



LAND AT TODDINGTON LANE, TODDINGTON

FOUL & SURFACE WATER DRAINAGE ASSESSMENT Final Report v1.1

May 2017

Weetwood Services Ltd
70 Cowcross Street
London
EC1M 6EJ



Report Title: **Land at Toddington Lane, Toddington**
Foul & Surface Water Drainage Assessment
Final Report v1.1

Client: Rabbit Waste Management Ltd

Date of Issue: 9 May 2017

Prepared by: James Aldridge BEng (Hons) MSc MCIWEM
Associate Director

Checked and
approved by: Rebecca Murphy BSc (Hons)
Associate Director

This document has been prepared solely as a Foul & Surface Water Drainage Assessment for Rabbit Waste Management Ltd. This report is confidential to Rabbit Waste Management Ltd and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by Rabbit Waste Management Ltd for the purposes for which it was originally commissioned and prepared.

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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd (“Weetwood”) has been instructed by Rabbit Waste Management Ltd to prepare a strategy for the disposal of foul and surface water from the proposed development of land at Toddington Lane, Toddington.

This strategy is informed by an assessment of existing sewerage infrastructure in the vicinity of the site and the projected demand of the proposed development.

1.2 REPORT STRUCTURE

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Presents national and local drainage policy
- Section 3** Provides background information relating to the development site
- Section 4** Provides background information relating to foul and surface water sewerage infrastructure
- Section 5** Presents a foul water drainage assessment for the development proposals, including calculations for provisional load estimations, potential connection points based on existing infrastructure and the proposed drainage layout
- Section 6** Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere
- Section 7** Presents a summary of key findings

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY

The aim of the National Planning Policy Framework (NPPF) is to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

Policy GEN9 – Foul and Surface Water Drainage of the Arun District Council Local Plan (2003) states that:

“Planning permission for development which will materially increase foul and/or surface water discharges will be refused unless the Local Planning Authority is satisfied that either adequate drainage capacity exists or appropriate drainage capacity can be provided as part of the development. Consideration should also be given to the use of Sustainable Urban Drainage Systems (SUDS) as alternatives to conventional drainage where appropriate.”

Policy W DM3 – Sustainable Urban Drainage Systems of the emerging Arun Local Plan 2011 – 2031 (2014) should also be considered and states that:

“To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of [SUDS], appropriate to the size of the development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include:

- *Green roofs*
- *Permeable driveways and parking*
- *Soakaways*
- *Water harvesting and storage features including water butts.*

Proposals for major development must also integrate SUDS within public open spaces and roads, in liaison with West Sussex County Council, (the SUDS Approval Body) or its agent. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area*
- b. Effectively manage water (including its quality)*
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and*
- d. Provide amenity for local residents (ensuring safe environment) and*
- e. Retain existing open drainage ditches in their current form.*

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.*
- g. Undertake up to six months groundwater monitoring within the winter period.*

- h. Undertake winter percolation testing in accordance with BRE365.*
- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.*
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.*
- k. Flow routes through the development must be demonstrated as a first stage in the design process, demonstrating how water will travel at or near the surface for three types of flow:*
 - Low flow routes: Once surface water run-off has been collected, cleaned and controlled in source control features it will either be stored where it fell as rain in permeable pavement, or flow onward to local storage structures. The day-to-day flows from these features should travel in low flow channels through the development in a controlled way contributing to landscape quality.*
 - Overflows: In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.*
 - Exceedance routes: When SUDS are overwhelmed by exceptional rainfall then exceedance routes protect people and property by providing unobstructed overland flow routes from the development and should be considered for all drainage schemes. The SUDS design must demonstrate that flow routes have been considered at each design stage to take into account the effect of proposed development on the natural flow pattern for the site. Exceedance routes should also be protected from future changes in land use."*

2.3 REQUIREMENTS FOR SUSTAINABLE DRAINAGE SYSTEMS

Sustainable Drainage Systems (SuDS) aim to mimic natural drainage and can achieve multiple objectives such as removing pollutants from urban runoff at source, controlling surface water runoff from developments, and ensuring that flood risk is not increased downstream. Combining water management with green space can provide amenity and biodiversity enhancement.

In considering a development that includes a sustainable drainage system, the local planning authority will need to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance.

According to Technical Standards¹ published by DEFRA, surface water drainage systems must be designed so that:

- Flooding does not occur on any part of the site for a 1 in 30 annual probability rainfall event, unless an area is designed to hold and/or convey water as part of the design;*
- Flooding does not occur in any part of a building during a 1 in 100 annual probability event; and*
- Flows resulting from rainfall in excess of a 1 in 100 annual probability rainfall event are managed in exceedance routes that minimise the risks to people and property, so far as is reasonably practicable.*

¹ Non-Statutory Technical Standards for Sustainable Drainage Systems, Defra, March 2015

- *For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.*
- *Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event*
- *Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body, the runoff volume must be discharged at a rate that does not adversely affect flood risk.*
- *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.*
- *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*
- *The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.*

3 SITE DETAILS

3.1 SITE DESCRIPTION

The 0.4 hectare (ha) site is located to the east of Granborough Road, Winslow, at Ordnance Survey National Grid Reference SP 767 273, as shown in **Figure 1**.

The site currently comprises areas of rough concrete, grass and spoil; with a barn located in the centre of the site.

