

|                                            |                                  |                                                                                     |
|--------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|
| A L Daines & Partners                      |                                  | Page 1                                                                              |
| 28 Castle Street<br>Carlisle<br>CA3 8TP    |                                  |  |
| Date 01/02/2023 10:57<br>File MD CALCS.MDX | Designed by petera<br>Checked by |                                                                                     |
| Micro Drainage Network 2020.1.3            |                                  |                                                                                     |

  

Free Flowing Outfall Details for Storm

| Outfall<br>Pipe Number | Outfall<br>Name | C. Level<br>(m) | I. Level<br>(m) | Min<br>I. Level<br>(m) | D,L<br>(mm) | W<br>(mm) |
|------------------------|-----------------|-----------------|-----------------|------------------------|-------------|-----------|
| 3.005                  | OUTFALL         | 49.000          | 48.025          | 0.000                  | 0           | 0         |

  

Free Flowing Outfall Details for Storm

| Outfall<br>Pipe Number | Outfall<br>Name | C. Level<br>(m) | I. Level<br>(m) | Min<br>I. Level<br>(m) | D,L<br>(mm) | W<br>(mm) |
|------------------------|-----------------|-----------------|-----------------|------------------------|-------------|-----------|
| 7.001                  | 5               | 56.975          | 55.175          | 0.000                  | 1500        | 0         |

  

Simulation Criteria for Storm

|                                 |       |                                     |        |
|---------------------------------|-------|-------------------------------------|--------|
| Volumetric Runoff Coeff         | 0.750 | Additional Flow - % of Total Flow   | 50.000 |
| Areal Reduction Factor          | 1.000 | MADD Factor * 10m³/ha Storage       | 2.000  |
| Hot Start (mins)                | 0     | Inlet Coefficient                   | 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 | 4 |
| Number of Online Controls   | 4 | 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          | Summer |
| Return Period (years) | 100               | Cv (Summer)           | 0.750  |
| Region                | England and Wales | Cv (Winter)           | 0.840  |
| M5-60 (mm)            | 22.000            | Storm Duration (mins) | 30     |
| Ratio R               | 0.196             |                       |        |

  

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|                                            |                                  |                                                                                     |
|--------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|
| A L Daines & Partners                      |                                  | Page 2                                                                              |
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| Micro Drainage                             | Network 2020.1.3                 |                                                                                     |

### Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW09, DS/PN: 3.002, Volume (m³): 11.2

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SHE-0151-1200-1500-1200 |
| Design Head (m)                   | 1.500                      |
| Design Flow (l/s)                 | 12.0                       |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Minimise upstream storage  |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 151                        |
| Invert Level (m)                  | 53.660                     |
| Minimum Outlet Pipe Diameter (mm) | 225                        |
| Suggested Manhole Diameter (mm)   | 1500                       |

| Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.500    | 12.0       |
| Flush-Flo™                | 0.442    | 12.0       |
| Kick-Flo®                 | 0.944    | 9.6        |
| Mean Flow over Head Range | -        | 10.4       |

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     | 5.4        | 1.200     | 10.8       | 3.000     | 16.7       | 7.000     | 25.0       |
| 0.200     | 10.8       | 1.400     | 11.6       | 3.500     | 17.9       | 7.500     | 25.9       |
| 0.300     | 11.7       | 1.600     | 12.4       | 4.000     | 19.1       | 8.000     | 26.7       |
| 0.400     | 12.0       | 1.800     | 13.1       | 4.500     | 20.2       | 8.500     | 27.5       |
| 0.500     | 12.0       | 2.000     | 13.7       | 5.000     | 21.3       | 9.000     | 28.2       |
| 0.600     | 11.8       | 2.200     | 14.4       | 5.500     | 22.3       | 9.500     | 29.0       |
| 0.800     | 11.1       | 2.400     | 15.0       | 6.000     | 23.2       |           |            |
| 1.000     | 9.9        | 2.600     | 15.6       | 6.500     | 24.1       |           |            |

