

# Drainage Design Report

## Flow

v8.1

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|                           |  |
|---------------------------|--|
| <b>Network</b>            | Storm Network  |
| <b>Filename</b>           | C:\Users\Bob\Documents\reford\18.526 dog and partridge pub\drainage design\dog 5.pfd |
| <b>Username</b>           | Bob Ford (r.e.ford@virginmedia.com)  |
| <b>Last analysed</b>      | 14/03/2019 17:55:30  |
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<http://support.causeway.com>

|   |                   |
|---|-------------------|
| <b>Rainfall Methodology</b>                 | FSR               |
| <b>Return Period (years)</b>                | 2                 |
| <b>Additional Flow (%)</b>                  | 0                 |
| <b>FSR Region</b>                           | England and Wales |
| <b>M5-60 (mm)</b>                           | 19.000            |
| <b>Ratio-R</b>                              | 0.250             |
| <b>CV</b>                                   | 0.750             |
| <b>Time of Entry (mins)</b>                 | 5.00              |
| <b>Maximum Time of Concentration (mins)</b> | 30.00             |
| <b>Maximum Rainfall (mm/hr)</b>             | 75.0              |
| <b>Minimum Velocity (m/s)</b>               | 1.00              |
| <b>Connection Type</b>                      | Level Soffits     |
| <b>Minimum Backdrop Height (m)</b>          | 2.000             |
| <b>Preferred Cover Depth (m)</b>            | 0.400             |
| <b>Include Intermediate Ground</b>          |                   |
| <b>Enforce best practice design rules</b>   |                   |

| Name | Area (ha) | T of E (mins) | Add Inflow (l/s) | Cover Level (m) | Node Type | Diameter (mm) | Depth (m) |
|------|-----------|---------------|------------------|-----------------|-----------|---------------|-----------|
| 1    | 0.008     | 5.00          |                  | 100.400         | Manhole   | 100           | 0.500     |
| 2    | 0.008     | 5.00          |                  | 100.400         | Manhole   | 450           | 0.820     |
| 3    | 0.012     | 5.00          |                  | 100.400         | Manhole   | 450           | 1.005     |
| 4    | 0.012     | 5.00          |                  | 100.400         | Manhole   | 450           | 1.190     |
| 5    | 0.023     | 5.00          |                  | 100.400         | Manhole   | 1200          | 1.350     |
| 6    | 0.005     | 5.00          |                  | 100.200         | Manhole   | 1200          | 1.398     |
| 7    | 0.006     | 5.00          |                  | 100.300         | Manhole   | 100           | 0.500     |
| 8    | 0.005     | 5.00          |                  | 100.250         | Manhole   | 450           | 0.669     |
| 9    |           |               |                  | 100.200         | Manhole   | 450           | 0.838     |
| 10   | 0.007     | 5.00          |                  | 100.300         | Manhole   | 100           | 0.500     |
| 11   | 0.006     | 5.00          |                  | 100.250         | Manhole   | 450           | 0.669     |
| 12   |           |               |                  | 100.200         | Manhole   | 450           | 1.057     |
| 13   | 0.013     | 5.00          |                  | 100.200         | Manhole   | 1200          | 1.438     |
| 14   | 0.009     | 5.00          |                  | 100.000         | Manhole   | 100           | 0.500     |
| 14A  | 0.006     | 5.00          |                  | 99.900          | Manhole   | 450           | 0.800     |
| 15   | 0.017     | 5.00          |                  | 100.000         | Manhole   | 1200          | 1.425     |
| 16   | 0.012     | 5.00          |                  | 100.000         | Manhole   | 1200          | 1.537     |
| 17   | 0.011     | 5.00          |                  | 100.000         | Manhole   | 1200          | 1.596     |
| 18   |           |               |                  | 99.900          | Manhole   | 1200          | 1.549     |
| 19   |           |               |                  | 99.800          | Manhole   | 1200          | 1.491     |