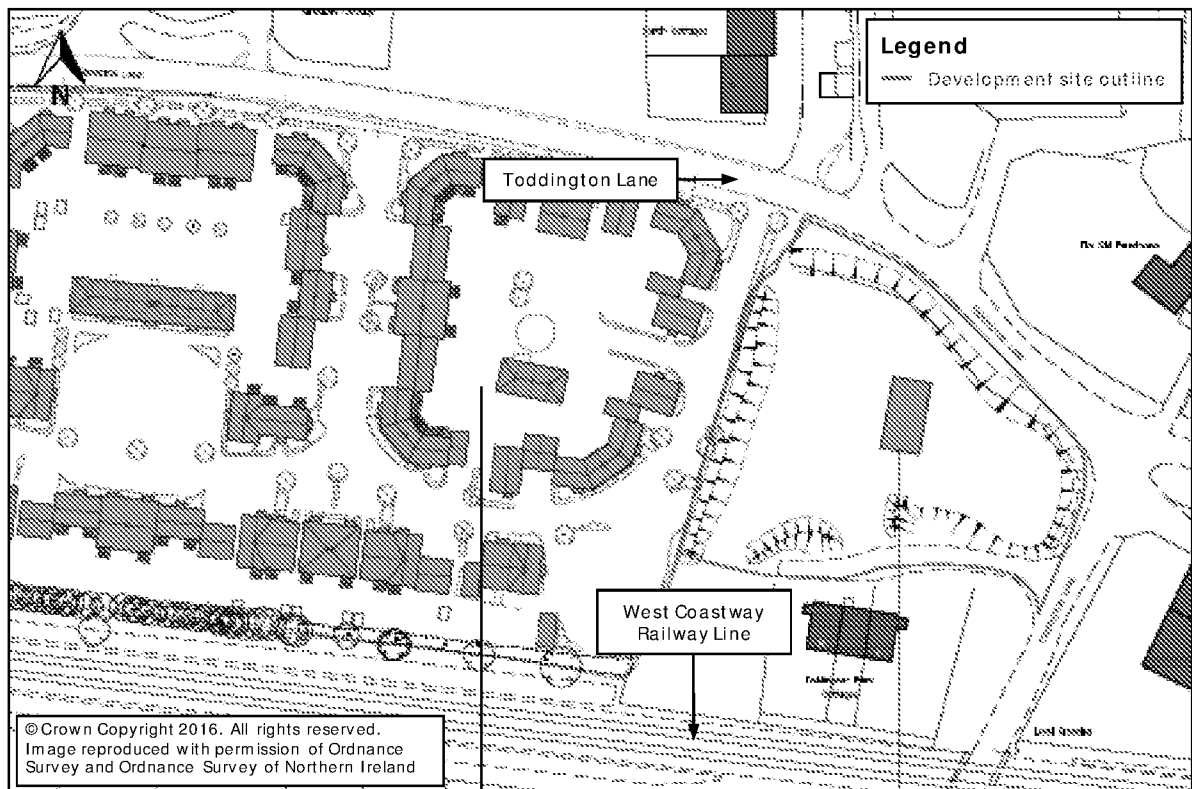


Figure 1: Site Location

3.2 PROPOSED DEVELOPMENT

The proposals are for the construction of 10 residential dwellings with associated gardens, access roads, parking and public open space. The development proposals are presented in **Appendix A**.

3.3 SITE LEVELS

Site levels are generally shown to range between approximately 4.8 metres Above Ordnance Datum (m AOD) and 7.3 m AOD. However, the site is shown to be embanked along its northern and eastern boundaries with levels falling approximately 1.5 m to Toddington Lane.

There is a small embankment along the western boundary of the site with a crest level of approximately 8.4 m AOD.

3.4 GROUND CONDITIONS

British Geological Survey (BGS) mapping indicates that the site is underlain by sand, silt and clay (River Terrace Deposits) and that the bedrock geology comprises chalk of the New Pit Chalk Formation.

Borehole records associated with the neighbouring development site² indicate that the superficial deposits comprise clay to depths ranging between 1.4 and 2.8 m below ground level (bgl). The clay deposits were found to be underlain by deposits of sand and the chalk bedrock.

Groundwater was encountered at 1.6 m bgl within a single exploratory hole adjacent to the site but was not encountered in other exploratory holes to depths in excess of 4.4 m bgl.

² Planning ref: LU/116/113

4 FOUL & SURFACE WATER SEWERAGE INFRASTRUCTURE

4.1 EXISTING APPARATUS

The local public sewer network is owned and operated by Southern Water. An extract of the public sewer record obtained from Southern Water is provided in **Figure 2** (refer to **Appendix B** for detailed record).

