## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| US/MH PN | US/MH Name | Level Exceeded |
|---|---|---|

## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 2 | +0% | | | | | 51.558 | -0.392 | 0.000 | 0.04 | | |
| S1.001 | S2 | 15 Winter | 2 | +0% | | | | | 49.654 | -0.367 | 0.000 | 0.08 | | |
| S1.002 | S3 | 15 Winter | 2 | +0% | 100/15 Summer | | | | 48.228 | -0.298 | 0.000 | 0.25 | | |
| S1.003 | S4 | 720 Winter | 2 | +0% | 2/60 Winter | | | | 46.729 | 0.132 | 0.000 | 0.04 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S1.000 | S1 | 20.5 | OK | |
| S1.001 | S2 | 38.0 | OK | |
| S1.002 | S3 | 55.6 | OK | |
| S1.003 | S4 | 1.2 | SURCHARGED | |

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

### Simulation Criteria

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

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

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | D3 (1km) | 0.234 |
| FEH Rainfall Version | 1999 | E (1km) | 0.332 |
| Site Location | GB 526100 184450 TQ 26100 84450 | F (1km) | 2.519 |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | | |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| US/MH PN | US/MH Name | Level Exceeded |
|---|---|---|

## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 30 | +0% | | | | | 51.599 | -0.351 | 0.000 | 0.11 | | |
| S1.001 | S2 | 15 Winter | 30 | +0% | | | | | 49.717 | -0.304 | 0.000 | 0.23 | | |
| S1.002 | S3 | 15 Winter | 30 | +0% | 100/15 Summer | | | | 48.374 | -0.152 | 0.000 | 0.76 | | |
| S1.003 | S4 | 720 Winter | 30 | +0% | 2/60 Winter | | | | 47.286 | 0.689 | 0.000 | 0.04 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S1.000 | S1 | 55.1 | OK | |
| S1.001 | S2 | 113.5 | OK | |
| S1.002 | S3 | 171.8 | OK | |
| S1.003 | S4 | 1.3 | SURCHARGED | |

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

### Simulation Criteria

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

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

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | D3 (1km) | 0.234 |
| FEH Rainfall Version | 1999 | E (1km) | 0.332 |
| Site Location | GB 526100 184450 TQ 26100 84450 | F (1km) | 2.519 |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | | |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| US/MH PN | Name | Level Exceeded |
|---|---|---|

## 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. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 Winter | 100 | +40% | | | | | 51.649 | -0.301 | 0.000 | 0.24 | | |
| S1.001 | S2 | 15 Winter | 100 | +40% | | | | | 49.798 | -0.223 | 0.000 | 0.50 | | |
| S1.002 | S3 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 48.804 | 0.278 | 0.000 | 1.65 | | |
| S1.003 | S4 | 720 Winter | 100 | +40% | 2/60 Winter | | | | 48.296 | 1.699 | 0.000 | 0.06 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S1.000 | S1 | 120.6 | OK | |
| S1.001 | S2 | 248.1 | OK | |
| S1.002 | S3 | 374.2 | SURCHARGED | |
| S1.003 | S4 | 1.9 | SURCHARGED | |

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

| | | | |
|---|---|---|---|
| Return Period (years) | 100 | Maximum Time of Concentration (mins) | 30 |
| | | Foul Sewage (l/s/ha) | 0.000 |
| FEH Rainfall Version | 1999 | Volumetric Runoff Coeff. | 0.750 |
| Site Location | GB 526100 184450 TQ 26100 84450 | PIMP (%) | 100 |
| C (1km) | -0.025 | Add Flow / Climate Change (%) | 10 |
| D1 (1km) | 0.330 | Minimum Backdrop Height (m) | 1.500 |
| D2 (1km) | 0.277 | Maximum Backdrop Height (m) | 1.500 |
| D3 (1km) | 0.234 | Min Design Depth for Optimisation (m) | 1.200 |
| E (1km) | 0.332 | Min Vel for Auto Design only (m/s) | 1.00 |
| F (1km) | 2.519 | Min Slope for Optimisation (1:X) | 500 |
| Maximum Rainfall (mm/hr) | 50 | | |