| Name  | US Node | DS Node | Length (m) | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | Link Type | T of C (mins) | Rain (mm/hr) | Min DS IL (m) | Lateral Area (ha) | Lateral Ins Point (%) | Lateral T of E (mins) |
|-------|---------|---------|------------|-----------|-----------|----------|-------------|----------|-----------|---------------|--------------|---------------|-------------------|-----------------------|-----------------------|
| 1.000 | 1       | 2       | 19.000     | 99.900    | 99.580    | 0.320    | 59.4        | 100      | Circular  | 5.32          | 51.3         |               |                   |                       |                       |
| 1.001 | 2       | 3       | 11.000     | 99.580    | 99.395    | 0.185    | 59.5        | 100      | Circular  | 5.50          | 50.6         |               |                   |                       |                       |
| 1.002 | 3       | 4       | 11.000     | 99.395    | 99.210    | 0.185    | 59.5        | 100      | Circular  | 5.68          | 50.0         |               |                   |                       |                       |
| 1.003 | 4       | 6       | 7.000      | 99.210    | 98.852    | 0.358    | 19.6        | 100      | Circular  | 5.75          | 49.8         |               |                   |                       |                       |
| 2.000 | 5       | 6       | 25.000     | 99.050    | 98.802    | 0.248    | 100.8       | 150      | Circular  | 5.42          | 50.9         |               |                   |                       |                       |
| 1.004 | 6       | 13      | 4.000      | 98.802    | 98.762    | 0.040    | 100.0       | 150      | Circular  | 5.82          | 49.6         |               |                   |                       |                       |
| 3.000 | 7       | 8       | 13.000     | 99.800    | 99.581    | 0.219    | 59.4        | 100      | Circular  | 5.22          | 51.6         |               |                   |                       |                       |
| 3.001 | 8       | 9       | 13.000     | 99.581    | 99.362    | 0.219    | 59.4        | 100      | Circular  | 5.43          | 50.8         |               |                   |                       |                       |
| 3.002 | 9       | 12      | 13.000     | 99.362    | 99.143    | 0.219    | 59.4        | 100      | Circular  | 5.65          | 50.1         |               |                   |                       |                       |
| 4.000 | 10      | 11      | 13.000     | 99.800    | 99.581    | 0.219    | 59.4        | 100      | Circular  | 5.22          | 51.6         |               |                   |                       |                       |
| 4.001 | 11      | 12      | 13.000     | 99.581    | 99.143    | 0.438    | 29.7        | 100      | Circular  | 5.37          | 51.1         |               |                   |                       |                       |
| 3.003 | 12      | 13      | 5.000      | 99.143    | 98.812    | 0.331    | 15.1        | 100      | Circular  | 5.69          | 50.0         |               |                   |                       |                       |
| 1.005 | 13      | 16      | 15.000     | 98.762    | 98.538    | 0.224    | 67.0        | 150      | Circular  | 6.02          | 48.9         |               |                   |                       |                       |
| 5.000 | 14      | 14A     | 5.000      | 99.500    | 99.100    | 0.400    | 12.5        | 100      | Circular  | 5.04          | 52.3         |               |                   |                       |                       |
| 5.001 | 14A     | 15      | 6.000      | 99.100    | 98.700    | 0.400    | 15.0        | 100      | Circular  | 5.09          | 52.1         |               |                   |                       |                       |
| 5.002 | 15      | 16      | 19.000     | 98.575    | 98.463    | 0.112    | 169.6       | 225      | Circular  | 5.40          | 50.9         |               |                   |                       |                       |
| 1.006 | 16      | 17      | 10.000     | 98.463    | 98.404    | 0.059    | 169.5       | 225      | Circular  | 6.19          | 48.4         |               |                   |                       |                       |
| 1.007 | 17      | 18      | 9.000      | 98.404    | 98.351    | 0.053    | 169.8       | 225      | Circular  | 6.34          | 48.0         |               |                   |                       |                       |
| 1.008 | 18      | 19      | 7.000      | 98.351    | 98.309    | 0.042    | 166.7       | 225      | Circular  | 6.45          | 47.6         |               |                   |                       |                       |

