

|                                                             |                     |                           |                                                                     |                            |                          |                                                                                     |                       |        |
|-------------------------------------------------------------|---------------------|---------------------------|---------------------------------------------------------------------|----------------------------|--------------------------|-------------------------------------------------------------------------------------|-----------------------|--------|
| MJA Consulting                                              |                     |                           |                                                                     |                            |                          | Page 1                                                                              |                       |        |
| Monarch House<br>Barton Lane<br>OX14 3NB                    |                     |                           | Westergate & Eastergate<br>Northern Overflow Section<br>1:100+40%cc |                            |                          |  |                       |        |
| Date 01/05/2018<br>File NORTHERN OVERFLOW SECTI...          |                     |                           | Designed by C.Pendle<br>Checked by                                  |                            |                          |                                                                                     |                       |        |
| Innovyze                                                    |                     |                           | Source Control 2017.1.2                                             |                            |                          |                                                                                     |                       |        |
| <u>Summary of Results for 100 year Return Period (+40%)</u> |                     |                           |                                                                     |                            |                          |                                                                                     |                       |        |
| Half Drain Time : 44 minutes.                               |                     |                           |                                                                     |                            |                          |                                                                                     |                       |        |
| Storm<br>Event                                              | Max<br>Level<br>(m) | Max<br>Depth<br>(m)       | Max<br>Infiltration<br>(l/s)                                        | Max<br>Control<br>(l/s)    | Max<br>Overflow<br>(l/s) | Max<br>Σ Outflow<br>(l/s)                                                           | Max<br>Volume<br>(m³) | Status |
| 15 min Summer                                               | 12.247              | 0.300                     | 2.8                                                                 | 1.0                        | 0.0                      | 3.7                                                                                 | 12.8                  | O K    |
| 30 min Summer                                               | 12.278              | 0.331                     | 3.1                                                                 | 1.0                        | 0.0                      | 4.1                                                                                 | 15.5                  | O K    |
| 60 min Summer                                               | 12.293              | 0.346                     | 3.3                                                                 | 1.0                        | 0.0                      | 4.2                                                                                 | 17.0                  | O K    |
| 120 min Summer                                              | 12.291              | 0.344                     | 3.3                                                                 | 1.0                        | 0.0                      | 4.2                                                                                 | 16.8                  | O K    |
| 180 min Summer                                              | 12.280              | 0.333                     | 3.1                                                                 | 1.0                        | 0.0                      | 4.1                                                                                 | 15.7                  | O K    |
| 240 min Summer                                              | 12.267              | 0.320                     | 3.0                                                                 | 1.0                        | 0.0                      | 3.9                                                                                 | 14.5                  | O K    |
| 360 min Summer                                              | 12.242              | 0.295                     | 2.8                                                                 | 1.0                        | 0.0                      | 3.7                                                                                 | 12.3                  | O K    |
| 480 min Summer                                              | 12.219              | 0.272                     | 2.6                                                                 | 1.0                        | 0.0                      | 3.4                                                                                 | 10.5                  | O K    |
| 600 min Summer                                              | 12.199              | 0.252                     | 2.4                                                                 | 1.0                        | 0.0                      | 3.2                                                                                 | 9.0                   | O K    |
| 720 min Summer                                              | 12.179              | 0.232                     | 2.2                                                                 | 1.0                        | 0.0                      | 3.1                                                                                 | 7.7                   | O K    |
| 960 min Summer                                              | 12.146              | 0.199                     | 1.9                                                                 | 1.0                        | 0.0                      | 2.8                                                                                 | 5.6                   | O K    |
| 1440 min Summer                                             | 12.095              | 0.148                     | 1.4                                                                 | 1.0                        | 0.0                      | 2.4                                                                                 | 3.1                   | O K    |
| 2160 min Summer                                             | 12.044              | 0.097                     | 0.9                                                                 | 1.0                        | 0.0                      | 1.9                                                                                 | 1.3                   | O K    |
| 2880 min Summer                                             | 12.011              | 0.064                     | 0.6                                                                 | 1.0                        | 0.0                      | 1.6                                                                                 | 0.6                   | O K    |
| 4320 min Summer                                             | 11.979              | 0.032                     | 0.2                                                                 | 1.0                        | 0.0                      | 1.2                                                                                 | 0.1                   | O K    |
| 5760 min Summer                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.9                        | 0.0                      | 0.9                                                                                 | 0.0                   | O K    |
| 7200 min Summer                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.8                        | 0.0                      | 0.8                                                                                 | 0.0                   | O K    |
| 8640 min Summer                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.7                        | 0.0                      | 0.7                                                                                 | 0.0                   | O K    |
| 10080 min Summer                                            | 11.947              | 0.000                     | 0.0                                                                 | 0.6                        | 0.0                      | 0.6                                                                                 | 0.0                   | O K    |
| 15 min Winter                                               | 12.267              | 0.320                     | 3.0                                                                 | 1.0                        | 0.0                      | 3.9                                                                                 | 14.5                  | O K    |
| Storm<br>Event                                              | Rain<br>(mm/hr)     | Flooded<br>Volume<br>(m³) | Discharge<br>Volume<br>(m³)                                         | Overflow<br>Volume<br>(m³) | Time-Peak<br>(mins)      |                                                                                     |                       |        |
| 15 min Summer                                               | 127.204             | 0.0                       | 15.5                                                                | 0.0                        | 17                       |                                                                                     |                       |        |
| 30 min Summer                                               | 85.821              | 0.0                       | 20.9                                                                | 0.0                        | 30                       |                                                                                     |                       |        |
| 60 min Summer                                               | 55.250              | 0.0                       | 26.9                                                                | 0.0                        | 46                       |                                                                                     |                       |        |
