

Proposed Residential Development Cote Lane, Thurgoland

Flood Risk Assessment

March 2018

Alfa Homes

Report

This report consists of a Flood Risk Assessment and Drainage Strategy, produced to support the proposed residential development of the site located at Cote Lane, Thurgoland. It has been produced by FORTEM Civil Engineering Consultants Ltd for Alfa Homes.

Revision History

Rev Ref	Date	Amendments	By	Chk'd
1	07.03.2018	First Issue	RD	AC

Contract

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Executive Summary

Site Description	The proposed development site is located off Cote Lane, Thurgoland near Sheffield, is 1.0ha in size and currently consists of agricultural grassland. The site is steeply sloping with gradients of 1:10 in the north, increasing to 1:4 in the south. There is a surface water sewer located within the western boundary of the proposed development and a combined sewer located in Cote Lane.
Proposed Development	It is proposed for Alfa Homes to construct 24No residential dwellings on the site, with associated infrastructure.
Flood Risk	The site is located in Flood Zone 1 with the flood risk from all sources low. As part of the intrusive site investigation, the potential of an onsite spring is to be investigated further, with a focus on the south west corner of the site. Finished floor levels to be set minimum 150mm above external levels to mitigate any risk from blockage and exceedance events. Within the detailed drainage design blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows.
Drainage	Following a review of surface water discharge options, the most appropriate for the proposed development is to discharge to the existing 225mm surface water sewer within the development boundary. It is proposed to restrict the discharge to 5l/s, with a requirement of 310m³ of attenuation. The foul water flows from the development will discharge to the existing 300mm diameter combined sewer located in Cote Lane.

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1. Introduction

1.1. Report Background

- 1.1.1. This report has been produced to support the detailed application by Alfa Homes for the proposed residential development off Cote Lane, Thurgoland. It has been produced in accordance with the National Planning Policy Framework (NPPF) and guidance documents produced by Barnsley Metropolitan Borough Council.
- 1.1.2. The study consists of data collection, consultation and review with regulatory bodies and third parties in relation to flood risk and drainage. FORTEM cannot guarantee the reliability of third party information and/or changes in consultee conclusions/responses.

1.2. Site Description

- 1.2.1. The site is located off Cote Lane, Thurgoland, OS grid reference SE 29172 00630, see Appendix A for Location Plan. Details of the site are tabled below:

Site Area		1.0ha
Topography		The site is steeply sloping falling from a high point located centrally on the northern boundary 196.60m AOD (high point) to the south-east corner 186.30m AOD (low point). The northern part of site falls south 1:10 typ, with the central to southern 1:4 typ, see Appendix A for topographical survey.
Land Use		The proposed development site is currently agricultural grassland.
Boundaries	North:	Existing dwellings (rear boundaries) after which is Springwood Close (adopted highway).
	South:	A small number of existing dwellings on the western part of the boundary with a large extended garden on eastern part.
	East:	Spring Wood (dense woodland).
	West:	Cote Lane.
Watercourses		There is an unnamed watercourse located to the east of the proposed development in Spring Wood and another unnamed watercourse located to the west in farmland. Both look to potentially converge to the south of the, before possibly discharging to the River Don, located 700m to the south of the proposed development.
Public Sewers		Yorkshire Water confirm the existence of a 150mm surface water sewer which crosses the frontage of the development, before upsizing to 225mm, crossing Cote Lane and discharging to the unnamed watercourse located to the west (referenced above). Yorkshire Water record drawings indicate a 300mm diameter combined sewer located to the west of the development, beyond Cote Lane, with agricultural grassland. However intrusive CCTV investigation into the network confirms this system to be located within the verge of Cote Lane (within adopted highway). See Appendix A for existing drainage networks.
Other Drainage		There are no known existing drainage systems serving the proposed development land, however it is anticipated the site could be served by a series of existing land drains?

Ground	Delta Simons have undertaken a desktop study of the site, which indicates the site is likely underlain by a sequence of topsoil underlain by bedrock of the Pennine Lower Coal Measures Formation. There is a potential for coal outcropping on a small area of the site and a spring is also recorded on the site.
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- 1.2.2. FORTEM undertook a site walkover on 9th January 2018, see Appendix A for a photographic record of the visit.

1.3. Proposed Development

- 1.3.1. The detailed application is for the construction of 24No residential dwellings complete with associated infrastructure. The site layout has been provided by JRP Associates, P17:5149:01, see Appendix B.

1.4. Consultation

- 1.4.1. Consultation with the relevant consultees has been undertaken, see summary below:

Consultee	Response Summary
Barnsley Metropolitan Borough Council	In accordance with early dialogue, FRA to be in accordance with policies CSP3 Sustainable Drainage Systems, CSP4 Flood Risk and South Yorkshire Residential Design Guide.
Yorkshire Water	Response to pre-planning enquiry confirms foul water can discharge to the 300mm diameter combined sewer in Cote Lane. Surface water can discharge to the 225mm diameter sewer located within the development site, restricted to a discharge no greater than 5l/s.

For copies of responses, see Appendix D.

2. Sources of Flood Risk

2.1. Summary

- 2.1.1. Below is a summary of the sources of flood risk and the potential risk associated to the proposed development:

Source	Risk Level	Notes
Fluvial	low	Site is within Flood Zone 1, see Appendix C for EA flood mapping.
Tidal	low	Site is within Flood Zone 1, see Appendix C for EA flood mapping.
Surface Water/Pluvial	low	Environment Agency maps confirm no risk of surface water flooding for the site.
Groundwater	low (by mitigation)	Within the Delta Simons desktop study, they reference the possible presence of a spring on site, see Section 2.2.1 below.
Sewers	low	Based upon the searches undertaken as part of this report, no historic incidents have been recorded either within the proposed development or within the vicinity.
Other Man-Made Sources	low	The site is not in an area at risk from a major failure of a reservoir and there are no other known artificial sources of flood risk in the area

Copies of the Environment Agency flood maps are included in Appendix C.

2.2. Groundwater

- 2.2.1. The Delta Simons desktop study indicates a natural spring located within the site? During two independent site visits (November 2017 and January 2018), the site was noted to be wet underfoot however no water was seen to be propagating from any part of the site or any overland flows? The standing water and wet strata is considered to be as a result of natural ground conditions and the winter season (when visited) and will be addressed by the development of the site and a positive drainage system. However as part of the intrusive site investigation, the potential of an onsite spring is to be investigated further, with a focus on the south west corner of the site.

2.3. Mitigation

- 2.3.1. In addition to the specific flood risk mitigation measures above, it is recommended the following are included to ensure a robust development:
- 2.3.2. Finished floor levels to be set minimum 150mm above external levels to mitigate any risk from blockage and exceedance events.
- 2.3.3. Within the detailed drainage design blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows.
- 2.3.4. Development surface water drainage scheme to be designed such that there is no external flooding for the 1 in 30 year event and all flows retained on site for up to the 1 in 100 year plus climate change event.

3. Development Drainage

3.1. Existing Site Drainage

- 3.1.1. As covered in section 1.2 Yorkshire Water record drawings indicate an existing 150mm surface water sewer crossing the site frontage (located within the development red line) and an existing 300mm combined sewer within Cote Lane.

In accordance with the CIRIA SuDS Manual the greenfield run-off for a site should be considered as 2l/s/ha or calculated QBAR (whichever the greater). Therefore the existing greenfield run-off for the site has been assessed using IH124, with a QBAR for 50ha of 364.2l/s, reducing to 7.28l/s for the 1ha development site, see Appendix A for calculations.

