Report No: 15/025.01
Revision: 00
Dated: 31st July 2015

Development of land off Barnburgh Lane, Goldthorpe Barnsley

Flood Risk Assessment

Client:

Gleeson Developments Ltd
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Sheffield Business Park
Sheffield
S9 1XE

Prepared by:

joc consultants ltd

Park Farm House
Leathley Lane
Leathley
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SITE	Land off Barnburgh Lane, Goldthorpe, Barnsley.
PURPOSE OF THIS REPORT	This site-specific flood risk assessment is required in connection with a planning application to Barnsley Metropolitan Borough Council for a residential development at the site. References in this report to "the site" are references to the site which is the subject of the planning application.
PLANNING APPLICATION NUMBER	Not issued
ANNEXES TO THIS REPORT	
Annex A	Figure 1: Location Plan
Annex B	Topographical Survey Plan
Annex C	Site Layout Plan
Annex D	Surface water run-off estimates: Tables D1 – D4
Annex E	Estimate of existing peak flow rates from the site
Annex F	Estimate of total storage required for excess run-off volume from the site
SITE LOCATION AND DESCRIPTION	See Figure 1: Location Plan at Annex A.
National Grid Reference	446652E, 403629N
Gross Site Area	1.95ha
Ground surface	Greenfield site: permeable surface

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Topography

Ground levels fall towards the SW corner of the site and vary between the maximum of 22.30m AOD at the NW corner and 18.75 at the SW corner.

See topographical survey at Annex B.

Ground conditions

A ground investigation by Eastwood and Partners dated December 2014, identified clay topsoil overlying firm to stiff clay overlying mudstone, coal and sandstone.

Shallow groundwater was encountered at depths of 2.0m to 2.5m below ground level.

The investigation concluded that the ground conditions are not suitable for infiltration drainage due to the high water table and the poor permeability of the sub-soil.

History

The site is undeveloped and has been in agricultural use.

Watercourses

There are several watercourses in the vicinity of the site which drain southwards towards the River Dearne which is approximately 1.25km to the south of the site.

West Moor Dike is approximately 285m to the east and Far Moor Dike is approximately 380m to the south.

In addition there is un-named watercourse immediately adjacent to Engine Lane, close to the eastern boundary of the site and an open drain which commences at the SW corner of the site and flows southwards.

Two small ponds are recorded on the OS Map (see Figure 1) at the SE corner of the site, but they are not evident on the topographical survey. The OS Map also records 'sinks' adjacent to these ponds, so it is probable that the ponds reflect seasonal variation in the water table.

Reservoirs

There are no reservoirs within 1km of the site.

Existing site drainage

The land drains naturally to the open land drain at the SW corner of the site. This flows southwards into Far Moor Dike wich in turn flows into the River Dearne after its confluence with West Moor Dike.

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THE DEVELOPMENT	A residential development of 61 dwellings is proposed. The development forms the second phase of a housing development already commenced on the land between the northern boundary of the site and Barnburgh Lane. It is estimated that the development will create impermeable area amounting to approximately 55% of the site area. The site layout plan is provided at Annex C
VULNERABILITY CLASSIFICATION	The development is classified as **'More Vulnerable'**, in accordance with Table 2 of the Technical Guidance to the National Planning Policy Framework (NPPF).
FLOOD ZONE	Flood zone 1, as shown on the current Environment Agency flood map.
REQUIREMENT FOR THE SEQUENTIAL TEST	As the site is in flood zone 1, there is no requirement for the Sequential Test.
REQUIREMENT FOR THE EXCEPTION TEST	In accordance with Table 3 of the NPPF Technical Guidance, there is no requirement for the Exception Test.
HISTORY OF FLOODING	The Barnsley SFRA Map 2 shows the site to have been unaffected by the flood events occurring in: March 1947; January 1982; Autumn 2000; and June 2007
FLUVIAL FLOODING	
Functional floodplain	The site is not in the functional floodplain.
Annual probability of fluvial flooding	0.1% or less.
Flood defences	None
Fluvial flood hazard	None

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Loss of floodplain storage	None
Obstruction to overland fluvial flow routes	None
Flood warning area	The site is not in a flood warning area.

SURFACE WATER FLOODING

Risk of surface water flooding	The Environment Agency surface water flood map shows the risk of this type of flooding to be 'Low', the annual probability of which is between 0.1% and 1%. The map however, indicates an overland flow route for surface water passing through the site from NE to SW. The depth of flooding is indicated to be less than 300mm, with a velocity greater than 0.25m/s.
Critical Drainage Areas	The site is not in a critical drainage area.