| Rainfall Methodology                         | FSR               |  | Return Period (years) | Climate Change (%) |
|--|-------------------|--|-----------------------|--------------------|
| <b>FSR Region</b>                            | England and Wales |  | 1                     | 0                  |
| <b>M5-60 (mm)</b>                            | 19.000            |  | 30                    | 0                  |
| <b>Ratio-R</b>                               | 0.250             |  | 100                   | 0                  |
| <b>Summer CV</b>                             | 0.750             |  | 100                   | 30                 |
| <b>Winter CV</b>                             | 0.840             |  |                       |                    |
| <b>Analysis Speed</b>                        | Normal            |  |                       |                    |
| <b>Skip Steady State</b>                     | x                 |  |                       |                    |
| <b>Drain Down Time (mins)</b>                | 240               |  |                       |                    |
| <b>Additional Storage (m<sup>3</sup>/ha)</b> | 20.0              |  |                       |                    |
| <b>Storm Durations (mins)</b>                | 15                |  |                       |                    |
|  | 30                |  |                       |                    |
|  | 60                |  |                       |                    |
|  | 120               |  |                       |                    |
|  | 180               |  |                       |                    |
|  | 240               |  |                       |                    |
|  | 360               |  |                       |                    |
|  | 480               |  |                       |                    |
|  | 600               |  |                       |                    |
|  | 720               |  |                       |                    |
|  | 960               |  |                       |                    |
|  | 1440              |  |                       |                    |
| <b>Check Discharge Rate(s)</b>               | x                 |  |                       |                    |
| <b>1 year (l/s)</b>                          |                   |  |                       |                    |
| <b>30 year (l/s)</b>                         |                   |  |                       |                    |
| <b>100 year (l/s)</b>                        |                   |  |                       |                    |
| <b>Check Discharge Volume</b>                | x                 |  |                       |                    |
| <b>100 year 360 minute (m<sup>3</sup>)</b>   |                   |  |                       |                    |

| Hydro-Brake® |            |                  |                          |              |                  |                  |                   |                           |                |                             |                         |                        |
|--------------|------------|------------------|--------------------------|--------------|------------------|------------------|-------------------|---------------------------|----------------|-----------------------------|-------------------------|------------------------|
| Node         | Flap Valve | Online / Offline | Replaces Downstream Link | Loop to Node | Invert Level (m) | Design Depth (m) | Design Flow (l/s) | Objective                 | Sump Available | Product Number              | Min Outlet Diameter (m) | Min Node Diameter (mm) |
| 18           | x          | Online           | x                        |              | 98.351           | 1.500            | 5.0(HE)           | Minimise upstream storage |                | CTL-SHE-0098-5000-1500-5000 | 0.150                   | 1200                   |

| Depth/Area/Inf Area |                             |                             |               |          |                  |                           |           |                        |                             |
|---------------------|-----------------------------|-----------------------------|---------------|----------|------------------|---------------------------|-----------|------------------------|-----------------------------|
| Node                | Base Inf Coefficient (m/hr) | Side Inf Coefficient (m/hr) | Safety Factor | Porosity | Invert Level (m) | Time to half empty (mins) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
| 18                  | 0.00000                     | 0.00000                     | 2.0           | 0.95     | 98.351           | 212                       | 0.000     | 47.0                   | 0.0                         |
|                     |                             |                             |               |          |                  |                           | 1.000     | 47.0                   | 0.0                         |
|                     |                             |                             |               |          |                  |                           | 1.001     | 0.0                    | 0.0                         |