3.2. Development Surface Water Drainage

- 3.2.1. The potential surface water outfall/discharge options have been considered and summarised below:

Outfall/Discharge Option (Ranked in order of Preference)	✓/✗	Notes
1. Infiltration	✗	Infiltration drainage is not considered appropriate for use as part of the development due to: - Natural strata (coal measure) & standing water; - Steep site topography (migration/propagation).
2. Discharge to Watercourse	✗	The watercourse to the east cannot be used on the following grounds: - Ecological and tree protection (watercourse located in Spring Wood); - Located outside development boundary and land ownership (no right to discharge); The watercourse to the west cannot be used on the following grounds: - Located outside development boundary and land ownership (no right to discharge); - Any proposed connection would cross/run parallel with an existing surface water sewer which discharges to the watercourse (parallel surface water sewer networks). Therefore due to the items above, these are not a viable options.
3. Discharge to Public Surface Water Sewer.	✓	Existing 150/225mm diameter sewer located within the western boundary of the proposed development.
4. Discharge to Public Combined Sewer.	✓	Existing 300mm diameter sewer located in the verge on the westside of Cote Lane.

- 3.2.2. Based upon the findings of the review above, it is proposed to discharge the surface water from the proposed development to the existing surface water sewer which crosses the frontage of the site and then outfalls to the open watercourse to the west of the development. Based upon early consultation with Yorkshire Water, they have confirmed their acceptance of the discharge regime, limiting the discharge to 5l/s for the development, see Appendix D for Yorkshire Water Correspondence.

- 3.2.3. The proposed development surface water drainage is to be designed such that there is no external flooding for the 1 in 30 year event and all flows retained on site for up to the 1 in 100 year plus climate change event. Early consideration into exceedance and blockage events has

been undertaken to ensure the layout does not increase potential flood risk. This will be fully detailed post planning and an exceedance assessment produced.

- 3.2.4. Based upon a discharge rate of 5l/s, the attenuation required for the development is 310m³ (1 in 100 + 30% c/c event), with the water attenuated in underground storage tanks discharge by gravity to the existing surface water sewer that crosses the site frontage, see Appendix B for attenuation calculations and drawing 1018-002.
- 3.2.5. Due to the proximity of the existing 150mm diameter surface water sewer to a proposed garage, it may be necessary to locally divert the sewer. To be considered post planning at detailed design submission stage.
- 3.2.6. It is proposed for both the foul and surface water drainage networks to be adopted by Yorkshire Water under a Section 104 Agreement. Therefore the long term maintenance of the adoptable drainage system, including attenuation will be the responsibility of Yorkshire Water.

3.3. Development Foul Water Drainage

- 3.3.1. It is proposed to discharge the foul water flows from the development by gravity to the existing 300mm diameter combined sewer located on the westside of Cote Lane.

4. Conclusion

4.1. Flood Risk

- 4.1.1. The proposed development is located in Flood Zone 1 with the flood risk from all sources low.
- 4.1.2. As part of the intrusive site investigation, the potential of an onsite spring is to be investigated further, with a focus on the south west corner of the site.
- 4.1.3. In addition to the specific mitigation above, the following are recommended:
 - Finished floor levels to be set minimum 150mm above external levels to mitigate any risk from blockage and exceedance events.
 - Within the detailed drainage design blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows.

4.2. Drainage

- 4.2.1. The surface water drainage hierarchy has been considered and the most appropriate discharge regime for the proposed development is the existing 225mm surface water sewer located within the site, restricting discharge to greenfield runoff.
- 4.2.2. The surface water discharge rate is to be limited to 5l/s and the surface water drainage designed such that there is no external flooding for the 1 in 30 year event and all flows retained on site for up to the 1 in 100 year plus climate change event.
- 4.2.3. The foul water flows from the development will discharge to the existing 300mm diameter combined sewer in the verge on the westside of Cote Lane.

