3 – 6 Spring Place Spring Place Ltd

Surface Water Drainage Statement

Heyne Tillett Steel September 2016



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1399 - 3-6 Spring Place | Surface Water Management Plan



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1 Introduction

This Surface Water Management Report has been prepared by Heyne Tillett Steel Ltd (HTS) to support a detailed planning application for the redevelopment of 3-6 Spring Place, London NW5 3BA, which is in the London Borough of Camden (LBC).

This proposed surface water management analysis has been prepared to the requirements of the National Planning Policy Framework, 2012 (NPPF), and the National Planning Practice Guidance (NPPG), which sets out the guidance for reducing flood risk in general by using Sustainable drainage systems (SuDS),

The surface water management strategy will demonstrate a scheme of SuDS which will be achieved as part of the development in accordance with the Defra - Nonstatutory technical standards for sustainable drainage, March 2015 which sets out the government policy to SuDS schemes.

The main purpose of this report is to analyse the pre and post development surface water run-off rates and volumes, where post development surface run-off rates are not to exceed the pre development run-off rates, and are to be reduced as much as practical (to adhere to current guidance), in order to reduce the risk of flooding to areas within and in the vicinity of the site.

The London Plan Paragraph 5.13 states that the preferred surface water run-off is to greenfield levels where practical and the PPG, Paragraph 051 states the drainage is to be designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible, provide opportunities to reduce the causes and impacts of flooding, and remove pollutants from urban run-off at source.

Supplementary Planning Guidance (SPG) produced by the Greater London Authority offers recommendations for developers. Clauses 3.4.2, 3.4.12 and 3.4.14 set out the expectation of SuDS to be incorporated into the design of new developments to prevent increasing volumes of surface water runoff and reduce flood risk. Clauses 3.4.8 - 3.4.9 stipulate that:

"Most developments referred to the Mayor have been able to achieve at least 50% attenuation of the site's (prior to re-development) surface water runoff at peak times. This is the minimum expectation from development proposals".

Based on the above guidance, the proposed surface water drainage system will aim to restrict the surface water to greenfield run-off rate if practical, and to reduce the post development run-off rates to 50% of the pre development rates as a minimum.

2 Existing and Proposed Site

2.1 Site Location

The existing site is located at 3-6 Spring Place, London NW5 3BA, which is in the London Borough of Camden (LBC).

The proposed site is approximately 0.222 ha in area is triangular in shape and is located to the west of Spring Place, includes an existing Network Rail viaduct in the centre, and will be adjacent to existing commercial and residential buildings to the east that lead onto Grafton Road.

The OS coordinates for the centre of the site are - E: 528574, N: 184989,

2.2 Existing Site Description

The existing site currently comprises of commercial buildings that are 2 storeys in height with mezzanine levels on the first floor, and are located each site if the Network Rail viaduct.

Plans of the existing / topographical plan can be found in Appendix A.

2.3 Ground Conditions

The investigation generally encountered the expected ground conditions. Beneath a moderate to significant thickness of made ground, London Clay was encountered and proved to the maximum depth investigated of 24.00 m (11.51 m OD). The made ground generally comprised brown silty sandy clay with flint gravel, brick and concrete fragments and extended to depths of between 1.30 m and 2.10 m (33.92 m OD and 32.33 m OD), although extended to a depth of at least 2.50 m at a single location. The London Clay initially comprised firm becoming stiff fissured medium strength becoming high strength brown mottled grey silty clay, becoming brownish grey from a depth of about 6.00 m which extended to depths of 8.90 m and 9.00 m (25.48 m OD and 26.51 m OD). Below this depth, stiff becoming very stiff fissured high strength becoming very high strength grey silty clay was encountered. Claystones were encountered at various depths within the London Clay.

2.4 Thames Water Assets

The Thames Water asset records (Appendix B) indicates that there is a 300mm combined sewer within Spring Place that runs in a southerly direction towards the junction with Spring Place and Holmes Road. The sewer is approximately 3.40m deep, with the invert level being approximately 31.390m.

There is also a combined sewer that crosses the west corner of the site, which connects to a 450mm combined sewer that runs along the west site boundary and under the Network Rail viaduct. The depth of this sewer and the diameter of the sewer crossing the site is to be confirmed.

2.5 Existing Site Drainage

A CCTV drainage survey was carried out in August 2016 by JPD Technical Services. As shown on the drainage survey plan (Appendix C), there is an existing combined water drainage network and sewer within the site.

The main sewer details running across the site are unknown, but it assumed to be a 300mm - 450mm diameter combined sewer at an approximate depth of 1.60m. A combined water drainage network is located along Spring Place, which consists of 100mm pipes; is at an approximate / average depth of 1.300m; and is believed to discharge to the 300mm combined sewer within Spring Place.

As there a combined water drainage networks within the site, and no records of any SuDS features, it is believed that the surface water is currently positively drained off the site.

2.6 Proposed Development

In a brief summary, and in relation to this surface water management report, the proposed development is to demolish the existing single storey, double-height servicing garage and construct new office blocks to the east and west of the existing railway viaduct. These will be connected at ground floor level via an external communal area.

The building to the west of the Network Rail viaduct will be 2-storeys in height, and the building to the east of the Network Rail viaduct will be 6-storeys in height and will also include a single storey basement.

The ground floor will consist of public cafe, informal work and meeting spaces and an open courtyard2.7 with further office space being provided below the existing Network Rail viaduct.

3 Surface Water Run-Off Analysis

2.7 Site Areas

The overall development site / site boundary area is approx. 0.222 ha.

In terms of permeable and impermeable areas of the existing / pre development site, it is deemed that all of the site (2222m²) is impermeable, as there is no evidence of landscaped / grassed / undeveloped areas.

In terms of permeable and impermeable areas of the proposed / post development site, it is deemed that all of the site (2222m²) is impermeable, but may be scope of having landscape terrace areas at roof levels of the buildings and new garden off Grafton Street.

The two areas of the development (each side of the viaduct) equate to approximately 760m² / 0.076 ha to the west of the viaduct, and approximately 1240m² / 0.124 ha to the east of the viaduct. The railway viaduct has not been taken into consideration for the surface water management analysis, as it does not form part of the new development.

The post development surface water run-off is to be reduced to as low as feasible, in order to reduce the risk of flooding, with the preferred being the greenfield run-off rate, and the minimum requirement being a 50% betterment of the pre development rates.

In order to establish the required reduction / restriction for the post development surface water run-off rates, the pre development greenfield run-off rates and pre development positively drained surface water run-off rates, will be calculated.

The post development surface water run-off rates are then to be calculated to establish the impact of the development in terms of flood risk. The pre and post development figures are to be used to analyse the required SuDS methods to control the surface water, and to calculate the attenuation volumes required to prevent flooding for the 1 in 30-year storm, and controlled flooding for the 1 in 100-year storm including climate change.





4 Pre Development Surface Water Run-Off Rates

In order to minimise the surface water run-off from the new development areas of the site, it is preferred for the post development surface water run-off to be restricted to the greenfield run-off rate.

Relevant documents state that in order to calculate the Greenfield run-off rates on small catchments less than 25km², the IH 124 QBAR equation (and the equation for the instantaneous time to peak for the unit hydrograph approach) is to be used.

The IH method is based on the Flood Studies Report (FSR) approach and is developed for use on catchments less than 25 km². It yields the Mean Annual Maximum Strom (QBAR). This reference also recommends the use of Ciria Book 14 to generate Growth Factors. These are used to convert QBAR to different return periods for different regions in the UK.

The input variables to establish QBAR are:

Return Period (years)	Results based on a	area (Re
	range of return periods and the specified RP;	Based o factors each of
Area	Catchment Area (ha) which is adjusted to km2 for use in the equation;	Storm
SAAR	Average annual rainfall in mm (1941-1970) from FSR figure II.3.1;	Q
Soil	Soil index of the catchment from FSR	Q3
Wallingford Procee Volume 3. Soil clas	Wallingford Procedure Volume 3. Soil classes	Q10
	values of 0.15, 0.3, 0.4, 0.45 and 0.5 respectively;	These of Solution
Region Number	Region number of the catchment based on FSR Figure 1.2.4.	in Appe conform this are
	QBAR(I/s)	0.20 / 5

The output variables to establish QBAR are calculated using the following formula (equation yields m³/s):

QBAR	=	0.00108 x AREA0.89 x
		SAAR1.17 x SOIL2.17

The IH 124 Variables (taken from FSR) that are specific to the leisure facility site are as follows:

Area	=	0.222 ha
SAAR	=	600
Soil	=	0.300
Region Number	=	6

Based on the above variables and formula the QBAR for the site = 0.30 $\ensuremath{\mathsf{I/s}}$

Now that the QBAR has been calculated the existing Greenfield run-off rates can be calculated for each of the storm events.

Ciria C753 Table 24.2 identifies the growth factors for each of the storm events, based on the known QBAR figure. The growth factors from the table vary depending on the site location. In this case hydrometric area (Region Number) is 6.

Based on the figures derived from the table, the growth factors and the existing greenfield run-off rates for each of the storm events is as follows: -

Storm Event	QBAR	Growth Factor (C753 Table 24.2)	Greenfield Run-off Rate
Q1	0.30 l/s	0.85	0.26 l/s
Q30	0.30 l/s	2.40	0.72 l/s
Q100	0.30 l/s	3.19	0.96 l/s

These calculations have been checked against XP Solution WinDes computer software and can be found in Appendix D. The area entered for the calculation to conform to the IH124 method is 50 ha. The results of this are to be pro rata to the actual area of the site (e.g. $0.20 / 50 = 0.0040, 0.0040 \times 76.1 \text{ l/s} = 0.30 \text{ l/s}$).

The greenfield run-off volume has also been calculated in the XP Solution WinDes software (Appendix D) for the 1 in 100-year, 6-hour storm event, which results in $30.23m^3$ for the pre development site.

5 Pre Development Surface Water Run-Off Rates – Positive Drainage

The pre development positively drained surface water run-off rates are based on the existing impermeable area of 0.222 ha, and also the data given by the Flood Studies Report (FSR) and Wallingford Procedure. The post development surface water run-off rates have also been simulated in a 'mock' network in the XP Solution WinDes software (Appendix E).

The variables used to calculate the existing positively drained surface water run-off rates for the post development site are as follows:

Existing Impermeable Area	=	0.222 ha
M5 – 60 (mm)	=	20.600
Ratio R	=	0.437
Cv (Summer)	=	0.750
Cv (Winter)	=	0.840
Time of Entry minutes	=	5
Climate Change	=	0

Based on the above variables and computer software results, the post development surface water run-off rates will be as follows:

Q1	=	30 I/s
Q30	=	70 I/s
Q100	=	90 I/s

Based on the above variables for and the results from the WinDes computer software the pre development surface water running volume for a 1 in 100-year 6-hour storm event has been calculated to be 104m³.

Q1 Q30 Q100 Based the W surfac

6 Post Development Surface Water Run-Off Rates – No Restrictions

The post development surface water run-off rates and volumes are to be calculated to assess the impact of the development in terms of surface water management.

The post development surface water run-off rates are based on the impermeable area of 2222m² / 0.222 ha. These areas are also to be used with the data given by the Flood Studies Report (FSR) and Wallingford Procedure. The post development surface water runoff rates have also been simulated in the XP Solution WinDes software (Appendix F).

The variables used to calculate the surface water runoff rates for the post development site are as follows: -

Proposed Impermeable Area	=	0.222 ha
M5 – 60 (mm)	=	20.600
Ratio R	=	0.437
Cv (Summer)	=	0.750
Cv (Winter)	=	0.840
Time of Entry minutes	=	5
Climate Change	=	20%*

*NPPF states that the peak rainfall intensity will increase by 20% by the years 2055 to 2085 As the development is for office purposes the life span of the building (before further work takes place) will fall in to these years.

Based on the above variables and computer software results, the post development surface water run-off rates will be as follows:

	=	30 I/s
	=	70 I/s
+ CC	=	105 I/s

Based on the above variables for and the results from the WinDes computer software the post development surface water running volume for a 1 in 100-year 6-hour storm event (including 20% climate change) has been calculated to be 125m³.



7 Surface Water SuDS Analysis

As the results from the above calculations show, the post development surface water run-off rates exceed the greenfield rates, and the positively drained rates for the 1 in 100-year storm event due to climate change. Therefore, in order to reduce the surface water run-off to the preferred rate of greenfield, or to 50% of the pre development rate as a minimum, further SuDS methods are to be introduced to the post development design.

HTS have considered a number of SuDS methods as per the Sustainable Drainage System (SuDS) hierarchy (NPPF Paragraph 080).