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.52%

| Event             | US Node ID | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status | Link ID | DS Node ID | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-------------------|------------|-------------|-----------|-----------|--------------|---------------|------------|--------|---------|------------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter  | 1          | 11          | 99.923    | 0.023     | 0.9          | 0.0075        | 0.0000     | OK     | 1.000   | 2          | 0.9           | 0.511          | 0.114    | 0.0338        |                    |
| 15 minute winter  | 2          | 11          | 99.613    | 0.033     | 1.8          | 0.0115        | 0.0000     | OK     | 1.001   | 3          | 1.8           | 0.632          | 0.229    | 0.0314        |                    |
| 15 minute winter  | 3          | 11          | 99.441    | 0.046     | 3.2          | 0.0182        | 0.0000     | OK     | 1.002   | 4          | 3.1           | 0.952          | 0.397    | 0.0361        |                    |
| 15 minute winter  | 4          | 11          | 99.251    | 0.041     | 4.5          | 0.0149        | 0.0000     | OK     | 1.003   | 6          | 4.5           | 1.508          | 0.323    | 0.0207        |                    |
| 15 minute winter  | 5          | 10          | 99.088    | 0.038     | 2.6          | 0.0566        | 0.0000     | OK     | 2.000   | 6          | 2.5           | 0.417          | 0.144    | 0.1638        |                    |
| 15 minute winter  | 6          | 11          | 98.882    | 0.080     | 7.6          | 0.0964        | 0.0000     | OK     | 1.004   | 13         | 7.5           | 0.776          | 0.425    | 0.0389        |                    |
| 15 minute winter  | 7          | 10          | 99.820    | 0.020     | 0.7          | 0.0049        | 0.0000     | OK     | 3.000   | 8          | 0.7           | 0.479          | 0.084    | 0.0181        |                    |
| 15 minute winter  | 8          | 10          | 99.608    | 0.027     | 1.3          | 0.0083        | 0.0000     | OK     | 3.001   | 9          | 1.2           | 0.726          | 0.152    | 0.0218        |                    |
| 15 minute winter  | 9          | 11          | 99.389    | 0.027     | 1.2          | 0.0042        | 0.0000     | OK     | 3.002   | 12         | 1.2           | 0.688          | 0.154    | 0.0228        |                    |
| 15 minute winter  | 10         | 11          | 99.822    | 0.022     | 0.8          | 0.0062        | 0.0000     | OK     | 4.000   | 11         | 0.8           | 0.593          | 0.102    | 0.0177        |                    |
| 15 minute winter  | 11         | 10          | 99.606    | 0.025     | 1.5          | 0.0083        | 0.0000     | OK     | 4.001   | 12         | 1.5           | 0.890          | 0.130    | 0.0214        |                    |
| 15 minute winter  | 12         | 11          | 99.172    | 0.029     | 2.6          | 0.0045        | 0.0000     | OK     | 3.003   | 13         | 2.7           | 1.353          | 0.169    | 0.0101        |                    |
| 15 minute winter  | 13         | 11          | 98.844    | 0.082     | 11.6         | 0.1081        | 0.0000     | OK     | 1.005   | 16         | 11.6          | 1.213          | 0.533    | 0.1434        |                    |
| 15 minute winter  | 14         | 10          | 99.516    | 0.016     | 1.0          | 0.0060        | 0.0000     | OK     | 5.000   | 14A        | 1.0           | 0.942          | 0.058    | 0.0055        |                    |
| 15 minute winter  | 14A        | 10          | 99.123    | 0.023     | 1.7          | 0.0071        | 0.0000     | OK     | 5.001   | 15         | 1.7           | 1.275          | 0.107    | 0.0079        |                    |
| 15 minute winter  | 15         | 10          | 98.620    | 0.045     | 3.6          | 0.0614        | 0.0000     | OK     | 5.002   | 16         | 3.5           | 0.314          | 0.088    | 0.2357        |                    |
| 15 minute winter  | 16         | 11          | 98.573    | 0.110     | 16.4         | 0.1414        | 0.0000     | OK     | 1.006   | 17         | 16.3          | 0.861          | 0.410    | 0.1896        |                    |
| 120 minute winter | 17         | 82          | 98.555    | 0.151     | 7.6          | 0.1917        | 0.0000     | OK     | 1.007   | 18         | 7.3           | 0.758          | 0.185    | 0.2977        |                    |
| 120 minute winter | 18         | 82          | 98.555    | 0.204     | 7.3          | 9.3225        | 0.0000     | OK     | 1.008   | 19         | 4.1           | 0.635          | 0.103    | 0.0456        | 21.5               |
| 120 minute winter | 19         | 82          | 98.357    | 0.048     | 4.1          | 0.0000        | 0.0000     | OK     |         |            |               |                |          |               |                    |



