## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

| | | | |
|---|---|---|---|
| Return Period (years) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 20.000 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.348 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 200 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Inverts

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|
| 0-4 | 0.000 | 4-8 | 0.000 | 8-12 | 0.297 | 12-16 | 0.569 | 16-20 | 0.024 |

Total Area Contributing (ha) = 0.890

Total Pipe Volume (m³) = 104.133

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | n | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 31.599 | 0.200 | 158.0 | 0.045 | 5.00 | 0.0 | 0.600 | | o | 225 | Pipe/Conduit | |
| S2.000 | 7.423 | 0.050 | 148.5 | 0.085 | 5.00 | 0.0 | 0.600 | | o | 225 | Pipe/Conduit | |

### Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 62.85 | 5.51 | 22.600 | 0.045 | 0.0 | 0.0 | 0.0 | 1.04 | 41.3 | 7.7 |
| S2.000 | 64.79 | 5.12 | 22.450 | 0.085 | 0.0 | 0.0 | 0.0 | 1.07 | 42.6 | 14.9 |

©1982-2020 Innovyze

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | n | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.001 | 24.648 | 0.120 | 205.4 | 0.010 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S3.000 | 7.195 | 0.048 | 149.9 | 0.035 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S1.002 | 34.068 | 0.140 | 243.3 | 0.060 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S4.000 | 7.120 | 0.060 | 118.7 | 0.035 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S1.003 | 18.234 | 0.080 | 227.9 | 0.035 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S5.000 | 4.429 | 0.040 | 110.7 | 0.035 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S1.004 | 10.530 | 0.040 | 263.3 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S6.000 | 7.121 | 0.051 | 139.6 | 0.035 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S1.005 | 13.943 | 0.059 | 236.3 | 0.035 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S1.006 | 47.539 | 0.200 | 237.7 | 0.115 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.001 | 61.11 | 5.88 | 22.400 | 0.140 | 0.0 | 0.0 | 0.0 | 1.09 | 77.3 | 23.2 |
| S3.000 | 64.63 | 5.15 | 22.500 | 0.035 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 6.1 |
| S1.002 | 58.69 | 6.45 | 22.280 | 0.235 | 0.0 | 0.0 | 0.0 | 1.00 | 70.9 | 37.4 |
| S4.000 | 64.72 | 5.13 | 22.200 | 0.035 | 0.0 | 0.0 | 0.0 | 0.92 | 16.3 | 6.1 |
| S1.003 | 57.53 | 6.74 | 22.140 | 0.305 | 0.0 | 0.0 | 0.0 | 1.04 | 73.3 | 47.5 |
| S5.000 | 64.99 | 5.08 | 22.100 | 0.035 | 0.0 | 0.0 | 0.0 | 0.95 | 16.9 | 6.2 |
| S1.004 | 56.83 | 6.92 | 22.060 | 0.340 | 0.0 | 0.0 | 0.0 | 0.96 | 68.2 | 52.3 |
| S6.000 | 64.67 | 5.14 | 22.070 | 0.035 | 0.0 | 0.0 | 0.0 | 0.85 | 15.0 | 6.1 |
| S1.005 | 55.99 | 7.15 | 22.019 | 0.410 | 0.0 | 0.0 | 0.0 | 1.02 | 72.0 | 62.2 |
| S1.006 | 53.31 | 7.93 | 21.960 | 0.525 | 0.0 | 0.0 | 0.0 | 1.02 | 71.8« | 75.8 |

©1982-2020 Innovyze

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | n | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S7.000 | 26.965 | 0.115 | 234.5 | 0.065 | 5.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S8.000 | 4.426 | 0.050 | 88.5 | 0.039 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S7.001 | 55.419 | 0.230 | 241.0 | 0.080 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S9.000 | 5.919 | 0.050 | 118.4 | 0.065 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S10.000 | 6.283 | 0.050 | 125.7 | 0.025 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S7.002 | 9.185 | 0.040 | 229.6 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S7.003 | 5.000 | 0.020 | 250.0 | 0.010 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S1.007 | 18.338 | 0.075 | 244.5 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S11.000 | 28.016 | 0.093 | 301.2 | 0.081 | 5.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S12.000 | 4.034 | 0.065 | 62.1 | 0.000 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S1.008 | 8.312 | 0.035 | 237.5 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 375 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S7.000 | 63.17 | 5.44 | 22.165 | 0.065 | 0.0 | 0.0 | 0.0 | 1.02 | 72.3 | 11.1 |
| S8.000 | 65.03 | 5.07 | 22.100 | 0.039 | 0.0 | 0.0 | 0.0 | 1.07 | 18.9 | 6.9 |
| S7.001 | 59.08 | 6.36 | 22.050 | 0.184 | 0.0 | 0.0 | 0.0 | 1.01 | 71.3 | 29.4 |
| S9.000 | 64.84 | 5.11 | 21.870 | 0.065 | 0.0 | 0.0 | 0.0 | 0.92 | 16.3 | 11.4 |
| S10.000 | 64.79 | 5.12 | 21.870 | 0.025 | 0.0 | 0.0 | 0.0 | 0.90 | 15.8 | 4.4 |
| S7.002 | 58.47 | 6.50 | 21.820 | 0.274 | 0.0 | 0.0 | 0.0 | 1.03 | 73.0 | 43.4 |
| S7.003 | 58.14 | 6.59 | 21.780 | 0.284 | 0.0 | 0.0 | 0.0 | 0.99 | 70.0 | 44.7 |
| S1.007 | 52.35 | 8.24 | 21.760 | 0.809 | 0.0 | 0.0 | 0.0 | 1.00 | 70.8« | 114.7 |
| S11.000 | 62.80 | 5.52 | 21.800 | 0.081 | 0.0 | 0.0 | 0.0 | 0.90 | 63.7 | 13.8 |
| S12.000 | 65.12 | 5.05 | 21.750 | 0.000 | 0.0 | 0.0 | 0.0 | 1.28 | 22.6 | 0.0 |
| S1.008 | 51.98 | 8.36 | 21.685 | 0.890 | 0.0 | 0.0 | 0.0 | 1.17 | 129.4 | 125.3 |

