



DRAINAGE STRATEGY REPORT

PROPOSED RESIDENTIAL DEVELOPMENT BROWNHILLS CLOSE & BURY RD DEVELOPMENT TOTTINGTON BURY BL8 3LF

Author:

Daniel Slattery

Client:

Dickens Property Group

Doc Ref:

rep-tjba-DPG-brownhills cl & bury rd-DSR-280924.docx

Revision	Date	Reason
0	November 2024	Original for Planning.

T J Booth Associates.

20A Eastgate St,

Rochdale,

Lancs,

OL16 1DH.

Tel: 01706 868288.

Email: office@tjba.co.uk



Contents.

1	Introduction.	3
1.1	Planning consultation.	3
1.2	General regulatory requirements.	3
2	Plans.	4
2.1	Location plan.	4
2.2	Site plan.	4
3	Derivation of Data, Surveys and Models.	4
3.1	Topography.	4
3.2	Site Investigations.	4
3.3	Drainage Surveys.	5
3.4	Sewer Undertaker Records.	5
3.5	Landmark Records.	5
4	Drainage Strategy.	5
4.1	Existing Rainfall & Drainage Systems.	5
4.2	Rainfall Climate change impacts on the proposed development.	5
4.3	Proposed Rainfall & Drainage Systems.	5
4.3.1	Proposed Foul Water System.	6
4.3.2	Adoption.	6
4.3.3	Maintenance.	6
5	Appendix.	7
5.1	Proposed Plans.	7
5.2	HR Wallingford UK SUDS Greenfield Runoff Estimation Report.	8
5.3	Microdrainage Calculation Proposed Development.	10
5.4	United Utilities Sewer Plans.	22

1 Introduction.

The purpose of the assessment is to inform & accompany a planning application for a residential development.

An outline planning application was approved in June 2023, under application No. 67243, for the 'Outline application with 'Access' for erection of up to 5 dwellings, and new/improved formal and informal community open space, replacement / improved footpath connections and wider greenspace enhancements'.

Planning conditions Nos. 5 & 10 were included on the approval notice relating to drainage.

- 5 As part of the submission of the first reserved matters application, details of a sustainable surface water drainage scheme and a foul water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority. The drainage schemes must include:
- (i) An investigation of the hierarchy of drainage options in the National Planning Practice Guidance (or any subsequent amendment thereof). This investigation shall include evidence of an assessment of ground conditions, the potential for infiltration of surface water in accordance with BRE365;
 - (ii) A restricted rate of discharge of surface water agreed with the local planning authority (if it is agreed that infiltration is discounted by the investigations).
 - (iii) Levels of the proposed drainage systems including proposed ground and finished floor levels in AOD;
 - (iv) Incorporate mitigation measures to manage the risk of sewer surcharge; and
 - (v) Foul and surface water shall drain on separate systems within the site.

The approved schemes shall also be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards and no surface water shall discharge to the public sewer either directly or indirectly.

- 10 As part of the first reserved matters, full details of the sustainable drainage measures proposed shall be submitted to and approved in writing to the Local Planning Authority which demonstrate that there would be no negative impact on biodiversity.

1.1 Planning consultation.

No Planning consultation has been provided to date.

1.2 General regulatory requirements.

The primary purpose of the report is to assess drainage proposals in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding Site assessment, this report will appraise the existing and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- infiltration.
- Watercourse.
- surface water sewer.
- combined sewer.

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.

- Development should be designed so that there is no flooding to the development in a 30yr event, and so that there is no property flooding in a 100yr event considering climate change.

2 Plans.

2.1 Location plan.

Refer to Location Plan in Appendix showing the area features.

The Site is located on the urban fringe of housing estate development, on the edge of the Kirklees Brook valley.

There is a watercourse flowing through and culverted beneath part of the Site.

2.2 Site plan.

The Site is made up of a former & historic landfill Site, comprising hummocky ground bordering tributaries to Kirklees Brook.

The Site comprises two parts:

A north Site adjacent Brownhills Close, and a southern part adjacent Bury Road.

An historic and unnamed culvert flows beneath the Bury Road Site at approximately 10m depth. There is also a 2nd unnamed watercourse which flows from the west, which also culverts beneath the Bury Road Site. Both culverts share a confluence beneath the Bury Road Site.

Both Sites are heavily vegetated and considered greenfield for the purposes of drainage assessment.

