

flood risk assessment

Chalcroft Nursery, Chalcroft
Lane, Bersted, West Sussex

CCE/U101/FRA-02

July 2020

For Landform Bersted Ltd

Document Review Sheet

This document has been prepared for the use of Landform Bersted Ltd. Its content should not be relied upon by others without the written authority of Cannon Consulting Engineers. If any unauthorised third party makes use of this report they do so at their own risk and Cannon Consulting Engineers owes them no duty of care or skill.

Reference	Date	Author	Checked
CCE/U101/FRA-01	June 2020	JH	RT
CCE/U101/FRA-02	July 2020	JH	RT

Contents

1. Introduction
2. Forms of Flooding
3. Surface Water Management
4. Conclusions

Figures

1. Site Location Plan
2. Flood Zone & Reservoir Inundation Map
3. Groundwater Source Protection Zone Map
4. Surface Water Flood Map

Appendices

A. Existing Site

Topographical survey
Photo key plan
Southern Water sewer plans
Arun District Council drainage plan
Infiltration Test results
Groundwater monitoring plan and results

B. Proposed Site

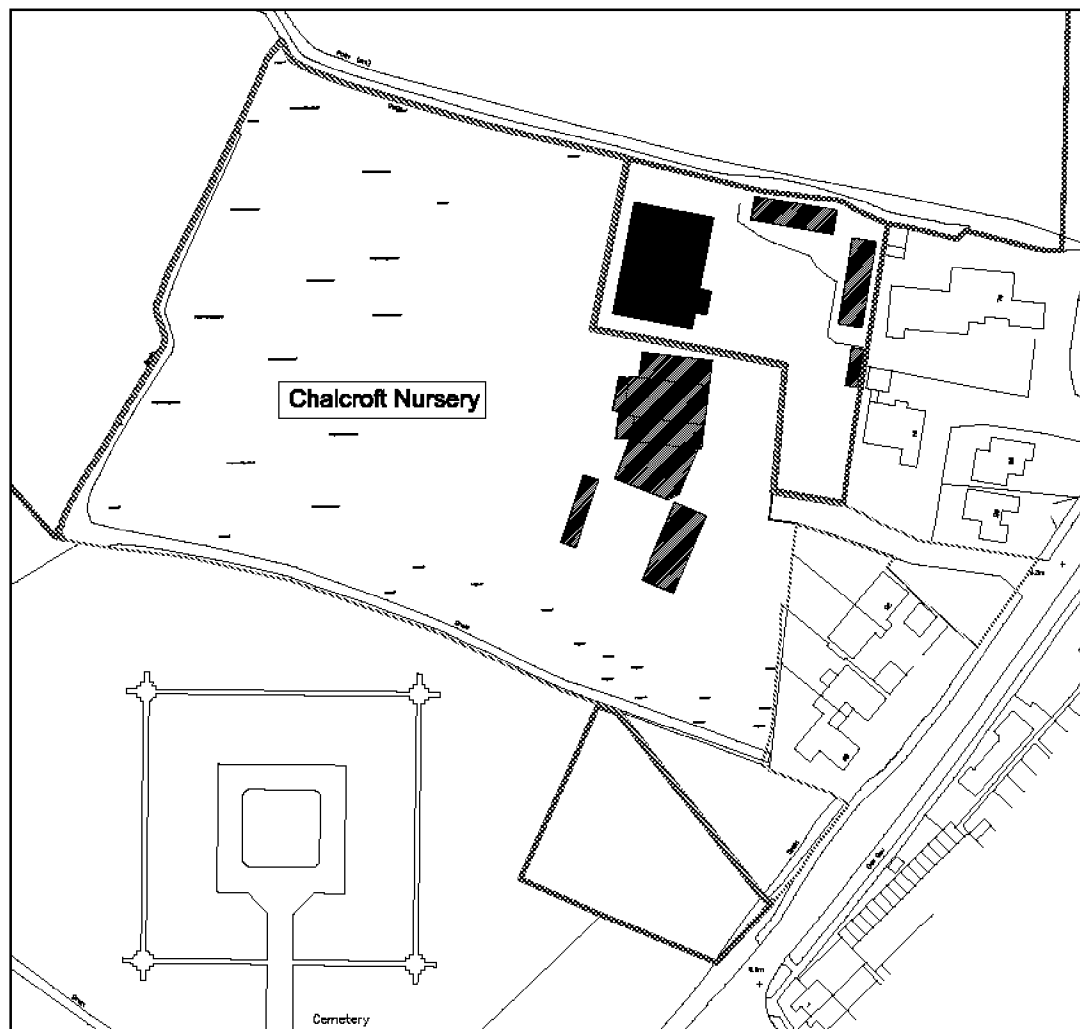
Illustrative Layout
Indicative Surface water management strategy
Typical sections
Development catchment and exceedance plan
Causeway flow results
Outline surface water maintenance plan
Proposed culvert strategy

Summary Table

Site location	Chalcroft Nursery, Chalcroft Lane, Bersted, West Sussex, PO21 5TS Grid reference 491801, 100529.
Planning application	Outline
Existing site	Brownfield,
Site area	Approximately 2.1 ha
Proposed development	Mixed use comprising 2,240 m ² of commercial space, up to 20 residential dwellings and access road.
Flood Zone	1
Reservoir Inundation Zone	None
Surface water flooding	Some small spots of pooling on and around the site.
Surface water management	On-site treatment and attenuation with restricted discharge (Q1) to boundary watercourse/s.

1.0 Introduction

- 1.1 This Flood Risk Assessment (FRA) has been prepared for the use of Landform Bersted Ltd to support an outline planning application for mixed-use development of the Chalcroft Nursery site in Bersted, West Sussex. Refer to Figure 1 for a site location plan.
- 1.2 The site is approximately centred on Ordnance Survey grid reference 491801, 100529. The existing site use comprises various retail and horticultural uses with made ground in the west.



Red and blue application boundary image

- 1.3 The development proposal comprises up to 20 residential units, 2,240 m² of commercial space (Use Class A1, B1, and B8) with associated parking, infrastructure, open space and access. The site forms part of the West of Bersted Strategic Housing Site SD3 identified in the Arun District Council Local Plan.
- 1.4 This assessment takes account of the National Planning Policy Framework (NPPF) and the definitions of sources of flooding within the Flood and Water Management Act (FWMA) 2010.

- 1.5 The report has been prepared following a site visit and liaison with Arun District Council (in their surface water management role).
- 1.6 The nursery site extends to approximately 2.4 ha. This includes both the land which is the subject of the application (outlined in red on the image below) and existing development which will be maintained (outlined in blue in the north-east of the site). As part of the redevelopment land within the blue outline will also be modified (under its current permitted commercial use) to allow for an integrated site wide surface water management solution. This 'update' will primarily allow for a coherent internal access and parking strategy to be developed and the installation of permeable parking bays.
- 1.7 Site levels reflect the developed nature of the site and range from approximately 6.7 m AOD in the south-east to approximately 7.3 m AOD in the south-west (a topographical survey is included in Appendix A).
- 1.8 The northern, southern, and the majority of the western boundary of the current nursery site are marked by drainage ditches. These are connected to the Southern Water surface water sewer network at the north-eastern and south-eastern corners of the site. The connections are best shown on the Arun District Council plan in Appendix A (Southern Water plans are also included in Appendix A). The topographical survey shows that the ditches are in the order of 1.2 m to 1.5 m deep. The ditch beds do not consistently slope in a single direction and so can be considered land drainage ditches rather than 'flowing watercourses'.
- 1.9 As part of the proposed access works a short section of the southern ditch (circa 40 m) and the engineered ditch alongside Chalcroft Lane will need to be piped. Consent for this will be sought separately (from West Sussex County Council or Arun District Council). Figure 5 (photo key plan) shows the Chalcroft Lane ditch on the other side of the wall in image 1, and the southern boundary ditch in images 3 and 4.
- 1.10 British Geological Survey (BGS) mapping describes the site geology as river terrace deposits (superficial geology) over the clays silts and sands of the Lambeth Group (solid geology). Trial pit logs (see Appendix A for the infiltration test investigation) confirm the presence of made ground or topsoil over superficial deposits of slightly gravelly clay.
- 1.11 Groundwater monitoring wells have been installed at the site and will continue to be recorded for several months in order to obtain winter levels. A location plan and table of the results from June 2020 are included in Appendix A.

2.0 Forms of Flooding

Watercourses and Tidal

- 2.1 As shown on Figure 2 the site sits in Flood Zone 1 (the low probability flood area) and is not considered likely to flood as the result of overtopping from a watercourse or from coastal flooding.

Surface water flooding

- 2.2 Surface water flood mapping (see Figure 4) shows only minor spots of flooding on the site. The spots are likely to be the result of localised pooling of direct rainfall on the site. The scale of the flooding means that it is not considered a notable threat to the proposals.
- 2.3 Both the northern and southern boundary ditches are highlighted on the mapping. This is to be expected as the maps show where water will pool and/or flow. The mapping is effectively highlighting the presence of the ditches as functional land drains.

Surface Water Sewers

- 2.4 Southern Water sewer plans (extract included in Appendix A) show no currently adopted surface water or combined networks upstream/upslope of the site and therefore no associated flood risk.

Groundwater

- 2.5 The area is prone to seasonally shallow groundwater levels. Current levels (June 2020) are more than 2 m below ground level (see appended table and plans) but this is expected to be higher during wetter months. Quantifying the likelihood of groundwater flooding is problematic and the Arun District Council Surface Water Management Study (SSWMS) does not include any reports of groundwater flooding in the area. The boundary ditches will provide an element of protection for the site by providing an early 'release valve' for rising groundwater intercepting it and directing it into the Southern Water surface water sewer network. However should groundwater rise to a point where it emerged at the site it would tend to flow off-site (as sheet flow) and follow ground levels of the surrounding land (rather than pooling on site to a point where it would enter the proposed buildings).

Reservoirs

- 2.6 The site does not lie in a reservoir inundation area (see image Figure 2).

3.0 Surface Water Management

- 3.1 Initial infiltration testing at the site suggests that the geology will support infiltrations rates which are low, but within the generally accepted range. However, given the potential for shallow groundwater at the site the proposed surface water management scheme will pursue a restricted discharge to the adjacent ditches.
- 3.2 The primary surface water management scheme (refer to the plans and calculations in Appendix B) relies on two separate attenuation facilities each of which restricts the rates from the 1 in 100 annual probability storm plus 40 % climate change to the calculated annual greenfield rate (1.6 l/s/ha) for the area. The two residential units which will replace the current site access will manage their own runoff at source in private on-plot facilities which will be connected to the Southern Water surface water sewer network at rates to be agreed at a later stage.
- 3.3 The two facilities serving the main site comprise:
- A complex of three shallow basins, 500 to 700 mm deep with 1 in 3 side slopes which run along the northern boundary of the access road. The basins will be hydraulically linked by a *drainage layer which will also serve to filter and treat runoff. The drainage layer will sit beneath engineered soils which will increase the treatment potential of the basins. The result will arguably be a hybrid facility, partway between a basin and a bioretention system. The facility will serve to drain the proposed access road, the western residential parcel, and an element of the commercial parcel. The facility will discharge via an orifice control chamber (protected by the drainage layer). The approximate impermeable catchment area for the facility is 0.65 ha (including a 5 % increase applied to the residential element for urban creep) and the allowable discharge rate is approximately 1.0 l/s.
 - A 500 mm deep stone drainage blanket and floodable car park and hardstanding serving the remaining commercial parcel. Treatment will be provided by permeable car parking bays, SuDS planters, and the stone blanket itself. The outfall from the facility will be to the northern boundary ditch. The approximate impermeable catchment area served by the facility is 0.85 ha (with no creep applied given the proposed land used) and the allowable discharge rate is approximately 1.3 l/s.
- *to allow the basins to be modelled they have been connected with dummy pipes.
- 3.4 Surface water runoff from the two residential units on Chalcraft Lane will pass through permeably paved driveways and/or SuDS planters and be attenuated in attenuation crates/combined harvesting tank.
- 3.5 Half drain down times for the main facilities are necessarily long (given the low discharge rate). The drain down times are considered appropriate as they are based on a long duration storm (the peak levels are only reached during the 7 day storm).

- 3.6 The proposed discharge rates do not include any allowance for existing discharge rates from the site. The commercial development that is to remain and the proposed development will both be restricted to the annual greenfield rate (with the exception of the two residential units in the site access) which should result in a small improvement in rates leaving the site either as overland flow or via infiltration.

Treatment

- 3.7 Based on Table 26.2 in the SuDS Manual the highest pollution hazard level for the site would be medium (based on the more heavily trafficked spine road and the commercial parcel). The treatment provided by the permeable paving, SuDS planters and augmented basins fits with the proposed uses.

Maintenance

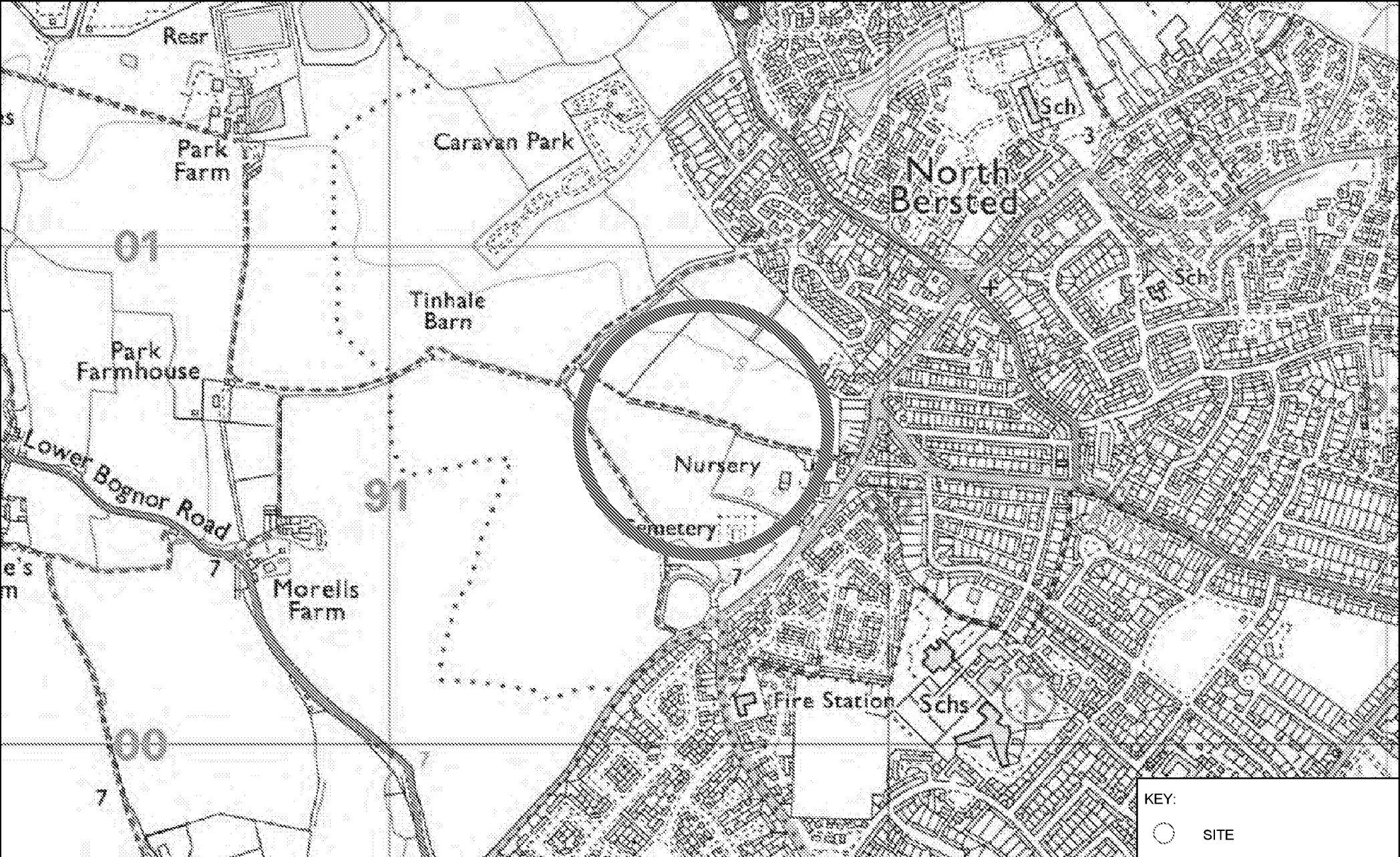
- 3.8 Maintenance responsibilities for the attenuation and treatment facilities and their outfalls will be determined at the appropriate later stages. Currently it is envisaged that the scheme will be managed by a private management company the 18 unit residential parcel) property owners (for the two proposed properties on Chalcroft Lane). And the nursery owners/operators. Outline maintenance schedules are included in Appendix B.

