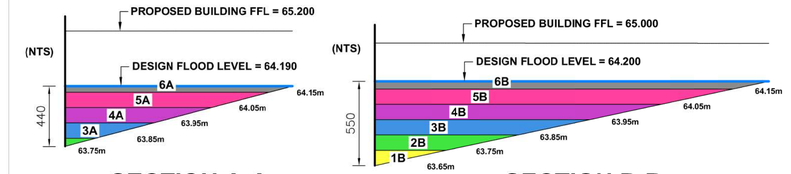
APPENDIX D

BJH Flood Compensation Plans:

S1358 - Ext - 44A - Lost Flood Volume (1000 Year Extent)
S1358 - Ext - 45A - Gained Flood Volume (1000 Year Extent)



KEY

(7)	Area between 64.25 and 64.35
(6)	Area between 64.15 and 64.25
(5)	Area between 64.05 and 64.15
(4)	Area between 63.95 and 64.05
(3)	Area between 63.85 and 63.95
(2)	Area between 63.75 and 63.85
(1)	Area between 63.65 and 63.75

#	Level (mAOD)	Lost Volume
7	64.25 - 64.35	191 m3
6	64.15 - 64.25	1703 m3
5	64.05 - 64.15	2678 m3
4	63.95 - 64.05	1945 m3
3	63.85 - 63.95	1235 m3
2	63.75 - 63.85	456 m3
1	63.65 - 63.75	81 m3
	TOTAL	8289 m3

PRELIMINARY

Rev	Date	Revision Description
A	14.03.22	Updated to latest Architects site layout

Revision Schedule

Project Title
Catalyst Bicester
Wendlebury Road, Bicester

Client
ALBION LAND

Drawing Title
Lost Flood Storage Plan
(1000 Year Event)

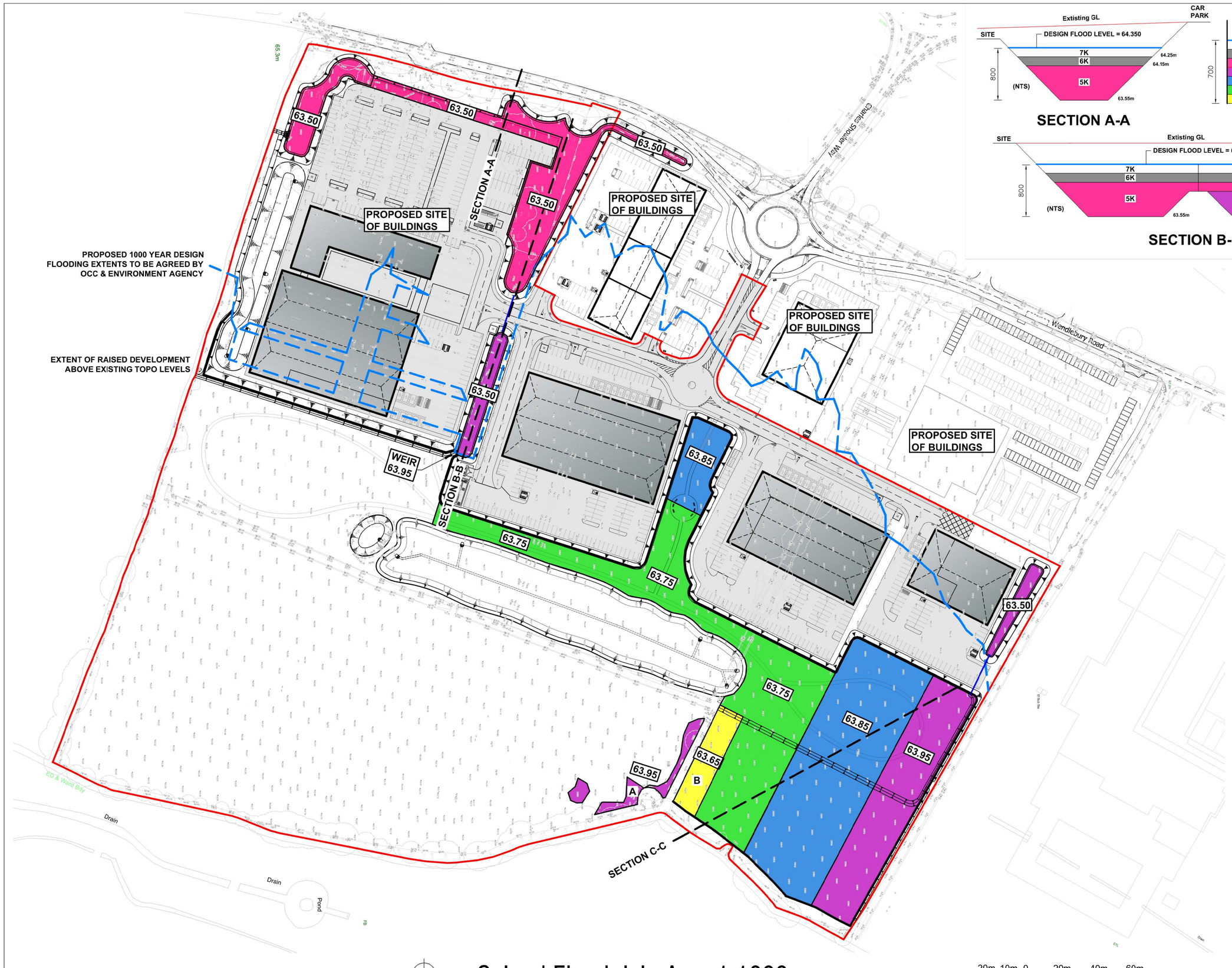
BAILEY JOHNSON HAYES
Consulting Engineers
ST.ALBANS: Suite 4, Phoenix House, 63 Campfield Rd, ST.ALBANS, Herts AL1 5FL
MANCHESTER: Grange House, John Dalton Street, MANCHESTER, M2 6FW

