


# Appendix B.2




**1 IN 100 YEAR**

WSP Group Ltd		Page 1
<div><div>.</div><div>.</div><div>.</div></div>	Workhouse Lane, Burbage 1 in 100 Year	
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	111.192	0.192	6.0	156.9	O K
30 min Summer	111.245	0.245	6.0	204.0	O K
60 min Summer	111.297	0.297	6.0	250.2	O K
120 min Summer	111.341	0.341	6.0	291.5	O K
180 min Summer	111.360	0.360	6.0	310.1	O K
240 min Summer	111.370	0.370	6.0	318.8	O K
360 min Summer	111.374	0.374	6.0	323.3	O K
480 min Summer	111.372	0.372	6.0	321.2	O K
600 min Summer	111.369	0.369	6.0	318.1	O K
720 min Summer	111.365	0.365	6.0	314.1	O K
960 min Summer	111.354	0.354	6.0	304.4	O K
1440 min Summer	111.330	0.330	6.0	281.2	O K
2160 min Summer	111.291	0.291	6.0	245.0	O K
2880 min Summer	111.254	0.254	6.0	211.6	O K
4320 min Summer	111.194	0.194	6.0	158.8	O K
5760 min Summer	111.154	0.154	5.9	124.1	O K
7200 min Summer	111.130	0.130	5.6	104.2	O K
8640 min Summer	111.117	0.117	5.0	93.3	O K
10080 min Summer	111.107	0.107	4.6	85.0	O K
15 min Winter	111.214	0.214	6.0	176.2	O K
30 min Winter	111.274	0.274	6.0	229.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	96.688	0.0	148.8	22
30 min Summer	63.453	0.0	197.7	37
60 min Summer	39.674	0.0	258.2	66
120 min Summer	23.974	0.0	312.9	124
180 min Summer	17.621	0.0	345.3	184
240 min Summer	14.081	0.0	368.1	242
360 min Summer	10.218	0.0	400.8	360
480 min Summer	8.142	0.0	425.9	424
600 min Summer	6.821	0.0	445.9	482
720 min Summer	5.901	0.0	462.7	544
960 min Summer	4.690	0.0	490.0	674
1440 min Summer	3.389	0.0	529.5	942
2160 min Summer	2.444	0.0	583.0	1344
2880 min Summer	1.937	0.0	615.5	1728
4320 min Summer	1.393	0.0	661.0	2428
5760 min Summer	1.102	0.0	703.3	3112
7200 min Summer	0.918	0.0	731.8	3752
8640 min Summer	0.790	0.0	755.1	4496
10080 min Summer	0.696	0.0	773.3	5240
15 min Winter	96.688	0.0	167.7	22
30 min Winter	63.453	0.0	222.2	36

WSP Group Ltd		Page 2
. . .	Workhouse Lane, Burbage 1 in 100 Year	
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	111.330	0.330	6.0	281.6	O K
120 min Winter	111.380	0.380	6.0	329.2	O K
180 min Winter	111.403	0.403	6.0	351.5	O K
240 min Winter	111.415	0.415	6.0	362.8	O K
360 min Winter	111.423	0.423	6.0	371.0	O K
480 min Winter	111.423	0.423	6.0	370.7	O K
600 min Winter	111.417	0.417	6.0	365.2	O K
720 min Winter	111.410	0.410	6.0	357.7	O K
960 min Winter	111.395	0.395	6.0	343.8	O K
1440 min Winter	111.359	0.359	6.0	309.0	O K
2160 min Winter	111.300	0.300	6.0	253.6	O K
2880 min Winter	111.245	0.245	6.0	203.4	O K
4320 min Winter	111.162	0.162	5.9	131.4	O K
5760 min Winter	111.125	0.125	5.4	99.7	O K
7200 min Winter	111.107	0.107	4.6	85.6	O K
8640 min Winter	111.096	0.096	4.0	76.4	O K
10080 min Winter	111.089	0.089	3.6	70.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	39.674	0.0	289.7	66
120 min Winter	23.974	0.0	350.9	122
180 min Winter	17.621	0.0	387.2	180
240 min Winter	14.081	0.0	412.7	238
360 min Winter	10.218	0.0	449.3	352
480 min Winter	8.142	0.0	477.3	462
600 min Winter	6.821	0.0	499.7	564
720 min Winter	5.901	0.0	518.5	590
960 min Winter	4.690	0.0	548.9	734
1440 min Winter	3.389	0.0	593.0	1030
2160 min Winter	2.444	0.0	653.4	1452
2880 min Winter	1.937	0.0	689.9	1824
4320 min Winter	1.393	0.0	741.5	2508
5760 min Winter	1.102	0.0	788.1	3112
7200 min Winter	0.918	0.0	820.1	3824
8640 min Winter	0.790	0.0	846.3	4504
10080 min Winter	0.696	0.0	867.4	5240

WSP Group Ltd		Page 3
.	Workhouse Lane, Burbage	
.	1 in 100 Year	
.		
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	


#### 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)	19.600	Shortest Storm (mins)	15
Ratio R	0.402	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

#### Time Area Diagram

Total Area (ha) 0.890

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.450	4	8	0.440

WSP Group Ltd		Page 4
.	Workhouse Lane, Burbage	
.	1 in 100 Year	
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Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

### Model Details

Storage is Online Cover Level (m) 112.000

### Tank or Pond Structure

Invert Level (m) 111.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	770.0	1.000	1330.0

### Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0120-6000-0700-6000
Design Head (m)	0.700
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	120
Invert Level (m)	111.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	6.0
Flush-Flo™	0.222	6.0
Kick-Flo®	0.493	5.1
Mean Flow over Head Range	-	5.1

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	4.2	1.200	7.7	3.000	11.9	7.000	17.8
0.200	6.0	1.400	8.3	3.500	12.8	7.500	18.4
0.300	5.9	1.600	8.8	4.000	13.6	8.000	19.0
0.400	5.7	1.800	9.3	4.500	14.4	8.500	19.6
0.500	5.1	2.000	9.8	5.000	15.2	9.000	20.2
0.600	5.6	2.200	10.3	5.500	15.9	9.500	20.7
0.800	6.4	2.400	10.7	6.000	16.6		
1.000	7.1	2.600	11.1	6.500	17.2		


# Appendix B.3




**1 IN 100 YEAR + CLIMATE CHANGE**



WSP Group Ltd				Page 1	
.		Workhouse Lane, Burbage			
.		1 in 100 Year + 40% CC			
.					
Date 31/03/2020		Designed by PS			
File Workhouse Lane, Burbage...		Checked by DW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	111.264	0.264	6.0	220.9	O K
30 min Summer	111.337	0.337	6.0	288.2	O K
60 min Summer	111.407	0.407	6.0	355.2	O K
120 min Summer	111.470	0.470	6.0	418.3	O K
180 min Summer	111.501	0.501	6.0	450.0	O K
240 min Summer	111.519	0.519	6.0	467.9	O K
360 min Summer	111.535	0.535	6.0	484.8	O K
480 min Summer	111.540	0.540	6.0	490.7	O K
600 min Summer	111.539	0.539	6.0	489.7	O K
720 min Summer	111.535	0.535	6.0	484.7	O K
960 min Summer	111.524	0.524	6.0	473.4	O K
1440 min Summer	111.499	0.499	6.0	447.7	O K
2160 min Summer	111.455	0.455	6.0	403.2	O K
2880 min Summer	111.413	0.413	6.0	361.1	O K
4320 min Summer	111.336	0.336	6.0	286.6	O K
5760 min Summer	111.269	0.269	6.0	225.2	O K
7200 min Summer	111.216	0.216	6.0	178.3	O K
8640 min Summer	111.178	0.178	5.9	144.4	O K
10080 min Summer	111.150	0.150	5.8	120.8	O K
15 min Winter	111.294	0.294	6.0	248.0	O K
30 min Winter	111.374	0.374	6.0	323.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	135.363	0.0	211.4	22	
30 min Summer	88.834	0.0	278.8	37	
60 min Summer	55.544	0.0	363.2	66	
120 min Summer	33.563	0.0	439.5	126	
180 min Summer	24.669	0.0	484.6	186	
240 min Summer	19.713	0.0	516.2	244	
360 min Summer	14.306	0.0	561.6	364	
480 min Summer	11.398	0.0	596.1	482	
600 min Summer	9.550	0.0	623.7	600	
720 min Summer	8.261	0.0	646.6	688	
960 min Summer	6.566	0.0	683.2	794	
1440 min Summer	4.744	0.0	733.2	1044	
2160 min Summer	3.422	0.0	817.1	1432	
2880 min Summer	2.711	0.0	862.8	1820	
4320 min Summer	1.950	0.0	928.3	2596	
5760 min Summer	1.542	0.0	985.6	3296	
7200 min Summer	1.285	0.0	1025.8	3968	
8640 min Summer	1.106	0.0	1058.7	4664	
10080 min Summer	0.975	0.0	1085.1	5344	
15 min Winter	135.363	0.0	237.4	22	
30 min Winter	88.834	0.0	312.2	37	
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WSP Group Ltd			Page 2		
.		Workhouse Lane, Burbage			
.		1 in 100 Year + 40% CC			
.					
Date 31/03/2020		Designed by PS			
File Workhouse Lane, Burbage...		Checked by DW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	111.452	0.452	6.0	399.6	O K
120 min Winter	111.522	0.522	6.0	471.9	O K
180 min Winter	111.557	0.557	6.0	508.3	O K
240 min Winter	111.576	0.576	6.0	529.1	O K
360 min Winter	111.596	0.596	6.0	550.3	O K
480 min Winter	111.604	0.604	6.0	559.3	O K
600 min Winter	111.606	0.606	6.0	560.8	O K
720 min Winter	111.603	0.603	6.0	557.6	O K
960 min Winter	111.590	0.590	6.0	543.3	O K
1440 min Winter	111.559	0.559	6.0	510.0	O K
2160 min Winter	111.504	0.504	6.0	453.0	O K
2880 min Winter	111.439	0.439	6.0	386.4	O K
4320 min Winter	111.320	0.320	6.0	271.7	O K
5760 min Winter	111.224	0.224	6.0	184.7	O K
7200 min Winter	111.160	0.160	5.9	129.2	O K
8640 min Winter	111.129	0.129	5.6	103.3	O K
10080 min Winter	111.115	0.115	5.0	91.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.544	0.0	407.2	66	
120 min Winter	33.563	0.0	492.4	124	
180 min Winter	24.669	0.0	542.7	182	
240 min Winter	19.713	0.0	578.0	240	
360 min Winter	14.306	0.0	628.5	356	
480 min Winter	11.398	0.0	666.8	470	
600 min Winter	9.550	0.0	697.3	582	
720 min Winter	8.261	0.0	722.4	690	
960 min Winter	6.566	0.0	761.9	896	
1440 min Winter	4.744	0.0	811.0	1114	
2160 min Winter	3.422	0.0	915.3	1580	
2880 min Winter	2.711	0.0	966.6	1992	
4320 min Winter	1.950	0.0	1040.7	2768	
5760 min Winter	1.542	0.0	1104.3	3456	
7200 min Winter	1.285	0.0	1149.3	4032	
8640 min Winter	1.106	0.0	1186.4	4584	
10080 min Winter	0.975	0.0	1216.7	5256	
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WSP Group Ltd		Page 3
.	Workhouse Lane, Burbage	
.	1 in 100 Year + 40% CC	
.		
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	