4.0 Conclusions

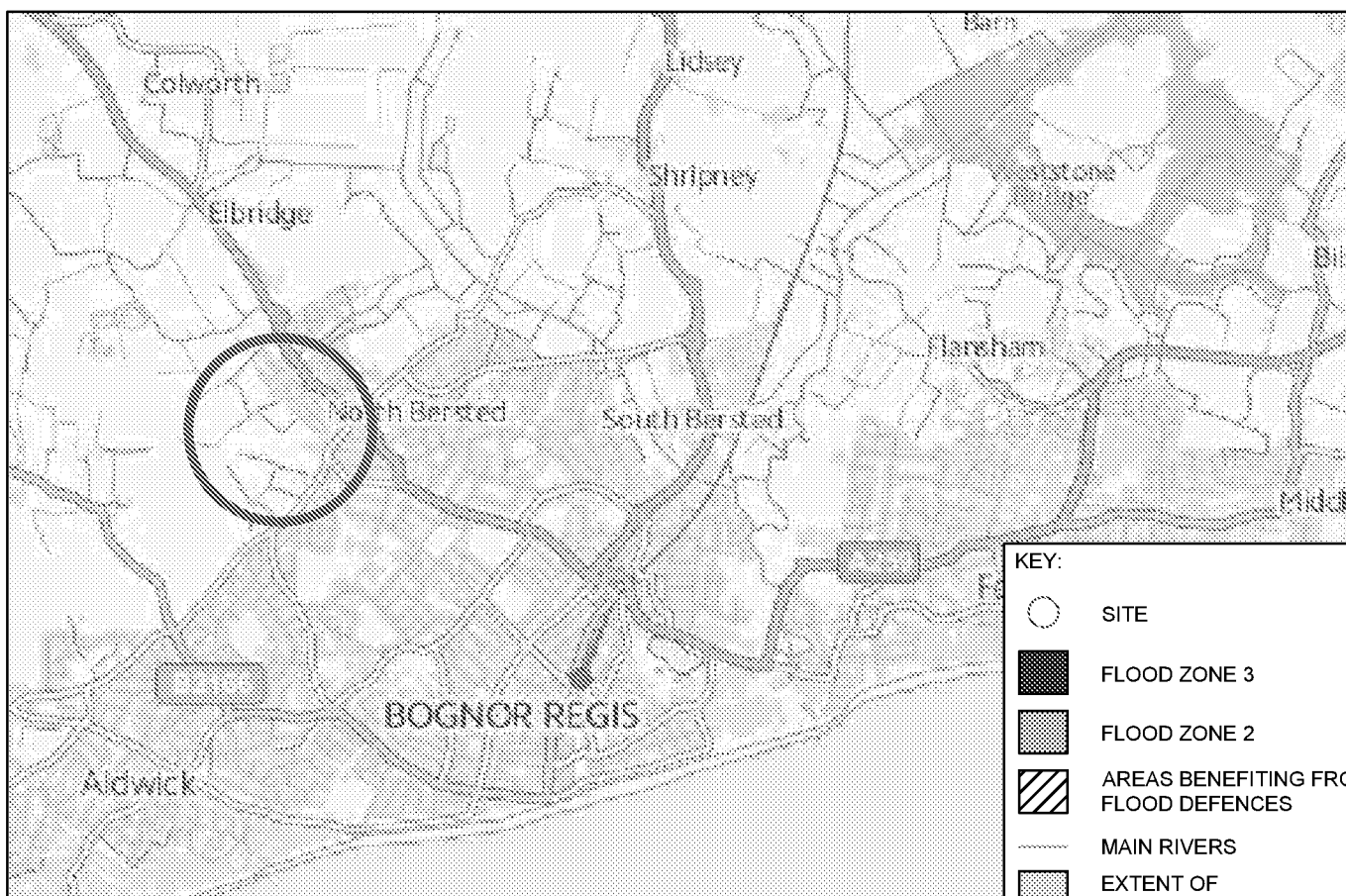
- 4.1 The proposed development is not considered to be subject to significant or unmanageable flooding from the sources identified in the Flood and Water Management Act 2010 (FWMA).
- 4.2 The surface water management strategy relies on restricted discharge to ditches and/or adopted surface water sewers.
- 4.3 The assessed surface water management scheme provides sufficient on-site attenuation to manage the 1 in 100 annual probability storm plus 40 % climate change allowance.
- 4.4 The proposed features provide a suitable level of treatment for the proposed land uses.

Figures

1. Site Location Plan
2. Flood Zone & Reservoir Inundation Map
3. Groundwater Source Protection Zone Map
4. Surface Water Flood Map



DATE 26/06/2020	PROJECT TITLE CHALCROFT NURSERY, BERSTED	FIGURE NUMBER 1	PROJECT NO. U101	CANNON CONSULTING ENGINEERS Highway · Transport & Infrastructure Planning
DRAWN BY DP	FIGURE TITLE SITE LOCATION PLAN			
SCALE @ A4 SIZE D.N.S.				



KEY:

-  SITE
-  FLOOD ZONE 3
-  FLOOD ZONE 2
-  AREAS BENEFITING FROM FLOOD DEFENCES
-  MAIN RIVERS
-  EXTENT OF RESERVOIR FLOODING

DATE
26/06/2020

DRAWN BY
DP

SCALE @ A4 SIZE
D.N.S.

PROJECT TITLE
CHALCROFT NURSERY, BERSTED

FIGURE TITLE
FLOOD ZONES & RESERVOIR INUNDATION PLAN

DRAWING NUMBER

2

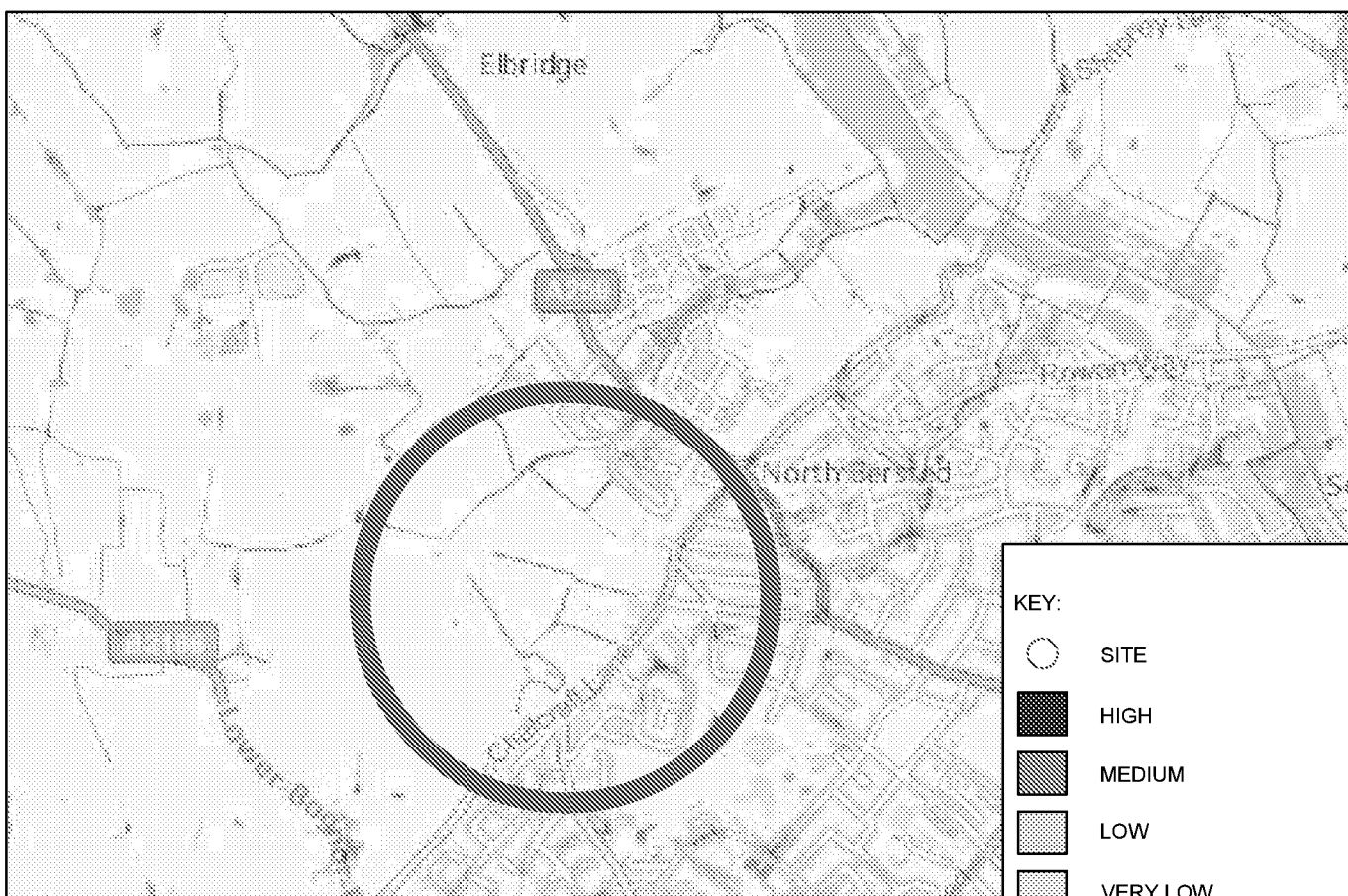
PROJECT NO.

U101

CANNON
CONSULTING ENGINEERS
Highways, Floods, Water & Environmental Engineering



DATE 26/06/2020	PROJECT TITLE CHALCROFT NURSERY, BERSTED	FIGURE NUMBER 3	PROJECT NO. U101	CANNON CONSULTING ENGINEERS Highway Transport & Infrastructure Planning
DRAWN BY DP	FIGURE TITLE GROUNDWATER SOURCE PROTECTION ZONES PLAN			
SCALE @ A4 SIZE D.N.S.				



DATE
26/06/2020

DRAWN BY
DP

SCALE @ A4 SIZE
D.N.S.

PROJECT TITLE
CHALCROFT NURSERY, BERSTED

FIGURE TITLE
SURFACE WATER FLOOD MAPS

DRAWING NUMBER

4

PROJECT NO.

U101

CANNON
CONSULTING ENGINEERS
Highways, Floods, Drainage, Water, Sewerage, Groundwater, Environmental

A. Existing Site

Topographical survey

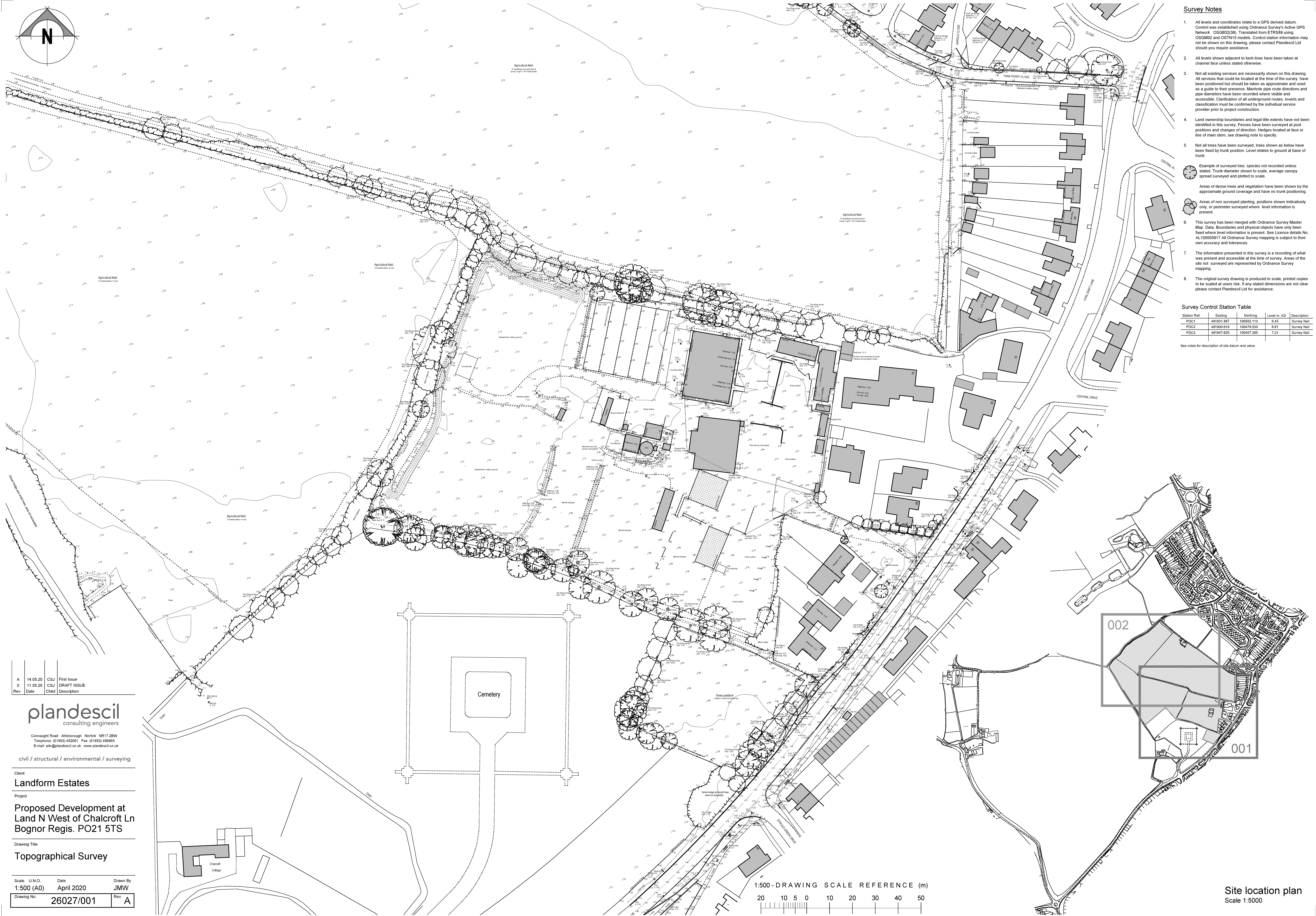
Photo key plan

Southern Water sewer plans

Arun District Council drainage plan

Infiltration Test results

Groundwater monitoring plan and results



Survey Notes

- All levels and coordinates relate to a GPS derived datum. Control was established using Ordnance Survey's Active GPS Network. OSG83(26). Translated from ETRS89 using OSGM02 and OSTN15 models. Control station information may not be shown on this drawing, please contact Plandescil Ltd should you require assistance.
- All levels shown adjacent to kerb lines have been taken at channel face unless stated otherwise.
- Not all existing services are necessarily shown on this drawing. All services that could be located at the time of the survey have been positioned but should be taken as approximate and used as a guide to their presence. Manhole pipe route directions and pipe diameters have been recorded where visible and accessible. Clarification of all underground routes, inverts and classification must be confirmed by the individual service provider prior to project construction.
- Land ownership boundaries and legal title extents have not been identified in this survey. Fences have been surveyed at post positions and changes of direction. Hedges located at face or line of main stem, see drawing note to specify.
- Not all trees have been surveyed, trees shown as below have been fixed by trunk position. Level relates to ground at base of trunk.
 Example of surveyed tree, species not recorded unless stated. Trunk diameter shown to scale, average canopy spread surveyed and plotted to scale.
Areas of dense trees and vegetation have been shown by the approximate ground coverage and have no trunk positioning.
 Areas of non surveyed planting, positions shown indicatively only, or perimeter surveyed where level information is present.
- This survey has been merged with Ordnance Survey Master Map Data. Boundaries and physical objects have only been fixed where level information is present. See Licence details No. AL10005917. All Ordnance Survey mapping is subject to their own accuracy and tolerances.
- The information presented in this survey is a recording of what was present and accessible at the time of survey. Areas of the site not surveyed are represented by Ordnance Survey mapping.
- The original survey drawing is produced to scale, printed copies to be scaled at users risk. If any stated dimensions are not clear please contact Plandescil Ltd for assistance.

