HYDRAULIC FOUL WATER SEWER CAPACITY ASSESSMENT FOR PROPOSED DEVELOPMENT ON LAND AT BROCKHILL WEST, REDDITCH.

Client : PERSIMMON HOMES/
MILLER HOMES/
SOUTHERN & REGIONAL
DEVELOPMENT.

Sewerage Asset Protection
Strongford STW's
Barlaston Old Road
Barlaston
Stoke-on-Trent
ST12 9EX

TABLE OF CONTENTS

1. BACKGROUND INFORMATION

The Site: Proposed development on land off Brockhill Drive, Brockhill West, Redditch, Worcestershire (OS Grid Ref: 401601, 267853).

The Project: A consortium consisting of, Persimmon Homes, Miller Homes and Southern & Regional Development, commissioned Severn Trent Water to consider the impact of connecting a the foul flows from a proposed development site to the nearest available public foul water sewer.

FW Sewers: The client wishes to explore the option of connecting the development site foul water flows to the existing foul water sewerage system located nearest to the site.

There is a 225mm dia. public foul water sewer located at junction of Salters Lane with Yew Tree Close, which flows in a generally north-easterly direction to Beech Tree Close where it connects to a 450mm dia. sewer.

From Beech Tree Close the sewer flows in a south-easterly direction to Willow Way and Batchley Way where the sewer changes to a 675/600mm pipe. The sewer now flows in a generally north-easterly direction to Windsor Road.

From Windsor Road the sewer flows in a north-easterly direction into Middlehouse Lane where it changes to a 750mm dia. pipe. From Middlehouse Lane the sewer continues to flow in an easterly direction to Millrace Road and Park Way where the sewer turns to flow in a southerly. From Park Way the sewer flow southwards to Holloway Drive, Old Forge Drive, Washford Drive and the Birmingham Road before eventually discharging into the company's Spernal STW's.

Hydraulic Models:

The hydraulic model used for the foul water sewer assessment was based on the Company's Spernal DAP models which was converted to and run on InfoWorks CS V9.02. The models were subsequently locally updated and amended to reflect the additional flows generated by the development proposals.

The sewer systems were modeled using multiple simulation runs of 1, 5, 10, 20, 30 & 40-year return period summer & winter storms of 15, 30, 60, 90,120, & 240-minute duration.

It should also be noted that the data used in the amended model has not been checked or verified.

Project Details:

The client's consultant on the project, RPS, has requested a possible connection point to the nearest suirable existing public sewer in Salters Lane.

The foul water sewer assessment therefore considered the performance of the existing sewers downstream of proposed connection point in Salters Lane through to the Spernal STW's.

Additional maximum foul water flows were based on data provided by the client, calculated as per the following table;

REF. No.	LOCATION	DISCHARGE POINT @ M/H	PROPOSED CONTRIBUTING FLOW (l/s)
Senario 1	Salters Lane	SP0267_4802	230 Residential Units
		MAX. FOUL FLOW (6dwf)	10.6 l/s
		PEAK FOUL FLOW (3dwf)	**5.3 l/s**
Senario 2	Salters Lane	SP0267_4802	160 Residential Units – 7.4 l/s 2.5ha Business Employment (B1) – 1.3 l/s
		MAX. FOUL FLOW (6dwf)	8.7 l/s
		PEAK FOUL FLOW (3dwf)	**4.4 l/s**

The assessment therefore considered the performance of the existing sewer with the following scenario's;

No	LOCATION	DISCHARGE POINT	DESCRIPTION
FOUL WATER SEWER			
1	Salters Lane	SP0267_4802	• Existing foul/combined sewer performance. • Ex. FWS performance + 5.3 l/s peak development foul flow connecting at existing manhole No. 4802.
2	Salters Lane	SP0267_4802	• Existing foul/combined sewer performance. • Ex. FWS performance + 4.4 l/s peak development foul flow connecting at existing manhole No. 4802.

The foul water sewer system was assessed using the worst case, M30-60 summer flow rates.

2. HYDRAULIC MODEL - SIMULATION RESULTS

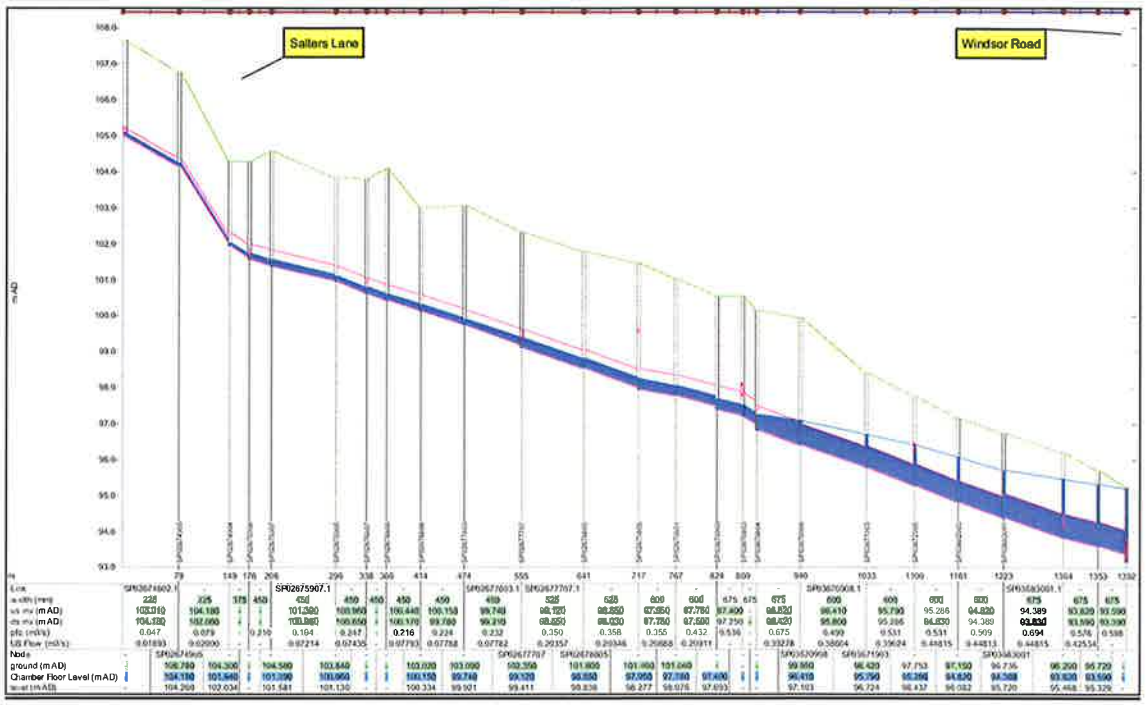
Results Summary:

Senario 1. - Performance of Foul/Combined Sewer + 5.3 l/s Dev. Foul Flow

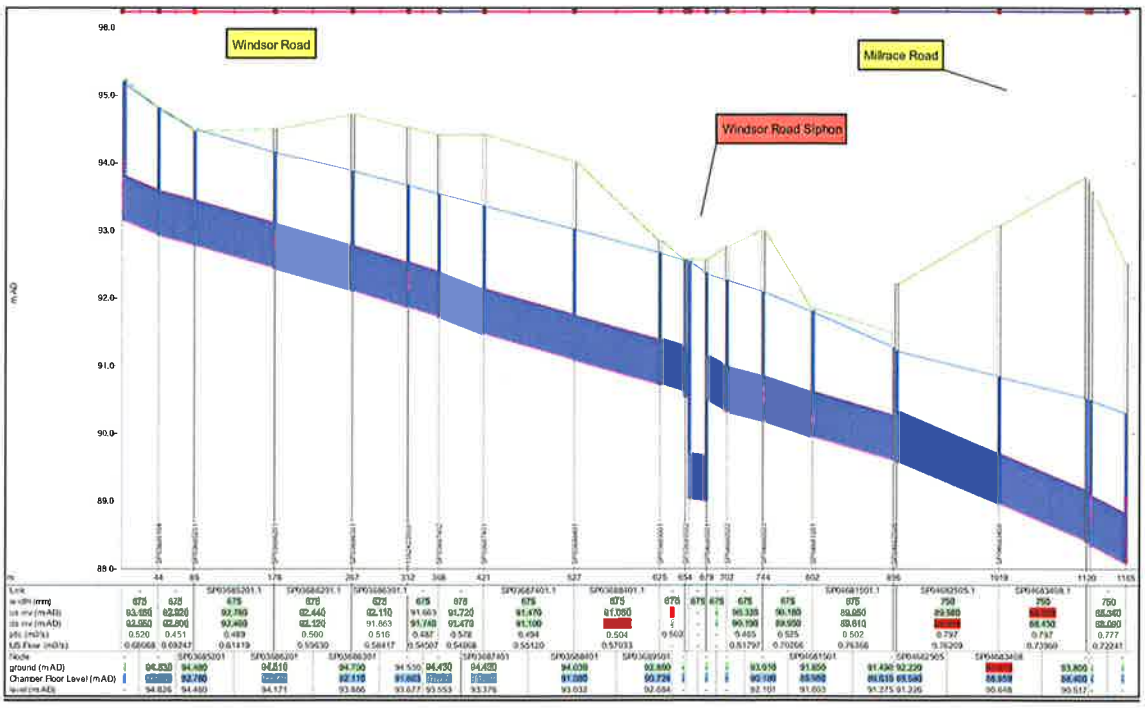
Sewer Details			Existing Flows			Ex. + 5.3 l/s Development Flow		
Sewer Run (Manhole to Manhole)	Pipe Size (mm)	Pipe full Cap. (l/s)	Surcharge/ Flood RP (X >30yr)	Flood Volume (m^3) M30-60	Max Flow M30-60	Surcharge/ Flood RP (X >30yr)	Flood Volume (m^3) M30-60	Max Flow M30-60
FOUL/COMBINED SEWER								
Salters Lane								
4802 to 4905	225	47	X – X	-	18	X – X	-	24
4905 to 4904	225	79	X – X	-	20	X – X	-	25
4904 to 5908	375	183	X – X	-	21	X – X	-	26
5908 to 5907	450	210	X – X	-	67	X – X	-	72
5907 to 5905	450	194	X – X	-	72	X – X	-	77
5905 to 6807	450	247	X – X	-	74	X – X	-	79
6807 to 6805	450	227	X – X	-	77	X – X	-	83
Willow Way								
6805 to 6806	450	216	X – X	-	77	X – X	-	83
6806 to 7803	450	225	X – X	-	77	X – X	-	83
7803 to 7707	450	233	X – X	-	77	X – X	-	83
Batchley Road								
7707 to 8805	525	350	X – X	-	203	X – X	-	208
8805 to 9805	525	359	X – X	-	203	X – X	-	214
9805 to 9801	600	355	X – X	-	208	X – X	-	214
9801 to 0909	600	432	X – X	-	208	X – X	-	214
0909 to 0803	675	537	X – X	-	209	X – X	-	214
0803 to 0804	675	857	X – X	-	392	X – X	-	397
0804 to 0908	675	675	30 – X	-	392	30 – X	-	398
0908 to 1903	600	499	20 – X	-	386	20 – X	-	392
1903 to 2905	600	531	10 – X	-	390	10 – X	-	394
2905 to 2003	600	532	5 – X	-	448	5 – X	-	453
2003 to 3001	600	509	2 – X	-	448	2 – X	-	453
3001 to 4103	675	694	2 – X	-	448	2 – X	-	453
4103 to 4104	675	576	2 – X	-	425	2 – X	-	429
4104 to 4102	675	599	2 – X	-	425	1 – X	-	429
Windsor Road								
4102 to 5104	675	520	1 – X	-	680	1 – X	-	681
5104 to 5201	675	451	1 – X	-	692	1 – X	-	693
5201 to 6201	675	489	1 – 5	297.9	614	1 – 2	305.2	614
6201 to 6301	675	500	1 – X	-	595	1 – X	-	596
6301 to 3959	675	516	1 – X	-	581	1 – X	-	584
3959 to 7402	675	487	1 – X	-	543	1 – X	-	546
7402 to 7401	675	578	1 – X	-	547	1 – X	-	549
7401 to 8401	675	494	1 – X	-	549	1 – X	-	571
8401 to 9501	675	504	1 – X	-	569	1 – X	-	572
9501 to 9502	675	502	1 – X	-	571	1 – X	-	573
9502 to 9503	675	313	1 – X	-	579	1 – X	-	581
9503 to 0501	675	200	1 – X	-	578	1 – X	-	579
0501 to 0502	675	676	1 – X	-	576	1 – X	-	578
0502 to 0503	675	465	1 – X	-	614	1 – X	-	619
Middlehouse Lane								
0503 to 1501	675	525	2 – X	-	699	2 – X	-	703
1501 to 2506	675	502	2 – X	-	759	2 – X	-	764
2506 to 2505	675	0	5 – X	-	759	5 – X	-	764
2505 to 3408	750	798	5 – X	-	758	5 – X	-	763
Millrace Road								
3408 to 4412	750	797	5 – X	-	735	5 – X	-	741
4412 to 4411	890 x 750	1737	2 – X	-	722	2 – X	-	730
4411 to 4410	750	769	2 – X	-	716	2 – X	-	724
Forge Mill Road								