#### 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)	19.600	Shortest Storm (mins)	15
Ratio R	0.402	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

#### Time Area Diagram

Total Area (ha) 0.890

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.450	4	8	0.440

WSP Group Ltd		Page 4
.	Workhouse Lane, Burbage	
.	1 in 100 Year + 40% CC	
.		
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

### Model Details

Storage is Online Cover Level (m) 112.000

### Tank or Pond Structure

Invert Level (m) 111.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	770.0	1.000	1330.0

### Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0120-6000-0700-6000
Design Head (m)	0.700
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	120
Invert Level (m)	111.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	6.0
Flush-Flo™	0.222	6.0
Kick-Flo®	0.493	5.1
Mean Flow over Head Range	-	5.1


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	4.2	1.200	7.7	3.000	11.9	7.000	17.8
0.200	6.0	1.400	8.3	3.500	12.8	7.500	18.4
0.300	5.9	1.600	8.8	4.000	13.6	8.000	19.0
0.400	5.7	1.800	9.3	4.500	14.4	8.500	19.6
0.500	5.1	2.000	9.8	5.000	15.2	9.000	20.2
0.600	5.6	2.200	10.3	5.500	15.9	9.500	20.7
0.800	6.4	2.400	10.7	6.000	16.6		
1.000	7.1	2.600	11.1	6.500	17.2		

# Appendix B.4



**1 IN 100 YEAR + CLIMATE CHANGE & CREEP**

WSP Group Ltd				Page 1	
.		Workhouse Lane, Burbage			
.		Development Creep			
.					
Date 31/03/2020		Designed by PS			
File Workhouse Lane, Burbage...		Checked by DW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	111.289	0.289	6.0	243.7	O K
30 min Summer	111.369	0.369	6.0	318.0	O K
60 min Summer	111.445	0.445	6.0	392.6	O K
120 min Summer	111.514	0.514	6.0	463.6	O K
180 min Summer	111.548	0.548	6.0	499.2	O K
240 min Summer	111.567	0.567	6.0	519.4	O K
360 min Summer	111.586	0.586	6.0	539.6	O K
480 min Summer	111.594	0.594	6.0	547.6	O K
600 min Summer	111.594	0.594	6.0	548.1	O K
720 min Summer	111.590	0.590	6.0	544.0	O K
960 min Summer	111.580	0.580	6.0	532.5	O K
1440 min Summer	111.556	0.556	6.0	507.4	O K
2160 min Summer	111.518	0.518	6.0	467.0	O K
2880 min Summer	111.475	0.475	6.0	422.7	O K
4320 min Summer	111.393	0.393	6.0	341.1	O K
5760 min Summer	111.321	0.321	6.0	272.9	O K
7200 min Summer	111.261	0.261	6.0	217.5	O K
8640 min Summer	111.213	0.213	6.0	175.3	O K
10080 min Summer	111.177	0.177	5.9	143.9	O K
15 min Winter	111.322	0.322	6.0	273.5	O K
30 min Winter	111.409	0.409	6.0	357.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	135.363	0.0	233.4	22	
30 min Summer	88.834	0.0	307.0	37	
60 min Summer	55.544	0.0	400.2	66	
120 min Summer	33.563	0.0	484.0	126	
180 min Summer	24.669	0.0	533.6	186	
240 min Summer	19.713	0.0	568.3	244	
360 min Summer	14.306	0.0	618.0	364	
480 min Summer	11.398	0.0	655.7	482	
600 min Summer	9.550	0.0	685.7	600	
720 min Summer	8.261	0.0	710.5	714	
960 min Summer	6.566	0.0	749.4	816	
1440 min Summer	4.744	0.0	797.9	1066	
2160 min Summer	3.422	0.0	899.8	1472	
2880 min Summer	2.711	0.0	950.1	1876	
4320 min Summer	1.950	0.0	1022.7	2640	
5760 min Summer	1.542	0.0	1085.6	3392	
7200 min Summer	1.285	0.0	1129.8	4104	
8640 min Summer	1.106	0.0	1166.2	4752	
10080 min Summer	0.975	0.0	1195.5	5440	
15 min Winter	135.363	0.0	261.9	22	
30 min Winter	88.834	0.0	343.3	37	
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.		Workhouse Lane, Burbage			
.		Development Creep			
.					
Date 31/03/2020		Designed by PS			
File Workhouse Lane, Burbage...		Checked by DW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	111.493	0.493	6.0	441.6	O K
120 min Winter	111.570	0.570	6.0	522.0	O K
180 min Winter	111.608	0.608	6.0	562.9	O K
240 min Winter	111.629	0.629	6.0	586.7	O K
360 min Winter	111.652	0.652	6.0	611.9	O K
480 min Winter	111.662	0.662	6.0	623.7	O K
600 min Winter	111.666	0.666	6.0	627.2	O K
720 min Winter	111.664	0.664	6.0	625.4	O K
960 min Winter	111.653	0.653	6.0	612.8	O K
1440 min Winter	111.622	0.622	6.0	579.1	O K
2160 min Winter	111.573	0.573	6.0	525.0	O K
2880 min Winter	111.517	0.517	6.0	465.8	O K
4320 min Winter	111.389	0.389	6.0	337.7	O K
5760 min Winter	111.282	0.282	6.0	236.5	O K
7200 min Winter	111.200	0.200	6.0	163.8	O K
8640 min Winter	111.148	0.148	5.8	119.4	O K
10080 min Winter	111.126	0.126	5.5	100.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.544	0.0	448.6	66	
120 min Winter	33.563	0.0	542.2	124	
180 min Winter	24.669	0.0	597.4	182	
240 min Winter	19.713	0.0	636.1	240	
360 min Winter	14.306	0.0	691.2	356	
480 min Winter	11.398	0.0	732.8	470	
600 min Winter	9.550	0.0	765.4	584	
720 min Winter	8.261	0.0	792.1	694	
960 min Winter	6.566	0.0	832.3	904	
1440 min Winter	4.744	0.0	866.2	1126	
2160 min Winter	3.422	0.0	1007.9	1588	
2880 min Winter	2.711	0.0	1064.1	2048	
4320 min Winter	1.950	0.0	1146.1	2852	
5760 min Winter	1.542	0.0	1216.2	3528	
7200 min Winter	1.285	0.0	1265.9	4176	
8640 min Winter	1.106	0.0	1306.8	4752	
10080 min Winter	0.975	0.0	1340.4	5320	
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WSP Group Ltd		Page 3
.	Workhouse Lane, Burbage	
.	Development Creep	
.		
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

