

Flood Risk Assessment, Surface and Foul Water Drainage Strategy

Land at SRC Recycling, Eastergate, West Sussex

29 October 2021

Prepared for
Offset Architects



Prepared for:
Offset Architects
Frontwell Avenue
Eastergate
Chichester
PO20 3RU

Prepared by:
Markides Associates
81 Southwark Bridge Road
London
SE1 0NQ



Project Number: 20293
Doc Number: 20293-MA-XX-XX-RP-C-FR01

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
P01.1	Issued for comment	BL	SF	-	-	28.10.21

Copyright 2021 Markides Associates Ltd. The concepts and information contained in this document are the property of Markides Associates. Use or copying of this document in whole or in part without the written permission of Markides Associates constitutes an infringement of copyright.

Limitation: This report has been prepared on behalf of, and for the exclusive use of the client of Markides Associates, and is subject to, and issued in accordance with, the provisions of the contract between the client and Markides Associates. Markides Associates accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Contents

INTRODUCTION.....	3
FLOOD RISK MANAGEMENT POLICY.....	6
3. BASELINE CONDITIONS	11
4. FLOOD RISK ASSESSMENT	15
5. SURFACE WATER MANAGEMENT	17
6. FOUL WATER STRATEGY.....	26
7. CONCLUSIONS	27

Tables

Table 1.1 Site Details.....	3
Table 5.1: Peak rainfall intensity allowance in small catchments (less than 5km ²) or urban drainage catchments (based on a 1961 to 1990 baseline).....	17
Table 5.2 Existing run-off rate.....	18
Table 5.3 Drainage Hierarchy Assessment.....	19
Table 5.4 SuDS Hierarchy.....	20

Figures

Figure 1.1 Site Location Plan
Figure 1.2 Illustrative Masterplan
Figure 3.1 Hydrology
Figure 3.2 BGS Mapping – Superficial Deposits
Figure 3.3 BGS Mapping – Bedrock Geology
Figure 3.4 Soakage Location Plan
Figure 3.4 Southern Water Asset Map
Figure 4.1 EA Flood map for planning
Figure 4.2 Flood risk from surface water
Figure 5.1 SuDS Management Plan

Appendices

Appendix A – Proposed Development Plan
Appendix B – Topographical Survey
Appendix C – Soakage Testing Letter Report
Appendix D – ESTimate of Existing RUN-OFF RATESa and PUBLIC SEWER RECORDS
Appendix E – PROPOSED Drainage Calculations & Strategy
Appendix F – Water Quality Assessment
Appendix G – SuDS Management & Maintenance Plan

Introduction

1.1 Introduction

- 1.1.1 Markides Associates has been appointed by Offset Architect to prepare a Flood Risk Assessment (FRA) and Drainage Strategy to support a planning application for the proposed residential development at Land at SRC Recycling, Eastergate, West Sussex, PO20 3RU.
- 1.1.2 In the preparation of this FRA, all sources of flooding have been considered, in accordance with the requirements of the National Planning Policy Framework (NPPF) and current flood risk management policy.
- 1.1.3 The existing site is located in in the designated countryside. Refer to **Table 1.1** below for details of the site, and the site location plan shown in **Figure 1.1** below.

Table 1.1 Site Details

Site Address	Land at SRC Recycling, Eastergate, West Sussex, PO20 3RU
Grid reference	494424mE, 105784mN (SU9442405784)
Topography	Relatively level;
Geology	Clay, Silt, Sand and Gravel
Site Area	3.2 ha
Existing Use	car salvage centre
Boundaries	North – Woodland
	East – Residential Development alongside east side of Fontwell Avenue
	South – recently permitted residential development
	West – recently permitted residential development alongside west side of Fontwell Avenue with gaps and open fields beyond
Access	Fontwell Avenue
Local Planning Authority	Arun District Council
Lead Local Flood Authority	West Sussex County Council

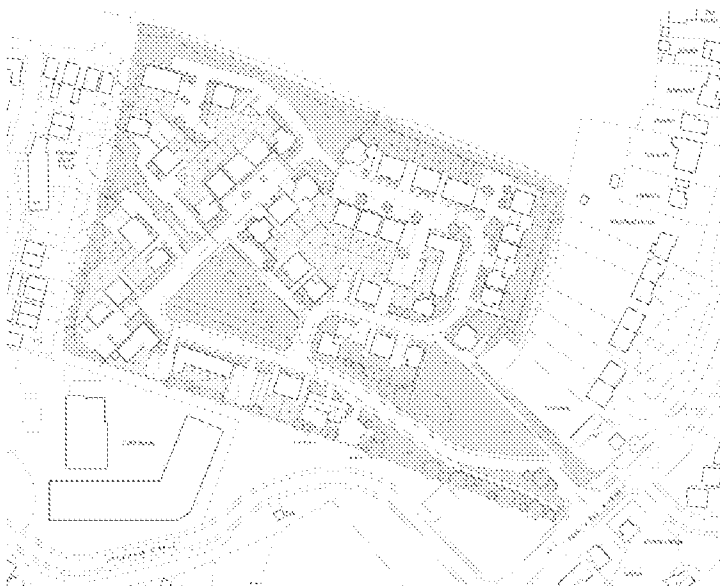
1.2.1	This report has been prepared as a means of demonstrating that flooding and surface water drainage issues would not constrain the development of the Site or have any adverse effects on existing public foul/surface water drainage networks and watercourses or groundwater source protection zones.
1.2.2	In terms of surface water drainage and potential for flooding, it examines the site's suitability in respect of planning policy and physical characteristics in order to allow suggested solutions to deal with drainage following development, thus ensuring the site is drained in a sustainable manner whilst not impacting the surrounding area. The surface water drainage strategy (SuDS scheme) will be designed to conform to non-statutory Technical Guidance for a detailed planning application and the CIRIA SuDS Manual.
1.2.3	Foul drainage discharge emanating from the site, has also been reviewed and will be designed to the current Sewerage Sector Guidance (SSG).

1.3.1 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. However, Markides Associates Ltd cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

1.4 Development Proposals

- 1.4.1 The proposals comprises of demolition of the existing buildings and the change of use of the site from a sui generis (car salvage centre) to 80 x dwelling houses (Use Class C3) Refer to **Figure 1.2** below for illustration of the proposed development. The full development plans are included in Appendix A.

Figure 1.2 Illustrative Masterplan



Flood Risk Management Policy

2.1 National Planning Policy Framework

- 2.1.1 The National Planning Policy Framework (NPPF) provides national guidance to planning authorities, developers, the public, and the Environment Agency (EA), to ensure that flood risk is considered at all stages of the planning process.
- 2.1.2 The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
- 2.1.3 The NPPF states that Local Plans should be supported by Strategic Flood Risk Assessments (SFRA) and policies developed in order to manage flood risk from all sources, considering advice from the EA and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. It advises that Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:
- ✧ Applying the Sequential Test and if necessary, the Exception Test;
 - ✧ Safeguarding land from development that is required for current and future flood management;
 - ✧ Using opportunities offered by new development to reduce the causes and impacts of flooding;
 - ✧ Where climate change is expected to increase flood risk so that some existing developments may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of the development, including housing, to more sustainable locations.
- 2.1.4 The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the Proposed Development in areas with a lower risk of flooding.
- 2.1.5 If it is not possible for development to be located in zones with a lower risk of flooding (considering wider sustainable development objectives), it may be necessary to demonstrate through the Exception Test can be applied. For the Exception Test to be passed:
- ✧ The development would provide wider sustainability benefits to the community that outweigh the flood risk;

- ✱ The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

- 2.1.6 This report at section 4 confirms that it is considered that the site would pass the Sequential Test and the Exception Test is not required.

2.2 National Planning Practice Guidance

- 2.2.1 The NPPF provides additional guidance to LPAs to ensure effective implementation of the planning policies set out within the NPPF regarding development in areas at risk of flooding.
- 2.2.2 The PPG states that developers and LPAs should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS.

2.3 Flood and Water Management Act

- 2.3.1 The Flood and Water Management Act 2010 (FWMA) was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with the UK Government's response to Sir Michael Pitt's Review of the Summer 2007 floods.
- 2.3.2 The Lead Local Flood Authority (LLFA) for the site is West Sussex County Council. All LLFAs have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from surface run-off, groundwater and ordinary watercourses (i.e. non-main rivers).

2.4 Sustainable Drainage Systems: Non-statutory technical standards

- 2.4.1 The Non-statutory technical standards for sustainable drainage systems sets out non-statutory technical standards for sustainable drainage systems. They should be used in conjunction with the NPPG.
- 2.4.2 The LPA may set local requirements for planning permission that have the effect of more stringent requirements than the non-statutory technical standards.
- 2.4.3 The Non-Statutory Technical Standards for Sustainable Drainage Systems: Best Practice Guidance was published by Local Authority SuDS Officer Organisation (LASOO) in July 2015 to provide an interpretation of the technical standard.

2.5 Local Flood Risk Management Policy

2.5.1 The following documents have been reviewed as part of this Flood Risk Assessment:

- ❖ West Sussex Preliminary Flood Risk Assessment (May 2011)
- ❖ West Sussex Local Flood Risk Management Strategy Report
- ❖ West Sussex Strategic Environmental Assessment

2.5.2 The Arun Local Plan 2011-2031 was adopted by resolution of Full Council on 18th of July 2018. Policy W DM2 Flood Risk states:

Development in areas at risk from flooding, identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood Risk Assessment (SFRA) , will only be permitted where all of the following criteria have been satisfied:

- a) The sequential test in accordance with the National Planning Policy Guidance has been met.*
- b) A site specific Flood Risk Assessment demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall.*
- c) The sustainability benefits to the wider community are clearly identified. d. The scheme identifies adaptation and mitigation measures.*
- d) Appropriate flood warning and evacuation plans are in place; and*
- e) New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas.*

The reports prepared as part of the criteria above must take into account contingency allowances, taking climate change into account as set out in Flood Risk Assessments: climate change allowances section of the NPPG.

In locations where strategic flood defence or resilient and resistant construction measures are necessary within the site itself, proposals will be required to demonstrate how measures have been incorporated as an intrinsic part of the scheme in a manner which is compatible with the latest Strategic Flood Risk Assessment.

All development proposals must take account of relevant Surface Water Management Plans, Catchment Flood Management Plans and related Flood Defence Plans and strategies such as the Lower Tidal River Arun Strategy. The council may require financial contributions from development on sites where measures to address flood risk or to improve the environmental quality of watercourses have been identified by these Plans and Strategies.

2.5.3 Policy W DM3 sustainable Urban Drainage System states:

To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process. Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include:

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

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- f) Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.*
- g) Effectively manage water (including its quality)*
- h) Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and*
- i) Provide amenity for local residents (ensuring a safe environment) e. Retain the existing drainage network of the site and the wider area,*
- j) Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.*

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

Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.

- k) Undertake up to six months groundwater monitoring within the winter period.*
- l) Undertake winter percolation testing in accordance with BRE365.*
- m) The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.*
- n) The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.*

2.5.4 Barnham and Eastergate's Neighbourhood Plan 2014-2029, Policy ES1 Flooding, Drainage and new development states that *"New development should aim to reduce the overall level of flood risk in the area:*

- ❖ *Development, other than minor domestic or commercial extensions, will not be supported:*
 - without clear evidence provided of there being no flood risk (either to the development site or to other land) arising from the carrying out and use of the development; and
 - should take account of the Surface Water Management Plan for Lidsey Catchment and the Aldingbourne and Barnham Rife Strategy when published.
- ❖ *Planning permission should only be granted for new development subject to a condition that:*
 - no development shall commence until full details of the proposed drainage schemes for surface and foul water (including details of their routing, design, and subsequent management and maintenance) have been submitted to and approved by the planning authority; and
 - no building shall be occupied until the drainage schemes have been implemented in accordance with the approved details.

2.5.5 Policy H7. Drainage for new housing states that "Wherever possible, new housing development should be designed so as to have a predicted water discharge of no more than 80 litres of water per person per day, in line with the requirements of Level 5 of the Code for Sustainable Homes (CfSH)." Although the CfSH no longer applies, the policy is still applicable.