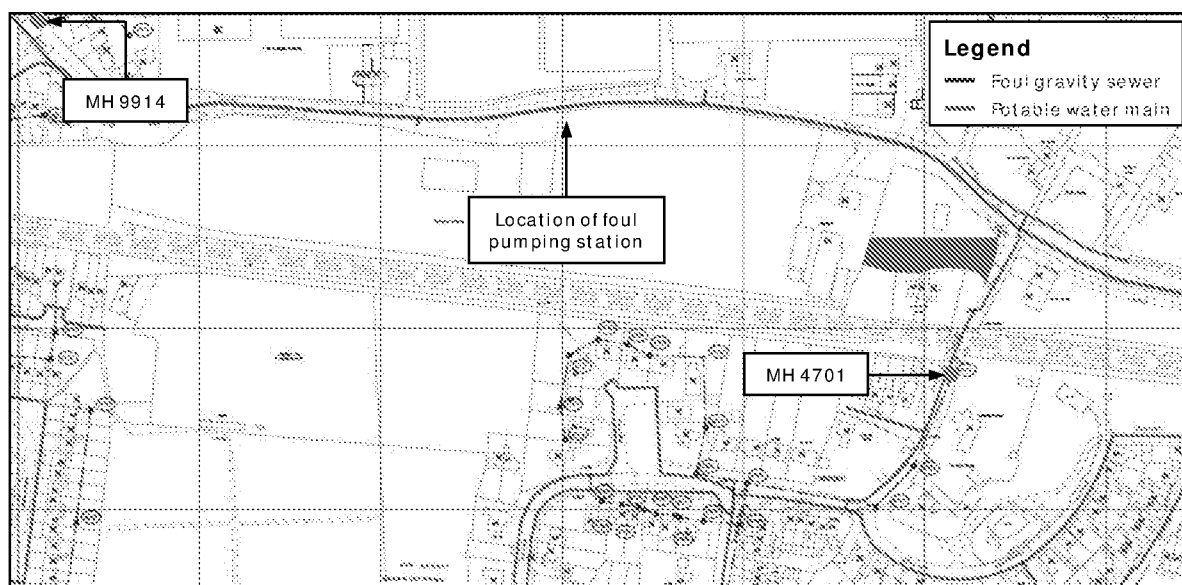


Figure 2: Wastewater Infrastructure

There are no surface water sewers in the vicinity of the development site. Details of existing foul water apparatus in the vicinity of the site, based upon the public sewer records, are summarised as follows:

- A foul gravity sewer is located along Toddington Lane to the south of West Coastway Railway Line. MH 4701 is located approximately 55 m south of the site entrance.
- It is understood that the foul water drainage network constructed to serve the neighbouring development site³ has been offered for adoption under a S104 agreement and includes a foul pumping station located adjacent to Toddington Lane approximately 175 m to the west of the site.
- A foul gravity sewer is located along Mill Lane approximately 485 m to the west of the site (MH 9914).

The position of the Southern Water apparatus shown by the sewer records indicates the general position and nature of their apparatus. The accuracy of this information cannot be guaranteed and a survey to determine the exact location of apparatus should be undertaken prior to the commencement of any construction work.

The proposed foul drainage network for the neighbouring development site is not currently presented on the public sewer record because the adoption process may not be complete.

³ Planning ref: LU/234/14/DOC

5 FOUL WATER DRAINAGE ASSESSMENT

5.1 FOUL WATER LOADINGS

5.1.1 Residential Development

The peak foul flow rate from the proposed residential development is estimated to be 0.5 litres per second using the approach set out in Sewers for Adoption (7th Edition).

The above approach assumes a total foul water loading of 4,000 litres/dwelling/day based on the following assumptions:

- Occupancy rate of 3 persons per dwelling
- Domestic loading of 200 litres per person per day
- An infiltration allowance of 10%
- An average to peak dry weather flow rate conversion factor of 6.

It is generally accepted that the Sewers for Adoption approach is conservative and overestimates loadings from new developments. A more realistic estimate of the peak foul flow rate can be derived using the calculation procedure presented by Urban Drainage (3rd Edition). This approach is based on the following assumptions:

- Occupancy rate of 2.3 persons per dwelling⁴
- Domestic loading of 150 litres per person per day⁵
- An infiltration allowance of 10%
- An average to peak dry weather flow rate conversion factor of 6.

Application of this latter approach provides a peak flow rate of 0.3 litres per second.

Notwithstanding the above, it is recognised that many water companies, including Southern Water, tend to apply the more conservative Sewers for Adoption approach.

5.2 NEW CONNECTIONS

Southern Water has confirmed by way of a letter dated 7 April 2017 (**Appendix C**) that there is currently adequate capacity in the local sewerage network to accommodate foul water from the development at or downstream of manholes MH 4701 or MH 9914 (see **Figure 2**).

Foul water may also be directed to the adoptable foul drainage network which has been constructed to serve the adjacent residential development site; subject to agreement with Southern Water following adoption of this system.

Based on an assessment of ground levels at and in the vicinity of the site; it is expected that foul water will have to be pumped from the site. A preliminary foul drainage layout presenting the options for disposal of foul water is provided by **Appendix D**.

⁴ 2011 Census: Population and household estimate for the United Kingdom, March 2011

⁵ British Water, Code of Practice, Flows and Loads - 4, 2013

6 SURFACE WATER MANAGEMENT

6.1 EXISTING FLOW REGIMES

Surface water runoff generated at the existing site would be expected to flow overland in a generally easterly direction prior to being intercepted by Toddington Lane where it would enter the highway drainage network.

In the event that the capacity of the highway drainage network is exceeded, water would be expected to pond adjacent to the north-east corner of the site within the Toddington Lane carriageway.

6.2 DISPOSAL OF SURFACE WATER

In accordance with the NPPF Planning Practice Guidance⁶, surface water runoff should be disposed of according to the following hierarchy:

1. Into the ground (infiltration)
2. To a surface water body
3. To a surface water sewer, highway drain, or another drainage system
4. To a combined sewer

There are no surface water bodies or sewers in the vicinity of the site to which surface water can be directed. However, borehole records (refer **Section 3.4**) in the vicinity of the site indicate that the area is underlain by permeable geology at depths in excess of 1.4 m bgl.

Based upon the above, it is proposed to dispose of surface water into the ground through the use of infiltration devices. Infiltration testing should be undertaken in accordance with BRE Digest 365 to confirm infiltration rates in the location of the proposed infiltration structures.

6.3 MANAGING SURFACE WATER WITHIN THE DEVELOPMENT

It is proposed to attenuate surface water generated across the proposed roof and hardstanding areas within a geo-cellular infiltration tank. However, runoff from the proposed access road will be managed through the use of a lined soakaway.