GROUNDWATER FLOODING	Groundwater flooding is associated with highly permeable rock such as chalk. This type of geology is not present at the site. The poor permeability of the topsoil, subsoil and underlying solid geology however, creates the conditions for perched water and this was evident in the ground investigation, which found a water table at depths between 2.0m and 2.5m. Notes of 'Issues' and 'Sinks' on the OS map, and the apparent seasonal presence of ponds close to the site further indicate the presence of a high water table. Any emergence of groundwater is likely to be in the depression where there is reed growth, immediately to the south of the site, as shown on the topographical survey plan at Annex B. The risk of groundwater flooding within the site boundaries is assessed to be low.

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SEWER FLOODING

The Barnsely SFRA notes at section 5.8 that Goldthorpe is prone to sewer flooding. The precise location of this flooding is not stated. Any emergence of surface water from gullies in Barnburgh Lane opposite the site would result in surface flow eastwards, to the low point of 32m at the crossing of West Moor Dike. It is therefore unlikely that the site would be affected by this type of flooding.

RESERVOIR FLOODING

The Environment Agency reservoirs flood map shows the site is not in an area at risk from the uncontrolled release of water from reservoirs.

EFFECT OF THE DEVELOPMENT ON FLOOD RISK

Fluvial and tidal flood risk

No effect

Surface water flood risk

As noted above, the development will create impermeable area amounting to approximately 55% of the existing site area. It is estimated that this will increase surface water run-off volume by approximately 112%, (see Tables D1 to D4 in Annex D).

The 'greenfield' run-off rates from the site 1 in 1 year are estimated to be:

1 in 1 year: 6.93 l/s;

1 in 100 years: 16.77 l/s

(see UK SUDS estimate at Annex E).

Groundwater flood risk

No effect

Sewer flooding risk

No effect

EFFECT OF CLIMATE CHANGE

Climate change must be considered over the expected lifetime of the development which, in this case is taken to be 100 years. Climate change must therefore be considered up to 2115.

Peak rainfall intensities are predicted to increase by 30% in the period 2085 to 2115 and peak river flow is predicted to increase by 20% in the period 2025 to 2115[1].

The effects of climate change must be taken into account in the design of the drainage system.

[1] NPPF Technical Guidance Table 5

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FLOOD RISK MANAGEMENT

Fluvial flood risk — No recommendations

Surface water flood risk

Controlled surface water discharge — The ground investigation indicates that infiltration drainage is will not be feasible due to the underlying low-permeability soils and the high water table.

It is therefore recommended that surface water from the development is discharged to the watercourse at the SW corner of the site at a controlled rate, not exceeding 6.93 l/s, in accordance with the non-statutory technical guidance issued in March 2015[2].

Attenuation storage — The estimate total storage requirement for the excess run-off volume is estimated to be 742m^3, (see UK SUDS estimate at Annex F).

Overland flow routes — The overland route indicated on the Environment Agency surface water flood map will have already been modified by the first phase of the development to the north of the site. Any surface water entering the site from Barnburgh Lane will follow the gradients in the highway leading to the site and will be safely routed through the site towards the watercourse at the SW corner.

Groundwater flood risk — No recommendations.

Sewer flooding risk — No recommendations.

Reservoir flood risk — No recommendations.

[2] Sustainable Drainage Systems. Non-statutory technical standards for sustainable drainage systems. DEFRA, March 2015.

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CONCLUSIONS

1. The site is in flood zone 1 where the annual probability of fluvial flooding is 1% or less.

2. The site currently drains naturally to Far Moor Dike which is part of the River Dearne catchment.

3. There is no requirement for the development to be subjected to the Sequential Test or the Exception Test.

4. The risk of surface water flooding at the site is described as 'Low' on the Environment Agency surface water flood map. The annual probability of such flooding is between 0.1% and 1%.

5. The risk of groundwater flooding is assessed to be low.

6. The site is not in an area at risk from the uncontrolled release of water from a reservoir.

7. The effect of the development will be to increase surface water run-off volumes by approximately 112%. This will be mitigated by limiting the peak run-off rate to the 1 in 1 year greenfield run-off rate, which is estimated to be 6.93 l/s, and by providing storage for the excess volume.

RECOMMENDATIONS

1. A detailed drainage design should be prepared and submitted to Barnsley Metropolitan Borough Council and Yorkshire Water for approval, prior to construction of the development.