2. HYDRAULIC MODEL - SIMULATION RESULTS continued……

1. Existing Flows - Long Section – M30-60



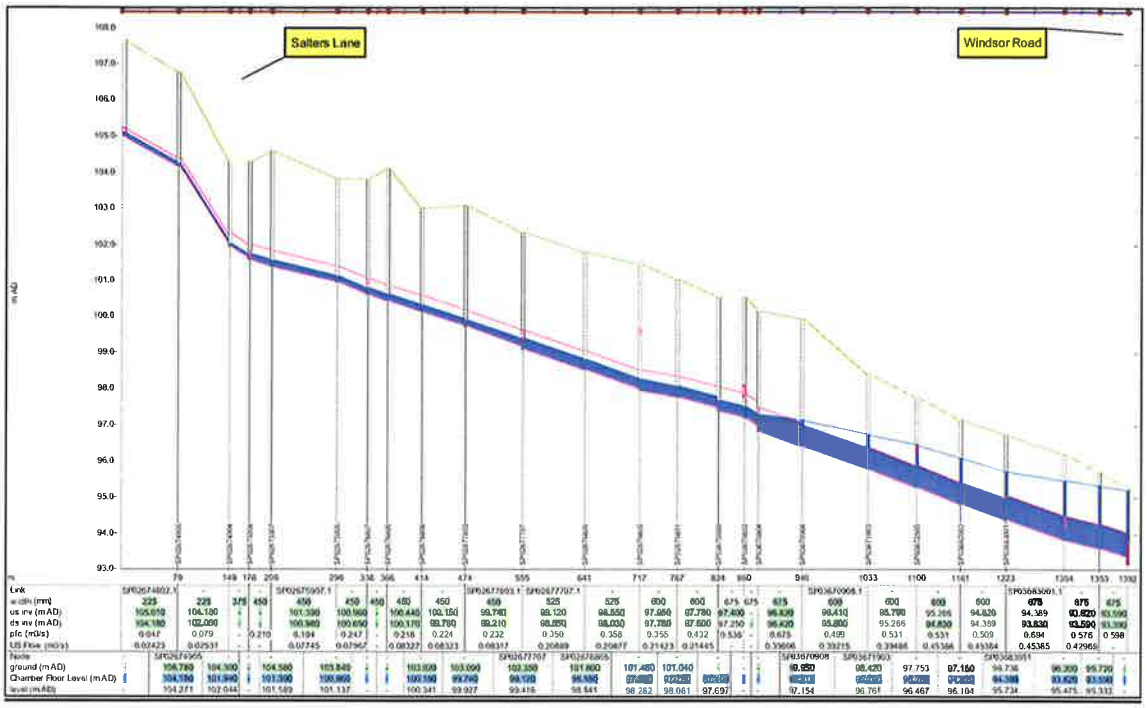
1.1 Foul Sewer – Salters Lane to Windsor Road - M/H's 4802 to 4102



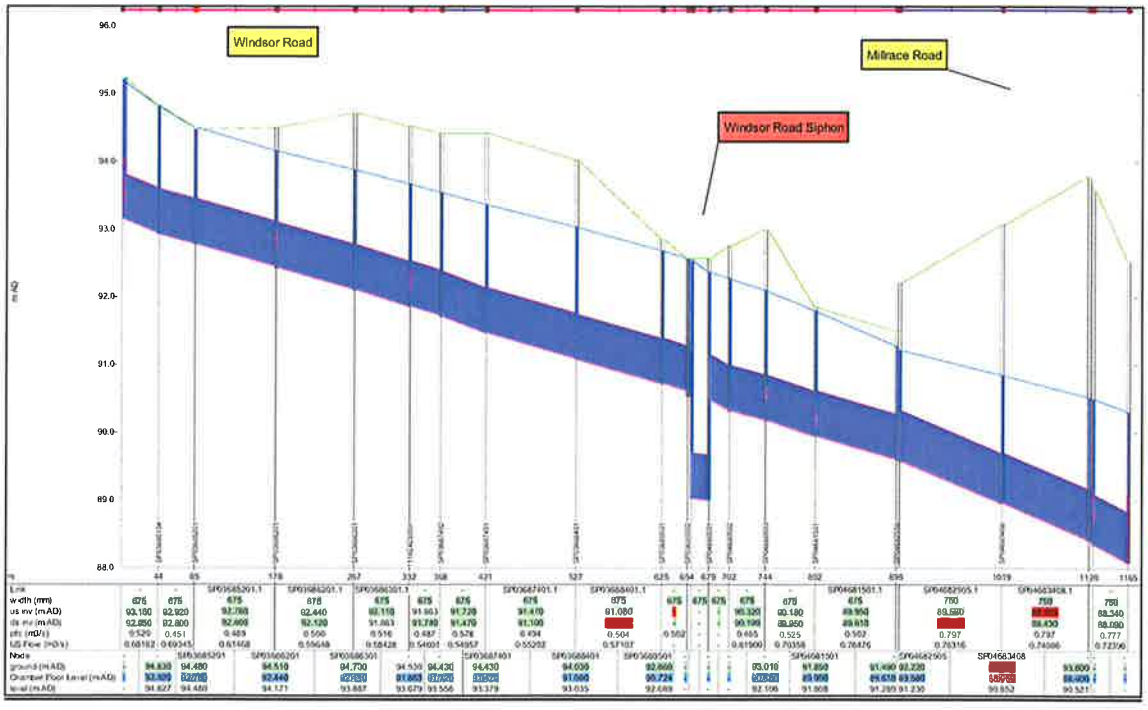
1.2 Foul Sewer – Windsor Road to Forge Mill Road - M/H's 4102 to 4410

