St Andrew the Apostle School, London

Flood Risk Assessment and Drainage Strategy Report

Curtins Ref: 072661-CUR-ZZ-XX-RP-C-0002 Revision: V02 Issue Date: 17 May 2021

Client Name: Bowmer & Kirkland

Client Address: Southern Regional Office, 1230 Arlington Business Park, Theale, Reading, RG7 4SA.





Curtins 56 The Ropewalk, Nottingham, NG1 5DW Tel: 0115 941 5551

CIVILS & STRUCTURES • TRANSPORT PLANNING • ENVIRONMENTAL • INFRASTRUCTURE • GEOTECHNICAL • CONSERVATION & HERITAGE • PRINCIPAL DESIGNER Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham



Rev	Description	Issued by	Checked	Date
V01	Planning Issue	AS	WH	09/04/21
V02	Revised to suit client team comments	RW	WH	17/05/2021

This report has been prepared for the sole benefit, use, and information of the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
Alicja Smolen MSc (Hons) Project Engineer	Lala	09/04/21

Reviewed and Authorised	Signature	Date
Wayne Howland BSc (Hons) CEng MIStructE Associate	Mr Apaland	09/04/21



Table of contents

1.0	Introduction	1
2.0	Surface Water	2
3.0	Foul Water	6
4.0	Appendices	1



1.0 Introduction

1.1 Project Background

Curtins has been appointed by Bowmer & Kirkland to provide a Drainage Strategy Report for the proposed school development located on the 1.9 ha land in Barnet, London, N11 1GN.

The site is currently occupied by buildings of miscellaneous use, office blocks, multi storey car park, in addition to the St Andrews school which is currently located in a converted office building.

This document will be used in support of a planning application to provide a 4 storey main school block with a basement car park and rooftop MUGA, a separate single storey sports block, associated infrastructure and landscaped areas. The Flood Risk Assessment (FRA) for the site was previously produced by Awcock Ward Partnership (AWP) in December 2015. This document has been produced to reflect the changes to the previously proposed drainage design and subsequently supersedes the drainage strategy provided in the AWP report.

Flood Risk Assessment produced by AWP is included in Appendix K.

Proposals contained in or forming part of this report, represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.



2.0 Surface Water

2.1 National Guidelines

The aim of the surface water drainage proposals is to focus on the capture and management the surface water within the site boundary, to prevent any likelihood of flooding to the proposed development, adjacent sites and infrastructure.

General national guidance for the design of the surface water drainage systems include the following:

- National Planning Policy Framework (NPPF)
- Non-Statutory Technical Standards for Sustainable Drainage Systems, DEFRA, March 2015
- Written Ministerial Statement regarding Sustainable Drainage (HCWS161)
- The SUDS Manual C753, CIRIA Industry Best Practice Guidance
- Flood Risk Planning Practice Guidance
- Building Regulations Part H

The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes to the volume and rate of surface runoff from development sites, and recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new developments.

Building Regulations 2010 Requirement H3 stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of hierarchy:

- I. Discharge into the ground;
- II. Discharge to a surface water body;
- III. Discharge to a surface water sewer;
- IV. Discharge to a combined sewer where there are absolutely no other options and only where agreed in advance with the relevant sewage undertaker.

The site details are as follows:

- Site Address (approximate) Building 5, North London Business Park, London N11 1GN
- National Grid Reference (approximate) X(Easting) 528227, Y(Northing) 193443
- Altitude 53.5m AoD (South West) 47.5m AoD (North East)
- Sewerage Undertaker Thames Water
- Lead Local Flood Authority London Borough of Barnet



 Aure Browtig Hill

 Aure Browtig Hill

 Aure Browtig Hill

 Aure Browtig Hill

 Broth Door

 Aure Browtig Hill

 Broth Door

 Broth Door</td

A location plan of the existing site is shown below:

Figure 1 – Location Plan_ Blue – school development boundary (approximate)

This Report forms the Drainage Strategy for the site, including the necessary attenuation requirements.

The proposed site layout is included in Appendix A.

Discharge into the ground

The following report was issued to Curtins as a part of the ISP and Feasibility Study documentation:

- 15_07932_OUT-APP_13.1_PHASE_1_GEO-REPORT_I1-3259264 (WSP Environmental, December 2007)

The document reported that the site is underlaid by the London Clay Formation (unproductive aquifer) with no reported geological faults within the site boundary. No superficial deposits were recorded beneath the site; however, land south of the site is reported to be underlaid by the Dollis Hill Gravel Member.

Extracts from GEO Report are included in Appendix B.



The FRA produced by AWP suggested that the underlying geology is likely to be unsuitable for infiltration into the ground, as the site suffers from the "impeded drainage".

Based on the above, the use of a large scale soakaway type drainage is not considered viable and the on-site attenuation system as a primary method has been proposed.

Discharge into a surface water body

The nearest surface water body is the existing pond adjacent to the development boundary to the west.

The pond has been reported to be used as an attenuation feature for the whole/majority of the Business Park. However, the catchment areas that feed into the pond are unknown and it is unclear what the open waterbody may withstand during the large storm events. The only information to hand regarding the existing drainage network, are the as-built records identified within the FRA (By AWP in December 2015), which only identify drains taken from Thames Water sewer records. Furthermore, it is noted in the FRA that there are no flow control devices from the pond to the public sewer, therefore it is anticipated that the peak flows are unrestricted. In view of the above, surface water discharge from the school site to the existing pond is not considered suitable.

The second nearest natural watercourse to the site is Pymmes Brook which is approximately 515m east of the development. With Brunswick Park Road, residential properties and a cemetery between the site and the brook, a connection here is not considered suitable.

Discharge into a surface water sewer

In accordance with the hierarchical approach outlined in the Building Regulations Part H, it is proposed to discharge surface water from the development to the Thames Water public surface water network. The nearest viable connection to the existing network is located on the site close to the eastern boundary MH Reference: 2401. It is proposed to connect into the existing sewers via the proposed diversion route which ultimately discharges into MH 2401.

The sewer records are included in Appendix C.

2.2 Flood Risk

The following reports were issued to Curtins as part of the Tender documentation:

• Flood Risk Assessment (December 2015, AWP)

This report was submitted to the Local Authority as a part of an outline planning application made by Comer Homes Group for the wider masterplan development.

The report concludes that the site is in Flood Zone 1 and is not at risk of flooding.



2.3 Proposed Surface Water Design

The development site covers an area of approximately 1.9 ha. The estimated impermeable area of the development is 1.4 ha.

Development creep is not considered applicable for this site. If the site is ever expanded and the impermeable area increased, such scheme would go through the usual design and planning process, with an appropriate drainage strategy, which would include additional attenuation and flow control.

The surface water runoff from site will be positively drained and discharged to the public surface water sewer (MH 2401) located within the eastern part of the site.

A S106 application will be required for the proposed connection to the public sewer.

There are two existing surface water public sewers, one 375mm dia. And 600mm dia., crossing the site and in their current location will be running underneath the proposed building footprint. It is proposed to divert the 375mm sewer north into the 600mm sewer, the combined sewers will then be diverted around the north and east of the site back to their original connection point close to the eastern boundary of the site.

The Wallingford runoff tool, and the ICP SUDS calculator in Microdrainage, were used to estimate Greenfield runoff rates for the site. The Q_{BAR} rates were 8.7 l/s and 12 l/s, respectively. The conservative discharge rate of 8.7 l/s has been proposed for the design.

The summary sheets for Greenfield runoff rates are included in Appendix D.

The following Sustainable Drainage Systems (SuDS) have been proposed:

- Permeable parking
- Permeable MUGAs
- Filter drains
- Below ground attenuation tank
- Rain Gardens/bio-retention area
- Pocket soakaways

The Microdrainage Network module was used to determine the size of the attenuation required for the site. The majority of the proposed parking within the site will be provided utilising a permeable surface with a wrapped stone subbase. The subbase will provide water quality improvement and surface water storage. The MUGA will also utilise a permeable surface and storage within the subbase. Filter drains and rain gardens have been proposed to provide extra treatment system and an element of storage. The minor hardstanding areas such as the pedestrian footpath etc. to be served by the local pocket soakaway. The primary volume control for the site is provided via the two below ground geo-cellular storage tanks.



Due to the project specification/parameters/school operational requirements, it is not possible to provide any significant above ground attenuation feature, such as a swale/basin/pond.

The Surface Water Drainage Layout is included in Appendix E.

The surface water system has been designed to accommodate a 1 in 100 year plus 40% allowance for climate change storm event. The drainage has been designed to accommodate all of the flow during a 1 in 30 year storm event below ground.

The outputs for the 1 year, 30 year and 100 year plus climate change events are included in Appendix F.

For events greater than 100 year plus 40% climate change, a Flow Exceedance Plan is provided in Appendix G. The site levels have been designed to shed runoff away from the building in the event of exceedance flows, therefore it is considered unlikely that exceedance events will affect the proposed building.

Water Quality

The new SuDS Manual (CIRIA C753, November 2015) introduced a slightly different approach compared to the previous version for the water quality management of surface water. The manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e. the pollution source);
- The effectiveness of the SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels (i.e. the pollutant pathway); and,
- The sensitivity of the receiving environment (the environmental receptor).

In accordance with the SuDS Manual, the site is classified as presenting a low pollutant hazard level in vehicular areas (car parking). In order to ensure water quality improvement permeable subbase to the parking bays is proposed. In addition to this filter drainage/rain garden are provided at other locations.

An outline Operations and Maintenance Manual is included in Appendix H.

3.0 Foul Water

The foul water network will be a gravity fed system, connecting to the existing Thames Water public sewer in Brunswick Park Road near the sites eastern boundary.

Through a pre-development enquiry and an ongoing pre planning correspondence with Thames Water, we have received a confirmation that there is adequate capacity within the public sewer network to accept the foul and surface water flows from the development.

The construction of the outfall will be subject to S106 approval with Thames Water.

The sewer records are included in Appendix C.

072661 St Andrew the Apostle School, London

Flood Risk Assessment and Drainage Strategy Report



The STW pre-development enquiry response is included in Appendix J.

The Foul Water Drainage Layout is included in Appendix I.



4.0 Appendices

Appendix A	Proposed Layout
Appendix B	Phase I Geo Investigation Report Extracts
Appendix C	Sewer Records
Appendix D	Greenfield runoff rates
Appendix E	Surface Water Drainage Layout
Appendix F	Attenuation Calculation – 1, 30 and 100 year + 40% climate change
Appendix G	Flow Exceedance Plan
Appendix H	Outline Operations and Maintenance Manual
Appendix I	Foul Water Drainage Layout
Appendix J	STW Correspondence
Appendix K	Flood Risk Assessment (AWP, 2015)



Appendix A Proposed Layout





Appendix B Phase I Geo Investigation Report Extracts

Groundsure **Enviroinsight**

Address:	NORTH LONDON BUSINE
Date:	26 Nov 2015
Reference:	HMD-411-2612457
Client:	Ruddlesden Geotechnical

9

Groundsure

ORTH LONDON BUSINESS PARK & OAKLEY ROAD SOUTH, BARNET, N11 1HR

NW

NE

Е



W

SW

Aerial Photograph Capture date: 28-Apr-2013 Grid Reference: 528088,193479 Site Size: 16.50ha

SE

Report Reference: HMD-411-2612457 Client Reference: 14477



5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
DHGR	DOLLIS HILL GRAVEL MEMBER	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

5.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type	
LC-CLSISA	LONDON CLAY FORMATION	CLAY, SILT AND SAND	

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)



6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Environisight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distanc e (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	302	E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	389	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Environisight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distanc e (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow



Appendix C Sewer Records



The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13 T 0800 009 4540 E searches@thameswater.co.uk I www.thameswater-propertysearches.co.uk



Appendix D Greenfield runoff rates



Alicja Smolen

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and

the basis for setting consents for the drainage of surface water runoff from sites.

the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may

St Andrew

N11 1BF

Calculated by:

Site name:

be

Site location:

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Site Details

Latitude:	51.62579° N
Longitude:	0.14853° W
Reference:	845200535
Date:	Apr 09 2021 13:56

Runoff estimation approach		IH124]
Site characteristics			Notes	
Total site area (ha):	1.9		(1) IS $Q_{BAD} < 2.0 \text{ I/s/ha}$?	
Methodology				
Q _{BAR} estimation method:	Calculate fro	om SPR and SAAR		When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.
SPR estimation method:	Calculate fro	om SOIL typ	е	
Soil characteristics			Edited	
SOIL type:		4	4	(2) Are flow rates < 5.0 l/s?
HOST class:		N/A	N/A	Where flow rates are less than 5.0 l/s consent for discharge is
SPR/SPRHOST:		0.47	0.47	usually set at 5.0 l/s if blockage from vegetation and other
Hydrological characteristics			Edited	the blockage risk is addressed by using appropriate drainage elements.
SAAR (mm):		670	670	
Hydrological region:		6	6	
Growth curve factor 1 year:		0.85	0.85	Where groundwater levels are low enough the use of soakaways
Growth curve factor 30 years:		2.3	2.3	to avoid discharge offsite would normally be preferred for disposal of surface water runoff.
Growth curve factor 100 years:		3.19	3.19	
Growth curve factor 200 years:		3.74	3.74	

Greenfield runoff rates

	Default	Edited	
Q _{BAR} (I/s):	8.71	8.71	
1 in 1 year (l/s):	7.41	7.41	
1 in 30 years (l/s):	20.04	20.04	
1 in 100 year (l/s):	27.8	27.8	
1 in 200 years (I/s):	32.59	32.59	

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Appendix E Surface Water Drainage Layout



AFETY, HEALTH AND	GENERAL NOTES
NMENTAL INFORMATION	1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS
WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR OPRIATE, TO AN APPROVED METHOD STATEMENT. ARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK VING, NOTE THE FOLLOWING:	2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE
OVE THE TANK NOT TO BE EXCEEDED. MAXIMUM LOADING AS	
SEVERATION. SEWER. EXCAVATION MUST BE TAKEN WITH CARE AND SMUST BE ARRANGED PRIOR TO CONSTRUCTION.	A EOR GENERAL NOTES REFER TO CURTINS DRAWING
	"FS02000-CUR-ZZ-ZZ-DR-C-0100_GENERAL INFRASTRUCTURE NOTES".
NOVE THE TANK NOT TO BE EXCEEDED. MAXIMUM LOADING AS ECIFICATION.	KEY
	PROPOSED SURFACE WATER
J.	DRAINAGE
	RAIN GARDEN
\mathbf{V}	ATTENUATION SUB-BASE (CAR PARKING)
Ŷ	POCKET SOAKAWAY
	ATTENUATION TANK
	PROPOSED PERMEABLE MUGA CONSTRUCTION TO BE DESIGNED BY
	SPECIALIST FILTER DRAIN WITH PERFORATED PIPE
OVET	
BJECT	
JVAL	AT OUTFALL CONCRETE DISHED CHANNEL
	BEANY KERB
. 02m	DESIGN NOTES
	1. SIPHONIC DOWN PIPES ARE SHOWN INDICATIVELY AT THIS STAGE. TO BE CONFIRMED BY SPECIALIST. FINAL DOWN PIPE POSITIONS MAY AFFECT
- Ex / 47.12m	THE FINAL DRAINAGE DESIGN. 2. COVER LEVELS ARE BASED ON ARES DRAWING FS0200-ALA-XX-XX-M2-L-0001 LANDSCAPE LAYOUT RECEIVED 29.03.21. SUBJECT TO CHANGE FOLLOWING RECEIPT OF DETAILED LEVELS
	DESIGN. 3. CURRENT ATTENUATION VOLUMES ARE BASED ON THE CURRENT IMPERATION FOR A DEAD (4.44-2)
+ Ex / 47.28m	4. DRAINAGE DESIGN AND DISCHARGE RATE SUBJECT TO APPROVAL FROM
	 ALL GULLY/CHANNEL DRAIN CONNECTIONS TO BE 150mmØ. ALL CATCHPITS TO HAVE A MINIMUM SUMP OF 300mm BELOW INVERT.
	7. ALL PERMEABLE PARKING BAYS AND MUGA SUBBASE STORAGE TO INCORPORATE A MINIMUM OF 350mm SUB-BASE STORAGE.
4 EX / 4/.42m	8. ALL MANHOLE COVERS TO BE CLASS D400 UNLESS SITUATION WITHIN NONE TRAFFICKED AREAS.
8.52m	9. INVERT AND COVER LEVELS OF EXISTING SEWERS ASSUMED, TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION.
	10. ALL EXISTING SURFACE WATER RUNS WITHIN THE SITE BOUNDARY TO BE SURVEYED BEFORE THE CONSTRUCTION AND ANY ABANDONING WORKS
	11. PLEASE REFER TO DESIGNER'S HAZARD REGISTER - FS0200-CUR-XX-XX-RR-S-0001
+ Ex / 49.52m	TO BE READ IN CONJUNCTION WITH:
	DRAWING TO BE READ IN CONJUNCTION WITH:
5547 48.35m	 FS0200-CUR-ZZ-ZZ-DR-C-9031_SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2
	- FS0200-CUR-ZZ-ZZ-DR-C-9040_FOUL WATER DRAINAGE LAYOUT SHEET 1 OF 2
	- FS0200-CUR-ZZ-ZZ-DR-C-9041_FOUL WATER DRAINAGE LAYOUT SHEET 2 OF 2
	- FS0200-CUR-ZZ-ZZ-DR-G-9051_DRAINAGE CONSTRUCTION DETAILS SHEET 1 OF 2 ES0200 CUB 77 77 DR C 9052 DRAINAGE CONSTRUCTION DETAILS
	SHEET 2 OF 2
	P04 ISSUED FOR PLANNING 09.04.21 JW AS
	P03 UPDATED TO SUIT SIDE WIDE UTILITY SURVEY 09.03.21 EMC WH P02 DBAET CP ISSUE 26.02.21 EMC BW
	P01 PRELIMINARY ISSUE 19.02.21 EMC RW
At	Rev: Description: Date: By: Chkd:
	Acurting
	56 The Ropewalk, Nottingham, NG1 5DW 0115 941 5551
	nottingham@curtins.com www.curtins.com
	Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Notlingham
	ST ANDREW THE APOSTLE,
	BARNET
	Drg Title:
	SURFACE WATER DRAINAGE
	LAYOUT
	SHEET 1 OF 2
·	Size: Date: Drawn By: Designed By: Checked By:
	A1 19.02.21 EMC RW RW
KEY PLAN	Project No: Originator: Volume: Level: Type: Role: Category / Number: Rev:
	FS0200 - CUR - ZZ - ZZ - DR - C - 9030 - P04

GENERAL NOTES THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. 4.FOR GENERAL NOTES REFER TO CURTINS DRAWING "FS02000-CUR-ZZ-ZZ-DR-C-0100_GENERAL INFRASTRUCTURE NOTES". KEY PROPOSED SURFACE WATER DRAINAGE SURFACE WATER DRAINAGE DIVERSION EXISTING SURFACE WATER SEWER -0-0-0-0-0-RAIN GARDEN ATTENUATION SUB-BASE A. 4. 4 (CAR PARKING) POCKET SOAKAWAY 1, 1, 1 ATTENUATION TANK PROPOSED PERMEABLE MUGA CONSTRUCTION TO BE DESIGNED BY SPECIALIST FILTER DRAIN WITH PERFORATED PIPE DIFFUSER UNIT ----LINEAR CHANNEL DRAIN WITH SUMP UNIT

AT OUTFALL

DESIGN NOTES

SIPHONIC DOWN PIPES ARE SHOWN INDICATIVELY AT THIS STAGE. TO BE

BEANY KERB

CONCRETE DISHED CHANNEL

CONFIRMED BY SPECIALIST. FINAL DOWN PIPE POSITIONS MAY AFFECT THE FINAL DRAINAGE DESIGN. 2. COVER LEVELS ARE BASED ON ARES DRAWING FS0200-ALA-XX-XX-M2-L-0001 LANDSCAPE LAYOUT RECEIVED 29.03.21. SUBJECT TO CHANGE FOLLOWING RECEIPT OF DETAILED LEVELS DESIGN. CURRENT ATTENUATION VOLUMES ARE BASED ON THE CURRENT IMPERMEABLE AREAS (1.4ha) DRAINAGE DESIGN AND DISCHARGE RATE SUBJECT TO APPROVAL FROM THE LLFA AND THAMES WATER. ALL GULLY/CHANNEL DRAIN CONNECTIONS TO BE 150mmØ. ALL CATCHPITS TO HAVE A MINIMUM SUMP OF 300mm BELOW INVERT. ALL PERMEABLE PARKING BAYS AND MUGA SUBBASE STORAGE TO INCORPORATE A MINIMUM OF 350mm SUB-BASE STORAGE. 8. ALL MANHOLE COVERS TO BE CLASS D400 UNLESS SITUATION WITHIN NONE TRAFFICKED AREAS. INVERT AND COVER LEVELS OF EXISTING SEWERS ASSUMED, TO BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION. 10. ALL EXISTING SURFACE WATER RUNS WITHIN THE SITE BOUNDARY TO BE SURVEYED BEFORE THE CONSTRUCTION AND ANY ABANDONING WORKS 11. PLEASE REFER TO DESIGNER'S HAZARD REGISTER -FS0200-CUR-XX-XX-RR-S-0001 TO BE READ IN CONJUNCTION WITH: FS0200-CUR-ZZ-ZZ-DR-C-9030_SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 2 FS0200-CUR-ZZ-ZZ-DR-C-9040_FOUL WATER DRAINAGE LAYOUT SHEET 1 OF 2 FS0200-CUR-ZZ-ZZ-DR-C-9041_FOUL WATER DRAINAGE LAYOUT SHEET 2 OF 2 FS0200-CUR-ZZ-ZZ-DR-C-9051_DRAINAGE CONSTRUCTION DETAILS SHEET 1 OF 2 FS0200-CUR-ZZ-ZZ-DR-C-9052_DRAINAGE CONSTRUCTION DETAILS SHEET 2 OF 2 P04 ISSUED FOR PLANNING 09.04.21 JW AS 09.03.21 EMC WH P03 UPDATED TO SUIT SIDE WIDE UTILITY SURVEY P02 DRAFT CP ISSUE 26.02.21 EMC RW P01 PRELIMINARY ISSUE 19.02.21 EMC RW Date: By: Chkd: Description: **C**-curtins

> 56 The Ropewalk, Nottingham, NG1 5DW 0115 941 5551 nottingham@curtins.com www.curtins.com

Project

Drg Title:

Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer mingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottinghan

PRELIMINARY

ST ANDREW THE APOSTLE, BARNET

SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2

Size:	Date:		Drawn By	r:	Designe	d By:	Checked	l By:	
A1	A1 19.02.21			FMO		D\W			
Scale: 1:250						RW			
Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / N	umber:	Rev:	
FS0200 -	CUR ·	ZZ -	ZZ ·	- DR	- C -	903	1 -	P04	

Appendix F Attenuation Calculation – 1, 30 and 100 year + 40% climate change

Curtins Consulting Limited		Page 1								
56 The Ropewalk										
Nottingham		and and								
NG1 5DW		Micro								
Date 10/04/2021 19:55	Designed by slawinska_a	Drainage								
YP Solutions	Network 2018 1 1	and the first of the second								
	Network 2010.1.1									
STORM SEWER DESIGN	by the Modified Rational Method									
Design	<u>Criteria for Storm</u>									
Pipe Sizes STA	NDARD Manhole Sizes STANDARD									
FSR Rainfall	Model - England and Wales									
Return Period (years) M5-60 (mm)	20.000 Add Flow / Climate Chang	MP(%) 100 are(%) 0								
Ratio R	0.448 Minimum Backdrop Heigh	ht (m) 0.200								
Maximum Rainfall (mm/hr)	50 Maximum Backdrop Heigh 30 Min Design Depth for Optimication	ht (m) 1.500								
Foul Sewage (l/s/ha)	0.000 Min Vel for Auto Design only	(m/s) 1.00								
Volumetric Runoff Coeff.	0.750 Min Slope for Optimisation	(1:X) 500								
Design	ed with Level Soffits									
Time Are	ea Diagram for Storm									
Time Area Time Area Time Area (mins) (ha) (mins) (ha) (mins) (ha)										
0-4 0.139	4-8 0.842 8-12 0.414									
Total Area	Contributing (ha) = 1.395									
Total Pi	be Volume (m³) = 46.020									
Network D	esign Table for Storm									
« - Indica	tes pipe capacity < flow									
DN Longth Foll Clone I Area Mil	- Pass k HVD DIA Sastien									
(m) (m) (1:X) (ha) (mi	ns) Flow (1/s) (mm) SECT (mm)	Design								
1.000 21.217 0.105 202.1 0.169 4	00 0.0 0.600 o 375 Pipe/Con	duit 🤒								
2.000 10.897 0.255 42.7 0.153 4	00 0.0 0.600 o 375 Pipe/Con	iduit 🔒								
1.001 16.773 0.085 197.3 0.000 0	vol 0.0 0.000 o 3/5 Pipe/Con	iduit 🍟								
<u>Network Results Table</u>										
PN Rain T.C. US/IL Σ I.A (mm/hr) (mins) (m) (ha	rea Σ Base Foul Add Flow Vel Ca) Flow (l/s) (l/s) (l/s) (m/s) (l,	ap Flow /s) (l/s)								
1.000 50.00 4.28 48.925 0.	169 0.0 0.0 0.0 1.27 140	0.4 22.9								
2.000 50.00 4.07 49.075 0.	153 0.0 0.0 0.0 2.78 300	6.9 20.7								
1.001 50.00 4.50 48.820 0.	322 0.0 0.0 0.0 1.29 142	2.1 43.6								

Curti	ns Con	sultir	a Limit	ed						Page	2
56 Th	e Rope	walk								2 a g o	
Notti	ngham	nain								1 m	
NG1 5	DW										L.m
Date	10/04/	2021 1	9:55		Des	igned by	slawin	nska a		MIC	0
File	072661	-CUR-C)0-XX-D(. Che	cked by	0 1 0 1 1 1			Urall	nage
XP So	lution				Net	work 2018	.1.1			0.020.0000000	
			N	<u>letwork</u>	Desig	<u>n Table f</u>	or St	<u>orm</u>			
PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD DIA	Section	і Туре	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (1/s)	(mm)	SECT (mm)			Design
											_
3.000	50.504	0.589	85.7	0.180	4.00	0.0	0.600	0 375) Pipe/Co Pipe/Co	onduit	
5.001	51.455	0.540	52.5	0.127	0.00	0.0	0.000	0 575	, iipe/co	maarc	•
4.000	22.202	0.340	65.3	0.000	4.00	0.0	0.600	o 150) Pipe/Co	nduit	0
1.002	22.268	0.110	202.4	0.000	0.00	0.0	0.600	o 450) Pipe/Cc	onduit	٠
1.003	12.197	0.100	122.0	0.000	0.00	0.0	0.600	o 450) Pipe/Co	onduit	ē
5.000	64.771	0.488	132.7	0.086	4.00	0.0	0.600	o 225	pipe/Cc	nduit	•
6.000	21.793	0.370	58.9	0.023	4.00	0.0	0.600	o 150) Pipe/Cc	nduit	•
7.000	103.501	0.260	398.1	0.500	4.00	0.0	0.600	0 375	i Pipe/Cc	nduit	۵
7.001	19.108	0.096	199.0	0.000	0.00	0.0	0.600	0 375	pipe/Cc	onduit	-
5.001	22.778	0.005	4555.6	0.000	0.00	0.0	0.600	o 225	pipe/Cc	onduit	•
1 004	16 100	0 001	16100 0	0 000	0 00	0 0	0 600	0 450	Pine/Co	ndui +	•
1.005	63.528	6.629	9.6	0.000	0.00	0.0	0.600	o 150) Pipe/CC	onduit	-
8.000	32.307	1.540	21.0	0.000	4.00	0.0	0.600	o 150) Pipe/Cc	onduit	•
				Net	twork	Results Ta	able				-
	PN R	ain '	T.C. US	3/IL Σ]	[.Area	Σ Base	Foul	Add Flow	Vel Ca	p Flo	wc
	(mn	1/hr) (1	mins) ((m)	(ha) i	Flow (l/s)	(1/s)	(1/s) ((m/s) (1/	s) (1/	s)
_					0 1 0 0		0 0				
3	.000 5	0.00	4.43 49	.669	0.180	0.0	0.0	0.0	1.96 216	i.3 24 2 2 41	.4
				.075	0.007	0.0	0.0	0.0	1.00 200		• •
4	.000 5	0.00	4.30 49	.300	0.000	0.0	0.0	0.0	1.25 22	.0 0	.0
1	.002 5	0.00	4.97 48	.660	0.629	0.0	0.0	0.0	1.43 226	.7 85	. 2

4.000	50.00	4.30	49.300	0.000	0.0	0.0	0.0	1.25	22.0	0.0	
1.002	50.00	4.97	48.660	0.629	0.0	0.0	0.0	1.43	226.7	85.2	
1.003	50.00	5.08	48.550	0.629	0.0	0.0	0.0	1.84	292.6	85.2	
5.000	50.00	4.95	49.250	0.086	0.0	0.0	0.0	1.13	45.1	11.6	
6.000	50.00	4.28	49.250	0.023	0.0	0.0	0.0	1.31	23.2	3.1	
7.000	50.00	5.91	48.779	0.500	0.0	0.0	0.0	0.90	99.6	67.7	
7.001	50.00	6.16	48.519	0.500	0.0	0.0	0.0	1.28	141.4	67.7	
5.001	50.00	8.22	48.455	0.609	0.0	0.0	0.0	0.18	7.3«	82.5	
1.004	50.00	9.99	48.450	1.238	0.0	0.0	0.0	0.15	24.0«	167.6	
1.005	50.00	10.32	48.449	1.238	0.0	0.0	0.0	3.27	57.9«	167.6	
8.000	50.00	4.24	49.150	0.000	0.0	0.0	0.0	2.21	39.0	0.0	
			C	1982-2018 I	nnovy	ze					

Curtins Consulting Limited		Page 3
56 The Ropewalk		
Nottingham		
NG1 5DW		Micco
Date 10/04/2021 19:55	Designed by slawinska_a	Dcainago
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	L

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
8.001	6.754	0.360	18.8	0.024	0.00	0.0	0.600	0	150	Pipe/Conduit	•
9.000	12.348	0.320	38.6	0.012	4.00	0.0	0.600	0	150	Pipe/Conduit	
8.002	21.310	0.670	31.8	0.000	0.00	0.0	0.600	0	150	Pipe/Conduit	0
10.000	4.126	0.030	137.5	0.018	4.00	0.0	0.600	0	150 150	Pipe/Conduit Pipe/Conduit	
11.000	6.324	0.040	158.1	0.007	4.00	0.0	0.600	0	150	Pipe/Conduit	
11.001	18.060	1.260	14.3	0.000	0.00	0.0	0.600	0	150	Pipe/Conduit	0
12.000	11.636	1.670	7.0	0.035	4.00	0.0	0.600	0	150	Pipe/Conduit	0
13.000 13.001	13.341 6.241	0.355 0.565	37.6 11.0	0.031 0.000	4.00 0.00	0.0	0.600	0	150 150	Pipe/Conduit Pipe/Conduit	•
8.003 8.004	7.066	0.001 4.759	7066.0	0.000	0.00	0.0	0.600	0	150 150	Pipe/Conduit Pipe/Conduit	•
14.000 14.001	6.534 6.534	0.044 3.836	150.0 1.7	0.030	4.00	0.0	0.600	0	150 150	Pipe/Conduit Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (1/s)	Add Flow (l/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)	
8.001	50.00	4.29	47.610	0.024	0.0	0.0	0.0	2.34	41.3	3.2	
9.000	50.00	4.13	47.570	0.012	0.0	0.0	0.0	1.63	28.7	1.6	
8.002	50.00	4.49	47.250	0.036	0.0	0.0	0.0	1.79	31.7	4.9	
10.000 10.001	50.00 50.00	4.08 4.10	48.230 48.200	0.018 0.018	0.0	0.0	0.0	0.86 5.41	15.1 95.6	2.4 2.4	
11.000 11.001	50.00 50.00	4.13 4.24	48.150 48.110	0.007 0.007	0.0	0.0	0.0	0.80 2.67	14.1 47.3	0.9 0.9	
12.000	50.00	4.05	48.250	0.035	0.0	0.0	0.0	3.84	67.9	4.7	
13.000 13.001	50.00 50.00	4.14 4.17	47.500 47.145	0.031 0.031	0.0	0.0	0.0	1.65 3.05	29.1 53.9	4.2 4.2	
8.003 8.004	50.00 50.00	5.55 6.16	46.580 46.579	0.127 0.127	0.0	0.0	0.0	0.11 2.38	<mark>2.0«</mark> 42.0	17.2 17.2	
14.000 14.001	50.00 50.00	4.13 4.15	45.700 45.656	0.030 0.030	0.0	0.0	0.0	0.82 7.78	14.5 137.6	4.1 4.1	
	©1982-2018 Innovyze										

Curtins C	Consult	ing Lir	mited								Pa	ge 4
56 The Ro	pewalk											
Nottingha	am											-
NG1 5DW											M	irm
Date 10/C	04/2021	19:55		D	esigned	by s	slaw	inska	_a		n.	ainage
File 0726	561-CUR	-00-XX-	-DC-C-C) C	hecked	by						aniage
XP Soluti	Lons			N	etwork	2018	.1.1					
			Notwo	rk Doc	ian Tob	lo f	or C	torm				
			Netwo	IK DES	<u>iyn iab</u>	16 1	01 5	COTIL				
PN Lei	ngth Fai	ll Slop	e I.Area	a T.E.	Base	1	k	HYD	DIA	Secti	on Type	e Auto
((m) (m	n) (1:X) (ha)	(mins)	Flow (1	/s)	(mm)	SECT	(mm)			Design
1.006 16	.022 0.0	28 572.	2 0.000	0.00)	0.0 0	.600	0	150	Pipe/	Condui	t 🔒
			,	Votroni	- Doguli		hla					
			<u>1</u>	Networ	k Result	LS Ta	<u>era</u>					
PN	Rain	T.C.	US/IL	Σ I.Area	a ΣBas	se	Foul	Add H	Flow	Vel	Cap	Flow
	(mm/hr)	(mins)	(m)	(ha)	Flow (L/s)	(l/s)	(1/	s)	(m/s)	(l/s)	(1/s)
1.006	50.00	10.96	41.820	1.39	5	0.0	0.0		0.0	0.41	7.3«	188.9
				@1000	-2010		18.0					
				©1987-	-ZATA TI	movy	<u>ize</u>					

Curtins Consulting Limited		Page 5
56 The Ropewalk		
Nottingham		
NG1 5DW		Micco
Date 10/04/2021 19:55	Designed by slawinska_a	Desinado
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	

Area Summary for Storm

Pipe Number	РІМР Туре	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	_	_	100	0.169	0.169	0.169
2.000	-	-	100	0.153	0.153	0.153
1.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.180	0.180	0.180
3.001	-	-	100	0.127	0.127	0.127
4.000	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.086	0.086	0.086
6.000	-	-	100	0.023	0.023	0.023
7.000	-	-	100	0.500	0.500	0.500
7.001	-	-	100	0.000	0.000	0.000
5.001	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.000	0.000	0.000
8.001	-	-	100	0.024	0.024	0.024
9.000	-	-	100	0.012	0.012	0.012
8.002	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.018	0.018	0.018
10.001	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.007	0.007	0.007
11.001	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.035	0.035	0.035
13.000	-	-	100	0.031	0.031	0.031
13.001	-	-	100	0.000	0.000	0.000
8.003	-	-	100	0.000	0.000	0.000
8.004	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.030	0.030	0.030
14.001	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.395	1.395	1.395

Free Flowing Outfall Details for Storm

Out Pipe	tfall Number	Outfall Name	c.	Level (m)	Ι.	Level (m)	I.	Min Level (m)	D,L (mm)	W (mm)
	1.006			49.230		41.792	2	41.792	0	0