3. Baseline Conditions

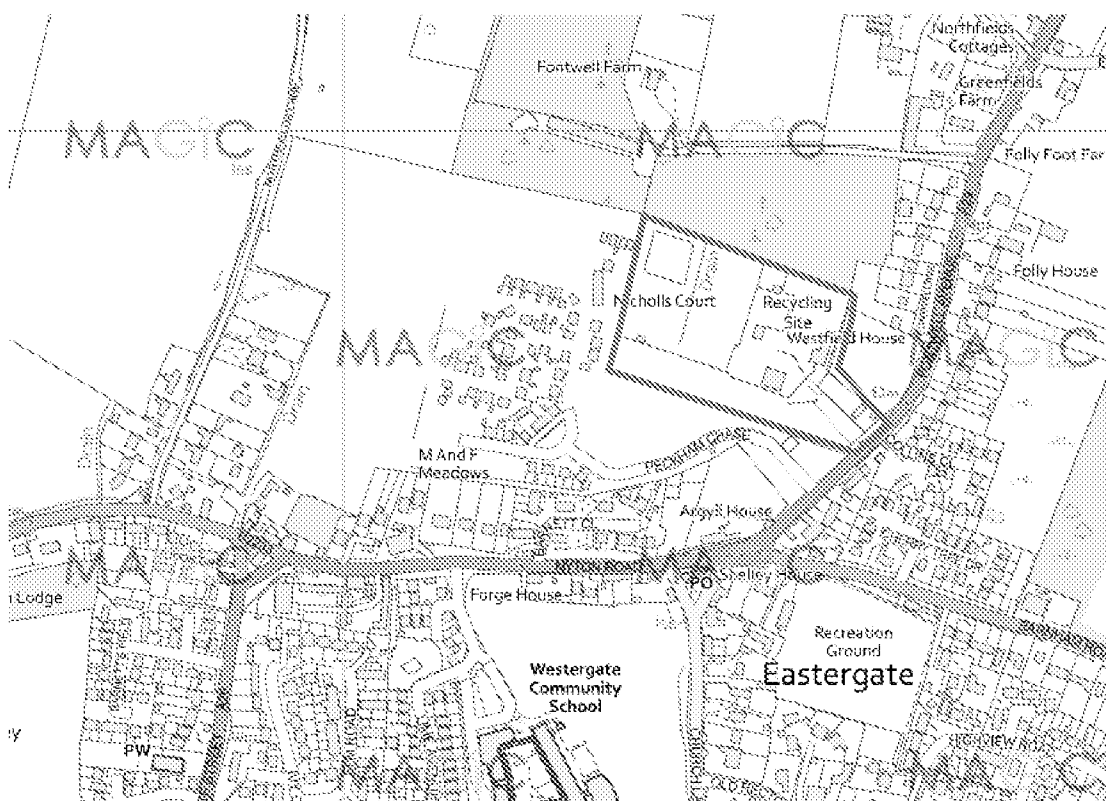
3.1 Topography

- 3.1.1 Based on the Topographical Survey by J. Brotherton & Partners (ref. 20141) in June 2010, the site is generally flat, falling from northwest to southeast from approximately 14.7m AODN to 123m AODN. The full survey drawings are included in **Appendix B**.

3.2 Hydrology

- 3.2.1 The local area is a Coastal Plain extending from South Downs to the current seacoast. The land is flat, close to the sea level and is only drained by means of a series of drainage channels known as “rifles”. The nearest rifle to the Site is located 380m west of the western site boundary. Refer to **Figure 3.1** below. A small drain is shown on the OS plan within the site, however this no longer exists.

Figure 3.1 Hydrology



- 3.2.2 The villagers of Barnham and Eastergate are known to face flooding from the rifles and ditches whenever there was heavy rainfall in the past. The risk of flooding in the area of Eastergate is investigated in more detail below.

3.3 Geology

3.3.1 Based on the British Geology Survey (BGS) online data, the site appears to be underlain by the Head Deposits of Clay, silt, Sand and Gravel. Refer to **Figure 3.2** and **Figure 3.3** below.

Figure 3.2 BGS Mapping – Superficial Deposits

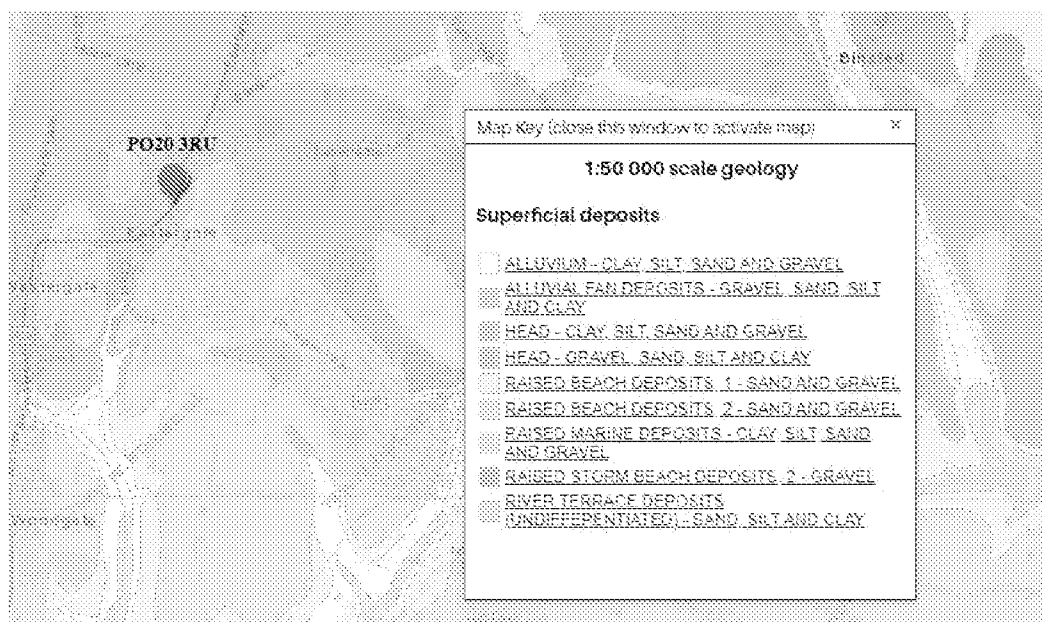
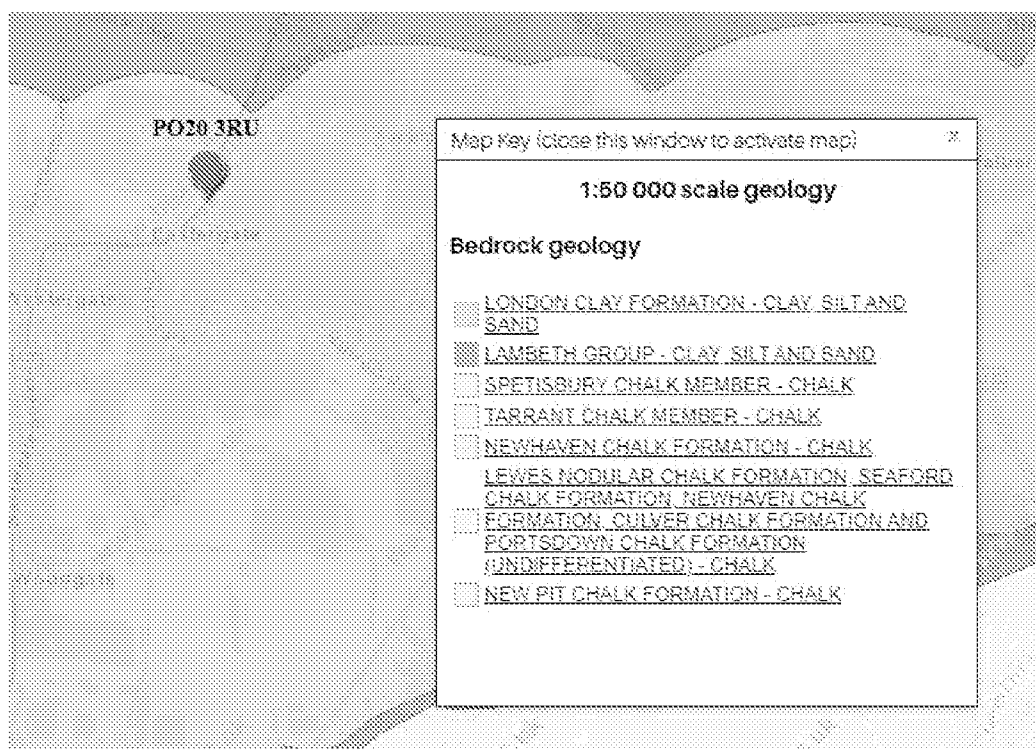
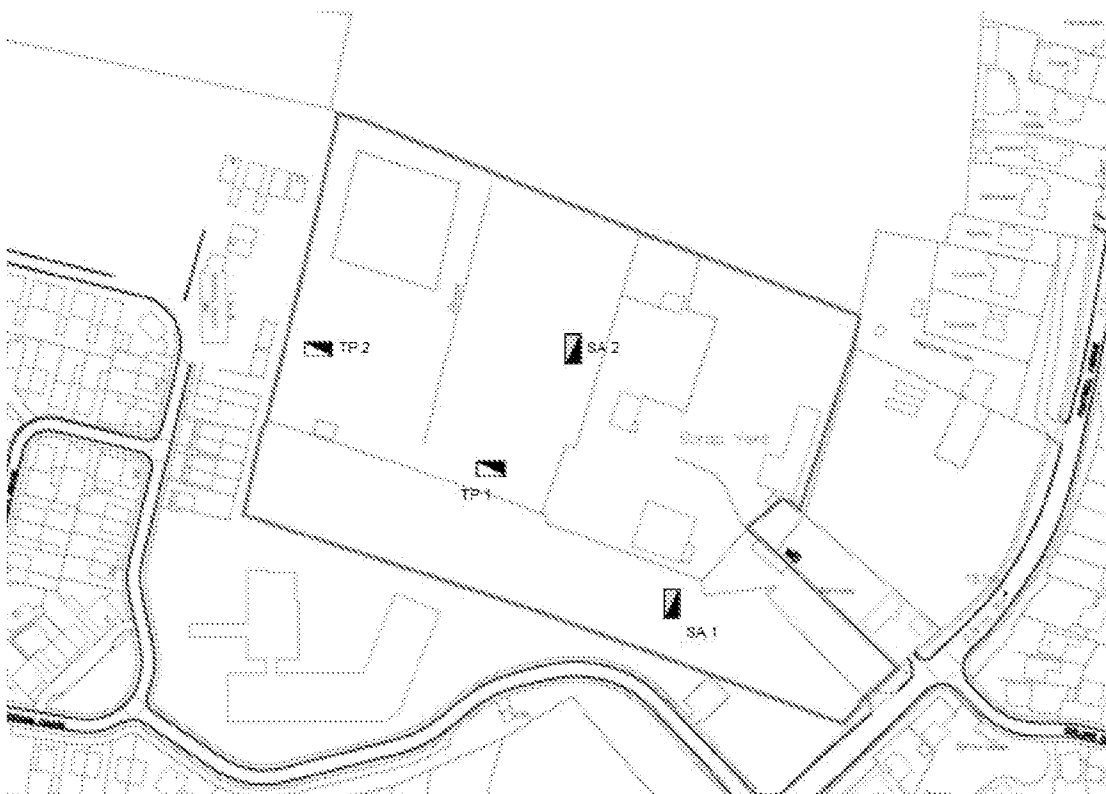


Figure 3.3 BGS Mapping – Bedrock Geology



- 3.3.2 Soakage testing was undertaken at the site in December 2020 and confirmed that the site is underlain by Head Deposits of varied composition of clay at the top followed by Gravel/Silt. Refer to **Appendix C** for the Soakage Testing Letter Report.
- 3.3.3 Groundwater level only encountered in Trial Pit 1 at 2.9m (rest level) within the south-central section of the site). No groundwater was encountered at other Trial Pits location, even though Trial Pit 2 was excavated to a depth of 4mbgl.
- 3.3.4 Following BRE365 methodology, soakage tests were undertaken at two locations: SA1 and SA2. Refer to **Figure 3.4** below. Soil infiltration rates of 6.40×10^{-5} m/s and 4.98×10^{-5} m/s were attained at SA1 and SA2, respectively.
- 3.3.5 The lower of the infiltration rates was used in the calculations of the attenuation storage. Soakaways across the site have been designed to terminate 1m above the known water table, although water table was reached only alongside the southern border of the site.

