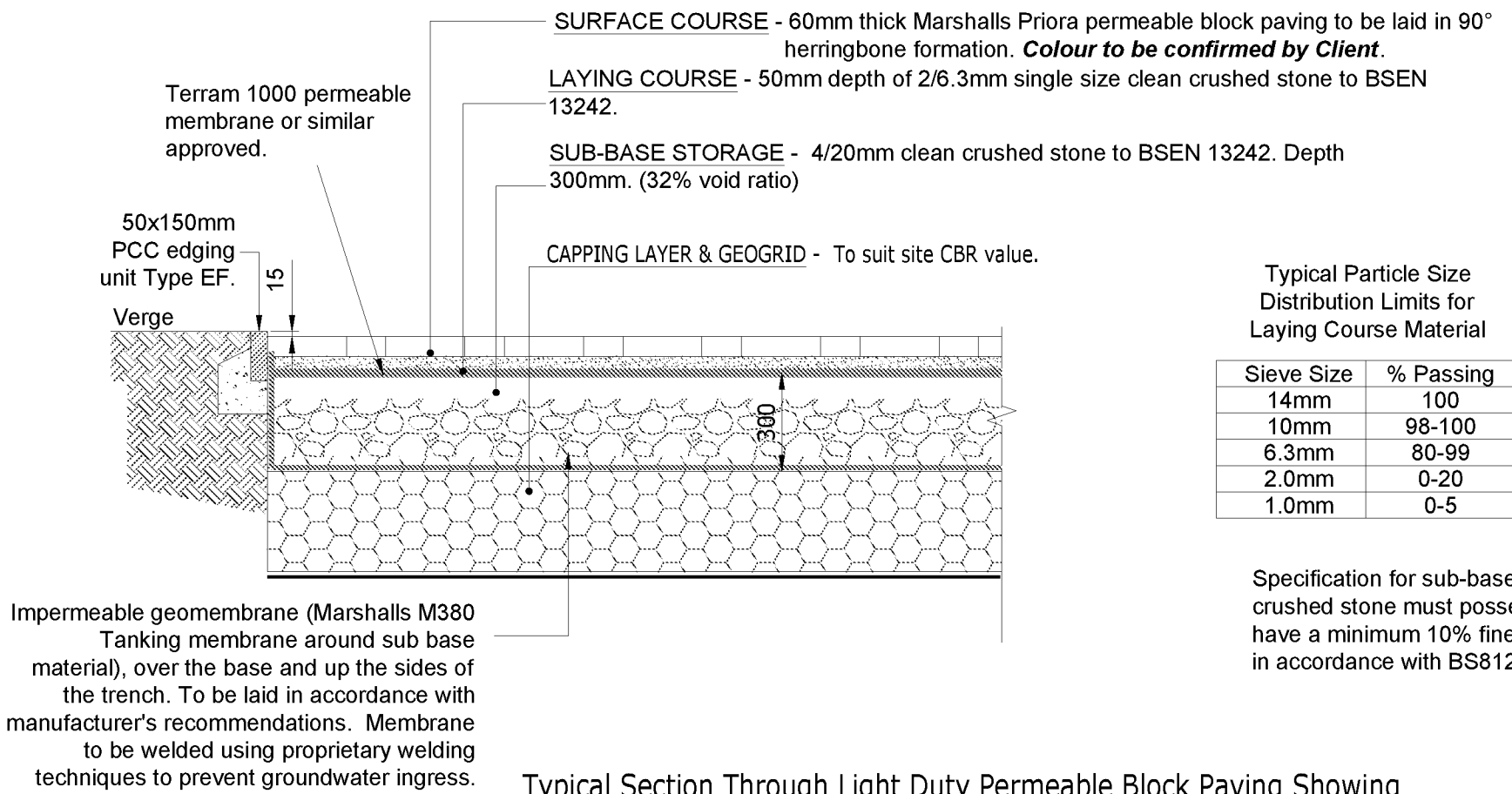
Title
Exceedance Flows



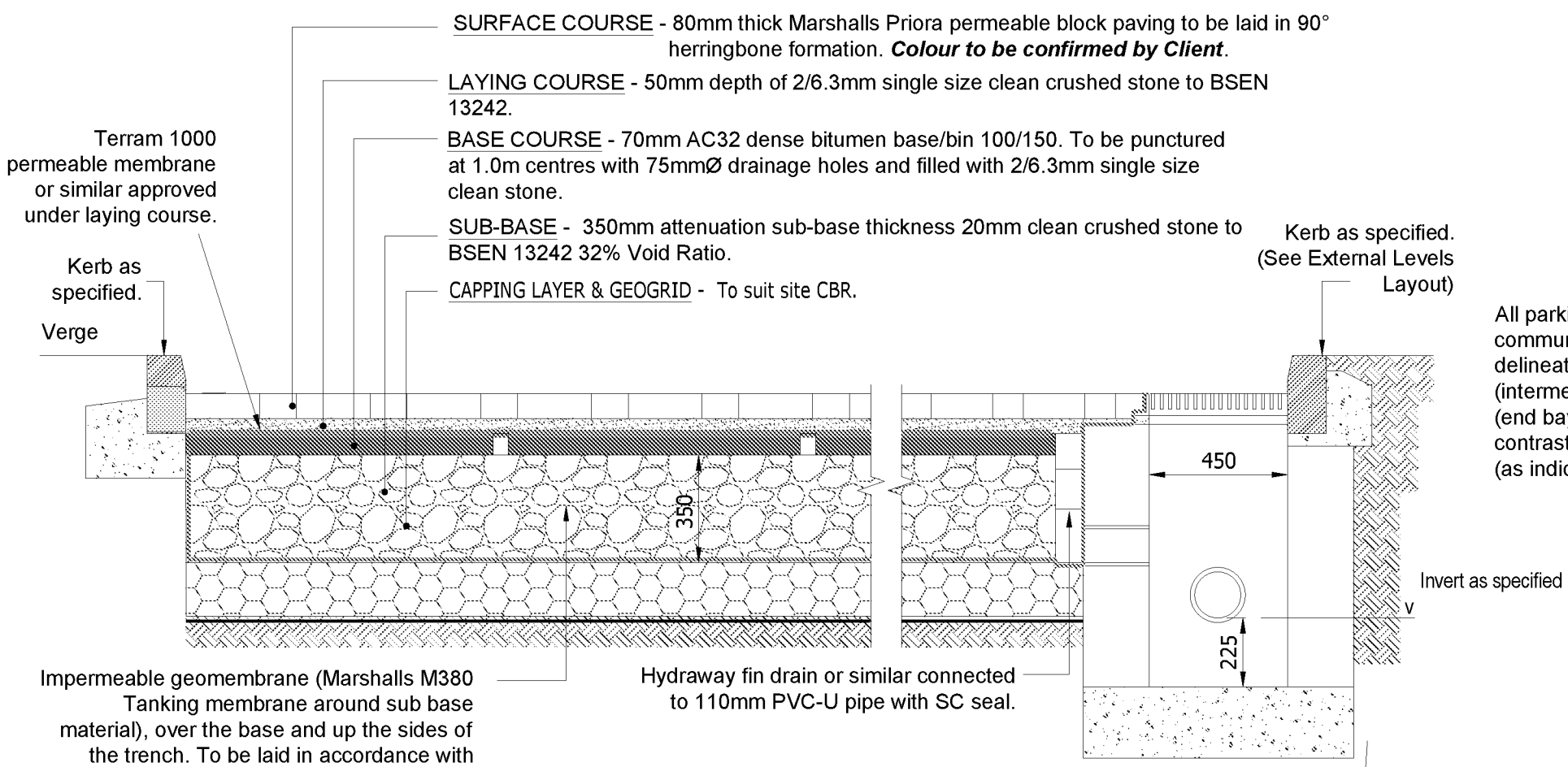
Scale	1:200 on A1	Drawn	JH
Date	08/10/2021	Checked	TL
File	21-023-Acad-003	Drawing No	21-023-003
		Rev	A

Appendix H

Construction Details



Typical Section Through Light Duty Permeable Block Paving Showing

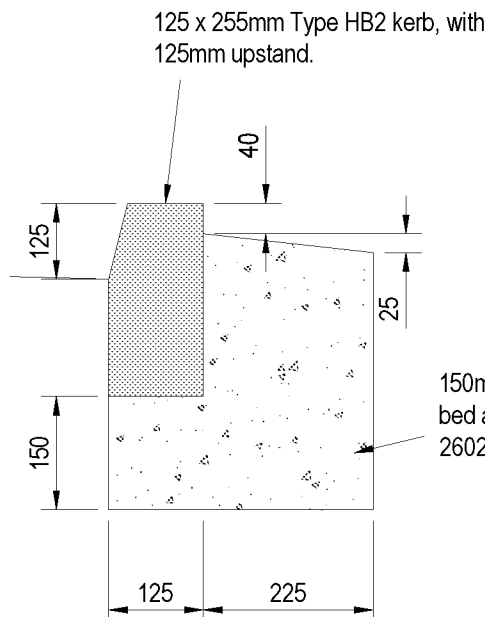


Typical Section Through Heavy Duty Permeable Block Paving Showing Road Sump Gully

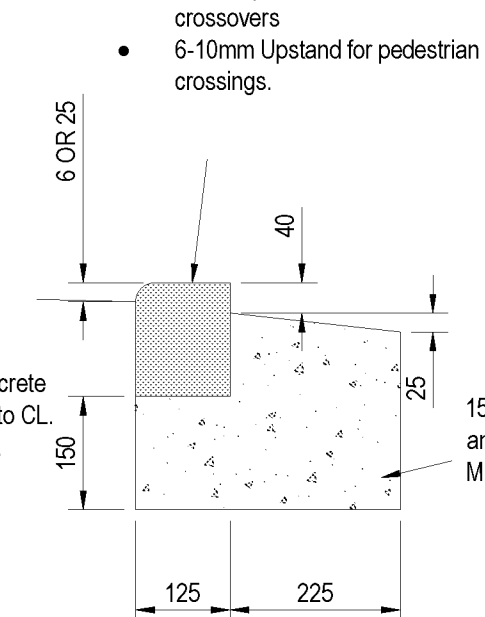
Marshalls Table & Capping Layer Thickness

Subgrade CBR Value	Capping Layer Thickness Type C Systems (mm)			
	Open Graded Crushed Rock or MOT Type 1		Capping Material	
	Without M15 Grid	With M15 Grid	Without M15 Grid	With M15 Grid
5%	--	--	--	--
4%	100	--	150	--
3%	125	100	225	150
2%	175	125	350	225
1%	300	175	600	350

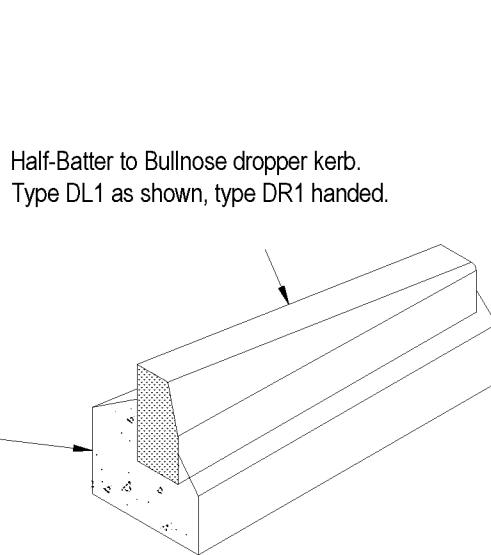
Kerb Detail-Type HB2



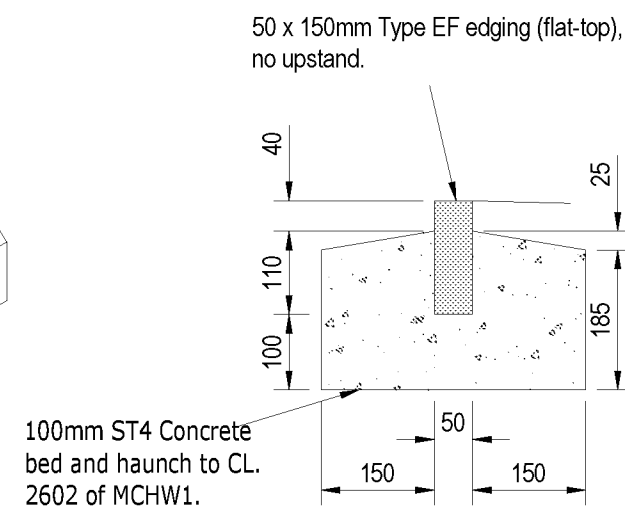
Kerb Detail-Type BN (Dropped)



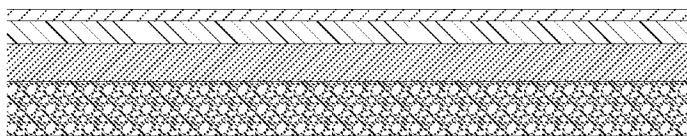
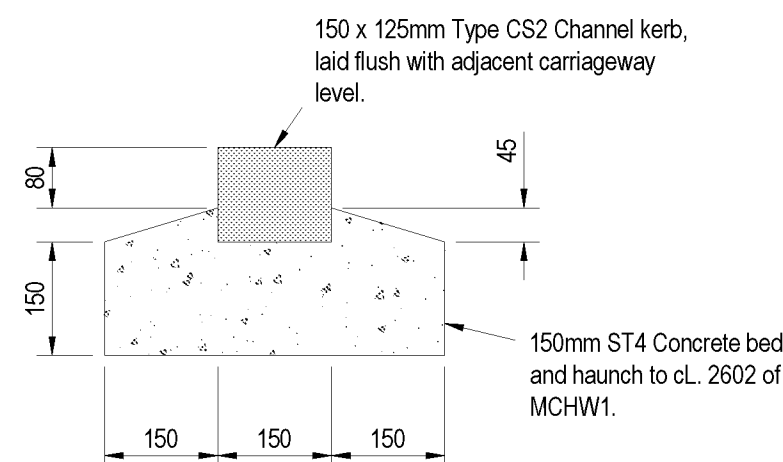
Dropper Kerb Type DL1 (& DR1 handed) (N.T.S.)



Edging Type EF



Channel Kerb Detail-Type CS2



CONSTRUCTION SPECIFICATION FOR PRIVATE ACCESS ROAD

(NHBC 2022 Table 2a: Private road having frequent use by commercial vehicles)

SURFACE COURSE

30mm thickness of 10mm Stone Mastic Asphalt SMA to BS EN 13108-5 and PD 6691 utilising aggregate to BS EN 13043 and PD 6682-2.

BINDER COURSE

60mm thickness Asphalt concrete AC20 dense binder 100/150 des to BS EN 13108-1 and PD 6682-2.

BASE

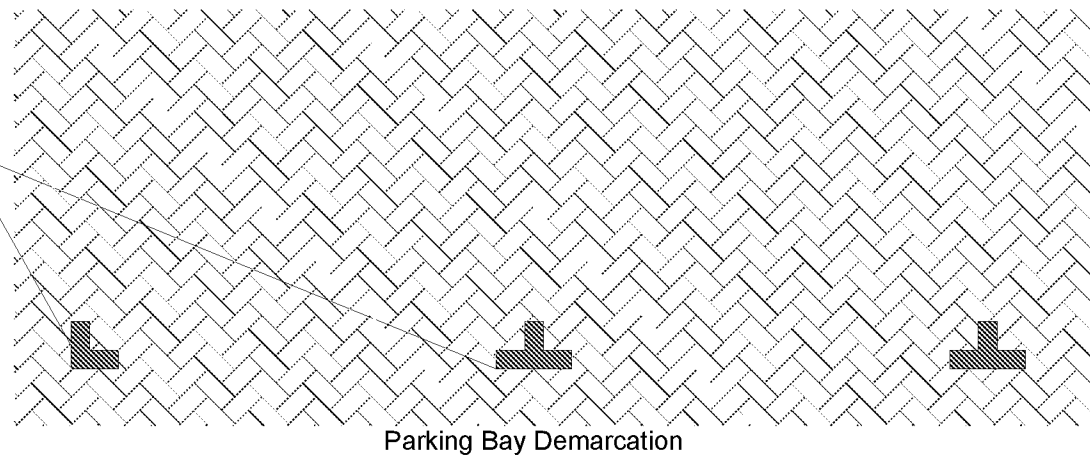
100mm thickness Asphalt Concrete AC32 dense base 100/150 des to BS EN 13108-1 and PD 6682-2

SUB-BASE

Type 1 granular material to Clause 803 table 8/2 MCHW Volume 1 Series 800. Thickness to suit CBR value (refer to table 1).

GEOTEXTILE

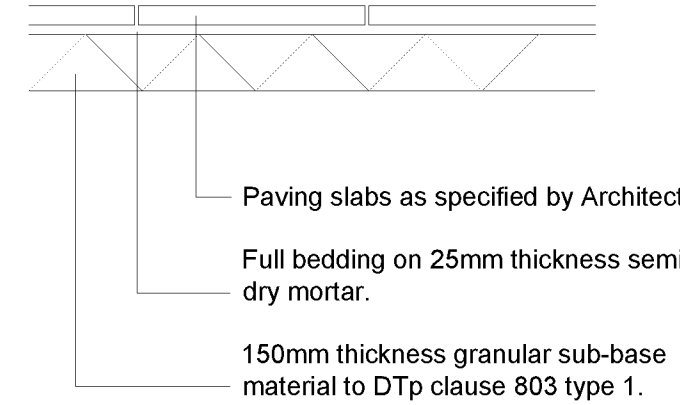
Optional



All parking spaces within communal areas to be delineated by a 'I' (intermediate bays) or 'I' (end bays) using contrasting colour blocks (as indicated above).

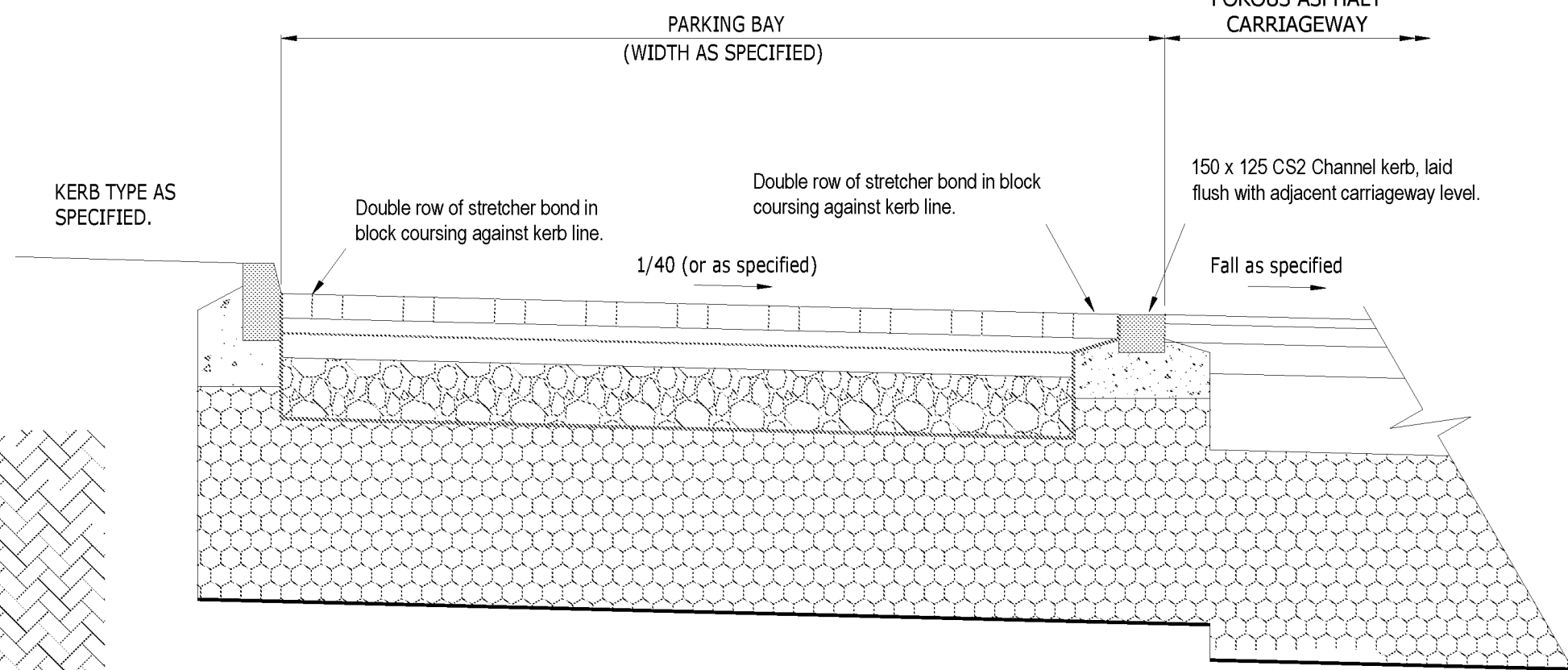
Table 1: Minimum sub-base thickness for paved areas (NHBC Table 3)

CBR Value	Minimum thickness (mm) of sub-base Consolidated in accordance with MCHW volume 1 clause 801, table 8/4
Less than 2%	Subgrade requires improvement
2-3%	325
3-5%	250
5-7%	150
7-20%	100



Paths and Patio Areas

In private pedestrian areas only.



