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| Richard Jackson Plc                                      |  | Page 1  |
| 26 HIGH ST. HADLEIGH<br>IPSWICH SUFFOLK<br>IP7 5AP       |  | Queenswood Sch 47175<br>Proposed rev a<br>inc green space |
| Date 04/07/2017 10:07<br>File proposed inc green spac... |  | Designed by MJG<br>Checked by                             |
| Micro Drainage   |  | Source Control 2015.1                                     |




Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 20 minutes.

| Storm Event      | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max E Outflow (l/s) | Max Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|---------------------|-----------------|--------|
| 15 min Summer    | 49.561        | 0.261         | 0.0                    | 20.8              | 20.8                | 34.5            | O K    |
| 30 min Summer    | 49.585        | 0.285         | 0.0                    | 20.8              | 20.8                | 38.1            | O K    |
| 60 min Summer    | 49.579        | 0.279         | 0.0                    | 20.8              | 20.8                | 37.2            | O K    |
| 120 min Summer   | 49.527        | 0.227         | 0.0                    | 20.8              | 20.8                | 29.5            | O K    |
| 180 min Summer   | 49.475        | 0.175         | 0.0                    | 20.7              | 20.7                | 22.3            | O K    |
| 240 min Summer   | 49.437        | 0.137         | 0.0                    | 20.4              | 20.4                | 17.2            | O K    |
| 360 min Summer   | 49.394        | 0.094         | 0.0                    | 18.1              | 18.1                | 11.5            | O K    |
| 480 min Summer   | 49.372        | 0.072         | 0.0                    | 15.4              | 15.4                | 8.7             | O K    |
| 600 min Summer   | 49.356        | 0.056         | 0.0                    | 13.2              | 13.2                | 6.8             | O K    |
| 720 min Summer   | 49.345        | 0.045         | 0.0                    | 11.7              | 11.7                | 5.4             | O K    |
| 960 min Summer   | 49.329        | 0.029         | 0.0                    | 9.6               | 9.6                 | 3.4             | O K    |
| 1440 min Summer  | 49.310        | 0.010         | 0.0                    | 7.0               | 7.0                 | 1.2             | O K    |
| 2160 min Summer  | 49.300        | 0.000         | 0.0                    | 5.3               | 5.3                 | 0.0             | O K    |
| 2880 min Summer  | 49.300        | 0.000         | 0.0                    | 4.1               | 4.1                 | 0.0             | O K    |
| 4320 min Summer  | 49.300        | 0.000         | 0.0                    | 3.0               | 3.0                 | 0.0             | O K    |
| 5760 min Summer  | 49.300        | 0.000         | 0.0                    | 2.4               | 2.4                 | 0.0             | O K    |
| 7200 min Summer  | 49.300        | 0.000         | 0.0                    | 2.0               | 2.0                 | 0.0             | O K    |
| 8640 min Summer  | 49.300        | 0.000         | 0.0                    | 1.7               | 1.7                 | 0.0             | O K    |
| 10080 min Summer | 49.300        | 0.000         | 0.0                    | 1.5               | 1.5                 | 0.0             | O K    |
| 15 min Winter    | 49.598        | 0.298         | 0.0                    | 20.8              | 20.8                | 40.0            | O K    |


| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 15 min Summer    | 120.653      | 0.0                 | 50.0                  | 16               |
| 30 min Summer    | 78.493       | 0.0                 | 64.3                  | 25               |
| 60 min Summer    | 48.611       | 0.0                 | 80.3                  | 42               |
| 120 min Summer   | 29.095       | 0.0                 | 96.5                  | 76               |
| 180 min Summer   | 21.273       | 0.0                 | 105.4                 | 106              |
| 240 min Summer   | 16.942       | 0.0                 | 112.4                 | 134              |
| 360 min Summer   | 12.241       | 0.0                 | 121.7                 | 192              |
| 480 min Summer   | 9.724        | 0.0                 | 128.9                 | 252              |
| 600 min Summer   | 8.128        | 0.0                 | 134.7                 | 312              |
| 720 min Summer   | 7.017        | 0.0                 | 139.6                 | 372              |
| 960 min Summer   | 5.561        | 0.0                 | 147.5                 | 492              |
| 1440 min Summer  | 4.002        | 0.0                 | 159.1                 | 736              |
| 2160 min Summer  | 2.875        | 0.0                 | 171.6                 | 0                |
| 2880 min Summer  | 2.272        | 0.0                 | 180.8                 | 0                |
| 4320 min Summer  | 1.628        | 0.0                 | 194.3                 | 0                |
| 5760 min Summer  | 1.285        | 0.0                 | 204.4                 | 0                |
| 7200 min Summer  | 1.068        | 0.0                 | 212.5                 | 0                |
| 8640 min Summer  | 0.918        | 0.0                 | 219.2                 | 0                |
| 10080 min Summer | 0.808        | 0.0                 | 225.0                 | 0                |
| 15 min Winter    | 120.653      | 0.0                 | 55.8                  | 16               |

