CANNON
CONSULTING ENGINEERS
Highways, Transport & Infrastructure Planning

Land at Malyons Farm,
Hullbridge, Essex

Flood Risk Assessment

October 2014

For
Southern and Regional
Developments Ltd

Ref: CCE/F221/FRA-03

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Document Review Sheet:

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Reference	Date	Author	Checked
CCE/F221/FRA-01	October 2014	JOH	RBT
CCE/F221/FRA-02	October 2014	JOH	RBT
CCE/F221/FRA-03	October 2014	JOH	RBT

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Summary Table

Site location	North of Lower Road on the western edge of Hullbridge. Grid reference – 580730, 194525
Planning application	Outline
Existing site	Agricultural (predominantly greenfield)
Site area	Approximately 21.79 ha
Proposed development	Residential
Source of Flooding	Surface water flood areas present on the south and south-eastern boundaries
Surface water management	Restricted to the existing 1 in 1 annual probability greenfield rate with on-site attenuation provided to manage the 1 in 100 annual probability storm inclusive of a 30 % climate change allowance.

1.0 Introduction

Context

1.1 This Flood Risk Assessment (FRA) has been prepared on behalf of Southern and Regional Developments Ltd to support an outline planning application for a proposed residential development on land to the north of Lower Road on the western edge of Hullbridge in Essex (refer to Figure 1 for the site location).

1.2 The site is allocated for residential development under Policy SER6 of the Rochford District Council Local Development Framework Allocations Document.

1.3 In accordance with the site allocation, the development proposals comprise up to 500 residential dwellings, associated hard and soft landscaping, and access roads.

1.4 The report has been prepared following site visits and two public consultation events. A review of the Rochford District Council Strategic Flood Risk Assessment (SFRA) and the South Essex Surface Water Management Plan (SWMP) was also undertaken.

1.5 Essex County Council has commissioned an investigation into the repeat flooding of Watery Lane. The investigation follows recommendations within the South Essex SWMP and is expected to define mitigation measures which could in-part be funded through the delivery of allocation SER6.

1.6 This assessment takes account of the National Planning Policy Framework (NPPF) and the sources of flooding defined by the Flood and Water Management Act (FWMA) 2010. It also responds to Core Strategy policies ENV3 (flood risk) and 4 (SuDS), and policy SER6 of the Allocations Document.

Baseline Information

1.7 The Environment Agency (EA) Flood Map (refer to Figure 2) shows that the site lies within Flood Zone 1 and is not therefore designated as being at risk of inundation from a river with a catchment greater than 3 km^2 or from coastal flooding.

1.8 The EA surface water flood mapping (Figure 4) shows that the south of the site, and smaller areas along the eastern site boundary, may be affected by floodwater resulting from the accumulation of runoff from the surrounding area.

1.9 The site is located in Critical Drainage Area (CDA) ROC2 as defined by the SWMP. The SWMP defines a CDA as an area where multiple sources of flooding lead to one or more flooding hotspots which affect people, property or local infrastructure during severe weather.

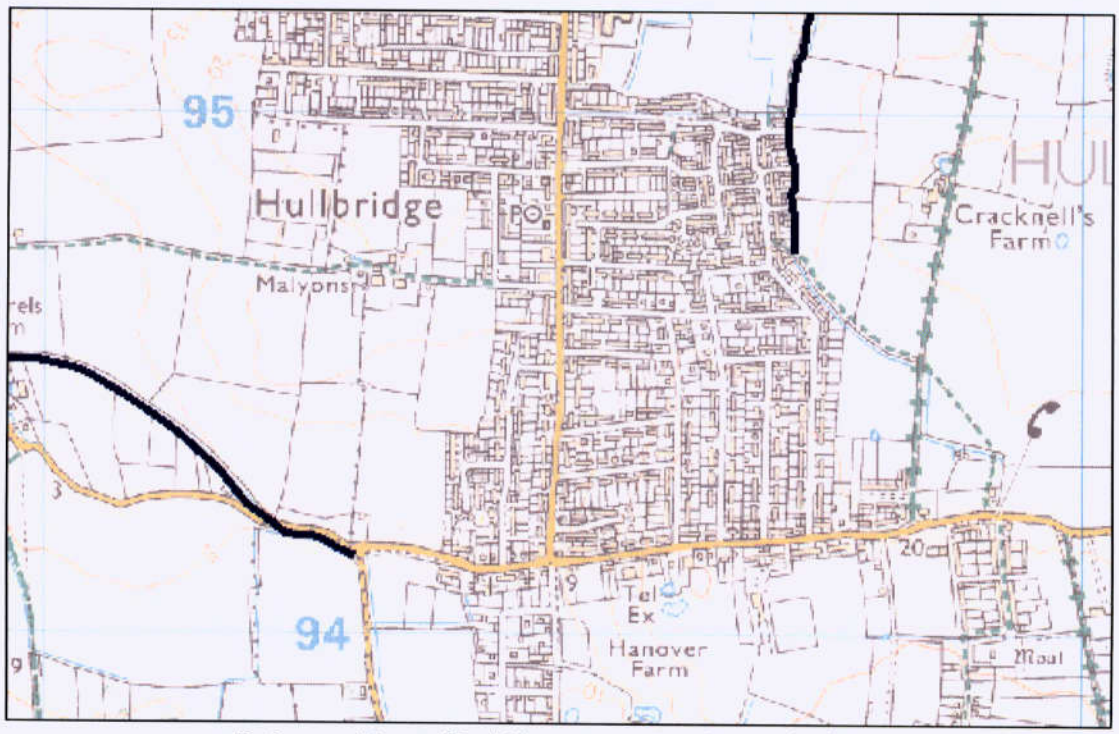
1.10 The site is approximately centred on Ordnance Survey grid reference 580730, 194525 and extends to approximately 21.79 ha. The majority of the site is currently undeveloped and laid to agricultural use. The group of buildings which make up Malyons Farm sit approximately two thirds of the way up the site. The proposed development will involve the redevelopment of some of the farm buildings whilst some will be retained.

1.11 The site is bordered by residential development to the north and east with open farmland to the west. The land to the south is a mix of open land and small areas of residential and commercial development. The southern boundary of the site is formed by Lower Road.

1.12 The dominant direction of fall of the site is from north to south. Levels range from approximately 22 m AOD in the north to approximately 6 m AOD in the south-west corner.

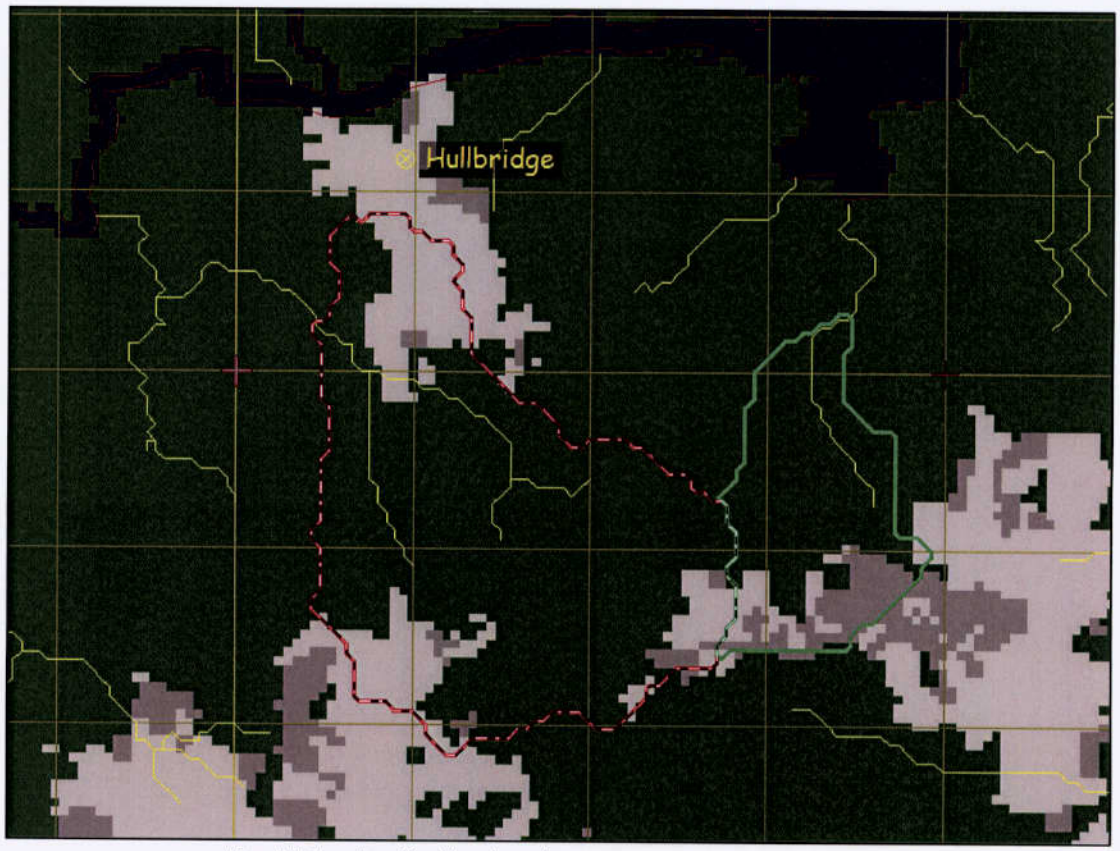
1.13 Not far beyond the northern site boundary the land then falls away to the north down towards the River Crouch.

1.14 The most notable watercourse in the area is the River Crouch, a tidal main river some 450 m to the north of the site. The closest watercourse to the site is Beeches Brook, a designated Main River which runs generally westwards from a point near the south-west corner of the site, to join/outfall to the Crouch. The channel is the continuation of a complex series of ordinary watercourses (i.e. channels which are not designated as Main Rivers) and drains which serve the land to the south and east of the site. Beeches Brook is a flashy watercourse and known to respond quickly to intense rainfall events.



Environment Agency Flood Map, source = EA website 03/10/2014

1.15 The catchment area feeding into the head of the section of Beeches Brook designated as Main River is approximately 4.5 km^2 according to the Flood Estimation Handbook. The catchment is outlined in red on the image below (the catchment represents the approximate area of land which drains into the channel).



Flood Estimation Handbook catchment area source = FEH data CD 3

1.16 Anglian Water owns and operates a wastewater (foul sewerage) pumping station which lies off-site, immediately adjacent to the south-western corner of the site. The location is shown on the adopted sewer plans in Appendix A. The pumping station is discussed in the separate Services Assessment report ref CCE/F221/SA.

1.17 British Geological Survey (BGS) mapping shows that the majority of the site sits on London Clay with superficial head deposits (clay, silt, sand and gravel) only present to limited extents on the northern and southern boundaries.

2.0 Forms of Flooding

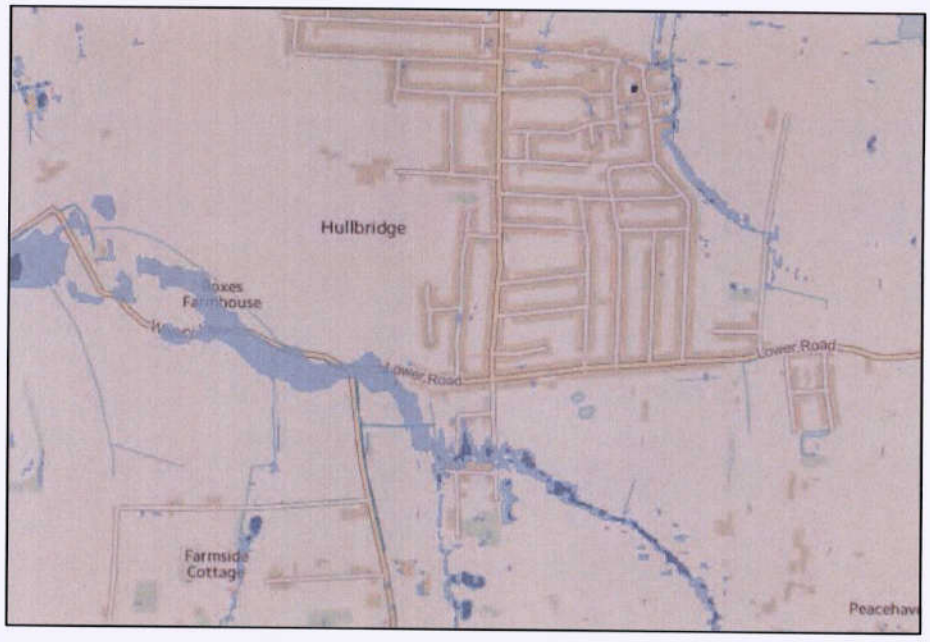
Watercourses

2.1 The site lies within Flood Zone 1 (as shown on Figure 2); the low probability flood area with regards to tidal and fluvial flooding from watercourses with a catchment larger than 3 km^2.

Surface Water

2.2 The most recent EA surface water flood mapping (refer to Figure 4) shows that the south of the site is considered to be at risk of inundation from surface water runoff. There are three risk categories which are associated with three different statistical probabilities of storm (see below). As the risk category decreases, the extent of potential flooding increases because the lower risk categories are associated with larger, less probable storms. The following extracts from the EA surface water flood maps show the predicted surface water flood depths. The depths are divided into three brackets (less than 300 mm, 300 mm to 900 mm, and greater than 900 mm) which are shown as three shades of blue with the darker shades representing greater depths.

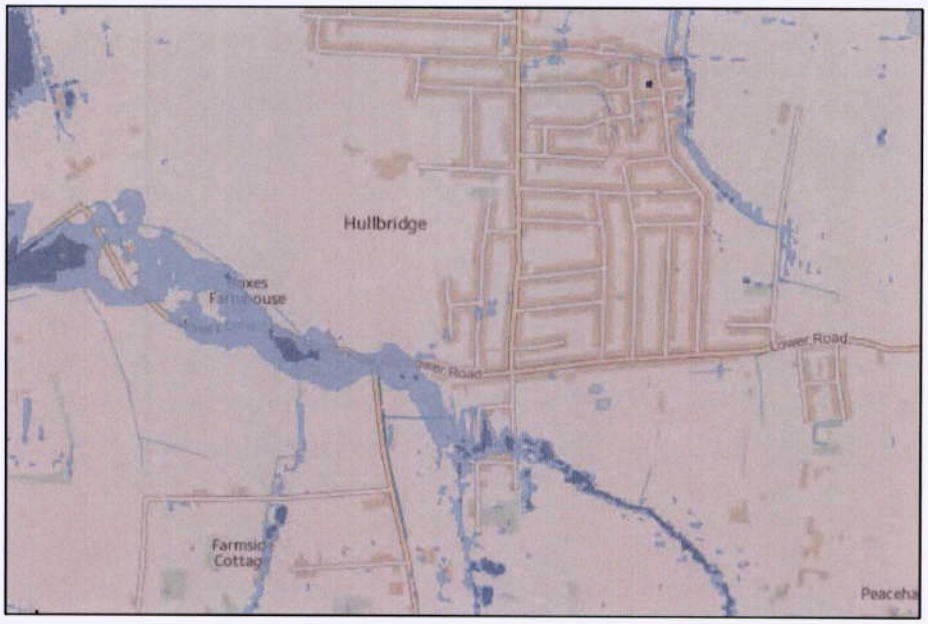
<u>High risk: greater than a 1 in 30 chance of flooding</u>
The map shows that on-site depths would be less than 300 mm.



Surface water depth – High Chance of Flooding

Medium risk: between a 1 in 100 and a 1 in 30 chance of flooding

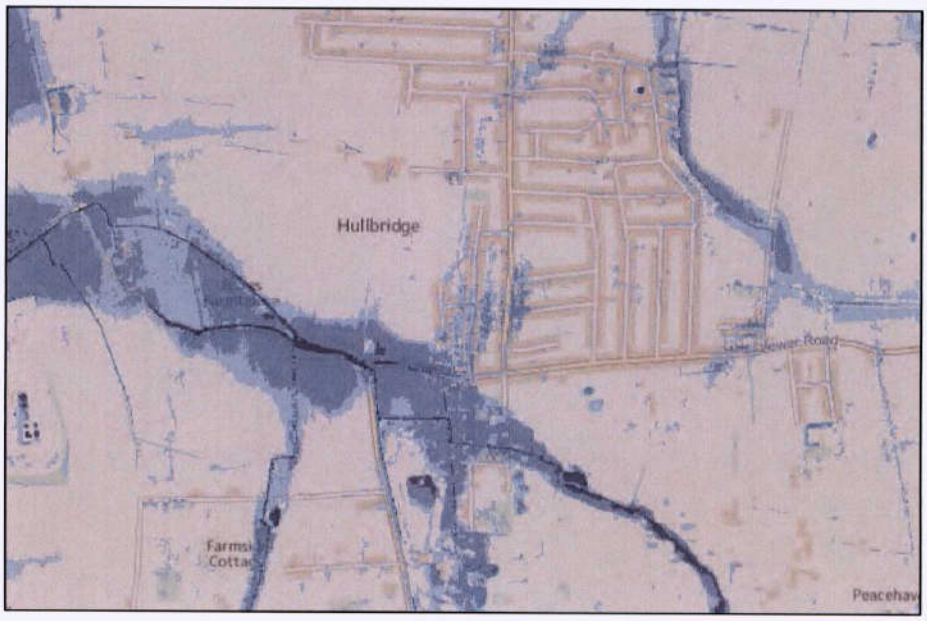
The map shows that on-site depths would be less than 300 mm.



Surface water depth – Medium Chance of Flooding

Low risk: between a 1 in 1,000 and a 1 in 100 chance of flooding

The map shows that the on-site depths for the majority of the site (except for a small area in the south west corner) are predicted at less than 900 mm.



Surface water depth – Low Chance of Flooding

Groundwater

2.3 British Geological Survey (BGS) mapping identifies the site as being underlain by superficial silts and clays over London Clay. The presence of London Clay (for all intents and purposes an impermeable rock) means that groundwater flooding due to upwelling of water from a significant below-ground water body is not possible.

2.4 There may be some seasonal waterlogging of soils and superficial geological deposits (where they are present) as the London Clay will tend to prevent water percolating downwards. There is likely to be some sub-surface flow which follows the topography of the clay horizon (the underground surface effectively) with some potential for local waterlogging in any depressions in the surface of the clay. Problems with waterlogged rear gardens in properties which back on to the site were raised during the public consultations.

Surface Water Sewers

2.5 Anglian Water records (included in Appendix A) show that there are various runs of adopted surface water sewers in Hullbridge. There are various reports of flooding associated with the surface water sewer network when it becomes inundated during intense rainfall. The main risk posed to the development from sewer flooding would be if flows were to run overland from the areas of Hullbridge which are higher than the site.

