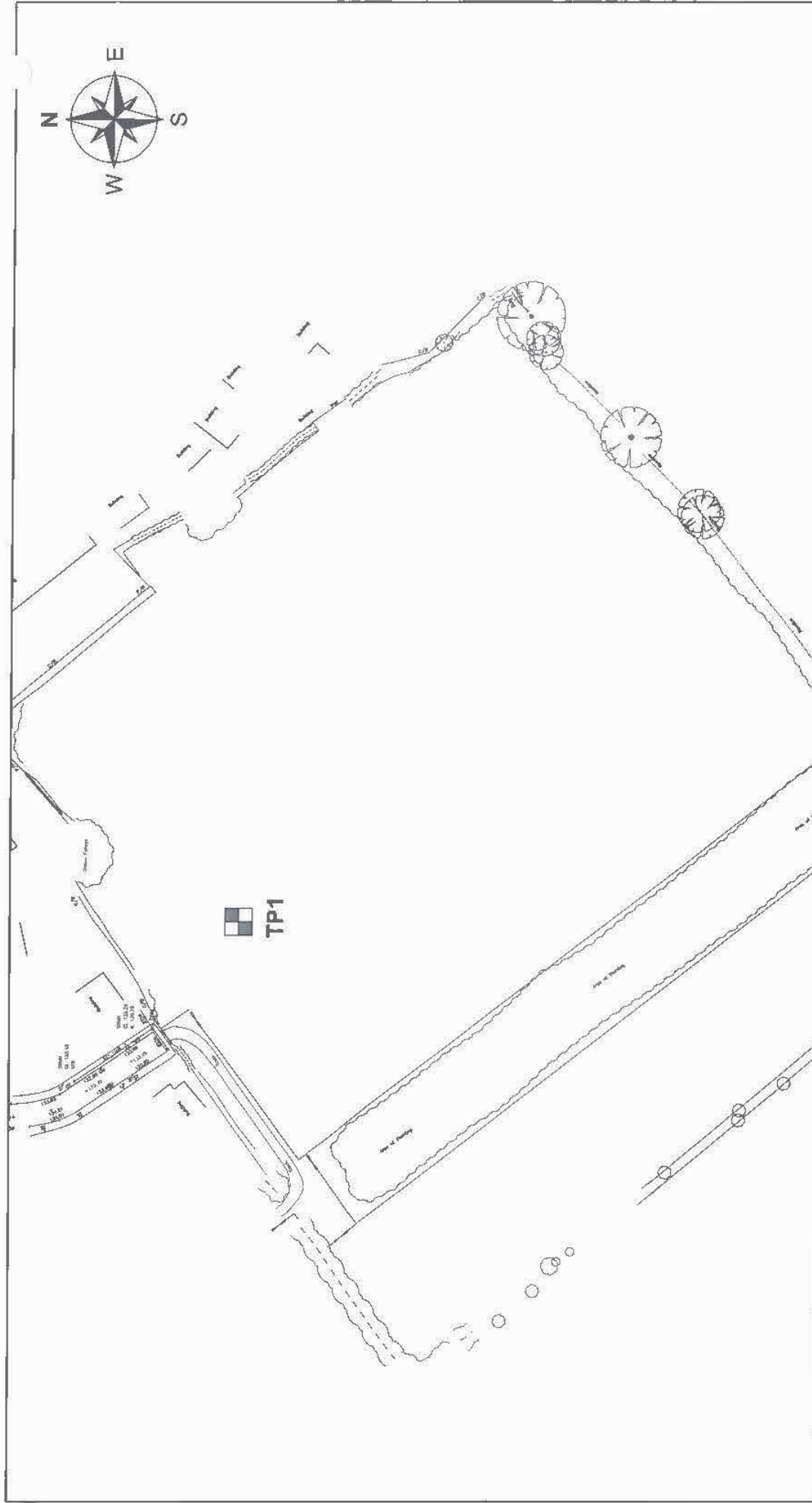


APPENDIX D

ONSITE INFILTRATION TESTING RESULTS



 PRP: consulting civil & structural engineers	Project:		Status:			
	Land off Beech Drive, Thornton		Engineer:	RG	Drawn:	GF
	Title:		Date:	Oct 2014	Scales @ A4:	NTS
	Test Pit Location Plan		Drawing No:	60977 - SK10	Rev:	-



PRP

consulting civil & structural engineers

Leicester
0116
275 1710

Northampton
01604
889670

Huntingdon
01832
710959

SOIL INFILTRATION REPORT

Project No:

60977

Project:

Land off Beech Drive 60977

Prepared by:

R Gray

10/10/2014

Checked by:

Sheet:

Test Pit 1

Soil type	mudstone	Size	Length (m)	Width (m)	Depth (m)
Ground Water Level (m below GL)	-0.47		0.30	0.30	0.60

No	Site Readings			
	Time (hh:mm)	Water Level from Base of Pit (mm)	Time (mins)	Depth of Water Below Ground Level (m)
1	10:20	220	0	-0.47
2	10:25	220	5	-0.47
3	10:30	210	10	-0.48
4	10:35	205	15	-0.48
5	10:40	200	20	-0.49
6	10:45	197	25	-0.49
7	10:55	195	35	-0.49
8	11:25	191	65	-0.49
9	11:40	190	80	-0.49
10	11:55	188	95	-0.49
11	12:10	187	110	-0.49
12	12:25	187	125	-0.49
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

	25%	75%
Effective depth (m)	-0.49	-0.48
Time (min)	90	5

taken from Graph

Volume outflowing between 75% & 25% effective depth

$$V_{p75-25} = 0.3 \times 0.3 \times (0.49 - 0.48) = 0.0009 \quad \text{m}^3$$

$$Q_{p50} = (0.3 \times 0.01 \times 2) +$$

$$+ (0.3 \times 0.01 \times 2) +$$

$$+ (0.3 \times 0.3)$$

$$= 0.102 \quad \text{m}^2$$

$$t_{p75-25} = 90 - 5$$

$$= 85 \quad \text{min}$$

Soil infiltration rate

$$f = \frac{0.0009}{0.102 \times 85 \times 60} = 1.73\text{E-}06 \quad \text{m/sec}$$



PRP

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60977

Project:

Land off Beech Drive 60977

Prepared by:

R Gray

10/10/2014

Checked by:

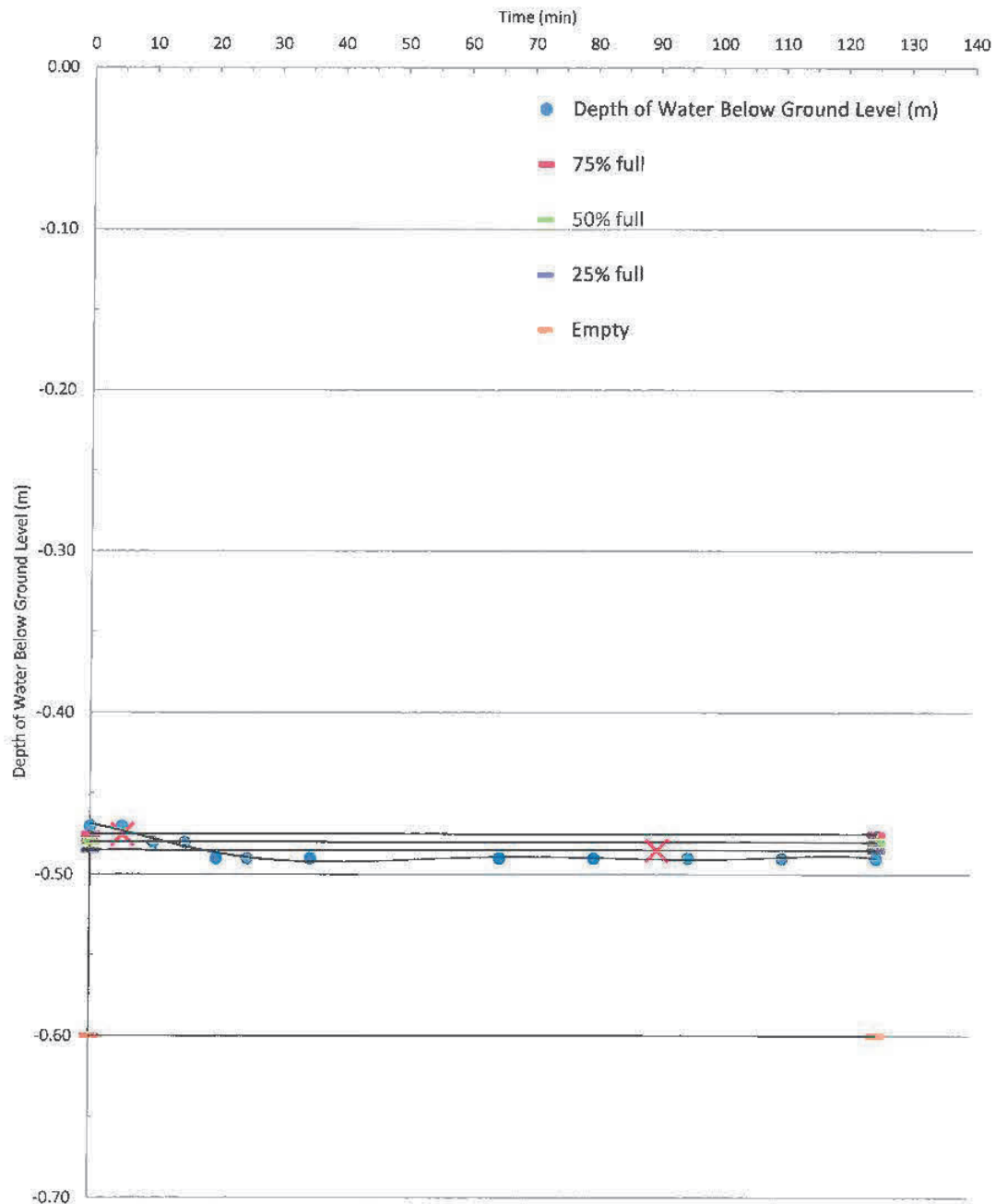
0

Sheet:

01

Test Pit 1

Relationship Between Time and Depth of Water



APPENDIX E

LLFA EARLY ENGAGEMENT RESPONSE

Matthew Genn

From: Jack Harriman <Jack.Harriman@leics.gov.uk> on behalf of llfa <llfa@leics.gov.uk>
Sent: 17 March 2020 09:11
To: Matthew Genn
Subject: LLFA Response: Ref. 2019/9699/04/FEN- Beech Drive, Thornton, Leicestershire

Dear Matthew Genn

Thank you for request for pre-application advice. Following review of the submitted documents, I can confirm the following.

The applicant is seeking to develop an existing greenfield site with approximately 50 dwellings and associated infrastructure.

When determining planning applications, the local planning authority should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site-specific flood risk assessment (FRA) confirming it will not put the users of the development at risk. Where a FRA is applicable this should be undertaken in accordance with the National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG).

From review of the Flood Map for Planning which shows fluvial flood risk, the site is wholly located in flood zone 1.

The risk of flooding from surface water map shows areas of the site to be at very low risk from surface water flooding with some parts located within low risk areas at the north west corner of the site.

Other sources of flood risk including (but not limited to) groundwater, canals, reservoirs, sewers, etc. should be considered as part of any forthcoming planning application. The LLFA would recommend reviewing the relevant Strategic Flood Risk Assessment for this area which may contain additional flood risk details.

The proposed site is situated within the Rothley Brook catchment. Leicestershire County Council's Infrastructure Planning (Flood Risk Management) team has no records of flooding incidents within close proximity to the site. It is advised that not all instances of flooding are reported to Leicestershire County Council and as such, there may be a history of flooding for which we have no record.

All development has the potential to increase flood risk so it is essential that all forms of flooding are taken into consideration within any flood risk assessment (where required) or planning application. Where there is insufficient information regarding any aspect of risk, the responsibility to investigate falls to the applicant.

Leicestershire County Council as the Lead Local Flood Authority (LLFA) would expect a sequential approach to masterplan development, locating development in areas at lowest risk of flooding.

The LLFA would expect any surface water drainage proposal to seek to infiltrate unless demonstrated to be unfeasible. Such demonstration should include infiltration testing in accordance with BRE Digest 365 Soakaway Design.

Should this not be appropriate, the LLFA would expect runoff from site to be discharge to the next most appropriate receptor at rates and volumes no greater than the event specific greenfield values.

Over the lifetime of a development, it is possible that the overall impermeable area contributing to surface water runoff within the site could significantly increase (known as 'urban creep'). Sensitivity testing of a 10% increase in impermeable

area should therefore be included where appropriate to ensure that surface water drainage designs can cope with future increases in impermeable areas.

The adjacent filed ditches connecting into the nearby unnamed ordinary watercourse to the west are classified as ordinary watercourses; as such consent may be required from Leicestershire County Council in their role as LLFA, under the Land Drainage Act (1991) for any activities within close proximity. Further information on the types of work/structure which require consent together with a template application form can be found on our website under the section 'Regulation of activities on watercourses'.

Leicestershire County Council opposes the culverting of watercourses; however, we recognise there are instances where culverting may be unavoidable. Any applicant will be required to justify the use of culverts and provide information demonstrating that there will be no detrimental effect on flood risk. Please refer to the County Council's Local Flood Risk Management Strategy which contains the culverting policy (Appendix 3) which can also be found on our website.

To safeguard access to watercourses or ditches for future maintenance, inspection and improvement works in the future; clear margins should be provided from the top of banks. A minimum clear margin of 3m should be provided from each top of bank for watercourses less than 2 metres in width, a minimum clear margin of 4.5m should be provided for watercourses 2 metres or greater in width.