Typical Cross Section Through Permeable Block Paved Parking Bay Adjacent Tarmac Construction (1:20)

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Where existing trees are shown to be retained they should be subject to a Full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A Foundation is to be provided to accommodate the proposed tree planting, where applicable.

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NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
- ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
- NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
- ALL MATERIALS AND WORKMANSHIP SHALL COMPLY FULLY WITH THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME ONE (MCHW1) SPECIFICATION FOR HIGHWAY WORKS AND KEY COUNTY COUNCIL.
- THE CONTRACTOR SHALL UNDERTAKE SUCH MATERIALS TESTING AS INDICATED IN THE SPECIFICATIONS AND SHALL INCLUDE THE COST OF TESTING IN THE TENDER.
- WHERE NECESSARY, ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF AT AN APPROVED TIF OFF-SITE.

KERB NOTES:

- ALL KERBS TO BE IN ACCORDANCE WITH BS7263 PART 1: 2001.
- ALL INSTITUTE CONCRETE TO FOUNDATION AND HAUNCH TO BE CLASS ST1 TO CL. 2602 OF BS812.
- KERB FOUNDATION TO BE LAID ON ROLLED SUB-BASE OF MINIMUM THICKNESS 150mm.
- THE KERB BED AND BACKING SHALL BE LAID IN ONE OPERATION.
- WHERE THE BED IS LAID IN ADVANCE OF THE KERBS A 300mm DIA. MILD STEEL DOVEL BARS WILL BE REQUIRED IN BACKING AT 600mm CENTRES AND KERBS WILL BE BEDDED ON 10mm THICK STARTER TO DESIGNS (IN) OF CL. 2604 OF SHW.
- KERBS SHALL BE LAID WITH DRY JOINTS AND CLOSELY BUTTED LEAVING A 2-3mm GAP AT EACH JOINT FOR EXPANSION.
- TRANSITION KERBS SHALL BE USED AT ALL CHANGES IN KERB FACE.
- FOR KERB AND CHANNEL RADI OF 12m OR LESS, THE APPROPRIATE RADIUS SHALL BE USED.
- FOR RADI OF BETWEEN 12m AND 18m STRAIGHT KERBS 600mm LONG SHALL BE USED.
- CUTTING KERBS AND CHANNELS SHALL BE OF AN APPROVED MECHANICAL MEANS.
- THE LENGTH OF ANY KERB OR CHANNEL SHALL NOT BE LESS THAN 300mm.

CONSTRUCTION NOTES:

- ALL SOFT SPOTS AND VOIDS SHALL BE REMOVED BEFORE CONSTRUCTION AND REPLACED WITH SUITABLE FILL MATERIAL.
- ROAD FORMATION TO BE IN ACCORDANCE WITH CLAUSE 816 AND COMPACTED IN ACCORDANCE WITH TABLE THE REQUIREMENTS OF 84 OF THE SPECIFICATION FOR HIGHWAY WORKS - SERIES 800 EARTHWORKS.
- THE CONTRACTOR MUST VERIFY CBR VALUES ALONG EACH ACCESS ROAD AT FORMATION LEVEL AT APPROX 30m INTERVALS. THE RESULTS OF WHICH MUST BE SENT TO THE ENGINEER & HIGHWAYS INSPECTOR FOR CONFIRMATION OF THE CARRIAGEWAY CONSTRUCTION SHOWN ON THIS DRAWING. PRIOR TO COMMENCING THE WORKS.
- A RESIDUAL TRANSLUCATED TOTAL HERBICIDE WITH SOME CONTACT EFFECT, BUT NON-POISONOUS TO HUMAN BEINGS, ANIMALS AND INSECTS SHALL BE SPRAY APPLIED TO ALL FORMATIONS. THE PROPOSED HERBICIDE TO BE USED BY THE CONTRACTOR MUST FIRST OBTAIN ITS APPROVAL, BY THE HIGHWAY AUTHORITY.
- ALL CONCRETE AND CEMENT MORTAR MUST BE SULPHATE RESISTING TO BS8421.
- ALL CARRIAGEWAY MATERIALS SHALL BE SUPPLIED AND LAID IN ACCORDANCE WITH BS EN 13108.
- ALL MATERIALS IN CARRIAGEWAY & FOOTWAY TO BE LAID BY MACHINE.
- NO SURFACE WORKS ARE PERMITTED WITHIN THE ADAPTABLE HIGHWAY.
- THE AVERAGE TEXTURE DEPTH FOR BITUMINOUS SURFACING SHALL BE EQUAL TO OR MORE THAN 1mm AND NOT MORE THAN 1.2mm.
- FOR ALL BITUMINOUS MATERIALS, TRANSPORTATION, LAYING, COMPACTION AND TYPE TESTING PROTOCOLS SHALL CONFORM TO BS 5948:2010.
- WHERE AGREED IN WRITING WITH THE HIGHWAY AUTHORITY, RECLAIMED ASPHALT MAY BE USED IN ACCORDANCE WITH BS EN 13108 AND CLAUSES 802 & 844 OF MCHW1. FOR ADDITIONAL GUIDANCE REFER TO PD 6691: 2007.
- WHERE THE SURFACE FINISH VARIES WITHIN THE WORKS, E.G. ASPHALT, CONCRETE, BLOCK PAVERS ETC TO THE SPECIFICATION OF MATERIALS USED SHALL REMAIN CONSISTANT THROUGHOUT.
- BOND COATS SHALL BE APPLIED BETWEEN BOUND LAYERS OF BITUMINOUS MATERIALS BY METERED MECHANICAL SPRAYING EQUIPMENT. SPRAY TANKER OR SPRAYING DEVICE INTEGRAL WITH THE PAVING MACHINE. BOND COATS SHALL HAVE BBA CERTIFICATION AND COMPLY WITH CLAUSE 820 OF MCHW1.

CDM NOTES:

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

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
PENDING APPROVAL

Rev.	Description	Dm	Ckd	Date
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Project

Land adjacent Seftor School,
House, Seftor Road

Title

Pavement Construction
Details



Scale	As shown @ A1	Drawn	MD
Date	March 2022	Checked	TL
File	PR21-023-Civils-dwgs-360	Drawing No	21-023-360
		Rev	-

Maximum depth from cover level to soffit of pipe for areas subject to vehicle loading 3m, non entry.
Based on Sewers for Adoption 7th Edition
Scale: 1:20

Access opening restricted to 350mm diameter or 300mm x 300mm if depth to invert is > 1m

Manholes cover to suit BS EN 124 loading Highways - Class D400 600mm clear opening

Class B engineering brickwork, concrete blocks or precast concrete cover frame seating ring

Precast concrete slab or in-situ concrete slab to support cover and frame

Flexible Seal

DOT Type 1 sub base (thickness varies)

Temporarily cap manhole shaft during construction

Minimal Internal dimensions 450mm diameter or 450mm x 450mm

Excavation width varies with depth

Joints between base and shaft and between shaft components to be fitted with watertight seals

Base unit to have all connection with soffit levels no lower than that of the main pipe

150mm granular pipe bedding material

Joints to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

Invert of connecting pipe at least 50mm above that of the main pipe.

Maximum depth from cover level to soffit of pipe 3m, non entry.
Based on Sewers for Adoption 7th Edition
Scale: 1:20

Class B125
See Clause E2.32, Sewers for Adoption 7th Edition

Mortar bedding and haunching to cover and frame to Clause E6.7

150mm deep concrete collar

Flexible Seal

Temporarily cap manhole shaft during construction

Joints between base and shaft and between shaft components to be fitted with watertight seals

Joints to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

Access opening restricted to 350mm diameter or 300mm x 300mm if depth of chamber to invert is >1m

DOT Type 1 sub base (thickness varies) or concrete surround

Minimal internal dimensions 450mm diameter or 450mm x 450mm

Excavation width varies with depth

Base unit to have all connection with soffit levels no lower than that of the main pipe

150mm granular pipe bedding material

Invert of connecting pipe at least 50mm above that of the main pipe.

See Clause E2.32, Sewers for Adoption 7th Edition

Mortar bedding and haunching to cover and frame to Clause E6.7

Topsoil

Flexible Seal

Temporarily cap manhole shaft during construction

Joints between base and shaft and between shaft components to be fitted with watertight seals

Joints to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

Access opening restricted to 350mm diameter or 300mm x 300mm if depth of chamber to invert is >1m

DOT Type 1 sub base (thickness varies) or concrete surround

Minimal internal dimensions 450mm diameter or 450mm x 450mm

Excavation width varies with depth

Base unit to have all connection with soffit levels no lower than that of the main pipe

150mm granular pipe bedding material

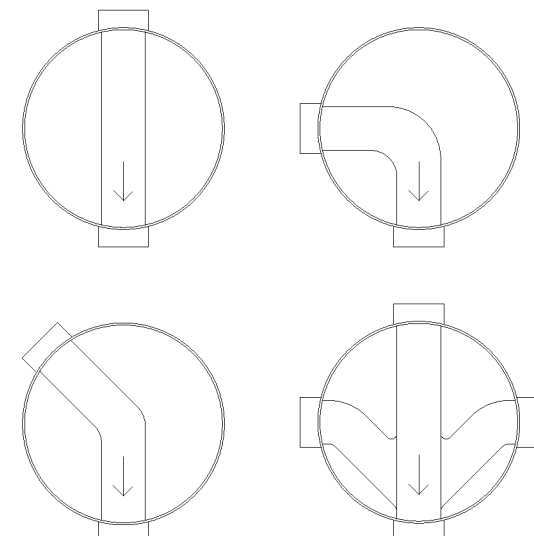
Invert of connecting pipe at least 50mm above that of the main pipe.

Maximum depth from cover level to soffit of pipe for areas subject to vehicle loading 3m, non entry.
Based on Sewers for Adoption 7th Edition
Scale: 1:20

Figure B.18
Typical Inspection Chamber Detail - Type 3
Maximum depth from cover level to soffit of pipe for areas subject to vehicle loading 25', non entry
Based on Sewers for Adoption 7th Edition
Scale 1:20

Based on Sewers for Adoption 7th Edition
Scale: NTS

Note: Where bend is used immediately outside the manhole, this may be used as the rocker pipe



Maximum depth from cover level to soffit of pipe 2m, non entry.
Based on Sewers for Adoption 7th Edition
Scale: 1:20

of the main pipe

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
PENDING APPROVAL

Rev.	Description	Dm	Ckd	Date

Client



HHD
HUMAN CAPITAL DEVELOPMENT
www.hhd.co.uk

Project

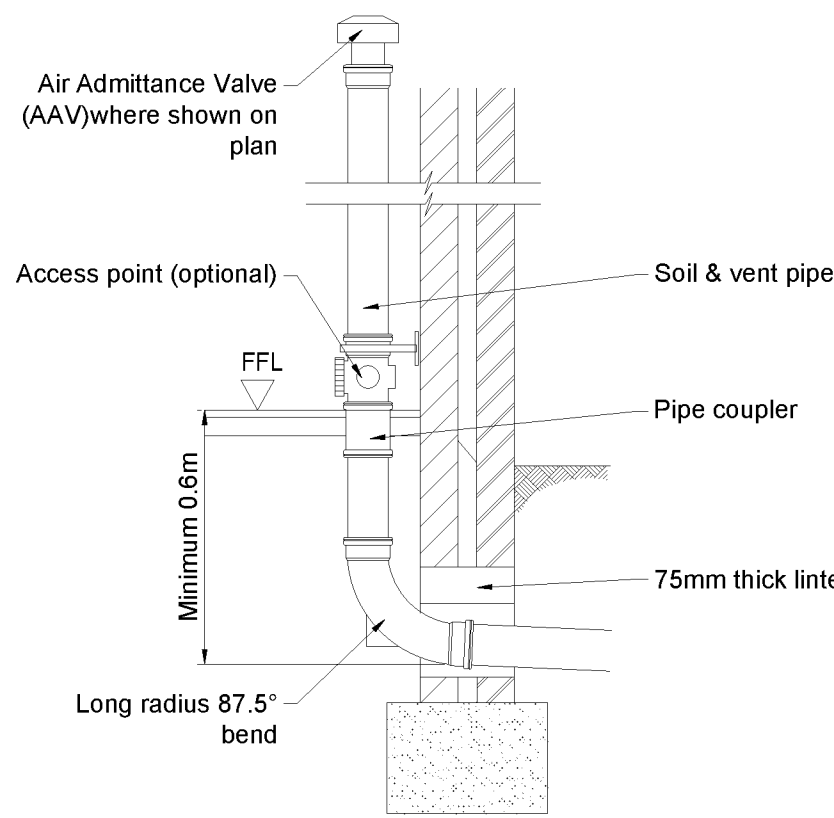
Land adjacent Sefton School,
House, Sefton Road

Title

Private Drainage
Details - Sheet 1

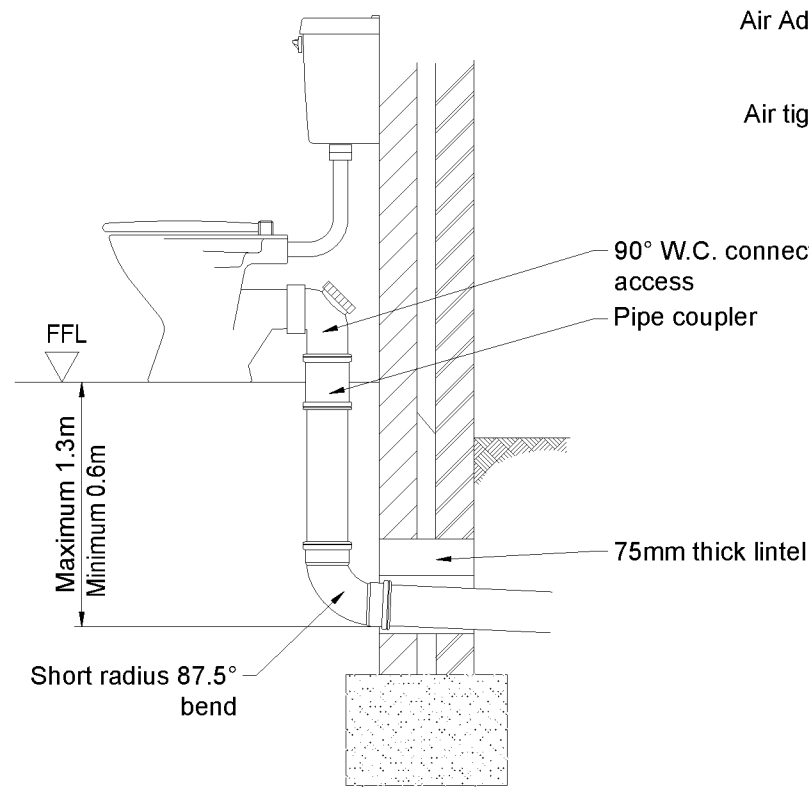

ADAMA
CONSULTING
Civil & Infrastructure Engineering Design
Unit 34, The Enterprise Centre, Cranborne Road, Poiters Bar, EN6 3DQ
Tel: 01207 890 271 E-mail: info@adama-consulting.com
Web: www.adama-consulting.com

Scale	As shown @ A1	Drawn	MD
Date	March 2022	Checked	TL
File	PR21-023-Civils-dwgs-450	Drawing No	21-023-450
			Rev
			-