Reservoirs

2.6 The site does not lie in a reservoir inundation zone (refer to Figure 2).

Flood Management

2.7 The residential parcels have been set back from the southern and eastern site boundaries in order to keep them outside of the potential surface water flow/ponding areas as defined on the EA mapping. As a conservative approach, the southern limit for residential development is approximately marked by the 7.0 m AOD contour which places it inside the very low risk surface water flood area (the area with less than a 1 in 1,000 chance of flooding in a year). The eastern edge of the built development towards the lower part of the site will be set 15 to 20 m from the site boundary in order to intercept any surface water runoff, as well as any flow associated with surface water sewer flooding shed from the adjacent upslope areas of Hullbridge, and route this southwards away from both the existing and proposed development.

2.8 Access/egress during times of severe surface water flooding can be provided via a number of pedestrian/cycle links and secondary vehicular access via Malyons Lane.

3.0 Surface Water Management

3.1 As the site is underlain by low permeability geology (London Clay) the proposed surface water management scheme will rely on a positive outfall to the drainage ditch which runs along the southern boundary. In accordance with the Essex County Council SuDS guidance, and general good practice in areas with existing surface water drainage problems, the discharge rate from the site will be set at the calculated greenfield runoff rate for the 1 in 1 annual probability storm (often referred to as the 1 year storm).

3.2 Surface water attenuation will be provided in four main facilities/areas:

- Two open basins (grassed attenuation basins, possibly with some opportunity to include seasonally wet and planted micropools).
- A complex of cellular storage crates beneath the eastern site boundary. An element of below ground storage is required in order to accommodate the other site constraints.
- A storage tank/s adjacent to the site access to provide attenuation for the adoptable highway.

A catchment plan showing which parcels of land will drain to which facilities is included in Appendix B.

3.3 The attenuation facilities simulated in Appendix B are sized to manage up to and including the 1 in 100 annual probability storm inclusive of a 30 % climate change allowance. Restricting the flow from larger storms to the rate associated with smaller storms (in this case the 1 year storm) will inherently reduce flood flows in the downstream (flood prone) network.

3.4 The attenuated flows will be conveyed from the basins and tanks via a below and above ground network which discharges to the watercourse adjacent to the south western corner of the site (the southern side of Lower Road).

3.5 The surface water management network upstream of the attenuation features will comprise:

- Drained permeable surfacing for all areas of private hardstanding and parking bays
- SuDS planters/roadside bio-retention areas and an under-drained swale/grassed filter drain serving public and private roads
- Private rain gardens for selected properties, primarily in the low density parcels

3.6 All proposals are subject to the later detailed design and approval of relevant parties. In light of the change of direction with regards to SuDS Approval Bodies, it is proposed that adoption and maintenance of the residential surface water management system will be offered to Anglian Water with the "highways" surface water management network being adopted by ECC. Typical maintenance requirements are included in Appendix B.

4.0 Conclusions

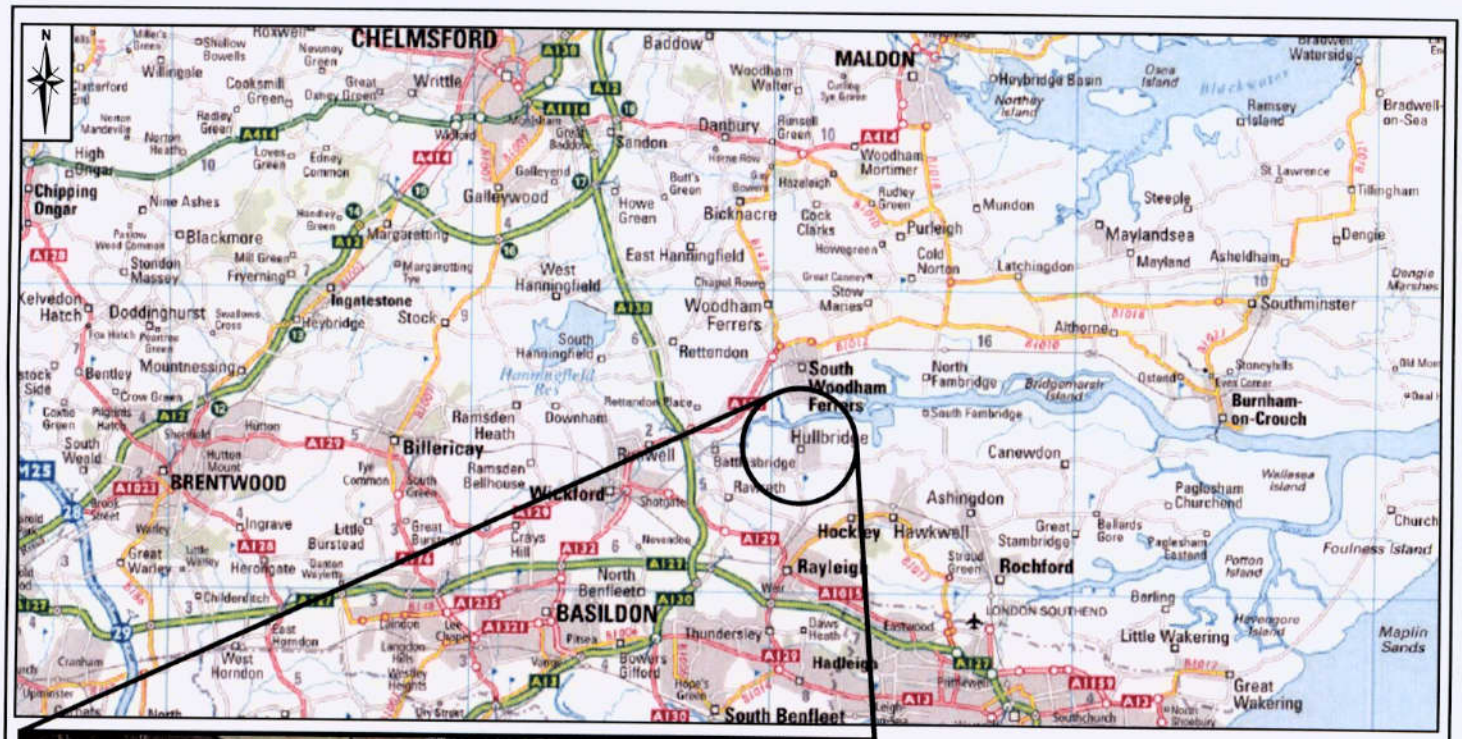
4.1 The development site is located within Flood Zone 1 and is therefore not considered to be at risk of flooding from main rivers or watercourse with a significant catchment, or from a tidal source.

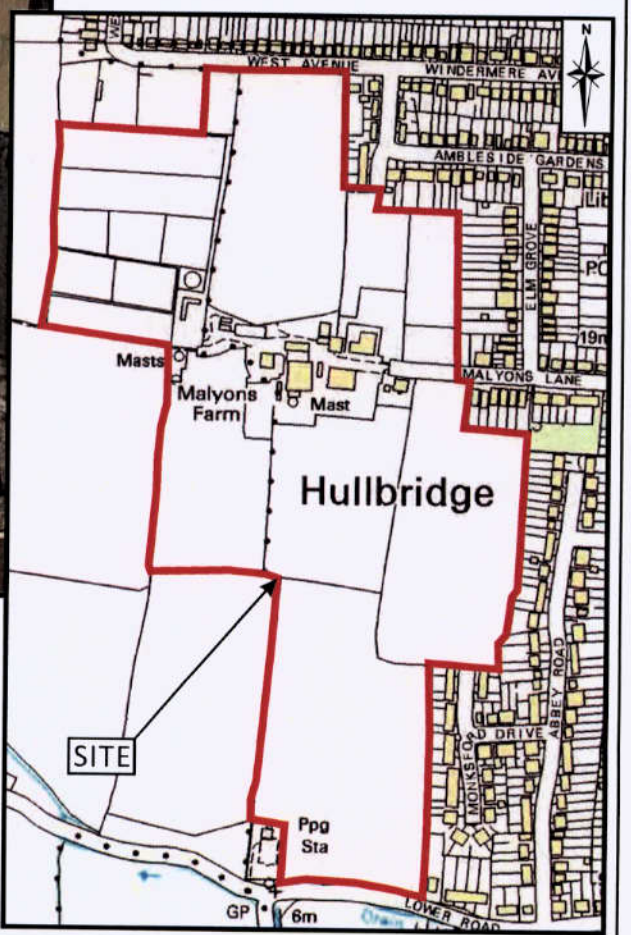
4.2 Areas of in the south and east of the site are identified on EA mapping as being potentially at risk of surface water flooding. Built development has been excluded from these areas.

4.3 The site is not considered to be likely to flood from any of the other sources listed in the Flood and Water Management Act.

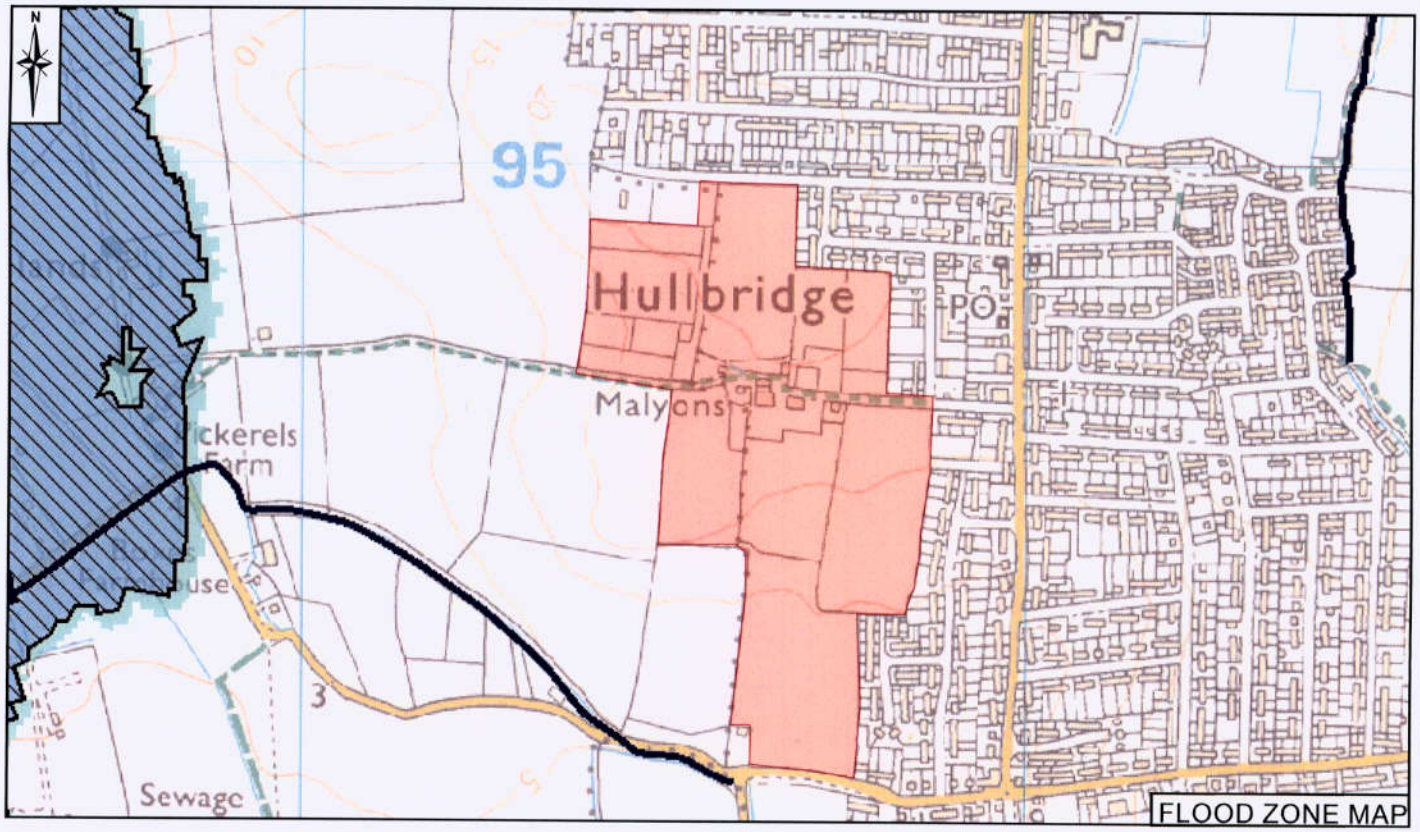
4.4 Surface water runoff will be managed within four main attenuation facilities with upstream permeable paving and SuDS planters to provide source control and treatment. Runoff will be restricted to the 1 in 1 annual probability greenfield rate with attenuation sized to manage for up to and including the 1 in 100 annual probability event inclusive of the requisite allowance for climate change.

Figures

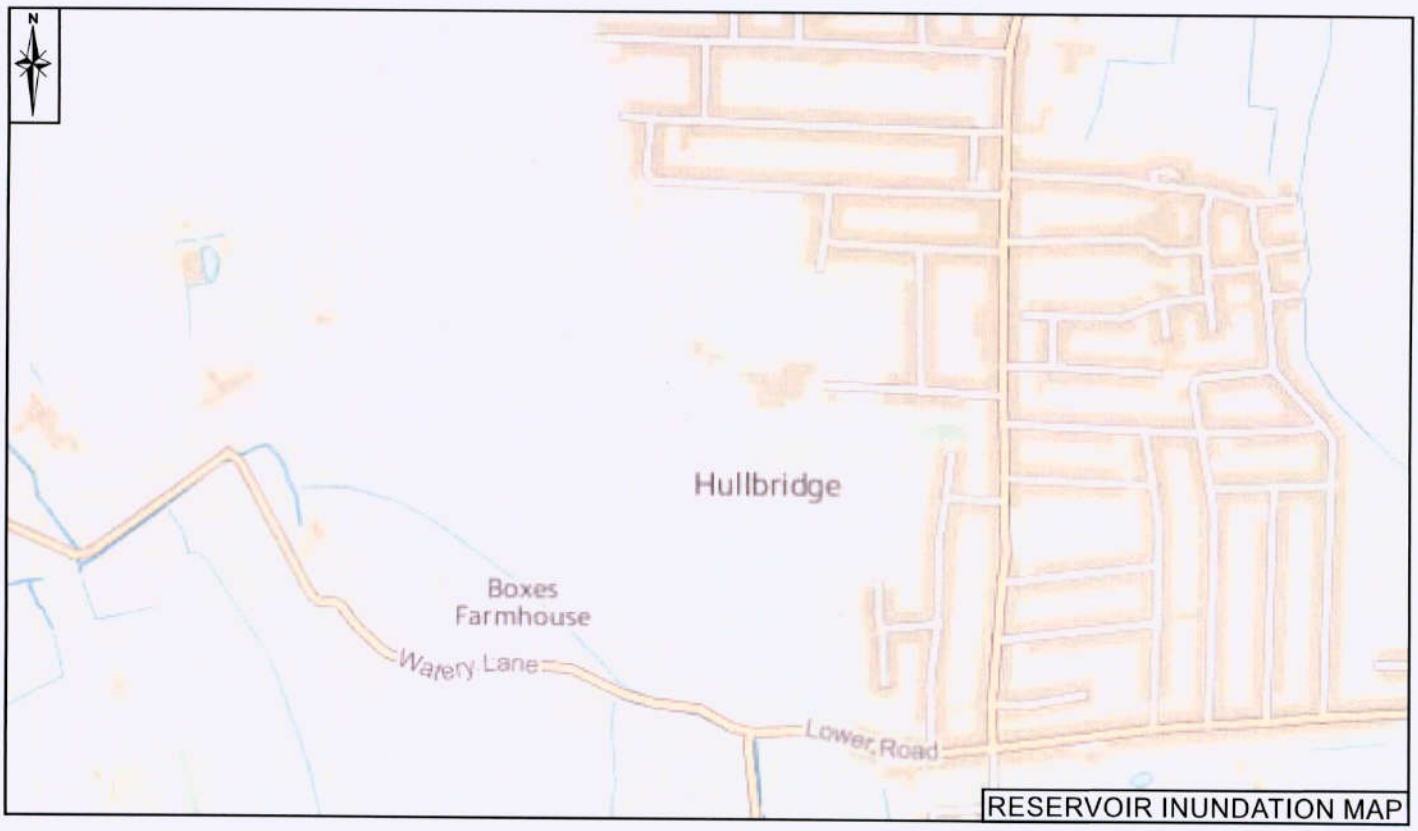




Scale: N.T.S	Job Title: LAND AT MALYONS FARM, HULLBRIDGE, ESSEX	Drawing Title: SITE LOCATION PLAN	Cambridge House, Lanwades Business Park, Kentford, Newmarket, CB8 7PN Tel: 01484 677 255 Fax: 01484 677 779 Email: info@cannonce.co.uk Web www.cannonce.co.uk	CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning	Project No: F221
Date: 10/10/2014	Client: SOUTHERN & REGIONAL DEVELOPMENT LTD				Figure No: FIGURE 1
Drawn By: JAM					