The LLFA would expect any future surface water drainage scheme to assess the use of SuDS including but not limited to swales, attenuation basins and permeable paving in line with 'CIRIA C753 The SuDS Manual'. Such above ground SuDS structures would also provide one of the required treatment trains to manage water quality. It should be noted that the LLFA do not consider the use of underground storage tanks or oversize pipes as a suitable treatment train and as such where these are proposed, additional treatment trains should be implemented. Leicestershire County Council, in their role as LLFA, does not adopt SuDS. For enquiries regarding the proposed development and future adoption and maintenance of SuDS features, please direct these to your local District or Borough Council.

Any surface water drainage features should be located within the areas at lowest risk of flooding to ensure they remain operational during an extreme event. Any drainage features should also consider how an extreme event may constrain the discharge from any proposed drainage system and ensure the drainage infrastructure can adequately manage surface water runoff regardless (for example a surcharged outfall).

Where a site-specific flood risk assessment (FRA) is required by NPPF the associated drainage strategy should also provide outline operation and maintenance details along with an indicative proposal of who will maintain any SuDS features over the lifetime of the development.

The LLFA planning checklist and guidance which provides further details can be found [here](#).

If you have any further questions, please do not hesitate to contact us.

Kind regards

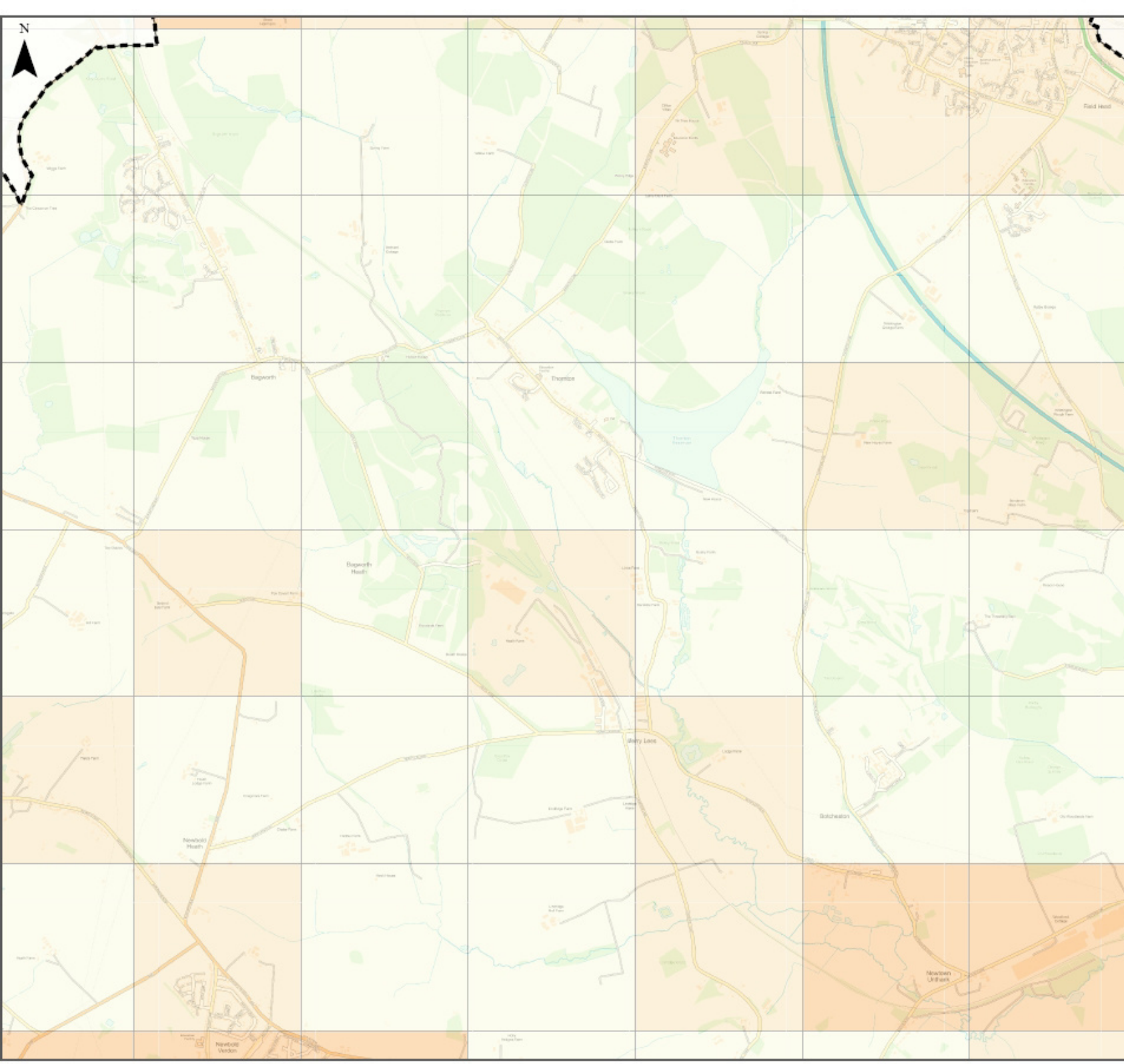
Flood Risk Management (Infrastructure Planning)
Environment & Transport Department
Leicestershire County Council
[e. llfa@leics.gov.uk](mailto:e.llfa@leics.gov.uk)
t. 0116 305 0001