Scale 1:1000 @A1
Date 20.11.19
Drawn JNG

Drawing Number
S1358-Ext-44 A

Lost Floodplain Area 1:1000

20m 10m 0 20m 40m 60m
Scale 1:1000 @A1



KEY

(7)	Area between 64.25 and 64.35
(6)	Area between 64.15 and 64.25
(5)	Area between 64.05 and 64.15
(4)	Area between 63.95 and 64.05
(3)	Area between 63.85 and 63.95
(2)	Area between 63.75 and 63.85
(1)	Area between 63.65 and 63.75
63.75	Proposed Compensation Level

#	Level (mAOD)	Lost Vol.	Gained Vol.
7	64.25 - 64.35	191 m3	462 m3
6	64.15 - 64.25	1703 m3	1725 m3
5	64.05 - 64.15	2678 m3	2754 m3
4	63.95 - 64.05	1945 m3	1950 m3
3	63.85 - 63.95	1235 m3	1335 m3
2	63.75 - 63.85	456 m3	636 m3
1	63.65 - 63.75	81 m3	88 m3
	TOTAL	8289 m3	8950 m3

PRELIMINARY

Rev	Date	Revision Description
A	14.03.22	Updated to latest Architects site layout

Revision Schedule

Project Title
Catalyst Bicester
Wendlebury Road, Bicester

Client
ALBION LAND

Drawing Title
Gained Flood Storage Plan
(1000 Year Event)

BAILEY JOHNSON HAYES
Consulting Engineers
ST.ALBANS: Suite 4, Phoenix House, 63 Campfield Rd, ST.ALBANS, Herts AL1 5FL
MANCHESTER: Grange House, John Dalton Street, MANCHESTER, M2 6FW