Designed with Level Soffits

### 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) |
|---|---|---|---|---|---|---|
| S1.003 | S | 49.000 | 46.220 | 0.000 | 0 | 0 |

## Simulation Criteria for Storm

| | | | | | |
|---|---|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Manhole Headloss Coeff (Global) | 0.500 | Inlet Coeffiecient | 0.800 |
| Areal Reduction Factor | 1.000 | Foul Sewage per hectare (l/s) | 0.000 | Flow per Person per Day (l/per/day) | 0.000 |
| Hot Start (mins) | 0 | Additional Flow - % of Total Flow | 0.000 | Run Time (mins) | 60 |
| Hot Start Level (mm) | 0 | MADD Factor * 10m³/ha Storage | 2.000 | Output Interval (mins) | 1 |

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

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | E (1km) | 0.332 |
| Return Period (years) | 100 | F (1km) | 2.519 |
| FEH Rainfall Version | 1999 | Summer Storms | Yes |
| Site Location | GB 526100 184450 TQ 26100 84450 | Winter Storms | No |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | Storm Duration (mins) | 30 |
| D3 (1km) | 0.234 | | |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.003, Volume (m³): 14.1

| | | | |
|---|---|---|---|
| Unit Reference | MD-SHE-0054-1800-2000-1800 | Sump Available | Yes |
| Design Head (m) | 2.000 | Diameter (mm) | 54 |
| Design Flow (l/s) | 1.8 | Invert Level (m) | 46.500 |
| Flush-Flo™ | Calculated | Minimum Outlet Pipe Diameter (mm) | 75 |
| Objective | Minimise upstream storage | Suggested Manhole Diameter (mm) | 1200 |
| Application | Surface | | |

| Control Points | Head (m) | Flow (l/s) | Control Points | Head (m) | Flow (l/s) |
|---|---|---|---|---|---|
| Design Point (Calculated) | 2.000 | 1.8 | Kick-Flo® | 0.482 | 1.0 |
| Flush-Flo™ | 0.240 | 1.2 | Mean Flow over Head Range | - | 1.3 |

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) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.100 | 1.0 | 0.600 | 1.0 | 1.600 | 1.6 | 2.600 | 2.0 | 5.000 | 2.7 | 7.500 | 3.3 |
| 0.200 | 1.1 | 0.800 | 1.2 | 1.800 | 1.7 | 3.000 | 2.2 | 5.500 | 2.9 | 8.000 | 3.4 |
| 0.300 | 1.1 | 1.000 | 1.3 | 2.000 | 1.8 | 3.500 | 2.3 | 6.000 | 3.0 | 8.500 | 3.5 |
| 0.400 | 1.1 | 1.200 | 1.4 | 2.200 | 1.9 | 4.000 | 2.5 | 6.500 | 3.1 | 9.000 | 3.6 |
| 0.500 | 1.0 | 1.400 | 1.5 | 2.400 | 2.0 | 4.500 | 2.6 | 7.000 | 3.2 | 9.500 | 3.7 |

## Storage Structures for Storm

### Tank or Pond Manhole: S4, DS/PN: S1.003

Invert Level (m) 46.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 265.0 | 2.000 | 265.0 | 2.001 | 0.0 |