Figure 3.4 Soakage Location Plan

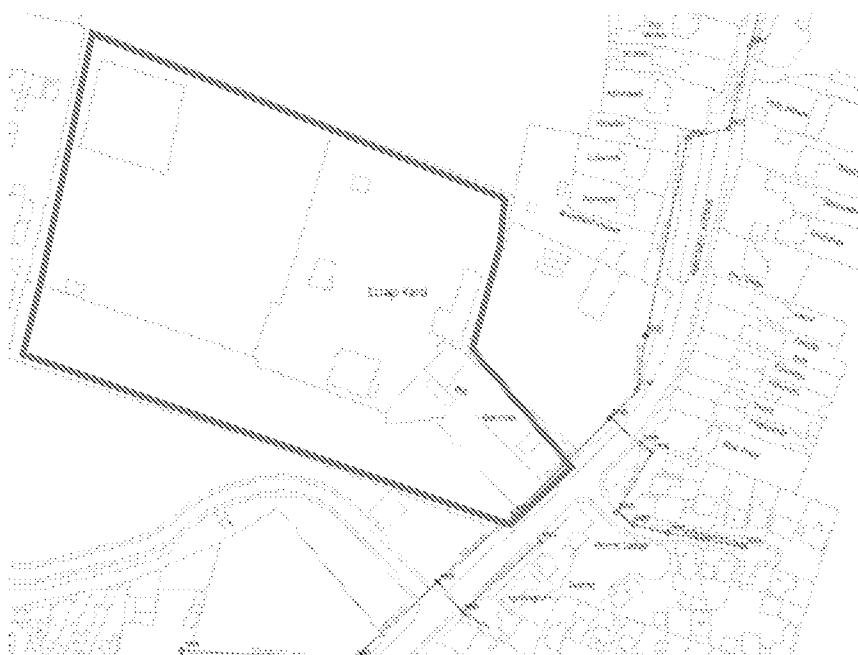


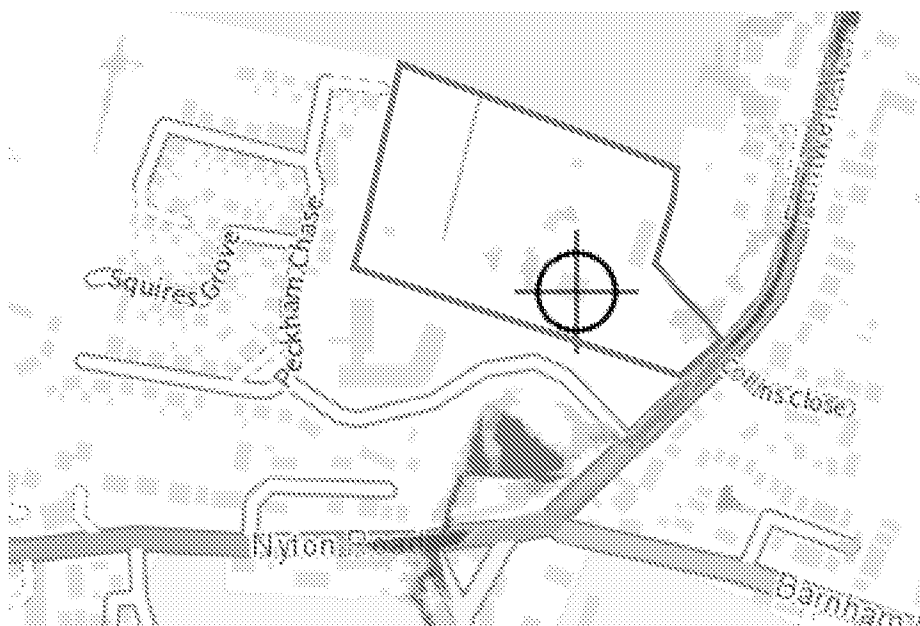
- 3.3.6 The site is located within low Groundwater Vulnerability. The groundwater vulnerability maps show the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre.
- 3.3.7 The site lies outside of Source Protection Zones and does not lie within an Aquifer.

3.4 Existing Sewer Infrastructure

- 3.4.1 Based on Southern Water sewer records there are 225mm diameter foul sewers conveying flows southwards alongside western perimeter of Frontwell Avenue. Refer to **Figure 3.5** below and **Appendix D** for the full sewer records.
- 3.4.2 The nearest foul water manhole to the site is FW 4601 with the depth to invert (DTI) being 1.82m (CL 12.73, IL 10.91)

Figure 3.5 Southern Water Asset Map





4.3 Groundwater Flooding

- 4.3.1 Based on bedrock strata of Clay in the locality, the risk of groundwater flooding is very low
- 4.3.2 During the soakage testing no groundwater was encountered only in one of the trial holes at a level of 2.9m bgl alongside the southern boundary. Groundwater was not found at any other location, even though one of trial holes was dug to a depth of 4m bgl.

4.4 Flooding from Sewers

- 4.4.1 Based on the Southern Water Sewer Maps, there are no surface water sewers in the vicinity of in close proximity to the site. Therefore, there is no risk of flooding from surface water sewer surcharge.
- 4.4.2 Foul water sewers in the southern extremities of the site can be susceptible to ingress of groundwater flooding into the sewers. Foul water sewers will be constructed to high standard to prevent groundwater ingress in the future. The risk of foul water sewer flooding is therefore very low.

4.5 Reservoirs, Canals, & Artificial Sources

- 4.5.1 Based on the EA data, the site is located outside the extent of flooding from reservoirs. Therefore, the risk to site of flooding from Reservoirs, Canals, & Artificial Sources is assessed as low.

4.6 Application of Sequential and Exception Tests

- 4.6.1 As the application site is located within Flood Zone 1, and other risks of flooding have been assessed as low, the site will pass the sequential test, when applied by LPA. There is no restriction on residential development on this site. The exception test is not required.

5. Surface Water Management

- 5.1.1 This surface water drainage strategy has been developed based on the Non-statutory Technical Guidance for Sustainable Drainage Systems, CIRIA Guidance C753 “The SuDS Manual”, and Water, People, Places – A guide for master planning sustainable drainage into developments– taking into account the spatial and environmental constraints of the site.
- 5.1.2 Based on the most recent advice on climate change reported in NPPG, peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. It is recommended that considerations for future climate change are included in Flood Risk Assessments for proposed developments.
- 5.1.3 In July 2020, the Environment Agency published new guidance on how to use climate change allowances in Flood Risk Assessments and Drainage Strategies. It is recommended that designs accommodate the upper and central allowances of the climate change to understand the range of impact. Table 2 of the guidance (reproduced below) shows anticipated changes in peak rainfall intensity in small catchments. As a minimum, there should be no significant flood hazard to people from on-site flooding for the central allowance.

Table 5.1: Peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage catchments (based on a 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

- 5.1.4 The site is likely to be subject to increases in rainfall intensity of 20% to 40% for the central and upper allowances. Therefore, the sustainable drainage system that will serve the proposed development will be designed to cater for the 1 in 100- year plus 40% rainfall event.

5.3 Post-development surface water runoff

5.3.1 In accordance with the PPG, Building Act 2000 Clause H3.3, surface water run off not collected for re-use must be discharged in the following hierarchy:

- 1) To ground (infiltration techniques);
- 2) To a surface water body;
- 3) To a surface water sewer; or
- 4) To the combined sewer.

5.3.2 Refer to **Table 5.3** for an assessment of the drainage hierarchy.

Table 5.3 Drainage Hierarchy Assessment

Disposal method	Feasible	Comments
1st) Infiltration	✓	In-situ soakaway testing confirmed that infiltration techniques are feasible.
2nd) Watercourse	✗	No watercourses in close proximity.
3rd) Surface Water sewer	✗	No surface water sewers in close vicinity.
4th) Combined sewer	✗	No combined sewers in close vicinity.

5.3.3 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to infiltrate surface water to the ground.

5.4 Sustainable Drainage Systems

5.4.1 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to increase the biodiversity, provide amenity, control discharge volumes, and manage water quality.

5.4.2 The opportunities and constraints for the use of SuDS within the site are assessed in **Table 5.4**. The assessment is based on the management train approach outlined in CIRIA C753 "The SuDS Manual" and Building Regulations SuDS Hierarchy.

Table 5.4 SuDS Hierarchy

SuDS Component	Feasible	Comment
Green Roofs	✗	Residential units most likely to have pitched roofs, making green roofs unfeasible.
Ponds / Basins	✓	In order to facilitate practicable maintenance and maximise attenuation benefits 1:4 side-slope basins tend to require a significant land requirement.
Swales & Filter strips	✓	Swales and filter strips could be incorporated and integrated with the landscape strategy.
Infiltration	✓	The majority of the site appears to be underlain by permeable sands and gravels at depth of approx. 3mbgl.
Permeable Surfacing	✓	Opportunities to utilise permeable paving will be maximised in parking areas to improve the water quality of the surface water discharge.
Tanked systems	✗	Should attenuation be required this could be achieved by use of oversized sewers or geo-cellular storage attenuation below the surface.

5.4.3 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are permeable paving, soakaways, dry basins, and rain gardens.

5.5 SUDS Design Particulars

- 5.5.1 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30-year rainfall event, and any flooding up to the 1 in 100 year plus 40% for climate change will be contained on site.
- 5.5.2 As infiltration to the ground will be the sole means of discharge of surface water run-off. Water draining from the impermeable areas across the site will be drained to the ground, via SuDS features, see **Table 5.5** for details.
- 5.5.3 Roofs of all houses would discharge to a soakaway located in the back garden of each property, located 5m away from the building. All car paring spaces will be covered with permeable paving which would then discharge to the ground aided by 0.9m diameter soakaway beneath the permeable paving. As groundwater was found at the depth of 2.9m in the centre-west of the site, all soakaways are designed to terminate 1m above the established groundwater table.

Table 5.5 On-site application of SUDS

Hard Standing area	Impermeable Catchment (m2)	Device	Pit width (m2) 1.9m deep	Half Drainage time (hours)
Detached house	90	House Soakaway	1.8m dia	4.5
Terraced House	60	House Soakaway	1.5m	3.4
Block Of flats	165	House Soakaway	2 x 1.5m	2.4
	220		2 x 1.8	3.0
	250		2 x 2.1	3.4
2 Car Parking spaces	25	Permeable paving + soakaways	2 x 0.9	9
2 Car Parking spaces + Rd	90	Permeable paving + soakaways	4 x 0.9	4.2
Road NW of water main	81	Filter Drain	4m W x 12m L	1
Site roads	510	Dry Basin	Trench 3.5 W x 16m L x 2.1m D Basin 1m D, side slopes 1:4	2.0
Road , adjacent to Central POS	185	Rain Garden	0.8m deep	N/A

- 5.5.4 A rain garden located in the central public space will treat water run-off from the adjacent road.
- 5.5.5 Presence of an existent water main trespassing the site. No surface water drainage was designed to cross the existing district water main. West of the water main, surface water run-off will be treated and discharge to the ground locally via permeable paving or filter drain. Roads east of the drain will be drained positively via gullies with attenuation provided in the dry basin, close to the Frontwell Avenue.
- 5.5.6 All infiltration devices will be respective of the root protection zones
- 5.5.7 Refer to drawing 20293-MA-XX-XX-DR-C-0501 for the Indicative Drainage Strategy illustrating how the Site could be drained in **Appendix E**.

5.6 Urbanisation & Long Term Storage

- 5.6.1 The hydraulic calculations for the house soakaways have been tested for additional 10% increase in impermeable area for building footprints, to allow for urban creep.
- 5.6.2 The proposed strategy will utilize discharge to the ground, therefore there is no requirement to provide long term storage.

5.7 Overland Flow Routes

- 5.7.1 The proposed surface water drainage network within the Site will be designed to contain the critical duration of 1 in 30 year return period storm. Any flooding occurring rainfall event exceeding the design criteria of the critical 1 in 100-year return period storm with a 40% allowance for climate change shall be contained the open space which includes dry basin which is the lowest point of the site.