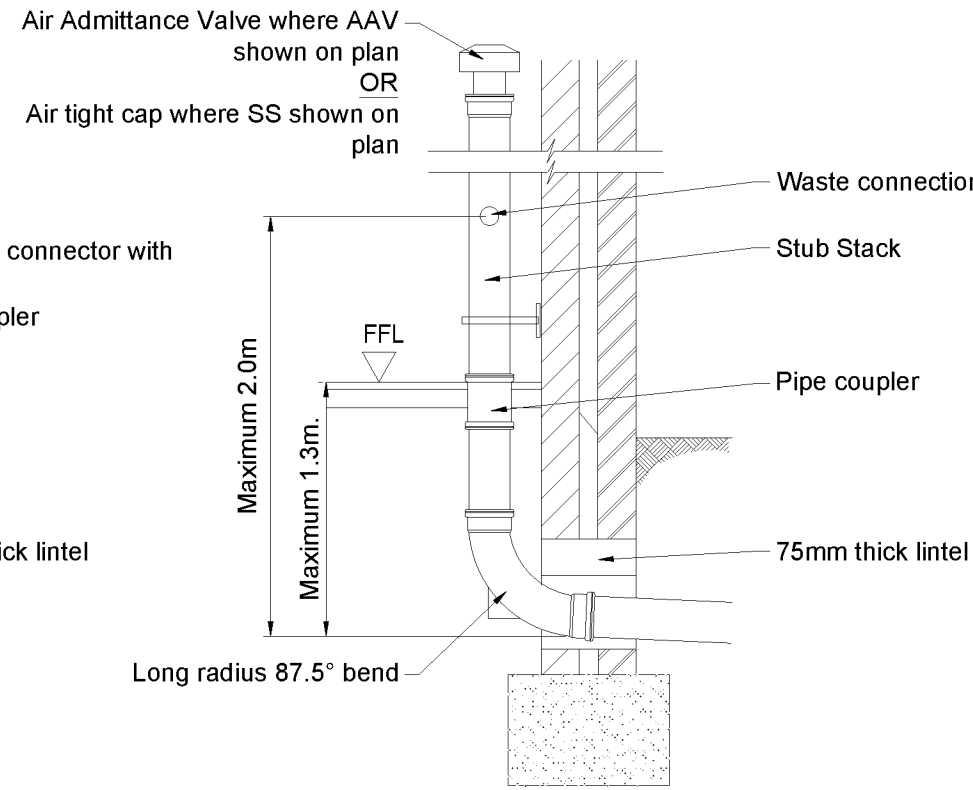
SVP to drain

Scale: 1:20



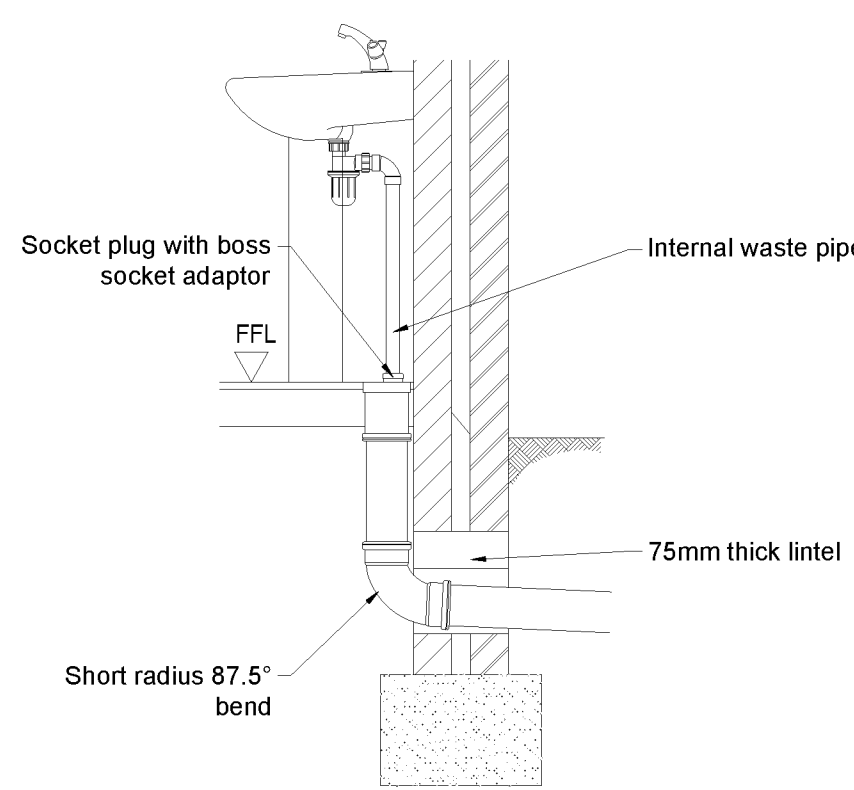
W.C. Direct to drain

Scale: 1:20



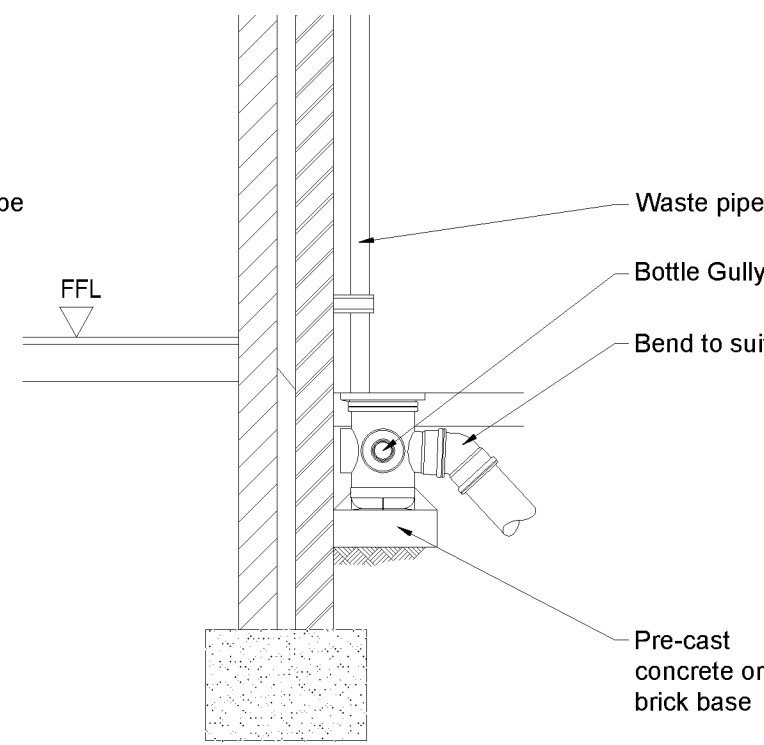
SS to drain

Scale: 1:20



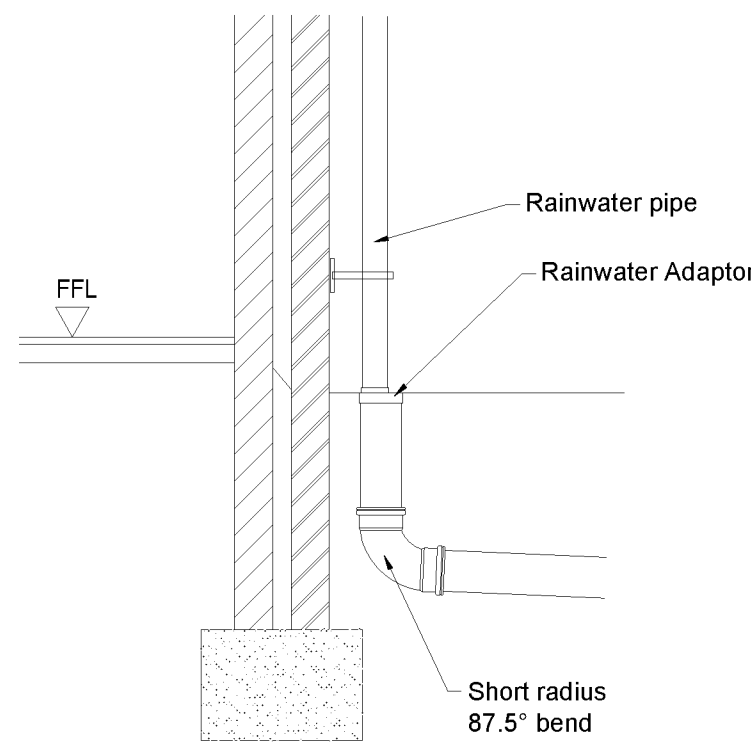
Internal Waste to drain

Scale: 1:20



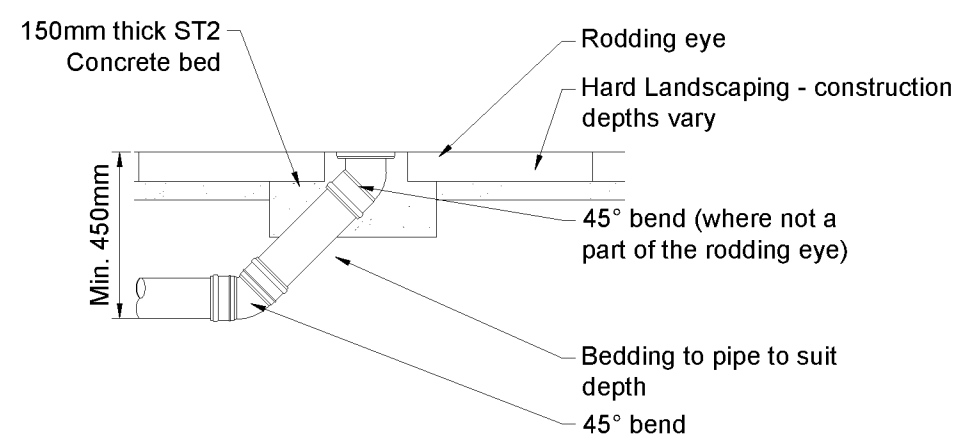
External Waste to Gully

Scale: 1:20



RWP to drain

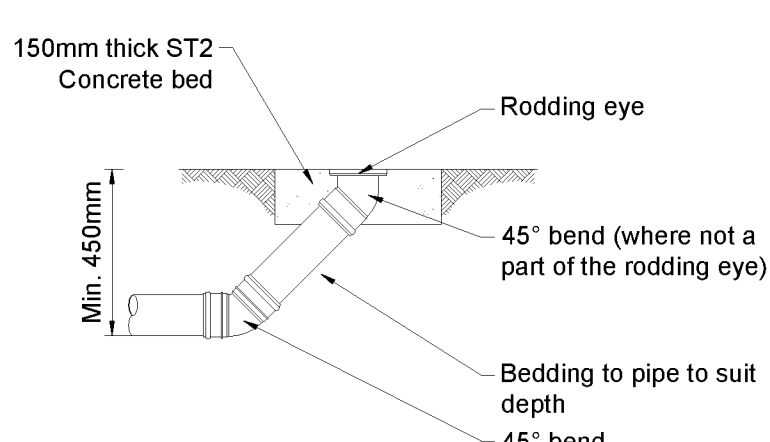
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Rodding Eye

Hard Landscaped Area

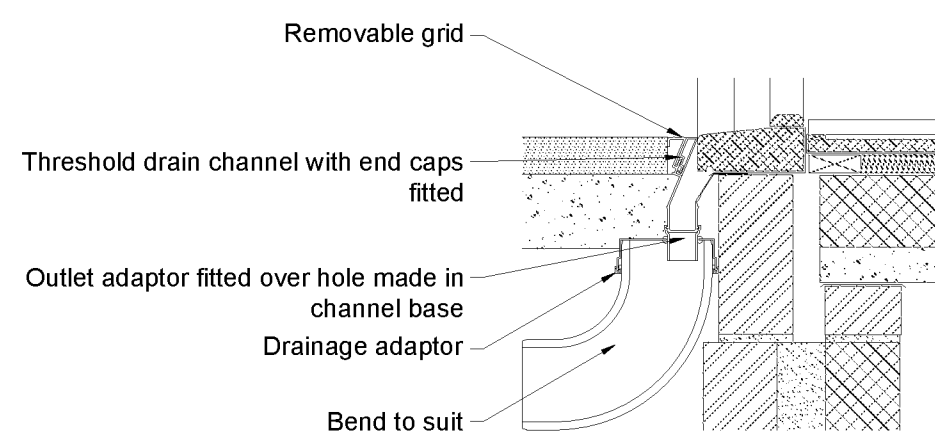
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Rodding Eye

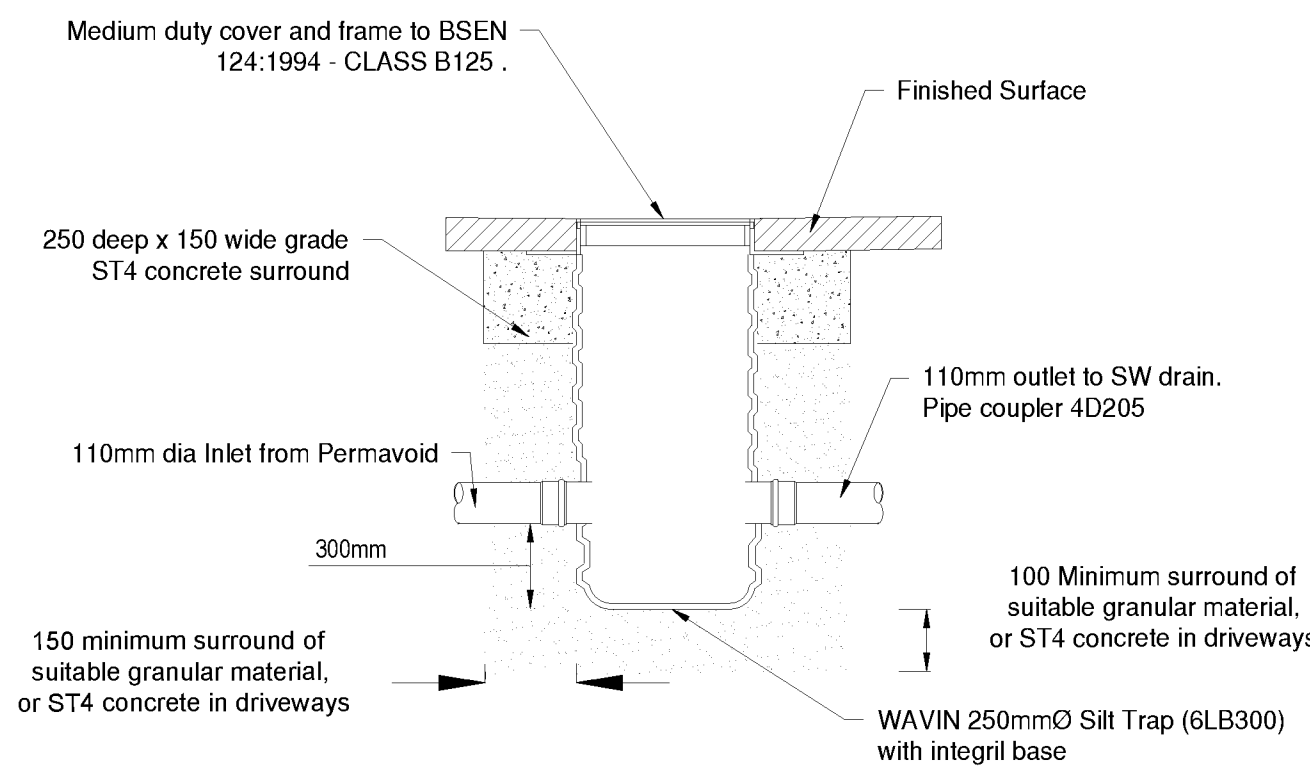
Soft Landscaped Area

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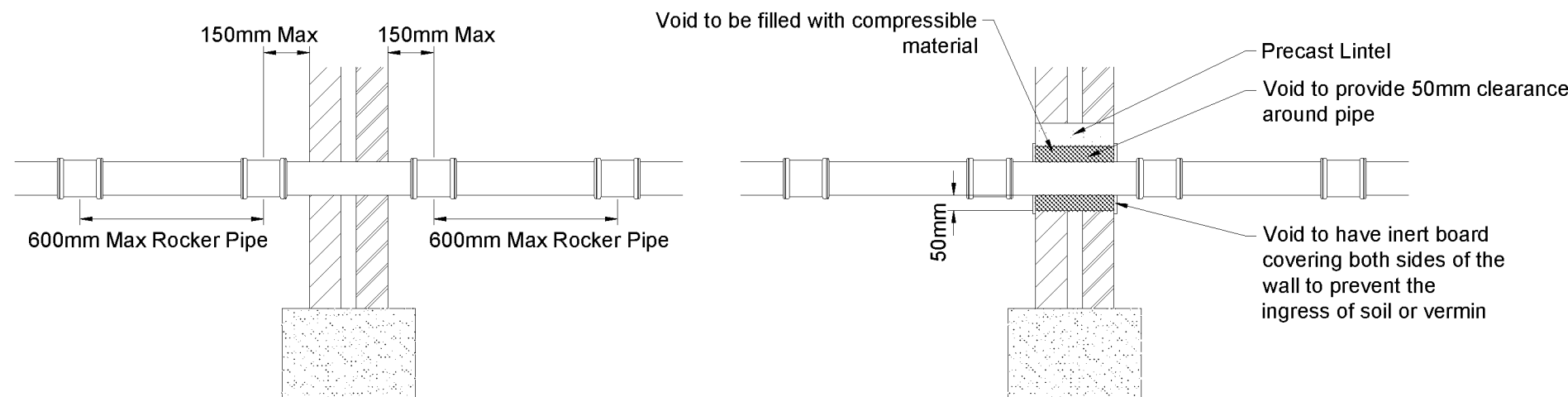
Threshold Drain Detail

Scale: 1:20



Silt Trap Detail (ST)

Scale: 1:20



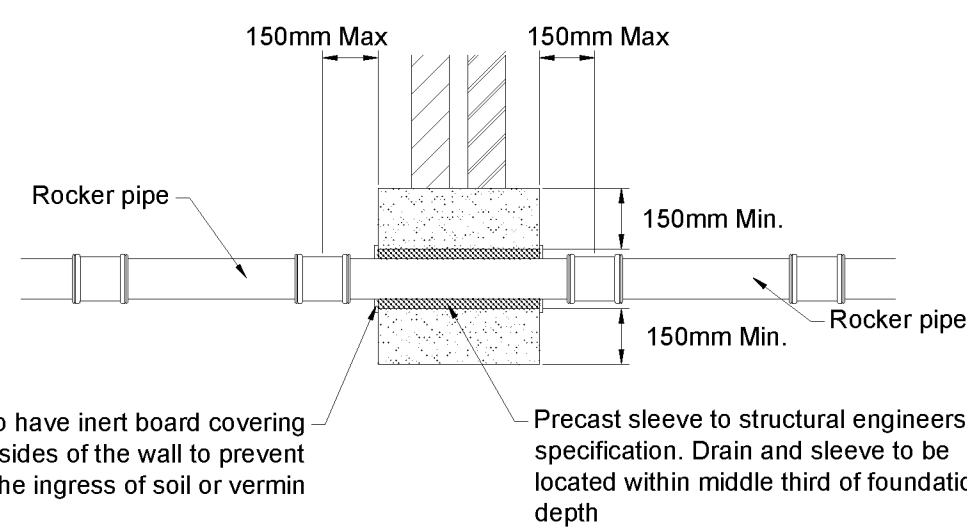
(A) Short length of pipe bedded in wall, joints formed within 150 of either wall face. adjacent rocker pipes of max. length 600mm with flexible joints.

(B) Arch or linteled opening to give 50 space all round the pipe.