2. The flood risk management measures recommended in this report should be implemented in the design of the development.

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USE OF REPORT

This report is prepared specifically for Gleeson Developments Ltd for the purpose of the aforementioned planning application and the report may not be used for any other purpose and it may not be assigned to any third party without our written permission.

DISCLAIMER

This flood risk assessment is based on data available at the time of its preparation and JOC Consultants Ltd accepts no liability for the consequences of any changes to or re-assessment of this data in the future.

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ANNEX A

Figures 1: Location Plan

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Ordnance Survey © Crown Copyright 2015. All rights reserved. Licence number 100022432. Plotted Scale - **1:5000**

Promap®

Figure 1: Location Plan

ANNEX B

Topographical Survey Plan

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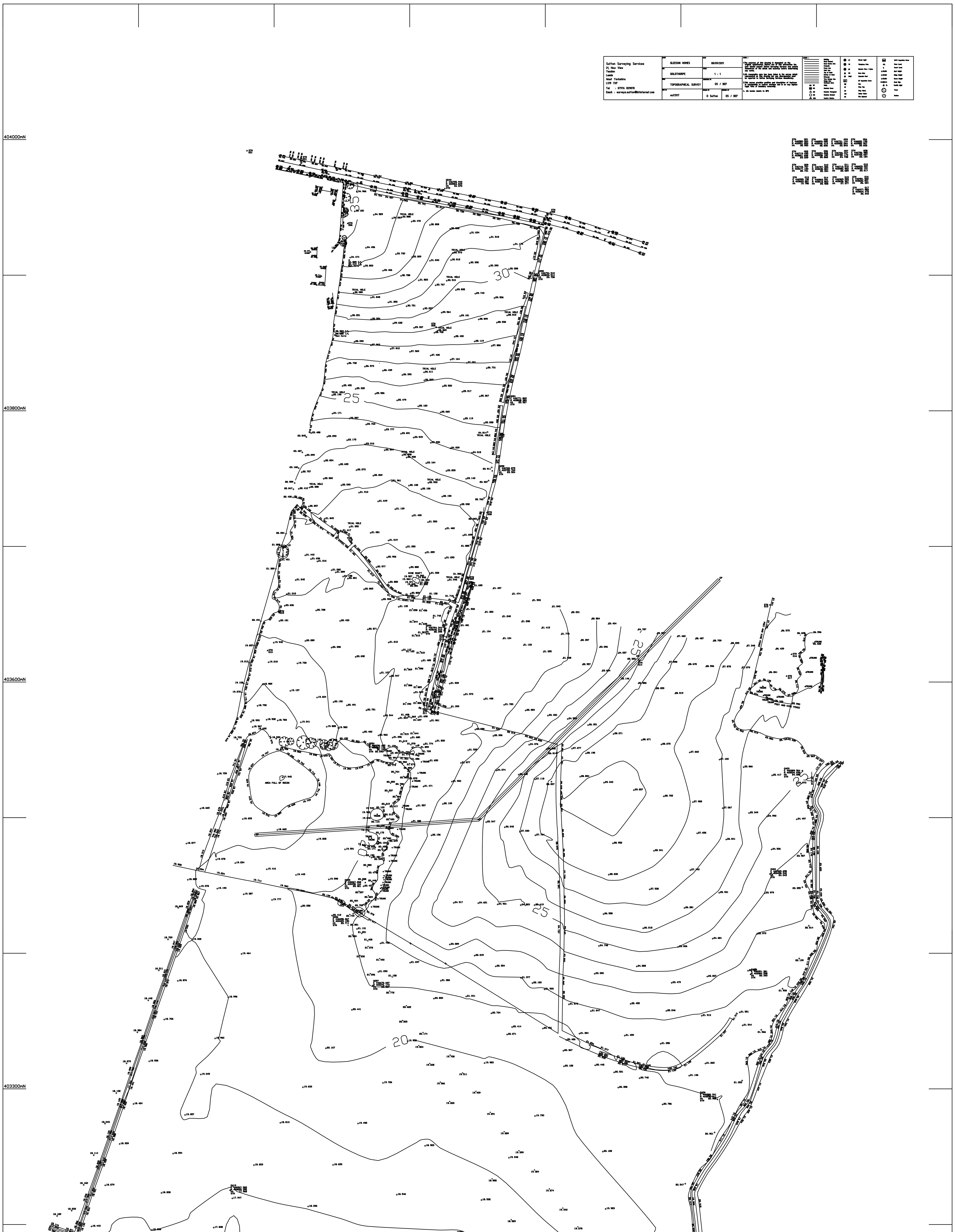