2. HYDRAULIC MODEL - SIMULATION RESULTS continued……

1. Existing + 5.3 l/s DEVELOPMENT Flow - Long Section – M30-60



1.3 Foul Sewer – Salters Lane to Windsor Road - M/H's 4802 to 4102



1.4 Foul Sewer – Windsor Road to Forge Mill Road - M/H's 4102 to 4410

2. HYDRAULIC MODEL - SIMULATION RESULTS continued……

Senario 2. - Performance of Foul/Combined Sewer + 4.4 l/s Dev. Foul Flow

Sewer Details			Existing Flows			Ex. + 4.4 l/s Development Flow		
Sewer Run (Manhole to Manhole)	Pipe Size (mm)	Pipe full Cap. (l/s)	Surcharge/ Flood RP (X >30yr)	Flood Volume (m^3) M30-60	Max Flow M30-60	Surcharge/ Flood RP (X >30yr)	Flood Volume (m^3) M30-60	Max Flow M30-60
FOUL/COMBINED SEWER								
Salters Lane								
4802 to 4905	225	47	X – X	-	18	X – X	-	23
4905 to 4904	225	79	X – X	-	20	X – X	-	24
4904 to 5908	375	183	X – X	-	21	X – X	-	25
5908 to 5907	450	210	X – X	-	67	X – X	-	71
Beech Tree Close								
5907 to 5905	450	194	X – X	-	72	X – X	-	76
5905 to 6807	450	247	X – X	-	74	X – X	-	78
6807 to 6805	450	227	X – X	-	77	X – X	-	82
Willow Way								
6805 to 6806	450	216	X – X	-	77	X – X	-	82
6806 to 7803	450	225	X – X	-	77	X – X	-	82
7803 to 7707	450	233	X – X	-	77	X – X	-	82
Batchley Road								
7707 to 8805	525	350	X – X	-	203	X – X	-	207
8805 to 9805	525	359	X – X	-	203	X – X	-	207
9805 to 9801	600	355	X – X	-	208	X – X	-	213
9801 to 0909	600	432	X – X	-	208	X – X	-	213
0909 to 0803	675	537	X – X	-	209	X – X	-	213
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0908 to 1903	600	499	20 – X	-	386	20 – X	-	391
1903 to 2905	600	531	10 – X	-	390	10 – X	-	394
2905 to 2003	600	532	5 – X	-	448	5 – X	-	452
2003 to 3001	600	509	2 – X	-	448	2 – X	-	452
3001 to 4103	675	694	2 – X	-	448	2 – X	-	452
4103 to 4104	675	576	2 – X	-	425	2 – X	-	428
4104 to 4102	675	599	2 – X	-	425	1 – X	-	428
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7402 to 7401	675	578	1 – X	-	547	1 – X	-	549
7401 to 8401	675	494	1 – X	-	549	1 – X	-	551
8401 to 9501	675	504	1 – X	-	569	1 – X	-	570
9501 to 9502	675	502	1 – X	-	571	1 – X	-	572
9502 to 9503	675	313	1 – X	-	579	1 – X	-	581
9503 to 0501	675	200	1 – X	-	578	1 – X	-	579
0501 to 0502	675	676	1 – X	-	576	1 – X	-	578
0502 to 0503	675	465	1 – X	-	614	1 – X	-	618
Middlehouse Lane								
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Millrace Road								
3408 to 4412	750	797	5 – X	-	735	2 – X	-	740
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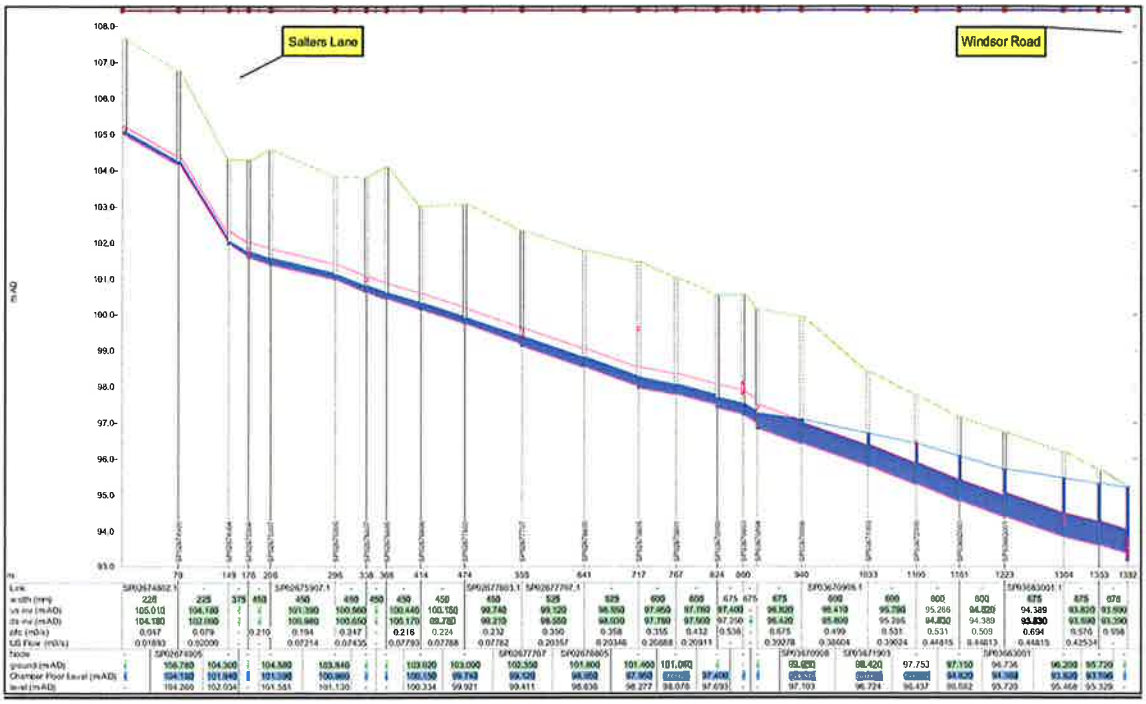
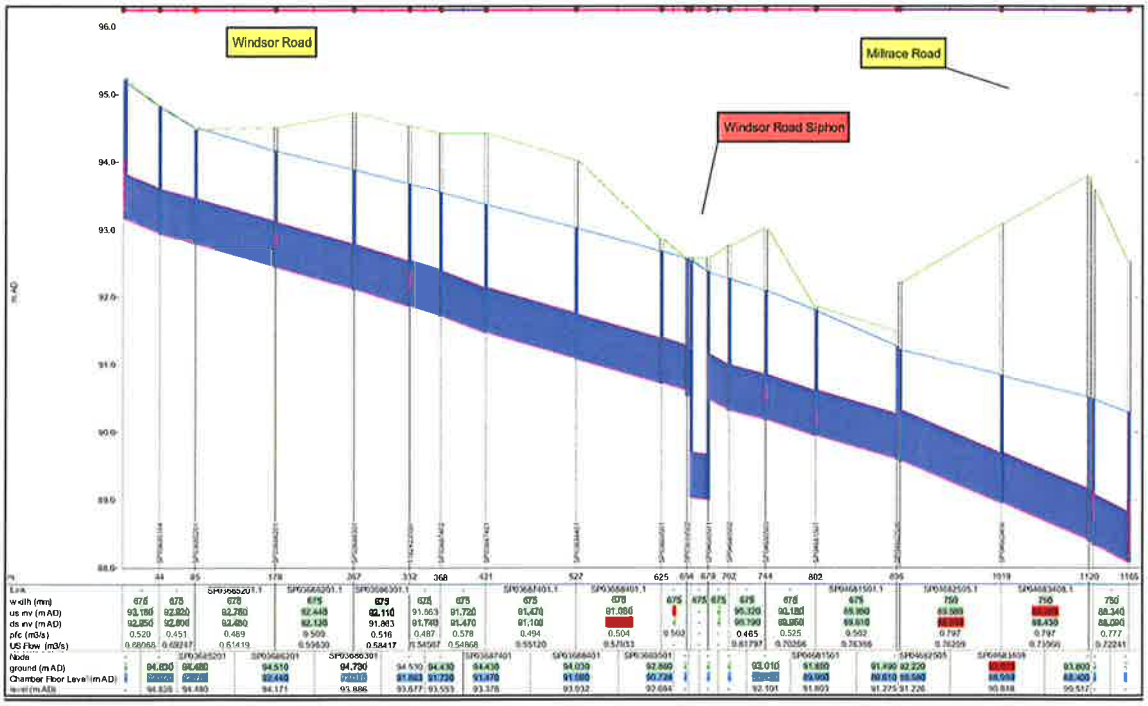
Forge Mill Road								

