

**Vertu Motors
Mercedes Reading
Richfield Avenue
RG1 8EQ**

Drainage Strategy



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Ref: NP/1871/DS

Date: January 2018

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CHECKED:	NP	18.01.18
APPROVED:	NP	18.01.18
REPORT REF NO.:		NP/1871/DS
STATUS:		Final

CONTENTS PAGE

- 1.0 Introduction
- 2.0 Surface Water Drainage
- 3.0 Proposed Surface Water Strategy
- 4.0 Foul Water Drainage
- 5.0 Proposed Foul Water Strategy

Appendices

- Appendix A Existing drained area and existing drainage infrastructure
- Appendix B Indicative drainage layout
- Appendix C Drainage calculations

1.0 Introduction

This document has been produced in addition to the Flood Risk Assessment for the site undertaken by RPS dated 29/11/2017 and referenced CLE30189\05\01. That report covers the background to the site including location, history, flooding, drainage and mitigation measures and these will therefore not be covered here unless specifically required. Any text taken from that report and used within this document will be referenced so.

2.0 Surface Water Drainage

Existing Drainage Infrastructure

Extract taken from the RPS FRA...

The records also show a large diameter surface water sewer running west to east near the southern boundary of the site. This becomes a culverted watercourse running south-east along Newport Road and presumably discharges into the River Thames further south. It is presumed that surface water runoff from the site is drained into this.

We are awaiting confirmation of a full drainage survey of the site, but a review of the above ground topography and application of logic would suggest that a connection to the public surface water sewer at existing manhole 9351 is the most likely discharge point. The sewer records are included under Appendix C of the RPS FRA and therefore not reproduced here.

Existing Surface Water Runoff

Extract taken from the RPS FRA...

The existing site is largely impermeable, consisting of two large buildings surrounded by hardstanding. Proposals are to extend one building onto an adjacent area of hardstanding. Impermeability and runoff volume will be unchanged. It is considered that, in these circumstances, restriction of outflow rate and volume will not be required.

Existing Surface Water Runoff Assessment

Runoff from the existing site has been estimated using the Modified Rational methodology. The calculated rates are provided in Table 3 below.

<i>Return Period</i>	<i>Unit Flow in Litres per Second per Hectare (l/s/Ha)</i>	<i>Flow in Litres per Second (l/s)</i>
<i>1 in 1 year</i>	<i>48.4</i>	<i>58.0</i>
<i>1 in 2 year</i>	<i>54.8</i>	<i>65.8</i>
<i>1 in 30 year</i>	<i>153.3</i>	<i>184.0</i>
<i>1 in 100 year</i>	<i>232.1</i>	<i>278.6</i>

Table 4: Existing Site Runoff Rates

A drawing showing the existing drained area and existing drainage infrastructure is included in Appendix A.

The winter rainfall acceptance profile maps included in the Wallingford Procedure show the site as lying within soil class 3, described as

- (i) Relatively impermeable soils in boulder and sedimentary clays, and in alluvium, especially in eastern England*
- (ii) Permeable soils with shallow ground-water in low lying areas.*
- (iii) Mixed areas of permeable and impermeable soils, in approximately equal proportions LANDIS information shows “loamy and clayey soils of coastal flats with naturally high groundwater” and naturally wet drainage.*

Mapping from the British Geological Survey shows an underlying geology of Pennine Lower Coal Measures overlain with Alluvium. All available data suggests that the potential for infiltration drainage will be small. The River Thames lies approximately 280m to the east of the site. Construction of a new surface water outfall to the river would involve disproportionate cost. It is presumed that surface water from the existing site is drained to the large diameter surface water sewer along the southern boundary, and it is recommended that this is retained. Given that there is no change in existing permeability or runoff, it is considered that regulation of runoff is not required.

Although there is no available intrusive ground investigation for the site the above review of the geology confirms that infiltration would be prohibitive.

3.0 Proposed Surface Water Strategy

The strategy proposed for the surface water drainage is in line with the recommendations within the FRA.

Extract taken from the RPS FRA...

The site is currently largely impermeable and the proposed alterations will not change this. It is believed that runoff from the site currently drains to the large diameter surface water sewer which runs close to the southern boundary, and it is intended to maintain this drainage connection. No change in runoff volume or rate is therefore envisaged and hence no surface water runoff management is considered necessary.