Pipe Through Walls

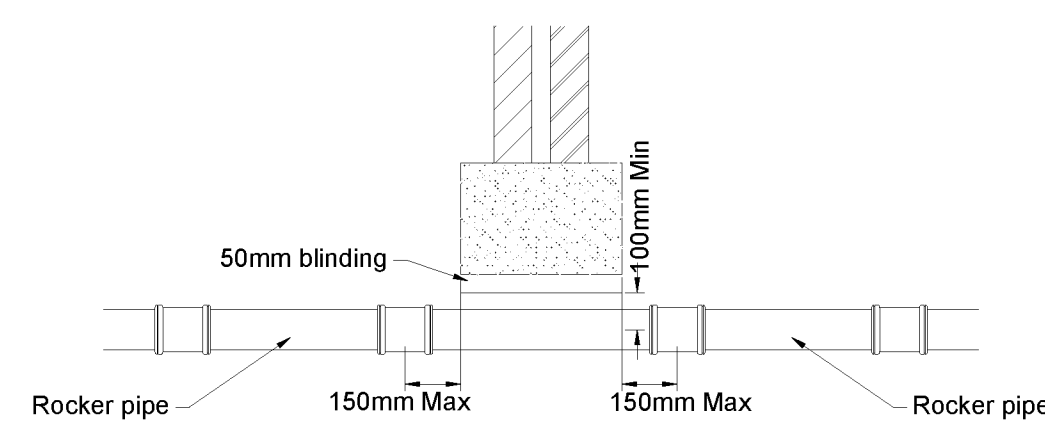
Building Regulations Part H Diagram 7

Scale: 1:20



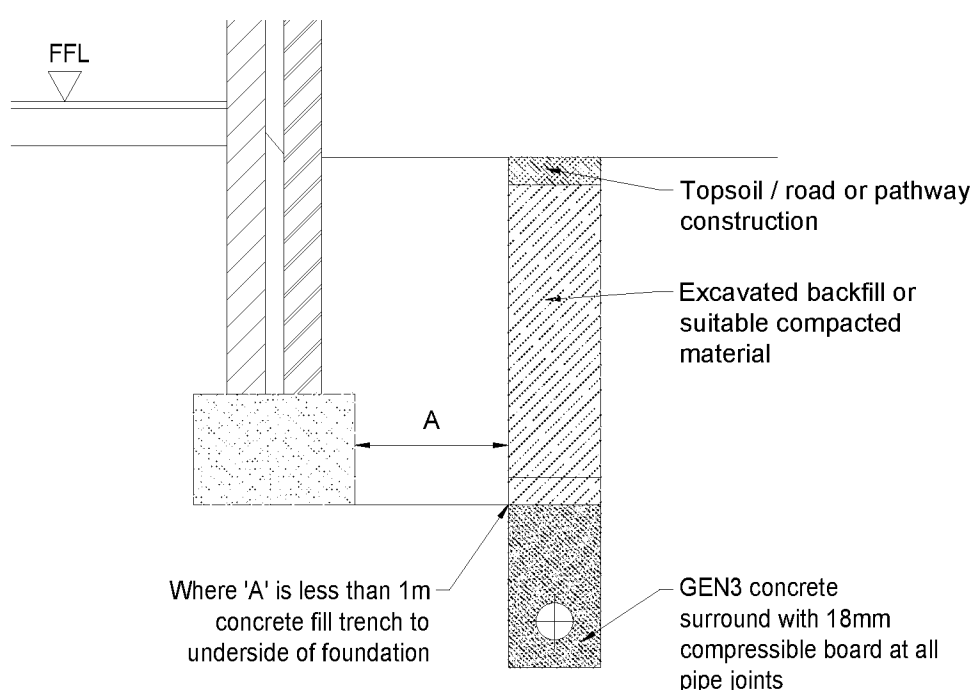
Pipe Through Strip Foundation

Scale: 1:20



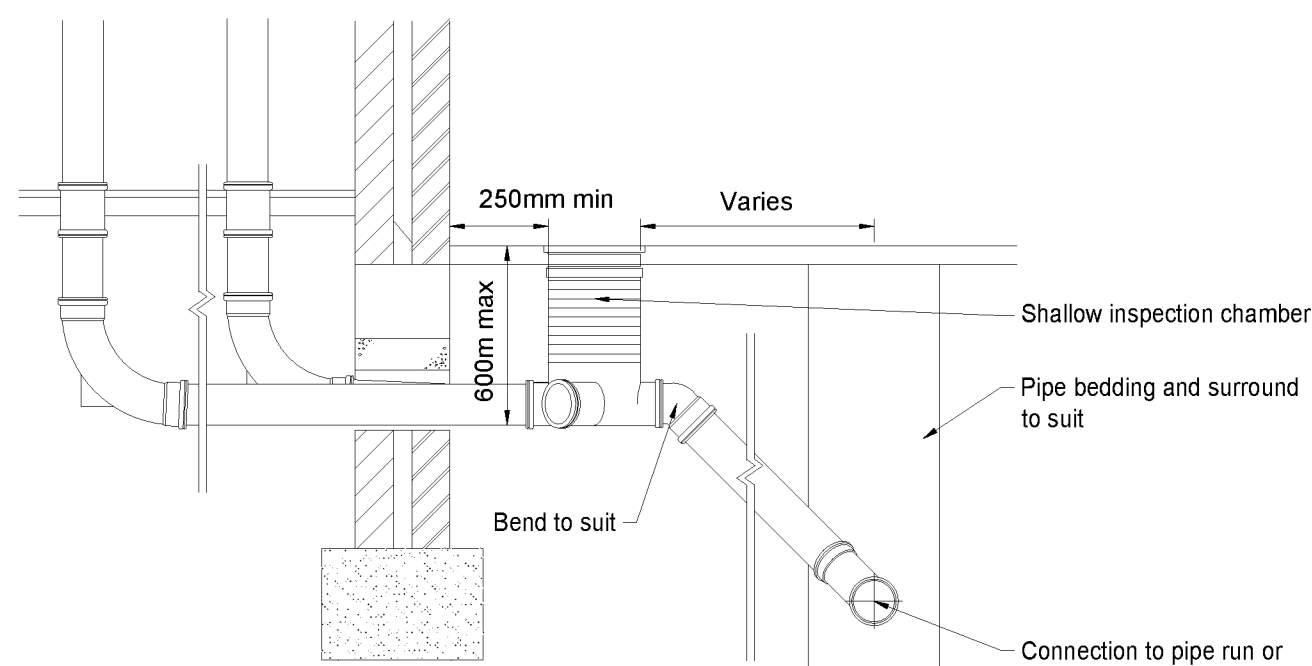
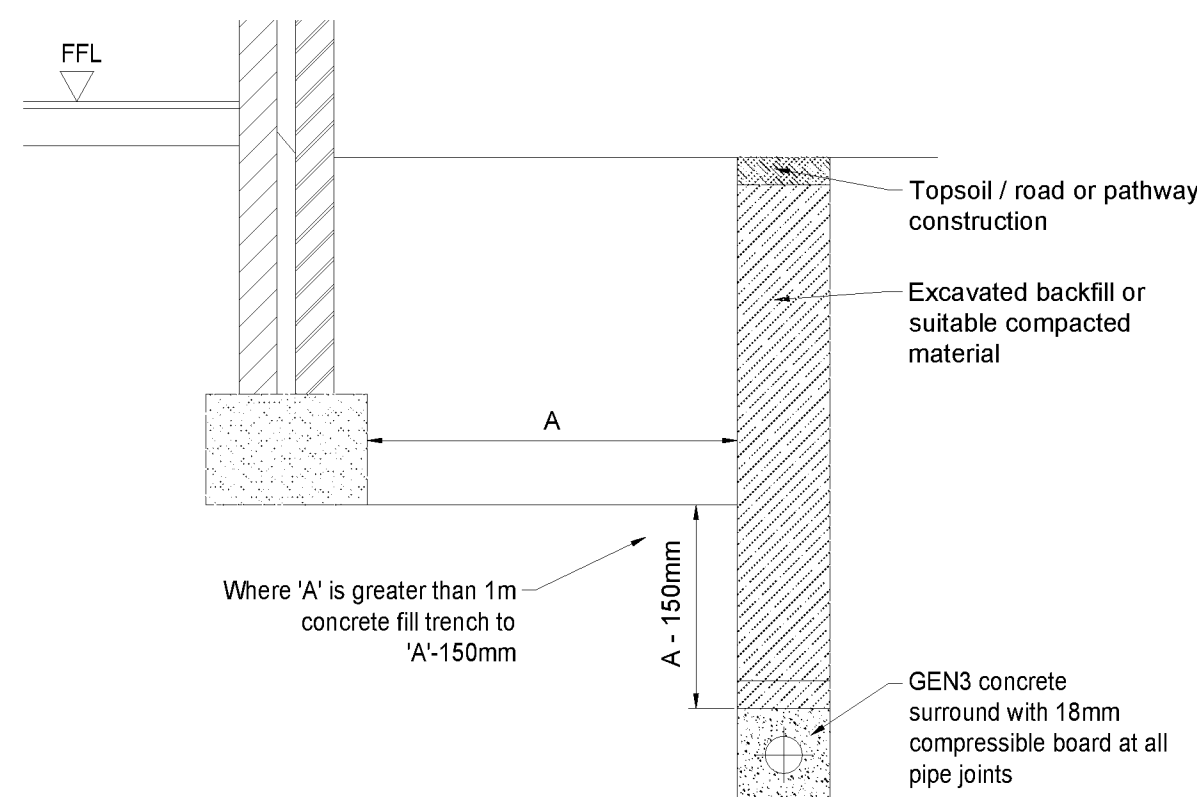
Pipe Under Foundation

Scale: 1:20



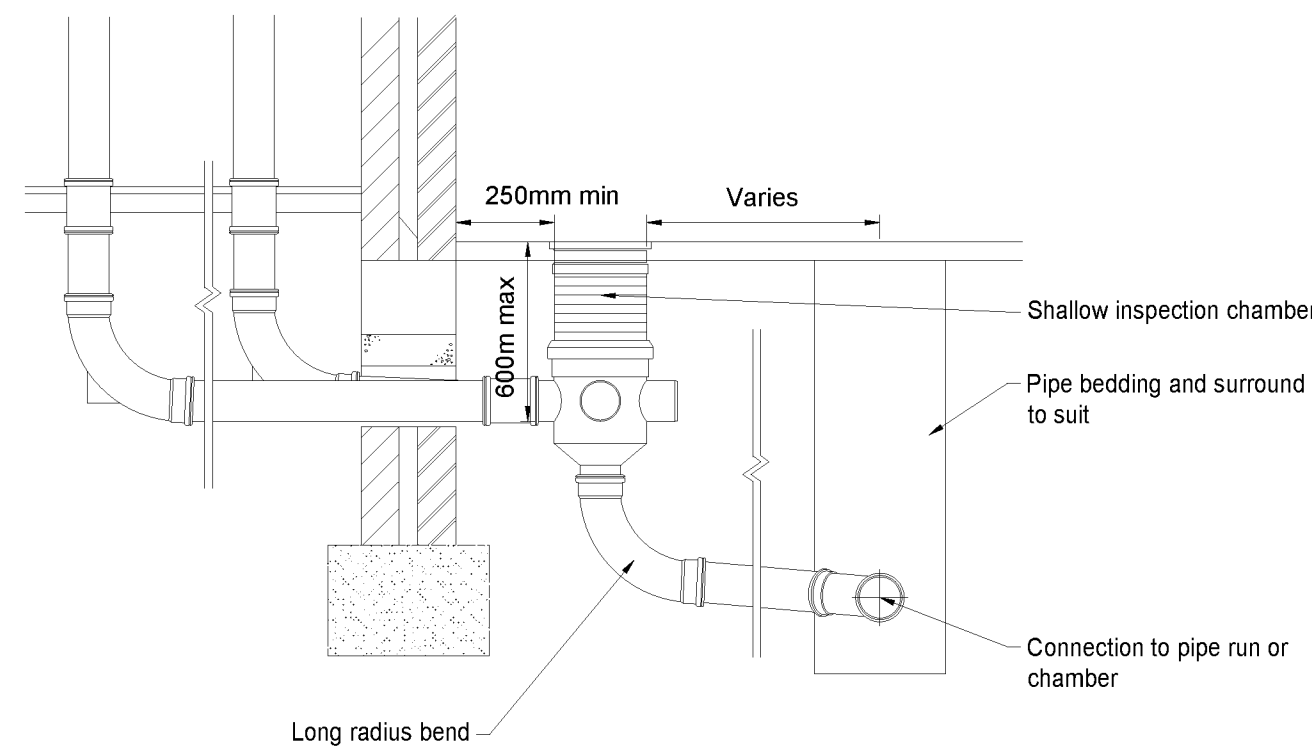
Pipe Runs Near Buildings

Scale: 1:20



SIC Connection to Main Drain Run

Scale: 1:20



250mm Ø Bottom Outlet Chamber to Main Drain Run

Scale: 1:20

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 - The setting out of the drainage works is to be agreed on-site with the engineer, prior to the commencement of works.
 - The contractor shall take all necessary precautions to protect the drainage works for the duration of the contract.
 - The contractor shall contact all of the appropriate statutory undertakers and establish the exact location of all services, prior to the commencement of the works, by hand dug trial pits.
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- #### PLOT DRAINAGE
- Private foul water and surface water drainage is to be constructed in accordance with the building regulations, BS EN 752 and relevant agreement certificates.
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 - Backfilling of drain trenches adjacent to dwellings of other structures to be in accordance with the building regulations Part H, diagram 8.
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 - Drains to be constructed under dwellings with suspended floor slabs should be either installed using a proprietary hanger system where "beam and pot" or similar construction is used, or should be cast into local slab thickening where reinforced concrete ground slabs are to be poured in situ.
 - Drains in areas of made ground to be constructed by first making up the area to approximately finished level and then excavate through the fill material into undisturbed ground. The drain trench is then to be backfilled to formation level using suitable granular fill material well compacted in layers not exceeding 225mm.

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
PENDING APPROVAL

Rev.	Description	Dm	Ckd	Date
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Project

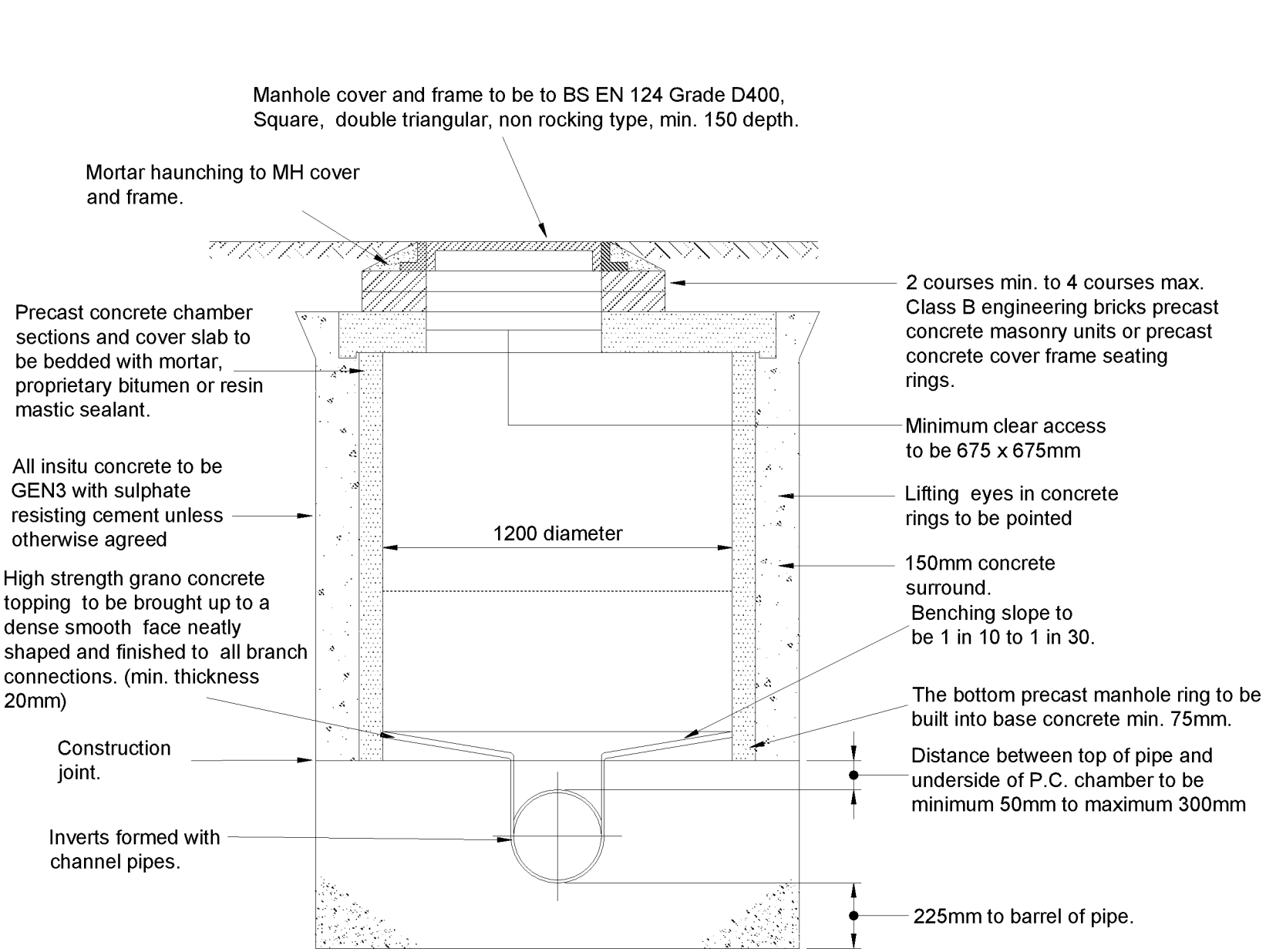
Land adjacent Seftor School,
House, Seftor Road

Title

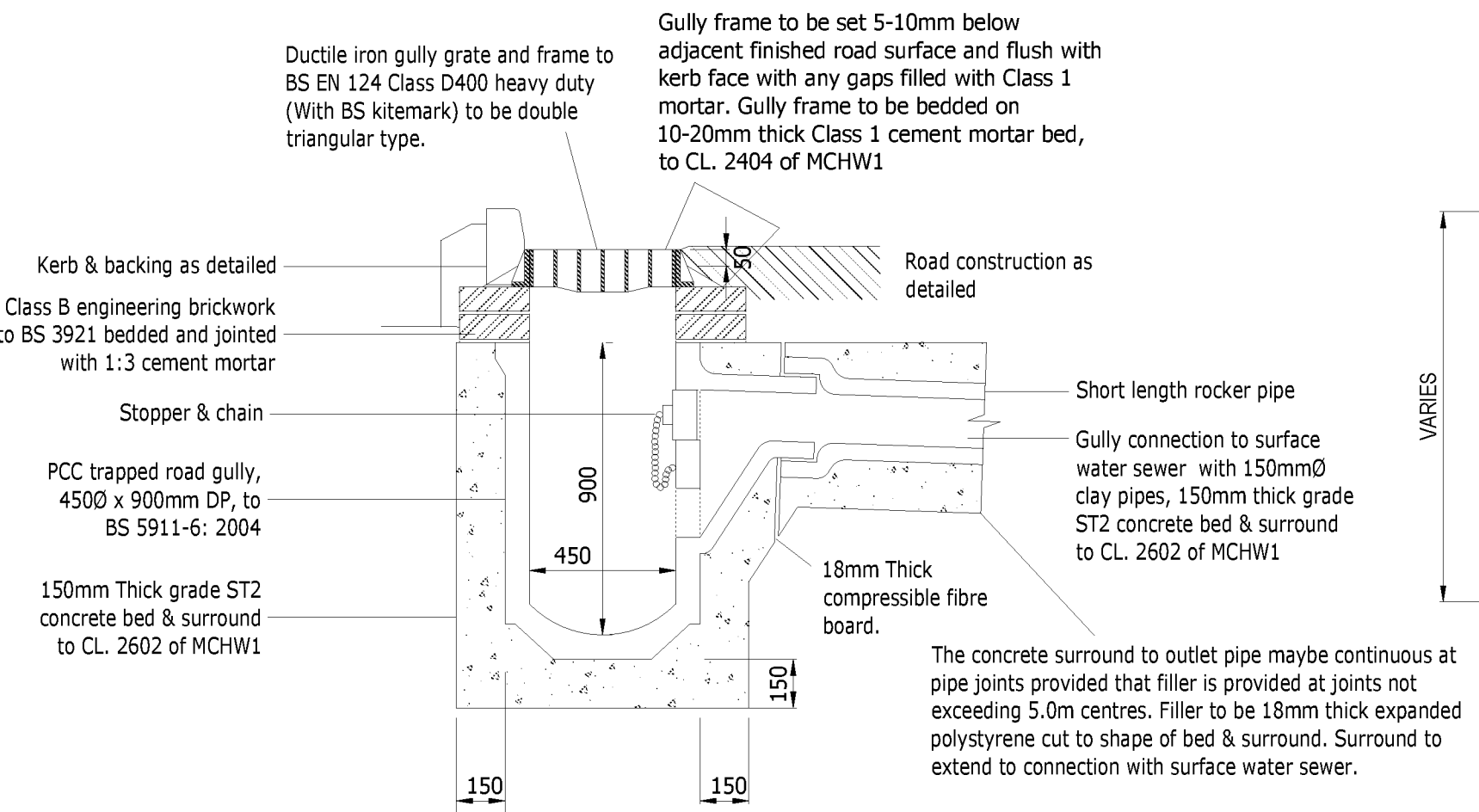
Private Drainage
Details - Sheet 2



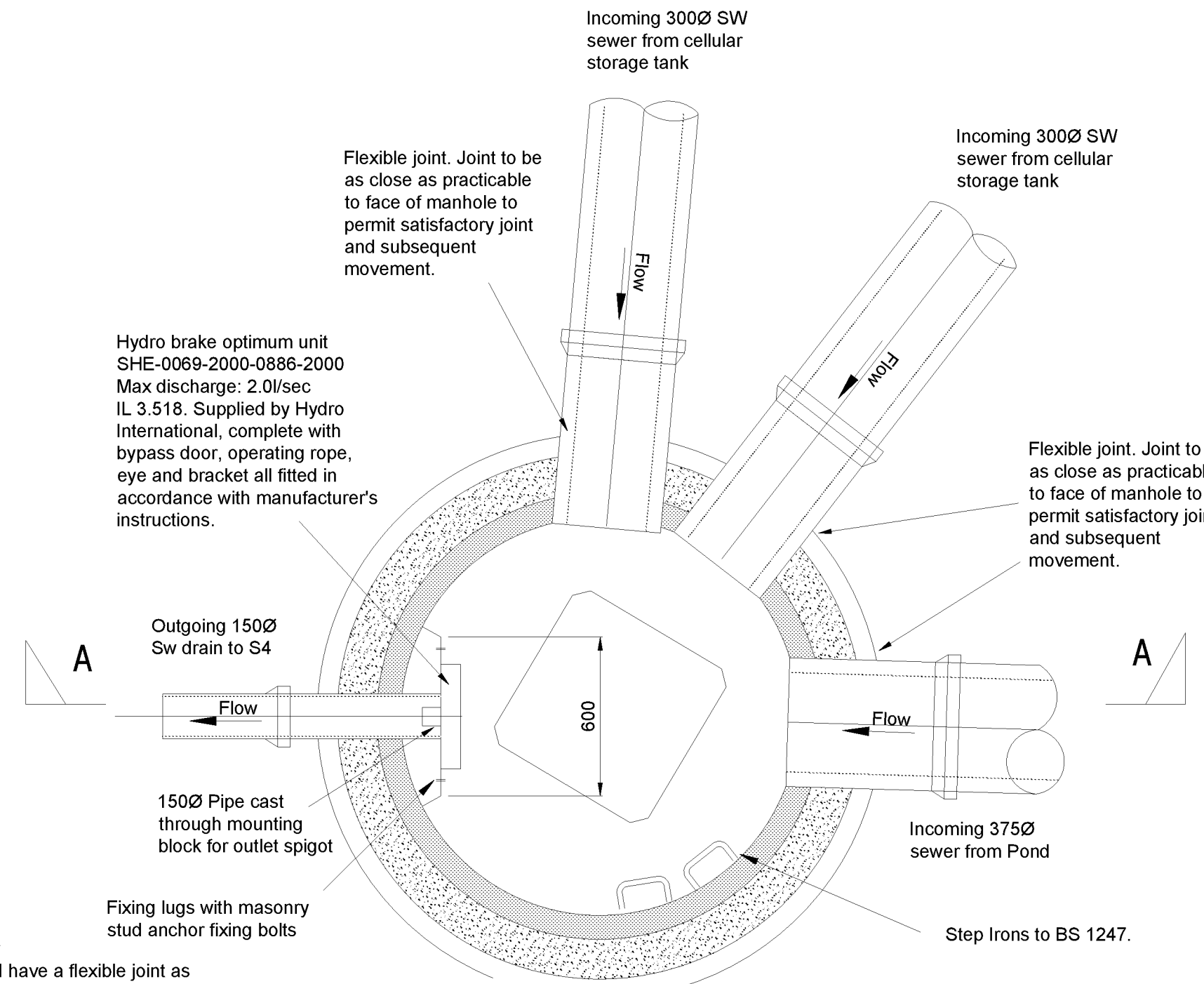
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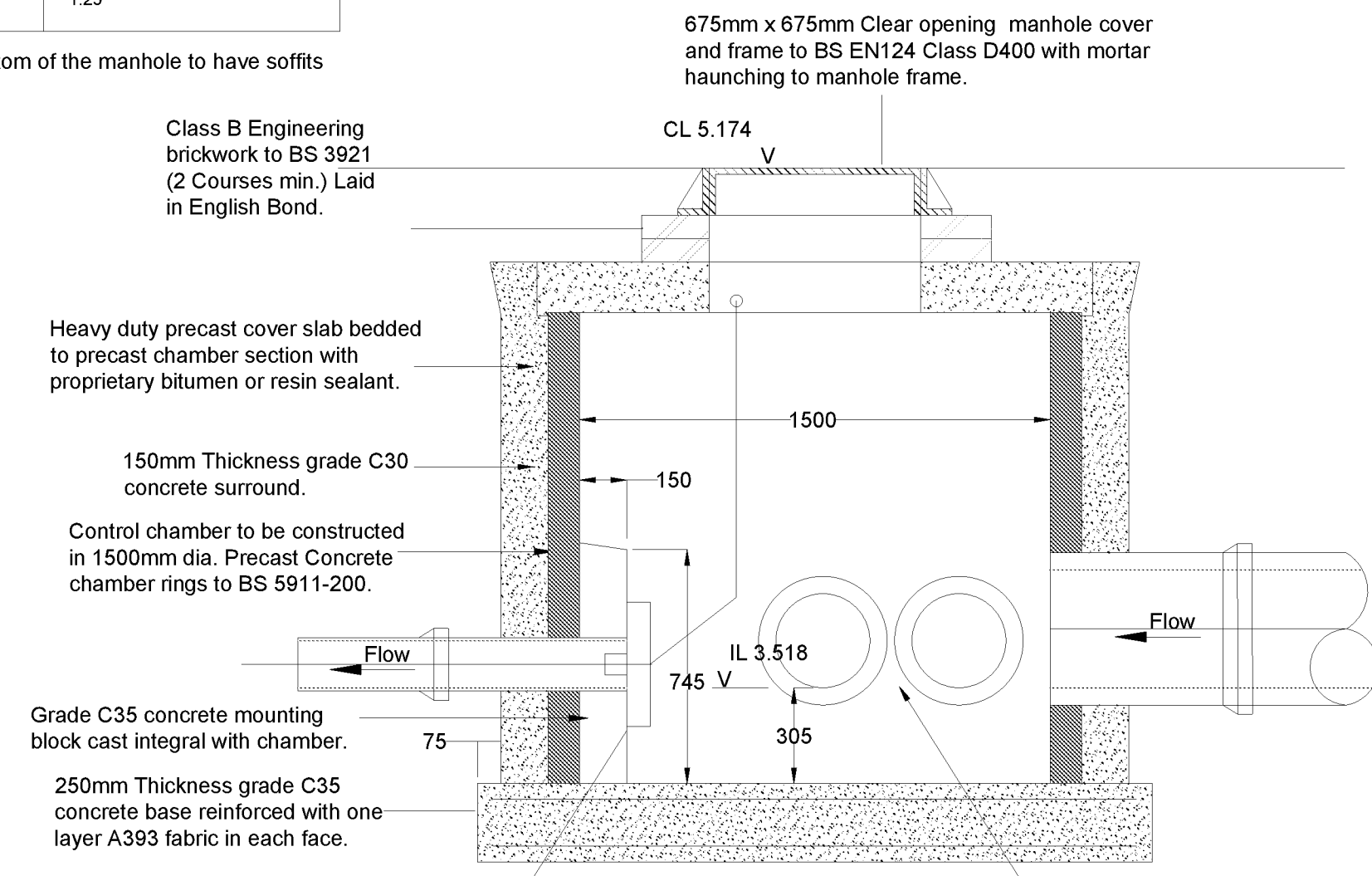
MANHOLE TYPE E
Typical Depth 1.0m - 1.45m



