Construction Design Solutions
Consulting Civil, Structural, Highway & Drainage Engineers

Drainage Assessment



Development :

Former Goodfellows School Development,
Spalding Common
Lincolnshire

Client :
Country Court Care Ltd.

CDS Project Reference : 2014.5563

June 2015

Prepared By:

Construction Design Solutions, 78 Wollaton Road, Beeston, Nottinghamshire, NG9 2NZ
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Country Court Care Home
Spalding Common 2014.5563

Storm Drainage

The existing site is a former school house and separate dwelling with large gardens to the North.

There are storm collection points on and around the existing buildings in the form of rainwater pipes and gullies. The former playground has a concrete 'slot' type drain along the southern boundary of the site.

None of the storm collection points are able to be traced. It appears that all storm water runs to soakaway systems

Discussions with the Local Authority suggest that typically, storm drainage is dealt with by way of soakaways in the local vicinity.
There is no evidence to suggest that the adopted foul system was once 'combined' as is the case in many urban developments.

A ground investigation has been completed and percolation values calculated for two locations within the site. To the north, the better percolation values are found with K = 5.33x10(-5) m/s. This is an acceptable value for consideration of SUDS systems.

Water table levels indicate that water will be struck at 1.7 - 2.0m typically, so SUDS systems will need to be sited above this level.

Taking the percolation value given in the report for the northern area of the site, our initial estimates for storage required in a soakaway structure is 85m cubed. This is based upon the design criteria of a 1/100 year storm with 30% climate change. The soakaway SUDS system will either take the form of a cellular tank structure or a stone filled trench with carrier pipe(s).

Swale systems would be unsuitable for this development as vehicular access will be required within the railway easement along the western boundary. Also, Swales are 'space' inefficient in small developments such as this. Any structures used for percolation will need to be designed in a manner to give a suitable sub surface capacity for possible vehicle access along the easement. At this time we assume that drainage systems can be placed within the easement as long as no physical barrier impedes the easement access.

The underground positive drainage system will be designed in accordance with BS EN752. Pipes will not surcharge for a 1 in 2 year design storm and will not flood for a 1 in 30 year design storm.

In an exceedence event over and above the design storm criteria, local topography will be set below the floor level and will allow overland flows to run off site without disruption or loss of amenity to any personnel.

Foul Drainage

Foul drainage will be collected in a positive underground gravity drainage system and exit the site using the existing outfall pipes to Anglian Water Manhole ref 3402.

A peak foul flow calculation is enclosed within Appendix 2.

The existing foul sewer within the development will have an easement. The width of this will need to be clarified when Anglian Water approval is sought for the development.

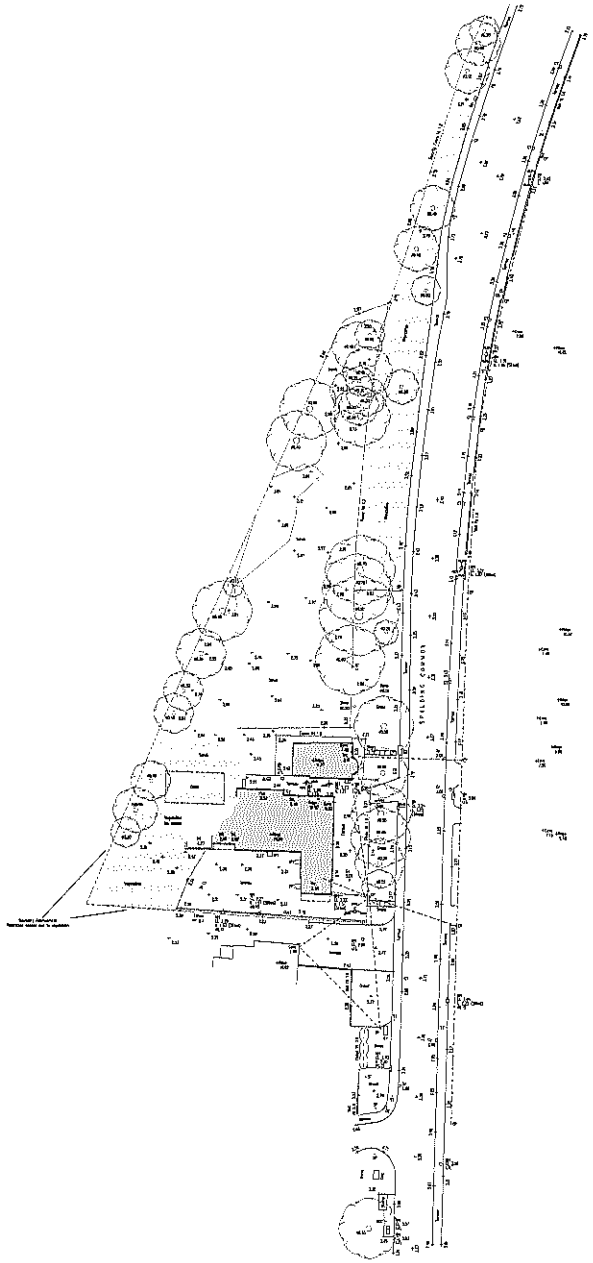
The new connection will require an Indirect Section 106 application. The lead contractor is responsible for this application.

