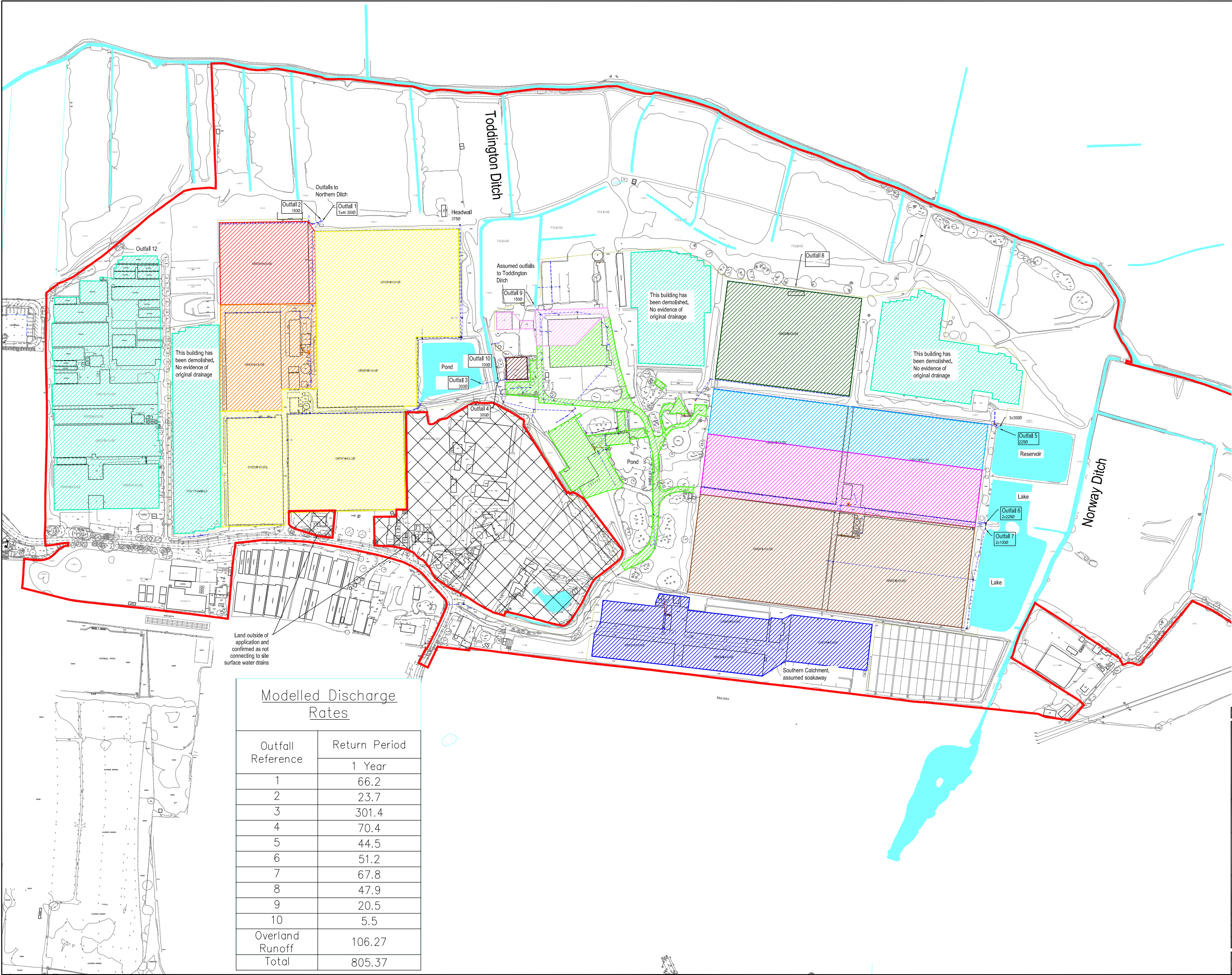




- NOTES
1. This drawing is to be read in conjunction with all other relevant documents and specifications.
  2. Dimensions not to be scaled.
  3. All drainage catchments are indicative only and based on the drainage survey drawing completed by mksurveys, job no. 20644.
  4. Simulation modelling using WinDes has been undertaken based on the existing network identified by mksurveys.
  5. Simulation modelling has included surcharged outfalls in accordance with the modelled flood levels provided by the Environment Agency.
  6. Overland runoff from areas where no positive drainage connection was identified has been undertaken.