The various SuDS methods, their description and feasible or impractical use on this development are described below:

SuDS Methods	Description and Feasibility
Green Roofs and 'Blu-Roof' System	The Green and/or blu-roof systems are not feasible due to the shape of the the roof lighting and PVs.
Infiltration Devices	Infiltration devices cannot be built in made ground due to instability, and clay i Infiltration structures are also to be 5m from any structure and 2.5m from the built due to the nature of the site. Due to the ground conditions not being viable for infiltration and the nature of not a feasible SuDS method.
Basins and Ponds - Above Ground Storage	Given the nature of the development, where the majority of the site will comp and ponds is not a feasible SuDS method.
Filter Strips and Swales	Given the nature of the development, where the majority of the site will comp conditions the use of filter strips and swales is not a feasible SuDS method.
Rainwater Harvesting Tanks	Rainwater harvesting tanks could potentially be used for the development to p office buildings. This however will require a dual plumbing system where one will be from the w harvesting tank in the event of the harvesting tank being empty. The cost of the dual plumbing system is very expensive, and has not been cons Therefore, at the time of writing this report, it is deemed that rainwater harves
Flow Control and Attenuation System	In order to ensure the surface water is restricted to the desired rate a flow con proposed drainage network. There will also be a required to store the attenuat pipes, oversized manholes or a cellular storage structure.
Discharge Rainwater directly to watercourse	There are no watercourses within the direct vicinity of the site for the network
Discharge Rainwater to a surface water sewer	There are no surface water sewers within the direct vicinity of the site for the
Discharge Rainwater to a combined water sewer	As there are watercourses or surface water sewers within the direct vicinity of / discharge the surface water to the combined sewer within Spring Place to m

roofs and limited space following introduction of
s not a porous material. development boundary, and won't be able to be f site not being suitable, infiltration devices are
rise of the proposed building the use of basins
rise of the proposed building the current ground
provide water to the toilet facilities within the new ater mains and the other being from the
sidered as part of the overall development design. sting is not a feasible SuDS method.
ntrol system can be incorporated into the ted water which could be achieved by oversized
to connect / discharge to.
network to connect / discharge to.
the site the only alternative would be to connect imic existing.



8 Surface Water Management Analysis

8.1 SuDS Summary

As detailed in the above sections, the post development surface water run-off rate exceeds the required pre development greenfield run-off rates for each of the storm events.

Therefore, suitable SuDS methods are to be used in the post development design in order to reduce the post development surface water run-off and discharge volume to the required rates.

The preferred SuDS methods are to use retention ponds, wetlands and detentions basin. Where these cannot be used soakaways, swales and other infiltration rates are preferred. If none of the above a practical, then green roofs and flow controls can be used.

Due to the layout and nature of the development, where the building is the majority of the site area, the use of wetlands, ponds or detention basins is not a SuDS option.

A full ground investigation is yet to take place at the development site. However, borehole logs found on the British Geological Survey website in a location approximately 100m to the north of the site location indicates that the ground consists of made ground over clay. Clay has a very low (if any) percolation and therefore infiltration of the surface water cannot be achieved.

Due to the ground condition the alternative would be to formally discharge the surface water run-off from the site via a vortex flow control to the existing combined water sewer in Spring Place.

8.2 Surface Water Run-Off Rate

Ciria document C753 - The SuDS Manual states that the flow controls / orifice design should be designed so that it has simplicity on operation, and has resistance to clogging, blocking or mechanical failure.

The previous Ciria SuDS Manual (C697) states that the limiting discharge rate is to take into account a minimum practical orifice size. The minimum size of opening in an orifice plate or vortex control to provide an acceptable risk of blockage is often accepted to be 75mm.

However, the surface water is to connect to a combined public sewer, and therefore the demarcation chamber, flow control and outfall pipe are to adhere to Sewers for Adoption 7th Edition. Sewer for Adoption 7th Edition states that the minimum diameter for an outfall pipe is to be 100mm.

Taking the above guidance into consideration, it is deemed that the orifice size to reduce the surface water run-off rates to greenfield will be too small, and therefore will be prone to blockage and subsequent flooding.

The surface water is therefore to be reduced to a maximum discharge through a 100mm flow control / orifice which is 5 l/s for all storm event including climate change.

The 5 l/s discharge rate is the equivalent to five times 1 in 100-year greenfield run-off rate, an 83% betterment of the pre development peak 1 in 1-year rate, an 93% betterment of the pre development peak 1 in 30-year rate, and an 94% betterment of the pre development peak 1 in 100-year rate.

The discharge rate of 5 l/s also adheres to the guidance in Supplementary Planning Guidance (SPG) produced by the Greater London Authority.

8.3 Surface Water Run-Off Volume

The above calculations also show that the post development surface water flood volume / volume of discharge from the site will exceeds the pre development greenfield volume during the 1 in 100 year 6-hour storm event.

The 'Non-Statutory Technical Standards for Sustainable Drainage Systems - March 2015' states that the post development surface water run-off rate should not exceed the pre development greenfield rate, but where this is not reasonably practical the surface water runoff volume must be discharged at a rate that does not adversely affect flood risk.

The most practical solution to prevent the exceedance in the run-off volume would be to discharge the water to ground. However, as stated previously, the ground condition is not feasible for infiltration, and therefore other SuDS methods are to be used. By reducing the surface water run-off to five times the greenfield and a minimum 83% betterment of the pre development rate, the development site will not adversely affect flood risk.

The surface water run-off volume for the 1 in 100 year, 6-hour storm event (including climate change), if restricted to a maximum rate of 5 l/s, will be 108m³ (5 x 60 x 60 x 6). This is $4m^3$ greater than the volume for pre development 1 in 100 year, 6-hour storm event, but 17m³ less than the volume for the pre development 1 in 100 year 6-hour storm event including climate change. Therefore, 9.2 the run-off volume will not adversely affect flood risk.

9 Surface Water Attenuation Calculations

As stated above the surface water run-off from the surface water catchment area of the site (east and west of viaduct) are to be restricted to 5 l/s, with the surface water catchment area equating to 0.222 ha.

The estimated required attenuation volumes to prevent / contain flooding for each storm event has been calculated via the XP Solutions software, using the variables and data set out previously in this report (refer Appendix G).

The WinDes output file indicates the maximum volume of attenuation required (highlighted in red), which is the equivalent required attenuation volume.

9.1 Note:

The flow control in the software is indicated as a pump, as this will ensure the results show a discharge rate (maximum outflow) of 5 l/s. The actual flow control will be via a hydrobrake / vortex control chamber, details of which will be required at detailed design stage.

The summary of the required attenuation volumes (including climate change) for the post development surface water catchment area, and for each of the storm events is as follows:

Q1	=	16m³
Q30	=	49m³
Q100	=	70m³

Ciria SuDS Manual 2015, Paragraph 10.2.4 states that: 'Exceedance flows (i.e. flows in excess of those for which the system is designed) should be managed safely in above-ground space such that risks to people and property are acceptable'.

And PPS25 Practice Guidance Paragraph 5.51 previously stated that: 'For events with a return-period in excess of 30 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property, and avoid creating hazards to access and egress routes. No flooding of property should occur as a result of a one in 100-year storm event (including an appropriate allowance for climate change)'.

The attenuation tank in the computer software matches the true tank area and depth shown on the outline drainage drawing (Appendix H). The proposed attenuation tank area is to be 64m², with a depth of 1.2m giving a total volume of 76.8m³.

As the computer software results show, with the tank volume of 76.8m³ is adequately sized so that there is no flood risk of the 1 in 30-year storm, and just a flood risk with no flooding occurring during the 1 in 100-year storm event (including climate change).



10 Maintenance Requirements

The maintenance of the SuDS features is required in order to ensure that the infiltration structure is working affectively, and subsequently reducing the risk of flooding on the site.

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthly
Debris removal from catchment surface (where may cause risk performance)	Monthly
Check manhole for blockage or silt, algae or other matter by jetting	As required, but at least 4 times a year.
Remove sediment from upstream drainage network, and sediment from within manhole by jetting	As required, but at least 4 times a year
Repair/check all inlets and flow control	As required
Inspect/check all inlets and flow control to ensure they are operating as designed	4 times a year as a minimum and after large storms

The maintenance for the Hydro brake / vortex control manhole is as follows:

The maintenance for the cellular storage is as follows:

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthly
Debris removal from catchment surface (where may cause risk performance)	Monthly
Where rainfall infiltration into cellular storage from above, check surface or filter for blockage or silt, algae or other matter by jetting	As required, but at least 5 times a year
Remove sediment from upstream surface water network by jetting.	Twice annually or as required
Repair/check all inlets, outlet, overflows and vents	As required
Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

11 Conclusion

The proposed / post development surface water drainage has aimed to meet the requirement of The London Plan Paragraph 5.13 that states that the preferred surface water run-off is to greenfield levels where practical.

All SuDS methods have been assessed to establish whether they are feasible for the development in order to reduce the surface water run-off to the preferred greenfield rate.

Due to the size and nature of the site, and as well as the ground conditions, the use of wetlands, ponds, detention basins or infiltration structures are not feasible SuDS options for the development site.

Therefore, the only alternative would be to formally restrict the surface water run-off via a vortex control chamber prior to formal discharge into an existing sewer network.

It has been calculated that the greenfield run-off rates for the site are very low and are deemed too low to be controlled by vortex and / or orifice. Therefore, the surface water is to be controlled by a suitable control diameter of 100mm for the surface water catchment area. This equates to the surface water run-off for the post development site being 5 l/s.

The 5 l/s discharge rate is the equivalent to five times 1 in 100-year greenfield run-off rate, an 83% betterment of the pre development peak 1 in 1-year rate, an 93% betterment of the pre development peak 1 in 30-year rate, and an 94% betterment of the pre development peak 1 in 100-year rate.

The discharge rate of 5 I/s also adheres to the guidance in Supplementary Planning Guidance (SPG) produced by the Greater London Authority.

The maximum restricted rate of 5 l/s for the 1 in 100 year, 6-hour storm event (including climate change) will equate to a maximum run-off rate of 108m³. This is 4m³ greater than the volume for pre development 1 in 100 year, 6-hour storm event, but 17m³ less than the volume for the pre development 1 in 100 year 6-hour storm event including climate change. Therefore, the run-off volume will not adversely affect flood risk.

9.3 As the surface water is restricted to 5 l/s for surface water catchment area there will be a requirement for attenuation. This is to be in the form below ground cellular storage for all storm events up to and including the 1 in 100-year (Including climate change), as no flooding can occur at surface level.

The required attenuation volume for the surface catchment area of 0.222 ha during a 1 in 100-year storm event (Inc. climate change) will be 70m³. The actual tank volume provided will be 76.8m³.

The surface water management of the post development site will reduce the flood risk for the site and areas within the vicinity of the site. The surface water management of the post development site adheres to all current regulations.



Appendix A Topographical / Existing Site Plan











Appendix B Existing Drainage Survey Plan







Appendix C Thames Water Asset Plan





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 E searches@thameswater.co.uk
 I www.thameswater-propertysearches.co.uk



Appendix D Greenfield Run-Off Rates and Volumes



Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	Greenfiled Run-Off Rates	L.
SW17 OBX		Micco
Date 18.05.16	Designed by MDS	Desinado
File	Checked by MDS	Dialinatie
XP Solutions	Source Control 2015.1	

IH 124 Mean Annual Flood

Input

Return	Period	(ye	ears)	1		Soil	0.300	J
	Ar	rea	(ha)	50.000		Urban	0.000	I
	SA	AR	(mm)	600	Region	Number	Region 6)

Results 1/s

QBAR	Rural	76.1
QBAR	Urban	76.1

Q1 year 64.7

Q1 year 64.7 Q2 years 67.0 Q5 years 97.4 Q10 years 123.3 Q20 years 152.4 Q25 years 163.4 Q30 years 172.4 Q50 years 199.3 Q100 years 242.7 Q200 years 285.3 Q250 years 299.0 Q1000 years 392.6

Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	Greenfield Run-Off Volume	L
SW17 OBX		Micro
Date 18.05.16	Designed by MDS	Desinado
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XP Solutions	Source Control 2015.1	

Greenfield Runoff Volume

FSR Data

Return Period (years) Storm Duration (mins) Region M5-60 (mm) Ratio R Areal Reduction Factor Area (ha) SAAR (mm) CWI Urban SPR

Results

Greenfield Runoff Volume (m³) 30.230

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	100
	360
England	and Wales
	20.600
	0.437
	1.00
	0.200
	600
	87.000
	0.000
	30.000