The proposed infiltration structures have been sized to store the 1 in 100 annual probability rainfall event; including a 30% increase in rainfall intensity in order to allow for climate change. A conservative estimate of infiltration rates (0.01 m/hr) has been adopted based on the infiltration testing undertaken in association with the neighbouring development site.

The preliminary drainage layout is presented in **Appendix D** and has been modelled using MicroDrainage (**Appendix E**). The total volume of storage provided by the geo-cellular storage tank and soakaway for the critical 1 in 100 annual probability rainfall events (+30%) has been calculated to be 130 m³.

In the event that the capacity of the proposed drainage system is exceeded, surface water would be directed off-site, away from the proposed dwellings towards the east.

⁶ Paragraph 080, Reference ID: 7-080-20150323

The potential for additional SuDS features to be utilised on the site may be investigated further at the detailed design stage.

6.4 MAINTENANCE OF SUDS

It is anticipated that the pipe network, geo-cellular storage crates and lined soakaway are to be maintained by a management company. An indicative maintenance schedule for the aforementioned SuDS features is presented by **Table 1**.

Table 1: Maintenance Requirements

Schedule	Required action	Frequency
Geo-cellular crates / lined soakaway		
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove sediment from pre-treatment structures, internal forbays and concrete manhole rings	Annually, or as required
Remedial action	Repair/rehabilitate inlets, outlets and vents	Annually, or as required
	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile	As required
Monitoring	Inspect/check all inlets, outlets and vents	Annually
	Check soakaway to ensure emptying is occurring	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required

7 SUMMARY

This foul and surface water drainage assessment has been prepared on behalf of Rabbit Waste Management Ltd for the proposed development of land at Toddington Lane, Toddington.

The peak foul flow rate from the site has been estimated to be 0.5 l/s using the approach set out in Sewers for Adoption (7th Edition).

Southern Water has confirmed that foul water may be directed to the public sewer network to the south or west of the site. Alternatively, foul water may be directed to the adoptable foul drainage network which has been constructed to serve the adjacent residential development site.

The illustrative surface water drainage scheme presented in this report provides SuDS elements to ensure that there will be no increase in peak surface water runoff rates and volumes as a result of the proposed development. The storage calculations may be refined at the detailed design stage and a final decision made on the types of storage to be provided.

APPENDIX A:

Development Proposals

Accommodation Schedule

Plot 1	3-Bedroom House	c. 94sqm
Plot 2	2-Bedroom House	c. 79sqm
Plot 3	2-Bedroom House	c. 79sqm
Plot 4	2-Bedroom Flat	c. 64sqm
Plot 5	2-Bedroom Flat	c. 69sqm
Plot 6	3-Bedroom House	c. 93sqm
Plot 7	4-Bedroom Townhouse	c. 117sqm
Plot 8	4-Bedroom Townhouse	c. 117sqm
Plot 9	4-Bedroom Townhouse	c. 117sqm
Plot 10	4-Bedroom Townhouse	c. 117sqm

Total 10no. Dwellings

Car Parking 1 space per Flat
2 spaces per House
Visitor Parking at 0.3 spaces per dwelling

Cycle Parking 2 spaces per dwelling in car barns and
Sheffield stands



Public Open Space 256sqm

11 steps @ 159.1mm rise, 400mm going

Open Car Barns to Plots 1-3 and 9-10

Red Line indicates edge of road - 1.5m wide footpath suggested
around northern site boundary with bank retained as required

Sheffield stand

Low level (0.6m) planting to access road entrance

Pedestrian priority shared surface
access road finished in block paving

Access maintained to and from
Toddington Cottages

Client's Name
Greg Blurton

Job Title
Land at Toddington Lane,
Toddington

Drawing Title
Site Layout
Proposed

Scale
1:500 @ A3

metres 5 10 15 20

Drawn	Checked	Date
SM	AK	20.01.17
Job No	Drawing No	Rev
6436	(00) 002	D

Status

APPROVAL

D	18.04.17	Updated for Planning	SM	AK
C	13.02.17	Planning Submission	PA	AK
B	13.02.17	Issued for Planning	SM	AK
A	20.01.17	Draft site plan issued for comments	SM	AK

Rev	Date	Revision Details	Dr	Ch
-----	------	------------------	----	----



London: Unit 1, West Coats House
3 Coats Street, London, E2 9AG
T 020 7729 5505 E london@ecearchitecture.com
Sussex: Brooklyn Chambers, 11 Goring Road
Worthing, West Sussex, BN12 4AP
T 01903 248777 E sussex@ecearchitecture.com
Bristol: Westworks, St. Nicholas House
31-34 High Street, Bristol, BS1 2AW
T 0117 315 8557 E bristol@ecwestworks.com
ECE Architecture
www.ecearchitecture.com

APPENDIX B:

Public Sewer Record

SEWER RECORDS PAGE 1 OF 2

103999



103711

003164

O.S. REF. TQ0303NW	Drawn by: yadavs	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. <i>WARNING: BAC pipes are constructed of Bonded Asbestos Cement</i> <i>WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement</i>		
	Scale: 1:1250			
Title: 236882_Toddington Lane, Little	Date: 13/03/2017	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.		