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

### Simulation Criteria

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

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

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | D3 (1km) | 0.234 |
| FEH Rainfall Version | 1999 | E (1km) | 0.332 |
| Site Location | GB 526100 184450 TQ 26100 84450 | F (1km) | 2.519 |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | | |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 minute 2 year Winter I+0% | 49.500 | 48.108 | -0.267 | 0.000 | 0.18 | | 22.9 | OK |
| S1.001 | S2 | 15 minute 2 year Winter I+0% | 49.000 | 47.971 | -0.209 | 0.000 | 0.41 | | 42.5 | OK |
| S1.002 | S3 | 15 minute 2 year Winter I+0% | 49.000 | 47.818 | -0.310 | 0.000 | 0.21 | | 42.1 | OK |
| S2.000 | S4 | 15 minute 2 year Winter I+0% | 49.500 | 48.099 | -0.276 | 0.000 | 0.15 | | 22.8 | OK |
| S2.001 | S5 | 15 minute 2 year Winter I+0% | 49.150 | 47.710 | -0.308 | 0.000 | 0.22 | | 42.5 | OK |
| S1.003 | S4 | 720 minute 2 year Winter I+0% | 49.150 | 46.916 | 0.443 | 0.000 | 0.04 | | 1.1 | SURCHARGED |

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

### Simulation Criteria

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

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

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | D3 (1km) | 0.234 |
| FEH Rainfall Version | 1999 | E (1km) | 0.332 |
| Site Location | GB 526100 184450 TQ 26100 84450 | F (1km) | 2.519 |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | | |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 minute 30 year Winter I+0% | 49.500 | 48.264 | -0.111 | 0.000 | 0.47 | | 59.7 | OK |
| S1.001 | S2 | 15 minute 30 year Winter I+0% | 49.000 | 48.211 | 0.031 | 0.000 | 1.14 | | 119.0 | SURCHARGED |
| S1.002 | S3 | 15 minute 30 year Winter I+0% | 49.000 | 47.928 | -0.200 | 0.000 | 0.58 | | 116.0 | OK |
| S2.000 | S4 | 15 minute 30 year Winter I+0% | 49.500 | 48.170 | -0.205 | 0.000 | 0.41 | | 61.1 | OK |
| S2.001 | S5 | 15 minute 30 year Winter I+0% | 49.150 | 47.834 | -0.184 | 0.000 | 0.64 | | 124.1 | OK |
| S1.003 | S4 | 960 minute 30 year Winter I+0% | 49.150 | 47.483 | 1.010 | 0.000 | 0.05 | | 1.3 | SURCHARGED |

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

### Simulation Criteria

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

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

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | D3 (1km) | 0.234 |
| FEH Rainfall Version | 1999 | E (1km) | 0.332 |
| Site Location | GB 526100 184450 TQ 26100 84450 | F (1km) | 2.519 |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | | |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 2, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|

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

| PN | US/MH Name | Event | US/CL (m) | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 15 minute 100 year Winter I+40% | 49.500 | 48.950 | 0.575 | 0.000 | 1.04 | | 133.1 | SURCHARGED |
| S1.001 | S2 | 15 minute 100 year Winter I+40% | 49.000 | 48.738 | 0.558 | 0.000 | 2.53 | | 264.4 | FLOOD RISK |
| S1.002 | S3 | 1440 minute 100 year Winter I+40% | 49.000 | 48.437 | 0.309 | 0.000 | 0.05 | | 9.6 | SURCHARGED |
| S2.000 | S4 | 1440 minute 100 year Winter I+40% | 49.500 | 48.437 | 0.062 | 0.000 | 0.03 | | 4.8 | SURCHARGED |
| S2.001 | S5 | 1440 minute 100 year Winter I+40% | 49.150 | 48.437 | 0.419 | 0.000 | 0.05 | | 9.6 | SURCHARGED |
| S1.003 | S4 | 1440 minute 100 year Winter I+40% | 49.150 | 48.437 | 1.964 | 0.000 | 0.06 | | 1.8 | SURCHARGED |