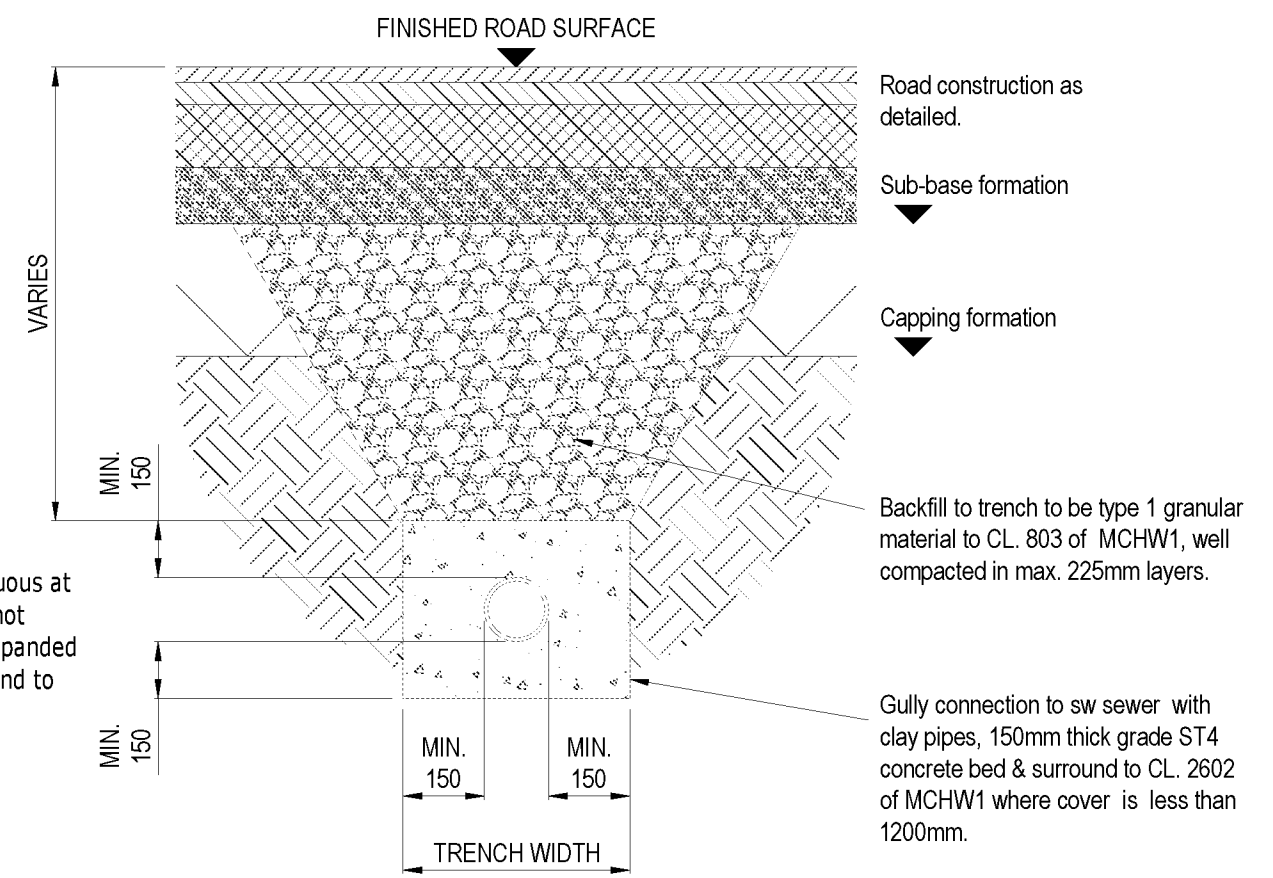
ROAD GULLY DETAIL
(1:20)



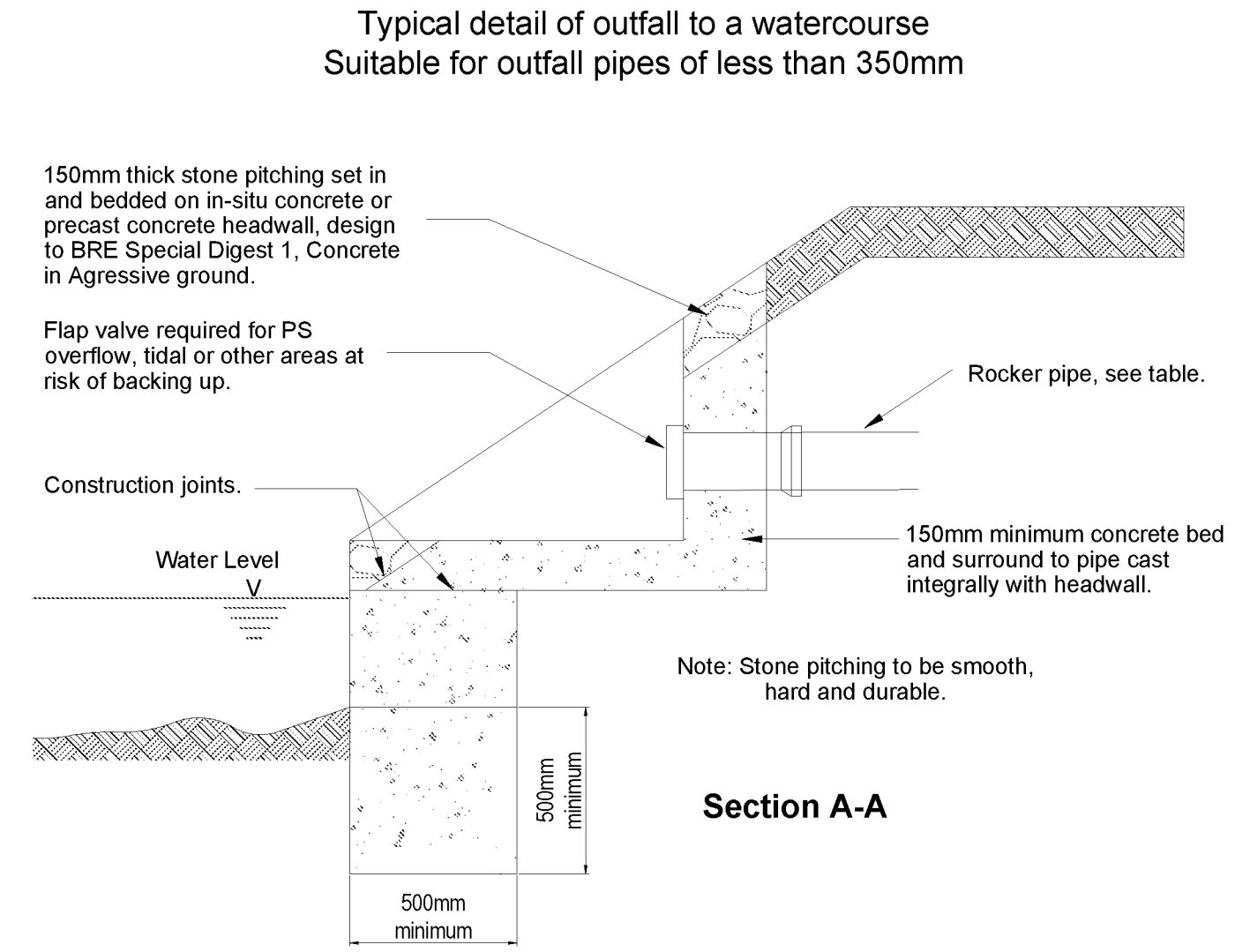
Catchpit Control Manhole S3
General Arrangement



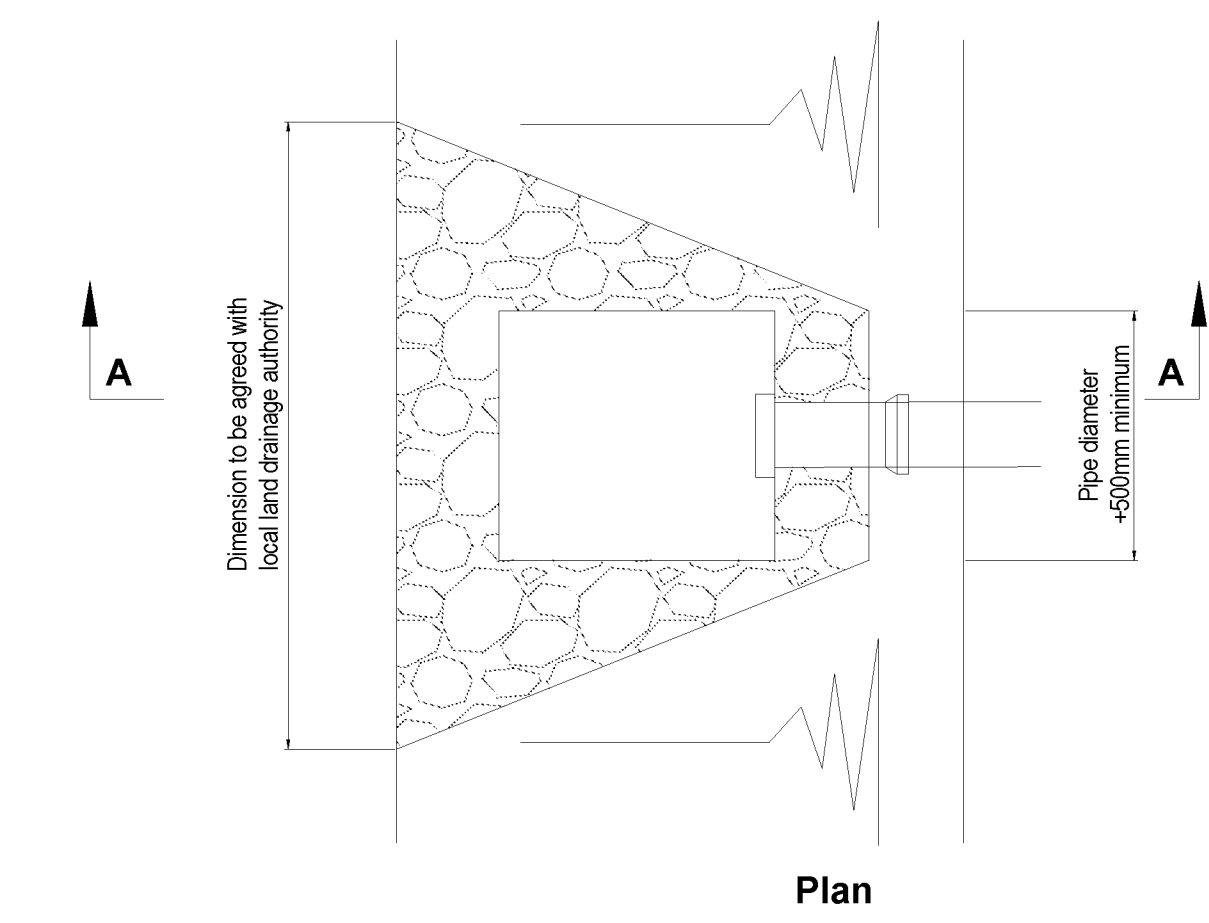
Section A-A



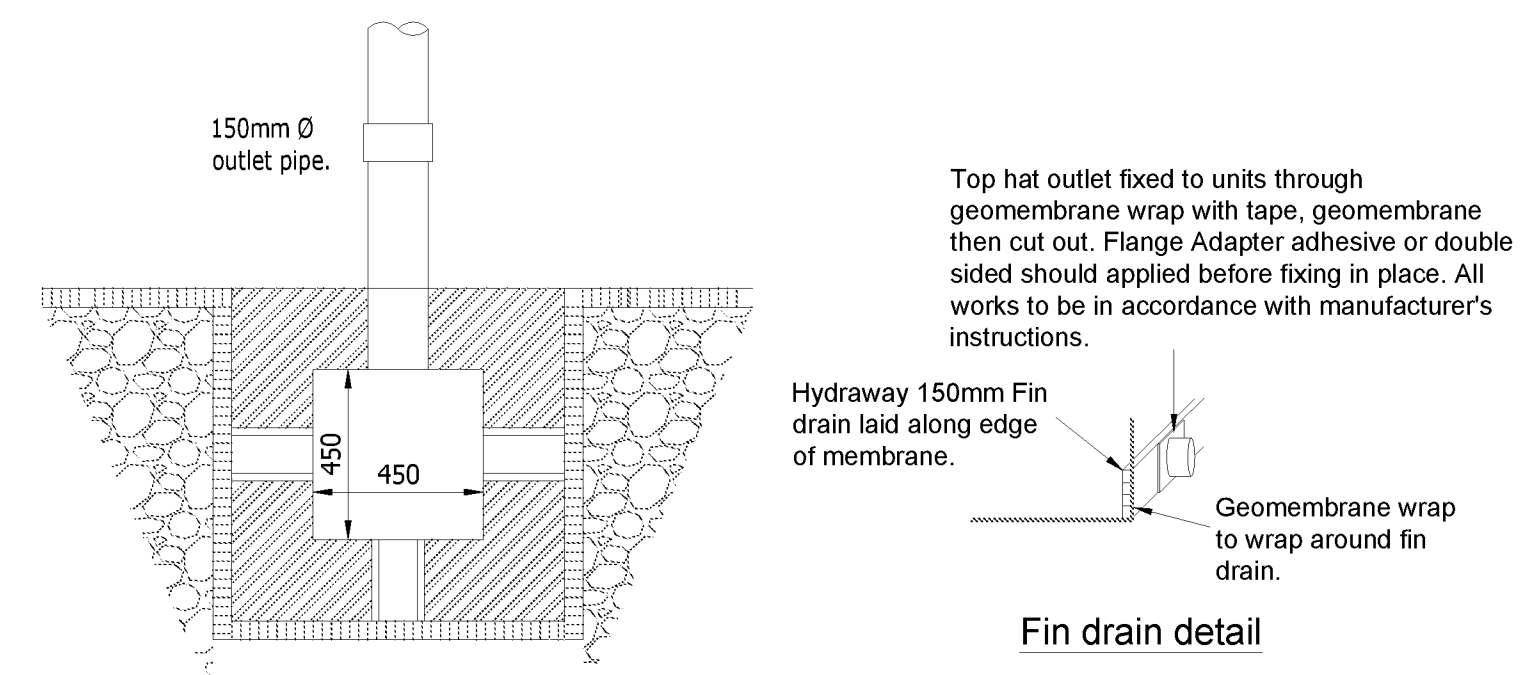
GULLY CONNECTION DETAIL
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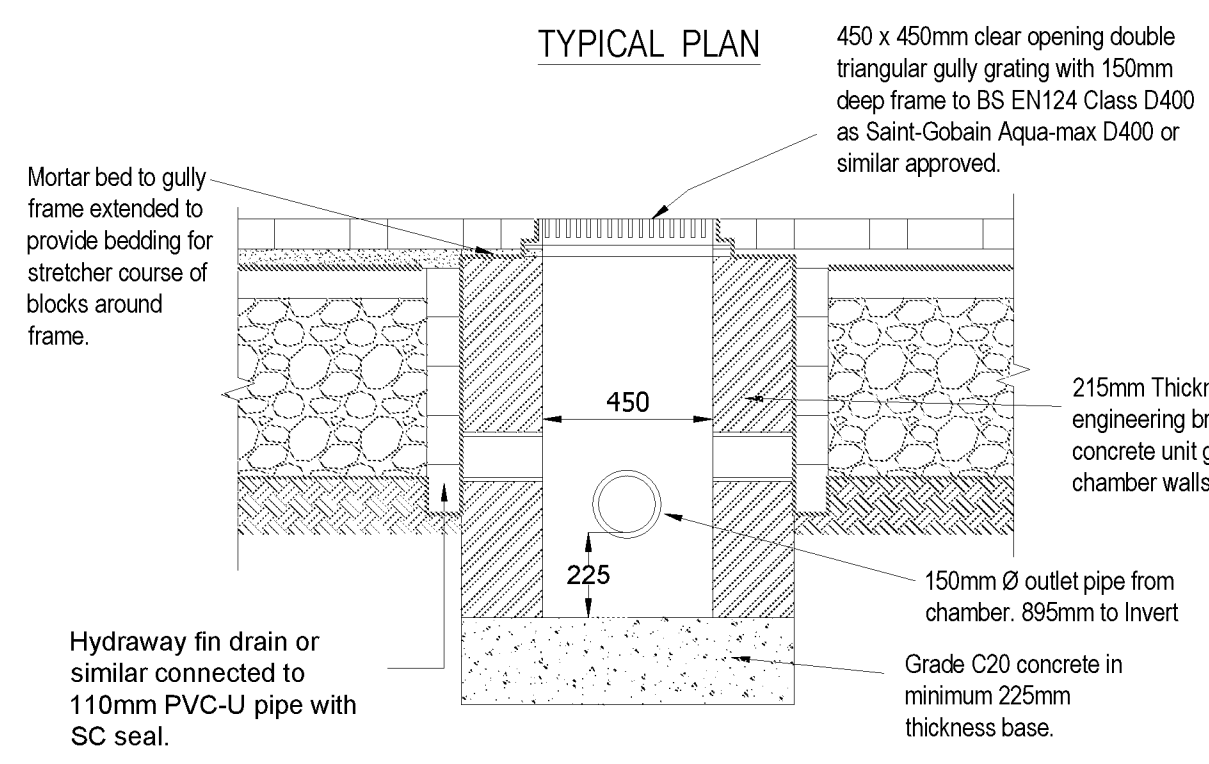
Section A-A



Plan



Fin drain detail



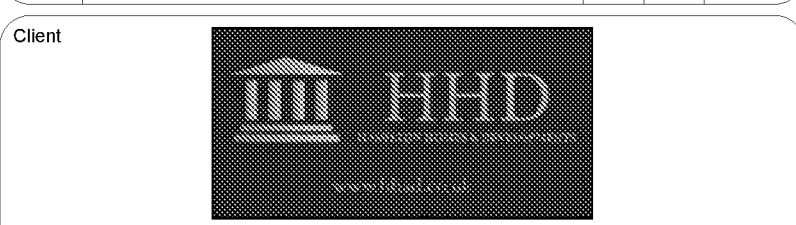
Typical Sump Gully Detail
(Where denoted Sg)