Scale	1:1000 @A1
Date	20.11.19
Drawn	JNG

Drawing Number
S1358-Ext-45 A

Gained Floodplain Area 1:1000

20m 10m 0 20m 40m 60m
Scale 1:1000 @A1

APPENDIX E

BJH SW Drainage Design Calculation Packs

BAILEY JOHNSON HAYES
CONSULTING ENGINEERS
Bailey Johnson Hayes
Grange House, John Dalton Street
Manchester. M2 6FW
Tel: 0161 279 7777 Fax: 0161 236 3552
Web: www.bjh.co.uk

Project	Project No.	Sheet No.
Catalyst Bicester, Wendlebury Rd, Bicester. for Albion Land.	S1358	D1
	Drawing No.	Rev.
		3
Section	By	Date
Surface Water Drainage Design	JG	March 2022
	Checked	Date
	WB	March 2022

Calculations

PROPOSED DEVELOPMENT

CATALYST BICESTER

WENDLEBURY ROAD, BICESTER

FOR

ALBION LAND

SURFACE WATER DRAINAGE DESIGN

1.0 INTRODUCTION

The following calculations are prepared to justify the principles for design of below-ground surface water drainage systems for the above development.

The development plot has an area of 18.4 ha and exhibits a gentle gradient from west to east. With the exception of a chicken farm in the southwestern corner, the site is presently undeveloped and comprises of open fields used as arable land. The proposed scheme is to develop the site with new roads, buildings and external yard hardstanding areas for B1(c), B2, and B8 use classes, and a Leisure Club.

The site presently drains naturally in an easterly direction towards Langford Brook which forms the eastern site boundary. Ground levels within the site boundary shall be adjusted by local raising levels in the northern sector to create a plateau for building development, with associated lowering of levels within the western and southern sectors to provide flood compensation. Details of the flood compensation scheme are appended to the BJH site-specific flood risk assessment.

The surface water drainage strategy for the developed site is to maintain the existing outfall arrangements and limit flows to existing greenfield values by utilising substantial retention swales and/or below-ground

Bailey Johnson Hayes
Grange House, John Dalton Street
Manchester. M2 6FW
Tel: 0161 279 7777 Fax: 0161 236 3552
Web: www.bjh.co.uk

Calculations

attenuation storage, and incorporating flow control devices to the drainage network. The design for the site drainage shall include an allowance for climate change.

2.0 GROUND CONDITIONS

The published BGS geology map indicates Alluvium across the majority of the site. The Alluvium is absent in the northwest and the southwest of the site, where River Terrace deposits are shown. Solid geology of the Kellaway's Formation is anticipated below, comprising interbedded sandstone and siltstone of the Kellaway's Sand Member, underlain by mudstone interbedded with siltstone and sandstone of the Kellaway's Clay Member. Kellaway's Sand is shown to be absent in the north of the site. The Kellaway's Formation is anticipated to be underlain by limestone of the Cornbrash Formation.

A series of 18 trial pits have been excavated by Applied Geology on behalf of Albion Land Ltd. Topsoil and subsoil was encountered at surface across the site and was underlain by Superficial Deposits comprising Alluvium and River Terrace Deposits, which in turn was underlain by the Kellaways Formation, predominantly comprising clay, with initial horizons of sand in the southeast of the site. This is broadly consistent with the published geological records. Groundwater was recorded as seepages in all trial pits, with the exception of TP12 (no River Terrace Deposits present) within the River Terrace Deposits at depths of between 0.5m and 1.3m bgl.

3.0 DESIGN

3.1 Greenfield Runoff Estimate

Greenfield runoff estimation is undertaken using the UK SuDS Tools Website using the Institute of Hydrology Report 124 methodology. Based upon soils information for the development site obtained from the Cranfield Soil and AgriFood Institute Soilscapes Viewer

Calculations

and the ground conditions established during the trial pitting exercise undertaken by Applied Geology, the SOIL is conservatively considered to be type 3 for the purpose of greenfield runoff estimation. The default value of SOIL type 1 (sandy highly permeable material), allocated by the UK SuDS Tools Website for the subject site, is considered inappropriate and is therefore edited within the input data.