2. HYDRAULIC MODEL - SIMULATION RESULTS continued.....

1. Existing Flows - Long Section – M30-60



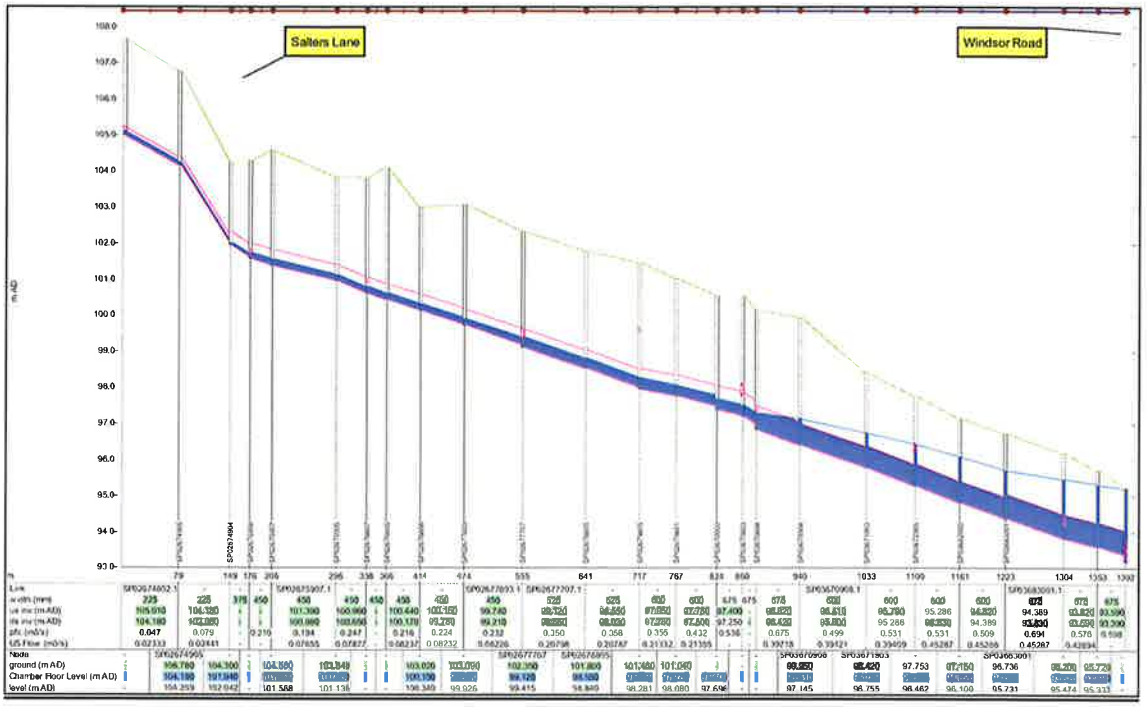
2.1 Foul Sewer – Salters Lane to Windsor Road - M/H's 4802 to 4102