Prepared By S Nicoll - CDS Consulting

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Appendix 1 - Existing Site Topo Survey & Drainage Survey



© BluePlan Surveys Limited 2014

A1

Plan S

Abbreviations

Survey Control

Station	Eastings	Northings	Level
S1	523336.943	329427.744	3.057
S2	523353.173	329375.269	2.806
S3	523359.061	329440.489	2.448
S4	523346.837	329513.884	3.358
S5	523356.336	329418.277	2.325

Grid & Datum

General Notes

1. Do not scale this drawing. All dimensions must be checked / verified on site. If in doubt ask.
2. All dimensions are in metres.

Rev	Date	Description	CAD
	15/12/14	Original issue	

Client

Linestyle Architecture

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Location

Goodfellows School
Spalding
Lincolnshire

Title

Topographical Survey

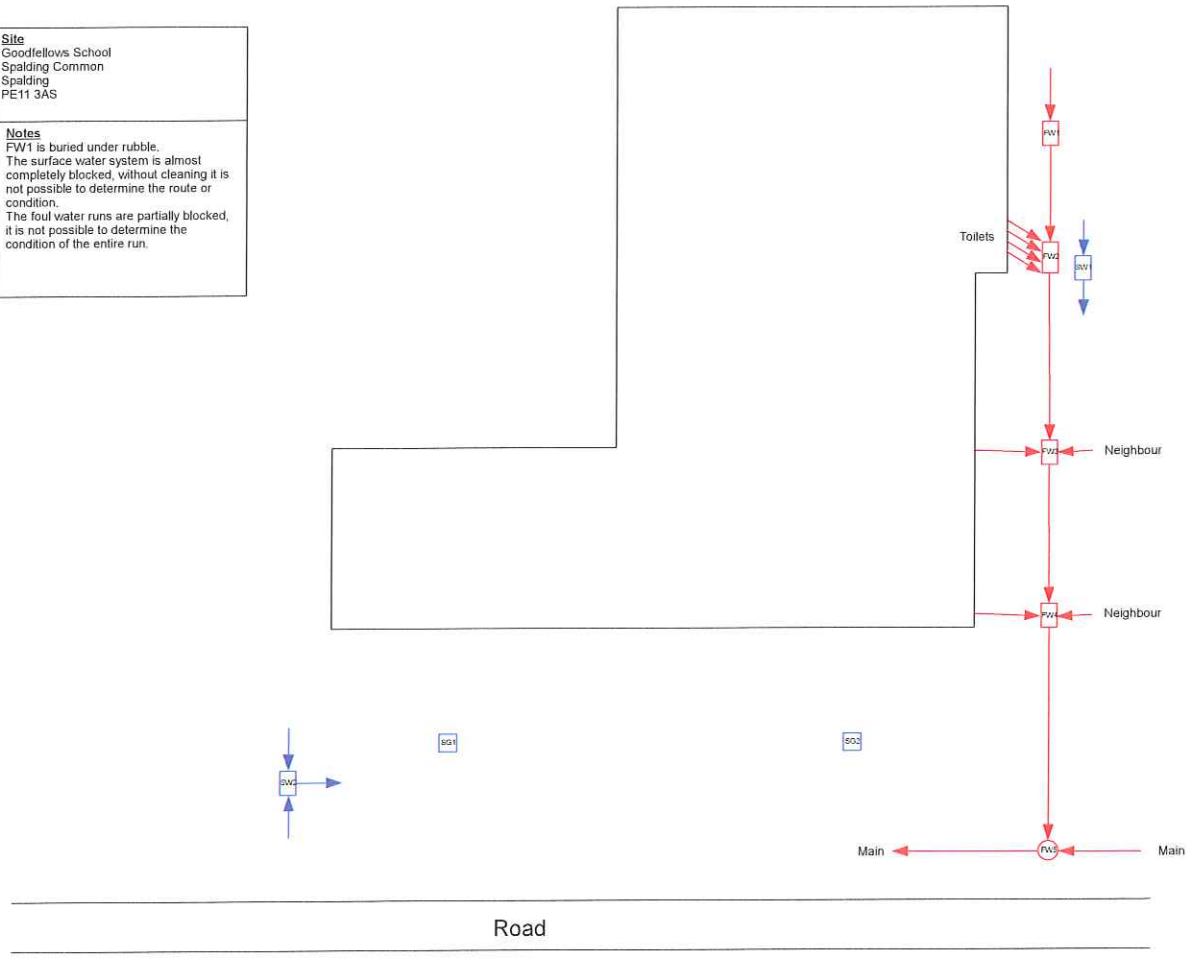
Scale

Plotted Scale: 1:500

Surv:LS	CAD: LS	Checker: CM	Rev:-

Date: 15/12/14 | Job No. 2019

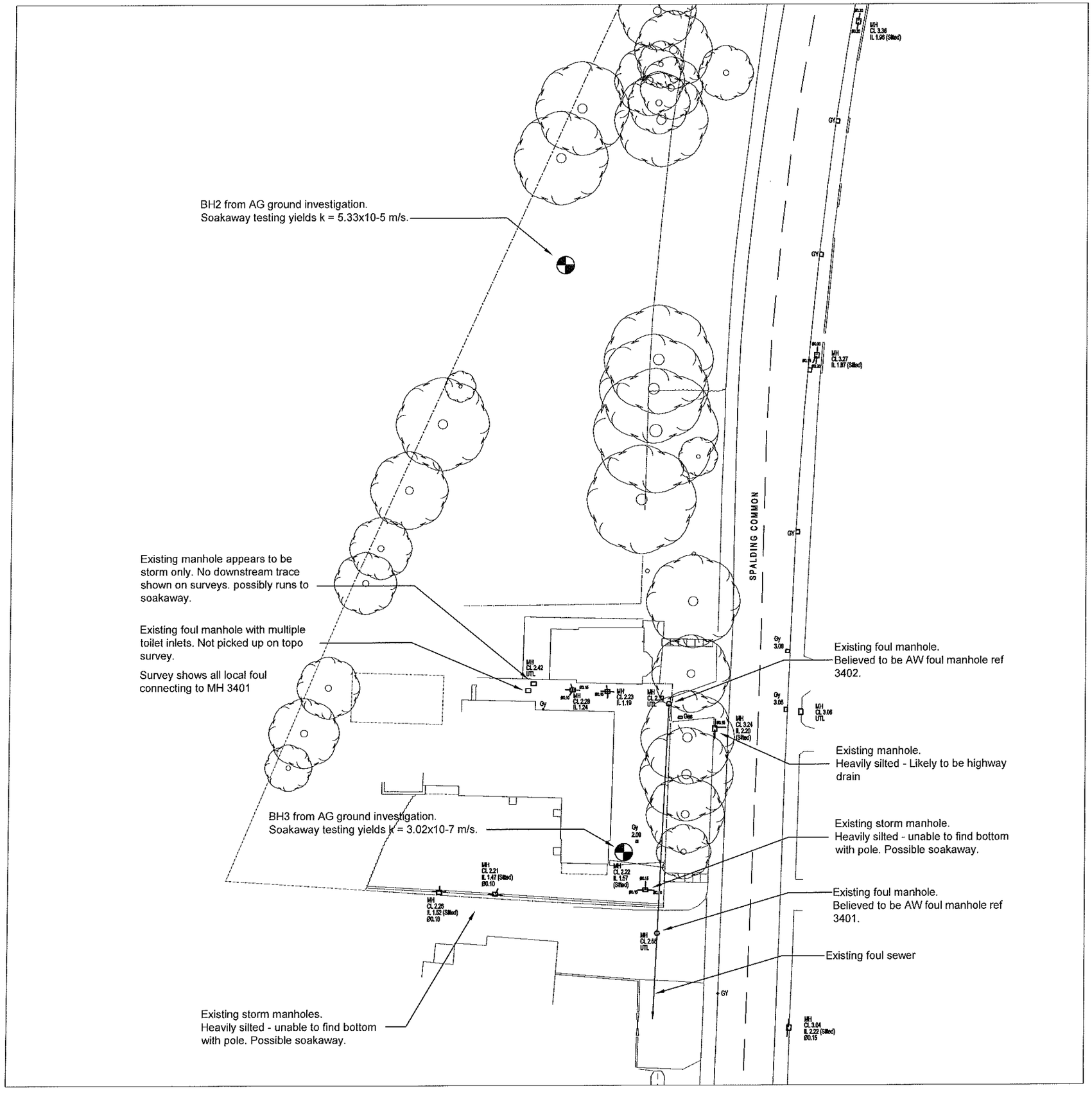
Customer Wynbrook Survey Date 24.04.2015	Site Goodfellows School Spalding Common Spalding PE11 3AS
Invert Depths FW1 – Buried. FW2 – 750mm. FW3 – 1060mm. FW4 – 1110mm. FW5 – 2000mm. SW1 – 450mm. SW2 – Blocked. FW= Foul Water SW= Surface Water SG= Surface Gully	Notes FW1 is buried under rubble. The surface water system is almost completely blocked, without cleaning it is not possible to determine the route or condition. The foul water runs are partially blocked, it is not possible to determine the condition of the entire run.