www.flooding@leics.gov.uk

www.leicestershire.gov.uk/planning-and-environment/flooding-and-drainage

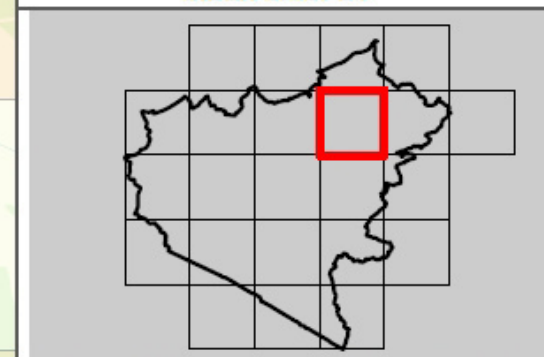
APPENDIX F

AREAS SUSCEPTIBLE TO GROUNDWATER FLOODING MAP



HINCKLEY AND BOSWORTH BOROUGH LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

APPENDIX A: GEOPDF FLOOD RISK MAPPING INDEX GRID: B4



**Note: All layers are turned off by default.
Click the box next to the layer of interest to**

Authority Information

- Council Boundary
- Main Rivers
- Detailed River Network

Flood Zones

- Flood Zone 3b
- Indicative Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

Surface Water

- RoFFSW 3.3% AEP
- RoFFSW 1% AEP
- RoFFSW 0.1% AEP

Emergency Planning

- Flood Warning Areas
- Flood Alert Areas

Climate Change

- Climate Change Central
- Climate Change Higher Central
- Climate Change Upper
- Indicative Flood Zone 2

Areas Susceptible to Groundwater Flooding

- $\geq 75\%$
- $\geq 50\% < 75\%$
- $\geq 25\% < 50\%$
- $< 25\%$

Historical Flooding

- Historic Flooding

Defences

- demountable defence
- embankment
- wall

0 0.35 0.7 1.4 Km

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APPENDIX G

SURFACE WATER RUNOFF CALCULATIONS

ADC Infrastructure Limited		Page 1
22 Esher Grove Nottingham NG3 5DR	Beech Drive Thornton	
Date 04/03/2020 File	Designed by Matthew Genn Checked by Richard Winn	
Innovyze Source Control 2018.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 700 Urban 0.000
Area (ha) 2.153 Soil 0.450 Region Number Region 4

