## 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) | 19.300 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.391 | Minimum Backdrop Height (m) | 0.000 |
| Maximum Rainfall (mm/hr) | 100 | 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 0.502 | 4-8 | 0.160 |

Total Area Contributing (ha) = 0.662

Total Pipe Volume ($m^3$) = 102.257

### 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 22.177 | 0.797 | 27.8 | 0.132 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.001 | 16.300 | 0.770 | 21.2 | 0.045 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.002 | 19.048 | 1.297 | 14.7 | 0.043 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 1.003 | 39.522 | 1.474 | 26.8 | 0.067 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| 1.004 | 16.146 | 0.708 | 22.8 | 0.083 | 0.00 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 65.94 | 5.19 | 128.227 | 0.132 | 0.0 | 0.0 | 0.0 | 1.92 | 33.9 | 23.6 |
| 1.001 | 65.28 | 5.32 | 127.430 | 0.177 | 0.0 | 0.0 | 0.0 | 2.20 | 38.9 | 31.3 |
| 1.002 | 64.66 | 5.44 | 126.660 | 0.220 | 0.0 | 0.0 | 0.0 | 2.64 | 46.7 | 38.5 |
| 1.003 | 63.34 | 5.70 | 125.288 | 0.287 | 0.0 | 0.0 | 0.0 | 2.54 | 100.9 | 49.2 |
| 1.004 | 62.87 | 5.79 | 123.814 | 0.370 | 0.0 | 0.0 | 0.0 | 2.75 | 109.4 | 63.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.005 | 18.533 | 0.046 | 402.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 1350 | Pipe/Conduit | |
| 1.006 | 17.066 | 0.043 | 400.0 | 0.034 | 0.00 | 0.0 | 0.600 | o | 1350 | Pipe/Conduit | |
| 2.000 | 17.666 | 1.045 | 16.9 | 0.115 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| 2.001 | 14.344 | 0.036 | 398.4 | 0.049 | 0.00 | 0.0 | 0.600 | o | 1350 | Pipe/Conduit | |
| 2.002 | 18.880 | 0.047 | 401.7 | 0.039 | 0.00 | 0.0 | 0.600 | o | 1350 | Pipe/Conduit | |
| 1.007 | 11.453 | 0.115 | 99.6 | 0.055 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.005 | 62.13 | 5.95 | 121.000 | 0.370 | 0.0 | 0.0 | 0.0 | 2.00 | 2859.0 | 63.0 |
| 1.006 | 61.47 | 6.09 | 120.954 | 0.404 | 0.0 | 0.0 | 0.0 | 2.00 | 2869.3 | 67.3 |
| 2.000 | 66.34 | 5.12 | 123.900 | 0.115 | 0.0 | 0.0 | 0.0 | 2.46 | 43.5 | 20.7 |
| 2.001 | 65.70 | 5.24 | 121.000 | 0.164 | 0.0 | 0.0 | 0.0 | 2.01 | 2875.0 | 29.2 |
| 2.002 | 64.87 | 5.40 | 120.964 | 0.203 | 0.0 | 0.0 | 0.0 | 2.00 | 2863.2 | 35.7 |
| 1.007 | 60.61 | 6.28 | 120.530 | 0.662 | 0.0 | 0.0 | 0.0 | 1.01 | 17.8« | 108.7 |