56 The Ropewalk NotLingham NotLingham NotLingham Date 10/04/2021 19:55 File 072661-CUR-00-XX-DC-C-C Retwork 2018.1.1 Designed by slawinska_a Checked by Network 2018.1.1 Online Controls for Storm Online Control Storm Unit Reference MD-SHT (0.000 -0700 Design Head (w) Design Head (w) Online Reference MD-SHT (0.000-0700 Design Point (Calcolated) Online Reference MD-SHT (0.0000 -0700 Design Point (Calcolated) Suggested Manhole Diameter (m) Online Tree Manneter (m) Online Reference Monge Online Stored Range Point (Calcolated) Network Read Range Online Stored Range <td colspan<="" th=""><th>Curtins Consulting Limit</th><th>ed</th><th></th><th></th><th></th><th>P</th><th>age 6</th></td>	<th>Curtins Consulting Limit</th> <th>ed</th> <th></th> <th></th> <th></th> <th>P</th> <th>age 6</th>	Curtins Consulting Limit	ed				P	age 6		
Notingham Notingham Notingham Notingham Date (004/2021 19:55 File 072601-CDR-00-XX-DC-Co.) Network 2018.1.1 Designed by slawinska_s Checked by Network 2018.1.1 Diffee Controls for Stores Designed by slawinska_s Checked by Network 2018.1.1 Designed by slawinska_s Checked by Network 2018.1.1 Diffee Manhole: 15, DS/PN: 7,001, Volume (m'): 13.7 Diffee Manhole: 15, DS/PN: 7,001, Volume (m'): 13.7 Diffee Manhole: 12, DS/PN: 7,001, Volume (m'): 13.7 Diffee Manhole: 12, DS/PN: 1,004, Volume (m'): 5.1 Units of the fore more MD-SHB-0105-4700-6800-4700 Design Flow (1/s) 4.7 Distribution Surgestore Surgestore Distribution Surgestore Surgestore Distribution Surgestore Surgestore Distribution Surgestore Minimise uppresentatorage Surgestore Network 2018 Distribution Calculated Objective Minimise uppresentatorage Surgestore Network 2019 Distribution Surgestore Minimise uppresentatorage Surgestore Network 2019 Distribution Surgestore Minimise uppresentatorage Surgestore Network 2019 Distribution Surgestore Minimise uppresentatorage Surgestore Network 2019 Distribution Surgesto	56 The Ropewalk					0	_			
NST 500 Date 10/04/2021 19:55 F14 07064/2021 19:55 F14 07064/2021 19:55 P2 Solutions Designed by slawinska_s Checked by Network 2018.1.1 Checked by Network 2018.1.0 Checked by Network 2018.1.1 Network 2018.1.1 Distore Network 2018.0.101 Another 10.0.1 Network 2018.0.101 Minitake upstreams torage Network 2018.1.1 Network 2018.1.1 Distore (m) 100 Network 2018.1.1 Distore (m) 100 Network 2018.0.1 Superior (ave (m) 100 Distore (m) 100	Nottingham					5				
Data Display Designed by slawinska a Checked by File 072661-CDR-00-XX-DC-C-0 Network 2018.1.1 Checked by Network 2018.1.1 Checked by Network 2018.1.1 Controls for Storm Office Manhole: 15, DS/PN: 7,001, Volume (m ²): 13,7 Dimeter (m) 0.020 bischarge Coefficient 0.600 Invert Level (m) 48.519 Hydro-Brake@ Optimum Manhole: 12, DS/FN: 1.004, Volume (m ²): 5.1 Unit Reference MD-SEE-0105-4700-0800-4700 Design Head (m) Outcome MD-SEE-0105-4700-0800-4700 Design Head (m) Outcome MD-SEE-0105-4700-0800-4700 Design Head (m) Dimeter (m) <t< td=""><td>NG1 5DW</td><td></td><td></td><td></td><td></td><td></td><td>Hereit</td></t<>	NG1 5DW						Hereit			
Bile 07261-CUR+00-XX-DC-C-0 Checked by XF Solutions Network 2018.1.1 Define Controls for Storm Gine Controls for Storm Diffice Manhole: 15, DS/PN: 7,001, Volume (m ²): 13.7 Diffice Manhole: 15, DS/PN: 7,001, Volume (m ²): 13.7 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.004, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.000 Diffice Manhole: 12, DS/PN: 1.001, Volume (m ²): 5.1 Diffice Manhole: 12, DS/PN: 1.001, Volume (m ³): 5.1 Diffice Manhole: 12, DS/PN: 1.001, Volume (m ³): 1.1 Diffice Manhole: 12, DS/PN: 1.001, Volume (m ³): 1.1 Diffice Manhole: 12, DS/PN: 1.001, Volume (m ³): 1.1 Diffice Manhole: 21, DS/PN: 1.001, Volume (m ³): 1.1	Date 10/04/2021 19:55		Designe	d by slawi	nska a		viiciu			
Network 2018.1.1 Attended by Network 2018.1.1 Chiline Controls for Storm Orifice Manhole: 15, DS/PN: 7,001, Volume (m²): 13.7 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.519 Unit Reference MD-SHE-0105-4700-0800-4700 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.519 Unit Reference MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD-SHE-0105-4700-0800-4700 Diameter (MD Diameter (MD)	File 0.72661 - CUB - 0.0 - XX - DC		Checker	hy	noka_a	L	Jrainage			
Descriptions Description Online Controls for Storm Controls for Store Store Ford (Calculated) Control Store Control Store Control Store Control Store Store Control Store	VP Solutions		Network	. Dy - 2010 1 1			2			
<section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><text><text></text></text></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header>			Network	2010.1.1						
<section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header>		<u>Online</u>	Control	s for Stori	<u>m</u>					
Orifice Manhole: 1, DSPN: 7,001, Volume (m²): 13.7Jameer (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800Jameer (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800Carl Markon (M)Carl Markon (M)Markon (M)Carl Markon (M)Markon (M) <td colspan="10"></td>										
Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.513Jameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.513Jameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.600 Discipt Plow (1/s) 0.600 Discipt Plow	Orifice Manh	ole: 15,	DS/PN:	7.001, Vol	ume (m³):	13.7				
Humber (m) voice Fishing Coefficient vice invertised (m) voice Hydro-Brake@ Optimum Manhole: 12, DS/PN: 1.004, Volume (m ³): 5.1 Unit Reference MD-SHE-0105-4700-0800-4700 Design Flow (1/s) 0.800 0.800 0.800 0.800 0.800 Design Flow (1/s) 0.800 0.800 Design Flow (1/s) 0.800 0.800 Design Flow (1/s) 0.800 0.800 Diameter (nm) 105 Innum Outle Fipe Diameter (nm) 150 Suggested Manhole Diameter (nm) 1200 Control Point Med (M) Flow (1/s) Besign Point (Calculated) 0.800 0.534 1.7 Kick-Flow 0.534 3.9 Man Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) [Depth (m) Flow (1/s) [Depth (m) Flow (1/s) [Repth (m) Flow (1/s)] 0.200 4.7 1.600 6.1 3.500 9.500 13.0 0.400 4.7 1.600 6.1 4.500 13.0 13.0 0.200 4.7 1.600 6.1 3.500 9.500 13.1 0.100 3.6 1.200 7.5<										
Hydro-Brake@ Optimum Manhole: 12, DS/PN: 1,004, Volume (m³): 5.1 Unit Reference MD-SHE-0105-4700-0800-4700 Design Flow (1/s) 0.800 Design Flow (1/s) Flush-Flo [∞] Calculated Objective Minimise upstream storage Application Sump Available Yes Diameter (mm) 103 Invert Level (m) Minimum Outlet Flpe Diameter (mm) 1200 Control Foint Head (m) Flow (1/s) Design Point (Calculated) 0.800 Mean Flow over Head Range - Mean Flow over Head Range - Mydro-Brake@Optimum@ be utilised then these storage routing calculations will be invalidated Diamotic (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) L200 5.7 0.300 8.7 7.000 13.0 0.200 4.7 1.600 6.5 4.000 10.6 0.100 3.6 1.200 5.7 5.000 11.1 3.000 14.7 0.200 4.7 1.600 6.5 4.000 10.6 8.500 13.0 0.200 4.7 1.600 6.5 4.000 10.6 8.500 14.7 <td>Diameter (m) 0.020</td> <td>Discharge</td> <td>COEIIICI</td> <td></td> <td>IVELC TEAST</td> <td>(10) 40.01</td> <td>. 9</td>	Diameter (m) 0.020	Discharge	COEIIICI		IVELC TEAST	(10) 40.01	. 9			
Unit Reference MD-SHE-0105-4700-0800-4700 Design Flad (m) 0.800 Design Flad (m) 0.800 Plush-Flo ^m Calculated Suplication Surface Diameter (mn) 103 Inum Outlet Flop Diameter (mn) 100 Digested Manhole Diameter (mn) 1200 Control Point Read (n) Flow (l/s) Design Flow (Calculated) 0.800 4.7 The h-Pio ^m 0.231 3.3 Man Flow over Head Range - 4.1 The hydroological calculations have been based on the Head/Discharge relationship for the Rydroo-Brake Optimum as specified. Should another type of control device other than a stype of the mass specified. Should another type of control device other than a stype of the store of the store store of the store store of the store o	<u>Hydro-Brake® Optim</u>	um Manho	le: 12,	DS/PN: 1.0	04, Volum	e (m³):	5.1			
Design Read (m) 0.800 Design Read (m) 0.7 Flush-Flow Calculated Objectiv Minimise upstream storage Application Surface Sum Available Yes Diameter (mm) 105 Trevet Level (m) 48.450 Digested Manhole Diameter (mm) 100 Design Foit (Calculated) 0.800 1.7 Flush-Flow 0.241 4.7 Sugneted Manhole Diameter (mm) 100 Design Foit (Calculated) 0.800 4.7 Man Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the storage optimum as specified. Should another type of control device other than a stydro-Brake Optimum as specified. Should another type of control device other than a stydro-Brake Optimum as specified. Should another type of a storage invalidated Depth (n) Flow (1/n) Pepth (n) Flow (1/n) Pepth (n) Flow (1/n) Pepth (n) Flow (1/n) 0.100 3.6 1.200 5.7 3.000 8.7 0.200 4.7 1.400 6.1 3.500 1.4 0.100 3.6 1.200 7.5 5.000 1		Unit	Referenc	e MD-SHE-010	5-4700-0800	-4700				
Design Flow (1/s) (-7) Flush-Flow Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 105 Invert Level (m) 48.450 Minimum Outlet Pipe Diameter (mm) 1200 Control Point Head (m) Flow (1/s) Design Flow (1/s) 0.800 4.7 Eusing Point (Calculated) 0.800 4.7 Flush-Flow 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimuma as specified. Should another type of control device other than a Hydro-Brake Optimuma be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 0.200 4.7 1.600 6.5 4.000 10.6 8.500 13.5 0.300 4.7 2.600 7.2 5.000 11.1 9.000 14.7		Desig	n Head (m	1)		0.800				
Flush-Flow Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 105 Trivert Level (m) 48.450 Minimum Outlet Pipe Diameter (mm) 1200 Control Points Head (m) Flow (l/s) Design Foint (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Maine Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum as specified. Should another type of control device other than a Hydro-Brake@ Optimum be utilised then these storage routing calculations will be invalidated Depth (m) Flow (l/s) pepth (m) Flow (l/s) pepth (m) Flow (l/s) 13.5 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.400 4.5 1.800 6.5 4.000 10.6 8.500 13.6 0.400 4.5 1.800 6.3 4.500 10.6 8.500 14.7		Design	Flow (l/s	.)		4.7				
Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 105 Invert Level (m) 48.450 Minimum Outlet Pipe Diameter (mm) 1200 Concol Points Head (m) Flow (l/s) Design Point (Calculated) 0.800 4.7 Flush-Flo* 0.241 4.7 Kick-Flo® 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 0.300 4.7 1.600 6.5 4.000 10.0 0.400 4.5 1.600 6.9 4.500 10.47 0.600 4.7 1.600 6.9 4.500 10.47 0.600 4.7 2.600			Flush-Flo	m Minimir	Calcu	lated				
Application Sum Available Yes Diameter (mm) 105 Invert Level (m) 48.450 Sungested Manhole Diameter (mm) 1200 Cotrol Points Head (m) Flow (1/s) Design Point (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Kick-Flow 0.241 4.7 Model Point (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Model Point (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Mydro-Brake@ Optimum as specified. Should another type of control device other than a Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Pepth (m) Flow (1/s) Pepth (m) Flow (1/s) Pepth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 0.300 4.7 1.600 6.1 4.000 10.0 8.000 13.9 0.300 4.7 2.400 7.2 5.000 11.1 9.000 14.7		7	Ubjectiv	re Minimise	upstream st	orage rfaco				
Diameter (mm) 103 Invert Level (n) 48.450 Minium Outle Pipe Diameter (mm) 1200 Control Form Head (n) Flow (l/s) Design Point (Calculated) 0.800 4.7 Pissh-Flow 0.241 4.7 Kick-Flow 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum as specified. Should another type of control device other than a Bydro-Brake Optimum be utilised then these storage routing calculations will be invalued Depth (m) Flow (l/s) Pepth (n) Flow (l/s) Pepth (m) Flow (l/s) Pepth (m) Flow (l/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.300 4.7 1.600 6.5 4.000 10.0 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.8 6.500 12.6 12.0 0.500 4.2 2.600 8.2		Suma	Availabl	- -	Su	Yes				
Invert Level (m) 48.450 Minimum Outlet Pipe Diameter (mm) 150 Suggested Manhole Diameter (mm) 1200 Control Foine Bead (m) Flow (l/s) Design Point (Calculated) 0.800 4.7 Sign Point (Calculated) 0.801 4.7 Filesh-Flow 0.234 3.9 Man Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum be utilised then these storage routing calculations will be invalidated Depth (n) Flow (l/s) Pepth (m) Flow (l/s) Pepth (m) Flow (l/s) Pepth (m) Flow (l/s) Pepth (m) Flow (l/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.500 13.0 0.400 4.5 1.800 6.9 4.500 10.6 8.500 13.3 0.500 4.2 2.000 7.5 5.500 11.1 9.500 15.1 0.600 4.7 2.400 7.8 6.500 12.6 15.1 0.600 4.2 2.000 7.5 5.500 12.6<		Dia	meter (mm	ı)		105				
Minimum Outlet Pipe Planmeter (mm) 150 Nurder Vanhole Diameter (mm) 1200 Control Point Head (n) Flow (l/s) Design Point (Calculated) 0.800 4.7 Flush=Flow 0.241 4.7 Kick=Flow 0.241 4.7 Stick=Flow 0.241 4.7 Minimum Sub over Head Range - 4.1 The Hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be unilised then these storage routing calculations will be unilised then these storage routing calculations will be unilised then these storage routing calculations will be 1.000 6.7 0.100 3.6 1.200 5.7 3.500 8.7 7.000 13.6 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 12.6 15.1 0.500 4.7 2.400 7.8 6.000 12.6 15.1 0.500 4.7 2.400 7.8 6.000 12.6 15.1 15.1 0.600 4.7 2.600 </td <td></td> <td>Invert</td> <td>Level (m</td> <td>1)</td> <td>4</td> <td>8.450</td> <td></td>		Invert	Level (m	1)	4	8.450				
Suggested Manhole Diameter (mm) 1200 Control Point Read (m) Flow (l/s) Design Point (Calculated) 0.800 4.7 Flush-Flo* 0.241 4.7 Kick-Flo@ 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated Depth (m) Flow (l/s) pepth (m) Flow (l/s) pepth (m) Flow (l/s) pepth (m) Flow (l/s) 13.5 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.600 6.3 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.500 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 12.6 15.1 0.600 4.7 2.600 8.2 6.500 12.6 15.1 0.600 4.7 2.600 8.2 <td>Minimum Outle</td> <td>t Pipe Dia</td> <td>meter (mm</td> <td>1)</td> <td></td> <td>150</td> <td></td>	Minimum Outle	t Pipe Dia	meter (mm	1)		150				
Control Point Bead (m) Flow (l/s) Design Point (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Kick-Flow 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum & sepecified. Should another type of control device other than a Hydro-Brake Optimum & sepecified. Should another type of (n) Flow (l/s) Pepth (n) Flow (l/s) Pepth (n) Flow (l/s) Pepth (n) Flow (l/s) Pepth (n) Flow (l/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.500 13.3 0.500 4.2 2.000 7.2 5.500 11.6 9.500 15.1 0.500 4.7 2.600 8.20 12.6 15.1 15.1 0.500 4.7 2.600 7.6 5.500 11.6 </td <td>Suggested M</td> <td>anhole Dia</td> <td>meter (mm</td> <td>1)</td> <td></td> <td>1200</td> <td></td>	Suggested M	anhole Dia	meter (mm	1)		1200				
Design Point (Calculated) 0.800 4.7 Flush-Flow 0.241 4.7 Kick-Flow 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological collulations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.600 4.7 2.400 7.8 6.500 12.6 15.1 0.600 5.2 </td <td></td> <td>Control Po</td> <td>ints</td> <td>Head (m) F</td> <td>low (l/s)</td> <td></td> <td></td>		Control Po	ints	Head (m) F	low (l/s)					
Flush-Flow 0.241 4.7 Kick-Flow 0.534 3.9 Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.4 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.6 12.6 Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 0	Design	n Point (Ca	lculated	0.800	4.7					
Mean Flow over Head Range - 4.1 The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 11.1 9.000 14.3 0.500 4.2 2.000 7.2 5.000 11.6 9.500 15.1 0.600 4.7 2.400 7.8 6.000 12.6 15.1 1.000 15.1 0.800 4.7 2.400 7.8 6.500 12.6 15.1 1.00 Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.100 <td col<="" td=""><td></td><td>E</td><td>lush-Flo</td><td>™ 0.241</td><td>4.7</td><td></td><td></td></td>	<td></td> <td>E</td> <td>lush-Flo</td> <td>™ 0.241</td> <td>4.7</td> <td></td> <td></td>		E	lush-Flo	™ 0.241	4.7				
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 1.100 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110	Mean B	'low over H	KICK-FIO Head Range	B 0.534	3.9 4.1					
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake@ Optimum@ be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.2 2.600 8.2 6.500 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Drifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 0rifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110			5							
Hydro-Brake© Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum© be utilised then these storage routing calculations will be invalidated Depth (m) Flow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.1 2.200 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Drifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110	The hydrological calculati	ons have b	een based	l on the Head	/Discharge	relations	hip for the			
Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.600 4.1 2.200 7.8 6.000 12.1 9.500 15.1 0.800 4.7 2.400 7.8 6.500 12.6 15.1 Drifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110	Hydro-Brake Optimum as sp Hydro-Brake Optimum® be ut	ecified. ilised the	n these s	otner type o storage routi	r control d	evice oth	er than a			
Depth (m) Flow (1/s) 0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 15.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.100 Mathematical M	invalidated	IIISCU CHC		corage routr	ing carcurat	IONS WIII	DC			
0.100 3.6 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 15.1 Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 48.110	Depth (m) Flow (1/s) Dept	b (m) ፑነ _{ርኒ}	ת (1/e) ∣ח	enth (m) Flo	w (1/s) Den	+b (m) ፑነ	ow (1/s)			
0.100 3.0 1.200 5.7 3.000 8.7 7.000 13.0 0.200 4.7 1.400 6.1 3.500 9.4 7.500 13.5 0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 <u>Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0</u> Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.100 <u>Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1</u> Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110		1 000				7 000	12.0			
0.300 4.7 1.600 6.5 4.000 10.0 8.000 13.9 0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 Eige2-2018 Innovyze	0.200 4 7	1.400	5./	3.500	9.4	7.500	⊥3.U 13 5			
0.400 4.5 1.800 6.9 4.500 10.6 8.500 14.3 0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Drifice Manhole: 21, DS/PN: 10.001, Volume (m ³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 Piameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110	0.300 4.7	1.600	6.5	4.000	10.0	8.000	13.9			
0.500 4.2 2.000 7.2 5.000 11.1 9.000 14.7 0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 9.500 15.1 1.000 5.2 2.600 8.2 6.500 12.6 9.500 15.1 Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	0.400 4.5	1.800	6.9	4.500	10.6	8.500	14.3			
0.600 4.1 2.200 7.5 5.500 11.6 9.500 15.1 0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 9.500 15.1 Orifice Manhole: 21, DS/PN: 10.001, Volume (m ³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 Eigeneter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110	0.500 4.2	2.000	7.2	5.000	11.1	9.000	14.7			
0.800 4.7 2.400 7.8 6.000 12.1 1.000 5.2 2.600 8.2 6.500 12.6 Orifice Manhole: 21, DS/PN: 10.001, Volume (m ³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	0.600 4.1	2.200	7.5	5.500	11.6	9.500	15.1			
<pre>1.000 5.2 2.600 8.2 6.500 12.6 Orifice Manhole: 21, DS/PN: 10.001, Volume (m³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 @1982-2018 Innovyze</pre>	0.800 4.7	2.400	7.8	6.000	12.1					
Orifice Manhole: 21, DS/PN: 10.001, Volume (m ³): 1.0 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	1.000 5.2	2.600	8.2	6.500	12.6					
Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200 <u>Orifice Manhole: 23, DS/PN: 11.001, Volume (m³): 1.1</u> Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	Orifice Manhole: 21, DS/PN: 10.001, Volume (m ³): 1.0									
Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1 Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.200									
Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 48.110 ©1982-2018 Innovyze	Orifice Manhole: 23, DS/PN: 11.001, Volume (m ³): 1.1									
©1982-2018 Innovyze	Diameter (m) 0.020 Discharge Coefficient 0.600 Truest Level (m) 49.110									
©1982-2018 Innovyze		Siscurige	00011101		LOLU HOVEL	() IU.II				
©1982-2018 Innovyze										
-		©198	82-2018	Innovyze						

Curtins Con	sulting L	imited					Page 7
56 The Rope	walk						ruge ,
Nottingham	Waik						a second
							and the second
NGI SDW	0001 10 5	_					Micro
Date 10/04/	2021 19:5	5	Desig	ned by s.	lawinska_a		Drainage
File 072661	-CUR-00-X	X-DC-C-0	Check	ed by			brainage
XP Solution	S		Netwo	rk 2018.	1.1		
	<u>Orifice I</u>	Manhole: 25	, DS/PN	: 13.001	, Volume (m ³): 2.3	
Dia	meter (m) O	.040 Discharg	re Coeffi	cient 0.60	00 Invert Le	vel (m) 47	.145
<u>Hydro</u>	-Brake® Oj	otimum Manh	ole: 20	, DS/PN:	8.003, Vc	lume (m³)	: 3.4
		Uni	t Refere	nce MD-SHF	-0088-3700-	1200-3700	
		Desi	.gn Head	(m)	,	1.200	
		Desigr	Flow (l	/s)		3.7	
			Flush-F	lom	C	alculated	
			Object	ive Minim	nise upstrea	m storage	
		Sum	Applicat	lon		Surface	
		Di	ameter (mm)		88	
		Inver	t Level	(m)		46.580	
	Minimum O	utlet Pipe Di	ameter (mm)		150	
	Suggest	ed Manhole Di	ameter (mm)		1200	
		Control F	oints	Head (m) Flow (1/s	3)	
	De	esign Point (Calculate	ed) 1.2	00 3.	.7	
			Flush-Fl	.om 0.3	61 3.	. 7	
			Kick-Fl	.o® 0.7	43 3.	. 0	
	Me	an Flow over	Head Rar	ige	- 3.	. 2	
The hydrold Hydro-Brake Hydro-Brake invalidated	ogical calcu 2® Optimum a 2 Optimum® b 1	lations have s specified. e utilised th	been bas Should hen these	ed on the another ty storage r	Head/Discha ype of contr couting calc	rge relatic ol device c ulations wi	onship for the other than a ll be
Depth (m)	Flow (l/s)	Depth (m) Flo	ow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	1.200	3.7	3.000	5.7	7.000	8.4
0.200	3.5	1.400	4.0	3.500	6.1	7.500	8.7
0.300	3.7	1.600	4.2	4.000	6.5	8.000	9.0
0.400	3.7	1.800	4.5	4.500	6.9	8.500	9.3
0.500	3.6	2.000	4./	5.000	1.2	9.000	9.5
0.800	3.1	2.200	5.1	6.000	7.9	5.500	5.0
1.000	3.4	2.600	5.3	6.500	8.2		
	Orifice I	Manhole: 30	DS/PN	• 14 001	Volume	m ³)•13	
	<u>UTTTTCC I</u>		, 00/11	. 14.001	, vorune (<u>III / • 1 • 5</u>	
Dia	meter (m) O	.020 Discharg	re Coeffi	cient 0.60	0 Invert Le	vel (m) 45	.656

Curtins Consulting Limited			Page 8
56 The Ropewalk			
Nottingham			
NG1 5DW			Micro
Date 10/04/2021 19:55	Designed	by slawinska_a	Dcainago
File 072661-CUR-00-XX-DC-C-0	Checked b	У	Diamage
XP Solutions	Network 2	018.1.1	
	~· ·		
<u>Storage</u>	Structures	<u>for Storm</u>	
Porous Car Parl	<pre>K Manhole:</pre>	15, DS/PN: 7.001	
Infiltration Coefficient Base	(m/hr) 0.000	000 Width (m)	90.0
Membrane Percolation (Max Percolation	mm/hr) 10 (1/s) 137	5 0 Length (m) 5 0 Slope (1·X)	55.0 200 0
Safety	Factor 2	2.0 Depression Storage (mm)	5
Po	rosity 0	30 Evaporation (mm/day)	3
Invert Lev	el (m) 48.8	357 Cap Volume Depth (m)	0.350
Cellular Storad	e Manhole:	12, DS/PN: 1.004	
Inve	rt Level (m)	48.450 Safety Factor 2.	0
Infiltration Coefficient	Base (m/hr)	0.00000 Porosity 0.9	5
		0.00000	
Depth (m) Area (m²) Inf. Are	ea (m²) Dept	h (m) Area (m²) Inf. Area	(m²)
0.000 655.0	0.0	0.801 0.0	0.0
0.800 655.0	0.0		
		01 DC/DN 10 001	
Porous Car Park	Manhole:	21, DS/PN: 10.001	
Infiltration Coefficient Base	(m/hr) 0.000	000 Width (m)	12.0
Membrane Percolation (mm/hr) 10	000 Length (m)	4.8
Max Percolation	(l/s) 10	5.0 Slope (1:X)	60 0
Safety	Factor 2	0 Doprossion Storage (mm)	00.0
		Depression Scorage (nun)	5
Po Transat Los	rosity 0	30 Evaporation (mm/day)	5 3
Invert Lev	rosity 0 el (m) 48.2	30 Evaporation (mm/day) 200 Cap Volume Depth (m)	5 3 0.350
Po Invert Lev <u>Porous Car Park</u>	rosity 0 el (m) 48.2 Manhole:	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001	5 3 0.350
Po Invert Lev <u>Porous Car Park</u>	rosity 0 el (m) 48.2 <u>Manhole:</u>	23, DS/PN: 11.001	5 3 0.350
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000	30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m)	4.8
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10	30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m)	4.8 4.8
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (l/s) 6 Factor	30 Evaporation Storage (nm) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 000 Slope (1:X) 000 Storage (mm)	4.8 4.8 60.0
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (l/s) 6 Factor 2 rosity 0	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 0000 Length	4.8 4.8 60.0 5 3
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 0 Factor 2 rosity 0 el (m) 48.2	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 5.4 Slope (1:X) 2.0 Depression Storage (mm) 30 Evaporation (mm/day) 10 Cap Volume Depth (m)	4.8 4.8 4.8 60.0 5 3 0.350
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2	30 Evaporation Storage (nm) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 0.4 Slope (1:X) 2.0 Depression Storage (mm) 30 Evaporation (mm/day) 10 Cap Volume Depth (m)	4.8 4.8 60.0 5 3 0.350
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u>	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 0 Factor 2 rosity 0 el (m) 48.3 <u>Manhole:</u>	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 000 Evaporation (mm/day) 000 Length (m) 000 Length (m) 000 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001	4.8 4.8 4.8 60.0 5 3 0.350
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 0 Factor 2 rosity 0 el (m) 48.3 <u>Manhole:</u> (m/hr) 0.000	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 5.4 Slope (1:X) 2.0 Depression Storage (mm) 30 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m)	4.8 4.8 4.8 60.0 5 3 0.350
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 00 Length (m) 0.4 Slope (1:X) .0 Depression Storage (mm) 30 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Length (m)	4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8
Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 010 Cap Volume Depth (m) 020 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Length (m)	4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8 60.0
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 000 Evaporation (mm/day) 000 Length (m) 000 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Width (m) 000 Length (m) 000 Length (m) 000 Length (m) 000 Slope (1:X) 000 Slope (1:X)	4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8 60.0 5
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2 Factor 2 Factor 2 rosity 0 el (m) 47	30 Evaporation (mm/day) 30 Cap Volume Depth (m) 23, DS/PN: 11.001 900 Width (m) 900 Length (m) 900 Evaporation (mm/day) 900 Evaporation (mm/day) 900 Cap Volume Depth (m) 900 Width (m) 900 Width (m) 900 Width (m) 900 Length (m) 900 Length (m) 900 Length (m) 900 Slope (1:X) 900 Length (m) 900 Slope (1:X) 900 Slope (1:X) 900 Evaporation (mm/day) 900 Evaporation (mm/day) 900 Evaporation (mm/day)	4.8 4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8 60.0 5 3 0.350
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2 Factor 2 rosity 0 el (m) 47.2	30 Evaporation (mm/day) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 900 Width (m) 900 Length (m) 900 Length (m) 901 Length (m) 902 Evaporation (mm/day) 903 Evaporation (mm/day) 904 Cap Volume Depth (m) 905 DS/PN: 13.001 900 Width (m) 900 Width (m) 900 Length (m) 900 Length (m) 900 Slope (1:X) 900 Slope (1:X) 900 Evaporation (mm/day) 900 Evaporation (mm/day)	$ \begin{array}{c} & 5 \\ & 5 \\ & 3 \\ 0.350 \\ \end{array} $ $ \begin{array}{c} & 4.8 \\ & 4.8 \\ 60.0 \\ & 5 \\ & 3 \\ 0.350 \\ \end{array} $ $ \begin{array}{c} & 16.5 \\ & 4.8 \\ & 60.0 \\ & 5 \\ & 3 \\ 0.350 \\ \end{array} $
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.3 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2 rosity 0 el (m) 47.3	30 Evaporation (mm/day) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 000 Length (m) 000 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Width (m) 200 Slope (1:X) 2.0 Slope (1:X) 2.0 Evaporation Storage (mm) 30 Evaporation (mm/day) 45 Cap Volume Depth (m)	4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8 60.0 5 3 0.350
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 0 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2 rosity 0 el (m) 47.2	30 Evaporation (mm/day) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 000 Length (m) 000 Length (m) 000 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Width (m) 000 Width (m) 200 Slope (1:X) 000 Length (m) 000 Length (m) 000 Length (m) 000 Slope (1:X) 000 Length (m) 000 Slope (1:X) 000 Length (m) 010 Slope (1:X) 020 Slope (1:X) 03 Evaporation (mm/day) 045 Cap Volume Depth (m)	4.8 4.8 4.8 60.0 5 3 0.350 16.5 4.8 60.0 5 3 0.350
Po Invert Lev Porous Car Park Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev <u>Porous Car Park</u> Infiltration Coefficient Base Membrane Percolation (Max Percolation Safety Po Invert Lev	rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 6 Factor 2 rosity 0 el (m) 48.2 <u>Manhole:</u> (m/hr) 0.000 mm/hr) 10 (1/s) 22 Factor 2 rosity 0 el (m) 47.2	30 Evaporation (mm/day) 30 Evaporation (mm/day) 200 Cap Volume Depth (m) 23, DS/PN: 11.001 000 Width (m) 000 Length (m) 5.4 Slope (1:X) 2.0 Depression Storage (mm) 30 Evaporation (mm/day) 10 Cap Volume Depth (m) 25, DS/PN: 13.001 000 Width (m) 000 Width (m) 000 Length (m) 200 Slope (1:X) 201 Evaporation (mm/day) 30 Evaporation (mm/day) 45 Cap Volume Depth (m)	$ \begin{array}{c} & 5 \\ & 3 \\ 0.350 \\ \end{array} $ $ \begin{array}{c} & 4.8 \\ & 4.8 \\ 60.0 \\ & 5 \\ & 3 \\ 0.350 \\ \end{array} $ $ \begin{array}{c} & 16.5 \\ & 4.8 \\ & 60.0 \\ & 5 \\ & 3 \\ 0.350 \\ \end{array} $

Cunting Conculting Limited		Do go
Curtins consulting Limited		Page 9
56 The Ropewalk		
Nottingham		
NG1 5DW		Mirrn
Date 10/04/2021 19:55	Designed by slawinska_a	Drainago
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamaye
XP Solutions	Network 2018.1.1	
<u>Cellular Storag</u>	e Manhole: 20, DS/PN: 8.003	
Inver	t Level (m) 46.580 Safety Factor 2.0	
Infiltration Coefficient	Base (m/hr) 0.00000 Porosity 0.95	
Infiltration Coefficient	Side (m/hr) 0.00000	
Depth (m) Area (m ²) Inf. Are	(m^2) Depth (m) Area (m ²) Inf. Area	(m²)
		, /
0.000 43.0	45.0 1.201 0.0 8	37.0
1.200 43.0	87.0	
Porous Car Park	Mannole: 30, DS/PN: 14.001	
Infiltration Coofficient D	(m/hm) 0 00000 575 355 ()	10.0
Membrane Percolation (m	$(m/m_{f} = 0.00000 \qquad \text{Wldth (m)}$ $m/hr) = 1000 \qquad \text{Length (m)}$	20.0
Max Percolation	(1/s) 55.6 Slope (1:X)	1000.0
Safety B	Factor 2.0 Depression Storage (mm)	5
Por	cosity 0.30 Evaporation (mm/day)	3
Invert Leve	el (m) 45.656 Cap Volume Depth (m)	0.350
©198	32-2018 Innovyze	

Curtins	s Cons	sulti	ng Lim	nited						Page 10
56 The	Ropev	valk								
Notting	gham									
NG1 5DV	V									Micro
Date 10	0/04/2	2021	19 : 55		De	esigned	by sl	.awinska_a		Drainage
File 07	72661-	-CUR-	00-XX-	DC-C-0	Ch	lecked	by			brainiage
XP Solu	utions	3			Ne	etwork	2018.1	.1		
<u>l year</u>	<u>Retu</u>	<u>irn P</u>	eriod	Summar	y of Cr <u>f</u>	<u>ritical</u> or Sto:	<u>Resul</u> rm	lts by Maxim	<u>um Leve</u>	<u>l (Rank 1)</u>
Mai	nhole : Foul S	Area Hot Headlo ewage Numb Nu	l Reduct Hot St t Start per hea mer of I mber of	cion Fac cart (mi Level (ff (Glob ctare (1 nput Hyo Online	Simula stor 1.00 nns) mm) bal) 0.50 //s) 0.00 drograph Control	ation Cr 00 Add 0 00 Flow 00 s 0 Num s 0 Num c 0 Num	iteria itional MADD H per Per Der of Der of	L Flow - % of ? Factor * 10m³/l Inlet Con rson per Day () Storage Struct Time/Area Diag	Total Flo na Storag effiecier l/per/day ures 7 grams 0 rols 0	w 0.000 ee 2.000 t 0.800) 0.000
		Num	ber oi	OIIIINe	Control	s U Numi	ber of	Real Time Cont	rols U	
			Rainfa M5	<u>S</u> 11 Mode Region -60 (mm)	<u>ynthetic</u> l n Englan)	<u>Rainfa</u> d and Wa	<u>ll Deta</u> FSR ales Cv .100 Cv	<u>ils</u> Ratio R 0.44 (Summer) 0.75 (Winter) 0.84	17 50 10	
		Maro	gin for	Flood R A	tisk Warr Malysis DJ	ning (mm Timeste IS Statu) 300.0 p Fine s ON) DVD Stati e Inertia Stati I	us OFF us OFF	
		Dur	Pi cation(s	rofile(s s) (mins) 15	, 30, 60 720, 960), 120,), 1440	Summer 180, 240, 360 , 2160, 2880, 7200,	and Wint , 480, 60 4320, 570 8640, 100	cer 00, 50, 080
	Reti	ırn Pe Cli	eriod(s) Lmate Ch	(years nange (%))				1, 30, 1 0, 0,	40
PN	US/MH Name	St	torm	Return Period	Climate Change	First Surch	: (X) arge	First (Y) Flood	First () Overflo	2) Overflow w Act.
1.000	1	15	Winter	1	+0%	100/15	Summer			
2.000	2	15	Summer	1	+0%	100/15	Summer			
1.001	2	15	Winter	1	+0%	30/15	Summer			
3.000	4	15 15	Winter	1	+0% +0%	100/15	Summer			
4.000	6	360	Winter	1	+0%	100/15	Summer			
1.002	3	15	Winter	1	+0%	30/15	Summer			
1.003	4	15	Winter	1	+0%	30/15	Summer			
5.000	12	15	Winter	1	+0%	100/15	Summer			
7.000	13	15	Winter	1	+0% +0%	30/15	Summer	100/15 Summer		
7.001	15	1440	Winter	1	+0%	1/15	Summer	tt, 10 Summer		
5.001	13	15	Winter	1	+0%	1/15	Summer			
1.004	12	480	Winter	1	+0%	100/60	Summer			
1.005	13	480	Winter	1	+0응 -1 ^ o					
8.001	18	300 15	Winter	⊥ 1	+0%					
9.000	19	15	Summer	1	+0%					
8.002	19	15	Winter	1	+0%					
	©1982-2018 Innovyze									

Curtins Consulting Limited		Page 11
56 The Ropewalk		
Nottingham		
NG1 5DW		Micro
Date 10/04/2021 19:55	Designed by slawinska_a	Desinado
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	

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

	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow /	Overflow	Pipe Flow	Shahaa	Level
PN	Name	(m)	(m)	(m ³)	Cap.	(1/5)	(1/S)	Status	Exceeded
1.000	1	49.051	-0.249	0.000	0.22		26.0	OK	
2.000	2	49.161	-0.289	0.000	0.12		23.8	OK	
1.001	2	48.993	-0.202	0.000	0.43		49.2	OK	
3.000	4	49.762	-0.282	0.000	0.14		27.7	OK	
3.001	5	49.198	-0.252	0.000	0.23		42.9	OK	
4.000	6	49.300	-0.150	0.000	0.00		0.0	OK	
1.002	3	48.884	-0.226	0.000	0.49		92.1	OK	
1.003	4	48.780	-0.220	0.000	0.51		90.6	OK	
5.000	12	49.335	-0.140	0.000	0.31		13.4	OK	
6.000	13	49.290	-0.110	0.000	0.16		3.6	OK	
7.000	14	49.051	-0.103	0.000	0.67		64.3	OK	4
7.001	15	49.023	0.129	0.000	0.00		0.6	SURCHARGED	
5.001	13	48.701	0.021	0.000	1.55		15.8	SURCHARGED	
1.004	12	48.606	-0.294	0.000	0.06		3.5	OK	
1.005	13	48.473	-0.126	0.000	0.06		3.5	OK	
8.000	17	49.150	-0.150	0.000	0.00		0.0	OK	
8.001	18	47.639	-0.121	0.000	0.08		2.9	OK	
9.000	19	47.596	-0.124	0.000	0.07		1.9	OK	
8.002	19	47.290	-0.110	0.000	0.16		4.8	OK	

©1982-2018 Innovyze
Curtins Consulting Limited		Page 12
56 The Ropewalk		
Nottingham		1
NG1 5DW		Micro
Date 10/04/2021 19:55	Designed by slawinska_a	Dcainago
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	1

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

											Water
	US/MH			Return	Climate	First	= (X)	First (Y)	First (2	Z) Overflow	Level
PN	Name	S	torm	Period	Change	Surch	narge	Flood	Overflo	w Act.	(m)
10.000	20	60	Winter	1	+0%	30/30	Summer				48.303
10.001	21	60	Winter	1	+0읭	30/15	Summer				48.303
11.000	21	30	Winter	1	+0%	100/15	Summer				48.185
11.001	23	30	Winter	1	+0%	30/60	Winter				48.184
12.000	22	15	Winter	1	+0%						48.280
13.000	23	15	Summer	1	+0%	100/30	Winter				47.543
13.001	25	30	Winter	1	+0%	30/15	Summer				47.250
8.003	20	60	Winter	1	+0%	30/15	Summer				46.716
8.004	24	60	Winter	1	+0%						46.604
14.000	29	15	Summer	1	+0%	100/15	Summer				45.764
14.001	30	240	Winter	1	+0%	100/15	Winter				45.717
1.006	17	120	Winter	1	+0%	30/15	Winter				41.934

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	Exceeded
10.000	20	-0.077	0.000	0.12		1.3	OK	
10.001	21	-0.047	0.000	0.00		0.3	OK	
11.000	21	-0.115	0.000	0.06		0.8	OK	
11.001	23	-0.076	0.000	0.00		0.2	OK	
12.000	22	-0.120	0.000	0.09		5.4	OK	
13.000	23	-0.107	0.000	0.18		4.8	OK	
13.001	25	-0.045	0.000	0.02		1.0	OK	
8.003	20	-0.014	0.000	0.38		2.8	OK	
8.004	24	-0.125	0.000	0.07		2.8	OK	
14.000	29	-0.086	0.000	0.38		4.7	OK	
14.001	30	-0.089	0.000	0.00		0.2	OK	
1.006	17	-0.036	0.000	0.94		6.0	OK	

©1982-2018 Innovyze

56 The Ropewalk Date 10/04/2021 19:55 Designed by slawinska_a Date 10/04/2021 19:55 Designed by slawinska_a Discrete to the state of the sta	Curtins	s Cons	sulti	ng Lim	nited				Page 13	
Notlingham NG1 SDW Date 10/04/2021 19:55 File 072661-CUR-00-XX-DC-C-0 Pesigned by slawinska_a File 072661-CUR-00-XX-DC-C-0 Pesigned by slawinska_a Checked by Network 2018.1.1 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Elimitation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start Level (mins) 0 MaDD Factor 1 2007/ha Storage 2.000 Hot Start Level (mins) 0 Manbole Headloas Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewapp per hectire (1/S) 0.000 Number of Online Controls 7 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Online Controls 7 Number of Online Controls 7 Number of Online Controls 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number of Online Controls 0 Number of Storage Structures 7 Number 0 Storage (mains) 12, 30, 60, 120, 180, 420, 360, 450, 600, 720, 960, 1440, 2160, 2860, 4300, 5760, 720, 960, 1440, 2160, 2860, 4300, 5760, 7200, 960, 1440, 2160, 2860, 4300, 5760, 7200, 960, 1440, 2160, 2860, 4300, 5760, 7200, 960, 10083 Return Period (s) (wars) 1, 30, 100 Climate Change Surcharge Flood Overflow Act. 1.000 1 15 Ninter 30 +06 100/15 Summer 1.001 2 15 Ninter 30 +06 100/15 Summer 1.002 3 15 Ninter 30 +06 30/15 Summer 1.003 4 15 Ninter 30 +06 30/15 Summer 1.003 4 15 Ninter 30 +0	56 The	Ropev	walk							
NGL 5DW Date 10/04/2021 19:55 File 072661-CUR-00-XX-DC-C-0. Checked by XP Solutions Network 2018.1.1 30 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 Rot Start (mins) 0 MADD Factor - % of Total Flow 0.000 Rot Start tevel (mm) 0 The Coefficient 0.800 Number of Start tevel (mm) 0 The Coefficient 0.800 Number of Online Controls 7 Number of Time/Areal Dagrams 0 Number of Online Controls 7 Number of Time/Areal Dagrams 0 Number of Offline Controls 7 Number of Time/Areal Dagrams 0 Number of Offline Controls 7 Number of Time/Areal Dagrams 0 Number of Offline Controls 7 Number of Time/Areal Dagrams 0 Number of Offline Controls 7 Number of Number 0.860 Kargin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Climate Change (%) Climate Change (%) Climate Change (%) Climate Change (%) Climate Tag Adv Adv Adv, 500, 120, 180, 240, 260, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1440, 2160, 2880, 430, 5760, 120, 960, 1460, 100/15 Summer 1.001 1 15 Winter 30 40% 100/15 Summer 1.002 1 3 Winter 30 40% 100/15 Summer 1.003 4 15 Winter 30 40% 100/15 Summer 1.003 4 15 Winter 30 40% 100/15 Summer 1.003 1 3 Sinter 30 40% 100/15 Summer 1.003 1 3 Sinter 30 40% 100/15 Summer 1.003 1 3 Sinter 30 40%	Notting	gham								
Date 10/04/2021 19:55 Designed by slawinska_a File 072661-CUR-00-XX-DC-C-0 Checked by XP Solutions Network 2018.1.1 10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Simulation Criteria Areal Reduction Factor 1.000 Neal Reduction Factor 1.000 Additional Plow - % of Total Plow 0.000 Hot Start Level (mm) NAMD Factor * 1.00*/na Storage 2.000 Hot Start Level (mm) Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Storage Structures 7 Number of Offline Controls 0 Number of Real Time Controls 0 Number of Offline Controls 0 Number of Neal Plow 0.753 MS-60 (mm) 20.100 Cv (Winter) 0.940 Margin for Flood Risk Naring (mm) 00.0 DVD Status 0FF Analysis Timesep Fine Inertis Status 0FF Duration(s) (mines) 15, 30, 60, 120, 180, 240, 360, 480, 680, 720, 960, 1440, 2160, 2880, 480, 580, 720, 960, 1440, 10080 Return Climate First (X) First (Y) First (2) Overflow Act. 1.000 1 58 Ninter 30 -08 100/15 Summer 1.001 2 15 Ninter 30 -08 100/15 Summer 1.002 3 15 Ninter 30 -08 100/15 Summer	NG1 5DW	N							Micco	
File 072661-CUR-00-XX-DC-C-0 Checked by XP Solutions Network 2018.1.1 30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Bot Start (mins) 0 MaD Patotr * 10m*/hs Storage 2.000 Bot Start (mins) 0 MinD Patotr * 10m*/hs Storage 2.000 Manhole Bedioss Coeff (Global) 0.500 Flow per Person per Day (L/per/day) 0.000 Foul Sewage per Nectare (L/s) 0.000 Number of Input Hydrographs 0 Number of Starge Structures 7 Number of Online Controls 7 Number of Starge Structures 7 Number of Online Controls 7 Number 0 Starge Structures 7 Number of Online Controls 7 Number 0.840 Region England and Wales CV (Summer) 0.750 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timmestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 350, 430, 650, 120, 960, 1440, 2160, 240, 350, 430, 5760, 720, 964, 1000 Return Period(s) (years) Climate Change (S) US/MET Return Climate First (X) First (Y) First (2) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 100/15 Summer 1.001 1 15 Winter 30 +0% 100/15 Summer 1.003 1 2 16 Winter 30 +0% 100/15 Summer 1.003 1 2 16 Winter 30 +0% 100/15 Summer 1.003 1 3 Winter 30 +0% 100/15 Summer 1.003 1 3 Winter 30 +0% 100/15 Summer 1.003 1 3 Winter 30 +0% 100/15 Summer 1.003 1 4 15 Winter 30 +0% 100/15 Summer 1.003 1 3 Winter 30 +0% 100/15 Summer 1.005 1 3 36 Winter 30 +0% 100/15 Summer 1.005 1 3 15 Winter 30 +0% 10/15 Summer 1.005 1 3 15 Winter 30 +0% 30 0 10% 1 15 Summer 100/15 Su	Date 10	0/04/2	2021	19:55		De	signed by s	lawinska a	Desinado	
XP Solutions Network 2018.1.1 Simulation Critical Results by Maximum Level (Rank 1) for Storm Simulation Critical Results by Maximum Level (Rank 1) for Store Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Stare Level (mins) Mathematical Start Mathematical Start	File 0	72661-	-CUR-	-00-xx-	DC-C-0	Ch	ecked by	—	Drainage	
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1). Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Barban Structures 7 Manbol Feeducation Criteria Areal Reduction Factor 1.000 Marbon Structures 7 Marbon Structures 7 Number of Cifficient 0.800 Marbon Structures 7 Number of Imput Hydrographs 0 Number of Storage Structures 7 Number of Imput Hydrographs 0 Number of Time/Area Diagrams 0 Number of Imput Hydrographs 0 Number of Real Time Controls 0 Synthetic Rainfall Details Ratic R 0.447 Region England and Wales CV (Summer) 0.750 Margin for Flood Riak Warning (sm) 300.0 DVD Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 8640, 10080 Perifile(s) Summer and Winter Dis Status ON Dis Status ON Dis Minter 30 +05 100/15 Summer Dis Winter 30 +05 100/15 Summer	XP Solu	utions	3			Ne	twork 2018.	1.1		
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Simulation Criteria Areal Reduction Pactor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Pactor * 10m//ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Readloss Coeff (Global) 0.500 Flow per Person per bay (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Input Hydrographs 0 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Offline Controls 7 Number of Time/Area Diagrame 0 Number of Input Hydrographs 0 Number of Time/Area Diagrame 0 Number of Input Start 0 Number of Time/Area Diagrame 0 Number of Input Start 0 Number of Time 0 Number 0 Time 1 Flood Order Start 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 Number 0 N										
for Storm Simulation Criteris Areal Reduction Pactor 1.000 Additional Plow - % of Total Plow 0.000 Hot Start Level (min 0 NADD Pactor * 10m/ha Storage 2.000 Inder Coefficient 0.000 Nanber of Storage Structures 7 Number of Imput Hydrographs 0 Number of Storage Structures 7 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Input Hydrographs 0 Number of Time/Ares Diagrams 0 Number of Input Hydrographs 0 Number of Time/Ares Diagrams 0 Number of Input Hydrographs 0 Number of Time/Ares Diagrams 0 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Input Hydrographs 0 Number of Real Time Controls 0 Summer of Inme/Ares Diagrams 0 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Input Hydrographs 0 Number of Real Time Controls 0 Summer Time Controls 0 Number of Input Hydrographs 0 Number of Real Time Controls 0 Distary Structures 7 Numer of Online Controls 0	<u>30 yea</u>	r Ret	urn 1	Period	Summar	<u>ry of C</u>	<u>ritical Res</u>	ults by Maxin	<u>num Level (Rank 1)</u>	
Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mina) 0 MADD Factor * 10m*/ha Storage 2.000 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Offline Controls 7 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Swithetic Rainfall Details Southetic Rainfall Details FSR Rainfall Model FSR Southetic Rainfall Details Summer and Winter Diration(s) (mins) 20.100 CV (Winter) 0.840 Margin for Flood Risk Warning (mm) 100.0 DU Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 140, 2160, 2880, 4320, 5760, 720, 960, 140, 2160, 2880, 4320, 5760, 720, 960, 140, 2160, 2880, 4320, 5760, 720, 960, 140, 2160, 700 Act. 1.000 1 15 Winter 30 40% 100/15 Summer 1.001 1 5 Winter 30 40% 100/15 Summer <						f	<u>or Storm</u>			
Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (ins) 0 MADD Factor * 10m*/ha Storage 2.000 Manchole Readloss 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 7 Number of Offline Controls 0 Number of Real Time Controls 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DUD Status OFF Analysis Timestep Flow Inertia Status OFF Analysis Timestep Flow 10.000 Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 380, 480, 600, 7200, 960, 1200, 1400, 2160, 2880, 4320, 5760, 7200, 960, 1400, 2160, 2880, 4320, 5760, 7200, 960, 1400, 2160, 2880, 4320, 5760, 7200, 960, 1400, 2160, 2880, 4320, 5760, 7200, 960, 1400, 2160, 2880, 4320, 5760, 7200, 960, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>										
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m ³ /ha Storage 2.000 Hot Start Level (m) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per bectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Offline Controls 7 Number of Time/Area Diagrams 0 Number of Offline Controls 7 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.100 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, 430, 600, 720, 960, 1440, 2160, 230, 5760, 720, 960, 1400, 210, 190, 240, 320, 5760, 720, 960, 1400, 210, 190, 240, 320, 5760, 720, 960, 1400, 210, 100, 000 Return Period(s) (years) Climate Change (%) 00/15 Summer 1.001 1 15 Winter 30 +0% 100/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Ninter 30 +0% 100/15 Summer 3.001 4 15 Winter 30 +0% 100/15 Summer 3.001 13 15 Winter 30 +0% 100/15 Summer 3.001 14 15 Winter 30 +0% 100/15 Summer 3.001 15 15 Winter 30 +0% 100/15 Summer 3.001 14 15 Winter 30 +0% 100/15 Summer 3.001 15 SWinter 30 +0% 100/15 Summer 3.001 14 15 Winter 30 +0% 8.001 17 360 Winter 30 +0% 8.001						Gimul	ation Critoria			
Hot Start Level (m) 0 MADD Factor * 10m*/hs Storage 2.000 Hot Start Level (m) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Online Controls 7 Number of Time/Area Diagrams 0 Number of Offline Controls 7 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) Margin for Flood Risk Marning (mm) 300.0 DVD Status OFF Margin for Flood Risk Marning (mm) 300.0 DVD Status OFF 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, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 0 +08 100/15 Summer 1.001 2 15 Winter 0 +08 100/15 Summer 1.002 1 5 Winter 0 +08 100/15 Summer <td></td> <td></td> <td>Area</td> <td>l Reduct</td> <td>cion Fac</td> <td>tor 1.00</td> <td>0 Addition</td> <td><u>-</u> al Flow - % of ?</td> <td>Total Flow 0.000</td>			Area	l Reduct	cion Fac	tor 1.00	0 Addition	<u>-</u> al Flow - % of ?	Total Flow 0.000	
Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Online Controls 7 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Rainfall Model FSR Namer of Offline Controls 0 Number 0.750 M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 0, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 0, 0, 0, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 15 Winter 30 +0% 100/15 Summer				Hot St	tart (mi	.ns)	0 MADD	Factor * 10m ³ /H	na Storage 2.000	
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (I/per/day) 0.000 Foul Sewage per hectare (I/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Ofline Controls 0 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Swythetic Rainfall Details Rainfall Model FSR Number of Ofline Controls 0 Summer 0.750 M5-60 (mm) 20.100 CV (Ninter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2860, 4300, 5760, 720, 960, 1440, 2160, 2860, 4300, 5760, 7200, 9640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 3.001 1 5 Winter 30 +0% 100/15 Summer 3.001 1 5 Winter 30 +0% 100/15 Summer 3.001 1 5 Winter 30			Но	t Start	Level (mm)	0	Inlet Coe	effiecient 0.800	
Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Offline Controls 7 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 0.447 Region England and Wales Cv (Summer) 0.750 MS-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 660, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period (s) (years) Climate Change (%) VS/MH VS/MH VS/MH Name VS/MH VS/MH VS/MH Name Summer and Winter DTS Status ON Profile(s) Summer and Winter DTS Status ON T200, 8640, 10080 Return Climate First (X) First (Z) Overflow PN Name Summer 300 A to % 100/15 Summer 3000 1 300 <td>Ma</td> <td>nhole Foul S</td> <td>Headl</td> <td>oss Coei</td> <td>Ef (Glob Stare (1</td> <td>(a1) 0.50</td> <td>)0 Flow per Pe</td> <td>erson per Day ()</td> <td>1/per/day) 0.000</td>	Ma	nhole Foul S	Headl	oss Coei	Ef (Glob Stare (1	(a1) 0.50)0 Flow per Pe	erson per Day ()	1/per/day) 0.000	
Number of Input Hydrographs 0 Number of Storage Structures 7 Number of Online Controls 7 Number of Real Time Controls 0 Number of Offine Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status Summer and Winter DTS Status Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, T20, 960, 1440, 2160, 2880, 4320, 5760, T20, 8640, 10080 Return Period(s) (years) T20, 960, 1440, 2160, 2880, 4320, 5760, T200, 8640, 10080 Return Period(s) (years) I, 30, 100 Climate Change (%) O, 0, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 3.001 1 15 Winter 30 +0% 100/15 Summer 3.001 5 Sitter 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 3.001 4 15 Winter 30 +0% 30/15 Summer 3.001		FOUL 5	ewaye	per net	Juare (1	./5) 0.00	50			
Number of Online Controls 7 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Number of Offline Controls 0 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1440, 2160, 2880, 4320, 5760, 7200, 960, 1400, 2160, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 30/15 Summer <t< td=""><td></td><td></td><td>Numb</td><td>per of I</td><td>nput Hy</td><td>drograph</td><td>s 0 Number of</td><td>Storage Struct</td><td>ures 7</td></t<>			Numb	per of I	nput Hy	drograph	s 0 Number of	Storage Struct	ures 7	
Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 MS-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF DTS Status ON Profile(s) Summer and Winter DUS (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1040 Climate Change (%) 0, 0, 0, 40 US/MH Return Climate First (X) First (Y) First (2) Overflow Manee South colspan="2">South colspan="2">South colspan="2">South colspan="2" 1,030 1,030,100 Climate Change Surcharge Flood Overflow Act. South colspan="2" 1,040 <td colspa<="" td=""><td></td><td></td><td>Nu</td><td>umber of</td><td>Online</td><td>Control</td><td>s 7 Number of</td><td>Time/Area Diag</td><td>rams 0</td></td>	<td></td> <td></td> <td>Nu</td> <td>umber of</td> <td>Online</td> <td>Control</td> <td>s 7 Number of</td> <td>Time/Area Diag</td> <td>rams 0</td>			Nu	umber of	Online	Control	s 7 Number of	Time/Area Diag	rams 0
Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.447 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 280, 4320, 670, 720, 960, 1440, 2160, 280, 4320, 5760, 720, 960, 1440, 2160, 280, 4320, 5760, 720, 960, 1440, 2160, 280, 4320, 5760, 720, 960, 1440, 2160, 280, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow Act. Name Storm Period Change Summer Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 3.001 2 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 3.001 5 <td></td> <td></td> <td>Nun</td> <td>nber of</td> <td>Offline</td> <td>Control</td> <td>s 0 Number of</td> <td>Real Time Cont</td> <td>rols 0</td>			Nun	nber of	Offline	Control	s 0 Number of	Real Time Cont	rols 0	
Rainfall Model FSR Ratio R 0.447 Region England and Wales CV (Summer) 0.750 M5-60 (mm) 20.100 CV (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 960, 1440, 2160, 2880, 4320, 5760, 720, 9640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow FN Name Storm Return Climate First (X) First (Y) First (Z) Overflow Name Storm Period Change Storm Period Change Storm Return Climate First (X) First (Y) First (Z) Overflow Name Storm Adv 100/15 Summer Sto					S	vnthetic	Rainfall Det	ails		
Region England and Wales CV (Summer) 0.750 M5-60 (mm) 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) DTS Status ON Profile(s) Summer and Winter Duration(s) (mins) DTS Status ON Profile(s) Summer and Winter Duration(s) (mins) DTS Status ON Return Period(s) (years) Climate Change (%) O, 0, 400 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Act. 1.000 15 Winter 30 30 15 Winter 30 30 1.00/15 Summer 3.001 15 Winter 30 40% 100/15 Summer 3.001 15 Winter 30 3.001 15 Winter 30 3.001 15 Winter 30				Rainfa	ll Mode	1	FSR	Ratio R 0.44	ł7	
M5-60 (mm) 20.100 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF 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, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Summer 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 3.001 4 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 15 Summer 100/15 Summer <td></td> <td></td> <td></td> <td>_</td> <td>Regio</td> <td>n Englan</td> <td>d and Wales C</td> <td>v (Summer) 0.75</td> <td>50</td>				_	Regio	n Englan	d and Wales C	v (Summer) 0.75	50	
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, 280, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 7200, 8640, 10080 Climate Change (%) 0, 0, 40 Voreflow PN Name Storm Period Change Summer 1.000 1 15 Winter 30 Adv 40% 100/15 Summer 1.001 1 Summer 100/15 Summer 1.001 1 Swinter 30 Summer 1.001 1 Swinter 30 Summer 1.001 1 1.001 1 2 15 Winter 30 Summer				M5	-60 (mm)	20.100 C	v (Winter) 0.84	ŧ O	
Malysis 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, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 0, 30, 100 Climate Change (%) 1, 30, 100 VS/MH Return Climate First (X) First (Y) First (Z) Overflow Name Storm Period Change Surcharge Flood Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 3.001 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 3.001 4 15 Winter 30 +0% 30/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 <			Mar	gin for	Flood F	lisk Warr	ning (mm) 300.	.0 DVD Stati	us 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, 40 VS/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Surcharge Flood Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 3.001 1 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 1 15 Winter 30 +0% 100/15 Summer 3.001 1 15 Winter 10 <td></td> <td></td> <td></td> <td>2</td> <td>A</td> <td>nalysis</td> <td>Timestep Fir</td> <td>ne Inertia Statu</td> <td>us OFF</td>				2	A	nalysis	Timestep Fir	ne Inertia Statu	us OFF	
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, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Surcharge Flood Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer Act. 1.001 1 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 100/15 Summer 1.003 4 15 Winter 30 +0% 100/15 Summer 1.003 4 15 Winter 30 +0% 100/15 Summer 1.004 12						DI	TS Status (N		
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 240, 360, 480, 600, 7200, 8640, 10080 Return Period(s) (years) 7200, 8640, 10080 Climate Change (%) 1, 30, 100 US/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Succharge Flood 0 0, 0, 40 1.000 1 1 S Winter 30 1.001 2 15 Winter 30 1.001 2 15 Winter 30 1.001 515 Winter 3.000 4 4.000 6 360 Winter 3.015 5 Summer 1.002 3 15 Winter 30 100 15 12 15 Winter 30 +0% 30/15 Summer 1.001 15 Winter 1										
US/MH Return Climate First (X) First (Y) First (Z) Overflow Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Succharge Flood Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer Overflow Act. 1.001 2 15 Winter 30 +0% 100/15 Summer Overflow Act. 3.001 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 5.001 12 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 1.00/15 Summer 5.001 13 15 Winter 30 +0% 30/15 Summer			D	Pr	ofile(s)	20 00 120	Summer	and Winter	
7200, 8640, 10080 Return Period (s) (years) Climate Change (%) VS/MH Return Climate First (X) First (Y) First (Z) Overflow Overflow Act. Name Storm Period Change Surcharge Flood Overflow Act. 1.000 1 5 Winter 30 100/15 Summer 1.001 1 5 Winter 30 100/15 Summer 3.000 4 100/15 Summer 3.001 5 Winter 30 + 0% 100/15 Summer 1.002 3 15 Winter 30 + 0% 1.002 3 15 Winter 30 + 0% 3.001 1.002 3 100/15 S			Du	ration(s	3) (mins) 15	, 30, 60, 120 720, 960, 144	, 180, 240, 360 0, 2160, 2880,	4320, 5760,	
Return Period (s) (years) Climate Change (%) 1, 30, 100 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow 0verflow Act. Name Storm Period Change Surcharge First (Y) First (Z) Overflow 0verflow Name Storm Period Change Surcharge Flood Overflow 0verflow Name Storm Period Change Surcharge First (Y) First (Z) Overflow 0verflow 1.000 1 15 Winter 30 +0% 100/15 Summer -0% -0% 100/15 Summer 3.001 5 15 Winter 30 +0% 30/15 Summer -0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer -0% 100/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer -0% 100/15 Summer 5.000 12 15 Winter 30 +0% 30/15 Summer 100/15 Summer							-,,	7200,	8640, 10080	
Climate Change (%) 0, 0, 40 US/MH Return Climate First (X) First (Y) First (Z) Overflow PN Name Storm Period Change Surcharge First (Y) First (Z) Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer Overflow Act. 1.001 2 15 Winter 30 +0% 100/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 100/15 Summer 1.003 15 15 Winter 30 +0% 1/15 Summer 1.003 15 15 Winter 30 +0% <		Reti	urn Pe	eriod(s)	(years)			1, 30, 100	
US/MH Return Climate First (X) First (Y) First (Z) Overflow 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 30/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.001 12 15 Winter 30 +0% 100/15 Summer 1.001 13 15 Winter 30			Cli	imate Ch	nange (%)			0, 0, 40	
US/MH Return Climate First (X) First (Y) First (Z) Overflow 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 100/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 30/15 Summer 7.001 15 2160 Winter										
PN Name Storm Period Change Surcharge Flood Overflow Act. 1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 30/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 100/15 Summer 1.001 12 15 Winter 30 +0% 100/15 Summer 7.001 15 2160		IIS/MH			Beturn	Climate	First (X)	First (V)	First (7) Overflow	
1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 30/15 Summer 1.001 2 15 Winter 30 +0% 30/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 30/15 Summer 6.000 13 15 Winter 30 +0% 7.001 14 15 Winter 30 +0% 30/15 Summer 1.004 12 360 Winter 30 +0% 1/15 Summer 1.005 13 360 Winter 30 +0% 100/60 Summer 1.005 13 60 Winter 30 +0% 8.001 18 15 Winter 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	PN	Name	S	torm	Period	Change	Surcharge	Flood	Overflow Act.	
1.000 1 15 Winter 30 +0% 100/15 Summer 2.000 2 15 Winter 30 +0% 100/15 Summer 1.001 2 15 Winter 30 +0% 30/15 Summer 3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 100/15 Summer 5.000 12 15 Winter 30 +0% 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 1.004 12 360 <td< td=""><td>1 0 0 0</td><td>-</td><td></td><td></td><td></td><td></td><td>100/15 0</td><td></td><td></td></td<>	1 0 0 0	-					100/15 0			
1.001 2 15 Winter 30 +0% 30/15 Summer 3.001 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 30/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.004 12 360	2 000	2	15	Winter Winter	30 30	+0% +0%	100/15 Summe	r r		
3.000 4 15 Winter 30 +0% 100/15 Summer 3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 30/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 7.000 14 15 Winter 30 +0% 30/15 Summer 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	1.001	2	15	Winter	30	+0%	30/15 Summe	r		
3.001 5 15 Winter 30 +0% 100/15 Summer 4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 100/15 Summer 6.000 13 15 Winter 30 +0% 7.000 14 15 Winter 30 +0% 30/15 Summer 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	3.000	4	15	Winter	30	+0%	100/15 Summe	r		
4.000 6 360 Winter 30 +0% 100/15 Summer 1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 100/15 Summer 6.000 13 15 Winter 30 +0% 100/15 Summer 7.000 14 15 Winter 30 +0% 30/15 Summer 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 40% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer <	3.001	5	15	Winter	30	+0%	100/15 Summe	r		
1.002 3 15 Winter 30 +0% 30/15 Summer 1.003 4 15 Winter 30 +0% 30/15 Summer 5.000 12 15 Winter 30 +0% 100/15 Summer 6.000 13 15 Winter 30 +0% 30/15 Summer 7.000 14 15 Winter 30 +0% 30/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% 0 +0% 19	4.000	6	360	Winter	30	+0%	100/15 Summe:	r		
5.000 12 15 Winter 30 +0% 100/15 Summer 6.000 13 15 Winter 30 +0% 7.000 14 15 Winter 30 +0% 7.001 15 2160 Winter 30 +0% 1/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	1 002	3 4	15	Winter	30	+03 +0%	30/15 Summe	r		
6.000 13 15 Winter 30 +0% 7.000 14 15 Winter 30 +0% 30/15 Summer 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	5.000	12	15	Winter	30	+0%	100/15 Summe	r		
7.000 14 15 Winter 30 +0% 30/15 Summer 100/15 Summer 7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	6.000	13	15	Winter	30	+0%				
7.001 15 2160 Winter 30 +0% 1/15 Summer 5.001 13 15 Winter 30 +0% 1/15 Summer 1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	7.000	14	15	Winter	30	+0%	30/15 Summe	r 100/15 Summer		
1.004 12 360 Winter 30 +0% 100/60 Summer 1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0%	7.001	15 1 2	2160	Winter	30	+U응 ⊥∩∾	1/15 Summe:	r		
1.005 13 360 Winter 30 +0% 8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% (©1982-2018 Inpovuze	1.004	12	360	Winter	30	+0%	100/60 Summe	r		
8.000 17 360 Winter 30 +0% 8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% (©1982-2018 Inpovuze	1.005	13	360	Winter	30	+0응				
8.001 18 15 Winter 30 +0% 9.000 19 15 Summer 30 +0% 8.002 19 15 Summer 30 +0% (01982-2018 Ippoyvze	8.000	17	360	Winter	30	+0%				
8.002 19 15 Summer 30 +0% (01982-2018 Innovyze	8.001	18	15	Winter	30	+0%				
@1982-2018 Innovvze	8.002	19 19	15 15	Summer	30	+0% +0%				
		-				@1982_	2018 Innovi	70		