©1982-2020 Innovyze

## Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | n | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S13.000 | 16.792 | 0.600 | 28.0 | 0.000 | 5.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S13.001 | 21.695 | 0.840 | 25.8 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |
| S13.002 | 43.740 | 0.550 | 79.5 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 225 | Pipe/Conduit | |
| S13.003 | 4.870 | 0.030 | 162.3 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 375 | Pipe/Conduit | |
| S13.004 | 5.692 | 0.010 | 569.2 | 0.000 | 0.00 | 0.0 | | 0.350 | 1.5 _/ | 500 | 1:1.5 Ditch | |
| S13.005 | 7.343 | 0.030 | 244.8 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 450 | Pipe/Conduit | |
| S13.006 | 16.855 | 0.050 | 337.1 | 0.000 | 0.00 | 0.0 | | 0.350 | 1.5 _/ | 500 | 1:1.5 Ditch | |
| S1.009 | 9.945 | 0.050 | 198.9 | 0.000 | 0.00 | 0.0 | | 0.350 | 1.5 _/ | 500 | 1:1.5 Ditch | |
| S1.010 | 10.448 | 0.079 | 132.3 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S1.011 | 28.212 | 0.001 | 28212.0 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 300 | Pipe/Conduit | |
| S1.012 | 18.413 | 0.061 | 301.9 | 0.000 | 0.00 | 0.0 | 0.600 | | o | 150 | Pipe/Conduit | |

## Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| S13.000 | 64.63 | 5.15 | 23.300 | 0.000 | 0.0 | 0.0 | 0.0 | 1.91 | 33.8 | 0.0 |
| S13.001 | 63.72 | 5.33 | 22.900 | 0.000 | 0.0 | 0.0 | 0.0 | 1.99 | 35.2 | 0.0 |
| S13.002 | 61.37 | 5.82 | 22.060 | 0.000 | 0.0 | 0.0 | 0.0 | 1.47 | 58.4 | 0.0 |
| S13.003 | 61.11 | 5.88 | 21.510 | 0.000 | 0.0 | 0.0 | 0.0 | 1.42 | 156.8 | 0.0 |
| S13.004 | 51.96 | 8.37 | 21.480 | 0.000 | 0.0 | 0.0 | 0.0 | 0.04 | 10.9 | 0.0 |
| S13.005 | 51.67 | 8.46 | 21.470 | 0.000 | 0.0 | 0.0 | 0.0 | 1.30 | 206.0 | 0.0 |
| S13.006 | 39.57 | 14.12 | 21.440 | 0.000 | 0.0 | 0.0 | 0.0 | 0.05 | 14.1 | 0.0 |
| S1.009 | 36.03 | 16.68 | 21.390 | 0.890 | 0.0 | 0.0 | 0.0 | 0.06 | 18.4« | 125.3 |
| S1.010 | 35.88 | 16.81 | 21.340 | 0.890 | 0.0 | 0.0 | 0.0 | 1.37 | 96.5« | 125.3 |
| S1.011 | 30.38 | 22.33 | 21.261 | 0.890 | 0.0 | 0.0 | 0.0 | 0.09 | 6.0« | 125.3 |
| S1.012 | 29.95 | 22.86 | 21.260 | 0.890 | 0.0 | 0.0 | 0.0 | 0.57 | 10.1« | 125.3 |

©1982-2020 Innovyze

## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 23.900 | 1.300 | Open Manhole | 1200 | S1.000 | 22.600 | 225 | | | | |
| S2 | 23.850 | 1.400 | Open Manhole | 1200 | S2.000 | 22.450 | 225 | | | | |
| S3 | 23.850 | 1.450 | Open Manhole | 1200 | S1.001 | 22.400 | 300 | S1.000 | 22.400 | 225 | |
| | | | | | | | | S2.000 | 22.400 | 225 | |
| S4 | 23.870 | 1.370 | Open Manhole | 1200 | S3.000 | 22.500 | 150 | | | | |
| S5 | 23.760 | 1.480 | Open Manhole | 1200 | S1.002 | 22.280 | 300 | S1.001 | 22.280 | 300 | |
| | | | | | | | | S3.000 | 22.452 | 150 | 22 |
| S6 | 23.190 | 0.990 | Open Manhole | 1200 | S4.000 | 22.200 | 150 | | | | |
| S7 | 23.100 | 0.960 | Open Manhole | 1200 | S1.003 | 22.140 | 300 | S1.002 | 22.140 | 300 | |
| | | | | | | | | S4.000 | 22.140 | 150 | |
| S8 | 23.045 | 0.945 | Open Manhole | 1200 | S5.000 | 22.100 | 150 | | | | |
| S9 | 23.080 | 1.020 | Open Manhole | 1200 | S1.004 | 22.060 | 300 | S1.003 | 22.060 | 300 | |
| | | | | | | | | S5.000 | 22.060 | 150 | |
| S10 | 23.190 | 1.120 | Open Manhole | 1200 | S6.000 | 22.070 | 150 | | | | |
| S11 | 23.080 | 1.061 | Open Manhole | 1200 | S1.005 | 22.019 | 300 | S1.004 | 22.020 | 300 | 1 |
| | | | | | | | | S6.000 | 22.019 | 150 | |
| S12 | 23.930 | 1.970 | Open Manhole | 1200 | S1.006 | 21.960 | 300 | S1.005 | 21.960 | 300 | |
| S13 | 24.000 | 1.835 | Open Manhole | 1200 | S7.000 | 22.165 | 300 | | | | |
| S14 | 23.345 | 1.245 | Open Manhole | 1200 | S8.000 | 22.100 | 150 | | | | |
| S15 | 23.300 | 1.250 | Open Manhole | 1200 | S7.001 | 22.050 | 300 | S7.000 | 22.050 | 300 | |
| | | | | | | | | S8.000 | 22.050 | 150 | |
| S16 | 23.045 | 1.175 | Open Manhole | 1200 | S9.000 | 21.870 | 150 | | | | |
| S17 | 23.210 | 1.340 | Open Manhole | 1200 | S10.000 | 21.870 | 150 | | | | |
| S18 | 23.125 | 1.305 | Open Manhole | 1200 | S7.002 | 21.820 | 300 | S7.001 | 21.820 | 300 | |
| | | | | | | | | S9.000 | 21.820 | 150 | |
| | | | | | | | | S10.000 | 21.820 | 150 | |
| S19 | 22.700 | 0.920 | Open Manhole | 1200 | S7.003 | 21.780 | 300 | S7.002 | 21.780 | 300 | |
| S20 | 22.900 | 1.140 | Open Manhole | 1200 | S1.007 | 21.760 | 300 | S1.006 | 21.760 | 300 | |
| | | | | | | | | S7.003 | 21.760 | 300 | |
| S21 | 22.500 | 0.700 | Open Manhole | 1200 | S11.000 | 21.800 | 300 | | | | |
| S22 | 22.500 | 0.750 | Open Manhole | 1200 | S12.000 | 21.750 | 150 | | | | |
| S22 | 22.550 | 0.865 | Open Manhole | 1350 | S1.008 | 21.685 | 375 | S1.007 | 21.685 | 300 | |
| | | | | | | | | S11.000 | 21.707 | 300 | |
| | | | | | | | | S12.000 | 21.685 | 150 | |

