Ref: 14216
November 2016; Rev C Jan 17

Flood Risk Assessment
For
Housing Development
Folly Lane
Cheddleton
Staffordshire

Unit A, Racecourse Business Park
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ST14 8GB

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Ref: 14216
November 2016; Rev C Jan 17

Flood Risk Assessment
Proposed Housing Development Folly Lane, Cheddleton

1.0 Brief

1.1 ABA Consulting were instructed by WW Planning on behalf of Manybrook Limited to provide an initial Flood Risk Assessment to support a proposed Policy Submission for a Housing Allocation in the Site Allocations plan being prepared by Staffordshire Moorlands District Council.

1.2 At this stage there is no defined site layout and as such for the purposes of establishing that the principle of development of this site is acceptable in flooding and drainage terms we have made certain assumptions about the development off the site.
These assumptions are:

This stated there is considerable design and layout flexibility for this site and this will only be examined by a developer at the time a planning application is prepared. This initial FRA does therefore consider and make conclusions about the overall suitability and acceptability of this site in flooding and drainage terms.

1.3 . This report describes the risks associated with flooding to the development and describes measures required to reduce such risks.

1.4 The proposed development consists of up to 100 residential dwellings and associated roadways and access.

1.5 The proposed development will include a pond which will form part of the surface water attenuation. Options for and risks associated with surface water disposal are described in section 6. The pond will be located in the south western corner of the site.

2.0 Site Location

2.1 The site is located on greenfield land adjacent between Folly Lane and Cheadle Road, south of Millstone Edge. The site is located at the OS map reference 396800,350150 and the site area is defined on drawing reference at Appendix A. Folly Lane and Cheadle Road form the Western and Eastern boundaries of site, which the housing on Millstone edge the Northern. Agricultural Land lies to the south.

2.2 A copy of an Illustrative Site Layout Plan ABA 14216-01 is provided at Appendix A. This drawing shows the site boundary and position of potential site entrances along with the existing watercourses and landscaping features.

3.0 Site Levels and Existing Services

3.1 ABA Drawing reference 14216-02 shows the approximate levels of the site and the positions of adopted manholes and sewers in close proximity to the site. The site falls from the north east corner to the south west boundary; from a level of approx. 217m AOD at the north east corner to a level around 208m at the boundary in the south west corner.

3.2 Enquiries have been made to Severn Trent water in respect of existing foul and surface water sewers in the area of the development. A public combined 225mm sewer runs almost parallel to the south west boundary falling with the site levels. An adopted surface water drain discharges adjacent to the northwest corner of the site into the ditch/watercourse which runs close to the northern boundary. A second surface water sewer discharges into the continuation of this ditch at the south west corner of the site.

4.0 Flood Plain and Flood Levels

4.1 Reference to the Environment Agency website indicates that the site lies within flood zone 1 and hence is land assessed as having a less than 1 in 1000 annual probability of river flooding. Surface water is generally routed via ditches initially to west before turning north towards Park Pool. Further north it junctions with Endon Brook and heads east becoming the River Churnet.

4.2 The site has a significant slope falling to a low point on the south western boundary. The ditches which drain the site flow under Cheadle Road before leaving the west of the site. The levels of Cheadle Road in the south west corner, at approximately 206m AOD, are below the areas of the site to be developed for housing.

5.0 Floor Levels of Proposed Buildings

5.1 All floor levels will be set a minimum of 150mm above the surrounding ground levels and the lowest properties will have floor levels in excess of 600mm above the maximum proposed floor levels in the attenuation pond.

5.2 The main roadway to the site will have an access onto Folly Lane at a level of approximately 214m AOD and will follow the line of the adopted combined sewer such the maintenance of the sewer will be from the highway. Branch roadways will rise to the north.

5.3 As the combined sewer is located beneath the roadway at the lowest edge of the site properties are not at risk from any surcharging of the combined sewer.

6.0 Proposed Drainage

6.1 There are existing surface water ditches across the site. One runs close to the northern boundary and one to the south. The adopted surface water sewer in the north east corner has an oufall into the nothern ditch. The position of this outfall and lines of the ditches are shown on ABA drawing reference 14216-02 at Appendix B. The water leaves the site via a culvert under Cheadle Road on the western boundary of the site. The culvert feeds to a watercourse which heads west and ultimately discharges to west before turning north towards Park Pool. Further north it junctions with Endon Brook and heads east becoming the River Churnet.