The site use and drained impermeable area, pre and post development, are very similar and although the layout will be adjusted slightly the principle will remain unchanged. The existing drainage is via gullies and channel drainage and collected below ground with a network of pipes which outfall to the existing Thames Water manhole reference 9351. The proposed drainage will require a large proportion of the existing drainage infrastructure to be rebuilt because of the alternative layout but the same philosophy of gullies / channel drains connected below ground will be used. An indicative drainage layout is included in Appendix B for reference.

The surface water network has been designed to not surcharge for a 1 year storm, not flood for a 30 year storm and not flood buildings for the 100 year storm. The simulation results provided in Appendix C show that this criterion has been met. The small amount of flooding that occurs during the 100 year event will be locally and temporarily stored above ground and not with 300mm of the finished floor levels.

4.0 Foul Water Drainage

Existing drainage Infrastructure

Extract taken from the RPS FRA...

Inspection of Thames Water's sewer records shows a 300mm diameter combined sewer running west to east parallel to Richfield Avenue, within the site boundary. It is presumed that foul flow from the site is drained into this.

Project No. : 1871
Project Title : Vertu Motors Reading
Document : Drainage Strategy
Date : 18 January 2018
Revision :



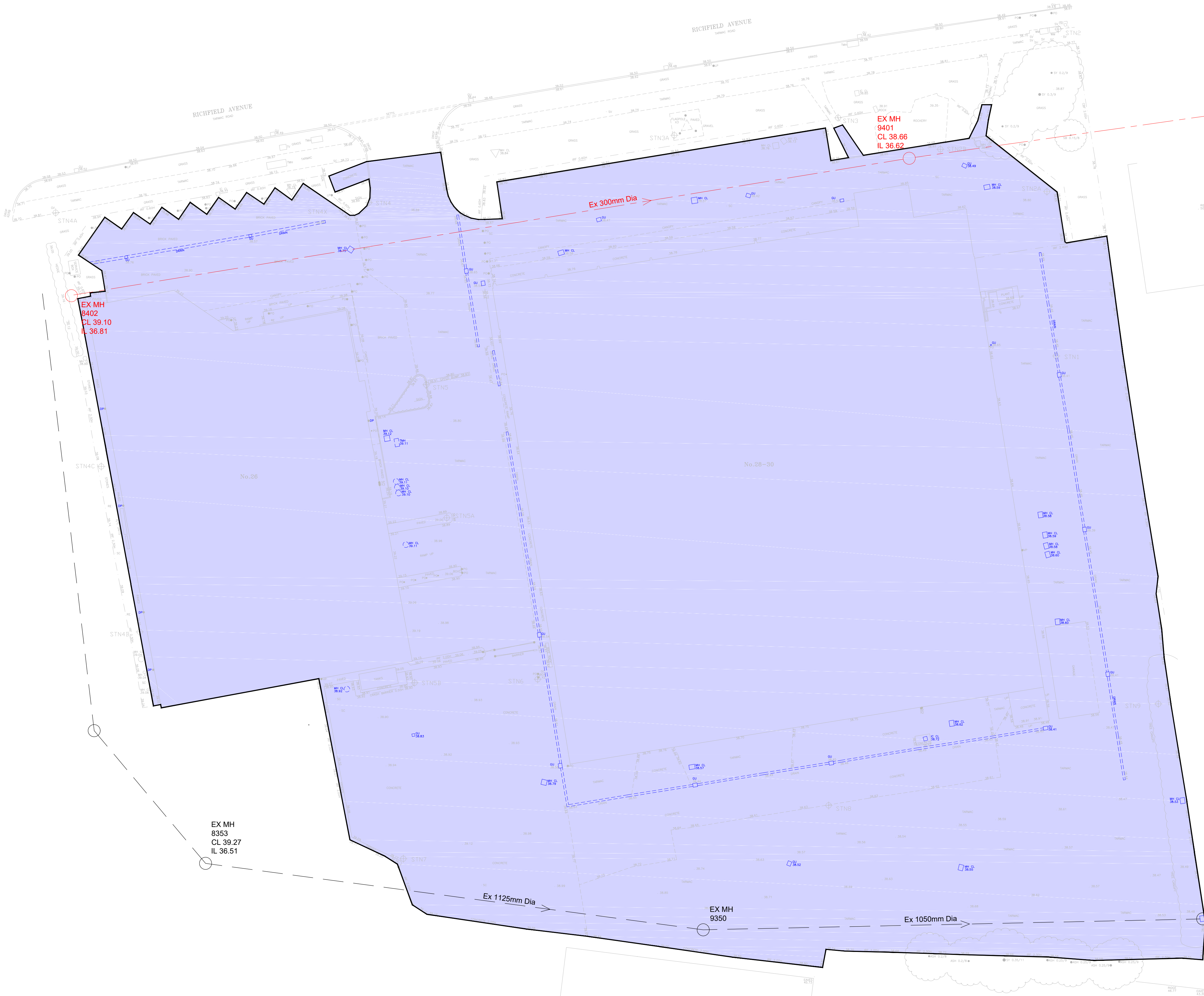
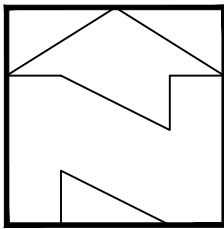
5.0 Proposed Foul Water Strategy