| 120 min Summer                                              | 34.307              | 0.0                       | 33.4                                                                | 0.0                        | 80                       |                                                                                     |                       |        |
| 180 min Summer                                              | 25.552              | 0.0                       | 37.4                                                                | 0.0                        | 116                      |                                                                                     |                       |        |
| 240 min Summer                                              | 20.570              | 0.0                       | 40.1                                                                | 0.0                        | 148                      |                                                                                     |                       |        |
| 360 min Summer                                              | 15.173              | 0.0                       | 44.4                                                                | 0.0                        | 214                      |                                                                                     |                       |        |
| 480 min Summer                                              | 12.206              | 0.0                       | 47.6                                                                | 0.0                        | 278                      |                                                                                     |                       |        |
| 600 min Summer                                              | 10.302              | 0.0                       | 50.2                                                                | 0.0                        | 340                      |                                                                                     |                       |        |
| 720 min Summer                                              | 8.963               | 0.0                       | 52.4                                                                | 0.0                        | 400                      |                                                                                     |                       |        |
| 960 min Summer                                              | 7.189               | 0.0                       | 56.1                                                                | 0.0                        | 520                      |                                                                                     |                       |        |
| 1440 min Summer                                             | 5.257               | 0.0                       | 61.5                                                                | 0.0                        | 752                      |                                                                                     |                       |        |
| 2160 min Summer                                             | 3.836               | 0.0                       | 67.3                                                                | 0.0                        | 1104                     |                                                                                     |                       |        |
| 2880 min Summer                                             | 3.063               | 0.0                       | 71.7                                                                | 0.0                        | 1468                     |                                                                                     |                       |        |
| 4320 min Summer                                             | 2.226               | 0.0                       | 78.1                                                                | 0.0                        | 2192                     |                                                                                     |                       |        |
| 5760 min Summer                                             | 1.773               | 0.0                       | 83.0                                                                | 0.0                        | 0                        |                                                                                     |                       |        |
| 7200 min Summer                                             | 1.487               | 0.0                       | 87.0                                                                | 0.0                        | 0                        |                                                                                     |                       |        |
| 8640 min Summer                                             | 1.289               | 0.0                       | 90.5                                                                | 0.0                        | 0                        |                                                                                     |                       |        |
| 10080 min Summer                                            | 1.142               | 0.0                       | 93.5                                                                | 0.0                        | 0                        |                                                                                     |                       |        |
| 15 min Winter                                               | 127.204             | 0.0                       | 17.4                                                                | 0.0                        | 17                       |                                                                                     |                       |        |
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|                                                             |                     |                           |                                                                     |                            |                          |                           |                                                                                     |        |
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| Monarch House<br>Barton Lane<br>OX14 3NB                    |                     |                           | Westergate & Eastergate<br>Northern Overflow Section<br>1:100+40%cc |                            |                          |                           |  |        |
| Date 01/05/2018<br>File NORTHERN OVERFLOW SECTI...          |                     |                           | Designed by C.Pendle<br>Checked by                                  |                            |                          |                           |                                                                                     |        |
| Innovyze                                                    |                     |                           | Source Control 2017.1.2                                             |                            |                          |                           |                                                                                     |        |
| <u>Summary of Results for 100 year Return Period (+40%)</u> |                     |                           |                                                                     |                            |                          |                           |                                                                                     |        |
| Storm<br>Event                                              | Max<br>Level<br>(m) | Max<br>Depth<br>(m)       | Max<br>Infiltration<br>(l/s)                                        | Max<br>Control<br>(l/s)    | Max<br>Overflow<br>(l/s) | Max<br>Σ Outflow<br>(l/s) | Max<br>Volume<br>(m³)                                                               | Status |
| 30 min Winter                                               | 12.302              | 0.355                     | 3.4                                                                 | 1.0                        | 0.0                      | 4.3                       | 17.9                                                                                | O K    |
| 60 min Winter                                               | 12.318              | 0.371                     | 3.5                                                                 | 1.0                        | 0.0                      | 4.5                       | 19.5                                                                                | O K    |
| 120 min Winter                                              | 12.313              | 0.366                     | 3.5                                                                 | 1.0                        | 0.0                      | 4.4                       | 19.0                                                                                | O K    |
| 180 min Winter                                              | 12.295              | 0.348                     | 3.3                                                                 | 1.0                        | 0.0                      | 4.2                       | 17.2                                                                                | O K    |
| 240 min Winter                                              | 12.275              | 0.328                     | 3.1                                                                 | 1.0                        | 0.0                      | 4.0                       | 15.3                                                                                | O K    |
| 360 min Winter                                              | 12.240              | 0.293                     | 2.8                                                                 | 1.0                        | 0.0                      | 3.7                       | 12.1                                                                                | O K    |
| 480 min Winter                                              | 12.208              | 0.261                     | 2.5                                                                 | 1.0                        | 0.0                      | 3.3                       | 9.7                                                                                 | O K    |
| 600 min Winter                                              | 12.178              | 0.231                     | 2.2                                                                 | 1.0                        | 0.0                      | 3.0                       | 7.6                                                                                 | O K    |
| 720 min Winter                                              | 12.152              | 0.205                     | 1.9                                                                 | 1.0                        | 0.0                      | 2.9                       | 5.9                                                                                 | O K    |