Appendix A Existing Site

Drawing P17:5149:02 - Location Plan

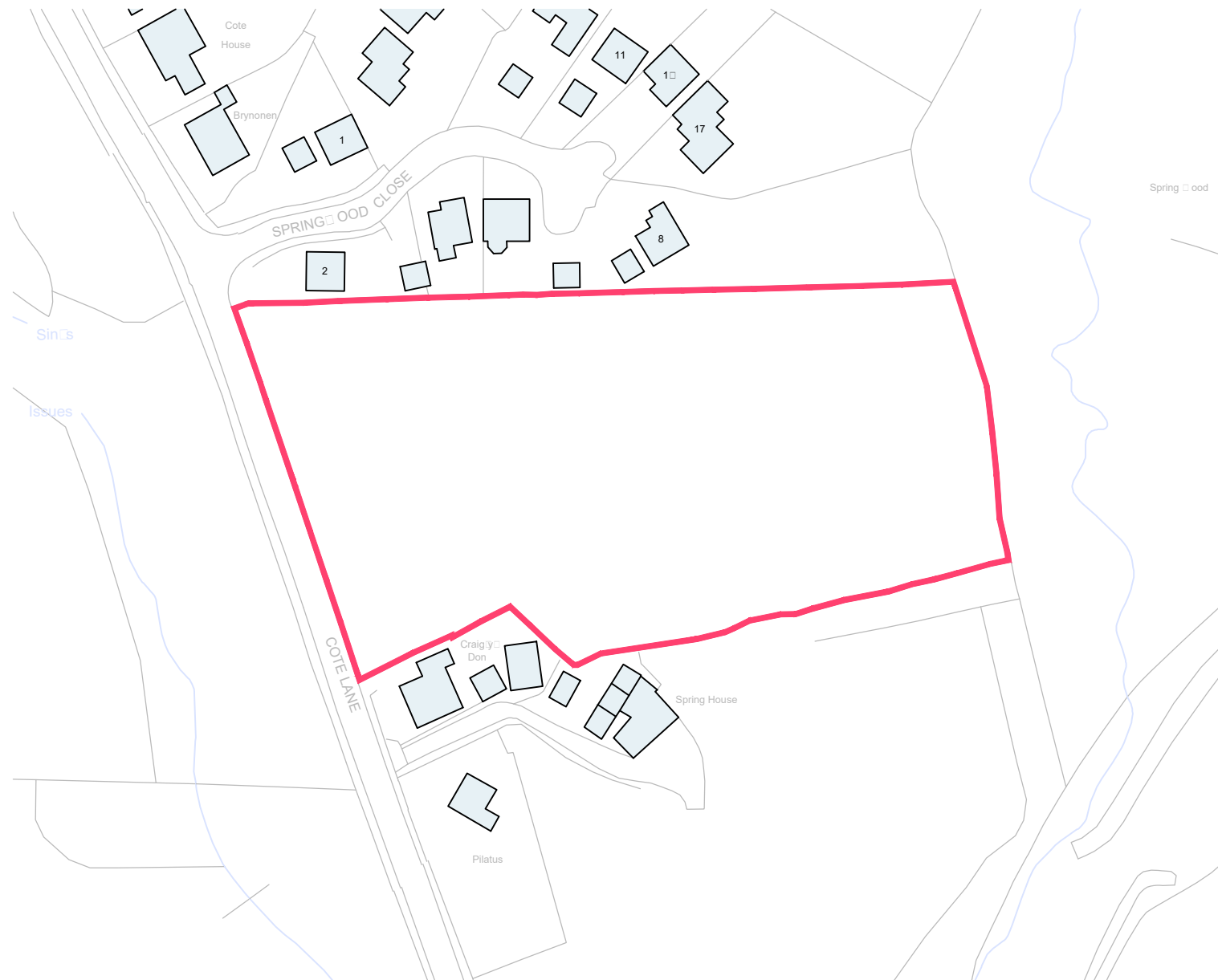
Drawing 10432-01 - Topographical Survey

Yorkshire Water Sewer Records

Drawing 1008-001 – Existing Drainage Records

FORTEM Site Visit Photo Record 09.01.2018

IH124 Calculations



CLIENT:
BERKELEY DEVEER

PROJECT:
COTE LANE, THURGOLAND

DRAWING:
LOCATION PLAN

DRAWING NUMBER:
P17:5149:02

SCALE @ A3:
1:1250

DRAWN: RAN **DATE:** FEB 18

CHECKED: VS **DATE:** FEB 18

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02 / LOCATION PLAN



Date Requested : 15/12/2017, 07:46:45
Date Generated : 15/12/2017, 07:46:47

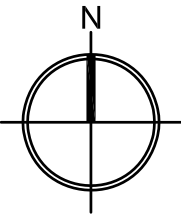
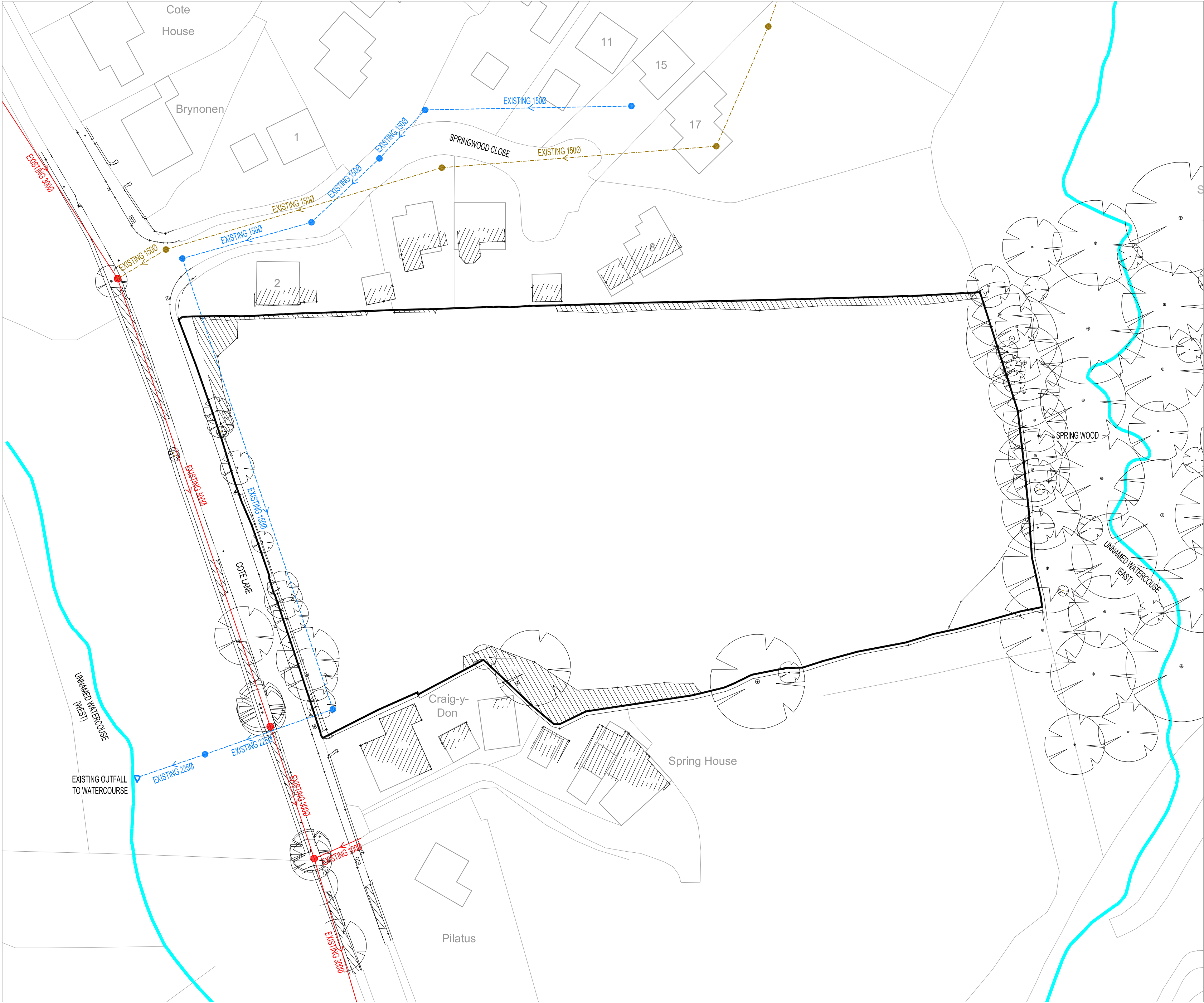
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NOTES:

- 1. THIS DRAWING IS BASED UPON:
ORDNANCE SURVEY DATA MAPS;
CSL SURVEYS TOPOGRAPHICAL SURVEY 10432-01;
YORKSHIRE WATER SEWER RECORDS;
GP DRAINS CCTV SURVEY DATED 13.02.2018.
- 2. THE POSITION OF THE EXISTING SEWER NETWORKS HAVE BEEN ADJUSTED TO TAKE INTO ACCOUNT THE GP DRAINS CCTV SURVEY. THIS HAS INCLUDED THE REPOSITIONING OF SEWERS WITHIN THE SITE AND WITHIN COTE LANE. PRIOR TO WORKS COMMENCING ON SITE, SEWER POSITIONS ARE TO BE VERIFIED BY THE CONTRACTOR.

KEY:

- PLANNING APPLICATION DEVELOPMENT BOUNDARY
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING WATER COURSE

Rev	Date	Amendments	By
Drawing Status.			
PLANNING			
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Client			
ALFA HOMES			
Project			
COTE LANE, THURGOLAND			
Drawing Title.			
EXISTING DRAINAGE NETWORKS			
Drawn: RD		Scale: 1:500 @ A2	
Checked: ADC		Date: MARCH 2018	
Drawing No.			Rev.
1018 - 001			-

SITE VISIT RECORD SHEET

FORTEM

E: info@fortemconsultants.co.uk
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Location: Cote Lane, Thurgoland

Purpose: Site Visit

Job No: 1018

Attendees: Richard Harrison (Alfa Homes)
Andrew Calvert & Ricky Dale (both FORTEM)

Visit Date: 09.01.2018



Southern view on site.



Northern view on site.



Unnamed watercourse (east of site).



View on southern boundary.



Cote Lane



Combined manhole (in Cote Lane)

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11 The Covert York YO24 1JN	Cote Lane Thurgoland	
Date 15/02/2018 09:20 File	Designed by Ricky Dale Checked by Andrew Calvert	
XP Solutions Source Control 2017.1.2		

IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.500
Area (ha)	50.000	Urban	0.000
SAAR (mm)	887	Region Number	Region 3

Results l/s

QBAR Rural	364.2
QBAR Urban	364.2
Q1 year	313.2
Q1 year	313.2
Q2 years	343.7
Q5 years	455.3
Q10 years	528.1
Q20 years	598.1
Q25 years	621.3
Q30 years	640.2
Q50 years	689.8
Q100 years	757.5
Q200 years	859.5
Q250 years	892.3
Q1000 years	1107.2