Curtins Consulting Limited	Page 14	
56 The Ropewalk		
Nottingham		
NG1 5DW		Micro
Date 10/04/2021 19:55	Designed by slawinska_a	Dcainago
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	1

<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>

	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow /	Overflow	Pipe Flow		Level
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	Exceeded
1.000	1	49.266	-0.034	0.000	0.49		58.6	OK	
2.000	2	49.253	-0.197	0.000	0.29		56.9	OK	
1.001	2	49.232	0.037	0.000	0.91		103.9	SURCHARGED	
3.000	4	49.821	-0.224	0.000	0.34		68.2	OK	
3.001	5	49.292	-0.158	0.000	0.62		114.5	OK	
4.000	6	49.300	-0.150	0.000	0.00		0.0	OK	
1.002	3	49.162	0.052	0.000	1.13		210.1	SURCHARGED	
1.003	4	49.021	0.021	0.000	1.18		211.1	SURCHARGED	
5.000	12	49.396	-0.079	0.000	0.74		32.1	OK	
6.000	13	49.316	-0.084	0.000	0.40		8.8	OK	
7.000	14	49.791	0.637	0.000	1.58		151.8	SURCHARGED	4
7.001	15	49.131	0.237	0.000	0.01		0.6	SURCHARGED	
5.001	13	48.824	0.144	0.000	3.78		38.7	SURCHARGED	
1.004	12	48.809	-0.091	0.000	0.08		4.7	OK	
1.005	13	48.478	-0.121	0.000	0.08		4.7	OK	
8.000	17	49.150	-0.150	0.000	0.00		0.0	OK	
8.001	18	47.662	-0.098	0.000	0.26		9.2	OK	
9.000	19	47.612	-0.108	0.000	0.18		4.6	OK	
8.002	19	47.322	-0.078	0.000	0.46		13.8	OK	

Curtins Consulting Limited							
56 The Ropewalk							
Nottingham							
NG1 5DW		Micro					
Date 10/04/2021 19:55	Designed by slawinska_a	Desinado					
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage					
XP Solutions	Network 2018.1.1						

<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>

											Water
	US/MH			Return	Climate	First	t (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	S	torm	Period	Change	Surch	narge	Flood	Overflow	Act.	(m)
10.000	20	120	Winter	30	+0%	30/30	Summer				48.422
10.001	21	120	Winter	30	+0%	30/15	Summer				48.421
11.000	21	60	Winter	30	+0%	100/15	Summer				48.261
11.001	23	60	Winter	30	+0%	30/60	Winter				48.260
12.000	22	15	Winter	30	+0%						48.297
13.000	23	15	Winter	30	+0%	100/30	Winter				47.570
13.001	25	60	Winter	30	+0%	30/15	Summer				47.374
8.003	20	60	Winter	30	+0%	30/15	Summer				46.936
8.004	24	60	Winter	30	+0읭						46.609
14.000	29	15	Summer	30	+0%	100/15	Summer				45.815
14.001	30	180	Winter	30	+0%	100/15	Winter				45.795
1.006	17	120	Winter	30	+0%	30/15	Winter				41.980

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	Exceeded
10.000	20	0.042	0.000	0.16		1.8	SURCHARGED	
10.001	21	0.071	0.000	0.00		0.4	SURCHARGED	
11.000	21	-0.039	0.000	0.09		1.1	OK	
11.001	23	0.000	0.000	0.01		0.3	SURCHARGED	
12.000	22	-0.103	0.000	0.22		13.4	OK	
13.000	23	-0.080	0.000	0.45		11.8	OK	
13.001	25	0.079	0.000	0.03		1.5	SURCHARGED	
8.003	20	0.206	0.000	0.50		3.7	SURCHARGED	
8.004	24	-0.120	0.000	0.09		3.7	OK	
14.000	29	-0.035	0.000	0.94		11.5	OK	
14.001	30	-0.011	0.000	0.00		0.3	OK	
1.006	17	0.010	0.000	1.34		8.6	SURCHARGED	

©1982-2018 Innovyze

Curtins C	Consul	lting Lim	ited				Page 16			
56 The Ro	pewal	k								
Nottingha	ım									
NG1 5DW							Micro			
Date 10/0	4/202	21 19:55		De	signed by sl	awinska_a	Drainage			
File 0726	61-CU	JR-00-XX-	DC-C-0	Ch	ecked by		brainiage			
XP Soluti	ons			Ne	twork 2018.1	.1				
100 year Return Period Summary of Critical Results by Maximum Level (Rank <u>1) for Storm</u> Simulation Criteria										
Manho Fou	Ar le Hea l Sewa	real Reduct Hot St Hot Start dloss Coes uge per heo	cion Fac cart (mi Level (Ef (Glob ctare (l	<u>Simula</u> tor 1.00 ns) mm) pal) 0.50 /s) 0.00	ation Criteria 00 Additional 0 MADD F 0 00 Flow per Per 00	Flow - % of T Factor * 10m³/h Inlet Coe rson per Day (1	Fotal Flow 0.000 ha Storage 2.000 effiecient 0.800 L/per/day) 0.000			
	N1]	umber of I Number of Number of	nput Hyd Online Offline	drograph Control Control	s 0 Number of 3 s 7 Number of 4 s 0 Number of 1	Storage Struct Time/Area Diag Real Time Cont	ures 7 rams 0 rols 0			
		Rainfa	<u>S</u> 11 Modei	<u>ynthetic</u> l	Rainfall Deta: FSR	<u>ils</u> Ratio R 0.44	7			
		М5	Region -60 (mm)	n Englan)	d and Wales Cv 20.100 Cv	(Summer) 0.75 (Winter) 0.84	0			
	Μ	Margin for	Flood R	isk Warr	ning (mm) 300.0	DVD Statu	is OFF			
			A	nalysis Dī	Timestep Fine S Status ON	e Inertia Statu I	is OFF			
		Pr	ofile(s)		Summer	and Winter			
		Duration(s	s) (mins) 15	, 30, 60, 120, 720, 960, 1440,	180, 240, 360 , 2160, 2880, 7200,	480, 600, 4320, 5760, 8640, 10080			
:	Return	Period(s) Climate Ch	(years ange (%)			1, 30, 100 0, 0, 40			
US PN Na	/MH ame	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow Overflow Act.			
1 000	1	15 Winter	100	1 4 0 0	100/15 0					
2.000	1 2	15 Winter	100	+40%	100/15 Summer					
1.001	2	15 Winter	100	+40%	30/15 Summer					
3.000	4	15 Winter	100	+40%	100/15 Summer					
3.001	5	15 Winter	100	+40%	100/15 Summer					
4.000	6	15 Winter	100	+40%	100/15 Summer					
1.002	З 4	15 Winter	100	+403 +408	30/15 Summer					
5.000	12	15 Winter	100	+40%	100/15 Summer					
6.000	13	15 Winter	100	+40%						
7.000	14	15 Winter	100	+40%	30/15 Summer	100/15 Summer				
7.001	15 28	80 Winter	100	+40%	1/15 Summer					
5.001	13 6	00 Winter	100	+40%	1/15 Summer					
1.004	12 6	00 Winter	100	+40%	100/60 Summer					
8.000	⊥3 b 17 3	60 Winter	100	+4U≷ +4N⊱						
8.001	18	15 Winter	100	+40%						
9.000	19	15 Winter	100	+40%						
8.002	19 1	20 Winter	100	+40%						
				©1982-	2018 Innovyz	e				

Curtins Consulting Limited		Page 17
56 The Ropewalk		
Nottingham		
NG1 5DW		Micro
Date 10/04/2021 19:55	Designed by slawinska_a	Desinado
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (1/s)	Pipe Flow (l/s)	Status	Level Exceeded
					-				
1.000	1	49.974	0.674	0.000	0.84		99.6	FLOOD RISK	
2.000	2	49.940	0.490	0.000	0.45		89.5	FLOOD RISK	
1.001	2	49.902	0.707	0.000	1.65		188.0	FLOOD RISK	
3.000	4	50.126	0.081	0.000	0.57		114.1	SURCHARGED	
3.001	5	49.972	0.522	0.000	0.92		169.3	FLOOD RISK	
4.000	6	49.670	0.220	0.000	0.14		2.8	FLOOD RISK	
1.002	3	49.675	0.565	0.000	1.88		350.9	SURCHARGED	
1.003	4	49.274	0.274	0.000	1.98		352.9	SURCHARGED	
5.000	12	49.775	0.300	0.000	1.18		51.6	FLOOD RISK	
6.000	13	49.345	-0.055	0.000	0.73		16.0	OK	
7.000	14	50.223	1.069	23.032	2.13		204.2	FLOOD	4
7.001	15	49.290	0.396	0.000	0.01		0.7	SURCHARGED	
5.001	13	49.161	0.481	0.000	0.59		6.1	SURCHARGED	
1.004	12	49.159	0.259	0.000	0.08		4.7	SURCHARGED	
1.005	13	48.478	-0.121	0.000	0.08		4.7	OK	
8.000	17	49.150	-0.150	0.000	0.00		0.0	OK	
8.001	18	47.683	-0.077	0.000	0.48		16.7	OK	
9.000	19	47.628	-0.092	0.000	0.32		8.3	OK	
8.002	19	47.395	-0.005	0.000	0.24		7.0	OK	

Curtins Consulting Limited		Page 18
56 The Ropewalk		
Nottingham		
NG1 5DW		Mirco
Date 10/04/2021 19:55	Designed by slawinska_a	Desinado
File 072661-CUR-00-XX-DC-C-0	Checked by	Diamage
XP Solutions	Network 2018.1.1	

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

PN	US/MH Name	s	torm	Return Period	Climate Change	First Surch	t (X) harge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
10.000	20	120	Winter	100	+40%	30/30	Summer				48.738
10.001	21	120	Winter	100	+40%	30/15	Summer				48.737
11.000	21	60	Winter	100	+40%	100/15	Summer				48.389
11.001	23	60	Winter	100	+40%	30/60	Winter				48.387
12.000	22	15	Winter	100	+40%						48.315
13.000	23	60	Winter	100	+40%	100/30	Winter				47.812
13.001	25	60	Winter	100	+40%	30/15	Summer				47.802
8.003	20	120	Winter	100	+40%	30/15	Summer				47.390
8.004	24	30	Summer	100	+40%						46.609
14.000	29	15	Summer	100	+40%	100/15	Summer				45.926
14.001	30	240	Winter	100	+40%	100/15	Winter				45.918
1.006	17	180	Winter	100	+40%	30/15	Winter				41.981

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(l/s)	Status	Exceeded
10.00	0 20	0.358	0.000	0.30		3.3	FLOOD RISK	
10.00)1 21	0.387	0.000	0.01		0.6	FLOOD RISK	
11.00	0 21	0.089	0.000	0.17		2.0	SURCHARGED	
11.00)1 23	0.127	0.000	0.01		0.4	SURCHARGED	
12.00	0 22	-0.085	0.000	0.40		24.3	OK	
13.00	0 23	0.162	0.000	0.38		10.2	SURCHARGED	
13.00)1 25	0.507	0.000	0.05		2.5	SURCHARGED	
8.00)3 20	0.660	0.000	0.50		3.7	SURCHARGED	
8.00	24	-0.120	0.000	0.09		3.7	OK	
14.00	0 29	0.076	0.000	1.70		20.8	SURCHARGED	
14.00)1 30	0.112	0.000	0.00		0.4	SURCHARGED	
1.00)6 17	0.011	0.000	1.35		8.7	SURCHARGED	

©1982-2018 Innovyze

Flood Risk Assessment and Drainage Strategy Report



Appendix G Flow Exceedance Plan





GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND
- ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
- FOR GENERAL NOTES REFER TO CURTINS DRAWING "DR-C-9000_GENERAL INFRASTRUCTURE NOTES".

TO BE READ IN CONJUNCTION WITH:

DRAWING TO BE READ IN CONJUNCTION WITH: FS0200-CUR-ZZ-ZZ-DR-C-9030_SURFACE WATER DRAINAGE LAYOUT

- SHEET 1 OF 2 FS0200-CUR-ZZ-ZZ-DR-C-9031_SURFACE WATER DRAINAGE LAYOUT
- SHEET 2 OF 2
- FS0200-CUR-ZZ-ZZ-DR-C-9051_DRAINAGE CONSTRUCTION DETAILS SHEET 1 OF 2
- FS0200-CUR-ZZ-ZZ-DR-C-9052_DRAINAGE CONSTRUCTION DETAILS SHEET 2 OF 2
- FS0200-CUR-ZZ-ZZ-DR-C-9261_FLOOD EXCEEDENCE PLAN SHEET 2 OF 2

<u>KEY</u>



EXCEEDANCE FLOW DIRECTION FOR EVENTS UP TO 1 IN 100 YEAR + 50CC





Flood Risk Assessment and Drainage Strategy Report



Appendix H Outline Operations and Maintenance Manual

SuDS Operations and Maintenance Manual

Curtins Ref: 072661-CUR-ZZ-XX-RP-C-0003

Revision: V01 Issue Date: 09 April 2021

 Client Name:
 Bowmer and Kirkland

 Client Address:
 Southern Regional Office, 1230 Arlington Business Park, Theale, Reading, RG7 4SA

Curtins 40 Compton Stree London, EC1V 0B Tel: 020 7324 2240





STRUCTURES • CIVILS • ENVIRONMENTAL • INFRASTRUCTURE • TRANSPORT PLANNING • SUSTAINABILITY • EXPERT ADVISORY SERVICES Birmingham • Bristol • Cardiff • Douglas • Edinburgh • Kendal • Leeds • Liverpool • London • Manchester • Nottingham



SuDS Operations and Maintenance Manual

Rev	Description	Issued by	Checked	Date
P01	Planning Issue	AS	WH	09/04/21

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
Alicja Smolen MSc (Hons) Project Engineer	Lala	09/04/21

Reviewed	Signature	Date
Wayne Howland BSc (Hons) CEng MIStructE Associate	Mr Apaland	09/04/21



SuDS Operations and Maintenance Manual

Table of contents

1.0	Intro	oduction	3
1.1	1	Project Background	3
1.2	2	Scope of O&M Manual	3
2.0	Pipe	es	4
2.1	1	Location and Description	4
2.2	2	Operation	4
2.3	3	Inspection and Maintenance Regime	4
5.0	Atte	enuation Tank (Geocellular Units)	8
5.1	1	Location and Description	8
5.2	2	Operation	8
5.3	3	Inspection and Maintenance Regime	8
6.0	Filte	er Strips, French Drains	10
6.1	1	Location and Description	10
6.2	2	Operation	10
6.3	3	Inspection and Maintenance Regime	10
7.0	Flo	v Control Chambers	13
7.1	1	Location and Description	13
7.2	2	Operation	13
7.3	3	Inspection and Maintenance Regime	13
8.0	Rai	n Gardens and Tree Pits	15
8.1	1	Location and Description	15
8.2	2	Operation	15
8.3	3	Inspection and Maintenance Regime	15
9.0	Our	Locations	17



SuDS Operations and Maintenance Manual

1.0 Introduction

1.1 Project Background

Curtins Consulting Limited has been appointed by Bowmer and Kirkland to prepare a SuDS Operations and Maintenance Manual to supplement Drainage Strategy produced by Curtins. Document reference: 072661-CUR-ZZ-XX-RP-C-0002.

Particular reference is paid to the inspection, aftercare and maintenance of SuDs drainage features as part of this manual in order to demonstrate to the LLFA or adopting authority the effectiveness and longevity of the SuDs features designed within the scheme as opposed to the standard Building Regulations local and domestic drainage and/or the main discharge drainage connections to 'Sewers for Adoption' standards.

This report is based on current best practice guidance as described in the SuDS Manual, CIRIA, C753.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Scope of O&M Manual

This manual is intended to give an overview of the operation and maintenance for SuDS features included with the drainage strategy and in relation to typical details only. Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

Maintenance responsibility for the system is expected to revert to the DfE and the St Andrew the Apostle School management teams at the end of the contractor's defects liability period.



SuDS Operations and Maintenance Manual

2.0 Pipes

2.1 Location and Description

Pipes are the main conveyance across the site as shown on drainage drawings;

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacturer's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the Curtins' drainage specification.

2.2 Operation

They are intended to be dry except for during rainfall events. These have been designed to be selfcleansing for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.

2.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with the DfE and the St Andrew the Apostle School management teams

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.



SuDS Operations and Maintenance Manual

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more	Initial inspection should be provided as post construction CCTV survey.	N/A
year of operation and adjusted as required)	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.



SuDS Operations and Maintenance Manual

3.0 Permeable Pavements

3.1 Location and Description

Permeable paving is being used in parking bays in the car park areas as shown on surface water drainage drawings;

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

The permeable pavement has been designed in accordance with CIRIA C753.

Permeable pavements contain proprietary products and as such, the manufacturer's recommendations should be followed where used.

3.2 Operation

Permeable pavements are an efficient means of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium.

The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers in to the voided stone which makes up the sub-base.

3.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the pervious pavement. Maintenance responsibility for the pipes should be placed with the DfE and the St Andrew the Apostle School management teams.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.



SuDS Operations and Maintenance Manual

4.0 Diffuser Units

4.1 Location and Description

Diffuser units are being used in parking bays in the car park areas as shown on surface water drainage drawings;

FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2 FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

Diffuser units are proprietary products and as such, the manufacturer's recommendations and maintenance plan should be followed where used. For full maintenance details please see details provided by the manufacturer.

4.2 Operation

The subbase below the permeable pavement is sloped towards the diffuser units, the units are ideal for shallow attenuation and contribute towards the treatment.

4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the diffuser unit. Maintenance responsibility for the pipes should be placed with the DfE and the St Andrew the Apostle School management teams.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.



SuDS Operations and Maintenance Manual

5.0 Attenuation Tank (Geocellular Units)

5.1 Location and Description

There are two geocellular attenuation tanks located to the north and south-west of the main building, as shown on surface water drainage drawings:

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

The tank has/will be designed in accordance with CIRIA C697.

Geocellular units are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration. Additionally different manufacturers may have different connection types and arrangements which will need to be taken in to consideration.

5.2 Operation

The attenuation tank is intended to be the surface water storage feature to attenuate the discharge from the site up to and including the 1 in 100 year plus 40% climate change event. The tank is intended to be empty between rainfall events.

5.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of attenuation tanks as designed. Maintenance responsibility for the pipes should be placed with the DfE and the St Andrew the Apostle School management teams.

As the feature is buried a regularly inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, especially where run-off is taken from potentially contaminated areas such as car parks/service yards.



SuDS Operations and Maintenance Manual

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check penstocks and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.



SuDS Operations and Maintenance Manual

6.0 Filter Strips, French Drains

6.1 Location and Description

Filter drains are located throughout the site, as shown on surface water drainage strategy drawing:

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

The features have/will be designed in accordance with CIRIA C697.

6.2 Operation

The filter strips/French drains are intended to be the surface water conveyance, water quality and attenuation storage features. These features are intended to be dry except during rainfall events.

The surface water should permeate through the upper layer of the feature in to the permeable stone below. The water is then collected and conveyed in the perforate pipe within the aggregate trench.

Access for maintenance has been provided through access chambers and rodding points.

6.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the features. Maintenance responsibility for the features and their surrounding area should be placed with the DfE and the St Andrew the Apostle School management teams.

Plant management, to achieve the required habitat/appearance, should be specified clearly in a maintenance schedule by the landscape architect planned to coincide with other site wide maintenance operations.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, especially where run-off is taken from potentially contaminated areas such as car parks/service yards.



SuDS Operations and Maintenance Manual

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect feature surface to identify evidence of erosion, compaction, ponding, sedimentation and contamination	Half yearly and after large storms.
	Check feature surface for even gradients	Half yearly
	Inspect gravel diaphragm trench upstream of filter strip for clogging	Half yearly.
	Inspect silt accumulation rates and establish appropriate removal frequencies.	Half yearly.
Regular	Litter and debris removal	Monthly or as required
maintenance\inspection	Grass cutting (to maintain grass height within landscape architect's specified design range)	To be confirmed by Landscape Architect [Monthly (during growing season) or as required]
	Manage other vegetation and remove nuisance plants/dead growth.	Monthly (at start, then as required).
	Remove sediment from main channel.	Annually (or as required after heavy rainfall events)
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible.	Annually, or as required. As per landscape architect's specification.
	Re-seed areas of poor vegetation growth (seed mix to landscape architect's specification).	Annually, or as required. As per landscape architect's specification
Remedial actions	Repair of erosion or other damage by re-seeding or re-turfing. Soil	As required.



SuDS Operations and Maintenance Manual

reinforcement such as coir matting should be used and staked in accordance with manufacturer's instructions.	
Realignment of flow channel/dished surface.	As required.
Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.
Re-level uneven surfaces and reinstate design levels. This may be required as part of sediment removal.	As required.



SuDS Operations and Maintenance Manual

7.0 Flow Control Chambers

7.1 Location and Description

The flow control chambers are located immediately downstream of the attenuation tanks, as shown on surface water drainage strategy drawing:

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

Flow control chambers are proprietary products and the manufacturer's recommendations should be followed. Regardless of the actual flow control used it will be fully compliant with the Curtins drainage specification.

7.2 Operation

Flow control chambers are intended to restrict the surface water runoff discharge rate from the site to a designed rate utilising techniques such as an orifice plate, vortex separator or mechanical float control.

7.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drain efficiently, thus exposing the development to a greater level of flood risk.

Maintenance responsibility for the pipes should be placed with the DfE and the St Andrew the Apostle School management teams.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first	Initial inspection should be provided using a post construction CCTV survey.	N/A
adjusted as required)	Inspect for evidence of poor operation via water level in chambers. If required take remedial action.	3-monthly, 48 hours after large storms.

A recommended schedule is detailed in the table below.



SuDS Operations and Maintenance Manual

Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Open penstock where poor performance is identified. Inspect and rectify any issues found.	As required.
	If continued poor performance, jet and CCTV survey.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.



SuDS Operations and Maintenance Manual

8.0 Rain Gardens and Tree Pits

8.1 Location and Description

The features are used in various locations throughout the proposed drainage system, as shown on surface water drainage drawings;

- FS0200-CUR-ZZ-ZZ-DR-C-9030-P02_Surface Water Drainage Layout Sheet 1 of 2
- FS0200-CUR-ZZ-ZZ-DR-C-9031-P02_Surface Water Drainage Layout Sheet 2 of 2

The features have been/will be designed in accordance with CIRIA C753.

8.2 Operation

The rain gardens and tree pits are intended to be a combination of surface water conveyance, water quality and attenuation storage features. They are particularly effective in delivering interception and can also provide biodiversity.

Engineered soils and/or HDPE crates are used to provide the necessary attenuation volume and water quality improvement. In the case of rain gardens, the choice of vegetation can also improve water quality and evapotranspiration levels. The tree pits will be supplemented by perforated carrier drains laid horizontal, with outlet inspection chambers including an orifice control to maximise the attenuation volume. Permeable membrane should be used around carrier drains to ensure that fines do not get washed downstream and clog up the wider drainage system. In areas near structures, impermeable liners are included to prevent water from infiltrating.

8.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the features.

The tree pits have outlet inspection chambers to facilitate visual inspection of the operation and efficacy of the network, particularly in respect of fines potentially clogging up the system. Both features will require appropriate maintenance to strike the correct balance between leaf litter for vegetation nutrients and ensuring that the engineering properties are maintained.

In the longer term, the upper soil layer of the tree pit, and the rain gardens will require soil replacement. The project arboriculturalist will be able to advise on this matter.



SuDS Operations and Maintenance Manual

Maintenance Schedule	Required Action	Frequency
Regular maintenance\inspection	Inspect infiltration surfaces for silting and ponding, record de- watering time of the facility and assess standing water levels in underdrain to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Bianually
	Inspect inlets and outlets for blockages	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (more frequently for aesthetic reasons)
	Remove sediment, litter and debris build-up from around inlets	Quarterly
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required and as per landscape architect's specification.
	Clear water inlet points and soil aeration vents	Biannually
	Repair minor accumulations of silt by raking away surface mulch or scarifying surface of medium	As required.
Remedial actions	Remove and replace filter medium and vegetation above	As required.



SuDS Operations and Maintenance Manual

9.0 Our Locations

Birmingham

2 The Wharf Bridge Street Birmingham B1 2JS T. 0121 643 4694 birmingham@curtins.com

Bristol

Quayside 40-58 Hotwell Road Bristol BS8 4UQ T. 0117 302 7560 bristol@curtins.com

Cambridge

50 Cambridge Place Cambridge CB2 1NS T. 01223 631 799 cambridge@curtins.com

Cardiff

3 Cwrt-y-Parc Earlswood Road Cardiff CF14 5GH T. 029 2068 0900 cardiff@curtins.com

Douglas

Varley House 29-31 Duke Street Douglas Isle of Man IM1 2AZ T. 01624 624 585 douglas@curtins.com

Dublin

39 Fitzwilliam Square Dublin 2 Ireland T. 00353 1 507 9447 dublin@curtins.com

Edinburgh

1a Belford Road Edinburgh EH4 3BL T. 0131 225 2175 edinburgh@curtins.com

Glasgow

Queens House 29 St Vincent Place Glasgow G1 2DT T. 0141 319 8777 glasgow@curtins.com

Kendal 28 Lowther Street Kendal Cumbria LA9 4DH T. 01539 724 823

kendal@curtins.com

Leeds Rose Wharf Ground Floor Leeds L29 8EE T. 0113 274 8509 leeds@curtins.com

Liverpool

Curtin House Columbus Quay Riverside Drive Liverpool L3 4DB T. 0151 726 2000 liverpool@curtins.com

London

40 Compton Street London EC1V 0BD T. 020 7324 2240 Iondon@curtins.com

Manchester

Merchant Exchange 17-19 Whitworth Street West Manchester M1 5WG T. 0161 236 2394 manchester@curtins.com

Nottingham

56 The Ropewalk Nottingham NG1 5DW T. 0115 941 5551 nottingham@curtins.com Flood Risk Assessment and Drainage Strategy Report



Appendix I Foul Water Drainage Layout



SAFETY, HEALTH AND	GENERAL NOTES
/IRONMENTAL INFORMATION	1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR RE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK HIS DRAWING, NOTE THE FOLLOWING:	2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE
Ν	CHECKED / VERIFIED ON SITE.
	ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. EOR GENERAL NOTES REFER TO CURTINS DRAWING
CLEANING	"FS02000-CUR-ZZ-ZZ-DR-C-0100_GENERAL INFRASTRUCTURE NOTES".
	KEY
	PROPOSED FOUL WATER DRAINAGE
NEW MANHOLE ON EXISTING SEWER	
IL: TBC	PROPOSED INTERNAL FOUL WATER
- LEVELS TBC BY CONTRACTOR PRIOR TO CONSTRUCTION	
SUBJECT TO S106 AGREEMENT WITH THAMES WATER	DESIGN NOTES
	FOUL WATER CONNECTION SUBJECT TO S106 AGREEMENT WITH THAMES WATER EXISTING FOUL WATER SEWER BASED ON SEWER MAPS RECEIVED
	29.03.21 3. FOUL WATER POP UPS ARE ASSUMED AND LOCATIONS ARE TO BE
	 CONFIRMED BY M&E/ARCHITECT DURING DETAILED DESIGN COVER LEVELS ASSUMED AT THIS STAGE, FOLLOWING THE DETAILED LANDSCAPING DESIGN.
	5. ALL SVP CONNECTION PIPES ARE ASSUMED TO BE 100mmØ. 150mmØ CONNECTIONS WILL UPSIZE THE MANHOLE.
	NON-TRAFFICKED AREA. 7. REQUIREMENT FOR CAST IRON DRAINAGE TO RECEIVE HOT FLOWS TO
	 BE CONFIRMED BY KITCHEN SPECIALIST. 8. DILUTION TRAPS TO BE PROVIDED ON ALL CLASSROOM SINKS. 9. INVERT AND COVER LEVELS OF EXISTING SEWERS ARE ASSUMED. TO
	BE CONFIRMED BY CONTRACTOR PRIOR TO CONSTRUCTION 10. PLEASE REFER TO DESIGNER'S HAZARD REGISTER -
+ Ex / 46.93m	DRAWING TO BE READ IN CONJUNCTION WITH:
	- FS0200-CUR-ZZ-ZZ-DR-C-9031_SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 2
+ Ex / 47.12m	 FS0200-CUR-ZZ-ZZ-DR-C-9040_FOOL WATER DRAINAGE LAYOUT SHEET FS0200-CUR-ZZ-ZZ-DR-C-9041_FOUL WATER DRAINAGE LAYOUT SHEET
	2 OF 2 - FS0200-CUR-ZZ-ZZ-DR-C-9051_DRAINAGE CONSTRUCTION DETAILS SHEET 1 OF 2
+ Ex / 47.28m	 FS0200-CUR-ZZ-ZZ-DR-C-9052_DRAINAGE CONSTRUCTION DETAILS SHEET 2 OF 2
the second secon	
+ Ex / 47.42m	
+ Ex / 48.52m	
+ Ex / 49.5217	
and a second	
N	
Λ	
V	
ľ	
	P03 ISSUED FOR PLANNING 09.04.21 JW AS P02 DRAFT CP ISSUE 26.02.21 EMC RW
	P01 PRELIMINARY ISSUE 19.02.20 EMC RW Bev Description: Date: Bv: Chkd:
	56 The Ropewalk, Nottingham, NG1 5DW
	0115 941 5551 nottingham@curtins.com www.curtins.com
	Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham
	Status: PRELIMINARY
	BARNET
	Drg Title:
	FOUL WATER DRAINAGE
	Size: Date: Drawn By: Designed By: Checked By: A1 19.01.21 EMC DW/ DW/
ΚΕΥ ΡΙ ΔΝΙ	Scale: 1:250 KVV KVV Project No: Originator: Volume: Level: Type: Role: Category / Number: Rev:
	FS0200 - CUR - ZZ - ZZ - DR - C - 9040 - P03
	<u> </u>



Flood Risk Assessment and Drainage Strategy Report



Appendix J STW & LLFA Correspondence

WONDERFUL ON TAP



Curtins Consulting Ltd 50 The Ropewalk Nottingham NG1 5DW

FAO Robin Wells

26th February 2021

Dear Mr Wells

Proposed School Development (1500 pupils & 1 swimming pool) Land at: West Coventry Academy, Nutbrook Avenue, Coventry (428030,278489).

I refer to your Development Enquiry Request submitted in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Public Sewers in Site – Required Protection

According to our sewer records there are no public sewers within the site boundary. Due to a change in legislation on 1 October 2011 there may also be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Foul Water Drainage

The enclosed sewer record extract shows a 150mm diameter public foul water sewer in Hornbeam Drive. Your plans show that manhole 8208 is the preferred connection point. Flows generated from swimming pool backwash will require a trade effluent discharge consent from our Commercial Services team, if it will be open to the public. You will find all information relating trade effluent on our website:

https://www.stwater.co.uk/businesses/trade-effluent/trade-effluentconsent/

From the information you have provided and our desktop assessment, we feel that sewer modelling will be required. This will enable us to ensure that we fully understand the impact of your Severn Trent Water Ltd Leicester Water Centre Gorse Hill Anstey Leicester LE7 7GU

Tel: 02477 716843

www.stwater.co.uk net.dev.east@severntrent.co.uk

Contact: Asif Mussa

Your ref: Our ref: 8462461

WONDERFUL ON TAP



proposals on our network.

Based on our current assessment of the risk and the information you have provided so far, we would like to commence the modelling once the site has progressed through the planning process.

In a change to our previous process, we no longer charge developers for the hydraulic modelling service. We will liaise with you over time with regard to the outcome of our investigations and any impact that may have on the Planning status, occupation, or phasing of the site. However while we can provide a brief summary of our findings if you need us to, we will no longer provide the full external capacity assessment report.

Please inform us as and when planning has progressed as this will help determine how quick we carry out the modelling exercise. In the meantime the site will be added to our modelling tracker and reviewed regularly until the site can be progressed for sewer modelling.

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical and no watercourse is available as an alternative, the use of sewerage should be considered. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

In the event that following testing, it is demonstrated that soakaways would not be possible on the site; satisfactory evidence will need to be submitted. The evidence should be either percolation test results or a statement from the SI consultant (extract or a supplementary letter). This would satisfy SGN1 (enclosed).

In this scenario, a surface water connection to the available public sewer would be acceptable subject to formal S106 approval (see later) with the discharge rate requested to be restricted in accordance with SGN2 (Brownfield site). Please note the following comments.

Subject to the above, you will need to demonstrate how the site is currently drained if indeed it is positively drained; identifying which impermeable areas drain to which pipeline and the connections/outfalls to the public sewerage system identified.

WONDERFUL ON TAP



Ideally, a drainage survey of the existing site is required; in the case of multiple connections the survey needs to also identify which impervious areas drain to which pipeline. When this information is made available a decision will be made on the permitted surface water discharge.

New Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, you will need to submit a Section 106 application form. Our New Connections department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk.

Please quote 8462461 in any future correspondence (including emails) with STW Limited. Please note that 'Development Enquiry' responses are only valid for 6 months from the date of this letter.

Yours sincerely,

Asif Mussa Wholesale Operations - Asset Protection (East)
Flood Risk Assessment and Drainage Strategy Report



Appendix K Flood Risk Assessment (AWP, 2015)

Proposed Redevelopment of North London Business Park (Royal Brunswick Park)

Comer Homes Group

Environmental Statement Appendix 12.1 Flood Risk Assessment





Proposed Redevelopment of North London Business Park (Royal Brunswick Park)

Environmental Statement Appendix 12.1

Flood Risk Assessment

Job Title	Proposed Redevelopment of North London Business Park (Royal Brunswick Park)
Project Number	0031
Date	17 December 2015
Client	Comer Homes Group
Prepared by	G Jane
Checked by	C Yalden
Authorised by	R Ward
File Reference	p:\0031 royal brunswick park\c documents\reports\0031 royal brunswick park - fra.docx

Kensington Court Woodwater Park Pynes Hill Exeter EX2 5TY Tel: 01392 409007 www.awpexeter.com



Contents

Conte	ents	
1	Introduction	. 1
2	Existing Site	. 3
3	Proposed Development	. 7
4	Surface Water Management Plan	. 9
5	Miscellaneous Issues	14
6	Mitigation, Conclusions and Recommendations	15

Appendices
Appendix A – Topographic Survey
Appendix B – Soilscape Report
Appendix C – Proposed Masterplan
Appendix D – MicroDrainage Output
Appendix E – Drainage Layout Drawings
Appendix F – Thames Water Correspondence



1 Introduction

- 1.1. This site-specific Flood Risk Assessment (FRA) has been prepared on behalf of Comer Homes Group by Awcock Ward Partnership (AWP) to assess the potential flood risks that may affect the hybrid application for the redevelopment of North London Business Park to provide a mixed use development of up to 1,200 dwellings, 3,214sqm office space, 1,153sqm retail space, 510sqm community space, 300sqm nursery and a 1,050 pupil capacity school.
- 1.2. The mixed use development will be delivered across a number of phases. The detailed application covers Phase 1 of the site, which includes the school site and 376 new residential dwellings, whilst the remaining phases of development will be covered by an outline application.
- 1.3. This FRA has been prepared to "identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account" as required by the National Planning Policy Framework (NPPF).