5.8 Water Quality Management

- 5.8.1 SuDS will be provided to form a management train in line with the best practice outlined in CIRIA C753 "The SuDS Manual". Source control techniques including swales and permeable paving could be provided within the catchments to manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits.
- 5.8.2 Permeable paving and soakaway would provide a stage of water treatment at car parking areas. Catchpit will be provided prior to discharge to the filter drain and dry soakaway for discharge from the road.
- 5.8.3 In line with CIRIA C753 The SuDS Manual, Tables 26.2 and 26.3, the pollution hazards indices associated with a residential development are mitigated by the proposed SuDS. Refer to **Appendix F** for Simple Index Method assessment.

5.9 SuDS Operation and Maintenance Requirements

- 5.9.1 The following sections outline recommended maintenance requirements for the various aspects of the drainage system for the development. If necessary, these outline maintenance and management proposals will be refined by the applicant once the site is operational to suit specific conditions.
- 5.9.2 A management company will be set up to manage and maintain the long-term integrity and function of the private proposed SuDS facilities that will fall under private ownership.
- 5.9.3 The proposed development layout (refer to Appendix E provides adequate maintenance access to key SuDS features.
- 5.9.4 The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual. The recommended Operation and Maintenance requirements for the proposed permeable paving, dry basin, soakaways are outlined in **Appendix G** for a recommended SuDS Management Plan.

Figure 5.1 SuDS Management Plan

TABLE 13.1 Operation and maintenance requirements for soakaways			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually	
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)	
	Trimming any roots that may be causing blockages	Annually (or as required)	
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections	
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required	
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required	
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually	
	Check soakaway to ensure emptying is occurring	Annually	

TABLE 13.2 Operation and maintenance requirements for infiltration basins			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Remove litter, debris and trash	Monthly	
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required	
	Cut grass – meadow grass in and around basin	Half yearly, spring (before nesting season) and autumn	
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required	
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required	
	Prune and trim trees and remove cuttings	As required	
	Remove sediment from pre-treatment system when 50% full	As required	
Remedial actions	Repair erosion or other damage by reseedling or re-turfing	As required	
	Realign the rip-rap	As required	
	Repair or rehabilitate inlets, outlets and overflows	As required	
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required	
	Relieve uneven surfaces and reinstate design levels	As required	
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly	
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly	
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly	
	Inspect infiltration surfaces for compaction and ponding	Monthly	

TABLE 16.1 Operation and maintenance requirements for filter drains			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)	
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly	
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly	
	Remove sediment from pre-treatment devices	Six monthly, or as required	
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3696:2010)	As required	
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required	
	Clear perforated pipework of blockages	As required	

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 45 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

6. Foul Water Strategy

6.1 Design Approach

- 6.1.1 This section outlines indicative proposals for managing foul water drainage within the development. The design is intended to mitigate the risk of foul water flooding and environmental damage, and to make provision for the system to be adopted by Southern Water Ltd which is the Water Authority for this area.
- 6.1.2 A new foul water drainage system will be constructed for adoption by the Water Authority. This system will be designed to accord with the adoption standards as set out in the current Sewer Sector Guidance (SSG) and offered for adoption under a Section 104 Agreement in accordance with the Water Industry Act 1991.
- 6.1.3 Under the Water Industry Act 1991, Water Companies have general duties to develop and maintain an efficient water supply system, and to provide, improve and extend a system of Public Sewers. Developers also benefit from a statutory right that allows them to connect new sewers to existing public sewers. Water companies therefore have duties to provide for new development.

6.2 Offsite Connections

- 6.2.1 Asset records provided by Southern Water (Appendix D), indicate the location of foul sewers adjacent to the site. An existing sewer is located within the Frontwell avenue towards the east of the site.

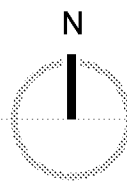
6.3 Proposed Foul Drainage Strategy

- 6.3.1 Due to the existing levels in the foul water network, in relation to ground levels within the site, it will not be possible to connect to the nearest location of the public foul water sewer by gravity.
- 6.3.2 A foul Water Pumping Station is therefore proposed at the south -east section of the site which will pump foul water via raising main to the existing foul water sewer in Frontwell Avenue. Proposed Foul Water Drainage Strategy is appended in Appendix E.

7. Conclusions

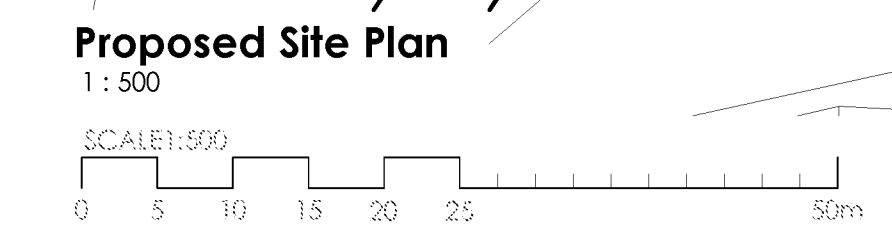
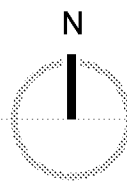
- 7.1.1 Markides Associates has been appointed by Offset Architect to prepare a Flood Risk Assessment (FRA) and Drainage Strategy to support a planning application for the proposed residential development at Land at SRC, Eastergate, West Sussex.
- 7.1.2 The proposals seek to develop the site to provide 80no. residential units with associated access roads and landscaping.
- 7.1.3 The Site is situated within Flood Zone 1. Flood risk to the Site from other potential sources, such as surface water, groundwater, sewer systems and infrastructure failure are considered negligible due to the ground conditions and topography encountered at the site and in the surrounding area. Therefore, the Site is suitable for 'more vulnerable use category' such as residential development, without the need for an exception test.
- 7.1.4 No formal flood mitigation measures or flood resilience measures are deemed to be required, aside from maintaining a standard level differential between finished floor levels of the proposed development above corresponding external ground levels.
- 7.1.5 Underlying largely permeable ground conditions are deemed viable for the disposal of surface water runoff via infiltration. A number of Sustainable Urban Drainage (SuDS) devices such as soakaways, filter drain, permeable paving and dry basin would be used to treat water prior to the discharge to the ground. The depth of the soakaways will be restricted to 1.9m, which is 1 m above the established water table, in the south of the site.
- 7.1.6 The site-wide surface water drainage with sympathetically located attenuation features (a combination of soakaways, filter drains, rain garden and permeable paving) will store runoff on-site for up to and including the critical 1% Annual Exceedance Probability (AEP) (in other words 1 in 100-year) storm event incorporating climate change allowances over the lifetime of the development (applied as a 40% uplift in peak rainfall intensity).
- 7.1.7 A residual risk remains that an event exceeding the design parameters used in designing the drainage system may occur, or part of the drainage system may fail due to rainfall event exceeding design criteria or a blockage. The finished site levels will be designed to ensure that there is no risk of floodwaters ponding to a significant depth and the overland flow paths for any such exceedance storm events will be directed to open space areas and/or public highways, but, away from the domestic units.
- 7.1.8 The site can be adequately drained in terms of foul water discharge via a new connection to existing public foul water sewers in Frontwell Avenue. Should the existing public sewerage network require upgrading/reinforcement this will be undertaken by Southern Water Ltd via the infrastructure charging regime.
- 7.1.9 In conclusion, this report demonstrates that the proposals are consistent with the aims of the NPPF and its Planning Practice Guidance, along with the aims of the Local Flood Risk Management Strategy. Surface water runoff can be adequately managed without increasing the risk of flooding on site or elsewhere.

APPENDIX A – PROPOSED DEVELOPMENT PLAN



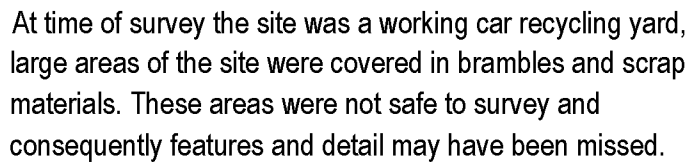
Proposed Site Plan
1 : 500
SCALE: 1:500
0 5 10 15 20 25 50m

Rev	Date	Comments
PLANNING		
CLIENT SRC RECYCLING LTD		
PROJECT Land At SRC Recycling Fontwell Avenue Eastergate, West Sussex PO20 3RU		
TITLE Proposed Site Plan		
PROJECT NO. 7334		DATE Sept 21
DRAWING NO. 7334 - PD20		REVISION
SCALE 1 : 500@ A1		DRAWN TH
		CHECKED DA
Nepicor House, London Road, Worthing, BN15 7RS phone: 01732 753333 fax: 01732 753334 info@offsetarchitects.co.uk www.offsetarchitects.com		offset architects



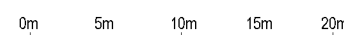
Rev	Date	Comments
PLANNING		
CLIENT SRC RECYCLING LTD		
PROJECT Land At SRC Recycling Fontwell Avenue Eastergate, West Sussex PO20 3RU		
TITLE Proposed Site Plan		
PROJECT NO. 7334		DATE Sept 21
DRAWING NO. 7334 - PD20		REVISION
SCALE 1 : 500@ A1		DRAWN TH
		CHECKED DA
Nepicor House, London Road, Worham Heath, DN15 7RS phone: 01732 753333 fax: 01732 753334 info@offsetarchitects.co.uk www.offsetarchitects.com		offset architects

APPENDIX B – TOPOGRAPHICAL SURVEY



Scale Bar

1:500 Scale Bar



Stations List

Name	Eastling	Northling	Height
GPS1	494509.038	105690.498	12.545
SR02	494509.418	105595.500	10.1482
SR03	494480.893	105680.014	12.226
SR04	494487.962	105703.870	10.5555
SR05	494425.404	105726.565	12.706
SR06	494454.849	105747.561	10.3552
SR07	494442.091	105764.121	12.375
SR08	494355.877	105749.925	10.9251
SR09	494266.662	105791.848	10.4182
SR10	494294.332	105846.329	14.132
SR11	494416.449	105787.346	13.403
SR12	494450.160	105757.523	13.2223
SR13	494446.118	105786.936	13.070
SR14	494461.843	105831.635	14.3474
SR15	494451.342	105775.496	13.352
SR16	494455.196	105814.142	13.9742

Tree List

Ref.No	Name	Trunk Dia	North	South	East	West	Height	Trunks
1	SYCAMORE	600	5	7	8.5	5	14	1
2	OAK	1000	5	10	10	10	16	1
3	OAK	2000	11	9	10	10	14	1
4	SYCAMORE	400	5	6	6	6	12	2
5	UNKNOWN	350	3	6	5	4	14	2

Abbreviations

[illegible]

Fences	
BWF	barbed wire
CB	crash barrier
CBF	close board fence
CI	corrugated iron
CLF	chain link
CNP	chestnut paling
IR	iron railing
PMW	post and wire
PMM	post and wire mesh
PNR	post and rail

Multi directional tree canopy

Trunk position

100

Tree species should be confirmed by a horticultural consultant if critical

Notes

Eaves heights (where shown) are taken at the end of the tile / top of guttering.
Ridge heights are taken at the top of the ridge tile

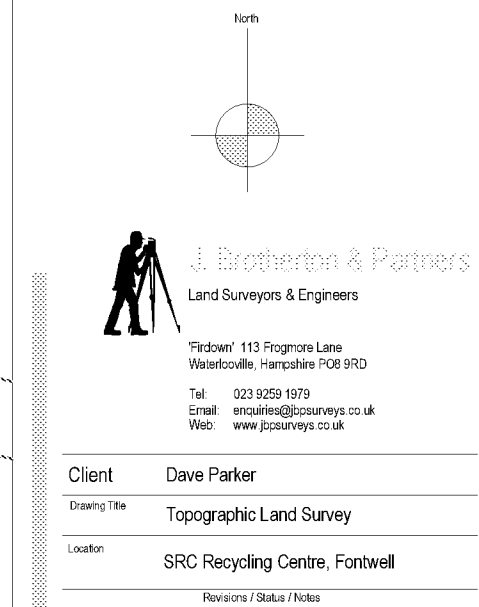
Service covers indicated where visible at time of survey

Buildings outside of the survey area may not show

The grid and datum for this survey is based on the Ordinance Survey grid OSGB36, site centered on

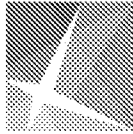
Ordinance Survey data has been added to this drawing to give contextual information that has not been surveyed by or checked by J Brotherton and Partners. All Ordinance Survey data is shown in grey and is on the layer - OS Data

This drawing has been created for use at a scale of 1:200



LEVELS BASED ON		CGSSG	Surveyor:	MB	Assistant:	MD
GRADE BASED ON		CGSSG	Dram By:	MB	Checked by:	JB
Drawing S.C.D. Ref.						
JOB - 20141 - SRC Recycling Centre Survey.dwg						
SCALE (when printed)		REVISION No.		NATIONAL  NATIONAL ARCHIVES THE RECORDS SERVICE		
1500 @ A1				 BRITISH COUNCIL THE BRITISH AMBASSY		
Date		10.06.20				
Removal of this block also removes all warranties						

APPENDIX C – SOAKAGE TESTING LETTER REPORT



LUSTRE CONSULTING

2nd Floor North
The Fitted Rigging House
The Historic Dockyard
Chatham
Kent
ME4 4TJ

14/12/2020

Our Ref: 3765 - 20201112 - JW

Dave Parker
SRC Recycling Ltd
Fontwell Avenue
Eastergate
West Sussex
PO20 3RU

Sent via email

Dear Dave,

EASTERGATE – WEST SUSSEX BRE 365 SOAKAGE INVESTIGATION

Lustre attended SRC Recycling Ltd on 10th December 2020 to undertake soakage testing to the BRE 365 methodology and excavate trial pits to prove depth to groundwater. As agreed beforehand, four locations across the open land to the west and south of the scrap yard were identified for the soakage tests and trial pits.