Hydro-Brake® Optimum Manhole: SW05, DS/PN: 4.004, Volume (m³): 5.8

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SHE-0091-3400-0800-3400 |
| Design Head (m)                   | 0.800                      |
| Design Flow (l/s)                 | 3.4                        |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Minimise upstream storage  |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 91                         |
| Invert Level (m)                  | 55.165                     |
| Minimum Outlet Pipe Diameter (mm) | 150                        |
| Suggested Manhole Diameter (mm)   | 1200                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|----------------|----------------------------|-----------------|---------------------------|-------------------|------------|------------|------------|-----------|---------------------------|-------------|---------|---------------------------|-----|---------------|-----|------------------|--------|-----------------------------------|------|---------------------------------|------|-------|-----|-------|-----|-------|-----|-------|-----|-------|------|-------|-----|-------|-----|-------|-----|-------|------|-------|-----|-------|-----|-------|-----|-------|------|-------|-----|-------|-----|-------|-----|-------|------|-------|-----|-------|-----|-------|-----|--|--|-------|-----|-------|-----|-------|-----|--|--|
| A L Daines & Partners                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  | Page 3                                                                              |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 28 Castle Street<br>Carlisle<br>CA3 8TP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  |  |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Date 01/02/2023 10:57<br>File MD CALCS.MDX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Designed by petera<br>Checked by |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Micro Drainage Network 2020.1.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <u>Hydro-Brake® Optimum Manhole: SW05, DS/PN: 4.004, Volume (m³): 5.8</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.800</td><td>3.4</td></tr><tr><td>Flush-Flo™</td><td>0.238</td><td>3.4</td></tr><tr><td>Kick-Flo®</td><td>0.521</td><td>2.8</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.9</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  |                                                                                     | Control Points | Head (m)                   | Flow (l/s)      | Design Point (Calculated) | 0.800             | 3.4        | Flush-Flo™ | 0.238      | 3.4       | Kick-Flo®                 | 0.521       | 2.8     | Mean Flow over Head Range | -   | 2.9           |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Control Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Head (m)                         | Flow (l/s)                                                                          |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Design Point (Calculated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.800                            | 3.4                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Flush-Flo™                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.238                            | 3.4                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Kick-Flo®                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.521                            | 2.8                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Mean Flow over Head Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                | 2.9                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <p>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</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>2.8</td><td>1.200</td><td>4.1</td><td>3.000</td><td>6.3</td><td>7.000</td><td>9.4</td></tr><tr><td>0.200</td><td>3.4</td><td>1.400</td><td>4.4</td><td>3.500</td><td>6.8</td><td>7.500</td><td>9.7</td></tr><tr><td>0.300</td><td>3.4</td><td>1.600</td><td>4.7</td><td>4.000</td><td>7.2</td><td>8.000</td><td>10.0</td></tr><tr><td>0.400</td><td>3.3</td><td>1.800</td><td>4.9</td><td>4.500</td><td>7.6</td><td>8.500</td><td>10.3</td></tr><tr><td>0.500</td><td>2.9</td><td>2.000</td><td>5.2</td><td>5.000</td><td>8.0</td><td>9.000</td><td>10.6</td></tr><tr><td>0.600</td><td>3.0</td><td>2.200</td><td>5.4</td><td>5.500</td><td>8.4</td><td>9.500</td><td>10.9</td></tr><tr><td>0.800</td><td>3.4</td><td>2.400</td><td>5.7</td><td>6.000</td><td>8.7</td><td></td><td></td></tr><tr><td>1.000</td><td>3.8</td><td>2.600</td><td>5.9</td><td>6.500</td><td>9.1</td><td></td><td></td></tr></table> |                                  |                                                                                     | Depth (m)      | Flow (l/s)                 | Depth (m)       | Flow (l/s)                | Depth (m)         | Flow (l/s) | Depth (m)  | Flow (l/s) | 0.100     | 2.8                       | 1.200       | 4.1     | 3.000                     | 6.3 | 7.000         | 9.4 | 0.200            | 3.4    | 1.400                             | 4.4  | 3.500                           | 6.8  | 7.500 | 9.7 | 0.300 | 3.4 | 1.600 | 4.7 | 4.000 | 7.2 | 8.000 | 10.0 | 0.400 | 3.3 | 1.800 | 4.9 | 4.500 | 7.6 | 8.500 | 10.3 | 0.500 | 2.9 | 2.000 | 5.2 | 5.000 | 8.0 | 9.000 | 10.6 | 0.600 | 3.0 | 2.200 | 5.4 | 5.500 | 8.4 | 9.500 | 10.9 | 0.800 | 3.4 | 2.400 | 5.7 | 6.000 | 8.7 |  |  | 1.000 | 3.8 | 2.600 | 5.9 | 6.500 | 9.1 |  |  |
| Depth (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Flow (l/s)                       | Depth (m)                                                                           | Flow (l/s)     | Depth (m)                  | Flow (l/s)      | Depth (m)                 | Flow (l/s)        |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2.8                              | 1.200                                                                               | 4.1            | 3.000                      | 6.3             | 7.000                     | 9.4               |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.4                              | 1.400                                                                               | 4.4            | 3.500                      | 6.8             | 7.500                     | 9.7               |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.4                              | 1.600                                                                               | 4.7            | 4.000                      | 7.2             | 8.000                     | 10.0              |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.3                              | 1.800                                                                               | 4.9            | 4.500                      | 7.6             | 8.500                     | 10.3              |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2.9                              | 2.000                                                                               | 5.2            | 5.000                      | 8.0             | 9.000                     | 10.6              |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.0                              | 2.200                                                                               | 5.4            | 5.500                      | 8.4             | 9.500                     | 10.9              |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.4                              | 2.400                                                                               | 5.7            | 6.000                      | 8.7             |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 1.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3.8                              | 2.600                                                                               | 5.9            | 6.500                      | 9.1             |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <u>Hydro-Brake® Optimum Manhole: SW16, DS/PN: 5.004, Volume (m³): 3.5</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <table><tr><td>Unit Reference</td><td>MD-SHE-0144-1000-1150-1000</td></tr><tr><td>Design Head (m)</td><td>1.150</td></tr><tr><td>Design Flow (l/s)</td><td>10.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>144</td></tr><tr><td>Invert Level (m)</td><td>49.200</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>225</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                                                                                     | Unit Reference | MD-SHE-0144-1000-1150-1000 | Design Head (m) | 1.150                     | Design Flow (l/s) | 10.0       | Flush-Flo™ | Calculated | Objective | Minimise upstream storage | Application | Surface | Sump Available            | Yes | Diameter (mm) | 144 | Invert Level (m) | 49.200 | Minimum Outlet Pipe Diameter (mm) | 225  | Suggested Manhole Diameter (mm) | 1200 |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Unit Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MD-SHE-0144-1000-1150-1000       |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Design Head (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1.150                            |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Design Flow (l/s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10.0                             |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Flush-Flo™                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Calculated                       |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Objective                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Minimise upstream storage        |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Surface                          |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Sump Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                              |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Diameter (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 144                              |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Invert Level (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 49.200                           |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Minimum Outlet Pipe Diameter (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 225                              |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Suggested Manhole Diameter (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1200                             |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.150</td><td>10.0</td></tr><tr><td>Flush-Flo™</td><td>0.344</td><td>10.0</td></tr><tr><td>Kick-Flo®</td><td>0.754</td><td>8.2</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>8.6</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                  |                                                                                     | Control Points | Head (m)                   | Flow (l/s)      | Design Point (Calculated) | 1.150             | 10.0       | Flush-Flo™ | 0.344      | 10.0      | Kick-Flo®                 | 0.754       | 8.2     | Mean Flow over Head Range | -   | 8.6           |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Control Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Head (m)                         | Flow (l/s)                                                                          |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Design Point (Calculated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.150                            | 10.0                                                                                |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Flush-Flo™                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.344                            | 10.0                                                                                |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Kick-Flo®                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.754                            | 8.2                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Mean Flow over Head Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                | 8.6                                                                                 |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <p>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</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                  |                                                                                     |                |                            |                 |                           |                   |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>5.2</td><td>0.300</td><td>10.0</td><td>0.500</td><td>9.8</td><td>0.800</td><td>8.4</td></tr><tr><td>0.200</td><td>9.5</td><td>0.400</td><td>10.0</td><td>0.600</td><td>9.5</td><td>1.000</td><td>9.4</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                                                     | Depth (m)      | Flow (l/s)                 | Depth (m)       | Flow (l/s)                | Depth (m)         | Flow (l/s) | Depth (m)  | Flow (l/s) | 0.100     | 5.2                       | 0.300       | 10.0    | 0.500                     | 9.8 | 0.800         | 8.4 | 0.200            | 9.5    | 0.400                             | 10.0 | 0.600                           | 9.5  | 1.000 | 9.4 |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| Depth (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Flow (l/s)                       | Depth (m)                                                                           | Flow (l/s)     | Depth (m)                  | Flow (l/s)      | Depth (m)                 | Flow (l/s)        |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5.2                              | 0.300                                                                               | 10.0           | 0.500                      | 9.8             | 0.800                     | 8.4               |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
| 0.200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 9.5                              | 0.400                                                                               | 10.0           | 0.600                      | 9.5             | 1.000                     | 9.4               |            |            |            |           |                           |             |         |                           |     |               |     |                  |        |                                   |      |                                 |      |       |     |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |       |      |       |     |       |     |       |     |  |  |       |     |       |     |       |     |  |  |
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|                                                                                                                                                                                                                                                                             |            |                                  |            |                                                                                     |                     |           |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------|------------|-------------------------------------------------------------------------------------|---------------------|-----------|------------|
| A L Daines & Partners                                                                                                                                                                                                                                                       |            |                                  | Page 4     |                                                                                     |                     |           |            |
| 28 Castle Street<br>Carlisle<br>CA3 8TP                                                                                                                                                                                                                                     |            |                                  |            |  |                     |           |            |
| Date 01/02/2023 10:57<br>File MD CALCS.MDX                                                                                                                                                                                                                                  |            | Designed by petera<br>Checked by |            |                                                                                     |                     |           |            |
| Micro Drainage                                                                                                                                                                                                                                                              |            | Network 2020.1.3                 |            |                                                                                     |                     |           |            |
| <u>Hydro-Brake® Optimum Manhole: SW16, DS/PN: 5.004, Volume (m³): 3.5</u>                                                                                                                                                                                                   |            |                                  |            |                                                                                     |                     |           |            |
| Depth (m)                                                                                                                                                                                                                                                                   | Flow (l/s) | Depth (m)                        | Flow (l/s) | Depth (m)                                                                           | Flow (l/s)          | Depth (m) | Flow (l/s) |
| 1.200                                                                                                                                                                                                                                                                       | 10.2       | 2.400                            | 14.2       | 5.000                                                                               | 20.1                | 8.000     | 25.2       |
| 1.400                                                                                                                                                                                                                                                                       | 11.0       | 2.600                            | 14.7       | 5.500                                                                               | 21.0                | 8.500     | 25.9       |
| 1.600                                                                                                                                                                                                                                                                       | 11.7       | 3.000                            | 15.7       | 6.000                                                                               | 21.9                | 9.000     | 26.7       |
| 1.800                                                                                                                                                                                                                                                                       | 12.3       | 3.500                            | 16.9       | 6.500                                                                               | 22.8                | 9.500     | 27.4       |
| 2.000                                                                                                                                                                                                                                                                       | 13.0       | 4.000                            | 18.1       | 7.000                                                                               | 23.6                |           |            |
| 2.200                                                                                                                                                                                                                                                                       | 13.6       | 4.500                            | 19.1       | 7.500                                                                               | 24.4                |           |            |
| <u>Hydro-Brake® Optimum Manhole: SW19, DS/PN: 6.001, Volume (m³): 4.6</u>                                                                                                                                                                                                   |            |                                  |            |                                                                                     |                     |           |            |
| Unit Reference MD-SHE-0100-3700-0360-3700                                                                                                                                                                                                                                   |            |                                  |            |                                                                                     |                     |           |            |