#### 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)	19.600	Shortest Storm (mins)	15
Ratio R	0.402	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

#### Time Area Diagram

Total Area (ha) 0.980

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.490	4	8	0.490



WSP Group Ltd		Page 4
.	Workhouse Lane, Burbage	
.	Development Creep	
.		
Date 31/03/2020	Designed by PS	
File Workhouse Lane, Burbage...	Checked by DW	
XP Solutions	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 112.000

Tank or Pond Structure

Invert Level (m) 111.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	770.0	1.000	1330.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0120-6000-0700-6000
Design Head (m)	0.700
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	120
Invert Level (m)	111.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	6.0
Flush-Flo™	0.222	6.0
Kick-Flo®	0.493	5.1
Mean Flow over Head Range	-	5.1

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	4.2	1.200	7.7	3.000	11.9	7.000	17.8
0.200	6.0	1.400	8.3	3.500	12.8	7.500	18.4
0.300	5.9	1.600	8.8	4.000	13.6	8.000	19.0
0.400	5.7	1.800	9.3	4.500	14.4	8.500	19.6
0.500	5.1	2.000	9.8	5.000	15.2	9.000	20.2
0.600	5.6	2.200	10.3	5.500	15.9	9.500	20.7
0.800	6.4	2.400	10.7	6.000	16.6		
1.000	7.1	2.600	11.1	6.500	17.2		

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# Appendix C

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**CORRESPONDENCE** 

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CB2 1LA

**wsp.com**

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**From:** Jack Harriman [<mailto:Jack.Harriman@leics.gov.uk>]  
**Sent:** 14 August 2019 10:14  
**To:** Leslie, Joe <[Joe.Leslie@wsp.com](mailto:Joe.Leslie@wsp.com)>  
**Cc:** Ward, Dean <[Dean.Ward@wsp.com](mailto:Dean.Ward@wsp.com)>  
**Subject:** LLFA Response: Ref. 2019/6659/04/F - Workhouse Lane, Burbage, Leicestershire

Dear Joe,

Thank you for request for pre-application advice. Following review of the submitted documents, I can confirm the following.

The applicant is seeking to gather information for a flood risk assessment (FRA) to accompany a future planning application.

When determining planning applications, the local planning authority should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site-specific FRA confirming it will not put the users of the development at risk. Where a FRA is applicable this should be undertaken in accordance with the National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG).

From review of the Flood Map for Planning which shows fluvial flood risk, the site is within Flood Zone 1.

The risk of flooding from surface water map shows areas of the site to be at high risk from surface water flooding located with high risk areas located at the sites southern boundary.

Other sources of flood risk including (but not limited to) groundwater, canals, reservoirs, sewers, etc. should be considered as part of any forthcoming planning application. The LLFA would recommend reviewing the relevant Strategic Flood Risk Assessment for this area which may contain additional flood risk details.

The proposed site is situated within the Soar Brook from source to River Soar catchment. Leicestershire County Council's Infrastructure Planning (Flood Risk Management) team has records of the following flooding incidents within close proximity to the site.

- Groundwater encountered whilst construction was taking place. Temporary de-watering works carried out.  
– Lutterworth Road, Burbage (0.15km Southeast) – January 2018.
- External property flooding and highway flooding due to unknown issues within the existing drainage system.  
– Britannia Road, Burbage (0.4km North) – July 2013
- External property flooding from highway – Coventry Road, Burbage (0.6km North)

It is advised that not all instances of flooding are reported to Leicestershire County Council and as such, there may be a history of flooding for which we have no record. Currently no studies have been undertaken by LCC as its role as the LLFA to study or model flooding in Burbage.



All development has the potential to increase flood risk so it is essential that all forms of flooding are taken into consideration within any flood risk assessment (where required) or planning application. Where there is insufficient information regarding any aspect of risk, the responsibility to investigate falls to the applicant.