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GLEESON HOMES
08/09/2011
GOLDTHORPE
1 : 1
TOPOGRAPHICAL SURVEY
DS / BEF
sut3317
D Sutton
DS / BEF
404000mN
403800mN
403600mN
403300mN
403100mN
446600mE
446800mE
447000mE
AREA FULL OF REEDS
MINE SHAFT
POST AND WIRE FENCE

ANNEX C

Site Layout Plan

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- NOT FOR USE ON SITE -
PROVISIONAL LAYOUT DRAWING, SUBJECT TO PLANNING APPROVAL

Proposed pumping station with 15m minimum stand off from pump housing

Proposed divereted footpath with existing link retained

10m landscape buffer within site boundary

KILNE SHAFT 21.980

PHASE 1

Proposed drainage route amended to suit new road layout

Existing hedge retained and trimmed

Existing footpath to be diverted

10m landscape buffer within site boundary

8.00m drainage easement

Proposed divereted footpath with existing link retained

Existing hedge retained and trimmed

5.5m widw shared space street with 600mm margins

0m 10m 20m 30m 40m 50m 60m 70m 80m 90m 100m

HOUSE TYPE

code	type	no
201	2 bed semi det/ terr	7
202	2 bed semi det	4
301	3 bed semi det	6
302	3 bed semi det	5
303	3 bed semi det	6
304	3 bed detached	3
307	3 bed detached	2
309	3 bed semi det	7
310	3 bed detached	2
311	3 bed semi det	9
401	4 bed detached	3
404	4 bed detached	4
405	4 bed detached	3
TOTAL		**61**

- Existing tree to be removed
- Existing tree to be retained and protected during construction to British Standard 5837:1991.
- Areas of new tree planting see schedule for species
- New shurbs/ ground cover planting
- Grass to front garden
- Paving slab access paths to level threshold for principle entrance. Gradient not to exceed 1in 12 for maximum 5.00m length
- Private drives
- 1.80m high screen wall
- S.W. boarded vertical screen fence 1.80m high (100 x 22mm boards with 22mm gaps, 3No. 75 x 38mm rails, 100 x 100mm posts @ 1.875m centres).
- Plot division fence, post & wire
- 201 House tupe code reference number
- 8 Plot number
- Garages location.
- Parking bays

gleeson

Richard Ward Design

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Architectural Design & Development Consultant

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Weston Favell
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BARNBURGH LANE GOLDTHORPE Ph2

planning layout

GLEESON HOMES & REGENERATION

A	Plots re-numbered. 14.07.15	Scale
		1:500 at A2
		Date
		03.01.15
		Dwg No
		453/2-A

ANNEX D

Estimates of surface water run-off volumes

Tables D1 to D4

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Table D1: Rapid response run-off from 3.3% A.E.P. rainfall event: existing condition

Duration	Rainfall	Area (m^2)			Volume (m^3)		
	at Site	Impervious	Pervious	Total	Impervious	Pervious	Run-off
hours	mm	Area (ha)	Area (ha)	Area (ha)	Area	Area	Volume
		C_v	SPR HOST				
		90.0%	29.6%				
0.0	0.0	0.00	1.95	1.95	0.00	0.00	0.00
0.5	24.3	0.00	1.95	1.95	0.00	140.26	140.26
1.0	29.1	0.00	1.95	1.95	0.00	167.97	167.97
2.0	34.6	0.00	1.95	1.95	0.00	199.71	199.71
3.0	38.4	0.00	1.95	1.95	0.00	221.64	221.64
4.0	41.2	0.00	1.95	1.95	0.00	237.81	237.81
6.0	45.6	0.00	1.95	1.95	0.00	263.20	263.20
8.0	49.0	0.00	1.95	1.95	0.00	282.83	282.83
12.0	54.2	0.00	1.95	1.95	0.00	312.84	312.84
18.0	62.0	0.00	1.95	1.95	0.00	357.86	357.86
24.0	68.3	0.00	1.95	1.95	0.00	394.23	394.23
36.0	78.2	0.00	1.95	1.95	0.00	451.37	451.37
48.0	86.1	0.00	1.95	1.95	0.00	496.97	496.97
72.0	91.3	0.00	1.95	1.95	0.00	526.98	526.98
96.0	95.1	0.00	1.95	1.95	0.00	548.92	548.92
144.0	100.9	0.00	1.95	1.95	0.00	582.39	582.39
192.0	105.1	0.00	1.95	1.95	0.00	606.64	606.64