6.2 The existing water course will remain in the current location, though it will be modified close to the western boundary where an attenuation pond will be formed. The outflow from the system will be restricted such that the outfall will discharge less than the current unrestricted system in all rainfall events. The design of the system will include an

allowance for climate change and hence the system will offer significant benefits downstream in respect of protection for the effect of climate change.

6.3 There are existing adopted combined/foul sewers running along the southern edge of the development and the foul drains serving the new properties will connect into these drains. A developers Enquiry Application has been sent into Severn Trent Water to establish that the drains have adequate capacity to receive the proposed flows.

7.0 Conclusions

7.1 The proposed development is within flood zone 1 and the proposed housing is significantly higher level that the existing surface water discharges from the site. The risk of flooding from watercourses is not considered significant.

7.2 The surface water runoff from the site will be controlled and discharged at a rate of 15l/s This is in line with the existing green field run off from the site to the existing water course

7.3 The drainage system utilises SUDs principles with a balancing pond being used to attenuate the surface water runoff. The pond will permit some natural infiltration and evaporation, though permeability of the site is low.

7.4 The proposed buildings are not at risk from flooding and the development will not generate run offs which increase flood risk below the site. Adjacent properties are at a higher level and are not at risk from the development

7.5 Foul water will be routed by gravity sewers to the public combined sewer in running under the site roughly parallel to the south western Boundary, subject to the approval of Severn Trent Water.

7.6 The properties will have floor levels above the adjacent ground and a minimum 600mm above the surface level of the balancing pond. The properties are not at risk from any surface flows.

7.7 The levels of Cheadle Road are such that should the existing culvert below the road become blocked water will overtop Cheadle Road before putting the properties at risk.

7.8 The development is not at a level where any surcharging of the foul system places properties at risk.

Report Prepared By
A.M. Dyer B.Eng C.Eng MICE
For ABA Consulting



Appendix A

Site Plans

ABA Drawing Ref. 14216-01

NOTES

This drawing has been produced working off the drawings provided by an OS Survey, Severn Trent Sewer Record drawing.
The contour lines have been taken from billy Architect and creative studios drawing reference 0102-PL-02.
The level of the contours on the drawing produced by billy architects is not very clear and need verifying.
The contours shown on this drawing are approximate and have been based on the known ST manhole reference points

KEY

Denotes Contours

Denotes Watercourse

Site Boundary
31552m2 / 3.15HA

Site Access Options as proposed by billy (Architects + Creative studio)

350300N
350250N
350200N
350150N
350100N
350050N
350000N

396600N
396650N
396700N
396750N
396800N
396850N
396900N
396950N

349950N

218.5m
219.5m
FOLLY LANE
Track
Pp
El Sub Sta
Drain
Issues
Issues
206.00
208.00
210.00
212.00
214.00
216.00
218.00
220.00
222.00
224.00
40
42
23
44
12
1
58
70
82