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Appendix 2 - Existing Site Drainage Notes - CDS



Rev.	By	Date	Details	Chkd
Drawing Status			Information	

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Client
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Spalding Common

Title
Existing Drainage Notes

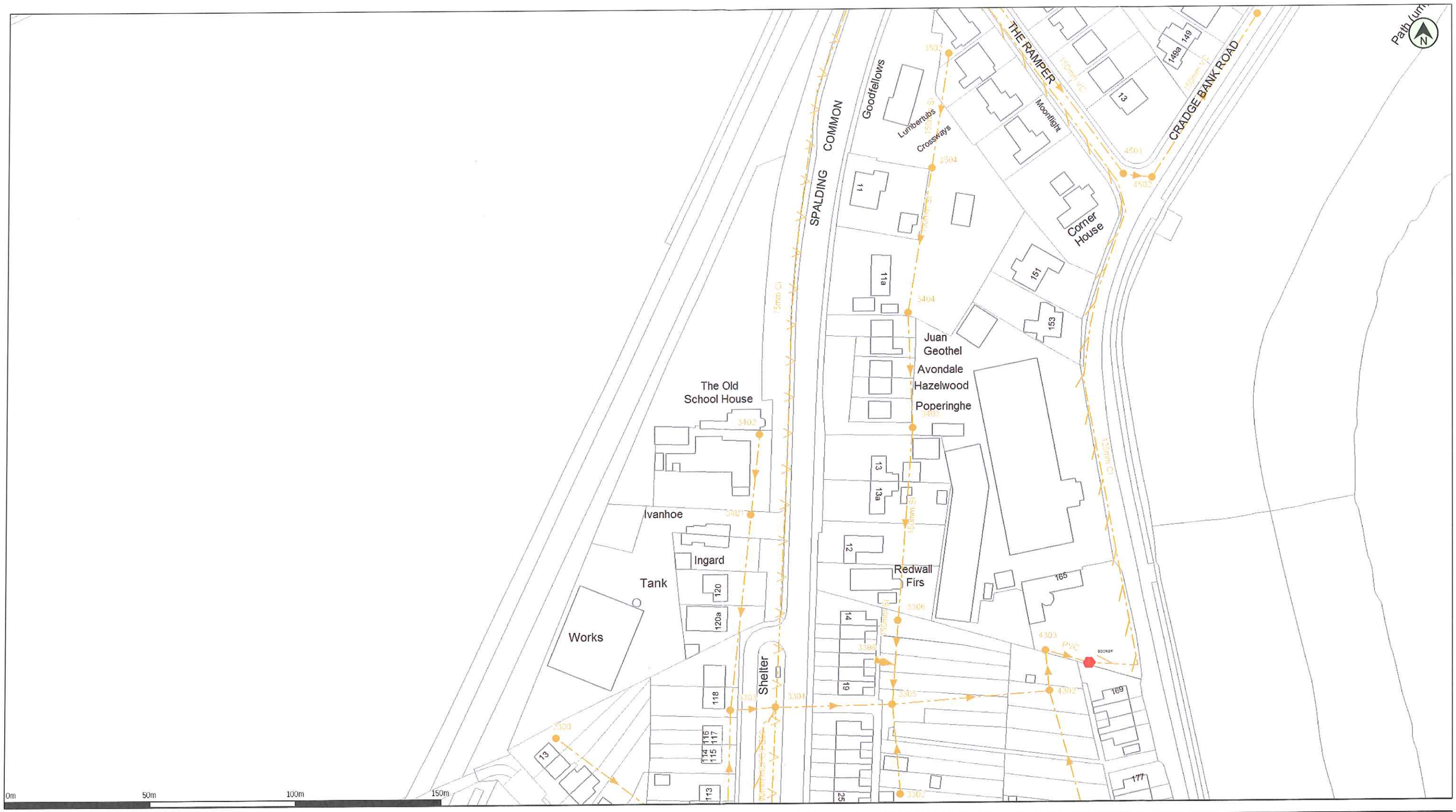
Scale (A3)	Drawn by.	Drg. No.
1/500	SN	2014.5563.SK01
Date. Jun 2015	Checked by.	