The proposed foul drainage strategy will be in line with the existing situation. The foul connections and drainage from the existing building will remain unchanged. The building that is being removed will have the redundant foul drainage capped or removed as appropriate. There will be some additional connections generated from washing facilities and these will be applied under a S106 application with Thames Water.

Project No. : 1871
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Appendix A Existing drained area and existing drainage infrastructure



NOTES

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant Architects, Engineers and Specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the Engineer immediately.

DRAINAGE KEY

- REPRESENTS EXISTING PUBLIC FOUL SEWER
- REPRESENTS EXISTING PUBLIC SURFACE SEWER
- REPRESENTS EXISTING ONSITE PRIVATE DRAINAGE
- EXISTING DRAINED IMPERMEABLE AREA (MEASURED AREA 11,450sqm)

P1	04.01.18	PRELIMINARY ISSUE	PJS	DAC	
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Project Title

**MERCEDES BENZ
RICHFIELD AVENUE,
READING**

Drawing Title

**EXISTING SITE
DRAINAGE**

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1:250	04.01.18	PJS	DAC

Drawing Status

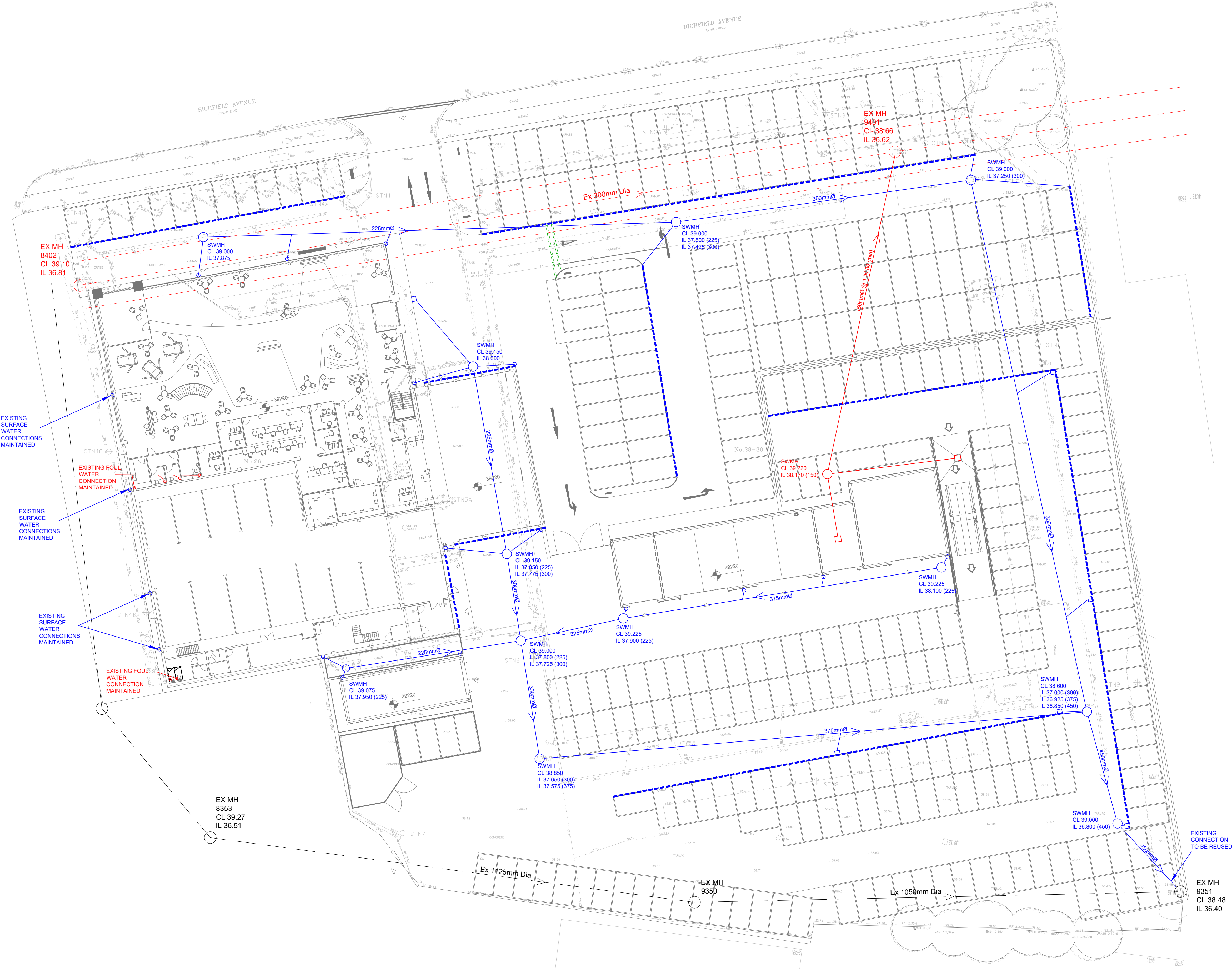
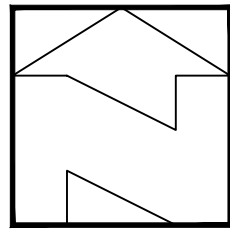
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Drawing No:	Revision
1871-105	P1

