

HAZEL COTTAGE RUFFORTH

HYDRAULICS REPORT

1. INTRODUCTION

This report provides the background to the surface water and foul design for a development at Hazel Cottage, Rufforth.

2. SURFACE WATER SCHEME

Investigations show that no infiltration is possible on site as the strata is clay. No surface water sewers are available for surface water disposal.

The surface water scheme on the development is to discharge the surface water to the existing combined drain on site at a rate of 0.5l/s, with storage provided as cellular storage under the driveway.

The existing house roof to remain as existing.

3. HYDRAULIC CALCULATIONS

The SuDS system has been modelled in Microdrainage with the following criteria:-

M5-60 = 19mm

Ration $r = 0.4$

Return period 1 in 100 years

Climate change +30%

Contributing areas (roof areas of new house) = 61 sq m and driveway 95 sq m.
(0.016hectares).

The proposed system works satisfactorily in the 1 in 100 year storm plus 30% climate change with no flooding, whilst discharge is limited to 0.5l/s.

The Microdrainage calculations show that the 120 minute storm is the critical event, requiring 5.8 Cu m of storage.

4. FOUL WATER

Foul water will be connected to the public foul sewerage system.




Report by

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HM Design



APPENDED: Microdrainage Calculations


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| Micro Drainage | Source Control 2020.1 | |

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 134 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Outflow (l/s) | Max Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|-------------------|-----------------|--------|
| 15 min Summer | 15.567 | 0.117 | 0.0 | 0.4 | 0.4 | 3.3 | O K |
| 30 min Summer | 15.597 | 0.147 | 0.0 | 0.4 | 0.4 | 4.2 | O K |
| 60 min Summer | 15.619 | 0.169 | 0.0 | 0.4 | 0.4 | 4.8 | O K |
| 120 min Summer | 15.626 | 0.176 | 0.0 | 0.4 | 0.4 | 5.0 | O K |
| 180 min Summer | 15.623 | 0.173 | 0.0 | 0.4 | 0.4 | 4.9 | O K |
| 240 min Summer | 15.617 | 0.167 | 0.0 | 0.4 | 0.4 | 4.8 | O K |
| 360 min Summer | 15.604 | 0.154 | 0.0 | 0.4 | 0.4 | 4.4 | O K |
| 480 min Summer | 15.593 | 0.143 | 0.0 | 0.4 | 0.4 | 4.1 | O K |
| 600 min Summer | 15.582 | 0.132 | 0.0 | 0.4 | 0.4 | 3.8 | O K |
| 720 min Summer | 15.573 | 0.123 | 0.0 | 0.4 | 0.4 | 3.5 | O K |
| 960 min Summer | 15.556 | 0.106 | 0.0 | 0.4 | 0.4 | 3.0 | O K |
| 1440 min Summer | 15.529 | 0.079 | 0.0 | 0.3 | 0.3 | 2.3 | O K |
| 2160 min Summer | 15.501 | 0.051 | 0.0 | 0.3 | 0.3 | 1.5 | O K |
| 2880 min Summer | 15.482 | 0.032 | 0.0 | 0.2 | 0.2 | 0.9 | O K |
| 4320 min Summer | 15.460 | 0.010 | 0.0 | 0.2 | 0.2 | 0.3 | O K |
| 5760 min Summer | 15.450 | 0.000 | 0.0 | 0.2 | 0.2 | 0.0 | O K |
| 7200 min Summer | 15.450 | 0.000 | 0.0 | 0.2 | 0.2 | 0.0 | O K |
| 8640 min Summer | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |
| 10080 min Summer | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |
| 15 min Winter | 15.582 | 0.132 | 0.0 | 0.4 | 0.4 | 3.8 | O K |


| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 15 min Summer | 121.269 | 0.0 | 3.6 | 18 |
| 30 min Summer | 79.695 | 0.0 | 4.8 | 32 |
| 60 min Summer | 49.937 | 0.0 | 6.0 | 60 |
| 120 min Summer | 30.267 | 0.0 | 7.3 | 102 |
| 180 min Summer | 22.297 | 0.0 | 8.0 | 134 |
| 240 min Summer | 17.851 | 0.0 | 8.5 | 168 |
| 360 min Summer | 12.957 | 0.0 | 9.3 | 236 |
| 480 min Summer | 10.330 | 0.0 | 9.9 | 306 |
| 600 min Summer | 8.659 | 0.0 | 10.4 | 374 |
| 720 min Summer | 7.492 | 0.0 | 10.8 | 440 |
| 960 min Summer | 5.959 | 0.0 | 11.4 | 568 |
| 1440 min Summer | 4.309 | 0.0 | 12.4 | 822 |
| 2160 min Summer | 3.110 | 0.0 | 13.4 | 1188 |
| 2880 min Summer | 2.466 | 0.0 | 14.2 | 1552 |
| 4320 min Summer | 1.775 | 0.0 | 15.3 | 2248 |
| 5760 min Summer | 1.405 | 0.0 | 16.2 | 2936 |
| 7200 min Summer | 1.171 | 0.0 | 16.9 | 0 |
| 8640 min Summer | 1.008 | 0.0 | 17.4 | 0 |
| 10080 min Summer | 0.889 | 0.0 | 17.9 | 0 |
| 15 min Winter | 121.269 | 0.0 | 4.1 | 18 |