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| Date 04/07/2017 10:07<br>File proposed inc green spac... | Designed by MJG<br>Checked by                             |   |
| Micro Drainage   | Source Control 2015.1                                     |   |

Summary of Results for 100 year Return Period (+20%)

| Storm Event      | Max Level (m) | Max Depth (m) | Max Infiltration (1/s) | Max Control (1/s) | Max Σ Outflow (1/s) | Max Volume (m³) | Status     |
|------------------|---------------|---------------|------------------------|-------------------|---------------------|-----------------|------------|
| 30 min Winter    | 49.628        | 0.328         | 0.0                    | 20.8              | 20.8                | 44.7            | Flood Risk |
| 60 min Winter    | 49.610        | 0.310         | 0.0                    | 20.8              | 20.8                | 41.8            | Flood Risk |
| 120 min Winter   | 49.528        | 0.228         | 0.0                    | 20.8              | 20.8                | 29.7            | O K        |
| 180 min Winter   | 49.453        | 0.153         | 0.0                    | 20.5              | 20.5                | 19.3            | O K        |
| 240 min Winter   | 49.408        | 0.108         | 0.0                    | 19.6              | 19.6                | 13.3            | O K        |
| 360 min Winter   | 49.370        | 0.070         | 0.0                    | 15.1              | 15.1                | 8.4             | O K        |
| 480 min Winter   | 49.349        | 0.049         | 0.0                    | 12.2              | 12.2                | 5.9             | O K        |
| 600 min Winter   | 49.335        | 0.035         | 0.0                    | 10.4              | 10.4                | 4.2             | O K        |
| 720 min Winter   | 49.325        | 0.025         | 0.0                    | 9.0               | 9.0                 | 3.0             | O K        |
| 960 min Winter   | 49.311        | 0.011         | 0.0                    | 7.2               | 7.2                 | 1.3             | O K        |
| 1440 min Winter  | 49.300        | 0.000         | 0.0                    | 5.3               | 5.3                 | 0.0             | O K        |
| 2160 min Winter  | 49.300        | 0.000         | 0.0                    | 3.8               | 3.8                 | 0.0             | O K        |
| 2880 min Winter  | 49.300        | 0.000         | 0.0                    | 3.1               | 3.1                 | 0.0             | O K        |
| 4320 min Winter  | 49.300        | 0.000         | 0.0                    | 2.2               | 2.2                 | 0.0             | O K        |
| 5760 min Winter  | 49.300        | 0.000         | 0.0                    | 1.8               | 1.8                 | 0.0             | O K        |
| 7200 min Winter  | 49.300        | 0.000         | 0.0                    | 1.4               | 1.4                 | 0.0             | O K        |
| 8640 min Winter  | 49.300        | 0.000         | 0.0                    | 1.2               | 1.2                 | 0.0             | O K        |
| 10080 min Winter | 49.300        | 0.000         | 0.0                    | 1.1               | 1.1                 | 0.0             | O K        |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|------------------|
| 30 min Winter    | 78.493       | 0.0                 | 72.5                  | 27               |
| 60 min Winter    | 48.611       | 0.0                 | 89.7                  | 46               |
| 120 min Winter   | 29.095       | 0.0                 | 107.8                 | 80               |
| 180 min Winter   | 21.273       | 0.0                 | 118.5                 | 110              |
| 240 min Winter   | 16.942       | 0.0                 | 125.8                 | 136              |
| 360 min Winter   | 12.241       | 0.0                 | 136.3                 | 196              |
| 480 min Winter   | 9.724        | 0.0                 | 144.3                 | 256              |
| 600 min Winter   | 8.128        | 0.0                 | 150.9                 | 314              |
| 720 min Winter   | 7.017        | 0.0                 | 156.3                 | 376              |
| 960 min Winter   | 5.561        | 0.0                 | 165.1                 | 494              |
| 1440 min Winter  | 4.002        | 0.0                 | 178.3                 | 0                |
| 2160 min Winter  | 2.875        | 0.0                 | 192.2                 | 0                |
| 2880 min Winter  | 2.272        | 0.0                 | 202.5                 | 0                |
| 4320 min Winter  | 1.628        | 0.0                 | 217.7                 | 0                |
| 5760 min Winter  | 1.285        | 0.0                 | 228.9                 | 0                |
| 7200 min Winter  | 1.068        | 0.0                 | 238.0                 | 0                |
| 8640 min Winter  | 0.918        | 0.0                 | 245.5                 | 0                |
| 10080 min Winter | 0.808        | 0.0                 | 252.0                 | 0                |