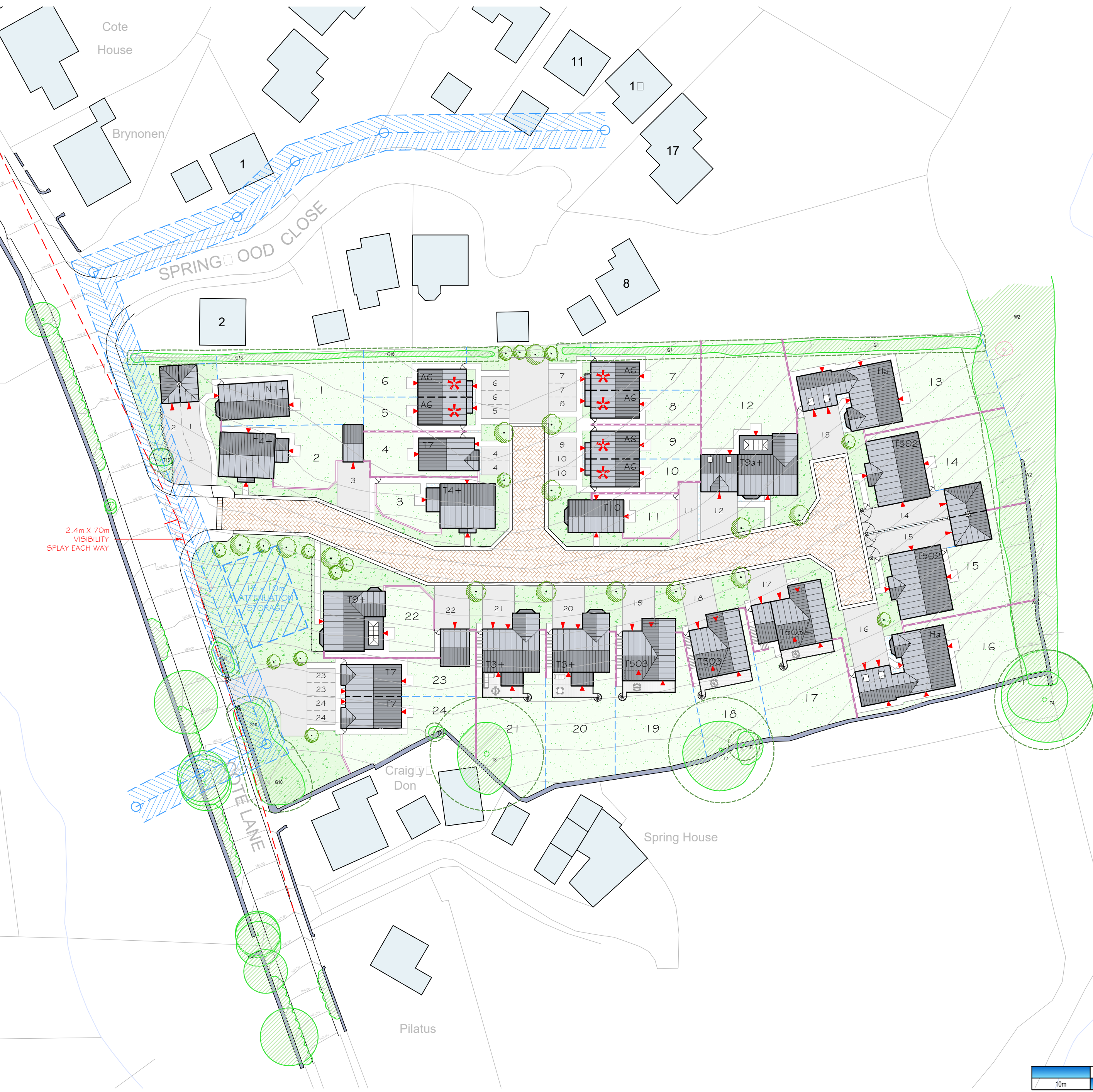
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Appendix B Proposed Development

Drawing P17:5149:01 - Proposed Site Layout

Drawing 1018-002 – Proposed Drainage Strategy

Attenuation Calculations



SCHEDULE OF ACCOMMODATION:

AFFORDABLE	HOUSETYPE	AMOUNT
	A6 2 STOREY 2 BED 7411ft²	6 No.
	T10 2 STOREY 3 BED 960ft²	1 No.
	T7 2 STOREY 3 BED 1001ft²	3 No.

SCHEDULE OF ACCOMMODATION:

OPEN MARKET	HOUSETYPE	AMOUNT
	T1+ 2 STOREY 4 BED 1331ft²	1 No.
	T4+ 2 STOREY 4 BED 1412ft²	2 No.
	T9+ 2 STOREY 4 BED 1828ft²	1 No.
	T502 2 STOREY 5 BED 2013ft²	2 No.
	T503 2/3 STOREY 5 BED 2119ft²	2 No.
	T503+ 2/3 STOREY 5 BED 2119ft²	1 No.
	T3+ 2/3 STOREY 5 BED 2168ft²	2 No.
	HARROGATE 2 STOREY 5 BED 2202ft²	2 No.
	T9a+ 2 STOREY 5 BED 2221ft²	1 No.
	TOTAL No.	24 No.

PLANNING LAYOUT LAYERS KEY:

- EXISTING WALL
- 1800mm STONE WALL
- STONE RETAINING WALL (VARYING IN HEIGHT)
- 1800mm TIMBER FENCE
- 900mm METAL ESTATE RAILINGS
- 450mm KNEE HIGH RAIL
- YORKSHIRE WATER EASEMENT
- PILLARS
- LOCKABLE REAR ACCESS GATE
- AFFORDABLE PLOT
- GRASSED AREAS (FRONT GARDEN)
- GRASSED AREAS (REAR GARDEN)
- BLOCK PAVING/GRAVEL
- TARMACADAM

01 / PROPOSED SITE LAYOUT

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CLIENT:
BERKELEY DEVEER

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
COTE LANE, THURGOLAND
DRAWING:
PROPOSED SITE LAYOUT

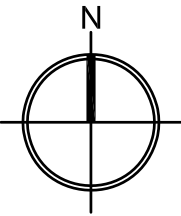
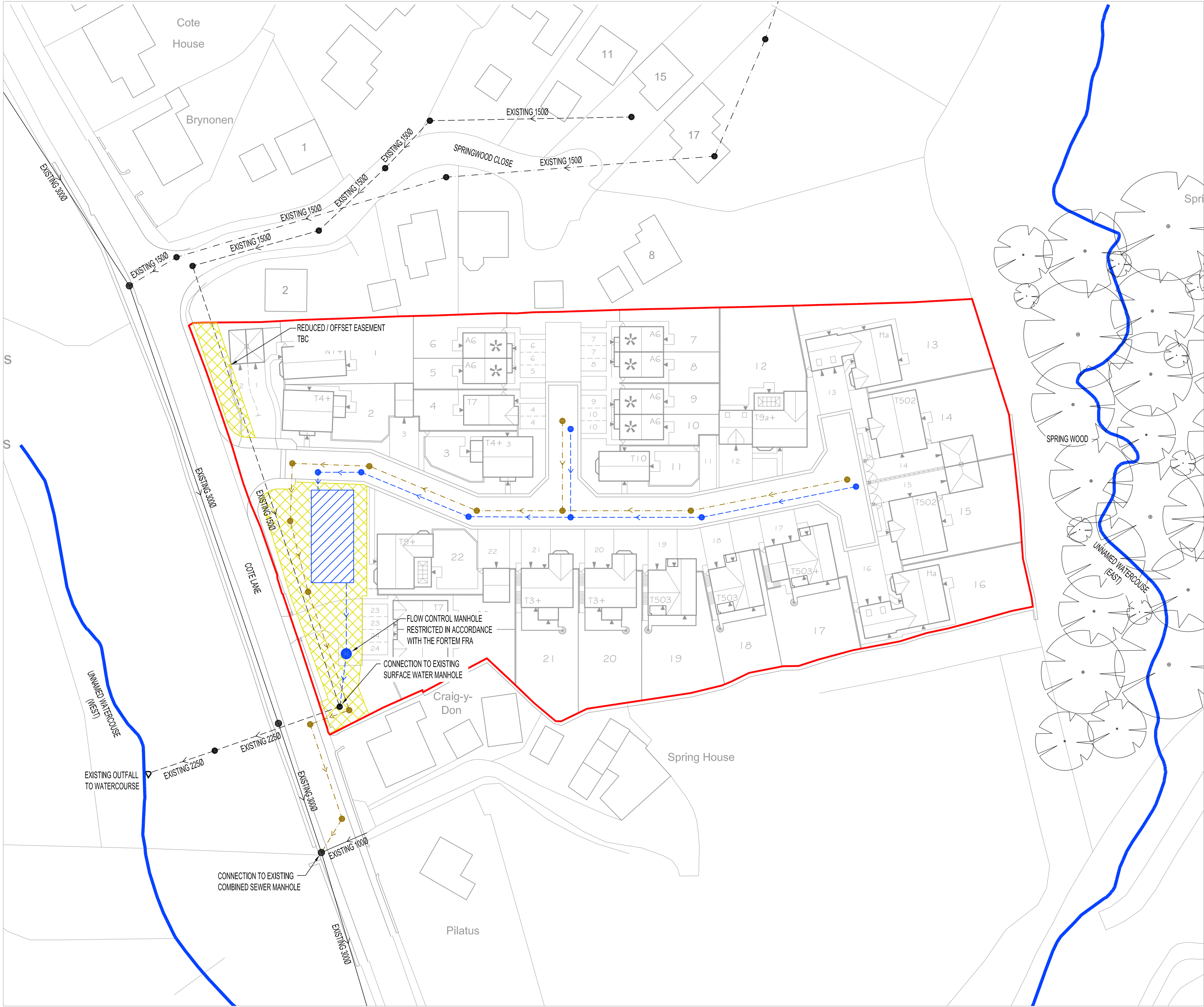
DRAWING NUMBER:
P17:5149:01