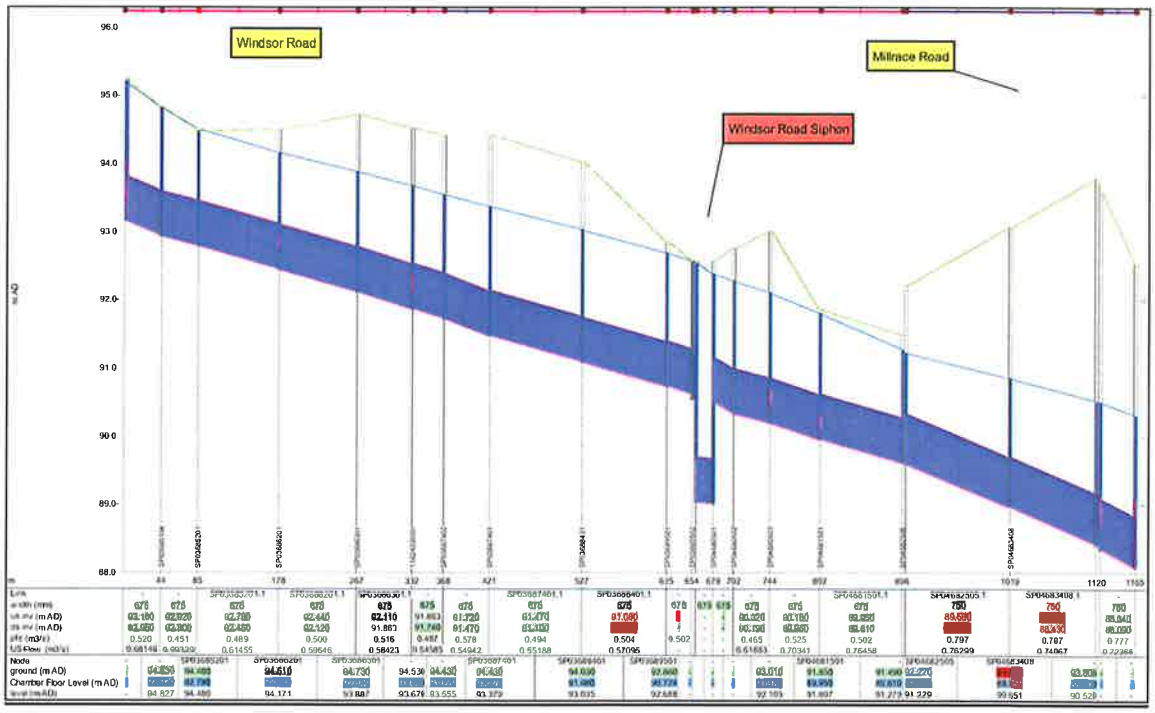
2.2 Foul Sewer – Windsor Road to Forge Mill Road - M/H's 4102 to 4410

2. HYDRAULIC MODEL - SIMULATION RESULTS continued……

2. Existing + 4.4 l/s DEVELOPMENT Flow - Long Section – M30-60



2.3 Foul Sewer – Salters Lane to Windsor Road - M/H's 4802 to 4102



2.4 Foul Sewer – Windsor Road to Forge Mill Road - M/H's 4102 to 4410

3. CONCLUSIONS & RECOMMENDATIONS

Conclusions: **Hydraulic Performance of FWS**

Existing FWS: The model indicates that the hydraulic performance of the existing foul sewer downstream of the proposed connection point in Salters Lane to Windsor Road is generally satisfactory, with surcharging predicted in a 2 year event in Batchley Road.

However, the model shows that sewer downstream of Windsor Road is overloaded in storm conditions with surcharging predicted in 1 year event.

Flooding is also predicted in a 5 year event from manhole No. 5201 in Windsor Road, however, there are no sewer flooding incidents recorded in this location and therefore the predicted flooding cannot be verified.

Senario 1 – 5.3 l/s into Salters Lane:

The model was re-run with the existing, plus a development site flow of 5.3 l/s added to the existing gravity sewer in Salters Lane at existing manhole No. 4802.

This resulted in a general increase in the level & frequency of surcharge in the sewers downstream of proposed connection point and the predicted flood volume from manhole No. 5201 is nominally increased.

We would therefore conclude that although adding a development site flow of 5.3 l/s to the sewer in Salters Lane increases the potential risk of flooding from the downstream sewers, the overall effect on the hydraulic performance is minimal.

Senario 2 – 4.4 l/s into Salters Lane:

The model was again re-run with the existing, plus a development site flow of 4.4 l/s added to the existing gravity sewer in Salters Lane at existing manhole No. 4802.

Again this resulted in a general increase in the level & frequency of surcharge in the sewers downstream of proposed connection point and the predicted flood volume from manhole No. 5201 is nominally increased.

We would therefore conclude that although adding a development site flow of 4.4 l/s to the sewer in Salters Lane increases the potential risk of flooding from the downstream sewers, the overall effect on the hydraulic performance is minimal.

Recommendations:

The model suggests that the existing combined sewer downstream of Winsor Road is already overloaded in storm conditions, however, the effect of the Senario 1 or 2 flows have a minimal impact on the overall hydraulic performance of the existing sewer system.