## 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 129.577 | 1.350 | Open Manhole | 1200 | 1.000 | 128.227 | 150 | | | | |
| 2 | 128.780 | 1.350 | Open Manhole | 1200 | 1.001 | 127.430 | 150 | 1.000 | 127.430 | 150 | |
| 3 | 128.010 | 1.350 | Open Manhole | 1200 | 1.002 | 126.660 | 150 | 1.001 | 126.660 | 150 | |
| 4 | 126.713 | 1.425 | Open Manhole | 1200 | 1.003 | 125.288 | 225 | 1.002 | 125.363 | 150 | |
| 5 | 125.239 | 1.425 | Open Manhole | 1200 | 1.004 | 123.814 | 225 | 1.003 | 123.814 | 225 | |
| 6 | 124.531 | 3.531 | Open Manhole | 2400 | 1.005 | 121.000 | 1350 | 1.004 | 123.106 | 225 | 981 |
| 7 | 123.800 | 2.846 | Open Manhole | 2250 | 1.006 | 120.954 | 1350 | 1.005 | 120.954 | 1350 | |
| 8 | 125.340 | 1.440 | Open Manhole | 1200 | 2.000 | 123.900 | 150 | | | | |
| 9 | 124.295 | 3.295 | Open Manhole | 2400 | 2.001 | 121.000 | 1350 | 2.000 | 122.855 | 150 | 655 |
| 10 | 123.343 | 2.379 | Open Manhole | 2400 | 2.002 | 120.964 | 1350 | 2.001 | 120.964 | 1350 | |
| 11 | 123.411 | 2.881 | Open Manhole | 2700 | 1.007 | 120.530 | 150 | 1.006 | 120.911 | 1350 | 1581 |
| | | | | | | | | 2.002 | 120.917 | 1350 | 1587 |
| | 122.531 | 2.116 | Open Manhole | 0 | | OUTFALL | | 1.007 | 120.415 | 150 | |

## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| 1.000 | o | 150 | 1 | 129.577 | 128.227 | 1.200 | Open Manhole | 1200 |
| 1.001 | o | 150 | 2 | 128.780 | 127.430 | 1.200 | Open Manhole | 1200 |
| 1.002 | o | 150 | 3 | 128.010 | 126.660 | 1.200 | Open Manhole | 1200 |
| 1.003 | o | 225 | 4 | 126.713 | 125.288 | 1.200 | Open Manhole | 1200 |
| 1.004 | o | 225 | 5 | 125.239 | 123.814 | 1.200 | Open Manhole | 1200 |
| 1.005 | o | 1350 | 6 | 124.531 | 121.000 | 2.181 | Open Manhole | 2400 |
| 1.006 | o | 1350 | 7 | 123.800 | 120.954 | 1.496 | Open Manhole | 2250 |
| 2.000 | o | 150 | 8 | 125.340 | 123.900 | 1.290 | Open Manhole | 1200 |
| 2.001 | o | 1350 | 9 | 124.295 | 121.000 | 1.945 | Open Manhole | 2400 |
| 2.002 | o | 1350 | 10 | 123.343 | 120.964 | 1.029 | Open Manhole | 2400 |
| 1.007 | o | 150 | 11 | 123.411 | 120.530 | 2.731 | Open Manhole | 2700 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 22.177 | 27.8 | 2 | 128.780 | 127.430 | 1.200 | Open Manhole | 1200 |
| 1.001 | 16.300 | 21.2 | 3 | 128.010 | 126.660 | 1.200 | Open Manhole | 1200 |
| 1.002 | 19.048 | 14.7 | 4 | 126.713 | 125.363 | 1.200 | Open Manhole | 1200 |
| 1.003 | 39.522 | 26.8 | 5 | 125.239 | 123.814 | 1.200 | Open Manhole | 1200 |
| 1.004 | 16.146 | 22.8 | 6 | 124.531 | 123.106 | 1.200 | Open Manhole | 2400 |
| 1.005 | 18.533 | 402.9 | 7 | 123.800 | 120.954 | 1.496 | Open Manhole | 2250 |
| 1.006 | 17.066 | 400.0 | 11 | 123.411 | 120.911 | 1.150 | Open Manhole | 2700 |
| 2.000 | 17.666 | 16.9 | 9 | 124.295 | 122.855 | 1.290 | Open Manhole | 2400 |
| 2.001 | 14.344 | 398.4 | 10 | 123.343 | 120.964 | 1.029 | Open Manhole | 2400 |
| 2.002 | 18.880 | 401.7 | 11 | 123.411 | 120.917 | 1.144 | Open Manhole | 2700 |
| 1.007 | 11.453 | 99.6 | | 122.531 | 120.415 | 1.966 | Open Manhole | 0 |

## 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) |
|---|---|---|---|---|---|---|
| 1.007 | | 122.531 | 120.415 | 120.390 | 0 | 0 |

## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.840 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 0.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

| | | | |
|---|---|---|---|
| Number of Input Hydrographs | 0 | Number of Storage Structures | 2 |
| Number of Online Controls | 1 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Winter |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.200 | Storm Duration (mins) | 30 |
| Ratio R | 0.390 | | |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: 11, DS/PN: 1.007, Volume (m³): 60.8

| | |
|---|---|
| Unit Reference | MD-SHE-0119-1000-3000-1000 |
| Design Head (m) | 3.000 |
| Design Flow (l/s) | 10.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 119 |
| Invert Level (m) | 120.530 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 3.000 | 10.0 |
| Flush-Flo™ | 0.522 | 7.7 |
| Kick-Flo® | 1.063 | 6.1 |
| Mean Flow over Head Range | - | 7.7 |

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 | 4.2 | 1.200 | 6.5 | 3.000 | 10.0 | 7.000 | 15.0 |
| 0.200 | 6.7 | 1.400 | 7.0 | 3.500 | 10.7 | 7.500 | 15.5 |
| 0.300 | 7.3 | 1.600 | 7.4 | 4.000 | 11.5 | 8.000 | 15.9 |
| 0.400 | 7.6 | 1.800 | 7.9 | 4.500 | 12.1 | 8.500 | 16.4 |
| 0.500 | 7.7 | 2.000 | 8.3 | 5.000 | 12.7 | 9.000 | 16.9 |
| 0.600 | 7.7 | 2.200 | 8.6 | 5.500 | 13.3 | 9.500 | 17.3 |
| 0.800 | 7.4 | 2.400 | 9.0 | 6.000 | 13.9 | | |
| 1.000 | 6.6 | 2.600 | 9.3 | 6.500 | 14.4 | | |

## Storage Structures for Storm

### Cellular Storage Manhole: 10, DS/PN: 2.002

Invert Level (m) 120.964 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 | 55.0 | 0.0 | 1.801 | 0.0 | 0.0 |
| 1.800 | 55.0 | 0.0 | | | |

### Cellular Storage Manhole: 11, DS/PN: 1.007

Invert Level (m) 120.530 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 | 60.0 | 0.0 | 1.801 | 0.0 | 0.0 |
| 1.800 | 60.0 | 0.0 | | | |

## 1 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 | 0.000 |
| 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 | 2 |
| Number of Online Controls | 1 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.390 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.200 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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 |
| Return Period(s) (years) | 1, 2, 30, 100 |
| Climate Change (%) | 0, 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 15 Winter | 1 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.001 | 2 | 15 Winter | 1 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.002 | 3 | 15 Winter | 1 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.003 | 4 | 15 Winter | 1 | +0% | 100/15 Summer | | | |
| 1.004 | 5 | 15 Winter | 1 | +0% | 30/15 Summer | | | |
| 1.005 | 6 | 15 Winter | 1 | +0% | 100/120 Winter | | | |
| 1.006 | 7 | 120 Winter | 1 | +0% | 100/120 Winter | | | |
| 2.000 | 8 | 15 Winter | 1 | +0% | 100/15 Summer | 100/15 Winter | | |
| 2.001 | 9 | 120 Winter | 1 | +0% | 100/120 Winter | | | |
| 2.002 | 10 | 120 Winter | 1 | +0% | 100/120 Winter | | | |
| 1.007 | 11 | 120 Winter | 1 | +0% | 1/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 128.307 | -0.070 | 0.000 | 0.55 | | 17.5 | OK | 6 |

## 1 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 ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | 2 | 127.517 | -0.063 | 0.000 | 0.62 | | 22.3 | OK | 6 |
| 1.002 | 3 | 126.747 | -0.063 | 0.000 | 0.62 | | 27.1 | OK | 3 |
| 1.003 | 4 | 125.383 | -0.130 | 0.000 | 0.36 | | 34.7 | OK | |
| 1.004 | 5 | 123.921 | -0.118 | 0.000 | 0.45 | | 44.1 | OK | |
| 1.005 | 6 | 121.159 | -1.191 | 0.000 | 0.03 | | 44.1 | OK | |
| 1.006 | 7 | 121.114 | -1.190 | 0.000 | 0.01 | | 17.9 | OK | |
| 2.000 | 8 | 123.964 | -0.086 | 0.000 | 0.38 | | 15.2 | OK | 1 |
| 2.001 | 9 | 121.114 | -1.236 | 0.000 | 0.01 | | 7.3 | OK | |
| 2.002 | 10 | 121.114 | -1.200 | 0.000 | 0.01 | | 8.3 | OK | |
| 1.007 | 11 | 121.114 | 0.434 | 0.000 | 0.48 | | 7.7 | SURCHARGED | |