| 960 min Winter                                              | 12.108              | 0.161                     | 1.5                                                                 | 1.0                        | 0.0                      | 2.5                       | 3.7                                                                                 | O K    |
| 1440 min Winter                                             | 12.048              | 0.101                     | 1.0                                                                 | 1.0                        | 0.0                      | 1.9                       | 1.5                                                                                 | O K    |
| 2160 min Winter                                             | 11.997              | 0.050                     | 0.5                                                                 | 1.0                        | 0.0                      | 1.5                       | 0.4                                                                                 | O K    |
| 2880 min Winter                                             | 11.978              | 0.031                     | 0.2                                                                 | 1.0                        | 0.0                      | 1.2                       | 0.1                                                                                 | O K    |
| 4320 min Winter                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.9                        | 0.0                      | 0.9                       | 0.0                                                                                 | O K    |
| 5760 min Winter                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.7                        | 0.0                      | 0.7                       | 0.0                                                                                 | O K    |
| 7200 min Winter                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.6                        | 0.0                      | 0.6                       | 0.0                                                                                 | O K    |
| 8640 min Winter                                             | 11.947              | 0.000                     | 0.0                                                                 | 0.5                        | 0.0                      | 0.5                       | 0.0                                                                                 | O K    |
| 10080 min Winter                                            | 11.947              | 0.000                     | 0.0                                                                 | 0.4                        | 0.0                      | 0.4                       | 0.0                                                                                 | O K    |
|                                                             |                     |                           |                                                                     |                            |                          |                           |                                                                                     |        |
| Storm<br>Event                                              | Rain<br>(mm/hr)     | Flooded<br>Volume<br>(m³) | Discharge<br>Volume<br>(m³)                                         | Overflow<br>Volume<br>(m³) | Time-Peak<br>(mins)      |                           |                                                                                     |        |
| 30 min Winter                                               | 85.821              | 0.0                       | 23.4                                                                | 0.0                        | 30                       |                           |                                                                                     |        |
| 60 min Winter                                               | 55.250              | 0.0                       | 30.2                                                                | 0.0                        | 48                       |                           |                                                                                     |        |
| 120 min Winter                                              | 34.307              | 0.0                       | 37.5                                                                | 0.0                        | 88                       |                           |                                                                                     |        |
| 180 min Winter                                              | 25.552              | 0.0                       | 41.8                                                                | 0.0                        | 124                      |                           |                                                                                     |        |
| 240 min Winter                                              | 20.570              | 0.0                       | 44.9                                                                | 0.0                        | 160                      |                           |                                                                                     |        |
| 360 min Winter                                              | 15.173              | 0.0                       | 49.8                                                                | 0.0                        | 226                      |                           |                                                                                     |        |
| 480 min Winter                                              | 12.206              | 0.0                       | 53.3                                                                | 0.0                        | 292                      |                           |                                                                                     |        |
| 600 min Winter                                              | 10.302              | 0.0                       | 56.2                                                                | 0.0                        | 354                      |                           |                                                                                     |        |
| 720 min Winter                                              | 8.963               | 0.0                       | 58.7                                                                | 0.0                        | 414                      |                           |                                                                                     |        |
| 960 min Winter                                              | 7.189               | 0.0                       | 62.8                                                                | 0.0                        | 530                      |                           |                                                                                     |        |
| 1440 min Winter                                             | 5.257               | 0.0                       | 68.9                                                                | 0.0                        | 762                      |                           |                                                                                     |        |
| 2160 min Winter                                             | 3.836               | 0.0                       | 75.4                                                                | 0.0                        | 1100                     |                           |                                                                                     |        |
| 2880 min Winter                                             | 3.063               | 0.0                       | 80.3                                                                | 0.0                        | 1456                     |                           |                                                                                     |        |
| 4320 min Winter                                             | 2.226               | 0.0                       | 87.5                                                                | 0.0                        | 0                        |                           |                                                                                     |        |
| 5760 min Winter                                             | 1.773               | 0.0                       | 92.9                                                                | 0.0                        | 0                        |                           |                                                                                     |        |
| 7200 min Winter                                             | 1.487               | 0.0                       | 97.4                                                                | 0.0                        | 0                        |                           |                                                                                     |        |
| 8640 min Winter                                             | 1.289               | 0.0                       | 101.3                                                               | 0.0                        | 0                        |                           |                                                                                     |        |
| 10080 min Winter                                            | 1.142               | 0.0                       | 104.7                                                               | 0.0                        | 0                        |                           |                                                                                     |        |
|                                                             |                     |                           |                                                                     |                            |                          |                           |                                                                                     |        |
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|                                                    |                                                                     |                                                                                     |
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| Monarch House<br>Barton Lane<br>OX14 3NB           | Westergate & Eastergate<br>Northern Overflow Section<br>1:100+40%cc |  |
| Date 01/05/2018<br>File NORTHERN OVERFLOW SECTI... | Designed by C.Pendle<br>Checked by                                  |                                                                                     |
| Innovyze                                           | Source Control 2017.1.2                                             |                                                                                     |

