

**LAND AT REAR OF RED LION PUBLIC
HOUSE, CHARING HEATH**

PROPOSED RESIDENTIAL DEVELOPMENT

Surface Water Drainage Statement

Prepared on Behalf of

Shepherd Neame

2017/D1428/DS1.1

16 January 2018

DOCUMENT CONTROL




Project: Land at Rear of Red Lion Public House, Charing Heath
Proposed Residential Development

Document: **Surface Water Drainage** Statement

Client: Shepherd Neame

Reference: 2017/D1428/DS1.1

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1 INTRODUCTION

1.1 Background

- 1.1.1 RGP Design Ltd (RGP) is instructed by Shepherd Neame to prepare Drainage Strategy to support a planning application for the development of a site on land to the rear of Red Lion Pub in Charing Heath, TN27 0AU.
- 1.1.2 This strategy considers Kent County and Ashford Borough Councils, Planning Guidance documents regarding Flooding / Flood risk, Surface Water and Sustainable Drainage.
- 1.1.3 This strategy considers Kent County and Ashford Borough Councils, Planning Guidance documents regarding Flooding / Flood risk, Surface Water and Sustainable Drainage.
- 1.1.4 In preparing this report, RGP has made reference to the following documents and information:
- Environment Agency Flood Maps for Planning
 - Long Term Flood Risk Assessment Surface Water Flood Risk Maps
 - Long Term Flood Risk Assessment Reservoir Flood Risk Maps
 - Local Authority Strategic Flood Risk Assessment
 - Topographical Survey Information
 - British Geological Survey Information
- 1.1.5 This strategy has been prepared to demonstrate that the proposed development will not increase flood risk and maximises the use of sustainable drainage techniques.
- 1.1.6 This report has been prepared for the benefit of the named Client only.

1.2 Site Location and Description

- 1.2.1 The site falls within the Borough of Ashford and is located approximately 10km to the North West of the centre of Ashford. The proposed development is on land the the rear of an existing public house.
- 1.2.2 The site is bounded by residential properties to the North, Tile Lodge Road to the West and open space to the East.
- 1.2.3 The nearest Main River (Great Stour) lies approximately 1.57m to the South (beyond the M20 motorway), with the smaller ordinary watercourses located approximately 250m to the East and West of the site.
- 1.2.4 The existing site is currently an unused field.
- 1.2.5 The site is approximately 0.49Ha (4900m²) in size and it lies between 86m and 94m AOD, falling from North East to South West.

- 1.2.6 The pre-development site is 100% permeable, with no existing hard paved areas or buildings. This is shown on drawing SK200, included in this report.
- 1.2.7 The proposed development comprises the construction of five residential properties with shared driveway and parking area.
- 1.2.8 The post development impermeable area is 1384m² (0.14Ha).

1.3 Flood Risk

- 1.3.1 Whilst a formal flood risk assessment is not required due to the sites area and proximity to an Environment Agency designated Flood Zone, a brief assessment of flood risk, generally in accordance with National Planning Policy Guidance (NPPF): Flood Risk and Coastal Change, follows:
- 1.3.2 The NPPF requires that all sources of flooding are considered. These being Tidal, Fluvial, Pluvial, Groundwater, Sewers and Man-Made reservoirs / canals.
- 1.3.3 The SFRA confirms that the site is located in Flood Zone 1.
- 1.3.4 The SFRA confirms that there is no historical flooding in close proximity to the site.
- 1.3.5 As there are no incidents of historic flooding in close proximity to the site and that SUD's methods of surface water disposal will be implemented onsite, the flood risk on and offsite will remain low.
- 1.3.6 See Appendix B, for SFRA mapping extracts.
- 1.3.7 The Environment Agency Flood Risk mapping shows that the site is located within a Flood Zone 1, and that the long-term risk of flooding is very low.
- 1.3.8 The Environment Agency flood maps for Surface Water Flooding show that the site is at very low risk of flooding from this source.
- 1.3.9 The mapping confirms the site is located in a High Groundwater vulnerability area and that an Outer Groundwater Source Protection Zone. As set out in the SFRA, as there have been no recorded incidents of flooding from this source within close proximity to the site, it is considered the risk of flooding from this source to be low.
- 1.3.10 See Appendix B, for Environment Agency mapping.
- 1.3.11 A review of the Environment Agency's flood maps for Planning, the Long Term Flood Risk Assessment and the local authorities Strategic Flood Risk Assessment concludes that the site is at low risk of flooding:

Environment Agency Flood Zone	1
Flood Risk from Rivers and the Sea	Low
Flood risk from Groundwater	Low
Flood risk from Reservoirs	Low
Flood Risk from Sewers	Low

- 1.3.12 In conclusion, the site is at low risk of flooding.

2 EXISTING DRAINAGE

2.1 Surface Water

- 2.1.1 The public sewer records show that there are no existing surface water sewers near the site.
- 2.1.2 The existing site is a greenfield site, therefore existing surface water on site would mainly infiltrate into the underlying soils, with some minor surface water flowing overland in severe storm events.
- 2.1.3 The existing run-off rate (QBar) has been calculated using Microdrainage (ICOP SUDS) to be 2.2l/s.

2.2 Foul Water

- 2.2.1 The public sewer records show there is a 150mm diameter public foul water sewer in Tile Lodge Road at a depth of approximately 1.5m.
- 2.2.2 The existing site has no connection to the foul sewerage network.

2.3 Highway Drainage

- 2.3.1 Tile Lodge Road has no formal drainage, surface water either infiltrates at the road edge or runs along the carriageway to a point where it can infiltrate or escape on to lower lying land (Volume II) dated July 2008, although this document also does not specifically refer to the site.

2.4 Ground Conditions

- 2.4.1 Analysis of the BGS website data within the local area confirms underlying strata to be as follows:
 - Bedrock Geology:
 - Folkstone Formation - Sandstone. Sedimentary Bedrock.
 - Superficial Deposits:
 - None.
- 2.4.2 The BGS has historic borehole records within 250m of the site which confirm the soil to be sand. The historic borehole was taken to a depth of 1.2m BGL, and is recorded as being dry, therefore groundwater can be assumed as being deeper than this.
- 2.4.3 An intrusive site investigation has not yet been undertaken.
- 2.4.4 It is anticipated that the soil underlying the site will have moderate infiltration potential which should be confirmed by testing on site.

3 PROPOSED DEVELOPMENT

3.1 Surface Water Run Off

- 3.1.1 The SUDS manual and Building Regulations sets out a hierarchy of drainage methods to ensure that developments maximise the use of sustainable drainage techniques. In short, this hierarchy favours infiltration methods of disposal over other methods such as watercourses or sewers.
- 3.1.2 As discussed in section 2.4, the soil underlying the site is likely to have moderate infiltration potential. Surface water run off should be disposed of using infiltration drainage methods. It is anticipated that the infiltration rate will be in the region of $1 \times 10^{-5} \text{m/s}$, this should be confirmed by testing on site.
- 3.1.3 The proposed development results in an increase in impermeable area on the site to approximately 1384m^2 .
- 3.1.4 It is proposed to construct the new shared parking area using permeable/porous paving. Calculations show that a sub base storage depth of 137mm will be required.
- 3.1.5 The run off from the roof areas will be drained into new soakaways. Each plot will have its own cellular soakaway to drain its roof area.
- 3.1.6 The strategy above will ensure that there is no increase in the amount of run-off leaving the site, therefore no increase in the risk of flooding from this source.
- 3.1.7 The proposed infiltration drainage system will be designed to accommodate a 1 in 100 year critical storm and will include an allowance for the effects of climate change (40% increase in rainfall intensity).
- 3.1.8 Although there is an increase in impermeable area, as all surface water will be disposed of within the site boundary via infiltration methods there will be no increase in the risk of flooding either onsite or offsite.
- 3.1.9 The proposed surface water drainage strategy is shown on drawing **SK300**, included in this report.

3.2 Foul Water

- 3.2.1 It is proposed to connect the development to the public foul water sewer.
- 3.2.2 As the existing site is undeveloped it has no existing connection to the Southern Water public foul sewer network.
- 3.2.3 As the site is elevated above Tile Lodge Road, a gravity connection to the public sewer will be possible, to the existing manhole referenced 9302.
- 3.2.4 The proposed development will generate a wastewater flow of the order of 0.23l/s (calculated in accordance with Sewers for Adoption).

The proposed foul drainage layout is shown on drawing **SK300**.

3.3 Maintenance

- 3.3.1 Maintenance plays an important part in the long term performance of a surface water drainage system and will be required to ensure that it remains fully operational.
- 3.3.2 The traditional parts (inspection chambers, pipes, gullies, etc) of the proposed surface water drainage system will need a minimal amount of maintenance similar to other traditional systems.
- 3.3.3 The SUDS devices will require slightly more maintenance focusing on reducing the amount of silt that is allowed to enter the system. For the cellular soakaways, this will involve ensuring that upstream catchpits and gully sumps are regularly emptied of silt.
- 3.3.4 It is important to ensure that the porous paved areas are properly maintained in accordance with the manufacturers recommendations which may include:
 - Periodic surface sweeping to reduce silt and debris accumulation.
 - Periodic silt removal from porous paved construction.
 - Redressing the joints on the block paved surface as required.
- 3.3.5 It is recommended that a simple maintenance strategy is prepared by monitoring the proposed drainage system over a specific duration to establish the rate at which silt builds up, which can then inform a programme of regular works.

4 SUMMARY

- 4.1.1 This strategy considers Kent County Councils and Ashford Borough Councils Planning Guidance Documents.
- 4.1.2 Reference has been made to the Local Authorities Strategic Flood Risk Assessment (SFRA), Public Sewer Records, and flood maps.
- 4.1.3 The existing site is currently an undeveloped greenfield site.
- 4.1.4 The application site is approximately 0.49Ha in size and it lies between 89m and 94m AOD, sloping from North East to South West. The pre-development site is 100% permeable.
- 4.1.5 Although a formal flood risk assessment is not required to support a planning application due to the overall size of the site, a brief assessment has been undertaken which concludes that flood risk is low.
- 4.1.6 It is assumed that at present the surface water run off infiltrates naturally onsite.
- 4.1.7 The proposed development will result in an increase in impermeable area of 1384m². However, as it is proposed to use infiltration methods of surface water disposal within the site boundary, there will be no increased flood risk onsite or offsite.
- 4.1.8 The proposed drainage system will be designed to cater for a 1 in 100 year critical storm event and include an allowance of 40% to cater for the effects of climate change.
- 4.1.9 The nature of the development will ensure that overflow land flows during an exceedance event will remain unchanged.
- 4.1.10 The foul drainage for the proposed development will be disposed of to the existing public foul sewer by gravity.
- 4.1.11 A maintenance regime should be established to ensure the long-term effectiveness of the surface water drainage system.
- 4.1.12 This surface water drainage strategy shows that the development can be implemented without increasing flows on to adjacent land or to existing surface water drainage systems, ensuring that flood risk is not increased.