©1982-2020 Innovyze

## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S23 | 24.300 | 1.000 | Open Manhole | 1200 | S13.000 | 23.300 | 150 | | | | |
| S24 | 23.960 | 1.260 | Open Manhole | 1200 | S13.001 | 22.900 | 150 | S13.000 | 22.700 | 150 | |
| S25 | 23.150 | 1.090 | Open Manhole | 1200 | S13.002 | 22.060 | 225 | S13.001 | 22.060 | 150 | |
| S26 | 22.700 | 1.190 | Open Manhole | 1350 | S13.003 | 21.510 | 375 | S13.002 | 21.510 | 225 | |
| S27 | 22.500 | 1.020 | Junction | | S13.004 | 21.480 | 500 | S13.003 | 21.480 | 375 | |
| S28 | 22.500 | 1.030 | Junction | | S13.005 | 21.470 | 450 | S13.004 | 21.470 | 500 | |
| S29 | 22.500 | 1.060 | Junction | | S13.006 | 21.440 | 500 | S13.005 | 21.440 | 450 | |
| S30 | 22.500 | 1.110 | Junction | | S1.009 | 21.390 | 500 | S1.008 | 21.650 | 375 | 335 |
| | | | | | | | | S13.006 | 21.390 | 500 | |
| S31 | 22.500 | 1.160 | Junction | | S1.010 | 21.340 | 300 | S1.009 | 21.340 | 500 | |
| S32 | 22.500 | 1.239 | Open Manhole | 1200 | S1.011 | 21.261 | 300 | S1.010 | 21.261 | 300 | |
| S33 | 22.350 | 1.090 | Open Manhole | 1200 | S1.012 | 21.260 | 150 | S1.011 | 21.260 | 300 | |
| S | 21.700 | 0.501 | Open Manhole | 0 | | OUTFALL | | S1.012 | 21.199 | 150 | |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S1 | 526880.870 | 118782.284 | 526880.870 | 118782.284 | Required |  |
| S2 | 526848.671 | 118786.414 | 526848.671 | 118786.414 | Required |  |
| S3 | 526851.278 | 118793.364 | 526851.278 | 118793.364 | Required |  |
| S4 | 526852.746 | 118816.976 | 526852.746 | 118816.976 | Required |  |
| S5 | 526859.921 | 118816.447 | 526859.921 | 118816.447 | Required |  |
| S6 | 526864.767 | 118848.875 | 526864.767 | 118848.875 | Required |  |

©1982-2020 Innovyze

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S7 | 526871.867 | 118848.352 | 526871.867 | 118848.352 | Required | |
| S8 | 526881.261 | 118862.170 | 526881.261 | 118862.170 | Required | |
| S9 | 526878.261 | 118865.429 | 526878.261 | 118865.429 | Required | |
| S10 | 526874.851 | 118875.813 | 526874.851 | 118875.813 | Required | |
| S11 | 526881.953 | 118875.290 | 526881.953 | 118875.290 | Required | |
| S12 | 526886.843 | 118888.348 | 526886.843 | 118888.348 | Required | |
| S13 | 526903.936 | 118784.170 | 526903.936 | 118784.170 | Required | |
| S14 | 526916.388 | 118806.165 | 526916.388 | 118806.165 | Required | |
| S15 | 526913.392 | 118809.423 | 526913.392 | 118809.423 | Required | |
| S16 | 526926.906 | 118861.343 | 526926.906 | 118861.343 | Required | |
| S17 | 526937.701 | 118857.361 | 526937.701 | 118857.361 | Required | |
| S18 | 526932.824 | 118861.323 | 526932.824 | 118861.323 | Required | |
| S19 | 526936.045 | 118869.925 | 526936.045 | 118869.925 | Required | |
| S20 | 526931.363 | 118871.678 | 526931.363 | 118871.678 | Required | |

©1982-2020 Innovyze

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S21 | 526911.556 | 118898.676 | 526911.556 | 118898.676 | Required | |
| S22 | 526936.411 | 118892.641 | 526936.411 | 118892.641 | Required | |
| S22 | 526937.793 | 118888.852 | 526937.793 | 118888.852 | Required | |
| S23 | 526907.158 | 118786.629 | 526907.158 | 118786.629 | Required | |
| S24 | 526919.696 | 118797.800 | 526919.696 | 118797.800 | Required | |
| S25 | 526928.359 | 118817.690 | 526928.359 | 118817.690 | Required | |
| S26 | 526939.355 | 118860.026 | 526939.355 | 118860.026 | Required | |
| S27 | 526944.145 | 118860.907 | | | No Entry | |
| S28 | 526946.282 | 118866.183 | | | No Entry | |
| S29 | 526947.181 | 118873.471 | | | No Entry | |
| S30 | 526945.981 | 118890.283 | | | No Entry | |
| S31 | 526945.174 | 118900.196 | | | No Entry | |
| S32 | 526938.723 | 118908.414 | 526938.723 | 118908.414 | Required | |
| S33 | 526911.257 | 118914.863 | 526911.257 | 118914.863 | Required | |



©1982-2020 Innovyze

## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S | 526893.747 | 118920.558 | | | No Entry | |

