PROPOSED RESIDENTIAL PROPERTIES

Edgelands Rise

Cudworth

Barnsley

S72 8EF

DRAINAGE REPORT

HM DESIGN
10 The Green York YO26 5LR 07919 031289

1. INTRODUCTION

This report provides the background information for the drainage design for two new properties to be built at Edgelands Rise Cudworth.

This report should be read in conjunction with HM Design drainage design drawing YH857/1.

This report and design is to be used to discharge planning condition 8 of planning consent 2021/0651.

2. LOCATION AND SITE

The site is immediately adjacent to Edgeland Rise.

3. EXISTING DRAINAGE

Existing private drains exist at the boundary of the site and will be used as the outfalls for this development.

4. SURFACE WATER ASSESSMENT

The surface water from this development should use Sustainable Drainage Systems (SuDS) to deal with the surface water. This system or systems should discharge surface water through one or more of the following, in this order of priority.

- Discharge to the ground (infiltration).
- Discharge to a surface water body.
- Discharge to a surface water sewer, highway drain or other drain.
- Discharge to a combined sewer.

<u>INFILTRATION.</u>

To determine if soakaways can be used on this development, a test to BRE Digest 365 was undertaken.

Photographs of the test hole and the test are provided below.

The photographs show that ground conditions are clay and that the water within the test pit did not reduce after more than 2 hours and so the test failed.

Therefore, infiltration has been ruled out as a means of surface water disposal.

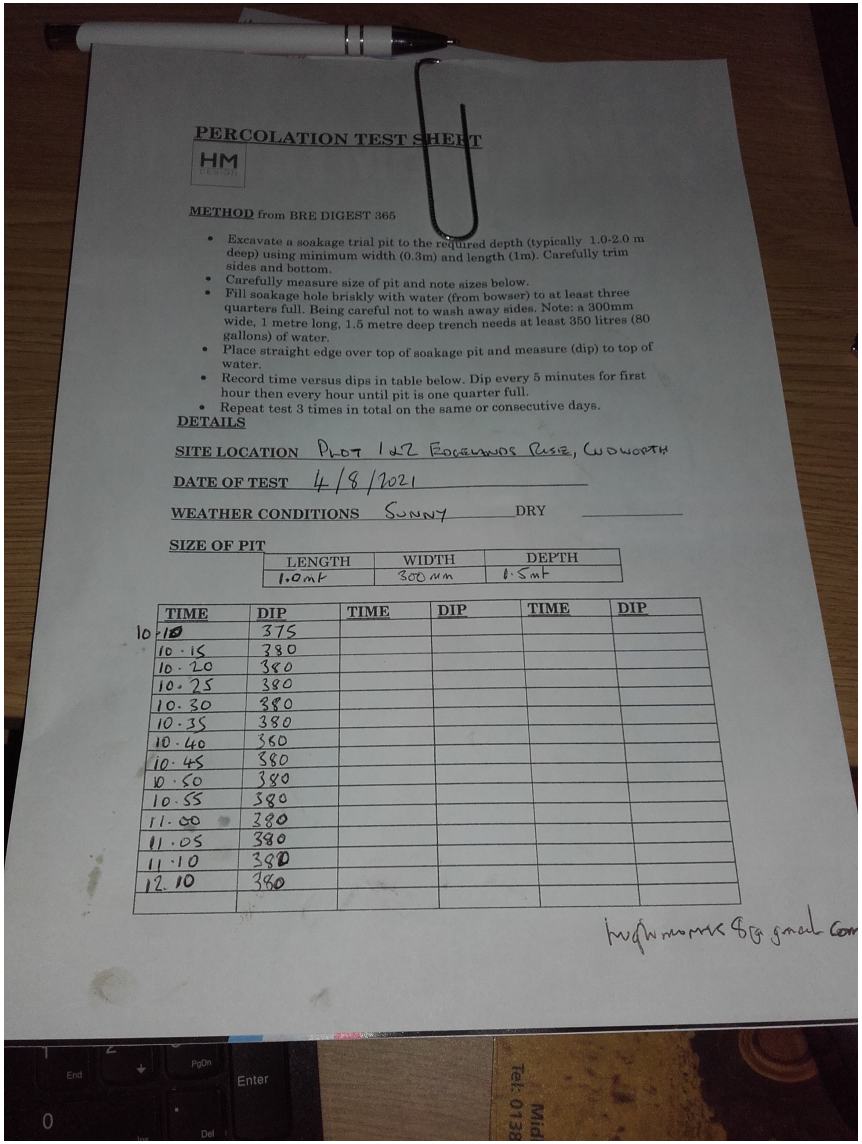




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PERCOLATION TEST SHEET

HM

METHOD from BRE DIGEST 365

- Excavate a soakage trial pit to the required depth (typically 1.0-2.0 m deep) using minimum width (0.3m) and length (1m). Carefully trim sides and bottom.
- Carefully measure size of pit and note sizes below.
- Fill soakage hole briskly with water (from bowser) to at least three quarters full. Being careful not to wash away sides. Note: a 300mm wide, 1 metre long, 1.5 metre deep trench needs at least 350 litres (80 gallons) of water.
- Place straight edge over top of soakage pit and measure (dip) to top of water.
- Record time versus dips in table below. Dip every 5 minutes for first hour then every hour until pit is one quarter full.
- Repeat test 3 times in total on the same or consecutive days.