The Site areas are considered below:

Area type.		Brownhills Close Site.	Bury Rd Site.	Combined Area Totals.
Existing.	Soft landscaping:	1415 sqm	2095 sqm	3510sqm
	Hardstanding:	0 sqm	0 sqm	0 sqm
	Site totals:	1415 sqm	2095 sqm	3510sqm
Proposed.	Soft landscaping:	565 sqm	1440 sqm	2005 sqm
	Hardstanding (access rd):	235 sqm	235 sqm	470 sqm
	Dwelling & patio/drives:	615 sqm	420 sqm	1035 sqm
	Site totals:	1415 sqm	2095 sqm	3510 sqm

Refer to Proposed Plan in appendix.

3 Derivation of Data, Surveys and Models.

3.1 Topography.

Brownhills Site:

The Site is on a plateau on the edge of the local estate nominally 122.00-123.00m aOD.

A local open watercourse is noted to the south, down a steep and heavily vegetated embankment, nominally 110.5m aOD (prior to culvert).

Bury Rd Site.

The Bury Road Site is nominally 119.50-119.00m aOD. There is a gently fall towards the north of approx 35m before a steep and heavily vegetated fall to the local brook at around 107.75m aOD.

3.2 Site Investigations.

Site investigations have been undertaken by LK Consult Ltd, ref 'Phase 2 Geo-Environmental Investigation, Risk Assessment and Outline Remediation Strategy, Brownhills Close / Bury Road, Tottington, LK Consult, Reference: CL-602-LKC 22 1047-01 R0, July 2022'.

The Site investigation found elevated arsenic, chromium, copper, mercury, PAHS (naphthalene, Anthracene, Fluoranthene), and hydrocarbons (aromatic c21-35, and aliphatic c21-35); and noted a moderate risk to controlled waters.

3.3 Drainage Surveys.

Not undertaken.

3.4 Sewer Undertaker Records.

The sewer info indicates multiple UU sewers beneath the Brownhills Close Site, and SW culverts beneath the Bury Road Site.

3.5 Landmark Records.

Not obtained.

4 Drainage Strategy.

4.1 Existing Rainfall & Drainage Systems.

Local rainfall characteristics are as follows:

SAAR (mm)	1137
M5-60 rainfall depth (mm)	20
'r' ratio M5-60 / M5-2day	0.3
FEH/FSR conversion factor	1.14
Hydrological region	10

The HR Wallingford UK SUDS Website was used to estimate greenfield flow rates at the Site (excerpts below & full report in Appendix):

Site characteristics

Total site area (ha):

Notes

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.88	2.99
1 in 1 year (l/s):	3.38	2.6
1 in 30 years (l/s):	6.59	5.08
1 in 100 year (l/s):	8.07	6.22
1 in 200 years (l/s):	9.19	7.08

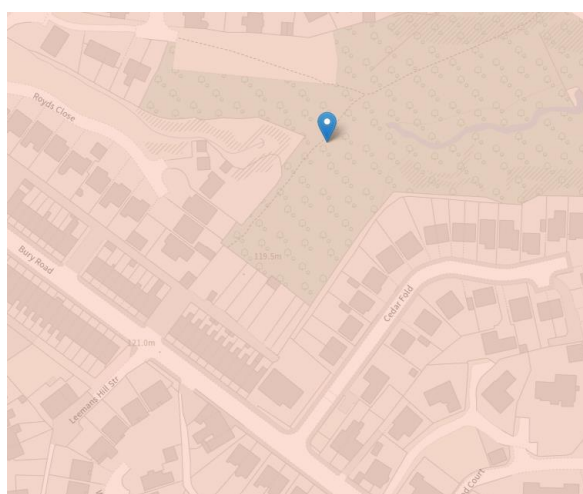
4.2 Rainfall Climate change impacts on the proposed development.

Climate change allowances to peak rainfall intensity are given nationally across the whole of England, based upon river management catchment areas. Refer to graphic inset:

Given the proposed residential end use, the 2070s epoch is considered suitable for climate change allowance estimation, which suggests the following allowances to be used:

30yr rainfalls +40% climate change allowance.

100yr rainfalls +45% climate change allowance.



3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

4.3 Proposed Rainfall & Drainage Systems.

Following the guidance of hierarchy for disposal of surface water (SUDS):

- **INFILTRATION:**

Site investigations have been undertaken by a third-party environmental consultancy, who have advised a risk to controlled waters from past contamination and landfilling processes beneath both Sites.

This method is not considered to be a suitable means of control, and the next available method should be considered.