## 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 | 0.000 |
| 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 | 2 |
| Number of Online Controls | 1 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.390 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.200 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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 |
| Return Period(s) (years) | 1, 2, 30, 100 |
| Climate Change (%) | 0, 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 15 Winter | 2 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.001 | 2 | 15 Winter | 2 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.002 | 3 | 15 Winter | 2 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.003 | 4 | 15 Winter | 2 | +0% | 100/15 Summer | | | |
| 1.004 | 5 | 15 Winter | 2 | +0% | 30/15 Summer | | | |
| 1.005 | 6 | 120 Winter | 2 | +0% | 100/120 Winter | | | |
| 1.006 | 7 | 120 Winter | 2 | +0% | 100/120 Winter | | | |
| 2.000 | 8 | 15 Winter | 2 | +0% | 100/15 Summer | 100/15 Winter | | |
| 2.001 | 9 | 120 Winter | 2 | +0% | 100/120 Winter | | | |
| 2.002 | 10 | 120 Winter | 2 | +0% | 100/120 Winter | | | |
| 1.007 | 11 | 120 Winter | 2 | +0% | 1/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 128.321 | -0.056 | 0.000 | 0.71 | | 22.6 | OK | 6 |

## 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 ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | 2 | 127.534 | -0.046 | 0.000 | 0.80 | | 28.9 | OK | 6 |
| 1.002 | 3 | 126.764 | -0.046 | 0.000 | 0.80 | | 35.1 | OK | 3 |
| 1.003 | 4 | 125.398 | -0.115 | 0.000 | 0.47 | | 44.9 | OK | |
| 1.004 | 5 | 123.939 | -0.100 | 0.000 | 0.59 | | 57.0 | OK | |
| 1.005 | 6 | 121.219 | -1.131 | 0.000 | 0.01 | | 20.1 | OK | |
| 1.006 | 7 | 121.219 | -1.085 | 0.000 | 0.01 | | 21.4 | OK | |
| 2.000 | 8 | 123.974 | -0.076 | 0.000 | 0.49 | | 19.7 | OK | 1 |
| 2.001 | 9 | 121.219 | -1.131 | 0.000 | 0.01 | | 8.9 | OK | |
| 2.002 | 10 | 121.219 | -1.095 | 0.000 | 0.01 | | 9.1 | OK | |
| 1.007 | 11 | 121.219 | 0.539 | 0.000 | 0.48 | | 7.7 | SURCHARGED | |

## 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 | 0.000 |
| 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 | 2 |
| Number of Online Controls | 1 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.390 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.200 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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 |
| Return Period(s) (years) | 1, 2, 30, 100 |
| Climate Change (%) | 0, 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 15 Winter | 30 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.001 | 2 | 15 Winter | 30 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.002 | 3 | 15 Winter | 30 | +0% | 30/15 Summer | 100/15 Summer | | |
| 1.003 | 4 | 15 Winter | 30 | +0% | 100/15 Summer | | | |
| 1.004 | 5 | 15 Winter | 30 | +0% | 30/15 Summer | | | |
| 1.005 | 6 | 180 Winter | 30 | +0% | 100/120 Winter | | | |
| 1.006 | 7 | 180 Winter | 30 | +0% | 100/120 Winter | | | |
| 2.000 | 8 | 15 Winter | 30 | +0% | 100/15 Summer | 100/15 Winter | | |
| 2.001 | 9 | 180 Winter | 30 | +0% | 100/120 Winter | | | |
| 2.002 | 10 | 180 Winter | 30 | +0% | 100/120 Winter | | | |
| 1.007 | 11 | 180 Winter | 30 | +0% | 1/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 129.480 | 1.103 | 0.000 | 1.07 | | 34.3 | FLOOD RISK | 6 |