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 - All soft spots and voids shall be removed prior to construction and replaced with suitable fill material as agreed with the engineer.
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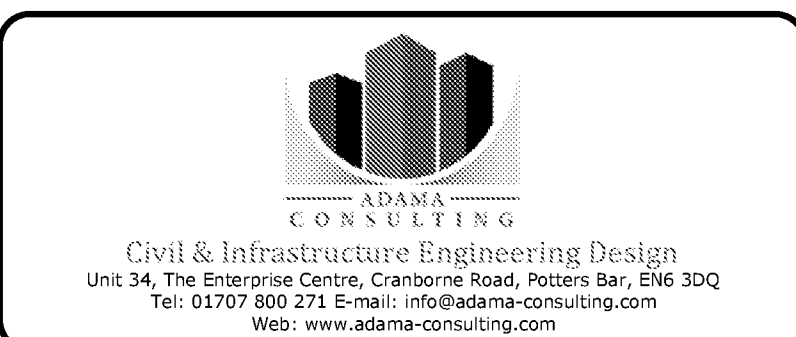
PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
PENDING APPROVAL

Rev.	Description	Dm	Ckd	Date
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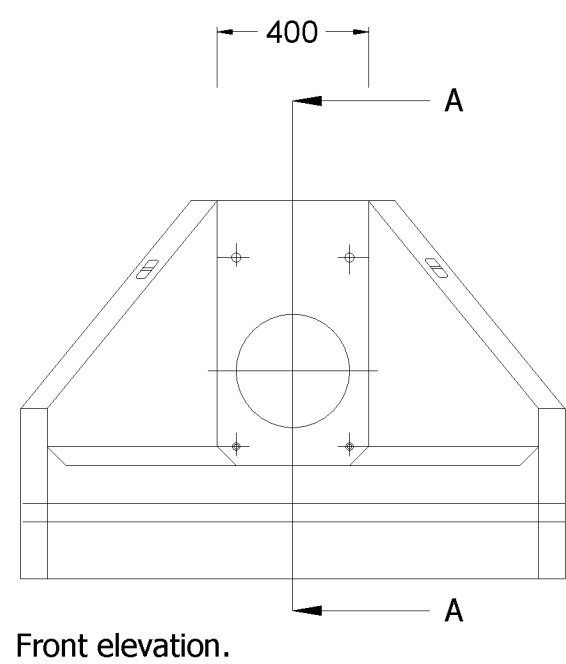
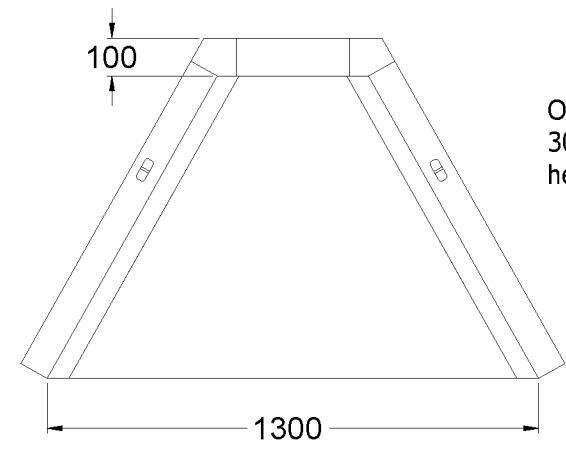
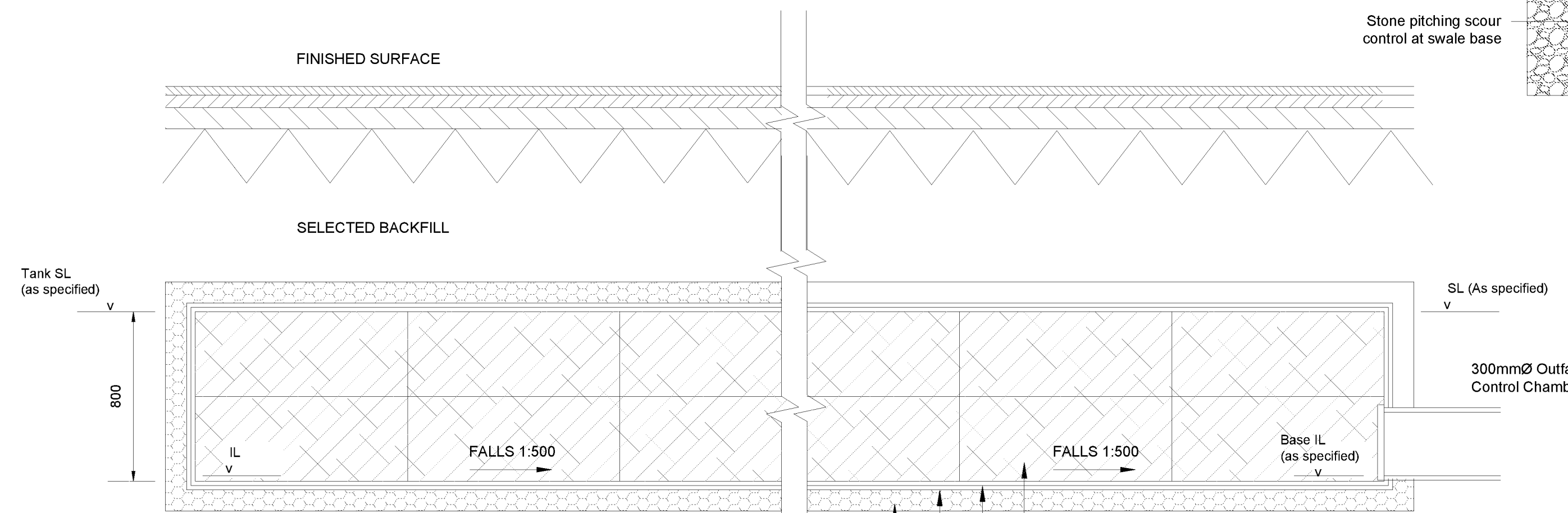
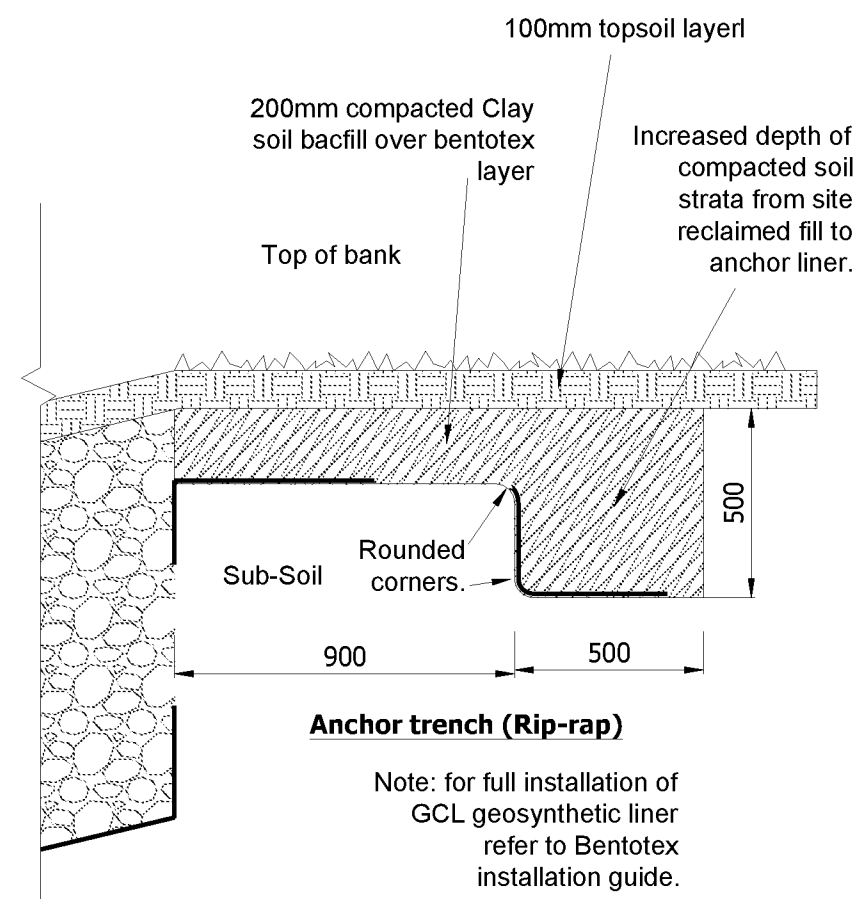
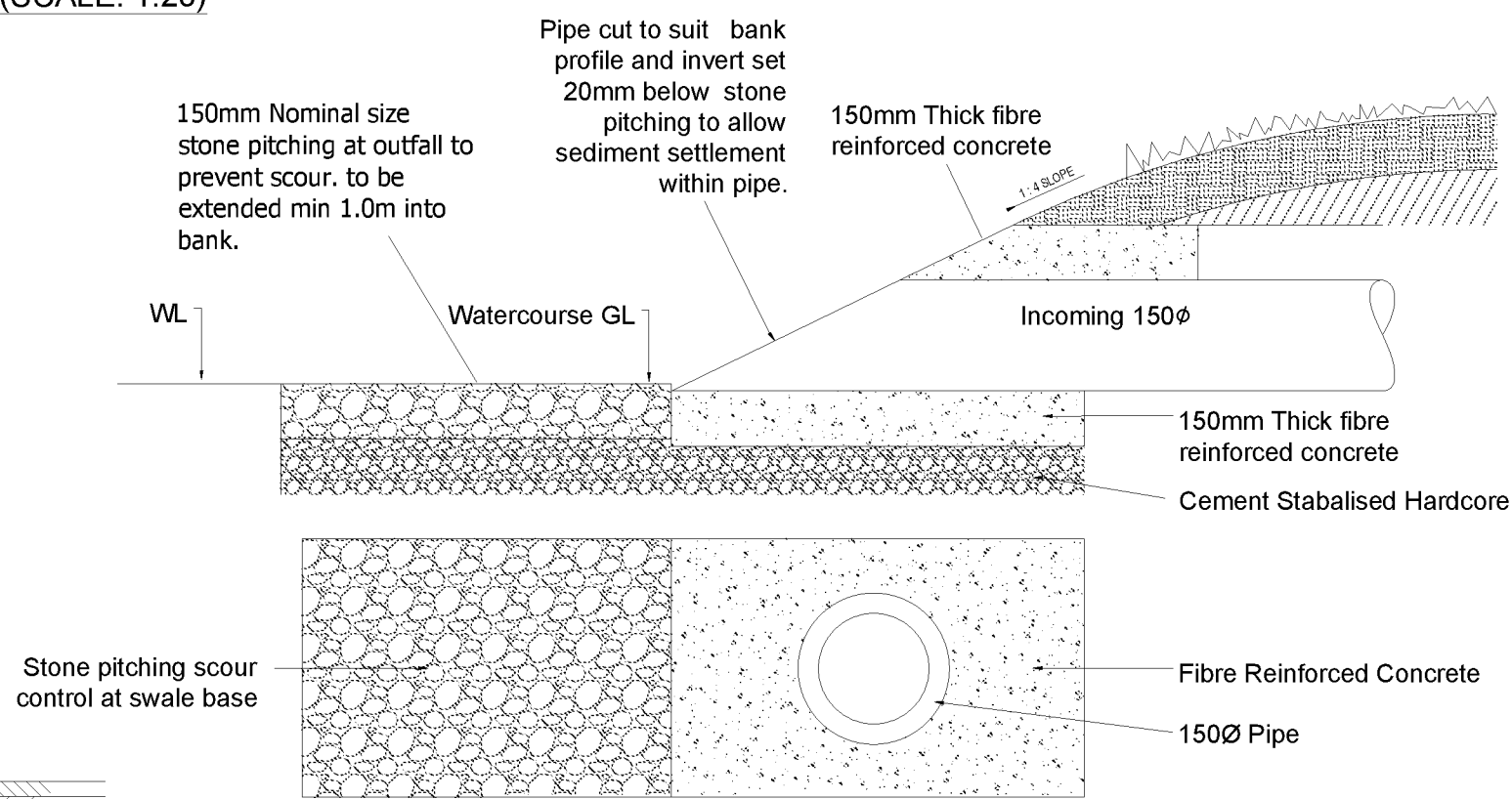
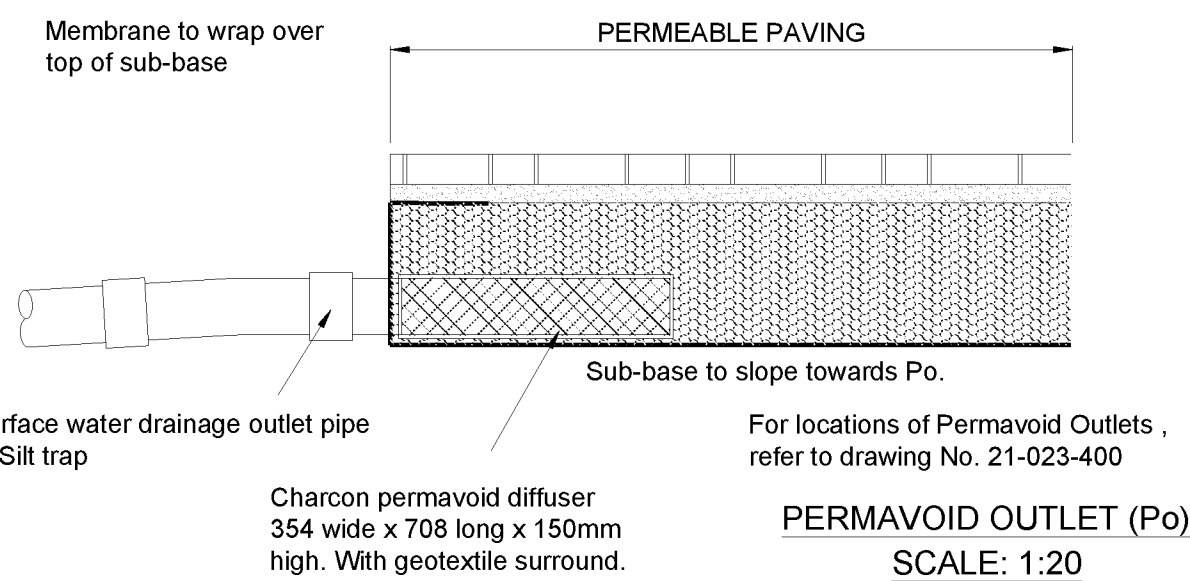
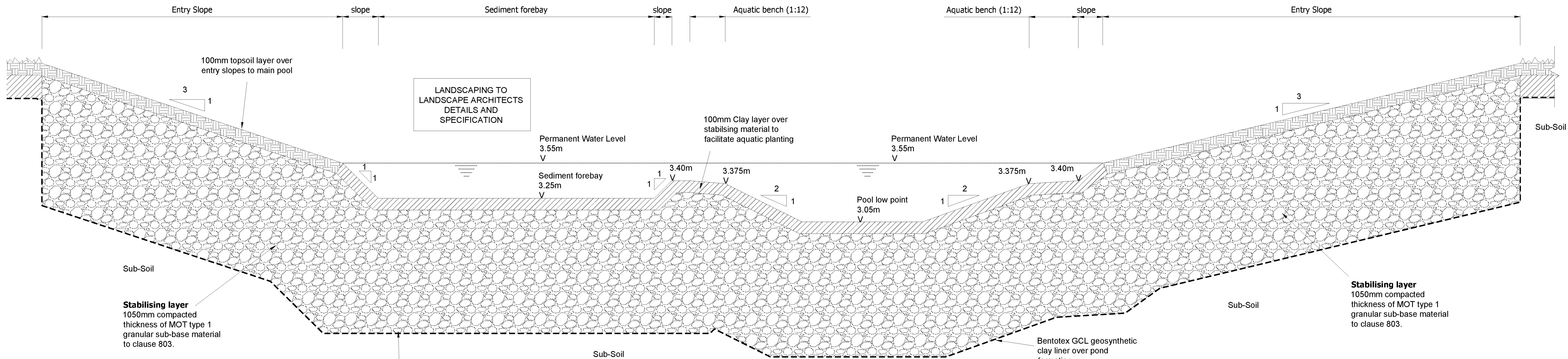


Project
Land adjacent Seftor School, House, Seftor Road

Title
Private Drainage Details - Sheet 3



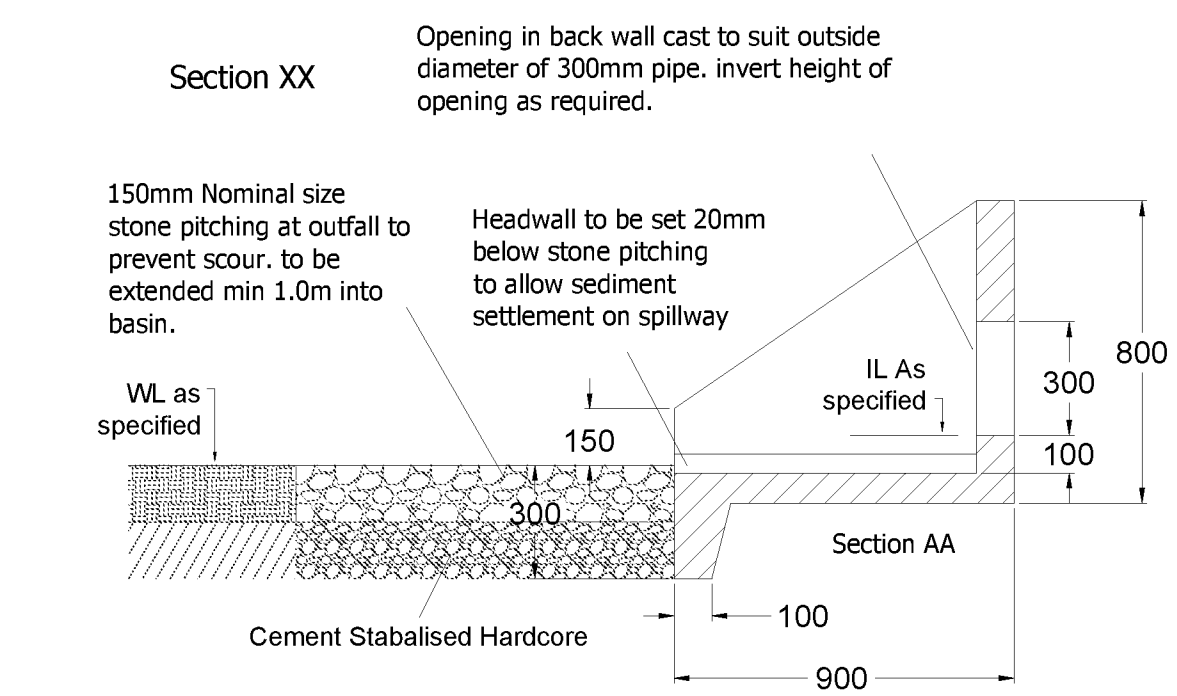
Scale	1:20 @ A1	Drawn	MD
Date	March 22	Checked	TL
File	PR21-023-Civils-dwgs-452	Drawing No	21-023-452
		Rev	-



Opening in back wall cast to suit up to 300mm inside diameter pipe at invert height of opening as required.

Material: Reinforced concrete
Weight approximately 540kg
All dimensions in mm

Units should be bedded on minimum 100mm of semi-dry concrete. Sit the headwall level from pipe to spill mouth. For full detailed installation instructions contact Althon.



ALTHON OUTFALL HEADWALL DETAIL
TYPE H3C - SCALE: 1:20

SURFACE WATER STORAGE SYSTEM NOTES

Storage system detail shown on this drawing is subject to a full design by polypipe civils (or manufacturer where similar approved products used).

Polystorm, geomembrane and geotextile to be installed and maintained in accordance with manufacturers instructions.

Connectors, flange adaptors as specified by the manufacturer.