Percentage Runoff (%) 24.41





Flo Conquit IN Itd				Dago 1	
7 Portal Dood		2 6 Coming F		Page 1	
/ Berlai Koau		5-0 Spring P	lace	2	
		GW Durn off D		1 mm	
SWIT UBA	—— Micro				
Dale 18.05.10	Le 18.05.16 Designed by MDS				
File VD Galutions		Checked by M			
XP Solutions		Network 2015	.⊥		
STORM	SEWER DESIGN	by the Modifi	ied Rational	Method	
	Dipo Circo (TN)	TOTAL Marhala			
	Pipe Sizes STA	NDARD Manhole S	Sizes STANDARD		
Return Maximum H Maximum Time of Conce Foul Volumetr:	FSR Rainfall h Period (years) M5-60 (mm) Ratio R Rainfall (mm/hr) entration (mins) Sewage (l/s/ha) ic Runoff Coeff.	Model - Englan 1 20.600 0.437 50 Min Des 30 Min 7 0.000 Min 0.750	nd and Wales Add Flow / Clin Minimum Back Maximum Back ign Depth for Op Vel for Auto Den n Slope for Opt	<pre>nate Change (%) 0 drop Height (m) 0.200 drop Height (m) 1.500 ptimisation (m) 1.200 sign only (m/s) 1.00 imisation (1:X) 500</pre>	
	Designe	ed with Level So	offits		
	<u>Time Are</u>	a Diagram fo	r Storm		
	Time (mins) 0-4 Total Area (Total Pij	AreaTime(ha)(mins)0.1504-8Contributing (hpe Volume (m³)	Area (ha) 0.050 (ha) = 0.200 = 0.795		
	Network De	esign Table f	for Storm		
PN Leng (m	th Fall Slope I) (m) (1:X)	Area T.E. (ha) (mins) F	Base k low (l/s) (mm)	HYD DIA SECT (mm)	
1.000 10.0 1.001 10.0	00 0.100 100.0 00 0.100 100.0	0.200 5.00 0.000 0.00	0.0 0.600 0.0 0.600	o 225 o 225	
	Netwo	ork Results T	able		
PN Rain T. (mm/hr) (mi	C. US/IL Σ I.An ns) (m) (ha)	rea ΣBase) Flow (l/s)	Foul Add Flow (l/s) (l/s)	Vel Cap Flow (m/s) (l/s) (l/s)	
1.000 50.00 5 1.001 50.00 5	.13 10.000 0.2 .25 9.900 0.2	200 0.0 200 0.0	0.0 0.0 0.0 0.0	1.31 52.0 27.1 1.31 52.0 27.1	
	@1022	2015 YD Colv	tions		

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7 Bertal Road	3-6 Spring Place	
London	Pre Development	L
SW17 OBX	SW Run-Off Rates	Micco
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File	Checked by MDS	Diamage
XP Solutions	Network 2015.1	

Simulation Criteria for Storm

1010	netric Runoii	Coeff 0	.840	
Area	al Reduction F	actor 1	.000 <i>I</i>	Addi
	Hot Start (mins)	0	
Ho	ot Start Level	(mm)	0	
Manhole Head	loss Coeff (Gl	obal) O	.500	
Numb Nu Num	er of Input Hy mber of Online ber of Offline	ydrograp e Contro e Contro	hs 0 ls 0 ls 0	Numl Numl
	Sy	nthetic	c Rai	nfa
R Return P	<u>Sy</u> ainfall Model eriod (years)	nthetic	c Rai	nfa FS
R Return P	<u>Sy</u> ainfall Model eriod (years) Region	nthetic England	c Rai:	nfa FS Wale
R Return P	<u>Sy</u> ainfall Model eriod (years) Region M5-60 (mm)	nthetic England	C Rai:	nfa FS Wale
R Return P	<u>Sy</u> ainfall Model eriod (years) Region M5-60 (mm) Ratio R	nthetic England	c Rai:	nfa FS Wale 0.60

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Foul	Sewage	pe	er h	ectar	e	(l/s)	0.000
tiona	al Flow	-	8 0	f Tot	al	Flow	0.000
MADD	Factor	*	10m	³/ha	St	orage	2.000
			Run	Time	e (mins)	60
	Outpu	ıt	Int	erval	. (mins)	1

mber of Storage Structures 0 mber of Time/Area Diagrams 0

all Details

	Prof	ile	Type	Winter
	Cv	(Sur	nmer)	0.750
	Cv	(Wir	nter)	0.840
Storm	Duratio	on (r	mins)	15
	Storm	Prof Cv Cv Storm Duratic	Profile Cv (Sur Cv (Win Storm Duration (r	Profile Type Cv (Summer) Cv (Winter) Storm Duration (mins)

Flo_Cons	ult UK	Ltd						Page 2	Flo_Consult UK Ltd	Page 1
7 Bertal	Road			3-6 Sprin	ng Plac	e			7 Bertal Road 3-6 Spring Place	
London				Pre Devel	opment			4	London Pre Development	4
SW17 OBX				SW Run-Of	f Rate	S			SW17 OBX SW Run-Off Rates	- Com
Date 18.	05.16			Designed	by MDS			MICIO	Date 18.05.16 Designed by MDS	Micio
File				Checked 1	y MDS			Urainag	File Checked by MDS	Urainage
XP Solut	ions			Network 2	2015.1				XP Solutions Network 2015.1	
	Summ	ary of Resu	ults for	15 minu	te 1 ye	ar Wint	er (Sto	orm)	Simulation Criteria for Storm	
	Ma	rgin for Floc	od Risk Wa Analysi	rning (mm) s Timester DTS Status	300.0 9 Fine 8 ON	DVD S Inertia S	Status OB Status OB	FF FF	Volumetric Runoff Coeff 0.840 Foul Sewage per Areal Reduction Factor 1.000 Additional Flow - % Hot Start (mins) 0 MADD Factor * 1 Hot Start Level (mm) 0 R	hectare (l/s) 0.000 of Total Flow 0.000 Om ³ /ha Storage 2.000 un Time (mins) 60
		Water	Surcharg	ed Flooded			Pipe		Manhole Headloss Coeff (Global) 0.500 Output I	nterval (mins) 1
		US/MH Level	Depth	Volume	Flow /	Overflow	v Flow		Number of Input Hydrographs 0 Number of Storage S	Structures 0
	PN	Name (m)	(m)	(m³)	Cap.	(l/s)	(l/s) S	Status	Number of Online Controls 0 Number of Time/Area Number of Offline Controls 0	1 Diagrams 0
	1.000 1.001	1 10.138 2 10.038	-0.0 -0.0	87 0.000 87 0.000	0.68 0.68		29.4 29.5	OK OK	Synthetic Rainfall Details	
									Return Period (years) 30 Cv Region England and Wales Cv M5-60 (mm) 20.600 Storm Duratic Ratio R 0.437	(Summer) 0.750 (Winter) 0.840 m (mins) 15
			©1982-2	2015 XP S	olutio	ıs			©1982-2015 XP Solutions	

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7 Bertal Road	1	3	8-6 Spri	ing Place			1	7 Bertal Road	3-6 Spring Place	
London		F	re Deve	elopment		L.		London	Pre Development	L.
SW17 OBX		S	SW Run-C	Off Rates		Micro		SW17 OBX	SW Run-Off Rates	Micro
Date 18.05.16	5	E	esigned	d by MDS		Desinance		Date 18.05.16	Designed by MDS	Desipado
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XP Solutions		N	Jetwork	2015.1			_	XP Solutions	Network 2015.1	I
Sur	mmary of Res	ults for	<u>15 minu</u>	ute 30 yea	ar Winte	er (Storm)		Volumetric P	Simulation Criteria for Storm	tare (1/s) 0 000
	hargin for Fic	Analysi:	s Timeste DTS Stati	ep Fine In us ON	nertia St	atus OFF		Areal Reduc Hot S Hot Start	ction Factor 1.000 Additional Flow - % of T Start (mins) 0 MADD Factor * 10m ³ /h : Level (mm) 0 Run Ti	Intervention Intervention Intervention Intervention Intervention Intervention Intervention Intervention Intervention Intervention
	Water	Surcharged	Flooded		Pi	pe		Mailliole Headloss coe	GIODAI) 0.500 Output interv	
PN	US/MH Level Name (m)	Depth (m)	Volume (m ³)	Flow / Ove Cap. (erflow Fl l/s) (l	.ow /s) Status		Number of I Number of Number of (nput Hydrographs 0 Number of Storage Struct Online Controls 0 Number of Time/Area Diag Offline Controls 0	tures 0 grams 0
1.000	2 10.275	0.150	0.000	1.61	6	9.9 SURCHARGED			Synthetic Rainfall Details	
								Rainfall Return Period (y M5-61 Ra	Model FSR Profile 7 years) 100 Cv (Sum Region England and Wales Cv (Wind 0 (mm) 20.600 Storm Duration (m: atio R 0.437	Type Winter mer) 0.750 ter) 0.840 ins) 15
		<u> </u>	015 775	0 - 1					01000 0015 VD 0 1 1	
		©1982-2	UIS XP	Solution	S				©1982-2015 XP Solutions	

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7 Bertal Road	3-6 Spring Place	
London	Pre Development	L.
SW17 OBX	SW Run-Off Rates	Micro
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File	Checked by MDS	Diginarie
XP Solutions	Network 2015.1	

Summary of Results for 15 minute 100 year Winter (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	Pipe Flow (l/s)	Status
1.000	1	10.876	0.651	0.000	2.07		89.7	SURCHARGED
1.001	2	10.445	0.320	0.000	2.06		89.2	SURCHARGED





Flo_Consult UK L	itd		1					Pag	ge 1	
7 Bertal Road			3-6 Spring Place							
London			Post I	Develop	ment			2	~	
SW17 OBX			SW Rur	n-Off R	ates			M	irm	
Date 18.05.16			Design	ned by	MDS			n	ainado	
File			Checke	ed by M	IDS				anaye	
XP Solutions Network 2015.1										
STORM SEWER DESIGN by the Modified Rational Method										
	Pipe	Sizes STA	NDARD M	anhole S	izes S	STANDARD				
FSR Rainfall Model - England and Wales Return Period (years) 1 Add Flow / Climate Change (%) 0 M5-60 (mm) 20.600 Minimum Backdrop Height (m) 0.200 Ratio R 0.437 Maximum Backdrop Height (m) 1.500 Maximum Rainfall (mm/hr) 50 Min Design Depth for Optimisation (m) 1.200 Maximum Time of Concentration (mins) 30 Min Vel for Auto Design only (m/s) 1.00 Foul Sewage (1/s/ha) 0.000 Min Slope for Optimisation (1:X) 500 Volumetric Runoff Coeff. 0.750 Designed with Level Soffits										
		Time Are	ea Diac	ram fo	r Sto	rm				
	Т	Time (mins) 0-4 Dtal Area Total Pi	Area (ha) 4 0.150 Contribu	Time (mins) 4-8 ating (h ne (m ³)	Area (ha) 0.050 (a) = 0 = 0.79).200 95				
	N	etwork D	esign '	Table f	for St	torm				
PN I	ength Fal (m) (m	1 Slope 1) (1:X)	I.Area (ha) (T.E. mins) F	Base low (1	k /s) (mm)	HYD SECT	DIA (mm)		
1.000 1 1.001 1	.0.000 0.10	00 100.0 00 100.0	0.200 0.000	5.00 0.00		0.0 0.600 0.0 0.600	0	<mark>225</mark> 225		
		Netwo	ork Res	ults T	able					
PN Rain (mm/hr)	T.C. US (mins) (1	/IL Σ I.A m) (ha	rea Σ .) Flow	Base w (l/s)	Foul (l/s)	Add Flow (1/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	
1.000 50.00 1.001 50.00	5.13 <mark>10</mark> . 5.25 9.	000 0. 900 0.	200 200	0.0 0.0	0.0	0.0	1.31 1.31	52.0 52.0	27.1 27.1	
		@1982	-2015 V		tions					

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7 Bertal Road	3-6 Spring Place	
London	Post Development	L
SW17 OBX	SW Run-Off Rates	Micco
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File	Checked by MDS	Diamage
XP Solutions	Network 2015.1	•

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840
Areal Reduction Factor	1.000 Addi
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coeff (Global)	0.500
Number of Input Hydrogr	aphs 0 Num
Number of Online Cont	rols 0 Num
Number of Offline Cont	rols 0
Synthet	ic Rainfa
Rainfall Model	F
Return Period (years)	
Region Engla	and and Wale
M5-60 (mm)	20.6
Ratio R	0.4

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Foul	Sewage	pe	er h	ectar	e	(l/s)	0.000
tiona	al Flow	-	8 0	f Tot	al	Flow	0.000
MADD	Factor	*	10m	³/ha	St	orage	2.000
			Run	Time	e (mins)	60
	Outpu	ıt	Int	erval	. (mins)	1

mber of Storage Structures 0 mber of Time/Area Diagrams 0

all Details

	Prof	ile	Type	Winter
	Cv	(Sur	nmer)	0.750
	Cv	(Wir	nter)	0.840
Storm	Duratio	on (r	nins)	15
	Storm	Prof Cv Cv Storm Duratic	Profile Cv (Sur Cv (Win Storm Duration (r	Profile Type Cv (Summer) Cv (Winter) Storm Duration (mins)