Table D2: Rapid response run-off from 1% A.E.P. rainfall event: existing condition

Duration	Rainfall at Site	Area (m^2)			Volume (m^3)		
		Impervious	Pervious	Total	Impervious	Pervious	Run-off
hours	mm	Area (ha)	Area (ha)	Area (ha)	Area	Area	Volume
		Cv	SPR HOST				
		90.0%	29.6%				
0.00	0.0	0.00	1.95	1.95	0.00	0.00	0.00
0.50	35.7	0.00	1.95	1.95	0.00	206.06	206.06
1.00	41.8	0.00	1.95	1.95	0.00	241.27	241.27
2.00	48.8	0.00	1.95	1.95	0.00	281.67	281.67
3.00	53.4	0.00	1.95	1.95	0.00	308.22	308.22
4.00	56.9	0.00	1.95	1.95	0.00	328.43	328.43
6.00	62.2	0.00	1.95	1.95	0.00	359.02	359.02
8.00	66.3	0.00	1.95	1.95	0.00	382.68	382.68
12.00	72.4	0.00	1.95	1.95	0.00	417.89	417.89
18.00	81.9	0.00	1.95	1.95	0.00	472.73	472.73
24.00	89.5	0.00	1.95	1.95	0.00	516.59	516.59
36.00	101.2	0.00	1.95	1.95	0.00	584.13	584.13
48.00	110.5	0.00	1.95	1.95	0.00	637.81	637.81
72.0	115.8	0.00	1.95	1.95	0.00	668.40	668.40
96.0	119.7	0.00	1.95	1.95	0.00	690.91	690.91
144.0	125.4	0.00	1.95	1.95	0.00	723.81	723.81
192.0	129.6	0.00	1.95	1.95	0.00	748.05	748.05

Table D3: Rapid response run-off from 3.3% A.E.P. rainfall event: post development condition

Duration	Rainfall	Area (m^2)			Volume (m^3)		
	at Site	Impervious	Pervious	Total	Impervious	Pervious	Run-off
hours	mm	Area (ha)	Area (ha)	Area (ha)	Area	Area	Volume
		Cv	SPR HOST				
		90.0%	29.6%				
0.0	0.0	1.07	0.88	1.95	0.00	0.00	0.00
0.5	24.3	1.07	0.88	1.95	234.56	63.12	297.67
1.0	29.1	1.07	0.88	1.95	280.89	75.58	356.47
2.0	34.6	1.07	0.88	1.95	333.98	89.87	423.85
3.0	38.4	1.07	0.88	1.95	370.66	99.74	470.40
4.0	41.2	1.07	0.88	1.95	397.68	107.01	504.70
6.0	45.6	1.07	0.88	1.95	440.15	118.44	558.60
8.0	49.0	1.07	0.88	1.95	472.97	127.27	600.25
12.0	54.2	1.07	0.88	1.95	523.17	140.78	663.94
18.0	62.0	1.07	0.88	1.95	598.46	161.04	759.49
24.0	68.3	1.07	0.88	1.95	659.27	177.40	836.67
36.0	78.2	1.07	0.88	1.95	754.83	203.12	957.94
48.0	86.1	1.07	0.88	1.95	831.08	223.64	1054.72
72.0	91.3	1.07	0.88	1.95	881.27	237.14	1118.42
96.0	95.1	1.07	0.88	1.95	917.95	247.01	1164.97
144.0	100.9	1.07	0.88	1.95	973.94	262.08	1236.01
192.0	105.1	1.07	0.88	1.95	1014.48	272.99	1287.46

Table D4: Rapid response run-off from 1% A.E.P. rainfall event: post development condition