  

Model Details

Storage is Online Cover Level (m) 12.650

Porous Car Park Structure

|                                      |         |                         |       |
|--------------------------------------|---------|-------------------------|-------|
| Infiltration Coefficient Base (m/hr) | 0.07200 | Width (m)               | 3.5   |
| Membrane Percolation (mm/hr)         | 1000    | Length (m)              | 156.0 |
| Max Percolation (l/s)                | 151.7   | Slope (1:X)             | 270.0 |
| Safety Factor                        | 2.0     | Depression Storage (mm) | 0     |
| Porosity                             | 0.30    | Evaporation (mm/day)    | 3     |
| Invert Level (m)                     | 11.947  | Cap Volume Depth (m)    | 0.800 |

Hydro-Brake® Optimum Outflow Control

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SHE-0054-1000-0500-1000 |
| Design Head (m)                   | 0.500                      |
| Design Flow (l/s)                 | 1.0                        |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Minimise upstream storage  |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 54                         |
| Invert Level (m)                  | 11.855                     |
| Minimum Outlet Pipe Diameter (mm) | 75                         |
| Suggested Manhole Diameter (mm)   | 1200                       |

  

| Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 0.500    | 1.0        |
| Flush-Flo™                | 0.151    | 1.0        |
| Kick-Flo®                 | 0.332    | 0.8        |
| Mean Flow over Head Range | -        | 0.9        |

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     | 1.0        | 1.200     | 1.5        | 3.000     | 2.2        | 7.000     | 3.4        |
| 0.200     | 1.0        | 1.400     | 1.6        | 3.500     | 2.4        | 7.500     | 3.5        |
| 0.300     | 0.9        | 1.600     | 1.7        | 4.000     | 2.6        | 8.000     | 3.6        |
| 0.400     | 0.9        | 1.800     | 1.8        | 4.500     | 2.7        | 8.500     | 3.7        |
| 0.500     | 1.0        | 2.000     | 1.9        | 5.000     | 2.8        | 9.000     | 3.8        |
| 0.600     | 1.1        | 2.200     | 1.9        | 5.500     | 3.0        | 9.500     | 3.9        |
| 0.800     | 1.2        | 2.400     | 2.0        | 6.000     | 3.1        |           |            |
| 1.000     | 1.4        | 2.600     | 2.1        | 6.500     | 3.2        |           |            |

Weir Overflow Control

Discharge Coef 0.544 Width (m) 0.500 Invert Level (m) 12.362

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