

STEVENSON ASSOCIATES

CEMETERY ROAD, HEMINGFIELD

FLOOD RISK and DRAINAGE STATEMENT

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CEMETERY ROAD, HEMINGFIELD, BARNLEY, S73 0PU

INTRODUCTION

- 1 Planning Permission is sought to develop land to the rear of 29A Cemetery Road in Hemingfield, Barnsley and this report has been commissioned to determine how the site will be drained and whether the site will be affected by flooding or if the development will cause others to flood.
- 2 This report should be read in conjunction with the topographical survey prepared by Haycock and Todd along with design proposals prepared by Mark Booth Design (drawing extracts are appended to this report for illustrative purposes).

THE SITE

- 3 Hemingfield is a small village approximately two kilometres south of Wombwell in the district of Barnsley. Cemetery Road is a road passing through the middle of the village and number 29A lies on the south side of the road; the centre of the site proposed for development is approximately at OS Grid reference 439160e, 401370n.
- 4 The site currently comprises of a detached dwelling fronting Cemetery Road and a series of outbuilding sparsely laid out in a field at the rear comprising of a piggery-type building and an assortment of garage/small buildings and hard-standing. Including the dwelling and garden, the overall site covers an area of around 0.63 hectare.
- 5 The site is approximately 108 metres in length and around 60 metres wide. It falls from Cemetery Road at a level of 61.8m in this location towards the southernmost corner at 54m above Ordnance Datum producing a nominal gradient of about 7% (1 in 14).
- 6 It is proposed to demolish the existing dwelling to provide a road access to serve the main area of land, where some 20 mixed type houses and parking areas will be constructed around a new estate road.

EXISTING DRAINAGE

Foul Water

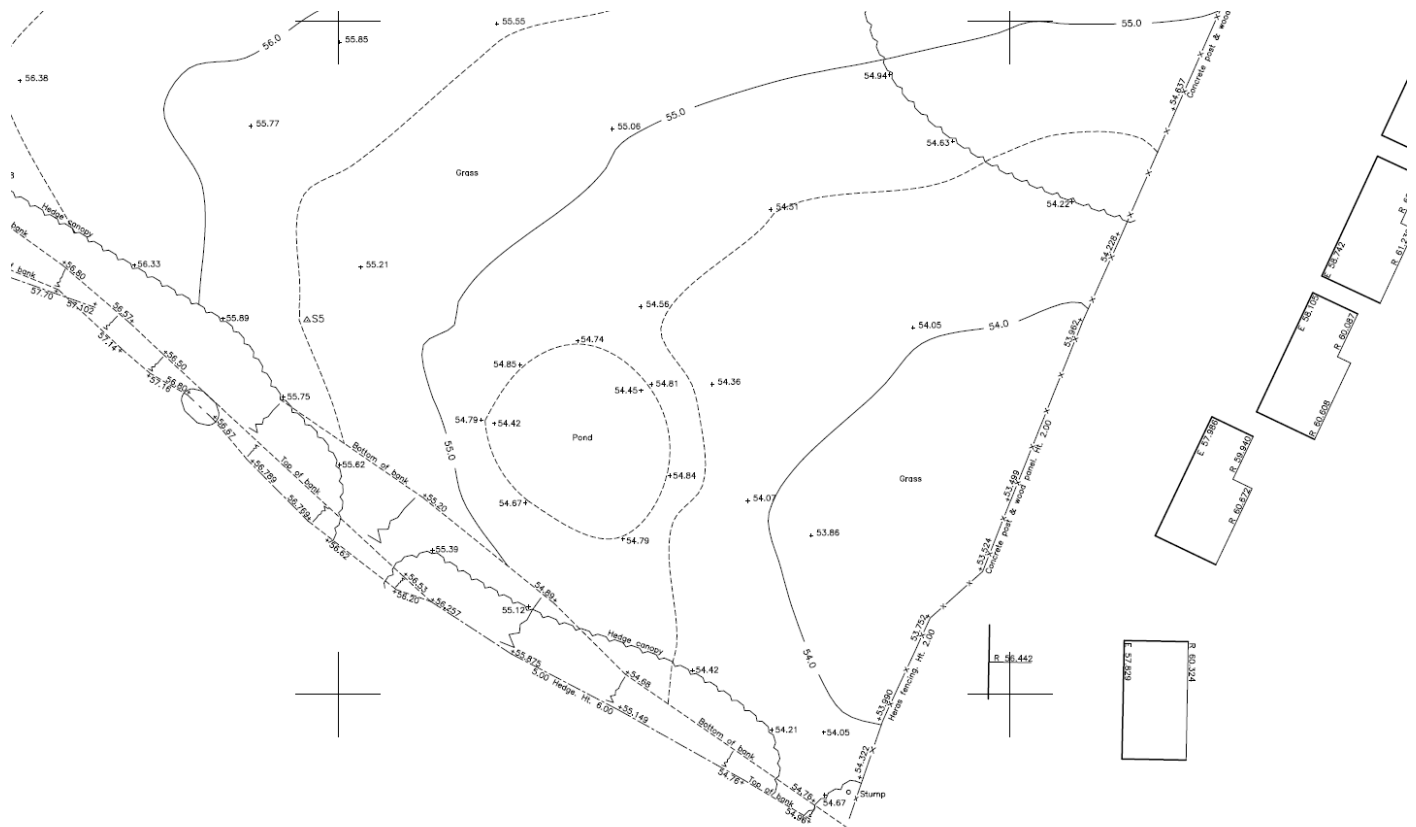
- 7 Foul water in the area is drained via foul water sewers from some newer properties and via a combined foul/surface water drainage system from some older properties. The properties along Cemetery Road in this vicinity drain to a combined sewer in the road [wrongly labelled on the public sewer record map as a pure foul sewer]. This immediate sewer drains towards the west where it joins with others before turning southeast along the site's southern boundary – initially as 225mm before increasing to 300mm downstream with the addition of another sewer.