N
W E
S

0 50 100

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REV	DATE	DESCRIPTION	BY

SHEET SIZE A0

CLIENT
Willard Planning

PROJECT
Proposed Housing Dev
Folly Lane ,Cheddleton
Staffordshire Moorlands

DRAWING TITLE
Existing OS Survey showing site entrances and watercourse

APPENDIX A

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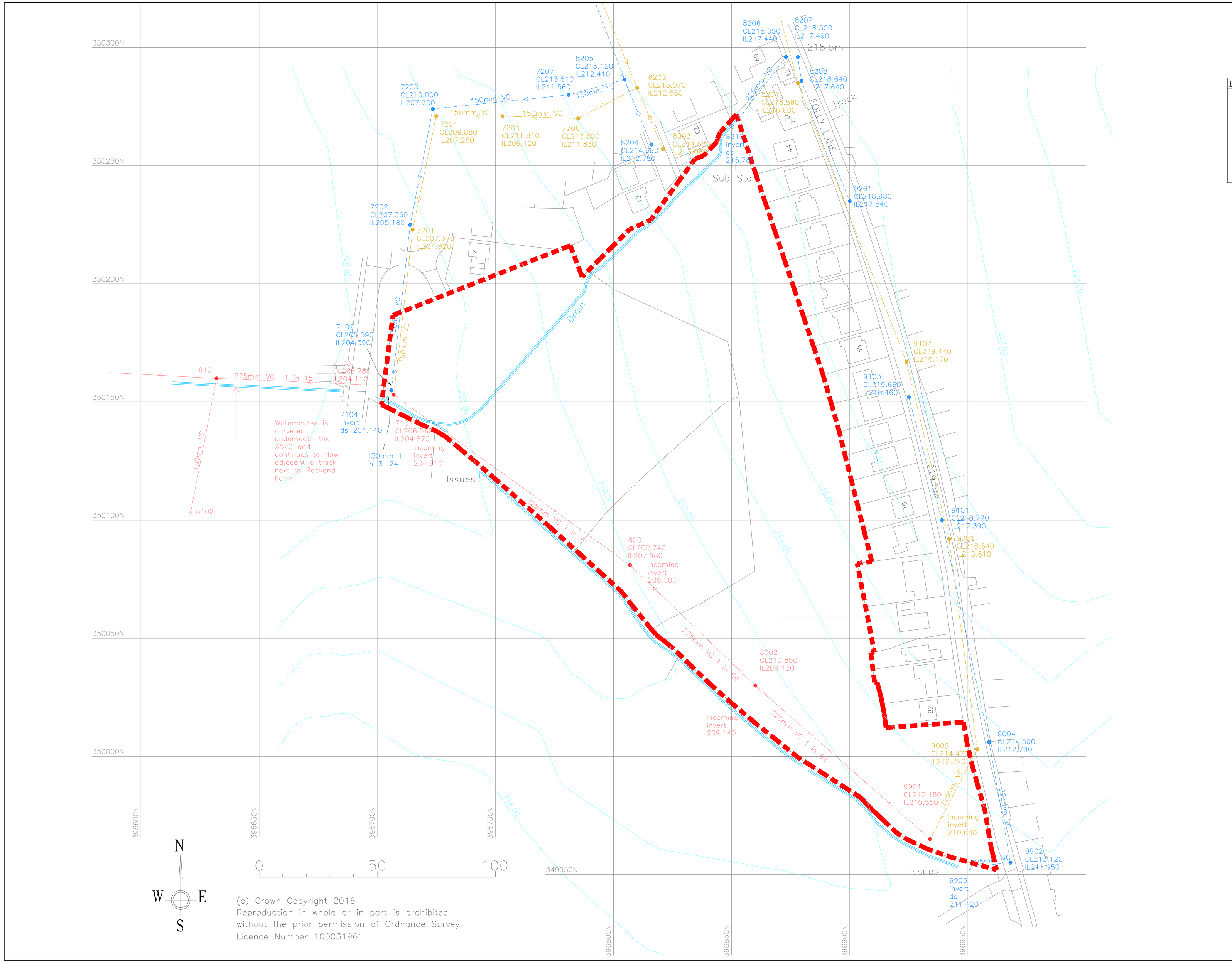
DRAWN BY	N.W.EDGE	DATE	24.11.16
CHECKED BY	MD	SCALE	1:500
PROJECT No	DRAWING No	REVISION	
14216	01	~	

Appendix B

Site Topography and Existing Sewers



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The contours shown on this drawing are approximate and have been based on the known ST manhole reference points

KEY

- Denotes Contours
- Denotes Seven Trent Foul drain
- Denotes Severn Trent Surface Drain
- Denotes Severn Trent Combined Drain
- Denotes Watercourse
- Site Boundary 31552m2 / 3.15HA

REV	DATE	DESCRIPTION	BY

SHEET SIZE A0

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PROJECT
Proposed Housing Dev
Folly Lane ,Cheddleton
Staffordshire Moorlands