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Spalding Common

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Appendix 3 - Anglian Water Sewer Records



(c) Crown Copyright and database rights 2014 Ordnance Survey 100022432 Date: 20/05/15 Scale: 1:1250 Map Centre: 523306,320448 Data updated: 01/05/15 Our Ref: 141997 - 1 Wastewater Plan A3

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited from Ordnance Survey © Crown Copyright, 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main (Colour denotes effluent type)
- Private Sewer (Colour denotes effluent type)
- Decommissioned Sewer (Colour denotes effluent type)
- Outfall (Colour denotes effluent type)
- Inlet (Colour denotes effluent type)
- Manhole (Colour denotes effluent type)
- Sewage Treatment Works
- Pumping Station

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Spalding Common

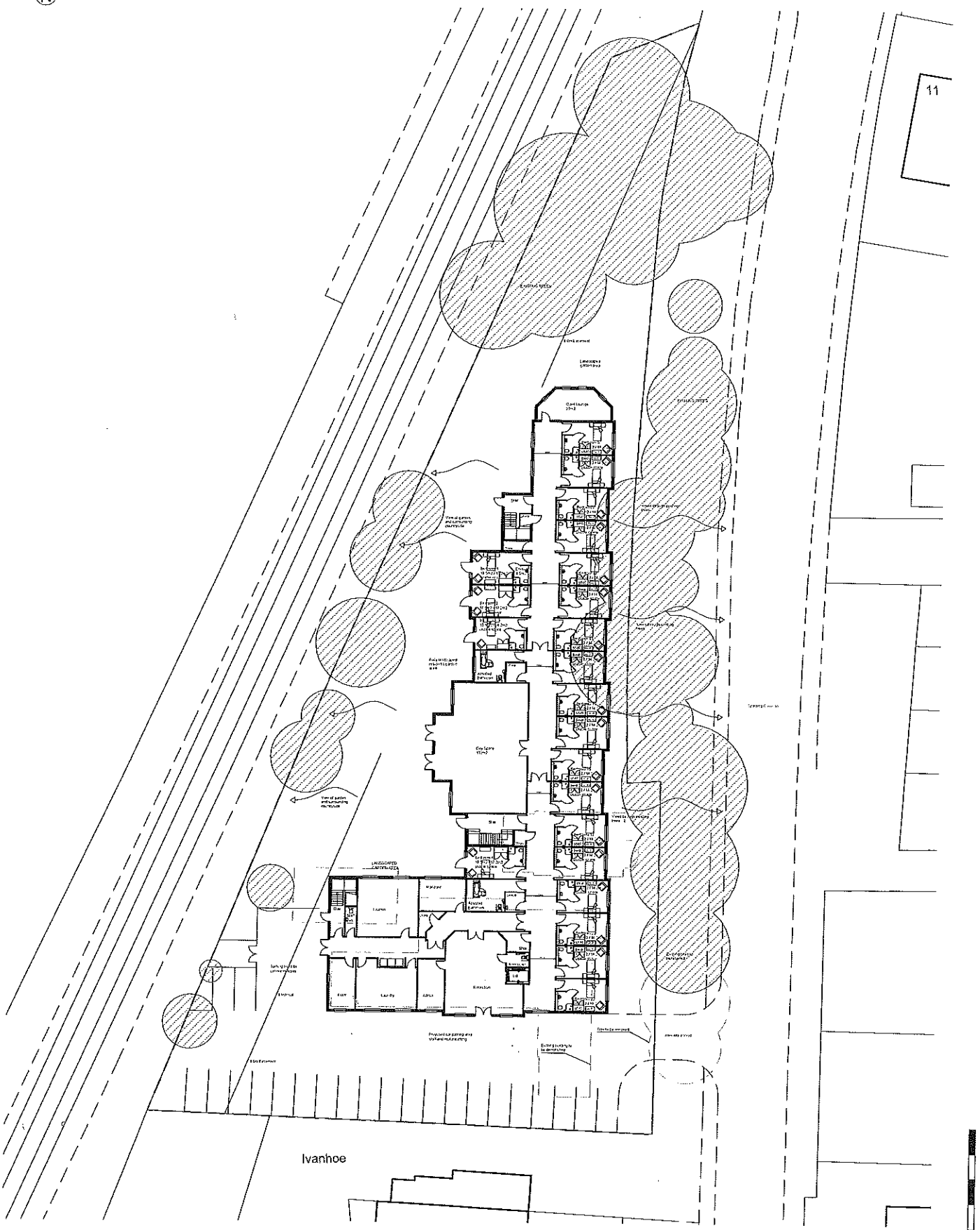
love every drop anglianwater

Country Court Care Home
Spalding Common

2014.5563

Appendix 4 - Proposed Site Layout - Architect's Plan

Do not scale this drawing all dimensions to be checked on site, if in doubt ask.