©1982-2020 Innovyze

## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.000 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 2.000 | - | - | 100 | 0.085 | 0.085 | 0.085 |
| 1.001 | - | - | 100 | 0.010 | 0.010 | 0.010 |
| 3.000 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 1.002 | - | - | 100 | 0.060 | 0.060 | 0.060 |
| 4.000 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 1.003 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 5.000 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 1.004 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 6.000 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 1.005 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 1.006 | - | - | 100 | 0.115 | 0.115 | 0.115 |
| 7.000 | - | - | 100 | 0.065 | 0.065 | 0.065 |
| 8.000 | - | - | 100 | 0.039 | 0.039 | 0.039 |
| 7.001 | - | - | 100 | 0.080 | 0.080 | 0.080 |
| 9.000 | - | - | 100 | 0.065 | 0.065 | 0.065 |
| 10.000 | - | - | 100 | 0.025 | 0.025 | 0.025 |
| 7.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.003 | - | - | 100 | 0.010 | 0.010 | 0.010 |
| 1.007 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 11.000 | - | - | 100 | 0.081 | 0.081 | 0.081 |
| 12.000 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.008 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.000 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.003 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.004 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.005 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 13.006 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.009 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.010 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.011 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.012 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 0.890 | 0.890 | 0.890 |

## Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---|---|---|---|---|---|---|
| S1.012 | S | 21.700 | 21.199 | 0.000 | 0 | 0 |

©1982-2020 Innovyze

## Online Controls for Storm

### Orifice Manhole: S3, DS/PN: S1.001, Volume (m³): 3.1

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 22.400

### Orifice Manhole: S5, DS/PN: S1.002, Volume (m³): 3.4

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 22.280

### Orifice Manhole: S11, DS/PN: S1.005, Volume (m³): 2.0

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 22.019

### Orifice Manhole: S15, DS/PN: S7.001, Volume (m³): 3.3

Diameter (m) 0.125 Discharge Coefficient 0.600 Invert Level (m) 22.050

### Orifice Manhole: S18, DS/PN: S7.002, Volume (m³): 5.5

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 21.820

### Orifice Manhole: S22, DS/PN: S1.008, Volume (m³): 4.4

Diameter (m) 0.270 Discharge Coefficient 0.600 Invert Level (m) 21.685

### Hydro-Brake® Optimum Manhole: S33, DS/PN: S1.012, Volume (m³): 3.1

| | |
|---|---|
| Unit Reference | MD-SHE-0100-4600-1100-4600 |
| Design Head (m) | 1.100 |
| Design Flow (l/s) | 4.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 100 |
| Invert Level (m) | 21.260 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) | Control Points | Head (m) | Flow (l/s) |
|---|---|---|---|---|---|
| Design Point (Calculated) | 1.100 | 4.6 | Kick-Flo® | 0.689 | 3.7 |
| Flush-Flo™ | 0.326 | 4.6 | Mean Flow over Head Range | - | 4.0 |

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

©1982-2020 Innovyze

Hydro-Brake® Optimum Manhole: S33, DS/PN: S1.012, Volume (m³): 3.1

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 | 3.3 | 1.200 | 4.8 | 3.000 | 7.3 | 7.000 | 11.0 |
| 0.200 | 4.4 | 1.400 | 5.1 | 3.500 | 7.9 | 7.500 | 11.3 |
| 0.300 | 4.6 | 1.600 | 5.5 | 4.000 | 8.4 | 8.000 | 11.7 |
| 0.400 | 4.6 | 1.800 | 5.8 | 4.500 | 8.9 | 8.500 | 12.0 |
| 0.500 | 4.4 | 2.000 | 6.1 | 5.000 | 9.4 | 9.000 | 12.4 |
| 0.600 | 4.2 | 2.200 | 6.4 | 5.500 | 9.8 | 9.500 | 12.7 |
| 0.800 | 4.0 | 2.400 | 6.6 | 6.000 | 10.2 | | |
| 1.000 | 4.4 | 2.600 | 6.9 | 6.500 | 10.6 | | |

©1982-2020 Innovyze

## Offline Controls for Storm

### Weir Manhole: S32, DS/PN: S1.011, Loop to PN: S1.012

Discharge Coef 0.544 Width (m) 4.000 Invert Level (m) 21.261

©1982-2020 Innovyze

## Storage Structures for Storm

### Cellular Storage Manhole: S2, DS/PN: S2.000

Invert Level (m) 22.450 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 590.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 590.0 | 0.0 | | | |

### Cellular Storage Manhole: S4, DS/PN: S3.000

Invert Level (m) 22.500 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 | 112.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 112.0 | 0.0 | | | |

### Porous Car Park Manhole: S6, DS/PN: S4.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 5.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 25.0 |
| Max Percolation (l/s) | 34.7 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 22.700 | Cap Volume Depth (m) | 0.700 |

### Porous Car Park Manhole: S8, DS/PN: S5.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 5.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 42.0 |
| Max Percolation (l/s) | 58.3 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 22.100 | Cap Volume Depth (m) | 0.400 |

### Cellular Storage Manhole: S10, DS/PN: S6.000

Invert Level (m) 22.070 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

©1982-2020 Innovyze

## Cellular Storage Manhole: S10, DS/PN: S6.000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 100.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 100.0 | 0.0 | | | |

## Cellular Storage Manhole: S14, DS/PN: S8.000

Invert Level (m) 22.100 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 | 141.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 141.0 | 0.0 | | | |

## Cellular Storage Manhole: S16, DS/PN: S9.000

Invert Level (m) 21.870 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 | 165.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 165.0 | 0.0 | | | |

## Cellular Storage Manhole: S17, DS/PN: S10.000

Invert Level (m) 21.870 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 | 255.0 | 0.0 | 0.401 | 0.0 | 0.0 |
| 0.400 | 255.0 | 0.0 | | | |

## Porous Car Park Manhole: S22, DS/PN: S12.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 9.9 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 27.5 |
| Max Percolation (l/s) | 75.6 | Slope (1:X) | 1000.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 21.750 | Cap Volume Depth (m) | 0.450 |

©1982-2020 Innovyze

## Swale Manhole: S27, DS/PN: S13.004

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Length (m) | 70.0 |
| Infiltration Coefficient Side (m/hr) | 0.00000 | Side Slope (1:X) | 1.5 |
| Safety Factor | 2.0 | Slope (1:X) | 27.7 |
| Porosity | 1.00 | Cap Volume Depth (m) | 0.000 |
| Invert Level (m) | 21.480 | Cap Infiltration Depth (m) | 0.000 |
| Base Width (m) | 0.5 | Include Swale Volume | Yes |