PLANS AND DRAWINGS

CDP Architecture Drawings

738/SK21 Proposed Farm Yard Site Plan

RGP Design Ltd Drawings:

SK100 Site Location Plan

SK101 Topographic Survey

SK200 Impermeable Area

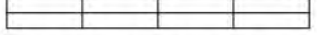
SK300 Proposed Drainage Strategy



Rev.	Description	Int.	Date

Client	Shepherd Neame
Job Title	Red Lion Public House Charing Heath

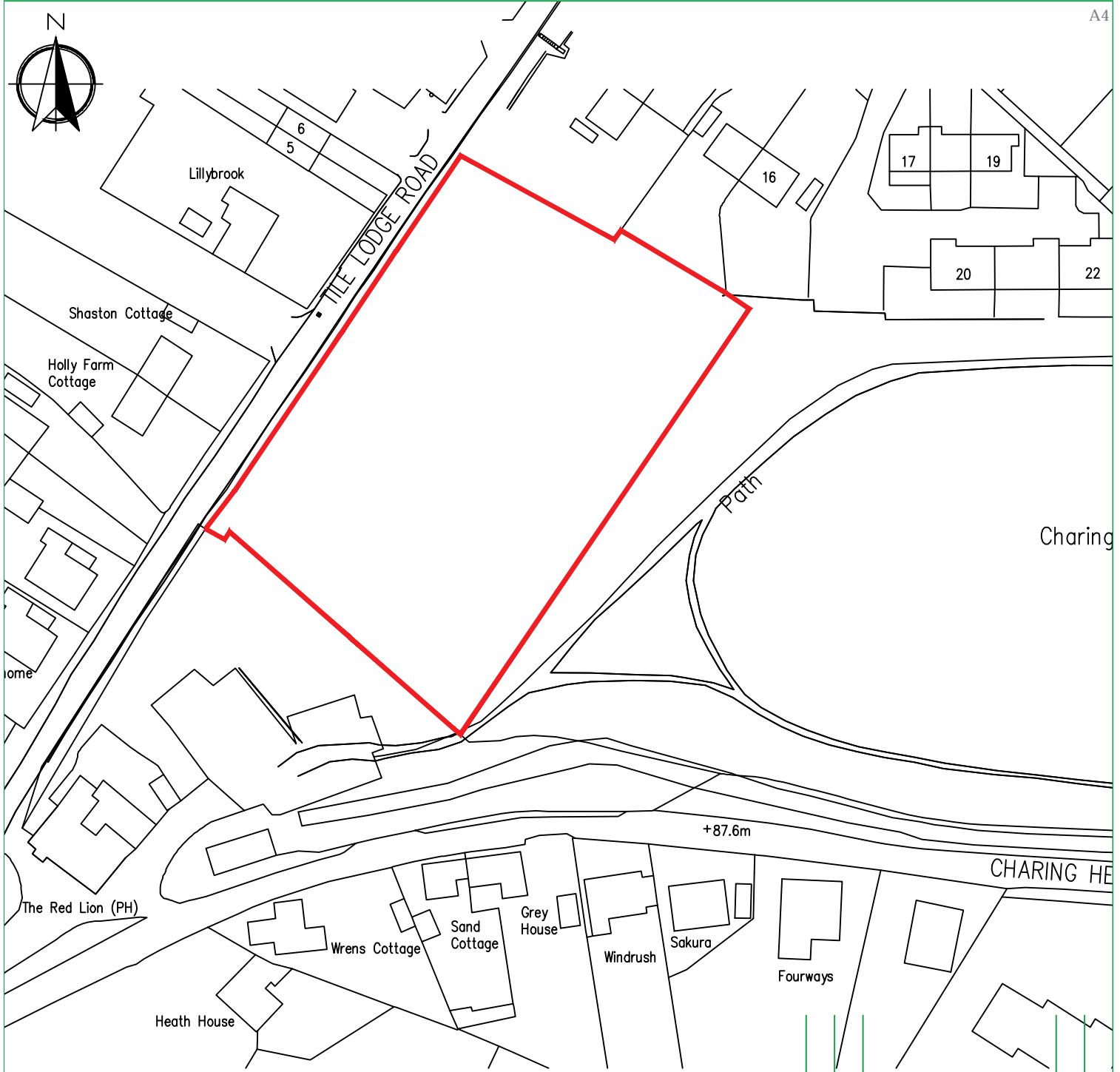

CDP
 Architecture Ltd
 22-23 North Lane, Canterbury
 Kent, CT2 7EE
 Tel: 01227 458181 Fax: 01227 451543
 info@thinkcdp.com www.thinkcdp.com

1:500 scale bar
 0m 10m 20m

 CDP original printed to scale.
 Prints from PDF's could distort.

Drawing Title	Proposed Farm Yard Site Plan
---------------	---------------------------------

Scale	A3	1:500	Preliminary
Drawn	MW		Comment
Date			Planning
Checked			Tender
			Construction
			As built

738	: SK21
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Rev.	Date	Amendments	Drawn	Appr.



Transport Planning and Infrastructure Design Consultants
 2 West Barn, Norton Lane, Chichester, West Sussex, PO20 3AF
 Tel: 01243 410418 Fax: 01483 861682 www.rgp.co.uk

Client
Shepherd Neame

Project
**Land Rear of Red Lion PH
 Charing Heath**

Drawing Title
Site Location Plan

Scale
 1:1000

Drawn By
 LDF

Checked By

Approved By

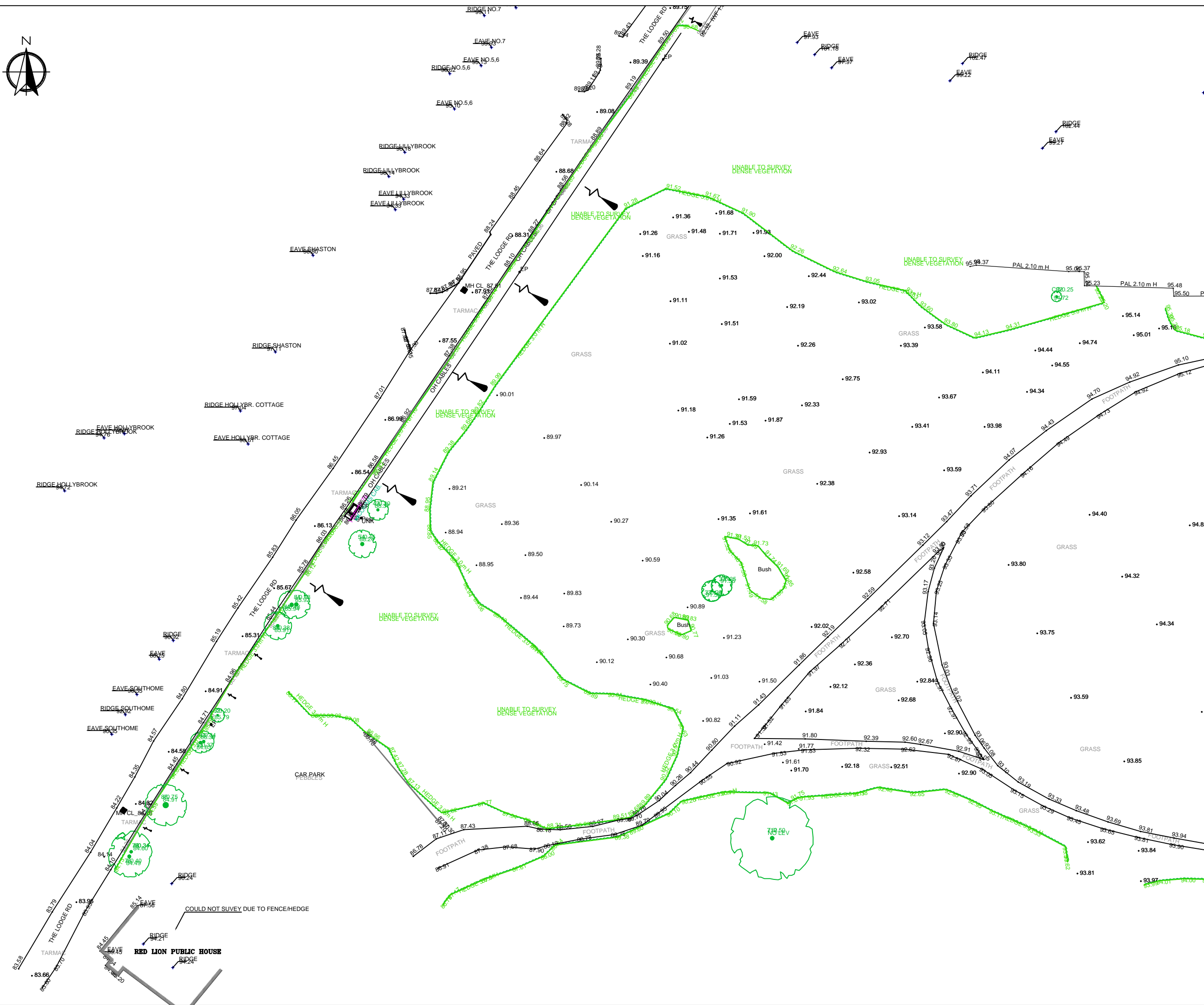
Date
 Jan 18

Drawing No.
 2017/D1428/100

Rev.
 -

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NOTES

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8. The main contractor is responsible for dealing with all occurrences of ground water during the construction period.
9. The contractor must comply with all current legislation relating to health & safety.
10. All products specified shall be installed in strict accordance with the manufacturers recommendations and instructions. If there are discrepancies between that information and the details on any RGP drawings, the manufacturers instructions must be used.