Surface Water

- 8 Surface water is predominantly drained via surface water sewers although some surface water is drained to the combined sewer /foul water sewer system, such as properties along this section of Cemetery Road.
- 9 A major surface water drainage system runs along the site's southern boundary: a 450mm public surface water sewer from Cemetery Road and beyond discharges into a surface water drain halfway along the site. What once was an open watercourse/drain was culverted in 2011 by Barnsley MBC using a 450mm diameter pipe-work.
- 10 The watercourse flows to Knoll Beck, 500 metres away on the southern edge of Hemingfield, which in turn flows east to the River Dearne 4 kilometres to the east.

Site Drainage

- 11 Only the existing dwelling (29A) is drained (foul and surface water) to the public combined sewer, other outbuildings and hard-standings have no positive drainage and surface water from these areas is allowed to discharge onto the adjacent ground. Surface water from the roof of the house would discharge at a nominal rate of around 1.3 litres per second into the public sewer network [1 in 1-year storm @ 50mm/hr].
- 12 Rainwater falling on the majority of the site soaks away in part but predominantly flows overland towards the southeast corner. There is hollow on site which does pond but most of the water flows to the watercourse alongside the site boundary; water later soaking away from the pond is likely to enter the watercourse a little further downstream.
- 13 Using the HR Wallingford IH124 method for calculating Greenfield runoff, surface water flows from the site would be in the order of 0.87 l/s during 1 in 1-year storms and 2.12 l/s during 1 in 100-year events (see Appendix 3).



PROPOSED DEVELOPMENT

- 14 It is proposed to demolish the existing dwelling to provide a road access and construct 20 new dwellings of mixed types along with parking areas around a new estate road.
- 15 The site will be developed with separate foul and surface water drainage systems.

Foul water

- 16 Foul water from the new dwellings will drain to the public foul sewerage system connecting to the existing combined sewer adjacent to the southern boundary.