FLOOD ZONE MAP



RESERVOIR INUNDATION MAP

KEY

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

Scale: N.T.S	Job Title: LAND AT MALYON FARM, HULLBRIDGE, ESSEX	Drawing Title: FLOOD ZONE AND RESERVOIR INUNDATION MAPS	Cambridge House, Lanwades Business Park, Kentford, Newmarket, CB8 7PN Tel: 01494 677 255 Fax: 01494 677 779 Email: info@cannonce.co.uk Web www.cannonce.co.uk	CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning	Project No: F221
Date: 10/10/2014	Client: SOUTHERN AND REGIONAL DEVELOPMENTS LTD				Figure No: FIGURE 2
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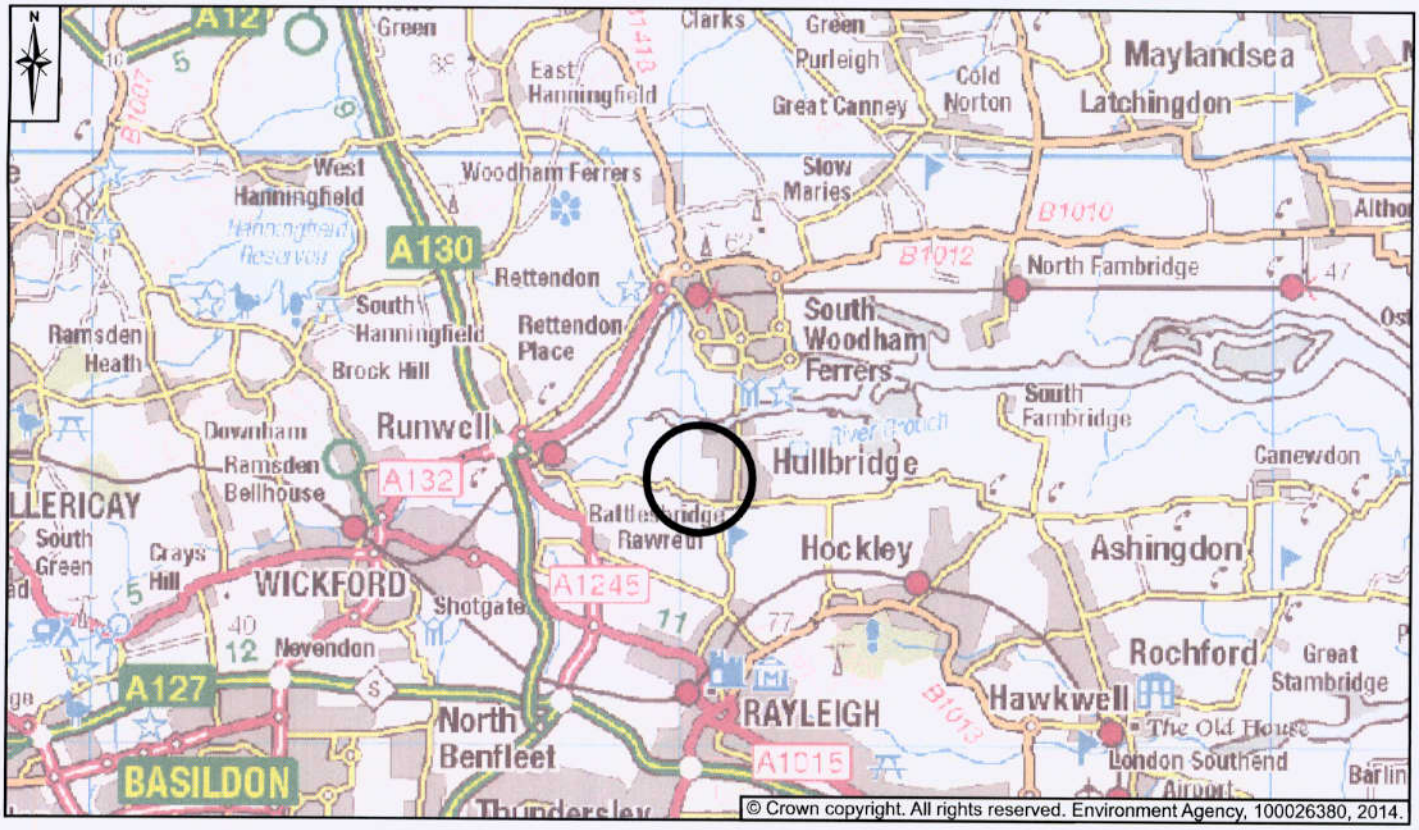

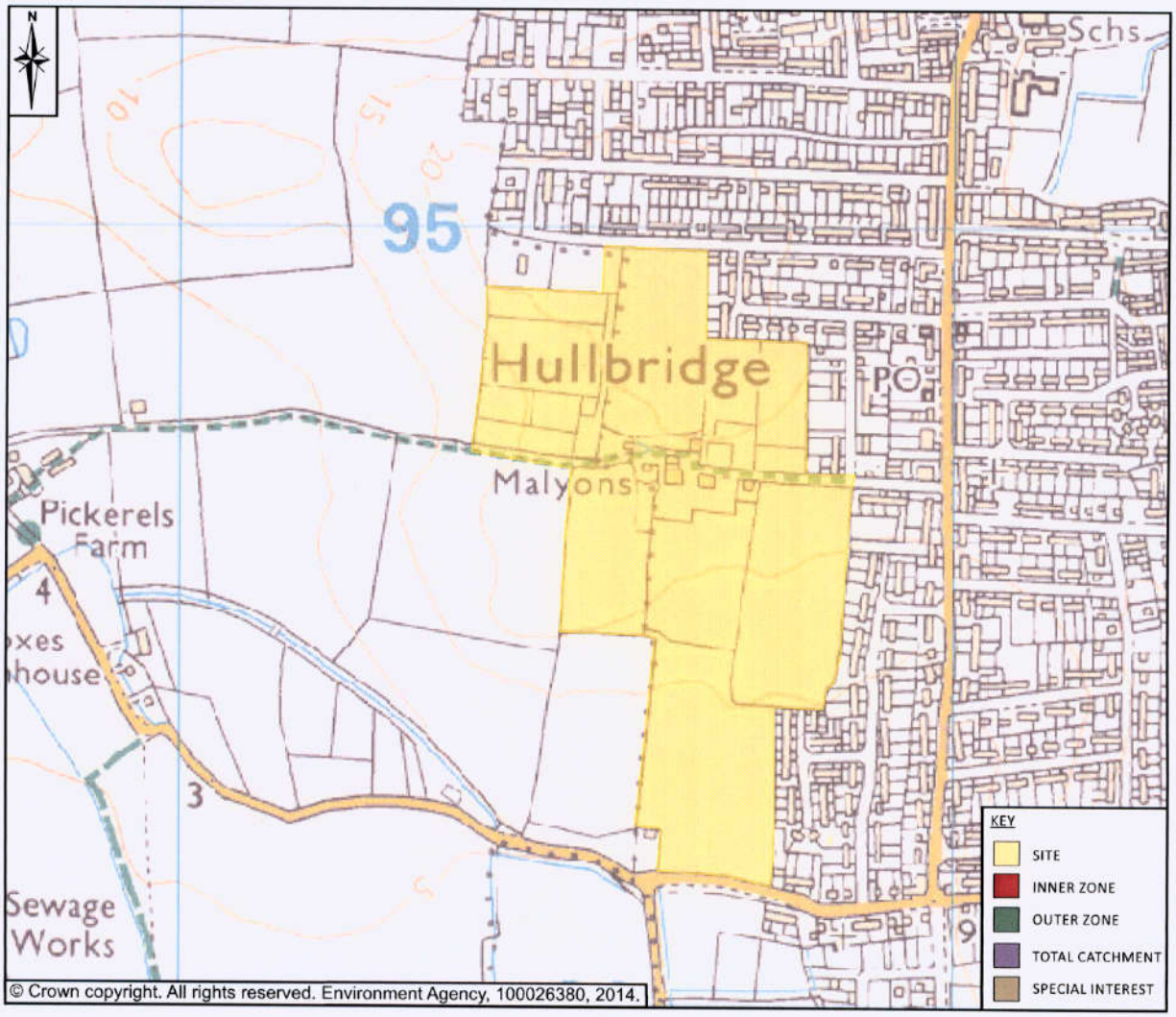

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Date: 10/10/2014	Client: SOUTHERN AND REGIONAL DEVELOPMENTS LTD				Figure No: FIGURE 3
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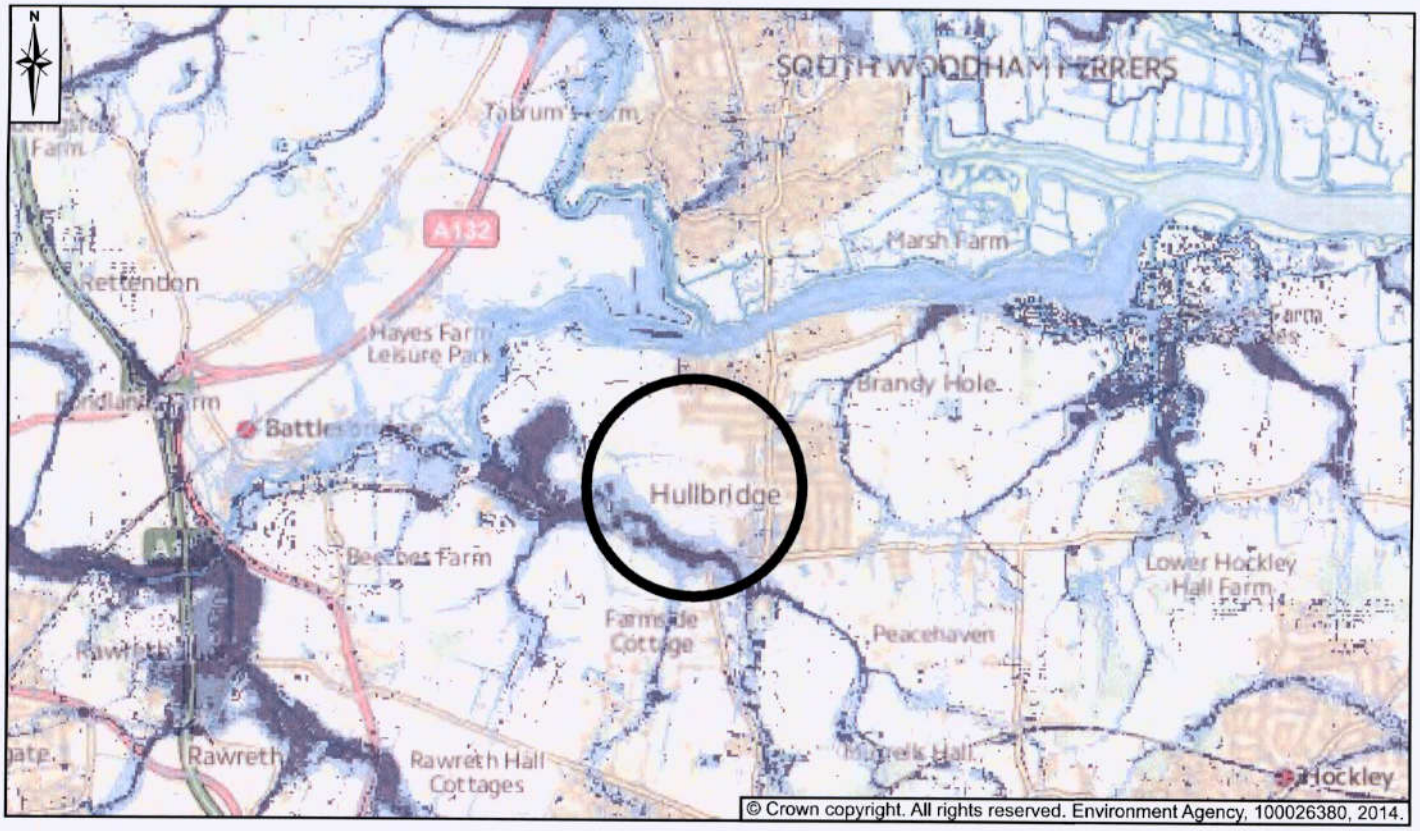
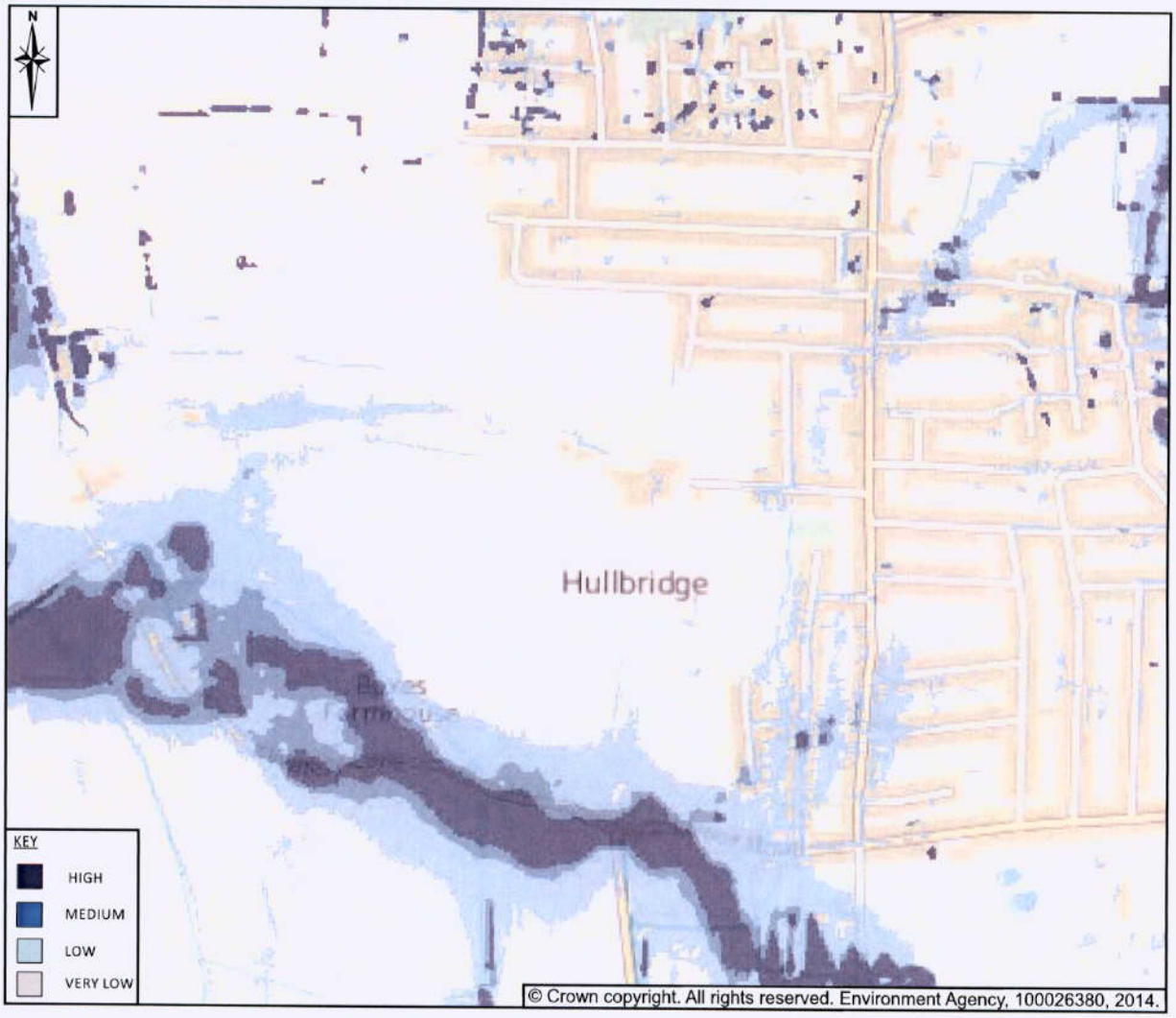




Scale: N.T.S Date: 09/10/2014 Drawn By: JAM	Job Title: LAND AT BRETFORTON ROAD, BADSEY, EVESHAM Client: SOUTHERN AND REGIONAL DEVELOPMENTS LTD	Drawing Title: SURFACE WATER FLOODING PLAN	Cambridge House, Lanwades Business Park, Kentford, Newmarket, CB8 7PN Tel: 01494 677 255 Fax: 01494 677 778 Email: info@cannonce.co.uk Web www.cannonce.co.uk	CANNON CONSULTING ENGINEERS Highways Transport & Infrastructure Planning	Project No: F221 Figure No: FIGURE 4

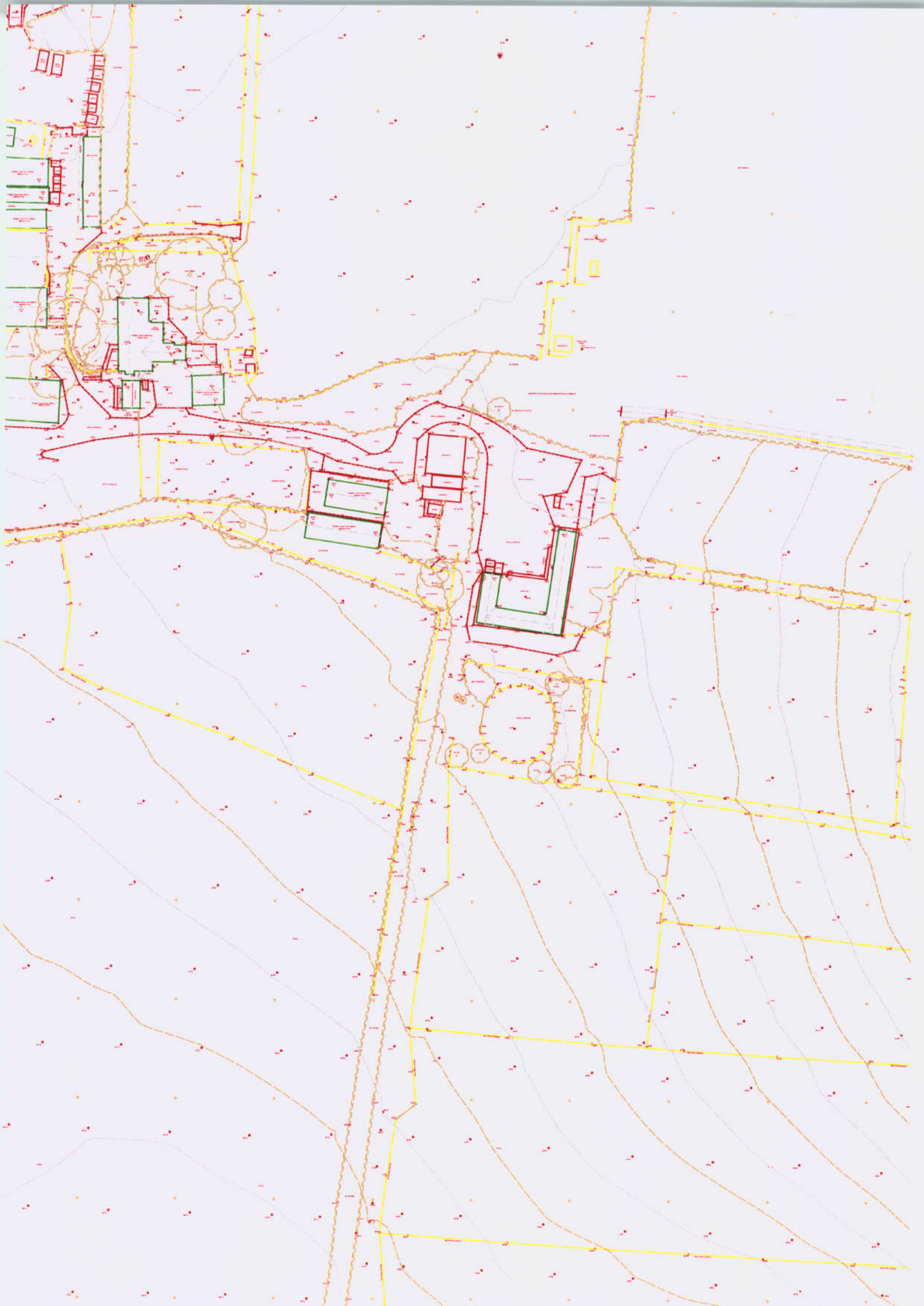
Appendices

A. Existing Site

Topographical Survey

Adopted Sewer Plans

Geology Map




The New Bungalow
Malyons Farm
Def
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Def
Mast
Little Malyons
MALYONS LANE
Brooklands
Mulberrie
1.22m RH
ED & Ward Bdy
1.22m RH
THE PRIORIES