KEY TO IMPERMEABLE AREAS

|                           |                            |
|---------------------------|----------------------------|
| [Red hatched box]         | Outfall 1                  |
| [Orange hatched box]      | Outfall 2                  |
| [Yellow hatched box]      | Outfall 3                  |
| [Light green hatched box] | Outfall 4                  |
| [Light blue hatched box]  | Outfall 5                  |
| [Pink hatched box]        | Outfall 6                  |
| [Brown hatched box]       | Outfall 7                  |
| [Dark green hatched box]  | Outfall 8                  |
| [Purple hatched box]      | Outfall 9                  |
| [Dark brown hatched box]  | Outfall 10                 |
| [Light blue wavy line]    | Overland runoff            |
| [Blue wavy line]          | Soakaway catchment         |
| [Dashed blue line]        | Assumed flow direction     |
| [Red line]                | Site Boundary              |
| [Blue line]               | Existing ditches and ponds |

| Modelled Discharge Rates |               |
|--------------------------|---------------|
| Outfall Reference        | Return Period |
|                          | 1 Year        |
| 1                        | 66.2          |
| 2                        | 23.7          |
| 3                        | 301.4         |
| 4                        | 70.4          |
| 5                        | 44.5          |
| 6                        | 51.2          |
| 7                        | 67.8          |
| 8                        | 47.9          |
| 9                        | 20.5          |
| 10                       | 5.5           |
| Overland Runoff          | 106.27        |
| Total                    | 805.37        |

| Rev.                                                                                                                                                                                                                                                                     | Description | Date                                  | Chkd                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------|----------------------|
|  <b>Glanville</b><br>Cornerstone House<br>62 Foxhall Road, Didcot<br>Oxon, OX11 7AD<br>Tel: (01235) 515550 Fax: (01235) 817799<br>postbox@glanvillegroup.com www.glanvillegroup.com |             |                                       |                      |
| Client :                                                                                                                                                                                                                                                                 |             | Persimmon Homes                       |                      |
| Project :                                                                                                                                                                                                                                                                |             | North Littlehampton                   |                      |
| Title :                                                                                                                                                                                                                                                                  |             | Existing Surface Water Drainage Rates |                      |
| Project Engineer :                                                                                                                                                                                                                                                       |             | S.Hudson                              | Scale : 1:2000 @ A1  |
| Project Director :                                                                                                                                                                                                                                                       |             | K.Rayner                              | Date : February 2015 |
| Status :                                                                                                                                                                                                                                                                 |             | PRELIMINARY                           |                      |
| Drawing No.                                                                                                                                                                                                                                                              |             | 8140927/121                           | Rev                  |

## **Appendix L**

### **Windes Calculations Existing Rates**

|                                                         |                                   |                                                                                     |
|---------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|
| Glanville Consultants                                   |                                   | Page 1                                                                              |
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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 10.000        | 0.050       | 200.0          | 0.500          | 4.00           | 0.0                | 0.600     | oo          | 41          |  |
| 1.001 | 20.000        | 0.500       | 40.0           | 0.000          | 0.00           | 0.0                | 0.600     | oo          | 41          |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.15           | 3.050        | 0.500            | 0.0                  | 0.0           | 0.0               | 1.11         | 156.0        | 0.0           |
| 1.001 | 0.00            | 4.28           | 3.000        | 0.500            | 0.0                  | 0.0           | 0.0               | 2.49         | 351.0        | 0.0           |

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|                                                         |                                   |                                                                                     |
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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 15 Winter | 1             | +0%            | 30/15 Summer    |                 |                    |               | 3.210           |
| 1.001 | 2          | 15 Winter | 1             | +0%            |                 |                 |                    |               | 3.092           |

| PN    | US/MH Name | Depth (m) | Surcharged Volume (m³) | Flooded Flow / Cap. (l/s) | Pipe Flow (l/s) | Level Exceeded | Status |
|-------|------------|-----------|------------------------|---------------------------|-----------------|----------------|--------|
|       |            |           |                        |                           |                 |                |        |
| 1.000 | 1          | -0.140    | 0.000                  | 0.54                      | 65.4            | OK             |        |
| 1.001 | 2          | -0.208    | 0.000                  | 0.22                      | 66.2            | OK             |        |

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|                                                         |                                   |                                                                                     |
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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 85.000        | 0.570       | 149.1          | 0.800          | 4.00           | 0.0                | 0.600     | o           | 150         |  |
| 1.001 | 20.000        | 0.780       | 25.6           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 5.73           | 3.050        | 0.800            | 0.0                  | 0.0           | 0.0               | 0.82         | 14.5         | 0.0           |
| 1.001 | 0.00            | 5.89           | 2.480        | 0.800            | 0.0                  | 0.0           | 0.0               | 2.00         | 35.3         | 0.0           |