Rev.	Date	Amendments	Drawn



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 Transport Planning and Infrastructure Design Consultants
 2 West Barn, Norton Lane, Chichester, West Sussex, PO20 3AF
 Tel: 01243 210418 Fax: 01483 861682 www.rgp.co.uk

Client Shepherd Neame			
Project Land Rear of Red Lion PH Charing Heath			
Drawing Title Topographic Survey			
Scale 1:500	Drawn By LF	Checked By LF	Approved By LF
Date Jan 2018	Drawing No. 2017/D1423/SK101	Rev. -	

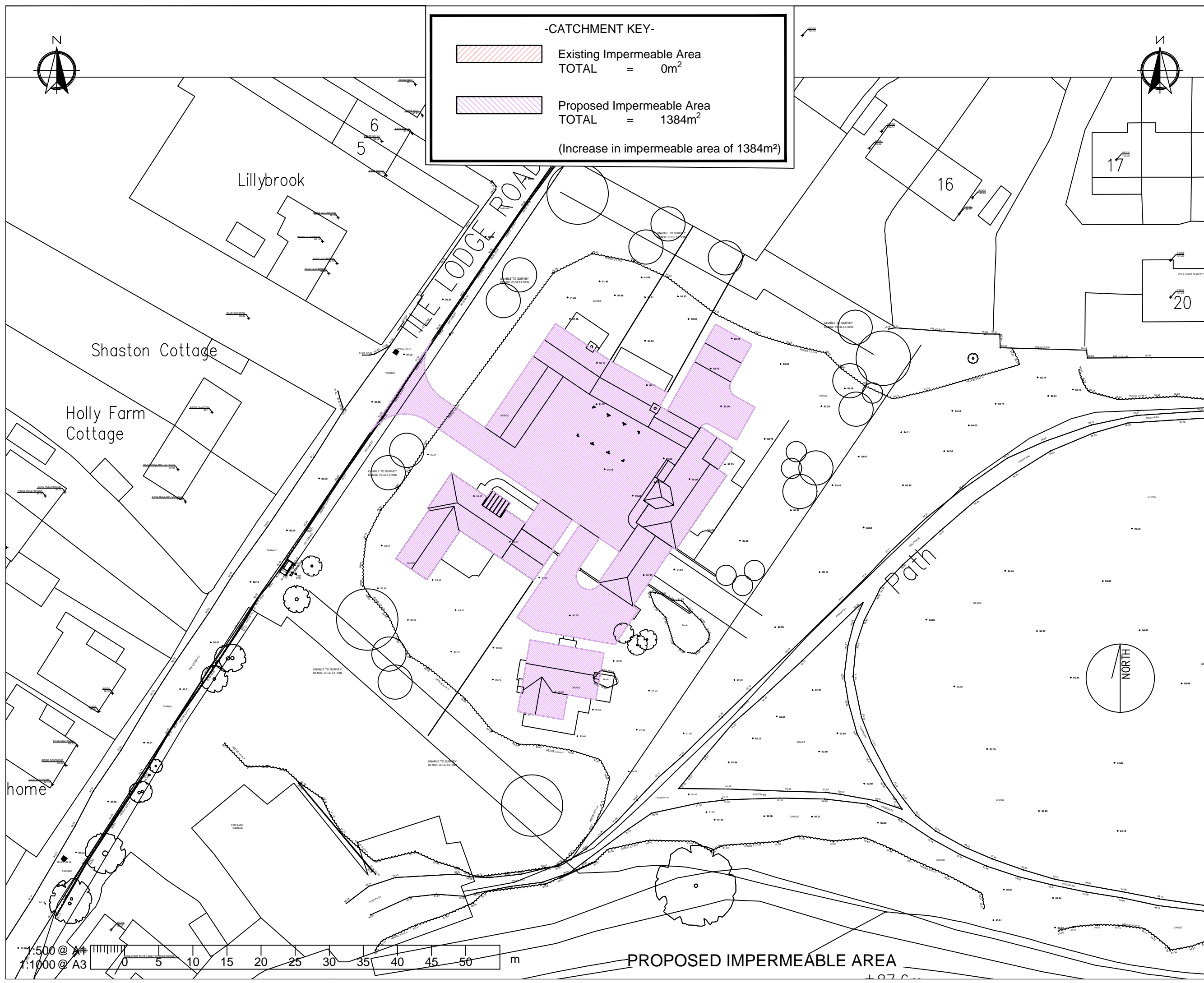
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9. The contractor must comply with all current legislation relating to health & safety.
10. All products specified shall be installed in strict accordance with the manufacturers recommendations and instructions. If there are discrepancies between that information and the details on any RGP drawings, the manufacturers instructions must be used.

-CATCHMENT KEY-

	Existing Impermeable Area TOTAL = 0m ²
	Proposed Impermeable Area TOTAL = 1384m ²

(Increase in impermeable area of 1384m²)



PROPOSED IMPERMEABLE AREA

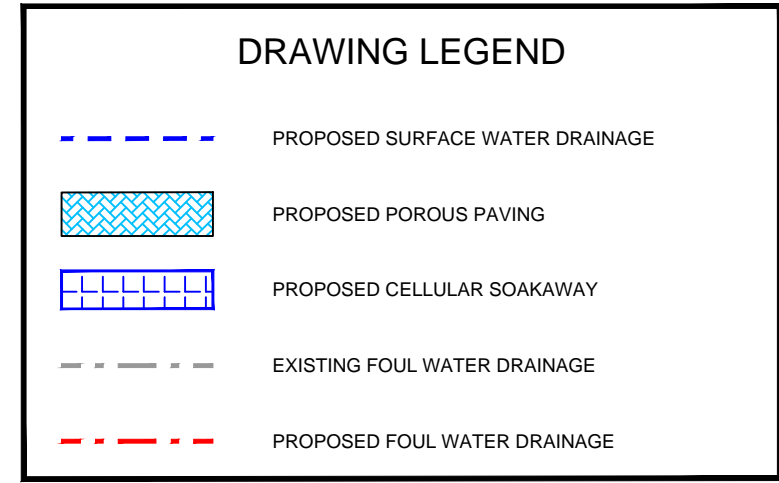
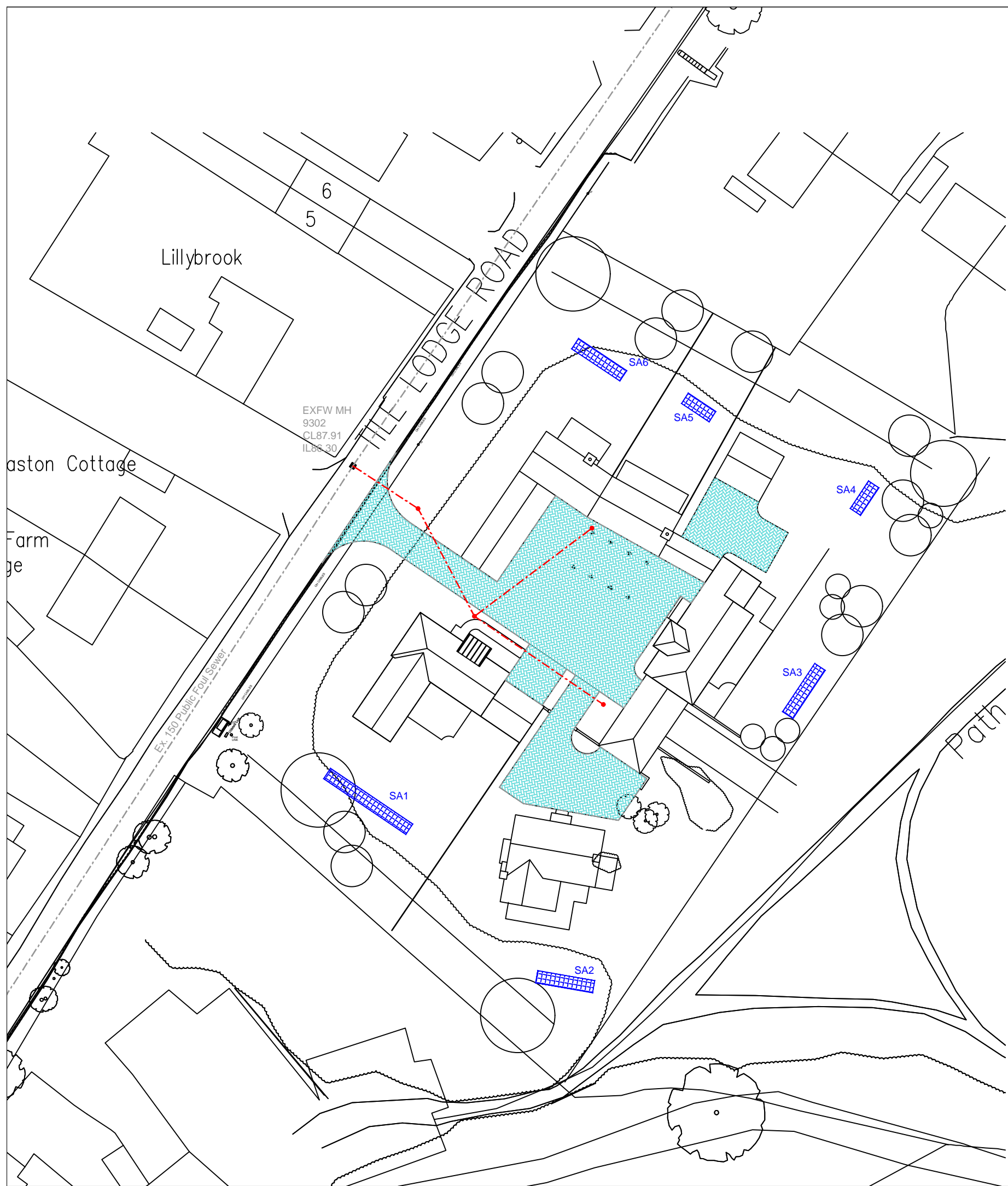
Rev.	Date	Amendments	Drawn



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 Transport Planning and Infrastructure Design Consultants
 2 West Barn, Norton Lane, Chichester, West Sussex, PO20 3AF
 Tel: 01243 210418 Fax: 01483 861682 www.rgp.co.uk

Client	Shepherd Neame
Project	Land Rear of Red Lion PH Charing Heath
Drawing Title	Impermeable Area

Scale	1:500	Drawn By	LF	Checked By	LF	Approved By	LF
Date	Jan 2018	Drawing No.	2017/D1423/SK200	Rev.	-		



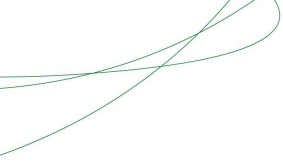
NOTES:

1. This drawing is to be read in conjunction with all other RGP drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
2. RGP accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.
3. Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.
4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain. The main contractor is responsible for checking all information on site prior to work commencing and taking due care whilst undertaking the works.
5. All dimensions to be checked on site. All details and dimensions relating to sub-contractors work must be checked and agreed between the sub-contractor or supplier and the general contractor.
6. The electronic information from this drawing can not be guaranteed as dimensionally drawn exact. Figured dimensions must be used for setting out and detailing. RGP logos and company information must be removed from copies if information is re-used.
7. The main contractor is responsible for the design of all temporary works, and is also responsible for the safe maintenance and stability of existing buildings at all times.
8. The main contractor is responsible for dealing with all occurrences of ground water during the construction period.
9. The contractor must comply with all current legislation relating to health & safety.
10. All products specified shall be installed in strict accordance with the manufacturers recommendations and instructions. If there are discrepancies between that information and the details on any RGP drawings, the manufacturers instructions must be used.
11. Contractor to confirm all invert levels where connections are proposed prior to commencing any drainage works. Contractor to commence drainage works at the point of discharge.