Results for 30 year Critical Storm Duration. Lowest mass balance: 99.52%

| Event             | US Node ID | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     | Link ID | DS Node ID | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-------------------|------------|-------------|-----------|-----------|--------------|---------------|------------|------------|---------|------------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter  | 1          | 10          | 99.936    | 0.036     | 2.2          | 0.0118        | 0.0000     | OK         | 1.000   | 2          | 2.2           | 0.647          | 0.276    | 0.0638        |                    |
| 15 minute winter  | 2          | 10          | 99.633    | 0.053     | 4.4          | 0.0187        | 0.0000     | OK         | 1.001   | 3          | 4.3           | 0.741          | 0.547    | 0.0627        |                    |
| 15 minute winter  | 3          | 11          | 99.482    | 0.087     | 7.7          | 0.0346        | 0.0000     | OK         | 1.002   | 4          | 7.6           | 1.119          | 0.967    | 0.0826        |                    |
| 15 minute winter  | 4          | 12          | 99.333    | 0.122     | 10.9         | 0.0442        | 0.0000     | SURCHARGED | 1.003   | 6          | 10.4          | 1.601          | 0.753    | 0.0548        |                    |
| 15 minute winter  | 5          | 12          | 99.115    | 0.065     | 6.4          | 0.0961        | 0.0000     | OK         | 2.000   | 6          | 6.3           | 0.474          | 0.357    | 0.3120        |                    |
| 15 minute winter  | 6          | 12          | 99.097    | 0.295     | 18.1         | 0.3543        | 0.0000     | SURCHARGED | 1.004   | 13         | 16.2          | 0.922          | 0.914    | 0.0704        |                    |
| 15 minute winter  | 7          | 10          | 99.831    | 0.031     | 1.7          | 0.0078        | 0.0000     | OK         | 3.000   | 8          | 1.7           | 0.617          | 0.213    | 0.0354        |                    |
| 15 minute winter  | 8          | 10          | 99.625    | 0.044     | 3.1          | 0.0137        | 0.0000     | OK         | 3.001   | 9          | 3.0           | 0.912          | 0.382    | 0.0429        |                    |
| 15 minute winter  | 9          | 11          | 99.405    | 0.043     | 3.0          | 0.0069        | 0.0000     | OK         | 3.002   | 12         | 3.0           | 0.872          | 0.388    | 0.0481        |                    |
| 15 minute winter  | 10         | 10          | 99.834    | 0.034     | 2.0          | 0.0098        | 0.0000     | OK         | 4.000   | 11         | 1.9           | 0.750          | 0.248    | 0.0338        |                    |
| 15 minute winter  | 11         | 10          | 99.620    | 0.039     | 3.6          | 0.0133        | 0.0000     | OK         | 4.001   | 12         | 3.6           | 1.142          | 0.322    | 0.0451        |                    |
| 15 minute winter  | 12         | 11          | 99.195    | 0.052     | 6.6          | 0.0083        | 0.0000     | OK         | 3.003   | 13         | 6.4           | 1.357          | 0.407    | 0.0300        |                    |
| 15 minute winter  | 13         | 12          | 99.040    | 0.278     | 25.7         | 0.3643        | 0.0000     | SURCHARGED | 1.005   | 16         | 25.2          | 1.433          | 1.160    | 0.2641        |                    |
| 15 minute winter  | 14         | 10          | 99.526    | 0.026     | 2.5          | 0.0095        | 0.0000     | OK         | 5.000   | 14A        | 2.5           | 1.178          | 0.144    | 0.0106        |                    |
| 15 minute winter  | 14A        | 10          | 99.137    | 0.037     | 4.2          | 0.0115        | 0.0000     | OK         | 5.001   | 15         | 4.2           | 1.626          | 0.264    | 0.0153        |                    |
| 120 minute winter | 15         | 92          | 98.927    | 0.352     | 3.6          | 0.4822        | 0.0000     | SURCHARGED | 5.002   | 16         | 3.1           | 0.267          | 0.079    | 0.7557        |                    |
| 120 minute winter | 16         | 92          | 98.927    | 0.464     | 15.9         | 0.5971        | 0.0000     | SURCHARGED | 1.006   | 17         | 15.3          | 0.661          | 0.385    | 0.3977        |                    |
| 120 minute winter | 17         | 92          | 98.926    | 0.522     | 16.5         | 0.6621        | 0.0000     | SURCHARGED | 1.007   | 18         | 16.2          | 0.961          | 0.407    | 0.3579        |                    |
| 120 minute winter | 18         | 92          | 98.925    | 0.574     | 16.2         | 26.2556       | 0.0000     | SURCHARGED | 1.008   | 19         | 4.9           | 0.665          | 0.122    | 0.0515        | 50.6               |
| 120 minute summer | 19         | 74          | 98.362    | 0.053     | 4.9          | 0.0000        | 0.0000     | OK         |         |            |               |                |          |               |                    |