| Design Head (m) 0.360                                                                                                                                                                                                                                                       |            |                                  |            |                                                                                     |                     |           |            |
| Design Flow (l/s) 3.7                                                                                                                                                                                                                                                       |            |                                  |            |                                                                                     |                     |           |            |
| Flush-Flo™ Calculated                                                                                                                                                                                                                                                       |            |                                  |            |                                                                                     |                     |           |            |
| Objective Minimise upstream storage                                                                                                                                                                                                                                         |            |                                  |            |                                                                                     |                     |           |            |
| Application Surface                                                                                                                                                                                                                                                         |            |                                  |            |                                                                                     |                     |           |            |
| Sump Available Yes                                                                                                                                                                                                                                                          |            |                                  |            |                                                                                     |                     |           |            |
| Diameter (mm) 100                                                                                                                                                                                                                                                           |            |                                  |            |                                                                                     |                     |           |            |
| Invert Level (m) 52.500                                                                                                                                                                                                                                                     |            |                                  |            |                                                                                     |                     |           |            |
| Minimum Outlet Pipe Diameter (mm) 150                                                                                                                                                                                                                                       |            |                                  |            |                                                                                     |                     |           |            |
| Suggested Manhole Diameter (mm) 1200                                                                                                                                                                                                                                        |            |                                  |            |                                                                                     |                     |           |            |
| Control Points                                                                                                                                                                                                                                                              |            |                                  |            |                                                                                     | Head (m) Flow (l/s) |           |            |
| Design Point (Calculated)                                                                                                                                                                                                                                                   |            |                                  |            |                                                                                     | 0.360 3.7           |           |            |
| Flush-Flo™                                                                                                                                                                                                                                                                  |            |                                  |            |                                                                                     | 0.149 3.7           |           |            |
| Kick-Flo®                                                                                                                                                                                                                                                                   |            |                                  |            |                                                                                     | 0.279 3.3           |           |            |
| Mean Flow over Head Range                                                                                                                                                                                                                                                   |            |                                  |            |                                                                                     | - 3.0               |           |            |
| 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 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                            | 6.5        | 3.000                                                                               | 10.0                | 7.000     | 15.1       |
| 0.200                                                                                                                                                                                                                                                                       | 3.6        | 1.400                            | 7.0        | 3.500                                                                               | 10.7                | 7.500     | 15.6       |
| 0.300                                                                                                                                                                                                                                                                       | 3.4        | 1.600                            | 7.4        | 4.000                                                                               | 11.4                | 8.000     | 16.2       |
| 0.400                                                                                                                                                                                                                                                                       | 3.9        | 1.800                            | 7.8        | 4.500                                                                               | 12.1                | 8.500     | 16.7       |
| 0.500                                                                                                                                                                                                                                                                       | 4.3        | 2.000                            | 8.2        | 5.000                                                                               | 12.8                | 9.000     | 17.1       |
| 0.600                                                                                                                                                                                                                                                                       | 4.7        | 2.200                            | 8.6        | 5.500                                                                               | 13.4                | 9.500     | 17.6       |
| 0.800                                                                                                                                                                                                                                                                       | 5.4        | 2.400                            | 9.0        | 6.000                                                                               | 14.0                |           |            |
| 1.000                                                                                                                                                                                                                                                                       | 5.9        | 2.600                            | 9.3        | 6.500                                                                               | 14.6                |           |            |
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|                                            |                                  |                                                                                     |
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Storage Structures for Storm