SCALE @ A2:
1:500

DRAWN: RAN
CHECKED: VS
DATE: JAN '18
DATE: JAN '18

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NOTES:

- THIS DRAWING IS BASED UPON:
JPG SITE LAYOUT DRAWING P17:5149:01
ORDINANCE SURVEY DATA MAPS;
CSL SURVEYS TOPOGRAPHICAL SURVEY 10432-01;
YORKSHIRE WATER SEWER RECORDS;
GP DRAINS CCTV SURVEY DATED 13.02.2018.
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE
FORTEM FLOOD RISK ASSESSMENT REF: 1018-R001-V1.

KEY:

- PLANNING APPLICATION DEVELOPMENT BOUNDARY
- PROPOSED SURFACE WATER NETWORK
- PROPOSED FOUL WATER NETWORK
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING OPEN WATERCOURSE
- UNDERGROUND ATTENUATION TANK
- PROPOSED EASEMENT (SEWER NETWORK LOCATED OUTSIDE ADOPTABLE HIGHWAY)

Rev	Date	Amendments	By
Drawing Status.			
PLANNING			
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Client			
ALFA HOMES			
Project			
COTE LANE, THURGOLAND			
Drawing Title.			
PROPOSED DRAINAGE STRATEGY			
Drawn: RD Checked: ADC		Scale: 1:500 @ A2 Date: MAR 2018	
Drawing No.			Rev.
1018 - 002			-

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11 The Covert York YO24 1JN		Cote Lane Thurgoland			
Date 20/12/2017 09:50 File		Designed by Ricky Dale Checked by Andrew Calvert			
XP Solutions		Source Control 2017.1.2			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	187.271	0.771	4.0	112.3	O K
30 min Summer	187.536	1.036	4.0	151.6	O K
60 min Summer	187.813	1.313	4.0	192.8	O K
120 min Summer	188.075	1.575	4.4	231.6	O K
180 min Summer	188.197	1.697	4.5	249.8	O K
240 min Summer	188.255	1.755	4.6	258.5	O K
360 min Summer	188.303	1.803	4.6	265.6	O K
480 min Summer	188.302	1.802	4.6	265.4	O K
600 min Summer	188.289	1.789	4.6	263.5	O K
720 min Summer	188.271	1.771	4.6	260.8	O K
960 min Summer	188.227	1.727	4.6	254.3	O K
1440 min Summer	188.133	1.633	4.4	240.3	O K
2160 min Summer	187.991	1.491	4.3	219.3	O K
2880 min Summer	187.855	1.355	4.1	199.0	O K
4320 min Summer	187.602	1.102	4.0	161.5	O K
5760 min Summer	187.355	0.855	4.0	124.7	O K
7200 min Summer	187.074	0.574	4.0	83.1	O K
8640 min Summer	186.911	0.411	4.0	58.9	O K
10080 min Summer	186.805	0.305	4.0	43.1	O K
15 min Winter	187.365	0.865	4.0	126.3	O K
30 min Winter	187.663	1.163	4.0	170.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	113.129	0.0	116.7	26	
30 min Summer	76.900	0.0	158.6	41	
60 min Summer	49.937	0.0	206.0	70	
120 min Summer	31.293	0.0	258.2	128	
180 min Summer	23.430	0.0	289.9	186	
240 min Summer	18.928	0.0	312.3	244	
360 min Summer	14.007	0.0	346.7	362	
480 min Summer	11.299	0.0	372.9	448	
600 min Summer	9.555	0.0	394.1	506	
720 min Summer	8.327	0.0	412.2	568	
960 min Summer	6.696	0.0	441.9	698	
1440 min Summer	4.914	0.0	486.5	976	
2160 min Summer	3.597	0.0	534.2	1388	
2880 min Summer	2.879	0.0	570.0	1800	
4320 min Summer	2.099	0.0	623.4	2604	
5760 min Summer	1.675	0.0	663.4	3416	
7200 min Summer	1.408	0.0	697.2	4040	
8640 min Summer	1.222	0.0	726.1	4672	
10080 min Summer	1.084	0.0	751.5	5344	
15 min Winter	113.129	0.0	130.7	26	
30 min Winter	76.900	0.0	177.6	40	
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11 The Covert York YO24 1JN		Cote Lane Thurgoland			
Date 20/12/2017 09:50 File		Designed by Ricky Dale Checked by Andrew Calvert			
XP Solutions		Source Control 2017.1.2			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	187.978	1.478	4.2	217.3	O K
120 min Winter	188.282	1.782	4.6	262.4	O K
180 min Winter	188.429	1.929	4.8	284.3	O K
240 min Winter	188.505	2.005	4.9	295.6	O K
360 min Winter	188.578	2.078	5.0	306.5	O K
480 min Winter	188.594	2.094	5.0	308.7	O K
600 min Winter	188.578	2.078	5.0	306.4	O K
720 min Winter	188.551	2.051	4.9	302.4	O K
960 min Winter	188.499	1.999	4.9	294.6	O K
1440 min Winter	188.363	1.863	4.7	274.4	O K
2160 min Winter	188.148	1.648	4.5	242.6	O K
2880 min Winter	187.942	1.442	4.2	211.9	O K
4320 min Winter	187.560	1.060	4.0	155.2	O K
5760 min Winter	187.090	0.590	4.0	85.5	O K
7200 min Winter	186.830	0.330	4.0	46.8	O K
8640 min Winter	186.708	0.208	3.7	28.7	O K
10080 min Winter	186.646	0.146	3.4	19.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	49.937	0.0	230.7	68	
120 min Winter	31.293	0.0	289.1	126	
180 min Winter	23.430	0.0	324.7	182	
240 min Winter	18.928	0.0	349.8	240	
360 min Winter	14.007	0.0	388.3	352	
480 min Winter	11.299	0.0	417.6	462	
600 min Winter	9.555	0.0	441.4	564	
720 min Winter	8.327	0.0	461.7	592	
960 min Winter	6.696	0.0	495.0	740	
1440 min Winter	4.914	0.0	544.8	1052	
2160 min Winter	3.597	0.0	598.3	1500	
2880 min Winter	2.879	0.0	638.4	1940	
4320 min Winter	2.099	0.0	698.2	2812	
5760 min Winter	1.675	0.0	743.0	3464	
7200 min Winter	1.408	0.0	780.9	4040	
8640 min Winter	1.222	0.0	813.2	4664	
10080 min Winter	1.084	0.0	841.7	5248	
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Micro
Drainage