DRAWING TITLE
Existing Severn Trent Drainage Layout overlaid onto OS Survey

APPENDIX B

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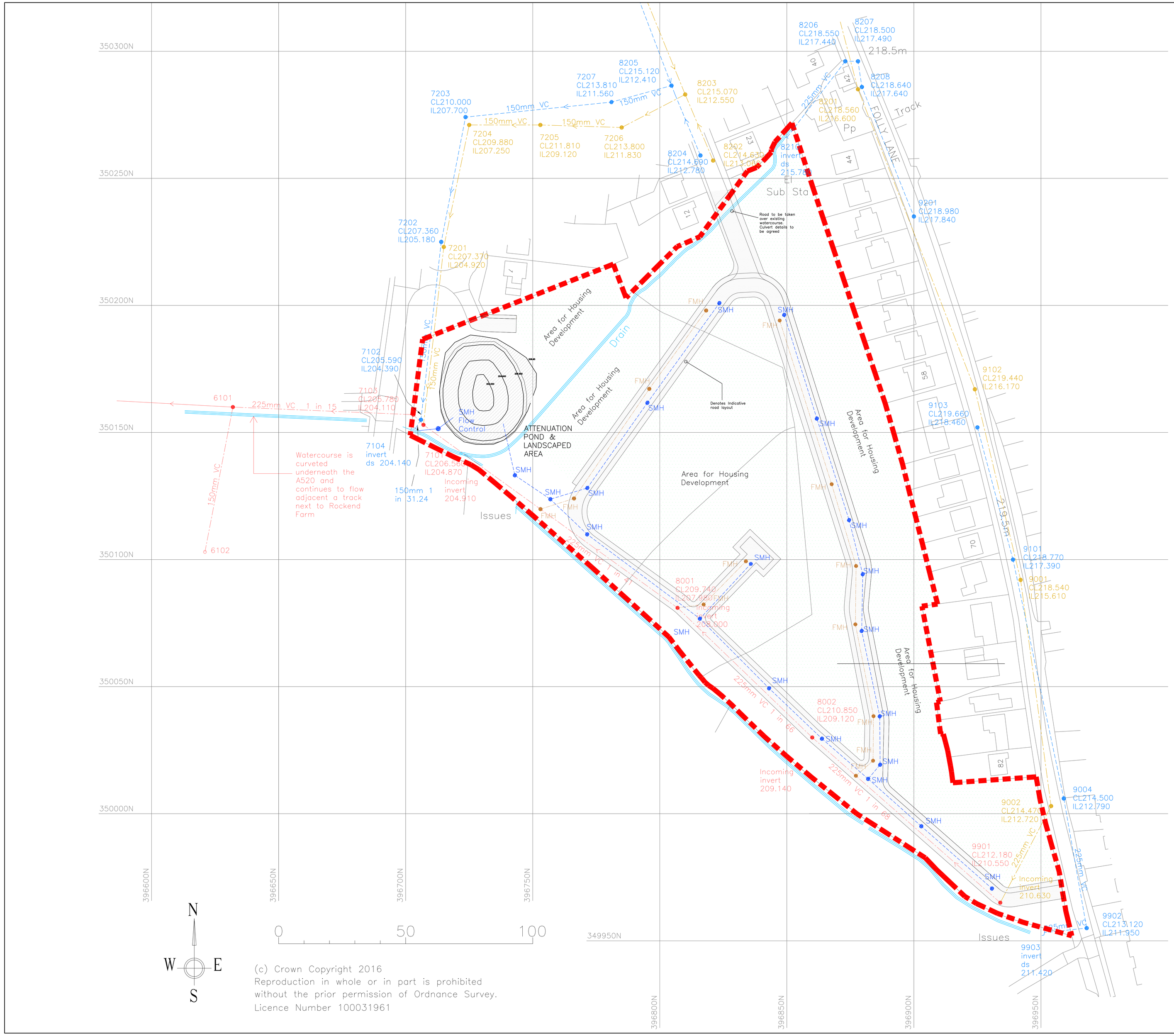
CHECKED BY	MD	SCALE	1:500

PROJECT No	DRAWING No	REVISION
14216	02	~

Appendix C

Proposed Drainage Arrangement.



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The level of the contours on the drawing produced by billy architects is not very clear and need veryifying.
The contours shown on this drawing are approximate and have been based on the known ST manhole reference points

KEY

- Denotes Seven Trent Foul drain
- Denotes Severn Trent Surface Drain
- Denotes Severn Trent Combined Drain
- Denotes Watercourse
- Site Boundary 31552m2 / 3.15HA
- Denotes New Surface water Drainage
- Denotes New Foul Surface Drainage

ROAD AND DRAINAGE LAYOUT IS AN INDICATIVE LAYOUT ONLY

REV	DATE	DESCRIPTION	BY
A	13.01.17	AMENDED TO SHOW OUTFLOW FROM POND ENTERING DIRECTLY INTO THE WATERCOURSE	NWE

SHEET SIZE A0

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PROJECT
Proposed Housing Dev
Folly Lane ,Cheddleton
Staffordshire Moorlands