- **WATERCOURSE/SW SEWER:** There are local watercourses which are culverted beneath the Site. It is proposed to utilise discharge to the brook. However, due to the c10m steep and heavily vegetated banks, and the required removal of mature trees & effects on Biodiversity Net Gain (BNG) to implement this, it is proposed to saddle into an existing 939Ø UU SW sewer for the final 20m of its length between the proposed connection point and the watercourse.

The proposal is for both Sites to discharge to an detention basin, controlled to greenfield qbar rate via control manhole & hydrobrake, before discharging via the ex UU pipe to watercourse. Microdrainage calculations for the detention basin are included in the Appendix.

- **COMBINED SEWER:** not required.

4.3.1 *Proposed Foul Water System.*

The Sites will discharge to separate points on the combined network, but will remain separate from surface water flows.

4.3.2 *Adoption.*

The drainage systems drainage will remain private, although scope has been allowed for the adoption of the foul sewer to the Brownhills Road Site.

4.3.3 *Maintenance.*

Maintenance of suds will be private. A maintenance plan is included on the Drainage Plan specification.

Signed.....



D.S. Slattery BSc (Hons).

T J Booth Associates.

Authorised...

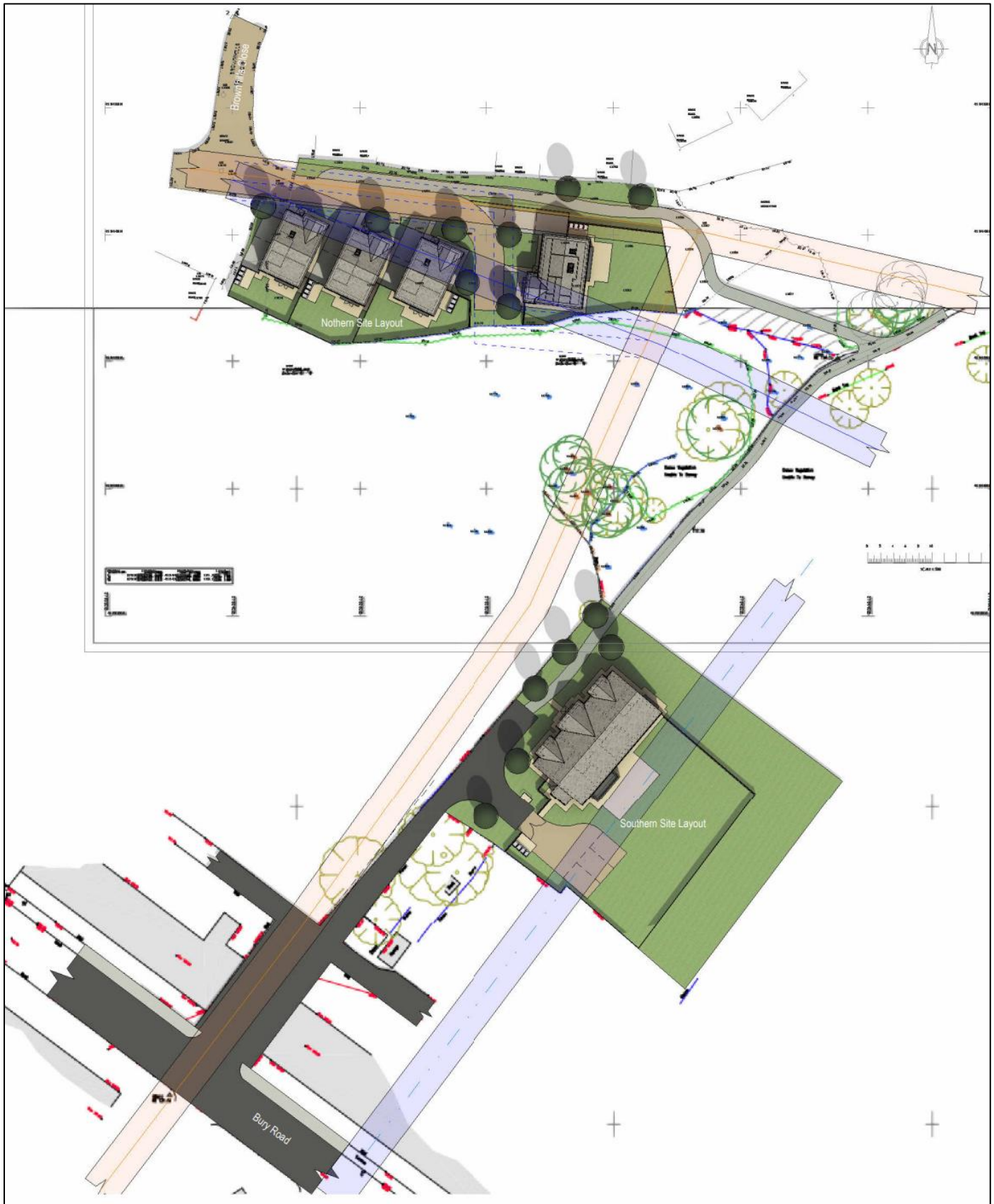


T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

5 Appendix.

5.1 Proposed Plans.



5.2 HR Wallingford UK SUDS Greenfield Runoff Estimation Report.



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dan S
Site name:	Brownhills Close & Bury Road
Site location:	Tottington

Site Details

Latitude: 53.60759° N

Longitude: 2.32779° W

Reference: 4003669393

Date: Nov 08 2024 16:35

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.351

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Notes

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

When Q_{BAR} is $< 2.0 \text{ l/s/ha}$ then limiting discharge rates are set at 2.0 l/s/ha .

Soil characteristics

	Default	Edited
SOIL type:	5	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.47

(2) Are flow rates $< 5.0 \text{ l/s}$?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	1137	1137
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.88	2.99
1 in 1 year (l/s):	3.38	2.6
1 in 30 years (l/s):	6.59	5.08