Project No. : 1871
Project Title : Vertu Motors Reading
Document : Drainage Strategy
Date : 18 January 2018
Revision :



Appendix B Indicative drainage layout



NOTES

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Project Title

**MERCEDES BENZ
RICHFIELD AVENUE,
READING**

Drawing Title

**PROPOSED INDICATIVE
DRAINAGE STRATEGY**

Scale	Date	Drawn	Authorised
1:250	04.01.18	PJS	DAC

Drawing Status

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Drawing No:	Revision
1871-110	P1

Project No. : 1871
Project Title : Vertu Motors Reading
Document : Drainage Strategy
Date : 18 January 2018
Revision :



Appendix C Drainage calculations

Lumax Consulting		Page 1
4 Harlaxton Drive Nottingham NG7 1JA		
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	18.700	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.725	4-8	0.417

Total Area Contributing (ha) = 1.142

Total Pipe Volume (m³) = 18.466

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	58.407	0.375	155.8	0.172	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	36.337	0.175	207.6	0.222	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	67.406	0.325	207.4	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.93	37.875	0.172	0.0	0.0	0.0	1.05	41.6	23.3
S1.001	50.00	5.49	37.425	0.394	0.0	0.0	0.0	1.09	76.9	53.4
S1.002	50.00	6.52	37.250	0.512	0.0	0.0	0.0	1.09	76.9	69.3

Lumax Consulting		Page 2
4 Harlaxton Drive Nottingham NG7 1JA		
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	22.800	0.150	152.0	0.101	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	9.876	0.050	197.5	0.121	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	13.869	0.075	184.9	0.097	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.003	68.024	0.650	104.7	0.148	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	14.000	0.035	400.0	0.163	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	4.47	38.000	0.101	0.0	0.0	0.0	0.81	14.4	13.7
S2.001	50.00	4.65	37.775	0.222	0.0	0.0	0.0	0.93	36.8	30.1
S2.002	50.00	4.85	37.650	0.319	0.0	0.0	0.0	1.15	81.5	43.2
S2.003	50.00	5.58	37.575	0.467	0.0	0.0	0.0	1.54	108.6	63.2
S1.003	50.00	6.75	36.775	1.142	0.0	0.0	0.0	1.01	160.7	154.6

Lumax Consulting	Page 3
4 Harlaxton Drive Nottingham NG7 1JA	
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.172	0.172	0.172
1.001	-	-	100	0.222	0.222	0.222
1.002	-	-	100	0.118	0.118	0.118
2.000	-	-	100	0.101	0.101	0.101
2.001	-	-	100	0.121	0.121	0.121
2.002	-	-	100	0.097	0.097	0.097
2.003	-	-	100	0.148	0.148	0.148
1.003	-	-	100	0.163	0.163	0.163
				Total	Total	Total
				1.142	1.142	1.142

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.003	S	38.650	36.740	36.750	0	0
--------	---	--------	--------	--------	---	---

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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Page 4



1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 0

Number of Storage Structures 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.700 Cv (Winter) 0.840

Ratio R 0.400

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep Fine Inertia Status OFF

DTS Status ON

DVD Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 0

PN

US/MH Name

Storm

Return Period

Climate Change

First (X) Surchage

First (Y) Flood

First (Z) Overflow

Overflow Act.