## Tank or Pond Manhole: S33, DS/PN: S1.012

Invert Level (m) 21.260

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 246.0 | 1.010 | 336.0 | 1.090 | 336.0 |

©1982-2020 Innovyze

## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 11 |
| Number of Online Controls | 7 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 1 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526885 118830 TQ 26885 18830 |
| Data Type | Point |
| Cv (Summer) | 0.850 |
| Cv (Winter) | 0.850 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | OFF |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 45 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Summer | 2 | +0% | 100/15 Summer | | | | 22.673 |
| S2.000 | S2 | 360 Summer | 2 | +0% | | | | | 22.485 |
| S1.001 | S3 | 15 Summer | 2 | +0% | 30/15 Summer | | | | 22.649 |
| S3.000 | S4 | 120 Summer | 2 | +0% | 100/15 Summer | | | | 22.535 |
| S1.002 | S5 | 30 Summer | 2 | +0% | 30/15 Summer | | | | 22.576 |
| S4.000 | S6 | 30 Summer | 2 | +0% | 30/15 Summer | | | | 22.302 |
| S1.003 | S7 | 30 Summer | 2 | +0% | 30/15 Summer | | | | 22.291 |
| S5.000 | S8 | 30 Summer | 2 | +0% | 2/15 Summer | | | | 22.283 |
| S1.004 | S9 | 30 Summer | 2 | +0% | 30/15 Summer | | | | 22.280 |
| S6.000 | S10 | 240 Summer | 2 | +0% | 2/120 Summer | | | | 22.255 |

©1982-2020 Innovyze

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | -0.152 | 0.000 | 0.20 | | | 7.6 | OK | |
| S2.000 | S2 | -0.190 | 0.000 | 0.04 | | 253 | 1.3 | OK | |
| S1.001 | S3 | -0.051 | 0.000 | 0.03 | | | 1.8 | OK | |
| S3.000 | S4 | -0.115 | 0.000 | 0.12 | | 64 | 1.5 | OK | |
| S1.002 | S5 | -0.004 | 0.000 | 0.09 | | | 5.8 | OK | |
| S4.000 | S6 | -0.048 | 0.000 | 0.38 | | 12 | 5.3 | OK | |
| S1.003 | S7 | -0.149 | 0.000 | 0.23 | | | 14.4 | OK | |
| S5.000 | S8 | 0.033 | 0.000 | 0.27 | | 14 | 3.4 | SURCHARGED | |
| S1.004 | S9 | -0.080 | 0.000 | 0.25 | | | 13.4 | OK | |
| S6.000 | S10 | 0.035 | 0.000 | 0.30 | | 100 | 3.8 | SURCHARGED | |

©1982-2020 Innovyze

## 2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 30 Summer | 2 | +0% | 30/15 Summer | | | |
| S1.006 | S12 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| S7.000 | S13 | 15 Summer | 2 | +0% | 30/15 Summer | | | |
| S8.000 | S14 | 240 Summer | 2 | +0% | 30/30 Summer | | | |
| S7.001 | S15 | 15 Summer | 2 | +0% | 30/15 Summer | 100/15 Summer | | |
| S9.000 | S16 | 480 Summer | 2 | +0% | 30/30 Summer | | | |
| S10.000 | S17 | 600 Winter | 2 | +0% | 30/60 Summer | | | |
| S7.002 | S18 | 30 Summer | 2 | +0% | 100/15 Summer | | | |
| S7.003 | S19 | 30 Summer | 2 | +0% | 30/15 Summer | | | |
| S1.007 | S20 | 30 Summer | 2 | +0% | 30/15 Summer | | | |
| S11.000 | S21 | 30 Summer | 2 | +0% | 30/15 Summer | | | |
| S12.000 | S22 | 360 Summer | 2 | +0% | 30/15 Summer | | | |
| S1.008 | S22 | 30 Summer | 2 | +0% | 30/15 Summer | | | |
| S13.000 | S23 | 15 Summer | 2 | +0% | | | | |
| S13.001 | S24 | 15 Summer | 2 | +0% | | | | |
| S13.002 | S25 | 15 Summer | 2 | +0% | 100/720 Summer | | | |
| S13.003 | S26 | 120 Summer | 2 | +0% | 100/60 Summer | | | |
| S13.004 | S27 | 120 Summer | 2 | +0% | | | | |
| S13.005 | S28 | 120 Summer | 2 | +0% | 100/120 Summer | | | |
| S13.006 | S29 | 120 Summer | 2 | +0% | | | | |
| S1.009 | S30 | 15 Summer | 2 | +0% | | | | |
| S1.010 | S31 | 480 Summer | 2 | +0% | 2/360 Summer | | | |
| S1.011 | S32 | 480 Summer | 2 | +0% | 2/180 Summer | | 2/15 Summer | 96 |
| S1.012 | S33 | 480 Summer | 2 | +0% | 2/60 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 22.271 | -0.048 | 0.000 | 0.11 | | | 6.4 | OK |
| S1.006 | S12 | 22.075 | -0.185 | 0.000 | 0.30 | | | 20.0 | OK |
| S7.000 | S13 | 22.297 | -0.168 | 0.000 | 0.17 | | | 10.8 | OK |
| S8.000 | S14 | 22.157 | -0.093 | 0.000 | 0.15 | | 54 | 2.1 | OK |
| S7.001 | S15 | 22.284 | -0.066 | 0.000 | 0.20 | | | 13.2 | OK |
| S9.000 | S16 | 21.991 | -0.029 | 0.000 | 0.11 | | 220 | 1.5 | OK |
| S10.000 | S17 | 21.951 | -0.069 | 0.000 | 0.09 | | 206 | 1.2 | OK |
| S7.002 | S18 | 22.042 | -0.078 | 0.000 | 0.05 | | | 2.6 | OK |
| S7.003 | S19 | 21.948 | -0.132 | 0.000 | 0.07 | | | 3.2 | OK |
| S1.007 | S20 | 21.946 | -0.114 | 0.000 | 0.33 | | | 20.2 | OK |
| S11.000 | S21 | 21.931 | -0.169 | 0.000 | 0.21 | | | 12.1 | OK |
| S12.000 | S22 | 21.801 | -0.099 | 0.000 | 0.06 | | 108 | 0.9 | OK |
| S1.008 | S22 | 21.920 | -0.140 | 0.000 | 0.28 | | | 25.1 | OK |