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7 Bertal Road	3-6 Spj	ring Place		7 Bertal Road	3-6 Spring Place	
London	Post De	evelopment	4	London	Post Development	4
SW17 OBX	SW Run-	-Off Rates		SW17 OBX	SW Run-Off Rates	m
Date 18.05.16	Designe	ed by MDS	- Micio	Date 18.05.16	Designed by MDS	MICLO
File	Checkee	d by MDS	Drainage	File	Checked by MDS	Drainage
XP Solutions	Networł	k 2015.1		XP Solutions	Network 2015.1	
SW17 OBX Date 18.05.16 File XP Solutions Mar Mar 1.000 1.001	SW Run- Designe Checked Networl ary of Results for 15 mi: ogin for Flood Risk Warning (Analysis Times DTS Sta Water Surcharged Flood IS/MH Level Depth Volu Name (m) (m) (m ³ 1 10.138 -0.087 0.0 2 10.038 -0.087 0.0	-Off Rates ed by MDS d by MDS k 2015.1 nute 1 year Winter (Storm mm) 300.0 DVD Status OFF step Fine Inertia Status OFF itus ON ded Pipe mme Flow / Overflow Flow cap. (1/s) (1/s) Sta 000 0.68 29.4 000 0.68 29.5		SW17 OBX Date 18.05.16 File XP Solutions Simulati Volumetric Runoff Coeff Areal Reduction Factor Hot Start (mins) Hot Start Level (mm) Manhole Headloss Coeff (Global) Number of Input Hydrog Number of Online Con Number of Offline Con Synthe Rainfall Model Return Period (years) Region Engl M5-60 (mm) Ratio R	SW Run-Off Rates Designed by MDS Checked by MDS Network 2015.1 Con Criteria for Storm Con Criteria for Storage Con Criteria for Storage Con Criteria for Storage Structures 0 MADD Factor * 10m ³ /ha Storage Con Criteria for Storage Structures 0 Con Criteria for Storage Structures 0 Criteria for Storage Structures 0 Criteria for Storage Structures 0 Criteria for Storage Structures 0 Criteria for Storm Diracion (mins) Con Storm Duration (mins) Con Storm Duration (mins) Con Store Storage Structures (mins) Con Store	s) 0.000 bw 0.000 ge 2.000 s) 60 s) 1
	©1982-2015 XE	P Solutions		©1982	2-2015 XP Solutions	

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7 Bertal Road		3	-6 Spri	ing Place	5			7 Bertal Road 3-6 Spring Place	
London		P	ost Dev	velopment	t		L	London Post Development	L.
SW17 OBX		S	W Run-C	Off Rates	5		Micro	SW17 OBX SW Run-Off Rates	Micco
Date 18.05.16		D	esigned	d by MDS			Desinado	Date 18.05.16 Designed by MDS	
File		C	hecked	by MDS			Diamaye	File Checked by MDS	Digiti
KP Solutions		N	etwork	2015.1				XP Solutions Network 2015.1	
Sum	mary of Res	ults for 1	15 minu	ite 30 ye	ear Winte	er (St	torm)	Simulation Criteria for Storm	<u>n</u>
1	Margin for Flo	ood Risk War Analysis	rning (mm s Timeste	m) 300.0 ep Fine I	DVD St Inertia St	tatus (tatus ()FF)FF	Volumetric Runoff Coeff 0.840 Foul Sewage pe Areal Reduction Factor 1.000 Additional Flow -	er hectare (1/s) 0.000 % of Total Flow 20.000
	Wator	funchanged	Flooded	us ON		ino		Hot Start (mins) 0 MADD Factor * Hot Start Level (mm) 0 Manhole Headloss Coeff (Global) 0.500 Output	Run Time (mins) 60 Interval (mins) 1
PN	US/MH Level Name (m)	Depth (m)	Volume (m ³)	Flow / Ov Cap. (rerflow Fi (1/s) (1	low /s)	Status	Number of Input Hydrographs 0 Number of Storage Number of Online Controls 0 Number of Time/Ar Number of Offline Controls 0	: Structures 0 cea Diagrams 0
1.000 1.001	1 10.543 2 10.275	0.318 0.150	0.000	1.62 1.61	7 6	70.0 SU 59.9 SU	JRCHARGED JRCHARGED	Synthetic Rainfall Details	
								Return Period (years) 100 C Region England and Wales C M5-60 (mm) 20.600 Storm Durat Ratio R 0.437	Sille Type Winter V (Summer) 0.750 V (Winter) 0.840 Lion (mins) 15
		01000	015						
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7 Bertal Road	3-6 Spring Place	
London	Post Development	Y
SW17 OBX	SW Run-Off Rates	Micro
Date 18.05.16	Designed by MDS	Desinado
File	Checked by MDS	Dramada
XP Solutions	Network 2015.1	

Summary of Results for 15 minute 100 year Winter (Storm)

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

PN	Water Surc US/MH Level De Name (m) (Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	Pipe Flow (l/s)	Pipe Flow (l/s) Status	
1.000	1	11.230	1.005	0.000	2.45		106.0	SURCHARGED	
1.001	2	10.620	0.495	0.000	2.42		105.0	SURCHARGED	





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7 Bertal Road	3-6 Spring Place	
London	SW Atenaution Calculations	L.
SW17 OBX	East Catchment Area	Micro
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File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 1 year Return Period

Half Drain Time : 6 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max v Volume (m³)	Status
15 30	min Su min Su	ummer ummer	10.058 10.064	0.058 0.064	0.0	5.0 5.0	5.(5.(2.8 3.1	ОК ОК
60 120	min Su min Su	ummer	10.052	0.052	0.0	5.0 5.0	5.0	2.5	ОК
180	min Su	ummer	10.004	0.004	0.0	5.0	5.0	0.2	O K
360	min Su	ummer	10.000	0.000	0.0	4.0	3.1	5 0.0	0 K
480 600	min Su min Su	ummer	10.000	0.000	0.0	2.9	2.9	0.0 5 0.0	ОК
720 960	min Su min Su	ummer ummer	10.000 10.000	0.000	0.0	2.2 1.7	2.2	2 0.0 7 0.0	ОК ОК
1440 2160	min Su min Su	ummer	10.000	0.000	0.0	1.3 0.9	1.3	3 0.0 9 0.0	ОК ОК
2880 4320	min Su min Su	ummer	10.000	0.000	0.0	0.8	0.8	3 0.0 5 0.0	ОК
5760	min Su	ummer	10.000	0.000	0.0	0.5	0.1	5 0.0	O K
8640	min Su	ummer	10.000	0.000	0.0	0.4	0.2	± 0.0 3 0.0	0 K
10080 15	min Su min Wi	Immer Inter	10.000 10.072	0.000	0.0	0.3 5.0	0.3 5.0	3 0.0) 3.4	ОК

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15	min Summer	33.081	0.0	7.5	20
30	min Summer	21.343	0.0	9.9	28
60	min Summer	13.306	0.0	12.3	44
120	min Summer	8.118	0.0	15.1	74
180	min Summer	6.048	0.0	16.9	102
240	min Summer	4.901	0.0	18.2	0
360	min Summer	3.622	0.0	20.2	0
480	min Summer	2.915	0.0	21.7	0
600	min Summer	2.463	0.0	22.9	0
720	min Summer	2.146	0.0	23.9	0
960	min Summer	1.726	0.0	25.7	0
1440	min Summer	1.271	0.0	28.4	0
2160	min Summer	0.936	0.0	31.3	0
2880	min Summer	0.754	0.0	33.6	0
4320	min Summer	0.554	0.0	37.1	0
5760	min Summer	0.446	0.0	39.8	0
7200	min Summer	0.377	0.0	42.0	0
8640	min Summer	0.328	0.0	44.0	0
10080	min Summer	0.292	0.0	45.7	0
15	min Winter	33.081	0.0	8.6	20
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London	SW Atenaution Calculations	L.
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XP Solutions	Source Control 2015.1	

Summary of Results for 1 year Return Period

	Storm Event	1	Max Level (m)	Max Depth (m)	M Infilt (1	ax tration /s)	Max Control (1/s)	Σ	Max Dutflow (1/s)	Max Volume (m³)	Stat	us
30	min V	Winter	10.078	0.078		0.0	5.0		5.0	3.7	7 0	к
60	min V	Winter	10.055	0.055		0.0	5.0		5.0	2.6	5 0	Κ
120	min V	Winter	10.009	0.009		0.0	5.0		5.0	0.4	1 O	K
180	min V	Winter	10.000	0.000		0.0	4.3		4.3	0.0) 0	K
240	min V	Winter	10.000	0.000		0.0	3.5		3.5	0.0) 0	K
360	min V	Winter	10.000	0.000		0.0	2.6		2.6	0.0) 0	K
480	min V	Winter	10.000	0.000		0.0	2.1		2.1	0.0) 0	K
600	min V	Winter	10.000	0.000		0.0	1.8		1.8	0.0) 0	K
720	min V	Winter	10.000	0.000		0.0	1.6		1.6	0.0) 0	Κ
960	min V	Winter	10.000	0.000		0.0	1.3		1.3	0.0) 0	K
1440	min V	Winter	10.000	0.000		0.0	0.9		0.9	0.0) 0	K
2160	min V	Winter	10.000	0.000		0.0	0.7		0.7	0.0) 0	K
2880	min V	Winter	10.000	0.000		0.0	0.6		0.6	0.0) 0	Κ
4320	min V	Winter	10.000	0.000		0.0	0.4		0.4	0.0) 0	K
5760	min V	Winter	10.000	0.000		0.0	0.3		0.3	0.0) 0	K
7200	min V	Winter	10.000	0.000		0.0	0.3		0.3	0.0) 0	Κ
8640	min V	Winter	10.000	0.000		0.0	0.2		0.2	0.0) 0	Κ
10080	min V	Winter	10.000	0.000		0.0	0.2		0.2	0.0) 0	K
			Storm	:	Rain	Flooded	Dischar	ge	Time-Pe	eak		
			Event	(1	m/hr)	Volume	Volum	е	(mins)		
						(m ³)	(m ³)					

	Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30	min	Winter	21.343	0.0	11.0	29
60	min	Winter	13.306	0.0	13.9	46
120	min	Winter	8.118	0.0	16.9	74
180	min	Winter	6.048	0.0	18.9	0
240	min	Winter	4.901	0.0	20.4	0
360	min	Winter	3.622	0.0	22.6	0
480	min	Winter	2.915	0.0	24.3	0
600	min	Winter	2.463	0.0	25.7	0
720	min	Winter	2.146	0.0	26.8	0
960	min	Winter	1.726	0.0	28.8	0
1440	min	Winter	1.271	0.0	31.8	0
2160	min	Winter	0.936	0.0	35.1	0
2880	min	Winter	0.754	0.0	37.7	0
4320	min	Winter	0.554	0.0	41.6	0
5760	min	Winter	0.446	0.0	44.6	0
7200	min	Winter	0.377	0.0	47.1	0
8640	min	Winter	0.328	0.0	49.2	0
10080	min	Winter	0.292	0.0	51.1	0

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	3-6 Spring Place			7 Bertal Roa	ad		3-6 Spi	ring Place	3	1	C
	SW Atenaution Calculations	4		London			SW Ater	naution Ca	alculation	IS	4
	East Catchment Area	- Com		SW17 OBX			East Ca	atchment A	Area		- Cu
	Designed by MDS			Date 18.05.3	16		Designe	ed by MDS			MILIU
	Checked by MDS	Urainage		File			Checked	l by MDS			Urainage
	Source Control 2015.1	M		XP Solutions	s		Source	Control 2	2015.1		
			-								
Ra	ainfall Details						Model De	tails			
Rainfall Model rn Period (years)	FSR Winter Storms Y 1 Cv (Summer) 0.7	/es /50				Storage is	Online Cove	er Level (m) 11.000		
Region Engl M5-60 (mm)	and and Wales Cv (Winter) 0.8 20.700 Shortest Storm (mins)	340 15				<u>Cellu</u>	lar Stora	ge Struct	ure		
Ratio R Summer Storms	0.437 Longest Storm (mins) 100 Yes Climate Change %)80 +0			Infiltratio	In n Coefficie	vert Level nt Base (m/2	(m) 10.000 hr) 0.00000	Safety Fac) Poros	tor 2.0; ity 0.95	
Ti	me Area Diagram			Deni	th (m) Area	(m ²) Inf	Area (m^2)	(m)	rea (m²) Tn	f Area (m	2)
Tot	al Area (ha) 0.124			Dep	u, m) Ared	(CPCII (III) AL		., mea (III	,
Time (mins) Area T	ime (mins) Area Time (mins) Area				0.000 1.000	50.0 50.0	50.0 80.0	1.100	0.0	80	.0
0 4 0.041	4 8 0.041 8 12 0.042					Pu	mp Outflo	w Control			
						Ir	nvert Level	(m) 0.000			
				Depth (m) 1	Flow (l/s)	Depth (m) F	low (l/s) D	epth (m) F	Low (l/s) De	∋pth (m) F	low (l/s)
				0.100	5.0000	0.900	5.0000	1.700	5.0000	2.500	5.0000
				0.200	5.0000	1.000	5.0000	1.800	5.0000	2.600	5.0000
				0.300	5.0000	1.200	5.0000	2.000	5.0000	2.800	5.0000
				0.500	5.0000	1.300	5.0000	2.100	5.0000	2.900	5.0000
				0.600	5.0000	1.400	5.0000	2.200	5.0000	3.000	5.0000
				0.700	5.0000	1.500	5.0000	2.300	5.0000		
				0.800	5.0000	1.000	5.0000	2.400	5.0000		