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

| | | | |
|---|---|---|---|
| Return Period (years) | 100 | Maximum Time of Concentration (mins) | 30 |
| | | Foul Sewage (l/s/ha) | 0.000 |
| FEH Rainfall Version | 1999 | Volumetric Runoff Coeff. | 0.750 |
| Site Location | GB 526100 184450 TQ 26100 84450 | PIMP (%) | 100 |
| C (1km) | -0.025 | Add Flow / Climate Change (%) | 0 |
| D1 (1km) | 0.330 | Minimum Backdrop Height (m) | 1.500 |
| D2 (1km) | 0.277 | Maximum Backdrop Height (m) | 1.500 |
| D3 (1km) | 0.234 | Min Design Depth for Optimisation (m) | 1.200 |
| E (1km) | 0.332 | Min Vel for Auto Design only (m/s) | 1.00 |
| F (1km) | 2.519 | Min Slope for Optimisation (1:X) | 500 |
| Maximum Rainfall (mm/hr) | 50 | | |

Designed with Level Soffits

### 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) |
|---|---|---|---|---|---|---|
| S1.002 | S6 | 49.000 | 46.360 | 0.000 | 0 | 0 |

## Simulation Criteria for Storm

| | | | | | |
|---|---|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Manhole Headloss Coeff (Global) | 0.500 | Inlet Coeffiecient | 0.800 |
| Areal Reduction Factor | 1.000 | Foul Sewage per hectare (l/s) | 0.000 | Flow per Person per Day (l/per/day) | 0.000 |
| Hot Start (mins) | 0 | Additional Flow - % of Total Flow | 0.000 | Run Time (mins) | 60 |
| Hot Start Level (mm) | 0 | MADD Factor * 10m³/ha Storage | 2.000 | Output Interval (mins) | 1 |

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

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | E (1km) | 0.332 |
| Return Period (years) | 100 | F (1km) | 2.519 |
| FEH Rainfall Version | 1999 | Summer Storms | Yes |
| Site Location | GB 526100 184450 TQ 26100 84450 | Winter Storms | No |
| C (1km) | -0.025 | Cv (Summer) | 0.750 |
| D1 (1km) | 0.330 | Cv (Winter) | 0.840 |
| D2 (1km) | 0.277 | Storm Duration (mins) | 30 |
| D3 (1km) | 0.234 | | |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S5, DS/PN: S1.002, Volume (m³): 45.9

| | | | |
|---|---|---|---|
| Unit Reference | MD-SHE-0120-8500-2000-8500 | Sump Available | Yes |
| Design Head (m) | 2.000 | Diameter (mm) | 120 |
| Design Flow (l/s) | 8.5 | Invert Level (m) | 46.398 |
| Flush-Flo™ | Calculated | Minimum Outlet Pipe Diameter (mm) | 150 |
| Objective | Minimise upstream storage | Suggested Manhole Diameter (mm) | 1200 |
| Application | Surface | | |

| Control Points | Head (m) | Flow (l/s) | Control Points | Head (m) | Flow (l/s) |
|---|---|---|---|---|---|
| Design Point (Calculated) | 2.000 | 8.5 | Kick-Flo® | 1.076 | 6.4 |
| Flush-Flo™ | 0.524 | 8.0 | Mean Flow over Head Range | - | 7.2 |

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) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.100 | 4.3 | 0.600 | 8.0 | 1.600 | 7.7 | 2.600 | 9.6 | 5.000 | 13.1 | 7.500 | 15.9 |
| 0.200 | 6.9 | 0.800 | 7.7 | 1.800 | 8.1 | 3.000 | 10.3 | 5.500 | 13.7 | 8.000 | 16.4 |
| 0.300 | 7.6 | 1.000 | 6.9 | 2.000 | 8.5 | 3.500 | 11.1 | 6.000 | 14.3 | 8.500 | 16.9 |
| 0.400 | 7.9 | 1.200 | 6.7 | 2.200 | 8.9 | 4.000 | 11.8 | 6.500 | 14.9 | 9.000 | 17.4 |
| 0.500 | 8.0 | 1.400 | 7.2 | 2.400 | 9.3 | 4.500 | 12.5 | 7.000 | 15.4 | 9.500 | 17.8 |

## Storage Structures for Storm

### Tank or Pond Manhole: S5, DS/PN: S1.002

Invert Level (m) 46.398

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 600.0 | 2.000 | 600.0 | 2.001 | 0.0 |