National Planning Policy Framework

1.4. The NPPF and the accompanying National Planning Practice Guidance (NPPG) were published by the Department for Communities and Local Government in March 2012 and March 2014 respectively. As a consequence PPS25 "Development and Flood Risk" was replaced, although its key elements were retained.

Structure and limitations of this FRA

- 1.5. This site-specific FRA has been written in accordance with the guidance set by the NPPF and NPPG, using the information that is currently available.
- 1.6. The report has been structured to describe the existing site parameters, the proposed development and to offer a Surface Water Management Plan (SWMP), indicating how surface water runoff can be managed so that it does not increase flood risk within the downstream catchment.



1.7. It is important to note that this FRA does not attempt to present a final design of the surface water drainage system nor the most value engineered design. This will be left until the detailed design stage when further work can be undertaken and all other types of systems can be evaluated. This evaluation will also need to include other assessments, including health and safety, CDM etc.

Consultation

- 1.8. To scope any site specific or catchment specific flood risks or drainage requirements we have engaged with Barnet Council, as the Lead Local Flood Authority, and Thames Water's Development Engineer and Technical Coordinator.
- 1.9. Furthermore, a public consultation was held which provided an opportunity for members of the public to review the proposals and share any thoughts or concerns relating to the existing site or the outline drainage strategy.
- 1.10. The output of the above consultation process has helped to inform the FRA and the inherent Surface Water Management Plan (SWMP).

Reference

- 1.11. This FRA has been prepared by reference to the following documents:
 - National Planning Policy Framework (March 2012);
 - National Planning Practice Guidance (March 2014);
 - The London Plan (March 2015);
 - Barnet's Surface Water Management Plan (October 2011);
 - North London SFRA (August 2008);
 - Groundsure Enviroinsight report (November 2015);
 - CIRIA Guide 753 'The SuDS Manual';
 - Thames Water's Asset Record Plans; and
 - Environment Agency mapping.



2 Existing Site

Site location

2.1. The existing site is located off Brunswick Park Road in East Barnet, at national grid reference TQ 280 934. Figure 1 below shows the extents of the application site.



Figure 1 – Site Location Plan

Existing land uses

- 2.2. The existing site comprises a series of operational uses within the North London Business Park site. The site comprises a number of buildings, internal access roads and car parking, with areas of undeveloped green space to the east and north.
- 2.3. Within the eastern green space there is an existing attenuation pond which receives runoff from the existing brownfield site.

Surrounding land use

2.4. The site is bordered by residential development to the north and south, Brunswick Park Road and further residential development to the east, and a railway line to the west, with residential development beyond.



Topographic survey

- 2.5. A topographic survey has been undertaken and indicates that the existing site generally falls towards its most easterly extents, from a high point of approximately 72m above ordnance datum (AOD) at its north-western corner, to a low point of approximately 48m AOD near the south-east corner.
- 2.6. A copy of the existing site survey has been included as drawing 0031-XS-001 within Appendix A of this report.

Existing flood risk

2.7. An extract of the EA's 'Flood Map for Planning' for the East Barnet area is reproduced below as Figure 2. This mapping shows the site to be wholly within 'Flood Zone 1 – Low Risk' from fluvial flooding. This means that the site located is not at risk of flooding from fluvial sources in up to the 1 in 1000 year return period flood (<0.1%).



Figure 2 – Flood Map for Planning

2.8. A copy of the EA's 'Flooding from Surface Water' map has been reproduced as Figure 3. This mapping is based on LIDAR data and indicates the typical conveyance routes of concentrated surface water runoff.





Figure 3 – Flooding from Surface Water

2.9. This mapping extract highlights the location of the existing attenuation pond and indicates that any overland exceedance routes within the site follow the existing road network, before crossing the green landscaped areas towards the pond.

Existing site drainage / drainage infrastructure

- 2.10. The existing drainage regime is typical of an existing brownfield site. A number of private and adoptable surface and foul water networks have been identified.
- 2.11. Thames Water's (TW) asset records indicate public surface and foul sewerage networks beneath Brunswick Park Road to the east of the site. The records also illustrate that surface water sewers run west to east beneath the site towards Brunswick Park Road.
- 2.12. Historic drainage records (including as-built plans) identify existing private surface and foul water networks serving the site.
- 2.13. The records indicate that storm flows are conveyed to the existing attenuation pond, with a positive discharge to the public surface water sewer beneath Brunswick Park Road.
- 2.14. Similarly, the records indicate on-site private foul water drains routing to the public foul water sewers beneath Brunswick Park Road.



2.15. The existing alignments of adoptable sewers within the site and its local vicinity have been identified on the site survey drawing (ref. 0031-XS-001) included within Appendix A of this report.

Ground conditions

- 2.16. A desk-top assessment has been undertaken using the DEFRA Soilscape dataset and is included within Appendix B of this report.
- 2.17. The desktop assessment indicates that the soils underlying the site suffer from "impeded drainage" and on this basis the use of infiltration features has been disregarded. Instead the proposed drainage strategy will utilise on-site attenuation with restricted discharges to the existing downstream receptors.



3 Proposed Development

- 3.1. The proposed development comprises the redevelopment of the North London Business Park to provide a mixed use development of up to 1,200 dwellings, 3,214sqm office space, 1,153sqm retail space, 510sqm community space, 300sqm nursery and a 1,050 pupil capacity school.
- 3.2. The mixed use development will be delivered across a number of phases. The detailed application covers Phase 1 of the site, which includes the school site and 376 new residential dwellings, whilst the remaining phases of development will be covered by an outline application.
- 3.3. The scheme also comprises internal access roads, garaging and parking and associated landscaping, drainage and engineering works.
- 3.4. A copy of the proposed masterplan for the development is provided within Appendix C of this report.

Vulnerability

3.5. In accordance with the NPPG, the most vulnerable form of development being promoted is the residential elements, which are classified as "More Vulnerable". However as the scheme is entirely within 'Flood Zone 1 – Low Risk', Table 3 in the NPPG concludes that residential use is appropriate for this site.

Sequential Test

3.6. The site is located within 'Flood Zone 1 – Low Risk' and would therefore pass the Sequential Test, as there are no competing sites with a lower flood risk classification.

Cross sections and finished levels

- 3.7. It is anticipated that the existing ground profile will be modified locally to reflect the requirements of the new development.
- 3.8. Any future level design should aim to minimise the extent of any re-profiling works and wherever possible should look to retain existing watershed catchments.



Safe access and egress

3.9. The full extents of the site and all roads surrounding the site are within 'Flood Zone 1 – Low Risk' and hence access and egress for motorised and non-motorised vehicles will not be affected during any fluvial flood events.

Climate change impacts

- 3.10. The NPPF requires that the impact of climate change be considered. The NPPG states "In making an assessment of the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment, the sensitivity ranges in Table 5 may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed."
- 3.11. Table 5 in the former Technical Guidance to the NPPF detailed the latest UKCIP climate change predictions on future weather conditions: peak rainfall is predicted to increase by approximately 30% during the next 100 years and river flows will increase by approximately 20% over the same period. A copy of this table can be seen below as Figure 4.

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115		
Peak rainfall intensity	+5%	+10%	+10% +20% +30			
Peak river flow	+10%		+20%			
Offshore wind speed	+	·5%	i% +10%			
Extreme wave height	-+	5% +10%				

Figure 4 – Recommended national precautionary ranges

3.12. The on-site attenuation has been sized to offer flood protection for the development and its downstream catchment throughout its 100 year design life, with an allowance for the predicted effects of climate change.



4 Surface Water Management Plan

Existing surface water runoff

- 4.1. Surface water runoff generated by the existing brownfield site is predominantly routed towards the on-site attenuation pond. The as-built drainage records identify piped connections between this pond and the Thames Water surface water sewer beneath Brunswick Park Road; the records do not identify any form of hydraulic control indicating that peak flows are likely to be unrestricted.
- 4.2. In line with the requirements of the London Plan (Policy 5.13), the proposed development must ensure that future discharges are restricted to the equivalent greenfield runoff rates, providing a significant level of betterment over the existing scenario and thus reducing flood risk within the downstream catchment.
- 4.3. The MicroDrainage Source Control module has been used to assess the equivalent greenfield runoff rates for the site. In accordance with best practice, the assessment is based on the IH 124 methodology.
- 4.4. A copy of this assessment can be seen within Appendix D of this report, with the results summarised in Table 1 below.

Return	Greenfield Runoff Rates (I/s)					
Period	Ph1	Ph2	Ph3	Ph4	Ph5	TOTAL
2 year	21.5	16.3	4.6	10.0	10.9	63.3
30 year	46.0	41.7	11.4	26.0	27.8	152.9
100 year	75.5	57.2	15.9	36.0	38.1	222.7

Table 1 – Greenfield Runoff Rates

Surface Water Strategy

- 4.5. The surface water strategy for the site has been developed to respect the masterplan, accounting for runoff in up to the 100 year (+30% climate change) critical storm event.
- 4.6. A review of the proposed masterplan in conjunction with the alignment of Thames Water's existing surface water sewers has identified potential conflicts. Through consultation with Thames Water we have received confirmation that a build-over



agreement will not be acceptable and that asset protection should be secured through suitable diversionary works.

- 4.7. A diversion corridor has been agreed with Thames Water and will be implemented by the proposed development to ensure that those served by the existing networks will be uninterrupted. It is proposed to unify the two existing Thames Water sewers with a single diversion sewer of equal hydraulic capacity.
- 4.8. The Soilscape desktop assessment indicates that the soils underlying the site suffer from "impeded drainage" and on this basis the use of infiltration features has been disregarded. Instead, the surface water strategy for the proposed development will comprise a network of:
 - Adoptable and non-adoptable underground pipework;
 - Rainwater harvesting systems;
 - SuDS Attenuation Pond;
 - Cellular Storage;
 - Hydraulic controls; and,
 - Overland exceedance measures.

Phase 1 Strategy (Detailed Application)

- 4.9. The proposed school site will benefit from its own on-site attenuation system, whilst the balance of Phase 1 will be served by a private communal drainage network.
- 4.10. Runoff generated by the school site will be intercepted by new private storm drainage which will convey flows to a cellular storage attenuation feature, with greenfield discharge to the Thames Water surface water sewers beneath Brunswick Park Road.
- 4.11. Roof level runoff from residential buildings within Phase 1 will feed into rainwater harvesting tanks. These tanks will seek to intercept the first 5mm of runoff for re-use for toilet flushing, thus reducing the level of pollutants being discharged to downstream surface water sewers and reducing potable water demand throughout the development.



- 4.12. Beyond the capacity of the rainwater harvesting tanks, any further inflow of runoff will overflow to an external storm drainage network which will route flows to the on-site attenuation pond.
- 4.13. Whilst they share a similar location within the site, the proposed attenuation pond will replace the existing pond and form part of a wider Public Open Space. The pond will provide water quality enhancement whilst also offering ecological and biodiversity benefits.
- 4.14. The outflow from the pond will be restricted to the equivalent greenfield runoff rate for the respective catchment and will discharge to the Thames Water surface water sewers beneath Brunswick Park Road.
- 4.15. Thames Water have confirmed through a pre-application enquiry that they agree with the principles of the proposed drainage strategy. A copy of this correspondence is included within Appendix F of this report.
- 4.16. The drawing included in Appendix E (reference 0031-PDL-100) shows a Preliminary Drainage Layout for the Phase 1 site, including the proposed diversion of Thames Water's sewers.

Phase 2-5 Strategy (Outline Application)

- 4.17. The surface water strategy for each future phase of development will include rainwater harvesting with on-site attenuation to restrict any residual flows to the equivalent greenfield runoff rate.
- 4.18. Restricted flows will be discharged to the Phase 1 network, passing through the pond before outfalling to the Thames Water surface water sewers beneath Brunswick Park Road.
- 4.19. The drawing included in Appendix E (reference 0031-PDL-200) shows the Preliminary Drainage Layout for the later development phases.

Attenuation storage volumes

4.20. The MicroDrainage Source Control module has been used to determine the storage requirements for each phase of the proposed development.



4.21. The output of these models can be seen within Appendix D of this report, with the results summarised in Table 2:

Proposed Storage Feature	Proposed 100yr+30% Volume (m³)
Phase 1 Attenuation Pond	768
Phase 1 School Attenuation	356
Phase 2 Attenuation	920
Phase 3 Attenuation	160
Phase 4 Attenuation	722
Phase 5 Attenuation	799
Total	3725

Table 2 – Attenuation S	Storage Requirements
-------------------------	----------------------

- 4.22. The drawing included in Appendix E (reference 0031-PDL-101) shows the proposed arrangement of the Phase 1 attenuation pond.
- 4.23. The attenuation pond includes a permanently wet base with 1m depth of available storage above. The available storage will be split between two stages, the first 600mm depth caters for runoff from storms up to the 5 year return period (20% of occurrence in any given year), whilst runoff up to the 100 year return period (with 30% allowance for climate change) will be attenuated within a wider storage area, to a depth of 250mm, leaving 150mm of freeboard for exceedance storage.

Exceedance events

- 4.24. It is considered that the proposed drainage network will offer a significant level of betterment when compared to the existing site. The scheme will restrict the peak rate of discharge to the equivalent greenfield rates and will be designed to cater for runoff from all storms up to the 100 year return period, with 30% allowance for climate change.
- 4.25. During exceedance events, beyond the schemes 100 year design life, surface water runoff will overflow from the aforementioned systems and wherever possible will be directed away from buildings, towards areas of public open space. Any residual overland flows will then be routed towards the attenuation pond, as per the pre-development scenario.



Proposed foul water strategy

- 4.26. The existing site is served by private foul drains which can be diverted to accommodate the proposed development. Any diversionary works will retain the existing points of connectivity with Thames Waters public foul sewerage network beneath Brunswick Park Road.
- 4.27. Foul flows generated by the proposed development will be intercepted by new private foul networks within the site, prior to being discharged to Thames Waters public foul sewerage network beneath Brunswick Park Road.
- 4.28. The proposed development includes a series of basement car parks. Given that these areas are not exposed to rainfall it is considered that any drainage requirements will be limited to potential wash-down, spillages or other potential contaminants. It is therefore proposed to utilise private package pumps to transfer any basement drainage to the external foul water network.
- 4.29. A pre-development capacity enquiry has been submitted to Thames Water. The enquiry seeks to establish whether the existing points of connectivity can be retained for the proposed development, otherwise it will outline alternative points of adequacy or potential reinforcement requirements to accommodate any increased foul flows.
- 4.30. The drawings included within Appendix E (reference 0031-PDL-100 and 200) show the proposed foul drainage arrangements for the detailed and outline application sites.

Maintenance

- 4.31. The on-site sewer diversions will be designed in accordance with Sewers for Adoption (SfA) and will be offered to Thames Water for adoption.
- 4.32. All private drainage and SuDS features will be designed in accordance with Building Regulations Part H and CIRIA C753 and will become the responsibility of a 3rd party Management Company, or each respective homeowner / landlord / building management company.



5 Miscellaneous Issues

Construction issues

- 5.1. It is good practice to offer a Construction Environmental Management Plan (CEMP) to allow the construction and phasing of drainage works to be closely monitored. Prior to the commencement of construction, the contractor will produce a CEMP and agree it with the EA / LLFA.
- 5.2. Any facilities for the storage of oils, fuels or chemicals need to be situated in suitable bunded bases that will be equivalent to at least the volume of the tank plus 10%.

Residual flood risks

- 5.3. It has been established that the proposed developable area is wholly within 'Flood Zone 1 – Low Risk'. There is no habitable development within Flood Zones 2 or 3. There are therefore no residual flood risks with regard to high risk flood zones.
- 5.4. Safe access and egress has been identified.

Health and safety

- 5.5. Until such time as the hazards relating to the site or location are known, we are unable to confirm that our recommendations will be acceptable in terms of safe buildability / maintainability.
- 5.6. Under the CDM Regulations, adequate information about the site must be provided by the client in order to allow the potential hazards to be reviewed by the designer, and avoidance / mitigation measures taken where reasonably practicable.



6 Mitigation, Conclusions and Recommendations

Mitigation

- 6.1. The proposed development has been assessed in line with the NPPF, to allow the planning application to be progressed and to show that the development can be undertaken in an acceptable manner from a flood risk perspective.
- 6.2. In line with policy requirements the proposed development will restrict runoff from the site to the equivalent greenfield runoff rates. This will enable a significant reduction in surface water runoff being discharged off-site, freeing up capacity within Thames Waters surface water sewers and thus reducing flood risk within the downstream catchment.
- 6.3. The proposed drainage strategy promotes the use of rainwater harvesting. This will reduce the demand for potable water supply and will help to capture the first 5mm of runoff, reducing the level of pollutants being discharged off-site.
- 6.4. The inclusion of a SuDS attenuation pond will offer water quality enhancement as well as other ecological and biodiversity benefits.
- 6.5. Exceedance flows beyond the 100 year plus 30% critical storm event will be routed towards convenient holding points within the confines of the development area, away from properties and primary access routes.
- 6.6. Foul flows from the development will discharge to the existing foul sewerage network beneath Brunswick Park Road, retaining existing drainage connections wherever possible.

Conclusions

6.7. The proposed development has been assessed in line with the NPPF and other relevant policies, to allow the planning application to be progressed and to show that the development can be undertaken in an acceptable manner from a flood risk perspective.



This Flood Risk Assessment has been assessed in line with the NPPF. It is concluded that the development can be undertaken in a sustainable manner with the ability to provide a significant reduction in flood risk to existing properties in the downstream catchment.

The FRA does not attempt to present a final design of the surface water system. Detailed design of the surface water network and inherent features will commence upon approval of the outline strategy and will include assessments due to further site investigations, health and safety, CDM etc.

Recommendations

6.8. As the development will be safe from flooding for its design life and will reduce flood risk to properties in the downstream catchment, it is recommended that the Local Planning Authority confirm they have no objections to the proposed development.



Appendices



Appendix A – Topographic Survey





Appendix B – Soilscape Report



MAGIC 0031 - Royal Brunswick Park - Site Check Map



30/11/2015

Site Check Report Report generated on Mon Nov 30 2015 You selected the location: Centroid Grid Ref: TQ280935 The following features have been found in your search area:

Soilscape (England)

Reference Name Main Surface Texture Class Natural Drainage Type Natural Fertility Characteristic Semi-natural Habitats Main Land Cover Hyperlink 18

SLOWLY PERMEABLE SEASONALLY WET SLIGHTLY ACID BUT BASE-RICH LOAMY AND CLAYEY SOILS LOAMY IMPEDED DRAINAGE MODERATE LOWLAND SEASONALLY WET PASTURES AND WOODLANDS GRASSLAND AND ARABLE SOME WOODLAND /Metadata_for_magic/soilscape_summary.pdf



Appendix C – Proposed Masterplan



NOTES: This drawing is the copyright of hyteroEcoger Driver. 8 must not be copied or reproduced without written consent. Only figured dmeenicons are to be taken from this drawing. Al contractors must visit the site and be responsible for taking and checking dimensions related to the works shown on this drawing.	TH MENT UNUSUAL RISKS Construction: Unusual Risks (list)/No unusual risks based and Maintenance: Unusual Risks (list)/No unusual risks d Dismantling/Demolition: Unusual Risks (list)/No unusual risks	REVISIONS DATE DRAWN BY CHECKED BY DATE DATE DRAWN BY DC 24.08.15 EHdM DC DRAWNG STATUS SCALE at ATIAS PLANNING 1:1000 PROJECT Royal Brunswick Park DRAWING TITLE Illustrative Landscape Masterplan DRAWING NUMBER REVISION HED-1140-RBP-LA-0001 P00	CLIENT COMER GROUP H E D Hyland Edgar Driver Landscape Architects & Urban Designers London & Winchester Waterloo Court 10 Theed Street London SE1 857 Che Wessex Way Colden Common Winchester S021 1WG





Appendix D – MicroDrainage Output

Awcock Ward Partnership Consulting Ltd		Page 1
Kensington Court	0031 Royal Brunswick Park	
Woodwater Park Pynes Hill	Greenfield Runoff (Per Ha)	L.
Exeter EX2 5TY		Micco
Date 17/12/2015 10:13	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	-
<u>ICP SU</u> Return Period (years) Area (ha) 1.0	DS Mean Annual Flood Input 2 SAAR (mm) 700 Urban 0.000 000 Soil 0.450 Region Number Region 6 Results 1/s	
	OBAR Urban 4.4	
	Q2 years 3.9	
	Q1 year 3.7	
	Q30 years 10.0	
	Q100 years 14.0	

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:37	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	·

|--|

	Stor: Even	m t	Max Level	Max Depth	Max Control	Max Overflow	Max E Outflow	Max Volume	Status
			(m)	(m)	(1/5)	(1/5)	(1/5)	(m°)	
15	min	Summer	49.267	0.267	19.4	0.0	19.4	142.9	ОК
30	min	Summer	49.321	0.321	19.4	0.0	19.4	175.0	ОК
60	min	Summer	49.359	0.359	19.4	0.0	19.4	198.2	ОК
120	min	Summer	49.374	0.374	19.4	0.0	19.4	207.8	ОК
180	min	Summer	49.374	0.374	19.4	0.0	19.4	208.1	ОК
240	min	Summer	49.369	0.369	19.4	0.0	19.4	204.6	ΟK
360	min	Summer	49.350	0.350	19.4	0.0	19.4	192.6	ΟK
480	min	Summer	49.326	0.326	19.4	0.0	19.4	178.0	ΟK
600	min	Summer	49.302	0.302	19.4	0.0	19.4	163.6	ΟK
720	min	Summer	49.279	0.279	19.4	0.0	19.4	150.2	ΟK
960	min	Summer	49.241	0.241	19.3	0.0	19.3	127.8	ΟK
1440	min	Summer	49.193	0.193	18.4	0.0	18.4	100.4	ΟK
2160	min	Summer	49.161	0.161	14.8	0.0	14.8	82.9	ΟK
2880	min	Summer	49.142	0.142	12.4	0.0	12.4	72.6	ΟK
4320	min	Summer	49.120	0.120	9.4	0.0	9.4	60.8	ΟK
5760	min	Summer	49.106	0.106	7.7	0.0	7.7	53.6	ΟK
7200	min	Summer	49.097	0.097	6.6	0.0	6.6	48.7	ΟK
8640	min	Summer	49.089	0.089	5.7	0.0	5.7	45.0	ΟK
10080	min	Summer	49.084	0.084	5.1	0.0	5.1	42.0	ΟK
15	min	Winter	49.298	0.298	19.4	0.0	19.4	161.0	ΟK
30	min	Winter	49.358	0.358	19.4	0.0	19.4	198.0	ΟK
60	min	Winter	49.403	0.403	19.4	0.0	19.4	226.2	ΟK
120	min	Winter	49.420	0.420	19.4	0.0	19.4	237.1	O K
180	min	Winter	49.416	0.416	19.4	0.0	19.4	234.2	ΟK
240	min	Winter	49.405	0.405	19.4	0.0	19.4	227.2	ΟK

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak
	Even	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
15	min	Cummor	11 721	0 0	150 7	0 0	10
10	III III	Summer	41./34	0.0	100.7	0.0	10
30	min	Summer	26.394	0.0	192.9	0.0	32
60	mın	Summer	16.285	0.0	238.9	0.0	60
120	min	Summer	9.752	0.0	286.4	0.0	96
180	min	Summer	7.183	0.0	316.5	0.0	130
240	min	Summer	5.773	0.0	339.3	0.0	164
360	min	Summer	4.234	0.0	373.4	0.0	230
480	min	Summer	3.389	0.0	398.7	0.0	296
600	min	Summer	2.851	0.0	419.2	0.0	362
720	min	Summer	2.475	0.0	436.8	0.0	422
960	min	Summer	1.980	0.0	465.7	0.0	540
1440	min	Summer	1.445	0.0	509.5	0.0	766
2160	min	Summer	1.055	0.0	559.8	0.0	1124
2880	min	Summer	0.844	0.0	596.8	0.0	1496
4320	min	Summer	0.616	0.0	652.2	0.0	2204
5760	min	Summer	0.492	0.0	697.4	0.0	2936
7200	min	Summer	0.414	0.0	732.7	0.0	3672
8640	min	Summer	0.359	0.0	762.7	0.0	4408
10080	min	Summer	0.319	0.0	788.3	0.0	5136
15	min	Winter	41.734	0.0	169.1	0.0	18
30	min	Winter	26 594	0.0	216 4	0.0	32
60	min	Winter	16 285	0.0	267 7	0.0	52 60
120	min	Winter	9 752	0.0	320 9	0.0	114
120	min	Winter	7 100	0.0	320.9	0.0	14
240		Winter	1.10J	0.0	304.7	0.0	140
240	111 11	wincer	5.115	0.0	380.3	0.0	1/8

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:37	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 2 year Return Period

	Stor Even	m t	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
360	min	Winter	49.371	0.371	19.4	0.0	19.4	206.2	ОК
480	min	Winter	49.333	0.333	19.4	0.0	19.4	182.4	ΟK
600	min	Winter	49.296	0.296	19.4	0.0	19.4	159.9	ОК
720	min	Winter	49.262	0.262	19.4	0.0	19.4	140.1	ΟK
960	min	Winter	49.211	0.211	19.0	0.0	19.0	110.5	ΟK
1440	min	Winter	49.167	0.167	15.6	0.0	15.6	86.5	ΟK
2160	min	Winter	49.138	0.138	11.8	0.0	11.8	70.5	ΟK
2880	min	Winter	49.121	0.121	9.6	0.0	9.6	61.5	ΟK
4320	min	Winter	49.101	0.101	7.1	0.0	7.1	51.0	ΟK
5760	min	Winter	49.089	0.089	5.7	0.0	5.7	44.9	ΟK
7200	min	Winter	49.081	0.081	4.8	0.0	4.8	40.7	ΟK
8640	min	Winter	49.075	0.075	4.2	0.0	4.2	37.6	ΟK
10080	min	Winter	49.071	0.071	3.7	0.0	3.7	35.2	ΟK

	Storm	Rain	Flooded	Discharge	Overflow Volume	Time-Peak
	Lvenc	(1111)	(m ³)	(m ³)	(m ³)	(11113)
360	min Winter	4.234	0.0	418.5	0.0	252
480	min Winter	3.389	0.0	446.7	0.0	320
600	min Winter	2.851	0.0	469.8	0.0	384
720	min Winter	2.475	0.0	489.4	0.0	442
960	min Winter	1.980	0.0	521.9	0.0	550
1440	min Winter	1.445	0.0	571.0	0.0	780
2160	min Winter	1.055	0.0	627.2	0.0	1144
2880	min Winter	0.844	0.0	668.7	0.0	1500
4320	min Winter	0.616	0.0	730.9	0.0	2208
5760	min Winter	0.492	0.0	781.2	0.0	2944
7200	min Winter	0.414	0.0	820.7	0.0	3672
8640	min Winter	0.359	0.0	854.4	0.0	4408
10080	min Winter	0.319	0.0	883.4	0.0	5120

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	4
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:37	Designed by gareth.jane	
File 0031-SW-01-F-PH1 DETENTION BA	. Checked by	Diamatje
XP Solutions	Source Control 2015.1	
Rainfall Model	Rainfall Details FSR Winter Storms Yes	
Return Period (years)	2 Cv (Summer) 0.750	
Region E	ngland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +0	
	<u>Time Area Diagram</u>	
	Total Area (ha) 1.970	
	Time (mins) Area	
	From: To: (ha)	
	0 4 1.970	

AWP		Page 4
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	4	
Exeter EX2 5TY	Micro	
Date 16/12/2015 15:37	MILLU	
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Drainage
XP Solutions	Source Control 2015.1	I
	Model Details	
Storage	e is Online Cover Level (m) 50.000	
	Tank or Pond Structure	
	Invert Level (m) 49 000	
	Inverte Lever (m) 49.000	
Depth (m) Area (m ²) Depth	(m) Area (m ²) Depth (m) Area (m ²) Depth (m) D	Area (m²)
0.000 487.0 0.	600 720.0 0.601 1650.0 1.000	1879.0
<u>Hydro-E</u>	rake Optimum® Outflow Control	
	Unit Defenses ND CUE 0202 1050 0500 1050	
	Design Head (m) 0.500	
	Design Flow (1/s) 19.5	
	Flush-Flo™ Calculated	
	Objective Minimise upstream storage	
	Diameter (mm) 202	
Minimum Outlate D	Invert Level (m) 49.000	
Suggested Manh	ble Diameter (mm) 225	
Control Points Head (m) Flow (l/s) Control Points Head	(m) Flow (l/s)
Design Point (Calculated) 0.5	00 19.4 Kick-Flo® 0.	428 18.0
Flush-Flo™ 0.2	82 19.4 Mean Flow over Head Bange	- 14 5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)								
0.100	6.9	0.800	24.3	2.000	37.7	4.000	52.7	7.000	69.0
0.200	18.8	1.000	27.0	2.200	39.4	4.500	55.8	7.500	71.4
0.300	19.4	1.200	29.4	2.400	41.1	5.000	58.7	8.000	73.8
0.400	18.5	1.400	31.7	2.600	42.7	5.500	61.0	8.500	76.1
0.500	19.4	1.600	33.8	3.000	45.8	6.000	63.8	9.000	78.3
0.600	21.1	1.800	35.8	3.500	49.4	6.500	66.4	9.500	80.5

Orifice Overflow Control

Diameter (m) 0.210 Discharge Coefficient 0.600 Invert Level (m) 49.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:37	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Stor	m	Max	Max	Max	Max	Max	Max	Status
	Even	t	Level	Depth	Control	Overflow Σ	Outflow	Volume	
			(m)	(m)	(1/S)	(1/5)	(1/S)	(m°)	
15	min	Summer	49.527	0.527	19.9	0.5	20.4	308.3	ОК
30	min	Summer	49.613	0.613	21.4	8.8	30.1	380.2	ОК
60	min	Summer	49.643	0.643	21.8	13.1	35.0	430.7	ОК
120	min	Summer	49.654	0.654	22.0	14.5	36.6	448.6	ОК
180	min	Summer	49.654	0.654	22.0	14.5	36.6	449.1	ОК
240	min	Summer	49.651	0.651	22.0	14.2	36.1	443.7	ОК
360	min	Summer	49.640	0.640	21.8	12.8	34.6	426.0	ОК
480	min	Summer	49.629	0.629	21.6	11.3	32.9	407.1	ΟK
600	min	Summer	49.618	0.618	21.4	9.7	31.2	389.1	ΟK
720	min	Summer	49.608	0.608	21.3	8.0	29.3	372.8	ΟK
960	min	Summer	49.580	0.580	20.8	4.3	25.1	345.3	ΟK
1440	min	Summer	49.499	0.499	19.4	0.0	19.4	289.3	ΟK
2160	min	Summer	49.358	0.358	19.4	0.0	19.4	197.8	ΟK
2880	min	Summer	49.259	0.259	19.4	0.0	19.4	138.2	ΟK
4320	min	Summer	49.181	0.181	17.2	0.0	17.2	94.2	ΟK
5760	min	Summer	49.155	0.155	14.1	0.0	14.1	79.7	ОК
7200	min	Summer	49.138	0.138	11.9	0.0	11.9	70.7	ΟK
8640	min	Summer	49.126	0.126	10.3	0.0	10.3	64.3	ОК
10080	min	Summer	49.117	0.117	9.1	0.0	9.1	59.5	ΟK
15	min	Winter	49.580	0.580	20.8	4.3	25.1	345.5	ОК
30	min	Winter	49.640	0.640	21.8	12.8	34.6	426.1	ОК
60	min	Winter	49.675	0.675	22.4	17.7	40.1	485.1	ОК
120	min	Winter	49.686	0.686	22.5	19.7	42.2	504.0	ОК
180	min	Winter	49.686	0.686	22.5	19.6	42.1	502.9	ОК
240	min	Winter	49 680	0 680	22 4	18 6	/1 1	493 5	O K

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak
	Even	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
15	min	Summer	87.227	0.0	318.3	0.3	18
30	min	Summer	55.777	0.0	407.9	16.8	32
60	min	Summer	34.065	0.0	501.4	47.1	62
120	min	Summer	20.201	0.0	595.0	77.3	100
180	min	Summer	14.736	0.0	651.2	90.8	132
240	min	Summer	11.736	0.0	691.6	96.2	166
360	min	Summer	8.483	0.0	750.0	92.4	234
480	min	Summer	6.739	0.0	794.4	78.9	304
600	min	Summer	5.634	0.0	830.1	64.3	372
720	min	Summer	4.865	0.0	860.2	50.3	440
960	min	Summer	3.858	0.0	909.5	24.4	578
1440	min	Summer	2.780	0.0	982.5	0.0	864
2160	min	Summer	2.001	0.0	1062.9	0.0	1216
2880	min	Summer	1.584	0.0	1121.5	0.0	1552
4320	min	Summer	1.138	0.0	1207.8	0.0	2208
5760	min	Summer	0.900	0.0	1275.6	0.0	2936
7200	min	Summer	0.750	0.0	1328.4	0.0	3672
8640	min	Summer	0.646	0.0	1372.7	0.0	4408
10080	min	Summer	0.569	0.0	1410.3	0.0	5136
15	min	Winter	87.227	0.0	356.9	4.6	18
30	min	Winter	55.777	0.0	457.3	35.0	32
60	min	Winter	34.065	0.0	561.8	74.1	60
120	min	Winter	20.201	0.0	666.6	113.4	100
180	min	Winter	14.736	0.0	729.6	130.9	138
240	min	Winter	11.736	0.0	774.8	138.0	176
AWP		Page 2					
------------------------------------	--------------------------------	----------					
Kensington Court	0031 - Royal Brunswick Park						
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.					
Exeter EX2 5TY	Detention Basin	Micco					
Date 16/12/2015 15:37	Designed by gareth.jane	Desinado					
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage					
XP Solutions	Source Control 2015.1	•					

	Stor Even	m t	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
360	min	Winter	49.664	0.664	22.2	15.9	38.1	466.2	ОК
480	min	Winter	49.647	0.647	21.9	13.7	35.6	438.0	ΟK
600	min	Winter	49.632	0.632	21.7	11.7	33.4	411.9	ΟK
720	min	Winter	49.618	0.618	21.4	9.6	31.1	388.9	ΟK
960	min	Winter	49.589	0.589	21.0	5.3	26.3	352.0	ΟK
1440	min	Winter	49.476	0.476	19.4	0.0	19.4	273.6	ОК
2160	min	Winter	49.268	0.268	19.4	0.0	19.4	143.3	ОК
2880	min	Winter	49.187	0.187	17.9	0.0	17.9	97.4	ОК
4320	min	Winter	49.147	0.147	13.1	0.0	13.1	75.6	ОК
5760	min	Winter	49.127	0.127	10.4	0.0	10.4	64.8	ОК
7200	min	Winter	49.114	0.114	8.7	0.0	8.7	57.8	ОК
8640	min	Winter	49.105	0.105	7.5	0.0	7.5	52.8	ОК
10080	min	Winter	49.097	0.097	6.6	0.0	6.6	48.9	ΟK

	Storm Event		Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m³)	(m³)	
360	min Winter	8.483	0.0	840.2	137.1	252
480	min Winter	6.739	0.0	889.9	123.8	324
600	min Winter	5.634	0.0	930.0	103.0	396
720	min Winter	4.865	0.0	963.7	81.4	466
960	min Winter	3.858	0.0	1018.9	39.2	614
1440	min Winter	2.780	0.0	1100.8	0.0	920
2160	min Winter	2.001	0.0	1190.6	0.0	1232
2880	min Winter	1.584	0.0	1256.2	0.0	1504
4320	min Winter	1.138	0.0	1353.2	0.0	2208
5760	min Winter	0.900	0.0	1428.8	0.0	2936
7200	min Winter	0.750	0.0	1488.0	0.0	3672
8640	min Winter	0.646	0.0	1537.7	0.0	4408
10080	min Winter	0.569	0.0	1580.1	0.0	5136

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	Y.
Exeter EX2 5TY	Detention Basin	Mirco
Date 16/12/2015 15:37	Designed by gareth.jane	
File 0031-SW-01-F-PH1 DETENTION BA	. Checked by	Diamage
XP Solutions	Source Control 2015.1	<u> </u>
Rainfall Model Return Period (years) Region : M5-60 (mm) Ratio R Summer Storms	Rainfall Details FSR Winter Storms Yes 30 Cv (Summer) 0.750 England and Wales Cv (Winter) 0.840 20.100 Shortest Storm (mins) 15 0.446 Longest Storm (mins) 10080 Yes Climate Change % +10 Time Area Diagram Total Area (ha) 1.970 Time (mins) Area	
	From: To: (ha)	
	0 4 1.970	

AWP		Page 4
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	4	
Exeter EX2 5TY	Micco	
Date 16/12/2015 15:37	Designed by gareth.jane	Designed
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Drainage
XP Solutions	Source Control 2015.1	
	Model Details	
Storage is	Online Cover Level (m) 50 000	
Storage 13	Online Cover Devel (m) 50.000	
Tan	<u>k or Pond Structure</u>	
т.	overt Level (m) 40,000	
11	nvert Level (m) 49.000	
Depth (m) Area (m ²) Depth (m)	Area (m^2) Depth (m) Area (m^2) Depth (m) Area (m^2)	(m²)
0.000 487.0 0.600	720.0 0.601 1650.0 1.000 187	79.0
<u>Hydro-Brak</u>	e Optimum® Outflow Control	
U De	nit Reference MD-SHE-0202-1950-0500-1950	
Desi	gn Flow (1/s) 19.5	
	Flush-Flo™ Calculated	
	Objective Minimise upstream storage	
	Diameter (mm) 202	
Inv	vert Level (m) 49.000	
Minimum Outlet Pipe Suggested Manhole	Diameter (mm) 225 Diameter (mm) 1200	
Control Points Head (m) H	Flow (l/s) Control Points Head (m) F	'low (1/s)
Design Point (Calculated) 0.500		19 0
Design Point (carculated) 0.500	10.428 RICK-FLOW 0.428	10.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)								
0.100	6.9	0.800	24.3	2.000	37.7	4.000	52.7	7.000	69.0
0.200	18.8	1.000	27.0	2.200	39.4	4.500	55.8	7.500	71.4
0.300	19.4	1.200	29.4	2.400	41.1	5.000	58.7	8.000	73.8
0.400	18.5	1.400	31.7	2.600	42.7	5.500	61.0	8.500	76.1
0.500	19.4	1.600	33.8	3.000	45.8	6.000	63.8	9.000	78.3
0.600	21.1	1.800	35.8	3.500	49.4	6.500	66.4	9.500	80.5

Orifice Overflow Control

Diameter (m) 0.210 Discharge Coefficient 0.600 Invert Level (m) 49.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:36	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm	n	Max	Max	Max	Max	Max	Max	Status
	Event	:	Level	Depth	Control	Overflow	Σ Outflow	volume	
			(m)	(m)	(l/s)	(1/s)	(l/s)	(m³)	
1 -		G	40 660	0 6 6 0	22.2	1.0 4	20 (470 5	0.14
15	min	summer	49.668	0.668	22.2	16.4	38.6	4/2.5	U K
30	min	Summer	49./34	0./34	23.3	28.3	51.6	585.2	Flood Risk
60	min :	Summer	49.778	0.//8	23.9	36.6	60.5	662.2	Flood Risk
120	min :	Summer	49.793	0.793	24.2	39.4	63.6	688.8	Flood Risk
180	min :	Summer	49.794	0.794	24.2	39.5	63.7	689.6	Flood Risk
240	min :	Summer	49.788	0.788	24.1	38.5	62.6	680.2	Flood Risk
360	min :	Summer	49.772	0.772	23.8	35.4	59.2	650.8	Flood Risk
480	min :	Summer	49.754	0.754	23.6	32.1	55.7	620.8	Flood Risk
600	min :	Summer	49.738	0.738	23.3	29.2	52.5	592.3	Flood Risk
720	min :	Summer	49.723	0.723	23.1	26.3	49.4	566.3	Flood Risk
960	min :	Summer	49.697	0.697	22.7	21.5	44.3	521.2	ОК
1440	min :	Summer	49.655	0.655	22.0	14.7	36.7	450.2	ОК
2160	min :	Summer	49.611	0.611	21.3	8.4	29.8	376.8	ОК
2880	min :	Summer	49.557	0.557	20.4	2.2	22.6	329.2	ОК
4320	min :	Summer	49.351	0.351	19.4	0.0	19.4	193.6	ОК
5760	min :	Summer	49.222	0.222	19.1	0.0	19.1	117.0	ОК
7200	min :	Summer	49.182	0.182	17.3	0.0	17.3	94.6	ОК
8640	min :	Summer	49.162	0.162	15.0	0.0	15.0	83.8	ОК
10080	min :	Summer	49.149	0.149	13.3	0.0	13.3	76.5	ОК
15	min N	Winter	49.701	0.701	22.8	22.3	45.1	529.3	Flood Risk
30	min N	Winter	49.775	0.775	23.9	36.0	59.8	656.5	Flood Risk
60	min N	Winter	49 826	0 826	24 6	43 2	67 0	746 5	Flood Risk
120	min I	Winter	49 842	0 842	24.9	44 8	69 5	775.8	Flood Risk
180	min	Winter	19.012	0 840	24.9	44.6	69 5	771 5	Flood Risk
240		Winton	10 020	0.020	27.0	12 6	co :	, ,,±.J	Flood Diek
240	111 1	wrncer.	49.830	0.030	24./	43.0	00.3	132.0	FICCU RISK

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak
Event			(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
		~					1.0
15	min	Summer	133.985	0.0	490.7	52.2	18
30	min	Summer	86.337	0.0	633.4	122.7	32
60	min	Summer	52.933	0.0	780.1	202.4	60
120	min	Summer	31.380	0.0	925.3	278.8	94
180	min	Summer	22.833	0.0	1010.0	315.2	128
240	min	Summer	18.130	0.0	1069.4	333.5	162
360	min	Summer	13.031	0.0	1153.1	343.7	230
480	min	Summer	10.316	0.0	1217.2	339.3	298
600	min	Summer	8.601	0.0	1268.4	324.7	366
720	min	Summer	7.410	0.0	1311.4	302.5	434
960	min	Summer	5.854	0.0	1381.2	259.7	568
1440	min	Summer	4.194	0.0	1483.9	188.1	824
2160	min	Summer	3.001	0.0	1594.7	95.3	1212
2880	min	Summer	2.364	0.0	1675.1	20.0	1616
4320	min	Summer	1.688	0.0	1792.5	0.0	2340
5760	min	Summer	1.328	0.0	1882.6	0.0	2992
7200	min	Summer	1.102	0.0	1952.7	0.0	3672
8640	min	Summer	0.946	0.0	2011.1	0.0	4408
10080	min	Summer	0.831	0.0	2060.5	0.0	5136
15	min	Winter	133.985	0.0	550.0	80.6	18
30	min	Winter	86.337	0.0	709.8	168.4	32
60	min	Winter	52.933	0.0	874.0	263.8	60
120	min	Winter	31.380	0.0	1036.6	353.5	98
180	min	Winter	22.833	0,0	1131.5	398.1	136
240	min	Winter	18.130	0.0	1198.0	422.8	174
2.10			10.100	0.0	1100.0	122.0	- / -

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:36	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Stori Even	m t	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Stat	us
360	min	Winter	49.802	0.802	24.3	40.9	65.2	704.4	Flood	Risk
480	min	Winter	49.777	0.777	23.9	36.4	60.3	660.9	Flood	Risk
600	min	Winter	49.755	0.755	23.6	32.2	55.8	621.6	Flood	Risk
720	min	Winter	49.735	0.735	23.3	28.5	51.8	586.7	Flood	Risk
960	min	Winter	49.701	0.701	22.8	22.3	45.0	528.5	Flood	Risk
1440	min	Winter	49.649	0.649	21.9	13.9	35.8	440.5		ΟK
2160	min	Winter	49.598	0.598	21.1	6.3	27.4	358.5		ΟK
2880	min	Winter	49.494	0.494	19.4	0.0	19.4	286.1		ОК
4320	min	Winter	49.205	0.205	18.9	0.0	18.9	107.2		ОК
5760	min	Winter	49.165	0.165	15.3	0.0	15.3	85.1		ΟK
7200	min	Winter	49.145	0.145	12.7	0.0	12.7	74.3		ОК
8640	min	Winter	49.131	0.131	11.0	0.0	11.0	67.1		ΟK
10080	min	Winter	49.121	0.121	9.6	0.0	9.6	61.7		ΟK

;	Storm Event		Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m³)	(m³)	
360	min Winte	er 13.031	0.0	1291.7	440.5	246
480	min Winte	er 10.316	0.0	1363.5	437.9	318
600	min Winte	er 8.601	0.0	1420.9	423.8	386
720	min Winte	er 7.410	0.0	1469.1	401.2	456
960	min Winte	er 5.854	0.0	1547.3	340.7	594
1440	min Winte	er 4.194	0.0	1662.3	232.2	864
2160	min Winte	er 3.001	0.0	1786.3	84.2	1256
2880	min Winte	er 2.364	0.0	1876.4	0.0	1756
4320	min Winte	er 1.688	0.0	2008.1	0.0	2288
5760	min Winte	er 1.328	0.0	2108.7	0.0	2944
7200	min Winte	er 1.102	0.0	2187.2	0.0	3672
8640	min Winte	er 0.946	0.0	2252.7	0.0	4408
10080	min Winte	er 0.831	0.0	2308.3	0.0	5144

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:36	Designed by gareth.jane	Desinado
File 0031-SW-01-F-PH1 DETENTION BA	Checked by	Diamage
XP Solutions	Source Control 2015.1	
<u>R</u> ainfall Model Return Period (years)	Rainfall Details FSR Winter Storms Yes 100 Cv (Summer) 0.750	
Region Eng M5-60 (mm) Ratio R Summer Storms	gland and Wales Cv (Winter) 0.840 20.100 Shortest Storm (mins) 15 0.446 Longest Storm (mins) 10080 Yes Climate Change % +30	
T	<u>ime Area Diagram</u>	
Te	otal Area (ha) 1.970	
	Time (mins) Area From: To: (ha)	
	0 4 1.970	

AWP		Page 4
Kensington Court	0031 - Royal Brunswick Par	k
Woodwater Park Pynes Hill	Preliminary Attenuation Si	zing
Exeter EX2 5TY	Detention Basin	Micco
Date 16/12/2015 15:36	Designed by gareth.jane	MILIU
File 0031-SW-01-F-PH1 DETENTION B	A Checked by	Drainacje
XP Solutions	Source Control 2015.1	
	Model Details	
Storag	ge is Online Cover Level (m) 50.000	
	Tank or Pond Structure	
	Invert Level (m) 49.000	
Depth (m) Area (m²) Depth	(m) Area (m ²) Depth (m) Area (m ²) Dept	th (m) Area (m²)
0.000 487.0 0	.600 720.0 0.601 1650.0	1.000 1879.0
Hydro-	Brake Optimum® Outflow Control	
<u>myaro</u>	Stand opermane duction concret	
	Unit Reference MD-SHE-0202-1950-0500)-1950
	Design Head (m)	0.500
	Design Flow (1/s)	19.5
	Objective Minimise unstream st	
	Diameter (mm)	202
	Invert Level (m) 4	19.000
Minimum Outlet	Pipe Diameter (mm)	225
Suggested Man	nole Diameter (mm)	1200
Control Points Head	(m) Flow (1/s) Control Points	Head (m) Flow (l/s)
Design Point (Calculated) 0.	500 19.4 Kick-Flo	® 0.428 18.0
- Flush-Flo™ 0.	282 19.4 Mean Flow over Head Bang	ie – 14.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)								
0.100	6.9	0.800	24.3	2.000	37.7	4.000	52.7	7.000	69.0
0.200	18.8	1.000	27.0	2.200	39.4	4.500	55.8	7.500	71.4
0.300	19.4	1.200	29.4	2.400	41.1	5.000	58.7	8.000	73.8
0.400	18.5	1.400	31.7	2.600	42.7	5.500	61.0	8.500	76.1
0.500	19.4	1.600	33.8	3.000	45.8	6.000	63.8	9.000	78.3
0.600	21.1	1.800	35.8	3.500	49.4	6.500	66.4	9.500	80.5

Orifice Overflow Control

Diameter (m) 0.210 Discharge Coefficient 0.600 Invert Level (m) 49.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 442 minutes.