Flo_Consult UK Ltd 7 Bertal Road

> Rainfall Model Return Period (years)

London

File

SW17 OBX

Date 18.05.16

XP Solutions

Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	SW Atenaution Calculations	L.
SW17 OBX	East Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period

Half Drain Time : 30 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (l/s)	Μ ΣΟυ (1	iax tflow /s)	Max Volume (m³)	Status
15 30 60	min Su min Su	ummer ummer	10.268 10.315	0.268	0.0	5.0 5.0		5.0 5.0	12.7 15.0 14 5	ОК
120 180	min Su min Su	ummer	10.259	0.259	0.0	5.0		5.0 5.0	12.3 9.9	ОК
240 360 480	min Su min Su	ummer ummer	10.160 10.082	0.160 0.082	0.0 0.0	5.0 5.0 5.0		5.0 5.0 5.0	7.6 3.9 1.5	ОК
600 720	min Su min Su	ummer	10.004	0.004	0.0	5.0 4.7		5.0 4.7	0.2	ОК
960 1440 2160	min Su min Su min Su	ummer ummer ummer	10.000 10.000 10.000	0.000	0.0 0.0 0.0	3.7 2.7 1.9		3.7 2.7 1.9	0.0 0.0 0.0	ОК ОК ОК
2880 4320	min Su min Su	ummer ummer	10.000	0.000	0.0	1.5		1.5	0.0	ОК
5760 7200 8640	min Su min Su min Su	ummer ummer ummer	10.000 10.000 10.000	0.000	0.0 0.0 0.0	0.9 0.7 0.6		0.9 0.7 0.6	0.0 0.0 0.0	O K O K O K
10080 15	min Su min Wi	ummer inter	10.000 10.313	0.000 0.313	0.0	0.5 5.0		0.5 5.0	0.0 14.9	0 K 0 K

	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)
15	min	Summer	81.241	0.0	18.9	22
30	min	Summer	52.101	0.0	24.3	32
60	min	Summer	31.905	0.0	29.5	50
120	min	Summer	18.960	0.0	35.2	84
180	min	Summer	13.841	0.0	38.4	116
240	min	Summer	11.027	0.0	41.2	148
360	min	Summer	7.991	0.0	44.6	208
480	min	Summer	6.355	0.0	47.3	262
600	min	Summer	5.318	0.0	49.5	314
720	min	Summer	4.596	0.0	51.3	0
960	min	Summer	3.648	0.0	54.3	0
1440	min	Summer	2.633	0.0	58.8	0
2160	min	Summer	1.898	0.0	63.5	0
2880	min	Summer	1.504	0.0	67.1	0
4320	min	Summer	1.082	0.0	72.5	0
5760	min	Summer	0.857	0.0	76.5	0
7200	min	Summer	0.714	0.0	79.7	0
8640	min	Summer	0.616	0.0	82.5	0
10080	min	Summer	0.543	0.0	84.8	0
15	min	Winter	81.241	0.0	21.1	22
		©198	32-2015	XP Sol	utions	

Flo_Consult UK Ltd		Page 2
7 Bertal Road	3-6 Spring Place	
London	SW Atenaution Calculations	L.
SW17 OBX	East Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period

	Stor: Even	m t	Max Level (m)	Max Depth (m)	M Infilt (1	ax ration /s)	Max Control (l/s)	Ma Σ Out (1/	x flow s)	Max Volume (m³)	Status
30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760 7200 8640	min min min min min min min min min min	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	$\begin{array}{c} 10.371 \\ 10.363 \\ 10.290 \\ 10.210 \\ 10.137 \\ 10.030 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \\ 10.000 \end{array}$	0.371 0.363 0.290 0.210 0.030 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000		$\begin{array}{c} 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0\\ 0.0$	5.0 5.0 5.0 5.0 5.0 4.6 3.9 3.4 2.7 1.9 1.4 1.1 0.8 0.6 0.5		5.0 5.0 5.0 5.0 5.0 4.6 3.9 3.4 2.7 1.9 1.4 1.1 0.8 0.6 0.5 0.5	$ \begin{array}{r} 17.6 \\ 17.2 \\ 13.8 \\ 10.0 \\ 6.5 \\ 1.4 \\ 0.0 \\ $	 K K<
10080		30 60	storm Event min Wir	(r nter s	Rain mm/hr)	Flooded Volume (m ³)	U.4 Dischar Volum (m ³)	rge Ti e	me-Pe	eak) 33	U K

	Storm Event		Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30	min	Winter	52.101	0.0	27.1	33		
60	min	Winter	31.905	0.0	33.5	54		
120	min	Winter	18.960	0.0	39.5	90		
180	min	Winter	13.841	0.0	43.4	124		
240	min	Winter	11.027	0.0	45.8	156		
360	min	Winter	7.991	0.0	49.9	210		
480	min	Winter	6.355	0.0	53.0	0		
600	min	Winter	5.318	0.0	55.4	0		
720	min	Winter	4.596	0.0	57.4	0		
960	min	Winter	3.648	0.0	60.8	0		
1440	min	Winter	2.633	0.0	65.8	0		
2160	min	Winter	1.898	0.0	71.2	0		
2880	min	Winter	1.504	0.0	75.2	0		
4320	min	Winter	1.082	0.0	81.2	0		
5760	min	Winter	0.857	0.0	85.7	0		
7200	min	Winter	0.714	0.0	89.3	0		
8640	min	Winter	0.616	0.0	92.4	0		
10080	min	Winter	0.543	0.0	95.0	0		

	Page 3]	Flo_Consult	UK Ltd						Page 4
Spring Place			7 Bertal Ro	ad		3-6 Spi	ring Place	e		
Atenaution Calculations	4		London			SW Ater	naution Ca	alculatior	ns	4
t Catchment Area	m		SW17 OBX			East Ca	atchment i	Area		- m
igned by MDS	MICLO		Date 18.05.	16		Designe	ad by MDS			MICLO
aked by MDS	Drainage		File			Checker	t by MDS			Drainage
rge Control 2015 1		-	XD Solution			Source	Control	2015 1		2
		-	XF SOLUCION	5		Source		2013.1		
ll Details						Model De	tails			
FSR Winter Storms Y 30 Cv (Summer) 0.7	es 50				Storage is	Online Cove	er Level (m) 11.000		
nd Wales Cv (Winter) 0.8 20.700 Shortest Storm (mins)	40 15				Cellu	ılar Stora	ge Struct	ure		
Yes Climate Change %	+0			Infiltratio Infiltratio	In on Coefficie on Coefficie	vert Level ent Base (m/ ent Side (m/	(m) 10.000 hr) 0.00000 hr) 0.00000) Safety Fac) Poros)	ctor 2.0 sity 0.95	
rea Diagram			Den	th (m) Area	a (m²) Tnf	Area (m^2)	enth (m) A	rea (m²) Tn	of Area (1	m 2)
ea (ha) 0.124			Dep	0 000			1 100	.ea (m-) III	I. Alea (i	
mins) Area Time (mins) Area To: (ha) From: To: (ha)				1.000	50.0	80.0	1.100	0.0	81).0
8 0.041 8 12 0.042	Page 3 P1 lace 7 1 Calculations Image: Storms Less Construction (Mins) (Pu	mp Outflo	w Control				
					I	nvert Level	(m) 0.000			
			Depth (m)	Flow (l/s)	Depth (m) F	low (l/s)	epth (m) F	low (l/s) D	epth (m) ?	Flow (l/s)
			0.100	5.0000	0.900	5.0000	1.700	5.0000	2.500	5.0000
			0.200	5.0000	1.000	5.0000	1.800	5.0000	2.600	5.0000
			0.300	5.0000	1.100	5.0000	1.900	5.0000	2.700	5.0000
			0.400	5.0000	1.200	5.0000	2.000	5.0000	2.800	5.0000
			0.600	5.0000	1.400	5.0000	2.200	5.0000	3.000	5.0000
			0.700	5.0000	1.500	5.0000	2.300	5.0000		
			0.800	5.0000	1.600	5.0000	2.400	5.0000		
		1								

Flo_Consult UK Ltd 7 Bertal Road 3-6 London SW A SW17 OBX East Date 18.05.16 Des File Cheo XP Solutions Sour

Rainfal

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.437	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Ar

Total Are

Time	(mins)	Area	Time	(mins)	Area	Time	(mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.041	4	8	0.041	8	12	0.042

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Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	SW Atenaution Calculations	L.
SW17 OBX	East Catchment Area	Micro
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 58 minutes.

	Storm Event	n :	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Σ	Max Outflow (l/s)	Max Volume (m³)	Status	
15	min :	Summer	10.480	0.480	0.0	5.0		5.0	22.8	ΟK	
30	min :	Summer	10.586	0.586	0.0	5.0		5.0	27.8	ΟK	
60	min :	Summer	10.613	0.613	0.0	5.0		5.0	29.1	ΟK	
120	min :	Summer	10.561	0.561	0.0	5.0		5.0	26.7	ΟK	
180	min :	Summer	10.502	0.502	0.0	5.0		5.0	23.9	ΟK	
240	min :	Summer	10.442	0.442	0.0	5.0		5.0	21.0	ΟK	
360	min :	Summer	10.330	0.330	0.0	5.0		5.0	15.7	ΟK	
480	min :	Summer	10.235	0.235	0.0	5.0		5.0	11.1	ΟK	
600	min :	Summer	10.156	0.156	0.0	5.0		5.0	7.4	ΟK	
720	min :	Summer	10.095	0.095	0.0	5.0		5.0	4.5	ΟK	
960	min :	Summer	10.019	0.019	0.0	5.0		5.0	0.9	ΟK	
1440	min :	Summer	10.000	0.000	0.0	4.1		4.1	0.0	ΟK	
2160	min :	Summer	10.000	0.000	0.0	2.9		2.9	0.0	ΟK	
2880	min :	Summer	10.000	0.000	0.0	2.3		2.3	0.0	ΟK	
4320	min :	Summer	10.000	0.000	0.0	1.6		1.6	0.0	ΟK	
5760	min :	Summer	10.000	0.000	0.0	1.3		1.3	0.0	ΟK	
7200	min :	Summer	10.000	0.000	0.0	1.1		1.1	0.0	ΟK	
8640	min :	Summer	10.000	0.000	0.0	0.9		0.9	0.0	ΟK	
10080	min :	Summer	10.000	0.000	0.0	0.8		0.8	0.0	ΟK	
15	min N	Winter	10.553	0.553	0.0	5.0		5.0	26.3	O K	

	Stor Even	m t	Rain (mm/hr)	Floode Volum (m ³)	ed e	Discharge Volume (m³)	Time-Peak (mins)
15	min	Summer	126.816	0.	0	29.4	23
30	min	Summer	81.944	0.	0	38.0	35
60	min	Summer	50.353	0.	0	46.9	60
120	min	Summer	29.886	0.	0	55.5	92
180	min	Summer	21.744	0.	0	60.7	126
240	min	Summer	17.257	0.	0	63.9	158
360	min	Summer	12.437	0.	0	69.5	224
480	min	Summer	9.856	0.	0	73.3	284
600	min	Summer	8.223	0.	0	76.5	344
720	min	Summer	7.089	0.	0	79.0	398
960	min	Summer	5.606	0.	0	83.4	504
1440	min	Summer	4.021	0.	0	89.7	0
2160	min	Summer	2.880	0.	0	96.4	0
2880	min	Summer	2.271	0.	0	101.4	0
4320	min	Summer	1.623	0.	0	108.7	0
5760	min	Summer	1.278	0.	0	114.1	0
7200	min	Summer	1.061	0.	0	118.4	0
8640	min	Summer	0.911	0.	0	122.0	0
10080	min	Summer	0.801	0.	0	125.1	0
15	min	Winter	126.816	0.	0	33.1	23
		©19	82-2015	XP So	1 1	utions	