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| Micro Drainage   | Source Control 2015.1                                     |   |

Rainfall Details

|                       |                   |                       |       |
|-----------------------|-------------------|-----------------------|-------|
| Rainfall Model        | FSR               | Winter Storms         | Yes   |
| Return Period (years) | 100               | Cv (Summer)           | 0.750 |
| Region                | England and Wales | Cv (Winter)           | 0.840 |
| M5-60 (mm)            | 20.000            | Shortest Storm (mins) | 15    |
| Ratio R               | 0.422             | Longest Storm (mins)  | 10080 |
| Summer Storms         | Yes               | Climate Change %      | +20   |


Pipe Network

|                             |     |                                |       |
|-----------------------------|-----|--------------------------------|-------|
| Volume in Pipe Network (m³) | 1   | Dia of Outfall Pipe (m)        | 0.2   |
| Slope of Outfall Pipe (1:X) | 150 | Roughness of Outfall Pipe (mm) | 0.600 |

Time Area Diagram

Total Area (ha) 0.221

| Time (mins) | Area  | Time (mins) | Area  | Time (mins) | Area  |
|-------------|-------|-------------|-------|-------------|-------|
| From:       | To:   | From:       | To:   | From:       | To:   |
| 0           | 4     | 4           | 8     | 8           | 12    |
|             | 0.218 |             | 0.001 |             | 0.002 |

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Model Details

Storage is Online Cover Level (m) 49.900

Infiltration Basin Structure

Invert Level (m) 49.300 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00  
 Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------|------------------------|-----------|------------------------|-----------|------------------------|
| 0.000     | 117.0                  | 0.700     | 0.0                    | 1.400     | 0.0                    | 2.100     | 0.0                    |
| 0.100     | 129.0                  | 0.800     | 0.0                    | 1.500     | 0.0                    | 2.200     | 0.0                    |
| 0.200     | 140.0                  | 0.900     | 0.0                    | 1.600     | 0.0                    | 2.300     | 0.0                    |
| 0.300     | 152.0                  | 1.000     | 0.0                    | 1.700     | 0.0                    | 2.400     | 0.0                    |
| 0.400     | 164.0                  | 1.100     | 0.0                    | 1.800     | 0.0                    | 2.500     | 0.0                    |
| 0.500     | 176.0                  | 1.200     | 0.0                    | 1.900     | 0.0                    |           |                        |
| 0.600     | 0.0                    | 1.300     | 0.0                    | 2.000     | 0.0                    |           |                        |

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0206-2100-0600-2100  
 Design Head (m) 0.600  
 Design Flow (l/s) 21.0  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Diameter (mm) 206  
 Invert Level (m) 49.210  
 Minimum Outlet Pipe Diameter (mm) 225  
 Suggested Manhole Diameter (mm) 1200

| Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 0.600    | 20.8       |
| Flush-Flo™                | 0.300    | 20.8       |
| Kick-Flo®                 | 0.491    | 18.9       |
| Mean Flow over Head Range | -        | 16.2       |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 7.1        | 1.200     | 28.9       | 3.000     | 45.0       | 7.000     | 67.6       |
| 0.200     | 19.8       | 1.400     | 31.2       | 3.500     | 48.5       | 7.500     | 70.0       |
| 0.300     | 20.8       | 1.600     | 33.2       | 4.000     | 51.7       | 8.000     | 72.3       |
| 0.400     | 20.3       | 1.800     | 35.2       | 4.500     | 54.8       | 8.500     | 74.6       |
| 0.500     | 19.1       | 2.000     | 37.0       | 5.000     | 57.7       | 9.000     | 76.8       |
| 0.600     | 20.8       | 2.200     | 38.8       | 5.500     | 60.4       | 9.500     | 78.9       |
| 0.800     | 23.8       | 2.400     | 40.4       | 6.000     | 63.0       |           |            |
| 1.000     | 26.5       | 2.600     | 42.0       | 6.500     | 65.1       |           |            |