Designed by Ricky Dale
Checked by Andrew Calvert

Source Control 2017.1.2

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Model Details

Storage is Online Cover Level (m) 190.000

Box Culvert Structure

Height (m) 2.100 Slope (1:X) 500.000 Downstream Invert (m) 186.500
Width (m) 10.000 Length (m) 14.750

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0090-5000-2100-5000
Design Head (m)	2.100
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	186.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	5.0
Flush-Flo™	0.397	4.0
Kick-Flo®	0.808	3.2
Mean Flow over Head Range	-	3.9

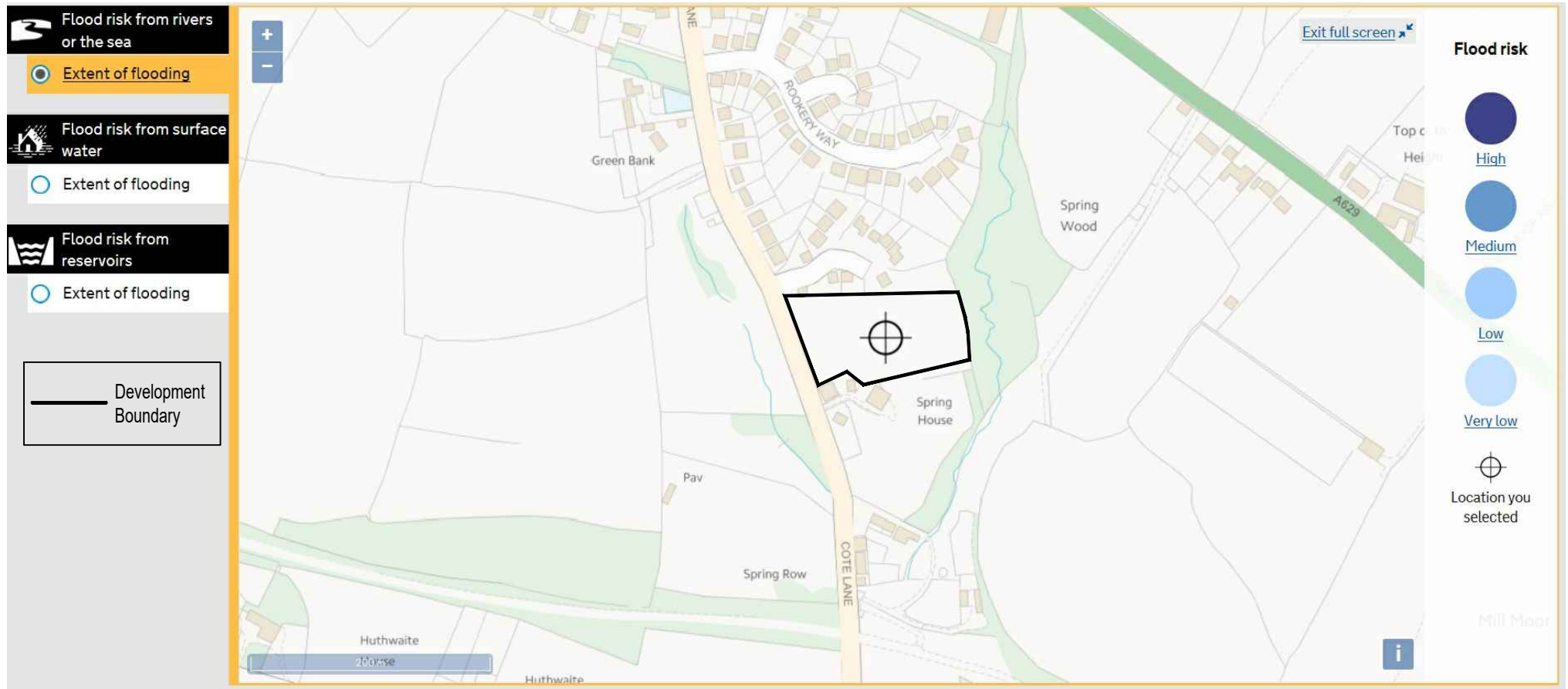
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	3.8	3.000	5.9	7.000	8.8
0.200	3.7	1.400	4.1	3.500	6.3	7.500	9.1
0.300	4.0	1.600	4.4	4.000	6.8	8.000	9.4
0.400	4.0	1.800	4.6	4.500	7.1	8.500	9.6
0.500	4.0	2.000	4.9	5.000	7.5	9.000	9.9
0.600	3.9	2.200	5.1	5.500	7.8	9.500	10.2
0.800	3.3	2.400	5.3	6.000	8.2		
1.000	3.5	2.600	5.5	6.500	8.5		

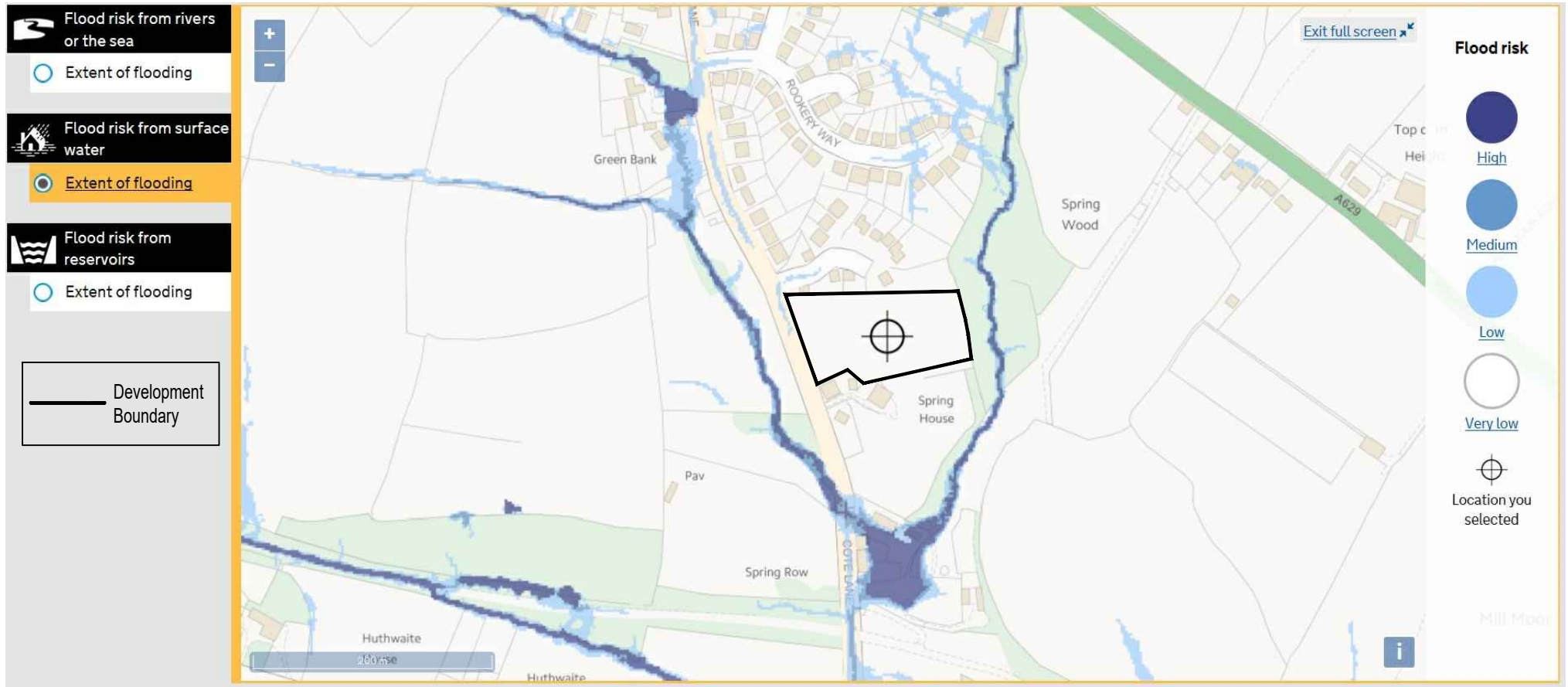
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Appendix C Flood Risk Mapping