| Results for 100 year Critical Storm Duration. Lowest mass balance: 99.52% |            |             |           |           |              |               |            |            |         |            |               |                |          |               |                    |
|---|------------|-------------|-----------|-----------|--------------|---------------|------------|------------|---------|------------|---------------|----------------|----------|---------------|--------------------|
| Event   | US Node ID | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     | Link ID | DS Node ID | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
| 15 minute winter  | 1          | 10          | 99.942    | 0.042     | 2.9          | 0.0137        | 0.0000     | OK         | 1.000   | 2          | 2.8           | 0.680          | 0.362    | 0.1029        |                    |
| 15 minute winter  | 2          | 12          | 99.747    | 0.167     | 5.7          | 0.0590        | 0.0000     | SURCHARGED | 1.001   | 3          | 5.0           | 0.737          | 0.632    | 0.0861        |                    |
| 15 minute winter  | 3          | 12          | 99.687    | 0.292     | 9.1          | 0.1162        | 0.0000     | SURCHARGED | 1.002   | 4          | 7.8           | 1.113          | 0.993    | 0.0861        |                    |
| 15 minute winter  | 4          | 12          | 99.503    | 0.293     | 11.9         | 0.1058        | 0.0000     | SURCHARGED | 1.003   | 6          | 11.0          | 1.638          | 0.797    | 0.0548        |                    |
| 15 minute winter  | 5          | 12          | 99.282    | 0.232     | 8.3          | 0.3410        | 0.0000     | SURCHARGED | 2.000   | 6          | 7.4           | 0.508          | 0.421    | 0.4401        |                    |
| 30 minute summer  | 6          | 20          | 99.255    | 0.453     | 18.6         | 0.5452        | 0.0000     | SURCHARGED | 1.004   | 13         | 16.1          | 0.915          | 0.907    | 0.0704        |                    |
| 15 minute winter  | 7          | 10          | 99.836    | 0.036     | 2.2          | 0.0089        | 0.0000     | OK         | 3.000   | 8          | 2.2           | 0.655          | 0.274    | 0.0428        |                    |
| 15 minute winter  | 8          | 10          | 99.633    | 0.052     | 4.0          | 0.0159        | 0.0000     | OK         | 3.001   | 9          | 3.9           | 0.980          | 0.490    | 0.0513        |                    |
| 15 minute winter  | 9          | 11          | 99.412    | 0.050     | 3.9          | 0.0079        | 0.0000     | OK         | 3.002   | 12         | 3.9           | 0.867          | 0.493    | 0.0742        |                    |