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

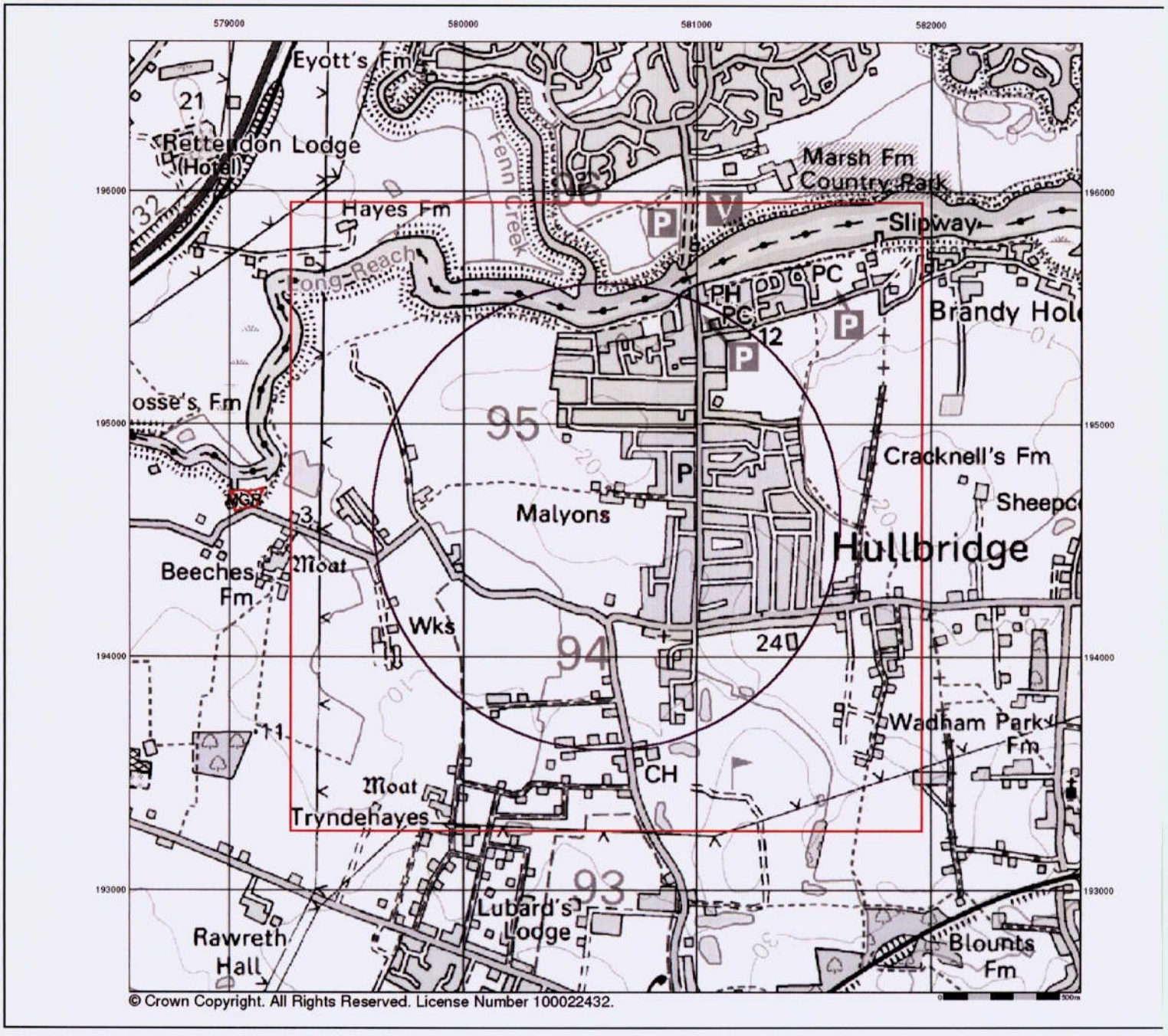
Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene

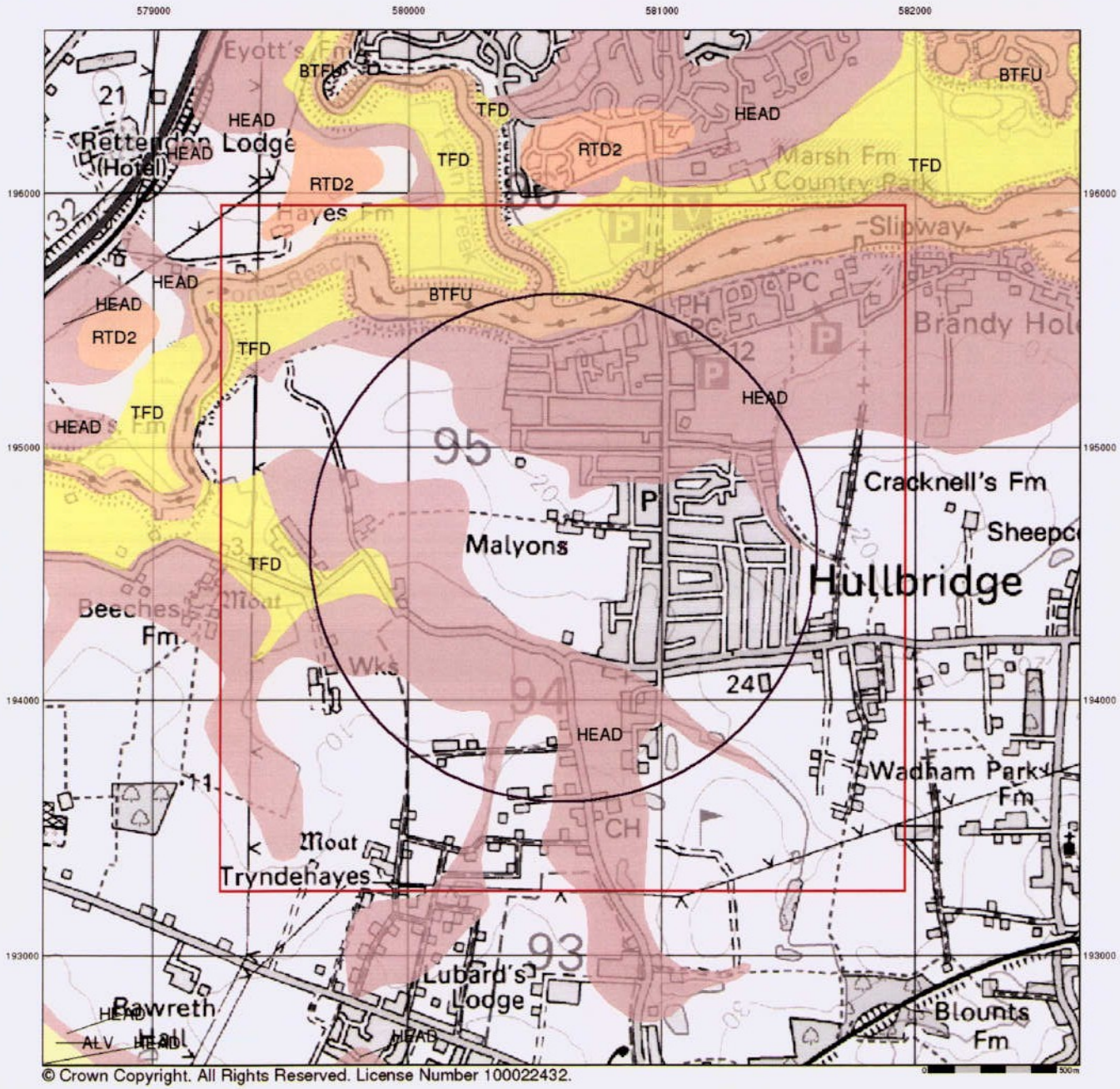
Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Flandrian - Flandrian
	TFD	Tidal Flat Deposits	Clay and Silt	Holocene - Holocene
	HEAD	Head	Clay, Silt, Sand and Gravel	Quaternary - Quaternary
	BTFU	Beach and Tidal Flat Deposits (Undifferentiated)	Clay, Silt and Sand	Quaternary - Quaternary
	RTD2	River Terrace Deposits, 2	Sand and Gravel	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay, Silt and Sand	Eocene - Eocene
	CLGB	Claygate Member	Clay, Silt and Sand	Eocene - Eocene





Envirocheck® Geology

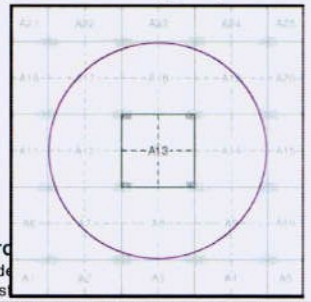
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A

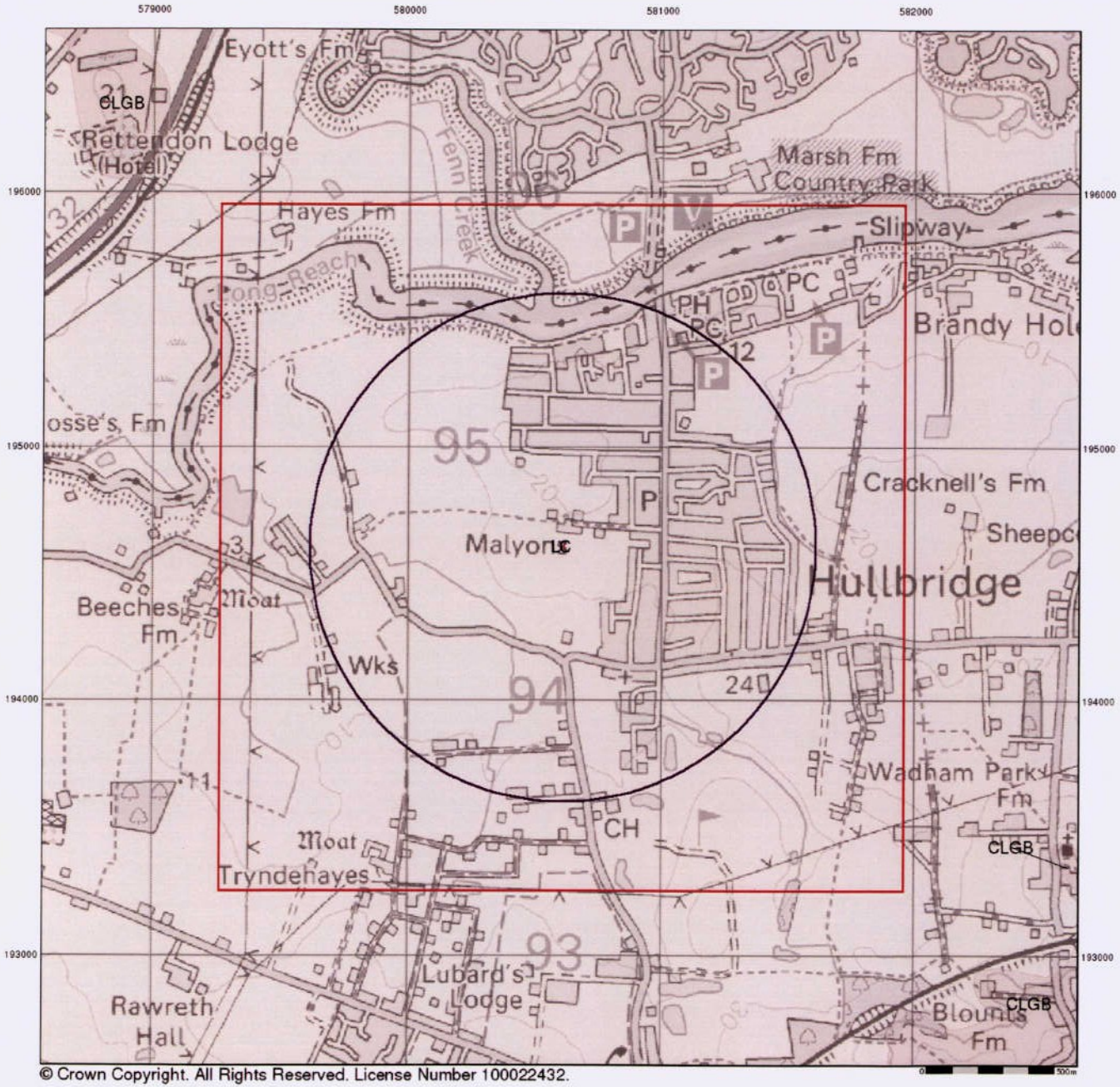


Ord
Orde
Cust

National Grid Reference: 580610, 194600
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details:
Site at, Hullbridge, Essex

Landmark
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Geology

Bedrock and Faults

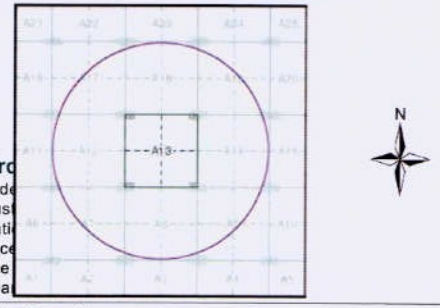
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



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Site at, Hullbridge, Essex

Landmark
Tel: 0844 844 9952
Fax: 0844 844 9951
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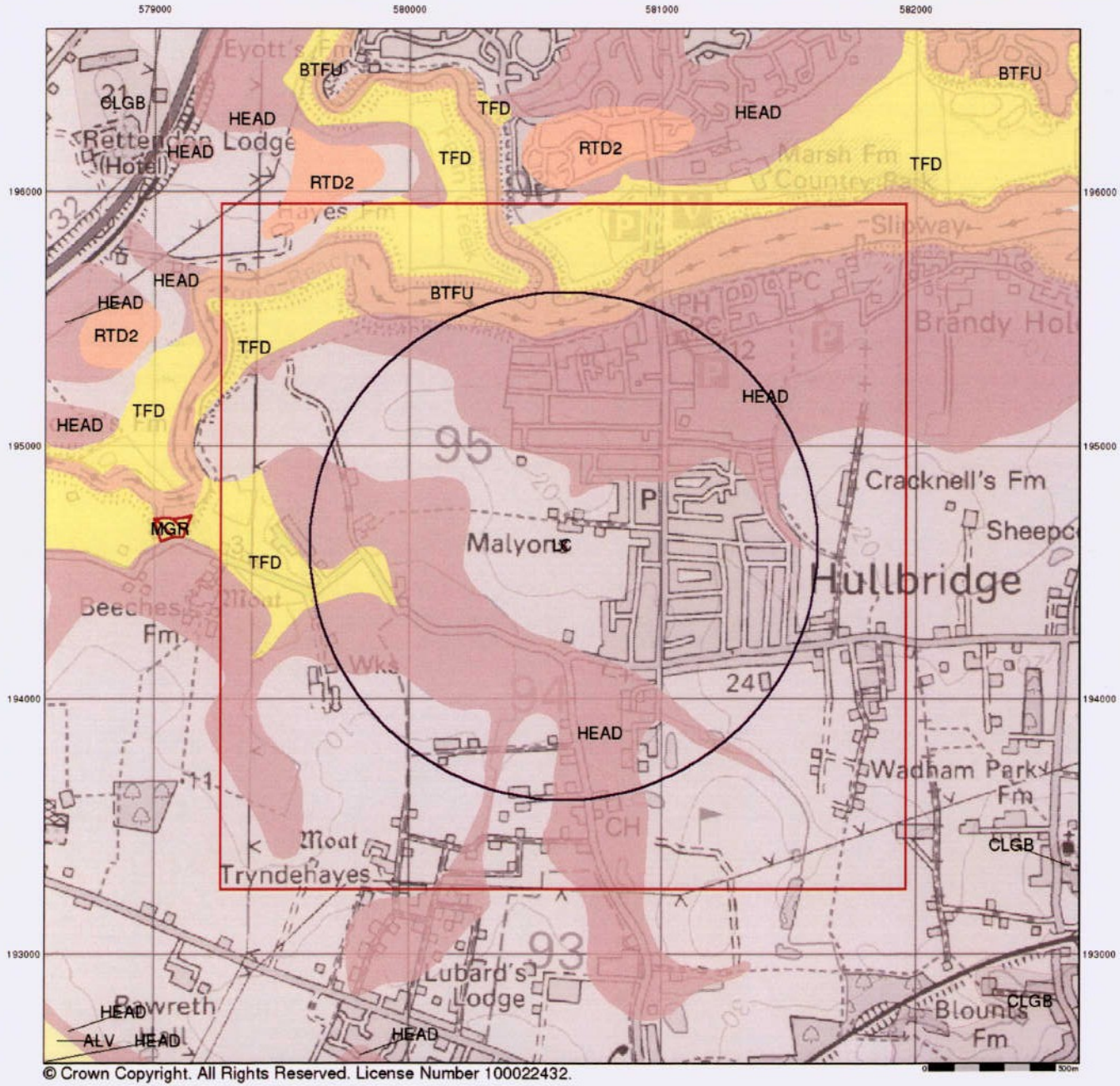

Envirocheck Geology

Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

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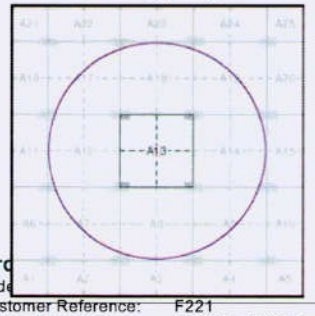
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



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Customer Reference: F221
National Grid Reference: 580610, 194600
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details:
Site at, Hullbridge, Essex

Landmark
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

B. Proposed Site
Illustrative Masterplan
Outline Surface Water Management Plan x 2
Catchment Plan
WinDes Simulations
SuDS Maintenance Schedules

Framework Plan

BroadwayMalyan[BM]