A review of readily available information indicates that the underlying geology at the site consists of bedrock of London Clay comprising bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. In addition, superficial deposits of Head comprising poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes are present across the site.

The location of the trial and soakage pits were cleared of services using statutory service plans and a CAT and genny by a suitable qualified Lustre consultant. Excavation of the pit locations was carried out by a tracked mini digger, overseen by Lustre. At the request of the drainage engineer the soakage pits were excavated through the Made Ground and into the natural soils to a depth of 1.7m bgl. Drawing 3765_001 shows the location of the soakage pits (SA1 and SA2) and the trial pits (TP1 and TP2) to prove depth to groundwater.

Ground Conditions

Initially topsoil and Made Ground was encountered to depths between 0.1m and 0.2m bgl over natural soils of Head deposits to the base of the pits, as below.

TP1:

- 0.0m – 0.1m bgl: Soft dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded flint, brick, glass, wood, plastic, clinker and metal. Occasional roots and rootlets. MADE GROUND
- 0.1m – 0.9m bgl: Soft brown slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS
- 0.9m – 1.3m bgl: Soft brown gravelly silty CLAY with a low cobble content of subangular flint. Gravel is fine to coarse angular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS
- 1.3m – 1.8m bgl: Cream slightly sandy gravelly SILT. Gravel is fine to coarse angular to subrounded flint and chalk. HEAD DEPOSITS
- 1.8m – 3.2m bgl: Yellowish brown clayey slightly sandy GRAVEL of fine to coarse angular to subrounded flint with a low cobble content of subangular flint. HEAD DEPOSITS
- Groundwater strike at 3.1m bgl. Groundwater rest level at 2.9m bgl.

TP2:

- 0.0m – 0.2m bgl: Grass over soft greyish brown slightly sandy sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded flint. Abundant roots and rootlets. TOPSOIL
- 0.2m – 1.0m bgl: Soft brown slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded flint. Frequent roots and rootlets. HEAD DEPOSITS
- 1.0m – 1.6m bgl: Soft brown gravelly silty CLAY with a low cobble content of subangular flint. Gravel is fine to coarse angular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS
- 1.6m – 2.4m bgl: Cream slightly sandy gravelly SILT. Gravel is fine to coarse angular to subrounded flint and chalk. HEAD DEPOSITS
- 2.4m – 3.0m bgl: Yellowish brown clayey slightly sandy GRAVEL of fine to coarse angular to subrounded flint with a low cobble content of subangular flint. HEAD DEPOSITS
- 3.0m – 4.0m bgl: Cream slightly sandy gravelly SILT. Gravel is fine to coarse angular to subrounded flint and chalk. HEAD DEPOSITS
- Groundwater was not encountered.

SA1:

- 0.0m – 0.15m bgl: Grass over soft greyish brown slightly sandy sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded flint. Abundant roots and rootlets. TOPSOIL
- 0.15m – 0.5m bgl: Soft brown slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded flint. Frequent roots and rootlets. HEAD DEPOSITS
- 0.5m – 1.1m bgl: Soft brown gravelly silty CLAY with a low cobble content of subangular flint. Gravel is fine to coarse angular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS
- 1.1m – 1.5m bgl: Yellowish brown clayey slightly sandy GRAVEL of fine to coarse angular to subrounded flint with a medium cobble content of subangular flint. HEAD DEPOSITS

SA2:

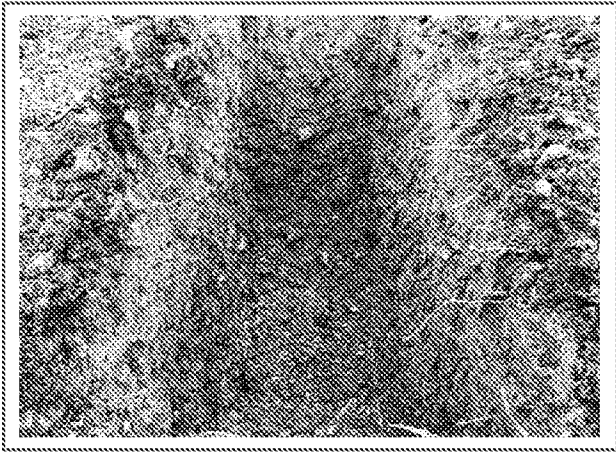
- 0.0m – 0.15m bgl: Soft dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to subrounded flint, brick, glass, wood, plastic, clinker and metal. Occasional roots and rootlets. MADE GROUND
- 0.15m – 1.1m bgl: Soft brown slightly gravelly silty CLAY. Gravel is fine to medium subangular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS
- 1.1m – 1.5m bgl: Soft brown gravelly silty CLAY with a low cobble content of subangular flint. Gravel is fine to coarse angular to subrounded flint. Occasional roots and rootlets. HEAD DEPOSITS



Made Ground at surface level from SA2



Slightly gravelly silty clay from TP1



View of entire soakage pit at SA2



Cream chalky head deposit from TP2



Clayey gravel from SA2



Groundwater at resting level in TP1

Groundwater Levels

Two trial pits were excavated to prove the depth of groundwater within the Head deposits. Groundwater was only encountered within TP1, excavated within the southern section of the site, at a depth of 3.10m bgl and rest level of 2.90m bgl. Groundwater was not encountered within TP2, which was excavated to a depth of 4.0m bgl.

Infiltration Testing

Although, the soils aren't typically susceptible to collapse when unsupported, measurements were taken at a distance of 1m from the edge of the pits to provide a safe working area, as the pits were left open rather than backfilling with clean shingle. Water was added via a pumped hoses connection to a 1000L IBC. 800 litres were added to soakage pit SA1 within 3 minutes and filled to 0.81m bgl. 1000 litres were added to soakage pit SA2 within 3 minutes and filled to 0.65m bgl. Both were subsequently measured in increasing increments of time. Due to time constraints, only a single test was able to be carried out at each location.

Therefore, based upon the BRE365 methodology, a soil infiltration rates of 6.40×10^{-5} m/s and 4.98×10^{-5} m/s were attained at SA1 and SA2, respectively.

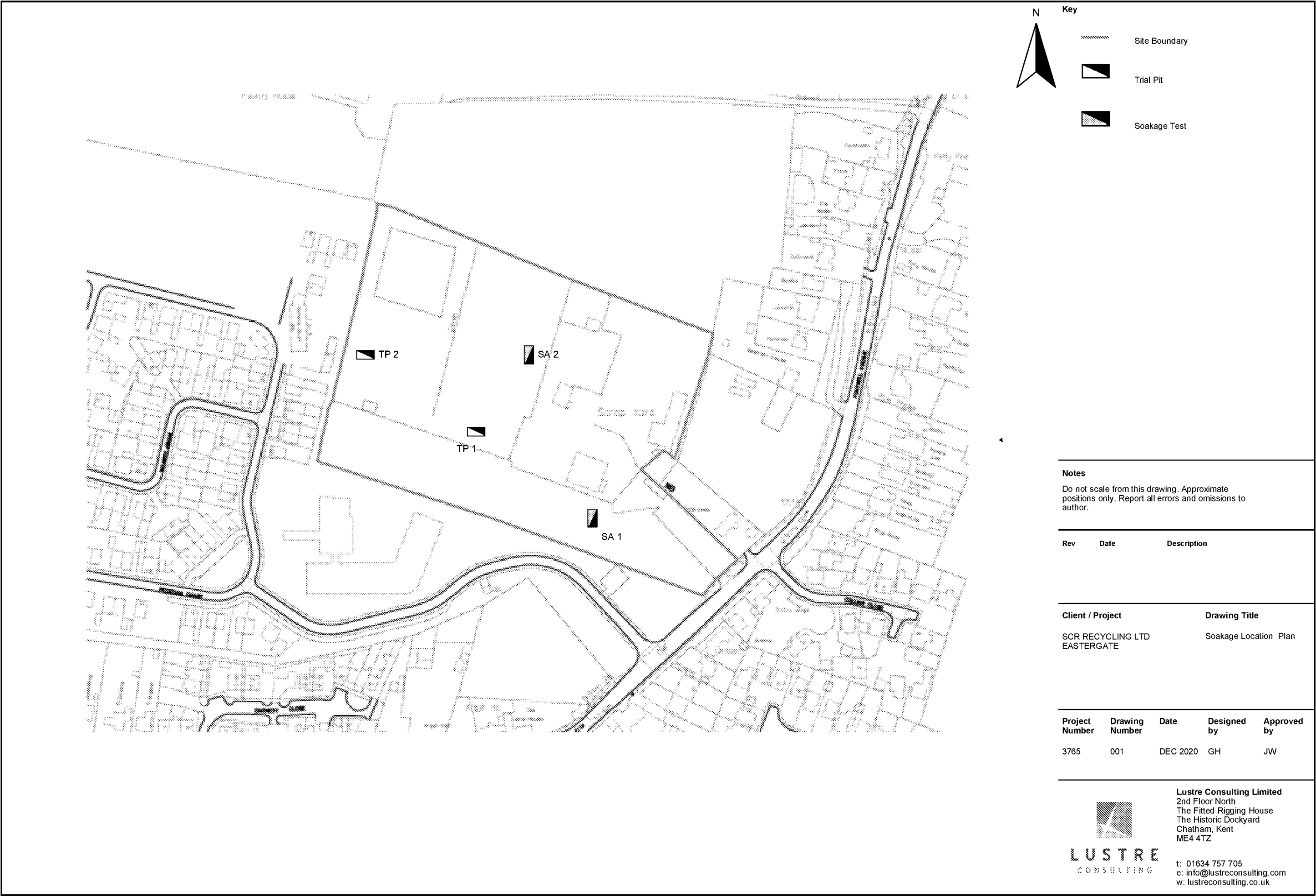
Yours sincerely,

[Redacted signature]

Jake Wade

BSc (Hons) MSc FGS
Graduate Consultant

Attachments
Drawing 3765_001
Soakage Testing Sheets.