| 15 minute winter  | 10         | 10          | 99.839    | 0.039     | 2.5          | 0.0112        | 0.0000     | OK         | 4.000   | 11         | 2.5           | 0.798          | 0.315    | 0.0404        |                    |
| 15 minute winter  | 11         | 10          | 99.626    | 0.045     | 4.7          | 0.0152        | 0.0000     | OK         | 4.001   | 12         | 4.6           | 1.172          | 0.413    | 0.0705        |                    |
| 15 minute winter  | 12         | 13          | 99.274    | 0.131     | 8.4          | 0.0208        | 0.0000     | SURCHARGED | 3.003   | 13         | 7.8           | 1.385          | 0.494    | 0.0391        |                    |
| 30 minute winter  | 13         | 21          | 99.203    | 0.441     | 25.6         | 0.5781        | 0.0000     | SURCHARGED | 1.005   | 16         | 24.1          | 1.366          | 1.106    | 0.2641        |                    |
| 15 minute winter  | 14         | 10          | 99.529    | 0.029     | 3.2          | 0.0108        | 0.0000     | OK         | 5.000   | 14A        | 3.2           | 1.256          | 0.185    | 0.0128        |                    |
| 120 minute winter   | 14A        | 100         | 99.173    | 0.073     | 2.2          | 0.0224        | 0.0000     | OK         | 5.001   | 15         | 2.2           | 1.333          | 0.140    | 0.0417        |                    |
| 120 minute winter   | 15         | 100         | 99.172    | 0.597     | 4.7          | 0.8183        | 0.0000     | SURCHARGED | 5.002   | 16         | 4.2           | 0.272          | 0.104    | 0.7557        |                    |
| 120 minute winter   | 16         | 100         | 99.172    | 0.709     | 19.9         | 0.9128        | 0.0000     | SURCHARGED | 1.006   | 17         | 19.4          | 0.651          | 0.488    | 0.3977        |                    |
| 120 minute winter   | 17         | 100         | 99.171    | 0.767     | 21.0         | 0.9738        | 0.0000     | SURCHARGED | 1.007   | 18         | 20.6          | 1.017          | 0.518    | 0.3579        |                    |
| 120 minute winter   | 18         | 100         | 99.170    | 0.819     | 20.6         | 37.5164       | 0.0000     | SURCHARGED | 1.008   | 19         | 4.9           | 0.665          | 0.122    | 0.0515        | 66.3               |
| 240 minute summer   | 19         | 128         | 98.362    | 0.053     | 4.9          | 0.0000        | 0.0000     | OK         |         |            |               |                |          |               |                    |