Architecture Urbanism Design

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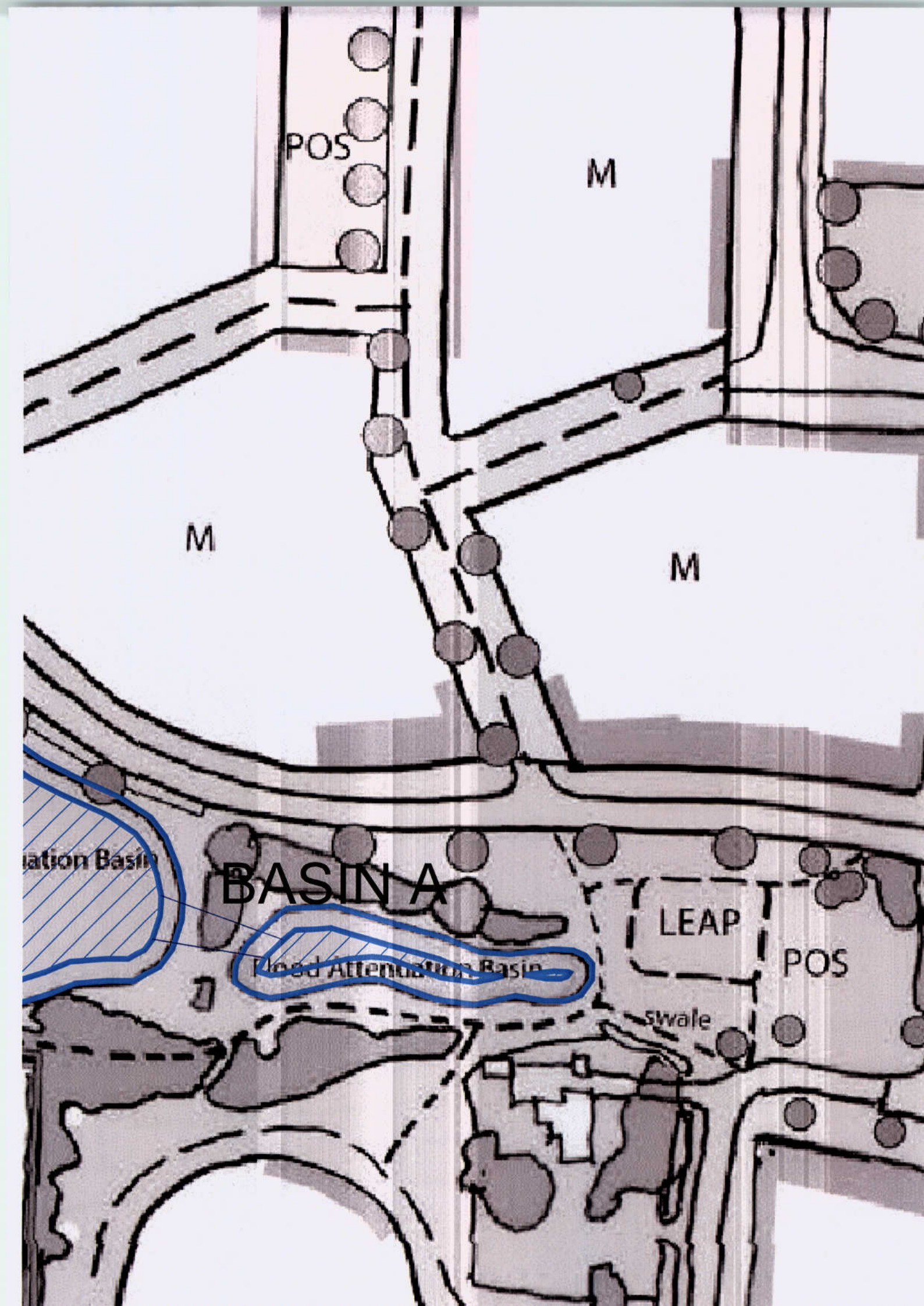
Information:

Client:	Southern and Regional Developments Ltd
Project:	Hullbridge
Description:	Masterplan Concept Rev H
Job No:	27716/1
Status:	Outline Planning Draft
Scale:	1:1250 @ A1
Drawn:	MY
Drawing No:	
Date:	31tst Oct 2014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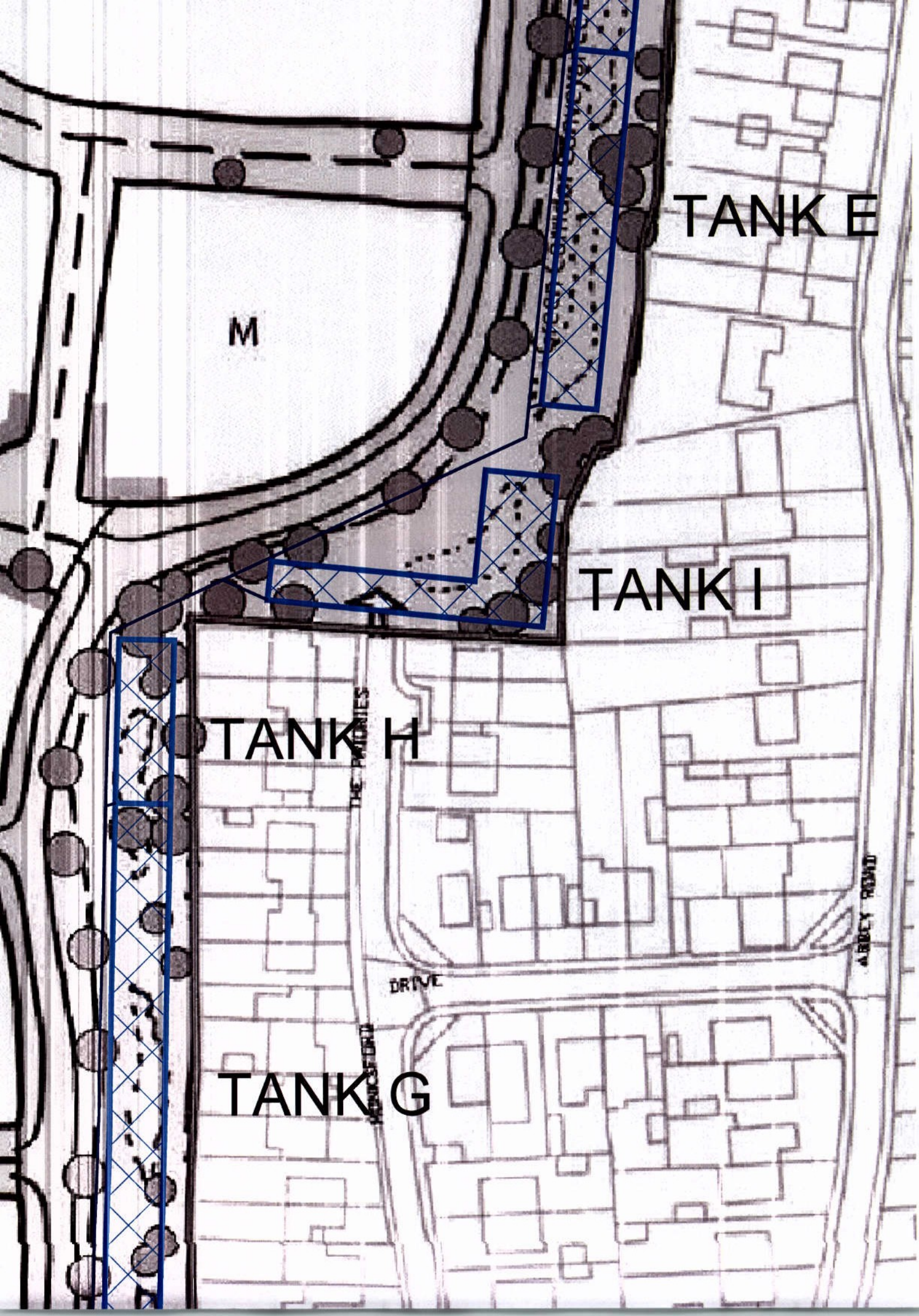
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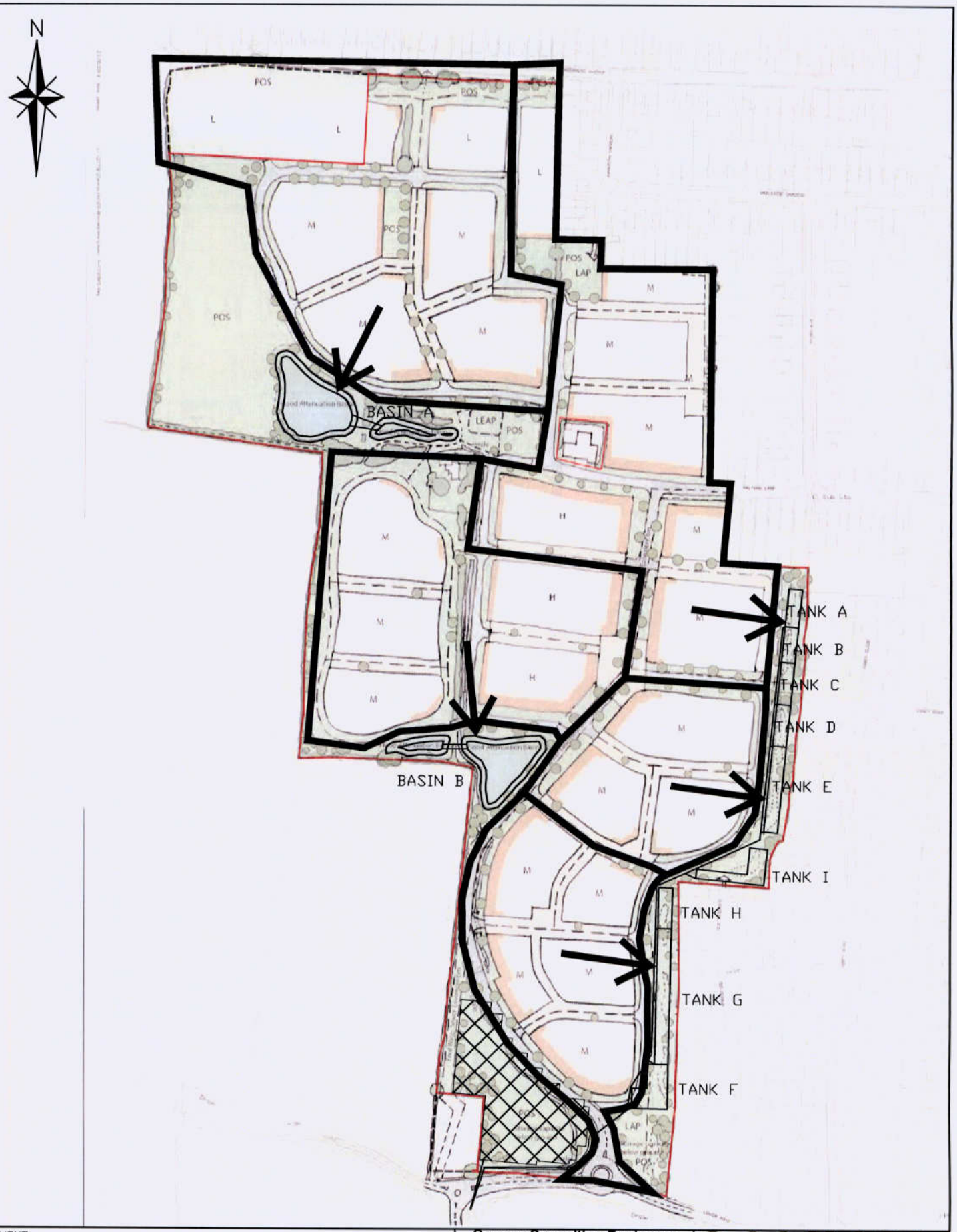

CLIENT: LANDHOLD CAPITAL	Cannon Consulting Engineers Cambridge House, Kentford, Newmarket, Cambs, CB8 7PN Tel: +44 (0)1638 555 107 Fax: +44 (0)1638 555 106 info@cannonce.co.uk www.cannonce.co.uk			CANNON CONSULTING ENGINEERS Highways, Transport & Infrastructure Planning	
PROJECT TITLE: MALYONS FARM, HULLBRIDGE	SCALE @ A4: NTS	DATE: OCT/2014			
DRAWING TITLE: CATCHMENT AREA PLAN	DESIGNED: DP	DRAWN: DP	ISSUE STATUS: -	DRAWING NUMBER: F221 - 004	REV: A

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.500
Area (ha)	1.000	Urban	0.000
SAAR (mm)	547	Region Number	Region 6

Results l/s

QBAR Rural	4.1
QBAR Urban	4.1
Q100 years	13.2
Q1 year	3.5
Q30 years	9.4
Q100 years	13.2

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.436	0.436	1.9	991.5	O K
30 min Summer	99.492	0.492	2.1	1136.2	O K
60 min Summer	99.554	0.554	2.2	1301.0	O K
120 min Summer	99.622	0.622	2.3	1487.5	O K
180 min Summer	99.664	0.664	2.4	1606.8	O K
240 min Summer	99.695	0.695	2.5	1695.8	O K
360 min Summer	99.740	0.740	2.6	1827.0	Flood Risk
480 min Summer	99.772	0.772	2.6	1923.4	Flood Risk
600 min Summer	99.798	0.798	2.7	1999.4	Flood Risk
720 min Summer	99.818	0.818	2.7	2061.9	Flood Risk
960 min Summer	99.838	0.838	2.7	2124.2	Flood Risk
1440 min Summer	99.863	0.863	2.8	2202.1	Flood Risk
2160 min Summer	99.882	0.882	2.8	2260.4	Flood Risk
2880 min Summer	99.889	0.889	2.8	2283.1	Flood Risk
4320 min Summer	99.874	0.874	2.8	2233.9	Flood Risk
5760 min Summer	99.850	0.850	2.7	2160.7	Flood Risk
7200 min Summer	99.829	0.829	2.7	2095.2	Flood Risk
8640 min Summer	99.810	0.810	2.7	2038.4	Flood Risk
10080 min Summer	99.793	0.793	2.7	1986.8	Flood Risk
15 min Winter	99.482	0.482	2.1	1110.6	O K
30 min Winter	99.543	0.543	2.2	1272.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	160.3	27
30 min Summer	133.307	0.0	170.7	42
60 min Summer	76.448	0.0	352.6	72
120 min Summer	43.841	0.0	374.5	132
180 min Summer	31.668	0.0	386.4	192
240 min Summer	25.142	0.0	394.0	252
360 min Summer	18.161	0.0	402.9	370
480 min Summer	14.418	0.0	407.3	490
600 min Summer	12.055	0.0	409.1	610
720 min Summer	10.415	0.0	409.2	730
960 min Summer	8.134	0.0	403.2	970
1440 min Summer	5.741	0.0	385.4	1448
2160 min Summer	4.052	0.0	802.1	2168
2880 min Summer	3.165	0.0	776.3	2884
4320 min Summer	2.197	0.0	704.3	4320
5760 min Summer	1.696	0.0	1480.5	5488
7200 min Summer	1.387	0.0	1420.7	6056
8640 min Summer	1.177	0.0	1352.5	6824
10080 min Summer	1.025	0.0	1277.4	7472
15 min Winter	232.456	0.0	169.5	27
30 min Winter	133.307	0.0	180.3	42

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.611	0.611	2.3	1457.5	O K
120 min Winter	99.685	0.685	2.5	1666.8	O K
180 min Winter	99.731	0.731	2.5	1800.8	Flood Risk
240 min Winter	99.765	0.765	2.6	1901.1	Flood Risk
360 min Winter	99.814	0.814	2.7	2048.9	Flood Risk
480 min Winter	99.849	0.849	2.7	2157.8	Flood Risk
600 min Winter	99.877	0.877	2.8	2243.9	Flood Risk
720 min Winter	99.899	0.899	2.8	2314.9	Flood Risk
960 min Winter	99.922	0.922	2.9	2386.6	Flood Risk
1440 min Winter	99.950	0.950	2.9	2478.0	Flood Risk
2160 min Winter	99.972	0.972	2.9	2549.8	Flood Risk
2880 min Winter	99.982	0.982	3.0	2582.3	Flood Risk
4320 min Winter	99.970	0.970	2.9	2542.3	Flood Risk
5760 min Winter	99.949	0.949	2.9	2475.7	Flood Risk
7200 min Winter	99.925	0.925	2.9	2397.9	Flood Risk
8640 min Winter	99.901	0.901	2.8	2319.1	Flood Risk
10080 min Winter	99.881	0.881	2.8	2257.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	76.448	0.0	373.0	72
120 min Winter	43.841	0.0	395.6	130
180 min Winter	31.668	0.0	407.8	190
240 min Winter	25.142	0.0	415.7	248
360 min Winter	18.161	0.0	424.8	366
480 min Winter	14.418	0.0	429.3	486
600 min Winter	12.055	0.0	431.1	604
720 min Winter	10.415	0.0	431.2	722
960 min Winter	8.134	0.0	424.8	958
1440 min Winter	5.741	0.0	406.2	1430
2160 min Winter	4.052	0.0	847.3	2128
2880 min Winter	3.165	0.0	820.1	2828
4320 min Winter	2.197	0.0	745.1	4196
5760 min Winter	1.696	0.0	1574.1	5528
7200 min Winter	1.387	0.0	1510.5	6768
8640 min Winter	1.177	0.0	1438.7	7104
10080 min Winter	1.025	0.0	1360.1	7872

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 2.279

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.760	4	8	0.760	8	12	0.760

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2018.0	1.000	3320.0

Orifice Outflow Control

Diameter (m) 0.038 Discharge Coefficient 0.600 Invert Level (m) 99.000

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	99.213	0.213	1.8	326.9	O K
30 min Summer	99.256	0.256	2.0	398.9	O K
60 min Summer	99.307	0.307	2.2	486.0	O K
120 min Summer	99.365	0.365	2.4	589.9	O K
180 min Summer	99.403	0.403	2.5	659.1	O K
240 min Summer	99.432	0.432	2.6	711.7	O K
360 min Summer	99.473	0.473	2.7	790.3	O K
480 min Summer	99.503	0.503	2.8	848.6	O K
600 min Summer	99.527	0.527	2.9	894.6	O K
720 min Summer	99.545	0.545	2.9	932.3	O K
960 min Summer	99.565	0.565	3.0	971.1	O K
1440 min Summer	99.587	0.587	3.0	1015.5	O K
2160 min Summer	99.598	0.598	3.1	1039.5	O K
2880 min Summer	99.600	0.600	3.1	1042.8	O K
4320 min Summer	99.603	0.603	3.1	1049.1	O K
5760 min Summer	99.601	0.601	3.1	1044.2	O K
7200 min Summer	99.595	0.595	3.1	1031.9	O K
8640 min Summer	99.586	0.586	3.0	1015.1	O K
10080 min Summer	99.577	0.577	3.0	995.9	O K
15 min Winter	99.236	0.236	1.9	366.2	O K
30 min Winter	99.284	0.284	2.1	447.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Discharge Volume (m^3)	Time-Peak (mins)
15 min Summer	149.714	0.0	133.0	27
30 min Summer	91.548	0.0	149.4	42
60 min Summer	55.981	0.0	299.3	72
120 min Summer	34.231	0.0	337.2	130
180 min Summer	25.673	0.0	359.3	190
240 min Summer	20.932	0.0	374.6	250
360 min Summer	15.699	0.0	394.7	370
480 min Summer	12.800	0.0	407.3	488
600 min Summer	10.925	0.0	415.4	608
720 min Summer	9.599	0.0	420.7	728
960 min Summer	7.680	0.0	421.2	966
1440 min Summer	5.607	0.0	411.4	1444
2160 min Summer	4.094	0.0	817.9	2160
2880 min Summer	3.276	0.0	809.5	2512
4320 min Summer	2.409	0.0	764.3	3248
5760 min Summer	1.937	0.0	1438.3	4040
7200 min Summer	1.636	0.0	1438.5	4896
8640 min Summer	1.425	0.0	1412.5	5712
10080 min Summer	1.268	0.0	1364.5	6552
15 min Winter	149.714	0.0	142.4	27
30 min Winter	91.548	0.0	159.4	41