SOAKAGE TESTING TO DETERMINE INFILTRATION RATE (BRE)



PROJECT NAME:	Eastergate - West Sussex	PROJECT NO.:	3765
SITE NAME:	SRC Recycling Ltd	CONSULTANT:	JW
DATE:	10/12/2020	WEATHER:	Overcast

Soakage Pit Number:	SA1	Length (m):	2	Width (m):	0.6	Depth (m):	1.5
Shingle Size (mm):		Slotted Pipe Diameter (mm):					

BRE DIGEST 343 - SOAKAGE TEST 1

Filling Start Time (hh/mm):	12:33	Filling End Time (hh/mm):	12:36	Start Water Depth (m bgl):			0.81
Effective Depths (m):	75%:	0.98	50%:	1.16	25%:	1.33	

BRE DIGEST 343 - SOAKAGE TEST 2

Filling Start Time (hh/mm):		Filling End Time (hh/mm):		Start Water Depth (m bgl):		
Effective Depths (m):	75%:	0.38	50%:	0.75	25%:	1.13

BRE DIGEST 343 - SOAKAGE TEST 3

Filling Start Time (hh/mm):		Filling End Time (hh/mm):			Start Water Depth (m bgl):			
Effective Depths (m):	75%:	0.38	50%:	0.75	25%:	1.13		

FIELD MEASUREMENTS

SOAKAGE TEST 1			SOAKAGE TEST 2			SOAKAGE TEST 3		
TIME		DEPTH	TIME		DEPTH	TIME		DEPTH
(min)	(sec)	(m bgl)	(min)	(sec)	(m bgl)	(min)	(sec)	(m bgl)
0	0	0.81	0	0		0	0	
0.5	30	0.82	0.5	30		0.5	30	
1	60	0.84	1	60		1	60	
1.5	90	0.86	1.5	90		1.5	90	
2	120	0.88	2	120		2	120	
3	180	0.89	3	180		3	180	
4	240	0.91	4	240		4	240	
5	300	0.93	5	300		5	300	
6	360	0.94	6	360		6	360	
7	420	0.95	7	420		7	420	
8	480	0.97	8	480		8	480	
9	540	0.98	9	540		9	540	
10	600	0.99	10	600		10	600	
12	720	1.01	12	720		12	720	
14	840	1.03	14	840		14	840	
16	960	1.05	16	960		16	960	
18	1080	1.07	18	1080		18	1080	
20	1200	1.09	20	1200		20	1200	
25	1500	1.15	25	1500		25	1500	
30	1800	1.19	30	1800		30	1800	
40	2400	1.28	40	2400		40	2400	
50	3000	1.38	50	3000		50	3000	
			60	3600		60	3600	
			90	5400		90	5400	
			120	7200		120	7200	
			150	9000		150	9000	
			180	10800		180	10800	
			210	12600		210	12600	
			240	14400		240	14400	
			270	16200		270	16200	
			300	18000		300	18000	
			330	19800		330	19800	
			360	21600		360	21600	
			390	23400		390	23400	

SOAKAGE TESTING TO DETERMINE INFILTRATION RATE (BRE)



PROJECT NAME:	Eastergate - West Sussex			PROJECT NO.:	3765		
DATE:	44175			WEATHER:	Overcast		
Soakage Pit Number:	SA1	Length (m):	2	Width (m):	0.6	Depth (m):	1.5

Comments:	
-----------	--

SA1 SOAKAGE TEST 1	
Time at 75% eff. depth:	9
Time at 25% eff. depth:	45
Volume of outflow (75% - 25%, m ³):	0.414
Mean surface area of outflow (m ²):	2.994
Time for outflow (75% - 25% eff. depth (mins)):	36
.....◆..... Water Level (m bgl) 75% Effective Depth (m bgl) 25% Effective Depth (m bgl)	
Soil infiltration rate (m/s):	6.40169E-05 @ 230.4609 litres/hour

SOAKAGE TESTING TO DETERMINE INFILTRATION RATE (BRE)



PROJECT NAME:	Eastergate - West Sussex	PROJECT NO.:	3765
SITE NAME:	SRC Recycling Ltd	CONSULTANT:	JW
DATE:	10/12/2020	WEATHER:	Overcast

Soakage Pit Number:	SA2	Length (m):	2	Width (m):	0.6	Depth (m):	1.5
Shingle Size (mm):		Slotted Pipe Diameter (mm):					

BRE DIGEST 365 - SOAKAGE TEST 1

Filling Start Time (hh/mm):	14:05	Filling End Time (hh/mm):		14:08	Start Water Depth (m bgl):			0.65
Effective Depths (m):	75%:	0.86	50%:	1.08	25%:	1.29		

BRE DIGEST 365 - SOAKAGE TEST 2

Filling Start Time (hh/mm):		Filling End Time (hh/mm):		Start Water Depth (m bgl):		
Effective Depths (m):	75%:	0.38	50%:	0.75	25%:	1.13

BRE DIGEST 365 - SOAKAGE TEST 3

Filling Start Time (hh/mm):		Filling End Time (hh/mm):			Start Water Depth (m bgl):			
Effective Depths (m):	75%:	0.38	50%:	0.75	25%:	1.13		

FIELD MEASUREMENTS

SOAKAGE TEST 1			SOAKAGE TEST 2			SOAKAGE TEST 3		
TIME		DEPTH	TIME		DEPTH	TIME		DEPTH
(min)	(sec)	(m bgl)	(min)	(sec)	(m bgl)	(min)	(sec)	(m bgl)
0	0	0.65	0	0		0	0	
0.5	30	0.67	0.5	30		0.5	30	
1	60	0.68	1	60		1	60	
1.5	90	0.70	1.5	90		1.5	90	
2	120	0.72	2	120		2	120	
3	180	0.73	3	180		3	180	
4	240	0.76	4	240		4	240	
5	300	0.80	5	300		5	300	
6	360	0.83	6	360		6	360	
7	420	0.86	7	420		7	420	
8	480	0.88	8	480		8	480	
9	540	0.90	9	540		9	540	
10	600	0.91	10	600		10	600	
12	720	0.94	12	720		12	720	
14	840	0.97	14	840		14	840	
16	960	1.00	16	960		16	960	
18	1080	1.03	18	1080		18	1080	
20	1200	1.05	20	1200		20	1200	
25	1500	1.10	25	1500		25	1500	
30	1800	1.13	30	1800		30	1800	
40	2400	1.19	40	2400		40	2400	
50	3000	1.25	50	3000		50	3000	
60	3600	1.30	60	3600		60	3600	
			90	5400		90	5400	
			120	7200		120	7200	
			150	9000		150	9000	
			180	10800		180	10800	
			210	12600		210	12600	
			240	14400		240	14400	
			270	16200		270	16200	
			300	18000		300	18000	
			330	19800		330	19800	
			360	21600		360	21600	
			390	23400		390	23400	

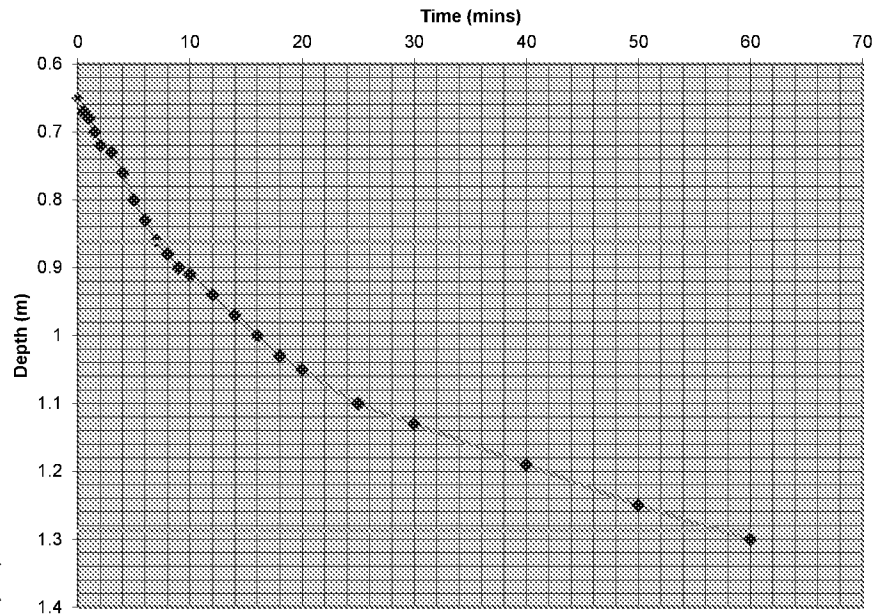
SOAKAGE TESTING TO DETERMINE INFILTRATION RATE (BRE)



PROJECT NAME:	Eastergate - West Sussex			PROJECT NO.:	3765		
DATE:	10/12/2020			WEATHER:	Overcast		
Soakage Pit Number:	SA2	Length (m):	2	Width (m):	0.6	Depth (m):	1.5

Comments:	
-----------	--

SA2 SOAKAGE TEST 1	
Time at 75% eff. depth:	7
Time at 25% eff. depth:	57
Volume of outflow (75% - 25%, m ³):	0.51
Mean surface area of outflow (m ²):	3.41
Time for outflow (75% - 25% eff. depth (mins)):	50
◆◆◆◆◆ Water Level (m bgl) 75% Effective Depth (m bgl) 25% Effective Depth (m bgl)	
Soil infiltration rate (m/s):	4.98534E-05 @ 179.4721 litres/hour



APPENDIX D – ESTIMATE OF EXISTING RUN-OFF RATES AND PUBLIC SEWER RECORDS



PROJECT
SUBJECT PRELIMINARY DRAINAGE CALCULATIONS
JOB NO.
DATE
PREPARED

PAGE NO.
REV NO.
CHECKED

EXISTING SITE INFORMATION

Total Site Area	3.2	ha
Impermeable Area	0.57	ha
PIMP	17.8	%

MODIFIED RATIONALE METHOD

$$Q_n = 2.78 CiA$$

where:

C *Runoff Coefficients* = 1 (in this case 1 as using impermeable area)
i_n *Rainfall Intensity for n return period (mm/hr)*
A *Impermeable Area (Ha)*
Q_n *Runoff for n return period (l/s)*

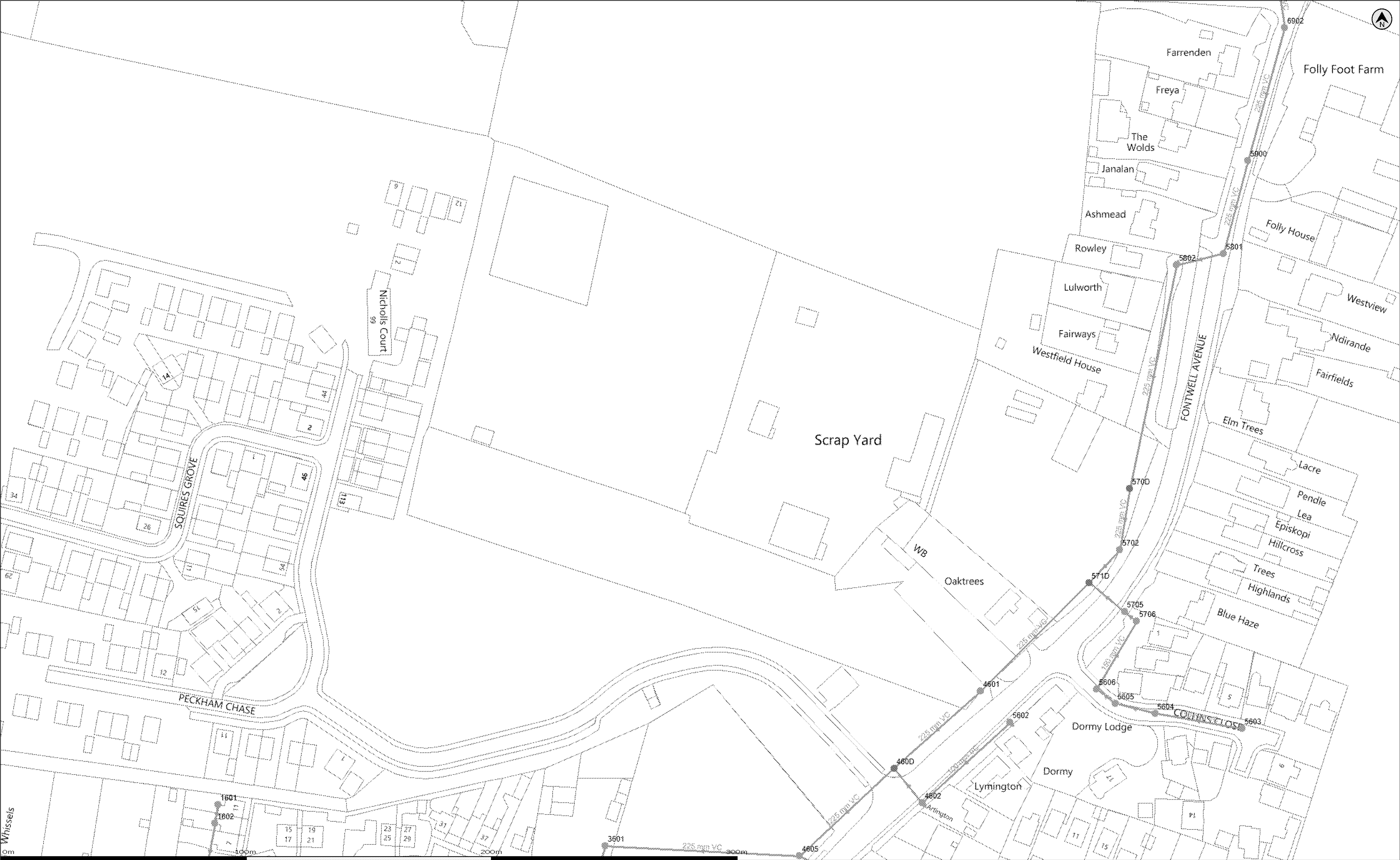
Rainfall Intensity

The rainfall intensities for various return periods were extracted from FEH 2013 website.