Results for 100 year +30% Critical Storm Duration. Lowest mass balance: 99.52%

| Event             | US Node ID | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     | Link ID | DS Node ID | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-------------------|------------|-------------|-----------|-----------|--------------|---------------|------------|------------|---------|------------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter  | 1          | 13          | 100.060   | 0.159     | 3.7          | 0.0523        | 0.0000     | SURCHARGED | 1.000   | 2          | 3.7           | 0.692          | 0.465    | 0.1487        |                    |
| 15 minute winter  | 2          | 13          | 100.036   | 0.456     | 7.4          | 0.1615        | 0.0000     | SURCHARGED | 1.001   | 3          | 5.1           | 0.741          | 0.652    | 0.0861        |                    |
| 15 minute winter  | 3          | 13          | 99.978    | 0.583     | 9.6          | 0.2320        | 0.0000     | SURCHARGED | 1.002   | 4          | 7.8           | 1.093          | 0.993    | 0.0861        |                    |
| 240 minute winter | 4          | 184         | 99.835    | 0.625     | 4.8          | 0.2257        | 0.0000     | SURCHARGED | 1.003   | 6          | 4.8           | 1.465          | 0.348    | 0.0548        |                    |
| 240 minute winter | 5          | 184         | 99.832    | 0.782     | 2.8          | 1.1511        | 0.0000     | SURCHARGED | 2.000   | 6          | 2.7           | 0.399          | 0.152    | 0.4401        |                    |
| 240 minute winter | 6          | 184         | 99.832    | 1.030     | 8.0          | 1.2386        | 0.0000     | SURCHARGED | 1.004   | 13         | 7.4           | 0.780          | 0.417    | 0.0704        |                    |
| 15 minute winter  | 7          | 10          | 99.841    | 0.041     | 2.8          | 0.0101        | 0.0000     | OK         | 3.000   | 8          | 2.8           | 0.691          | 0.350    | 0.0518        |                    |
| 240 minute winter | 8          | 184         | 99.833    | 0.252     | 1.3          | 0.0778        | 0.0000     | SURCHARGED | 3.001   | 9          | 1.3           | 0.733          | 0.165    | 0.1017        |                    |
| 240 minute winter | 9          | 184         | 99.832    | 0.470     | 1.5          | 0.0748        | 0.0000     | SURCHARGED | 3.002   | 12         | 1.3           | 0.716          | 0.165    | 0.1017        |                    |
| 15 minute winter  | 10         | 10          | 99.845    | 0.045     | 3.3          | 0.0131        | 0.0000     | OK         | 4.000   | 11         | 3.3           | 0.857          | 0.414    | 0.0494        |                    |
| 240 minute winter | 11         | 184         | 99.832    | 0.251     | 1.5          | 0.0849        | 0.0000     | SURCHARGED | 4.001   | 12         | 1.5           | 0.903          | 0.134    | 0.1017        |                    |
| 240 minute winter | 12         | 184         | 99.832    | 0.689     | 2.8          | 0.1095        | 0.0000     | SURCHARGED | 3.003   | 13         | 2.8           | 1.396          | 0.178    | 0.0391        |                    |
| 240 minute winter | 13         | 184         | 99.831    | 1.069     | 11.7         | 1.4021        | 0.0000     | SURCHARGED | 1.005   | 16         | 11.3          | 1.052          | 0.520    | 0.2641        |                    |
| 240 minute winter | 14         | 184         | 99.825    | 0.325     | 1.1          | 0.1197        | 0.0000     | FLOOD RISK | 5.000   | 14A        | 1.1           | 0.985          | 0.064    | 0.0391        |                    |
| 240 minute winter | 14A        | 184         | 99.825    | 0.725     | 1.8          | 0.2241        | 0.0000     | FLOOD RISK | 5.001   | 15         | 1.8           | 1.185          | 0.114    | 0.0469        |                    |
| 240 minute winter | 15         | 184         | 99.825    | 1.250     | 3.8          | 1.7119        | 0.0000     | FLOOD RISK | 5.002   | 16         | 3.4           | 0.254          | 0.086    | 0.7557        |                    |
| 240 minute winter | 16         | 184         | 99.824    | 1.361     | 16.1         | 1.7522        | 0.0000     | FLOOD RISK | 1.006   | 17         | 15.8          | 0.586          | 0.396    | 0.3977        |                    |
| 240 minute winter | 17         | 184         | 99.823    | 1.419     | 17.1         | 1.8011        | 0.0000     | FLOOD RISK | 1.007   | 18         | 16.7          | 0.898          | 0.421    | 0.3579        |                    |
| 240 minute winter | 18         | 184         | 99.822    | 1.471     | 16.7         | 46.3361       | 0.0000     | FLOOD RISK | 1.008   | 19         | 4.9           | 0.665          | 0.122    | 0.0515        | 108.2              |
| 15 minute winter  | 19         | 16          | 98.362    | 0.053     | 4.9          | 0.0000        | 0.0000     | OK         |         |            |               |                |          |               |                    |