Following the installation all connecting inspection chambers and catchpits are to be inspected to ensure they are free of silt and construction debris

Venting requirements to be agreed by the contractor with the manufacturer prior to construction / installation

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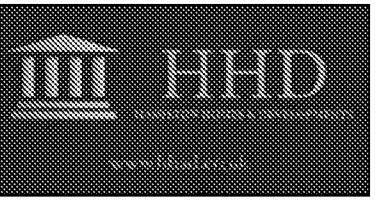
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- Private foul water and surface water drainage is to be constructed in accordance with the building regulations, BS EN 752 and relevant agreement certificates.
 - Drains to be constructed using flexibly jointed vitrified clay pipes to BS 65 "super strength" specification or upvc building drainage system pipework to BS EN 1401, bedded and backfilled in accordance with the manufacturer's instructions and the specifications.
 - Backfilling of drain trenches adjacent to dwellings of other structures to be in accordance with the building regulations Part H, diagram 8.
 - All soil vent pipe, stub stacks, air admittance valves and rain water pipe locations are indicative only. For actual locations please refer to architects plans and elevations.
 - Surface water from private areas is not to be discharged onto the proposed highway.
 - Drains to be constructed under dwellings with suspended floor slabs should be either installed using a proprietary hanger system where "beam and pot" or similar construction is used, or should be cast into local slab thickening where reinforced concrete ground slabs are to be poured in situ.
 - Drains in areas of made ground to be constructed by first making up the area to approximately finished level and then excavate through the fill material into undisturbed ground. The drain trench is then to be backfilled to formation level using suitable granular fill material well compacted in layers not exceeding 225mm.

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
PENDING APPROVAL

Rev.	Description	Dm	Ckd	Date
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Client


www.hhd.co.uk

Project

Land adjacent Seftor School,
House, Seftor Road

Title

Private Drainage
Details - Sheet 4


ADAMA CONSULTING
Civil & Infrastructure Engineering Design
Unit 34, The Enterprise Centre, Cranborne Road, Potters Bar, EN6 3DQ
Tel: 01707 800 271 E-mail: info@adama-consulting.com
Web: www.adama-consulting.com

Scale	1:20 @ A1	Drawn	MD
Date	March 22	Checked	TL
File	PR21-023-Civils-dwgs-453	Drawing No	21-023-453
		Rev	-

Bentotex

Installation Guide



What is Bentotex GCL?

Bentotex is a Geosynthetic Clay Liner; GCL for short. It is a innovative composite product manufactured using the naturally occurring Bentonite clay resource. The powdered Bentonite clay is sandwiched between a woven and a non woven geotextile to give a very robust high strength product.

The Bentonite clay gives the Bentotex it's unique 'self-healing' properties. Once the product is hydrated and confined under the required 300mm of cover material; if the product is punctured by an object Bentotex seals around it healing itself. This is one of the main reasons it is specified for a large proportion of public works contracts; as it is a 'fit it and forget it' solution.

The installation of the material is not dependant on prevailing weather conditions, and unlike manmade (HDPE / LLDPE / Rubber) liners, it can be laid in cold inclement conditions. One of our case studies actually shows it being laid with snow on the ground. The material needs no specialist welding or even the availability of power on site during installation there by offering a large saving on labour and plant costs.

This document is intended for use as a GENERAL GUIDELINE for the installation of GCLs. Exceptions to this guideline may be required to address site-specific and/or product-specific conditions.

1 INTRODUCTION

- 1.1 This document provides procedures for the installation of GCLs in a manner that maximizes safety, efficiency, and the physical integrity of the GCL.
- 1.2 These guidelines are based upon several years of experience at a variety of sites and should be generally applicable to any type of lining project using GCLs.
- 1.3 The performance of the GCL is wholly dependent on the quality of its installation. It is the installer's responsibility to adhere to these guidelines, and to the project specification and drawings, as closely as possible. It is the engineer's and owner's responsibility to provide construction quality assurance (CQA) for the installation in order to ensure that the installation has been executed properly. This document covers only installation procedures.

2 EQUIPMENT REQUIREMENTS

- 2.1 GCLs are in rolls weighing from 1190-1,320 kg. It is necessary to support this weight using an appropriate core pipe as indicated in Table 1. For any installation, the core pipe must not deflect more than 75 mm as measured from end to midpoint when a full GCL roll is lifted.

Product	Nominal GCL Panel Size (Length x Width (m))	Typical GCL Roll Weight (kg)	Isolated Core Size (mm)	Core Pipe Length x Diameter (m x mm)	Minimum Core Pipe Strength
Bentotex GCL	5 x 40	1190 and 1320	95	5.45 x 75	XXH (Double Extra Strong)

- 2.2 Lifting chains or straps each rated for at least twice the load of the GCL should be used in combination with a spreader bar made from an I-beam as shown in the cover illustration. The spreader bar ensures the lifting chains or straps do not chafe against the ends of the GCL roll, which must be able to rotate freely during installation. Details of a spreader beam and bar are available for sale or hire up upon request.
- 2.3 A front-end loader, backhoe, dozer, or other equipment can be furnished with the spreader bar and core bar. Alternatively, a forklift with a "stinger" attachment may be used for on-site handling and, in certain cases, installation. A forklift should not be used to lift or handle the GCL rolls.
- 2.4 When installing over certain geosynthetic materials, a 4-wheel all-terrain vehicle (ATV) can be used to deploy the GCL from behind. An ATV can be driven directly on the GCL provided that no sudden stops, starts, or turns are made.
- 2.5 Additional equipment needed for installation of GCL includes:
 - Utility knives and spare blades (for cutting GCL).
 - Granular bentonite or bentonite mastic (for overlapped seams of GCLs with needlepunched non-woven geotextiles and for sealing around structures and details).
 - Waterproof tarpaulins (for temporary cover on installed material as well as for stockpiled rolls).
 - Option chalk line marker to simplify bentonite placement at seams (when installing a GCL with needle punched non-woven geotextile components).

3 SUBGRADE PREPARATION

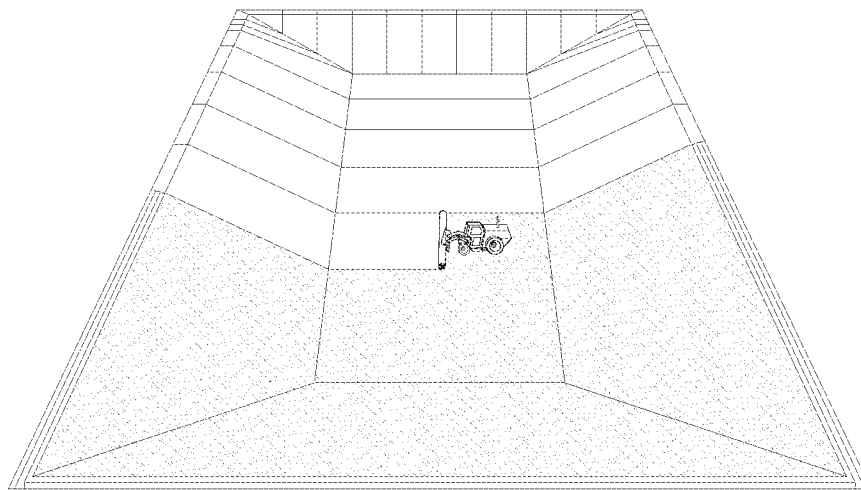
- 3.1 If the GCL is placed over an earthen subgrade, the surface must be compacted to at least 90 percent modified Proctor density or to the extent required by the project specifications. Engineer's approval of the subgrade must be obtained prior to installation. The finished surface must be firm and unyielding, without abrupt elevation changes, voids, cracks, ice, or standing water.
- 3.2 The subgrade surface must be free of vegetation, sharp-edged rocks, stones, sticks, construction debris, and other foreign material that could contact the GCL. The subgrade should be rolled with a smooth-drum compactor to remove any wheel ruts, footprints, or other abrupt grade changes. Furthermore, all protrusions extending more than 12 mm from the subgrade surface shall either be removed, crushed, or pushed into the surface with a smooth-drum compactor. The GCL may be installed on a frozen subgrade, but the subgrade soil in the unfrozen state should meet the above requirements.

4 UNLOADING

- 4.1 In most cases, GCLs are delivered on flatbed trucks. To unload the rolls from the flatbed, insert the core pipe through the roll. This may require removal of the core plug, which should be replaced after the roll is unloaded. Secure the lifting straps or chains to each end of the core pipe and to the spreader bar mounted on the lifting equipment. Hoist the roll straight up; make sure its weight is evenly distributed so that it does not tilt or sway when lifted.
- 4.2 GCLs are also occasionally delivered in closed shipping containers. To remove the roll from the container, it is best to utilize a forklift equipped with a "stinger" attachment. Guide the stinger as far as possible through the core and lift the roll up and out of the container.

5 INSTALLATION

- 5.1 GCL rolls should be taken to the working area of the site in their original packaging. Immediately prior to their deployment, the packaging should be carefully removed without damaging the GCL. The orientation of the GCL (i.e. which side faces up) may be important if the GCL has two different geotextiles. Unless otherwise specified, however, the GCL shall be installed such that the product name printed on one side of the GCL faces up.
- 5.2 Equipment which could damage the GCL shall not be allowed to travel directly on it. Acceptable installation, therefore, may be accomplished such that the GCL is unrolled in front of the backward-moving equipment (Figure 1). If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.



Typical Installation - (Figure 1)

- 5.3 Care must be taken to minimise the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL. A temporary geosynthetic subgrade covering commonly known as a slip sheet or rub sheet may be used to reduce friction damage during placement.
- 5.4 The GCL should be placed so that seams are parallel to the direction of the slope. End-of-roll seams should also be located at least 1 meter from the toe and crest of slopes steeper than 4H:1V.
- 5.5 All GCL panels should lie flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels.
- 5.6 For Bentotex, which is a reinforced GCL, the mat may remain uncovered for up to a week as the needle-punching effectively prevents any ~ adverse effect of premature hydration. However, if the mat is wet, it should not be frequently walked on.

6 ANCHORAGE

- 6.1 If required by the project drawings, one end of the GCL roll should be placed in an anchor trench at the top of the slope. The front edge of the trench shall be rounded so as to eliminate any sharp corners that could cause excessive stress on the GCL. Loose soil should be removed or compacted into the floor of the trench.
- 6.2 Sufficient anchorage may alternately be obtained by extending the end of the GCL roll back from the crest of the slope. The length of this "runout" anchor is project-specific.
- 6.3 If a trench is used for anchoring the end of the GCL, soil backfill should be placed in the trench to provide resistance against pullout. The size and shape of the trench, as well as the appropriate backfill procedures, should be in accordance with the project drawings and specifications. Typical dimensions are shown in Figure 2.

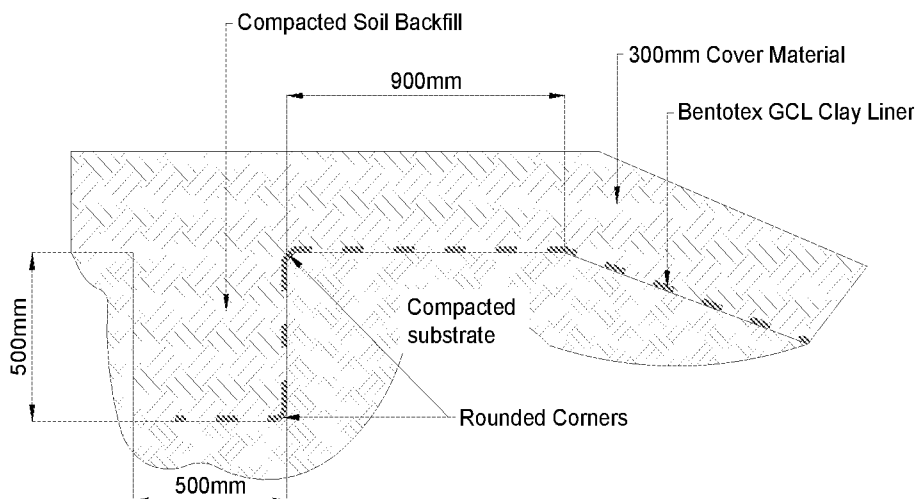


Figure 2. Typical Anchor Trench Location and Dimensions

- 6.3 The GCL should be placed in the anchor trench such that it covers the entire trench floor but does not extend up the rear trench wall.

7 SEAMING

- 7.1 GCL seams are constructed by overlapping their adjacent edges. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.
- 7.2 Unless otherwise specified, the minimum dimension of the longitudinal overlap should be 150 mm. End-of-roll overlapped seams should be similarly constructed, but the minimum overlap should measure 300 mm.
- 7.3 Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone.
- 7.4 Bentonite-enhanced seams are constructed first by overlapping the adjacent panels as instructed previously, then exposing the underlying edge, and then applying a continuous bead or fillet of granular sodium bentonite (supplied with the GCL) along a zone defined by the edge of the underlying panel and the 150mm line (Figure 3). The minimum application rate at which the bentonite is applied is 0.4 kg/m.
- 7.5 See section 10 for information on cover material.

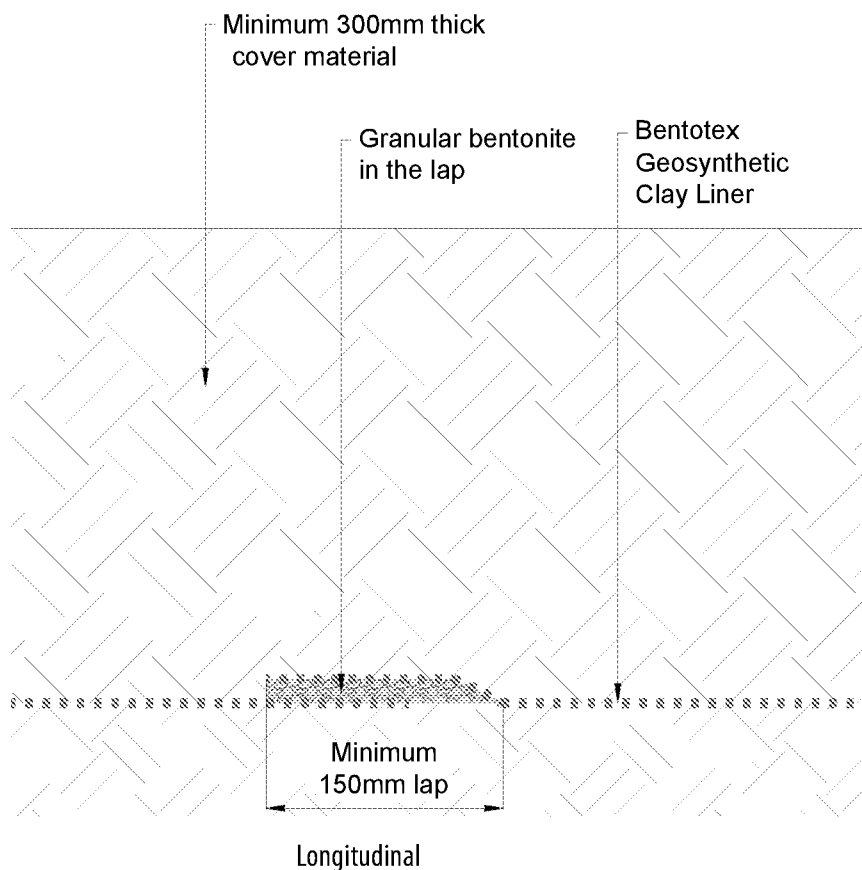


Figure 3. Bentonic-Enhanced Overlapped Seam

8 SEALING AROUND PENETRATIONS AND STRUCTURES

- 8.1 Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid irregular tearing of the geotextile components of the GCL during the cutting process.
- 8.2 The GCL shall be sealed around penetrations and structures embedded in the subgrade in accordance with Figures 4 through 6. Granular bentonite shall be used liberally (approximately 3 kg/m) to seal the GCL to these structures.

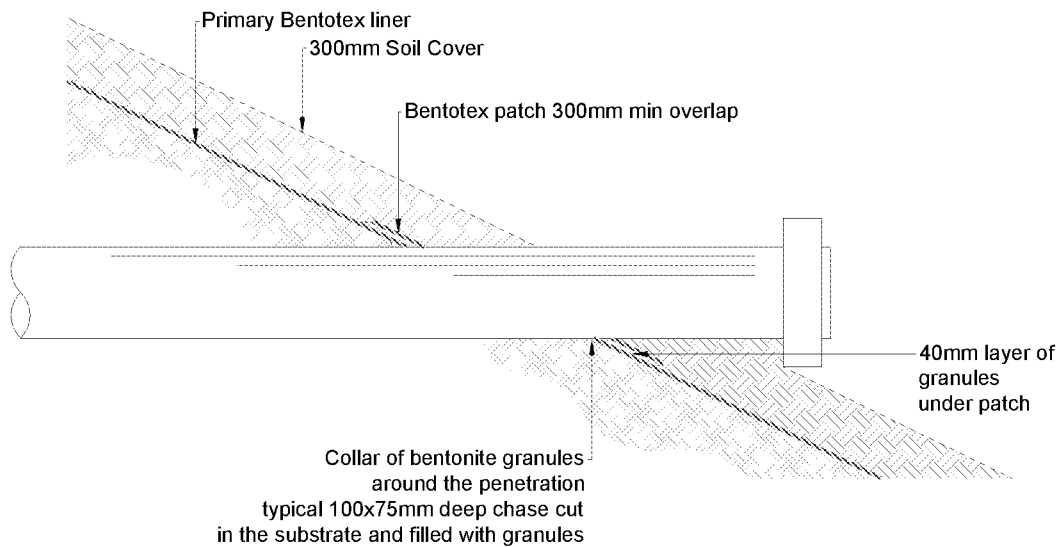


Figure 4a. Cross-Section of a Horizontal Pipe Penetration

- 8.3 When the GCL is placed over an earthen subgrade, a "notch" should be excavated into the subgrade around the penetration (Figure 4a). The notch should then be backfilled with granular bentonite.

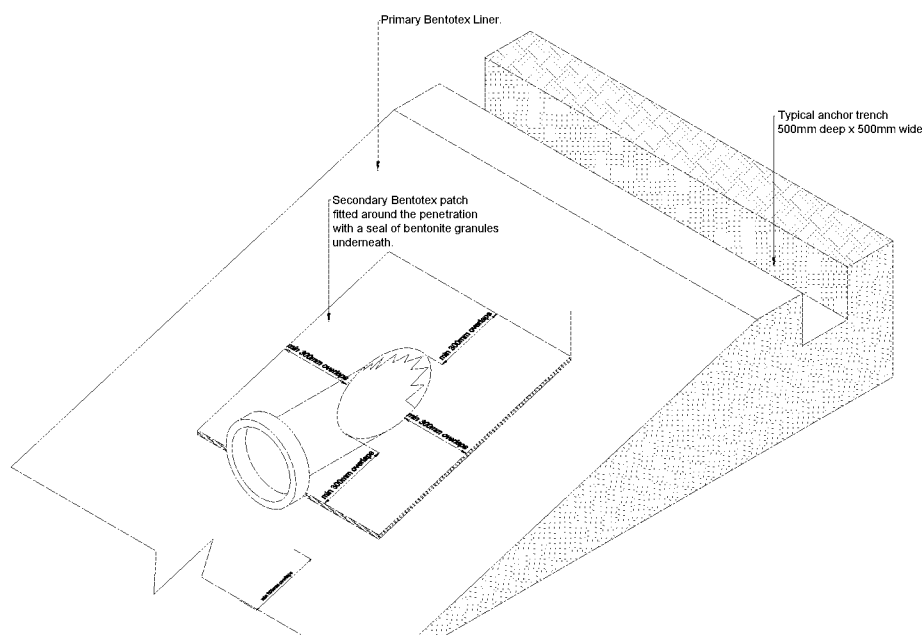


Figure 4b. Isometric view of completed Horizontal Pipe Penetration

- 8.4 A secondary collar of GCL should be placed around the penetration as shown in Figure 4b. It is helpful to first trace an outline of the penetration on the GCL and then to cut a "star" pattern in the collar to enhance the collar's fit around the penetration.

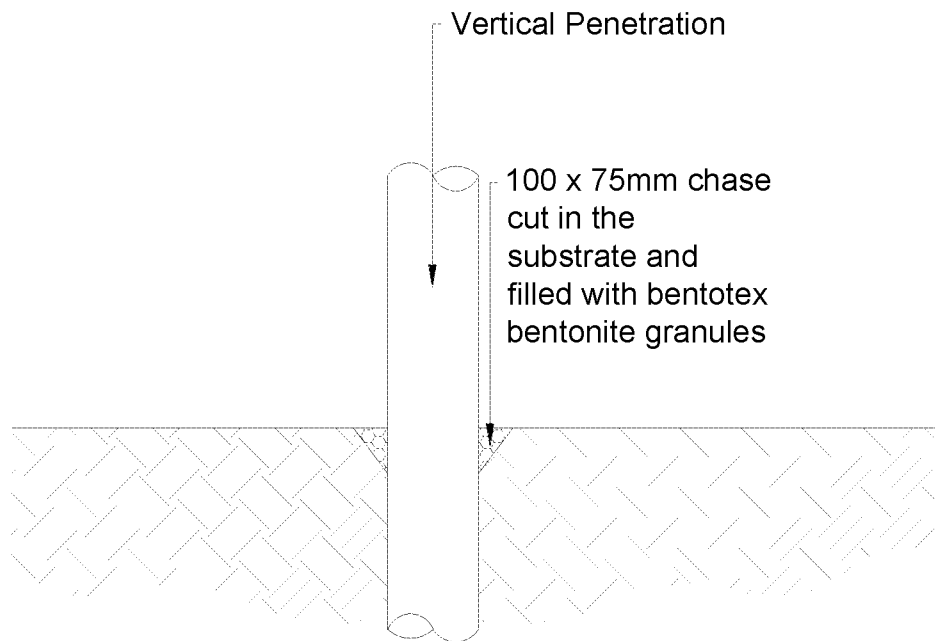


Figure 5a. Cross-section of a vertical penetration

- 8.5 Vertical penetrations are prepared by notching into the subgrade as shown in Figure 5a. The penetration is completed with two separate pieces of GCL as shown in Figure 5b. A secondary collar is optional in this case.