Results 1/s

QBAR Rural 9.5
QBAR Urban 9.5

Q100 years 24.3

Q1 year 7.9
Q30 years 18.5
Q100 years 24.3

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APPENDIX H

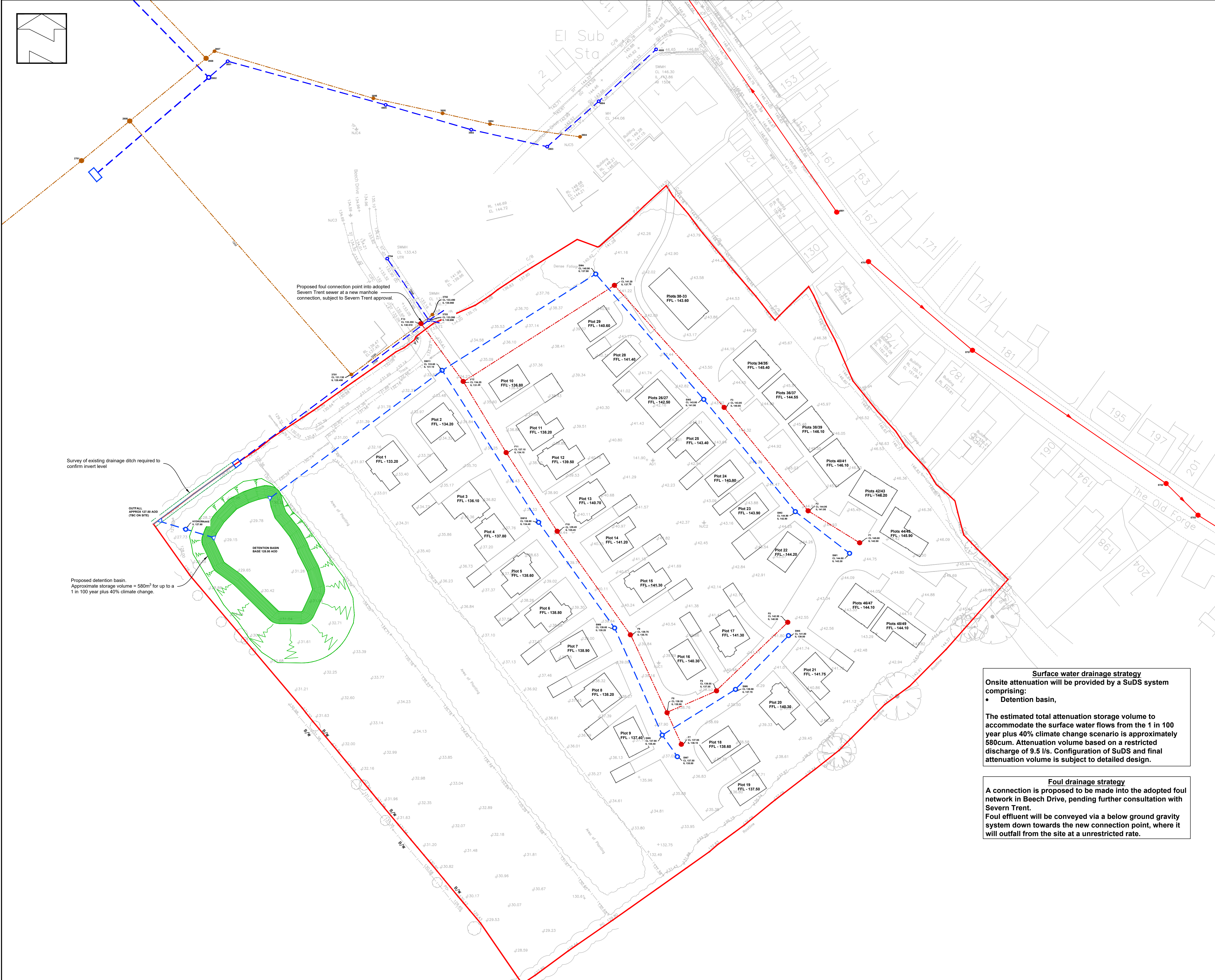
SURFACE WATER STORAGE CALCULATIONS

ADC Infrastructure Limited		Page 4																																																																																															
22 Esher Grove Nottingham NG3 5DR	Beech Drive Thornton																																																																																																
Date 16/03/2020 File Detention Basin V2.SRCX	Designed by Matthew Genn Checked by Richard Winn																																																																																																
Innovyze Source Control 2018.1																																																																																																	
Model Details Storage is Online Cover Level (m) 129.200 Tank or Pond Structure Invert Level (m) 128.000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>550.0</td><td>1.200</td><td>890.0</td></tr></tbody></table> Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0142-9500-1000-9500 Design Head (m) 1.000 Design Flow (l/s) 9.5 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 142 Invert Level (m) 128.000 Minimum Outlet Pipe Diameter (mm) 225 Suggested Manhole Diameter (mm) 1200 Control Points <table><thead><tr><th></th><th>Head (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>Design Point (Calculated)</td><td>1.000</td><td>9.5</td></tr><tr><td>Flush-Flo™</td><td>0.305</td><td>9.5</td></tr><tr><td>Kick-Flo®</td><td>0.675</td><td>7.9</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>8.2</td></tr></tbody></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>5.1</td><td>1.200</td><td>10.4</td><td>3.000</td><td>16.0</td><td>7.000</td><td>24.0</td></tr><tr><td>0.200</td><td>9.2</td><td>1.400</td><td>11.1</td><td>3.500</td><td>17.2</td><td>7.500</td><td>24.8</td></tr><tr><td>0.300</td><td>9.5</td><td>1.600</td><td>11.9</td><td>4.000</td><td>18.3</td><td>8.000</td><td>25.6</td></tr><tr><td>0.400</td><td>9.4</td><td>1.800</td><td>12.5</td><td>4.500</td><td>19.4</td><td>8.500</td><td>26.3</td></tr><tr><td>0.500</td><td>9.2</td><td>2.000</td><td>13.2</td><td>5.000</td><td>20.4</td><td>9.000</td><td>27.1</td></tr><tr><td>0.600</td><td>8.7</td><td>2.200</td><td>13.8</td><td>5.500</td><td>21.4</td><td>9.500</td><td>27.8</td></tr><tr><td>0.800</td><td>8.6</td><td>2.400</td><td>14.4</td><td>6.000</td><td>22.3</td><td></td><td></td></tr><tr><td>1.000</td><td>9.5</td><td>2.600</td><td>14.9</td><td>6.500</td><td>23.1</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	550.0	1.200	890.0		Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	9.5	Flush-Flo™	0.305	9.5	Kick-Flo®	0.675	7.9	Mean Flow over Head Range	-	8.2	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	5.1	1.200	10.4	3.000	16.0	7.000	24.0	0.200	9.2	1.400	11.1	3.500	17.2	7.500	24.8	0.300	9.5	1.600	11.9	4.000	18.3	8.000	25.6	0.400	9.4	1.800	12.5	4.500	19.4	8.500	26.3	0.500	9.2	2.000	13.2	5.000	20.4	9.000	27.1	0.600	8.7	2.200	13.8	5.500	21.4	9.500	27.8	0.800	8.6	2.400	14.4	6.000	22.3			1.000	9.5	2.600	14.9	6.500	23.1		
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																														
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0.100	5.1	1.200	10.4	3.000	16.0	7.000	24.0																																																																																										
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0.300	9.5	1.600	11.9	4.000	18.3	8.000	25.6																																																																																										
0.400	9.4	1.800	12.5	4.500	19.4	8.500	26.3																																																																																										
0.500	9.2	2.000	13.2	5.000	20.4	9.000	27.1																																																																																										
0.600	8.7	2.200	13.8	5.500	21.4	9.500	27.8																																																																																										