  

Porous Car Park Manhole: SW10, DS/PN: 3.001

  

|                                      |         |                         |      |
|--------------------------------------|---------|-------------------------|------|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m)               | 38.0 |
| Membrane Percolation (mm/hr)         | 1000    | Length (m)              | 85.0 |
| Max Percolation (l/s)                | 897.2   | Slope (1:X)             | 46.0 |
| Safety Factor                        | 2.0     | Depression Storage (mm) | 5    |
| Porosity                             | 0.30    | Evaporation (mm/day)    | 3    |
| Invert Level (m)                     | 53.820  | Membrane Depth (mm)     | 400  |

  

Cellular Storage Manhole: SW09, DS/PN: 3.002

  

|                                      |         |               |      |
|--------------------------------------|---------|---------------|------|
| Invert Level (m)                     | 53.660  | Safety Factor | 2.0  |
| Infiltration Coefficient Base (m/hr) | 0.00000 | Porosity      | 0.95 |
| Infiltration Coefficient Side (m/hr) | 0.00000 |               |      |

  

| Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000     | 650.0                  | 0.0                         | 0.961     | 0.0                    | 0.0                         |
| 0.960     | 650.0                  | 0.0                         |           |                        |                             |

  

Cellular Storage Manhole: SW16, DS/PN: 5.004

  

|                                      |         |               |      |
|--------------------------------------|---------|---------------|------|
| Invert Level (m)                     | 49.475  | Safety Factor | 2.0  |
| Infiltration Coefficient Base (m/hr) | 0.00000 | Porosity      | 0.95 |
| Infiltration Coefficient Side (m/hr) | 0.00000 |               |      |

  

| Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000     | 500.0                  | 0.0                         | 0.961     | 0.0                    | 0.0                         |
| 0.960     | 500.0                  | 0.0                         |           |                        |                             |

  

Cellular Storage Manhole: SW19, DS/PN: 6.001

  

|                                      |         |               |      |
|--------------------------------------|---------|---------------|------|
| Invert Level (m)                     | 52.500  | Safety Factor | 2.0  |
| Infiltration Coefficient Base (m/hr) | 0.00000 | Porosity      | 0.95 |
| Infiltration Coefficient Side (m/hr) | 0.00000 |               |      |

  

| Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000     | 300.0                  | 0.0                         | 0.961     | 0.0                    | 0.0                         |
| 0.960     | 300.0                  | 0.0                         |           |                        |                             |

  