1 in 100 year (l/s):	8.07	6.22
1 in 200 years (l/s):	9.19	7.08

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

5.3 Microdrainage Calculation Proposed Development.

T J Booth Associates				Page 1			
104 Yorkshire St Rochdale Lancashire OL16 1JY		full site attenuation dickens property grp brownhill cl & bury rd					
Date nov 2024 File CALC-T~1.SRC		Designed By ds Checked By					
Micro Drainage		Source Control W.10.4					
Summary of Results for 1 year Return Period							
Storm Duration (mins)		Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer		4.6	4.6	117.0882	0.0883	4.4	O K
30 Summer		4.8	4.8	117.0973	0.0973	4.9	O K
60 Summer		4.8	4.8	117.0983	0.0983	4.9	O K
120 Summer		4.6	4.6	117.0847	0.0848	4.2	O K
180 Summer		4.4	4.4	117.0683	0.0683	3.4	O K
240 Summer		4.2	4.2	117.0533	0.0533	2.6	O K
360 Summer		3.9	3.9	117.0283	0.0282	1.4	O K
480 Summer		3.7	3.7	117.0117	0.0118	0.6	O K
600 Summer		3.5	3.5	117.0023	0.0023	0.1	O K
720 Summer		3.3	3.3	117.0000	0.0000	0.0	O K
960 Summer		2.8	2.8	117.0000	0.0000	0.0	O K
1440 Summer		2.2	2.2	117.0000	0.0000	0.0	O K
2160 Summer		1.7	1.7	117.0000	0.0000	0.0	O K
2880 Summer		1.4	1.4	117.0000	0.0000	0.0	O K
4320 Summer		1.1	1.1	117.0000	0.0000	0.0	O K
5760 Summer		0.9	0.9	117.0000	0.0000	0.0	O K
7200 Summer		0.8	0.8	117.0000	0.0000	0.0	O K
8640 Summer		0.7	0.7	117.0000	0.0000	0.0	O K
10080 Summer		0.7	0.7	117.0000	0.0000	0.0	O K
15 Winter		4.8	4.8	117.1028	0.1028	5.2	O K
30 Winter		4.8	4.8	117.1117	0.1118	5.7	O K
60 Winter		4.8	4.8	117.1068	0.1068	5.4	O K
120 Winter		4.5	4.5	117.0807	0.0808	4.0	O K
180 Winter		4.2	4.2	117.0553	0.0553	2.7	O K
240 Winter		3.9	3.9	117.0328	0.0327	1.6	O K
	Storm Duration (mins)		Rain (mm/hr)	Time-Peak (mins)			
	15 Summer		28.17	14			
	30 Summer		19.18	23			
	60 Summer		12.80	40			
	120 Summer		8.41	74			
	180 Summer		6.56	106			
	240 Summer		5.47	136			
	360 Summer		4.21	196			
	480 Summer		3.50	254			
	600 Summer		3.03	308			
	720 Summer		2.70	0			
	960 Summer		2.25	0			
	1440 Summer		1.73	0			
	2160 Summer		1.33	0			
	2880 Summer		1.11	0			
	4320 Summer		0.85	0			
	5760 Summer		0.71	0			
	7200 Summer		0.61	0			
	8640 Summer		0.54	0			
	10080 Summer		0.49	0			
	15 Winter		28.17	15			
	30 Winter		19.18	25			
	60 Winter		12.80	44			
	120 Winter		8.41	78			
	180 Winter		6.56	110			
	240 Winter		5.47	140			
(c)1982-2006 Micro Drainage							