Survey Control Station Table

Station Ref	Easting	Northing	Level m. AD	Description
PCD1	491831.887	100502.113	6.45	Survey Nail
PCD2	491903.619	100478.520	6.61	Survey Nail
PCD3	491847.820	100407.385	7.21	Survey Nail

See notes for description of site datum and value

A	14.05.20	CSJ	First Issue
0	11.05.20	CSJ	DRAFT ISSUE
Rev	Date	Chkd	Description

plandescil
consulting engineers

Connaught Road, Attleborough, Norfolk, NR17 2BW
Telephone: (01953) 452001 Fax: (01953) 456955
E-mail: pdc@plandescil.co.uk www.plandescil.co.uk

civil / structural / environmental / surveying

Client

Landform Estates

Project

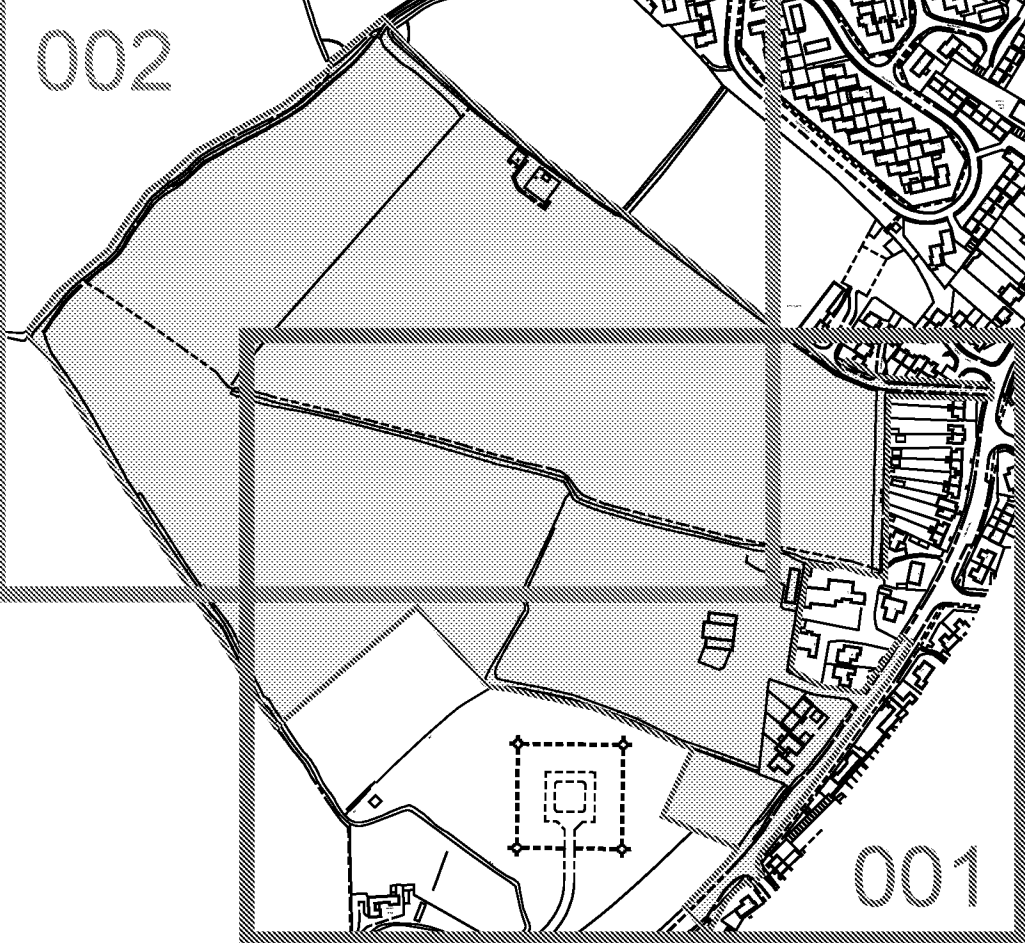
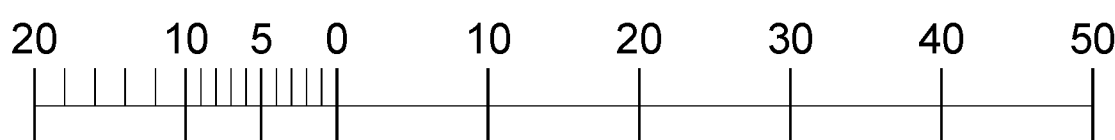
**Proposed Development at
Land N West of Chalcroft Ln
Bognor Regis. PO21 5TS**

Drawing Title

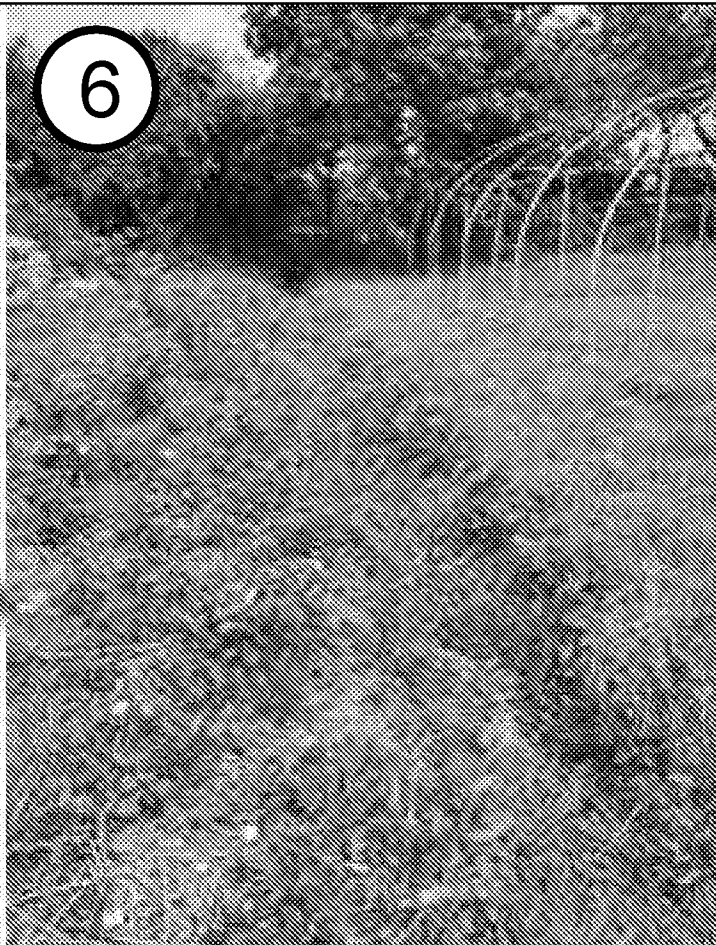
Topographical Survey

Scale	U.N.O.	Date	Drawn By
1:500 (A0)		April 2020	JMW
Drawing No.	26027/001	Rev	A

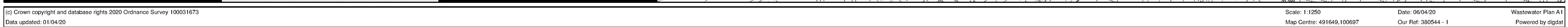
1:500-DRAWING SCALE REFERENCE (m)



Site location plan
Scale 1:5000



REV	DESCRIPTION	DE	DR	CH	DATE	PROJECT TITLE	CLIENT LANDFORM BERSTED LIMITED  Peak House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.uk Cambridge House, Lanwades Business Park, Kenford Newmarket, CB8 7PN Tel: 01638 555107 www.cannonce.co.uk
DESIGNED BY	DRAWN BY	CHECKED BY				DRAWING TITLE	
-	DP	-				PHOTO KEY PLAN	
SCALE @ A2 SIZE D.N.S.		DATE 22/07/2020				DRAWING NUMBER U101 - PL - SK - 354 REV. -	



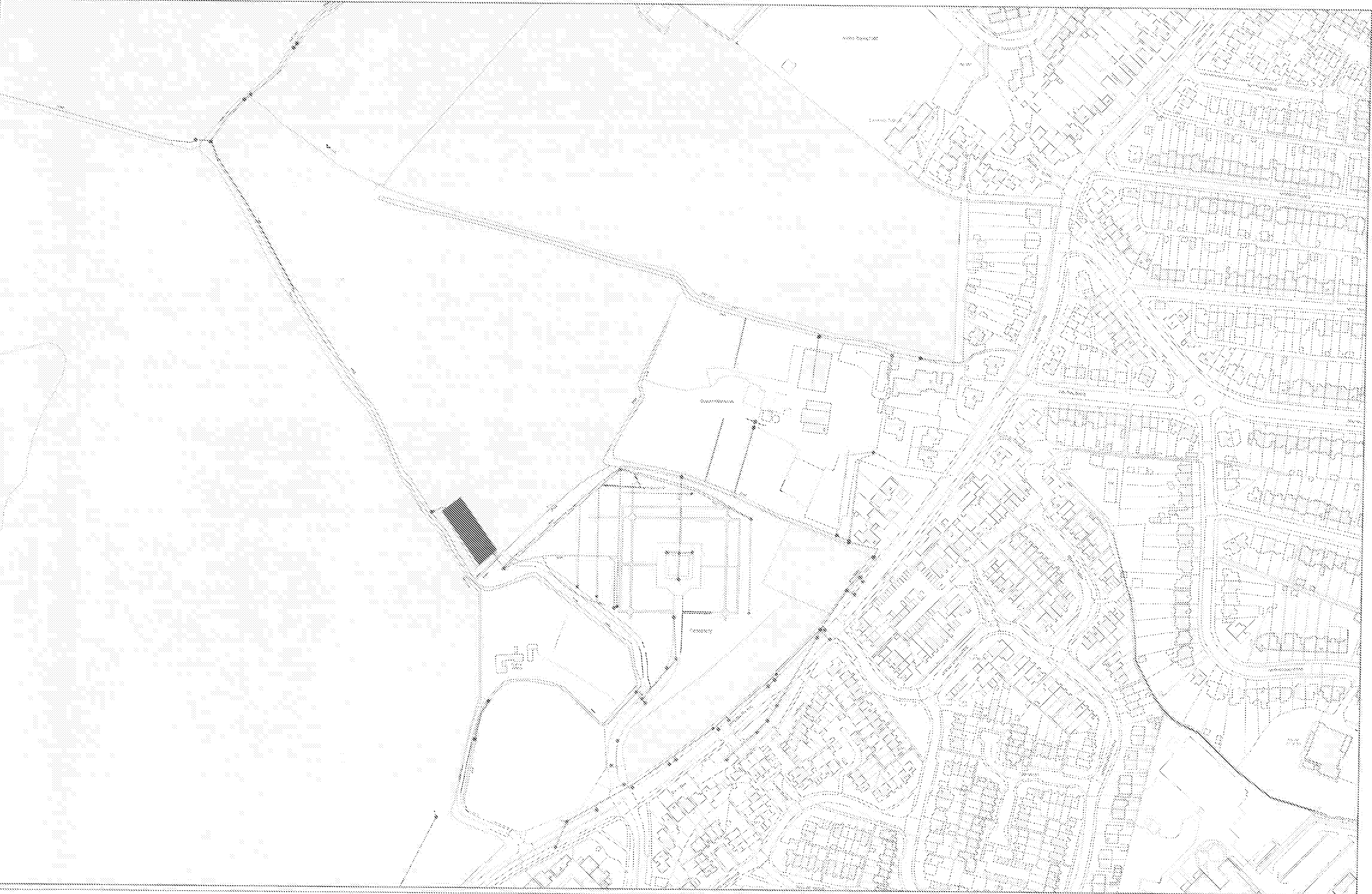
jenni.askew@cannonce.co.uk
Bersted



WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

9402	F	7.24	4.55		9154	S	3.61	2.02											
------	---	------	------	--	------	---	------	------	--	--	--	--	--	--	--	--	--	--	--

Arun District Council Maps



**Soil Infiltration Testing
Results - Factual Report**

**Land off Chalcraft Lane,
Bersted**

Client: Landform Bersted
Limited

Reference: 72302/R/005
Status: Draft for Comments
Date: 25th June 2020

Issued by: **Nott Group**
Unit L26
Hastingwood Industrial
Park
Wood Lane
Birmingham
B24 9QR

Prepared by:
Name Mark Hiatt MSci (Hons) CGeol EurGeol FGS
Signature
Title **Geotechnical Director**

Checked and Approved by:
Name Ed Bullivant BSc FGS CGeol SILC
Signature
Title **Director**

This report has been prepared by Nott Group with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

CONTENTS

1. BRIEF	1
2. GROUND CONDITIONS SUMMARY	1
2.1 Published Geology	1
2.2 Ground Conditions Encountered	2
3. TESTING METHODOLOGY AND RESULTS	3
3.1 Infiltration Testing and Results	3
3.2 Assessment of Results and Recommendations	3

APPENDICES

APPENDIX A	TRIAL PIT LOCATION PLAN
APPENDIX B	INFILTRATION TEST RESULTS
APPENDIX C	TRIAL PIT LOGS

1. BRIEF

The Nott Group have been instructed by the client to undertake soil infiltration testing at the above site.

This report has been prepared for the exclusive use of the client for the purpose of assisting them in evaluating the potential soakaway design for the above site.

The information presented within this report is based on observations made on site and ground conditions encountered which can vary between test locations.

2. GROUND CONDITIONS SUMMARY

2.1 PUBLISHED GEOLOGY

The following table summarises the published geological information for the site.

TABLE 1: PUBLISHED SITE GEOLOGY

Data	Information
Solid Geology	The Lambeth Group is mapped across the entire site and is described by the BGS as Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.
Superficial Geology	The River Terrace Deposits are mapped across the entire site and is described by the BGS as Sand and gravel, locally with lenses of silt, clay or peat.
Made Ground	None mapped on site by the BGS.

2.2 GROUND CONDITIONS ENCOUNTERED

The following table summarises the ground conditions encountered during the site works for the infiltration testing. Full descriptions of the ground conditions encountered can be found in Appendix C.

TABLE 2: GROUND CONDITIONS ENCOUNTERED SUMMARY

Strata Encountered	Description	Depth in meters below ground level (m bgl)
Topsoil	Brown very clayey slightly gravelly fine-grained SAND. Gravel is fine to medium angular quartz.	TP1: 0.00m - 0.26m TP2: 0.00m - 0.25m TP3: 0.00m - 0.31m TP4: 0.00m - 0.28m
Made Ground	Dark brown and black silty fine to coarse grained SAND and GRAVEL with some cobbles. Gravel is fine angular to rounded quartz and fine to coarse angular brick, metal fragments and wood fragments. Cobbles are angular brick and angular to rounded quartz.	TP5: 0.00m - 0.55m TP6: 0.00m - 0.62m
Natural Superficial Deposits	Soft to firm reddish brown sandy slightly gravelly CLAY. Gravel is medium angular flint and quartz.	TP1: 0.26m – 1.30m TP2: 0.25m – 0.68m TP3: 0.31m – 1.30m TP4: 0.28m – 0.70m TP5: 0.55m – 1.40m TP6: 0.62m – 1.35m

3. TESTING METHODOLOGY AND RESULTS

3.1 INFILTRATION TESTING AND RESULTS

The testing has been undertaken in general accordance of BRE Digest 365 2016 for Soakaway Design. The results of the testing are summarised in the following table. A full set of results with the adopted methodology are enclosed in Appendix B.

The site works were undertaken over two days (5th and 6th May 2020). The first day comprised the excavation of all pits and filling of water with follow-up monitoring and recording. At the end of the first day the trial pits were made safe. The second day comprised the refilling of the pits with water and further monitoring and recording.

The test locations and trial pit logs are enclosed in Appendix A and C.

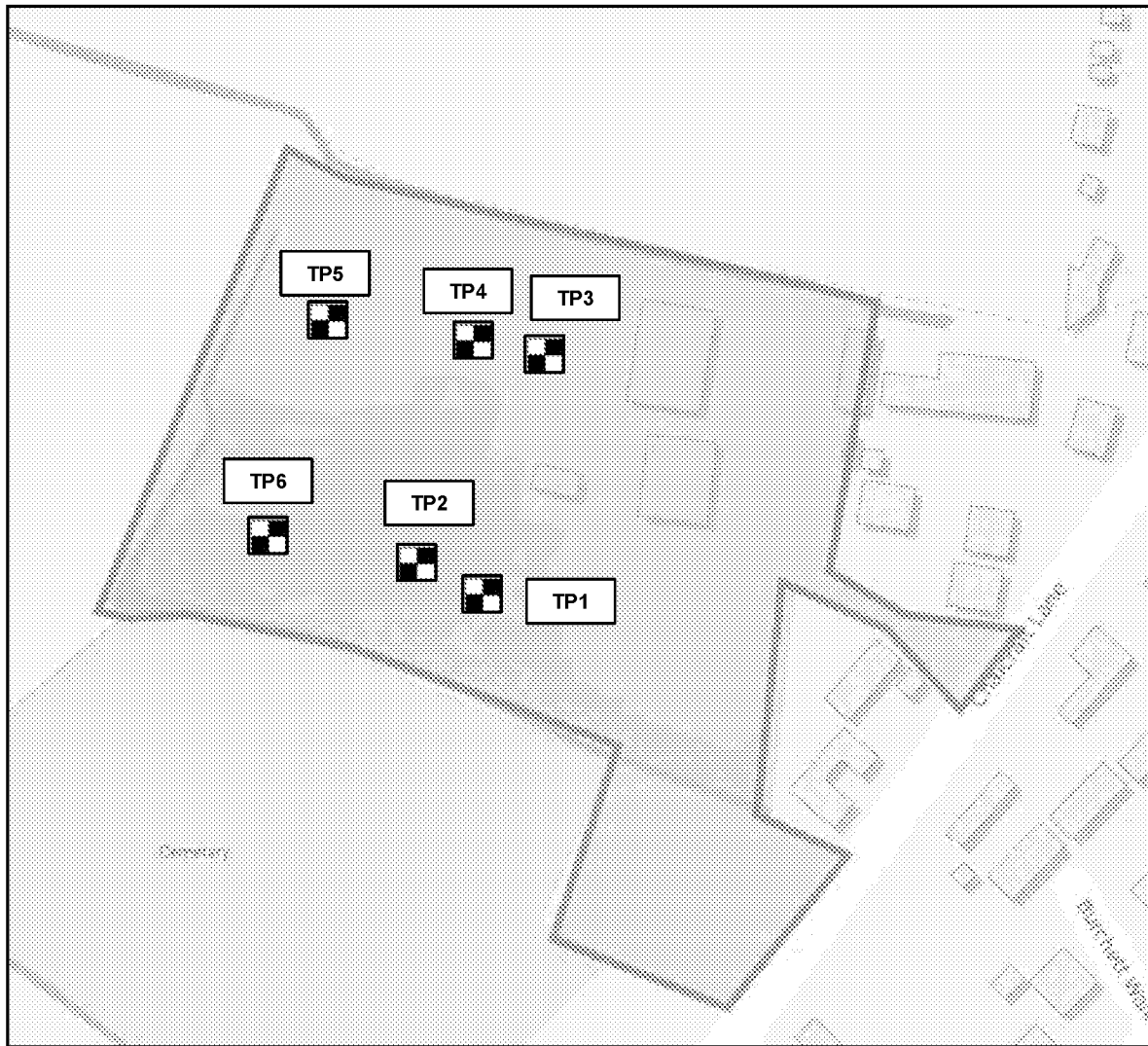
TABLE 3: RESULTS SUMMARY

Trial Pit Location	Depth of Pit (m bgl)	Minimum Result Obtained (m/s)	Comments
TP1	1.30m	2.1E-06	3 tests undertaken
TP2	0.68m	1.5E-06	3 tests undertaken
TP3	1.30m	2.4E-06	3 tests undertaken
TP4	0.7m	1.7E-06	3 tests undertaken
TP5	1.4m	-	No testing undertaken due to made ground deposits. Groundwater encountered at a depth of 1.15m bgl
TP6	1.35m	-	No testing undertaken due to made ground deposits.

3.2 ASSESSMENT OF RESULTS AND RECOMMENDATIONS

Based upon the above results and the ground conditions encountered (in accordance with BRE 365 2016) we recommend that soakaways are not suitable at this site. Further testing may be warranted to confirm this. Groundwater level monitoring is also recommended.