Greenfield runoff is calculated using the Institute of Hydrology Report 124 methodology; the appended calculation sheet confirms the 1:1 greenfield runoff rate = **20.43 litres/sec**

3.2 Quick Storage Estimate

For the purpose of initial sizing of flood storage requirements it shall be assumed that the outflow from the whole site shall be restricted to 20.4 l/sec for all rainfall events up to and including the 1 in 100 year event inclusive of an allowance of 40% for climate change in accordance with government guidance.

Drainage design is undertaken using the Source Control module of MicroDrainage Windes software. The surface water drainage shall be split into two systems; Units 7a-7b shall drain into Swale 1, and Units 1-6 + David Lloyd shall drain into Swale 2. Both swales shall discharge to existing field ditches which in turn outfall to Langford Brook to the east. The total permissible outflow rates are apportioned at 8 l/sec from Swale 1, and 12 l/sec from Swale 2. Input data and results of Quick Storage Estimates are presented on the following sheets no's 1 and 12. For 1 in 100 year +40% storm events (using FEH 2013 design rainfall) the software predicts storage volumes between 1674 m^3 and 1979 m^3 will be required for Swale 1, and between 4737 m^3 and 5761 m^3 will be required for Swale 2.

3.3 Drainage Layouts

The attached BJH drawings S1358-DD01B, DD02B & DD03B illustrate the hard surfaced drained site areas, pipe design references and lengths, and the layout of principal below-ground drainage runs respectively. The Leisure Centre plot has dedicated surface water attenuation provisions by virtue of private below-ground storage and a hydro brake flow control to restrict flows to 60 l/sec at the outfall manhole connecting to the shared system constructed through the industrial plot. This information is input to the Windes software and modelled in the Simulation module.

3.4 Units 7a-7b – Swale 1

In order to establish the critical storm event a simple model is created within the Source Control module of Windes using a Swale fitted with an Hydrobrake flow control device to restrict outflows to 8 l/sec. Swale 1 dimensions are shown on the attached BJH drawing M1358-DD04C.

MicroDrainage pages 2-7 include complete details of the network i.e., pipe details, manhole details, outfall details, simulation details, online controls, storage provisions and a volume summary. The total volume in the system from Swale 1, porous paving, pipes, and manholes is 1893 m^3. The following critical results have been presented for all storms assessed from 15 mins to 4320 mins (3 Days). All storms have been run for the 2-year, 30-year, and 100-year+40% return periods.

BAILEY JOHNSON HAYES
CONSULTING ENGINEERS
Bailey Johnson Hayes
Grange House, John Dalton Street
Manchester. M2 6FW
Tel: 0161 279 7777 Fax: 0161 236 3552
Web: www.bjh.co.uk

Project	Project No.	Sheet No.
Catalyst Bicester, Wendlebury Rd, Bicester. for Albion Land.	S1358	D4
	Drawing No.	Rev. 3
Section: Surface Water Drainage Design	By: JG	Date: March 2022
	Checked: WB	Date: March 2022

Calculations

3.4.1 Simulation 2yr Winter & Summer Storms

MicroDrainage page 8 indicates the critical storm simulation and results are for the 360-minute winter design storm. The water level in Swale 1 is 63.513m (depth of 513mm); discharge to outfall is 8 l/sec. The maximum volume of water in the system is 387 m^3. None of the pipes in the system are surcharged and no flooding is predicted.

3.4.2 Simulation 30yr Winter & Summer Storms

MicroDrainage page 9 indicates the critical storm simulation and results are for the 480-minute winter design storm. The water level in Swale 1 is 63.910m (depth of 910mm); discharge to outfall is 8 l/sec. The maximum volume of water in the system is 849 m^3. Some of the pipes in the system are surcharged and no flooding is predicted.