T J Booth Associates		Page 2
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024	Designed By ds	
File CALC-T~1.SRC	Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 1 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	3.5	3.5	117.0033	0.0033	0.2	O K
480 Winter	3.1	3.1	117.0000	0.0000	0.0	O K
600 Winter	2.7	2.7	117.0000	0.0000	0.0	O K
720 Winter	2.4	2.4	117.0000	0.0000	0.0	O K
960 Winter	2.1	2.1	117.0000	0.0000	0.0	O K
1440 Winter	1.6	1.6	117.0000	0.0000	0.0	O K
2160 Winter	1.2	1.2	117.0000	0.0000	0.0	O K
2880 Winter	1.0	1.0	117.0000	0.0000	0.0	O K
4320 Winter	0.8	0.8	117.0000	0.0000	0.0	O K
5760 Winter	0.7	0.7	117.0000	0.0000	0.0	O K
7200 Winter	0.6	0.6	117.0000	0.0000	0.0	O K
8640 Winter	0.5	0.5	117.0000	0.0000	0.0	O K
10080 Winter	0.5	0.5	117.0000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	4.21	194
480 Winter	3.50	0
600 Winter	3.03	0
720 Winter	2.70	0
960 Winter	2.25	0
1440 Winter	1.73	0
2160 Winter	1.33	0
2880 Winter	1.11	0
4320 Winter	0.85	0
5760 Winter	0.71	0
7200 Winter	0.61	0
8640 Winter	0.54	0
10080 Winter	0.49	0

T J Booth Associates		Page 3
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024	Designed By ds	
File CALC-T~1.SRC	Checked By	
Micro Drainage		Source Control W.10.4

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	1	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+0
Cv (Winter)	0.840		

Pipe Network

Volume in Pipe Network (m ³)	1	Dia of Outfall Pipe (m)	0.200
Slope of Outfall Pipe (1:x)	40.0	Roughness of Outfall Pipe	0.600

Time / Area Diagram

Total Area (ha) = 0.149

Time (mins)		Area
from:	to:	(ha)
0	4	0.149

T J Booth Associates		Page 4
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 117.000 Ground Level (m) 118.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	48.0	0.60	85.0	1.20	1000.0	1.80	1000.0	2.40	1000.0
0.10	53.0	0.70	92.0	1.30	1000.0	1.90	1000.0	2.50	1000.0
0.20	59.0	0.80	99.0	1.40	1000.0	2.00	1000.0		
0.30	65.0	0.90	107.0	1.50	1000.0	2.10	1000.0		
0.40	72.0	1.00	115.0	1.60	1000.0	2.20	1000.0		
0.50	78.0	1.10	1000.0	1.70	1000.0	2.30	1000.0		

Depth / Flow Outflow Control

Invert Level of Control 116.900

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	3.5	0.80	4.3	2.00	6.8	4.00	9.6	7.00	12.8
0.20	4.8	1.00	4.8	2.20	7.1	4.50	10.2	7.50	13.2
0.30	5.0	1.20	5.2	2.40	7.5	5.00	10.8	8.00	13.6
0.40	5.0	1.40	5.6	2.60	7.8	5.50	11.3	8.50	14.1
0.50	4.8	1.60	6.1	3.00	8.3	6.00	11.8	9.00	14.5
0.60	4.6	1.80	6.5	3.50	9.0	6.50	12.3	9.50	14.9