Surface Water

- 17 Surface water drainage will emulate existing as close as practicably possible. Drives and other hard-standing areas will be permeable allowing minor infiltration at low rates over large areas and concentrated volumes of surface water from roofs and road will be attenuated prior to discharging to the adjacent watercourse.
- 18 Although it is estimated that flows to the watercourse are currently in the order of 1 to 2 litres per second (see Appendix 4) it is not feasible using a 'Hydro-brake' flow control to reduce flows to this same level. In order to achieve such a level would require a flow control with an orifice less than 50mm in conjunction with small diameter storage pipes at minimum gradients [to reduce the head]. Without special measures to protect the 'Hydro-brake' from debris there would be extensive maintenance required and frequent cleaning; and the length of small pipes required to obtain the storage would result in excessively deep drains due to site levels/gradients.
- 19 Under 'normal' conditions a minimum flow rate of around 5 litres per second is considered both feasible and reasonable and this correlates to Yorkshire Water's requirement for 100mm minimum Hydro-brake size for adoption purposes.
- 20 To satisfy current standards, the proposed surface water drainage system must accommodate a 1 in 30-year storm with no surface flooding and no surface water run-off from the site during a 1 in 100-year storm (1% chance of annual occurrence). Moreover, in accordance with National Planning Policy Framework (NPPF) the design should allow for an additional 30% in rainfall intensities for climate change.
- 21 The existing pond / wetland has been assessed and is considered to have environmental importance with regard to wildlife (amphibians, reptiles and invertebrates etc) and is to remain within an area designated as 'Open Space'. During severe storms, there would be a small amount of additional storage capacity in and around the pond but due to the topography and proposed site layout it is unlikely that surface water from the larger storms could be stored above ground

satisfactorily without causing nuisance and it will therefore be necessary to store all attenuated water below ground.

- 22 For assessment purposes, draft calculations show that around 100 cubic metres will need to be stored if the flow from the site is restricted to less than 5 litres per second. The critical storm is shown to be that of 180 minutes during winter.
- 23 As shown on the indicative layout appended to this report, it is suggested that storage pipes be laid along the 'Private Drives' in front of Plots 8 to 11 and across the 'Open Space' for ease of construction and future access. However they could be located as necessary to suit other constraints or preference such as beneath the New Access road when design details are finalised.
- 24 The final design should be assessed using a simulation programme and include allowances for climate change.

FLOOD ZONES

- 25 The site is not within or close to an area designated Flood Zones 2 or 3 and is therefore identified as not being at risk to flooding from rivers or sea (less than a 0.1% risk of flooding annually – 1/1000).
- 26 Although not at risk from flooding from rivers, Environment Agency's maps show the site is subject to surface water flooding – especially in the low wetland/pond area and in general from surface water running off Cemetery Road across site towards the watercourse. The proposed development of the site with a positive drainage system will remove this concern; however, it might be prudent to also install a 'French Drain' along the site's northern boundary to intercept any surface water runoff from adjacent properties on Cemetery Road (numbers 31 to 45). It is also recommended that some intercepted ground water be diverted through the existing pond/wetland to sustain the habitat.



CONCLUSION

- 27 It is proposed to develop land at Hemingfield with residential properties along a new estate road.
- 28 The development will be drained via separate foul and surface water sewers and foul water will be drained directly to the public combined sewer passing along the site's southern boundary.
- 29 Surface water from dwellings and road will drain to the culverted watercourse alongside the site's southern boundary via an attenuation scheme and rainwater falling on drives and gardens will be allowed to soak away at source. The attenuated drainage scheme will restrict flows to no more than 5 litres per second and will provide storage below ground for all storms up to 1 in 100-year (1% chance of annual occurrence) with allowances for climate change – currently regarded as an increase in rainfall intensity of around 30%.
- 30 The site is not within a flood risk area (Flood Zone 2 or 3). Any surface water flooding currently affecting the site will be removed by the development's drainage systems.