DETAILS

SITE LOCATION Plot 122 Edgelands Rise, Cawood

DATE OF TEST 4/8/2021

WEATHER CONDITIONS Sunny DRY

SIZE OF PIT

LENGTH	WIDTH	DEPTH
1.0mt	300mm	1.5mt

TIME	DIP	TIME	DIP	TIME	DIP
10.00	375				
10.15	380				
10.20	380				
10.25	380				
10.30	380				
10.35	380				
10.40	380				
10.45	380				
10.50	380				
10.55	380				
11.00	380				
11.05	380				
11.10	380				
12.10	380				



DISCHARGE TO SURFACE WATER BODY

No surface water body is available on or close to this site.

DISCHARGE TO SEWER

A private drain exists at the boundary on site, which connects to the public sewer. This will be used as the outfall to the public sewer.

5. CLIMATE CHANGE

All calculations within this report include a climate change allowance of +40%

6. IMPERMEABLE AREAS

The total impermeable areas are the roof areas and the driveway areas for both properties and are 198 sq m and 209 sq m a total of 407 sq m (0.041 hectares).

A plan is shown below with the impermeable areas hatched.



7. SURFACE WATER DESIGN

The surface water drainage is to be connection to the surface water sewer with a restricted flow. The flow suggests is 2l/s to reduce peaks flows from the site, yet allow a reasonable size orifice be used in the flow control device.

Surface water will require storage on site, supplied by cellular storage under the front garden of the proposed houses.

The Microdrainage program has been used to determine the storage volume. The calculations have been based on the following parameters.

Impermeable area = 0.041hectares
1 in 100 year return period storm
40% climate change
Maximum discharge 2l/s, in all events and durations.

The Microdrainage calculations how that the maximum storage volume required is and this is a minimum of 13.5 Cu m that can be supplied by a cellular storage system 12m x 3m x 0.4m deep. The Microdrainage calculations are appended to this report.

8. FOUL DRAINAGE

This development will be connected to the public sewer via a private drain at the boundary of the site.

9. CONCLUSIONS

- This development site can be drained successfully.
- Surface water from the development will be disposed of by connection to the existing drain on site at a maximum rate of 2l/s.
- The surface water storage will cater for all storms up to 1 in 100 year plus 40% climate change.
- Foul water will be connected to the public foul sewerage system.

Report by



Hugh Morris BSc CEng MICE
23/08/2021

APPENDIX

- MICRODRAINAGE STORAGE CALCULATIONS
  1 in 100 year plus 40% climate change.

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 62 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	48.597	0.247	0.0	2.0	2.0	8.4	O K
30 min Summer	48.659	0.309	0.0	2.0	2.0	10.6	O K
60 min Summer	48.695	0.345	0.0	2.0	2.0	11.8	O K
120 min Summer	48.697	0.347	0.0	2.0	2.0	11.9	O K
180 min Summer	48.678	0.328	0.0	2.0	2.0	11.2	O K
240 min Summer	48.650	0.300	0.0	2.0	2.0	10.3	O K
360 min Summer	48.595	0.245	0.0	2.0	2.0	8.4	O K
480 min Summer	48.549	0.199	0.0	2.0	2.0	6.8	O K
600 min Summer	48.511	0.161	0.0	2.0	2.0	5.5	O K
720 min Summer	48.482	0.132	0.0	2.0	2.0	4.5	O K
960 min Summer	48.446	0.096	0.0	2.0	2.0	3.3	O K
1440 min Summer	48.423	0.073	0.0	1.6	1.6	2.5	O K
2160 min Summer	48.408	0.058	0.0	1.2	1.2	2.0	O K
2880 min Summer	48.400	0.050	0.0	0.9	0.9	1.7	O K
4320 min Summer	48.391	0.041	0.0	0.7	0.7	1.4	O K
5760 min Summer	48.386	0.036	0.0	0.6	0.6	1.2	O K
7200 min Summer	48.383	0.033	0.0	0.5	0.5	1.1	O K
8640 min Summer	48.380	0.030	0.0	0.4	0.4	1.0	O K
10080 min Summer	48.378	0.028	0.0	0.4	0.4	1.0	O K
15 min Winter	48.630	0.280	0.0	2.0	2.0	9.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	126.841	0.0	9.7	17
30 min Summer	84.549	0.0	13.0	31
60 min Summer	53.779	0.0	16.5	54
120 min Summer	33.057	0.0	20.3	88
180 min Summer	24.523	0.0	22.6	122
240 min Summer	19.713	0.0	24.2	156
360 min Summer	14.420	0.0	26.6	220
480 min Summer	11.554	0.0	28.4	280
600 min Summer	9.721	0.0	29.9	338
720 min Summer	8.437	0.0	31.1	392
960 min Summer	6.742	0.0	33.2	502
1440 min Summer	4.906	0.0	36.2	736
2160 min Summer	3.563	0.0	39.4	1100
2880 min Summer	2.836	0.0	41.8	1468
4320 min Summer	2.053	0.0	45.4	2176
5760 min Summer	1.631	0.0	48.1	2912
7200 min Summer	1.363	0.0	50.3	3648
8640 min Summer	1.176	0.0	52.1	4328
10080 min Summer	1.039	0.0	53.7	5120
15 min Winter	126.841	0.0	10.9	17