Leicestershire County Council as the Lead Local Flood Authority (LLFA) would expect a sequential approach to masterplan development, locating development in areas at lowest risk of flooding.

The LLFA would expect any surface water drainage proposal to seek to infiltrate unless demonstrated to be unfeasible. Such demonstration should include infiltration testing in accordance with BRE Digest 365 Soakaway Design. The LLFA holds no records on the level of groundwater and the risk from flooding from this source.

Should this not be appropriate, the LLFA would expect runoff from site to be discharge to the next most appropriate receptor at rates and volumes no greater than the event specific greenfield values.

Over the lifetime of a development, it is possible that the overall impermeable area contributing to surface water runoff within the site could significantly increase (known as 'urban creep'). Sensitivity testing of a 10% increase in impermeable area should therefore be included where appropriate to ensure that surface water drainage designs can cope with future increases in impermeable areas.

Mapping layers available to the LLFA indicate a spring on site is classified as an ordinary watercourse; as such consent may be required from Leicestershire County Council in their role as LLFA, under the Land Drainage Act (1991) for any activities within close proximity. Further information on the types of work/structure which require consent together with a template application form can be found on our website under the section 'Regulation of activities on watercourses'. Any works that require silt/pollution mitigation in the watercourse would also require temporary consent to

Leicestershire County Council opposes the culverting of watercourses; however, we recognise there are instances where culverting may be unavoidable. Any applicant will be required to justify the use of culverts and provide information demonstrating that there will be no detrimental effect on flood risk. Please refer to the County Council's Local Flood Risk Management Strategy which contains the culverting policy (Appendix 3) which can also be found on our website.

To safeguard access to watercourses or ditches for future maintenance, inspection and improvement works in the future; clear margins should be provided from the top of banks. A minimum clear margin of 3m should be provided from each top of bank for watercourses less than 2 metres in width, a minimum clear margin of 4.5m should be provided for watercourses 2 metres or greater in width.

The LLFA would expect any future surface water drainage scheme to assess the use of SuDS including but not limited to swales, attenuation basins and permeable paving in line with 'CIRIA C753 The SuDS Manual'. Such above ground SuDS structures would also provide one of the required treatment trains to manage water quality. It should be noted that the LLFA do not consider the use of underground storage tanks or oversize pipes as a suitable treatment train and as such where these are proposed, additional treatment trains should be implemented. Leicestershire County Council, in their role as LLFA, does not adopt SuDS. For enquiries regarding the proposed development and future adoption and maintenance of SuDS features, please direct these to your local District or Borough Council.

Any surface water drainage features should be located within the areas at lowest risk of flooding to ensure they remain operational during an extreme event. Any drainage features should also consider how an extreme event may constrain the discharge from any proposed drainage system and ensure the drainage infrastructure can adequately manage surface water runoff regardless (for example a surcharged outfall).

Where a site-specific flood risk assessment (FRA) is required by NPPF the associated drainage strategy should also provide outline operation and maintenance details along with an indicative proposal of who will maintain any SuDS features over the lifetime of the development.

The LLFA planning checklist and guidance which provides further details can be found [here](#).

If you have any further questions, please do not hesitate to contact us.

Kind regards

**Flood Risk Management (Infrastructure Planning)**

Environment & Transport Department

Leicestershire County Council

e. [llfa@leics.gov.uk](mailto:llfa@leics.gov.uk)

t. 0116 305 0001

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**EMD137163**

**Flood Map for Planning**

The Flood Map for Planning is now now classed as Open Data. As such it can be downloaded free of charge under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

Alternatively it can be viewed at the following address: <https://flood-map-for-planning.service.gov.uk/>

**Modelled Information**

**Currently no data for this area/site**

**Please note:** The flows provided represent **in channel flow only** and do not take into account flow on the floodplain.

**Updated Climate Change Guidance**

On 19th February 2016, the Flood risk assessments: climate change allowances' was published on [www.gov.uk](http://www.gov.uk) website. It has replaced previous guidance [Climate Change Allowances for Planners](https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).

The climate change guidance can be found at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>  
If your RFI is to assist with a Flood Risk Assessment (FRA) for a future planning application, please review this guidance to consider which allowances should be used for your site.

**Defence Information**

There are no Environment Agency maintained raised defences in this area.



### **Historic Information**

We have no records of historic fluvial flooding at this location. However, we would advise that this does not mean there has never been historic flooding in this location or that the area is automatically free from a risk of flooding. We do not claim that all flood events have been recorded.

### **Open Data Information**

The below datasets are now classed as Open Data and as such can be downloaded free of charge under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

- Risk of Flooding from Rivers and Sea (RoFRS) data
- LiDAR Data
- Flood Map for Planning (Rivers and Sea)
- Historic Flooding Data

### **Permitting Information**

Under the Environmental Permitting (England and Wales) Regulations 2016, any permanent or temporary works in, over or under a designated main river will require an Environmental Permit for Flood Risk Activities from the Environment Agency.

Any permanent or temporary works within 8 metres of the top of bank of a designated main river, or landward toe of a flood defence may require an Environmental Permit for Flood Risk Activities from the Environment Agency. In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities.

To find out whether your activity requires a permit or falls under a relevant exclusion, exemption or standard rule please follow the link below:

<https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

**Please note that a permit is separate to and in addition to any planning permission granted.**

## **Product Information**

Below is a brief overview of which Product is likely to be most appropriate for your needs. This information will only be provided where it is available as we do not hold detailed information on all watercourses.

