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| 8 Westleigh House Denby Dale Huddersfield | Buckstones Road Shaw |  |
| Date 23/05/2023 09:56 File 1315 SW Drainage.MDX | Designed by Sarah Griggs Checked by | |
| Micro Drainage | Network 2020.1.3 | |

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 | PIMP (%) | 100 |
| M5-60 (mm) | 19.800 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.261 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 0.300 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Soffits





Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|-------------|-----------|-------------|-----------|
| 0-4 | 0.015 | 4-8 | 0.006 |

Total Area Contributing (ha) = 0.021

Total Pipe Volume (m³) = 0.898

Network Design Table for Storm

| PN | Length (m) | Fall (m) | Slope (1:X) | I.Area (ha) | T.E. (mins) | Base Flow (l/s) | k (mm) | HYD SECT | DIA (mm) | Section | Type | Auto Design |
|-------|------------|----------|-------------|-------------|-------------|-----------------|--------|----------|----------|--------------|------|---|
| 1.000 | 9.980 | 0.080 | 124.8 | 0.010 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |  |
| 1.001 | 12.900 | 0.100 | 129.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |  |
| 2.000 | 17.650 | 0.180 | 98.1 | 0.011 | 5.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |  |
| 1.002 | 10.280 | 0.247 | 41.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |  |

Network Results Table

| PN | Rain (mm/hr) | T.C. (mins) | US/IL (m) | Σ I.Area (ha) | Σ Base Flow (l/s) | Foul (l/s) | Add Flow (l/s) | Vel (m/s) | Cap (l/s) | Flow (l/s) |
|-------|--------------|-------------|-----------|---------------|-------------------|------------|----------------|-----------|-----------|------------|
| 1.000 | 50.00 | 5.19 | 183.200 | 0.010 | 0.0 | 0.0 | 0.0 | 0.90 | 15.9 | 1.4 |
| 1.001 | 50.00 | 5.43 | 183.120 | 0.010 | 0.0 | 0.0 | 0.0 | 0.88 | 15.6 | 1.4 |
| 2.000 | 50.00 | 5.29 | 183.200 | 0.011 | 0.0 | 0.0 | 0.0 | 1.01 | 17.9 | 1.5 |
| 1.002 | 50.00 | 5.54 | 183.020 | 0.021 | 0.0 | 0.0 | 0.0 | 1.56 | 27.6 | 2.8 |

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Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out | | Pipes In | | | Backdrop (mm) |
|---------|-----------|--------------|---------------|-------------------|----------|------------------|---------------|-------|------------------|---------------|
| | | | | | PN | Invert Level (m) | Diameter (mm) | PN | Invert Level (m) | |
| RE | 183.650 | 0.450 | Open Manhole | 150 | 1.000 | 183.200 | 150 | | | |
| S1 | 183.950 | 0.830 | Open Manhole | 460 | 1.001 | 183.120 | 150 | 1.000 | 183.120 | 150 |
| RE | 183.650 | 0.450 | Open Manhole | 150 | 2.000 | 183.200 | 150 | | | |
| S2 | 183.830 | 0.810 | Open Manhole | 460 | 1.002 | 183.020 | 150 | 1.001 | 183.020 | 150 |
| | 183.903 | 1.130 | Open Manhole | 600 x 600 | | OUTFALL | | 2.000 | 183.020 | 150 |
| | | | | | | | | 1.002 | 182.773 | 150 |

No coordinates have been specified, layout information cannot be produced.

PIPELINE SCHEDULES for Storm

Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|-------|----------|-----------|---------|-------------|-------------|-------------|---------------|--------------------|
| 1.000 | o | 150 | RE | 183.650 | 183.200 | 0.300 | Open Manhole | 150 |
| 1.001 | o | 150 | S1 | 183.950 | 183.120 | 0.680 | Open Manhole | 460 |
| 2.000 | o | 150 | RE | 183.650 | 183.200 | 0.300 | Open Manhole | 150 |
| 1.002 | o | 150 | S2 | 183.830 | 183.020 | 0.660 | Open Manhole | 460 |

Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|-------|------------|-------------|---------|-------------|-------------|-------------|---------------|--------------------|
| 1.000 | 9.980 | 124.8 | S1 | 183.950 | 183.120 | 0.680 | Open Manhole | 460 |
| 1.001 | 12.900 | 129.0 | S2 | 183.830 | 183.020 | 0.660 | Open Manhole | 460 |
| 2.000 | 17.650 | 98.1 | S2 | 183.830 | 183.020 | 0.660 | Open Manhole | 460 |
| 1.002 | 10.280 | 41.6 | | 183.903 | 182.773 | 0.980 | Open Manhole | 600 x 600 |

Free Flowing Outfall Details for Storm

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---------------------|--------------|--------------|--------------|------------------|----------|--------|
| 1.002 | | 183.903 | 182.773 | 0.000 | 600 | 600 |