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Summary of Results for 100 year Return Period (+30%)

| 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 | 15.617 | 0.167 | 0.0 | 0.4 | 0.4 | 4.8 | O K |
| 60 min Winter | 15.644 | 0.194 | 0.0 | 0.4 | 0.4 | 5.5 | O K |
| 120 min Winter | 15.654 | 0.204 | 0.0 | 0.5 | 0.5 | 5.8 | O K |
| 180 min Winter | 15.650 | 0.200 | 0.0 | 0.5 | 0.5 | 5.7 | O K |
| 240 min Winter | 15.643 | 0.193 | 0.0 | 0.4 | 0.4 | 5.5 | O K |
| 360 min Winter | 15.624 | 0.174 | 0.0 | 0.4 | 0.4 | 5.0 | O K |
| 480 min Winter | 15.607 | 0.157 | 0.0 | 0.4 | 0.4 | 4.5 | O K |
| 600 min Winter | 15.592 | 0.142 | 0.0 | 0.4 | 0.4 | 4.0 | O K |
| 720 min Winter | 15.578 | 0.128 | 0.0 | 0.4 | 0.4 | 3.7 | O K |
| 960 min Winter | 15.554 | 0.104 | 0.0 | 0.3 | 0.3 | 3.0 | O K |
| 1440 min Winter | 15.519 | 0.069 | 0.0 | 0.3 | 0.3 | 2.0 | O K |
| 2160 min Winter | 15.485 | 0.035 | 0.0 | 0.3 | 0.3 | 1.0 | O K |
| 2880 min Winter | 15.464 | 0.014 | 0.0 | 0.2 | 0.2 | 0.4 | O K |
| 4320 min Winter | 15.450 | 0.000 | 0.0 | 0.2 | 0.2 | 0.0 | O K |
| 5760 min Winter | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |
| 7200 min Winter | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |
| 8640 min Winter | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |
| 10080 min Winter | 15.450 | 0.000 | 0.0 | 0.1 | 0.1 | 0.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 30 min Winter | 79.695 | 0.0 | 5.3 | 32 |
| 60 min Winter | 49.937 | 0.0 | 6.7 | 60 |
| 120 min Winter | 30.267 | 0.0 | 8.1 | 114 |
| 180 min Winter | 22.297 | 0.0 | 9.0 | 142 |
| 240 min Winter | 17.851 | 0.0 | 9.6 | 180 |
| 360 min Winter | 12.957 | 0.0 | 10.4 | 256 |
| 480 min Winter | 10.330 | 0.0 | 11.1 | 330 |
| 600 min Winter | 8.659 | 0.0 | 11.6 | 400 |
| 720 min Winter | 7.492 | 0.0 | 12.1 | 470 |
| 960 min Winter | 5.959 | 0.0 | 12.8 | 604 |
| 1440 min Winter | 4.309 | 0.0 | 13.9 | 854 |
| 2160 min Winter | 3.110 | 0.0 | 15.0 | 1216 |
| 2880 min Winter | 2.466 | 0.0 | 15.9 | 1584 |
| 4320 min Winter | 1.775 | 0.0 | 17.2 | 0 |
| 5760 min Winter | 1.405 | 0.0 | 18.1 | 0 |
| 7200 min Winter | 1.171 | 0.0 | 18.9 | 0 |
| 8640 min Winter | 1.008 | 0.0 | 19.5 | 0 |
| 10080 min Winter | 0.889 | 0.0 | 20.1 | 0 |

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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 | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +30 |

Time Area Diagram

Total Area (ha) 0.016

| Time (mins) | Area |
|-------------|---------|
| From: To: | (ha) |
| 0 | 4 0.016 |

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Model Details

Storage is Online Cover Level (m) 16.000

Cellular Storage Structure

Invert Level (m) 15.450 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m ²) | Inf. Area (m ²) | Depth (m) | Area (m ²) | Inf. Area (m ²) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000 | 30.0 | 30.0 | 0.211 | 0.0 | 34.6 |
| 0.210 | 30.0 | 34.6 | | | |

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 15.400