Therefore with this in mind we would make the following recommendations;

- **Senario 1 & 2:** - that the foul water flows from either Senario's 1 or 2 be allowed to connect to the existing foul water sewer in Salters Lane, **at/or in the vicinity of manhole No. SP0267_4802 and subject to maximum allowable discharge rate of 5.3 l/s**.

However, the final decision on this matter lies with your Asset Protection contact, which in this case is Ken Rogers. We would therefore recommend that you discuss this with Ken at the earliest opportunity, quoting our Ref. No. WT27023.

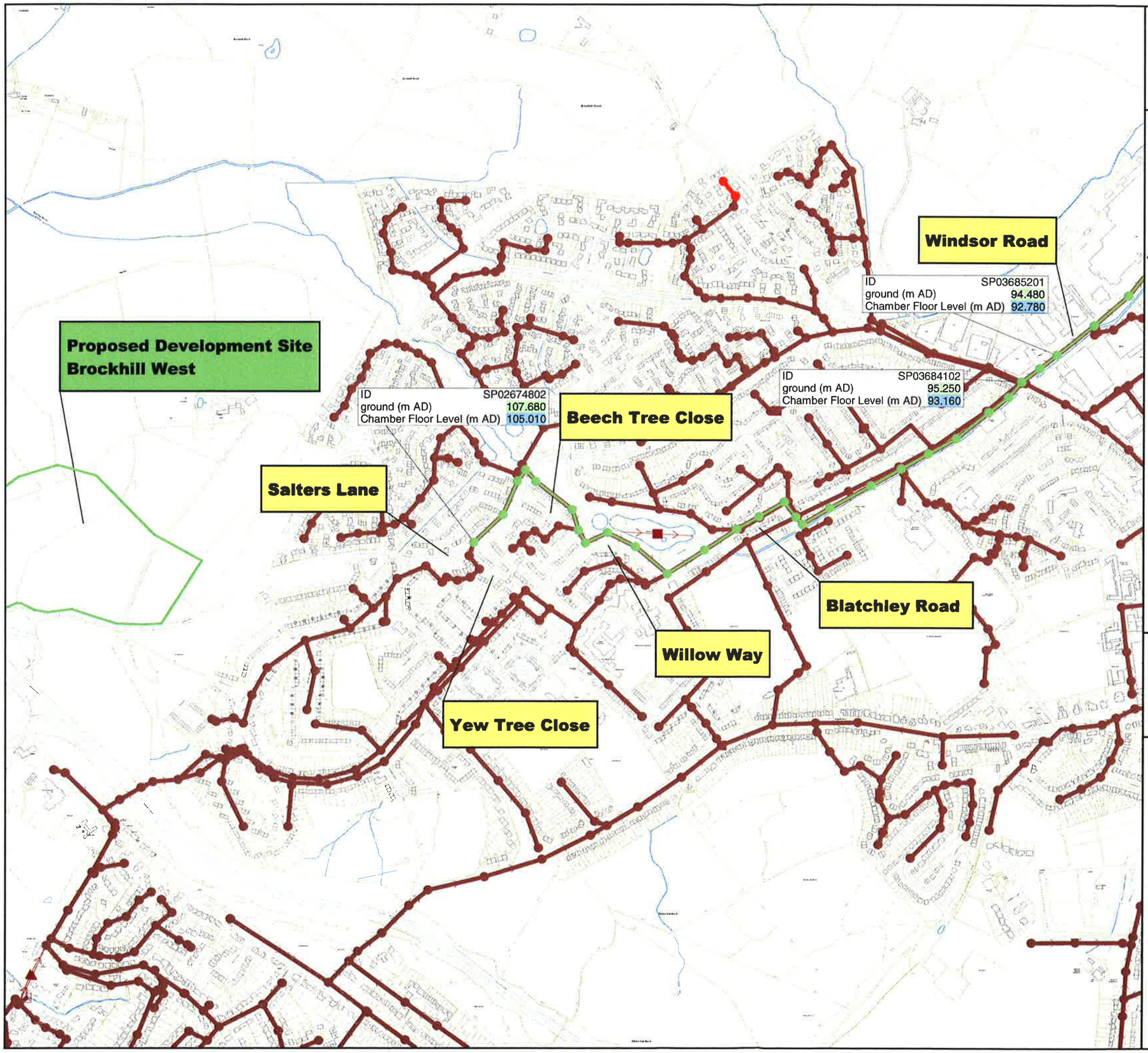
4. Appendices

A. Site Location Plan – 1 : 10,000 @ A3
B. Route of Salters Lane FWS – Model Plan – 1 : 7500 @ A3

APPENDIX B

PROPOSED DEVELOPMENT SITE
BROCKHILL WEST, REDDITCH

ROUTE OF SALTERS LANE FWS - MODEL PLAN



Data Flags
- #A - Asset Data
- #D - System Default
- - Data from GeoPlan
- #I - Model Import
- #V - CSV Import
- CC - Data from CCTV Survey
- FS - Data from Flow Survey
- GS - Data from Global Surveys
- IE - Inferred Data
- MO - Original Model Data
- SR - Data amened by Steve Ralph
- UA - Data from UADMS

Brockhill West Scenario 1 (Spemal Existing System Needs #3)

Key

Nodes [system types]
- [combined]
- [foul]
- [other]
- [overland]
- [storm]

Links [system types]
- CC TV
- Conduit [combined]
- Conduit [foul]
- Conduit [other]
- Conduit [overland]
- Conduit [storm]
- Culvert Inlet [combined]
- Culvert Inlet [foul,overland]
- Culvert Inlet [other]
- Culvert Inlet [storm]
- Culvert Outlet [combined,foul,other,overland]
- Culvert Outlet [storm]
- Flap valve [combined,foul,other,overland]
- Flap valve [storm]
- Flume [all]
- General Line
- General Line
- Orifice [all]
- Prune [all]
- Pump (all types) [all]
- River [all]
- Screen [all]
- Siphon [all]
- Sluice gate [all]
- User Control [all]
- Weir [all]