Water Level (m)

S1.000

S1 15

Winter

1

+0%

30/15 Summer

100/15 Summer

38.000

S1.001

S2 15

Winter

1

+0%

30/15 Summer

100/15 Winter

37.604

S1.002

S3 15

Winter

1

+0%

30/15 Summer

37.454

S2.000

S4 15

Winter

1

+0%

30/15 Summer

100/15 Summer

38.131

S2.001

S5 15

Winter

1

+0%

30/15 Summer

37.939

S2.002

S6 15

Winter

1

+0%

30/15 Summer

37.810

S2.003

S7 15

Winter

1

+0%

30/15 Summer

37.727

S1.003

S8 15

Winter

1

+0%

30/15 Summer

37.225

Surcharged Flooded

Pipe

US/MH

Depth

Volume

Flow / Overflow

Pipe

Level

PN

Name

(m)

(m³)

Cap.

(l/s)

(l/s)

Status

Exceeded

S1.000

S1

-0.100

0.000

0.56

22.6

OK

4

S1.001

S2

-0.121

0.000

0.65

46.1

OK

1

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for
Storm

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
S1.002	S3	-0.096	0.000	0.75		55.5	OK	4
S2.000	S4	-0.019	0.000	0.99		13.4	OK	
S2.001	S5	-0.061	0.000	0.87		26.8	OK	
S2.002	S6	-0.140	0.000	0.55		37.4	OK	
S2.003	S7	-0.148	0.000	0.50		52.1	OK	
S1.003	S8	0.000	0.000	1.08		113.0	OK	

Lumax Consulting		Page 6
4 Harlaxton Drive Nottingham NG7 1JA		
Date 04/01/2018 15:41 File Proposed Surface.MDX	Designed by Peter Stickley Checked by	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

	Profile(s)	Summer and Winter
	Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160
Return Period(s) (years)		1, 30, 100
Climate Change (%)		0, 0, 0

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1	15 Winter	30	+0%	30/15 Summer	100/15 Summer			38.906
S1.001	S2	15 Winter	30	+0%	30/15 Summer	100/15 Winter			38.570
S1.002	S3	15 Winter	30	+0%	30/15 Summer				38.274
S2.000	S4	15 Winter	30	+0%	30/15 Summer	100/15 Summer			39.008
S2.001	S5	15 Winter	30	+0%	30/15 Summer				38.545
S2.002	S6	15 Winter	30	+0%	30/15 Summer				38.382
S2.003	S7	15 Winter	30	+0%	30/15 Summer				38.273
S1.003	S8	15 Winter	30	+0%	30/15 Summer				37.396

PN	Surcharged		Flooded		Pipe		Status	Level Exceeded
	US/MH Name	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
S1.000	S1	0.806	0.000	0.99	39.7	FLOOD RISK	4	
S1.001	S2	0.845	0.000	1.28	90.8	SURCHARGED	1	

Lumax Consulting		Page 7
4 Harlaxton Drive Nottingham NG7 1JA		
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)			
S1.002	S3	0.724	0.000	1.57		115.1	SURCHARGED	
S2.000	S4	0.858	0.000	1.83		24.9	FLOOD RISK	4
S2.001	S5	0.545	0.000	1.80		55.2	SURCHARGED	
S2.002	S6	0.432	0.000	1.19		80.5	SURCHARGED	
S2.003	S7	0.398	0.000	1.14		118.5	SURCHARGED	
S1.003	S8	0.171	0.000	2.55		267.7	SURCHARGED	

Lumax Consulting		Page 9
4 Harlaxton Drive Nottingham NG7 1JA		
Date 04/01/2018 15:41 File Proposed Surface.MDX	Designed by Peter Stickley Checked by	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)			
S1.002	S3	1.143	0.000	1.84		135.1	SURCHARGED	
S2.000	S4	1.004	3.597	2.56		34.8	FLOOD	4
S2.001	S5	1.036	0.000	1.90		58.4	FLOOD RISK	
S2.002	S6	0.917	0.000	1.35		91.2	FLOOD RISK	
S2.003	S7	0.857	0.000	1.35		140.0	FLOOD RISK	
S1.003	S8	0.281	0.000	3.08		323.4	SURCHARGED	