i₁ 11.04 mm/hr
i₃₀ 33.32 mm/hr
i₁₀₀ 42.36 mm/hr

PRE-DEVELOPMENT SURFACE WATER RUNOFF

		<i>C</i>	<i>i_n</i>	<i>A</i>		<i>Q_n</i>	
<i>Q₁</i>	2.78	1	11.0	0.57	=	17.49	l/s
<i>Q₃₀</i>	2.78	1	33.3	0.57	=	52.80	l/s
<i>Q₁₀₀</i>	2.78	1	42.4	0.57	=	67.12	l/s



(c) Crown copyright and database rights 2020 Ordnance Survey 100031673 Date: 02/11/20 Scale: 1:1000 Map Centre: 494377,105800 Data updated: 19/10/20 Our Ref: 454111 - 1 Wastewater Plan A2

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

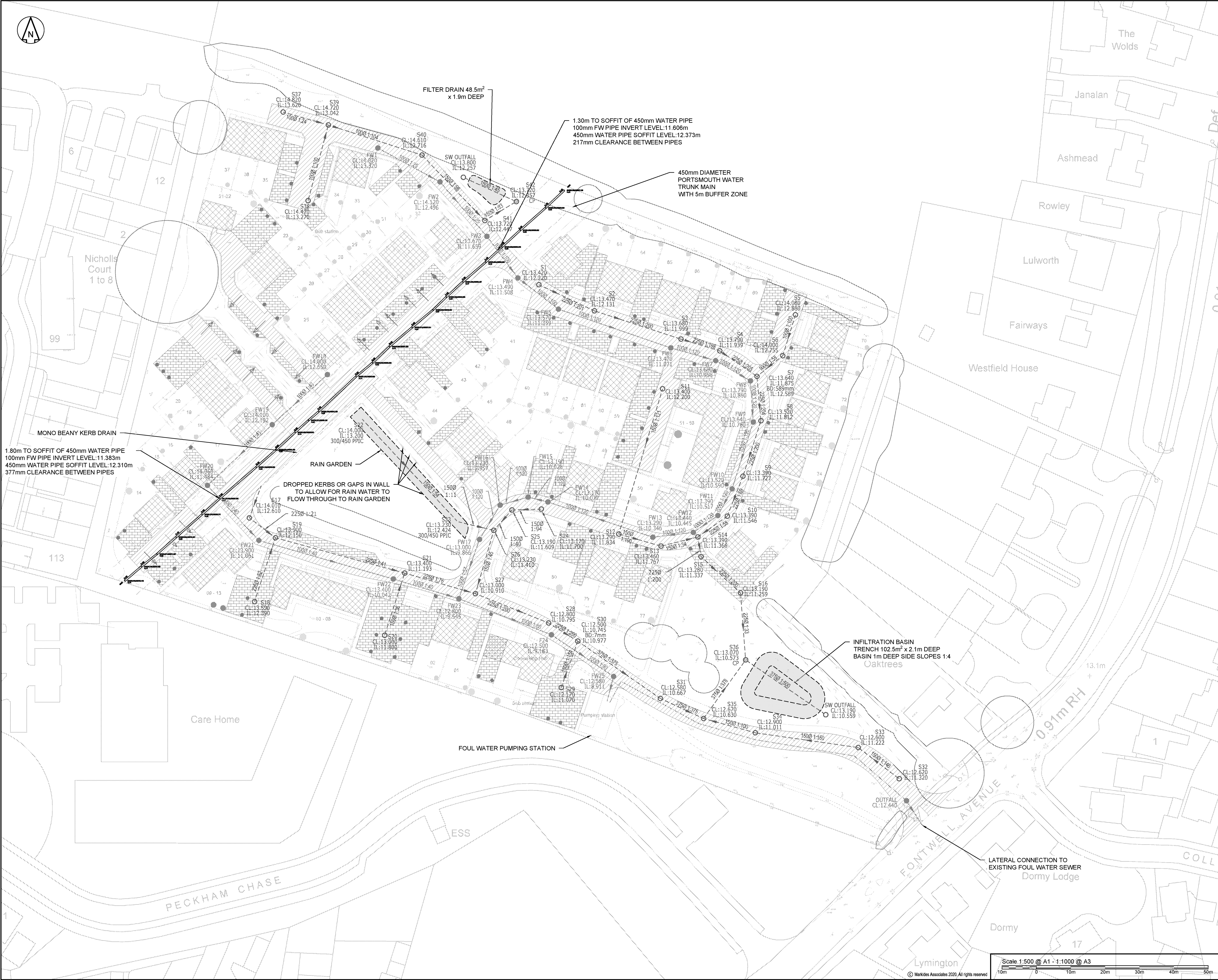
WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

payments.utilitysolutions@atkinsglobal.com
89825

from Southern Water.

APPENDIX E – PROPOSED DRAINAGE CALCULATIONS & STRATEGY



KEY:

----- SURVEY ROOT PROTECTION AREA

----- S2 O PROPOSED SURFACE WATER SEWER & MANHOLE (WITH MANHOLE REF. NO.)

----- F1 O PROPOSED ADOPTABLE FOUL WATER SEWER & MANHOLE (WITH MANHOLE REF. NO.)

----- EX.F1 O PROPOSED CONNECTION TO EXISTING FOUL WATER SEWER & EXISTING MANHOLE (WITH MANHOLE REF. NO.)

PROPOSED ROOFS DRAINING TO SOAKAWAYS;

- PROPOSED 1200mm SOAKAWAY
- PROPOSED 1500mm SOAKAWAY
- PROPOSED 1800mm SOAKAWAY
- PROPOSED 2100mm SOAKAWAY

PROPOSED PERMEABLE PAVING

- PROPOSED 900mm SOAKAWAY

PROPOSED HARDSTANDING ROADS

PROPOSED SUDS FEATURE

5m TRUNK MAIN BUFFER ZONE

PROPOSED CATCHPIT MANHOLE

PROPOSED FOUL WATER RISING MAIN

PROPOSED 450mm IC MANHOLE

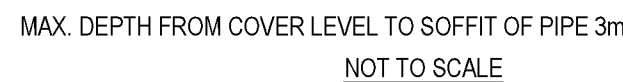
PROPOSED MONO BEANY KERB DRAIN

PRELIMINARY

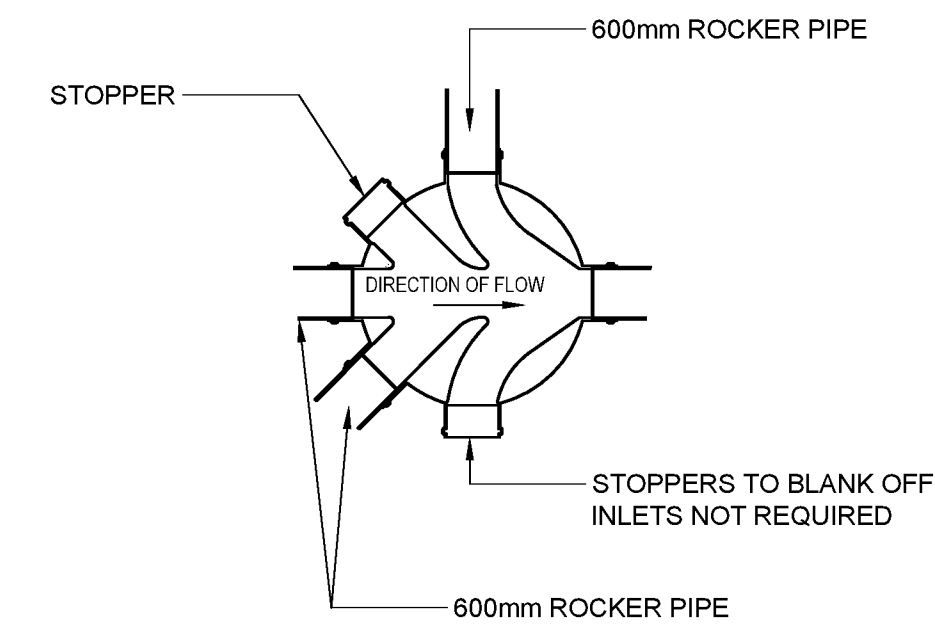
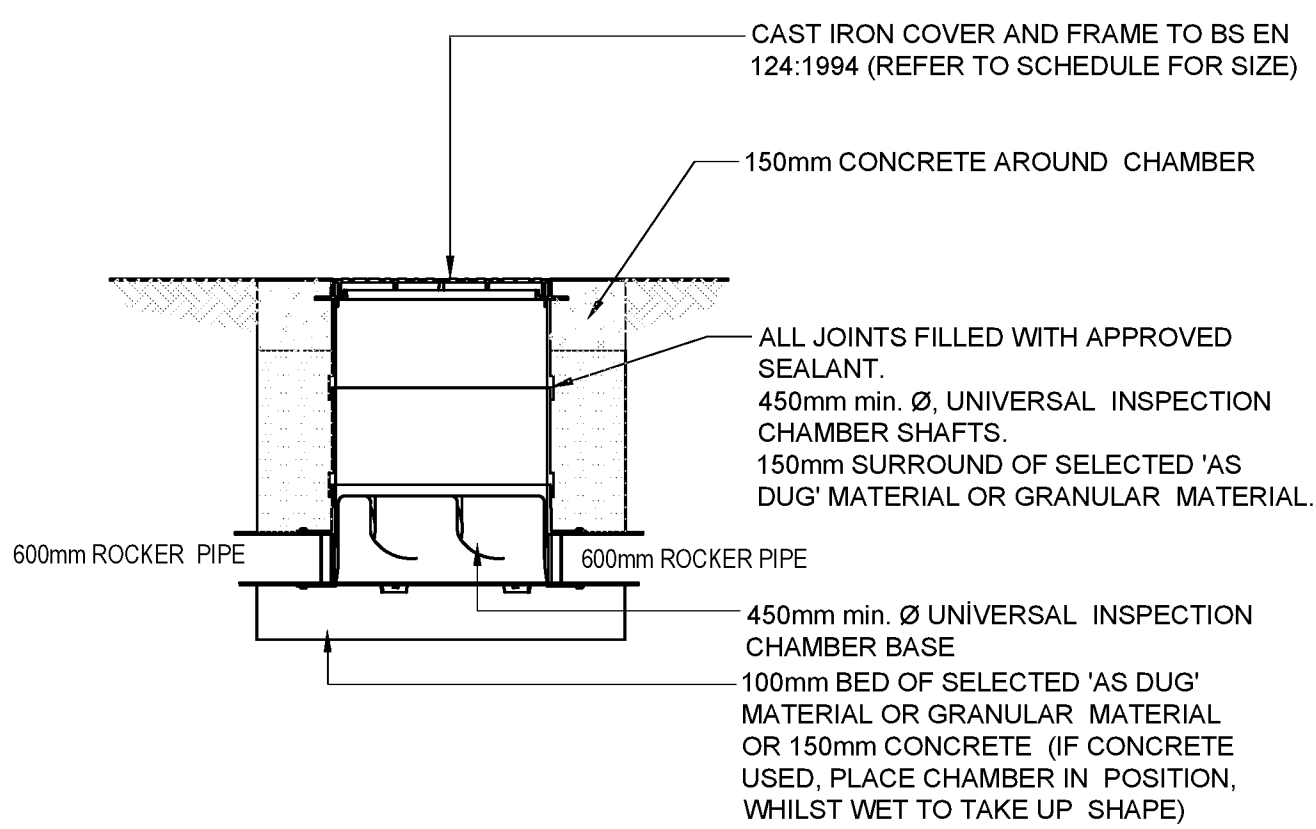
SRC RECYCLING