003636

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
1701X	7.33	6.31	100	VC	CIRC																		
2701X	5.87	3.53	150	VC	CIRC																		
2702X	6.65	4.77	150	VC	CIRC																		
2708X	7.05	5.31	150	VC	CIRC																		
2709X	7.31	5.41	150	VC	CIRC																		
270DX	6.88	5.11	150	VC	CIRC																		
2710X		5.5	150	VC	CIRC																		
2711X	7.36	5.59	150	VC	CIRC																		
2712X	7.38	6.67	100	VC	CIRC																		
3701X	4.6	2.93	225	CP	CIRC																		
3703X	4.01	3.18	225	CP	CIRC																		
4701X	4.84	3.38	225	CP	CIRC																		
4703X		3.23	150	VC	CIRC																		
4704X		1.36	225	VC	CIRC																		
4750X	6.01	3.93	450	GRC	CIRC																		
4751X	5.52	3.914	450	GRC	CIRC																		
4753X	5.78	4.1	375	GRC	CIRC																		
5702X		3.1	150	VC	CIRC																		
5703X		3	150	VC	CIRC																		
5704X		1.83	225	VC	CIRC																		
5705X		1.94	150	VC	CIRC																		
5706X		1.5	225	VC	CIRC																		
5751X	6.28	4.42	450	GRC	CIRC																		
5752X	5.65	4.54	225	VC	CIRC																		
5753X	6.3	4.13	450	GRC	CIRC																		

LINE STYLES / COLOURS

Brown	-----	Foul
	-----	Foul Siphon Sewer
	-----	Foul Vacuum Main
	-----	Foul Rising Main
Red	-----	Combined
	-----	Combined Siphon Sewer
	-----	Combined Rising Main
	-----	Lateral Drain
Orange	-----	Building Over Agreement Area
Dark Blue	-----	Treated Effluent
Purple	-----	Sludge
	-----	Sewer Catchment
	-----	Section 104 Area
Light Blue	-----	Surface Water
	-----	Surface Water Rising Main
Yellow	-----	Private
Green	-----	Access Shaft
	-----	Decommissioned

MATERIALS

AK	Alkaline
BAC	Bonded Asbestos Cement
BRD	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RFW	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vertifluid Clay
XXX	Other
ZZZ	Unknown

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Min-e (SW)
Flushing ch. Min-e (F&C)
Flushing ch. No-e (SW)
Flushing ch. No-e (F&C)
Demonstration Chamber

LEGEND - SEWERS

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Demiboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change In sewer (s)
Change In sewer
Reflex valve
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Balancing Pond

Wastewater treatment works
Marine treatment works
Outfall headworks
Vent
Vent column
Tidal storage tank
Blank end
Head of Public Sewer
Micro Pumping Station
SHAPES (S)
A Arched
B Barrel
C Circular
E Egg
H Horseshoe
R Rectangular
S Square
T Trapezoidal
U U Shape
X Other

1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
4th digit: next sequential node

Drawn by: yadavs	
Title: 236882_Toddington Lane, Little	
Date: 13/03/2017	

APPENDIX C:

Southern Water Letter



Weetwood Services Ltd.
70 Cowcross Street
London
EC1M 6EJ

Developer Services
Southern Water
Sparrowgrove House
Sparrowgrove
Otterbourne
Hampshire
SO21 2SW

Tel: 0330 303 0119

Email: developerservices@southernwater.co.uk

Your Ref:

Our Ref:

CC/003330

Date:

07 April 2017

F.A.O: Mr. Aldridge,

Site: Toddington Lane, Wick, Littlehampton, West Sussex, BN17 7PP.

Dear Mr. Aldridge,

I am now in receipt of the results of the capacity check you requested for the above development site.

FOUL WATER

Following initial investigations, there is currently adequate capacity in the local sewerage network to accommodate a foul flow for the above development at/downstream of manhole reference TQ03034701 and TQ02039914. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system.

Before any connection/s are made, an application form needs to be completed and approved by Southern Water Services.

Please let me know if we can be of any further assistance in this matter.

Yours faithfully,

David Akehurst
Developer Services

Please note: -

The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

APPENDIX D:

Preliminary Drainage Layout



- NOTES**
1. This drawing to be read in conjunction with all relevant Weetwood civil engineering drawings.
 2. Refer to Clifton Land Surveys drawing no. 6091996 dated October 2006 for topographical survey information.
 3. The Contractor should apply for sewer permits, road opening permits and discharge consents as necessary from the appropriate authorities prior to commencement on-site.

- LEGEND**
- Site boundary
- Proposed Private Surface Water Drainage**
- Proposed private surface water pipe
 - Proposed private surface water 450Ø PPIC
 - Proposed private surface water manhole
 - Proposed private geocellular storage tank
 - Proposed private lined soakaway
- Proposed Private Foul Water Drainage**
- Proposed private foul water pipe
 - Proposed private foul water manhole
 - Proposed private pumping station
 - Proposed private foul rising main

FOR INFORMATION

P1	04.05.17	Issued for Information	JA	TP
Rev	Date	Description	Drawn	Check

Weetwood
Development • Planning • Environment

70 Cowcross Street
London EC1M 6EJ
Tel 0203 757 5444
Fax 01352 756314
info@weetwood.net
www.weetwood.net

Drawing Status	Date	MAY 2017
PRELIMINARY	Scale	1:200@A1
Project	Drawn	JA
RABBIT WASTE MANAGEMENT TODDINGTON LANE TODDINGTON	Engineer	JA
Title	Project No	3710
DRAINAGE LAYOUT	Drawing No	100
	Revision	P1
Client Drawing No		N/A

APPENDIX E: MicroDrainage Outputs (Surface Water)