PRELIMINARY



Client Shepherd Neame			
Project Land Rear of Red Lion PH Charing Heath			
Drawing Title Proposed Drainage Strategy			
Scale 1:500	Drawn By LF	Checked By LF	Approved By LF
Date Jan 2018	Drawing No. 2017/D1423/SK300		Rev. -



APPENDICIES

Appendix A Public Sewer Map



RGP Design Ltd
Metro House
Northgate
Chichester
West Sussex
PO19 1BE

Your ref D1428
Our ref 273459
Date 28 December 2017
Contact searches@southernwater.co.uk
Tel 0845 272 0845
0330 303 0276
Fax 01634 844514

Attention: Liam Foord

Dear Customer

Re: Provision of public sewer record extract

Location: Red Lion Public House, Charing Heath Road, Charing TN27 0AU

Thank you for your order regarding the provision of extracts of our sewer and/or water main records. Please find enclosed the extracts from Southern Water's records for the above location.

We confirm payment of your fee in the sum of £49.92 and enclose a VAT receipt for your records.

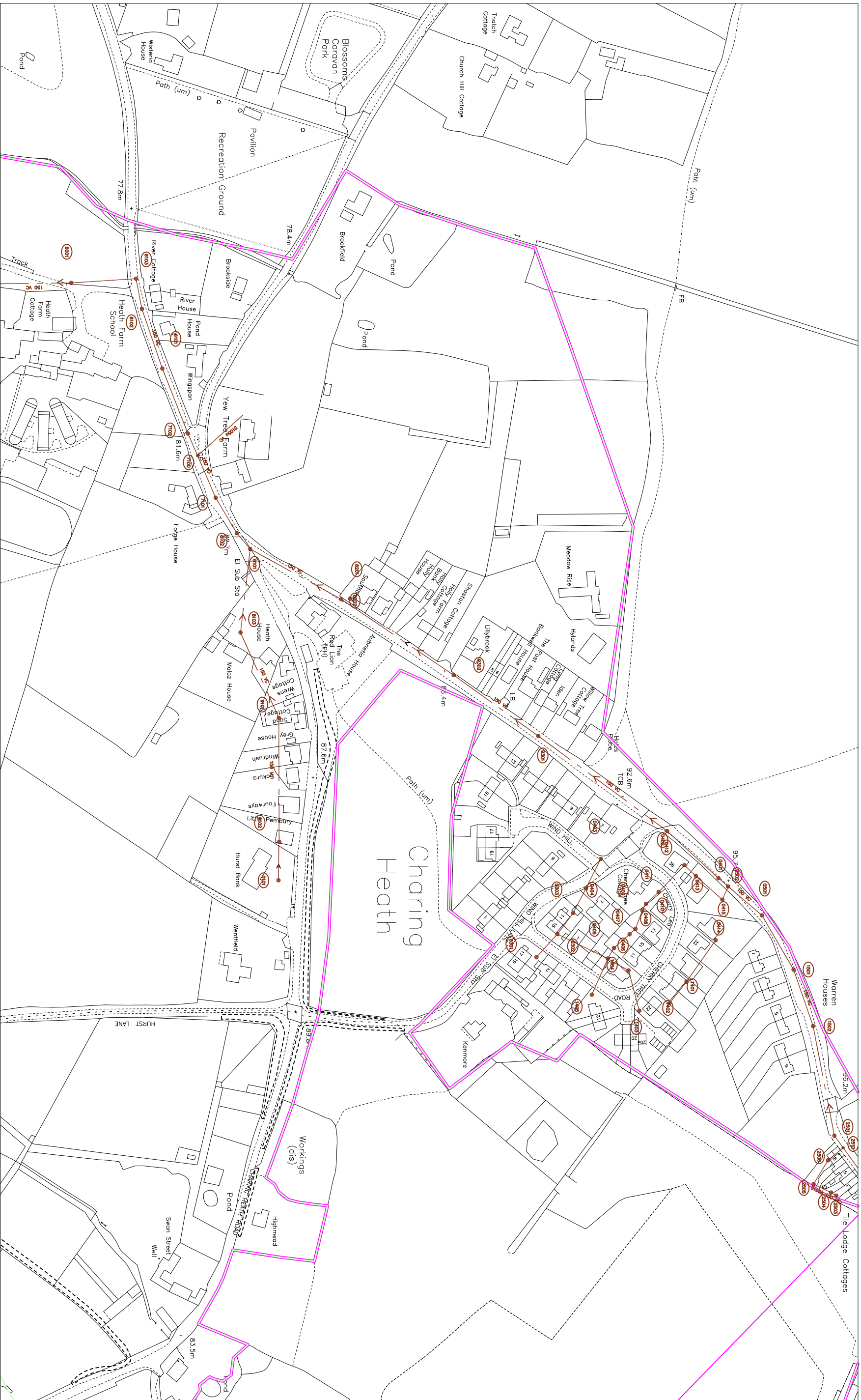
Customers should be aware that there are areas within our region in which there are neither sewers nor water mains. Similarly, whilst the enclosed extract may indicate the approximate location of our apparatus in the area of interest, it should not be relied upon as showing that further infrastructure does not exist and may subsequently be found following site investigation. Actual positions of the disclosed (and any undisclosed) infrastructure should therefore be determined on site, because Southern Water does not accept any responsibility for inaccuracy or omission regarding the enclosed plan. Accordingly it should not be considered to be a definitive document.

Should you require any further assistance regarding this matter, please contact the LandSearch team.

Yours faithfully

LandSearch

149589



149011

O.S. REF.
TQ9249SE

Drawn by: **kumaria**

Scale: **1:2500**

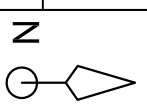
Date: **28/12/2017**

Title: **273459_Red Lion Public House,**

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.
The actual positions should be determined on site.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UK) materials may include Bonded Asbestos Cement

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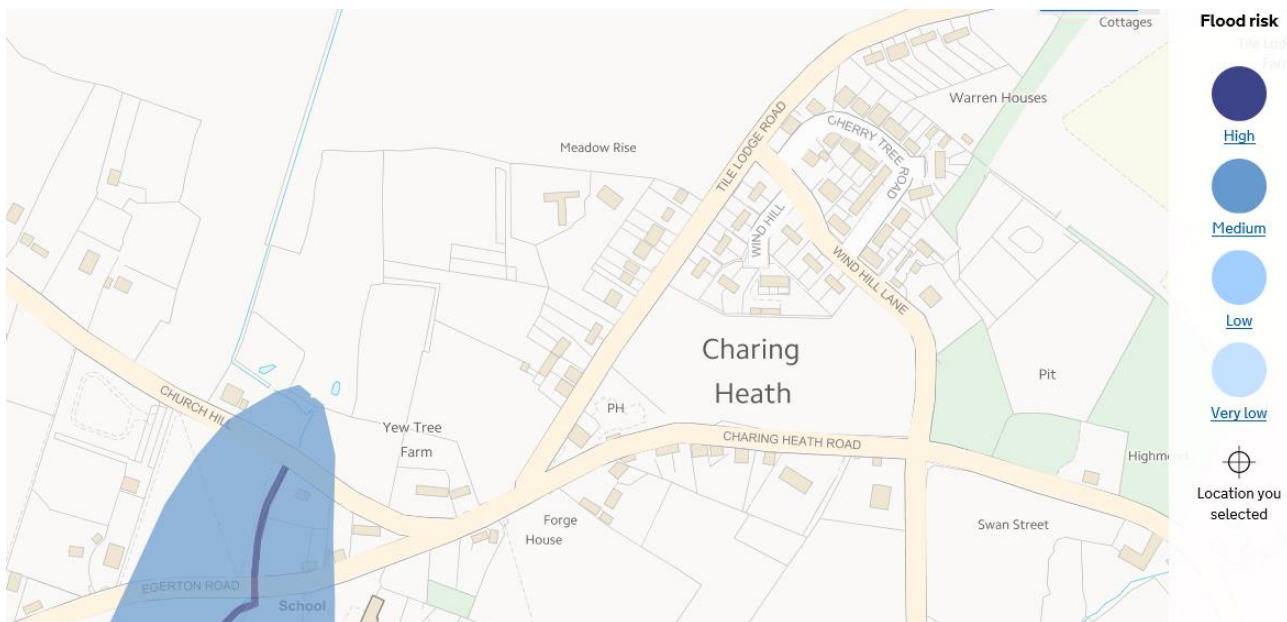
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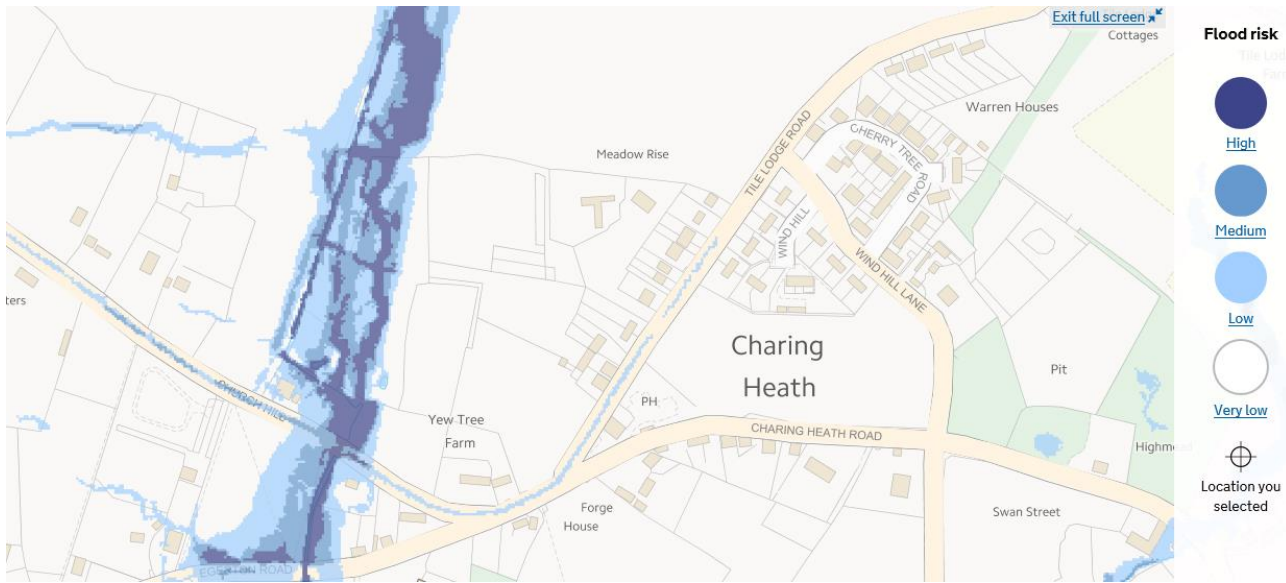
Appendix B Flood Maps – Environment Agency and SFRA