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ADC Infrastructure Limited					Page 2
22 Esher Grove Nottingham NG3 5DR		Beech Drive Thornton			
Date 16/03/2020 File Detention Basin V2.SRCX		Designed by Matthew Genn Checked by Richard Winn			
Innovyze		Source Control 2018.1			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	128.773	0.773	9.5	503.8	O K
120 min Winter	128.861	0.861	9.5	571.9	O K
180 min Winter	128.906	0.906	9.5	608.0	Flood Risk
240 min Winter	128.933	0.933	9.5	629.5	Flood Risk
360 min Winter	128.958	0.958	9.5	649.7	Flood Risk
480 min Winter	128.963	0.963	9.5	653.8	Flood Risk
600 min Winter	128.958	0.958	9.5	649.3	Flood Risk
720 min Winter	128.946	0.946	9.5	639.7	Flood Risk
960 min Winter	128.921	0.921	9.5	619.4	Flood Risk
1440 min Winter	128.862	0.862	9.5	572.7	O K
2160 min Winter	128.760	0.760	9.5	494.0	O K
2880 min Winter	128.636	0.636	9.5	402.4	O K
4320 min Winter	128.365	0.365	9.5	217.9	O K
5760 min Winter	128.208	0.208	9.3	119.6	O K
7200 min Winter	128.149	0.149	8.4	84.8	O K
8640 min Winter	128.129	0.129	7.3	73.1	O K
10080 min Winter	128.116	0.116	6.4	65.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	63.012	0.0	525.7	66	
120 min Winter	37.059	0.0	618.6	124	
180 min Winter	27.167	0.0	680.3	180	
240 min Winter	21.795	0.0	727.8	238	
360 min Winter	15.977	0.0	800.2	352	
480 min Winter	12.818	0.0	855.9	464	
600 min Winter	10.805	0.0	901.6	570	
720 min Winter	9.397	0.0	940.7	666	
960 min Winter	7.528	0.0	1004.2	754	
1440 min Winter	5.507	0.0	1099.3	1066	
2160 min Winter	4.029	0.0	1216.1	1520	
2880 min Winter	3.228	0.0	1298.9	1940	
4320 min Winter	2.270	0.0	1368.8	2600	
5760 min Winter	1.769	0.0	1425.2	3176	
7200 min Winter	1.457	0.0	1467.5	3744	
8640 min Winter	1.244	0.0	1502.7	4416	
10080 min Winter	1.088	0.0	1532.1	5144	
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ADC Infrastructure Limited					Page 1	
22 Esher Grove Nottingham NG3 5DR		Beech Drive Thornton				
Date 16/03/2020 File Detention Basin V2.SRCX		Designed by Matthew Genn Checked by Richard Winn				
Innovyze		Source Control 2018.1				
Summary of Results for 100 year Return Period (+40%)						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	128.537	0.537	9.5	333.1	O K	
30 min Summer	128.615	0.615	9.5	388.0	O K	
60 min Summer	128.698	0.698	9.5	447.6	O K	
120 min Summer	128.777	0.777	9.5	506.7	O K	
180 min Summer	128.816	0.816	9.5	536.9	O K	
240 min Summer	128.838	0.838	9.5	553.9	O K	
360 min Summer	128.856	0.856	9.5	567.7	O K	
480 min Summer	128.855	0.855	9.5	567.0	O K	
600 min Summer	128.848	0.848	9.5	561.7	O K	
720 min Summer	128.840	0.840	9.5	555.6	O K	
960 min Summer	128.820	0.820	9.5	540.2	O K	
1440 min Summer	128.777	0.777	9.5	506.8	O K	
2160 min Summer	128.706	0.706	9.5	453.5	O K	
2880 min Summer	128.623	0.623	9.5	393.5	O K	
4320 min Summer	128.440	0.440	9.5	267.0	O K	
5760 min Summer	128.308	0.308	9.5	181.8	O K	
7200 min Summer	128.224	0.224	9.3	129.3	O K	
8640 min Summer	128.173	0.173	9.0	99.1	O K	
10080 min Summer	128.150	0.150	8.5	85.1	O K	
15 min Winter	128.596	0.596	9.5	374.1	O K	
30 min Winter	128.682	0.682	9.5	436.3	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	182.171	0.0	334.0	22		
30 min Summer	107.140	0.0	393.2	37		
60 min Summer	63.012	0.0	469.2	66		
120 min Summer	37.059	0.0	552.1	126		
180 min Summer	27.167	0.0	607.3	184		
240 min Summer	21.795	0.0	649.7	244		
360 min Summer	15.977	0.0	714.4	362		
480 min Summer	12.818	0.0	764.2	474		
600 min Summer	10.805	0.0	805.1	522		
720 min Summer	9.397	0.0	840.0	586		
960 min Summer	7.528	0.0	896.8	714		
1440 min Summer	5.507	0.0	982.4	986		
2160 min Summer	4.029	0.0	1085.7	1408		
2880 min Summer	3.228	0.0	1159.5	1792		
4320 min Summer	2.270	0.0	1221.6	2512		
5760 min Summer	1.769	0.0	1272.3	3176		
7200 min Summer	1.457	0.0	1310.1	3824		
8640 min Summer	1.244	0.0	1341.4	4496		
10080 min Summer	1.088	0.0	1367.2	5144		
15 min Winter	182.171	0.0	374.4	22		
30 min Winter	107.140	0.0	440.3	37		
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APPENDIX I OUTLINE DRAINAGE PLAN