Flo_Consult UK Ltd								Page 2	
7 Bertal Road			3-6	Spring	Place				
London			SW A	tenaut	ion Ca	lculati	ons	4	
SW17 OBX			East	Catch	ment A	rea			m
Date 18.05.16			Desi	aned b	v MDS			- MICIC	J
File			Chec	ked by	MDS			Drain	age
XP Solutions			Sour	ce Con	$\frac{1125}{trol 2}$	015 1		-	
AF SOLUCIONS			JUUL	CE COII	CIOI Z	013.1			
Summary	r of Reg	ulta f	or 10	10 vear	Potur	n Derio	d (+20	윤)	
Summary	OI KCB	uits i	01 10	io ycar	nccui	II FCLIO	u (120	0 /	
Storm	Max	Max	Max		Max	Max	Max	Status	
Event	Level D	epth In	filtra	ation Co	ntrol Σ	2 Outflow	Volume		
	(m)	(m)	(l/s) (1/s)	(l/s)	(m ³)		
	10 600 0	600			F 0		20.2		
30 min Winter	10.680 0	.680		0.0	5.0	5.0	32.3	O K	
120 min Winter	10.730 0	661		0.0	5.0	5.0	34.7	O K	
180 min Winter	10.575 0	575		0.0	5.0	5.0	27 3	O K	
240 min Winter	10.482 0	.482		0.0	5.0	5.0	22.9	ОК	
360 min Winter	10.312 0	.312		0.0	5.0	5.0	14.8	ОК	
480 min Winter	10.172 0	.172		0.0	5.0	5.0	8.1	ОК	
600 min Winter	10.067 0	.067		0.0	5.0	5.0	3.2	ОК	
720 min Winter	10.006 0	.006		0.0	5.0	5.0	0.3	ОК	
960 min Winter	10.000 0	.000		0.0	4.1	4.1	0.0	ОК	
1440 min Winter	10.000 0	.000		0.0	2.9	2.9	0.0	ОК	
2160 min Winter	10.000 0	.000		0.0	2.1	2.1	0.0	ОК	
2880 min Winter	10.000 0	.000		0.0	1.7	1.7	0.0	O K	
4320 min Winter	10.000 0	.000		0.0	1.2	1.2	0.0	O K	
5760 min Winter	10.000 0	.000		0.0	0.9	0.9	0.0	O K	
7200 min Winter	10.000 0	.000		0.0	0.8	0.8	0.0	O K	
8640 min Winter	10.000 0	.000		0.0	0.7	0.7	0.0	ОК	
10080 min Winter	10.000 0	.000		0.0	0.6	0.6	0.0	ОК	
	-	_							
	Storm	1 (Rain	Flooded	l Discha	irge Time	-Peak		
	Event	(111	uu/IIF)	(m ³)	(m ³) 			
				(111-)	(111-)			
:	30 min Wi	nter 8	1.944	0.0	4	2.5	36		
	60 min Wi	nter 5	0.353	0.0	5	52.3	60		
1:	20 min Wi	nter 2	9.886	0.0	6	52.5	98		
1:	80 min Wi	nter 2	1.744	0.0	6	58.0	136		
2.	40 min Wi	nter 1	7.257	0.0	7	1.6	172		
3	60 min Wi	nter 1	2.437	0.0	7	7.6	238		
41	80 min Wi: 00 min Wi	nter	9.856	0.0	8	52.U	298		
6	oo min Wi: 20 min Wi	nter	o.223	0.0	8		348		
	∠∪ min W1: 60 min Wi	nter	1.089	0.0		0.0	384		
14.	00 ແມນ W1. 40 min Wi	nter	4 021	0.0	10	0 5	0		
211	10 min ₩1. 60 min ₩i	nter	2.880	0.0	10	18.0	0		
221	80 min Wi	nter	2.271	0.0	11	.3.5	0		
43	20 min Wi	nter	1.623	0.0	12	21.7	Ő		
57	60 min Wi	nter	1.278	0.0	12	27.8	0		
72	00 min Wi	nter	1.061	0.0	13	32.6	0		
86	40 min Wi	nter	0.911	0.0	13	86.7	0		
100	80 min Wi	nter	0.801	0.0	14	10.1	0		
		©1982-	-2015	XP So	lution	S			

Page 3 Page 4 Page 3 7 Bertal Road 3-6 Spring Place SW17 0BX East Catchment Area Image 4 Date 18.05.16 Designed by MDS Designed by MDS Page 4 XP Solutions Source Control 2015.1 Model Details XP Solutions Storage is Online Cover Level (m) 11.000 Invert Level (m) 10.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Pump Outflow Control 0.000 0.000 Pump Outflow Control Invert Level (m) 0.000 Depth (m) Flow (1/s) Pepth (m) Flow (1/s) Depth (m) Flow (1/s)
Yes 3-0 Spring Place Date 18.05.16 Designed by MDS File Checked by MDS XP Solutions Source Control 2015.1 Yes
Witcourse SW 7 0BX East Catchment Area Date 18.05.16 Designed by MDS Dialog File Checked by MDS Dialog XP Solutions Source Control 2015.1 Dialog Model Details Storage is Online Cover Level (m) 11.000 Dialog .750 .750 Invert Level (m) 10.000 Safety Factor 2.0 .15 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 .420 Depth (m) Area (m²) Inf. Area (m²) Depth (m) Area (m²) Inf. Area (m²) 0.000 50.0 50.0 1.100 0.0 0.000 50.0 80.0 1.100 0.0 80.0 Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 5.0000 1.000 5.0000 2.500 5.0000
Micro Date 18.05.16 Designed by MDS Micro Date 18.05.16 Designed by MDS Dialogo XP Solutions Source Control 2015.1 Model Details XP Solutions Storage is Online Cover Level (m) 11.000 Cellular Storage Structure 1080 Invert Level (m) 10.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 *20 Pepth (m) Area (m²) Inf. Area (m²) Depth (m) Area (m²) Depth (m) Area (m²) 0.000 50.0 50.0 1.100 0.0 80.0 Pump Outflow Control Invert Level (m) 0.000 Pepth (m) Flow (1/s) Pepth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.000 50.000 1.000 50.000 2.500 5.0000
Date 18.05.16 Designed by MDS Dringe Yes Source Control 2015.1 Model Details Model Details Yes Storage is Online Cover Level (m) 11.000 Cellular Storage Structure Invert Level (m) 10.000 Safety Factor 2.0 150 Infiltration Coefficient Sase (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Sage (m/hr) 0.00000 Porosity 0.95 20 Depth (m) Area (m²) Inf. Area (m²) 1.100 0.000 80.0 1.000 50.0 50.0 1.100 0.000 80.0 Pump Outflow Control Invert Level (m) 0.0000 1.000 80.0 2.500 5.0000 0.100 5.0000 0.900 5.0000 1.700 5.0000 2.500 5.0000
File Checked by MDS Checked by MDS XP Solutions Source Control 2015.1 Model Details Model Details Storage is Online Cover Level (m) 11.000 Cellular Storage Structure 15 Invert Level (m) 10.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.0000 Porosity 0.95 0.000 50.0 50.0 1.000 50.0 80.0 Pump Outflow Control Invert Level (m) 0.000 Pepth (m) Flow (1/s) Pepth (m) Flow (1/s) Pepth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Scoool 1.700 5.0000 0.100 5.0000 1.000 2.500 5.0000
Yes Source Control 2015.1 0.750 Storage is Online Cover Level (m) 11.000 0.840 Cellular Storage Structure 15 Invert Level (m) 10.000 Safety Factor 2.0 1nfiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 1nfiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95 0.000 50.0 50.0 1.000 50.0 1.100 0.0 0.000 50.0 80.0 1.100 80.0 0.000 50.0 80.0 1.100 1.00 80.0 0.000 50.0 80.0 1.100 2.500 5.0000 0.100 5.0000 0.900 5.0000 1.700 5.0000 2.500 5.0000
Yes Model Details Storage is Online Cover Level (m) 11.000 Storage Structure 15 Cellular Storage Structure 15 Invert Level (m) 10.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 Infiltration Coefficient Base (m/hr) 0.0000 Porosity 0.95 0.000 50.0 50.0 1.000 50.0 50.0 1.000 50.0 80.0 Pump Outflow Control Invert Level (m) 0.000 Pump Outflow Control Invert Level (m) 0.000 Depth (m) Flow (1/s) Pepth (m) Flow (1/s) Pepth (n) Flow (1/s) Pump Outflow Control Invert Level (m) 0.000
0.300 5.0000 1.100 5.0000 2.700 5.0000 0.400 5.0000 1.200 5.0000 2.800 5.0000 0.500 5.0000 1.300 5.0000 2.200 5.0000 2.900 5.0000 0.600 5.0000 1.400 5.0000 2.200 5.0000 3.000 5.0000 0.600 5.0000 1.500 5.0000 2.300 5.0000 3.000 5.0000 0.800 5.0000 1.600 5.0000 2.400 5.0000 5.0000

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Flo_Consult UK Ltd		Page 3
7 Bertal Road	3-6 Spring Place	
London	SW Atenaution Calculations	L
SW17 OBX	East Catchment Area	Micco
Date 18.05.16	Designed by MDS	Desinado
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	-

Rain

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)	20.700	Shortest Storm (mins)	15
Ratio R	0.437	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time

Total

Time	(mins)	Area	Time	(mins)	Area	Time	(mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.041	4	8	0.041	8	12	0.042

Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L.
SW17 OBX	West Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 1 year Return Period

Half Drain Time : 1 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (l/s)	Σ	Max Outflow (l/s)	Max Volume (m³)	Status	
15 30	min Sum min Sum	nmer	10.022	0.022	0.0	5.0 5.0		5.0 5.0	0.4 0.5	ок	
60	min Sum	nmer	10.010	0.010	0.0	5.0		5.0	0.2	ОК	
120	min Sum	nmer	10.000	0.000	0.0	4.2		4.2	0.0	ΟK	
180	min Sum	nmer	10.000	0.000	0.0	3.4		3.4	0.0	ΟK	
240	min Sum	nmer	10.000	0.000	0.0	2.8		2.8	0.0	ΟK	
360	min Sum	nmer	10.000	0.000	0.0	2.2		2.2	0.0	ΟK	
480	min Sum	nmer	10.000	0.000	0.0	1.8		1.8	0.0	ΟK	
600	min Sum	nmer	10.000	0.000	0.0	1.5		1.5	0.0	ΟK	
720	min Sum	nmer	10.000	0.000	0.0	1.3		1.3	0.0	ΟK	
960	min Sum	nmer	10.000	0.000	0.0	1.1		1.1	0.0	ΟK	
1440	min Sum	nmer	10.000	0.000	0.0	0.8		0.8	0.0	ΟK	
2160	min Sum	nmer	10.000	0.000	0.0	0.6		0.6	0.0	ΟK	
2880	min Sum	nmer	10.000	0.000	0.0	0.5		0.5	0.0	ΟK	
4320	min Sum	nmer	10.000	0.000	0.0	0.3		0.3	0.0	ΟK	
5760	min Sum	nmer	10.000	0.000	0.0	0.3		0.3	0.0	ΟK	
7200	min Sum	nmer	10.000	0.000	0.0	0.2		0.2	0.0	ΟK	
8640	min Sum	nmer	10.000	0.000	0.0	0.2		0.2	0.0	ΟK	
10080	min Sum	nmer	10.000	0.000	0.0	0.2		0.2	0.0	ΟK	
15	min Win	nter	10.040	0.040	0.0	5.0		5.0	0.8	ОК	

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15	min Summer	33.081	0.0	4.7	18
30	min Summer	21.343	0.0	6.1	26
60	min Summer	13.306	0.0	7.5	40
120	min Summer	8.118	0.0	9.3	0
180	min Summer	6.048	0.0	10.3	0
240	min Summer	4.901	0.0	11.2	0
360	min Summer	3.622	0.0	12.4	0
480	min Summer	2.915	0.0	13.3	0
600	min Summer	2.463	0.0	14.0	0
720	min Summer	2.146	0.0	14.7	0
960	min Summer	1.726	0.0	15.7	0
1440	min Summer	1.271	0.0	17.4	0
2160	min Summer	0.936	0.0	19.2	0
2880	min Summer	0.754	0.0	20.6	0
4320	min Summer	0.554	0.0	22.7	0
5760	min Summer	0.446	0.0	24.4	0
7200	min Summer	0.377	0.0	25.8	0
8640	min Summer	0.328	0.0	26.9	0
10080	min Summer	0.292	0.0	28.0	0
15	min Winter	33.081	0.0	5.3	18
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7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L.
SW17 OBX	West Catchment Area	Micro
Date 18.05.16	Designed by MDS	Desinado
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	
Summary of Resul	ts for 1 year Return Period	