DRAWING TITLE
Proposed Drainage and Indicative Road Layout

APPENDIX C

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CHECKED BY	MD	SCALE	1:500

PROJECT No	DRAWING No	REVISION
14216	03	A

Appendix D

Attenuation Calculations

Wallingford Modified Rational Method

Sheet number: 01
Design (MT): 1 in 1 Year Storm Event
Project Number: 14216
Project Title: Cheddleton FRA
Discharge Area: 1.276 ha
Calc Date: 24.11.16
Addtl Info: 0

Duration (hrs)	r	Z1 (mm)	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissable Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	35	0.36	18	6.48	0.62	4.02	48.40	1.00	0.75	1.276	167.23	15.00	45,486	45.49
0.167	35	0.51	18	9.18	0.62	5.69	34.15	1.00	0.75	1.276	117.98	15.00	61,787	61.79
0.25	35	0.62	18	11.16	0.61	6.81	27.23	1.00	0.75	1.276	94.07	15.00	71,167	71.17
0.50	35	0.79	18	14.22	0.62	8.82	17.63	1.00	0.75	1.276	60.92	15.00	82,651	82.65
1.00	35	1.00	18	18.00	0.64	11.52	11.52	1.00	0.75	1.276	39.80	15.00	89,276	89.28
2.00	35	1.22	18	21.96	0.65	14.27	7.14	1.00	0.75	1.276	24.66	15.00	69,528	69.53
4.00	35	1.50	18	27.00	0.66	17.82	4.46	1.00	0.75	1.276	15.39	15.00	5,630	5.63
6.00	35	1.69	18	30.42	0.68	20.69	3.45	1.00	0.75	1.276	11.91	15.00	-66,730	-66.73
8.00	35	1.82	18	32.76	0.68	22.28	2.78	1.00	0.75	1.276	9.62	15.00	-154,940	-154.94
10.00	35	1.95	18	35.10	0.68	23.87	2.39	1.00	0.75	1.276	8.25	15.00	-243,150	-243.15
24.00	35	2.48	18	44.64	0.70	31.25	1.30	1.00	0.75	1.276	4.50	15.00	-907,363	-907.36

Wallingford Modified Rational Method

Sheet number: 03
Design (MT): 1 in 30 Year Storm Event
Project Number: 14216
Project Title: Cheddleton FRA
Discharge Area: 1.276 ha
Calc Date: 24.11.16
Addtl Info: 0

Duration (hrs)	r	Z1 (mm)	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Permissable Discharge Rate (l/s)	Rqd storage (100%) (l)	Rqd storage (100%) (m3)
0.083	35	0.36	18	6.48	1.46	9.46	113.99	1.00	0.75	1.276	393.79	15.00	113,184	113.18
0.167	35	0.51	18	9.18	1.51	13.86	83.17	1.00	0.75	1.276	287.34	15.00	163,402	163.40
0.25	35	0.62	18	11.16	1.53	17.07	68.30	1.00	0.75	1.276	235.96	15.00	198,862	198.86
0.50	35	0.79	18	14.22	1.54	21.90	43.80	1.00	0.75	1.276	151.31	15.00	245,359	245.36
1.00	35	1.00	18	18.00	1.53	27.54	27.54	1.00	0.75	1.276	95.14	15.00	288,520	288.52
2.00	35	1.22	18	21.96	1.53	33.60	16.80	1.00	0.75	1.276	58.04	15.00	309,874	309.87
4.00	35	1.50	18	27.00	1.51	40.77	10.19	1.00	0.75	1.276	35.21	15.00	291,064	291.06
6.00	35	1.69	18	30.42	1.51	45.93	7.66	1.00	0.75	1.276	26.45	15.00	247,292	247.29
8.00	35	1.82	18	32.76	1.50	49.14	6.14	1.00	0.75	1.276	21.22	15.00	179,163	179.16
10.00	35	1.95	18	35.10	1.47	51.60	5.16	1.00	0.75	1.276	17.83	15.00	101,721	101.72
24.00	35	2.48	18	44.64	1.42	63.39	2.64	1.00	0.75	1.276	9.12	15.00	-507,623	-507.62

Wallingford Modified Rational Method

Sheet number: 04
Design (MT): 1 in 100 Year Storm Event +30%
Project Number: 14216
Project Title: Cheddleton FRA
Discharge Area: 1.276 ha
Calc Date: 24.11.16
Addtl Info: 0