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.340	0.340	2.3	544.6	O K
120 min Winter	99.405	0.405	2.5	661.5	O K
180 min Winter	99.446	0.446	2.6	739.3	O K
240 min Winter	99.477	0.477	2.7	798.7	O K
360 min Winter	99.523	0.523	2.9	887.8	O K
480 min Winter	99.556	0.556	3.0	954.1	O K
600 min Winter	99.582	0.582	3.0	1006.7	O K
720 min Winter	99.603	0.603	3.1	1049.9	O K
960 min Winter	99.625	0.625	3.1	1095.6	O K
1440 min Winter	99.651	0.651	3.2	1150.3	O K
2160 min Winter	99.668	0.668	3.2	1185.7	O K
2880 min Winter	99.671	0.671	3.3	1193.2	O K
4320 min Winter	99.670	0.670	3.3	1190.6	O K
5760 min Winter	99.665	0.665	3.2	1179.4	O K
7200 min Winter	99.655	0.655	3.2	1157.6	O K
8640 min Winter	99.642	0.642	3.2	1129.6	O K
10080 min Winter	99.627	0.627	3.1	1098.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	55.981	0.0	321.6	70
120 min Winter	34.231	0.0	361.0	130
180 min Winter	25.673	0.0	383.9	188
240 min Winter	20.932	0.0	399.7	246
360 min Winter	15.699	0.0	420.5	364
480 min Winter	12.800	0.0	433.4	482
600 min Winter	10.925	0.0	441.7	598
720 min Winter	9.599	0.0	447.0	716
960 min Winter	7.680	0.0	447.3	950
1440 min Winter	5.607	0.0	436.8	1410
2160 min Winter	4.094	0.0	874.8	2080
2880 min Winter	3.276	0.0	864.8	2720
4320 min Winter	2.409	0.0	816.1	3420
5760 min Winter	1.937	0.0	1563.6	4328
7200 min Winter	1.636	0.0	1558.2	5264
8640 min Winter	1.425	0.0	1526.5	6152
10080 min Winter	1.268	0.0	1473.1	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 163450 39000 SW 63450 39000
C (1km)	-0.031
D1 (1km)	0.433
D2 (1km)	0.367
D3 (1km)	0.385
E (1km)	0.281
F (1km)	2.470
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 1.170

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.390	4	8	0.390	8	12	0.390

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1434.0	1.000	2543.0

Orifice Outflow Control

Diameter (m) 0.044 Discharge Coefficient 0.600 Invert Level (m) 99.000

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	6800.0	6800.0	0.301	0.0	6899.1
0.300	6800.0	6899.0			

Orifice Outflow Control

Diameter (m) 0.056 Discharge Coefficient 0.600 Invert Level (m) 99.400

Summary of Results for 100 year Return Period (+30%)

Half Drain Time exceeds 7 days.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.051	0.051	0.0	0.0	0.0	328.4	O K
30 min Summer	99.062	0.062	0.0	0.0	0.0	401.7	O K
60 min Summer	99.076	0.076	0.0	0.0	0.0	491.2	O K
120 min Summer	99.093	0.093	0.0	0.0	0.0	600.8	O K
180 min Summer	99.105	0.105	0.0	0.0	0.0	675.8	O K
240 min Summer	99.114	0.114	0.0	0.0	0.0	734.7	O K
360 min Summer	99.128	0.128	0.0	0.0	0.0	826.5	O K
480 min Summer	99.139	0.139	0.0	0.0	0.0	898.5	O K
600 min Summer	99.148	0.148	0.0	0.0	0.0	958.7	O K
720 min Summer	99.156	0.156	0.0	0.0	0.0	1010.8	O K
960 min Summer	99.167	0.167	0.0	0.0	0.0	1078.2	O K
1440 min Summer	99.183	0.183	0.0	0.0	0.0	1180.9	O K
2160 min Summer	99.200	0.200	0.0	0.0	0.0	1293.4	O K
2880 min Summer	99.214	0.214	0.0	0.0	0.0	1379.7	O K
4320 min Summer	99.236	0.236	0.0	0.0	0.0	1522.2	O K
5760 min Summer	99.253	0.253	0.0	0.0	0.0	1632.1	O K
7200 min Summer	99.267	0.267	0.0	0.0	0.0	1722.8	O K
8640 min Summer	99.279	0.279	0.0	0.0	0.0	1800.6	O K
10080 min Summer	99.289	0.289	0.0	0.0	0.0	1869.2	O K
15 min Winter	99.057	0.057	0.0	0.0	0.0	367.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.714	0.0	0.0	27
30 min Summer	91.548	0.0	0.0	42
60 min Summer	55.981	0.0	0.0	72
120 min Summer	34.231	0.0	0.0	132
180 min Summer	25.673	0.0	0.0	192
240 min Summer	20.932	0.0	0.0	252
360 min Summer	15.699	0.0	0.0	372
480 min Summer	12.800	0.0	0.0	492
600 min Summer	10.925	0.0	0.0	612
720 min Summer	9.599	0.0	0.0	732
960 min Summer	7.680	0.0	0.0	972
1440 min Summer	5.607	0.0	0.0	1452
2160 min Summer	4.094	0.0	0.0	2172
2880 min Summer	3.276	0.0	0.0	2892
4320 min Summer	2.409	0.0	0.0	4332
5760 min Summer	1.937	0.0	0.0	5776
7200 min Summer	1.636	0.0	0.0	7216
8640 min Summer	1.425	0.0	0.0	8656
10080 min Summer	1.268	0.0	0.0	10096
15 min Winter	149.714	0.0	0.0	27

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.070	0.070	0.0	0.0	0.0	449.9	O K
60 min Winter	99.085	0.085	0.0	0.0	0.0	550.2	O K
120 min Winter	99.104	0.104	0.0	0.0	0.0	672.9	O K
180 min Winter	99.117	0.117	0.0	0.0	0.0	756.9	O K
240 min Winter	99.127	0.127	0.0	0.0	0.0	822.9	O K
360 min Winter	99.143	0.143	0.0	0.0	0.0	925.7	O K
480 min Winter	99.156	0.156	0.0	0.0	0.0	1006.4	O K
600 min Winter	99.166	0.166	0.0	0.0	0.0	1073.7	O K
720 min Winter	99.175	0.175	0.0	0.0	0.0	1132.1	O K
960 min Winter	99.187	0.187	0.0	0.0	0.0	1207.6	O K
1440 min Winter	99.205	0.205	0.0	0.0	0.0	1322.6	O K
2160 min Winter	99.224	0.224	0.0	0.0	0.0	1448.6	O K
2880 min Winter	99.239	0.239	0.0	0.0	0.0	1545.2	O K
4320 min Winter	99.264	0.264	0.0	0.0	0.0	1704.8	O K
5760 min Winter	99.283	0.283	0.0	0.0	0.0	1827.9	O K
7200 min Winter	99.299	0.299	0.0	0.0	0.0	1929.5	O K
8640 min Winter	99.531	0.531	0.0	2.1	2.1	1940.4	O K
10080 min Winter	99.526	0.526	0.0	2.1	2.1	1940.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.548	0.0	0.0	42
60 min Winter	55.981	0.0	0.0	72
120 min Winter	34.231	0.0	0.0	132
180 min Winter	25.673	0.0	0.0	192
240 min Winter	20.932	0.0	0.0	252
360 min Winter	15.699	0.0	0.0	372
480 min Winter	12.800	0.0	0.0	492
600 min Winter	10.925	0.0	0.0	612
720 min Winter	9.599	0.0	0.0	732
960 min Winter	7.680	0.0	0.0	972
1440 min Winter	5.607	0.0	0.0	1452
2160 min Winter	4.094	0.0	0.0	2172
2880 min Winter	3.276	0.0	0.0	2892
4320 min Winter	2.409	0.0	0.0	4332
5760 min Winter	1.937	0.0	0.0	5776
7200 min Winter	1.636	0.0	0.0	7216
8640 min Winter	1.425	0.0	76.5	7640
10080 min Winter	1.268	0.0	153.2	8120

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 163450 39000 SW 63450 39000
C (1km)	-0.031
D1 (1km)	0.433
D2 (1km)	0.367
D3 (1km)	0.385
E (1km)	0.281
F (1km)	2.470
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 1.170

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.390	4	8	0.390	8	12	0.390

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3795 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.625	0.625	0.0	0.7	0.7	166.2	O K
30 min Summer	97.715	0.715	0.0	0.7	0.7	190.3	O K
60 min Summer	97.818	0.818	0.0	0.8	0.8	217.5	O K
120 min Summer	97.932	0.932	0.0	0.8	0.8	247.9	O K
180 min Summer	98.004	1.004	0.0	0.8	0.8	266.9	O K
240 min Summer	98.056	1.056	0.0	0.9	0.9	280.9	O K
360 min Summer	98.131	1.131	0.0	0.9	0.9	300.7	O K
480 min Summer	98.183	1.183	0.0	0.9	0.9	314.7	O K
600 min Summer	98.223	1.223	0.0	0.9	0.9	325.2	O K
720 min Summer	98.253	1.253	0.0	0.9	0.9	333.4	O K
960 min Summer	98.276	1.276	0.0	0.9	0.9	339.4	O K
1440 min Summer	98.292	1.292	0.0	0.9	0.9	343.7	O K
2160 min Summer	98.280	1.280	0.0	0.9	0.9	340.5	O K
2880 min Summer	98.251	1.251	0.0	0.9	0.9	332.8	O K
4320 min Summer	98.180	1.180	0.0	0.9	0.9	313.9	O K
5760 min Summer	98.121	1.121	0.0	0.9	0.9	298.3	O K
7200 min Summer	98.068	1.068	0.0	0.9	0.9	284.1	O K
8640 min Summer	98.018	1.018	0.0	0.8	0.8	270.9	O K
10080 min Summer	97.972	0.972	0.0	0.8	0.8	258.7	O K
15 min Winter	97.700	0.700	0.0	0.7	0.7	186.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	51.4	31
30 min Summer	133.307	0.0	55.2	46
60 min Summer	76.448	0.0	109.8	76
120 min Summer	43.841	0.0	118.2	134
180 min Summer	31.668	0.0	123.1	194
240 min Summer	25.142	0.0	126.3	254
360 min Summer	18.161	0.0	130.4	372
480 min Summer	14.418	0.0	132.7	492
600 min Summer	12.055	0.0	134.0	612
720 min Summer	10.415	0.0	134.7	730
960 min Summer	8.134	0.0	133.4	968
1440 min Summer	5.741	0.0	128.4	1446
2160 min Summer	4.052	0.0	251.0	2160
2880 min Summer	3.165	0.0	245.2	2624
4320 min Summer	2.197	0.0	224.5	3292
5760 min Summer	1.696	0.0	408.9	4040
7200 min Summer	1.387	0.0	399.6	4896
8640 min Summer	1.177	0.0	385.7	5704
10080 min Summer	1.025	0.0	367.6	6464
15 min Winter	232.456	0.0	54.7	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.802	0.802	0.0	0.7	0.7	213.2	O K
60 min Winter	97.917	0.917	0.0	0.8	0.8	243.8	O K
120 min Winter	98.045	1.045	0.0	0.8	0.8	278.0	O K
180 min Winter	98.126	1.126	0.0	0.9	0.9	299.4	O K
240 min Winter	98.185	1.185	0.0	0.9	0.9	315.2	O K
360 min Winter	98.270	1.270	0.0	0.9	0.9	337.8	O K
480 min Winter	98.330	1.330	0.0	1.0	1.0	353.8	O K
600 min Winter	98.375	1.375	0.0	1.0	1.0	365.9	O K
720 min Winter	98.411	1.411	0.0	1.0	1.0	375.4	O K
960 min Winter	98.439	1.439	0.0	1.0	1.0	382.8	O K
1440 min Winter	98.462	1.462	0.0	1.0	1.0	389.0	O K
2160 min Winter	98.458	1.458	0.0	1.0	1.0	387.9	O K
2880 min Winter	98.433	1.433	0.0	1.0	1.0	381.1	O K
4320 min Winter	98.341	1.341	0.0	1.0	1.0	356.6	O K
5760 min Winter	98.268	1.268	0.0	0.9	0.9	337.3	O K
7200 min Winter	98.199	1.199	0.0	0.9	0.9	318.9	O K
8640 min Winter	98.133	1.133	0.0	0.9	0.9	301.4	O K
10080 min Winter	98.072	1.072	0.0	0.9	0.9	285.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	58.8	45
60 min Winter	76.448	0.0	117.4	74
120 min Winter	43.841	0.0	126.3	132
180 min Winter	31.668	0.0	131.4	192
240 min Winter	25.142	0.0	134.8	250
360 min Winter	18.161	0.0	139.1	368
480 min Winter	14.418	0.0	141.5	484
600 min Winter	12.055	0.0	142.9	602
720 min Winter	10.415	0.0	143.6	718
960 min Winter	8.134	0.0	142.2	952
1440 min Winter	5.741	0.0	136.8	1414
2160 min Winter	4.052	0.0	269.2	2088
2880 min Winter	3.165	0.0	262.9	2740
4320 min Winter	2.197	0.0	240.5	3428
5760 min Winter	1.696	0.0	445.1	4328
7200 min Winter	1.387	0.0	434.0	5264
8640 min Winter	1.177	0.0	418.3	6144
10080 min Winter	1.025	0.0	398.3	7056

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.383

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.096	4	8	0.096	8	12	0.096	12	16	0.095

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	280.0	280.0	1.501	0.0	380.4
1.500	280.0	380.4			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3109 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.648	0.648	0.0	0.7	0.7	160.1	O K
30 min Summer	97.742	0.742	0.0	0.7	0.7	183.3	O K
60 min Summer	97.848	0.848	0.0	0.8	0.8	209.5	O K
120 min Summer	97.966	0.966	0.0	0.8	0.8	238.6	O K
180 min Summer	98.040	1.040	0.0	0.8	0.8	256.9	O K
240 min Summer	98.094	1.094	0.0	0.9	0.9	270.2	O K
360 min Summer	98.170	1.170	0.0	0.9	0.9	289.1	O K
480 min Summer	98.224	1.224	0.0	0.9	0.9	302.3	O K
600 min Summer	98.264	1.264	0.0	0.9	0.9	312.2	O K
720 min Summer	98.295	1.295	0.0	0.9	0.9	319.8	O K
960 min Summer	98.316	1.316	0.0	1.0	1.0	325.2	O K
1440 min Summer	98.329	1.329	0.0	1.0	1.0	328.3	O K
2160 min Summer	98.312	1.312	0.0	1.0	1.0	324.0	O K
2880 min Summer	98.281	1.281	0.0	0.9	0.9	316.3	O K
4320 min Summer	98.206	1.206	0.0	0.9	0.9	297.8	O K
5760 min Summer	98.143	1.143	0.0	0.9	0.9	282.3	O K
7200 min Summer	98.086	1.086	0.0	0.9	0.9	268.1	O K
8640 min Summer	98.033	1.033	0.0	0.8	0.8	255.1	O K
10080 min Summer	97.984	0.984	0.0	0.8	0.8	243.0	O K
15 min Winter	97.726	0.726	0.0	0.7	0.7	179.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	52.1	31
30 min Summer	133.307	0.0	56.0	46
60 min Summer	76.448	0.0	110.7	76
120 min Summer	43.841	0.0	119.4	134
180 min Summer	31.668	0.0	124.3	194
240 min Summer	25.142	0.0	127.6	254
360 min Summer	18.161	0.0	131.8	372
480 min Summer	14.418	0.0	134.2	492
600 min Summer	12.055	0.0	135.6	610
720 min Summer	10.415	0.0	136.3	730
960 min Summer	8.134	0.0	135.0	968
1440 min Summer	5.741	0.0	130.1	1446
2160 min Summer	4.052	0.0	252.3	2160
2880 min Summer	3.165	0.0	246.8	2512
4320 min Summer	2.197	0.0	226.2	3212
5760 min Summer	1.696	0.0	404.8	3992
7200 min Summer	1.387	0.0	396.7	4832
8640 min Summer	1.177	0.0	383.8	5624
10080 min Summer	1.025	0.0	366.5	6456
15 min Winter	232.456	0.0	55.5	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.831	0.831	0.0	0.8	0.8	205.4	O K
60 min Winter	97.950	0.950	0.0	0.8	0.8	234.8	O K
120 min Winter	98.083	1.083	0.0	0.9	0.9	267.6	O K
180 min Winter	98.167	1.167	0.0	0.9	0.9	288.2	O K
240 min Winter	98.228	1.228	0.0	0.9	0.9	303.2	O K
360 min Winter	98.315	1.315	0.0	1.0	1.0	324.7	O K
480 min Winter	98.376	1.376	0.0	1.0	1.0	339.9	O K
600 min Winter	98.422	1.422	0.0	1.0	1.0	351.3	O K
720 min Winter	98.459	1.459	0.0	1.0	1.0	360.3	O K
960 min Winter	98.486	1.486	0.0	1.0	1.0	366.9	O K
1440 min Winter	99.384	2.384	0.0	1.3	1.3	371.5	O K
2160 min Winter	98.497	1.497	0.0	1.0	1.0	369.7	O K
2880 min Winter	98.466	1.466	0.0	1.0	1.0	362.0	O K
4320 min Winter	98.369	1.369	0.0	1.0	1.0	338.1	O K
5760 min Winter	98.290	1.290	0.0	0.9	0.9	318.7	O K
7200 min Winter	98.215	1.215	0.0	0.9	0.9	300.2	O K
8640 min Winter	98.145	1.145	0.0	0.9	0.9	282.8	O K
10080 min Winter	98.080	1.080	0.0	0.9	0.9	266.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	59.6	45
60 min Winter	76.448	0.0	118.5	74
120 min Winter	43.841	0.0	127.6	132
180 min Winter	31.668	0.0	132.8	192
240 min Winter	25.142	0.0	136.3	250
360 min Winter	18.161	0.0	140.7	366
480 min Winter	14.418	0.0	143.2	484
600 min Winter	12.055	0.0	144.6	602
720 min Winter	10.415	0.0	145.3	718
960 min Winter	8.134	0.0	144.0	952
1440 min Winter	5.741	0.0	139.4	1400
2160 min Winter	4.052	0.0	270.9	2084
2880 min Winter	3.165	0.0	264.8	2720
4320 min Winter	2.197	0.0	242.5	3384
5760 min Winter	1.696	0.0	441.6	4320
7200 min Winter	1.387	0.0	431.7	5200
8640 min Winter	1.177	0.0	416.9	6136
10080 min Winter	1.025	0.0	397.6	6968

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.369

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.093	4	8	0.092	8	12	0.092	12	16	0.092