©1982-2020 Innovyze

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S13.000 | S23 | 23.300 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.001 | S24 | 22.700 | -0.350 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.002 | S25 | 22.060 | -0.225 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.003 | S26 | 21.684 | -0.201 | 0.000 | 0.00 | | | 0.3 | OK |
| S13.004 | S27 | 21.684 | -0.816 | 0.000 | 0.00 | | 33 | 0.8 | OK |
| S13.005 | S28 | 21.685 | -0.235 | 0.000 | 0.01 | | | 1.1 | OK* |
| S13.006 | S29 | 21.685 | -0.815 | 0.000 | 0.01 | | | 1.4 | OK |
| S1.009 | S30 | 21.687 | -0.813 | 0.000 | 0.06 | | | 18.3 | OK |
| S1.010 | S31 | 21.661 | 0.021 | 0.000 | 0.20 | | | 14.3 | SURCHARGED* |
| S1.011 | S32 | 21.658 | 0.097 | 0.000 | 0.25 | 8.7 | | 5.9 | SURCHARGED |
| S1.012 | S33 | 21.656 | 0.246 | 0.000 | 0.48 | | | 4.6 | SURCHARGED |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| S1.005 | S11 | |
| S1.006 | S12 | |
| S7.000 | S13 | |
| S8.000 | S14 | |
| S7.001 | S15 | 1 |
| S9.000 | S16 | |
| S10.000 | S17 | |
| S7.002 | S18 | |
| S7.003 | S19 | |
| S1.007 | S20 | |
| S11.000 | S21 | |
| S12.000 | S22 | |
| S1.008 | S22 | |
| S13.000 | S23 | |
| S13.001 | S24 | |
| S13.002 | S25 | |
| S13.003 | S26 | |
| S13.004 | S27 | |
| S13.005 | S28 | |
| S13.006 | S29 | |
| S1.009 | S30 | |
| S1.010 | S31 | |
| S1.011 | S32 | |
| S1.012 | S33 | |

©1982-2020 Innovyze

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 11
Number of Online Controls 7 Number of Time/Area Diagrams 0
Number of Offline Controls 1 Number of Real Time Controls 0

### Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 526885 118830 TQ 26885 18830
Data Type Point
Cv (Summer) 0.850
Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Summer | 30 | +0% | 100/15 Summer | | | | 22.771 |
| S2.000 | S2 | 240 Winter | 30 | +0% | | | | | 22.537 |
| S1.001 | S3 | 15 Summer | 30 | +0% | 30/15 Summer | | | | 22.717 |
| S3.000 | S4 | 60 Summer | 30 | +0% | 100/15 Summer | | | | 22.623 |
| S1.002 | S5 | 15 Summer | 30 | +0% | 30/15 Summer | | | | 22.780 |
| S4.000 | S6 | 30 Summer | 30 | +0% | 30/15 Summer | | | | 22.504 |
| S1.003 | S7 | 30 Summer | 30 | +0% | 30/15 Summer | | | | 22.467 |
| S5.000 | S8 | 30 Summer | 30 | +0% | 2/15 Summer | | | | 22.403 |
| S1.004 | S9 | 30 Summer | 30 | +0% | 30/15 Summer | | | | 22.395 |
| S6.000 | S10 | 120 Summer | 30 | +0% | 2/120 Summer | | | | 22.350 |

©1982-2020 Innovyze

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | -0.054 | 0.000 | 0.45 | | | 17.5 | OK | |
| S2.000 | S2 | -0.138 | 0.000 | 0.10 | | 162 | 3.2 | OK | |
| S1.001 | S3 | 0.017 | 0.000 | 0.03 | | | 1.8 | SURCHARGED | |
| S3.000 | S4 | -0.027 | 0.000 | 0.43 | | 34 | 5.4 | OK | |
| S1.002 | S5 | 0.200 | 0.000 | 0.11 | | | 6.9 | SURCHARGED | |
| S4.000 | S6 | 0.154 | 0.000 | 0.85 | | 13 | 11.8 | SURCHARGED | |
| S1.003 | S7 | 0.027 | 0.000 | 0.41 | | | 25.8 | SURCHARGED | |
| S5.000 | S8 | 0.153 | 0.000 | 0.70 | | 18 | 8.8 | SURCHARGED | |
| S1.004 | S9 | 0.035 | 0.000 | 0.45 | | | 24.0 | SURCHARGED | |
| S6.000 | S10 | 0.130 | 0.000 | 0.26 | | 114 | 3.4 | SURCHARGED | |