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Summary of Results for 100 year Return Period (+40%)

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	48.703	0.353	0.0	2.0	2.0	12.1	O K
60 min Winter	48.745	0.395	0.0	2.0	2.0	13.5	O K
120 min Winter	48.743	0.393	0.0	2.0	2.0	13.4	O K
180 min Winter	48.714	0.364	0.0	2.0	2.0	12.4	O K
240 min Winter	48.675	0.325	0.0	2.0	2.0	11.1	O K
360 min Winter	48.585	0.235	0.0	2.0	2.0	8.1	O K
480 min Winter	48.516	0.166	0.0	2.0	2.0	5.7	O K
600 min Winter	48.468	0.118	0.0	2.0	2.0	4.0	O K
720 min Winter	48.442	0.092	0.0	1.9	1.9	3.1	O K
960 min Winter	48.424	0.074	0.0	1.6	1.6	2.5	O K
1440 min Winter	48.408	0.058	0.0	1.2	1.2	2.0	O K
2160 min Winter	48.397	0.047	0.0	0.9	0.9	1.6	O K
2880 min Winter	48.391	0.041	0.0	0.7	0.7	1.4	O K
4320 min Winter	48.384	0.034	0.0	0.5	0.5	1.2	O K
5760 min Winter	48.380	0.030	0.0	0.4	0.4	1.0	O K
7200 min Winter	48.377	0.027	0.0	0.3	0.3	0.9	O K
8640 min Winter	48.375	0.025	0.0	0.3	0.3	0.9	O K
10080 min Winter	48.374	0.024	0.0	0.3	0.3	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	84.549	0.0	14.5	31
60 min Winter	53.779	0.0	18.5	58
120 min Winter	33.057	0.0	22.8	94
180 min Winter	24.523	0.0	25.3	132
240 min Winter	19.713	0.0	27.1	170
360 min Winter	14.420	0.0	29.8	234
480 min Winter	11.554	0.0	31.8	292
600 min Winter	9.721	0.0	33.5	342
720 min Winter	8.437	0.0	34.9	384
960 min Winter	6.742	0.0	37.1	502
1440 min Winter	4.906	0.0	40.5	738
2160 min Winter	3.563	0.0	44.2	1092
2880 min Winter	2.836	0.0	46.9	1452
4320 min Winter	2.053	0.0	50.9	2184
5760 min Winter	1.631	0.0	53.9	2848
7200 min Winter	1.363	0.0	56.3	3672
8640 min Winter	1.176	0.0	58.3	4320
10080 min Winter	1.039	0.0	60.1	5080

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.368	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.041

Time From:	(mins) To:	Area (ha)
0	4	0.041

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Model Details

Storage is Online Cover Level (m) 49.200

Cellular Storage Structure

Invert Level (m) 48.350 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	36.0	36.0	0.401	0.0	45.6
0.400	36.0	45.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2000-0450-2000
Design Head (m)	0.450
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	48.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.450	2.0
Flush-Flo™	0.137	2.0
Kick-Flo®	0.317	1.7
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.1	3.000	4.8	7.000	7.2
0.200	2.0	1.400	3.4	3.500	5.1	7.500	7.5
0.300	1.8	1.600	3.6	4.000	5.5	8.000	7.7
0.400	1.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.1	2.000	4.0	5.000	6.1	9.000	8.2
0.600	2.3	2.200	4.1	5.500	6.4	9.500	8.4
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

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