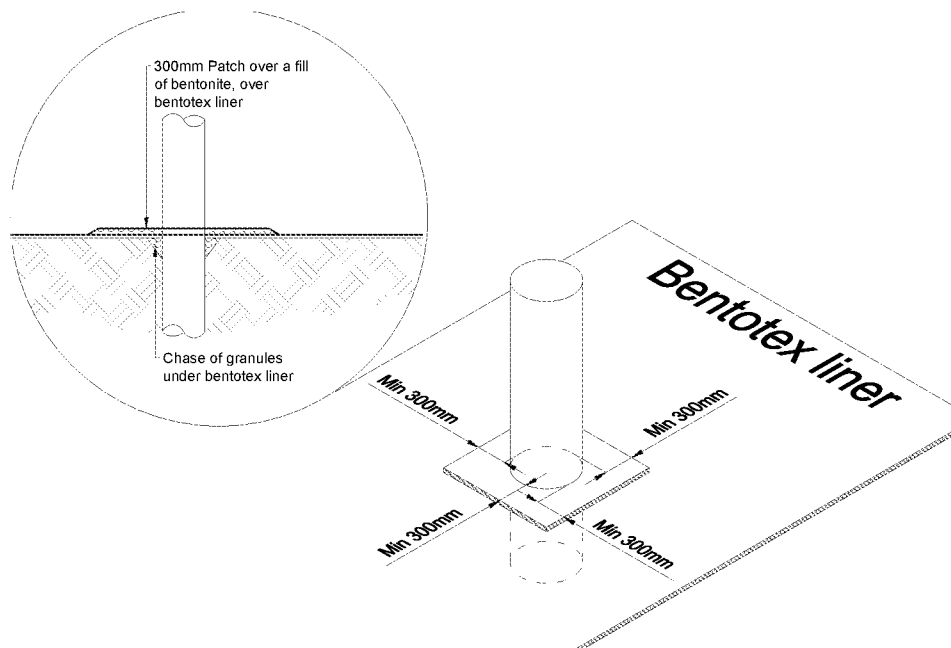


Figure 5b. Isometric view of completed vertical penetration

- 8.6 When the GCL is terminated at a structure or wall that is embedded into the subgrade, the subgrade should be notched as described in Section 8.3 and 8.5. The notch is filled with dry granular bentonite, and the GCL should be placed over the notch and up against the structure. The connection to the structure can be accomplished by placement of soil or stone backfill in this area.

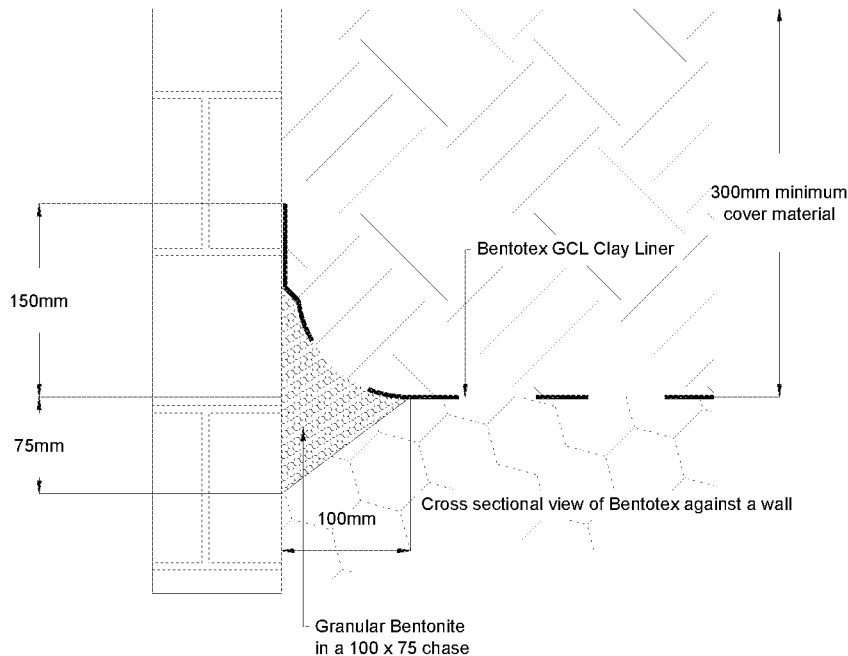


Figure 6. Cross-section of GCL against an embedded structure or wall

9 DAMAGE REPAIR

- 9.1 If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible to repair it by placing a patch over the damaged area (Figure 7). The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 300 mm is achieved around all parts of the damaged area. Granular bentonite or bentonite mastic should be applied around the damaged area prior to placement of the patch. It may be necessary to use an adhesive such as wood glue to fix the patch in place so that it is not moved during cover placement. Smaller patches also may be tucked under the damaged area to prevent patch movement.

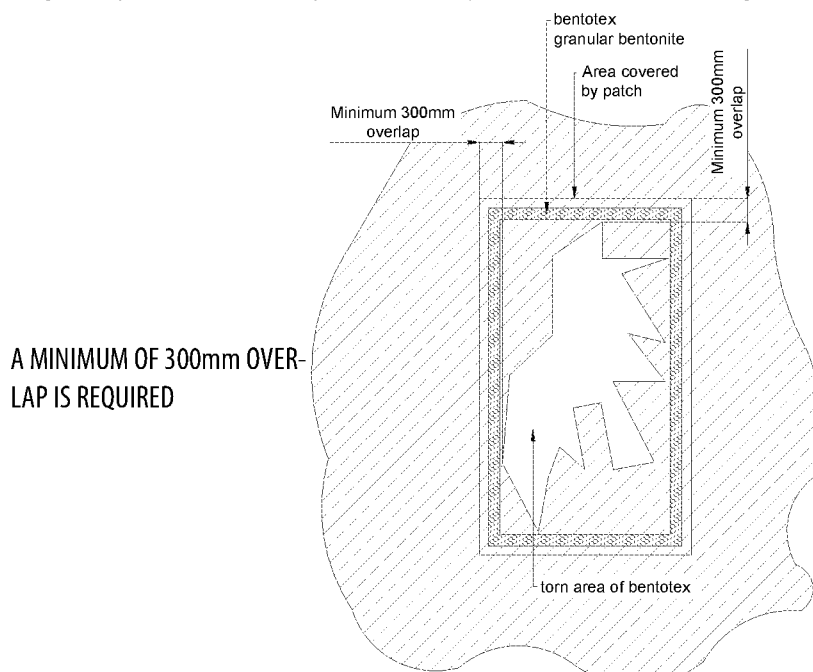


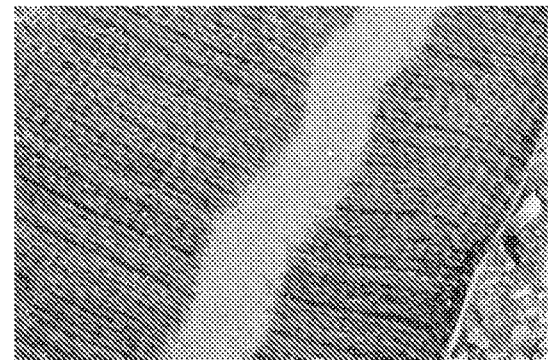
Figure 7. Damage repair by patching

10 COVER PLACEMENT

- 10.1 Cover soils shall be free of angular stones or other foreign matter which could damage the GCL. Cover soils should be approved by the Engineer, with respect to particle size, uniformity, and chemical compatibility. It is also the responsibility of the Design Engineer to check the chemical compatibility of the liner with the fluid to be contained.
- 10.2 Recommended cover soils should be a “no void” cohesive material typically have a particle size distribution ranging between fines and 25 mm. Soils with minimal fines or a high concentration of aggregate larger than 25 mm may require a field-scale test using the proposed subgrade surface, cover soil, and placement and compaction equipment. Following construction of the test pad, the GCL should be exhumed and inspected for any damage to the synthetic components of the GCL and for areas of visible bentonite displacement.
- 10.3 Soil cover shall be placed over the GCL using construction equipment that minimizes stresses on the GCL. A minimum thickness of 300 mm of cover should be maintained between the equipment tracks/tyres and the GCL at all times during the covering process. This thickness recommendation does not apply to frequently trafficked areas or roadways, for which a minimum thickness of 600 mm is required.
- 10.4 The final thickness of soil cover on the GCL varies with the application, but this cover layer should be at least 300mm thick to prevent damage by equipment, erosion, etc. Soil cover should be placed in a manner that prevents the soil from entering the GCL overlap zones.
- 10.5 Although direct vehicular contact with the GCL is to be avoided, lightweight, low ground pressure vehicles (such as 4-wheel all-terrain vehicles) may be used to facilitate the installation of geosynthetic products placed over the GCL. .

11 HYDRATION

- 11.1 In projects involving the containment of non-aqueous liquids (secondary containment around above-ground storage tanks), the GCL must be hydrated with clean water prior to use. The GCL does not function as a barrier until hydration takes place. Hydration is usually accomplished by natural rainfall if the GCL is covered by permeable material. If manual hydration is necessary, water can be introduced with the use of a sprinkler system.



Appendix I

Maintenance and Management



TECHNICAL NOTE

PROJECT	:	Land adjacent Sefter School House, Sefter Road, Pagham
NOTE REF.	:	Acl602-21023-A
NOTE TITLE	:	SuDS Maintenance and Management
AUTHOR	:	Tafari Lewis
APPROVED	:	Tafari Lewis
DATE	:	10 th March 2022

1.0 INTRODUCTION

The purpose of this file note is to ensure that the adopting authority / management company is entrusted with a robust inspection and maintenance programme to ensure the optimum operational efficiency of the surface water drainage network is maintained for the lifetime of the development.

2.0 MAINTENANCE & MANAGEMENT

This plan is developed in direct reference to CIRIA C753 The SuDS Manual.

Adopting authorities may have their own specific maintenance requirements which may not be as per the information provided within this document.

This section of the file note will review the following aspects:

- * Who is to maintain / Adopt the SuDS and associated features
- * Indicate a Maintenance Management Plan which reviews the activities to be undertaken, frequency and inspections
- * Actions required in the case of a network blockage or pollution incident.

The following provides an indication of the intentions for adoption and maintenance for the drainage as detailed on drawing 21-023-400 entitled Below Ground Drainage Layout.

There are three main SuDS components associated with the surface water drainage strategy on this scheme:

Attenuation Pond

Located and aimed to function as part of the public open space, a detention pond is proposed to treat and attenuate flows above the 1 in 30 year event. Storm water is temporarily stored in the pond during the 1:100 year peak surface flow events (with climate change allowance) prior to discharging into the downstream network.

Attenuation Modular Storage Tanks

An offline attenuation storage tank has been specified within the scheme. Storm water is temporarily stored in the attenuation crates during the 1:100 year peak surface flow events (with climate change allowance) prior to controlled release into the downstream drainage system

Porous Pavements

Type C permeable pavements (no infiltration) are located within private driveways and the shared access. These areas allow surface water to drain through a stone sub-base, slowing, collecting and filtering surface water flows.

Maintenance refers to the inspections required to identify performance issues and plan maintenance as required, operation and maintenance of the drainage system, landscape management and waste management associated with contaminated silt and other waste materials resulting from maintenance.

CIRIA C753 The SuDS Manual provides information in Chapter 32 for the Operation and maintenance of SuDS. The maintenance activities are broadly defined as regular, occasional and remedial maintenance. It is noted that some scenarios may require one-off maintenance activities. The SuDS Manual defines maintenance as –

- ✧ Regular Maintenance: consists of basic tasks carried out to a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once a year, vegetation management, sweeping or surfaces and litter / debris removal.
- ✧ Occasional maintenance: comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks.
- ✧ Remedial maintenance: describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised with good design, constructions and regular maintenance activities.

Maintenance regimes are to be reviewed on an annual basis to ensure that the approach adopted is meeting its objectives. All those responsible for the maintenance operations should adhere to the relevant health and safety legislation for the activities listed within this report

(including lone working, if relevant). Method statements and risk assessments should always be completed prior to the undertaking of any works.

Adoption

It is proposed that surface water drainage including the attenuation pond, geo-cellular storage tank and porous pavements are to be the responsibility of the developer and / or a management company. All surface water drainage on the development is to remain private.

Access

Access to SuDS elements is provided by the main access and parking areas which are under the control of the developer.

3.0 INDICATIVE MAINTENANCE MANAGEMENT PLAN

The information below is reproduced from Table 32.1 of CIRIA C753 The SuDS Manual and is used to indicate the maintenance and operation activities that each authority or management company is to apply –

Operation and maintenance activity	SuDS Component		
	Ponds	Modular Storage	Pervious Pavement
Regular Maintenance			
Inspection	■	■	■
Litter & Debris removal	■	□	■
Grass Cutting	■	□	□
Weed and Invasive plant control	□		□
Shrub Management (including Pruning)	□		□
Shoreline vegetation management	□		
Aquatic vegetation management	□		
Occasional Maintenance			
Sediment Management	■	■	■
Vegetation Replacement	□		
Vacuum sweeping and brushing			■
Remedial Maintenance			
Structure rehabilitation / repair	□	□	□
Infiltration surface reconditioning		□	□

Key

■ will be required

□ may be required

Extracts from Table 32.1 CIRIA C753 The SuDS Manual

Ponds

Ponds are basins that have a permanent pool of water. They can be created by using an existing natural depression, by excavating a new depression or by constructing embankments.

Each time it rains, the runoff entering the pond is detained and treated by setting out sediments and biological uptake until it is displaced by runoff from the next storm.

All ponds require a sediment forebay or other form of pre-treatment system. This is to remove the majority of incoming sediment from the runoff before it is more widely dispersed within the larger permanent pool.

Outlets are usually built into an embankment with easy access for maintenance.

Many of the specific maintenance activities for the pond will be undertaken as part of a general landscaping contract. Maintenance responsibility will be placed with the developers appointed management company. All maintenance should be carried out in accordance with CDM regulations (2015) and CIRIA C753

The table below gives a summary of the operation and maintenance requirements for a pond:

Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass (public areas)	Monthly (during the growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season and autumn)
	Inspect marginal bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect waterbody for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay, treatment areas and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build up has occurred, to inform management disposal options.	Half Yearly
	Check hydrobrake	Half Yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay or treatment area	Every 1-5 years (or as required)
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years (or as required)
	Remove tree saplings	Annually
Occasional Maintenance	Remove sediment from the main body of the pond when pool volume is reduced by 20%	With effective pre-treatment this will only be required rarely (e.g. every 25 – 50 years)
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required

	Aerate pond when signs of eutrophication are detected	As required
	Re-align rip-rap (geomembrane) or repair other damage.	As required
	Repair / rehabilitate inlets and outlets	As required
	Inspection and replacement of pond liner	As required

Modular Storage

Regular inspection and maintenance are required to ensure the effective long-term operation of below ground modular storage systems.

Catchpits are installed at the inlet to the tanks to allow for removal of silt / debris as required. The tanks are utilised for the 1:100 year storm event and as such are envisaged to have minimal levels of silt due to the use of trapped gullies within the system.

Inspection and maintenance of the tank will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for modular storage –

MODULAR STORAGE	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly	Monthly for 3 months after installation / regular usage
Debris and silt removal from catchment areas	Monthly
Removal of sediment from pre-treatment structures	Annually or as required
Remedial Works	Frequency
Repair / rehabilitation of inlets, outlets, overflows and vents	As required
Monitoring	Frequency
Inspect / check all inlets, inspection wells, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms
Inspection of surface above units for sag points or depressions which may indicate structural failure.	Annually
Survey inside of the tank for sediment build-up and removal as required	Every 5 years or as required

Permeable Surfaces

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

Regular inspection and maintenance is important for the effective operation of permeable pavements, they should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. In instances where jointing material is lost, this material should be replaced immediately.

Depending on the amount of usage and the environment that the permeable pavement has been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. If this situation should occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course may be considered. The laying course material, jointing and blocks may be reused (once cleaned), to aid in minimising costs.

Inspection and maintenance of the permeable surfaces will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for permeable paving –

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Brush regularly and remove sweepings from all hard surfaces	Three times a year at end of winter, mid-summer and after autumnal leaf fall, or as required based upon site specific observations or as per manufacturers recommendations
Occasional Tasks	Frequency
Removal of weeds	As required
Stabilise and mow contributing and adjacent areas	As required
Remedial Works	Frequency
Remediate any landscaping which, through vegetation maintenance or soil slip has encroached upon the permeable surface	As required
Remedial work to any depressions, rutting, cracked or broken blocks considered to be detrimental to the structure or that pose a hazard to users	As required
Rehabilitation of surface and upper substructure by sweeping	As required if infiltration performance is reduced
Monitoring	Frequency
Initial Inspection	Monthly for 3 months after installation / regular usage
Inspection for evidence of poor operation and / or weed growth	3 monthly & 48 hours after large storms
Inspection of silt accumulation	Annually
Monitoring of inspection chambers	Annually
Inspection for depressions, ponding or rutting	Annually

Existing watercourse

Vegetation within the banks to the watercourse should typically be maintained at a height of 75mm – 150mm to prevent flattening during flow events.

Many of the specific maintenance activities for the watercourse will be undertaken as part of a general landscaping contract. Maintenance responsibility will be placed with the developers appointed management company. All maintenance should be carried out in accordance with CDM regulations (2015) and CIRIA C753

The table below gives a summary of the operation and maintenance requirements for the existing watercourse adjacent the development –

SWALE / CONVEYANCE DITCH		
Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass (to retain grass height within the specified design range)	Monthly (during the growing season)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water ponding is > 48 hours	Monthly (or as 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 removal frequencies	Half yearly
	Inspect inlet for blockages	Monthly
Occasional Maintenance	Reseed areas of poor vegetation growth	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 reseedling or re-turfing	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 gravel trench (stone pitching at upstream inlet)	As required
	Remove and dispose of oils or petrol residues using safe standard practice	As required

Flow Control Chambers

The flow control chamber proposed for this site is a Hydro Brake which has no moving parts and are self-activating requiring minimal maintenance. The bypass disc is the only manually operated element and is applicable for use in the event of a blockage or issue with the drainage network. It is recommended that the chamber is inspected monthly for three months after installation and bi-annually thereafter to verify the condition and operation of the unit and check for blockages within the chamber or flow control device.

Any silt or debris found during inspections should be removed and cleaned out with the use of a sump vacuum cleaner.

The table below gives a summary of the operation and maintenance requirements for flow control devices –

CONTROL CHAMBERS	
Regular Maintenance	Frequency
Check there is no physical damage and that control is functioning. Ensure bypass arrangements are functional. Remove Debris and silt. Undertake inspection after autumnal leaf fall to ensure functionality of control and that there are no blockages	Monthly
Grease bypass door on hydro brake	Annually
Remedial Works	Frequency
Repair physical damage if required / replace unit is damaged	As required
Monitoring	Frequency
Inspect chamber and flow control units to ensure that they are in good condition and operating as designed.	Annually and after large storms

Pipes and Gullies

PIPES AND GULLIES		
Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers	Annually
	Remove any root ingress	As required
Occasional Maintenance	CCTV survey of drains to check alignment, cracking and joint displacement	10 year intervals

5.0 BLOCKAGES AND SPILLAGES

Blockage

In the event of a blockage within the drainage network, the key risk is that of flooding to the surrounding area. The extent and location of flooding is dependent upon the location of the blockage and the associated storm event.

If the blockage occurs at the flow control chamber, the bypass door can be operated to drain down the network such that works can be undertaken to remove the blockage.

In the event of a blockage elsewhere within the network, the network is to be drained down by use of suction equipment and the blockage removed.

Spillages

Due to the nature of the development, the likelihood of a spillage is minimal.

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung. Contact the Environment Agency immediately.