Duration	Rainfall	Area (m^2)			Volume (m^3)		
	at Site	Impervious	Pervious	Total	Impervious	Pervious	Run-off
hours	mm	Area (ha)	Area (ha)	Area (ha)	Area	Area	Volume
		Cv	C_v				
		90.0%	29.6%				
0.00	0.0	1.07	0.88	1.95	0.00	0.00	0.00
0.50	35.7	1.07	0.88	1.95	344.59	92.73	437.32
1.00	41.8	1.07	0.88	1.95	403.47	108.57	512.05
2.00	48.8	1.07	0.88	1.95	471.04	126.75	597.80
3.00	53.4	1.07	0.88	1.95	515.44	138.70	654.14
4.00	56.9	1.07	0.88	1.95	549.23	147.79	697.02
6.00	62.2	1.07	0.88	1.95	600.39	161.56	761.94
8.00	66.3	1.07	0.88	1.95	639.96	172.21	812.17
12.00	72.4	1.07	0.88	1.95	698.84	188.05	886.89
18.00	81.9	1.07	0.88	1.95	790.54	212.73	1003.27
24.00	89.5	1.07	0.88	1.95	863.90	232.47	1096.37
36.00	101.2	1.07	0.88	1.95	976.83	262.86	1239.69
48.00	110.5	1.07	0.88	1.95	1066.60	287.01	1353.61
72.00	115.8	1.07	0.88	1.95	1117.76	300.78	1418.54
96.00	119.7	1.07	0.88	1.95	1155.40	310.91	1466.31
144.00	125.4	1.07	0.88	1.95	1210.42	325.71	1536.14
192.00	129.6	1.07	0.88	1.95	1250.96	336.62	1587.59

ANNEX E

Estimate of greenfield peak run-off rates from the site

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Greenfield runoff estimation for sites

Site name:	Barnburgh Lane
Site location:	Goldthorpe

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 CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site coordinates

Latitude:	53.52799° N
Longitude:	1.29766° W
Reference:	gcx0d2rp4kd9 / 1.95
Date:	31 Jul 2015

Site characteristics

Total site area	1.95	ha
Significant public open space	0	ha
Area positively drained	1.95	ha

Methodology

Greenfield runoff method	IH124

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	4
HOST class	N/A
SPR	0.47

Hydrological characteristics

	Default	Edited	
SAAR	613	613	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.95	0.95	
Hydrological region	3	3	
Growth curve factor: 1 year	0.86	0.86	
Growth curve factor: 10 year	1.45	1.45	
Growth curve factor: 30 year	1.75	1.75	
Growth curve factor: 100 year	2.08	2.08	

Greenfield runoff rates

	Default	Edited	
Qbar	8.06	8.06	l/s
1 in 1 year	6.93	6.93	l/s
1 in 30 years	14.11	14.11	l/s
1 in 100 years	16.77	16.77	l/s

Please note that a minimum flow of 5 l/s applies to any site

HR Wallingford Ltd, the Environment Agency and any local authority are not liable for the performance of a drainage scheme which is based upon the output of this report.

ANNEX F

Estimate of total storage required for excess run-off volume from the site

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HR Wallingford
Working with water

Surface water storage requirements for sites

Site name:	Barnburgh Lane
Site location:	Goldthorpe

This is an estimation of the storage volume requirements 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 CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site coordinates

Latitude:	53.52880° N
Longitude:	1.2976° W
Reference:	gcx0d2x5gex3 / 1.95
Date:	31 Jul 2015

Site characteristics

Total site area	1.95	ha
Significant public open space	0	ha
Area positively drained	1.95	ha
Impermeable area	1.07	ha
Percentage of drained area that is impermeable	54.87	%
Impervious area drained via infiltration	0	ha
Return period for infiltration system design	10	year
Impervious area drained to rainwater harvesting systems	0	ha
Return period for rainwater harvesting system design	10	year
Compliance factor for rainwater harvesting system design	66	%
Net site area for storage volume design	1.95	ha

Methodology

Greenfield runoff method	IH124
Volume control approach	Use Long Term Storage

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type
SOIL type	4
HOST class	N/A
SPR	0.47

Hydrological characteristics

	Default	Edited	
SAAR	613	613	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.95	0.95	
Hydrological region	3	3	
Growth curve factor: 1 year	0.86	0.86	
Growth curve factor: 10 year	1.45	1.45	
Growth curve factor: 30 year	1.75	1.75	
Growth curve factor: 100 year	2.08	2.08	

Design criteria

Climate change allowance factor	1.3	
Urban creep allowance factor	1.1	
Interception rainfall depth	5	mm

Greenfield runoff rates

	Default	Edited	
Qbar	8.06	8.06	l/s
1 in 1 year	6.93	6.93	l/s
1 in 30 years	14.11	14.11	l/s
1 in 100 years	16.77	16.77	l/s

Please note that a minimum flow of 5 l/s applies to any site

Estimated storage volumes

	Default	Edited	
Interception storage	42.80	42.80	m^3
Attenuation storage	699.29	699.29	m^3
Long term storage	0.00	0.00	m^3
Treatment storage	128.40	128.40	m^3
Total storage	742.09	742.09	m^3

HR Wallingford Ltd, the Environment Agency and any local authority are not liable for the performance of a drainage scheme which is based upon the output of this report.

End of Report