	Storm Event	Max Level (m)	Max Depth (m)	M Infili (1	ax tration /s)	Max Control (l/s)	ΣC (Max utflow l/s)	Max Volume (m³)	Status
30	min Winter	10.038	0.038		0.0	5.0		5.0	0.7	ОК
60	min Winter	10.003	0.003		0.0	5.0		5.0	0.1	ОК
120	min Winter	10.000	0.000		0.0	3.5		3.5	0.0	ОК
180	min Winter	10.000	0.000		0.0	2.7		2.7	0.0	ОК
240	min Winter	10.000	0.000		0.0	2.2		2.2	0.0	ΟK
360	min Winter	10.000	0.000		0.0	1.6		1.6	0.0	ΟK
480	min Winter	10.000	0.000		0.0	1.3		1.3	0.0	ΟK
600	min Winter	10.000	0.000		0.0	1.1		1.1	0.0	O K
720	min Winter	10.000	0.000		0.0	1.0		1.0	0.0	O K
960	min Winter	: 10.000	0.000		0.0	0.8		0.8	0.0	ΟK
1440	min Winter	: 10.000	0.000		0.0	0.6		0.6	0.0	ΟK
2160	min Winter	10.000	0.000		0.0	0.4		0.4	0.0	ΟK
2880	min Winter	10.000	0.000		0.0	0.3		0.3	0.0	ΟK
4320	min Winter	10.000	0.000		0.0	0.2		0.2	0.0	ΟK
5760	min Winter	10.000	0.000		0.0	0.2		0.2	0.0	ΟK
7200	min Winter	: 10.000	0.000		0.0	0.2		0.2	0.0	ОК
8640	min Winter	10.000	0.000		0.0	0.1		0.1	0.0	ОК
10080	min Winter	10.000	0.000		0.0	0.1		0.1	0.0	ΟK
		Storm Event	(Rain mm/hr)	Flooded Volume (m³)	l Dischau Volum (m³)	rge e	Time-Pe (mins	eak)	
	_									
	3) min Wi	nter	21.343	0.0	6	5.8		26	
	6) min Wi	nter	13.306	0.0	5	3.5		40	
	12	J min Wi D min Wi	nter	8.118	0.0	1).4		0	
	18	J min Wi	nter	0.048	0.0	1	L.0		0	
	24) IIIIII WI) min Wi	nter	4.901	0.0	1	2.5		0	
	30) IIIIII WI) min Wi	nter	2 015	0.0	1/	1 0		0	
	40) min Wi	nter	2.913	0.0	11	±.9		0	
	72) min Wi	nter	2.405	0.0	14	5.7		0	
	96) min Wi	nter	1 726	0.0	1	7 6		0	
	144) min Wi	nter	1 271	0.0	10	7.0 7.5		0	
	216) min Wi	nter	0 936	0.0	21	1 5		0	
	288) min Wi	nter	0.754	0.0	21	x 1		0	
	432) min Wi	nter	0.554	0.0	2.	5.5		0	
	576) min Wi	nter	0.446	0.0	2.7	7.3		0	
	720) min Wi	nter	0.377	0.0	2.8	3.9		0	
	864) min Wi	nter	0.328	0.0	3().2		0	
	1008) min Wi	nter	0.292	0.0	31	L.3		0	

Page 3		Flo_Consult	: UK Ltd						Page 4
Spring Place		7 Bertal Ro	bad		3-6 S	pring Pla	ce		
tenuation Calculations		London			SW At	enuation	Calculati	ons	4
Catchment Area	~	SW17 OBX			West	Catchment	Area		- Cu
aned by MDS		Date 18.05	16		Desig	ned by MD	us		MICLO
by MDS Drainad	0	File	0		Check	ed by MDS			Drainage
red by hob		XD Solution			Source	e Control	2015 1		
		XF SOLUCIO	15		Sourc	e concroi	2013.1		
l Details					Model	Details			
FSR Winter Storms Yes 1 Cv (Summer) 0.750				Storage i	ls Online Co	over Level	(m) 11.000		
d Wales Cv (Winter) 0.840 20.700 Shortest Storm (mins) 15				Cell	lular Stor	rage Struc	ture		
0.437 Longest Storm (mins) 10080 Yes Climate Change % +0			Infiltrati Infiltrati	on Coeffic	Invert Leve ient Base (r ient Side (r	l (m) 10.0 m/hr) 0.000 m/hr) 0.000	00 Safety Fa 00 Por	actor 2.0 osity 0.95	
a Diagram		Det	oth (m) Are	a (m²) Inf	. Area (m ²)	Depth (m)	Area (m²)]	inf. Area (1	m²)
a (ha) 0.076					,	,			- ,
ins) Area Time (mins) Area			0.000 1.000	20.0 20.0	20.0 44.0	1.100	0.0	44	1.0
8 0.025 8 12 0.026				1	Pump Outfl	low Contro	<u>)1</u>		
					Invert Leve	el (m) 0.00	0		
		Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
		0.100	5.0000	0.900	5.0000	1.700	5.0000	2.500	5.0000
		0.200	5.0000	1.000	5.0000	1.800	5.0000	2.600	5.0000
		0.300	5.0000	1.100	5.0000	1.900	5.0000	2.700	5.0000
		0.400	5.0000	1.300	5.0000	2.000	5.0000	2.800	5.0000
		0.600	5.0000	1.400	5.0000	2.200	5.0000	3.000	5.0000
		0.700	5.0000	1.500	5.0000	2.300	5.0000		
		0.800	5.0000	1.600	5.0000	2.400	5.0000		

Flo_Consult UK Ltd 7 Bertal Road 3-6 London SW At SW17 OBX West Date 18.05.16 Desig File Check XP Solutions Sourc

Rainfal

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.437	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Are

Total Area

Time	(mins)	Area	Time	(mins)	Area	Time	(mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.025	4	8	0.025	8	12	0.026

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7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L.
SW17 OBX	West Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period

Half Drain Time : 14 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Σ	Max Outflow (l/s)	Max Volume (m³)	Status
15	min Sum	mer	10.320	0.320	0.0	5.0		5.0	6.1	ОК
30	min Sum	mer	10.363	0.363	0.0	5.0		5.0	6.9	ΟK
60	min Sum	mer	10.322	0.322	0.0	5.0		5.0	6.1	ΟK
120	min Sum	mer	10.217	0.217	0.0	5.0		5.0	4.1	ΟK
180	min Sum	mer	10.123	0.123	0.0	5.0		5.0	2.3	ΟK
240	min Sum	mer	10.054	0.054	0.0	5.0		5.0	1.0	ΟK
360	min Sum	mer	10.000	0.000	0.0	4.8		4.8	0.0	ΟK
480	min Sum	mer	10.000	0.000	0.0	3.9		3.9	0.0	O K
600	min Sum	mer	10.000	0.000	0.0	3.3		3.3	0.0	O K
720	min Sum	mer	10.000	0.000	0.0	2.9		2.9	0.0	ОК
960	min Sum	mer	10.000	0.000	0.0	2.3		2.3	0.0	ОК
1440	min Sum	mer	10.000	0.000	0.0	1.6		1.6	0.0	ОК
2160	min Sum	mer	10.000	0.000	0.0	1.2		1.2	0.0	ОК
2880	min Sum	mer	10.000	0.000	0.0	0.9		0.9	0.0	ОК
4320	min Sum	mer	10.000	0.000	0.0	0.7		0.7	0.0	ОК
5760	min Sum	mer	10.000	0.000	0.0	0.5		0.5	0.0	ОК
7200	min Sum	mer	10.000	0.000	0.0	0.4		0.4	0.0	ΟK
8640	min Sum	mer	10.000	0.000	0.0	0.4		0.4	0.0	ОК
10080	min Sum	mer	10.000	0.000	0.0	0.3		0.3	0.0	ОК
15	min Win	ter	10.382	0.382	0.0	5.0		5.0	7.2	O K

	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)	
15	min	Summer	81.241	0.0	11.4	21	
30	min	Summer	52.101	0.0	14.9	30	
60	min	Summer	31.905	0.0	18.3	46	
120	min	Summer	18.960	0.0	21.4	78	
180	min	Summer	13.841	0.0	23.5	108	
240	min	Summer	11.027	0.0	25.2	136	
360	min	Summer	7.991	0.0	27.3	0	
480	min	Summer	6.355	0.0	29.0	0	
600	min	Summer	5.318	0.0	30.3	0	
720	min	Summer	4.596	0.0	31.4	0	
960	min	Summer	3.648	0.0	33.3	0	
1440	min	Summer	2.633	0.0	36.0	0	
2160	min	Summer	1.898	0.0	38.9	0	
2880	min	Summer	1.504	0.0	41.1	0	
4320	min	Summer	1.082	0.0	44.4	0	
5760	min	Summer	0.857	0.0	46.9	0	
7200	min	Summer	0.714	0.0	48.9	0	
8640	min	Summer	0.616	0.0	50.5	0	
10080	min	Summer	0.543	0.0	52.0	0	
15	min	Winter	81.241	0.0	13.0	21	
		©198	32-2015	XP Sol	utions		

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7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L.
SW17 OBX	West Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	•

Summary of Results for 30 year Return Period

	Stori Event	n E	Ma: Lev (m	x el)	Max Depth (m)	M Infila (1	ax tration /s)	Max Control (l/s)	ΣΟ	Max Outflow (1/s)	Ma Volu (m [:]	x ume 3)	Status
30	min	Winter	10.4	134	0.434		0.0	5.0		5.0	8	3.2	ОК
60	min	Winter	10.3	369	0.369		0.0	5.0		5.0		7.0	ΟK
120	min	Winter	10.1	98	0.198		0.0	5.0		5.0		3.8	ΟK
180	min	Winter	10.0	060	0.060		0.0	5.0		5.0	-	1.1	ΟK
240	min	Winter	10.0	000	0.000		0.0	4.9		4.9	(0.0	ΟK
360	min	Winter	10.0	000	0.000		0.0	3.6		3.6	(0.0	ΟK
480	min	Winter	10.0	000	0.000		0.0	2.8		2.8	(0.0	ΟK
600	min	Winter	10.0	000	0.000		0.0	2.4		2.4	(0.0	ΟK
720	min	Winter	10.0	000	0.000		0.0	2.1		2.1	(0.0	O K
960	min	Winter	10.0	000	0.000		0.0	1.6		1.6	(0.0	O K
1440	min	Winter	10.0	000	0.000		0.0	1.2		1.2	(0.0	O K
2160	min	Winter	10.0	000	0.000		0.0	0.9		0.9	(0.0	O K
2880	min	Winter	10.0	000	0.000		0.0	0.7		0.7	(0.0	O K
4320	min	Winter	10.0	000	0.000		0.0	0.5		0.5	(0.0	O K
5760	min	Winter	10.0	000	0.000		0.0	0.4		0.4	(0.0	O K
7200	min	Winter	10.0	000	0.000		0.0	0.3		0.3	(0.0	O K
8640	min	Winter	10.0	000	0.000		0.0	0.3		0.3	(0.0	O K
10080	min	Winter	10.0	000	0.000		0.0	0.2		0.2	(0.0	ОК
			Stor	m		Rain	Flooded	l Dischar	rge	Time-Pe	eak		
			Even	t	(mm/hr)	Volume	Volum	e	(mins)		
							(m³)	(m³)					
		30	min	Win	ter	52.101	0.0) 10	5.6		31		
		60	min	Win	ter	31.905	0.0) 20	0.2		50		
		120	min	Win	ter	18.960	0.0) 24	1.3		82		
		180	min	Win	ter	13.841	0.0) 26	5.5	1	L10		
		240	min	Win	ter	11.027	0.0) 28	3.2		0		
		360	min	Win	ter	7.991	0.0) 3(0.6		0		
		480	min	Win	ter	6.355	0.0) 32	2.5		0		

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	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)
30	min	Winter	52.101	0.0	16.6	31
60	min	Winter	31.905	0.0	20.2	50
120	min	Winter	18.960	0.0	24.3	82
180	min	Winter	13.841	0.0	26.5	110
240	min	Winter	11.027	0.0	28.2	0
360	min	Winter	7.991	0.0	30.6	0
480	min	Winter	6.355	0.0	32.5	0
600	min	Winter	5.318	0.0	33.9	0
720	min	Winter	4.596	0.0	35.2	0
960	min	Winter	3.648	0.0	37.3	0
1440	min	Winter	2.633	0.0	40.3	0
2160	min	Winter	1.898	0.0	43.6	0
2880	min	Winter	1.504	0.0	46.1	0
4320	min	Winter	1.082	0.0	49.8	0
5760	min	Winter	0.857	0.0	52.5	0
7200	min	Winter	0.714	0.0	54.7	0
8640	min	Winter	0.616	0.0	56.6	0
10080	min	Winter	0.543	0.0	58.2	0

Page 3	Flo Consult	IIK Ltd						Page 4
Spring Place	7 Bertal Ro	ad		3-6 9	nring Dla	<u> </u>		rage r
tenuation Calculations	, Derear Ro	au		S U S	pring ria enuation	Calqulati	ong	4
Catabaant Anos				JW AL	Gatabrant	Amer	OIIS	1 mm
Micro Micro	SWI7 UBA	1.6		West		Area		- Micro
	Date 18.05.	16		Desig	ned by MD	S		Drainage
ked by MDS	File			Check	ed by MDS			brainage
ce Control 2015.1	XP Solution	IS		Sourc	e Control	2015.1		
gned by MDS ced by MDS ce Control 2015.1 I Details FSR Winter Storms Yes 30 Cv (Summer) 0.750 1 Wales Cv (Winter) 0.840 20.700 Shortest Storm (mins) 15 0.437 Longest Storm (mins) 10080 Yes Climate Change % +0 2a Diagram a (ha) 0.076 Mins) Area Time (mins) Area From: To: (ha) 8 0.025 8 12 0.026	Date 18.05. File XP Solution Depth (m) 0.100 0.200 0.300 0.400 0.500 0.600 0.700 0.800	<pre>16 Is Infiltratid Infiltratid Infiltratid oth (m) Area 0.000 1.000 5.000 5.0000 5</pre>	Storage i <u>Cell</u> on Coeffic: on Coeffic: a (m²) Inf 20.0 20.0 Inf 20.0 20.0 Inf 20.0 20.0 Inf 20.0 20.0 Inf 20.0 20.0 1.000 1.000 1.000 1.000 1.000 1.000 1.500 1.600	Desig Check Sourc <u>Model I</u> s Online Co lular Stor Invert Level ient Side (n . Area (m ²) 20.0 44.0 Pump Outfl Invert Leve Flow (1/s) 5.0000 5.0000 5.0000 5.0000 5.0000	ned by MD ed by MDS e Control Details over Level (m) 10.0 a/hr) 0.000 a/hr) 0.000 (Depth (m) 1.100 (m) 0.000 (Depth (m) 1.700 1.800 1.900 2.000 2.100 2.200 2.300 2.400	S 2015.1 (m) 11.000 ture 00 Safety F 00 Por 00 Area (m ²) S 0.0 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000	<pre>'actor 2.0 'osity 0.95 Inf. Area (</pre>	m ²) 4.0 Flow (1/s) 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000 5.0000