### **Product 4 – Producing a Flood Risk Assessment (FRA) where you:**

- Require mapped and tabulated outputs from an Environment Agency model *e.g flood levels for a range of events*
- Require information on local defences and historic flooding events
- Do not need to undertake additional hydraulic modelling

### **Product 6 – Producing a Flood Risk Assessment (FRA) where you:**

- Require raw modelling results files
- Require modelling results in GIS format

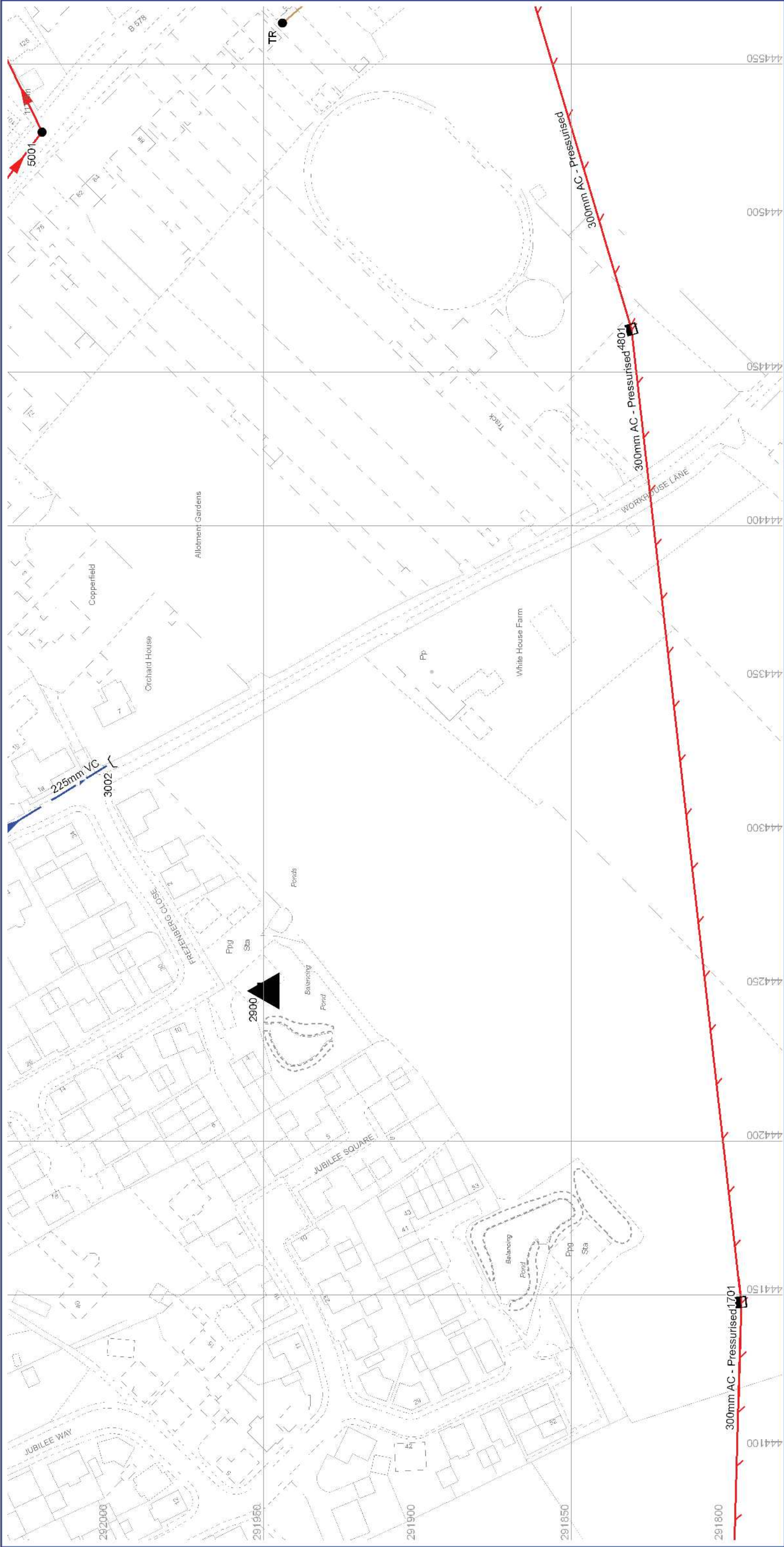
### **Product 7 - Producing a Flood Risk Assessment (FRA) where you:**

- Do need to undertake additional hydraulic modelling using an existing Environment Agency model

In most instances to supply Product 6 and Product 7 data a hard drive will need to be supplied due to the large file sizes associated with this information. Please note that this information will require specialist modelling software to view and run.

A Product 5 (Model Report) will be supplied with all Product 6 and 7 requests and can also be requested separately.