(c)1982-2006 Micro Drainage

T J Booth Associates				Page 1			
104 Yorkshire St Rochdale Lancashire OL16 1JY		full site attenuation dickens property grp brownhill cl & bury rd					
Date nov 2024		Designed By ds					
File CALC-T~1.SRC		Checked By					
Micro Drainage		Source Control W.10.4					
Summary of Results for 30 year Return Period (+40%)							
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status	
15 Summer	5.0	5.0	117.3802	0.3802	22.3	O K	
30 Summer	5.0	5.0	117.4637	0.4637	28.4	O K	
60 Summer	5.0	5.0	117.5152	0.5152	32.4	O K	
120 Summer	5.0	5.0	117.5232	0.5232	33.0	O K	
180 Summer	5.0	5.0	117.5107	0.5107	32.0	O K	
240 Summer	5.0	5.0	117.4917	0.4917	30.6	O K	
360 Summer	5.0	5.0	117.4467	0.4467	27.1	O K	
480 Summer	5.0	5.0	117.3962	0.3962	23.4	O K	
600 Summer	5.0	5.0	117.3447	0.3447	19.8	O K	
720 Summer	5.0	5.0	117.2957	0.2957	16.6	O K	
960 Summer	5.0	5.0	117.2127	0.2127	11.4	O K	
1440 Summer	4.8	4.8	117.1022	0.1023	5.2	O K	
2160 Summer	3.9	3.9	117.0328	0.0327	1.6	O K	
2880 Summer	3.5	3.5	117.0000	0.0000	0.0	O K	
4320 Summer	2.6	2.6	117.0000	0.0000	0.0	O K	
5760 Summer	2.1	2.1	117.0000	0.0000	0.0	O K	
7200 Summer	1.9	1.9	117.0000	0.0000	0.0	O K	
8640 Summer	1.7	1.7	117.0000	0.0000	0.0	O K	
10080 Summer	1.4	1.4	117.0000	0.0000	0.0	O K	
15 Winter	5.0	5.0	117.4252	0.4252	25.5	O K	
30 Winter	5.0	5.0	117.5222	0.5222	33.0	O K	
60 Winter	5.0	5.0	117.5892	0.5893	38.5	O K	
120 Winter	5.0	5.0	117.5987	0.5988	39.2	O K	
180 Winter	5.0	5.0	117.5762	0.5762	37.3	O K	
240 Winter	5.0	5.0	117.5462	0.5462	34.9	O K	
Storm Duration (mins)	Rain (mm/hr)		Time-Peak (mins)				
15 Summer	68.99		17				
30 Summer	47.08		32				
60 Summer	30.81		60				
120 Summer	19.53		92				
180 Summer	14.75		126				
240 Summer	12.05		160				
360 Summer	9.05		228				
480 Summer	7.38		294				
600 Summer	6.29		356				
720 Summer	5.52		418				
960 Summer	4.49		532				
1440 Summer	3.35		754				
2160 Summer	2.49		1108				
2880 Summer	2.02		0				
4320 Summer	1.50		0				
5760 Summer	1.21		0				
7200 Summer	1.03		0				
8640 Summer	0.90		0				
10080 Summer	0.81		0				
15 Winter	68.99		18				
30 Winter	47.08		32				
60 Winter	30.81		60				
120 Winter	19.53		100				
180 Winter	14.75		138				
240 Winter	12.05		176				
(c)1982-2006 Micro Drainage							

T J Booth Associates		Page 2
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 30 year Return Period (+40%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	5.0	5.0	117.4707	0.4707	28.9	O K
480 Winter	5.0	5.0	117.3862	0.3862	22.7	O K
600 Winter	5.0	5.0	117.3037	0.3037	17.1	O K
720 Winter	5.0	5.0	117.2318	0.2317	12.5	O K
960 Winter	4.8	4.8	117.1233	0.1233	6.3	O K
1440 Winter	3.9	3.9	117.0342	0.0342	1.7	O K
2160 Winter	3.2	3.2	117.0000	0.0000	0.0	O K
2880 Winter	2.5	2.5	117.0000	0.0000	0.0	O K
4320 Winter	2.0	2.0	117.0000	0.0000	0.0	O K
5760 Winter	1.5	1.5	117.0000	0.0000	0.0	O K
7200 Winter	1.4	1.4	117.0000	0.0000	0.0	O K
8640 Winter	1.2	1.2	117.0000	0.0000	0.0	O K
10080 Winter	1.0	1.0	117.0000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	9.05	248
480 Winter	7.38	314
600 Winter	6.29	374
720 Winter	5.52	434
960 Winter	4.49	538
1440 Winter	3.35	768
2160 Winter	2.49	0
2880 Winter	2.02	0
4320 Winter	1.50	0
5760 Winter	1.21	0
7200 Winter	1.03	0
8640 Winter	0.90	0
10080 Winter	0.81	0

T J Booth Associates

Page 3

104 Yorkshire St
Rochdale
Lancashire OL16 1JY

full site attenuation
dickens property grp
brownhill cl & bury rd

Date nov 2024
File CALC-T~1.SRC

Designed By ds
Checked By



Micro Drainage

Source Control W.10.4

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	30	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+40
Cv (Winter)	0.840		