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Flo_Consult UK Ltd		Page 3
7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L
SW17 OBX	West Catchment Area	Micco
Date 18.05.16	Designed by MDS	Desinado
File	Checked by MDS	Dialitage
XP Solutions	Source Control 2015.1	

Rainfal

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.437	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Are

Total Area

Time	(mins)	Area	Time	(mins)	Area	Time	(mins)	Area
From:	To:	(ha)	From:	то:	(ha)	From:	To:	(ha)
0	4	0 005		0	0 005		10	0 000

4 0.025 4 0

Flo_Consult UK Ltd		Page 1
7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L.
SW17 OBX	West Catchment Area	Micro
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamaye
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 28 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Σ	Max Outflow (l/s)	Max Volume (m³)	Status
15	min Summ	er 10.631	0.631	0.0	5.0		5.0	12.0	O K
30	min Summ	er 10.747	0.747	0.0	5.0		5.0	14.2	Flood Risk
60	min Summ	er 10.725	0.725	0.0	5.0		5.0	13.8	Flood Risk
120	min Summ	er 10.607	0.607	0.0	5.0		5.0	11.5	O K
180	min Summ	er 10.477	0.477	0.0	5.0		5.0	9.1	O K
240	min Summ	er 10.355	0.355	0.0	5.0		5.0	6.8	O K
360	min Summ	er 10.166	0.166	0.0	5.0		5.0	3.2	O K
480	min Summ	er 10.051	0.051	0.0	5.0		5.0	1.0	O K
600	min Summ	er 10.001	0.001	0.0	5.0		5.0	0.0	O K
720	min Summ	er 10.000	0.000	0.0	4.4		4.4	0.0	ОК
960	min Summ	er 10.000	0.000	0.0	3.5		3.5	0.0	O K
1440	min Summ	er 10.000	0.000	0.0	2.5		2.5	0.0	ОК
2160	min Summ	er 10.000	0.000	0.0	1.8		1.8	0.0	ОК
2880	min Summ	er 10.000	0.000	0.0	1.4		1.4	0.0	O K
4320	min Summ	er 10.000	0.000	0.0	1.0		1.0	0.0	O K
5760	min Summ	er 10.000	0.000	0.0	0.8		0.8	0.0	ОК
7200	min Summ	er 10.000	0.000	0.0	0.7		0.7	0.0	ОК
8640	min Summ	er 10.000	0.000	0.0	0.6		0.6	0.0	ОК
10080	min Summ	er 10.000	0.000	0.0	0.5		0.5	0.0	ОК
15	min Wint	er 10.737	0.737	0.0	5.0		5.0	14.0	Flood Risk

	Stor Even	m t	Rain (mm/hr)	Flood Volur (m³)	ed ne)	Discharge Volume (m³)	Time-Peak (mins)
15	min	Summer	126.816	0	.0	18.0	21
30	min	Summer	81.944	0	.0	23.3	32
60	min	Summer	50.353	0	.0	28.7	50
120	min	Summer	29.886	0	.0	34.3	84
180	min	Summer	21.744	0	.0	37.2	116
240	min	Summer	17.257	0	.0	39.3	148
360	min	Summer	12.437	0	.0	42.5	206
480	min	Summer	9.856	0	.0	44.9	260
600	min	Summer	8.223	0	.0	46.9	308
720	min	Summer	7.089	0	.0	48.5	0
960	min	Summer	5.606	0	.0	51.1	0
1440	min	Summer	4.021	0	.0	55.0	0
2160	min	Summer	2.880	0	.0	59.1	0
2880	min	Summer	2.271	0	.0	62.1	0
4320	min	Summer	1.623	0	.0	66.6	0
5760	min	Summer	1.278	0	.0	69.9	0
7200	min	Summer	1.061	0	.0	72.6	0
8640	min	Summer	0.911	0	.0	74.8	0
10080	min	Summer	0.801	0	.0	76.7	0
15	min	Winter	126.816	0	.0	20.2	22
		©198	82-2015	XP S	ol	utions	

Flo_Consult UK Ltd		Page 2
7 Bertal Road	3-6 Spring Place	
London	SW Atenuation Calculations	L
SW17 OBX	West Catchment Area	Micco
Date 18.05.16	Designed by MDS	
File	Checked by MDS	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+20%)

Sto Eve	rm nt	Max Level (m)	Max Depth (m)	Max Infiltra (1/s	ation (Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m ³)	Status
30 mir	Winter	10.882	0.882		0.0	<mark>5.0</mark>	<mark>5.0</mark>	16.7	Flood Risk
60 mir	Winter	10.859	0.859		0.0	5.0	5.0	16.3	Flood Risk
120 mir	Winter	10.675	0.675		0.0	5.0	5.0	12.8	O K
180 mir	Winter	10.472	0.472		0.0	5.0	5.0	9.0	0 K
240 mir	Winter	10.289	0.289		0.0	5.0	5.0	5.5	0 K
360 mir	Winter	10.040	0.040		0.0	5.0	5.0	0.8	0 K
480 mir	Winter	10.000	0.000		0.0	4.4	4.4	0.0	0 K
600 mir	Winter	10.000	0.000		0.0	3.7	3.7	0.0	0 K
720 mir	Winter	10.000	0.000		0.0	3.2	3.2	0.0	0 K
960 mir	Winter	10.000	0.000		0.0	2.5	2.5	0.0	0 K
1440 mir	Winter	10.000	0.000		0.0	1.8	1.8	0.0	0 K
2160 mir	Winter	10.000	0.000		0.0	1.3	1.3	0.0	0 K
2880 mir	Winter	10.000	0.000		0.0	1.0	1.0	0.0	0 K
4320 mir	Winter	10.000	0.000		0.0	0.7	0.7	0.0	0 K
5760 mir	Winter	10.000	0.000		0.0	0.6	0.6	0.0	0 K
7200 mir	Winter	10.000	0.000		0.0	0.5	0.5	0.0	0 K
8640 mir	Winter	10.000	0.000		0.0	0.4	0.4	0.0	0 K
10080 mir	Winter	10.000	0.000		0.0	0.4	0.4	0.0	0 K
		Storm Event		Rain (mm/hr)	Floode Volum (m³)	ed Disch Ne Vol (m	narge Time ume (mi ³)	-Peak .ns)	

	Stor Even	m t	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30	min	Winter	81.944	0.0	26.1	33
60	min	Winter	50.353	0.0	32.2	54
120	min	Winter	29.886	0.0	38.1	90
180	min	Winter	21.744	0.0	41.5	124
240	min	Winter	17.257	0.0	44.0	154
360	min	Winter	12.437	0.0	47.7	204
480	min	Winter	9.856	0.0	50.3	0
600	min	Winter	8.223	0.0	52.5	0
720	min	Winter	7.089	0.0	54.3	0
960	min	Winter	5.606	0.0	57.3	0
1440	min	Winter	4.021	0.0	61.6	0
2160	min	Winter	2.880	0.0	66.2	0
2880	min	Winter	2.271	0.0	69.6	0
4320	min	Winter	1.623	0.0	74.6	0
5760	min	Winter	1.278	0.0	78.3	0
7200	min	Winter	1.061	0.0	81.3	0
8640	min	Winter	0.911	0.0	83.8	0
10080	min	Winter	0.801	0.0	85.9	0

K Ltd	Page 3	Flo_Consult UK Lto	d		Page 4
	3-6 Spring Place	7 Bertal Road	3-6 S	pring Place	
	SW Atenuation Calculations	London	SW At	enuation Calculation	IS Contraction
	West Catchment Area	SW17 OBX	West	Catchment Area	Micro
	Designed by MDS	Date 18.05.16	Desig	ned by MDS	
	Checked by MDS	File	Check	ed by MDS	Diamage
	Source Control 2015.1	XP Solutions	Sourc	e Control 2015.1	I
Rat	infall Details		Model I	Details	
Dainfall Madel	ECD Winter Sterma Veg		Stowago ig Opling G	www.Towol (m) 11 000	
rn Period (years)	100 Cv (Summer) 0.750		Storage is online co	Ver Level (m) 11.000	
Region Engla	and and Wales Cv (Winter) 0.840		Cellular Stor	age Structure	
M5-60 (mm)	20.700 Shortest Storm (mins) 15				
Summer Storms	Yes Climate Change % +20		Invert Level	. (m) 10.000 Safety Fac	tor 2.0
		Infiltr	ation Coefficient Base (n ation Coefficient Side (n	1/hr) 0.00000 Poros	ity 0.95
Tim	ne Area Diagram			(/III) 0.00000	
		Depth (m)	Area (m²) Inf. Area (m²)	Depth (m) Area (m²) Inf	f. Area (m²)
Tota	al Area (ha) 0.076	0,000	20.0 20.0	1 100 0 0	44 0
Time (mins) Area Ti	me (mins) Area Time (mins) Area	1.000	20.0 20.0	1.100 0.0	11.0
From: To: (ha) Fro	om: To: (ha) From: To: (ha)				
0 4 0 0 25	4 8 0 025 8 12 0 026		Pump Outfl	ow Control	
0 1 0.025			Invert Leve	.1 (m) 0 000	
			THATC PEAG	1 (11) 0.000	
		Depth (m) Flow (1,	/s) Depth (m) Flow (l/s)	Depth (m) Flow (l/s) De	epth (m) Flow (l/s)
		0.100 5.00	0.900 5.0000	1.700 5.0000	2.500 5.0000
		0.200 5.00	1.000 5.0000	1.800 5.0000	2.600 5.0000
		0.300 5.00	000 1.100 5.0000	1.900 5.0000	2.700 5.0000
			1.200 5.0000		2.800 5.0000
		0.600 5.00	1.400 5.0000	2.200 5.0000	3.000 5.0000
		0.700 5.00	000 1.500 5.0000	2.300 5.0000	
		0.800 5.00	000 1.600 5.0000	2.400 5.0000	

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Flo_Consult UK Ltd 7 Bertal Road

> Rainfall Model Return Period (years)

London

File

SW17 OBX

Date 18.05.16

XP Solutions



Appendix H Outline Drainage Layout Plan





1	This drawing is to be read in conjunction with	
	all relevant architects, engineers and	
	specialists drawings and specifications.	

Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale the above bar should be 100mm

3 Abbreviations

CL	- Cover Level
IL.	- Invert Level
MH	- Manhole
OD	- Outer Diameter
RWP	- Rainwater Pipe
SVP	- Soil Vent Pipe

Drainage	Kev	

	Descended CIM desire over
	Proposed Sw drain run
	Proposed FW drain run
	Proposed CW drain run
	Proposed Pumped Rising Main
	Existing SW drain run
	Existing FW drain run
	Existing CW drain run
	Existing Pumped Rising Main
	Public sewer
	Unspecified drain run
	Proposed Channel Drain
****** * *****	Redundant drain run
RWP	
+ + Proposed	/ Existing Rain Water Pipe
♦ ⊕ ^{SVP} Proposed	/ Existing Soil Vent Pipe
Proposed	/ Existing Rodding Eye
+ + Proposed	/ Existing Drainage Point
♦ ⊕SS Proposed	/ Existing Stub Stack
G Proposed	/ Existing Gully
0	Proposed SW Manhole
۲	Proposed FW Manhole
۲	Proposed CW Manhole
\square O	Proposed Public Sewer Manhole
\Box \bigcirc	Existing Manhole

 P1
 13.09.16
 JGS
 SL
 STAGE 2 ISSUE

 Rev
 Date
 By
 Eng
 Amendments



STRUCTURAL ENGINEERS hts.uk.com

^{Job Name} 3 - 6 Spring Place, London

_{Drawing Title} Proposed Basement Drainage Strategy

 Purpose of Issue
 Stage 2 Issue
 Scale at A0
 As indicated

 Drawing No
 1399/DR600
 Rev
 P1



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