3.4.3 Simulation 100yr+40% Winter & Summer Storms

MicroDrainage pages 10-11 indicates the critical storm simulation and results are for the 600-minute winter design storm. The water level in Swale 1 is 64.311m (depth of 1311mm); discharge to outfall is 8 l/sec. The maximum volume of water in the system is 1623 m^3. Some of the pipes in the system are surcharged and no flooding is predicted.

3.5 Units 1-9 – Swale 2

In order to establish the critical storm event a simple model is created within the Source Control module of Windes using a Swale fitted with an Hydrobrake flow control device to restrict outflows to 12 l/sec. Swale 2 dimensions are shown on the attached BJH drawing M1358-DD04C.

MicroDrainage pages 13-24 include complete details of the network i.e., pipe details, manhole details, outfall details, simulation details, online controls, storage provisions and a volume summary. The total volume in the system from Swale 2, porous paving, pipes, and manholes is 7011 m^3. The following critical results have been presented for all storms assessed from 15 mins to 4320 mins (3 Days). All storms have been run for the 2-year, 30-year, and 100-year+40% return periods.

3.5.1 Simulation 2yr Winter & Summer Storms

MicroDrainage pages 25-26 indicates the critical storm simulation and results are for the 720-minute winter design storm. The water level in Swale 2 is 63.031m (depth of 231mm); discharge to outfall is 12 l/sec. The maximum volume of water in the system is 1397 m^3. None of the pipes in the system are surcharged and no flooding is predicted.

BAILEY JOHNSON HAYES
CONSULTING ENGINEERS
Bailey Johnson Hayes
Grange House, John Dalton Street
Manchester. M2 6FW
Tel: 0161 279 7777 Fax: 0161 236 3552
Web: www.bjh.co.uk

Project	Project No.	Sheet No.
Catalyst Bicester, Wendlebury Rd, Bicester. for Albion Land.	S1358	D5
	Drawing No.	Rev. 3
Section: Surface Water Drainage Design	By: JG	Date: March 2022
	Checked: WB	Date: March 2022

Calculations

3.5.2 Simulation 30yr Winter & Summer Storms

MicroDrainage pages 27-28 indicates the critical storm simulation and results are for the 720-minute winter design storm. The water level in Swale 2 is 63.264m (depth of 464mm); discharge to outfall is 12 l/sec. The maximum volume of water in the system is 2957 m^3. Some of the pipes in the system are surcharged and no flooding is predicted.

3.5.3 Simulation 100yr+40% Winter & Summer Storms

MicroDrainage page 29-30 indicates the critical storm simulation and results are for the 1440-minute winter design storm. The water level in Swale 2 is 63.604m (depth of 804mm); discharge to outfall is 12 l/sec. The maximum volume of water in the system is 5533 m^3. Some of the pipes in the system are surcharged and no flooding is predicted.

4.0 EXCEEDANCE EVENTS

Site levels will arranged to ensure that overland flow routes are created to encourage any build-up of surface water to flow in an easterly direction towards Langford Brook. Similarly, the bunding to the Swale will be constructed to ensure that there is facility for overspill to occur in an easterly direction away from the development land. Exceedance flow routes have been detailed on S1358-DD05.

APPENDIX A

GREENFIELD RUNOFF ESTIMATE

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	peter brooks
Site name:	Promised Land Farm
Site location:	Bicester

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	51.88559° N
Longitude:	1.16552° W

Reference:	6484523
Date:	2018-10-25T08:25:55

Methodology	IH124

Site characteristics

Total site area (ha)	9.7

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	1	3
HOST class	---	---
SPR/SPRHOST	0.1	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm)	617	617
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	1.41	24.04
1 in 1 year (l/s)	1.19	20.43
1 in 30 years (l/s)	3.23	55.29
1 in 100 years (l/s)	4.48	76.69