©1982-2020 Innovyze

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 60 Summer | 30 | +0% | 30/15 Summer | | | |
| S1.006 | S12 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| S7.000 | S13 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| S8.000 | S14 | 60 Summer | 30 | +0% | 30/30 Summer | | | |
| S7.001 | S15 | 15 Summer | 30 | +0% | 30/15 Summer | 100/15 Summer | | |
| S9.000 | S16 | 600 Summer | 30 | +0% | 30/30 Summer | | | |
| S10.000 | S17 | 600 Summer | 30 | +0% | 30/60 Summer | | | |
| S7.002 | S18 | 600 Summer | 30 | +0% | 100/15 Summer | | | |
| S7.003 | S19 | 30 Summer | 30 | +0% | 30/15 Summer | | | |
| S1.007 | S20 | 30 Summer | 30 | +0% | 30/15 Summer | | | |
| S11.000 | S21 | 15 Summer | 30 | +0% | 30/15 Summer | | | |
| S12.000 | S22 | 120 Summer | 30 | +0% | 30/15 Summer | | | |
| S1.008 | S22 | 30 Summer | 30 | +0% | 30/15 Summer | | | |
| S13.000 | S23 | 15 Summer | 30 | +0% | | | | |
| S13.001 | S24 | 15 Summer | 30 | +0% | | | | |
| S13.002 | S25 | 15 Summer | 30 | +0% | 100/720 Summer | | | |
| S13.003 | S26 | 720 Winter | 30 | +0% | 100/60 Summer | | | |
| S13.004 | S27 | 720 Winter | 30 | +0% | | | | |
| S13.005 | S28 | 720 Winter | 30 | +0% | 100/120 Summer | | | |
| S13.006 | S29 | 720 Winter | 30 | +0% | | | | |
| S1.009 | S30 | 720 Winter | 30 | +0% | | | | |
| S1.010 | S31 | 720 Winter | 30 | +0% | 2/360 Summer | | | |
| S1.011 | S32 | 720 Winter | 30 | +0% | 2/180 Summer | | 2/15 Summer | 96 |
| S1.012 | S33 | 720 Winter | 30 | +0% | 2/60 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 22.364 | 0.045 | 0.000 | 0.26 | | | 15.7 | SURCHARGED |
| S1.006 | S12 | 22.281 | 0.021 | 0.000 | 0.77 | | | 52.0 | SURCHARGED |
| S7.000 | S13 | 22.642 | 0.177 | 0.000 | 0.39 | | | 25.1 | SURCHARGED |
| S8.000 | S14 | 22.274 | 0.024 | 0.000 | 0.54 | | 44 | 7.5 | SURCHARGED |
| S7.001 | S15 | 22.567 | 0.217 | 0.000 | 0.30 | | | 20.5 | SURCHARGED |
| S9.000 | S16 | 22.096 | 0.076 | 0.000 | 0.16 | | 585 | 2.2 | SURCHARGED |
| S10.000 | S17 | 22.095 | 0.075 | 0.000 | 0.09 | | 570 | 1.2 | SURCHARGED |
| S7.002 | S18 | 22.095 | -0.025 | 0.000 | 0.05 | | | 3.0 | OK |
| S7.003 | S19 | 22.166 | 0.086 | 0.000 | 0.07 | | | 3.3 | SURCHARGED |
| S1.007 | S20 | 22.166 | 0.106 | 0.000 | 0.76 | | | 46.2 | SURCHARGED |
| S11.000 | S21 | 22.159 | 0.059 | 0.000 | 0.47 | | | 26.9 | SURCHARGED |
| S12.000 | S22 | 22.029 | 0.129 | 0.000 | 0.34 | | | 5.4 | SURCHARGED |
| S1.008 | S22 | 22.084 | 0.024 | 0.000 | 0.49 | | | 45.1 | SURCHARGED |

©1982-2020 Innovyze

## 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S13.000 | S23 | 23.300 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.001 | S24 | 22.700 | -0.350 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.002 | S25 | 22.060 | -0.225 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.003 | S26 | 21.861 | -0.024 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.004 | S27 | 21.861 | -0.639 | 0.000 | 0.00 | | 511 | 0.1 | OK |
| S13.005 | S28 | 21.861 | -0.059 | 0.000 | 0.00 | | | 0.1 | OK* |
| S13.006 | S29 | 21.861 | -0.639 | 0.000 | 0.00 | | | 0.1 | OK |
| S1.009 | S30 | 21.861 | -0.639 | 0.000 | 0.05 | | | 16.9 | OK |
| S1.010 | S31 | 21.860 | 0.220 | 0.000 | 0.24 | | | 16.9 | SURCHARGED* |
| S1.011 | S32 | 21.858 | 0.297 | 0.000 | 0.22 | 11.8 | | 5.1 | SURCHARGED |
| S1.012 | S33 | 21.856 | 0.446 | 0.000 | 0.48 | | | 4.6 | SURCHARGED |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| S1.005 | S11 | |
| S1.006 | S12 | |
| S7.000 | S13 | |
| S8.000 | S14 | |
| S7.001 | S15 | 1 |
| S9.000 | S16 | |
| S10.000 | S17 | |
| S7.002 | S18 | |
| S7.003 | S19 | |
| S1.007 | S20 | |
| S11.000 | S21 | |
| S12.000 | S22 | |
| S1.008 | S22 | |
| S13.000 | S23 | |
| S13.001 | S24 | |
| S13.002 | S25 | |
| S13.003 | S26 | |
| S13.004 | S27 | |
| S13.005 | S28 | |
| S13.006 | S29 | |
| S1.009 | S30 | |
| S1.010 | S31 | |
| S1.011 | S32 | |
| S1.012 | S33 | |

©1982-2020 Innovyze

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

### Simulation Criteria

| | | | |
|---|---|---|---|
| Areal Reduction Factor | 1.000 | Additional Flow - % of Total Flow | 0.000 |
| Hot Start (mins) | 0 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start Level (mm) | 0 | Inlet Coeffiecient | 0.800 |
| Manhole Headloss Coeff (Global) | 0.500 | Flow per Person per Day (l/per/day) | 0.000 |
| Foul Sewage per hectare (l/s) | 0.000 | | |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 11 |
| Number of Online Controls | 7 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 1 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| FEH Rainfall Version | 2013 |
| Site Location | GB 526885 118830 TQ 26885 18830 |
| Data Type | Point |
| Cv (Summer) | 0.850 |
| Cv (Winter) | 0.850 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | OFF |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 45 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Summer | 100 | +45% | 100/15 Summer | | | | 22.920 |
| S2.000 | S2 | 360 Summer | 100 | +45% | | | | | 22.640 |
| S1.001 | S3 | 15 Summer | 100 | +45% | 30/15 Summer | | | | 22.777 |
| S3.000 | S4 | 60 Summer | 100 | +45% | 100/15 Summer | | | | 22.780 |
| S1.002 | S5 | 15 Summer | 100 | +45% | 30/15 Summer | | | | 23.058 |
| S4.000 | S6 | 15 Summer | 100 | +45% | 30/15 Summer | | | | 22.857 |
| S1.003 | S7 | 15 Summer | 100 | +45% | 30/15 Summer | | | | 22.809 |
| S5.000 | S8 | 60 Summer | 100 | +45% | 2/15 Summer | | | | 22.657 |
| S1.004 | S9 | 15 Summer | 100 | +45% | 30/15 Summer | | | | 22.731 |
| S6.000 | S10 | 60 Summer | 100 | +45% | 2/120 Summer | | | | 22.691 |

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 0.095 | 0.000 | 0.84 | | | 32.3 | SURCHARGED | |
| S2.000 | S2 | -0.035 | 0.000 | 0.11 | | 349 | 3.3 | OK | |
| S1.001 | S3 | 0.077 | 0.000 | 0.02 | | | 1.4 | SURCHARGED | |
| S3.000 | S4 | 0.130 | 0.000 | 0.66 | | 47 | 8.2 | SURCHARGED | |
| S1.002 | S5 | 0.478 | 0.000 | 0.12 | | | 7.9 | SURCHARGED | |
| S4.000 | S6 | 0.507 | 0.000 | 1.66 | | 3 | 23.2 | SURCHARGED | |
| S1.003 | S7 | 0.369 | 0.000 | 0.66 | | | 41.7 | FLOOD RISK | |
| S5.000 | S8 | 0.407 | 0.000 | 0.86 | | 28 | 10.8 | SURCHARGED | |
| S1.004 | S9 | 0.371 | 0.000 | 0.69 | | | 37.1 | SURCHARGED | |
| S6.000 | S10 | 0.471 | 0.000 | 0.60 | | | 7.7 | SURCHARGED | |