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	6.600	1.350	Open Manhole	1200	S1.000	5.250	150				
S2	6.700	1.565	Open Manhole	1200	S1.001	5.135	150	S1.000	5.135	150	
S3	6.750	1.650	Open Manhole	1200	S1.002	5.100	150	S1.001	5.100	150	
S4	6.800	1.580	Open Manhole	1200	S1.003	5.020	150	S1.002	5.020	150	
S5	6.450	1.495	Open Manhole	1200	S1.004	4.955	150	S1.003	4.955	150	
S6	5.250	0.800	Open Manhole	450	S2.000	4.450	150				
S7	5.250	0.890	Open Manhole	450	S2.001	4.360	150	S2.000	4.360	150	
S8	6.750	0.900	Open Manhole	450	S3.000	5.850	150				
S9	6.600	1.300	Open Manhole	450	S3.001	5.300	150	S3.000	5.300	150	
S10	6.400	1.895	Open Manhole	450	S3.002	4.505	150	S3.001	4.505	150	
S11	6.200	2.065	Open Manhole	1200	S3.003	4.135	150	S3.002	4.135	150	
S12	6.200	1.905	Open Manhole	450	S4.000	4.235	150				
S13	6.200	2.250	Open Manhole	1200	S3.004	3.950	150	S3.003	3.950	150	
								S4.000	3.950	150	
STANK	6.150	2.200	Open Manhole	1200	S1.005	3.950	150	S1.004	3.950	150	
								S2.001	3.950	150	
								S3.004	3.950	150	
SDUMMY	6.150	2.260	Open Manhole	0		OUTFALL		S1.005	3.890	150	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	6.600	5.250	1.200	Open Manhole	1200
S1.001	o	150	S2	6.700	5.135	1.415	Open Manhole	1200
S1.002	o	150	S3	6.750	5.100	1.500	Open Manhole	1200
S1.003	o	150	S4	6.600	5.020	1.430	Open Manhole	1200
S1.004	o	150	S5	6.450	4.955	1.345	Open Manhole	1200
S2.000	o	150	S6	5.250	4.450	0.650	Open Manhole	450
S2.001	o	150	S7	5.250	4.360	0.740	Open Manhole	450
S3.000	o	150	S8	6.750	5.850	0.750	Open Manhole	450
S3.001	o	150	S9	6.600	5.300	1.150	Open Manhole	450
S3.002	o	150	S10	6.400	4.505	1.745	Open Manhole	450
S3.003	o	150	S11	6.200	4.135	1.915	Open Manhole	1200
S4.000	o	150	S12	6.200	4.295	1.755	Open Manhole	450
S3.004	o	150	S13	6.200	3.950	2.100	Open Manhole	1200
S1.005	o	150	STANK	6.150	3.950	2.050	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	16.936	147.3	S2	6.700	5.135	1.415	Open Manhole	1200
S1.001	5.123	146.4	S3	6.750	5.100	1.500	Open Manhole	1200
S1.002	11.440	143.0	S4	6.600	5.020	1.430	Open Manhole	1200
S1.003	9.243	142.2	S5	6.450	4.955	1.345	Open Manhole	1200
S1.004	15.534	15.5	STANK	6.150	3.950	2.050	Open Manhole	1200
S2.000	13.008	144.5	S7	5.250	4.360	0.740	Open Manhole	450
S2.001	10.585	25.8	STANK	6.150	3.950	2.050	Open Manhole	1200
S3.000	14.023	25.5	S9	6.600	5.300	1.150	Open Manhole	450
S3.001	11.437	14.4	S10	6.400	4.505	1.745	Open Manhole	450
S3.002	5.586	15.1	S11	6.200	4.135	1.915	Open Manhole	1200
S3.003	2.815	15.2	S13	6.200	3.950	2.100	Open Manhole	1200
S4.000	5.224	15.1	S13	6.200	3.950	2.100	Open Manhole	1200
S3.004	1.000#	0.0	STANK	6.150	3.950	2.050	Open Manhole	1200
S1.005	8.359	139.3	SDUMMY	6.150	3.890	2.110	Open Manhole	0

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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	User	-	100	0.028	0.028	0.028
1.001	User	-	100	0.015	0.015	0.015
1.002	User	-	100	0.008	0.008	0.008
	User	-	100	0.004	0.004	0.012
	User	-	100	0.011	0.011	0.023
1.003	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.006	0.006	0.006
2.000	User	-	100	0.010	0.010	0.010
2.001	User	-	100	0.007	0.007	0.007
3.000	User	-	100	0.006	0.006	0.006
	User	-	100	0.006	0.006	0.011
3.001	User	-	100	0.005	0.005	0.005
3.002	User	-	100	0.005	0.005	0.005
3.003	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.007	0.007	0.007
3.004	User	-	100	0.014	0.014	0.014
1.005	User	-	100	0.011	0.011	0.011
				Total	Total	Total
				0.142	0.142	0.142

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Storage Structures for Storm

Cellular Storage Manhole: STANK, DS/PN: S1.005

Invert Level (m) 3.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.01000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.01000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	108.0	108.0	1.201	0.0	158.4
1.200	108.0	158.4			

Volume Summary (Static)

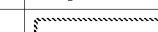
Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
S1.000	S1	1.527	0.299	0.000	1.826
S1.001	S2	1.770	0.091	0.000	1.861
S1.002	S3	1.866	0.202	0.000	2.068
S1.003	S4	1.787	0.163	0.000	1.950
S1.004	S5	1.691	0.275	0.000	1.966
S2.000	S6	0.127	0.230	0.000	0.357
S2.001	S7	0.142	0.187	0.000	0.329
S3.000	S8	0.143	0.248	0.000	0.391
S3.001	S9	0.207	0.202	0.000	0.409
S3.002	S10	0.301	0.099	0.000	0.400
S3.003	S11	2.335	0.050	0.000	2.385
S4.000	S12	0.303	0.092	0.000	0.395
S3.004	S13	2.545	0.018	0.000	2.562
S1.005	STANK	2.488	0.148	123.154	125.790
Total		17.232	2.303	123.154	142.689