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|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                                      |        |             |       |
|--------------------------------------|--------|-------------|-------|
| Rainfall Model                       | FSR    | Ratio R     | 0.350 |
| Region England and Wales Cv (Summer) | 0.750  |             |       |
| M5-60 (mm)                           | 19.300 | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         | OFF   |                     |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 30 Winter | 1             | +0%            | 1/15 Summer     | 2/30 Winter     |                    |               | 4.211           |
| 1.001 | 2          | 30 Winter | 1             | +0%            |                 |                 |                    |               | 2.574           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 1.011     | 0.000       | 1.66        |                | 23.7            | FLOOD RISK | 58             |
| 1.001 | 2          | -0.056    | 0.000       | 0.71        |                | 23.7            | OK         |                |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 40.000        | 0.660       | 60.6           | 2.500          | 4.00           | 0.0                | 0.600     | ∞           | 41          |  |
| 2.000 | 40.000        | 0.610       | 65.6           | 3.300          | 4.00           | 0.0                | 0.600     | ∞           | 41          |  |
| 1.001 | 20.000        | 0.760       | 26.3           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.33           | 3.800        | 2.500            | 0.0                  | 0.0           | 0.0               | 2.02         | 284.8        | 0.0           |
| 2.000 | 0.00            | 4.34           | 2.610        | 3.300            | 0.0                  | 0.0           | 0.0               | 1.94         | 273.7        | 0.0           |
| 1.001 | 0.00            | 4.45           | 2.000        | 5.800            | 0.0                  | 0.0           | 0.0               | 3.08         | 217.5        | 0.0           |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                                      |        |             |       |
|--------------------------------------|--------|-------------|-------|
| Rainfall Model                       | FSR    | Ratio R     | 0.350 |
| Region England and Wales Cv (Summer) |        |             | 0.750 |
| M5-60 (mm)                           | 19.300 | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|---------------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 15 Winter | 1             | +0%            | 1/15 Summer         | 30/15 Winter    |                    |               | 4.151           |
| 2.000 | 2          | 15 Winter | 1             | +0%            | 1/15 Summer         | 2/15 Winter     |                    |               | 3.531           |
| 1.001 | 3          | 15 Winter | 1             | +0%            | 1/15 Summer         | 99/15 Winter    |                    |               | 3.454           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.051     | 0.000       | 1.04        |                | 275.5           | SURCHARGED | 15             |
| 2.000 | 2          | 0.621     | 0.000       | 0.87        |                | 220.8           | FLOOD RISK | 46             |
| 1.001 | 3          | 1.154     | 0.000       | 1.59        |                | 301.4           | SURCHARGED | 16             |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 36.000        | 0.210       | 171.4          | 1.230          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 23.000        | 0.040       | 575.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.60           | 0.850        | 1.230            | 0.0                  | 0.0           | 0.0               | 1.00         | 39.6         | 0.0           |
| 1.001 | 0.00            | 5.19           | 0.640        | 1.230            | 0.0                  | 0.0           | 0.0               | 0.65         | 45.8         | 0.0           |

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|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|---------------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 15 Winter | 1             | +0%            | 1/15 Summer         | 30/15 Summer    |                    |               | 1.763           |
| 1.001 | 2          | 15 Winter | 1             | +0%            | 1/15 Summer         |                 |                    |               | 1.006           |

| Surcharged Flooded |            |           |             | Pipe        |            | Level      |
|--------------------|------------|-----------|-------------|-------------|------------|------------|
| PN                 | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Flow (l/s) | Status     |
| 1.000              | 1          | 0.688     | 0.000       | 1.89        | 70.6       | SURCHARGED |
| 1.001              | 2          | 0.066     | 0.000       | 1.94        | 70.4       | SURCHARGED |

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|                                                         |                                   |                                                                                     |
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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 160.000       | 0.640       | 250.0          | 1.700          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 12.000        | 0.100       | 120.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 7.24           | 3.240        | 1.700            | 0.0                  | 0.0           | 0.0               | 0.82         | 32.7         | 0.0           |
| 1.001 | 0.00            | 7.41           | 2.600        | 1.700            | 0.0                  | 0.0           | 0.0               | 1.19         | 47.4         | 0.0           |

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|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 60 Winter | 1             | +0%            | 1/15 Summer     | 2/15 Winter     |                    |               | 4.071           |
| 1.001 | 2          | 60 Winter | 1             | +0%            | 1/30 Summer     |                 |                    |               | 2.834           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.606     | 0.000       | 1.38        |                | 44.6            | FLOOD RISK | 69             |
| 1.001 | 2          | 0.009     | 0.000       | 1.10        |                | 44.5            | SURCHARGED |                |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 162.000       | 0.820       | 197.6          | 2.220          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 12.000        | 0.100       | 120.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 6.91           | 3.270        | 2.220            | 0.0                  | 0.0           | 0.0               | 0.93         | 36.8         | 0.0           |
| 1.001 | 0.00            | 7.08           | 2.450        | 2.220            | 0.0                  | 0.0           | 0.0               | 1.19         | 47.4         | 0.0           |