Appendix A TRIAL PIT LOCATION PLAN



Key



Machine Excavated
Trial Pit
(TP)

N



Do Not Scale



Title: **Appendix A – Trial Pit Location Plan**

Project Name: **Chalcroft Lane, Bersted**

Client: **Landform Bersted Limited**

Project No: **72302**

Date: **10/05/2020**

Drawing No **1**

Appendix B INFILTRATION TEST RESULTS



Project No.: 73002
Site: West Bersted
Test Location: TP1 - test 1
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

test pit top dimensions width (m) length (m)
 test pit base dimensions 0.42 1.95
 test pit depth 0.4 1.95
 1.3 m

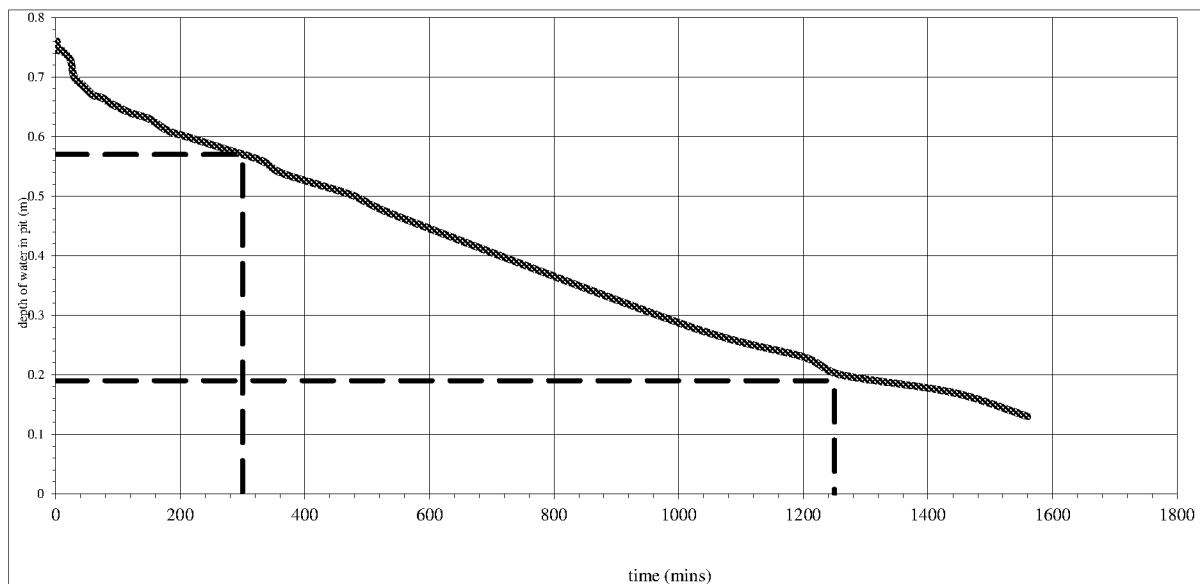
test infiltration rate (f) = 2.1E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.54	0.76	0	0.00	4.36
1	0.54	0.76	1	0.00	4.36
2	0.54	0.76	2	0.00	4.36
3	0.55	0.75	3	0.01	4.34
4	0.555	0.745	4	0.01	4.33
5	0.555	0.745	5	0.01	4.33
10	0.555	0.745	10	0.01	4.33
15	0.56	0.74	15	0.02	4.31
20	0.565	0.735	20	0.02	4.30
25	0.575	0.725	25	0.03	4.28
30	0.6	0.7	30	0.05	4.22
45	0.615	0.685	45	0.06	4.18
60	0.63	0.67	60	0.07	4.15
75	0.635	0.665	75	0.08	4.14
90	0.645	0.655	90	0.08	4.11
120	0.66	0.64	120	0.10	4.08
150	0.67	0.63	150	0.10	4.05
180	0.69	0.61	180	0.12	4.01
210	0.7	0.6	210	0.13	3.98
270	0.72	0.58	270	0.14	3.94
330	0.74	0.56	330	0.16	3.89
360	0.76	0.54	360	0.18	3.84
420	0.78	0.52	420	0.19	3.79
480	0.8	0.5	480	0.21	3.75
540	0.83	0.47	540	0.23	3.68
1020	1.02	0.28	1020	0.38	3.23
1200	1.07	0.23	1200	0.42	3.11
1260	1.1	0.2	1260	0.44	3.04
1440	1.13	0.17	1440	0.47	2.97
1560	1.17	0.13	1560	0.50	2.88

0.57 m water depth
 time is 300.0 minutes

0.19 m water depth
 time is 1250.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
300	0.73	0.57	0	0.00		
1250	1.11	0.19	950	0.30	2.57	2.1E-06





Project No.: 73002
Site: West Bersted
Test Location: TP1 - test 2
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

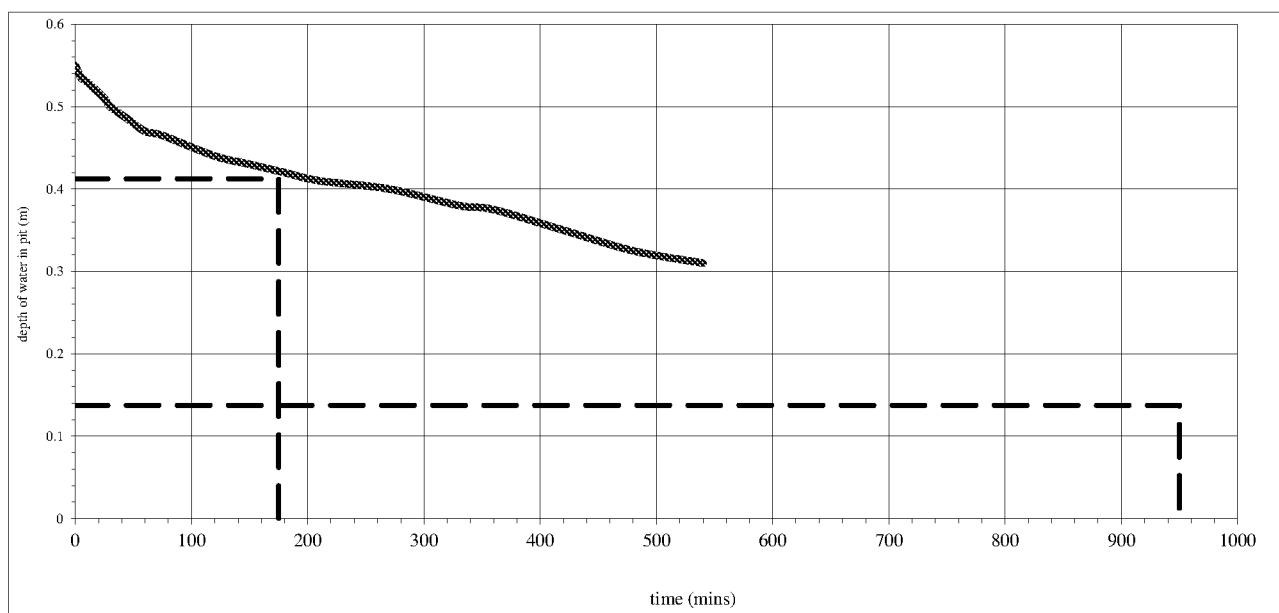
	width (m)	length (m)	
test pit top dimensions	0.42	1.95	
test pit base dimensions	0.4	1.95	test infiltration rate (f) = 2.2E-06 m/s
test pit depth	1.3	m	groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.75	0.55	0	0.00	3.37
5	0.765	0.535	5	0.01	3.33
10	0.77	0.53	10	0.02	3.32
25	0.79	0.51	25	0.03	3.28
30	0.8	0.5	30	0.04	3.25
45	0.815	0.485	45	0.05	3.22
60	0.83	0.47	60	0.06	3.18
75	0.835	0.465	75	0.07	3.17
120	0.86	0.44	120	0.09	3.11
150	0.87	0.43	150	0.10	3.09
180	0.88	0.42	180	0.10	3.06
210	0.89	0.41	210	0.11	3.04
270	0.9	0.4	270	0.12	3.02
330	0.92	0.38	330	0.13	2.97
360	0.925	0.375	360	0.14	2.96
420	0.95	0.35	420	0.16	2.90
480	0.975	0.325	480	0.18	2.84
540	0.99	0.31	540	0.19	2.80

0.4125 m water depth
 time is 175.0 minutes

0.1375 m water depth
 time is 950.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
175	0.8875	0.4125	0	0.00		
950	1.1625	0.1375	775	0.22	2.07	2.2E-06





Project No.: 73002
Site: West Bersted
Test Location: TP1 - test 3
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

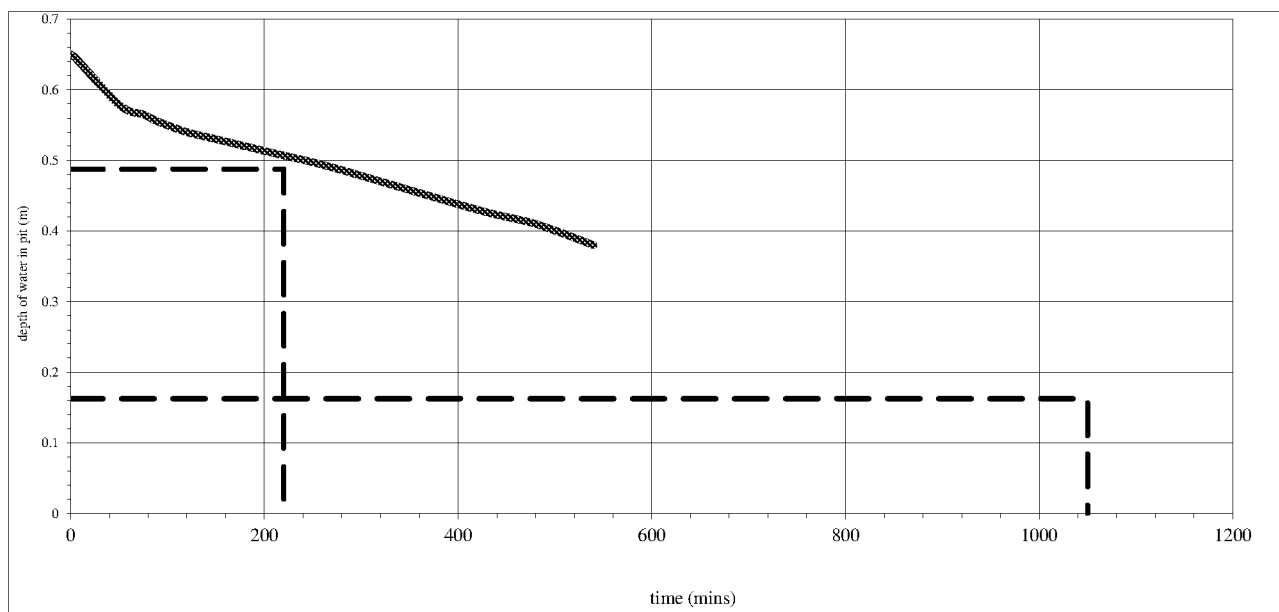
	width (m)	length (m)	
test pit top dimensions	0.42	1.95	
test pit base dimensions	0.4	1.95	test infiltration rate (f) = 2.2E-06 m/s
test pit depth	1.3	m	groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.65	0.65	0	0.00	3.84
5	0.655	0.645	5	0.00	3.83
45	0.715	0.585	45	0.05	3.69
60	0.73	0.57	60	0.06	3.65
75	0.735	0.565	75	0.07	3.64
90	0.745	0.555	90	0.08	3.62
120	0.76	0.54	120	0.09	3.58
150	0.77	0.53	150	0.10	3.56
180	0.78	0.52	180	0.10	3.53
210	0.79	0.51	210	0.11	3.51
270	0.81	0.49	270	0.13	3.46
420	0.87	0.43	420	0.18	3.32
480	0.89	0.41	480	0.19	3.28
540	0.92	0.38	540	0.21	3.20

0.4875 m water depth
 time is 220.0 minutes

0.1625 m water depth
 time is 1050.0 minutes

Extrapolated values				Tp75-25	Vp75-25	Ap50	F
220	0.8125	0.4875	0	0.00			
1050	1.1375	0.1625	830	0.26	2.31	2.2E-06	



Project No.: 73002
Site: West Bersted
Test Location: TP2 - test 1
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)	
test pit top dimensions	0.43	1.4	
test pit base dimensions	0.4	1.4	
test pit depth	0.68	m	

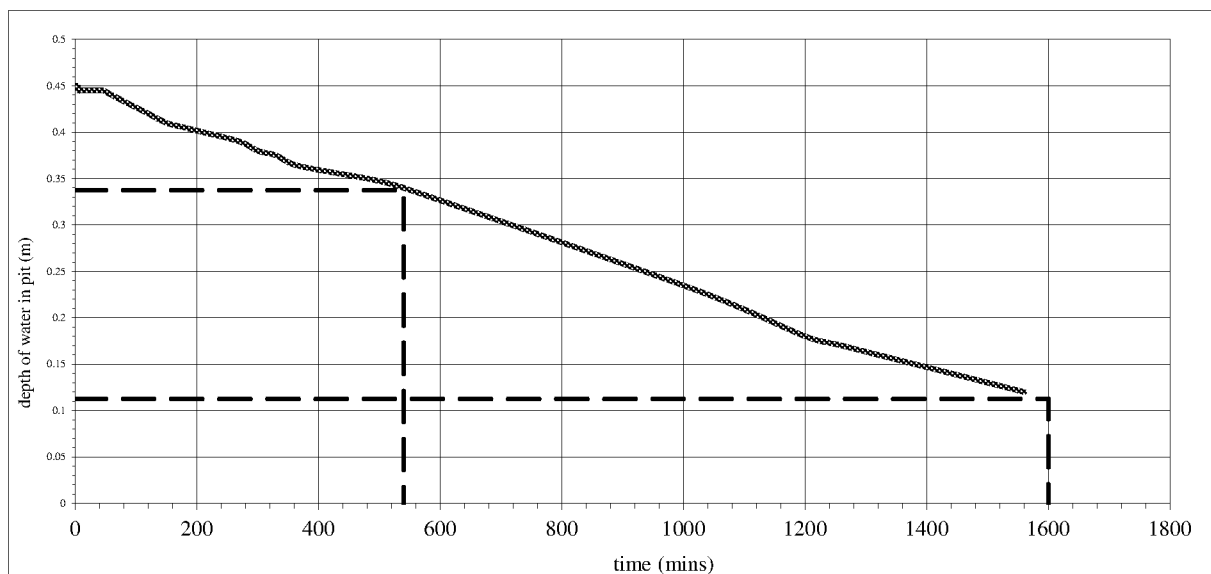
test infiltration rate (f) = 1.5E-06 m/s
 groundwater depth before adding water (m) = 0

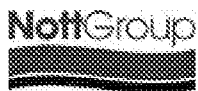
time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.23	0.45	0	0.00	2.19
1	0.23	0.45	1	0.00	2.19
2	0.23	0.45	2	0.00	2.19
3	0.23	0.45	3	0.00	2.19
4	0.23	0.45	4	0.00	2.19
5	0.235	0.445	5	0.00	2.18
10	0.235	0.445	10	0.00	2.18
15	0.235	0.445	15	0.00	2.18
20	0.235	0.445	20	0.00	2.18
25	0.235	0.445	25	0.00	2.18
30	0.235	0.445	30	0.00	2.18
45	0.235	0.445	45	0.00	2.18
60	0.24	0.44	60	0.01	2.17
75	0.245	0.435	75	0.01	2.16
90	0.25	0.43	90	0.01	2.15
120	0.26	0.42	120	0.02	2.13
150	0.27	0.41	150	0.02	2.12
180	0.275	0.405	180	0.03	2.11
210	0.28	0.4	210	0.03	2.10
270	0.29	0.39	270	0.04	2.08
300	0.3	0.38	300	0.04	2.06
330	0.305	0.375	330	0.04	2.05
360	0.315	0.365	360	0.05	2.03
420	0.323	0.357	420	0.05	2.02
480	0.33	0.35	480	0.06	2.01
540	0.34	0.34	540	0.06	1.99
1020	0.45	0.23	1020	0.13	1.79
1200	0.5	0.18	1200	0.16	1.70
1260	0.51	0.17	1260	0.16	1.68
1440	0.54	0.14	1440	0.18	1.63
1560	0.56	0.12	1560	0.19	1.59

0.3375 m water depth
 time is 540.0 minutes

0.1125 m water depth
 time is 1600.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
540	0.3425	0.3375	0	0.00		
1600	0.5675	0.1125	1060	0.13	1.37	1.5E-06





Project No.: 73002
Site: West Bersted
Test Location: TP2 - test 2
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.43	1.4
test pit base dimensions	0.4	1.4
test pit depth	0.68	m