M. Stevenson

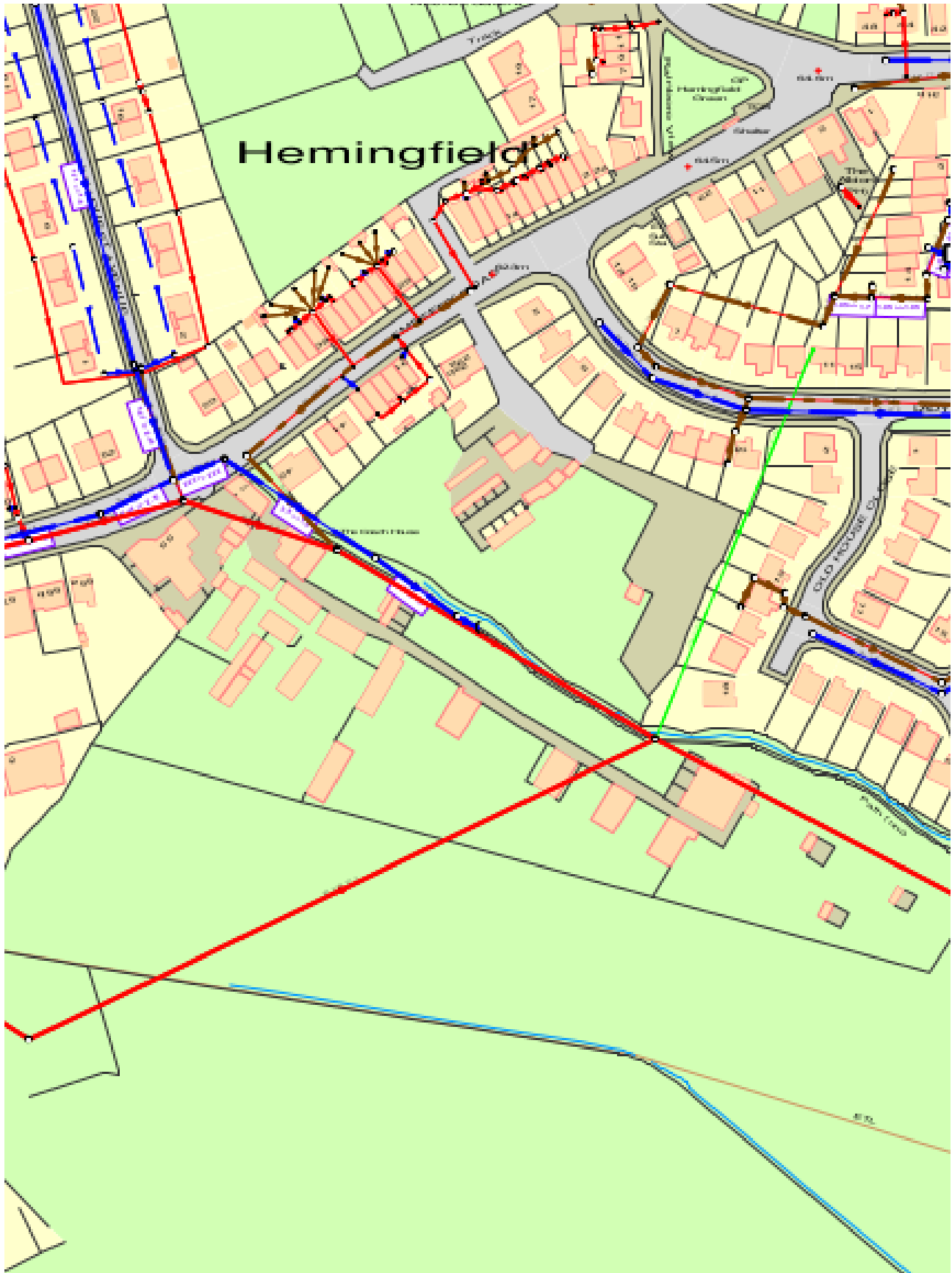
Michael Stevenson

25th June 2017

APPENDIX 1 – LOCATION PLAN



APPENDIX 2 – EXISTING PUBLIC SEWERS



APPENDIX 3 – HR WALLINGFORD RAINWATER RUNOFF



Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Michael Stevenson
Site name: Cemetery Road
Site location: Hemingfield