Subcatchments [system types]
- [combined]
- [foul]
- [other]
- [overland]
- [storm]
- 2D Simulation Polygon
- Flood Compartment
- Mesh Polygon
- Polygon Zone
- Roughness Polygon

Symbols
- 2D Point Selection Point
- Break Node
- Compound Weir/Orifice
- Flood Point
- Hyperlink
- Outflow Node
- Pond node
- Storage Node
- Var. crest level weir
- Var. sluice gate
- Var. width weir
- Vortex
- Link Arrows: Direction

Map Centre Coords
x: 402596, y: 267877
Date Printed: 04/01/2011
Scale 1:7500

100m

SEVERN TRENT WATER

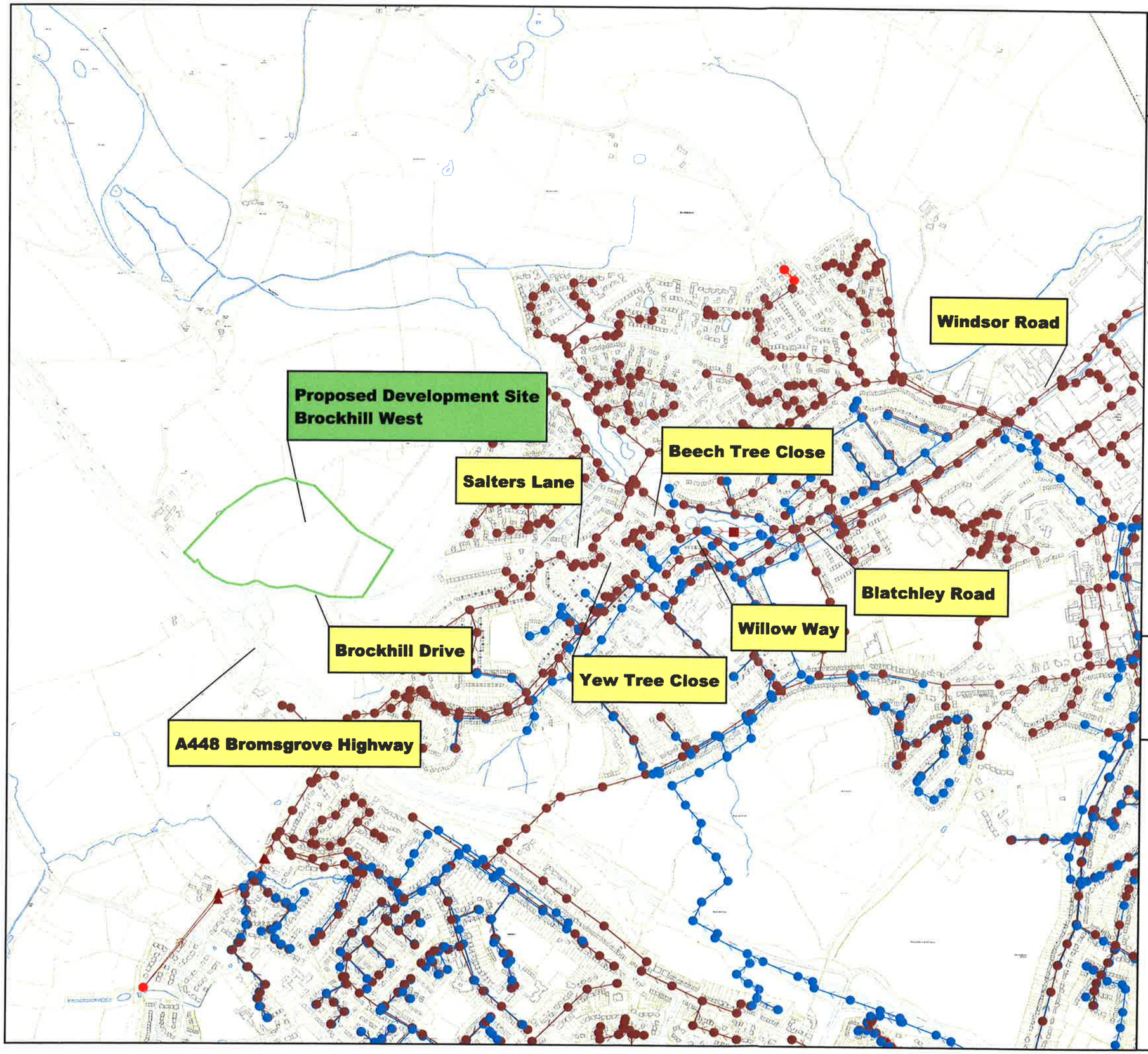
OPERATIONS MODELLING

Do not scale off drawing:
Disclaimer:
1. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution system.

APPENDIX A

PROPOSED DEVELOPMENT SITE
BROCKHILL WEST, REDDITCH

SITE LOCATION PLAN



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Brockhill West Scenario 1 (Spemal Existing System Needs #3)

Key

Nodes [system types]
- [combined]
- [foul]
- [other]
- [overland]
- [storm]

Links [system types]
- CC TV
- Conduit [combined]
- Conduit [foul]
- Conduit [other]
- Conduit [overland]
- Conduit [storm]
- Culvert Inlet [combined]
- Culvert Inlet [foul,overland]
- Culvert Inlet [other]
- Culvert Inlet [storm]
- Culvert Outlet [combined,foul,other,overland]
- Culvert Outlet [storm]
- Flap valve [combined,foul,other,overland]
- Flap valve [storm]
- Flume [all]
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- General Line
- Orifice [all]
- Prune [all]
- Pump (all types) [all]
- River [all]
- Screen [all]
- Siphon [all]
- Sluice gate [all]
- User Control [all]
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- [combined]
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- Flood Point
- Hyperlink
- Outflow Node
- Pond node
- Storage Node
- Var. crest level weir
- Var. sluice gate
- Var. width weir
- Vortex
- Link Arrows: Direction

Map Centre Coords
x: 402345, y: 267875
Date Printed: 04/01/2011
Scale 1:10000

500m

SEVERN TRENT WATER

OPERATIONS MODELLING

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