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

Simulation Criteria

Volumetric Runoff Coeff 0.750

Foul Sewage per hectare (l/s) 0.000

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 50.000

Hot Start (mins) 0

MADD Factor \* 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 4

Number of Online Controls 4

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0

DVD Status OFF

Analysis Timestep Fine

Inertia Status OFF

DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 50, 50

| PN    | US/MH Name | Storm      | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 3.000 | SW11       | 15 Winter  | 1             | +0%            | 30/15 Summer    |                 |                    |               | 54.191          |
| 3.001 | SW10       | 60 Winter  | 1             | +0%            | 30/15 Summer    |                 |                    |               | 54.004          |
| 3.002 | SW09       | 480 Winter | 1             | +0%            | 30/30 Summer    |                 |                    |               | 53.846          |
| 4.000 | SW01       | 15 Winter  | 1             | +0%            |                 |                 |                    |               | 55.582          |
| 4.001 | SW02       | 15 Winter  | 1             | +0%            |                 |                 |                    |               | 55.519          |
| 4.002 | SW03       | 15 Winter  | 1             | +0%            |                 |                 |                    |               | 55.374          |
| 4.003 | SW04       | 30 Winter  | 1             | +0%            |                 |                 |                    |               | 55.308          |
| 4.004 | SW05       | 30 Winter  | 1             | +0%            | 100/30 Winter   |                 |                    |               | 55.238          |
| 3.003 | SW08       | 480 Winter | 1             | +0%            |                 |                 |                    |               | 53.536          |
| 5.000 | SW12       | 15 Winter  | 1             | +0%            |                 |                 |                    |               | 52.972          |
| 5.001 | SW13       | 15 Winter  | 1             | +0%            | 100/15 Summer   |                 |                    |               | 52.086          |
| 5.002 | SW14       | 15 Winter  | 1             | +0%            | 30/15 Summer    |                 |                    |               | 49.627          |
| 5.003 | SW15       | 120 Winter | 1             | +0%            | 30/15 Summer    |                 |                    |               | 49.560          |
| 5.004 | SW16       | 120 Winter | 1             | +0%            | 30/15 Summer    |                 |                    |               | 49.551          |
| 3.004 | SW17       | 480 Winter | 1             | +0%            | 1/120 Winter    |                 |                    |               | 48.784          |
| 6.000 | SW20       | 15 Winter  | 1             | +0%            | 30/15 Summer    |                 |                    |               | 53.112          |
| 6.001 | SW19       | 360 Winter | 1             | +0%            | 30/30 Winter    |                 |                    |               | 52.660          |
| 3.005 | SW18       | 480 Winter | 1             | +0%            |                 |                 |                    |               | 48.268          |
| 7.000 | SW07       | 15 Winter  | 1             | +0%            | 100/15 Summer   |                 |                    |               | 55.349          |
| 7.001 | SW06       | 15 Winter  | 1             | +0%            | 30/15 Summer    |                 |                    |               | 55.331          |

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|                                                                                                       |            |            |             |                                  |                |             |            |                                                                                     |                |
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| Micro Drainage                                                                                        |            |            |             | Network 2020.1.3                 |                |             |            |                                                                                     |                |
| <u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u><br><u>for Storm</u> |            |            |             |                                  |                |             |            |                                                                                     |                |
|                                                                                                       |            | Surcharged | Flooded     |                                  |                | Half Drain  | Pipe       |                                                                                     |                |
| PN                                                                                                    | US/MH Name | Depth (m)  | Volume (m³) | Flow / Cap.                      | Overflow (l/s) | Time (mins) | Flow (l/s) | Status                                                                              | Level Exceeded |
| 3.000                                                                                                 | SW11       | -0.259     | 0.000       | 0.35                             |                |             | 53.4       | OK                                                                                  |                |
| 3.001                                                                                                 | SW10       | -0.266     | 0.000       | 0.35                             |                | 12          | 55.7       | OK                                                                                  |                |
| 3.002                                                                                                 | SW09       | -0.114     | 0.000       | 0.14                             |                | 208         | 10.6       | OK                                                                                  |                |
| 4.000                                                                                                 | SW01       | -0.273     | 0.000       | 0.02                             |                |             | 0.8        | OK                                                                                  |                |
| 4.001                                                                                                 | SW02       | -0.266     | 0.000       | 0.03                             |                |             | 1.3        | OK                                                                                  |                |
| 4.002                                                                                                 | SW03       | -0.261     | 0.000       | 0.04                             |                |             | 1.7        | OK                                                                                  |                |
| 4.003                                                                                                 | SW04       | -0.257     | 0.000       | 0.05                             |                |             | 2.2        | OK                                                                                  |                |
| 4.004                                                                                                 | SW05       | -0.227     | 0.000       | 0.01                             |                |             | 2.0        | OK                                                                                  |                |
| 3.003                                                                                                 | SW08       | -0.264     | 0.000       | 0.03                             |                |             | 11.0       | OK                                                                                  |                |
| 5.000                                                                                                 | SW12       | -0.228     | 0.000       | 0.13                             |                |             | 28.9       | OK                                                                                  |                |
| 5.001                                                                                                 | SW13       | -0.214     | 0.000       | 0.18                             |                |             | 35.6       | OK                                                                                  |                |
| 5.002                                                                                                 | SW14       | -0.248     | 0.000       | 0.25                             |                |             | 42.9       | OK                                                                                  |                |
| 5.003                                                                                                 | SW15       | -0.115     | 0.000       | 0.30                             |                |             | 31.8       | OK                                                                                  |                |
| 5.004                                                                                                 | SW16       | -0.024     | 0.000       | 0.11                             |                | 60          | 10.0       | OK                                                                                  |                |
| 3.004                                                                                                 | SW17       | 0.034      | 0.000       | 1.21                             |                |             | 21.0       | SURCHARGED                                                                          |                |
| 6.000                                                                                                 | SW20       | -0.188     | 0.000       | 0.30                             |                |             | 41.4       | OK                                                                                  |                |
| 6.001                                                                                                 | SW19       | -0.140     | 0.000       | 0.01                             |                | 174         | 3.7        | OK                                                                                  |                |
| 3.005                                                                                                 | SW18       | -0.082     | 0.000       | 0.73                             |                |             | 24.7       | OK                                                                                  |                |
| 7.000                                                                                                 | SW07       | -0.176     | 0.000       | 0.21                             |                |             | 6.4        | OK                                                                                  |                |
| 7.001                                                                                                 | SW06       | -0.164     | 0.000       | 0.43                             |                |             | 11.9       | OK                                                                                  |                |
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)