©1982-2020 Innovyze

## 100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S1.006 | S12 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S7.000 | S13 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S8.000 | S14 | 60 Winter | 100 | +45% | 30/30 Summer | | | |
| S7.001 | S15 | 15 Summer | 100 | +45% | 30/15 Summer | 100/15 Summer | | |
| S9.000 | S16 | 960 Winter | 100 | +45% | 30/30 Summer | | | |
| S10.000 | S17 | 960 Winter | 100 | +45% | 30/60 Summer | | | |
| S7.002 | S18 | 960 Winter | 100 | +45% | 100/15 Summer | | | |
| S7.003 | S19 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S1.007 | S20 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S11.000 | S21 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S12.000 | S22 | 1440 Winter | 100 | +45% | 30/15 Summer | | | |
| S1.008 | S22 | 15 Summer | 100 | +45% | 30/15 Summer | | | |
| S13.000 | S23 | 15 Summer | 100 | +45% | | | | |
| S13.001 | S24 | 15 Summer | 100 | +45% | | | | |
| S13.002 | S25 | 1440 Winter | 100 | +45% | 100/720 Summer | | | |
| S13.003 | S26 | 1440 Winter | 100 | +45% | 100/60 Summer | | | |
| S13.004 | S27 | 1440 Winter | 100 | +45% | | | | |
| S13.005 | S28 | 1440 Winter | 100 | +45% | 100/120 Summer | | | |
| S13.006 | S29 | 1440 Winter | 100 | +45% | | | | |
| S1.009 | S30 | 1440 Winter | 100 | +45% | | | | |
| S1.010 | S31 | 1440 Winter | 100 | +45% | 2/360 Summer | | | |
| S1.011 | S32 | 1440 Winter | 100 | +45% | 2/180 Summer | | 2/15 Summer | 96 |
| S1.012 | S33 | 1440 Winter | 100 | +45% | 2/60 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S1.005 | S11 | 22.729 | 0.410 | 0.000 | 0.33 | | | 19.6 | SURCHARGED |
| S1.006 | S12 | 22.776 | 0.516 | 0.000 | 1.19 | | | 80.5 | SURCHARGED |
| S7.000 | S13 | 23.391 | 0.926 | 0.000 | 0.70 | | | 45.8 | SURCHARGED |
| S8.000 | S14 | 22.461 | 0.211 | 0.000 | 0.96 | | 47 | 13.4 | SURCHARGED |
| S7.001 | S15 | 23.300 | 0.950 | 0.060 | 0.49 | | | 33.2 | FLOOD |
| S9.000 | S16 | 22.375 | 0.355 | 0.000 | 0.13 | | | 1.8 | SURCHARGED |
| S10.000 | S17 | 22.375 | 0.355 | 0.000 | 0.05 | | | 0.7 | SURCHARGED |
| S7.002 | S18 | 22.374 | 0.254 | 0.000 | 0.06 | | | 3.6 | SURCHARGED |
| S7.003 | S19 | 22.474 | 0.394 | 0.000 | 0.05 | | | 2.4 | FLOOD RISK |
| S1.007 | S20 | 22.474 | 0.414 | 0.000 | 1.30 | | | 79.2 | SURCHARGED |
| S11.000 | S21 | 22.444 | 0.344 | 0.000 | 0.91 | | | 52.4 | FLOOD RISK |
| S12.000 | S22 | 22.330 | 0.430 | 0.000 | 0.03 | | | 0.5 | FLOOD RISK |
| S1.008 | S22 | 22.356 | 0.296 | 0.000 | 0.97 | | | 88.0 | FLOOD RISK |

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S13.000 | S23 | 23.300 | -0.150 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.001 | S24 | 22.700 | -0.350 | 0.000 | 0.00 | | | 0.0 | OK |
| S13.002 | S25 | 22.320 | 0.035 | 0.000 | 0.00 | | | 0.0 | SURCHARGED |
| S13.003 | S26 | 22.320 | 0.435 | 0.000 | 0.00 | | | 0.1 | SURCHARGED |
| S13.004 | S27 | 22.320 | -0.180 | 0.000 | 0.00 | | 1096 | 0.5 | FLOOD RISK* |
| S13.005 | S28 | 22.320 | 0.400 | 0.000 | 0.00 | | | 0.7 | FLOOD RISK* |
| S13.006 | S29 | 22.320 | -0.180 | 0.000 | 0.00 | | | 0.6 | FLOOD RISK* |
| S1.009 | S30 | 22.320 | -0.180 | 0.000 | 0.05 | | | 17.1 | FLOOD RISK* |
| S1.010 | S31 | 22.319 | 0.679 | 0.000 | 0.23 | | | 16.3 | FLOOD RISK* |
| S1.011 | S32 | 22.317 | 0.756 | 0.000 | 0.19 | 12.6 | | 4.5 | FLOOD RISK |
| S1.012 | S33 | 22.315 | 0.905 | 0.000 | 0.48 | | | 4.6 | FLOOD RISK |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| S1.005 | S11 | |
| S1.006 | S12 | |
| S7.000 | S13 | |
| S8.000 | S14 | |
| S7.001 | S15 | 1 |
| S9.000 | S16 | |
| S10.000 | S17 | |
| S7.002 | S18 | |
| S7.003 | S19 | |
| S1.007 | S20 | |
| S11.000 | S21 | |
| S12.000 | S22 | |
| S1.008 | S22 | |
| S13.000 | S23 | |
| S13.001 | S24 | |
| S13.002 | S25 | |
| S13.003 | S26 | |
| S13.004 | S27 | |
| S13.005 | S28 | |
| S13.006 | S29 | |
| S1.009 | S30 | |
| S1.010 | S31 | |
| S1.011 | S32 | |
| S1.012 | S33 | |

©1982-2020 Innovyze