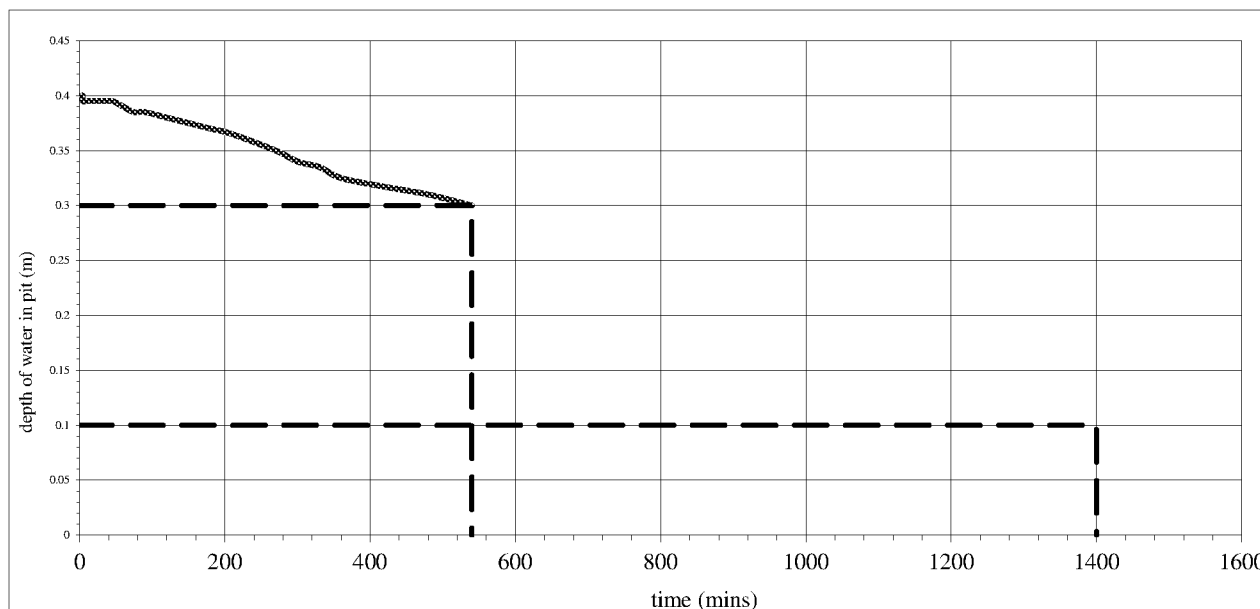
test infiltration rate (f) = 1.7E-06 m/s
 groundwater depth before adding water (m) = 0

	time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
	0	0.28	0.4	0	0.00	2.01
	1	0.28	0.4	1	0.00	2.01
	2	0.28	0.4	2	0.00	2.01
	3	0.28	0.4	3	0.00	2.01
	4	0.28	0.4	4	0.00	2.01
	5	0.285	0.395	5	0.00	2.00
	10	0.285	0.395	10	0.00	2.00
	15	0.285	0.395	15	0.00	2.00
	20	0.285	0.395	20	0.00	2.00
	25	0.285	0.395	25	0.00	2.00
	30	0.285	0.395	30	0.00	2.00
	45	0.285	0.395	45	0.00	2.00
	60	0.29	0.39	60	0.01	1.99
	75	0.295	0.385	75	0.01	1.98
1.5	90	0.295	0.385	90	0.01	1.98
2	120	0.3	0.38	120	0.01	1.97
2.5	150	0.305	0.375	150	0.01	1.96
3	180	0.31	0.37	180	0.02	1.95
3.5	210	0.315	0.365	210	0.02	1.94
4.5	270	0.33	0.35	270	0.03	1.92
5	300	0.34	0.34	300	0.03	1.90
5.5	330	0.345	0.335	330	0.04	1.89
6	360	0.355	0.325	360	0.04	1.87
7	420	0.363	0.317	420	0.05	1.86
8	480	0.37	0.31	480	0.05	1.84
9	540	0.38	0.3	540	0.06	1.83

0.3 m water depth
 time is 540.0 minutes

0.1 m water depth
 time is 1400.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
540	0.38	0.3	0	0.00		
1400	0.58	0.1	860	0.11	1.28	1.7E-06





Project No.: 73002
Site: West Bersted
Test Location: TP2 - test 3
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)	
test pit top dimensions	0.43	1.4	
test pit base dimensions	0.4	1.4	
test pit depth	0.68	m	

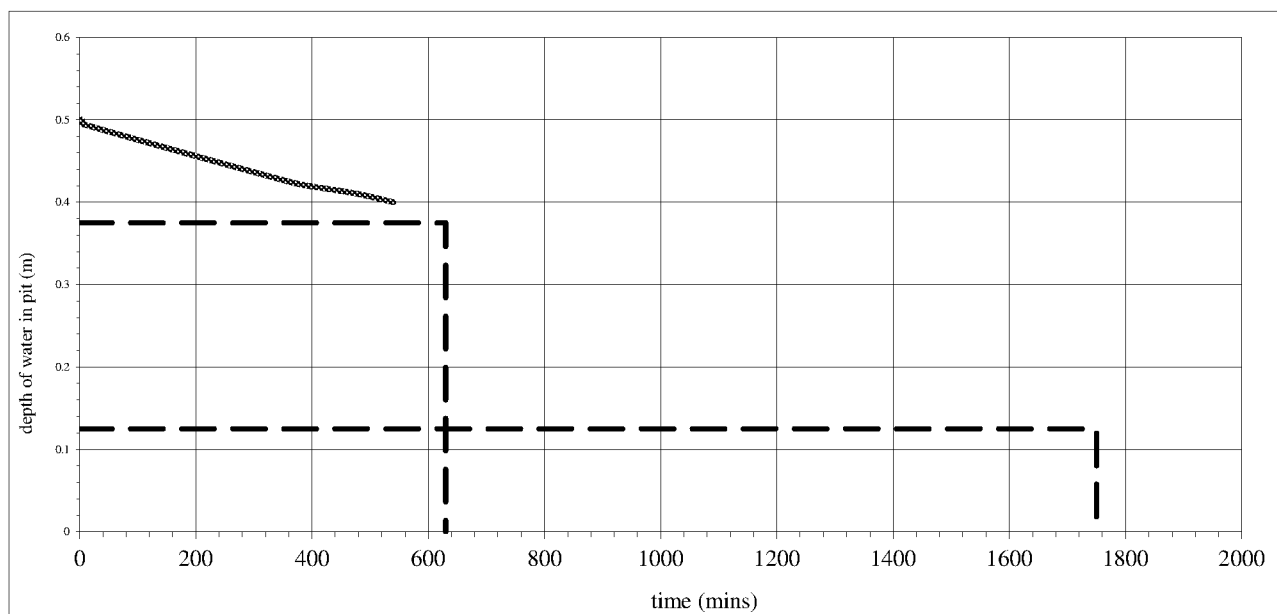
test infiltration rate (f) = 1.5E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.18	0.5	0	0.00	2.37
1	0.18	0.5	1	0.00	2.37
2	0.18	0.5	2	0.00	2.37
3	0.18	0.5	3	0.00	2.37
4	0.18	0.5	4	0.00	2.37
5	0.185	0.495	5	0.00	2.36
360	0.255	0.425	360	0.04	2.23
420	0.263	0.417	420	0.05	2.22
480	0.27	0.41	480	0.05	2.21
540	0.28	0.4	540	0.06	2.19

0.375 m water depth
 time is 630.0 minutes

0.125 m water depth
 time is 1750.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
630	0.305	0.375	0	0.00		
1750	0.555	0.125	1120	0.14	1.46	1.5E-06





Project No.: 73002
Site: West Bersted
Test Location: TP3 - test 1
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.55	1.82
test pit base dimensions	0.5	1.82
test pit depth	1.3	m

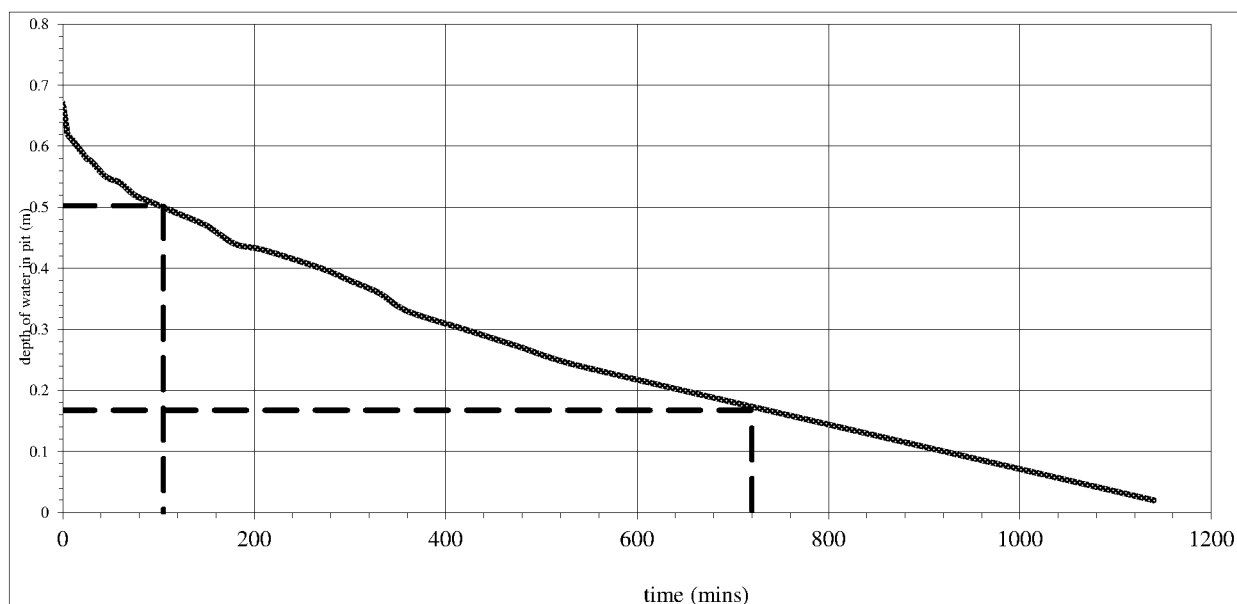
test infiltration rate (f) = 3.4E-06 m/s
 groundwater depth before adding water (m) =

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.63	0.67	0	0.00	4.04
1	0.64	0.66	1	0.01	4.01
2	0.65	0.65	2	0.02	3.99
3	0.66	0.64	3	0.03	3.97
4	0.67	0.63	4	0.04	3.94
5	0.68	0.62	5	0.05	3.92
10	0.69	0.61	10	0.06	3.90
15	0.7	0.6	15	0.07	3.87
20	0.71	0.59	20	0.08	3.85
25	0.72	0.58	25	0.09	3.83
30	0.725	0.575	30	0.09	3.81
45	0.75	0.55	45	0.11	3.75
60	0.76	0.54	60	0.12	3.73
75	0.78	0.52	75	0.14	3.68
90	0.79	0.51	90	0.15	3.66
120	0.81	0.49	120	0.17	3.61
150	0.83	0.47	150	0.19	3.57
180	0.86	0.44	180	0.22	3.50
210	0.87	0.43	210	0.23	3.47
270	0.9	0.4	270	0.26	3.40
300	0.92	0.38	300	0.27	3.36
330	0.94	0.36	330	0.29	3.31
360	0.97	0.33	360	0.32	3.24
420	1	0.3	420	0.35	3.17
480	1.03	0.27	480	0.38	3.10
540	1.06	0.24	540	0.40	3.03
1140	1.28	0.02	1140	0.61	2.52

0.5025 m water depth
 time is 105.0 minutes

0.1675 m water depth
 time is 720.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
105	0.7975	0.5025	0	0.00		
720	1.1325	0.1675	615	0.31	2.47	3.4E-06





Project No.: 73002
Site: West Bersted
Test Location: TP3 - test 2
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.55	1.82
test pit base dimensions	0.5	1.82
test pit depth	1.3	m

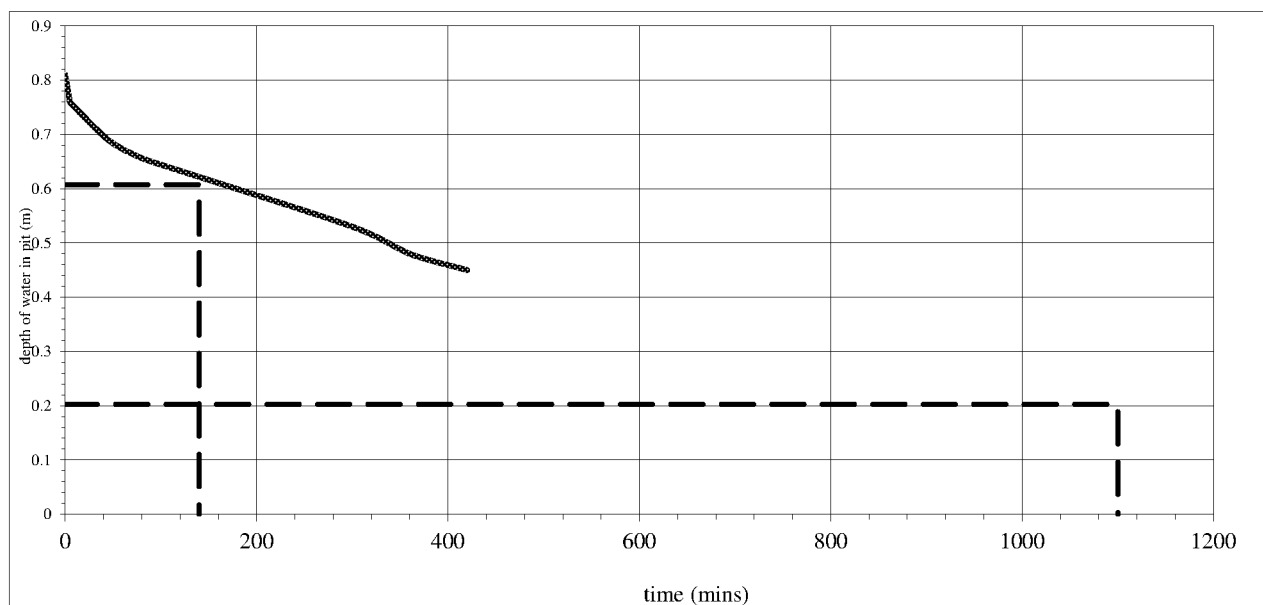
test infiltration rate (f) = 2.4E-06 m/s
 groundwater depth before adding water (m) =

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.49	0.81	0	0.00	4.69
1	0.5	0.8	1	0.01	4.67
2	0.51	0.79	2	0.02	4.65
3	0.52	0.78	3	0.03	4.62
4	0.53	0.77	4	0.04	4.60
5	0.54	0.76	5	0.05	4.58
10	0.55	0.75	10	0.06	4.55
45	0.61	0.69	45	0.12	4.41
75	0.64	0.66	75	0.14	4.34
90	0.65	0.65	90	0.15	4.32
300	0.77	0.53	300	0.27	4.04
360	0.82	0.48	360	0.32	3.92
420	0.85	0.45	420	0.34	3.85

0.6075 m water depth
 time is 140.0 minutes

0.2025 m water depth
 time is 1100.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
140	0.6925	0.6075	0	0.00		
1100	1.0975	0.2025	960	0.38	2.80	2.4E-06





Project No.: 73002
Site: West Bersted
Test Location: TP3 - test 3
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.55	1.82
test pit base dimensions	0.5	1.82
test pit depth	1.3	m

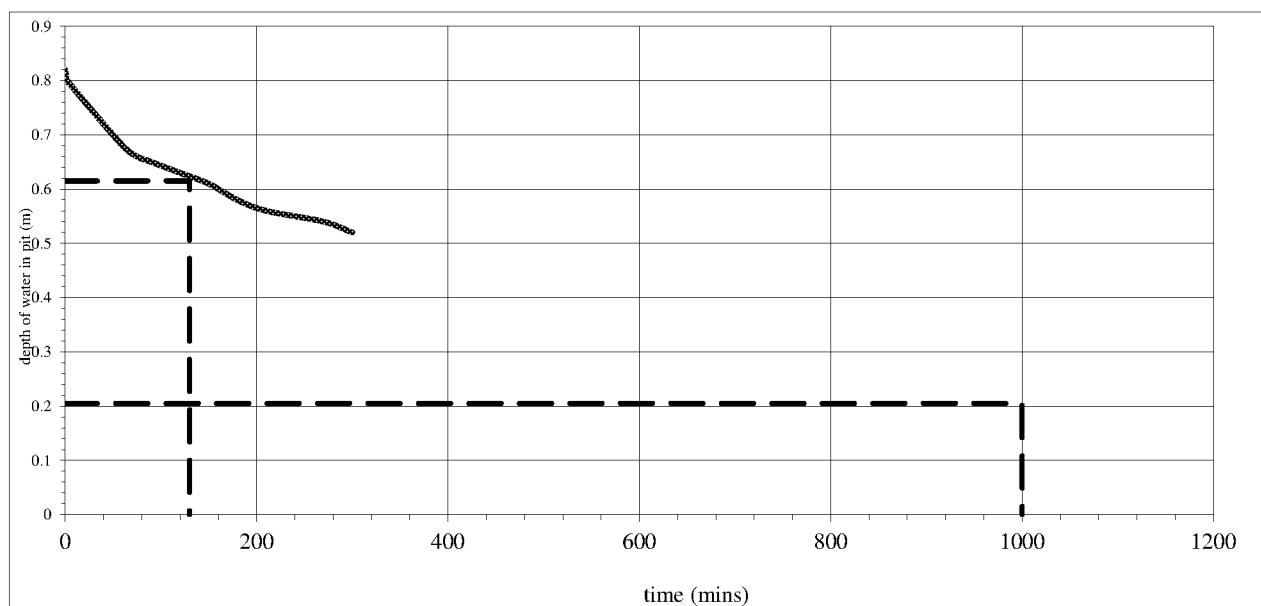
test infiltration rate (f) = 2.6E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.48	0.82	0	0.00	4.74
1	0.49	0.81	1	0.01	4.72
2	0.5	0.8	2	0.02	4.69
60	0.62	0.68	60	0.13	4.41
75	0.64	0.66	75	0.15	4.36
90	0.65	0.65	90	0.16	4.34
120	0.67	0.63	120	0.18	4.29
150	0.69	0.61	150	0.20	4.25
180	0.72	0.58	180	0.23	4.18
210	0.74	0.56	210	0.25	4.13
270	0.76	0.54	270	0.27	4.08
300	0.78	0.52	300	0.29	4.04