for Storm

Simulation Criteria

Volumetric Runoff Coeff 0.750Foul Sewage per hectare (l/s) 0.000

Areal Reduction Factor 1.000Additional Flow - % of Total Flow 50.000

Hot Start (mins) 0MADD Factor \* 10m³/ha Storage 2.000

Hot Start Level (mm) 0Inlet Coeffiecient 0.800

Manhole Headloss Coeff (Global) 0.500Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0Number of Storage Structures 4

Number of Online Controls 4Number of Time/Area Diagrams 0

Number of Offline Controls 0Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0DVD Status OFF

Analysis Timestep FineInertia Status OFF

DTS Status ON

Profile(s)Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720

Return Period(s) (years)1, 30, 100

Climate Change (%)0, 50, 50

| PN    | US/MH Name | Storm      | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 3.000 | SW11       | 15 Winter  | 30            | +50%           | 30/15 Summer    |                 |                    |               | 54.595          |
| 3.001 | SW10       | 720 Winter | 30            | +50%           | 30/15 Summer    |                 |                    |               | 54.366          |
| 3.002 | SW09       | 720 Winter | 30            | +50%           | 30/30 Summer    |                 |                    |               | 54.360          |
| 4.000 | SW01       | 15 Winter  | 30            | +50%           |                 |                 |                    |               | 55.611          |
| 4.001 | SW02       | 15 Winter  | 30            | +50%           |                 |                 |                    |               | 55.555          |
| 4.002 | SW03       | 30 Winter  | 30            | +50%           |                 |                 |                    |               | 55.423          |
| 4.003 | SW04       | 30 Winter  | 30            | +50%           |                 |                 |                    |               | 55.416          |
| 4.004 | SW05       | 30 Winter  | 30            | +50%           | 100/30 Winter   |                 |                    |               | 55.411          |
| 3.003 | SW08       | 60 Winter  | 30            | +50%           |                 |                 |                    |               | 53.541          |
| 5.000 | SW12       | 15 Winter  | 30            | +50%           |                 |                 |                    |               | 53.046          |
| 5.001 | SW13       | 15 Winter  | 30            | +50%           | 100/15 Summer   |                 |                    |               | 52.186          |
| 5.002 | SW14       | 15 Winter  | 30            | +50%           | 30/15 Summer    |                 |                    |               | 50.456          |
| 5.003 | SW15       | 15 Winter  | 30            | +50%           | 30/15 Summer    |                 |                    |               | 50.273          |
| 5.004 | SW16       | 360 Winter | 30            | +50%           | 30/15 Summer    |                 |                    |               | 50.058          |
| 3.004 | SW17       | 240 Summer | 30            | +50%           | 1/120 Winter    |                 |                    |               | 48.840          |
| 6.000 | SW20       | 15 Winter  | 30            | +50%           | 30/15 Summer    |                 |                    |               | 53.403          |
| 6.001 | SW19       | 720 Winter | 30            | +50%           | 30/30 Winter    |                 |                    |               | 53.183          |
| 3.005 | SW18       | 240 Summer | 30            | +50%           |                 |                 |                    |               | 48.283          |
| 7.000 | SW07       | 15 Winter  | 30            | +50%           | 100/15 Summer   |                 |                    |               | 55.525          |
| 7.001 | SW06       | 15 Winter  | 30            | +50%           | 30/15 Summer    |                 |                    |               | 55.496          |