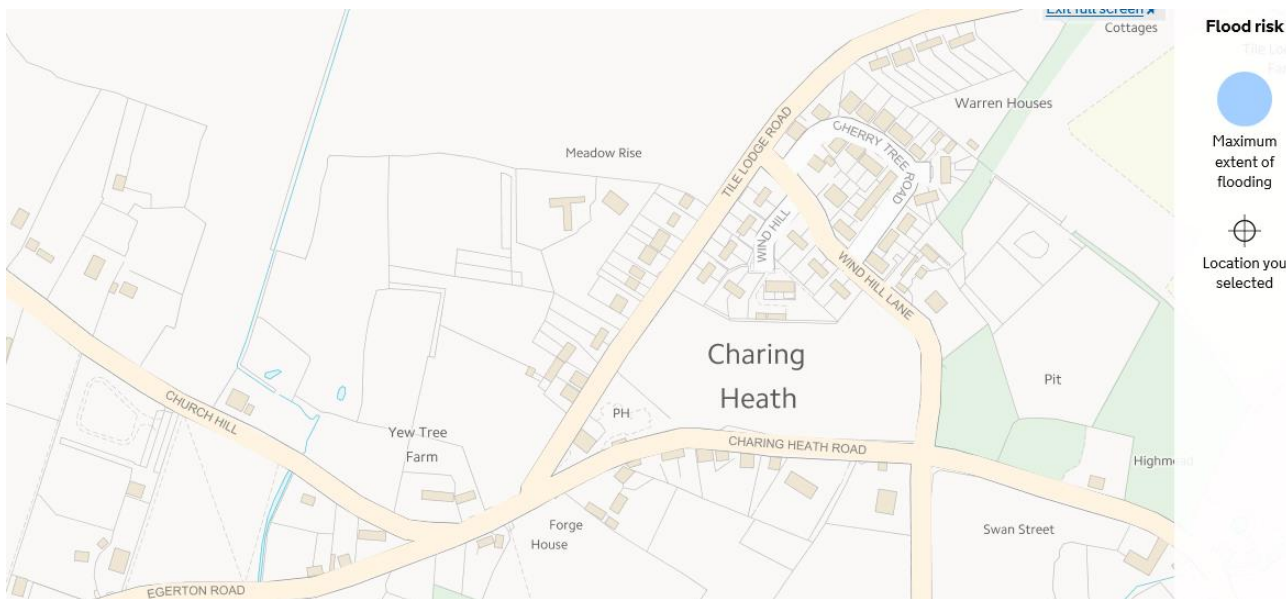
Flood Map for Planning



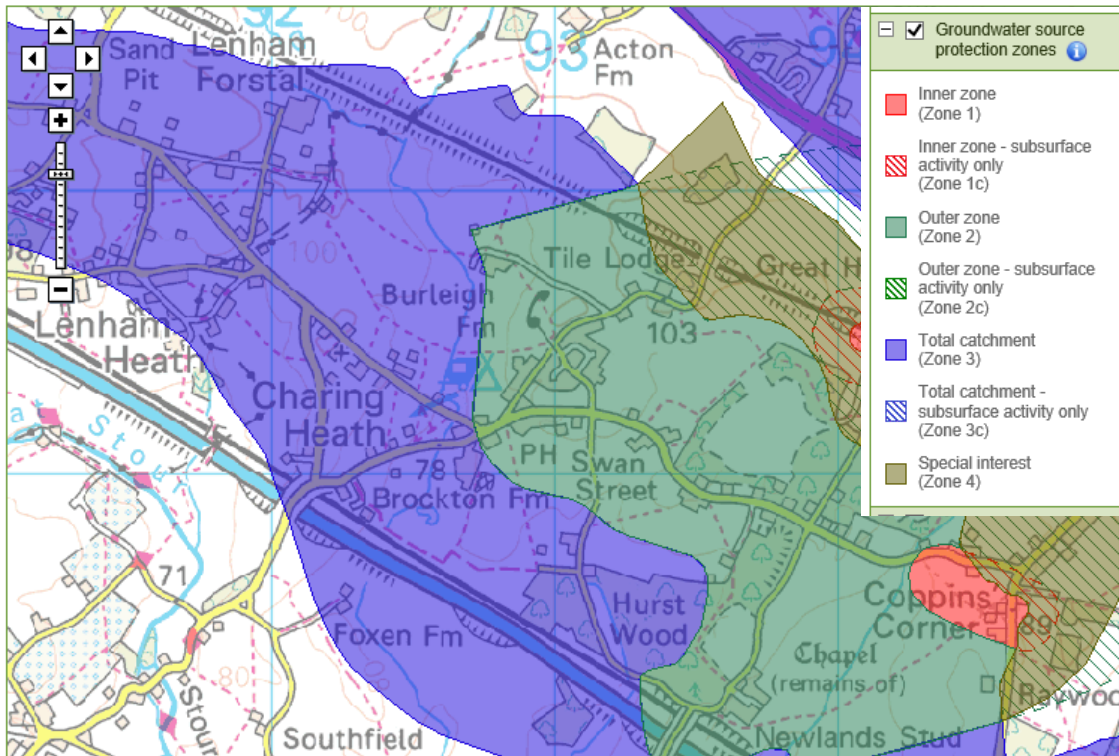
Long Term Flood Risk Map for Rivers and the Sea



Long Term Flood Risk Map for Surface Water

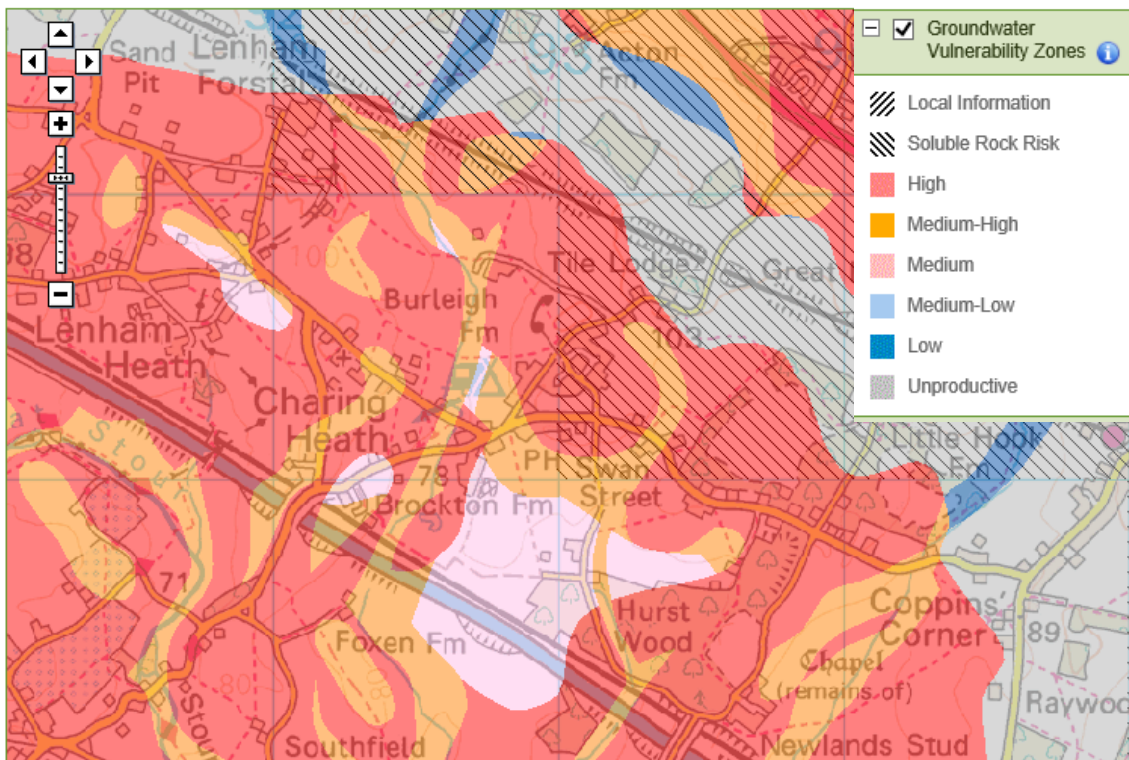


Flood Risk Map for Reservoirs



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Environment Agency Groundwater Source Protection Zones



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Environment Agency Groundwater Vulnerability Zones