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	260.0	260.0	1.501	0.0	356.8
1.500	260.0	356.7			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3206 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.643	0.643	0.0	0.7	0.7	189.2	O K
30 min Summer	97.736	0.736	0.0	0.8	0.8	216.7	O K
60 min Summer	97.841	0.841	0.0	0.8	0.8	247.7	O K
120 min Summer	97.959	0.959	0.0	0.9	0.9	282.3	O K
180 min Summer	98.032	1.032	0.0	0.9	0.9	304.0	O K
240 min Summer	98.086	1.086	0.0	1.0	1.0	319.9	O K
360 min Summer	98.163	1.163	0.0	1.0	1.0	342.6	O K
480 min Summer	98.218	1.218	0.0	1.0	1.0	358.6	O K
600 min Summer	98.258	1.258	0.0	1.0	1.0	370.6	O K
720 min Summer	98.291	1.291	0.0	1.0	1.0	380.1	O K
960 min Summer	98.314	1.314	0.0	1.1	1.1	387.1	O K
1440 min Summer	98.332	1.332	0.0	1.1	1.1	392.2	O K
2160 min Summer	98.321	1.321	0.0	1.1	1.1	389.1	O K
2880 min Summer	98.292	1.292	0.0	1.0	1.0	380.6	O K
4320 min Summer	98.220	1.220	0.0	1.0	1.0	359.2	O K
5760 min Summer	98.160	1.160	0.0	1.0	1.0	341.5	O K
7200 min Summer	98.105	1.105	0.0	1.0	1.0	325.5	O K
8640 min Summer	98.055	1.055	0.0	0.9	0.9	310.7	O K
10080 min Summer	98.008	1.008	0.0	0.9	0.9	296.9	O K
15 min Winter	97.720	0.720	0.0	0.8	0.8	212.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	57.6	31
30 min Summer	133.307	0.0	61.8	46
60 min Summer	76.448	0.0	123.1	76
120 min Summer	43.841	0.0	132.5	134
180 min Summer	31.668	0.0	137.9	194
240 min Summer	25.142	0.0	141.5	254
360 min Summer	18.161	0.0	146.1	372
480 min Summer	14.418	0.0	148.7	492
600 min Summer	12.055	0.0	150.2	612
720 min Summer	10.415	0.0	150.9	730
960 min Summer	8.134	0.0	149.4	968
1440 min Summer	5.741	0.0	143.8	1446
2160 min Summer	4.052	0.0	281.7	2160
2880 min Summer	3.165	0.0	275.2	2632
4320 min Summer	2.197	0.0	251.8	3328
5760 min Summer	1.696	0.0	461.2	4048
7200 min Summer	1.387	0.0	450.3	4904
8640 min Summer	1.177	0.0	434.3	5712
10080 min Summer	1.025	0.0	413.8	6552
15 min Winter	232.456	0.0	61.3	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.824	0.824	0.0	0.8	0.8	242.8	O K
60 min Winter	97.943	0.943	0.0	0.9	0.9	277.6	O K
120 min Winter	98.075	1.075	0.0	0.9	0.9	316.5	O K
180 min Winter	98.158	1.158	0.0	1.0	1.0	341.0	O K
240 min Winter	98.219	1.219	0.0	1.0	1.0	359.0	O K
360 min Winter	98.307	1.307	0.0	1.0	1.0	384.8	O K
480 min Winter	98.369	1.369	0.0	1.1	1.1	403.1	O K
600 min Winter	98.416	1.416	0.0	1.1	1.1	416.9	O K
720 min Winter	98.453	1.453	0.0	1.1	1.1	427.9	O K
960 min Winter	98.482	1.482	0.0	1.1	1.1	436.5	O K
1440 min Winter	99.726	2.726	0.0	1.5	1.5	443.1	Flood Risk
2160 min Winter	99.161	2.161	0.0	1.3	1.3	442.5	O K
2880 min Winter	98.480	1.480	0.0	1.1	1.1	435.8	O K
4320 min Winter	98.386	1.386	0.0	1.1	1.1	408.1	O K
5760 min Winter	98.312	1.312	0.0	1.1	1.1	386.4	O K
7200 min Winter	98.242	1.242	0.0	1.0	1.0	365.7	O K
8640 min Winter	98.175	1.175	0.0	1.0	1.0	346.0	O K
10080 min Winter	98.112	1.112	0.0	1.0	1.0	327.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	65.8	45
60 min Winter	76.448	0.0	131.6	74
120 min Winter	43.841	0.0	141.6	132
180 min Winter	31.668	0.0	147.2	192
240 min Winter	25.142	0.0	151.1	250
360 min Winter	18.161	0.0	155.8	368
480 min Winter	14.418	0.0	158.6	484
600 min Winter	12.055	0.0	160.1	602
720 min Winter	10.415	0.0	160.8	718
960 min Winter	8.134	0.0	159.2	952
1440 min Winter	5.741	0.0	154.4	1400
2160 min Winter	4.052	0.0	302.8	2068
2880 min Winter	3.165	0.0	294.9	2744
4320 min Winter	2.197	0.0	269.7	3460
5760 min Winter	1.696	0.0	501.6	4336
7200 min Winter	1.387	0.0	488.7	5264
8640 min Winter	1.177	0.0	470.8	6144
10080 min Winter	1.025	0.0	448.1	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.436

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.110	4	8	0.110	8	12	0.110	12	16	0.106

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	310.0	260.0	1.501	0.0	356.8
1.500	310.0	356.7			

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3206 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.643	0.643	0.0	0.7	0.7	189.2	O K
30 min Summer	97.736	0.736	0.0	0.8	0.8	216.7	O K
60 min Summer	97.841	0.841	0.0	0.8	0.8	247.7	O K
120 min Summer	97.959	0.959	0.0	0.9	0.9	282.3	O K
180 min Summer	98.032	1.032	0.0	0.9	0.9	304.0	O K
240 min Summer	98.086	1.086	0.0	1.0	1.0	319.9	O K
360 min Summer	98.163	1.163	0.0	1.0	1.0	342.6	O K
480 min Summer	98.218	1.218	0.0	1.0	1.0	358.6	O K
600 min Summer	98.258	1.258	0.0	1.0	1.0	370.6	O K
720 min Summer	98.291	1.291	0.0	1.0	1.0	380.1	O K
960 min Summer	98.314	1.314	0.0	1.1	1.1	387.1	O K
1440 min Summer	98.332	1.332	0.0	1.1	1.1	392.2	O K
2160 min Summer	98.321	1.321	0.0	1.1	1.1	389.1	O K
2880 min Summer	98.292	1.292	0.0	1.0	1.0	380.6	O K
4320 min Summer	98.220	1.220	0.0	1.0	1.0	359.2	O K
5760 min Summer	98.160	1.160	0.0	1.0	1.0	341.5	O K
7200 min Summer	98.105	1.105	0.0	1.0	1.0	325.5	O K
8640 min Summer	98.055	1.055	0.0	0.9	0.9	310.7	O K
10080 min Summer	98.008	1.008	0.0	0.9	0.9	296.9	O K
15 min Winter	97.720	0.720	0.0	0.8	0.8	212.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	57.6	31
30 min Summer	133.307	0.0	61.8	46
60 min Summer	76.448	0.0	123.1	76
120 min Summer	43.841	0.0	132.5	134
180 min Summer	31.668	0.0	137.9	194
240 min Summer	25.142	0.0	141.5	254
360 min Summer	18.161	0.0	146.1	372
480 min Summer	14.418	0.0	148.7	492
600 min Summer	12.055	0.0	150.2	612
720 min Summer	10.415	0.0	150.9	730
960 min Summer	8.134	0.0	149.4	968
1440 min Summer	5.741	0.0	143.8	1446
2160 min Summer	4.052	0.0	281.7	2160
2880 min Summer	3.165	0.0	275.2	2632
4320 min Summer	2.197	0.0	251.8	3328
5760 min Summer	1.696	0.0	461.2	4048
7200 min Summer	1.387	0.0	450.3	4904
8640 min Summer	1.177	0.0	434.3	5712
10080 min Summer	1.025	0.0	413.8	6552
15 min Winter	232.456	0.0	61.3	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.824	0.824	0.0	0.8	0.8	242.8	O K
60 min Winter	97.943	0.943	0.0	0.9	0.9	277.6	O K
120 min Winter	98.075	1.075	0.0	0.9	0.9	316.5	O K
180 min Winter	98.158	1.158	0.0	1.0	1.0	341.0	O K
240 min Winter	98.219	1.219	0.0	1.0	1.0	359.0	O K
360 min Winter	98.307	1.307	0.0	1.0	1.0	384.8	O K
480 min Winter	98.369	1.369	0.0	1.1	1.1	403.1	O K
600 min Winter	98.416	1.416	0.0	1.1	1.1	416.9	O K
720 min Winter	98.453	1.453	0.0	1.1	1.1	427.9	O K
960 min Winter	98.482	1.482	0.0	1.1	1.1	436.5	O K
1440 min Winter	99.726	2.726	0.0	1.5	1.5	443.1	Flood Risk
2160 min Winter	99.161	2.161	0.0	1.3	1.3	442.5	O K
2880 min Winter	98.480	1.480	0.0	1.1	1.1	435.8	O K
4320 min Winter	98.386	1.386	0.0	1.1	1.1	408.1	O K
5760 min Winter	98.312	1.312	0.0	1.1	1.1	386.4	O K
7200 min Winter	98.242	1.242	0.0	1.0	1.0	365.7	O K
8640 min Winter	98.175	1.175	0.0	1.0	1.0	346.0	O K
10080 min Winter	98.112	1.112	0.0	1.0	1.0	327.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	65.8	45
60 min Winter	76.448	0.0	131.6	74
120 min Winter	43.841	0.0	141.6	132
180 min Winter	31.668	0.0	147.2	192
240 min Winter	25.142	0.0	151.1	250
360 min Winter	18.161	0.0	155.8	368
480 min Winter	14.418	0.0	158.6	484
600 min Winter	12.055	0.0	160.1	602
720 min Winter	10.415	0.0	160.8	718
960 min Winter	8.134	0.0	159.2	952
1440 min Winter	5.741	0.0	154.4	1400
2160 min Winter	4.052	0.0	302.8	2068
2880 min Winter	3.165	0.0	294.9	2744
4320 min Winter	2.197	0.0	269.7	3460
5760 min Winter	1.696	0.0	501.6	4336
7200 min Winter	1.387	0.0	488.7	5264
8640 min Winter	1.177	0.0	470.8	6144
10080 min Winter	1.025	0.0	448.1	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.436

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.110	4	8	0.110	8	12	0.110	12	16	0.106

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	310.0	310.0	1.501	0.0	415.7
1.500	310.0	415.6			

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3363 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.640	0.640	0.0	1.5	1.5	388.9	O K
30 min Summer	97.732	0.732	0.0	1.6	1.6	445.3	O K
60 min Summer	97.837	0.837	0.0	1.7	1.7	509.1	O K
120 min Summer	97.954	0.954	0.0	1.8	1.8	580.3	O K
180 min Summer	98.028	1.028	0.0	1.9	1.9	625.0	O K
240 min Summer	98.082	1.082	0.0	1.9	1.9	657.7	O K
360 min Summer	98.159	1.159	0.0	2.0	2.0	704.5	O K
480 min Summer	98.213	1.213	0.0	2.1	2.1	737.5	O K
600 min Summer	98.254	1.254	0.0	2.1	2.1	762.4	O K
720 min Summer	98.286	1.286	0.0	2.1	2.1	782.0	O K
960 min Summer	98.310	1.310	0.0	2.1	2.1	796.7	O K
1440 min Summer	98.329	1.329	0.0	2.2	2.2	807.9	O K
2160 min Summer	98.319	1.319	0.0	2.1	2.1	802.2	O K
2880 min Summer	98.291	1.291	0.0	2.1	2.1	785.1	O K
4320 min Summer	98.220	1.220	0.0	2.1	2.1	741.7	O K
5760 min Summer	98.161	1.161	0.0	2.0	2.0	705.8	O K
7200 min Summer	98.107	1.107	0.0	2.0	2.0	673.4	O K
8640 min Summer	98.058	1.058	0.0	1.9	1.9	643.1	O K
10080 min Summer	98.012	1.012	0.0	1.9	1.9	615.0	O K
15 min Winter	97.717	0.717	0.0	1.6	1.6	435.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	116.8	31
30 min Summer	133.307	0.0	125.6	46
60 min Summer	76.448	0.0	250.2	76
120 min Summer	43.841	0.0	269.5	134
180 min Summer	31.668	0.0	280.4	194
240 min Summer	25.142	0.0	287.8	254
360 min Summer	18.161	0.0	297.0	372
480 min Summer	14.418	0.0	302.3	492
600 min Summer	12.055	0.0	305.3	612
720 min Summer	10.415	0.0	306.7	730
960 min Summer	8.134	0.0	303.7	968
1440 min Summer	5.741	0.0	292.1	1446
2160 min Summer	4.052	0.0	573.2	2160
2880 min Summer	3.165	0.0	559.7	2680
4320 min Summer	2.197	0.0	511.7	3332
5760 min Summer	1.696	0.0	940.7	4088
7200 min Summer	1.387	0.0	918.0	4904
8640 min Summer	1.177	0.0	885.1	5712
10080 min Summer	1.025	0.0	842.8	6552
15 min Winter	232.456	0.0	124.4	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.821	0.821	0.0	1.7	1.7	498.9	O K
60 min Winter	97.938	0.938	0.0	1.8	1.8	570.5	O K
120 min Winter	98.070	1.070	0.0	1.9	1.9	650.6	O K
180 min Winter	98.153	1.153	0.0	2.0	2.0	701.0	O K
240 min Winter	98.214	1.214	0.0	2.1	2.1	738.0	O K
360 min Winter	98.301	1.301	0.0	2.1	2.1	791.2	O K
480 min Winter	98.363	1.363	0.0	2.2	2.2	828.9	O K
600 min Winter	98.411	1.411	0.0	2.2	2.2	857.6	O K
720 min Winter	98.448	1.448	0.0	2.2	2.2	880.2	O K
960 min Winter	98.477	1.477	0.0	2.3	2.3	898.2	O K
1440 min Winter	99.450	2.450	0.0	2.9	2.9	913.2	O K
2160 min Winter	98.952	1.952	0.0	2.6	2.6	912.7	O K
2880 min Winter	98.478	1.478	0.0	2.3	2.3	898.7	O K
4320 min Winter	98.385	1.385	0.0	2.2	2.2	842.3	O K
5760 min Winter	98.313	1.313	0.0	2.1	2.1	798.2	O K
7200 min Winter	98.244	1.244	0.0	2.1	2.1	756.2	O K
8640 min Winter	98.178	1.178	0.0	2.0	2.0	716.3	O K
10080 min Winter	98.116	1.116	0.0	2.0	2.0	678.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	133.7	45
60 min Winter	76.448	0.0	267.6	74
120 min Winter	43.841	0.0	287.9	132
180 min Winter	31.668	0.0	299.5	192
240 min Winter	25.142	0.0	307.2	250
360 min Winter	18.161	0.0	316.9	368
480 min Winter	14.418	0.0	322.5	484
600 min Winter	12.055	0.0	325.5	602
720 min Winter	10.415	0.0	327.0	718
960 min Winter	8.134	0.0	323.7	952
1440 min Winter	5.741	0.0	312.5	1404
2160 min Winter	4.052	0.0	615.4	2076
2880 min Winter	3.165	0.0	600.0	2744
4320 min Winter	2.197	0.0	548.3	3464
5760 min Winter	1.696	0.0	1023.2	4376
7200 min Winter	1.387	0.0	996.5	5264
8640 min Winter	1.177	0.0	959.5	6152
10080 min Winter	1.025	0.0	912.9	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.896

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.230	4	8	0.230	8	12	0.220	12	16	0.216

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	640.0	310.0	1.501	0.0	415.7
1.500	640.0	415.6			

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3723 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.639	0.639	0.0	0.7	0.7	182.2	O K
30 min Summer	97.732	0.732	0.0	0.8	0.8	208.7	O K
60 min Summer	97.837	0.837	0.0	0.8	0.8	238.5	O K
120 min Summer	97.954	0.954	0.0	0.9	0.9	271.8	O K
180 min Summer	98.027	1.027	0.0	0.9	0.9	292.6	O K
240 min Summer	98.080	1.080	0.0	1.0	1.0	307.9	O K
360 min Summer	98.156	1.156	0.0	1.0	1.0	329.6	O K
480 min Summer	98.210	1.210	0.0	1.0	1.0	344.8	O K
600 min Summer	98.250	1.250	0.0	1.0	1.0	356.2	O K
720 min Summer	98.281	1.281	0.0	1.0	1.0	365.2	O K
960 min Summer	98.304	1.304	0.0	1.0	1.0	371.6	O K
1440 min Summer	98.319	1.319	0.0	1.1	1.1	375.9	O K
2160 min Summer	98.305	1.305	0.0	1.0	1.0	372.0	O K
2880 min Summer	98.275	1.275	0.0	1.0	1.0	363.5	O K
4320 min Summer	98.202	1.202	0.0	1.0	1.0	342.7	O K
5760 min Summer	98.142	1.142	0.0	1.0	1.0	325.4	O K
7200 min Summer	98.087	1.087	0.0	1.0	1.0	309.7	O K
8640 min Summer	98.035	1.035	0.0	0.9	0.9	295.1	O K
10080 min Summer	97.988	0.988	0.0	0.9	0.9	281.6	O K
15 min Winter	97.716	0.716	0.0	0.8	0.8	204.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	57.2	31
30 min Summer	133.307	0.0	61.5	46
60 min Summer	76.448	0.0	122.1	76
120 min Summer	43.841	0.0	131.5	134
180 min Summer	31.668	0.0	136.9	194
240 min Summer	25.142	0.0	140.5	254
360 min Summer	18.161	0.0	145.1	372
480 min Summer	14.418	0.0	147.7	492
600 min Summer	12.055	0.0	149.2	612
720 min Summer	10.415	0.0	149.9	730
960 min Summer	8.134	0.0	148.5	968
1440 min Summer	5.741	0.0	143.0	1446
2160 min Summer	4.052	0.0	278.8	2160
2880 min Summer	3.165	0.0	272.5	2572
4320 min Summer	2.197	0.0	249.5	3252
5760 min Summer	1.696	0.0	452.2	4040
7200 min Summer	1.387	0.0	442.2	4840
8640 min Summer	1.177	0.0	427.2	5704
10080 min Summer	1.025	0.0	407.3	6464
15 min Winter	232.456	0.0	61.0	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.820	0.820	0.0	0.8	0.8	233.8	O K
60 min Winter	97.938	0.938	0.0	0.9	0.9	267.3	O K
120 min Winter	98.069	1.069	0.0	0.9	0.9	304.7	O K
180 min Winter	98.152	1.152	0.0	1.0	1.0	328.3	O K
240 min Winter	98.212	1.212	0.0	1.0	1.0	345.5	O K
360 min Winter	98.299	1.299	0.0	1.0	1.0	370.2	O K
480 min Winter	98.360	1.360	0.0	1.1	1.1	387.6	O K
600 min Winter	98.406	1.406	0.0	1.1	1.1	400.8	O K
720 min Winter	98.443	1.443	0.0	1.1	1.1	411.2	O K
960 min Winter	98.471	1.471	0.0	1.1	1.1	419.2	O K
1440 min Winter	98.494	1.494	0.0	1.1	1.1	425.7	O K
2160 min Winter	98.488	1.488	0.0	1.1	1.1	424.0	O K
2880 min Winter	98.460	1.460	0.0	1.1	1.1	416.2	O K
4320 min Winter	98.366	1.366	0.0	1.1	1.1	389.3	O K
5760 min Winter	98.290	1.290	0.0	1.0	1.0	367.8	O K
7200 min Winter	98.219	1.219	0.0	1.0	1.0	347.3	O K
8640 min Winter	98.151	1.151	0.0	1.0	1.0	328.0	O K
10080 min Winter	98.087	1.087	0.0	1.0	1.0	309.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	65.5	45
60 min Winter	76.448	0.0	130.6	74
120 min Winter	43.841	0.0	140.5	132
180 min Winter	31.668	0.0	146.2	192
240 min Winter	25.142	0.0	150.0	250
360 min Winter	18.161	0.0	154.8	368
480 min Winter	14.418	0.0	157.5	484
600 min Winter	12.055	0.0	159.1	602
720 min Winter	10.415	0.0	159.8	718
960 min Winter	8.134	0.0	158.3	952
1440 min Winter	5.741	0.0	152.3	1414
2160 min Winter	4.052	0.0	299.1	2088
2880 min Winter	3.165	0.0	292.2	2740
4320 min Winter	2.197	0.0	267.4	3420
5760 min Winter	1.696	0.0	492.5	4328
7200 min Winter	1.387	0.0	480.6	5256
8640 min Winter	1.177	0.0	463.4	6144
10080 min Winter	1.025	0.0	441.5	7056