Pipe Network

Volume in Pipe Network (m³)	1	Dia of Outfall Pipe (m)	0.200
Slope of Outfall Pipe (1:x)	40.0	Roughness of Outfall Pipe	0.600

Time / Area Diagram

Total Area (ha) = 0.149

Time (mins)	Area (ha)
from: to:	
0 4	0.149

(c)1982-2006 Micro Drainage

T J Booth Associates		Page 4
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 117.000 Ground Level (m) 118.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	48.0	0.60	85.0	1.20	1000.0	1.80	1000.0	2.40	1000.0
0.10	53.0	0.70	92.0	1.30	1000.0	1.90	1000.0	2.50	1000.0
0.20	59.0	0.80	99.0	1.40	1000.0	2.00	1000.0		
0.30	65.0	0.90	107.0	1.50	1000.0	2.10	1000.0		
0.40	72.0	1.00	115.0	1.60	1000.0	2.20	1000.0		
0.50	78.0	1.10	1000.0	1.70	1000.0	2.30	1000.0		

Depth / Flow Outflow Control

Invert Level of Control 116.900

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	3.5	0.80	4.3	2.00	6.8	4.00	9.6	7.00	12.8
0.20	4.8	1.00	4.8	2.20	7.1	4.50	10.2	7.50	13.2
0.30	5.0	1.20	5.2	2.40	7.5	5.00	10.8	8.00	13.6
0.40	5.0	1.40	5.6	2.60	7.8	5.50	11.3	8.50	14.1
0.50	4.8	1.60	6.1	3.00	8.3	6.00	11.8	9.00	14.5
0.60	4.6	1.80	6.5	3.50	9.0	6.50	12.3	9.50	14.9

(c)1982-2006 Micro Drainage

T J Booth Associates		Page 1
104 Yorkshire St Rochdale Lancashire OL16 1JY	full site attenuation dickens property grp brownhill cl & bury rd	
Date nov 2024 File CALC-T-1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 100 year Return Period (+45%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	5.0	5.0	117.5027	0.5027	31.4	O K
30 Summer	5.0	5.0	117.6128	0.6128	40.5	O K
60 Summer	5.0	5.0	117.7163	0.7163	49.7	O K
120 Summer	5.0	5.0	117.7468	0.7468	52.6	O K
180 Summer	5.0	5.0	117.7348	0.7348	51.5	O K
240 Summer	5.0	5.0	117.7193	0.7193	50.0	O K
360 Summer	5.0	5.0	117.6823	0.6823	46.6	O K
480 Summer	5.0	5.0	117.6378	0.6378	42.6	O K
600 Summer	5.0	5.0	117.5888	0.5888	38.4	O K
720 Summer	5.0	5.0	117.5378	0.5377	34.2	O K
960 Summer	5.0	5.0	117.4332	0.4332	26.1	O K
1440 Summer	5.0	5.0	117.2542	0.2542	13.9	O K
2160 Summer	4.8	4.8	117.1028	0.1028	5.2	O K
2880 Summer	4.1	4.1	117.0447	0.0448	2.2	O K
4320 Summer	3.3	3.3	117.0000	0.0000	0.0	O K
5760 Summer	2.6	2.6	117.0000	0.0000	0.0	O K
7200 Summer	2.2	2.2	117.0000	0.0000	0.0	O K
8640 Summer	2.1	2.1	117.0000	0.0000	0.0	O K
10080 Summer	1.7	1.7	117.0000	0.0000	0.0	O K
15 Winter	5.0	5.0	117.5567	0.5567	35.7	O K
30 Winter	5.0	5.0	117.6928	0.6928	47.5	O K
60 Winter	5.0	5.0	117.7988	0.7988	57.6	O K
120 Winter	5.0	5.0	117.8448	0.8448	62.3	FLOOD RISK
180 Winter	5.0	5.0	117.8283	0.8283	60.6	FLOOD RISK
240 Winter	5.0	5.0	117.8048	0.8048	58.2	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	89.23	18
30 Summer	61.54	32
60 Summer	40.51	62
120 Summer	25.63	108
180 Summer	19.23	140
240 Summer	15.63	174
360 Summer	11.65	242
480 Summer	9.44	310
600 Summer	8.01	376
720 Summer	7.00	442
960 Summer	5.65	568
1440 Summer	4.17	794
2160 Summer	3.07	1124
2880 Summer	2.46	1472
4320 Summer	1.81	0
5760 Summer	1.45	0
7200 Summer	1.23	0
8640 Summer	1.07	0
10080 Summer	0.95	0
15 Winter	89.23	18
30 Winter	61.54	32
60 Winter	40.51	60
120 Winter	25.63	116
180 Winter	19.23	146
240 Winter	15.63	184