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|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 60 Winter | 1             | +0%            | 1/15 Summer     | 2/15 Winter     |                    |               | 4.368           |
| 1.001 | 2          | 60 Winter | 1             | +0%            | 1/15 Summer     |                 |                    |               | 2.724           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.873     | 0.000       | 1.41        |                | 51.3            | FLOOD RISK | 73             |
| 1.001 | 2          | 0.049     | 0.000       | 1.26        |                | 51.2            | SURCHARGED |                |

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|                                                         |                                   |                                                                                     |
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| Micro Drainage                                          | Network 2015.1                    |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 55.500        | 0.060       | 925.0          | 3.720          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 12.000        | 0.100       | 120.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | I.Area<br>(ha) | Base<br>Flow (l/s) | Foul<br>Flow (l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|----------------|--------------------|--------------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 6.19           | 2.230        | 3.720          | 0.0                | 0.0                | 0.0               | 0.42         | 16.8         | 0.0           |
| 1.001 | 0.00            | 6.36           | 2.170        | 3.720          | 0.0                | 0.0                | 0.0               | 1.19         | 47.4         | 0.0           |

|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 60 Winter | 1             | +0%            | 1/15 Summer     | 1/30 Winter     |                    |               | 3.619           |
| 1.001 | 2          | 60 Winter | 1             | +0%            | 1/15 Summer     |                 |                    |               | 2.563           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 1.164     | 39.094      | 4.19        |                | 67.8            | FLOOD      | 92             |
| 1.001 | 2          | 0.168     | 0.000       | 1.67        |                | 67.8            | SURCHARGED |                |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 80.000        | 0.600       | 133.3          | 1.800          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 12.000        | 0.100       | 120.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 5.18           | 3.300        | 1.800            | 0.0                  | 0.0           | 0.0               | 1.13         | 45.0         | 0.0           |
| 1.001 | 0.00            | 5.35           | 2.700        | 1.800            | 0.0                  | 0.0           | 0.0               | 1.19         | 47.4         | 0.0           |

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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                                      |        |             |       |
|--------------------------------------|--------|-------------|-------|
| Rainfall Model                       | FSR    | Ratio R     | 0.350 |
| Region England and Wales Cv (Summer) | 0.750  |             |       |
| M5-60 (mm)                           | 19.300 | Cv (Winter) | 0.840 |

|                                    |       |                |    |
|------------------------------------|-------|----------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status     | ON |
| Analysis Timestep                  | Fine  | Inertia Status | ON |
| DTS Status                         | OFF   |                |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 60 Winter | 1             | +0%            | 1/15 Summer     | 2/15 Winter     |                    |               | 3.861           |
| 1.001 | 2          | 60 Winter | 1             | +0%            | 1/15 Summer     |                 |                    |               | 3.140           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.336     | 0.000       | 1.09        |                | 47.9            | FLOOD RISK | 69             |
| 1.001 | 2          | 0.215     | 0.000       | 1.18        |                | 47.9            | SURCHARGED |                |

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|                                                         |                                   |                                                                                     |
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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 50.000        | 0.200       | 250.0          | 1.380          | 4.00           | 0.0                | 0.600     | o           | 300         |  |
| 1.001 | 10.000        | 0.100       | 100.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.84           | 3.600        | 1.380            | 0.0                  | 0.0           | 0.0               | 0.99         | 70.0         | 0.0           |
| 1.001 | 0.00            | 4.95           | 3.400        | 1.380            | 0.0                  | 0.0           | 0.0               | 1.57         | 111.1        | 0.0           |