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

PN	US/MH Name	Pipe		Status
		Overflow (l/s)	Flow (l/s)	
S1.000	S1		3.7	OK
S1.001	S2		5.2	OK
S1.002	S3		7.7	OK
S1.003	S4		7.7	OK
S1.004	S5		8.3	OK
S2.000	S6		1.3	OK
S2.001	S7		2.0	OK
S3.000	S8		1.5	OK
S3.001	S9		2.1	OK
S3.002	S10		2.7	OK
S3.003	S11		0.1	OK
S4.000	S12		0.9	OK
S3.004	S13		0.3	SURCHARGED
S1.005	STANK		0.0	SURCHARGED

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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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	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, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH		Event	US/CL (m)	Water	Surcharged	Flooded	Flow / Cap.
	Name				Level (m)	Depth (m)	Volume (m³)	
S1.000	S1	15 minute	30 year Winter I+0%	6.600	5.433	0.033	0.000	0.57
S1.001	S2	15 minute	30 year Winter I+0%	6.700	5.397	0.112	0.000	0.99
S1.002	S3	15 minute	30 year Winter I+0%	6.750	5.368	0.113	0.000	1.34
S1.003	S4	15 minute	30 year Winter I+0%	6.800	5.218	0.048	0.000	1.85
S1.004	S5	15 minute	30 year Winter I+0%	6.450	5.027	-0.078	0.000	0.45
S2.000	S6	2160 minute	30 year Winter I+0%	5.250	4.602	0.002	0.000	0.01
S2.001	S7	2880 minute	30 year Winter I+0%	5.250	4.602	0.092	0.000	0.01
S3.000	S8	15 minute	30 year Winter I+0%	6.750	5.884	-0.116	0.000	0.12
S3.001	S9	15 minute	30 year Winter I+0%	6.600	5.336	-0.114	0.000	0.13
S3.002	S10	2880 minute	30 year Winter I+0%	6.400	4.602	-0.053	0.000	0.01
S3.003	S11	2880 minute	30 year Winter I+0%	6.200	4.602	0.317	0.000	0.01
S4.000	S12	2880 minute	30 year Winter I+0%	6.200	4.602	0.157	0.000	0.00
S3.004	S13	2880 minute	30 year Winter I+0%	6.200	4.602	0.502	0.000	0.04
S1.005	STANK	2880 minute	30 year Winter I+0%	6.150	4.602	0.502	0.000	0.00

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

Simulation Criteria

Areal Reduction Factor 1.000	Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0	MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0	Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500	Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000	

Number of Input Hydrographs 0	Number of Storage Structures 1
Number of Online Controls 1	Number of Time/Area Diagrams 0
Number of Offline Controls 0	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR	Ratio R 0.350
Region England and Wales Cv (Summer) 0.750	
M5-60 (mm) 18.800	Cv (Winter) 0.840

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, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water	Surcharged	Flooded	Flow / Cap.
				Level (m)	Depth (m)	Volume (m³)	
S1.000	S1	15 minute 100 year Winter I+30%	6.600	5.894	0.494	0.000	0.85
S1.001	S2	15 minute 100 year Winter I+30%	6.700	5.809	0.524	0.000	1.53
S1.002	S3	15 minute 100 year Winter I+30%	6.750	5.727	0.477	0.000	2.03
S1.003	S4	15 minute 100 year Winter I+30%	6.600	5.381	0.211	0.000	2.08
S1.004	S5	2880 minute 100 year Winter I+30%	6.450	5.114	0.009	0.000	0.03
S2.000	S6	2880 minute 100 year Winter I+30%	5.250	5.113	0.513	0.000	0.01
S2.001	S7	2880 minute 100 year Winter I+30%	5.250	5.113	0.603	0.000	0.01
S3.000	S8	15 minute 100 year Winter I+30%	6.750	5.895	-0.105	0.000	0.19
S3.001	S9	15 minute 100 year Winter I+30%	6.600	5.347	-0.103	0.000	0.22
S3.002	S10	2880 minute 100 year Winter I+30%	6.400	5.114	0.459	0.000	0.01
S3.003	S11	2880 minute 100 year Winter I+30%	6.200	5.114	0.829	0.000	0.01
S4.000	S12	2880 minute 100 year Winter I+30%	6.200	5.113	0.668	0.000	0.00
S3.004	S13	2880 minute 100 year Winter I+30%	6.200	5.114	1.014	0.000	0.06
S1.005	STANK	2880 minute 100 year Winter I+30%	6.150	5.114	1.014	0.000	0.00

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

PN	US/MH Name	Pipe		Status
		Overflow (l/s)	Flow (l/s)	
S1.000	S1		11.6	SURCHARGED
S1.001	S2		17.9	SURCHARGED
S1.002	S3		27.2	SURCHARGED
S1.003	S4		27.3	SURCHARGED
S1.004	S5		1.2	SURCHARGED
S2.000	S6		0.2	FLOOD RISK
S2.001	S7		0.2	FLOOD RISK
S3.000	S8		6.3	OK
S3.001	S9		9.3	OK
S3.002	S10		0.3	SURCHARGED
S3.003	S11		0.3	SURCHARGED
S4.000	S12		0.1	SURCHARGED
S3.004	S13		0.6	SURCHARGED
S1.005	STANK		0.0	SURCHARGED