	Storm	L	Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(l/s)	(1/s)	(1/s)	(m³)	
15	min S	Summer	99.139	0.139	0.0	2.1	0.0	2.1	49.5	ОК
30	min S	Summer	99.175	0.175	0.0	2.1	0.0	2.1	62.4	ОК
60	min S	Summer	99.209	0.209	0.0	2.1	0.0	2.1	74.5	ОК
120	min S	Summer	99.240	0.240	0.0	2.1	0.0	2.1	85.4	ОК
180	min S	Summer	99.254	0.254	0.0	2.1	0.0	2.1	90.4	ОК
240	min S	Summer	99.261	0.261	0.0	2.1	0.0	2.1	92.9	ОК
360	min S	Summer	99.265	0.265	0.0	2.1	0.0	2.1	94.3	ΟK
480	min S	Summer	99.264	0.264	0.0	2.1	0.0	2.1	94.0	ΟK
600	min S	Summer	99.262	0.262	0.0	2.1	0.0	2.1	93.2	ΟK
720	min S	Summer	99.258	0.258	0.0	2.1	0.0	2.1	92.1	ΟK
960	min S	Summer	99.250	0.250	0.0	2.1	0.0	2.1	89.2	ΟK
1440	min S	Summer	99.231	0.231	0.0	2.1	0.0	2.1	82.1	ΟK
2160	min S	Summer	99.199	0.199	0.0	2.1	0.0	2.1	71.1	ΟK
2880	min S	Summer	99.171	0.171	0.0	2.1	0.0	2.1	61.0	ΟK
4320	min S	Summer	99.128	0.128	0.0	2.1	0.0	2.1	45.6	ΟK
5760	min S	Summer	99.101	0.101	0.0	2.0	0.0	2.0	36.0	ΟK
7200	min S	Summer	99.087	0.087	0.0	1.9	0.0	1.9	31.0	ΟK
8640	min S	Summer	99.078	0.078	0.0	1.7	0.0	1.7	27.8	ΟK
10080	min S	Summer	99.071	0.071	0.0	1.5	0.0	1.5	25.4	ΟK
15	min W	Vinter	99.156	0.156	0.0	2.1	0.0	2.1	55.6	ΟK
30	min W	Vinter	99.197	0.197	0.0	2.1	0.0	2.1	70.1	ΟK
60	min W	Vinter	99.236	0.236	0.0	2.1	0.0	2.1	83.9	ΟK
120	min W	Vinter	99.271	0.271	0.0	2.1	0.0	2.1	96.5	ΟK
180	min W	Vinter	99.288	0.288	0.0	2.1	0.0	2.1	102.7	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
		44 504		45 5		1.0
15	min Summe	er 41./34	0.0	47.5	0.0	19
30	min Summe	er 26.594	0.0	61.2	0.0	33
60	min Summe	er 16.285	0.0	77.7	0.0	62
120	min Summe	er 9.752	0.0	93.2	0.0	122
180	min Summe	er 7.183	0.0	103.1	0.0	182
240	min Summe	er 5.773	0.0	110.6	0.0	240
360	min Summe	er 4.234	0.0	121.7	0.0	342
480	min Summe	er 3.389	0.0	130.0	0.0	394
600	min Summe	er 2.851	0.0	136.7	0.0	454
720	min Summe	er 2.475	0.0	142.3	0.0	520
960	min Summe	er 1.980	0.0	151.8	0.0	654
1440	min Summe	er 1.445	0.0	165.8	0.0	924
2160	min Summe	er 1.055	0.0	184.0	0.0	1320
2880	min Summe	er 0.844	0.0	196.1	0.0	1700
4320	min Summe	er 0.616	0.0	213.8	0.0	2416
5760	min Summe	er 0.492	0.0	229.7	0.0	3064
7200	min Summe	er 0.414	0.0	241.2	0.0	3752
8640	min Summe	er 0.359	0.0	250.9	0.0	4496
10080	min Summe	er 0.319	0.0	258.9	0.0	5152
15	min Winte	er 41.734	0.0	53.5	0.0	18
30	min Winte	er 26.594	0.0	68.7	0.0	33
60	min Winte	er 16.285	0.0	87.1	0.0	62
120	min Winte	er 9.752	0.0	104.6	0.0	120
180	min Winte	er 7.183	0.0	115.6	0.0	178

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	

-	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wint	er 99.298	0.298	0.0	2.1	0.0	2.1	106.1	ОК
360	min Wint	er 99.305	0.305	0.0	2.1	0.0	2.1	108.7	ΟK
480	min Wint	er 99.304	0.304	0.0	2.1	0.0	2.1	108.1	ΟK
600	min Wint	er 99.298	0.298	0.0	2.1	0.0	2.1	106.2	ОК
720	min Wint	er 99.293	0.293	0.0	2.1	0.0	2.1	104.5	ОК
960	min Wint	er 99.281	0.281	0.0	2.1	0.0	2.1	100.0	ОК
1440	min Wint	er 99.250	0.250	0.0	2.1	0.0	2.1	88.9	ОК
2160	min Wint	er 99.201	0.201	0.0	2.1	0.0	2.1	71.5	ОК
2880	min Wint	er 99.158	0.158	0.0	2.1	0.0	2.1	56.4	ΟK
4320	min Wint	er 99.102	0.102	0.0	2.0	0.0	2.0	36.4	ОК
5760	min Wint	er 99.082	0.082	0.0	1.8	0.0	1.8	29.1	ΟK
7200	min Wint	er 99.071	0.071	0.0	1.5	0.0	1.5	25.1	ОК
8640	min Wint	er 99.063	0.063	0.0	1.3	0.0	1.3	22.5	ΟK
10080	min Wint	er 99.058	0.058	0.0	1.2	0.0	1.2	20.7	ΟK

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Overflow Volume (m ³)	Time-Peak (mins)
240 min Wi	nter 5.773	0.0	124.0	0.0	236
360 min Wi	nter 4.234	0.0	136.5	0.0	348
480 min Wi	nter 3.389	0.0	145.7	0.0	454
600 min Wi	nter 2.851	0.0	153.2	0.0	498
720 min Wi	nter 2.475	0.0	159.5	0.0	564
960 min Wi	nter 1.980	0.0	170.1	0.0	714
1440 min Wi	nter 1.445	0.0	185.8	0.0	1010
2160 min Wi	nter 1.055	0.0	206.2	0.0	1424
2880 min Wi	nter 0.844	0.0	219.8	0.0	1788
4320 min Wi	nter 0.616	0.0	239.8	0.0	2424
5760 min Wi	nter 0.492	0.0	257.3	0.0	3104
7200 min Wi	nter 0.414	0.0	270.3	0.0	3792
8640 min Wi	nter 0.359	0.0	281.2	0.0	4496
10080 min Wi	nter 0.319	0.0	290.3	0.0	5240

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	
Bainfall Model	Rainfall Details	
Return Period (years)	2 Cv (Summer) 0.750	
Region En	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R Summer Storms	0.446 Longest Storm (mins) 10080 Yes Climate Change % +0	
<u> </u>	'ime Area Diagram	
I	otal Area (ha) 0.650	
	Time (mins) Area From: To: (ba)	
	0 4 0.650	

AWP							Pag	e 4
Kensington Court			0031 -	Royal Br	unswick P	ark		
Woodwater Park Py	nes Hill		Prelim	inary Att	enuation	Sizing	2	
Exeter EX2 5TY			School	Attenuat	ion			licco
Date 16/12/2015 16	:04		Design	ed by gar	eth.jane			liciu
File 0031-SW-02-A-	PH1 SCHOOL A	TTEN	Checke	d by			L	rainage
XP Solutions			Source	Control	2015.1			
			<u>Model I</u>	<u>Details</u>				
				/				
	St	orage is	Online Co	ver Level (m) 100.000			
		Cellu	lar Stor	age Struc	sture			
		00110	141 0001	<u>ago 502a</u>	<u> </u>			
		In	vert Level	(m) 99.0	00 Safety Fa	actor 2.0		
	Infiltration	Coefficie	nt Base (m	/hr) 0.000	00 Porc	osity 0.95		
	Infiltration	Coefficie	nt Side (m	1/hr) 0.000	00			
De	epth (m) Area (m²) Inf.	Area (m²)	Depth (m)	Area (m²) I	nf. Area (m	²)	
	0 000 37	5 0	0 0	1 000	375 0	0	0	
	0.000 57	5.0	0.0	1.000	575.0	0	. 0	
	Hyd	ro-Brake	<u>e Optimu</u>	m® Outflo	ow Control	_		
		Ur	nit Refere sign Head	nce MD-SHE- (m)	-0076-2100-0	500-2100		
		Desid	gn Flow (l	(m) /s)		2.1		
			Flush-F	10 TM	Ca	lculated		
			Object	ive Minimi	lse upstream	storage		
		- I	Diameter (mm)		76		
	Minimum Out	Inve Lot Bipo I	ert Level Diamotor ((m)		99.000		
	Suggested	Manhole I	Diameter (Diameter (mm)		1200		
	_ · · · _					/	· / / / / / / / / /-	
Control	Points H	ead (m) F	10W (1/S)	Conti	rol Points	Head (1	n) FIOW (1/	S)
Design Point	(Calculated)	0.500	2.1		Kick-H	Flo® 0.34	15 1	.8
	Flush-Flo™	0.150	2.1	Mean Flow	over Head Ra	ange	- 1	. 8
The hydrological cal	culations have	been base	d on the F	lead/Dischau	rge relation	ship for the	e Hvdro-Bra	ake Optimum®
as specified. Shoul	d another type	of contro	l device c	ther than a	a Hydro-Brak	e Optimum® 1	be utilised	then these
storage routing calc	ulations will b	e invalid	ated					
Denth (n) Eleve (1/a		(1/2)		Π	Doubh (m) I)	11 (1 (-)
Depth (m) Flow (1/s) Depth (m) Fic	W (1/S) 1	Jeptn (m)	FIOW (I/S)	Depth (m) i	210W (1/S)	ертп (m) н	10W (1/S)
0.100 2.	0.800	2.6	2.000	4.0	4.000	5.5	7.000	7.2
0.200 2.	1 1.000	2.9	2.200	4.1	4.500	5.8	7.500	7.4
0.300 1.	9 1.200	3.1	2.400	4.3	5.000	6.1	8.000	7.7
0.400 1.	9 1.400	3.4	2.600	4.5	5.500	6.4	8.500	7.9
0.500 2.	1 1 200	3.6	3.000	4.8	6.000	6.6	9.000	8.1

5.1

6.500

3.500

3.8

9.500

6.9

8.4

0.600

2.3

1.800

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 99.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	·

Half Drain Time : 915 minutes.

	Storm		Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(l/s)	(1/s)	(1/s)	(m³)	
15	min S	Summer	99.294	0.294	0.0	2.1	0.0	2.1	104.8	ОК
30	min S	Summer	99.374	0.374	0.0	2.1	0.0	2.1	133.3	ΟK
60	min S	Summer	99.451	0.451	0.0	2.1	0.0	2.1	160.6	ОК
120	min S	Summer	99.521	0.521	0.0	2.1	0.1	2.3	185.4	ОК
180	min S	Summer	99.553	0.553	0.0	2.2	0.7	2.8	197.0	ОК
240	min S	Summer	99.568	0.568	0.0	2.2	0.9	3.1	202.5	ОК
360	min S	Summer	99.578	0.578	0.0	2.2	1.0	3.2	206.0	ОК
480	min S	Summer	99.576	0.576	0.0	2.2	1.0	3.2	205.3	ОК
600	min S	Summer	99.573	0.573	0.0	2.2	1.0	3.2	204.2	ОК
720	min S	Summer	99.570	0.570	0.0	2.2	0.9	3.1	203.0	ΟK
960	min S	Summer	99.562	0.562	0.0	2.2	0.8	3.0	200.1	ΟK
1440	min S	Summer	99.544	0.544	0.0	2.2	0.5	2.7	193.6	ΟK
2160	min S	Summer	99.512	0.512	0.0	2.1	0.0	2.2	182.3	ΟK
2880	min S	Summer	99.473	0.473	0.0	2.1	0.0	2.1	168.6	ΟK
4320	min S	Summer	99.401	0.401	0.0	2.1	0.0	2.1	143.0	ΟK
5760	min S	Summer	99.327	0.327	0.0	2.1	0.0	2.1	116.4	ΟK
7200	min S	Summer	99.260	0.260	0.0	2.1	0.0	2.1	92.5	ΟK
8640	min S	Summer	99.207	0.207	0.0	2.1	0.0	2.1	73.7	ΟK
10080	min S	Summer	99.166	0.166	0.0	2.1	0.0	2.1	59.0	ΟK
15	min V	Winter	99.330	0.330	0.0	2.1	0.0	2.1	117.5	ΟK
30	min V	Winter	99.420	0.420	0.0	2.1	0.0	2.1	149.5	ΟK
60	min V	Winter	99.506	0.506	0.0	2.1	0.0	2.1	180.2	ΟK
120	min V	Winter	99.582	0.582	0.0	2.2	1.0	3.3	207.3	ΟK
180	min V	Winter	99.617	0.617	0.0	2.3	1.3	3.6	219.6	ΟK

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
		~			101 0	0.0	1.0
15	mın	Summer	87.227	0.0	101.2	0.0	19
30	mın	Summer	55.///	0.0	128.7	0.0	34
60	min	Summer	34.065	0.0	163.6	0.0	64
120	min	Summer	20.201	0.0	194.1	0.2	122
180	min	Summer	14.736	0.0	212.3	2.9	182
240	min	Summer	11.736	0.0	225.4	6.0	242
360	min	Summer	8.483	0.0	244.3	10.4	360
480	min	Summer	6.739	0.0	258.6	13.3	450
600	min	Summer	5.634	0.0	269.9	15.0	506
720	min	Summer	4.865	0.0	279.3	15.7	570
960	min	Summer	3.858	0.0	294.1	14.7	700
1440	min	Summer	2.780	0.0	310.6	7.9	994
2160	min	Summer	2.001	0.0	349.5	0.4	1452
2880	min	Summer	1.584	0.0	368.6	0.0	1872
4320	min	Summer	1.138	0.0	396.5	0.0	2684
5760	min	Summer	0.900	0.0	420.5	0.0	3464
7200	min	Summer	0.750	0.0	437.8	0.0	4184
8640	min	Summer	0.646	0.0	452.1	0.0	4848
10080	min	Summer	0.569	0.0	464.0	0.0	5544
15	min	Winter	87.227	0.0	113.3	0.0	19
30	min	Winter	55.777	0.0	142.9	0.0	33
60	min	Winter	34.065	0.0	183.3	0.0	62
120	min	Winter	20.201	0.0	217.4	6.2	120
180	min	Winter	14.736	0.0	237.9	12.6	178

AWP						
Kensington Court	0031 - Royal Brunswick Park					
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.				
Exeter EX2 5TY	School Attenuation	Micco				
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado				
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage				
XP Solutions	Source Control 2015.1					

S E	torm vent	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240 n	min Winter	99.635	0.635	0.0	2.3	1.4	3.7	226.1	ОК
360 n	min Winter	99.648	0.648	0.0	2.4	1.5	3.8	230.8	ΟK
480 n	min Winter	99.648	0.648	0.0	2.4	1.5	3.8	230.8	ОК
600 n	nin Winter	99.642	0.642	0.0	2.3	1.5	3.8	228.7	ОК
720 n	nin Winter	99.638	0.638	0.0	2.3	1.4	3.8	227.4	ОК
960 n	nin Winter	99.627	0.627	0.0	2.3	1.4	3.7	223.5	ОК
1440 n	nin Winter	99.599	0.599	0.0	2.3	1.2	3.4	213.3	ОК
2160 n	nin Winter	99.558	0.558	0.0	2.2	0.7	2.9	198.7	ОК
2880 n	min Winter	99.520	0.520	0.0	2.1	0.1	2.2	185.2	ΟK
4320 n	nin Winter	99.416	0.416	0.0	2.1	0.0	2.1	148.2	ОК
5760 n	min Winter	99.299	0.299	0.0	2.1	0.0	2.1	106.7	ΟK
7200 n	min Winter	99.205	0.205	0.0	2.1	0.0	2.1	73.0	ΟK
8640 n	min Winter	99.140	0.140	0.0	2.1	0.0	2.1	49.8	ΟK
10080 n	nin Winter	99.103	0.103	0.0	2.0	0.0	2.0	36.5	ОК

	Storm	Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Wintor	11 736	0 0	252 6	17 2	236
240	IIIII WINCEL	11.750	0.0	252.0	17.2	250
360	min Winter	8.483	0.0	273.7	23.4	348
480	min Winter	6.739	0.0	289.6	27.5	454
600	min Winter	5.634	0.0	302.2	30.2	508
720	min Winter	4.865	0.0	312.7	31.9	566
960	min Winter	3.858	0.0	329.0	33.2	722
1440	min Winter	2.780	0.0	345.7	29.6	1028
2160	min Winter	2.001	0.0	391.5	14.5	1496
2880	min Winter	1.584	0.0	412.9	1.6	2016
4320	min Winter	1.138	0.0	443.9	0.0	2900
5760	min Winter	0.900	0.0	471.0	0.0	3688
7200	min Winter	0.750	0.0	490.4	0.0	4328
8640	min Winter	0.646	0.0	506.6	0.0	4928
10080	min Winter	0.569	0.0	520.1	0.0	5448

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:04	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Drainage
XP Solutions	Source Control 2015.1	
]	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Region En	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R Summer Storms	0.446 Longest Storm (mins) 10080 Yes Climate Change % +10	
<u> </u>	<u>lime Area Diagram</u>	
Т	Cotal Area (ha) 0.650	
	Time (mins) Area From: To: (ha)	
	0 4 0.650	
1		

AWP							Pag	e 4	
Kensington Court			0031 -	Royal Br	unswick P	ark			
Woodwater Park Py	nes Hill		Prelim	inary Att	enuation	Sizing	2		
Exeter EX2 5TY			School	Attenuat	ion			licco	
Date 16/12/2015 16:04 Designed by gareth.jane								liciu	
File 0031-SW-02-A-	File 0031-SW-02-A-PH1 SCHOOL ATTEN Checked by								
XP Solutions			Source	Control	2015.1				
			<u>Model I</u>	<u>Details</u>					
				/					
	St	orage is	Online Co	ver Level (m) 100.000				
		Cellu	lar Stor	age Struc	sture				
		00110	141 0001	<u>ago 502a</u>	<u> </u>				
		In	vert Level	(m) 99.0	00 Safety Fa	actor 2.0			
	Infiltration	Coefficie	nt Base (m	/hr) 0.000	00 Porc	osity 0.95			
	Infiltration	Coefficie	nt Side (m	1/hr) 0.000	00				
De	epth (m) Area (m²) Inf.	Area (m²)	Depth (m)	Area (m²) I	nf. Area (m	²)		
	0 000 37	5 0	0 0	1 000	375 0	0	0		
	0.000 57	5.0	0.0	1.000	575.0	0	. 0		
	Hyd	ro-Brake	<u>e Optimu</u>	m® Outflo	ow Control	_			
		Ur	nit Refere sign Head	nce MD-SHE- (m)	-0076-2100-0	500-2100			
		Desid	gn Flow (l	(m) /s)		2.1			
			Flush-F	10 TM	Ca	lculated			
			Object	ive Minimi	lse upstream	storage			
		- I	Diameter (mm)		76			
	Minimum Out	Inve Lot Bipo I	ert Level Diamotor ((m)		99.000			
	Suggested	Manhole I	Diameter (Diameter (mm)		1200			
	_ · · · _					/	· / / / / / / / / /-		
Control	Points H	ead (m) F	10W (1/S)	Conti	rol Points	Head (1	n) Flow (1/	S)	
Design Point	(Calculated)	0.500	2.1		Kick-H	Flo® 0.34	15 1	.8	
	Flush-Flo™	0.150	2.1	Mean Flow	over Head Ra	ange	- 1	. 8	
The hydrological cal	culations have	been base	d on the F	lead/Dischau	rge relation	ship for the	e Hvdro-Bra	ake Optimum®	
as specified. Shoul	d another type	of contro	l device c	ther than a	a Hydro-Brak	e Optimum® 1	be utilised	then these	
storage routing calc	ulations will b	e invalid	ated						
Denth (n) Eleve (1/a		(1/2)		Π	Doubh (m) I)	11 (1 (-)	
Depth (m) Flow (1/s) Depth (m) Fic	W (1/S) 1	Jeptn (m)	FIOW (I/S)	Depth (m) i	210W (1/S)	ертп (m) н	10W (1/S)	
0.100 2.	0.800	2.6	2.000	4.0	4.000	5.5	7.000	7.2	
0.200 2.	1 1.000	2.9	2.200	4.1	4.500	5.8	7.500	7.4	
0.300 1.	9 1.200	3.1	2.400	4.3	5.000	6.1	8.000	7.7	
0.400 1.	9 1.400	3.4	2.600	4.5	5.500	6.4	8.500	7.9	
0.500 2.	1 1 200	3.6	3.000	4.8	6.000	6.6	9.000	8.1	

5.1

6.500

3.500

3.8

9.500

6.9

8.4

0.600

2.3

1.800

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 99.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:03	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 1222 minutes.

	Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
	Event	:	Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(l/s)	(1/s)	(1/s)	(m³)	
15	min (Summer	99 454	0 454	0 0	2 1	0 0	2 1	161 7	ОК
30	min 9	Summer	99 580	0 580	0.0	2.1	1 0	2.1	206.8	0 K
60	min	Summer	99.500	0.699	0.0	2.2	1.8	4 2	249 0	0 K
120	min S	Summer	99 802	0.802	0.0	2.1	2 2	4 8	285 7	Flood Bisk
180	min (Summer	99.848	0.848	0.0	2.0	2.2	5 1	301 9	Flood Risk
240	min (Summer	99 869	0.869	0.0	2.7	2.1	5.2	309 6	Flood Risk
360	min S	Summer	99 880	0.880	0.0	2.7	2.5	5.2	313 6	Flood Risk
480	min (Summer	99 876	0.876	0.0	2 7	2.5	5.2	312 2	Flood Risk
600	min S	Summer	99 871	0.871	0.0	2.7	2.5	5.2	310 4	Flood Risk
720	min (Summer	99 865	0.865	0.0	2 7	2.5	5.2	308 2	Flood Risk
960	min S	Summer	99 850	0.850	0.0	2.7	2.3	5.1	302.2	Flood Risk
1440	min (Summer	99 814	0 814	0.0	2.6	23	4 9	290 1	Flood Risk
2160	min S	Summer	99 759	0.759	0.0	2.0	2.3	4 6	270.4	Flood Risk
2880	min 9	Summer	99 710	0 710	0.0	2.5	1 8	4 3	253 0	Flood Risk
4320	min 9	Summer	99 635	0 635	0.0	2.3	1 4	3 7	226.2	0 K
5760	min 9	Summer	99 581	0 581	0.0	2.3	1 0	3.7	206.9	0 K
7200	min 9	Summer	99 544	0.544	0.0	2.2	0.5	2 7	193 7	0 K
8640	min 9	Summer	99 500	0 500	0.0	2.2	0.0	2 1	178 0	0 K
10080	min 9	Summer	99 441	0 441	0.0	2 1	0.0	2.1	157 3	0 K
15	min N	Winter	99 509	0 509	0.0	2 1	0 0	2 1	181 2	0 K
30	min V	Winter	99.650	0.650	0.0	2.4	1.5	3.9	231.5	0 K
60	min W	Winter	99 784	0 784	0.0	2.6	2 2	4 7	279 3	Flood Risk
120	min V	Winter	99,901	0.901	0.0	2.7	2.2	53	321.1	Flood Risk
180	min V	Winter	99.955	0.955	0.0	2.8	2.8	5.6	340.2	Flood Risk

	Stor	m	Rain	Flooded	Discharge	Overflow	Time-Peak
	Even	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
		~		0.0	151 0	0.0	1.0
15	mın	Summer	133.985	0.0	151.9	0.0	19
30	mın	Summer	86.337	0.0	1//.5	5.0	34
60	min	Summer	52.933	0.0	254.5	22.8	64
120	min	Summer	31.380	0.0	301.8	43.2	122
180	min	Summer	22.833	0.0	329.3	55.1	182
240	min	Summer	18.130	0.0	348.4	63.2	242
360	min	Summer	13.031	0.0	375.1	73.9	360
480	min	Summer	10.316	0.0	395.3	81.3	430
600	min	Summer	8.601	0.0	410.9	86.7	488
720	min	Summer	7.410	0.0	423.5	90.6	550
960	min	Summer	5.854	0.0	441.3	95.7	676
1440	min	Summer	4.194	0.0	445.3	99.2	954
2160	min	Summer	3.001	0.0	524.7	94.5	1364
2880	min	Summer	2.364	0.0	550.8	80.8	1784
4320	min	Summer	1.688	0.0	586.9	56.6	2592
5760	min	Summer	1.328	0.0	620.7	34.4	3400
7200	min	Summer	1.102	0.0	643.7	12.6	4256
8640	min	Summer	0.946	0.0	662.7	0.0	5184
10080	min	Summer	0.831	0.0	678.4	0.0	5952
15	min	Winter	133.985	0.0	165.3	0.0	19
30	min	Winter	86.337	0.0	188.5	14.3	33
60	min	Winter	52.933	0.0	285.2	36.7	62
120	min	Winter	31.380	0.0	338.0	61.0	120
180	min	Winter	22.833	0.0	368.7	75.2	178

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:03	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	J

Storm Event			Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wi	nter	99.982	0.982	0.0	2.8	2.9	5.7	349.8	Flood Risk
360	min Wi	nter	100.000	1.000	0.0	2.9	2.9	5.8	356.2	Flood Risk
480	min Wi	nter	99.999	0.999	0.0	2.9	2.9	5.8	355.9	Flood Risk
600	min Wi	nter	99.988	0.988	0.0	2.9	2.9	5.7	352.1	Flood Risk
720	min Wi	nter	99.981	0.981	0.0	2.8	2.9	5.7	349.4	Flood Risk
960	min Wi	nter	99.961	0.961	0.0	2.8	2.8	5.6	342.4	Flood Risk
1440	min Wi	nter	99.910	0.910	0.0	2.7	2.6	5.4	324.2	Flood Risk
2160	min Wi	nter	99.831	0.831	0.0	2.6	2.3	5.0	296.1	Flood Risk
2880	min Wi	nter	99.762	0.762	0.0	2.5	2.1	4.6	271.6	Flood Risk
4320	min Wi	nter	99.659	0.659	0.0	2.4	1.6	3.9	234.8	ОК
5760	min Wi	nter	99.589	0.589	0.0	2.3	1.1	3.3	209.9	0 K
7200	min Wi	nter	99.544	0.544	0.0	2.2	0.5	2.7	193.8	ОК
8640	min Wi	nter	99.480	0.480	0.0	2.1	0.0	2.1	171.1	0 K
10080	min Wi	nter	99.392	0.392	0.0	2.1	0.0	2.1	139.7	O K

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
E	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Winter	18.130	0.0	390.0	84.8	236
360	min Winter	13.031	0.0	419.7	97.5	348
480	min Winter	10.316	0.0	441.9	106.6	454
600	min Winter	8.601	0.0	458.8	113.2	542
720 :	min Winter	7.410	0.0	472.0	118.2	568
960 :	min Winter	5.854	0.0	487.8	125.0	722
1440	min Winter	4.194	0.0	487.7	130.8	1024
2160	min Winter	3.001	0.0	587.8	129.2	1468
2880 :	min Winter	2.364	0.0	617.1	118.0	1900
4320	min Winter	1.688	0.0	656.7	83.8	2724
5760	min Winter	1.328	0.0	695.2	50.6	3568
7200 :	min Winter	1.102	0.0	721.0	16.6	4472
8640	min Winter	0.946	0.0	742.5	0.0	5536
10080 :	min Winter	0.831	0.0	760.3	0.0	6360

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	School Attenuation	Micco
Date 16/12/2015 16:03	Designed by gareth.jane	Desinado
File 0031-SW-02-A-PH1 SCHOOL ATTEN	Checked by	Diamage
XP Solutions	Source Control 2015.1	
]	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Requin En	gland and Wales Cv (Summer) 0.750	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	ies climate change & +30	
I	<u>'ime Area Diagram</u>	
Т	Cotal Area (ha) 0.650	
	Time (mins) Area	
	0 4 0.650	
1		

AWP							Page	4
Kensington Court			0031 - F	Royal Bru	nswick Par	k		
Woodwater Park H	Pynes Hill		Prelimir	hary Atte	nuation Si	zing	4	~
Exeter EX2 5TY			School A	Attenuati	on		Mic	Jun
Date 16/12/2015 1	16:03		Designed	d by gare	th.jane			.iu
File 0031-SW-02-A	A-PH1 SCHOOL	ATTEN	Checked	by			Uld	inage
XP Solutions			Source (Control 2	015.1			
			<u>Model De</u>	tails				
	c	storage is	Online Cove	r Level (m)	100 000			
		corage is	JIIIIIe COVE	T TEAET (III)	100.000			
		<u>Cellu</u>	lar Stora	ge Struct	ure			
	Tafiltastica	In	vert Level	(m) 99.000	Safety Fact	or 2.0		
	Infiltration	n Coefficie	nt Base (m/l nt Side (m/l	hr) 0.00000 hr) 0.00000	POTOSI	.ty 0.95		
	Depth (m) Area	(m ²) Inf.	Area (m²) D	epth (m) An	rea (m²) Inf	. Area (m²)		
	0.000 3	375.0	0.0	1.000	375.0	0.0		
			'					
	<u>Hy</u>	dro-Brake	<u>e Optimum</u>	B Outflow	<u>Control</u>			
		TTr	it Reference	MD_SHE_0	076-2100-050	0-2100		
		Des	ign Head (n	n)	070 2100 000	0.500		
		Desig	n Flow (l/s	3)		2.1		
			Flush-Flo	[™]	Calc	ulated		
		-	Objectiv	ve Minimis	e upstream s	torage		
		I	lameter (mn	1) 2)		76		
	Minimum Ou	tlet Pipe I	iameter (m	1) 1)		100		
	Suggeste	d Manhole I)iameter (mn	n)		1200		
Contr	ol Pointa	Hood (m) F	$\log (1/a)$	Contro	1 Dointa	Hood (m)	$\mathbf{Flow}(1/a)$	
Conce	or points	neau (m) r	10w (1/5)	CONCLO	FOILES	nead (m)	FIOW (1/5)	
Design Poir	nt (Calculated)	0.500	2.1		Kick-Flo	o® 0.345	1.8	
	Flusn-Flo ^m	0.150	2.1	ean Flow ov	er Head Kang	le –	1.8	
The hydrological c	alculations have	been base	d on the He	ad/Discharg	e relationsh	ip for the	Hydro-Brake	Optimum®
as specified. Sho	uld another type	e of contro	l device ot	her than a	Hydro-Brake	Optimum® be	utilised t	hen these
storage routing ca	lculations will	be invalid	ated					
						(• () -		/ . / .
Depth (m) Flow (1,	/s) Depth (m) F.	Low (1/s) I	epth (m) F.	Low (1/s) D	epth (m) Flo	w (l/s) De <u>r</u>	oth (m) Flow	w (1/s)
0.100	2.0 0.800	2.6	2.000	4.0	4.000	5.5	7.000	7.2
0.200	2.1 1.000	2.9	2.200	4.1	4.500	5.8	7.500	7.4
0.300	1.9 1.200	3.1	2.400	4.3	5.000	6.1	8.000	7.7
0.400	1.9 1.400	3.4	2.600	4.5	5.500	6.4	8.500	7.9
0.500	2.1 1.600	3.6	3.000	4.8	6.000	6.6	9.000	8.1
0.600	2.31 1.800	3.8	3.500	5.1	6.500	6.91	9.500	8.4

3.500

5.1

6.500

8.4

6.9

9.500

3.8

0.600

2.3

1.800

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 99.500

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:40	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 154 minutes.

	Storm	L	Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(1/s)	(1/s)	(1/s)	(m³)	
15	min S	Summer	98.339	0.339	0.0	16.3	0.0	16.3	161.2	ОК
30	min S	Summer	98.420	0.420	0.0	16.3	0.0	16.3	199.4	ОК
60	min S	Summer	98.486	0.486	0.0	16.3	0.0	16.3	231.0	ОК
120	min S	Summer	98.519	0.519	0.0	16.3	0.0	16.3	246.7	ОК
180	min S	Summer	98.522	0.522	0.0	16.3	0.0	16.3	247.9	ОК
240	min S	Summer	98.518	0.518	0.0	16.3	0.0	16.3	246.0	ОК
360	min S	Summer	98.499	0.499	0.0	16.3	0.0	16.3	236.9	ОК
480	min S	Summer	98.470	0.470	0.0	16.3	0.0	16.3	223.5	ОК
600	min S	Summer	98.439	0.439	0.0	16.3	0.0	16.3	208.4	ОК
720	min S	Summer	98.408	0.408	0.0	16.3	0.0	16.3	193.7	ОК
960	min S	Summer	98.351	0.351	0.0	16.3	0.0	16.3	166.7	ОК
1440	min S	Summer	98.263	0.263	0.0	16.3	0.0	16.3	125.0	ОК
2160	min S	Summer	98.190	0.190	0.0	15.8	0.0	15.8	90.3	ОК
2880	min S	Summer	98.163	0.163	0.0	13.6	0.0	13.6	77.3	ОК
4320	min S	Summer	98.134	0.134	0.0	10.5	0.0	10.5	63.7	ОК
5760	min S	Summer	98.118	0.118	0.0	8.6	0.0	8.6	55.9	ОК
7200	min S	Summer	98.107	0.107	0.0	7.3	0.0	7.3	50.6	ΟK
8640	min S	Summer	98.098	0.098	0.0	6.3	0.0	6.3	46.8	ОК
10080	min S	Summer	98.092	0.092	0.0	5.7	0.0	5.7	43.7	ΟK
15	min V	Winter	98.382	0.382	0.0	16.3	0.0	16.3	181.5	ОК
30	min V	Winter	98.475	0.475	0.0	16.3	0.0	16.3	225.5	ΟK
60	min V	Winter	98.550	0.550	0.0	16.3	0.0	16.3	261.4	ОК
120	min V	Winter	98.592	0.592	0.0	16.3	0.0	16.3	281.0	ОК
180	min V	Winter	98.590	0.590	0.0	16.3	0.0	16.3	280.1	ОК

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
15	min Summe:	r 41.734	0.0	167.9	0.0	18
30	min Summe:	r 26.594	0.0	214.8	0.0	32
60	min Summe:	r 16.285	0.0	265.7	0.0	62
120	min Summe:	r 9.752	0.0	318.5	0.0	116
180	min Summe:	r 7.183	0.0	352.1	0.0	144
240	min Summe:	r 5.773	0.0	377.4	0.0	176
360	min Summe:	4.234	0.0	415.3	0.0	246
480	min Summe:	r 3.389	0.0	443.4	0.0	314
600	min Summe:	r 2.851	0.0	466.3	0.0	380
720	min Summe:	r 2.475	0.0	485.8	0.0	442
960	min Summe:	r 1.980	0.0	518.0	0.0	568
1440	min Summe:	r 1.445	0.0	566.8	0.0	806
2160	min Summe:	r 1.055	0.0	622.5	0.0	1128
2880	min Summe:	c 0.844	0.0	663.7	0.0	1496
4320	min Summe:	r 0.616	0.0	725.3	0.0	2204
5760	min Summe:	r 0.492	0.0	775.4	0.0	2936
7200	min Summe:	c 0.414	0.0	814.6	0.0	3672
8640	min Summe:	r 0.359	0.0	848.0	0.0	4408
10080	min Summe:	r 0.319	0.0	876.6	0.0	5136
15	min Winte:	r 41.734	0.0	188.4	0.0	18
30	min Winte:	r 26.594	0.0	240.9	0.0	32
60	min Winte:	r 16.285	0.0	297.8	0.0	60
120	min Winte:	r 9.752	0.0	356.9	0.0	116
180	min Winte:	r 7.183	0.0	394.5	0.0	164

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:40	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	·

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Win	nter	98.582	0.582	0.0	16.3	0.0	16.3	276.6	ОК
360	min Win	nter	98.552	0.552	0.0	16.3	0.0	16.3	262.4	ΟK
480	min Win	nter	98.511	0.511	0.0	16.3	0.0	16.3	242.8	ΟK
600	min Win	nter	98.463	0.463	0.0	16.3	0.0	16.3	219.9	ΟK
720	min Win	nter	98.413	0.413	0.0	16.3	0.0	16.3	196.1	ΟK
960	min Win	nter	98.325	0.325	0.0	16.3	0.0	16.3	154.6	ОК
1440	min Win	nter	98.210	0.210	0.0	16.0	0.0	16.0	99.7	ОК
2160	min Win	nter	98.158	0.158	0.0	13.1	0.0	13.1	74.8	ОК
2880	min Win	nter	98.136	0.136	0.0	10.7	0.0	10.7	64.5	ОК
4320	min Win	nter	98.112	0.112	0.0	7.9	0.0	7.9	53.1	ОК
5760	min Win	nter	98.098	0.098	0.0	6.3	0.0	6.3	46.6	ОК
7200	min Win	nter	98.089	0.089	0.0	5.3	0.0	5.3	42.3	ΟK
8640	min Win	nter	98.082	0.082	0.0	4.6	0.0	4.6	39.0	ΟK
10080	min Win	nter	98.077	0.077	0.0	4.1	0.0	4.1	36.6	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
0.4.0			0 0	400.0	0.0	100
240	min Winter	5.//3	0.0	422.9	0.0	188
360	min Winter	4.234	0.0	465.4	0.0	264
480	min Winter	3.389	0.0	496.8	0.0	340
600	min Winter	2.851	0.0	522.4	0.0	414
720	min Winter	2.475	0.0	544.3	0.0	478
960	min Winter	1.980	0.0	580.5	0.0	598
1440	min Winter	1.445	0.0	635.1	0.0	810
2160	min Winter	1.055	0.0	697.4	0.0	1144
2880	min Winter	0.844	0.0	743.5	0.0	1500
4320	min Winter	0.616	0.0	812.8	0.0	2208
5760	min Winter	0.492	0.0	868.5	0.0	2944
7200	min Winter	0.414	0.0	912.5	0.0	3664
8640	min Winter	0.359	0.0	950.0	0.0	4408
10080	min Winter	0.319	0.0	982.3	0.0	5120

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:40	Designed by gareth.jane	Desinance
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamaye
XP Solutions	Source Control 2015.1	
<u> </u>	<u>Aainfall Details</u>	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	2 Cv (Summer) 0.750	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +0	
<u>T.</u>	<u>ime Area Diagram</u>	
То	otal Area (ha) 2.190	
	Time (mins) Area From: To: (ha)	
	0 4 2.190	

AWP			Page 4			
Kensington Court	0031 - Royal Br	runswick Park				
Woodwater Park Pynes Hill	Preliminary Att	enuation Sizing	L.			
Exeter EX2 5TY	Phase 2		Micco			
Date 16/12/2015 15:40	Designed by gas	reth.jane	Desinance			
File 0031-SW-03-A-PH2 ATTENUATION	Checked by		Diamatje			
XP Solutions	Source Control	2015.1				
	Model Details					
Storage is O	nline Cover Level	(m) 100.000				
Cellul	<u>ar Storage Stru</u>	<u>cture</u>				
Inv Infiltration Coefficien Infiltration Coefficien	ert Level (m) 98.0 t Base (m/hr) 0.000 t Side (m/hr) 0.000	00 Safety Factor 2.0 00 Porosity 0.95 00				
Depth (m) Area (m²) Inf. A	rea (m²) Depth (m)	Area (m²) Inf. Area	(m²)			
0.000 500.0	0.0 2.000	500.0	0.0			
<u>Hydro-Brake</u>	Optimum® Outfl	<u>ow Control</u>				
Un:	it Reference MD-SHE	-0186-1640-0600-1640				
Dest	ign Head (m)	0.600				
Design	n Flow (l/s)	16.4				
	Objective Minim	ise upstream storage				
D	iameter (mm)	186				
Inve	rt Level (m)	98.000				
Minimum Outlet Pipe D: Suggested Manhole D:	iameter (mm) iameter (mm)	225 1200				
Control Points Head (m) Fl	ow (1/s) Cont	rol Points Head	(m) Flow (1/s)			
Design Point (Calculated) 0 600	16.3	Kick-Flop 0	178 117			
Flush-Flo™ 0.278	16.3 Mean Flow	over Head Range	- 12.9			
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated						
Depth (m) Flow (1/s) Depth (m) Flow (1/s) De	epth (m) Flow (l/s)	Depth (m) Flow (1/s)	Depth (m) Flow (1/s)			
0.100 6.5 0.800 18.7	2.000 29.0	4.000 40.5	7.000 52.9			
0.200 15.9 1.000 20.8	2.200 30.4	4.500 42.9	7.500 54.8			
0.300 16.3 1.200 22.7	2.400 31.7	5.000 45.2	8.000 56.6			
0.500 15.0 1.400 24.5	2.000 32.9	6 000 47.3	9 000 60 1			
0.600 16.3 1.800 27.6	3.500 38.0	6.500 51.0	9.500 61.8			

Diameter (m) 0.110 Discharge Coefficient 0.600 Invert Level (m) 98.600

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:39	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 254 minutes.

	Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(l/s)	(l/s)	(1/s)	(l/s)	(m³)	
15	min S	Summer	98.725	0.725	0.0	17.9	5.8	23.6	344.2	ОК
30	min S	Summer	98.893	0.893	0.0	19.7	12.3	32.1	424.2	ΟK
60	min S	Summer	99.019	1.019	0.0	21.0	15.2	36.3	484.2	ΟK
120	min S	Summer	99.070	1.070	0.0	21.5	16.3	37.8	508.1	ΟK
180	min S	Summer	99.074	1.074	0.0	21.5	16.3	37.9	510.1	ΟK
240	min S	Summer	99.064	1.064	0.0	21.4	16.2	37.6	505.6	ΟK
360	min S	Summer	99.028	1.028	0.0	21.1	15.4	36.5	488.1	ΟK
480	min S	Summer	98.986	0.986	0.0	20.7	14.5	35.2	468.2	ΟK
600	min S	Summer	98.944	0.944	0.0	20.3	13.6	33.8	448.4	ΟK
720	min S	Summer	98.905	0.905	0.0	19.9	12.6	32.5	429.9	ΟK
960	min S	Summer	98.837	0.837	0.0	19.1	10.8	29.9	397.7	ΟK
1440	min S	Summer	98.741	0.741	0.0	18.0	6.9	25.0	351.8	ΟK
2160	min S	Summer	98.632	0.632	0.0	16.7	0.5	17.2	300.1	ΟK
2880	min S	Summer	98.490	0.490	0.0	16.3	0.0	16.3	232.7	ΟK
4320	min S	Summer	98.259	0.259	0.0	16.3	0.0	16.3	122.9	ΟK
5760	min S	Summer	98.182	0.182	0.0	15.4	0.0	15.4	86.5	ΟK
7200	min S	Summer	98.158	0.158	0.0	13.2	0.0	13.2	75.1	ΟK
8640	min S	Summer	98.142	0.142	0.0	11.4	0.0	11.4	67.6	ΟK
10080	min S	Summer	98.131	0.131	0.0	10.1	0.0	10.1	62.3	ΟK
15	min V	Winter	98.810	0.810	0.0	18.8	10.0	28.8	384.9	ОК
30	min V	Winter	99.003	1.003	0.0	20.9	14.9	35.8	476.5	ОК
60	min V	Winter	99.151	1.151	0.0	22.3	17.8	40.1	546.8	ОК
120	min V	Winter	99.213	1.213	0.0	22.8	18.9	41.7	576.3	ОК
180	min V	Winter	99.212	1.212	0.0	22.8	18.8	41.7	575.5	ΟK

	Storm	Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
15	min Summe	er 87.227	0.0	354.1	7.7	18
30	min Summe	er 55.777	0.0	453.8	41.9	32
60	min Summe	r 34.065	0.0	557.6	80.6	62
120	min Summe	er 20.201	0.0	661.7	118.1	104
180	min Summe	er 14.736	0.0	724.1	137.0	134
240	min Summe	r 11.736	0.0	769.1	147.6	168
360	min Summe	er 8.483	0.0	833.9	156.2	236
480	min Summe	er 6.739	0.0	883.3	154.1	306
600	min Summe	er 5.634	0.0	923.0	143.0	374
720	min Summe	er 4.865	0.0	956.5	130.4	440
960	min Summe	r 3.858	0.0	1011.3	106.4	576
1440	min Summe	er 2.780	0.0	1092.6	58.4	838
2160	min Summe	r 2.001	0.0	1181.7	2.6	1260
2880	min Summe	r 1.584	0.0	1246.9	0.0	1668
4320	min Summe	r 1.138	0.0	1343.0	0.0	2292
5760	min Summe	r 0.900	0.0	1418.2	0.0	2944
7200	min Summe	er 0.750	0.0	1476.9	0.0	3672
8640	min Summe	r 0.646	0.0	1526.2	0.0	4408
10080	min Summe	r 0.569	0.0	1568.1	0.0	5136
15	min Winte	r 87.227	0.0	397.0	21.9	18
30	min Winte	r 55.777	0.0	508.7	64.7	32
60	min Winte	r 34.065	0.0	624.7	110.6	60
120	min Winte	r 20.201	0.0	741.3	155.2	114
180	min Winte	er 14.736	0.0	811.2	178.0	140

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:39	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Winte	r 99.194	1.194	0.0	22.7	18.5	41.2	567.1	ОК
360	min Winte	r 99.135	1.135	0.0	22.1	17.5	39.6	539.0	ΟK
480	min Winte	r 99.071	1.071	0.0	21.5	16.3	37.8	508.7	ΟK
600	min Winte	r 99.010	1.010	0.0	20.9	15.1	36.0	479.8	ΟK
720	min Winte	r 98.955	0.955	0.0	20.4	13.8	34.2	453.5	ΟK
960	min Winte	r 98.862	0.862	0.0	19.4	11.5	30.9	409.3	ОК
1440	min Winte	r 98.739	0.739	0.0	18.0	6.8	24.8	350.9	ОК
2160	min Winte	r 98.583	0.583	0.0	16.3	0.0	16.3	277.1	ОК
2880	min Winte	r 98.335	0.335	0.0	16.3	0.0	16.3	159.3	ΟK
4320	min Winte	r 98.172	0.172	0.0	14.5	0.0	14.5	81.5	ОК
5760	min Winte	r 98.143	0.143	0.0	11.5	0.0	11.5	68.1	ΟK
7200	min Winte	r 98.127	0.127	0.0	9.7	0.0	9.7	60.4	ΟK
8640	min Winte	r 98.116	0.116	0.0	8.3	0.0	8.3	55.0	ΟK
10080	min Winte	r 98.107	0.107	0.0	7.3	0.0	7.3	51.0	ΟK

Stor	rm nt	Rain (mm/hr)	Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
		,,,	(m ³)	(m ³)	(m ³)	(
240 min	Winter	11.736	0.0	861.6	191.4	180
360 min	Winter	8.483	0.0	934.2	203.6	254
480 min	Winter	6.739	0.0	989.5	205.7	326
600 min	Winter	5.634	0.0	1034.0	198.9	398
720 min	Winter	4.865	0.0	1071.6	183.5	468
960 min	Winter	3.858	0.0	1132.9	148.5	604
1440 min	Winter	2.780	0.0	1223.9	74.3	880
2160 min	Winter	2.001	0.0	1323.7	0.0	1360
2880 min	Winter	1.584	0.0	1396.7	0.0	1676
4320 min	Winter	1.138	0.0	1504.6	0.0	2244
5760 min	Winter	0.900	0.0	1588.5	0.0	2944
7200 min	Winter	0.750	0.0	1654.3	0.0	3672
8640 min	Winter	0.646	0.0	1709.6	0.0	4408
10080 min	Winter	0.569	0.0	1756.8	0.0	5144

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:39	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Drainage
XP Solutions	Source Control 2015.1	
I	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years) Region En	30 CV (Summer) 0.750	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +10	
Ĩ	<u>'ime Area Diagram</u>	
Т	otal Area (ha) 2.190	
	Time (mins) Area From: To: (ha)	
	0 4 2.190	

AWP			Page 4						
Kensington Court	0031 - Royal Br	runswick Park							
Woodwater Park Pynes Hill	Preliminary Att	cenuation Sizing	4						
Exeter EX2 5TY	Phase 2		Micro						
Date 16/12/2015 15:39 Designed by gareth.jane									
File 0031-SW-03-A-PH2 ATTENUATION	Checked by		Drainage						
XP Solutions	Source Control	2015.1							
	<u>Model Details</u>								
Storage is Online Cover Level (m) 100.000									
<u>Cellul</u>	<u>ar Storage Stru</u>	<u>cture</u>							
Invert Level (m) 98.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000									
Depth (m) Area (m²) Inf. A	area (m²) Depth (m)	Area (m²) Inf. Area ((m²)						
0.000 500.0	0.0 2.000	500.0	0.0						
<u>Hydro-Brake</u>	Optimum® Outfl	<u>ow Control</u>							
IIn	it Reference MD-SHE	-0186-1640-0600-1640							
Des	ign Head (m)	0.600							
Desig	n Flow (l/s)	16.4							
	Flush-Flo™	Calculated							
ת	iameter (mm)	186 upstream storage							
Inve	rt Level (m)	98.000							
Minimum Outlet Pipe D.	iameter (mm)	225							
Suggested Manhole D.	iameter (mm)	1200							
Control Points Head (m) Fl	.ow (l/s) Cont	rol Points Head	(m) Flow (l/s)						
Design Point (Calculated) 0.600	16.3	Kick-Flo® 0.	478 14.7						
Flush-Flo™ 0.278	16.3 Mean Flow	over Head Range	- 12.9						
The hydrological calculations have been based	on the Head/Discha	rge relationship for t	the Hydro-Brake Optimum®						
as specified. Should another type of control	device other than	a Hydro-Brake Optimum®	be utilised then these						
storage routing calculations will be invalida	ted								
Depth (m) Flow (1/s) Depth (m) Flow (1/s) De	epth (m) Flow (l/s)	Depth (m) Flow (1/s)	Depth (m) Flow (1/s)						
0.100 6.5 0.800 18.7	2.000 29.0	4.000 40.5	7.000 52.9						
	2.200 30.4	4.500 42.9	7.500 54.8 8.000 56.6						
0.400 15.7 1.400 24 5	2.600 32.9	5.500 45.2	8.500 58.4						
0.500 15.0 1.600 26.1	3.000 35.3	6.000 49.3	9.000 60.1						
0.600 16.3 1.800 27.6	3.500 38.0	6.500 51.0	9.500 61.8						

Diameter (m) 0.110 Discharge Coefficient 0.600 Invert Level (m) 98.600

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:38	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	·

Half Drain Time : 328 minutes.

	Storm		Max	Max	Max	Max	Max		Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ	Outflow	Volume	
			(m)	(m)	(1/s)	(1/s)	(1/s)		(1/s)	(m³)	
15	min Summ	ner (99.110	1.110	0.0	21.9	17.0		38.9	527.3	ОК
30	min Summ	ner (99.387	1.387	0.0	24.3	21.6		46.0	658.9	0 K
60	min Summ	ner (99.604	1.604	0.0	26.1	24.6		50.7	761.8	0 K
120	min Summ	ner (99.700	1.700	0.0	26.8	25.8		52.7	807.3	0 K
180	min Sumn	ner 9	99.706	1.706	0.0	26.9	25.9		52.8	810.5	Flood Risk
240	min Sumn	ner 9	99.691	1.691	0.0	26.8	25.7		52.5	803.3	ОК
360	min Sumn	ner 9	99.631	1.631	0.0	26.3	25.0		51.3	774.9	ОК
480	min Sumn	ner 9	99.564	1.564	0.0	25.8	24.1		49.9	742.9	ОК
600	min Sumn	ner 9	99.495	1.495	0.0	25.2	23.1		48.4	709.9	ОК
720	min Sumn	ner 9	99.428	1.428	0.0	24.7	22.2		46.9	678.3	ОК
960	min Sumn	ner 9	99.309	1.309	0.0	23.7	20.4		44.1	621.9	ОК
1440	min Sumn	ner 9	99.124	1.124	0.0	22.0	17.3		39.3	534.1	ОК
2160	min Summ	ner 9	98.938	0.938	0.0	20.2	13.4		33.6	445.5	ОК
2880	min Summ	ner 9	98.816	0.816	0.0	18.9	10.1		29.0	387.5	ОК
4320	min Summ	ner 9	98.678	0.678	0.0	17.3	2.8		20.1	322.0	0 K
5760	min Summ	ner 9	98.491	0.491	0.0	16.3	0.0		16.3	233.1	ОК
7200	min Sumn	ner 9	98.284	0.284	0.0	16.3	0.0		16.3	135.1	O K
8640	min Summ	ner 9	98.201	0.201	0.0	15.9	0.0		15.9	95.6	0 K
10080	min Sumn	ner 9	98.174	0.174	0.0	14.7	0.0		14.7	82.7	O K
15	min Wint	ter 9	99.245	1.245	0.0	23.1	19.4		42.5	591.5	O K
30	min Wint	cer 9	99.561	1.561	0.0	25.8	24.0		49.8	741.4	O K
60	min Wint	ter 9	99.812	1.812	0.0	27.7	27.2		54.8	860.7	Flood Risk
120	min Wint	ter !	99.936	1.936	0.0	28.6	28.6		57.2	919.7	Flood Risk
180	min Wint	cer 9	99.929	1.929	0.0	28.5	28.5		57.0	916.2	Flood Risk

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	:	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
1 -		~	100 005	0 0	E 4 E 0	00.4	10
20	min :	summer	133.985	0.0	545.8	83.4	18
30	min :	Summer	86.337	0.0	/04.3	154.6	33
60	min S	Summer	52.933	0.0	867.4	227.3	62
120	min S	Summer	31.380	0.0	1028.8	297.1	110
180	min S	Summer	22.833	0.0	1123.0	333.5	140
240	min S	Summer	18.130	0.0	1189.0	355.5	172
360	min S	Summer	13.031	0.0	1282.0	379.4	240
480	min S	Summer	10.316	0.0	1353.3	391.6	308
600	min S	Summer	8.601	0.0	1410.3	395.8	376
720	min S	Summer	7.410	0.0	1458.1	394.0	442
960	min S	Summer	5.854	0.0	1535.7	368.7	578
1440	min S	Summer	4.194	0.0	1649.9	313.7	836
2160	min S	Summer	3.001	0.0	1773.0	240.1	1208
2880	min S	Summer	2.364	0.0	1862.4	167.3	1584
4320	min S	Summer	1.688	0.0	1993.1	32.4	2380
5760	min S	Summer	1.328	0.0	2093.0	0.0	3224
7200	min S	Summer	1.102	0.0	2170.9	0.0	3816
8640	min S	Summer	0.946	0.0	2235.9	0.0	4416
10080	min S	Summer	0.831	0.0	2291.0	0.0	5136
15	min V	Winter	133.985	0.0	611.7	113.3	18
30	min V	Winter	86.337	0.0	789.3	195.6	32
60	min V	Winter	52.933	0.0	971.7	279.5	60
120	min V	Winter	31.380	0.0	1152.5	360.6	116
180	min V	Winter	22.833	0.0	1258.0	403.8	146

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:38	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflor (l/s)	Max W Volume (m³)	Status
240	min W	Winter	99.903	1.903	0.0	28.3	28.2	56.	5 904.0	Flood Risk
360	min W	Winter	99.811	1.811	0.0	27.7	27.2	54.	8 860.0	Flood Risk
480	min W	Winter	99.709	1.709	0.0	26.9	25.9	52.	8 811.9	Flood Risk
600	min W	Winter	99.609	1.609	0.0	26.1	24.7	50.	3 764 . 1	O K
720	min W	Winter	99.514	1.514	0.0	25.4	23.4	48.	8 719.2	O K
960	min W	Winter	99.349	1.349	0.0	24.0	21.0	45.	1 640.8	O K
1440	min W	Winter	99.105	1.105	0.0	21.8	16.9	38.	8 525.1	O K
2160	min W	Winter	98.883	0.883	0.0	19.6	12.1	31.	7 419.2	O K
2880	min W	Winter	98.759	0.759	0.0	18.3	8.1	26.	4 360.4	O K
4320	min W	Winter	98.571	0.571	0.0	16.3	0.0	16.	3 271.3	O K
5760	min W	Winter	98.225	0.225	0.0	16.1	0.0	16.	1 107.0	O K
7200	min W	Winter	98.168	0.168	0.0	14.2	0.0	14.	2 79.9	O K
8640	min W	Winter	98.149	0.149	0.0	12.2	0.0	12.	2 70.8	O K
10080	min W	Winter	98.136	0.136	0.0	10.7	0.0	10.	7 64.7	O K

Storm Event		Rain (mm/hr)	Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m ³)	(m³)	
240	min Wint	er 18.130	0.0	1331.9	430.7	182
360	min Wint	er 13.031	0.0	1436.1	461.3	258
480	min Wint	er 10.316	0.0	1515.9	478.4	332
600	min Wint	er 8.601	0.0	1579.8	486.3	404
720	min Winte	er 7.410	0.0	1633.3	487.7	474
960	min Wint	er 5.854	0.0	1720.3	472.8	608
1440	min Winte	er 4.194	0.0	1848.1	396.8	866
2160	min Wint	er 3.001	0.0	1985.9	283.2	1252
2880	min Winte	er 2.364	0.0	2086.1	162.5	1616
4320	min Wint	er 1.688	0.0	2232.7	0.0	2592
5760	min Wint	er 1.328	0.0	2344.3	0.0	3112
7200	min Winte	er 1.102	0.0	2431.6	0.0	3672
8640	min Wint	er 0.946	0.0	2504.4	0.0	4400
10080	min Wint	er 0.831	0.0	2566.4	0.0	5136

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 2	Micco
Date 16/12/2015 15:38	Designed by gareth.jane	Desinado
File 0031-SW-03-A-PH2 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	
]	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	aland and Walco	
M5-60 (mm)	20 100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +30	
	<u>'ime Area Diagram</u>	
г	Cotal Area (ha) 2.190	
	Time (mins) Area From: To: (ha) 0 4 2.190	

AWP			Page 4
Kensington Court	0031 - Royal Br	runswick Park	
Woodwater Park Pynes Hill	Preliminary Att	enuation Sizing	4
Exeter EX2 5TY	Phase 2		Micco
Date 16/12/2015 15:38	Designed by gar	reth.jane	Designation
File 0031-SW-03-A-PH2 ATTENUATION	Checked by		Diamatje
XP Solutions	Source Control	2015.1	
	Model Details		
Storage is O	nline Cover Level (m) 100.000	
Cellula	<u>ar Storage Stru</u>	<u>cture</u>	
Inve Infiltration Coefficient	ert Level (m) 98.0 t Base (m/hr) 0.000 t Side (m/hr) 0.000	00 Safety Factor 2.0 00 Porosity 0.95)
Depth (m) Area (m ²) Inf. A	rea (m ²) Depth (m)	Area (m ²) Inf. Area	(m²)
0.000 500.0	0.0 2.000	500.0	0.0
<u>Hydro-Brake</u>	Optimum® Outfl	<u>ow Control</u>	
Uni	t Reference MD-SHE	-0186-1640-0600-1640	
Desi	lgn Head (m)	0.600	
Design	Flush-Flo™	Calculated	
	Objective Minim	ise upstream storage	
Di	Lameter (mm)	186	
Inver Minimum Outlet Pipe Di	rt Level (m) Lameter (mm)	98.000	
Suggested Manhole Di	Lameter (mm)	1200	
Control Points Head (m) Flo	ow (1/s) Cont	rol Points Head	(m) Flow (l/s)
Design Point (Calculated) 0.600	16.3	Kick-Flo® 0.	.478 14.7
Flush-Flo™ 0.278	16.3 Mean Flow	over Head Range	- 12.9
The hydrological calculations have been based as specified. Should another type of control storage routing calculations will be invalidat	on the Head/Discha device other than ted	rge relationship for a Hydro-Brake Optimum	the Hydro-Brake Optimum® ® be utilised then these
Depth (m) Flow (1/s) Depth (m) Flow (1/s) De	epth (m) Flow (l/s)	Depth (m) Flow (1/s)	Depth (m) Flow (1/s)
0.100 6.5 0.800 18.7	2.000 29.0	4.000 40.5	7.000 52.9
0.200 15.9 1.000 20.8	2.200 30.4	4.500 42.9	7.500 54.8
0.300 16.3 1.200 22.7	2.400 31.7	5.000 45.2	8.000 56.6
0.400 15.7 1.400 24.5	2.600 32.9	5.500 47.3	8.500 58.4
0.600 16.3 1.800 27.6	3.500 38.0	6.500 51.0	9.500 61.8

Diameter (m) 0.110 Discharge Coefficient 0.600 Invert Level (m) 98.600

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:44	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 92 minutes.

Storm		Max	Max	Max	Max	Max	Max	Max	Status
Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
		(m)	(m)	(1/s)	(l/s)	(1/s)	(l/s)	(m³)	
min S	limmer	98 373	0 373	0 0	4 6	0 0	4 6	30 1	ОК
min S	Summer	98 453	0.373	0.0	4 6	0.0	4 6	36.6	0 K
min S	lummer	98 505	0 505	0.0	4 6	0.0	4 6	40.8	0 K
min S	Summer	98 507	0.505	0.0	4 6	0.0	4 6	41 0	0 K
min S	lummer	98 490	0.290	0.0	4 6	0.0	4 6	39.6	0 K
min S	lummer	98 464	0.450	0.0	4.6	0.0	4.6	37 5	0 K
min S	Summer	98 408	0.408	0.0	4 6	0.0	4 6	33 0	0 K
min S	lummer	98 355	0 355	0.0	4 6	0.0	4 6	28 6	0 K
min S	Summer	98 306	0.306	0.0	4 6	0.0	4 6	20.0	0 K
min S	lummer	98 264	0 264	0.0	4 6	0.0	4 6	21.7	0 K
min S	Summer	98 198	0.198	0.0	4 6	0.0	4 6	16 0	0 K
min S	lummer	98 127	0 127	0.0	1.0 4 4	0.0	4 4	10.3	0 K
min S	Summer	98 098	0.127	0.0	35	0.0	3 5	7 9	0 K
min S	lummer	98 083	0.083	0.0	2 9	0.0	2 9	67	0 K
min S	lummer	98 068	0.005	0.0	2.5	0.0	2.5	55	0 K
min S	lummor	98 060	0.000	0.0	1 7	0.0	1 7	1 8	0 K
min S	lummer	98 054	0.000	0.0	1 4	0.0	1 4	1.0 4 4	0 K
min S	lummer	98 050	0.050	0.0	1 2	0.0	1 2	4 0	0 K
min S	lummer	98 047	0.030	0.0	1 1	0.0	1 1	3.8	0 K
min W	linter	98 /21	0.0121	0.0	1.1	0.0	1.1	34 0	0 K
min W	linter	98 516	0.516	0.0	4.6	0.0	4.6	21.0 41.7	0 K
min W	lintor	Q8 577	0.510	0.0	1.0	0.0	4.0	16 6	0 K
min M	linter	98 579	0.579	0.0	1.0	0.0	0	46.8	OK
min W	linter	98 556	0 556	0.0	4.6	0.0	4.6	44 9	0 K
	Storm Event min S min S	Storm Event min Summer min Summer	StormMaxEventLevelmin98.373min98.453min98.505min98.507min98.507min98.403min98.401min98.401min98.403min98.403min98.404min98.403min98.404min98.404min98.404min98.404min98.404min98.404min98.404min98.004min98.014min98.024min98.026min98.004min98.005min98.004min98.014min98.026min98	StormMaxMaxLevelLevelCapthLevelSameCapthminSummer98.3730.373minSummer98.4530.453minSummer98.5050.505minSummer98.5070.507minSummer98.4640.404minSummer98.4640.404minSummer98.4640.404minSummer98.4080.403minSummer98.4080.404minSummer98.3050.355minSummer98.1270.127minSummer98.0380.008minSummer98.0380.008minSummer98.0380.008minSummer98.0420.0161minSummer98.0580.051minSummer98.0580.051minSummer98.0510.051minSummer98.0510.051minSummer98.0510.051minSummer98.0510.051minSummer98.0510.051minSummer98.0510.51minSummer98.0510.51minSummer98.0510.51minSummer98.0510.51minSummer98.0510.57minSummer98.0510.57minSummer98.0510.57min	StormMaxMaxMaxLevelDepthInfiltration (1/s)min Summer98.3730.3730.00min Summer98.4530.4530.00min Summer98.5050.5050.00min Summer98.5070.5070.00min Summer98.4640.4640.00min Summer98.4640.4640.00min Summer98.4640.4640.00min Summer98.4640.4640.00min Summer98.4640.4080.00min Summer98.3550.3550.00min Summer98.2640.2640.00min Summer98.1270.1270.00min Summer98.1280.0180.00min Summer98.0480.0080.00min Summer98.0580.0080.00min Summer98.0580.0050.00min Summer98.0500.0050.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.0500.00min Summer98.0500.5760.00min Summer <td>StormMaxMaxMaxMaxMaxMaxMaxLevelDepthInfiltrationControlminSummer98.3730.3730.004.6minSummer98.4530.4530.004.6minSummer98.5050.5050.004.6minSummer98.5070.5070.004.6minSummer98.5070.5070.004.6minSummer98.4080.4080.004.6minSummer98.4080.4080.004.6minSummer98.4080.4080.004.6minSummer98.3050.3550.004.6minSummer98.3060.3060.004.6minSummer98.3050.3060.004.6minSummer98.1270.1270.004.6minSummer98.1270.1270.004.6minSummer98.0380.0980.003.5minSummer98.0680.0680.002.1minSummer98.0500.0500.001.1minSummer98.0500.0500.001.1minSummer98.0500.0510.001.1minSummer98.0500.0500.001.1minSummer98.0500.0510.001.1minSummer98.0500.057<!--</td--><td>Storm EventMax Level (m)Max Paph Opph (l/s)Max Infiltration (l/s)Max Opph Opph (l/s)Max Paph Opph (l/s)minSummer98.3730.3730.0.04.60.0minSummer98.4530.4530.004.60.0minSummer98.5050.5050.004.60.0minSummer98.5070.5070.004.60.0minSummer98.4090.4090.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.3060.004.60.0minSummer98.3050.3550.004.60.0minSummer98.1270.1270.004.60.0minSummer98.0830.0830.003.50.0minSummer98.0630.0640.01.10.0minSummer98.0540.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.1<td< td=""><td>StormMaxMaxMaxMaxMaxMaxMaxMaxLevelDeptInfiltrationControlCyerfloxSCulfloxminSummer98.3730.3730.004.60.004.6minSummer98.4530.4530.004.60.004.6minSummer98.5050.5050.004.60.004.6ninSummer98.5070.5070.004.60.004.6ninSummer98.4080.4040.004.60.004.6ninSummer98.4080.4080.004.60.004.6ninSummer98.4080.3060.004.60.004.6ninSummer98.3050.3550.004.60.004.6ninSummer98.3050.3060.004.60.004.6ninSummer98.1270.1270.004.60.004.6ninSummer98.0800.0830.002.10.002.2ninSummer98.0800.0680.001.10.001.1ninSummer98.0500.0570.001.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.1</td></td<><td>Storm EventMax Level (m)Max opp opp (m)Max filtration (n/s)Max control (n/s)Max s p sMax p s p sMax p s p sMax p p sMax p p p sMax p</td></td></td>	StormMaxMaxMaxMaxMaxMaxMaxLevelDepthInfiltrationControlminSummer98.3730.3730.004.6minSummer98.4530.4530.004.6minSummer98.5050.5050.004.6minSummer98.5070.5070.004.6minSummer98.5070.5070.004.6minSummer98.4080.4080.004.6minSummer98.4080.4080.004.6minSummer98.4080.4080.004.6minSummer98.3050.3550.004.6minSummer98.3060.3060.004.6minSummer98.3050.3060.004.6minSummer98.1270.1270.004.6minSummer98.1270.1270.004.6minSummer98.0380.0980.003.5minSummer98.0680.0680.002.1minSummer98.0500.0500.001.1minSummer98.0500.0500.001.1minSummer98.0500.0510.001.1minSummer98.0500.0500.001.1minSummer98.0500.0510.001.1minSummer98.0500.057 </td <td>Storm EventMax Level (m)Max Paph Opph (l/s)Max Infiltration (l/s)Max Opph Opph (l/s)Max Paph Opph (l/s)minSummer98.3730.3730.0.04.60.0minSummer98.4530.4530.004.60.0minSummer98.5050.5050.004.60.0minSummer98.5070.5070.004.60.0minSummer98.4090.4090.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.3060.004.60.0minSummer98.3050.3550.004.60.0minSummer98.1270.1270.004.60.0minSummer98.0830.0830.003.50.0minSummer98.0630.0640.01.10.0minSummer98.0540.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.1<td< td=""><td>StormMaxMaxMaxMaxMaxMaxMaxMaxLevelDeptInfiltrationControlCyerfloxSCulfloxminSummer98.3730.3730.004.60.004.6minSummer98.4530.4530.004.60.004.6minSummer98.5050.5050.004.60.004.6ninSummer98.5070.5070.004.60.004.6ninSummer98.4080.4040.004.60.004.6ninSummer98.4080.4080.004.60.004.6ninSummer98.4080.3060.004.60.004.6ninSummer98.3050.3550.004.60.004.6ninSummer98.3050.3060.004.60.004.6ninSummer98.1270.1270.004.60.004.6ninSummer98.0800.0830.002.10.002.2ninSummer98.0800.0680.001.10.001.1ninSummer98.0500.0570.001.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.1</td></td<><td>Storm EventMax Level (m)Max opp opp (m)Max filtration (n/s)Max control (n/s)Max s p sMax p s p sMax p s p sMax p p sMax p p p sMax p</td></td>	Storm EventMax Level (m)Max Paph Opph (l/s)Max Infiltration (l/s)Max Opph Opph (l/s)Max Paph Opph (l/s)minSummer98.3730.3730.0.04.60.0minSummer98.4530.4530.004.60.0minSummer98.5050.5050.004.60.0minSummer98.5070.5070.004.60.0minSummer98.4090.4090.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.4080.004.60.0minSummer98.4080.3060.004.60.0minSummer98.3050.3550.004.60.0minSummer98.1270.1270.004.60.0minSummer98.0830.0830.003.50.0minSummer98.0630.0640.01.10.0minSummer98.0540.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.10.0minSummer98.0470.0470.01.1 <td< td=""><td>StormMaxMaxMaxMaxMaxMaxMaxMaxLevelDeptInfiltrationControlCyerfloxSCulfloxminSummer98.3730.3730.004.60.004.6minSummer98.4530.4530.004.60.004.6minSummer98.5050.5050.004.60.004.6ninSummer98.5070.5070.004.60.004.6ninSummer98.4080.4040.004.60.004.6ninSummer98.4080.4080.004.60.004.6ninSummer98.4080.3060.004.60.004.6ninSummer98.3050.3550.004.60.004.6ninSummer98.3050.3060.004.60.004.6ninSummer98.1270.1270.004.60.004.6ninSummer98.0800.0830.002.10.002.2ninSummer98.0800.0680.001.10.001.1ninSummer98.0500.0570.001.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.1</td></td<> <td>Storm EventMax Level (m)Max opp opp (m)Max filtration (n/s)Max control (n/s)Max s p sMax p s p sMax p s p sMax p p sMax p p p sMax p</td>	StormMaxMaxMaxMaxMaxMaxMaxMaxLevelDeptInfiltrationControlCyerfloxSCulfloxminSummer98.3730.3730.004.60.004.6minSummer98.4530.4530.004.60.004.6minSummer98.5050.5050.004.60.004.6ninSummer98.5070.5070.004.60.004.6ninSummer98.4080.4040.004.60.004.6ninSummer98.4080.4080.004.60.004.6ninSummer98.4080.3060.004.60.004.6ninSummer98.3050.3550.004.60.004.6ninSummer98.3050.3060.004.60.004.6ninSummer98.1270.1270.004.60.004.6ninSummer98.0800.0830.002.10.002.2ninSummer98.0800.0680.001.10.001.1ninSummer98.0500.0570.001.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.10.01.1ninSummer98.0500.0570.01.1	Storm EventMax Level (m)Max opp opp (m)Max filtration (n/s)Max control (n/s)Max s p sMax p s p sMax p s p sMax p p sMax p p p sMax p

	Storm	Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
15	min Summer	41.734	0.0	33.1	0.0	18
30	min Summer	26.594	0.0	42.2	0.0	32
60	min Summer	16.285	0.0	51.8	0.0	60
120	min Summer	9.752	0.0	62.1	0.0	98
180	min Summer	7.183	0.0	68.6	0.0	130
240	min Summer	5.773	0.0	73.5	0.0	164
360	min Summer	4.234	0.0	80.9	0.0	230
480	min Summer	3.389	0.0	86.4	0.0	294
600	min Summer	2.851	0.0	90.8	0.0	356
720	min Summer	2.475	0.0	94.6	0.0	416
960	min Summer	1.980	0.0	100.9	0.0	530
1440	min Summer	1.445	0.0	110.4	0.0	750
2160	min Summer	1.055	0.0	121.0	0.0	1104
2880	min Summer	0.844	0.0	129.0	0.0	1468
4320	min Summer	0.616	0.0	141.2	0.0	2200
5760	min Summer	0.492	0.0	150.6	0.0	2928
7200	min Summer	0.414	0.0	158.2	0.0	3672
8640	min Summer	0.359	0.0	164.8	0.0	4368
10080	min Summer	0.319	0.0	170.5	0.0	5120
15	min Winter	41.734	0.0	37.1	0.0	18
30	min Winter	26.594	0.0	47.3	0.0	32
60	min Winter	16.285	0.0	58.1	0.0	60
120	min Winter	9.752	0.0	69.6	0.0	110
180	min Winter	7.183	0.0	76.9	0.0	138

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:44	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wint	er 98.522	0.522	0.0	4.6	0.0	4.6	42.2	ОК
360	min Wint	er 98.435	0.435	0.0	4.6	0.0	4.6	35.1	ОК
480	min Wint	er 98.349	0.349	0.0	4.6	0.0	4.6	28.2	ОК
600	min Wint	er 98.275	0.275	0.0	4.6	0.0	4.6	22.2	ОК
720	min Wint	er 98.215	0.215	0.0	4.6	0.0	4.6	17.4	ОК
960	min Wint	er 98.139	0.139	0.0	4.5	0.0	4.5	11.2	ОК
1440	min Wint	er 98.099	0.099	0.0	3.6	0.0	3.6	8.0	ОК
2160	min Wint	er 98.078	0.078	0.0	2.6	0.0	2.6	6.3	ОК
2880	min Wint	er 98.068	0.068	0.0	2.1	0.0	2.1	5.5	ОК
4320	min Wint	er 98.056	0.056	0.0	1.5	0.0	1.5	4.5	ОК
5760	min Wint	er 98.050	0.050	0.0	1.2	0.0	1.2	4.0	ОК
7200	min Wint	er 98.045	0.045	0.0	1.0	0.0	1.0	3.6	ОК
8640	min Wint	er 98.042	0.042	0.0	0.9	0.0	0.9	3.4	ОК
10080	min Wint	er 98.039	0.039	0.0	0.8	0.0	0.8	3.1	ОК

Storm Event		Rain (mm/hr)	Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m ³)	(m ³)	、 - ,
240 mi	In Winter	5.773	0.0	82.4	0.0	178
360 mi	In Winter	4.234	0.0	90.6	0.0	250
480 mi	In Winter	3.389	0.0	96.7	0.0	314
600 mi	In Winter	2.851	0.0	101.7	0.0	374
720 mi	In Winter	2.475	0.0	106.0	0.0	430
960 mi	In Winter	1.980	0.0	113.0	0.0	530
1440 mi	In Winter	1.445	0.0	123.7	0.0	750
2160 mi	In Winter	1.055	0.0	135.5	0.0	1104
2880 mi	In Winter	0.844	0.0	144.5	0.0	1468
4320 mi	In Winter	0.616	0.0	158.1	0.0	2176
5760 mi	In Winter	0.492	0.0	168.7	0.0	2920
7200 mi	In Winter	0.414	0.0	177.2	0.0	3672
8640 mi	In Winter	0.359	0.0	184.6	0.0	4416
10080 mi	ln Winter	0.319	0.0	191.0	0.0	5120

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:44	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Drainage
XP Solutions	Source Control 2015.1	
Ī	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	2 Cv (Summer) 0.750	
Region En M5-60 (mm)	gland and Wales CV (Winter) 0.840	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +0	
<u>т</u> т	<u>'ime Area Diagram</u> Total Area (ha) 0.425	
	Time (mins) Area From: To: (ha)	
	0 4 0.425	
1		

AWP				Page 4					
Kensington Court	0031 - Roy	al Brunswick Park							
Woodwater Park Pynes Hill	Preliminar	y Attenuation Siz	ing	L.					
Exeter EX2 5TY	Phase 3			Micro					
Date 16/12/2015 15:44	Designed b	y gareth.jane		Desinargo					
File 0031-SW-04-A-PH3 ATTENUATIO	ON Checked by			Dialitage					
XP Solutions	Source Con	trol 2015.1		I					
Model Details									
	<u>Cellular Storage Structure</u>								
Invert Level (m) 98.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000									
0.000 85.	0 0.0	2.000 85.0	0.0						
lundar	-Brake Optimum® (utflow Control							
		CONCLOY							
	Unit Reference M Design Head (m)	ID-SHE-0106-4700-0700- (4700						
	Design Flow (l/s) Flush-Flo™	Calcul	4./ ated						
	Objective	Minimise upstream sto	rage						
	Diameter (mm)		106						
Minimum Outle	Invert Level (m)	98	150						
Suggested M	anhole Diameter (mm)		1200						
Control Points Hea	d (m) Flow (l/s)	Control Points	Head (m)	Flow (l/s)					
Design Point (Calculated) Flush-Flo™	0.700 4.6 0.211 4.6 Mean	Kick-Flo® Flow over Head Range	0.477	3.9 4.0					
The hydrological calculations have be as specified. Should another type of storage routing calculations will be	The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated								
Depth (m) Flow (l/s) Depth (m) Flow	(1/s) Depth (m) Flow	(l/s) Depth (m) Flow	(l/s) Dept	th (m) Flow (l/s)					
0.100 3.6 0.800	4.9 2.000	7.6 4.000	10.5	7.000 13.7					
0.200 4.6 1.000	5.5 2.200	7.9 4.500	11.1	7.500 14.1					
0.300 4.5 1.200	6.0 2.400	8.2 5.000	11.7	8.000 14.6					
	6.4 2.600 6.8 3.000	8.6 5.500 9.2 6.000	$\begin{bmatrix} 12.2 \\ 12.7 \end{bmatrix}$	8.500 15.1 9.000 15.5					
0.600 4.3 1.800	7.2 3.500	9.8 6.500	13.2	9.500 15.9					

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 98.700

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:43	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 161 minutes.

	Storm Event		Max	Max	Max	Max	Max	Max		Max	Status
			Level	Depth	Infiltration	Control	Overflow	Σ	Outflow	Volume	
			(m)	(m)	(1/s)	(1/s)	(1/s)		(1/s)	(m³)	
15	min	Summer	98.808	0.808	0.0	5.0	2.1		7.0	65.2	ОК
30	min	Summer	98.975	0.975	0.0	5.4	3.7		9.1	78.8	ОК
60	min	Summer	99.072	1.072	0.0	5.6	4.4		10.0	86.6	ΟK
120	min	Summer	99.092	1.092	0.0	5.7	4.5		10.2	88.2	ΟK
180	min	Summer	99.073	1.073	0.0	5.6	4.4		10.0	86.6	ΟK
240	min	Summer	99.040	1.040	0.0	5.6	4.2		9.8	84.0	ΟK
360	min	Summer	98.972	0.972	0.0	5.4	3.7		9.1	78.5	ΟK
480	min	Summer	98.913	0.913	0.0	5.2	3.2		8.5	73.7	ΟK
600	min	Summer	98.863	0.863	0.0	5.1	2.7		7.8	69.7	ΟK
720	min	Summer	98.822	0.822	0.0	5.0	2.3		7.3	66.4	ΟK
960	min	Summer	98.760	0.760	0.0	4.8	1.0		5.8	61.4	ΟK
1440	min	Summer	98.601	0.601	0.0	4.6	0.0		4.6	48.5	ΟK
2160	min	Summer	98.327	0.327	0.0	4.6	0.0		4.6	26.4	ΟK
2880	min	Summer	98.183	0.183	0.0	4.6	0.0		4.6	14.8	ΟK
4320	min	Summer	98.108	0.108	0.0	3.9	0.0		3.9	8.7	ΟK
5760	min	Summer	98.088	0.088	0.0	3.1	0.0		3.1	7.1	ΟK
7200	min	Summer	98.078	0.078	0.0	2.6	0.0		2.6	6.3	ΟK
8640	min	Summer	98.070	0.070	0.0	2.2	0.0		2.2	5.7	ΟK
10080	min	Summer	98.065	0.065	0.0	2.0	0.0		2.0	5.3	ΟK
15	min	Winter	98.903	0.903	0.0	5.2	3.1		8.3	72.9	ΟK
30	min	Winter	99.098	1.098	0.0	5.7	4.6		10.3	88.7	ΟK
60	min	Winter	99.218	1.218	0.0	6.0	5.2		11.2	98.4	ΟK
120	min	Winter	99.237	1.237	0.0	6.0	5.3		11.4	99.9	ОК
180	min	Winter	99.206	1.206	0.0	6.0	5.2		11.1	97.4	ΟK

Storm			Rain	Flooded	Discharge	Overflow	Time-Peak	
Event			(mm/hr)	Volume	Volume	Volume	(mins)	
				(m³)	(m³)	(m³)		
		_						
15	min	Summer	87.227	0.0	69.4	1.9	18	
30	min	Summer	55.777	0.0	88.7	8.8	32	
60	min	Summer	34.065	0.0	108.5	16.2	60	
120	min	Summer	20.201	0.0	128.7	22.4	90	
180	min	Summer	14.736	0.0	140.8	24.7	124	
240	min	Summer	11.736	0.0	149.6	25.1	158	
360	min	Summer	8.483	0.0	162.2	22.0	228	
480	min	Summer	6.739	0.0	171.8	18.1	296	
600	min	Summer	5.634	0.0	179.5	14.5	362	
720	min	Summer	4.865	0.0	186.0	10.9	432	
960	min	Summer	3.858	0.0	196.7	3.7	570	
1440	min	Summer	2.780	0.0	212.5	0.0	852	
2160	min	Summer	2.001	0.0	229.5	0.0	1192	
2880	min	Summer	1.584	0.0	242.2	0.0	1524	
4320	min	Summer	1.138	0.0	261.1	0.0	2204	
5760	min	Summer	0.900	0.0	275.3	0.0	2936	
7200	min	Summer	0.750	0.0	286.8	0.0	3672	
8640	min	Summer	0.646	0.0	296.4	0.0	4400	
10080	min	Summer	0.569	0.0	304.7	0.0	5072	
15	min	Winter	87.227	0.0	77.7	5.0	18	
30	min	Winter	55.777	0.0	99.4	13.7	31	
60	min	Winter	34.065	0.0	121.5	22.5	58	
120	min	Winter	20.201	0.0	144.2	30.2	94	
180	min	Winter	14.736	0.0	157.7	33.3	132	
AWP		Page 2						
-----------------------------------	--------------------------------	-----------						
Kensington Court	0031 - Royal Brunswick Park							
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.						
Exeter EX2 5TY	Phase 3	Micco						
Date 16/12/2015 15:43	Designed by gareth.jane	Desinance						
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage						
XP Solutions	Source Control 2015.1							

	Storm Event	M Le (:	ax vel m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Win	ter 99.	.157	1.157	0.0	5.8	4.9	10.8	93.4	ОК
360	min Win	ter 99.	.055	1.055	0.0	5.6	4.3	9.9	85.2	ОК
480	min Win	ter 98.	.970	0.970	0.0	5.4	3.7	9.1	78.3	ΟK
600	min Win	ter 98.	.900	0.900	0.0	5.2	3.1	8.3	72.7	ΟK
720	min Win	ter 98.	.844	0.844	0.0	5.1	2.5	7.6	68.2	ΟK
960	min Win	ter 98.	765	0.765	0.0	4.8	1.2	6.0	61.8	ОК
1440	min Win	ter 98.	529	0.529	0.0	4.6	0.0	4.6	42.7	ОК
2160	min Win	ter 98.	.171	0.171	0.0	4.6	0.0	4.6	13.8	ΟK
2880	min Win	ter 98.	.109	0.109	0.0	3.9	0.0	3.9	8.8	ОК
4320	min Win	ter 98.	.083	0.083	0.0	2.9	0.0	2.9	6.7	ОК
5760	min Win	ter 98.	.071	0.071	0.0	2.3	0.0	2.3	5.7	ОК
7200	min Win	ter 98.	.063	0.063	0.0	1.9	0.0	1.9	5.1	ОК
8640	min Win	ter 98.	.058	0.058	0.0	1.6	0.0	1.6	4.7	ΟK
10080	min Win	ter 98.	054	0.054	0.0	1.4	0.0	1.4	4.3	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Wintow	11 726	0 0	1.07 5	24.2	170
240	min winter	11./36	0.0	107.5	34.3	1/0
360	min Winter	8.483	0.0	181.6	32.8	242
480	min Winter	6.739	0.0	192.4	27.6	314
600	min Winter	5.634	0.0	201.0	22.4	382
720	min Winter	4.865	0.0	208.3	17.0	454
960	min Winter	3.858	0.0	220.3	5.7	604
1440	min Winter	2.780	0.0	238.0	0.0	922
2160	min Winter	2.001	0.0	257.1	0.0	1188
2880	min Winter	1.584	0.0	271.3	0.0	1472
4320	min Winter	1.138	0.0	292.4	0.0	2188
5760	min Winter	0.900	0.0	308.4	0.0	2904
7200	min Winter	0.750	0.0	321.2	0.0	3584
8640	min Winter	0.646	0.0	332.0	0.0	4400
10080	min Winter	0.569	0.0	341.3	0.0	5128

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:43	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamaye
XP Solutions	Source Control 2015.1	
R	ainfall Details	
Rainiali Model Return Period (years)	30 Cv (Summer) 0.750	
Region Eng	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R Summer Storms	U.446 Longest Storm (mins) 10080 Ves Climate Change & +10	
	ies officie ondrige of the	
<u>T:</u>	<u>ime Area Diagram</u>	
Тс	otal Area (ha) 0.425	
1	Time (mins) Area From: To: (ha)	
	0 4 0.425	

AWP			Page 4								
Kensington Court	0031 - Royal Br	unswick Park									
Woodwater Park Pynes Hill	Preliminary Att	enuation Sizing	4								
Exeter EX2 5TY	Phase 3		Micro								
Date 16/12/2015 15:43	Designed by gar	eth.jane	IVIILI U								
File 0031-SW-04-A-PH3 ATTENUATION	Checked by		Drainage								
XP Solutions	Source Control	2015.1									
Model Details											
Storage is Online Cover Level (m) 100.000											
Caller											
	ar storage struc	cture									
Inve	ert Level (m) 98.00	0 Safety Factor 2.0									
Infiltration Coefficient	Base (m/hr) 0.0000	DO Porosity 0.95									
Infiltration Coefficient	: Side (m/hr) 0.0000	00									
Depth (m) Area (m²) Inf. A:	rea (m²) Depth (m)	Area (m²) Inf. Area (m	²)								
0.000 85.0	0.0 2.000	85.0 0	.0								
Hydro-Brake	Ontimum® Outfle	w Control									
<u>nydro brake</u>		<u>w concror</u>									
Uni	t Reference MD-SHE-	0106-4700-0700-4700									
Desi	gn Head (m)	0.700									
Design	Flow (1/S) Flush-Flo™	4./ Calculated									
	Objective Minimi	.se upstream storage									
Di	ameter (mm)	106									
Inver	t Level (m)	98.000									
Minimum Outlet Pipe Di Suggested Manhole Di	ameter (mm)	150 1200									
		1200									
Control Points Head (m) Flo	ow (1/s) Contr	col Points Head (m	n) Flow (l/s)								
Design Point (Calculated) 0.700	4.6	Kick-Flo® 0.47	77 3.9								
Flush-Flo™ 0.211	4.6 Mean Flow	over Head Range	- 4.0								
The hydrological calculations have been based	on the Head/Dischar	rae relationship for th	e Hudro-Brake Ontimum®								
as specified. Should another type of control	device other than a	a Hydro-Brake Optimum® 1	be utilised then these								
storage routing calculations will be invalidat	ed										
$\mathbf{D}_{\mathbf{r}} = \mathbf{D}_{\mathbf{r}} + \mathbf{D}_{\mathbf{r}} = \mathbf{D}_{\mathbf{r}} + $	$r = \frac{1}{2}$	Donth (m) Elow $(1/a)$	Conth (m) Elem (1/a)								
Depth (m) FIOW (1/5) Depth (m) FIOW (1/5) De	Pon (m) riow (1/S)	Debru (m) trow (1/2)	лероп (ш, гтом (т/s)								
0.100 3.6 0.800 4.9	2.000 7.6	4.000 10.5	7.000 13.7								
0.200 4.6 1.000 5.5	2.200 7.9	4.500 11.1	7.500 14.1								
	2.400 8.2	5.000 11.7	8.000 14.6								
	2.000 8.6	5.500 12.2 6.000 12.7	8.000 15.L 9.000 15 5								
0.000 4.0 1.000 0.8	5.000 9.2	0.000 12./	9.000 IJ.J								

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:42	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 228 minutes.