LineStyle Architecture

COMMENT

Client: Country Court Care Ltd

Project Title: Proposed care home at Goodfellows School, Spalding Common, Spalding

Drawing Title: Proposed Site Plan

Scale: 1:200 @ A2 Date: 12.12.2014 Project No.: 0074 Drawing No.: (10)003 Rev: A00

www.linestyle.co.uk / design@linestyle.co.uk

Alan House, Clumber Street, Nottingham NG1 3ED, tel +44 (0) 115 670 4563

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Spalding Common 2014.5563

Appendix 5 - CDS Proposed Drainage Philosophy Sketch

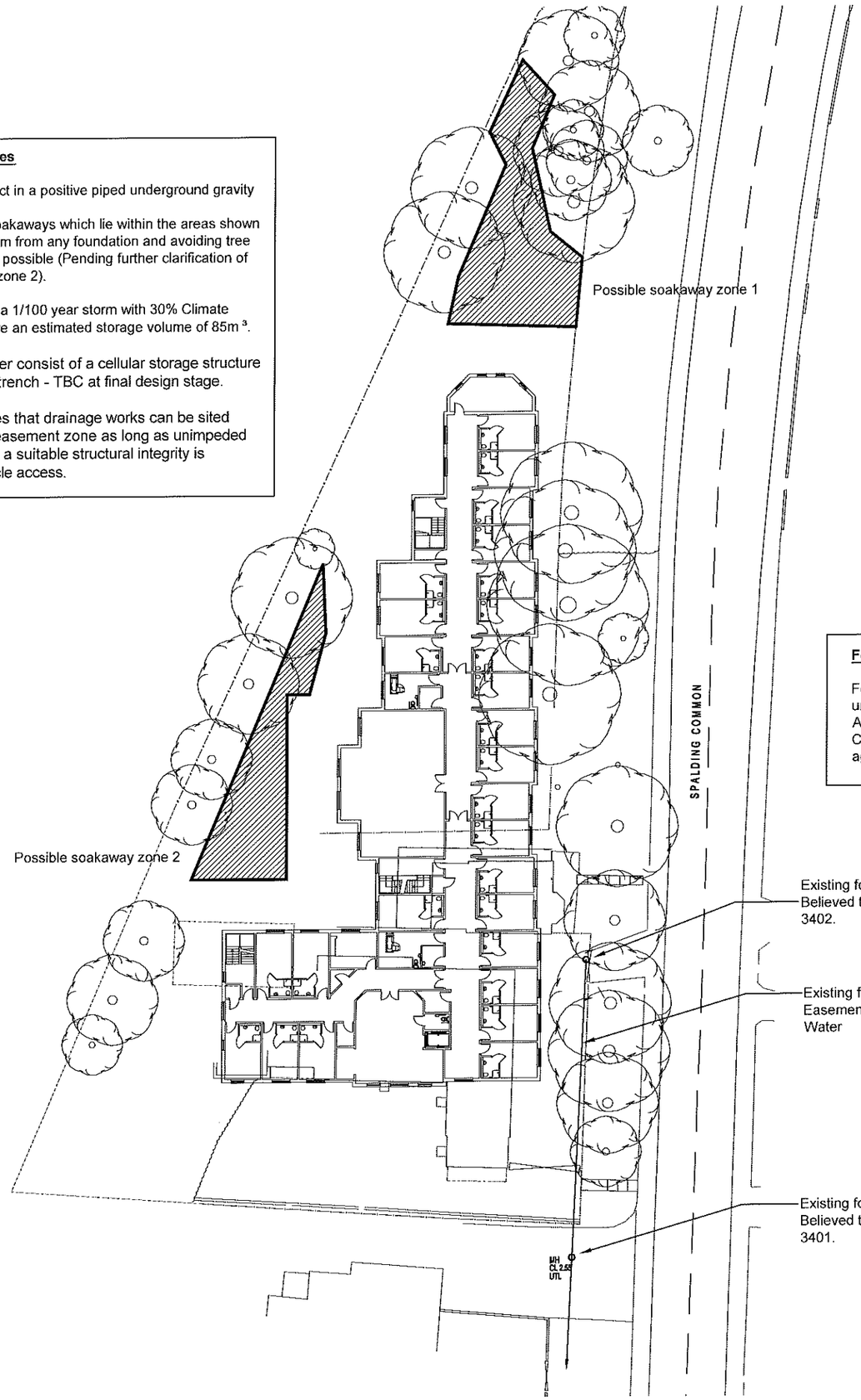
Storm Drainage Notes

Storm water will collect in a positive piped underground gravity system.
This will run to two soakaways which lie within the areas shown as Zones 1 & 2. i.e. 5m from any foundation and avoiding tree canopies as much as possible (Pending further clarification of ground conditions in zone 2).

Initial calculations for a 1/100 year storm with 30% Climate change allowance give an estimated storage volume of 85m ^{3}.

Soakaways will either consist of a cellular storage structure or wide stone filled trench - TBC at final design stage.

This design assumes that drainage works can be sited within the Railway easement zone as long as unimpeded access is given and a suitable structural integrity is maintained for vehicle access.



Foul Drainage Notes

Foul water will collect in a positive piped underground gravity system and connect to AW manhole 3402 using existing inlets. Connection to be made under Section 106 agreement.

Rev.	By	Date	Details	Chkd
Drawing Status			Information	

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Client
Country Court Care

Project
Proposed Care Home
Spalding Common

Title
Proposed Drainage Philosophy

Scale (A3)	Drawn by.	Drg. No.
1/500	SN	2014.5563.SK02
Date. Jun 2015	Checked by.	