Appendix C British Geological Survey Historic Borehole Records

 British Geological Survey <small>NATURAL ENVIRONMENT RESEARCH COUNCIL</small>				British Geological Survey Site CTRL GI DATA - Entire NDATA19 data set		Trial Pit Number TP8473		
Excavation Method Trial Pit		Dimensions		Ground Level (mOD) 75.70	Client UR/LCE			
		Location 592469 E 148854 N		Dates 22/07/1998	Engineer RLE			
Job Number Issue 1								
Sheet 1/1								
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15-0.15	D1			75.60	0.10	TOPSOIL.		
0.20-0.20	C1				(0.50)	Firm orange brown very fine sandy clay with some angular fine to coarse gravel and cobbles of sandstone. (MADE GROUND)		
0.50-0.50	C2			75.10	0.60			
0.50-0.50	B1			74.90	0.80	Soft to firm dark grey clayey organic silt. (MADE GROUND)		
0.60-0.60	D2				(0.30)			
0.80-0.80	D3			74.60	1.10	Firm grey brown mottled dark orange brown locally fine sandy very silty clay with a little to some angular medium to coarse gravel and cobbles of sandstone. Rare boulder size pockets of grey mottled brown clay. (MADE GROUND)		
1.00-1.00	C3			74.50	1.20			
1.00-1.00	B2				(0.10)	Light green and blue grey locally yellow brown very silty fine SAND. (SANDGATE BEDS - SAND)		
1.10-1.10	D4							
1.20-1.20	W4					Complete at 1.20m		
Plan				Remarks				
.				Ground water : Dry				
.								
.								
.								
.								
.				Scale (approx) 1:50		Logged By SMC		Figure No.

Produced by the GEOTECHNICAL DATABASE SYSTEM (GEODASY) (C) all rights reserved

Appendix D Microdrainage Calculations

RGP Design Limited		Page 1
Metro House Northgate Chichester PO19 1BE		
Date 16/01/2018 14:19 File	Designed by l.foord Checked by	
XP Solutions	Source Control 2017.1	


ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.490	Urban	0.000
SAAR (mm)	708	Region Number	Region 7

Results 1/s

QBAR Rural	2.2
QBAR Urban	2.2
Q100 years	7.0
Q1 year	1.9
Q30 years	4.9
Q100 years	7.0


RGP Design Limited		Page 1
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XP Solutions	Source Control 2017.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 74 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	89.619	0.069	3.0	12.4	O K
30 min Summer	89.643	0.093	3.0	16.7	O K
60 min Summer	89.661	0.111	3.0	19.9	O K
120 min Summer	89.670	0.120	3.0	21.6	O K
180 min Summer	89.669	0.119	3.0	21.4	O K
240 min Summer	89.665	0.115	3.0	20.6	O K
360 min Summer	89.653	0.103	3.0	18.6	O K
480 min Summer	89.641	0.091	3.0	16.4	O K
600 min Summer	89.630	0.080	3.0	14.4	O K
720 min Summer	89.620	0.070	3.0	12.6	O K
960 min Summer	89.605	0.055	3.0	9.9	O K
1440 min Summer	89.592	0.042	2.5	7.6	O K
2160 min Summer	89.583	0.033	2.0	5.9	O K
2880 min Summer	89.577	0.027	1.6	4.8	O K
4320 min Summer	89.570	0.020	1.2	3.6	O K
5760 min Summer	89.566	0.016	1.0	2.9	O K
7200 min Summer	89.564	0.014	0.8	2.4	O K
8640 min Summer	89.562	0.012	0.7	2.1	O K
10080 min Summer	89.560	0.010	0.6	1.8	O K
15 min Winter	89.630	0.080	3.0	14.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	17
30 min Summer	88.566	0.0	31
60 min Summer	56.713	0.0	56
120 min Summer	35.004	0.0	88
180 min Summer	25.973	0.0	122
240 min Summer	20.877	0.0	156
360 min Summer	15.365	0.0	224
480 min Summer	12.341	0.0	288
600 min Summer	10.402	0.0	350
720 min Summer	9.042	0.0	406
960 min Summer	7.241	0.0	520
1440 min Summer	5.284	0.0	752
2160 min Summer	3.848	0.0	1108
2880 min Summer	3.068	0.0	1472
4320 min Summer	2.226	0.0	2204
5760 min Summer	1.771	0.0	2936
7200 min Summer	1.483	0.0	3672
8640 min Summer	1.284	0.0	4360
10080 min Summer	1.137	0.0	5136
15 min Winter	131.851	0.0	17

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	89.657	0.107	3.0	19.3	O K
60 min Winter	89.679	0.129	3.0	23.1	O K
120 min Winter	89.687	0.137	3.0	24.6	O K
180 min Winter	89.683	0.133	3.0	24.0	O K
240 min Winter	89.675	0.125	3.0	22.5	O K
360 min Winter	89.656	0.106	3.0	19.1	O K
480 min Winter	89.637	0.087	3.0	15.7	O K
600 min Winter	89.620	0.070	3.0	12.7	O K
720 min Winter	89.607	0.057	3.0	10.3	O K
960 min Winter	89.595	0.045	2.7	8.1	O K
1440 min Winter	89.584	0.034	2.1	6.1	O K
2160 min Winter	89.575	0.025	1.5	4.5	O K
2880 min Winter	89.570	0.020	1.2	3.6	O K
4320 min Winter	89.565	0.015	0.9	2.6	O K
5760 min Winter	89.562	0.012	0.7	2.1	O K
7200 min Winter	89.560	0.010	0.6	1.7	O K
8640 min Winter	89.558	0.008	0.5	1.5	O K
10080 min Winter	89.558	0.008	0.5	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	31
60 min Winter	56.713	0.0	58
120 min Winter	35.004	0.0	96
180 min Winter	25.973	0.0	134
240 min Winter	20.877	0.0	170
360 min Winter	15.365	0.0	240
480 min Winter	12.341	0.0	304
600 min Winter	10.402	0.0	364
720 min Winter	9.042	0.0	414
960 min Winter	7.241	0.0	520
1440 min Winter	5.284	0.0	764
2160 min Winter	3.848	0.0	1124
2880 min Winter	3.068	0.0	1472
4320 min Winter	2.226	0.0	2200
5760 min Winter	1.771	0.0	2904
7200 min Winter	1.483	0.0	3576
8640 min Winter	1.284	0.0	4416
10080 min Winter	1.137	0.0	5128

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.069

Time (mins)		Area
From:	To:	(ha)
0	4	0.069


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Model Details

Storage is Online Cover Level (m) 90.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.03600	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	166.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	89.550	Membrane Depth (m)	0


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1291 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.769	0.269	0.1	4.6	O K
30 min Summer	87.860	0.360	0.1	6.2	O K
60 min Summer	87.955	0.455	0.1	7.8	O K
120 min Summer	88.049	0.549	0.1	9.4	O K
180 min Summer	88.098	0.598	0.1	10.2	O K
240 min Summer	88.128	0.628	0.1	10.7	O K
360 min Summer	88.166	0.666	0.1	11.4	O K
480 min Summer	88.186	0.686	0.1	11.7	O K
600 min Summer	88.197	0.697	0.1	11.9	O K
720 min Summer	88.200	0.700	0.1	12.0	O K
960 min Summer	88.194	0.694	0.1	11.9	O K
1440 min Summer	88.168	0.668	0.1	11.4	O K
2160 min Summer	88.129	0.629	0.1	10.8	O K
2880 min Summer	88.092	0.592	0.1	10.1	O K
4320 min Summer	88.021	0.521	0.1	8.9	O K
5760 min Summer	87.953	0.453	0.1	7.7	O K
7200 min Summer	87.890	0.390	0.1	6.7	O K
8640 min Summer	87.833	0.333	0.1	5.7	O K
10080 min Summer	87.781	0.281	0.1	4.8	O K
15 min Winter	87.802	0.302	0.1	5.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	22
30 min Summer	88.566	0.0	37
60 min Summer	56.713	0.0	66
120 min Summer	35.004	0.0	126
180 min Summer	25.973	0.0	184
240 min Summer	20.877	0.0	244
360 min Summer	15.365	0.0	364
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	722
960 min Summer	7.241	0.0	960
1440 min Summer	5.284	0.0	1190
2160 min Summer	3.848	0.0	1560
2880 min Summer	3.068	0.0	1964
4320 min Summer	2.226	0.0	2768
5760 min Summer	1.771	0.0	3576
7200 min Summer	1.483	0.0	4328
8640 min Summer	1.284	0.0	5104
10080 min Summer	1.137	0.0	5848
15 min Winter	131.851	0.0	22

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.904	0.404	0.1	6.9	O K
60 min Winter	88.012	0.512	0.1	8.8	O K
120 min Winter	88.119	0.619	0.1	10.6	O K
180 min Winter	88.177	0.677	0.1	11.6	O K
240 min Winter	88.212	0.712	0.1	12.2	O K
360 min Winter	88.259	0.759	0.1	13.0	O K
480 min Winter	88.287	0.787	0.1	13.5	O K
600 min Winter	88.303	0.803	0.1	13.7	O K
720 min Winter	88.312	0.812	0.1	13.9	O K
960 min Winter	88.316	0.816	0.1	13.9	O K
1440 min Winter	88.289	0.789	0.1	13.5	O K
2160 min Winter	88.235	0.735	0.1	12.6	O K
2880 min Winter	88.183	0.683	0.1	11.7	O K
4320 min Winter	88.075	0.575	0.1	9.8	O K
5760 min Winter	87.971	0.471	0.1	8.0	O K
7200 min Winter	87.875	0.375	0.1	6.4	O K
8640 min Winter	87.789	0.289	0.1	4.9	O K
10080 min Winter	87.714	0.214	0.1	3.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	37
60 min Winter	56.713	0.0	66
120 min Winter	35.004	0.0	124
180 min Winter	25.973	0.0	182
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	358
480 min Winter	12.341	0.0	474
600 min Winter	10.402	0.0	590
720 min Winter	9.042	0.0	704
960 min Winter	7.241	0.0	928
1440 min Winter	5.284	0.0	1356
2160 min Winter	3.848	0.0	1688
2880 min Winter	3.068	0.0	2136
4320 min Winter	2.226	0.0	3028
5760 min Winter	1.771	0.0	3864
7200 min Winter	1.483	0.0	4680
8640 min Winter	1.284	0.0	5368
10080 min Winter	1.137	0.0	6056