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.420

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.105	4	8	0.105	8	12	0.105	12	16	0.105

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	310.0	1.501	0.0	415.7
1.500	300.0	415.6			

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3533 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.414	0.414	0.0	1.2	1.2	393.2	O K
30 min Summer	97.474	0.474	0.0	1.3	1.3	450.4	O K
60 min Summer	97.542	0.542	0.0	1.4	1.4	515.3	O K
120 min Summer	97.619	0.619	0.0	1.5	1.5	588.1	O K
180 min Summer	97.668	0.668	0.0	1.5	1.5	634.2	O K
240 min Summer	97.703	0.703	0.0	1.6	1.6	668.2	O K
360 min Summer	97.755	0.755	0.0	1.6	1.6	717.6	O K
480 min Summer	97.793	0.793	0.0	1.7	1.7	753.0	O K
600 min Summer	97.821	0.821	0.0	1.7	1.7	780.2	O K
720 min Summer	97.844	0.844	0.0	1.7	1.7	802.1	O K
960 min Summer	97.864	0.864	0.0	1.7	1.7	821.0	O K
1440 min Summer	97.885	0.885	0.0	1.8	1.8	840.4	O K
2160 min Summer	97.891	0.891	0.0	1.8	1.8	846.4	O K
2880 min Summer	97.883	0.883	0.0	1.7	1.7	838.7	O K
4320 min Summer	97.839	0.839	0.0	1.7	1.7	797.1	O K
5760 min Summer	97.805	0.805	0.0	1.7	1.7	764.4	O K
7200 min Summer	97.775	0.775	0.0	1.6	1.6	735.9	O K
8640 min Summer	97.747	0.747	0.0	1.6	1.6	709.4	O K
10080 min Summer	97.721	0.721	0.0	1.6	1.6	684.5	O K
15 min Winter	97.464	0.464	0.0	1.3	1.3	440.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	95.0	31
30 min Summer	133.307	0.0	102.0	46
60 min Summer	76.448	0.0	206.9	76
120 min Summer	43.841	0.0	222.3	136
180 min Summer	31.668	0.0	231.1	194
240 min Summer	25.142	0.0	236.9	254
360 min Summer	18.161	0.0	244.1	374
480 min Summer	14.418	0.0	248.1	492
600 min Summer	12.055	0.0	250.2	612
720 min Summer	10.415	0.0	251.2	732
960 min Summer	8.134	0.0	248.3	970
1440 min Summer	5.741	0.0	238.2	1448
2160 min Summer	4.052	0.0	479.6	2164
2880 min Summer	3.165	0.0	466.5	2880
4320 min Summer	2.197	0.0	424.1	3644
5760 min Summer	1.696	0.0	826.3	4336
7200 min Summer	1.387	0.0	799.7	5120
8640 min Summer	1.177	0.0	765.8	5896
10080 min Summer	1.025	0.0	725.3	6760
15 min Winter	232.456	0.0	101.1	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.531	0.531	0.0	1.3	1.3	504.5	O K
60 min Winter	97.608	0.608	0.0	1.4	1.4	577.3	O K
120 min Winter	97.694	0.694	0.0	1.5	1.5	659.1	O K
180 min Winter	97.748	0.748	0.0	1.6	1.6	711.1	O K
240 min Winter	97.789	0.789	0.0	1.7	1.7	749.5	O K
360 min Winter	97.848	0.848	0.0	1.7	1.7	805.3	O K
480 min Winter	97.890	0.890	0.0	1.8	1.8	845.5	O K
600 min Winter	97.923	0.923	0.0	1.8	1.8	876.6	O K
720 min Winter	97.949	0.949	0.0	1.8	1.8	901.7	O K
960 min Winter	97.973	0.973	0.0	1.8	1.8	924.1	O K
1440 min Winter	97.998	0.998	0.0	1.9	1.9	948.2	O K
2160 min Winter	99.976	2.976	0.0	3.2	3.2	952.3	Flood Risk
2880 min Winter	98.947	1.947	0.0	2.6	2.6	951.3	O K
4320 min Winter	97.958	0.958	0.0	1.8	1.8	910.0	O K
5760 min Winter	97.913	0.913	0.0	1.8	1.8	867.2	O K
7200 min Winter	97.876	0.876	0.0	1.7	1.7	831.9	O K
8640 min Winter	97.840	0.840	0.0	1.7	1.7	797.7	O K
10080 min Winter	97.805	0.805	0.0	1.7	1.7	764.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	108.6	45
60 min Winter	76.448	0.0	221.0	74
120 min Winter	43.841	0.0	237.3	134
180 min Winter	31.668	0.0	246.4	192
240 min Winter	25.142	0.0	252.6	250
360 min Winter	18.161	0.0	260.2	368
480 min Winter	14.418	0.0	264.4	486
600 min Winter	12.055	0.0	266.6	604
720 min Winter	10.415	0.0	267.6	720
960 min Winter	8.134	0.0	264.5	956
1440 min Winter	5.741	0.0	253.8	1422
2160 min Winter	4.052	0.0	519.8	2040
2880 min Winter	3.165	0.0	502.9	2708
4320 min Winter	2.197	0.0	453.9	4036
5760 min Winter	1.696	0.0	893.3	4560
7200 min Winter	1.387	0.0	863.6	5480
8640 min Winter	1.177	0.0	826.5	6400
10080 min Winter	1.025	0.0	782.7	7272

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.905

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.230	4	8	0.225	8	12	0.225	12	16	0.225

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	310.0	1.001	0.0	415.7
1.000	1000.0	415.6			

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3530 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.207	0.207	0.0	0.4	0.4	129.5	O K
30 min Summer	97.237	0.237	0.0	0.4	0.4	148.3	O K
60 min Summer	97.271	0.271	0.0	0.4	0.4	169.7	O K
120 min Summer	97.309	0.309	0.0	0.5	0.5	193.8	O K
180 min Summer	97.333	0.333	0.0	0.5	0.5	209.0	O K
240 min Summer	97.351	0.351	0.0	0.5	0.5	220.3	O K
360 min Summer	97.378	0.378	0.0	0.5	0.5	236.7	O K
480 min Summer	97.396	0.396	0.0	0.5	0.5	248.5	O K
600 min Summer	97.411	0.411	0.0	0.5	0.5	257.6	O K
720 min Summer	97.423	0.423	0.0	0.5	0.5	265.0	O K
960 min Summer	97.433	0.433	0.0	0.5	0.5	271.5	O K
1440 min Summer	97.444	0.444	0.0	0.6	0.6	278.5	O K
2160 min Summer	97.449	0.449	0.0	0.6	0.6	281.3	O K
2880 min Summer	97.446	0.446	0.0	0.6	0.6	279.5	O K
4320 min Summer	97.425	0.425	0.0	0.5	0.5	266.3	O K
5760 min Summer	97.408	0.408	0.0	0.5	0.5	255.9	O K
7200 min Summer	97.394	0.394	0.0	0.5	0.5	246.8	O K
8640 min Summer	97.380	0.380	0.0	0.5	0.5	238.5	O K
10080 min Summer	97.368	0.368	0.0	0.5	0.5	230.6	O K
15 min Winter	97.231	0.231	0.0	0.4	0.4	145.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	29.7	31
30 min Summer	133.307	0.0	31.9	46
60 min Summer	76.448	0.0	65.0	76
120 min Summer	43.841	0.0	69.8	136
180 min Summer	31.668	0.0	72.6	194
240 min Summer	25.142	0.0	74.4	254
360 min Summer	18.161	0.0	76.6	374
480 min Summer	14.418	0.0	77.9	494
600 min Summer	12.055	0.0	78.5	612
720 min Summer	10.415	0.0	78.8	732
960 min Summer	8.134	0.0	77.9	970
1440 min Summer	5.741	0.0	74.6	1448
2160 min Summer	4.052	0.0	151.0	2164
2880 min Summer	3.165	0.0	146.8	2880
4320 min Summer	2.197	0.0	133.2	3724
5760 min Summer	1.696	0.0	262.4	4440
7200 min Summer	1.387	0.0	253.6	5192
8640 min Summer	1.177	0.0	242.4	5968
10080 min Summer	1.025	0.0	229.4	6768
15 min Winter	232.456	0.0	31.7	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.265	0.265	0.0	0.4	0.4	166.2	O K
60 min Winter	97.303	0.303	0.0	0.5	0.5	190.2	O K
120 min Winter	97.346	0.346	0.0	0.5	0.5	217.2	O K
180 min Winter	97.374	0.374	0.0	0.5	0.5	234.4	O K
240 min Winter	97.394	0.394	0.0	0.5	0.5	247.1	O K
360 min Winter	97.424	0.424	0.0	0.5	0.5	265.6	O K
480 min Winter	97.445	0.445	0.0	0.6	0.6	279.0	O K
600 min Winter	97.462	0.462	0.0	0.6	0.6	289.4	O K
720 min Winter	97.475	0.475	0.0	0.6	0.6	297.8	O K
960 min Winter	97.487	0.487	0.0	0.6	0.6	305.5	O K
1440 min Winter	97.690	0.690	0.0	0.7	0.7	313.9	O K
2160 min Winter	98.717	1.717	0.0	1.1	1.1	314.9	O K
2880 min Winter	98.251	1.251	0.0	0.9	0.9	314.5	O K
4320 min Winter	97.485	0.485	0.0	0.6	0.6	304.2	O K
5760 min Winter	97.463	0.463	0.0	0.6	0.6	290.2	O K
7200 min Winter	97.445	0.445	0.0	0.6	0.6	279.1	O K
8640 min Winter	97.428	0.428	0.0	0.5	0.5	268.3	O K
10080 min Winter	97.411	0.411	0.0	0.5	0.5	257.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	34.0	45
60 min Winter	76.448	0.0	69.4	74
120 min Winter	43.841	0.0	74.5	134
180 min Winter	31.668	0.0	77.4	192
240 min Winter	25.142	0.0	79.4	250
360 min Winter	18.161	0.0	81.7	368
480 min Winter	14.418	0.0	83.0	486
600 min Winter	12.055	0.0	83.7	604
720 min Winter	10.415	0.0	84.0	722
960 min Winter	8.134	0.0	83.0	956
1440 min Winter	5.741	0.0	79.7	1418
2160 min Winter	4.052	0.0	165.1	2032
2880 min Winter	3.165	0.0	160.4	2656
4320 min Winter	2.197	0.0	142.6	4068
5760 min Winter	1.696	0.0	283.6	4616
7200 min Winter	1.387	0.0	273.7	5488
8640 min Winter	1.177	0.0	261.6	6408
10080 min Winter	1.025	0.0	247.5	7360

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.298

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.075	4	8	0.075	8	12	0.075	12	16	0.073

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	660.0	660.0	0.501	0.0	711.4
0.500	660.0	711.4			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 97.000

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3266 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	97.639	0.639	0.0	1.4	1.4	370.3	O K
30 min Summer	97.732	0.732	0.0	1.5	1.5	424.0	O K
60 min Summer	97.837	0.837	0.0	1.6	1.6	484.8	O K
120 min Summer	97.954	0.954	0.0	1.7	1.7	552.6	O K
180 min Summer	98.027	1.027	0.0	1.8	1.8	595.2	O K
240 min Summer	98.081	1.081	0.0	1.8	1.8	626.5	O K
360 min Summer	98.158	1.158	0.0	1.9	1.9	671.2	O K
480 min Summer	98.213	1.213	0.0	1.9	1.9	702.8	O K
600 min Summer	98.254	1.254	0.0	2.0	2.0	726.7	O K
720 min Summer	98.286	1.286	0.0	2.0	2.0	745.4	O K
960 min Summer	98.311	1.311	0.0	2.0	2.0	759.8	O K
1440 min Summer	98.331	1.331	0.0	2.0	2.0	771.0	O K
2160 min Summer	98.323	1.323	0.0	2.0	2.0	766.6	O K
2880 min Summer	98.296	1.296	0.0	2.0	2.0	750.8	O K
4320 min Summer	98.224	1.224	0.0	1.9	1.9	709.6	O K
5760 min Summer	98.166	1.166	0.0	1.9	1.9	675.7	O K
7200 min Summer	98.113	1.113	0.0	1.8	1.8	645.1	O K
8640 min Summer	98.064	1.064	0.0	1.8	1.8	616.6	O K
10080 min Summer	98.018	1.018	0.0	1.8	1.8	590.1	O K
15 min Winter	97.716	0.716	0.0	1.5	1.5	414.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	232.456	0.0	109.3	31
30 min Summer	133.307	0.0	117.5	46
60 min Summer	76.448	0.0	234.5	76
120 min Summer	43.841	0.0	252.5	134
180 min Summer	31.668	0.0	262.7	194
240 min Summer	25.142	0.0	269.5	254
360 min Summer	18.161	0.0	278.2	374
480 min Summer	14.418	0.0	283.1	492
600 min Summer	12.055	0.0	285.8	612
720 min Summer	10.415	0.0	287.1	730
960 min Summer	8.134	0.0	284.3	970
1440 min Summer	5.741	0.0	273.4	1446
2160 min Summer	4.052	0.0	537.8	2164
2880 min Summer	3.165	0.0	525.0	2688
4320 min Summer	2.197	0.0	479.7	3340
5760 min Summer	1.696	0.0	886.7	4096
7200 min Summer	1.387	0.0	864.6	4904
8640 min Summer	1.177	0.0	833.1	5712
10080 min Summer	1.025	0.0	792.9	6560
15 min Winter	232.456	0.0	116.4	31

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	97.820	0.820	0.0	1.6	1.6	475.0	O K
60 min Winter	97.937	0.937	0.0	1.7	1.7	543.2	O K
120 min Winter	98.069	1.069	0.0	1.8	1.8	619.5	O K
180 min Winter	98.152	1.152	0.0	1.9	1.9	667.6	O K
240 min Winter	98.213	1.213	0.0	1.9	1.9	702.9	O K
360 min Winter	98.301	1.301	0.0	2.0	2.0	753.7	O K
480 min Winter	98.363	1.363	0.0	2.0	2.0	789.8	O K
600 min Winter	98.410	1.410	0.0	2.1	2.1	817.3	O K
720 min Winter	98.448	1.448	0.0	2.1	2.1	839.0	O K
960 min Winter	98.478	1.478	0.0	2.1	2.1	856.5	O K
1440 min Winter	99.854	2.854	0.0	3.0	3.0	870.8	Flood Risk
2160 min Winter	99.530	2.530	0.0	2.8	2.8	870.5	O K
2880 min Winter	98.483	1.483	0.0	2.1	2.1	859.4	O K
4320 min Winter	98.391	1.391	0.0	2.1	2.1	805.9	O K
5760 min Winter	98.319	1.319	0.0	2.0	2.0	764.6	O K
7200 min Winter	98.251	1.251	0.0	2.0	2.0	725.1	O K
8640 min Winter	98.186	1.186	0.0	1.9	1.9	687.5	O K
10080 min Winter	98.125	1.125	0.0	1.9	1.9	652.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	133.307	0.0	125.1	45
60 min Winter	76.448	0.0	250.7	74
120 min Winter	43.841	0.0	269.7	134
180 min Winter	31.668	0.0	280.5	192
240 min Winter	25.142	0.0	287.7	250
360 min Winter	18.161	0.0	296.8	368
480 min Winter	14.418	0.0	301.9	484
600 min Winter	12.055	0.0	304.7	602
720 min Winter	10.415	0.0	306.1	720
960 min Winter	8.134	0.0	303.0	954
1440 min Winter	5.741	0.0	293.2	1400
2160 min Winter	4.052	0.0	578.5	2060
2880 min Winter	3.165	0.0	562.6	2744
4320 min Winter	2.197	0.0	513.9	3500
5760 min Winter	1.696	0.0	963.8	4384
7200 min Winter	1.387	0.0	938.0	5272
8640 min Winter	1.177	0.0	902.6	6216
10080 min Winter	1.025	0.0	858.4	7064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 580600 194150 TQ 80600 94150
C (1km)	-0.022
D1 (1km)	0.299
D2 (1km)	0.242
D3 (1km)	0.201
E (1km)	0.317
F (1km)	2.616
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.853

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.215	4	8	0.214	8	12	0.212	12	16	0.212

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 97.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	610.0	610.0	1.501	0.0	758.2
1.500	610.0	758.2			

Orifice Outflow Control

Diameter (m) 0.029 Discharge Coefficient 0.600 Invert Level (m) 97.000

Cellular Crate Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly.
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms).
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms.

(Based on advice in CIRIA C697)

Cellular Crate Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly.
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms).
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms.

(Based on advice in CIRIA C697)

Basin and Swale Maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal.	Monthly.
	Grass cutting – for landscaped areas and access routes.	Monthly (during growing season), or as required.
Occasional maintenance	Re-seed areas of poor vegetation growth.	Monthly (at start, then as required).
	Prune and trim nearby trees and remove cuttings.	As required.
	Remove sediment from pre-treatment system when 50% full.	As required.
Remedial actions	Repair of erosion or other damage by re-seeding or re-turfing.	As required.
	Repair/rehabilitation of inlets, outlets and overflows.	As required.
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates.	As required.
Monitoring	Inspect inlets and connecting pipework for blockages, and clear if required.	Monthly.
	Inspect bank sides, structures, pipework, etc for evidence of physical damage.	Monthly.
	Inspect inlet and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
	Inspect infiltration surfaces for compaction and ponding.	Monthly.

(Based on advice in CIRIA C697)

Pervious Pavements Maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing.	Monthly.
Occasional maintenance	Removal of weed.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.
	Rehabilitation of surface and upper sub-structure.	As required

(Based on advice in CIRIA C697)