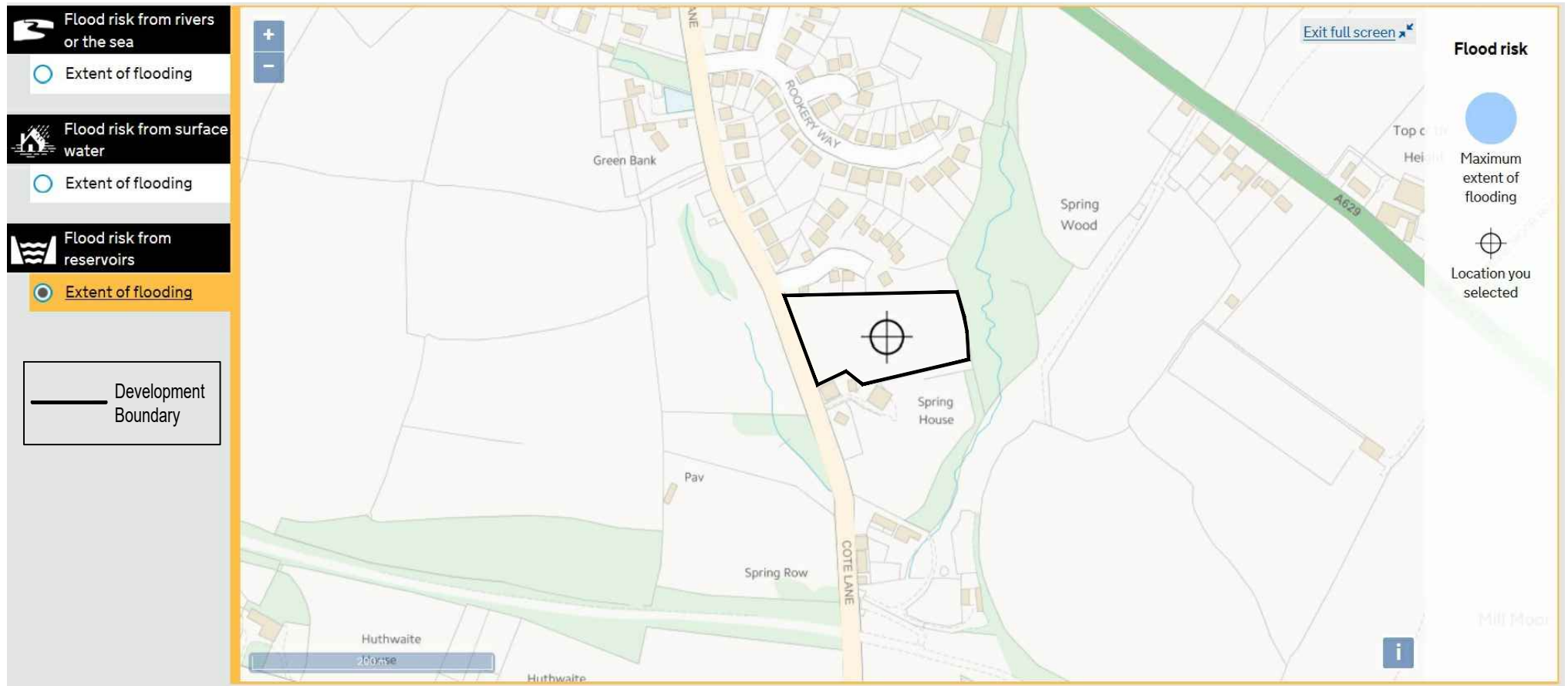
EA Map Risk from Rivers or Sea
EA Map Risk from Surface Water
EA Map Risk from Reservoir



COTE LANE, THURGOLAND
 EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
 RISK FROM FLOODING FROM RIVERS OR SEA
 EXTRACT TAKEN 13.02.2018 : NTS



COTE LANE, THURGOLAND
 EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
 RISK FROM FLOODING FROM SURFACE WATER
 EXTRACT TAKEN 13.02.2018 : NTS



COTE LANE, THURGOLAND
 EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
 RISK FROM FLOODING FROM RESERVOIR
 EXTRACT TAKEN 13.02.2018 : NTS

Appendix D Consultation Response

Yorkshire Water Correspondence 23.02.2018



YorkshireWater

Mr R Dale
Fortem Civil Engineering Consultants Ltd
11 The Covert
Dringhouses
York
YO24 1JN

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834

Your Ref:
Our Ref: U002933

Email:
Technical.Sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

23rd February 2018

Dear Mr Dale,

Proposed Residential Development. Land off Cote Lane. Thurgoland. Sheffield. S35 7AE - Pre Planning Application - R869305

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months.

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste should discharge to the 300 mm diameter public combined sewer recorded in Cote Lane, at a point to the west of the site.

From the information supplied, it is not possible to determine if the whole site will drain by gravity to the public sewer network. If the site, or part of it, will not drain by gravity, then it is likely that a sewage pumping station will be required to facilitate connection to the public sewer network. If sewage pumping is required foul water discharge must not exceed 3 (three) litres per second.

Surface Water

Curtilage surface water may discharge to the 225 mm diameter public surface water sewer recorded in Cote Lane, at a point to the west of the site. The surface water discharge from the site to be restricted to not greater than 5 (five) litres/second.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.



YorkshireWater

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water drain sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

The public sewer network is for domestic sewage purposes. This generally means foul water for domestic purposes and, where a suitable surface water or combined sewer is available, surface water from the roofs of buildings together with surface water from paved areas of land appurtenant to those buildings. Land and highway drainage have no automatic right of connection to the public sewer network. No land drainage to be connected/discharged to public sewer.

As a last resort, highway drainage may be accepted under certain circumstances. If it can be demonstrated, through satisfactory evidence, that SUDS are not a viable option, there are no watercourses or highway drains available and if capacity is available within the public sewer network, highway drainage discharges to the public sewer network may be permitted. In this event, the developer may be required to enter into a formal agreement with Yorkshire Water Services under Section 115 Water Industry Act 1991 to discharge non-domestic flows into the public sewer network.

All the above comments are based upon the information and records available at the present time. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Sewerage Technician
Developer Services

Appendix E FORTEM
FORTEM Consultants T&Cs

TERMS AND CONDITIONS

1. DEFINITIONS

“the Client” the company, individual or organisation identified within the Fee Proposal and commissioner of FORTEM Civil Engineering Consultants Ltd to undertake services on behalf of.

“the Scope of Services” list of services stated in the Fee Proposal.

“the Contract” these Terms and Conditions and the Fee Proposal unless and until they are replaced by a written, agreed and signed alternative contract.

“Fee Proposal” associated letter or document which covers the Scope of Services and the fees FORTEM Civil Engineering Consultants Ltd will charge the Client for the delivery of the Scope of Services, with any additional express terms of contact agreed between FORTEM Civil Engineering Consultants Ltd and the Client.

“Expenses and Disbursements” expenses incurred and disbursements made by FORTEM Civil Engineering Consultants Ltd in carrying out the Scope of Services for the Client, which include but are not limited to third party costs, document reproduction, travel, accommodation and sub-consultants costs.

“Due Date for Payment” date of FORTEM Civil Engineering Consultants Ltd invoice.

“Overdue Date for Payment” the date 28 days after the Due Date for payment.

“the Fees” fees, expenses and disbursements set out in the Fee Proposal.

“Additional Services” services undertaken not specifically covered by the list of services stated in the Fee Proposal.