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Spalding Common

2014.5563

Appendix 6 - Initial Storm SUDS Storage Estimate Calculations

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 158 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.317	0.317	4.4	45.1	O K
30 min Summer	100.406	0.406	4.5	57.9	O K
60 min Summer	100.477	0.477	4.6	68.0	O K
120 min Summer	100.507	0.507	4.7	72.3	O K
180 min Summer	100.499	0.499	4.7	71.1	O K
240 min Summer	100.484	0.484	4.6	68.9	O K
360 min Summer	100.448	0.448	4.6	63.9	O K
480 min Summer	100.415	0.415	4.6	59.2	O K
600 min Summer	100.384	0.384	4.5	54.7	O K
720 min Summer	100.353	0.353	4.5	50.3	O K
960 min Summer	100.297	0.297	4.4	42.3	O K
1440 min Summer	100.202	0.202	4.3	28.7	O K
2160 min Summer	100.105	0.105	4.1	15.0	O K
2880 min Summer	100.057	0.057	4.1	8.1	O K
4320 min Summer	100.039	0.039	3.2	5.5	O K
5760 min Summer	100.031	0.031	2.5	4.4	O K
7200 min Summer	100.026	0.026	2.1	3.7	O K
8640 min Summer	100.022	0.022	1.8	3.2	O K
10080 min Summer	100.020	0.020	1.6	2.8	O K
15 min Winter	100.358	0.358	4.5	51.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	121.269	0.0	24
30 min Summer	79.695	0.0	38
60 min Summer	49.937	0.0	66
120 min Summer	30.267	0.0	120
180 min Summer	22.297	0.0	150
240 min Summer	17.851	0.0	182
360 min Summer	12.957	0.0	250
480 min Summer	10.330	0.0	318
600 min Summer	8.659	0.0	386
720 min Summer	7.492	0.0	452
960 min Summer	5.959	0.0	582
1440 min Summer	4.309	0.0	828
2160 min Summer	3.110	0.0	1172
2880 min Summer	2.466	0.0	1480
4320 min Summer	1.775	0.0	2204
5760 min Summer	1.405	0.0	2936
7200 min Summer	1.171	0.0	3672
8640 min Summer	1.008	0.0	4400
10080 min Summer	0.889	0.0	5136
15 min Winter	121.269	0.0	25

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	100.461	0.461	4.6	65.6	O K
60 min Winter	100.545	0.545	4.7	77.7	O K
120 min Winter	100.590	0.590	4.8	84.0	O K
180 min Winter	100.581	0.581	4.8	82.8	O K
240 min Winter	100.561	0.561	4.7	80.0	O K
360 min Winter	100.513	0.513	4.7	73.1	O K
480 min Winter	100.464	0.464	4.6	66.1	O K
600 min Winter	100.416	0.416	4.6	59.3	O K
720 min Winter	100.370	0.370	4.5	52.7	O K
960 min Winter	100.285	0.285	4.4	40.6	O K
1440 min Winter	100.150	0.150	4.2	21.3	O K
2160 min Winter	100.049	0.049	4.0	7.0	O K
2880 min Winter	100.039	0.039	3.2	5.6	O K
4320 min Winter	100.028	0.028	2.3	4.0	O K
5760 min Winter	100.023	0.023	1.9	3.2	O K
7200 min Winter	100.019	0.019	1.5	2.6	O K
8640 min Winter	100.016	0.016	1.3	2.3	O K
10080 min Winter	100.014	0.014	1.2	2.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	79.695	0.0	38
60 min Winter	49.937	0.0	66
120 min Winter	30.267	0.0	120
180 min Winter	22.297	0.0	170
240 min Winter	17.851	0.0	194
360 min Winter	12.957	0.0	270
480 min Winter	10.330	0.0	346
600 min Winter	8.659	0.0	418
720 min Winter	7.492	0.0	488
960 min Winter	5.959	0.0	620
1440 min Winter	4.309	0.0	860
2160 min Winter	3.110	0.0	1108
2880 min Winter	2.466	0.0	1472
4320 min Winter	1.775	0.0	2204
5760 min Winter	1.405	0.0	2920
7200 min Winter	1.171	0.0	3584
8640 min Winter	1.008	0.0	4256
10080 min Winter	0.889	0.0	5120

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.220

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.073	4	8	0.073	8	12	0.073

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Model Details

Storage is Online Cover Level (m) 102.000

Cellular Storage Structure

Invert Level (m) 100.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.19200 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.19200

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	150.0	150.0	0.900	0.0	190.0
0.800	150.0	190.0			

800mm DEEP CELLULAR SOAKAWAY ASSUMED.