SEVERN  
TRENT  
WATER

Severn Trent Water Limited  
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PO Box 5344  
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Telephone: 0845 801 6616

Abandoned Gravity Sewer

Private Combined Gravity Sewer

Private Foul Gravity Sewer

Private Surface Water Gravity Sewer

Public Combined Gravity Sewer

Public Foul Gravity Sewer

Public Surface Water Gravity Sewer

Trunk Combined Gravity Sewer

Trunk Foul Use Gravity Sewer

Trunk Surface Water Gravity Sewer

Combined Use Pressurised Sewer

Foul Use Pressurised Sewer

Surface Water Pressurised Sewer

Highway Drain

Combined Lateral Drain (SS)

Foul Lateral Drain (SS)

Surface Water Lateral Drain (SS)

Culverted Watercourse

Cable, Earthing

Cable Junction

Cable, Optical Fibre/Instrumentation

Cable, Low Voltage

Cable, High Voltage

Cable, Other

Housing, Building

Housing, Kiosk

Disposal Site

Sewage Treatment Works

Housing, Other

Pipe Support Structure

Sewage Pumping Facility

Sewer Facility Connection Inlet / Outlet

Blind Shaft

Combined Use Manhole

Flushing Chamber

Foul Use Manhole

Grease Trap

Head Node

Hydrobrake

Lamphole

Outfall

Overflow

Pensstock

Perd Interceptor

Sewer Chemical Injection Point

Sewer Junction

Sewerage Air Valve

Sewerage Hatch Box Point

Sewerage Isolation Valve

Soakaway

Surface Water Manhole

Vert Column

Waste Water Storage

Pre-1837 Properties

W - WEIR

DB - DAMBOARD

SE - SIDE ENTRY

FV - FLAP VALVE

SD - SIDE DROP

S - SPOUT

HD - HIGHWAY DRAIN

S104 - SECTION 104

MATERIALS

AC - ASPHALT CEMENT

BR - BRICK

CC - CONCRETE BOX CULVERT

CI - CAST IRON

CSB - CONCRETE SEGMENTS (BOLTED)

CSU - CONCRETE SEGMENTS (UNBOLTED)

DI - DUCTILE IRON

GRC - GLASS REINFORCED CONCRETE

GRP - GLASS REINFORCED PLASTIC

MA - MASONRY

MAW - MASONRY RANDOMLY COURSED

PE - POLYETHYLENE

PF - PITCH

PP - POLYPROPYLENE

PVC - POLYVINYL CHLORIDE

RPM - REINFORCED PLASTIC MATRIX

SI - SPUN (GREY) IRON

ST - STEEL

VC - UNKNOWN

XXX - OTHER

CATEGORIES

W - WEIR

DB - DAMBOARD

SE - SIDE ENTRY

FV - FLAP VALVE

SD - SIDE DROP

S - SPOUT

HD - HIGHWAY DRAIN

S104 - SECTION 104

SHAPE

C - CIRCULAR

E - EGG SHAPED

O - OTHER

R - RECTANGLE

S - SQUARE

T - TRIANGULAR

U - UNKNOWN

PURPOSE

C - COMBINED

E - FINAL EFFLUENT

F - FOUL

L - SLUDGE

S - SURFACE WATER

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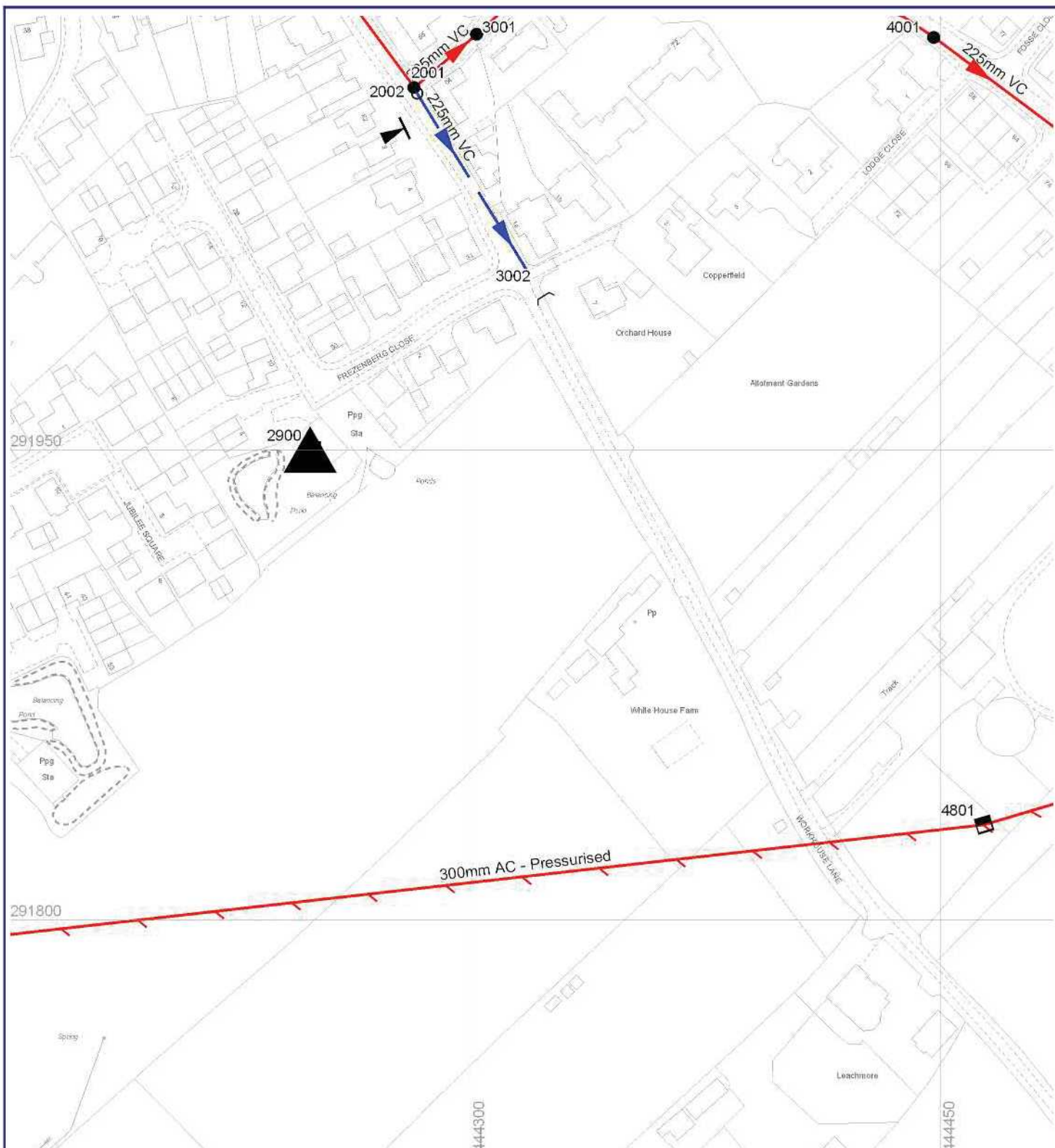
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All Private Sewers are shown in magenta  
All section 104 sewers are shown in green  
All Sewers that have been transferred to Severn Trent Water after the 1<sup>st</sup> October 2011, but have not been surveyed and confirmed by Severn Trent Water are shown in orange