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.019

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.013	4	8	0.006

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Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	18.0	18.0	0.900	0.0	39.6
0.800	18.0	39.6			


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1279 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.767	0.267	0.1	2.7	O K
30 min Summer	87.857	0.357	0.1	3.6	O K
60 min Summer	87.952	0.452	0.1	4.5	O K
120 min Summer	88.045	0.545	0.1	5.4	O K
180 min Summer	88.093	0.593	0.1	5.9	O K
240 min Summer	88.122	0.622	0.1	6.2	O K
360 min Summer	88.160	0.660	0.1	6.6	O K
480 min Summer	88.180	0.680	0.1	6.8	O K
600 min Summer	88.190	0.690	0.1	6.9	O K
720 min Summer	88.193	0.693	0.1	6.9	O K
960 min Summer	88.188	0.688	0.1	6.9	O K
1440 min Summer	88.161	0.661	0.1	6.6	O K
2160 min Summer	88.122	0.622	0.1	6.2	O K
2880 min Summer	88.086	0.586	0.1	5.8	O K
4320 min Summer	88.014	0.514	0.1	5.1	O K
5760 min Summer	87.946	0.446	0.1	4.5	O K
7200 min Summer	87.884	0.384	0.1	3.8	O K
8640 min Summer	87.827	0.327	0.1	3.3	O K
10080 min Summer	87.776	0.276	0.1	2.7	O K
15 min Winter	87.800	0.300	0.1	3.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	22
30 min Summer	88.566	0.0	37
60 min Summer	56.713	0.0	66
120 min Summer	35.004	0.0	126
180 min Summer	25.973	0.0	186
240 min Summer	20.877	0.0	244
360 min Summer	15.365	0.0	364
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	722
960 min Summer	7.241	0.0	960
1440 min Summer	5.284	0.0	1186
2160 min Summer	3.848	0.0	1560
2880 min Summer	3.068	0.0	1964
4320 min Summer	2.226	0.0	2768
5760 min Summer	1.771	0.0	3576
7200 min Summer	1.483	0.0	4328
8640 min Summer	1.284	0.0	5104
10080 min Summer	1.137	0.0	5848
15 min Winter	131.851	0.0	22

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.901	0.401	0.1	4.0	O K
60 min Winter	88.008	0.508	0.1	5.1	O K
120 min Winter	88.115	0.615	0.1	6.1	O K
180 min Winter	88.171	0.671	0.1	6.7	O K
240 min Winter	88.206	0.706	0.1	7.0	O K
360 min Winter	88.253	0.753	0.1	7.5	O K
480 min Winter	88.280	0.780	0.1	7.8	O K
600 min Winter	88.295	0.795	0.1	7.9	O K
720 min Winter	88.304	0.804	0.1	8.0	O K
960 min Winter	88.306	0.806	0.1	8.0	O K
1440 min Winter	88.280	0.780	0.1	7.8	O K
2160 min Winter	88.227	0.727	0.1	7.3	O K
2880 min Winter	88.175	0.675	0.1	6.7	O K
4320 min Winter	88.067	0.567	0.1	5.7	O K
5760 min Winter	87.963	0.463	0.1	4.6	O K
7200 min Winter	87.867	0.367	0.1	3.7	O K
8640 min Winter	87.782	0.282	0.1	2.8	O K
10080 min Winter	87.707	0.207	0.1	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	37
60 min Winter	56.713	0.0	66
120 min Winter	35.004	0.0	124
180 min Winter	25.973	0.0	182
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	358
480 min Winter	12.341	0.0	474
600 min Winter	10.402	0.0	590
720 min Winter	9.042	0.0	704
960 min Winter	7.241	0.0	928
1440 min Winter	5.284	0.0	1354
2160 min Winter	3.848	0.0	1684
2880 min Winter	3.068	0.0	2136
4320 min Winter	2.226	0.0	3028
5760 min Winter	1.771	0.0	3864
7200 min Winter	1.483	0.0	4680
8640 min Winter	1.284	0.0	5368
10080 min Winter	1.137	0.0	6056

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.011

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.007	4	8	0.004

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA2	
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Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	10.5	10.5	0.900	0.0	24.1
0.800	10.5	24.1			


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XP Solutions	Source Control 2017.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1279 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.767	0.267	0.1	2.7	O K
30 min Summer	87.857	0.357	0.1	3.6	O K
60 min Summer	87.952	0.452	0.1	4.5	O K
120 min Summer	88.045	0.545	0.1	5.4	O K
180 min Summer	88.093	0.593	0.1	5.9	O K
240 min Summer	88.122	0.622	0.1	6.2	O K
360 min Summer	88.160	0.660	0.1	6.6	O K
480 min Summer	88.180	0.680	0.1	6.8	O K
600 min Summer	88.190	0.690	0.1	6.9	O K
720 min Summer	88.193	0.693	0.1	6.9	O K
960 min Summer	88.188	0.688	0.1	6.9	O K
1440 min Summer	88.161	0.661	0.1	6.6	O K
2160 min Summer	88.122	0.622	0.1	6.2	O K
2880 min Summer	88.086	0.586	0.1	5.8	O K
4320 min Summer	88.014	0.514	0.1	5.1	O K
5760 min Summer	87.946	0.446	0.1	4.5	O K
7200 min Summer	87.884	0.384	0.1	3.8	O K
8640 min Summer	87.827	0.327	0.1	3.3	O K
10080 min Summer	87.776	0.276	0.1	2.7	O K
15 min Winter	87.800	0.300	0.1	3.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	22
30 min Summer	88.566	0.0	37
60 min Summer	56.713	0.0	66
120 min Summer	35.004	0.0	126
180 min Summer	25.973	0.0	186
240 min Summer	20.877	0.0	244
360 min Summer	15.365	0.0	364
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	722
960 min Summer	7.241	0.0	960
1440 min Summer	5.284	0.0	1186
2160 min Summer	3.848	0.0	1560
2880 min Summer	3.068	0.0	1964
4320 min Summer	2.226	0.0	2768
5760 min Summer	1.771	0.0	3576
7200 min Summer	1.483	0.0	4328
8640 min Summer	1.284	0.0	5104
10080 min Summer	1.137	0.0	5848
15 min Winter	131.851	0.0	22

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.901	0.401	0.1	4.0	O K
60 min Winter	88.008	0.508	0.1	5.1	O K
120 min Winter	88.115	0.615	0.1	6.1	O K
180 min Winter	88.171	0.671	0.1	6.7	O K
240 min Winter	88.206	0.706	0.1	7.0	O K
360 min Winter	88.253	0.753	0.1	7.5	O K
480 min Winter	88.280	0.780	0.1	7.8	O K
600 min Winter	88.295	0.795	0.1	7.9	O K
720 min Winter	88.304	0.804	0.1	8.0	O K
960 min Winter	88.306	0.806	0.1	8.0	O K
1440 min Winter	88.280	0.780	0.1	7.8	O K
2160 min Winter	88.227	0.727	0.1	7.3	O K
2880 min Winter	88.175	0.675	0.1	6.7	O K
4320 min Winter	88.067	0.567	0.1	5.7	O K
5760 min Winter	87.963	0.463	0.1	4.6	O K
7200 min Winter	87.867	0.367	0.1	3.7	O K
8640 min Winter	87.782	0.282	0.1	2.8	O K
10080 min Winter	87.707	0.207	0.1	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	37
60 min Winter	56.713	0.0	66
120 min Winter	35.004	0.0	124
180 min Winter	25.973	0.0	182
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	358
480 min Winter	12.341	0.0	474
600 min Winter	10.402	0.0	590
720 min Winter	9.042	0.0	704
960 min Winter	7.241	0.0	928
1440 min Winter	5.284	0.0	1354
2160 min Winter	3.848	0.0	1684
2880 min Winter	3.068	0.0	2136
4320 min Winter	2.226	0.0	3028
5760 min Winter	1.771	0.0	3864
7200 min Winter	1.483	0.0	4680
8640 min Winter	1.284	0.0	5368
10080 min Winter	1.137	0.0	6056

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA3	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.011

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.007	4	8	0.004

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA3	
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Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	10.5	10.5	0.900	0.0	24.1
0.800	10.5	24.1			


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1205 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.756	0.256	0.0	1.5	O K
30 min Summer	87.841	0.341	0.0	1.9	O K
60 min Summer	87.931	0.431	0.0	2.5	O K
120 min Summer	88.019	0.519	0.0	3.0	O K
180 min Summer	88.065	0.565	0.0	3.2	O K
240 min Summer	88.092	0.592	0.0	3.4	O K
360 min Summer	88.127	0.627	0.0	3.6	O K
480 min Summer	88.144	0.644	0.0	3.7	O K
600 min Summer	88.152	0.652	0.0	3.7	O K
720 min Summer	88.154	0.654	0.0	3.7	O K
960 min Summer	88.146	0.646	0.0	3.7	O K
1440 min Summer	88.120	0.620	0.0	3.5	O K
2160 min Summer	88.082	0.582	0.0	3.3	O K
2880 min Summer	88.046	0.546	0.0	3.1	O K
4320 min Summer	87.975	0.475	0.0	2.7	O K
5760 min Summer	87.908	0.408	0.0	2.3	O K
7200 min Summer	87.848	0.348	0.0	2.0	O K
8640 min Summer	87.792	0.292	0.0	1.7	O K
10080 min Summer	87.743	0.243	0.0	1.4	O K
15 min Winter	87.787	0.287	0.0	1.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	19
30 min Summer	88.566	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	35.004	0.0	124
180 min Summer	25.973	0.0	182
240 min Summer	20.877	0.0	242
360 min Summer	15.365	0.0	362
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	720
960 min Summer	7.241	0.0	936
1440 min Summer	5.284	0.0	1154
2160 min Summer	3.848	0.0	1536
2880 min Summer	3.068	0.0	1936
4320 min Summer	2.226	0.0	2764
5760 min Summer	1.771	0.0	3568
7200 min Summer	1.483	0.0	4320
8640 min Summer	1.284	0.0	5096
10080 min Summer	1.137	0.0	5752
15 min Winter	131.851	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.883	0.383	0.0	2.2	O K
60 min Winter	87.985	0.485	0.0	2.8	O K
120 min Winter	88.086	0.586	0.0	3.3	O K
180 min Winter	88.139	0.639	0.0	3.6	O K
240 min Winter	88.172	0.672	0.0	3.8	O K
360 min Winter	88.215	0.715	0.0	4.1	O K
480 min Winter	88.239	0.739	0.0	4.2	O K
600 min Winter	88.252	0.752	0.0	4.3	O K
720 min Winter	88.259	0.759	0.0	4.3	O K
960 min Winter	88.259	0.759	0.0	4.3	O K
1440 min Winter	88.230	0.730	0.0	4.2	O K
2160 min Winter	88.179	0.679	0.0	3.9	O K
2880 min Winter	88.126	0.626	0.0	3.6	O K
4320 min Winter	88.019	0.519	0.0	3.0	O K
5760 min Winter	87.916	0.416	0.0	2.4	O K
7200 min Winter	87.823	0.323	0.0	1.8	O K
8640 min Winter	87.742	0.242	0.0	1.4	O K
10080 min Winter	87.672	0.172	0.0	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	33
60 min Winter	56.713	0.0	62
120 min Winter	35.004	0.0	122
180 min Winter	25.973	0.0	180
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	356
480 min Winter	12.341	0.0	472
600 min Winter	10.402	0.0	588
720 min Winter	9.042	0.0	700
960 min Winter	7.241	0.0	924
1440 min Winter	5.284	0.0	1340
2160 min Winter	3.848	0.0	1664
2880 min Winter	3.068	0.0	2108
4320 min Winter	2.226	0.0	2984
5760 min Winter	1.771	0.0	3808
7200 min Winter	1.483	0.0	4608
8640 min Winter	1.284	0.0	5352
10080 min Winter	1.137	0.0	5960