Site coordinates

Latitude: 53.50754° N
Longitude: 1.41099° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference: 5971955
Date: 2017-06-08T16:28:41

Methodology	IH124
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Site characteristics

Total site area (ha)	0.63
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Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	631	631
Hydrological region	3	3
Growth curve factor: 1 year	0.86	0.86
Growth curve factor: 30 year	1.75	1.75
Growth curve factor: 100 year	2.08	2.08

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?
Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.
(2) Are flow rates < 5.0 l/s?
Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements
(3) Is $SPR/SPRHOST \leq 0.3$?
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	1.02	1.02
1 in 1 year (l/s)	0.87	0.87
1 in 30 years (l/s)	1.78	1.78
1 in 100 years (l/s)	2.12	2.12

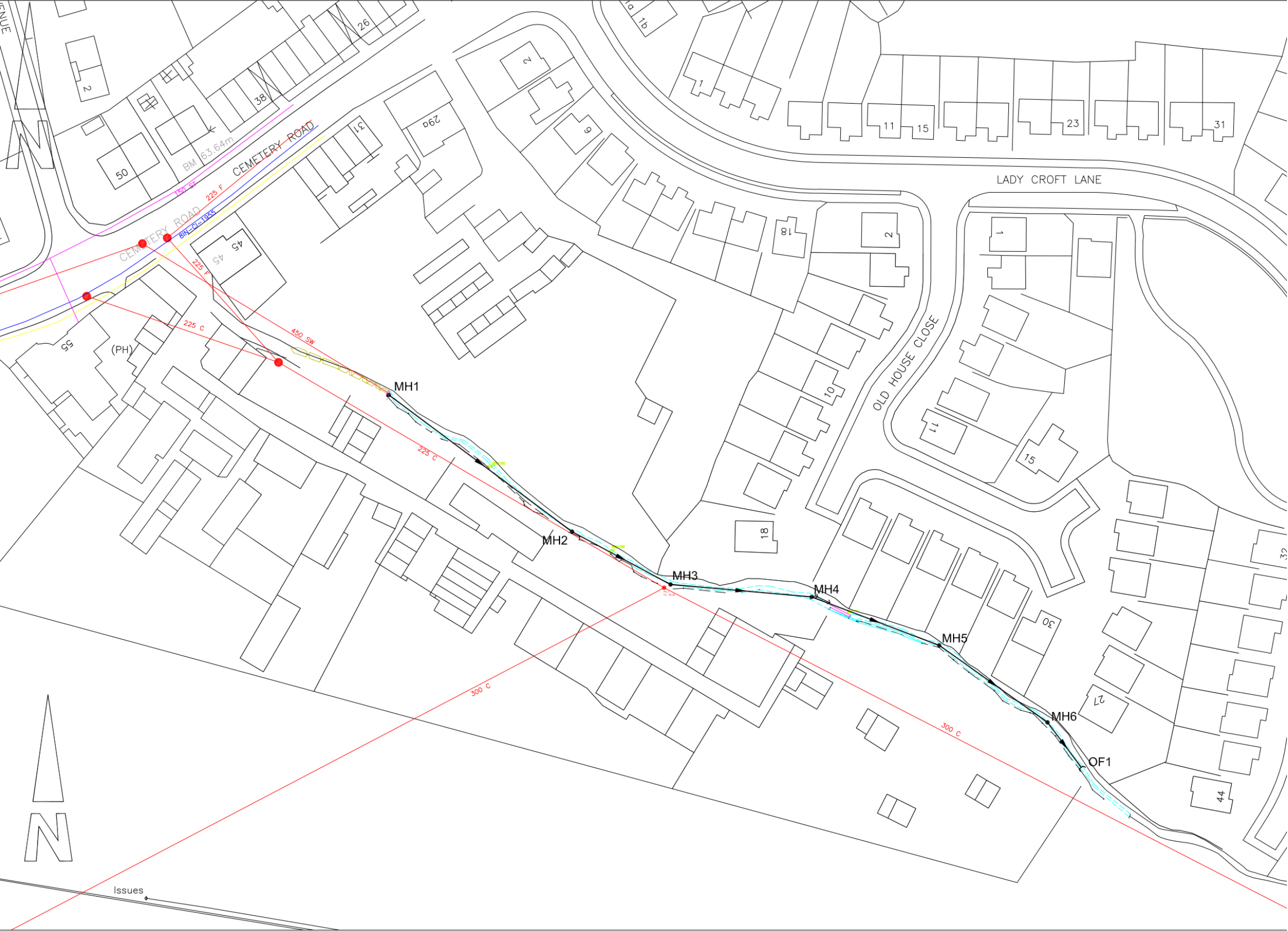
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydro Solutions or any other organisation for use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX 4 – STORAGE CALCULATION