0.615 m water depth
 time is 130.0 minutes

0.205 m water depth
 time is 1000.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
130	0.685	0.615	0	0.00		
1000	1.095	0.205	870	0.38	2.82	2.6E-06





Project No.: 73002
Site: West Bersted
Test Location: TP4 - test 1
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.44	1.64
test pit base dimensions	0.4	1.64
test pit depth	0.7	m

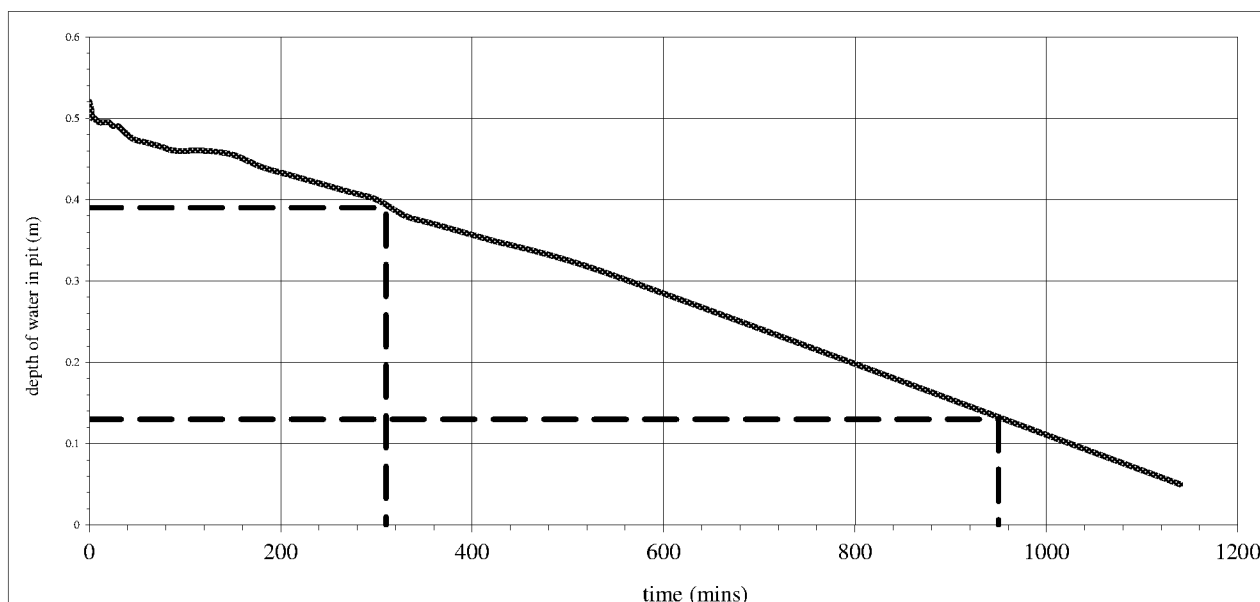
test infiltration rate (f) = 2.7E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.18	0.52	0	0.00	2.79
1	0.185	0.515	1	0.00	2.78
2	0.19	0.51	2	0.01	2.77
3	0.2	0.5	3	0.01	2.75
4	0.2	0.5	4	0.01	2.75
5	0.2	0.5	5	0.01	2.75
10	0.205	0.495	10	0.02	2.74
15	0.205	0.495	15	0.02	2.74
20	0.205	0.495	20	0.02	2.74
25	0.21	0.49	25	0.02	2.73
30	0.21	0.49	30	0.02	2.73
45	0.225	0.475	45	0.03	2.70
60	0.23	0.47	60	0.04	2.69
75	0.235	0.465	75	0.04	2.68
90	0.24	0.46	90	0.04	2.67
120	0.24	0.46	120	0.04	2.67
150	0.245	0.455	150	0.05	2.66
180	0.26	0.44	180	0.06	2.63
210	0.27	0.43	210	0.06	2.61
270	0.29	0.41	270	0.08	2.57
300	0.3	0.4	300	0.08	2.55
330	0.32	0.38	330	0.10	2.50
360	0.33	0.37	360	0.10	2.48
420	0.35	0.35	420	0.12	2.44
540	0.39	0.31	540	0.15	2.36
1140	0.65	0.05	1140	0.32	1.83

0.39 m water depth
 time is 310.0 minutes

0.13 m water depth
 time is 950.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
310	0.31	0.39	0	0.00		
950	0.57	0.13	640	0.18	1.72	2.7E-06





Project No.: 73002
Site: West Bersted
Test Location: TP4 - test 2
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.44	1.64
test pit base dimensions	0.4	1.64
test pit depth	0.7	m

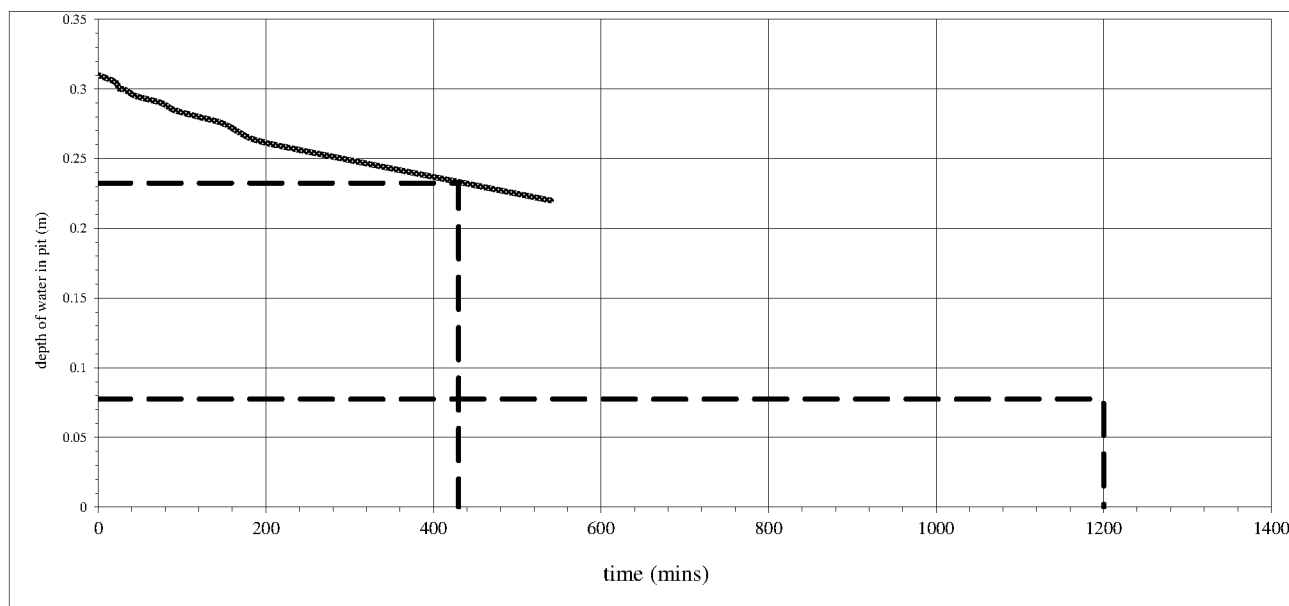
test infiltration rate (f) = 1.7E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.39	0.31	0	0.00	1.93
20	0.395	0.305	20	0.00	1.92
25	0.4	0.3	25	0.01	1.91
30	0.4	0.3	30	0.01	1.91
45	0.405	0.295	45	0.01	1.90
75	0.41	0.29	75	0.01	1.89
90	0.415	0.285	90	0.02	1.87
120	0.42	0.28	120	0.02	1.86
150	0.425	0.275	150	0.02	1.85
180	0.435	0.265	180	0.03	1.83
210	0.44	0.26	210	0.03	1.82
540	0.48	0.22	540	0.06	1.74

0.2325 m water depth
 time is 430.0 minutes

0.0775 m water depth
 time is 1200.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
430	0.4675	0.2325	0	0.00		
1200	0.6225	0.0775	770	0.10	1.29	1.7E-06





Project No.: 73002
Site: West Bersted
Test Location: TP4 - test 3
Date: 6th and 7th May 2020

Nott Group
Infiltration Test

Analysis using method as described in
 BRE Digest 365 2007

	width (m)	length (m)
test pit top dimensions	0.44	1.64
test pit base dimensions	0.4	1.64
test pit depth	0.7	m

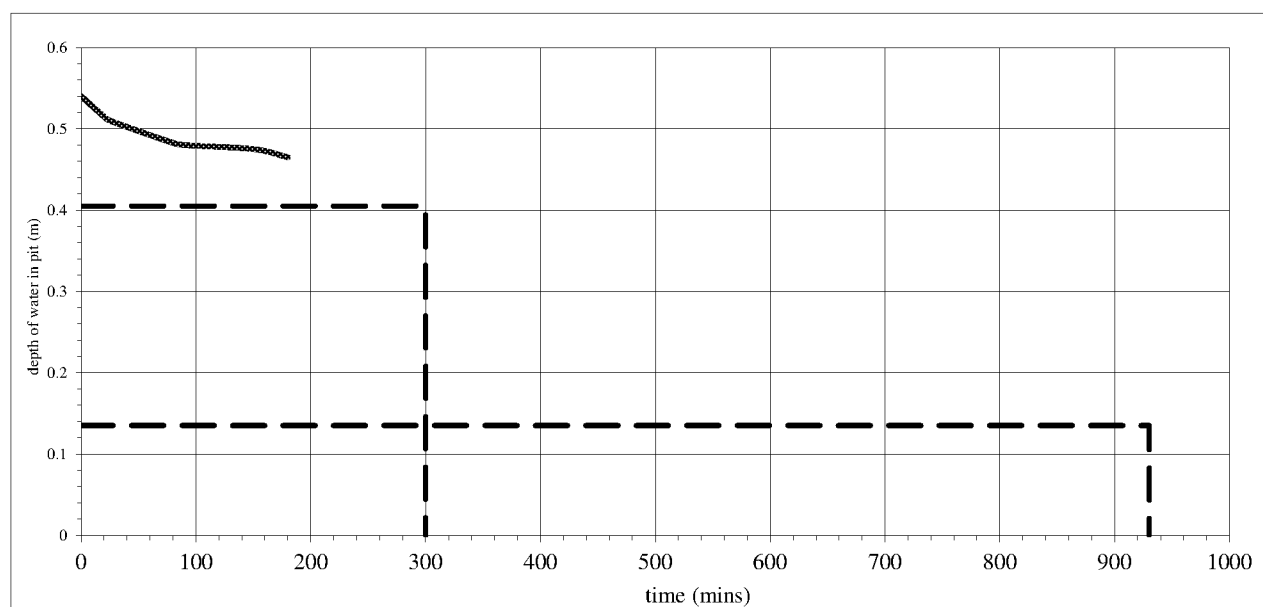
test infiltration rate (f) = 2.8E-06 m/s
 groundwater depth before adding water (m) = 0

time (mins)	depth to water surface (m)	depth of water in pit (m)	time elapsed from test start (mins)	volume of water lost from test start (m ³)	area of walls and base from test start (m ²)
0	0.16	0.54	0	0.00	2.88
20	0.185	0.515	20	0.02	2.82
25	0.19	0.51	25	0.02	2.81
75	0.215	0.485	75	0.04	2.76
90	0.22	0.48	90	0.04	2.75
150	0.225	0.475	150	0.05	2.74
180	0.235	0.465	180	0.05	2.72

0.405 m water depth
 time is 300.0 minutes

0.135 m water depth
 time is 930.0 minutes

Extrapolated values			Tp75-25	Vp75-25	Ap50	F
300	0.295	0.405	0	0.00		
930	0.565	0.135	630	0.18	1.76	2.8E-06

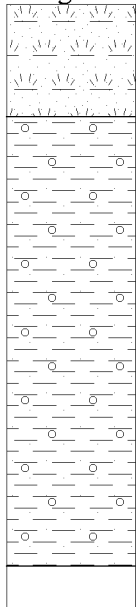




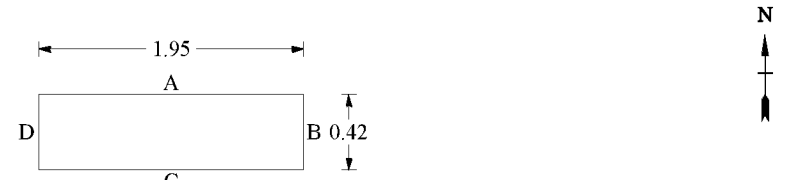
Appendix C TRIAL PIT LOGS

TRIAL PIT LOG

Project Proposed Development at Chalcraft Lane, Bersted, Bognor Regis, West Sussex				TRIAL PIT No TP1
Job No 73002	Date 06-05-20	Ground Level (m)	Co-Ordinates ()	
Contractor Nott Group				Sheet 1 of 1

0	A	B	C	D	0	Legend 
1					1	

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.26		Brown very clayey slightly gravelly fine grained SAND. Gravel is fine to medium angular quartz. (Topsoil).			
0.26-1.30		Firm reddish brown sandy slightly gravelly CLAY. Gravel is fine to medium angular quartz and flint.			

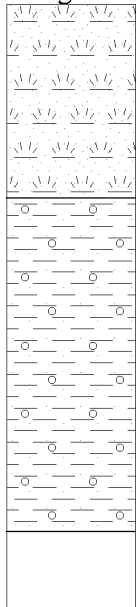
Shoring/Support: None. Stability: All sides noted to be stable. 	GENERAL REMARKS No groundwater encountered.
--	---

All dimensions in metres Scale 1:17.5	Client Landform Bersted Limited	Method/ Plant Used Tracked Excavator	Logged By EB
--	--	--	------------------------

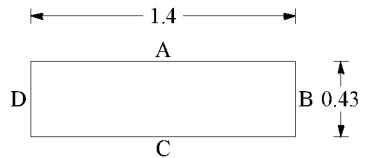
AGS3 UK TP CHALCRAFT LANE, BERSTED.GPJ GINT STD AGS 3_1.GDT 1/6/20

TRIAL PIT LOG

Project Proposed Development at Chalcraft Lane, Bersted, Bognor Regis, West Sussex				TRIAL PIT No TP2
Job No 73002	Date 06-05-20	Ground Level (m)	Co-Ordinates ()	
Contractor Nott Group				Sheet 1 of 1

0	A	B	C	D	0	Legend 

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		Brown clayey slightly gravelly fine to medium grained SAND. Gravel is fine to medium angular quartz. (Topsoil).			
0.25-0.68		Firm reddish brown sandy slightly gravelly CLAY. Gravel is fine to medium angular quartz.			

Shoring/Support: None. Stability: All sides noted to be stable.	N 
	

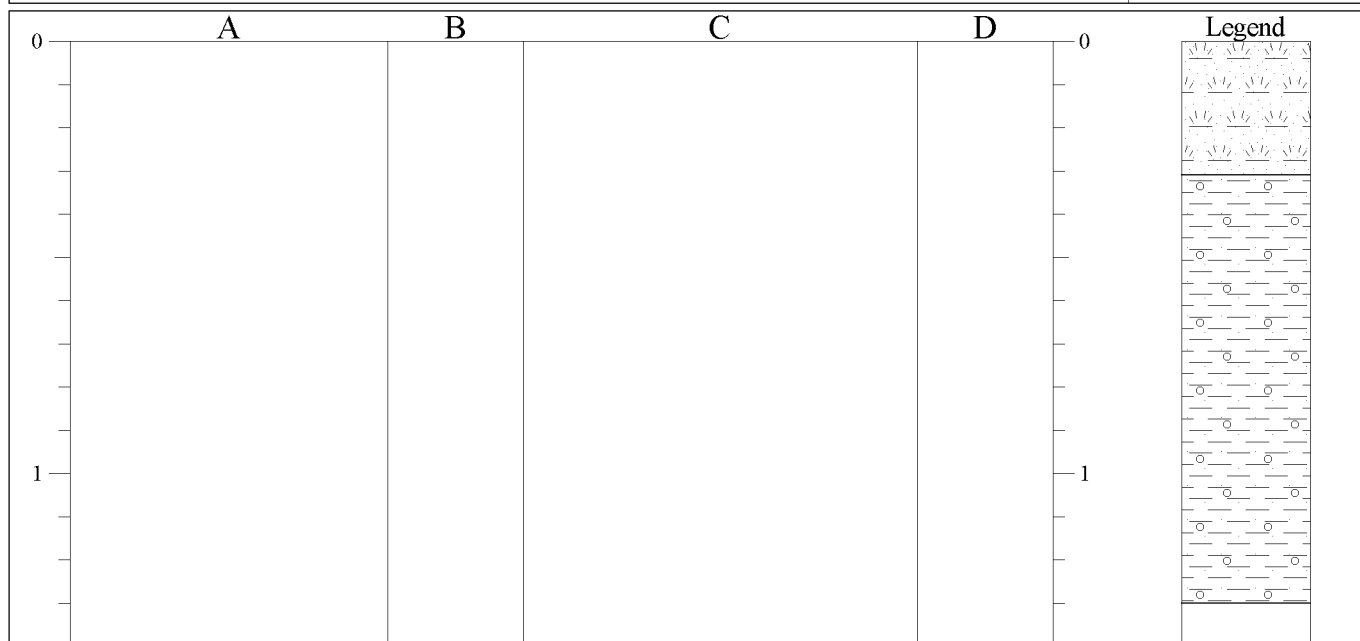
GENERAL REMARKS
No groundwater encountered.