## 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) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | 2 | 128.563 | 0.983 | 0.000 | 1.21 | | 43.8 | FLOOD RISK | 6 |
| 1.002 | 3 | 127.417 | 0.607 | 0.000 | 1.21 | | 53.0 | SURCHARGED | 3 |
| 1.003 | 4 | 125.438 | -0.075 | 0.000 | 0.76 | | 72.5 | OK | |
| 1.004 | 5 | 124.094 | 0.055 | 0.000 | 1.03 | | 99.6 | SURCHARGED | |
| 1.005 | 6 | 121.679 | -0.671 | 0.000 | 0.02 | | 27.8 | OK | |
| 1.006 | 7 | 121.679 | -0.625 | 0.000 | 0.02 | | 26.1 | OK | |
| 2.000 | 8 | 124.014 | -0.036 | 0.000 | 0.92 | | 37.3 | OK | 1 |
| 2.001 | 9 | 121.678 | -0.672 | 0.000 | 0.01 | | 11.8 | OK | |
| 2.002 | 10 | 121.678 | -0.636 | 0.000 | 0.00 | | 7.5 | OK | |
| 1.007 | 11 | 121.678 | 0.998 | 0.000 | 0.48 | | 7.7 | SURCHARGED | |

## 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 | 0.000 |
| 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 | 2 |
| Number of Online Controls | 1 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | | FSR | Ratio R 0.390 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.200 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 300.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| 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 |
| Return Period(s) (years) | 1, 2, 30, 100 |
| Climate Change (%) | 0, 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 15 Winter | 100 | +40% | 30/15 Summer | 100/15 Summer | | |
| 1.001 | 2 | 15 Winter | 100 | +40% | 30/15 Summer | 100/15 Summer | | |
| 1.002 | 3 | 15 Winter | 100 | +40% | 30/15 Summer | 100/15 Summer | | |
| 1.003 | 4 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| 1.004 | 5 | 15 Winter | 100 | +40% | 30/15 Summer | | | |
| 1.005 | 6 | 240 Winter | 100 | +40% | 100/120 Winter | | | |
| 1.006 | 7 | 240 Winter | 100 | +40% | 100/120 Winter | | | |
| 2.000 | 8 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | | |
| 2.001 | 9 | 240 Winter | 100 | +40% | 100/120 Winter | | | |
| 2.002 | 10 | 240 Winter | 100 | +40% | 100/120 Winter | | | |
| 1.007 | 11 | 240 Winter | 100 | +40% | 1/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 129.588 | 1.211 | 10.860 | 1.11 | | 35.7 | FLOOD | 6 |

## 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 ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| 1.001 | 2 | 128.785 | 1.205 | 5.398 | 1.41 | | 50.7 | FLOOD | 6 |
| 1.002 | 3 | 128.011 | 1.201 | 1.238 | 1.37 | | 60.0 | FLOOD | 3 |
| 1.003 | 4 | 126.195 | 0.682 | 0.000 | 0.96 | | 91.7 | SURCHARGED | |
| 1.004 | 5 | 124.825 | 0.786 | 0.000 | 1.44 | | 139.8 | SURCHARGED | |
| 1.005 | 6 | 123.086 | 0.736 | 0.000 | 0.03 | | 41.1 | SURCHARGED | |
| 1.006 | 7 | 123.086 | 0.782 | 0.000 | 0.03 | | 36.4 | SURCHARGED | |
| 2.000 | 8 | 125.340 | 1.290 | 0.283 | 1.50 | | 60.7 | FLOOD | 1 |
| 2.001 | 9 | 123.086 | 0.736 | 0.000 | 0.01 | | 17.4 | SURCHARGED | |
| 2.002 | 10 | 123.086 | 0.772 | 0.000 | 0.01 | | 8.6 | FLOOD RISK | |
| 1.007 | 11 | 123.086 | 2.406 | 0.000 | 0.58 | | 9.3 | SURCHARGED | |