	Storm		Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(l/s)	(l/s)	(1/s)	(l/s)	(m³)	
						<i>c o</i>				
15	min S	Summer	99.238	1.238	0.0	6.0	5.4	11.4	99.9	OK
30	min S	Summer	99.520	1.520	0.0	6.6	6.7	13.3	122.8	ОК
60	min S	Summer	99.702	1.702	0.0	7.0	7.4	14.4	137.4	Flood Risk
120	min S	Summer	99.749	1.749	0.0	7.1	7.6	14.7	141.2	Flood Risk
180	min S	Summer	99.727	1.727	0.0	7.1	7.5	14.6	139.5	Flood Risk
240	min S	Summer	99.678	1.678	0.0	7.0	7.3	14.3	135.5	O K
360	min S	Summer	99.558	1.558	0.0	6.7	6.8	13.6	125.8	O K
480	min S	Summer	99.451	1.451	0.0	6.5	6.4	12.9	117.2	ОК
600	min S	Summer	99.358	1.358	0.0	6.3	6.0	12.3	109.7	0 K
720	min S	Summer	99.278	1.278	0.0	6.1	5.6	11.7	103.2	ОК
960	min S	Summer	99.146	1.146	0.0	5.8	4.8	10.7	92.5	ОК
1440	min S	Summer	98.962	0.962	0.0	5.4	3.6	9.0	77.7	ОК
2160	min S	Summer	98.802	0.802	0.0	4.9	2.0	6.9	64.8	ОК
2880	min S	Summer	98.693	0.693	0.0	4.6	0.0	4.6	56.0	ОК
4320	min S	Summer	98.277	0.277	0.0	4.6	0.0	4.6	22.4	ОК
5760	min S	Summer	98.133	0.133	0.0	4.5	0.0	4.5	10.7	ОК
7200	min S	Summer	98.106	0.106	0.0	3.8	0.0	3.8	8.5	ОК
8640	min S	Summer	98.092	0.092	0.0	3.3	0.0	3.3	7.4	ОК
10080	min S	Summer	98.083	0.083	0.0	2.9	0.0	2.9	6.7	ОК
15	min W	linter	99.390	1.390	0.0	6.4	6.1	12.5	112.2	ОК
30	min W	linter	99.715	1.715	0.0	7.0	7.5	14.5	138.5	Flood Risk
60	min W	linter	99.934	1.934	0.0	7.4	8.2	15.7	156.2	Flood Risk
120	min W	linter	99,982	1.982	0.0	7.5	8.4	15.9	160.0	Flood Risk
180	min W	linter	99.942	1.942	0.0	7.5	8.3	15.7	156.9	Flood Risk

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak	
	Event	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
15	min	Summor	133 085	0 0	106 6	18 0	1.8
30	min	Summor	86 337	0.0	137 /	32 5	32
50	min	Summor	52 933	0.0	169 7	16.9	52
120	min	Summor	31 380	0.0	200.0	59.8	92
190	min	Summor	27.200	0.0	210.0	65 7	126
240	min	Summer	18 130	0.0	210.5	68 6	160
360	min	Summor	13 031	0.0	2/0 1	70.2	229
190	min	Summor	10 316	0.0	249.1	69.0	220
400	min	Summer	0 601	0.0	203.0	61.0	290
720		Gummen	0.0UI 7 410	0.0	274.1	04.4	302
720	min	Summer	7.410	0.0	283.4	60.1	420
960	min	Summer	5.854	0.0	298.5	52.4	556
1440	min	Summer	4.194	0.0	320.7	37.8	808
2160	mın	Summer	3.001	0.0	344.3	16.0	1192
2880	mın	Summer	2.364	0.0	361./	0.0	1644
4320	min	Summer	1.688	0.0	387.2	0.0	2296
5760	min	Summer	1.328	0.0	406.3	0.0	2936
7200	min	Summer	1.102	0.0	421.5	0.0	3672
8640	min	Summer	0.946	0.0	434.1	0.0	4360
10080	min	Summer	0.831	0.0	445.0	0.0	5136
15	min	Winter	133.985	0.0	119.4	24.2	18
30	min	Winter	86.337	0.0	153.9	41.1	32
60	min	Winter	52.933	0.0	188.9	57.8	60
120	min	Winter	31.380	0.0	224.0	73.2	96
180	min	Winter	22.833	0.0	244.5	80.6	134

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:42	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Σ	Max Outflow (1/s)	Max Volume (m³)	Status
240	min W	Vinter	99.868	1.868	0.0	7.3	8.0		15.3	150.8	Flood Risk
360	min W	Vinter	99.697	1.697	0.0	7.0	7.4		14.4	137.0	ΟK
480	min W	Vinter	99.544	1.544	0.0	6.7	6.8		13.5	124.7	0 K
600	min W	Vinter	99.414	1.414	0.0	6.4	6.2		12.6	114.2	O K
720	min W	Vinter	99.305	1.305	0.0	6.2	5.7		11.9	105.4	ОК
960	min W	Vinter	99.134	1.134	0.0	5.8	4.8		10.6	91.6	0 K
1440	min W	Vinter	98.918	0.918	0.0	5.3	3.3		8.5	74.1	0 K
2160	min W	Vinter	98.765	0.765	0.0	4.8	1.2		6.0	61.7	0 K
2880	min W	Vinter	98.505	0.505	0.0	4.6	0.0		4.6	40.8	0 K
4320	min W	Vinter	98.117	0.117	0.0	4.2	0.0		4.2	9.5	0 K
5760	min W	Vinter	98.093	0.093	0.0	3.3	0.0		3.3	7.5	0 K
7200	min W	Vinter	98.081	0.081	0.0	2.8	0.0		2.8	6.5	0 K
8640	min W	Vinter	98.073	0.073	0.0	2.4	0.0		2.4	5.9	0 K
10080	min W	Vinter	98.067	0.067	0.0	2.1	0.0		2.1	5.4	ОК

Storm Event	Rain (mm/hr)	Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
		(m³)	(m ³)	(m³)	,
240 min W:	inter 18.130	0.0	258.8	84.5	172
360 min W:	inter 13.031	0.0	279.1	87.4	246
480 min W:	inter 10.316	0.0	294.6	87.2	314
600 min W:	inter 8.601	0.0	307.0	84.3	384
720 min W:	inter 7.410	0.0	317.4	78.4	448
960 min W:	inter 5.854	0.0	334.3	67.3	578
1440 min W:	inter 4.194	0.0	359.2	44.5	836
2160 min W:	inter 3.001	0.0	385.6	9.8	1256
2880 min W:	inter 2.364	0.0	405.1	0.0	1760
4320 min W:	inter 1.688	0.0	433.7	0.0	2204
5760 min W:	inter 1.328	0.0	455.0	0.0	2928
7200 min W:	inter 1.102	0.0	472.0	0.0	3672
8640 min W:	inter 0.946	0.0	486.2	0.0	4400
10080 min W:	inter 0.831	0.0	498.4	0.0	4976

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 3	Micco
Date 16/12/2015 15:42	Designed by gareth.jane	Desinado
File 0031-SW-04-A-PH3 ATTENUATION	Checked by	Diamaye
XP Solutions	Source Control 2015.1	
E	<u>Aainfall Details</u>	
Rainfall Model Return Period (years)	FSR Winter Storms Yes	
Region En	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +30	
<u>T</u>	<u>ime Area Diagram</u>	
T	otal Area (ha) 0.425	
	Time (mins) Area From: To: (ha)	
	0 4 0.425	

AWP			Page 4									
Kensington Court	0031 - Royal Br	unswick Park										
Woodwater Park Pynes Hill	Preliminary Att	enuation Sizing	4									
Exeter EX2 5TY	Phase 3		Micco									
Date 16/12/2015 15:42	Designed by gar	eth.jane	MILIU									
File 0031-SW-04-A-PH3 ATTENUATION	Checked by		Drainage									
XP Solutions	Source Control	2015.1										
	<u>Model Details</u>											
Storage is O	nline Cover Level (m) 100.000										
Collular Storage Structure												
<u>Cellular Storage Structure</u>												
Inve	ert Level (m) 98.00	00 Safety Factor 2.0										
Infiltration Coefficient	Base (m/hr) 0.000	00 Porosity 0.95										
Infiltration Coefficient	: Side (m/hr) 0.0000	00										
Depth (m) Area (m²) Inf. A:	rea (m²) Depth (m)	Area (m²) Inf. Area (m²	²)									
0.000 85.0	0.0 2.000	85.0 0.	.0									
		~										
<u>Hydro-Brake</u>	<u>Optimum®</u> Outflo	<u>ow Control</u>										
Uni	t Reference MD-SHE-	-0106-4700-0700-4700										
Desi	gn Head (m)	0.700										
Design	Flow (l/s)	4.7										
	Objective Minimi	Calculated										
Di	ameter (mm)	106										
Inver	t Level (m)	98.000										
Minimum Outlet Pipe Di	ameter (mm)	150										
Suggested Manhole Di	ameter (mm)	1200										
Control Points Head (m) Flo	ow (l/s) Contr	col Points Head (m	n) Flow (l/s)									
Design Point (Calculated) 0.700	4.6	Kick-Flo® 0.47	3.9									
Flush-Flo™ 0.211	4.6 Mean Flow	over Head Range	- 4.0									
The hydrological calculations have been based	on the Head/Dischar	rge relationship for the	e Hydro-Brake Optimum®									
as specified. Should another type of control	device other than a	a Hydro-Brake Optimum® }	be utilised then these									
storage routing calculations will be invalidat	ced											
Ponth (m) = Pont (1/c) Ponth (m) = Pont (1/c) Ponth (m) = Pont (1/c) Ponth (m) = Ponth (n+h (m) Elow (1/a)	Dopth (m) Elow (1/a) $[$	harphi(m) = Flow(1/a)									
Depth (m) FIOW (1/5) Depth (m) FIOW (1/5) De	Pon (m) riow (1/S)	Depui (m) riow (1/S)	Seber (m) LTOM (T/S)									
0.100 3.6 0.800 4.9	2.000 7.6	4.000 10.5	7.000 13.7									
0.200 4.6 1.000 5.5	2.200 7.9	4.500 11.1	7.500 14.1									
	2.400 8.2	5.000 11.7	8.000 14.6									
	2.000 8.6	5.500 12.2 6.000 12.7	8.000 15.L 9.000 15 5									
	3 500 9.2	6 500 12 2	9.000 IJ.5									

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:47	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 2 year Return Period

Half Drain Time : 189 minutes.

	Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
	Event	:	Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(l/s)	(l/s)	(1/s)	(l/s)	(m³)	
1 5		~	00 001	0 001	0.0	10.0	0.0	10.0	101 0	
15	min S	Summer	98.331	0.331	0.0	10.0	0.0	10.0	121.8	OK
30	min S	Summer	98.411	0.411	0.0	10.0	0.0	10.0	151.4	ΟK
60	min S	Summer	98.481	0.481	0.0	10.0	0.0	10.0	177.1	ΟK
120	min S	Summer	98.526	0.526	0.0	10.0	0.0	10.0	193.5	ΟK
180	min S	Summer	98.531	0.531	0.0	10.0	0.0	10.0	195.3	ΟK
240	min S	Summer	98.528	0.528	0.0	10.0	0.0	10.0	194.5	ΟK
360	min S	Summer	98.515	0.515	0.0	10.0	0.0	10.0	189.4	ΟK
480	min S	Summer	98.493	0.493	0.0	10.0	0.0	10.0	181.5	ΟK
600	min S	Summer	98.467	0.467	0.0	10.0	0.0	10.0	171.8	ОК
720	min S	Summer	98.440	0.440	0.0	10.0	0.0	10.0	161.9	ОК
960	min S	Summer	98.389	0.389	0.0	10.0	0.0	10.0	143.0	ОК
1440	min S	Summer	98.300	0.300	0.0	10.0	0.0	10.0	110.6	ОК
2160	min S	Summer	98.210	0.210	0.0	10.0	0.0	10.0	77.3	ОК
2880	min S	Summer	98.162	0.162	0.0	9.8	0.0	9.8	59.6	ОК
4320	min S	Summer	98.128	0.128	0.0	7.7	0.0	7.7	47.3	ОК
5760	min S	Summer	98.111	0.111	0.0	6.4	0.0	6.4	41.0	ОК
7200	min S	Summer	98.100	0.100	0.0	5.4	0.0	5.4	36.9	ОК
8640	min S	Summer	98.092	0.092	0.0	4.8	0.0	4.8	33.9	ОК
10080	min S	Summer	98.086	0.086	0.0	4.2	0.0	4.2	31.6	ОК
15	min V	Winter	98.372	0.372	0.0	10.0	0.0	10.0	137.0	ОК
30	min V	Winter	98.464	0.464	0.0	10.0	0.0	10.0	170.9	ОК
60	min V	Winter	98.544	0.544	0.0	10.0	0.0	10.0	200.3	ОК
120	min V	Winter	98.597	0.597	0.0	10.0	0.0	10.0	219.9	ОК
180	min V	Winter	98.606	0.606	0.0	10.0	0.0	10.0	223.3	ОК

	Storm	Rair	n Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/h	r) Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
1 -		41 7		105 0	0.0	1.0
15	min Sum	mer 41./	34 0.0	125.9	0.0	18
30	mın Sum	mer 26.5	94 0.0	161.0	0.0	33
60	min Sum	mer 16.2	.85 0.0	199.1	0.0	62
120	min Sum	mer 9.7	52 0.0	238.6	0.0	120
180	min Sum	mer 7.1	.83 0.0	263.8	0.0	164
240	min Sum	mer 5.7	73 0.0	282.7	0.0	192
360	min Sum	mer 4.2	.34 0.0	311.1	0.0	258
480	min Sum	mer 3.3	89 0.0	332.1	0.0	328
600	min Sum	mer 2.8	51 0.0	349.3	0.0	394
720	min Sum	mer 2.4	75 0.0	363.9	0.0	460
960	min Sum	mer 1.9	0.0	388.1	0.0	588
1440	min Sum	mer 1.4	45 0.0	424.6	0.0	836
2160	min Sum	mer 1.0	0.0	466.3	0.0	1172
2880	min Sum	mer 0.8	44 0.0	497.1	0.0	1500
4320	min Sum	mer 0.6	i16 0 . 0	543.4	0.0	2208
5760	min Sum	mer 0.4	92 0.0	580.7	0.0	2936
7200	min Sum	mer 0.4	14 0.0	610.1	0.0	3672
8640	min Sum	mer 0.3	59 0.0	635.1	0.0	4408
10080	min Sum	mer 0.3	19 0.0	656.6	0.0	5136
15	min Win	ter 41.7	34 0.0	141.3	0.0	18
30	min Win	ter 26.5	94 0.0	180.6	0.0	32
60	min Win	ter 16.2	.85 0.0	223.1	0.0	62
120	min Win	ter 9.7	52 0.0	267.4	0.0	118
180	min Win	ter 7.1	.83 0.0	295.5	0.0	172

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:47	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	I

Summary of Results for 2 year Return Period

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wir	nter	98.599	0.599	0.0	10.0	0.0	10.0	220.6	ОК
360	min Wir	nter	98.579	0.579	0.0	10.0	0.0	10.0	213.3	ΟK
480	min Wir	nter	98.549	0.549	0.0	10.0	0.0	10.0	202.0	ΟK
600	min Wir	nter	98.513	0.513	0.0	10.0	0.0	10.0	188.9	ΟK
720	min Wir	nter	98.472	0.472	0.0	10.0	0.0	10.0	173.6	ОК
960	min Wir	nter	98.389	0.389	0.0	10.0	0.0	10.0	143.0	ОК
1440	min Wir	nter	98.257	0.257	0.0	10.0	0.0	10.0	94.6	ОК
2160	min Wir	nter	98.157	0.157	0.0	9.6	0.0	9.6	57.8	ОК
2880	min Wir	nter	98.131	0.131	0.0	7.9	0.0	7.9	48.1	ОК
4320	min Wir	nter	98.105	0.105	0.0	5.9	0.0	5.9	38.8	ОК
5760	min Wir	nter	98.092	0.092	0.0	4.7	0.0	4.7	33.8	ОК
7200	min Wir	nter	98.083	0.083	0.0	4.0	0.0	4.0	30.5	ОК
8640	min Wir	nter	98.076	0.076	0.0	3.5	0.0	3.5	28.2	ΟK
10080	min Wir	nter	98.071	0.071	0.0	3.1	0.0	3.1	26.3	ΟK

	Storm	Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Wintor	5 773	0 0	316 9	0 0	220
240	initii wincer	5.775	0.0	510.0	0.0	220
360	min Winter	4.234	0.0	348.0	0.0	276
480	min Winter	3.389	0.0	372.1	0.0	354
600	min Winter	2.851	0.0	391.3	0.0	430
720	min Winter	2.475	0.0	407.7	0.0	504
960	min Winter	1.980	0.0	434.8	0.0	634
1440	min Winter	1.445	0.0	475.8	0.0	866
2160	min Winter	1.055	0.0	522.3	0.0	1164
2880	min Winter	0.844	0.0	556.9	0.0	1504
4320	min Winter	0.616	0.0	608.9	0.0	2244
5760	min Winter	0.492	0.0	650.4	0.0	2944
7200	min Winter	0.414	0.0	683.4	0.0	3680
8640	min Winter	0.359	0.0	711.5	0.0	4408
10080	min Winter	0.319	0.0	735.8	0.0	5144

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:47	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Drainage
XP Solutions	Source Control 2015.1	-
E Rainfall Model Return Period (years) Region Eng M5-60 (mm) Ratio R Summer Storms T	Kainfall Details FSR Winter Storms Yes 2 Cv (Summer) 0.750 gland and Wales Cv (Winter) 0.840 20.100 Shortest Storm (mins) 15 0.446 Longest Storm (mins) 10080 Yes Climate Change % +0	
T	otal Area (ha) 1.640	
	Time (mins) Area From: To: (ha)	
	0 4 1.640	

Kensington Court0031 - Royal Brunswick ParkWoodwater Park Pynes HillPreliminary Attenuation SizingExeter EX2 5TYPhase 4Date 16/12/2015 15:47Designed by gareth.janeFile 0031-SW-05-A-PH4 ATTENUATIONChecked byXP SolutionsSource Control 2015.1Model DetailsStorage is Online Cover Level (m) 100.000Cellular Storage Structure												
Woodwater Park Pynes Hill Preliminary Attenuation Sizing Exeter EX2 5TY Phase 4 Date 16/12/2015 15:47 Designed by gareth.jane File 0031-SW-05-A-PH4 ATTENUATION Checked by XP Solutions Source Control 2015.1 Model Details Storage is Online Cover Level (m) 100.000 Cellular Storage Structure												
Exeter EX2 5TY Phase 4 Date 16/12/2015 15:47 Designed by gareth.jane File 0031-SW-05-A-PH4 ATTENUATION Checked by XP Solutions Source Control 2015.1 Model Details Storage is Online Cover Level (m) 100.000 Cellular Storage Structure												
Date 16/12/2015 15:47 File 0031-SW-05-A-PH4 ATTENUATION Designed by gareth.jane Checked by XP Solutions Source Control 2015.1 <u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u>												
File 0031-SW-05-A-PH4 ATTENUATION Checked by Uldinge XP Solutions Source Control 2015.1 Model Details Storage is Online Cover Level (m) 100.000 Cellular Storage Structure Cellular Storage Structure												
XP Solutions Source Control 2015.1 <u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u>												
<u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u>												
<u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u>												
Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u>												
<u>Cellular Storage Structure</u>												
<u>Cellular Storage Structure</u>												
Invert Level (m) 98.000 Safety Factor 2.0												
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95												
Infiltration Coefficient Side (m/hr) 0.00000												
Depth (m) Area (m ²) Inf. Area (m ²) Depth (m) Area (m ²) Inf. Area (m ²)												
0.000 387.5 0.0 2.000 387.5 0.0												
Hydro-Brake Optimum® Outflow Control												
Unit Reference MD-SHE-0151-1010-0650-1010												
Design Head (m) 0.650												
Design Flow (1/s) 10.1												
Objective Minimise upstream storage												
Diameter (mm) 151												
Invert Level (m) 98.000												
Minimum Outlet Pipe Diameter (mm) 225												
Suggested Manhole Diameter (mm) 1200												
Control Points Head (m) Flow (1/s) Control Points Head (m) Flow (1/s)												
Design Point (Calculated) 0.650 10.1 Kick-Flo® 0.483 8.7												
Flush-Flo: 0.239 10.0 Mean Flow over Head Range - 8.3												
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum®												
as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these												
Storage routing calculations will be invalidated												
Depth (m) Flow (l/s)												
0.100 5.4 0.800 11.1 2.000 17.1 4.000 23.8 7.000 31.1												
0.200 10.0 1.000 12.3 2.200 17.9 4.500 25.2 7.500 32.2												
0.300 10.0 1.200 13.4 2.400 18.7 5.000 26.6 8.000 33.3												
0.400 9.6 1.400 14.4 2.600 19.4 5.500 27.8 8.500 34.3												
0.500 8.9 1.600 15.4 3.000 20.8 6.000 29.0 9.000 35.3 0.600 9.7 1.800 16.3 3.500 22.4 6.500 30.1 9.500 36.3												

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:46	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 330 minutes.

	Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
	Event	:	Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(l/s)	(l/s)	(1/s)	(l/s)	(m³)	
		~	~~ ~~~		0.0	10 5				
15	min S	Summer	98.707	0.707	0.0	10.5	1.4	11.9	260.1	ΟK
30	min S	Summer	98.877	0.877	0.0	11.6	7.2	18.8	323.0	ΟK
60	min S	Summer	99.014	1.014	0.0	12.4	9.5	21.9	373.2	ОК
120	min S	Summer	99.082	1.082	0.0	12.8	10.5	23.3	398.1	ΟK
180	min S	Summer	99.089	1.089	0.0	12.8	10.6	23.4	400.8	ΟK
240	min S	Summer	99.085	1.085	0.0	12.8	10.6	23.4	399.3	ОК
360	min S	Summer	99.060	1.060	0.0	12.7	10.2	22.9	390.1	ΟK
480	min S	Summer	99.027	1.027	0.0	12.5	9.7	22.2	378.2	ОК
600	min S	Summer	98.994	0.994	0.0	12.3	9.2	21.5	365.7	ОК
720	min S	Summer	98.960	0.960	0.0	12.1	8.7	20.8	353.5	ОК
960	min S	Summer	98.900	0.900	0.0	11.7	7.7	19.4	331.4	ОК
1440	min S	Summer	98.807	0.807	0.0	11.1	5.7	16.8	297.2	ОК
2160	min S	Summer	98.717	0.717	0.0	10.5	1.8	12.3	263.9	ОК
2880	min S	Summer	98.608	0.608	0.0	10.0	0.0	10.0	223.8	ОК
4320	min S	Summer	98.355	0.355	0.0	10.0	0.0	10.0	130.5	ОК
5760	min S	Summer	98.213	0.213	0.0	10.0	0.0	10.0	78.5	ОК
7200	min S	Summer	98.158	0.158	0.0	9.7	0.0	9.7	58.1	ОК
8640	min S	Summer	98.139	0.139	0.0	8.5	0.0	8.5	51.1	ОК
10080	min S	Summer	98.126	0.126	0.0	7.6	0.0	7.6	46.2	ОК
15	min V	Winter	98.790	0.790	0.0	11.0	5.2	16.2	291.0	ОК
30	min V	Winter	98.984	0.984	0.0	12.2	9.1	21.3	362.2	ОК
60	min V	Winter	99.142	1.142	0.0	13.1	11.3	24.4	420.3	ОК
120	min V	Winter	99.229	1.229	0.0	13.6	12.4	25.9	452.6	ОК
180	min V	Winter	99.232	1.232	0.0	13.6	12.4	26.0	453.4	ОК

Storm			Rain	Flooded	Overflow	Time-Peak	
	Event			Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
1 -			07 007	0 0		1 0	1.0
10	min S	ummer	81.221	0.0	265.3	1.2	19
30	min S	ummer	55.///	0.0	339.8	24.1	33
60	min S	ummer	34.065	0.0	417.7	54.0	62
120	min S	ummer	20.201	0.0	495.6	84.0	118
180	min S	ummer	14.736	0.0	542.3	99.7	144
240	min S	ummer	11.736	0.0	576.0	109.0	176
360	min S	ummer	8.483	0.0	624.6	118.1	244
480	min S	ummer	6.739	0.0	661.5	120.7	314
600	min S	ummer	5.634	0.0	691.3	117.3	382
720	min S	ummer	4.865	0.0	716.4	109.1	450
960	min S	ummer	3.858	0.0	757.3	92.0	586
1440	min S	ummer	2.780	0.0	818.2	60.2	852
2160	min S	ummer	2.001	0.0	885.0	14.7	1276
2880	min S	ummer	1.584	0.0	933.9	0.0	1700
4320	min S	ummer	1.138	0.0	1006.0	0.0	2380
5760	min S	ummer	0.900	0.0	1062.1	0.0	3048
7200	min S	ummer	0.750	0.0	1106.1	0.0	3672
8640	min S	ummer	0.646	0.0	1143.0	0.0	4408
10080	min S	ummer	0.569	0.0	1174.5	0.0	5136
15	min W	inter	87.227	0.0	297.4	9.4	18
30	min W	inter	55.777	0.0	380.9	41.5	32
60	min W	inter	34.065	0.0	467.9	77.4	60
120	min W	inter	20.201	0.0	555.2	113.1	116
180	min W	inter	14.736	0.0	607.6	132.2	148

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:46	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	I

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wir	nter	99.225	1.225	0.0	13.6	12.3	25.9	450.9	ОК
360	min Wir	nter	99.185	1.185	0.0	13.3	11.8	25.2	436.2	ΟK
480	min Wir	nter	99.136	1.136	0.0	13.1	11.2	24.3	418.1	ΟK
600	min Wir	nter	99.085	1.085	0.0	12.8	10.6	23.4	399.4	ΟK
720	min Wir	nter	99.036	1.036	0.0	12.5	9.9	22.4	381.5	ΟK
960	min Wir	nter	98.951	0.951	0.0	12.0	8.6	20.6	349.9	ОК
1440	min Wir	nter	98.824	0.824	0.0	11.2	6.1	17.3	303.5	ОК
2160	min Wir	nter	98.711	0.711	0.0	10.5	1.6	12.1	261.8	ΟK
2880	min Wir	nter	98.543	0.543	0.0	10.0	0.0	10.0	200.0	ОК
4320	min Wir	nter	98.203	0.203	0.0	10.0	0.0	10.0	74.8	ΟK
5760	min Wir	nter	98.141	0.141	0.0	8.6	0.0	8.6	51.8	ОК
7200	min Wir	nter	98.121	0.121	0.0	7.2	0.0	7.2	44.7	ΟK
8640	min Wir	nter	98.110	0.110	0.0	6.3	0.0	6.3	40.3	ΟK
10080	min Wir	nter	98.101	0.101	0.0	5.5	0.0	5.5	37.2	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Winte	er 11.736	0.0	645.3	143.8	184
360	min Winte	er 8.483	0.0	699.7	156.1	262
480	min Winte	er 6.739	0.0	741.1	161.0	336
600	min Winte	er 5.634	0.0	774.4	160.9	410
720	min Winte	er 4.865	0.0	802.5	156.2	480
960	min Winte	er 3.858	0.0	848.4	134.3	618
1440	min Winte	er 2.780	0.0	916.5	87.7	894
2160	min Winte	er 2.001	0.0	991.3	15.8	1360
2880	min Winte	er 1.584	0.0	1046.1	0.0	1816
4320	min Winte	er 1.138	0.0	1127.0	0.0	2376
5760	min Winte	er 0.900	0.0	1189.6	0.0	2944
7200	min Winte	er 0.750	0.0	1238.9	0.0	3672
8640	min Winte	er 0.646	0.0	1280.3	0.0	4400
10080	min Winte	er 0.569	0.0	1315.8	0.0	5144

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:46	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	1
Ī	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Recurn Ferrod (years) Region En	aland and Wales Cv (Summer) 0.750	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +10	
Ţ	ime Area Diagram	
Т	otal Area (ha) 1.640	
	Time (mins) Area From: To: (ha)	
	0 4 1.640	

Kensington Court0031 - Royal Brunswick ParkWoodwater Park Pynes HillPreliminary Attenuation SizingExeter EX2 5TYPhase 4Date 16/12/2015 15:46Designed by gareth.jane												
Woodwater ParkPynes HillPreliminary Attenuation SizingExeterEX2 5TYPhase 4Date 16/12/2015 15:46Designed by gareth.jane												
Exeter EX2 5TYPhase 4Date 16/12/2015 15:46Designed by gareth.jane												
Date 16/12/2015 15:46 Designed by gareth.jane												
File 0031-SW-05-A-PH4 ATTENUATION Checked by												
XP Solutions Source Control 2015.1												
Model Details												
Storage is Online Cover Level (m) 100.000												
<u>Cellular Storage Structure</u>												
Invert Level (m) 98.000 Safety Factor 2.0												
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95												
Infiltration Coefficient Side (m/hr) 0.00000												
Depth (m) Area (m ²) Inf. Area (m ²) Depth (m) Area (m ²) Inf. Area (m ²)												
0.000 387.5 0.0 2.000 387.5 0.0												
Hydro-Brake Optimum® Outflow Control												
Unit Reference MD-SHE-0151-1010-0650-1010												
Design Head (m) 0.650												
Design Flow (1/s) 10.1												
Flush-Flo ⁴⁴ Calculated												
Diameter (mm) 151												
Invert Level (m) 98.000												
Minimum Outlet Pipe Diameter (mm) 225												
Suggested Manhole Diameter (mm) 1200												
Control Points Head (m) Flow (1/s) Control Points Head (m) Flow (1/s)												
Design Point (Calculated) 0.650 10.1 Kick-Flo® 0.483 8.7												
Flush-flo ^m 0.239 10.0 Mean Flow over Head Range - 8.3												
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum®												
as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated												
Depth (m) Flow (1/s)												
0.100 5.4 0.800 11.1 2.000 17.1 4.000 23.8 7.000 31.1												
0.200 10.0 1.000 12.3 2.200 17.9 4.500 25.2 7.500 32.2												
0.300 10.0 1.200 13.4 2.400 18.7 5.000 26.6 8.000 33.3												
U.400 9.6 1.400 14.4 2.600 19.4 5.500 27.8 8.500 34.3 0.500 0.0 1.600 15.4 2.000 00.0 0.000												
0.500 8.9 1.600 15.4 3.000 20.8 6.000 29.0 9.000 35.3												

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:45	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 423 minutes.

Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
Event	:	Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
		(m)	(m)	(l/s)	(l/s)	(1/s)	(1/s)	(m³)	
	~	0.0 0.01	1 001	0.0	10.0	10 5		200 1	o
min :	Summer	99.081	1.081	0.0	12.8	10.5	23.3	398.1	OK
min S	Summer	99.359	1.359	0.0	14.2	13.8	28.0	500.3	ΟK
min S	Summer	99.588	1.588	0.0	15.3	16.0	31.3	584.6	0 K
min S	Summer	99.715	1.715	0.0	15.9	17.1	33.0	631.5	Flood Risk
min S	Summer	99.727	1.727	0.0	16.0	17.2	33.1	635.6	Flood Risk
min S	Summer	99.719	1.719	0.0	15.9	17.1	33.0	632.8	Flood Risk
min S	Summer	99.678	1.678	0.0	15.7	16.8	32.5	617.7	O K
min S	Summer	99.627	1.627	0.0	15.5	16.3	31.8	599.0	ОК
min S	Summer	99.571	1.571	0.0	15.3	15.8	31.1	578.4	ОК
min S	Summer	99.514	1.514	0.0	15.0	15.3	30.3	557.5	ОК
min S	Summer	99.408	1.408	0.0	14.5	14.3	28.8	518.4	ОК
min S	Summer	99.235	1.235	0.0	13.6	12.4	26.0	454.8	ОК
min S	Summer	99.052	1.052	0.0	12.6	10.1	22.7	387.2	ОК
min S	Summer	98.925	0.925	0.0	11.9	8.1	20.0	340.5	ОК
min S	Summer	98.773	0.773	0.0	10.9	4.6	15.5	284.5	ОК
min S	Summer	98.671	0.671	0.0	10.2	0.2	10.4	247.1	ОК
min S	Summer	98.479	0.479	0.0	10.0	0.0	10.0	176.5	ОК
min S	Summer	98.292	0.292	0.0	10.0	0.0	10.0	107.7	ОК
min S	Summer	98.202	0.202	0.0	10.0	0.0	10.0	74.3	ОК
min V	Winter	99.213	1.213	0.0	13.5	12.2	25.7	446.5	ОК
min V	Winter	99.527	1.527	0.0	15.0	15.4	30.5	562.2	ОК
min V	Winter	99.790	1.790	0.0	16.2	17.7	33.9	659.0	Flood Risk
min T	Winter	99 950	1 950	0.0	16 9	18 9	35 8	717 7	Flood Risk
min t	Winter	99,961	1,961	0.0	17 0	19 0	36.0	722.1	Flood Risk
	Storm Event min a min a	Storm Event min Summer min Summer	StormMaxEventLevelminSummer99.081minSummer99.359minSummer99.715minSummer99.715minSummer99.717minSummer99.717minSummer99.717minSummer99.717minSummer99.717minSummer99.678minSummer99.571minSummer99.514minSummer99.521minSummer99.625minSummer99.625minSummer98.925minSummer98.731minSummer98.202minSummer98.202minSummer98.202minSummer98.202minSummer99.213minSummer99.213minSummer99.201minWinter99.721minWinter99.721minWinter99.721	StormMaxMaxEventLevenDepthEventLevenDepthminSummer99.0801.0309minSummer99.73051.5309minSummer99.71051.7101minSummer99.71051.7101minSummer99.71071.7121minSummer99.71071.7121minSummer99.62751.6271minSummer99.62751.6271minSummer99.5141.5141minSummer99.5141.5141minSummer99.05251.0252minSummer99.05251.0252minSummer99.05251.0252minSummer98.4730.7473minSummer98.4730.2121minSummer98.2020.2202minSummer98.2020.2202minSummer99.25271.5271minSummer99.7521.5271minWinter99.7501.7501minWinter99.7501.7501minWinter99.7521.5271minWinter99.7501.7501minWinter99.7501.7501	StormMaxMaxMaxLevelDepthInfiltration (1/s)minSummer99.0811.0810.00minSummer99.3591.3590.00minSummer99.5881.5880.00minSummer99.7271.7270.00minSummer99.7271.7270.00minSummer99.7271.7270.00minSummer99.7271.7270.00minSummer99.7271.6270.00minSummer99.6271.6270.00minSummer99.5711.5140.00minSummer99.5711.5140.00minSummer99.5251.2350.00minSummer99.10521.0520.00minSummer98.7370.7330.00minSummer98.6710.6710.00minSummer98.2020.2020.00minSummer98.2020.2020.00minSummer99.5271.5270.00minSummer99.5271.5270.00minWinter99.7901.7900.00minWinter99.7901.2900.00minWinter99.7901.5270.00minWinter99.7901.5900.00minWinter99.7901.5900.00minWinter99.	StormMaxMaxMaxMaxMaxLeventDepthInfiltrationControl (l/s)min Summer99.0811.0810.0012.8min Summer99.3591.3590.0014.2min Summer99.5881.5880.0015.3min Summer99.7151.7150.0015.9min Summer99.7271.7270.0016.0min Summer99.7271.7270.0015.9min Summer99.6271.6270.0015.5min Summer99.6271.6270.0015.5min Summer99.5711.5710.0015.5min Summer99.5211.5210.0015.5min Summer99.5251.2350.0014.5min Summer99.5251.2350.0014.5min Summer99.5251.2350.0012.6min Summer99.5250.9250.0011.9min Summer98.7230.7330.0010.2min Summer98.7230.7330.0010.0min Summer98.2020.2020.0010.0min Summer98.2230.2020.0010.0min Summer99.5271.5270.0013.5min Summer99.5271.5270.0013.5min Summer99.5271.5270.0013.5min Winter99.7901.7900.0015.2min Winter99.7901.	StormMaxMaxMaxMaxMaxMaxMaxLevelDepthInfiltrationControlOverflowminSummer99.0811.0810.0012.810.5minSummer99.5881.5880.0014.213.8minSummer99.7151.7150.0015.917.1minSummer99.7271.7270.0016.017.2minSummer99.7191.7190.0015.917.11minSummer99.7191.7270.0015.516.3minSummer99.7191.7190.0015.516.3minSummer99.6171.6270.0015.516.3minSummer99.5141.5140.0015.516.3minSummer99.5141.5140.0015.516.3minSummer99.5251.2350.0013.612.4minSummer99.5251.0520.0011.98.1minSummer98.6710.6710.0010.00.0minSummer98.2920.2920.0010.00.0minSummer98.2920.2920.0010.00.0minSummer98.2920.2920.0010.00.0minSummer98.2920.2920.0010.00.0minSummer98.2920.2920.00	Storm FyentMax Leven (m)Max perf perf (m)Max perf perf (l/s)Max perf perf (l/s)Max perf perf perf perf perf perf perf perf perf perf (l/s)Max perf p	Storm EventMax Level (m)Max perform (m)Max filteration (n/s)Max perform (n/s)Max perform perform (n/s)Max perform perform (n/s)Max perform perform perform perform (n/s)Max perform perform perform perform perform performMax perform perform perform perform perform perform performMax perform perform perform perform perform perform perform perform performMax perform perform perform perform perform perform perform perform perform perform perform perform perform perform perform performMax performMax perform <br< td=""></br<>

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak	
	Event			Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
15	min	Summor	133 095	0 0	109 7	55 7	1 0
30	min	Summor	100.900	0.0	527 3	111 3	33 TO
50		Gumman	50.557	0.0	527.5	100 0	55
120	min	Summer	21 200	0.0	770 5	100.0	120
100	III III mi m	Gummen	21.300	0.0	770.5	224.0	120
180	min	Summer	22.833	0.0	841.0	254.8	152
240	mın	Summer	18.130	0.0	890.4	2/3.4	182
360	mın	Summer	13.031	0.0	960.1	294.9	248
480	min	Summer	10.316	0.0	1013.4	307.3	316
600	min	Summer	8.601	0.0	1056.1	313.6	386
720	min	Summer	7.410	0.0	1091.9	315.8	454
960	min	Summer	5.854	0.0	1150.1	310.2	588
1440	min	Summer	4.194	0.0	1235.4	270.9	852
2160	min	Summer	3.001	0.0	1327.8	219.8	1232
2880	min	Summer	2.364	0.0	1394.8	171.6	1612
4320	min	Summer	1.688	0.0	1492.7	75.5	2376
5760	min	Summer	1.328	0.0	1567.4	1.7	3240
7200	min	Summer	1.102	0.0	1625.8	0.0	4040
8640	min	Summer	0.946	0.0	1674.5	0.0	4584
10080	min	Summer	0.831	0.0	1715.8	0.0	5240
15	min	Winter	133.985	0.0	458.0	78.9	18
30	min	Winter	86.337	0.0	590.9	143.4	32
60	min	Winter	52.933	0.0	727.8	209.9	60
120	min	Winter	31.380	0.0	863.1	274.9	116
180	min	Winter	22.833	0.0	942.1	310.2	168

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:45	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Σ	Max Outflow (1/s)	Max Volume (m³)	Stat	us
240	min V	Winter	99.943	1.943	0.0	16.9	18.9		35.8	715.4	Flood	Risk
360	min V	Winter	99.881	1.881	0.0	16.6	18.4		35.0	692.5	Flood	Risk
480	min V	Winter	99.804	1.804	0.0	16.3	17.8		34.1	664.0	Flood	Risk
600	min V	Winter	99.721	1.721	0.0	15.9	17.1		33.1	633.5	Flood	Risk
720	min V	Winter	99.639	1.639	0.0	15.6	16.4		32.0	603.5		ΟК
960	min V	Winter	99.490	1.490	0.0	14.9	15.1		29.9	548.4		ΟK
1440	min V	Winter	99.254	1.254	0.0	13.7	12.6		26.3	461.5		ΟK
2160	min V	Winter	99.021	1.021	0.0	12.4	9.7		22.1	375.9		ΟК
2880	min V	Winter	98.877	0.877	0.0	11.6	7.2		18.8	322.8		ΟK
4320	min V	Winter	98.733	0.733	0.0	10.6	2.5		13.1	269.8		ΟK
5760	min V	Winter	98.491	0.491	0.0	10.0	0.0		10.0	180.8		ΟK
7200	min V	Winter	98.202	0.202	0.0	10.0	0.0		10.0	74.5		ΟK
8640	min V	Winter	98.148	0.148	0.0	9.1	0.0		9.1	54.6		ΟK
10080	min V	Winter	98.132	0.132	0.0	8.0	0.0		8.0	48.6		ΟK

	Storm Event	Rain (mm/hr)	Rain Flooded I mm/hr) Volume		Overflow Volume	Time-Peak (mins)
			(111)	(111)	(111)	
240	min Winter	18.130	0.0	997.5	332.7	190
360	min Winter	13.031	0.0	1075.5	359.7	266
480	min Winter	10.316	0.0	1135.2	376.2	342
600	min Winter	8.601	0.0	1183.0	385.7	416
720	min Winter	7.410	0.0	1223.1	390.4	486
960	min Winter	5.854	0.0	1288.2	389.9	626
1440	min Winter	4.194	0.0	1383.9	350.6	894
2160	min Winter	3.001	0.0	1487.2	276.6	1276
2880	min Winter	2.364	0.0	1562.3	199.8	1648
4320	min Winter	1.688	0.0	1672.2	48.2	2508
5760	min Winter	1.328	0.0	1755.6	0.0	3520
7200	min Winter	1.102	0.0	1821.0	0.0	3888
8640	min Winter	0.946	0.0	1875.5	0.0	4408
10080	min Winter	0.831	0.0	1922.1	0.0	5136

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 4	Micco
Date 16/12/2015 15:45	Designed by gareth.jane	Desinado
File 0031-SW-05-A-PH4 ATTENUATION	. Checked by	Drainage
XP Solutions	Source Control 2015.1	
	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	100 Cv (Summer) 0.750	
Region E M5-60 (mm)	ngland and Wales CV (Winter) 0.840	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +30	
	<u>Time Area Diagram</u>	
	Total Area (ha) 1.640	
	Time (mins) Area From: To: (ha) 0 4 1.640	

AWP			Page 4											
Kensington Court	0031 - Royal Br	runswick Park												
Woodwater Park Pynes Hill	Preliminary Att	cenuation Sizing	4											
Exeter EX2 5TY	Phase 4		Micro											
Date 16/12/2015 15:45	Designed by gas	reth.jane	Designed											
File 0031-SW-05-A-PH4 ATTENUATION	Checked by		Drainage											
XP Solutions	Source Control	2015.1												
Model Details														
Storage is Online Cover Level (m) 100.000														
Cellul	<u>ar Storage Stru</u>	<u>cture</u>												
Inv	ert Level (m) 98.0	000 Safety Factor 2.0												
Infiltration Coefficien Infiltration Coefficien	t Base (m/hr) 0.000 t Side (m/hr) 0.000	000 Porosity 0.95												
Depth (m) Area (m²) Inf. A	rea (m²) Depth (m)	Area (m²) Inf. Area ((m²)											
0.000 387.5	0.0 2.000	387.5	0.0											
<u>Hydro-Brake</u>	Optimum® Outfl	<u>ow Control</u>												
Un:	it Reference MD-SHE	-0151-1010-0650-1010												
Dest	ign Head (m)	0.650												
Design	n Flow (l/s)	10.1												
	Objective Minim	ise upstream storage												
D	Lameter (mm)	151 151												
Inve	rt Level (m)	98.000												
Minimum Outlet Pipe Di	Lameter (mm)	225												
Suggested Manhole Di	iameter (mm)	1200												
Control Points Head (m) Fl	ow (l/s) Cont	rol Points Head	(m) Flow (l/s)											
Design Point (Calculated) 0.650	10.1	Kick-Flo® 0.	483 8.7											
Flush-Flo™ 0.239	10.0 Mean Flow	over Head Range	- 8.3											
The hydrological calculations have been based	on the Head/Discha	rge relationship for t	the Hydro-Brake Optimum®											
as specified. Should another type of control storage routing calculations will be invalida	device other than ted	a Hydro-Brake Optimum@	> be utilised then these											
Depth (m) Flow (1/s) Depth (m) Flow (1/s) De	epth (m) Flow (l/s)	Depth (m) Flow (1/s)	Depth (m) Flow (l/s)											
0.100 5.4 0.800 11.1	2.000 17.1	4.000 23.8	7.000 31.1											
0.200 10.0 1.000 12.3	2.200 17.9	4.500 25.2	7.500 32.2											
0.300 10.0 1.200 13.4	2.400 18.7	5.000 26.6	8.000 33.3											
0.400 9.6 1.400 14.4	2.600 19.4	5.500 27.8	8.500 34.3											
	3.000 20.8	6.000 29.0	9.000 35.3											
0.000 9.7 1.800 10.3	3.300 22.4	0.000 30.1	3.00 30.3											

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:50	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 2 year Return Period

Half Drain Time : 192 minutes.