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PO Box 58 Monk Fyston Leeds LS25 5WZ		Cemetery Road Hemingfield				
Date June 2016 File Cemetery 100.SRC		Designed By Stevenson Checked By				
Micro Drainage		Storage Design W.11.3				
<u>Summary of Results for 100 year Return Period</u>						
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	3.7	3.7	54.6378	0.6378	49.8	O K
30 Summer	4.0	4.0	54.7578	0.7578	64.2	O K
60 Summer	4.3	4.3	54.8618	0.8618	76.5	O K
120 Summer	4.4	4.4	54.9213	0.9213	83.3	O K
180 Summer	4.4	4.4	54.9173	0.9173	82.8	O K
240 Summer	4.4	4.4	54.9003	0.9003	80.9	O K
360 Summer	4.3	4.3	54.8628	0.8628	76.6	O K
480 Summer	4.2	4.2	54.8298	0.8298	72.8	O K
600 Summer	4.1	4.1	54.7988	0.7988	69.1	O K
720 Summer	4.1	4.1	54.7688	0.7688	65.5	O K
960 Summer	3.9	3.9	54.7108	0.7108	58.6	O K
15 Winter	3.9	3.9	54.6913	0.6913	56.2	O K
30 Winter	4.2	4.2	54.8298	0.8298	72.7	O K
60 Winter	4.5	4.5	54.9583	0.9583	87.3	O K
120 Winter	4.7	4.7	55.0468	1.0468	96.5	O K
180 Winter	4.7	4.7	55.0523	1.0523	97.0	O K
240 Winter	4.7	4.7	55.0273	1.0273	94.6	O K
360 Winter	4.6	4.6	54.9753	0.9753	89.2	O K
480 Winter	4.4	4.4	54.9243	0.9243	83.6	O K
600 Winter	4.3	4.3	54.8763	0.8763	78.1	O K
720 Winter	4.2	4.2	54.8298	0.8298	72.8	O K
960 Winter	4.0	4.0	54.7428	0.7428	62.4	O K
Storm Duration (mins)	Rain (mm/hr)		Time-Peak (mins)			
15 Summer	91.62		22			
30 Summer	60.74		36			
60 Summer	38.41		64			
120 Summer	23.49		122			
180 Summer	17.38		160			
240 Summer	13.95		192			
360 Summer	10.17		258			
480 Summer	8.13		328			
600 Summer	6.83		396			
720 Summer	5.92		464			
960 Summer	4.73		600			
15 Winter	91.62		22			
30 Winter	60.74		35			
60 Winter	38.41		64			
120 Winter	23.49		120			
180 Winter	17.38		174			
240 Winter	13.95		200			
360 Winter	10.17		276			
480 Winter	8.13		352			
600 Winter	6.83		428			
720 Winter	5.92		504			
960 Winter	4.73		648			
©1982-2008 Micro Drainage						