- 1.1. If any of the Terms and Conditions of the Contract are for any reason held to be illegal, invalid, ineffective, inoperable or otherwise unenforceable, it shall sever and be deemed to be deleted from this agreement and the validity and enforceability of the remainder of this agreement shall not be affected or impaired thereby.

2. SCOPE OF SERVICES

- 2.1. Any services required in addition of the Scope of Services shall be Additional Services and shall be charged in addition to the agreed Fees.
- 2.2. FORTEM Civil Engineering Consultants Ltd shall exercise reasonable skill and care in the delivery of the Scope of Services.
- 2.3. Any budgetary cost consultancy or programming offered by FORTEM Civil Engineering Consultants Ltd is to be regarded by the Client as guidance only.
- 2.4. The Client shall without charge and in the time required, so as not to disrupt the performance of the Scope of Services, do all things required to enable the Scope of Services to be performed and will indemnify FORTEM Civil Engineering Consultants Ltd against all losses and costs as a result of any failure to do so.

3. PAYMENT AND INVOICING

- 3.1. FORTEM Civil Engineering Consultants Ltd shall be entitled to be paid the Fees, Expenses and Disbursements stated within the Fee Proposal unless specifically agreed otherwise.
- 3.2. Invoices will be issued monthly unless agreed otherwise by FORTEM Civil Engineering Consultants Ltd.
- 3.3. If FORTEM Civil Engineering Consultants Ltd takes legal action to recover any outstanding Fees, all sums outstanding including un-invoiced Fees due for services wholly or partially complete will be due and payable immediately. The Client shall be liable for all legal costs incurred by FORTEM Civil Engineering Consultants Ltd in the recovery of the fees.
- 3.4. If payment is not received by the Overdue Date for Payment, FORTEM Civil Engineering Consultants Ltd shall be entitled to charge interest in accordance with the Late Payment of Commercial Debts (Interest) Act 1998 at the relevant reference rate plus the statutory rate of interest on the outstanding balance until payment is received by FORTEM Civil Engineering Consultants Ltd.
- 3.5. FORTEM Civil Engineering Consultants Ltd is entitled to issue invoices to the Client at any time to recharge the cost of management of third party services, if such third party services have been used by FORTEM Civil Engineering Consultants Ltd to complete the Scope of Services for the Client, FORTEM Civil Engineering Consultants Ltd is entitled to charge an additional fee of 10% of the third party costs.

4. INTELLECTUAL PROPERTY

- 4.1. All intellectual property rights associated with the Scope of Services shall remain vested in FORTEM Civil Engineering Consultants Ltd. A specific licence for use may be granted by FORTEM Civil Engineering Consultants Ltd. If the Client defaults on payment to FORTEM Civil Engineering Consultants Ltd any such licence is hereby automatically revoked.
- 4.2. FORTEM Civil Engineering Consultants Ltd shall not be liable for any use of copyright material for any purpose other than the original intent.
- 4.3. FORTEM Civil Engineering Consultants Ltd shall not be liable for any copyright infringement by the Client using copyright materials.
- 4.4. FORTEM Civil Engineering Consultants Ltd shall not be liable for any use of information produced for the Client in whole or part that have not had prior consent by any third party who have an obligation to approve the output.
- 4.5. The information contained in the Fee Proposal is provided in confidence and regarded as commercially sensitive and confidential as defined under the Freedom of Information Act.

5. INSURANCE, LIABILITIES & INDEMNITIES

- 5.1. The total liability of FORTEM Civil Engineering Consultants Ltd to the Client from the date of the Fee Proposal for each claim or series of claims arising from the same originating clause shall not exceed the sum of £2 million (two million pounds), save where specifically excluded.
- 5.2. FORTEM Civil Engineering Consultants Ltd shall have no liability for any losses arising from war and terrorism, toxic mould, nuclear risk, pollution and contamination and/or asbestos unless specifically agreed in writing with the Client.
- 5.3. FORTEM Civil Engineering Consultants Ltd shall have no responsibility for the removal, treatment, storage, transport or disposal of hazardous or toxic substances or other waste materials unless specifically agreed in writing with the Client.
- 5.4. FORTEM Civil Engineering Consultants Ltd liability for any claim or claims shall be further limited to such sum as it would be just and equitable for FORTEM Civil Engineering Consultants Ltd to pay having regard to the extent of its responsibility for the loss or damage suffered as a result of each claim or series of claims ("the loss and damage") and on the assumption that:
 - 5.4.1. all other legal entities working for the Client in relation to the project to which the Scope of Services relates ("the Other Parties") shall have provided contractual undertakings on terms no less onerous than those applying to FORTEM Civil Engineering Consultants Ltd, in respect of the carrying out of their obligations;
 - 5.4.2. there are no exclusions of or limitations of liability nor joint insurance or co-insurance provisions between the Client and the Other Parties and any other party who is responsible to any extent for the loss and damage is liable to the Client for the loss and damage, and:
 - 5.4.3. the Other Parties have paid, or agreed to pay, to the Client such proportion of the loss and damage which it would be just and equitable for them to pay having regard to the extent of their responsibility for the loss and damage.
- 5.5. The amount of Professional Indemnity Insurance provided by FORTEM Civil Engineering Consultants Ltd for each claim or series of claims arising from the same original clause shall be £2 million (two million pounds) in the aggregate provided such insurance is available at commercially reasonable rates and terms.
- 5.6. The amount of Public Liability Insurance carried by FORTEM Civil Engineering Consultants Ltd is £2 million (two million pounds).
- 5.7. FORTEM Civil Engineering Consultants Ltd accepts no responsibility for economic, consequential and indirect losses however caused and whether claimed in contract or tort which include, but are not limited to, loss of profits, loss of opportunity, loss of production, loss of business, opportunity or diminution in value of any asset.

6. ENTIRE AGREEMENT CLAUSE

- 6.1. The Contract forms the entire agreement between FORTEM Civil Engineering Consultants Ltd and the Client and replaces any previous agreements, understandings, discussions or arrangements relating to the Scope of Services. FORTEM Civil Engineering Consultants Ltd and the Client acknowledge that no statement or representation made by either party have been relied upon by the other in agreeing to enter into the Contract.

7. DISPUTES AND TERMINATION

- 7.1. In the event of a dispute that cannot be resolved by negotiation, FORTEM Civil Engineering Consultants Ltd and the Client agree to the initial process of Mediation. All costs, other than legal costs associated with the process, shall be shared equally by FORTEM Civil Engineering Consultants Ltd and the Client.
- 7.2. Either party has the right to refer a dispute in relation to the Scope of Services that relate to the United Kingdom based upon construction operations (as defined in the Act) to adjudication pursuant of the Housing Grant, Construction and Regeneration Act 1996 ("the Act") and any amendments thereto. The rules governing the adjudication will be Part 1 of the Scheme of the Construction Contracts (England and Wales) Regulations 1998 or equivalent in Scotland or Northern Ireland (as amended).
- 7.3. If the client terminates the Contract, the Client shall pay FORTEM Civil Engineering Consultants Ltd in full for all the work performed in relation to any of the Scope of Services and any Additional Services at the date of termination.

8. COLLATERAL WARRANTY, NOVATION AND ASSIGNMENT

- 8.1. FORTEM Civil Engineering Consultants Ltd is under no obligation to provide a collateral warranty to any party or consent a novation of the Contract to any third party unless such obligation is specifically included in the Fee Proposal.
- 8.2. The Contract shall not be transferrable or assignable by the Client to any other party.
- 8.3. The provisions of the Contracts (Rights of Third Parties) Act 1999 are specifically excluded from the Contract.

9. GOVERNING LAW

- 9.1. The Contract shall be governed by and constructed in accordance with English Law.
- 9.2. The Client and the Company hereby submit to the jurisdiction of the English Courts.