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70 Cowcross Street London EC1M 6EJ					
Date 10/03/2017 12:28 File 3710 SW DRAINAGE - SOAK...		Designed by JamesAldridge Checked by			
XP Solutions		Source Control 2016.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Half Drain Time : 1676 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	2.724	0.374	0.0	3.2	O K
30 min Summer	2.850	0.500	0.0	4.3	O K
60 min Summer	2.987	0.637	0.0	5.4	O K
120 min Summer	3.128	0.778	0.0	6.6	O K
180 min Summer	3.208	0.858	0.1	7.3	O K
240 min Summer	3.259	0.909	0.1	7.8	O K
360 min Summer	3.325	0.975	0.1	8.3	O K
480 min Summer	3.367	1.017	0.1	8.7	O K
600 min Summer	3.394	1.044	0.1	8.9	O K
720 min Summer	3.412	1.062	0.1	9.1	Flood Risk
960 min Summer	3.428	1.078	0.1	9.2	Flood Risk
1440 min Summer	3.427	1.077	0.1	9.2	Flood Risk
2160 min Summer	3.411	1.061	0.1	9.1	Flood Risk
2880 min Summer	3.385	1.035	0.1	8.8	O K
4320 min Summer	3.325	0.975	0.1	8.3	O K
5760 min Summer	3.265	0.915	0.1	7.8	O K
7200 min Summer	3.210	0.860	0.1	7.3	O K
8640 min Summer	3.160	0.810	0.0	6.9	O K
10080 min Summer	3.115	0.765	0.0	6.5	O K
15 min Winter	2.769	0.419	0.0	3.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	114.394	0.0	23		
30 min Summer	76.917	0.0	38		
60 min Summer	49.388	0.0	68		
120 min Summer	30.640	0.0	128		
180 min Summer	22.840	0.0	188		
240 min Summer	18.414	0.0	246		
360 min Summer	13.532	0.0	366		
480 min Summer	10.876	0.0	486		
600 min Summer	9.172	0.0	606		
720 min Summer	7.976	0.0	726		
960 min Summer	6.391	0.0	964		
1440 min Summer	4.669	0.0	1244		
2160 min Summer	3.404	0.0	1624		
2880 min Summer	2.716	0.0	2020		
4320 min Summer	1.973	0.0	2856		
5760 min Summer	1.570	0.0	3688		
7200 min Summer	1.315	0.0	4472		
8640 min Summer	1.138	0.0	5280		
10080 min Summer	1.007	0.0	6144		
15 min Winter	114.394	0.0	23		
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<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	2.911	0.561	0.0	4.8	O K
60 min Winter	3.065	0.715	0.0	6.1	O K
120 min Winter	3.224	0.874	0.1	7.5	O K
180 min Winter	3.315	0.965	0.1	8.2	O K
240 min Winter	3.373	1.023	0.1	8.7	O K
360 min Winter	3.450	1.100	0.1	9.4	Flood Risk
480 min Winter	3.500	1.150	0.1	9.8	Flood Risk
600 min Winter	3.534	1.184	0.1	10.1	Flood Risk
720 min Winter	3.557	1.207	0.1	10.3	Flood Risk
960 min Winter	3.582	1.232	0.1	10.5	Flood Risk
1440 min Winter	3.588	1.238	0.1	10.6	Flood Risk
2160 min Winter	3.564	1.214	0.1	10.4	Flood Risk
2880 min Winter	3.532	1.182	0.1	10.1	Flood Risk
4320 min Winter	3.448	1.098	0.1	9.4	Flood Risk
5760 min Winter	3.361	1.011	0.1	8.6	O K
7200 min Winter	3.282	0.932	0.1	8.0	O K
8640 min Winter	3.211	0.861	0.1	7.3	O K
10080 min Winter	3.146	0.796	0.0	6.8	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	76.917		0.0	38	
60 min Winter	49.388		0.0	68	
120 min Winter	30.640		0.0	126	
180 min Winter	22.840		0.0	184	
240 min Winter	18.414		0.0	244	
360 min Winter	13.532		0.0	360	
480 min Winter	10.876		0.0	476	
600 min Winter	9.172		0.0	592	
720 min Winter	7.976		0.0	706	
960 min Winter	6.391		0.0	930	
1440 min Winter	4.669		0.0	1358	
2160 min Winter	3.404		0.0	1692	
2880 min Winter	2.716		0.0	2164	
4320 min Winter	1.973		0.0	3072	
5760 min Winter	1.570		0.0	3976	
7200 min Winter	1.315		0.0	4832	
8640 min Winter	1.138		0.0	5704	
10080 min Winter	1.007		0.0	6552	
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70 Cowcross Street London EC1M 6EJ																						
Date 10/03/2017 12:28	Designed by JamesAldridge																					
File 3710 SW DRAINAGE - SOAK...	Checked by																					
XP Solutions		Source Control 2016.1																				
<u>Model Details</u> Storage is Online Cover Level (m) 3.700 <u>Lined Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01000</td> <td>Ring Diameter (m)</td> <td>1.80</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.01000</td> <td>Pit Multiplier</td> <td>1.6</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Number Required</td> <td>2</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>2.350</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01000	Ring Diameter (m)	1.80	Infiltration Coefficient Side (m/hr)	0.01000	Pit Multiplier	1.6	Safety Factor	2.0	Number Required	2	Porosity	0.30	Cap Volume Depth (m)	0.000	Invert Level (m)	2.350	Cap Infiltration Depth (m)	0.000
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