ROOF 1300m²

EXTERNALS 900m²

K = 5.33×10^{-5} m/s = 0.192 m/hr

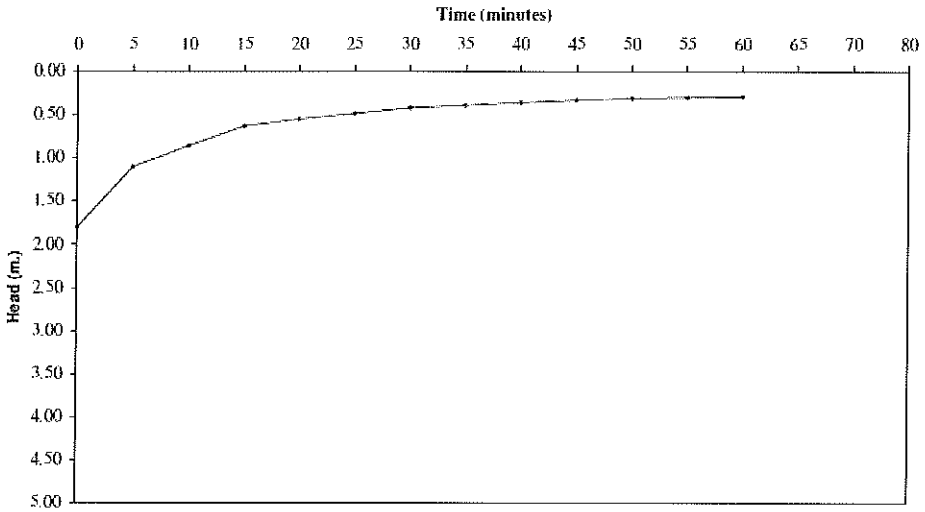
1/100YR + 30% CC

APPROXIMATE STORAGE VOL = 85m³

TBC AT FINAL DESIGN STAGE.

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Borehole Permeability Test Results **ANALYTICAL GEOTECHNICS LTD**



Falling Head Permeability	
Location	BH2
Effective depth	1.8m.
Response length	1.8m.
Diameter (average)	0.083m.
Cross Sectional Area	0.0054m^2
Ho (initial head of water)	1.80m
F (intake factor)	6.91
T (time factor)	14.7min.
k (10^{-5})	5.33m/s

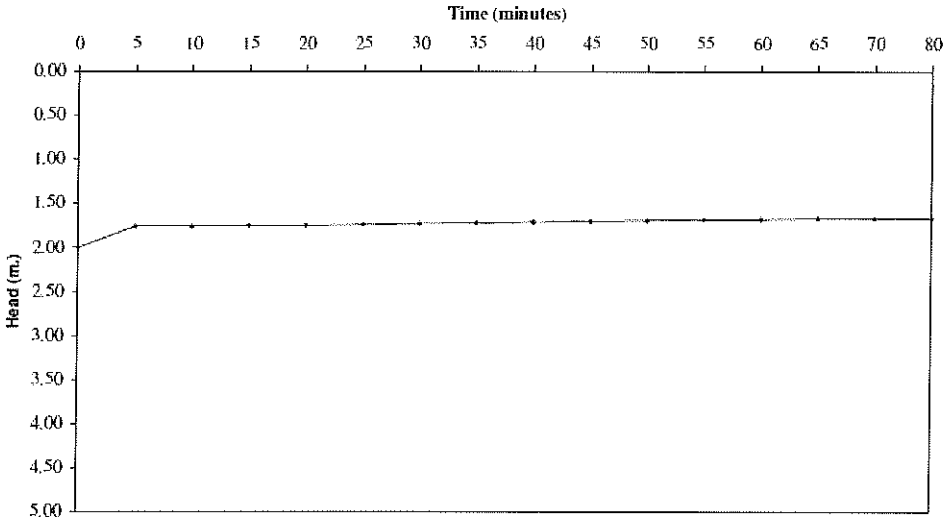
Site : Goodfellows School, Spalding

Date : 19th May, 2015

Weather : Showers.

Soil Type : FILL to 0.3m.; slightly sandy CLAY to 2.9m.; gravely SAND to 5.0m.
Water standing at 1.70m.bgl. before test.

Borehole Permeability Test Results **ANALYTICAL GEOTECHNICS LTD**



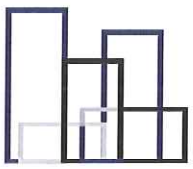
Falling Head Permeability	
Location	BH3
Effective depth	3.4m.
Response length	2.0m.
Diameter (average)	0.083m.
Cross Sectional Area	0.0054m^2
Ho (initial head of water)	2.00m
F (intake factor)	7.47
T (time factor)	2400min.
k (10^{-7})	3.02m/s

Site : Goodfellows School, Spalding

Date : 19th May, 2015

Weather : Showers.

Soil Type : FILL to 0.3m.; slightly sandy CLAY to 2.9m.; gravely SAND to 5.0m.
Water standing at 2.0m.bgl. before test



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