All dimensions in metres Scale 1:9.75	Client Landform Bersted Limited	Method/ Plant Used Tracked Excavator	Logged By EB
--	--	--	------------------------

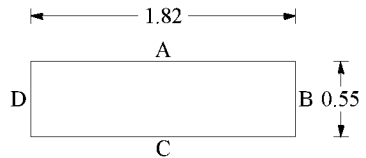
AGS3 UK TP CHALCRAFT LANE, BERSTED.GPJ GINT STD AGS 3_1.GDT 1/6/20

TRIAL PIT LOG

Project Proposed Development at Chalcraft Lane, Bersted, Bognor Regis, West Sussex				TRIAL PIT No TP3
Job No 73002	Date 06-05-20	Ground Level (m)	Co-Ordinates ()	
Contractor Nott Group				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.31		Grass over brown clayey slightly gravelly fine grained SAND. Gravel is fine angular quartz. (Topsoil).			
0.31-1.30		Soft reddish brown sandy slightly gravelly CLAY. Gravel is fine to medium angular flint and quartz.			

Shoring/Support: None. Stability: All sides noted to be stable.	N 
	

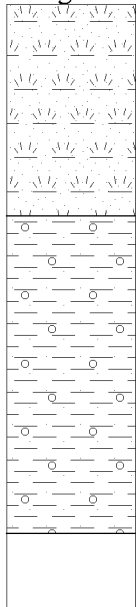
GENERAL REMARKS

All dimensions in metres Scale 1:17.5	Client Landform Bersted Limited	Method/ Plant Used Tracked Excavator	Logged By EB
--	--	--	------------------------

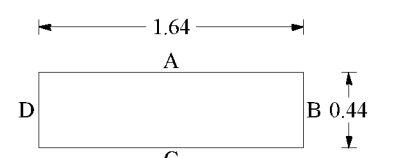
AGS3 UK TP CHALCRAFT LANE, BERSTED.GPJ GINT STD AGS 3_1.GDT 1/6/20

TRIAL PIT LOG

Project Proposed Development at Chalcraft Lane, Bersted, Bognor Regis, West Sussex				TRIAL PIT No TP4
Job No 73002	Date 06-05-20	Ground Level (m)	Co-Ordinates ()	
Contractor Nott Group				Sheet 1 of 1

0	A	B	C	D	0	Legend 

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.28		Grass over brown clayey slightly gravelly fine grained SAND. Gravel is fine angular quartz. (Topsoil).			
0.28-0.70		Firm reddish brown sandy slightly gravelly CLAY. Gravel is fine to medium angular flint and quartz.			

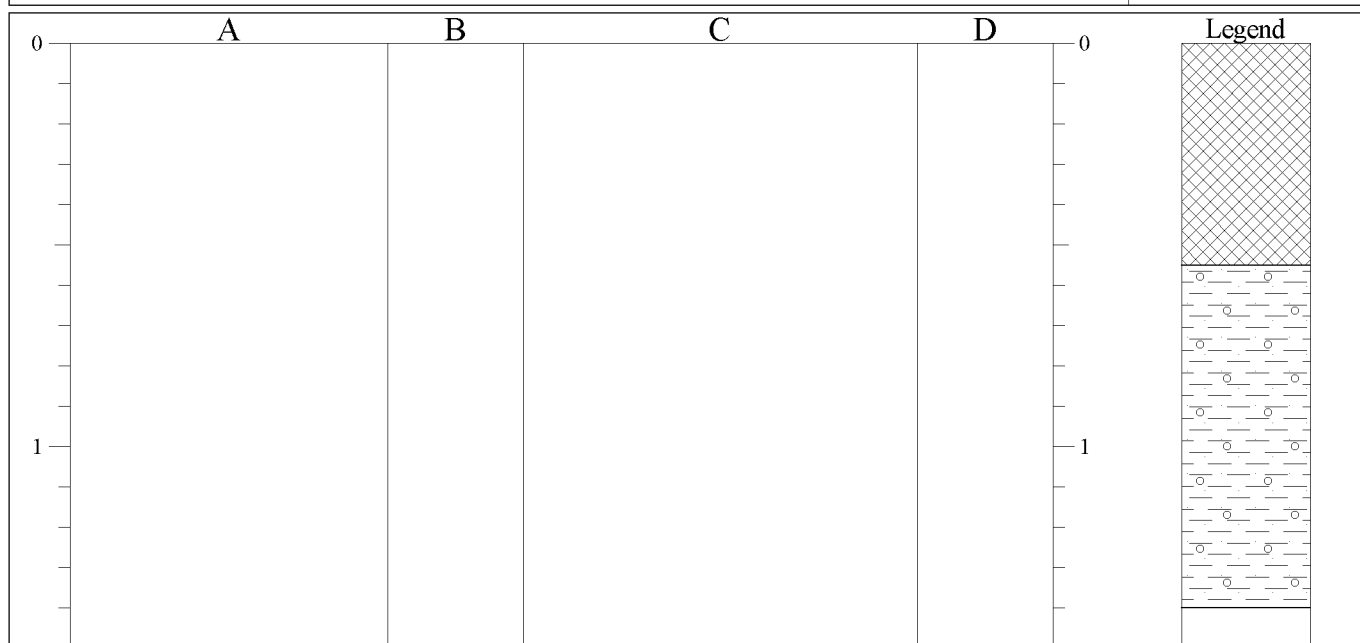
Shoring/Support: None. Stability: All sides noted to be stable.  	GENERAL REMARKS No groundwater encountered.
---	---

All dimensions in metres Scale 1:10	Client Landform Bersted Limited	Method/ Plant Used Tracked Excavator	Logged By EB
--	--	--	------------------------

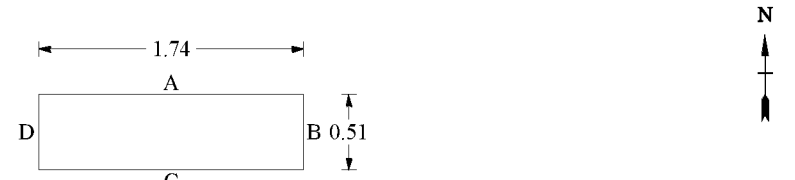
AGS3 UK TP CHALCRAFT LANE, BERSTED GPU GINT STD AGS 3_1.GDT 1/6/20

TRIAL PIT LOG

Project Proposed Development at Chalcraft Lane, Bersted, Bognor Regis, West Sussex				TRIAL PIT No TP5
Job No 73002	Date 06-05-20	Ground Level (m)	Co-Ordinates ()	
Contractor Nott Group				Sheet 1 of 1

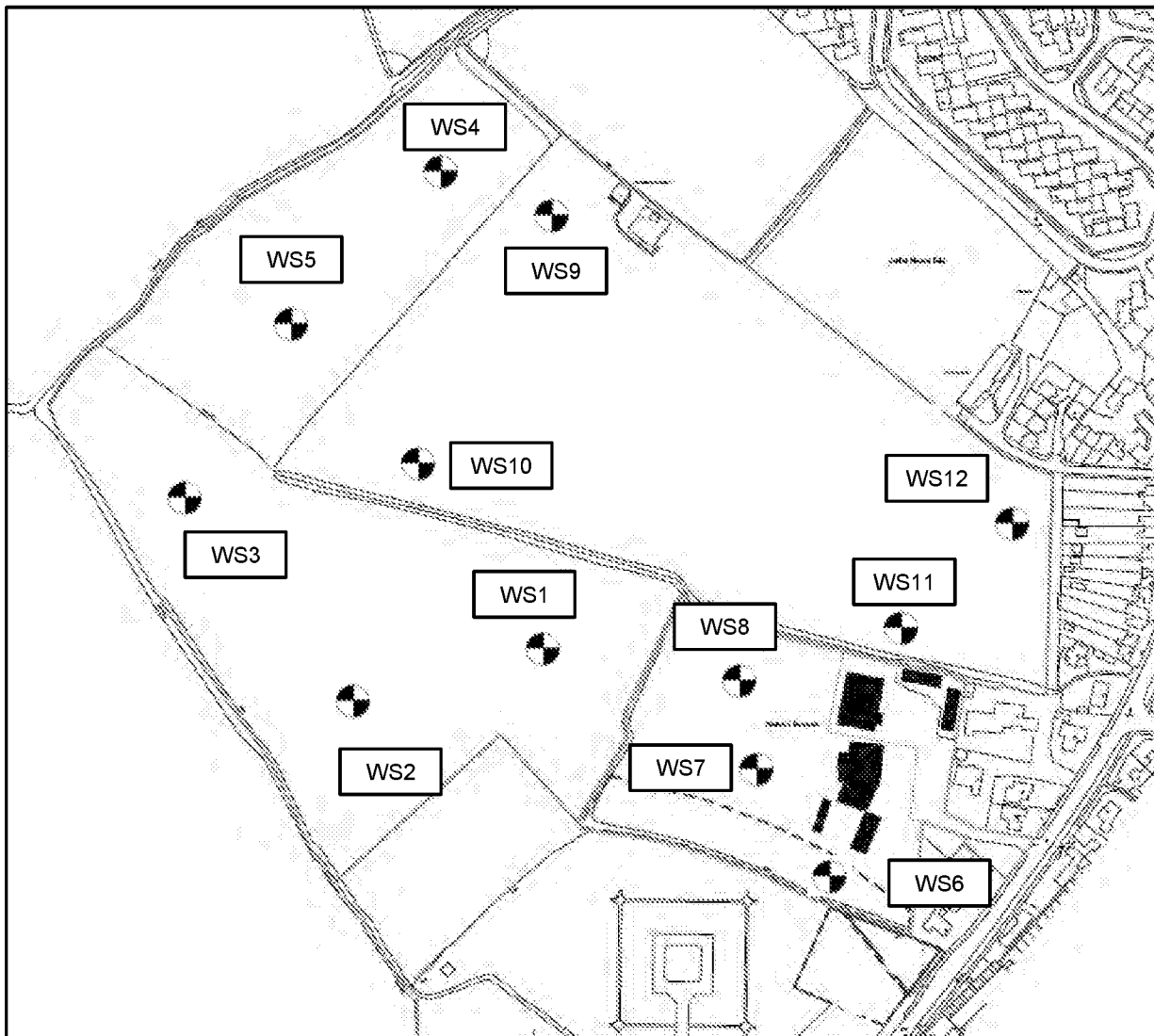


STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.55		MADE GROUND: Dark brown and black silty fine to coarse grained SAND and GRAVEL with some cobbles. Gravel is fine angular to rounded quartz and fine to coarse angular brick, metal fragments and wood fragments. Cobbles are angular brick and angular to rounded quartz.			
0.55-1.40		Soft reddish brown sandy slightly gravelly CLAY. Gravel is medium angular flint and quartz.			

Shoring/Support: None. Stability: All sides noted to be stable. 	GENERAL REMARKS Groundwater seepage encountered at 1.15m.
--	---

All dimensions in metres Scale 1:18.75	Client Landform Bersted Limited	Method/ Plant Used Tracked Excavator	Logged By EB
---	--	--	------------------------

AGS3 UK TP CHALCRAFT LANE, BERSTED.GPJ GINT STD AGS 3_1.GDT 1/6/20



Key



Borehole
Location

Do Not Scale



Title: **Appendix A – Groundwater Monitoring Boreholes**

Project Name: **Chalcra Lane, West Bersted**

Client: **Landform Bersted Limited**

Project No: **73002**

Date: **08/05/2020**

Drawing No **1**

Chalcraft Lane, Bersted	23/06/2020
Borehole Reference	Depth of Groundwater (m below ground level)
WS1	1.82
WS2	2.18
WS3	2.68
WS4	2.48
WS5	2.92
WS6	2.66
WS7	2.57
WS8	2.62
WS9	2.37
WS10	2.80
WS11	2.33
WS12	2.83

B. Proposed Site

Illustrative Layout

Indicative Surface water management strategy

Typical sections

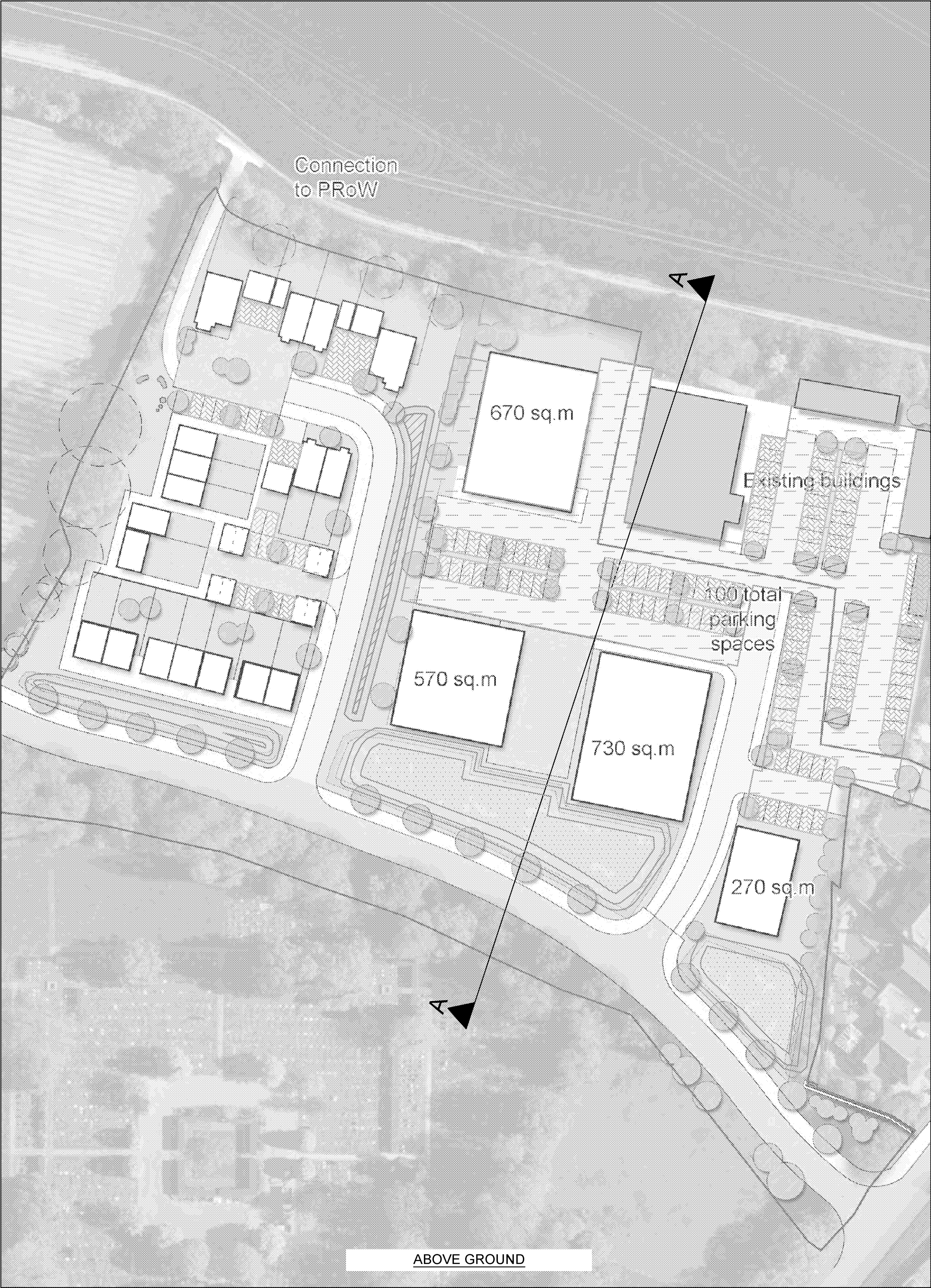
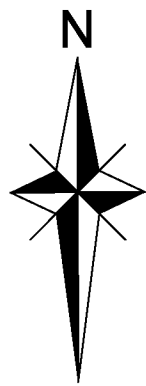
Development catchment and exceedance plan