<ul style="list-style-type: none"> <li>Abandoned Gravity Sewer</li> <li>Private Combined Gravity Sewer</li> <li>Private Foul Gravity Sewer</li> <li>Private Surface Water Gravity Sewer</li> <li>Public Combined Gravity Sewer</li> <li>Public Foul Gravity Sewer</li> <li>Public Surface Water Gravity Sewer</li> <li>Trunk Combined Gravity Sewer</li> <li>Trunk Foul Use Gravity Sewer</li> <li>Trunk Surface Water Gravity Sewer</li> <li>Abandoned Pressurised Sewer</li> <li>Combined Use Pressurised Sewer</li> <li>Foul Use Pressurised Sewer</li> <li>Surface Water Pressurised Sewer</li> <li>Highway Drain</li> <li>Combined Lateral Drain (SS)</li> <li>Foul Lateral Drain (SS)</li> <li>Surface Water Lateral Drain (SS)</li> </ul>	<ul style="list-style-type: none"> <li>Blind Shaft</li> <li>Combined Use Manhole</li> <li>Disposal Site</li> <li>Flushing Chamber</li> <li>Foul Use Manhole</li> <li>Grease Trap</li> <li>Head Node</li> <li>Hydrobrake</li> <li>Lamphole</li> <li>Outfall</li> <li>Overflow</li> <li>Penstock</li> <li>Petrol Interceptor</li> <li>Sewage Treatment Works</li> </ul>	<ul style="list-style-type: none"> <li>Sewer Chemical Injection Point</li> <li>Sewer Junction</li> <li>Sewerage Air Valve</li> <li>Sewerage Hatch Box Point</li> <li>Sewerage Isolation Valve</li> <li>Soakaway</li> <li>Surface Water Manhole</li> <li>Vent Column</li> <li>Waste Water Storage</li> <li>Culverted Watercourse</li> <li>Pre-1937 Properties</li> <li>Sewage Pumping Facility</li> <li>Sewer Facility Connection Inlet / Outlet</li> </ul>
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Severn Trent Water Limited  
 Asset Data Management  
 PO Box 5344  
 Coventry  
 CV3 9FT  
 Telephone: 0845 801 6616

## SEWER RECORD

O/S Map scale:	1:1750	This map is centred upon
Date of issue:	12.08.19	O / S Grid reference:
Sheet No:	1 of 2	x : 444319
		y : 291907

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Sewer Node

Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SP44922001	120.64	118.87	118.64	C	VC	C	225	nil	114.13	nil
SP44922002	120.56	119.23	116.11	S	VC	C	225	nil	23.75	nil
SP44923001	120.82	118.64	117.80	C	VC	C	nil	nil	98.58	nil
SP44924001	119.15	116.68	115.65	C	VC	C	225	nil	97.09	nil

MATERIALS

-	- NONE	PE	- POLYETHYLENE
AC	- ASBESTOS CEMENT	PF	- PITCH
BR	- BRICK	PP	- POLYPROPYLENE
CC	- CONCRETE BOX CULVERT	PSC	- PLASTIC STEEL COMPOSITE
CI	- CAST IRON	PVC	- POLYVINYL CHLORIDE
CO	- CONCRETE	RPM	- REINFORCED PLASTIC MATRIX
CSB	- CONCRETE SEGMENTS (BOLTED)	SI	- SPUN (GREY) IRON
CSU	- CONCRETE SEGMENTS (UNBOLTED)	ST	- STEEL
DI	- DUCTILE IRON	U	- UNKNOWN
GRC	- GLASS REINFORCED CONCRETE	VC	- VITRIFIED CLAY
RP	- GLASS REINFORCED PLASTIC	XXX	- OTHER
MAC	- MASONRY IN REGULAR COURSES		
MAR	- MASONRY RANDOMLY COURSED		

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

TABULAR KEY

- A. Sewer pipe data refers to downstream sewer pipe.
- B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.
- C. Gradient is stated a 1 in...



Severn Trent Water Limited  
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SEWER RECORD DATA TABLE

O/S Map scale:	1:1750	This map is centred upon O / S Grid reference:
Date of Issue:	12.08.19	X1 444319
Sheet No.	2 of 2	Y : 291907

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