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|                                                                                               |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
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| Micro Drainage                                                                                |            | Network 2020.1.3                              |                                                                                     |                |                 |                 |                    |               |                 |
| <u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u> |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| Simulation Criteria                                                                           |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| Volumetric Runoff Coeff                                                                       |            | 0.750                                         | Foul Sewage per hectare (l/s)                                                       | 0.000          |                 |                 |                    |               |                 |
| Areal Reduction Factor                                                                        |            | 1.000                                         | Additional Flow - % of Total Flow                                                   | 50.000         |                 |                 |                    |               |                 |
| 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          |                 |                 |                    |               |                 |
|                                                                                               |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| Number of Input Hydrographs                                                                   |            | 0                                             | Number of Storage Structures                                                        | 4              |                 |                 |                    |               |                 |
| Number of Online Controls                                                                     |            | 4                                             | Number of Time/Area Diagrams                                                        | 0              |                 |                 |                    |               |                 |
| Number of Offline Controls                                                                    |            | 0                                             | Number of Real Time Controls                                                        | 0              |                 |                 |                    |               |                 |
|                                                                                               |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| Margin for Flood Risk Warning (mm)                                                            |            | 300.0                                         | DVD Status                                                                          | OFF            |                 |                 |                    |               |                 |
| Analysis Timestep                                                                             |            | Fine                                          | Inertia Status                                                                      | OFF            |                 |                 |                    |               |                 |
| DTS Status                                                                                    |            | ON                                            |                                                                                     |                |                 |                 |                    |               |                 |
|                                                                                               |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| Profile(s)                                                                                    |            | Summer and Winter                             |                                                                                     |                |                 |                 |                    |               |                 |
| Duration(s) (mins)                                                                            |            | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720 |                                                                                     |                |                 |                 |                    |               |                 |
| Return Period(s) (years)                                                                      |            | 1, 30, 100                                    |                                                                                     |                |                 |                 |                    |               |                 |
| Climate Change (%)                                                                            |            | 0, 50, 50                                     |                                                                                     |                |                 |                 |                    |               |                 |
|                                                                                               |            |                                               |                                                                                     |                |                 |                 |                    |               |                 |
| PN                                                                                            | US/MH Name | Storm                                         | Return Period                                                                       | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
| 3.000                                                                                         | SW11       | 15 Winter                                     | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 54.856          |
| 3.001                                                                                         | SW10       | 720 Winter                                    | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 54.579          |
| 3.002                                                                                         | SW09       | 720 Winter                                    | 100                                                                                 | +50%           | 30/30 Summer    |                 |                    |               | 54.573          |
| 4.000                                                                                         | SW01       | 15 Winter                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 55.619          |
| 4.001                                                                                         | SW02       | 15 Winter                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 55.566          |
| 4.002                                                                                         | SW03       | 60 Winter                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 55.484          |
| 4.003                                                                                         | SW04       | 60 Winter                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 55.481          |
| 4.004                                                                                         | SW05       | 60 Winter                                     | 100                                                                                 | +50%           | 100/30 Winter   |                 |                    |               | 55.476          |
| 3.003                                                                                         | SW08       | 30 Summer                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 53.541          |
| 5.000                                                                                         | SW12       | 15 Winter                                     | 100                                                                                 | +50%           |                 |                 |                    |               | 53.071          |
| 5.001                                                                                         | SW13       | 15 Winter                                     | 100                                                                                 | +50%           | 100/15 Summer   |                 |                    |               | 52.420          |
| 5.002                                                                                         | SW14       | 15 Winter                                     | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 50.964          |
| 5.003                                                                                         | SW15       | 15 Winter                                     | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 50.693          |
| 5.004                                                                                         | SW16       | 360 Winter                                    | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 50.305          |
| 3.004                                                                                         | SW17       | 360 Summer                                    | 100                                                                                 | +50%           | 1/120 Winter    |                 |                    |               | 48.840          |
| 6.000                                                                                         | SW20       | 15 Winter                                     | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 53.809          |
| 6.001                                                                                         | SW19       | 720 Winter                                    | 100                                                                                 | +50%           | 30/30 Winter    |                 |                    |               | 53.397          |
| 3.005                                                                                         | SW18       | 120 Winter                                    | 100                                                                                 | +50%           |                 |                 |                    |               | 48.286          |
| 7.000                                                                                         | SW07       | 15 Winter                                     | 100                                                                                 | +50%           | 100/15 Summer   |                 |                    |               | 55.559          |
| 7.001                                                                                         | SW06       | 15 Winter                                     | 100                                                                                 | +50%           | 30/15 Summer    |                 |                    |               | 55.528          |

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