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.006

Time (mins)		Area
From:	To:	(ha)
0	4	0.006

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA4	
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Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	6.0	6.0	0.900	0.0	14.8
0.800	6.0	14.8			


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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA5	
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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1205 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.756	0.256	0.0	1.5	O K
30 min Summer	87.841	0.341	0.0	1.9	O K
60 min Summer	87.931	0.431	0.0	2.5	O K
120 min Summer	88.019	0.519	0.0	3.0	O K
180 min Summer	88.065	0.565	0.0	3.2	O K
240 min Summer	88.092	0.592	0.0	3.4	O K
360 min Summer	88.127	0.627	0.0	3.6	O K
480 min Summer	88.144	0.644	0.0	3.7	O K
600 min Summer	88.152	0.652	0.0	3.7	O K
720 min Summer	88.154	0.654	0.0	3.7	O K
960 min Summer	88.146	0.646	0.0	3.7	O K
1440 min Summer	88.120	0.620	0.0	3.5	O K
2160 min Summer	88.082	0.582	0.0	3.3	O K
2880 min Summer	88.046	0.546	0.0	3.1	O K
4320 min Summer	87.975	0.475	0.0	2.7	O K
5760 min Summer	87.908	0.408	0.0	2.3	O K
7200 min Summer	87.848	0.348	0.0	2.0	O K
8640 min Summer	87.792	0.292	0.0	1.7	O K
10080 min Summer	87.743	0.243	0.0	1.4	O K
15 min Winter	87.787	0.287	0.0	1.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	19
30 min Summer	88.566	0.0	34
60 min Summer	56.713	0.0	64
120 min Summer	35.004	0.0	124
180 min Summer	25.973	0.0	182
240 min Summer	20.877	0.0	242
360 min Summer	15.365	0.0	362
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	720
960 min Summer	7.241	0.0	936
1440 min Summer	5.284	0.0	1154
2160 min Summer	3.848	0.0	1536
2880 min Summer	3.068	0.0	1936
4320 min Summer	2.226	0.0	2764
5760 min Summer	1.771	0.0	3568
7200 min Summer	1.483	0.0	4320
8640 min Summer	1.284	0.0	5096
10080 min Summer	1.137	0.0	5752
15 min Winter	131.851	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.883	0.383	0.0	2.2	O K
60 min Winter	87.985	0.485	0.0	2.8	O K
120 min Winter	88.086	0.586	0.0	3.3	O K
180 min Winter	88.139	0.639	0.0	3.6	O K
240 min Winter	88.172	0.672	0.0	3.8	O K
360 min Winter	88.215	0.715	0.0	4.1	O K
480 min Winter	88.239	0.739	0.0	4.2	O K
600 min Winter	88.252	0.752	0.0	4.3	O K
720 min Winter	88.259	0.759	0.0	4.3	O K
960 min Winter	88.259	0.759	0.0	4.3	O K
1440 min Winter	88.230	0.730	0.0	4.2	O K
2160 min Winter	88.179	0.679	0.0	3.9	O K
2880 min Winter	88.126	0.626	0.0	3.6	O K
4320 min Winter	88.019	0.519	0.0	3.0	O K
5760 min Winter	87.916	0.416	0.0	2.4	O K
7200 min Winter	87.823	0.323	0.0	1.8	O K
8640 min Winter	87.742	0.242	0.0	1.4	O K
10080 min Winter	87.672	0.172	0.0	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	33
60 min Winter	56.713	0.0	62
120 min Winter	35.004	0.0	122
180 min Winter	25.973	0.0	180
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	356
480 min Winter	12.341	0.0	472
600 min Winter	10.402	0.0	588
720 min Winter	9.042	0.0	700
960 min Winter	7.241	0.0	924
1440 min Winter	5.284	0.0	1340
2160 min Winter	3.848	0.0	1664
2880 min Winter	3.068	0.0	2108
4320 min Winter	2.226	0.0	2984
5760 min Winter	1.771	0.0	3808
7200 min Winter	1.483	0.0	4608
8640 min Winter	1.284	0.0	5352
10080 min Winter	1.137	0.0	5960

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA5	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.006

Time (mins)		Area
From:	To:	(ha)
0	4	0.006

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA5	
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Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	6.0	6.0	0.900	0.0	14.8
0.800	6.0	14.8			


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1279 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	87.767	0.267	0.1	2.7	O K
30 min Summer	87.857	0.357	0.1	3.6	O K
60 min Summer	87.952	0.452	0.1	4.5	O K
120 min Summer	88.045	0.545	0.1	5.4	O K
180 min Summer	88.093	0.593	0.1	5.9	O K
240 min Summer	88.122	0.622	0.1	6.2	O K
360 min Summer	88.160	0.660	0.1	6.6	O K
480 min Summer	88.180	0.680	0.1	6.8	O K
600 min Summer	88.190	0.690	0.1	6.9	O K
720 min Summer	88.193	0.693	0.1	6.9	O K
960 min Summer	88.188	0.688	0.1	6.9	O K
1440 min Summer	88.161	0.661	0.1	6.6	O K
2160 min Summer	88.122	0.622	0.1	6.2	O K
2880 min Summer	88.086	0.586	0.1	5.8	O K
4320 min Summer	88.014	0.514	0.1	5.1	O K
5760 min Summer	87.946	0.446	0.1	4.5	O K
7200 min Summer	87.884	0.384	0.1	3.8	O K
8640 min Summer	87.827	0.327	0.1	3.3	O K
10080 min Summer	87.776	0.276	0.1	2.7	O K
15 min Winter	87.800	0.300	0.1	3.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.851	0.0	22
30 min Summer	88.566	0.0	37
60 min Summer	56.713	0.0	66
120 min Summer	35.004	0.0	126
180 min Summer	25.973	0.0	186
240 min Summer	20.877	0.0	244
360 min Summer	15.365	0.0	364
480 min Summer	12.341	0.0	482
600 min Summer	10.402	0.0	602
720 min Summer	9.042	0.0	722
960 min Summer	7.241	0.0	960
1440 min Summer	5.284	0.0	1186
2160 min Summer	3.848	0.0	1560
2880 min Summer	3.068	0.0	1964
4320 min Summer	2.226	0.0	2768
5760 min Summer	1.771	0.0	3576
7200 min Summer	1.483	0.0	4328
8640 min Summer	1.284	0.0	5104
10080 min Summer	1.137	0.0	5848
15 min Winter	131.851	0.0	22

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	87.901	0.401	0.1	4.0	O K
60 min Winter	88.008	0.508	0.1	5.1	O K
120 min Winter	88.115	0.615	0.1	6.1	O K
180 min Winter	88.171	0.671	0.1	6.7	O K
240 min Winter	88.206	0.706	0.1	7.0	O K
360 min Winter	88.253	0.753	0.1	7.5	O K
480 min Winter	88.280	0.780	0.1	7.8	O K
600 min Winter	88.295	0.795	0.1	7.9	O K
720 min Winter	88.304	0.804	0.1	8.0	O K
960 min Winter	88.306	0.806	0.1	8.0	O K
1440 min Winter	88.280	0.780	0.1	7.8	O K
2160 min Winter	88.227	0.727	0.1	7.3	O K
2880 min Winter	88.175	0.675	0.1	6.7	O K
4320 min Winter	88.067	0.567	0.1	5.7	O K
5760 min Winter	87.963	0.463	0.1	4.6	O K
7200 min Winter	87.867	0.367	0.1	3.7	O K
8640 min Winter	87.782	0.282	0.1	2.8	O K
10080 min Winter	87.707	0.207	0.1	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	88.566	0.0	37
60 min Winter	56.713	0.0	66
120 min Winter	35.004	0.0	124
180 min Winter	25.973	0.0	182
240 min Winter	20.877	0.0	240
360 min Winter	15.365	0.0	358
480 min Winter	12.341	0.0	474
600 min Winter	10.402	0.0	590
720 min Winter	9.042	0.0	704
960 min Winter	7.241	0.0	928
1440 min Winter	5.284	0.0	1354
2160 min Winter	3.848	0.0	1684
2880 min Winter	3.068	0.0	2136
4320 min Winter	2.226	0.0	3028
5760 min Winter	1.771	0.0	3864
7200 min Winter	1.483	0.0	4680
8640 min Winter	1.284	0.0	5368
10080 min Winter	1.137	0.0	6056

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.011

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.007	4	8	0.004

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Metro House Northgate Chichester PO19 1BE	R/O Red Lion PH Charing Heath SA6	
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XP Solutions	Source Control 2017.1	

Model Details

Storage is Online Cover Level (m) 90.000

Cellular Storage Structure

Invert Level (m) 87.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	10.5	10.5	0.900	0.0	24.1
0.800	10.5	24.1			