Key

Site Boundary

Proposed Buildings

- Drainage Notes
1.

All adoptable surface and foul water drainage works to be carried out in accordance with 'Sewers for Adoption 7th edition' and any specific requirements of the adopting authority/sewerage undertaker.
2.

All adoptable highway drainage works to be carried out in accordance with the Local Highway Authority requirements and the DfT MCHW specification for highway works.
3.

All private drainage works are to be carried out in accordance with Building Regulations Part H, BS EN 752, the Civil Engineering Specification for the Water Industry.
4.

Where applicable the contractor shall allow free and full access to the drainage works for the local highway authority, drainage authority or the overseeing organisation.
5.

The exact position, level, line, size and use of existing drainage is to be confirmed on site. Any discrepancies to be reported to the engineer prior to the commencement of works.
6.

All temporary works associated with the construction of the drainage works shall be the responsibility of the contractor, including the protection of any uncovered/shallow pipework against construction traffic.
7.

The Contractor is responsible for obtaining and paying for all necessary permissions to enable construction of the works to be undertaken, including but not limited to licences for street works and connections to existing sewers. This includes Section 106 applications when connecting directly or indirectly to the public sewerage network (complete application to be made at least 3 weeks prior to the planned outfall construction works).
8.

All proposed chamber covers are to be marked permanently with 'SWS' (or equiv.) on surface water sewers and 'FWS' (or equiv.) on foul sewers. All covers to be in accordance with BS EN 124.
9.

Finished floor levels shown are indicative and subject to detailed design and co-ordination with site levels design.
10.

Works in proximity to the watercourse will be subject to gaining the necessary consent and approval from the Lead Local Flood Authority.

p2	Minor amendments to site Masterplan	01/04/2020
p1	First issue for comment.	26/03/2020
Rev	Description	Date

Client:

BARWOOD

HOMES

Project:

Proposed Residential Development
Land off Beech Drive, Thornton

Title:

Proposed Surface and Foul Water
Drainage Layout

ADC

INFRASTRUCTURE

Drg Size:	Scale:	Date:
A1	1:500	01/04/2020
Drg No:	Rev:	
ADC1092/DR/050	P2	