Simulation Criteria for Storm

| | | | |
|---------------------------------|-------|--|-------|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m ³ /ha Storage | 2.000 |
| Hot Start (mins) | 0 | Inlet Coefficient | 0.800 |
| Hot Start Level (mm) | 0 | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins) | 60 |
| Foul Sewage per hectare (l/s) | 0.000 | Output Interval (mins) | 1 |

Number of Input Hydrographs 0
Number of Storage Structures 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 | 0.261 |
| Return Period (years) | 2 | Profile Type | Summer |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.800 | Cv (Winter) | 0.840 |

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Synthetic Rainfall Details

Storm Duration (mins) 30

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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 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
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 0.261
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
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, 30, 100
Climate Change (%) 0, 0, 40

| | | | | | | | | Water | |
|-------|------------|--------|---------------|----------------|--------------------|-----------------|--------------------|---------------|-----------|
| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surchage | First (Y) Flood | First (Z) Overflow | Overflow Act. | Level (m) |
| 1.000 | RE 15 | Winter | 1 | +0% | | | | | 183.229 |
| 1.001 | S1 15 | Winter | 1 | +0% | | | | | 183.149 |
| 2.000 | RE 15 | Winter | 1 | +0% | | | | | 183.228 |
| 1.002 | S2 15 | Winter | 1 | +0% | | | | | 183.052 |

| | | | Surcharged Flooded | Half Drain Pipe | | | | | |
|-------|------------|-----------|--------------------------|----------------------|-------|-------------|-----------------|--------|----------------|
| PN | US/MH Name | Depth (m) | Volume (m ³) | Flow / Overflow Cap. | (l/s) | Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
| 1.000 | RE | -0.121 | 0.000 | 0.08 | | | 1.2 | OK | |
| 1.001 | S1 | -0.121 | 0.000 | 0.08 | | | 1.2 | OK | |
| 2.000 | RE | -0.122 | 0.000 | 0.08 | | | 1.3 | OK | |
| 1.002 | S2 | -0.118 | 0.000 | 0.10 | | | 2.5 | OK | |

30 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 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
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 0.261
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840
Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
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, 30, 100
Climate Change (%) 0, 0, 40

| | | | | | | | | Water | |
|-------|------------|--------|---------------|----------------|--------------------|-----------------|--------------------|---------------|-----------|
| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surchage | First (Y) Flood | First (Z) Overflow | Overflow Act. | Level (m) |
| 1.000 | RE 15 | Winter | 30 | +0% | | | | | 183.246 |
| 1.001 | S1 15 | Winter | 30 | +0% | | | | | 183.166 |
| 2.000 | RE 15 | Winter | 30 | +0% | | | | | 183.245 |
| 1.002 | S2 15 | Winter | 30 | +0% | | | | | 183.071 |

| | | | Surcharged Flooded | Half Drain Pipe | | | |
|-------|------------|-----------|--------------------------|----------------------------|-------------|-----------------|----------------|
| PN | US/MH Name | Depth (m) | Volume (m ³) | Flow / Overflow Cap. (l/s) | Time (mins) | Pipe Flow (l/s) | Level Exceeded |
| 1.000 | RE | -0.104 | 0.000 | 0.21 | | 2.9 | OK |
| 1.001 | S1 | -0.104 | 0.000 | 0.20 | | 2.9 | OK |
| 2.000 | RE | -0.105 | 0.000 | 0.19 | | 3.2 | OK |
| 1.002 | S2 | -0.099 | 0.000 | 0.25 | | 6.1 | OK |

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100 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 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
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 0.261
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
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, 30, 100
Climate Change (%) 0, 0, 40

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surchage | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|-------|------------|--------|---------------|----------------|--------------------|-----------------|--------------------|---------------|-----------------|
| 1.000 | RE 15 | Winter | 100 | +40% | | | | | 183.264 |
| 1.001 | S1 15 | Winter | 100 | +40% | | | | | 183.184 |
| 2.000 | RE 15 | Winter | 100 | +40% | | | | | 183.261 |
| 1.002 | S2 15 | Winter | 100 | +40% | | | | | 183.091 |

| PN | US/MH Name | Surcharged Flooded | | | Half Drain Pipe | | Level Exceeded |
|-------|------------|--------------------|--------------------------|----------------------------|-----------------|-----------------|----------------|
| | | Depth (m) | Volume (m ³) | Flow / Overflow Cap. (l/s) | Time (mins) | Pipe Flow (l/s) | |
| 1.000 | RE | -0.086 | 0.000 | 0.37 | | 5.3 | OK |
| 1.001 | S1 | -0.086 | 0.000 | 0.37 | | 5.2 | OK |
| 2.000 | RE | -0.089 | 0.000 | 0.34 | | 5.8 | OK |
| 1.002 | S2 | -0.079 | 0.000 | 0.45 | | 11.0 | OK |