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|                                                         |  |                                                                                     |
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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                                      |        |             |       |
|--------------------------------------|--------|-------------|-------|
| Rainfall Model                       | FSR    | Ratio R     | 0.350 |
| Region England and Wales Cv (Summer) |        |             | 0.750 |
| M5-60 (mm)                           | 19.300 | Cv (Winter) | 0.840 |

|                                    |       |                     |     |
|------------------------------------|-------|---------------------|-----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON  |
| Analysis Timestep                  |       | Fine Inertia Status | ON  |
| DTS Status                         |       |                     | OFF |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 30 Winter | 1             | +0%            | 1/15 Summer     | 2/30 Winter     |                    |               | 4.134           |
| 1.001 | 2          | 15 Winter | 1             | +0%            | 1/15 Summer     | 100/15 Winter   |                    |               | 3.927           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.234     | 0.000       | 1.05        |                | 69.0            | FLOOD RISK | 43             |
| 1.001 | 2          | 0.227     | 0.000       | 0.74        |                | 58.7            | FLOOD RISK |                |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 43.000        | 0.540       | 79.6           | 0.350          | 4.00           | 0.0                | 0.600     | o           | 225         |  |
| 1.001 | 10.000        | 0.100       | 100.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.49           | 1.550        | 0.350            | 0.0                  | 0.0           | 0.0               | 1.47         | 58.3         | 0.0           |
| 1.001 | 0.00            | 4.62           | 1.010        | 0.350            | 0.0                  | 0.0           | 0.0               | 1.31         | 52.0         | 0.0           |

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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|---------------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 30 Winter | 1             | +0%            | 1/15 Summer         | 30/15 Summer    |                    |               | 2.126           |
| 1.001 | 2          | 30 Winter | 1             | +0%            | 1/15 Summer         |                 |                    |               | 2.052           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.351     | 0.000       | 0.37        |                | 20.3            | FLOOD RISK | 33             |
| 1.001 | 2          | 0.817     | 0.000       | 0.47        |                | 20.3            | FLOOD RISK |                |

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| Micro Drainage Network 2015.1                           |                                   |                                                                                     |

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 2      | Add Flow / Climate Change (%)         | 0     |
| M5-60 (mm)                           | 19.300 | Minimum Backdrop Height (m)           | 0.200 |
| Ratio R                              | 0.350  | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Rainfall (mm/hr)             | 0      | Min Design Depth for Optimisation (m) | 1.200 |
| Maximum Time of Concentration (mins) | 30     | Min Vel for Auto Design only (m/s)    | 1.00  |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Slope for Optimisation (1:X)      | 500   |
| Volumetric Runoff Coeff.             | 0.750  |                                       |       |

Designed with Level Soffits

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|---------------------------------------------------------------------------------------|
| 1.000 | 24.000        | 0.610       | 39.3           | 0.065          | 4.00           | 0.0                | 0.600     | o           | 100         |  |
| 1.001 | 10.000        | 0.100       | 100.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 0.00            | 4.32           | 2.080        | 0.065            | 0.0                  | 0.0           | 0.0               | 1.23         | 9.7          | 0.0           |
| 1.001 | 0.00            | 4.45           | 1.345        | 0.065            | 0.0                  | 0.0           | 0.0               | 1.31         | 52.0         | 0.0           |

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| Micro Drainage                                          |  | Network 2015.1                                                                      |

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

Simulation Criteria

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Areal Reduction Factor          | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Hot Start (mins)                | 0     | MADD Factor * 10m³/ha Storage       | 5.000 |
| 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 |
| Foul Sewage per hectare (l/s)   | 0.000 |                                     |       |

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

Synthetic Rainfall Details

|                          |             |             |       |
|--------------------------|-------------|-------------|-------|
| Rainfall Model           | FSR         | Ratio R     | 0.350 |
| Region England and Wales | Cv (Summer) |             | 0.750 |
| M5-60 (mm)               | 19.300      | Cv (Winter) | 0.840 |

|                                    |       |                     |    |
|------------------------------------|-------|---------------------|----|
| Margin for Flood Risk Warning (mm) | 300.0 | DVD Status          | ON |
| Analysis Timestep                  |       | Fine Inertia Status | ON |
| DTS Status                         |       | OFF                 |    |

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Profile(s)               | Summer and Winter                                        |
| Duration(s) (mins)       | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 2, 30, 99, 100                                        |
| Climate Change (%)       | 0, 0, 0, 0, 30                                           |

| PN    | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|-----------|---------------|----------------|---------------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | 1          | 15 Winter | 1             | +0%            | 1/15 Summer         | 30/15 Summer    |                    |               | 2.204           |
| 1.001 | 2          | 15 Summer | 1             | +0%            | 1/15 Summer         |                 |                    |               | 2.016           |

| PN    | US/MH Name | Depth (m) | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status     | Level Exceeded |
|-------|------------|-----------|-------------|-------------|----------------|-----------------|------------|----------------|
| 1.000 | 1          | 0.024     | 0.000       | 0.56        |                | 5.3             | FLOOD RISK | 19             |
| 1.001 | 2          | 0.446     | 0.000       | 0.12        |                | 5.2             | FLOOD RISK |                |

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## **APPENDIX L: Drainage Strategy, West of Wetlands**