(c)1982-2006 Micro Drainage

T J Booth Associates

Page 2

104 Yorkshire St
Rochdale
Lancashire OL16 1JYfull site attenuation
dickens property grp
brownhill cl & bury rdDate nov 2024
File CALC-T-1.SRCDesigned By ds
Checked By**Micro
Drainage®**

Micro Drainage

Source Control W.10.4

Summary of Results for 100 year Return Period (+45%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
360 Winter	5.0	5.0	117.7528	0.7528	53.1	O K
480 Winter	5.0	5.0	117.6853	0.6853	46.9	O K
600 Winter	5.0	5.0	117.6063	0.6063	39.9	O K
720 Winter	5.0	5.0	117.5222	0.5222	33.0	O K
960 Winter	5.0	5.0	117.3517	0.3517	20.3	O K
1440 Winter	4.8	4.8	117.1243	0.1243	6.4	O K
2160 Winter	3.8	3.8	117.0242	0.0242	1.2	O K
2880 Winter	3.2	3.2	117.0000	0.0000	0.0	O K
4320 Winter	2.4	2.4	117.0000	0.0000	0.0	O K
5760 Winter	2.0	2.0	117.0000	0.0000	0.0	O K
7200 Winter	1.7	1.7	117.0000	0.0000	0.0	O K
8640 Winter	1.4	1.4	117.0000	0.0000	0.0	O K
10080 Winter	1.3	1.3	117.0000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	11.65	264
480 Winter	9.44	338
600 Winter	8.01	408
720 Winter	7.00	472
960 Winter	5.65	588
1440 Winter	4.17	792
2160 Winter	3.07	1128
2880 Winter	2.46	0
4320 Winter	1.81	0
5760 Winter	1.45	0
7200 Winter	1.23	0
8640 Winter	1.07	0
10080 Winter	0.95	0

(c)1982-2006 Micro Drainage

T J Booth Associates

Page 3

104 Yorkshire St
Rochdale
Lancashire OL16 1JYfull site attenuation
dickens property grp
brownhill cl & bury rdDate nov 2024
File CALC-T-1.SRCDesigned By ds
Checked By

Micro Drainage

Source Control W.10.4

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+45
Cv (Winter)	0.840		

Pipe Network

Volume in Pipe Network (m³)	1	Dia of Outfall Pipe (m)	0.200
Slope of Outfall Pipe (1:x)	40.0	Roughness of Outfall Pipe	0.600

Time / Area Diagram

Total Area (ha) = 0.149

Time	(mins)	Area
from:	to:	(ha)
0	4	0.149

T J Booth Associates

Page 4

104 Yorkshire St
Rochdale
Lancashire OL16 1JY

full site attenuation
dickens property grp
brownhill cl & bury rd

Date nov 2024
File CALC-T-1.SRC

Designed By ds
Checked By



Micro Drainage

Source Control W.10.4

Tank/Pond Details

Invert Level (m) 117.000 Ground Level (m) 118.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	48.0	0.60	85.0	1.20	1000.0	1.80	1000.0	2.40	1000.0
0.10	53.0	0.70	92.0	1.30	1000.0	1.90	1000.0	2.50	1000.0
0.20	59.0	0.80	99.0	1.40	1000.0	2.00	1000.0		
0.30	65.0	0.90	107.0	1.50	1000.0	2.10	1000.0		
0.40	72.0	1.00	115.0	1.60	1000.0	2.20	1000.0		
0.50	78.0	1.10	1000.0	1.70	1000.0	2.30	1000.0		

Depth / Flow Outflow Control

Invert Level of Control 116.900

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	3.5	0.80	4.3	2.00	6.8	4.00	9.6	7.00	12.8
0.20	4.8	1.00	4.8	2.20	7.1	4.50	10.2	7.50	13.2
0.30	5.0	1.20	5.2	2.40	7.5	5.00	10.8	8.00	13.6
0.40	5.0	1.40	5.6	2.60	7.8	5.50	11.3	8.50	14.1
0.50	4.8	1.60	6.1	3.00	8.3	6.00	11.8	9.00	14.5
0.60	4.6	1.80	6.5	3.50	9.0	6.50	12.3	9.50	14.9

(c)1982-2006 Micro Drainage

5.4 United Utilities Sewer Plans.