Causeway flow results

Outline surface water maintenance plan

Proposed culvert strategy





ABOVE GROUND

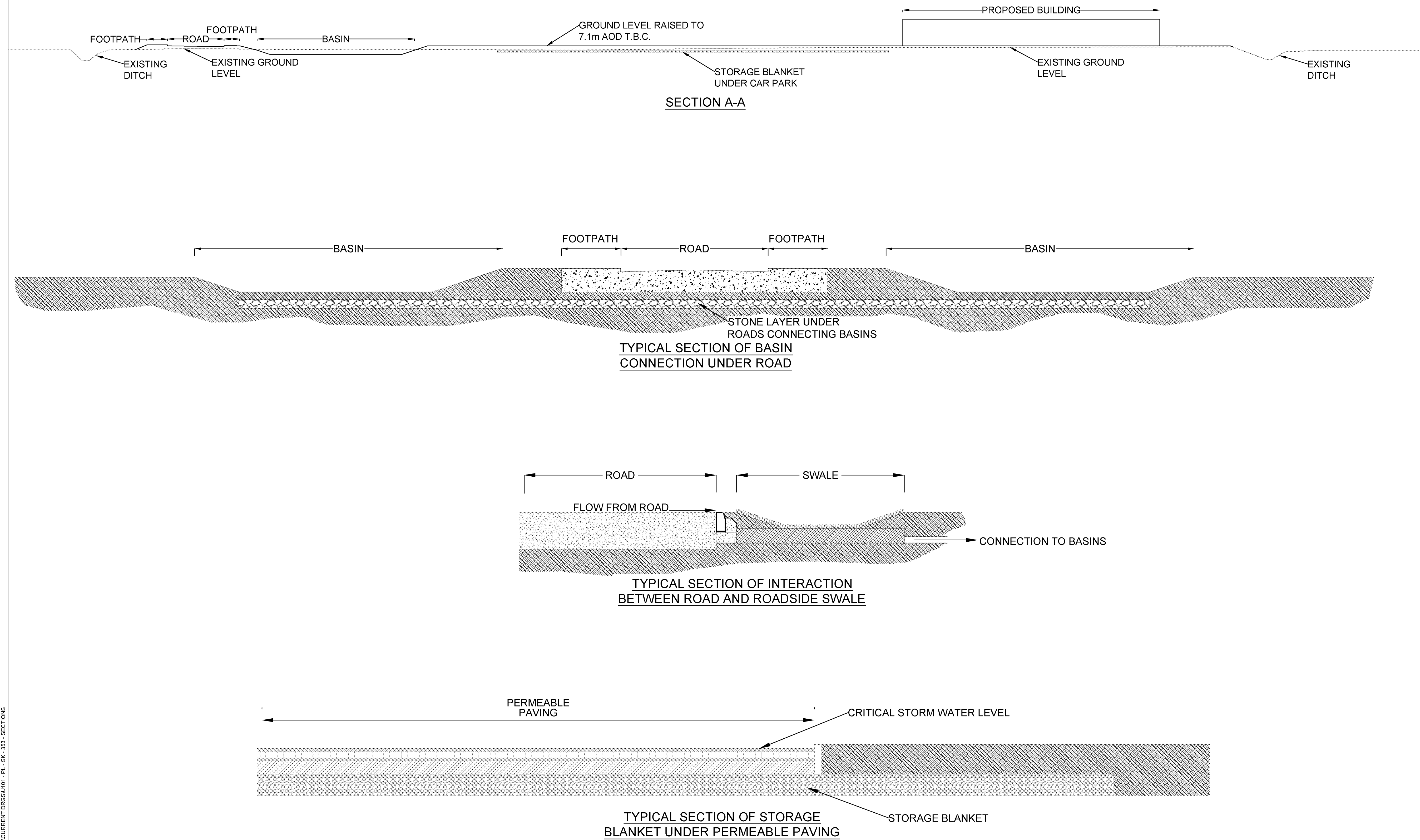


BELOW GROUND

- KEY
- ATTENUATION BASIN
 - ROADSIDE SWALE
 - STORAGE BLANKET UNDER CAR PARK
 - PERMEABLE PAVING
 - AREA OF CAR PARK ATTENUATING CRITICAL STORM
 - BOX CULVERT
 - OUTFALL ROUTE
 - ORIFICE CONTROL CHAMBER

NOTES

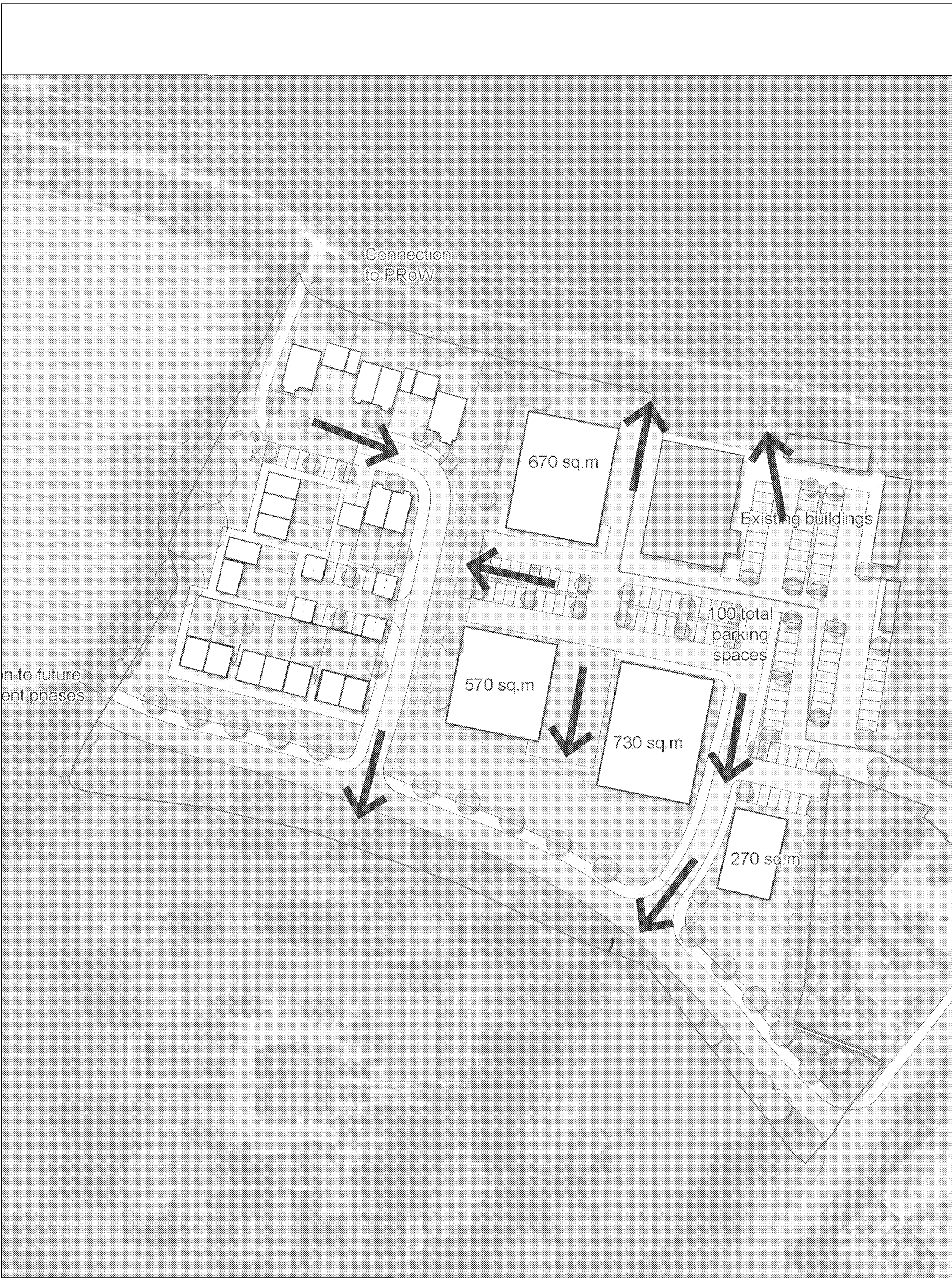
-	-	-	-	-	-		
REV		DESCRIPTION		DE	DR	CH	DATE
DESIGNED BY		DRAWN BY		CHECKED BY			
-		DP		-			
SCALE @ A1 SIZE				DATE			
D.N.S.				22/07/2020			
PROJECT TITLE							
CHALCROFT NURSERY, WEST BERTSED							
DRAWING TITLE							
SURFACE WATER MANAGEMENT STRATEGY							
CLIENT							
LANDFORM BERTSED LIMITED							
CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning							
Peck House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannon.co.uk Cambridge House, Lionwades Business Park, Kirtford, Norfolk, CB8 7PH Tel: 01538 555107 www.cannon.co.uk							
DRAWING NUMBER							REV.
U101 - PL - SK - 350							-



KEY

NOTES

REV	DESCRIPTION	DE	DR	CH	DATE
DESIGNED BY	DRAWN BY	CHECKED BY			
-	DP	-			
SCALE @ A1 SIZE		DATE			
D.N.S.		22/07/2020			
PROJECT TITLE					
CHALCROFT NURSERY, WEST BERTSED					
DRAWING TITLE					
SECTIONS					
CLIENT					
LANDFORM BERTSED LIMITED					
CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning Peck House, 20 Eastcheap London, EC3M 1EB Tel: 020 7717 5870 info@cannonce.co.uk Cambridge House, Lionwades Business Park, Kirtford, Northampton, CB8 7PH Tel: 01538 555167 www.cannonce.co.uk					
DRAWING NUMBER					REV.
U101 - PL - SK - 353					-



KEY

IMPERMEABLE AREA OF DEVELOPMENT TO BASINS

IMPERMEABLE AREA OF DEVELOPMENT TO STORAGE BLANKET UNDER CAR PARK

OVERLAND EXCEEDANCE ROUTE

NOTES

-	-		-		-
REV	DESCRIPTION	DE	DR	CH	DATE
DESIGNED BY	DRAWN BY	CHECKED BY			
-	DP	-			
SCALE @ A1 SIZE		DATE			
D.N.S.		21/05/2020			
PROJECT TITLE					

CHALCROFT NURSERY,
WEST BERSTED

DRAWING TITLE
SURFACE WATER CATCHMENT PLAN
AND OVERLAND EXCEEDANCE ROUTES

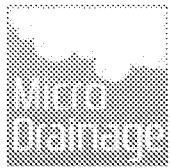
CLIENT
LANDFORM BERSTED LIMITED

CANNON
CONSULTING ENGINEERS
Highways, Transport & Infrastructure Planning

Peck House, 20 Eastcheap
London, EC3M 1EB
Tel: 020 7717 5870
info@cannonce.co.uk

Cambridge House, Lowryades
Business Park, Kirtford,
Northampton, CB8 7PH
Tel: 01538 555167
www.cannonce.co.uk

DRAWING NUMBER	REV.
U101 - PL - SK - 352	-

Cannon Consulting		Page 1
Cambridge House Lanwades Business Park Kentford		
Date 24/12/2019 11:32 File	Designed by JOH Checked by	
Micro Drainage Source Control 2018.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.299 Area (ha) 1.000 Urban 0.000 SAAR (mm) 716 Region Number Region 7 Results 1/s QBAR Rural 1.9 QBAR Urban 1.9 Q100 years 5.9 Q1 year 1.6 Q30 years 4.2 Q100 years 5.9		
©1982-2018 Innovyze		

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
BASIN 1	0.050	5.00	6.700	1200	0.500
BASIN 2	0.400	5.00	6.700	1200	0.700
BASIN 3	0.150	5.00	6.700	1200	0.700
OUTFALL			6.700	1200	0.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	BASIN 1	BASIN 2	5.000	0.600	6.200	6.000	0.200	25.0	100	5.05	50.0
1.001	BASIN 2	BASIN 3	5.000	0.600	6.000	6.000	0.000	0.0	150	5.14	50.0
1.002	BASIN 3	OUTFALL	5.000	0.600	6.000	6.000	0.000	0.0	150	5.22	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.550	12.2	8.6	0.400	0.600	0.050	0.0	62	1.679
1.001	1.000	17.7	77.2	0.550	0.550	0.450	0.0	0	∞
1.002	1.000	17.7	103.0	0.550	0.550	0.600	0.0	0	∞

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	5.000	25.0	100	CIRCULAR	6.700	6.200	0.400	6.700	6.000	0.600
1.001	5.000	0.0	150	CIRCULAR	6.700	6.000	0.550	6.700	6.000	0.550
1.002	5.000	0.0	150	CIRCULAR	6.700	6.000	0.550	6.700	6.000	0.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	BASIN 1	1200	Manhole	Adoptable	BASIN 2	1200	Manhole	Adoptable
1.001	BASIN 2	1200	Manhole	Adoptable	BASIN 3	1200	Manhole	Adoptable
1.002	BASIN 3	1200	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
BASIN 1	6.700	0.500	1200				
					0	1.000	6.200
BASIN 2	6.700	0.700	1200		1	1.000	6.000
					0	1.001	6.000
BASIN 3	6.700	0.700	1200		1	1.001	6.000
					0	1.002	6.000
OUTFALL	6.700	0.700	1200		1	1.002	6.000

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	5	0

Node OUTFALL Online Orifice Control

Flap Valve	x	Design Depth (m)	0.700	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	6.000	Diameter (m)	0.024		

Node BASIN 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	4.0	0.0	0.250	47.0	0.0	0.500	125.0	0.0

Node BASIN 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	564.0	0.0	0.350	724.0	0.0	0.700	890.0	0.0

Node BASIN 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	232.0	0.0	0.350	305.0	0.0	0.700	386.0	0.0

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	BASIN 1	7560	6.682	0.482	0.6	27.2452	0.0000	FLOOD RISK
10080 minute summer	BASIN 2	7560	6.682	0.682	5.1	500.9352	0.0000	FLOOD RISK
10080 minute summer	BASIN 3	7560	6.682	0.682	2.6	211.8006	0.0000	FLOOD RISK
10080 minute summer	OUTFALL	7560	6.682	0.682	1.0	0.7710	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	BASIN 1	1.000	BASIN 2	0.4	0.498	0.029	0.0391	
10080 minute summer	BASIN 2	1.001	BASIN 3	0.9	0.056	0.048	0.0880	
10080 minute summer	BASIN 3	1.002	OUTFALL	1.0	0.071	0.056	0.0880	
10080 minute summer	OUTFALL	Orifice		1.0				413.5

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
BLANKET	0.860	5.00	7.100	1200	0.900

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	5	0

Node BLANKET Online Orifice Control

Flap Valve	x	Design Depth (m)	0.900	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.4		
Invert Level (m)	6.200	Diameter (m)	0.026		

Node BLANKET Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	4650.0	0.0	0.500	4650.0	0.0	0.501	0.0	0.0

Node BLANKET Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	4750.0	0.0	0.100	4750.0	0.0

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 97.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	BLANKET	7680	7.080	0.880	10.2	1099.9070	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
10080 minute summer	BLANKET	Orifice	1.3	532.3

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
CRATES	0.012	5.00	7.100	1200	1.110

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	5	0

Node CRATES Online Orifice Control

Flap Valve	x	Design Depth (m)	0.400	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	5.990	Diameter (m)	0.027		

Node CRATES Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.990
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	76

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	25.0	0.0	0.400	25.0	0.0	0.401	0.0	0.0

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	CRATES	128	6.262	0.272	3.7	6.8179	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	CRATES	Orifice	0.8	10.7



1

Basin Maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Removal of litter and debris	Monthly
	Cut grass	Half yearly
	Manage other vegetation	Monthly then as required
	Inspect and clear inlets, outlets, overflows etc	Monthly
	Inspect and repair banks, pipes, headwalls etc	Monthly
	Inspect inlets and basin for silt accumulation	Monthly until able to establish the required silt removal frequency, then in accordance with established frequency
	Manage vegetation in wetter areas (micro-pools etc)	Annually or as established by ecologist/landscape architect
	Tidy dead growth	Annually (as per growing season)
	Remove sediment from traps, forebays etc	Annually
	Reseed	As required.
Occasional maintenance	Prune adjacent trees	Every 2 years, or as otherwise advised
	Silt removal	Every 5 years (depending on the requirement for regular maintenance)
	Repair erosion or other damage	As required
Remedial actions	Repair inlets, outlets and overflows	As required

2

Storage Blanket/Trench

Maintenance schedule	Required action	Frequency
	Inspect traps/chambers for sediment accumulation and remove	Six monthly, until a pattern of accumulation is established, then as required
	Remove sediment from traps	Annually/as required
	Repair/replace inlets	As required.
Remedial actions	Check inlets functioning as intended	Annually
Occasional Maintenance	Check for root ingress to blanket/trench and trim as necessary (in accordance with appropriate guidance on vegetation management)	Annually or less frequently depending on proximity and type of planting

3

Swale / Grassed Filter Drain Maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal	Monthly, as required
	Grass cutting	Monthly, as required by season
	Upkeep of any other planting	Monthly, then decreasing in frequency, as required by season
	Inspect the swale bed for any ponding (a possible indication of reduced infiltration).	Monthly, as required
	Inspect inlets, outlets, overflows for debris and condition	Monthly
	Inspect system for silt (traps, chambers and surfaces)	Half yearly
Occasional maintenance	Reseed and replant bare areas, consider reasons for poor growth and failure of plants to establish and amend planting, improve soil etc	As required
Remedial actions	Repair erosion or other damage (reseed or re-turf)	As required.
	Relevel uneven surfaces	As required.
	Scarify topsoil, remediate soil to improve any reduction in infiltration	As required.
	Remove notable accumulations of sediment	As required.
	Remove and safely dispose of any oils or petrol residues.	As required

4

Pervious Pavement Maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structure performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Annually
	Inspect tank internally, remove any sediment if present and if required	Every 5 years (or more frequently if necessary)
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hours after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5

Orifice Maintenance

Maintenance schedule	Required action	Frequency
Remedial actions	Repair/replace inlets, outlets, overflows.	As required
Monitoring	Check that controls, protection, outlets, inlets and overflows are in good condition and working as intended	Half Yearly

KEY

- 1 ATTENUATION BASIN
- 2 STORAGE BLANKET
- 3 ROADSIDE SWALE/GRASSED FILTER DRAIN
- 4 PERMEABLE PAVING
- 5 ORIFICE CONTROL CHAMBER

NOTES

REV	DESCRIPTION	DE	DR	CH	DATE
-	-	-	-	-	-
DESIGNED BY	DRAWN BY	CHECKED BY			
-	DP	-			
SCALE @ A1 SIZE		DATE			
D.N.S.		28/07/2020			
PROJECT TITLE					
CHALCROFT NURSERY, WEST BERSTED					
DRAWING TITLE					
MAINTENANCE PLAN					
CLIENT					
LANDFORM BERSTED LIMITED					
CANNONCONSULTING ENGINEERSHighways, Transport & Infrastructure Planning Peck House, 20 EastcheapLondon, EC3M 1EBTel 020 7717 5870info@cannonce.co.ukCambridge House, Lionwades Business Park, Kettleford, Newmarket, CB8 7PHTel 01538 555167www.cannonce.co.uk					
DRAWING NUMBER					REV.
U101 - PL - SK - 355					-

[illegible]