Duration (hrs)	r	Z1 (mm)	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Qp Discharge +30% (l/s)	Permissable Discharge Rate (l/s)	Rqd Storage (130%) (l)	Rqd Storage (130%) (m3)
0.083	35	0.36	18	6.48	1.91	12.38	149.12	1.00	0.75	1.276	515.17	669.72	15.00	195,630	195.63
0.167	35	0.51	18	9.18	1.99	18.27	109.61	1.00	0.75	1.276	378.67	492.28	15.00	286,366	286.37
0.25	35	0.62	18	11.16	1.99	22.21	88.83	1.00	0.75	1.276	306.90	398.97	15.00	345,573	345.57
0.50	35	0.79	18	14.22	2.03	28.87	57.73	1.00	0.75	1.276	199.45	259.29	15.00	439,725	439.72
1.00	35	1.00	18	18.00	2.03	36.54	36.54	1.00	0.75	1.276	126.24	164.11	15.00	536,791	536.79
2.00	35	1.22	18	21.96	1.97	43.26	21.63	1.00	0.75	1.276	74.73	97.15	15.00	591,461	591.46
4.00	35	1.50	18	27.00	1.97	53.19	13.30	1.00	0.75	1.276	45.94	59.72	15.00	643,993	643.99
6.00	35	1.69	18	30.42	1.97	59.93	9.99	1.00	0.75	1.276	34.51	44.86	15.00	644,926	644.93
8.00	35	1.82	18	32.76	1.89	61.92	7.74	1.00	0.75	1.276	26.74	34.76	15.00	569,084	569.08
10.00	35	1.95	18	35.10	1.89	66.34	6.63	1.00	0.75	1.276	22.92	29.79	15.00	532,590	532.59
24.00	35	2.48	18	44.64	1.81	80.80	3.37	1.00	0.75	1.276	11.63	15.12	15.00	10,375	10.37

Wallingford Modified Rational Method

Sheet number: 04
Design (MT): 1 in 100 Year Storm Event +40%
Project Number: 14216
Project Title: Cheddleton FRA
Discharge Area: 1.276 ha
Calc Date: 24.11.16
Addtl Info: 0

Duration (hrs)	r	Z1 (mm)	M5-60	M5-D (mm)	Z2 (mm)	MT-D (mm)	i (mm/hr)	Areal Reduction Factor	Cv	Area (ha)	Qp Discharge (l/s)	Qp Discharge +40% (l/s)	Permissable Discharge Rate (l/s)	Rqd Storage (140%) (l)	Rqd Storage (140%) (m3)
0.083	35	0.36	18	6.48	1.91	12.38	149.12	1.00	0.75	1.276	515.17	721.24	15.00	211,023	211.02
0.167	35	0.51	18	9.18	1.99	18.27	109.61	1.00	0.75	1.276	378.67	530.14	15.00	309,087	309.09
0.25	35	0.62	18	11.16	1.99	22.21	88.83	1.00	0.75	1.276	306.90	429.66	15.00	373,194	373.19
0.50	35	0.79	18	14.22	2.03	28.87	57.73	1.00	0.75	1.276	199.45	279.24	15.00	475,626	475.63
1.00	35	1.00	18	18.00	2.03	36.54	36.54	1.00	0.75	1.276	126.24	176.73	15.00	582,236	582.24
2.00	35	1.22	18	21.96	1.97	43.26	21.63	1.00	0.75	1.276	74.73	104.62	15.00	645,266	645.27
4.00	35	1.50	18	27.00	1.97	53.19	13.30	1.00	0.75	1.276	45.94	64.32	15.00	710,146	710.15
6.00	35	1.69	18	30.42	1.97	59.93	9.99	1.00	0.75	1.276	34.51	48.31	15.00	719,458	719.46
8.00	35	1.82	18	32.76	1.89	61.92	7.74	1.00	0.75	1.276	26.74	37.43	15.00	646,091	646.09
10.00	35	1.95	18	35.10	1.89	66.34	6.63	1.00	0.75	1.276	22.92	32.09	15.00	615,097	615.10
24.00	35	2.48	18	44.64	1.81	80.80	3.37	1.00	0.75	1.276	11.63	16.28	15.00	110,865	110.87