	Storm	L	Max	Max	Max	Max	Max	Max	Max	Status
	Event		Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(1/s)	(1/s)	(1/s)	(m³)	
15	min S	Summer	98.330	0.330	0.0	10.9	0.0	10.9	133.8	ОК
30	min S	Summer	98.410	0.410	0.0	10.9	0.0	10.9	166.5	ОК
60	min S	Summer	98.480	0.480	0.0	10.9	0.0	10.9	195.0	ОК
120	min S	Summer	98.524	0.524	0.0	10.9	0.0	10.9	213.0	ОК
180	min S	Summer	98.530	0.530	0.0	10.9	0.0	10.9	215.2	ОК
240	min S	Summer	98.528	0.528	0.0	10.9	0.0	10.9	214.6	ОК
360	min S	Summer	98.516	0.516	0.0	10.9	0.0	10.9	209.6	ΟK
480	min S	Summer	98.496	0.496	0.0	10.9	0.0	10.9	201.5	ОК
600	min S	Summer	98.473	0.473	0.0	10.9	0.0	10.9	191.9	ΟK
720	min S	Summer	98.446	0.446	0.0	10.9	0.0	10.9	181.1	ΟK
960	min S	Summer	98.395	0.395	0.0	10.9	0.0	10.9	160.4	ОК
1440	min S	Summer	98.308	0.308	0.0	10.9	0.0	10.9	124.9	ΟK
2160	min S	Summer	98.217	0.217	0.0	10.8	0.0	10.8	88.1	ОК
2880	min S	Summer	98.168	0.168	0.0	10.6	0.0	10.6	68.1	ОК
4320	min S	Summer	98.133	0.133	0.0	8.5	0.0	8.5	54.0	ΟK
5760	min S	Summer	98.115	0.115	0.0	7.0	0.0	7.0	46.8	ОК
7200	min S	Summer	98.104	0.104	0.0	5.9	0.0	5.9	42.2	ΟK
8640	min S	Summer	98.096	0.096	0.0	5.2	0.0	5.2	38.8	ОК
10080	min S	Summer	98.089	0.089	0.0	4.7	0.0	4.7	36.2	ΟK
15	min W	Winter	98.371	0.371	0.0	10.9	0.0	10.9	150.6	ОК
30	min W	Winter	98.463	0.463	0.0	10.9	0.0	10.9	187.9	ΟK
60	min W	Winter	98.542	0.542	0.0	10.9	0.0	10.9	220.1	ΟK
120	min V	Winter	98.596	0.596	0.0	10.9	0.0	10.9	241.9	ОК
180	min 🕅	Winter	98.605	0.605	0.0	10.9	0.0	10.9	245.8	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak	
	Event		(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
					100.0	0.0	1.0
15	min S	Summer	41./34	0.0	138.0	0.0	18
30	min S	Summer	26.594	0.0	176.5	0.0	33
60	min S	Summer	16.285	0.0	218.4	0.0	62
120	min S	Summer	9.752	0.0	261.8	0.0	120
180	min S	Summer	7.183	0.0	289.4	0.0	162
240	min S	Summer	5.773	0.0	310.2	0.0	192
360	min S	Summer	4.234	0.0	341.3	0.0	258
480	min S	Summer	3.389	0.0	364.4	0.0	326
600	min S	Summer	2.851	0.0	383.2	0.0	396
720	min S	Summer	2.475	0.0	399.2	0.0	462
960	min S	Summer	1.980	0.0	425.8	0.0	588
1440	min S	Summer	1.445	0.0	465.9	0.0	838
2160	min S	Summer	1.055	0.0	511.7	0.0	1188
2880	min S	Summer	0.844	0.0	545.5	0.0	1500
4320	min S	Summer	0.616	0.0	596.2	0.0	2208
5760	min S	Summer	0.492	0.0	637.3	0.0	2944
7200	min S	Summer	0.414	0.0	669.6	0.0	3672
8640	min S	Summer	0.359	0.0	697.0	0.0	4408
10080	min S	Summer	0.319	0.0	720.5	0.0	5136
15	min W	linter	41.734	0.0	154.8	0.0	18
30	min W	linter	26.594	0.0	197.9	0.0	32
60	min W	linter	16.285	0.0	244.8	0.0	62
120	min W	linter	9.752	0.0	293.4	0.0	118
180	min W	linter	7.183	0.0	324.3	0.0	172

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:50	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Summary of Results for 2 year Return Period

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240	min Wint	er 98.599	0.599	0.0	10.9	0.0	10.9	243.1	ОК
360	min Wint	er 98.580	0.580	0.0	10.9	0.0	10.9	235.7	ΟK
480	min Wint	er 98.551	0.551	0.0	10.9	0.0	10.9	223.8	ΟK
600	min Wint	er 98.517	0.517	0.0	10.9	0.0	10.9	210.1	ΟK
720	min Wint	er 98.480	0.480	0.0	10.9	0.0	10.9	195.0	ΟK
960	min Wint	er 98.397	0.397	0.0	10.9	0.0	10.9	161.4	ΟK
1440	min Wint	er 98.266	0.266	0.0	10.9	0.0	10.9	108.0	ΟK
2160	min Wint	er 98.163	0.163	0.0	10.6	0.0	10.6	66.0	ΟK
2880	min Wint	er 98.136	0.136	0.0	8.7	0.0	8.7	55.1	ОК
4320	min Wint	er 98.109	0.109	0.0	6.4	0.0	6.4	44.4	ΟK
5760	min Wint	er 98.095	0.095	0.0	5.2	0.0	5.2	38.7	ОК
7200	min Wint	er 98.086	0.086	0.0	4.4	0.0	4.4	34.9	ΟK
8640	min Wint	er 98.079	0.079	0.0	3.8	0.0	3.8	32.2	ΟK
10080	min Wint	er 98.074	0.074	0.0	3.4	0.0	3.4	30.1	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
240	min Winton	- 5 773	0 0	317 6	0 0	210
240	IIIII WINCEI		0.0	347.0	0.0	210
360	min Winter	4.234	0.0	382.5	0.0	274
480	min Winter	3.389	0.0	408.3	0.0	352
600	min Winter	2.851	0.0	429.3	0.0	428
720	min Winter	2.475	0.0	447.3	0.0	506
960	min Winter	1.980	0.0	477.1	0.0	636
1440	min Winter	1.445	0.0	522.1	0.0	868
2160	min Winter	1.055	0.0	573.2	0.0	1164
2880	min Winter	0.844	0.0	611.1	0.0	1504
4320	min Winter	0.616	0.0	668.1	0.0	2244
5760	min Winter	0.492	0.0	713.9	0.0	2944
7200	min Winter	0.414	0.0	750.0	0.0	3672
8640	min Winter	0.359	0.0	780.8	0.0	4408
10080	min Winter	0.319	0.0	807.4	0.0	5064

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:50	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	. Checked by	Diamage
XP Solutions	Source Control 2015.1	
	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	2 Cv (Summer) 0.750	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +0	
	<u>Time Area Diagram</u>	
	Total Area (ha) 1.800	
	Time (mins) Area From: To: (ha)	
	0 4 1.800	

AWP			Page 4									
Kensington Court	0031 - Royal B	runswick Park										
Woodwater Park Pynes Hill	Preliminary Att	cenuation Sizing	L.									
Exeter EX2 5TY	Phase 5		Micco									
Date 16/12/2015 15:50	Designed by gas	reth.jane	Designation									
File 0031-SW-06-A-PH5 ATTENUATION	Checked by		Diamage									
XP Solutions	Source Control	2015.1										
Model Details												
Storage is Online Cover Level (m) 100.000												
Cellul	<u>ar Storage Stru</u>	<u>cture</u>										
Inv Infiltration Coefficien Infiltration Coefficien	ert Level (m) 98.0 t Base (m/hr) 0.000 t Side (m/hr) 0.000	000 Safety Factor 2.0 000 Porosity 0.95 000										
Depth (m) Area (m²) Inf. A	rea (m²) Depth (m)	Area (m²) Inf. Area ((m²)									
0.000 427.5	0.0 2.000	427.5	0.0									
<u>Hydro-Brake</u>	<u>Optimum® Outfl</u>	<u>ow Control</u>										
Un:	it Reference MD-SHE	-0156-1090-0620-1090										
Desi	ign Head (m)	0.620										
Design	n Flow (l/s)	10.9										
	Objective Minim	ise upstream storage										
Di	iameter (mm)	156										
Inve	rt Level (m)	98.000										
Minimum Outlet Pipe Di	iameter (mm)	225										
Suggested Mannore D.	Lameter (mm)	1200										
Control Points Head (m) Fl	ow (1/s) Cont	rol Points Head	(m) Flow (1/s)									
Design Point (Calculated) 0.620	10.9 10.9 Mean Flow	Kick-Flo® 0.	470 9.5									
110511110 0.240	10.9 Healf 110w	over neda Range	0.9									
The hydrological calculations have been based	on the Head/Discha	rge relationship for t	the Hydro-Brake Optimum®									
as specified. Should another type of control storage routing calculations will be invalida	device other than ted	a Hydro-Brake Optimum®) be utilised then these									
	·····	\mathbf{D} and \mathbf{D} and \mathbf{D}	Doubh (m) Eleve (1 (a)									
	aptii (m) FIOW (1/S)	Depth (m) FIOW (1/S)	Depth (m) FIOW (1/S)									
0.100 5.6 0.800 12.3	2.000 19.0	4.000 26.4	7.000 34.5									
0.200 10.8 1.000 13.6	2.200 19.8	4.500 28.0	7.500 35.7									
	2.400 20.7	5.000 29.4	8.000 36.9									
	3 000 23 0	6 000 30.8	9 000 38.1									
0.600 10.7 1.800 18.0	3.500 24.8	6.500 33.2	9.500 40.3									

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 329 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m ³)	Status
15	min S	Summer	98.703	0.703	0.0	11.5	2.5	14.1	285.3	ΟK
30	min S	Summer	98.873	0.873	0.0	12.8	7.7	20.5	354.5	ΟK
60	min S	Summer	99.010	1.010	0.0	13.7	9.9	23.6	410.2	ΟK
120	min S	Summer	99.080	1.080	0.0	14.1	10.9	25.0	438.8	ΟK
180	min S	Summer	99.088	1.088	0.0	14.2	11.0	25.2	441.8	ΟK
240	min S	Summer	99.084	1.084	0.0	14.2	10.9	25.1	440.2	ΟK
360	min S	Summer	99.060	1.060	0.0	14.0	10.6	24.6	430.3	ΟK
480	min S	Summer	99.028	1.028	0.0	13.8	10.2	24.0	417.4	ΟK
600	min S	Summer	98.994	0.994	0.0	13.6	9.7	23.3	403.6	ΟK
720	min S	Summer	98.960	0.960	0.0	13.4	9.2	22.6	389.9	ΟK
960	min S	Summer	98.899	0.899	0.0	13.0	8.2	21.1	365.0	ΟK
1440	min S	Summer	98.801	0.801	0.0	12.3	6.2	18.5	325.5	ΟK
2160	min S	Summer	98.707	0.707	0.0	11.6	2.7	14.3	287.1	ΟK
2880	min S	Summer	98.613	0.613	0.0	10.9	0.0	10.9	249.0	ΟK
4320	min S	Summer	98.369	0.369	0.0	10.9	0.0	10.9	149.9	ΟK
5760	min S	Summer	98.224	0.224	0.0	10.8	0.0	10.8	90.8	ΟK
7200	min S	Summer	98.164	0.164	0.0	10.6	0.0	10.6	66.5	ΟK
8640	min S	Summer	98.144	0.144	0.0	9.3	0.0	9.3	58.5	ΟK
10080	min S	Summer	98.130	0.130	0.0	8.3	0.0	8.3	53.0	ΟK
15	min W	Vinter	98.786	0.786	0.0	12.2	5.9	18.0	319.2	ΟK
30	min W	Vinter	98.979	0.979	0.0	13.5	9.5	23.0	397.7	ΟK
60	min W	Vinter	99.138	1.138	0.0	14.5	11.6	26.1	462.1	ОК
120	min W	Vinter	99.228	1.228	0.0	15.0	12.7	27.7	498.9	ΟK
180	min W	Vinter	99.231	1.231	0.0	15.0	12.7	27.8	500.0	ΟK

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak
	Event	(mm/hr)	Volume	Volume	Volume	(mins)
			(m³)	(m³)	(m³)	
1 5	min Com		0 0	200 0	2 0	1.0
10	min Sum	mer 87.227	0.0	290.9	3.0	10
30	min Sum	mer 55.///	0.0	372.7	29.3	33
60	min Sumr	mer 34.065	0.0	458.3	61.1	62
120	min Sumr	mer 20.201	0.0	543.8	93.0	120
180	min Sumr	mer 14.736	0.0	595.1	109.8	146
240	min Sumr	mer 11.736	0.0	632.0	120.0	178
360	min Sumr	mer 8.483	0.0	685.4	130.2	246
480	min Sumr	mer 6.739	0.0	725.9	133.8	314
600	min Sumr	mer 5.634	0.0	758.6	132.0	382
720	min Sumr	mer 4.865	0.0	786.1	124.7	452
960	min Sumr	mer 3.858	0.0	831.1	107.0	588
1440	min Sumr	mer 2.780	0.0	897.8	74.3	852
2160	min Sumr	mer 2.001	0.0	971.3	25.8	1256
2880	min Sumr	mer 1.584	0.0	1024.9	0.0	1700
4320	min Sumr	mer 1.138	0.0	1103.9	0.0	2420
5760	min Sumr	mer 0.900	0.0	1165.7	0.0	3056
7200	min Sumr	mer 0.750	0.0	1213.9	0.0	3672
8640	min Sumr	mer 0.646	0.0	1254.4	0.0	4408
10080	min Sumr	mer 0.569	0.0	1288.9	0.0	5136
15	min Wint	ter 87.227	0.0	326.1	13.3	18
30	min Wint	ter 55.777	0.0	417.8	47.7	32
60	min Wint	ter 34.065	0.0	513.4	85.7	60
120	min Wint	ter 20.201	0.0	609.2	123.6	116
180	min Wint	ter 14.736	0.0	666.7	143.9	152

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
240	min Wint	er 99.225	1.225	0.0	15.0	12.6	27.7	497.4	ОК
360	min Wint	er 99.186	1.186	0.0	14.8	12.2	27.0	481.7	ΟK
480	min Wint	er 99.137	1.137	0.0	14.5	11.6	26.1	461.9	ΟK
600	min Wint	er 99.086	1.086	0.0	14.2	11.0	25.1	441.2	ΟK
720	min Wint	er 99.037	1.037	0.0	13.9	10.3	24.2	421.3	ΟK
960	min Wint	er 98.950	0.950	0.0	13.3	9.0	22.3	385.7	ΟK
1440	min Wint	er 98.818	0.818	0.0	12.4	6.6	19.0	332.1	ОК
2160	min Wint	er 98.701	0.701	0.0	11.5	2.4	13.9	284.5	ΟK
2880	min Wint	er 98.555	0.555	0.0	10.9	0.0	10.9	225.3	ΟK
4320	min Wint	er 98.216	0.216	0.0	10.8	0.0	10.8	87.7	ΟK
5760	min Wint	er 98.146	0.146	0.0	9.5	0.0	9.5	59.3	ΟK
7200	min Wint	er 98.126	0.126	0.0	7.9	0.0	7.9	51.2	ΟK
8640	min Wint	er 98.114	0.114	0.0	6.8	0.0	6.8	46.2	ΟK
10080	min Wint	er 98.105	0.105	0.0	6.0	0.0	6.0	42.5	ΟK

Stor Even	Storm Event		Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m³)	(m³)	
240 min	Winter	11.736	0.0	708.1	156.5	186
360 min	Winter	8.483	0.0	767.8	170.1	262
480 min	Winter	6.739	0.0	813.2	176.0	338
600 min	Winter	5.634	0.0	849.8	176.8	410
720 min	Winter	4.865	0.0	880.6	173.4	482
960 min	Winter	3.858	0.0	931.0	152.9	624
1440 min	Winter	2.780	0.0	1005.7	104.9	894
2160 min	Winter	2.001	0.0	1088.0	28.4	1340
2880 min	Winter	1.584	0.0	1148.0	0.0	1816
4320 min	Winter	1.138	0.0	1236.7	0.0	2380
5760 min	Winter	0.900	0.0	1305.6	0.0	2944
7200 min	Winter	0.750	0.0	1359.7	0.0	3672
8640 min	Winter	0.646	0.0	1405.2	0.0	4408
10080 min	Winter	0.569	0.0	1444.0	0.0	5136

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	
Ē	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	30 Cv (Summer) 0.750	
Region En	gland and Wales Cv (Winter) 0.840	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Summer Storms	Yes Climate Change % +10	
T	<u>ime Area Diagram</u>	
Т	otal Area (ha) 1.800	
	Time (mins) Area From: To: (ha)	
	0 4 1.800	

AWP				Page	4
Kensington Court	0031 - Ro	yal Brunswick	Park		
Woodwater Park Pynes Hill	Prelimina	ary Attenuation	Sizing	4	~
Exeter EX2 5TY	Phase 5			Mic	Jun
Date 16/12/2015 15:49	Designed	by gareth.jane	1	Der	inago
File 0031-SW-06-A-PH5 ATTENUAT	ION Checked b	у		Uld	inage
XP Solutions	Source Co	ontrol 2015.1		I	
	Model Det	ails			
St	orage is Online Cover	Level (m) 100.000			
	<u>Cellular Storage</u>	<u>e Structure</u>			
Infiltration	Invert Level (m Coefficient Base (m/hn Coefficient Side (m/hn	n) 98.000 Safety c) 0.00000 Po	Factor 2.0 rosity 0.95		
		.) 0.00000			
Depth (m) Area (m ²) Inf. Area (m ²) Dej	pth (m) Area (m ²)	Inf. Area (m	²)	
0.000 42	7.5 0.0	2.000 427.5	0	.0	
Hyd	ro-Brake Optimum®	Outflow Contro	<u>51</u>		
	Unit Reference Design Head (m)	MD-SHE-0156-1090-	-0620-1090 0.620		
	Design Flow (l/s)		10.9		
	Flush-Flo™	(Calculated		
	Objective Diameter (mm)	Minimise upstrea	am storage 156		
	Invert Level (m)		98.000		
Minimum Out	let Pipe Diameter (mm)		225		
Suggested	Manhole Diameter (mm)		1200		
Control Points H	ead (m) Flow (l/s)	Control Points	Head (1	m) Flow (l/s)	
Design Point (Calculated) Flush-Flo™	0.620 10.9 0.243 10.9 Me	Kick an Flow over Head	-Flo® 0.4 Range	70 9.5 - 8.9	
The budgelesical coloulations have	here been on the Here	/Dischause veleti	anabin fan th	e Undre Drehe	On the man
as specified. Should another type	of control device othe	er than a Hydro-Bra	ake Optimum®	be utilised t	hen these
storage routing calculations will b	e invalidated				
Depth (m) Flow (1/s) Depth (m) Flo	ow (l/s) Depth (m) Flo	w (l/s) Depth (m)	Flow (1/s)	Depth (m) Flo	w (l/s)
0 100 5 6 0 800	12 3 2 000	19.0 4.000	26.4	7 000	31 5
0.200 10.8 1.000	13.6 2.200	19.8 4.500	28.0	7.500	35.7
0.300 10.8 1.200	14.9 2.400	20.7 5.000	29.4	8.000	36.9
0.400 10.3 1.400	16.0 2.600	21.5 5.500	30.8	8.500	38.1
0.500 9.8 1.600	17.0 3.000	23.0 6.000	32.1	9.000	39.2
0.600 10.7 1.800	18.0 3.500	24.8 6.500	33.2	9.500	40.3

AWP		Page 1
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

Half Drain Time : 426 minutes.

	Storm	ı	Max	Max	Max	Max	Max	Max	Max	Status
	Event	:	Level	Depth	Infiltration	Control	Overflow	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(l/s)	(l/s)	(l/s)	(m³)	
15	min	Cummor	00 076	1 076	0.0	1/1 1	10 0	25 0	127 2	O K
20	min (Gummer	99.070	1 254	0.0	14.1	10.0	23.0	437.2	OK
50	. min :	Summer	99.334	1.334	0.0	15.7	14.0	29.8	549.9	O K
60	min :	Summer	99.585	1.585	0.0	17.0	16.2	33.2	643./	O K
120	min S	Summer	99.717	1.717	0.0	17.6	17.3	35.0	697.5	Flood Risk
180	min S	Summer	99.730	1.730	0.0	17.7	17.4	35.1	702.5	Flood Risk
240	min S	Summer	99.722	1.722	0.0	17.6	17.4	35.0	699.5	Flood Risk
360	min S	Summer	99.683	1.683	0.0	17.5	17.1	34.5	683.5	O K
480	min S	Summer	99.634	1.634	0.0	17.2	16.6	33.9	663.4	O K
600	min S	Summer	99.579	1.579	0.0	16.9	16.2	33.1	641.2	ОК
720	min S	Summer	99.523	1.523	0.0	16.6	15.7	32.3	618.6	ОК
960	min S	Summer	99.417	1.417	0.0	16.1	14.7	30.7	575.6	ОК
1440	min S	Summer	99.243	1.243	0.0	15.1	12.9	28.0	504.9	ОК
2160	min S	Summer	99.056	1.056	0.0	14.0	10.6	24.6	428.7	ОК
2880	min S	Summer	98.924	0.924	0.0	13.1	8.6	21.7	375.4	ОК
4320	min S	Summer	98.760	0.760	0.0	12.0	5.2	17.2	308.7	ОК
5760	min s	Summer	98.666	0.666	0.0	11.2	0.9	12.2	270.5	ОК
7200	min s	Summer	98.504	0.504	0.0	10.9	0.0	10.9	204.5	ОК
8640	min s	Summer	98.309	0.309	0.0	10.9	0.0	10.9	125.4	ОК
10080	min S	Summer	98.214	0.214	0.0	10.8	0.0	10.8	86.8	0 K
15	min T	Winter	99 207	1 207	0 0	14 9	12 5	27 4	490 3	0 K
30	min I	Winter	99 522	1 522	0.0	16.6	15 6	32 3	618 0	0 K
60	min T	Winter	00 796	1 796	0.0	10.0	17.0	35.0	725 /	Flood Bick
120	min T	Winter	00 051	1 051	0.0	10.0	10.2	27.0	702 4	Flood Dick
120	10111	winter	99.951	1.951	0.0	10./	19.2	37.9	792.4	FICOU KISK
T80	min N	winter	99.968	T.968	0.0	18.8	19.3	38.1	199.2	Flood Risk

Storm		Rain	Flooded	Discharge	Overflow	Time-Peak	
	Event	t	(mm/hr)	Volume	Volume	Volume	(mins)
				(m³)	(m³)	(m³)	
1 5		C	122 005	0 0	440 0	C2 7	1.0
10	m±n	Summer	133.985	0.0	448.2	02.7	10
30	min	summer	86.337	0.0	5/8.4	121.2	33
60	mın	Summer	52.933	0.0	/12.9	181.8	62
120	min	Summer	31.380	0.0	845.5	240.9	120
180	min	Summer	22.833	0.0	922.9	272.5	154
240	min	Summer	18.130	0.0	977.2	292.4	184
360	min	Summer	13.031	0.0	1053.6	315.5	250
480	min	Summer	10.316	0.0	1112.1	329.1	318
600	min	Summer	8.601	0.0	1159.0	336.4	386
720	min	Summer	7.410	0.0	1198.3	339.4	456
960	min	Summer	5.854	0.0	1262.1	336.3	588
1440	min	Summer	4.194	0.0	1355.7	297.5	852
2160	min	Summer	3.001	0.0	1457.2	244.4	1232
2880	min	Summer	2.364	0.0	1530.8	194.9	1612
4320	min	Summer	1.688	0.0	1638.2	96.0	2376
5760	min	Summer	1.328	0.0	1720.3	10.8	3224
7200	min	Summer	1.102	0.0	1784.3	0.0	4040
8640	min	Summer	0.946	0.0	1837.7	0.0	4592
10080	min	Summer	0.831	0.0	1883.0	0.0	5240
15	min	Winter	133.985	0.0	502.4	87.1	18
30	min	Winter	86.337	0.0	648.2	155.0	32
60	min	Winter	52.933	0.0	798.6	224.9	60
120	min	Winter	31.380	0.0	947.1	293.4	118
180	min	Winter	22.833	0.0	1033.8	330.7	170

©1982-2015 XP Solutions

AWP		Page 2
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Diamage
XP Solutions	Source Control 2015.1	

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Overflow (l/s)	Σ	Max Outflow (l/s)	Max Volume (m³)	Stat	tus
240	min W	Vinter	99.948	1.948	0.0	18.7	19.2		37.9	791.3	Flood	Risk
360	min W	Vinter	99.889	1.889	0.0	18.4	18.7		37.2	767.3	Flood	Risk
480	min W	Vinter	99.815	1.815	0.0	18.1	18.1		36.2	737.0	Flood	Risk
600	min W	Vinter	99.734	1.734	0.0	17.7	17.5		35.2	704.1	Flood	Risk
720	min W	Vinter	99.653	1.653	0.0	17.3	16.8		34.1	671.4		ΟK
960	min W	Vinter	99.504	1.504	0.0	16.5	15.5		32.0	610.7		ΟK
1440	min W	Vinter	99.265	1.265	0.0	15.2	13.1		28.3	513.7		ΟK
2160	min W	Vinter	99.024	1.024	0.0	13.8	10.1		23.9	416.0		ΟK
2880	min W	Vinter	98.873	0.873	0.0	12.8	7.7		20.5	354.3		ΟK
4320	min W	Vinter	98.716	0.716	0.0	11.6	3.2		14.8	290.9		ΟK
5760	min W	Vinter	98.519	0.519	0.0	10.9	0.0		10.9	211.0		ΟK
7200	min W	Vinter	98.218	0.218	0.0	10.8	0.0		10.8	88.5		ΟK
8640	min W	Vinter	98.154	0.154	0.0	10.0	0.0		10.0	62.6		ΟK
10080	min W	Vinter	98.137	0.137	0.0	8.8	0.0		8.8	55.7		ΟK

	Storm Event	Rain (mm/hr)	Flooded Volume	Discharge Volume	Overflow Volume	Time-Peak (mins)
			(m³)	(m³)	(m³)	
240	min Winte	r 18.130	0.0	1094.6	354.7	192
360	min Winte	r 13.031	0.0	1180.2	383.5	268
480	min Winte	r 10.316	0.0	1245.8	401.5	344
600	min Winte	r 8.601	0.0	1298.3	412.1	416
720	min Winte	r 7.410	0.0	1342.3	417.7	490
960	min Winte	r 5.854	0.0	1413.7	418.9	628
1440	min Winte	r 4.194	0.0	1518.7	383.9	896
2160	min Winte	r 3.001	0.0	1632.2	307.0	1280
2880	min Winte	r 2.364	0.0	1714.6	228.4	1668
4320	min Winte	r 1.688	0.0	1835.1	68.2	2468
5760	min Winte	r 1.328	0.0	1926.8	0.0	3464
7200	min Winte	r 1.102	0.0	1998.6	0.0	3896
8640	min Winte	r 0.946	0.0	2058.4	0.0	4408
10080	min Winte	r 0.831	0.0	2109.4	0.0	5136

AWP		Page 3
Kensington Court	0031 - Royal Brunswick Park	
Woodwater Park Pynes Hill	Preliminary Attenuation Sizing	L.
Exeter EX2 5TY	Phase 5	Micco
Date 16/12/2015 15:49	Designed by gareth.jane	Desinado
File 0031-SW-06-A-PH5 ATTENUATION	Checked by	Drainage
XP Solutions	Source Control 2015.1	
<u>-</u>	Rainfall Details	
Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	IOU CV (Summer) 0./50	
M5-60 (mm)	20.100 Shortest Storm (mins) 15	
Ratio R	0.446 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +30	
<u>_</u>	<u> Time Area Diagram</u>	
г	Cotal Area (ha) 1.800	
	Time (mins) Area From: To: (ha) 0 4 1.800	

AWP						P	age 4
Kensington Court	()031 - Roya	al Bru	unswick Pa	rk		
Woodwater Park Pynes Hill	E	Preliminary	y Atte	enuation S	izing		Lu
Exeter EX2 5TY	I	Phase 5					Micco
Date 16/12/2015 15:49	I	esigned by	y gare	eth.jane			Desinance
File 0031-SW-06-A-PH5 ATTENUAT	ION	Checked by					Diamage
XP Solutions	S	Source Cont	crol 2	2015.1			
	M	lodel Detai	<u>ls</u>				
St	orage is Oni	line Cover Le	evel (m	n) 100.000			
	<u>Cellula</u>	r Storage	Struc	<u>ture</u>			
Infiltration	Inver Coefficient	rt Level (m) Base (m/hr)	98.00	0 Safety Fac 0 Poros	tor 2.0 ity 0.95		
	coerricient						
Depth (m) Area (m²) Inf. Are	ea (m²) Depth	1 (m) 2	Area (m²) Ini	f. Area (m²)	
0.000 42	7.5	0.0 2	2.000	427.5		0.0	
Hyd	ro-Brake (<u>Optimum® O</u>	utflo	w Control			
	Unit Desig	Reference M n Head (m)	D-SHE-	0156-1090-062	20-1090		
	Design	Flow (l/s)			10.9		
		Flush-Flo™		Calc	culated		
	Dia	Objective	Minimi	se upstream s	storage 156		
	Invert	Level (m)			98.000		
Minimum Out	let Pipe Dia	meter (mm)			225		
Suggested	Manhole Dia	meter (mm)			1200		
Control Points H	ead (m) Flow	v (l/s)	Contro	ol Points	Head	(m) Flow ((1/s)
Design Point (Calculated) Flush-Flo™	0.620 0.243	10.9 10.9 Mean	Flow c	Kick-Fl over Head Ran	o® 0. ge	470 -	9.5 8.9
The budgelesical calculations have	heer beed	the Heed/D			in for t	he Heelme T	
as specified. Should another type	of control d	levice other	than a	Hydro-Brake	Optimum®) be utilis	sed then these
storage routing calculations will b	e invalidate	ed		1	-1		
Depth (m) Flow (1/s) Depth (m) Flo	ow (l/s) Dep	th (m) Flow	(1/s)	Depth (m) Fl	ow (l/s)	Depth (m)	Flow (l/s)
0 100 5 6 0 800	12 3	2 000	19 0	4 000	26.4	7 000	34 5
0.200 10.8 1.000	13.6	2.200	19.8	4.500	28.0	7.500	35.7
0.300 10.8 1.200	14.9	2.400	20.7	5.000	29.4	8.000	36.9
0.400 10.3 1.400	16.0	2.600	21.5	5.500	30.8	8.500	38.1
0.500 9.8 1.600	17.0	3.000	23.0	6.000	32.1	9.000	39.2
0.600 10.7 1.800	18.0	3.500	24.8	6.500	33.2	9.500	40.3



Appendix E – Drainage Layout Drawings

- 1. The development is entirely located within Flood Zone 1 Low Risk. It is therefore not at risk of flooding from fluvial sources in up to a 1 in 1000 year return period.
- 3. The proposed drainage strategy has been prepared in accordance with the National Planning Policy Framework (NPPF) and the supplementary Planning Practice Guidance (NPPG).
- 4. The Barnet Surface Water Management Plan identifies the site as being wholly located within Brunswick Park - Group2_030 Critical Drainage Area.
- 5. The site has been previously developed and is currently occupied by a business park and school, therefore the site can be classed as 'brownfield'.
- 6. In accordance with London Plan 'Policy 5.13 Sustainable Drainage' and the North London Strategic Flood Risk Assessment, the discharge from the proposed development will be restricted back to undeveloped Greenfield run-off rates.
- 6. A desk top study has indicated that the site suffers from 'impeded drainage', therefore the drainage strategy utilises attenuation features with a restricted discharge, sized to cater for up to the 1 in 100 year storm.
- 7. Roof water from buildings and private areas of hard-standing (including the on-site road network) will be collected from downpipes, gutters and trapped gullies before being transferred via a private storm network towards on site attenuation features.
- 8. Rainwater harvesting will be provided throughout the development to reduce the volume of runoff being discharged and to capture the first 5mm of rainfall.
- 9. This Preliminary Drainage Layout drawing does not attempt to present a final design of the proposed drainage systems. Detailed design of the systems and any inherent features will commence on approval of the strategy and will include assessments due to further site investigations, health and safety, CDM etc.
- 10. We are currently liaising with Thames water to agree on a point of connection for both surface water and foul and confirm whether the existing sewerage networks have capacity to accommodate the development or to otherwise outline any offsite reinforcement requirements.
- 11. Any private drainage networks or features will be designed in accordance with Building Regulations Part H. The operation and maintenance of any communal private drainage will be undertaken via a third party management company.
- 12. Any adoptable drainage networks will be designed in accordance with Sewers for Adoption and will be handed to Thames Water for adoption.
- 13. The alignment of existing public drainage infrastructure is based on Thames Water asset record plans, as built survey information and topographic survey information.

Pre Development Runoff

In accordance with Policy 5.13 of The London Plan and the North London Strategic Flood Risk Assessment, the rate of runoff from the proposed brownfield development site will be restricted to replicate the pre-development greenfield scenario.

Given the proposed Phase 1 development area of only 5.5ha, the pre-development greenfield run-off rates have been assessed in accordance with the ICP SuDS Method, which is based on IH124, but for catchments of less than 50 ha.

Greenfield Runoff Rates

100yr+30%

Return Period	Greenfield Runoff Rate (l/s)
2yr	21.5
30yr	55.0
100yr	77.0

5.8

Proposed Phase 1 Drainage Features

School Site to in	dependent Cellula	r Storage feature			
Ownership	-	Private (Management Company)			
Impermeable C	Catchment	0.65 ha			
Dimensions		37.5 m x 10.0 m x 1.0 m deep			
100yr + 30% Vol	ume	356 m ³			
Balance of Pha	se 1 to proposed De	etention Basin			
Ownership		Private (Management Company)			
Impermeable Catchment		1.97 ha			
100yr+30% Volume		768 m ³ (above permanent v	vater)		
100yr+30% water level		0.838 m (above permanent water)			
Future runoff rat	tes				
<u>Return Period</u>	<u>School Runoff (l/s</u>	<u>s)</u> <u>Basin Discharge (l/s)</u>	Total		
2yr	2.1	19.4	21.5		
30vr+10%	3.8	42.2	46.0		

69.7

75.5



Flow	Route	



- Notes
- The development is entirely located within Flood Zone 1 Low Risk. It is therefore not at risk of flooding from fluvial sources in up to a 1 in 1000 year return period.
- 3. The proposed drainage strategy has been prepared in accordance with the National Planning Policy Framework (NPPF) and the supplementary Planning Practice Guidance (NPPG).
- 4. The Barnet Surface Water Management Plan identifies the site as being wholly located within Brunswick Park - Group2_030 Critical Drainage Area.
- 5. The site has been previously developed and is currently occupied by a business park and school, therefore the site can be classed as 'brownfield'.
- 6. In accordance with London Plan 'Policy 5.13 Sustainable Drainage' and the North London Strategic Flood Risk Assessment, the discharge from the proposed development will be restricted back to undeveloped Greenfield run-off rates.
- 6. A desk top study has indicated that the site suffers from 'impeded drainage, therefore the drainage strategy utilises attenuation features with a restricted discharge, sized to cater for up to the 1 in 100 year storm.
- 7. Roof water from buildings and private areas of hard-standing (including the on-site road network) will be collected from downpipes, gutters and trapped gullies before being transferred via a private storm network towards on site attenuation features.
- 8. Rainwater harvesting will be provided throughout the development to reduce the volume of runoff being discharged and to capture the first 5mm of rainfall.
- 9. This Preliminary Drainage Layout drawing does not attempt to present a final design of the proposed drainage systems. Detailed design of the systems and any inherent features will commence on approval of the strategy and will include assessments due to further site investigations, health and safety, CDM etc.
- 10. We are currently liaising with Thames water to agree on a point of connection for both surface water and foul and confirm whether the existing sewerage networks have capacity to accommodate the development or to otherwise outline any offsite reinforcement requirements.
- 11. Any private drainage networks or features will be designed in accordance with Building Regulations Part H. The operation and maintenance of any communal private drainage will be undertaken via a third party management company.
- 12. Any adoptable drainage networks will be designed in accordance with Sewers for Adoption and will be handed to Thames Water for adoption. 13. The alignment of existing public drainage infrastructure is based on Thames Water asset record plans, as built survey information and
- topographic survey information. Pre Development Runoff

In accordance with Policy 5.13 of The London Plan and the North London Strategic Flood Risk Assessment, the rate of runoff from the proposed brownfield development site will be restricted to replicate the

pre-development greenfield scenario.

The pre-development greenfield run-off rates have been assessed in accordance with the ICP SuDS Method, which is based on IH124, but for catchments of less than 50 ha.

	G	reenfield Ru	noff Rates (l	/s)	
Return Period	Ph2	PH3	PH4	 PH5	Tota
2yr	16.4	4.7	10.1	10.9	42.1
30yr	42.0	12.0	26.0	28.0	108.0
100yr	58.8	16.8	36.4	39.2	151.2
Proposed Attenuation	on Features				
Phase 2					

Ownership Impermeable Catchment Dimensions 100yr + 30% Volume	Private (Management Company) 2.19 ha 25.0 m x 20.0 m x 2.0 m deep 920 m ³		
<u>Phase 3</u> Ownership Impermeable Catchment Dimensions 100yr + 30% Volume	Private (Management Company) 0.425 ha 12.0 m x 7.0 m x 2.0 m deep 160.0 m ³		
<u>Phase 4a</u> Ownership Impermeable Catchment Dimensions 100yr + 30% Volume	Private (Management Company) 0.32 ha 15.5 m x 5.0 m x 2.0 m deep 144 m ³		
<u>Phase 4b&c</u> Ownership Impermeable Catchment Dimensions 100yr + 30% Volume	Private (Management Company) 1.31 ha 15.5 m x 20.0 m x 2.0 m deep 578 m ³		
<u>Phase 5</u> Ownership Impermeable Catchment Dimensions 100yr + 30% Volume	Private (Management Company) 1.8 ha 26.0 m x 16.5 m x 2.0 m deep 799 m ³		
Future Runoff Rates			
Return Period PH2 (l/s)	<u>PH3 (l/s)</u> <u>PH4 (l/s)</u> <u>PH5 (l/s)</u> <u>Total</u>		

<u>Return Period</u>	<u>PH2 (l/s)</u>	<u>PH3 (l/s)</u>	<u>PH4 (l/s)</u>	<u>PH5 (l/s)</u>	<u>Total</u>
2yr	16.3	4.6	10.0	10.9	41.8
30yr+10%	41.7	11.4	26.0	27.8	106.9
100yr+30%	57.2	15.9	36.0	38.1	147.2



Key	Proposed Drainage
Detailed Application (Phase 1)	Imper
Outline Application Boundary	Cellul
Existing Retained Drainage	Overla
\longrightarrow Thames Water Foul Sewer	—→→ Tham (indic:
$\longrightarrow \longrightarrow$ Thames Water Surface Water Sewer	(incirc)

L	LIOM	коше	
'n		D' '	



Appendix F – Thames Water Correspondence
Chris Yalden

From:	DEVELOPER.SERVICES@THAMESWATER.CO.UK
Sent:	15 December 2015 08:32
То:	Chris Yalden
Subject:	IRef:1013480825 RE: Royal Brunswick Park re-development scheme, Barnet - Outline SW Strategy

Dear Chris,

Thank you for your email.

From the information you have provided, we have no issues with your reduction/attenuation measures.

Best regards

Shaun Picart

Thames Water - Development Engineer

0800 009 3921

Original Text

From:	chris.yalden@awpexeter.com
To:	DEVELOPER.SERVICES@THAMESWATER.CO.UK
CC:	
Sent:	08.12.15 15:12:50

Subject: Royal Brunswick Park re-development scheme, Barnet - Outline SW Strategy

FAO Shaun Picart, Development Engineer Chris Freeman, Technical Coordinator

Shaun, Chris,

We spoke with you both earlier this year with regard to the proposed school which forms Phase 1 of the 'Royal Brunswick Park re-development scheme', at Brunswick Park Road, Barnet (site formerly known as North London Business Park).

I would now like to seek your thoughts on our work-in-progress drainage strategy for the full redevelopment site. I am not seeking approval or final agreement as clearly you will need to review full details of the scheme, however I'm hoping your response will give us confidence that we're currently progressing in the right direction.

To remain compliant with local and regional policies the scheme will need to reduce the peak runoff from the brownfield site to the equivalent greenfield rates; offering a significant reduction and downstream betterment.

As-built records indicate connections between your existing surface water sewer and an existing on-site attenuation pond. In accordance with the London Plan Policy 5.13 Sustainable Drainage Hierarchy, we are

keen to retain the function of this pond to provide on-site attenuation, with a controlled discharge to your network, at greenfield rates. The proposals would demonstrate a significant reduction in peak rate of runoff whilst also providing water quality enhancement and improved site management.

Can you please confirm that this outline drainage strategy is acceptable in principle?

With regards to foul flows, the proposals will generate an increased foul flow. We've completed a predevelopment enquiry to establish whether this flow can be accommodated or whether any off-site reinforcement will be required – this will be submitted shortly.

I look forward to hearing from you in due course and welcome any discussions.

Best Regards,

Chris Yalden Associate MICE, IEng



Kensington Court, Woodwater Park, Pynes Hill, Exeter EX2 5TY

office:	01392 409007
direct dial:	01392 441066
Mobile:	07843 107790
email:	chris.yalden@awpexeter.com
web:	www.awpexeter.com

AWP is a regional engineering consultancy providing development planning and infrastructure services to developers and house builders across the south west.

From: DEVELOPER.SERVICES@THAMESWATER.CO.UK [mailto:DEVELOPER.SERVICES@THAMESWATER.CO.UK] Sent: 26 March 2015 11:14 To: Chris Yalden Subject: RE: RE: IRef:1012416174 RE: Query relating to Buildover Agreement (Ref. 50039476-BN)

Dear Chris,

Thank you for your email.

I've reviewed your drawing, what you're proposing seems fine in principal.

We look forward to receiving your application including longitudinal drawings.

Best regards

Shaun Picart

Thames Water - Development Engineer

0800 009 3921

Original Text

From:chris.yalden@awpexeter.comTo:DEVELOPER.SERVICES@THAMESWATER.CO.UK

CC:

Sent: 19.03.15 10:05:57

Subject: RE: IRef:1012416174 RE: Query relating to Buildover Agreement (Ref. 50039476-BN)

FAO Chris Freeman, Technical Coordinator

RE: Application to build over a Class 3 and a Class 2 Public Sewer (Ref: 50039476-BN) Site Address: Royal Brunswick Park, London, N14 5DU

Many thanks for your below email, received at the tail end of last year.

Given that Thames Water will not accept a build-over agreement and are making recommendations to divert the existing 375mm and 600mm diameter sewers, we have undertaken an assessment to define a possible diversion route. The output of this assessment can be seen on the attached Sketch Plan (ref. 0031-SK-101).

The deliverability of this potential diversion will be subject to existing sewer levels and capacity at the point of connection. There is a risk that the existing sewer beneath Brunswick Park Road will be too shallow / small to enable a connection and the diversion may need to include relaying of this system, downstream towards Caversham Court, where the public sewers turn and head east.

Pleas can you confirm whether the broad principles of this diversion are preferable to Thames Water, as opposed to the previously discussed build-over.

Best Regards,

Chris Yalden Associate MICE, IEng



Kensington Court, Woodwater Park, Pynes Hill, Exeter EX2 5TY

office:	01392 409007
direct dial:	01392 441066
email:	<u>chris.yalden@awpexeter.com</u>
web:	www.awpexeter.com

AWP is a regional engineering consultancy providing development planning and infrastructure services to developers and house builders across the south west.

From: <u>DEVELOPER.SERVICES@THAMESWATER.CO.UK</u> [mailto:DEVELOPER.SERVICES@THAMESWATER.CO.UK] Sent: 30 December 2014 10:01 To: Chris Yalden Cc: Gavin Swift; Ian Awcock Subject: IRef:1012416174 RE: Query relating to Buildover Agreement (Ref. 50039476-BN) Dear Mr Yalden,

Many thanks for your below email.

I have discussed your comments with our senior connections manager who is of the opinion that the Sewers For Adoption 6th Edition and specifically Table 2.1 which you mention is in it's principals referring to sewers in residential development land or in public roads and built-up domestic areas which due to the difficulty and complexities of cordoning off areas for open-cut trench works would make this type of access unlikely to be sought and given.

In areas such as parks and greenfield spaces however it is very likely that open-cut trenches would be used to repair sewers due to cost-effectiveness and simplicity of access even at 8 metres as tunnelling repairs would be significantly more costly.

It is for the above reasons and those previously mentioned that we are not able in this instance to allow these 2 sewers to be built over by this proposed development and we must request that an application be made under Section 185 of the Water Industry Act 1991 to divert the sewers around the proposed development.

Kind Regards

Chris Freeman

Technical Coordinator

Original Text

- From: chris.yalden@awpexeter.com
- To: <u>developer.services@thameswater.co.uk</u>
- CC: <u>lan.Awcock@awpexeter.com</u>;gavin.swift@awpexeter.com

Sent: 18.12.14 15:05:39

Subject: Query relating to Buildover Agreement (Ref. 50039476-BN)

FAO Chris Freeman, Technical Coordinator

RE: Application to build over a Class 3 and a Class 2 Public Sewer (Ref: 50039476-BN) Site Address: Royal Brunswick Park, London, N14 5DU

Many thanks for your response to our build-over application for the above scheme; I wanted to touch base with you to discuss the application in a little more detail but understand that you're out of office today.

We respect that it's likely a standard position for Thames Water to refuse Build Over Consent for developments located above large public sewers however in this case we wanted to ensure that consideration had been given to the fact the existing sewer is 8m deep. In accordance with Sewers for Adoption guidance (SfA 6th Edition, Table 2.1) any repair, maintenance or renewal of this network by opencut methods is not anticipated. On this basis we had considered that a build over agreement would be permitted for this scheme as it would not impact on any future works associated to the underlying sewers.

We welcome your comments on the above.

Regards,

Chris Yalden

Principal Engineer MICE, IEng



Kensington Court, Woodwater Park, Pynes Hill, Exeter EX2 5TY

office:	01392 409007
direct dial:	01392 441066
email:	<u>chris.yalden@awpexeter.com</u>
web:	www.awpexeter.com

AWP is a regional engineering consultancy providing development planning and infrastructure services to developers and house builders across the south west.

Private and confidential

This email is sent on behalf of Awcock Ward Partnership Consulting Limited (AWP) and its contents are private and confidential to the named recipient. If you receive this communication in error, please notify the sender immediately and delete any copies without disclosing the contents to any other person.

Awcock Ward Partnership Consulting Limited Registered Office: 2 Barnfield Crescent, Exeter, EX1 1QT Registered in England: Company No. 8230346

This email has been scanned by the Symantec Email Security.cloud service. For more information please visit <u>http://www.symanteccloud.com</u>

This email has been scanned by the Symantec Email Security.cloud service. For more information please visit <u>http://www.symanteccloud.com</u>

This email has been scanned by the Symantec Email Security.cloud service. For more information please visit http://www.symanteccloud.com

Our Locations

Birmingham

2 The Wharf Bridge Street Birmingham B1 2JS T. 0121 643 4694 birmingham@curtins.com

Bristol

Quayside 40-58 Hotwell Road Bristol BS8 4UQ T. 0117 302 7560 bristol@curtins.com

Cambridge

50 Cambridge Place Cambridge CB2 1NS T. 01223 631 799 cambridge@curtins.com

Cardiff

3 Cwrt-y-Parc Earlswood Road Cardiff CF14 5GH T. 029 2068 0900 cardiff@curtins.com

Douglas

Varley House 29-31 Duke Street Douglas Isle of Man IM1 2AZ T. 01624 624 585 douglas@curtins.com

Dublin

39 Fitzwilliam Square Dublin 2 Ireland T. 00353 1 507 9447 dublin@curtins.com

Edinburgh

1a Belford Road Edinburgh EH4 3BL T. 0131 225 2175 edinburgh@curtins.com

Glasgow

Queens House 29 St Vincent Place Glasgow G1 2DT T. 0141 319 8777 glasgow@curtins.com

Kendal

28 Lowther Street Kendal Cumbria LA9 4DH T. 01539 724 823 kendal@curtins.com

Leeds

Rose Wharf Ground Floor Leeds L29 8EE T. 0113 274 8509 leeds@curtins.com

Liverpool

Curtin House Columbus Quay Riverside Drive Liverpool L3 4DB T. 0151 726 2000 liverpool@curtins.com

London

40 Compton Street London EC1V 0BD T. 020 7324 2240 Iondon@curtins.com

Manchester

Merchant Exchange 17-19 Whitworth Street West Manchester M1 5WG T. 0161 236 2394 manchester@curtins.com

Nottingham

56 The Ropewalk Nottingham NG1 5DW T. 0115 941 5551 nottingham@curtins.com