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<u>Rainfall Details</u> <table> <tr> <td>Region</td> <td>ENG+WAL</td> <td>Cv (Summer)</td> <td>0.750</td> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Winter)</td> <td>0.840</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> <td>Shortest Storm (mins)</td> <td>15</td> <td></td> <td></td> </tr> <tr> <td>Ratio-R</td> <td>0.380</td> <td>Longest Storm (mins)</td> <td>960</td> <td></td> <td></td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) = 0.314 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>from:</th> <th>to:</th> <th>from:</th> <th>to:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>0.154</td> <td></td> </tr> <tr> <td></td> <td></td> <td>4</td> <td>8</td> </tr> <tr> <td></td> <td></td> <td>0.160</td> <td></td> </tr> </tbody> </table>			Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes	Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes	M5-60 (mm)	19.000	Shortest Storm (mins)	15			Ratio-R	0.380	Longest Storm (mins)	960			Time (mins)	Area (ha)	Time (mins)	Area (ha)	from:	to:	from:	to:	0	4	0.154				4	8			0.160	
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<u>Circular Pipe Details</u> Diameter (m) 1.200 Length (m) 100.000 Cover Level (m) 55.500 Slope (1:x) 500.0 Invert Level (m) 54.000 <u>Hydro-Brake Outflow Control</u> Design Head (m) 1.200 Hydro-Brake Type MD6 Invert Level (m) 54.000 Design Flow (l/s) 5.0 Diameter (mm) 90 <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> </tr> </thead> <tbody> <tr> <td>0.10</td> <td>2.6</td> <td>0.60</td> <td>3.7</td> <td>1.60</td> <td>5.8</td> <td>2.60</td> <td>7.4</td> <td>5.00</td> <td>10.3</td> <td>7.50</td> <td>12.6</td> </tr> <tr> <td>0.20</td> <td>3.7</td> <td>0.80</td> <td>4.1</td> <td>1.80</td> <td>6.2</td> <td>3.00</td> <td>8.0</td> <td>5.50</td> <td>10.8</td> <td>8.00</td> <td>13.1</td> </tr> <tr> <td>0.30</td> <td>3.5</td> <td>1.00</td> <td>4.6</td> <td>2.00</td> <td>6.5</td> <td>3.50</td> <td>8.6</td> <td>6.00</td> <td>11.3</td> <td>8.50</td> <td>13.5</td> </tr> <tr> <td>0.40</td> <td>3.4</td> <td>1.20</td> <td>5.1</td> <td>2.20</td> <td>6.8</td> <td>4.00</td> <td>9.2</td> <td>6.50</td> <td>11.8</td> <td>9.00</td> <td>13.8</td> </tr> <tr> <td>0.50</td> <td>3.5</td> <td>1.40</td> <td>5.5</td> <td>2.40</td> <td>7.2</td> <td>4.50</td> <td>9.8</td> <td>7.00</td> <td>12.2</td> <td>9.50</td> <td>14.2</td> </tr> </tbody> </table>			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.10	2.6	0.60	3.7	1.60	5.8	2.60	7.4	5.00	10.3	7.50	12.6	0.20	3.7	0.80	4.1	1.80	6.2	3.00	8.0	5.50	10.8	8.00	13.1	0.30	3.5	1.00	4.6	2.00	6.5	3.50	8.6	6.00	11.3	8.50	13.5	0.40	3.4	1.20	5.1	2.20	6.8	4.00	9.2	6.50	11.8	9.00	13.8	0.50	3.5	1.40	5.5	2.40	7.2	4.50	9.8	7.00	12.2	9.50	14.2
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PLAN (Scale 1/500)

APPENDIX 6—INDICATIVE DRAINAGE LAYOUT