Project	SRC RECYCLING
Drawing Title	DRAINAGE LAYOUT

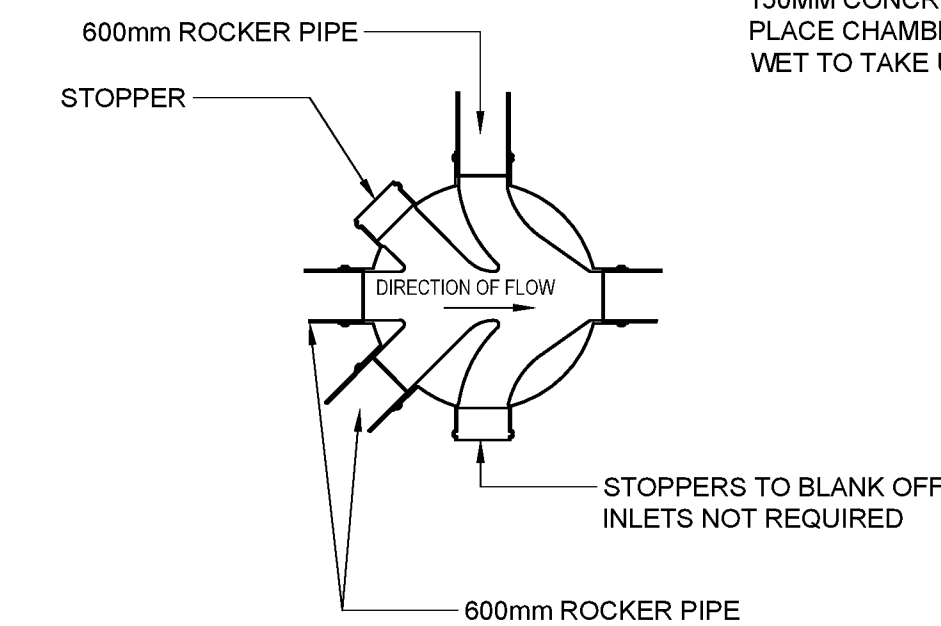
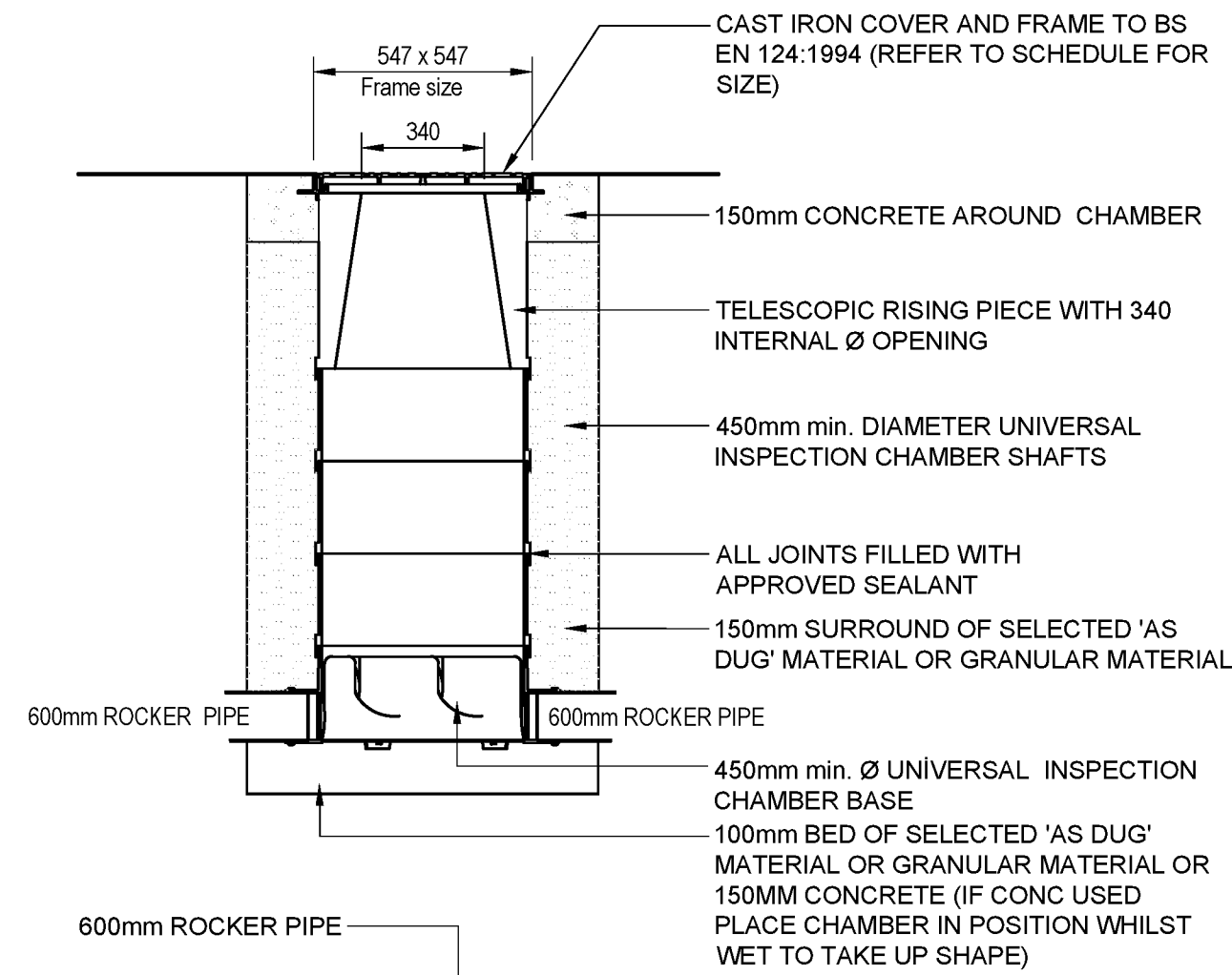
Scale 1:500 @ A1 - 1:1000 @ A3



20293-MA-XX-XX-DR-C-5000 - P01



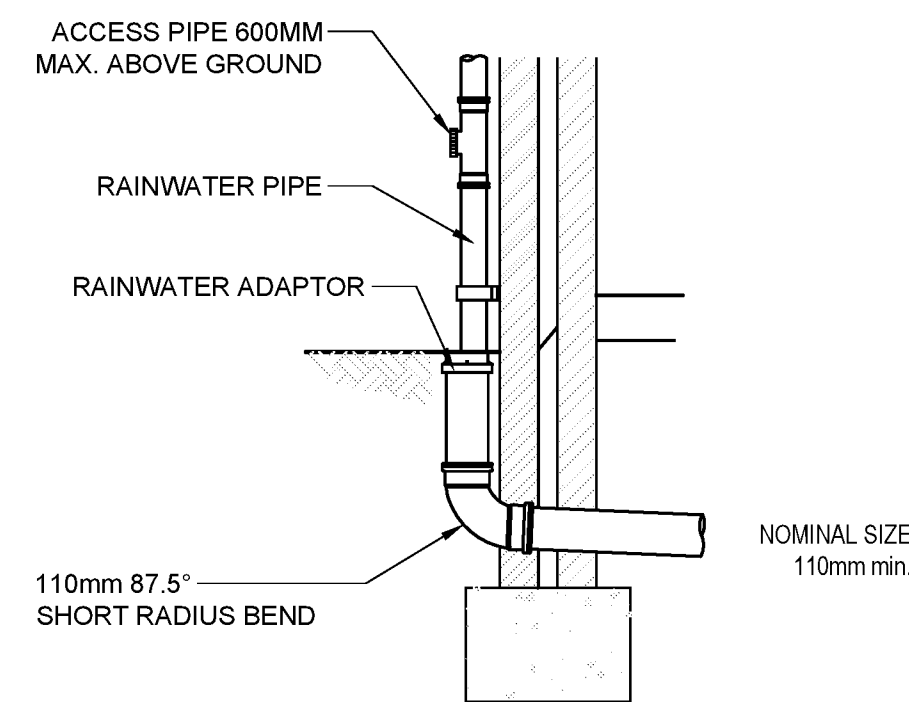
1.2m MAX DEPTH TO INVERT



1.2m to 3.0m MAX DEPTH TO INVERT

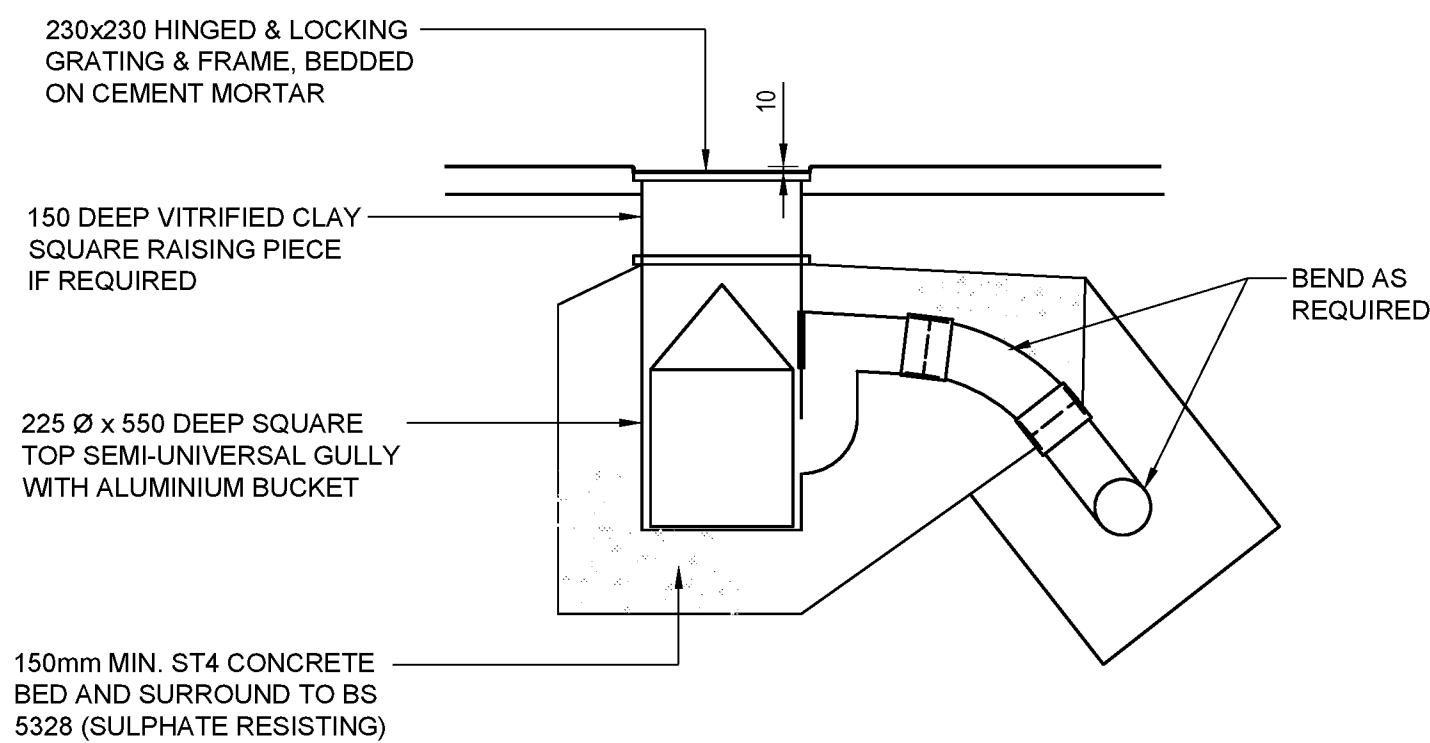
TYPICAL 450 Ø INSPECTION CHAMBER DETAIL

(SCALE 1:20)



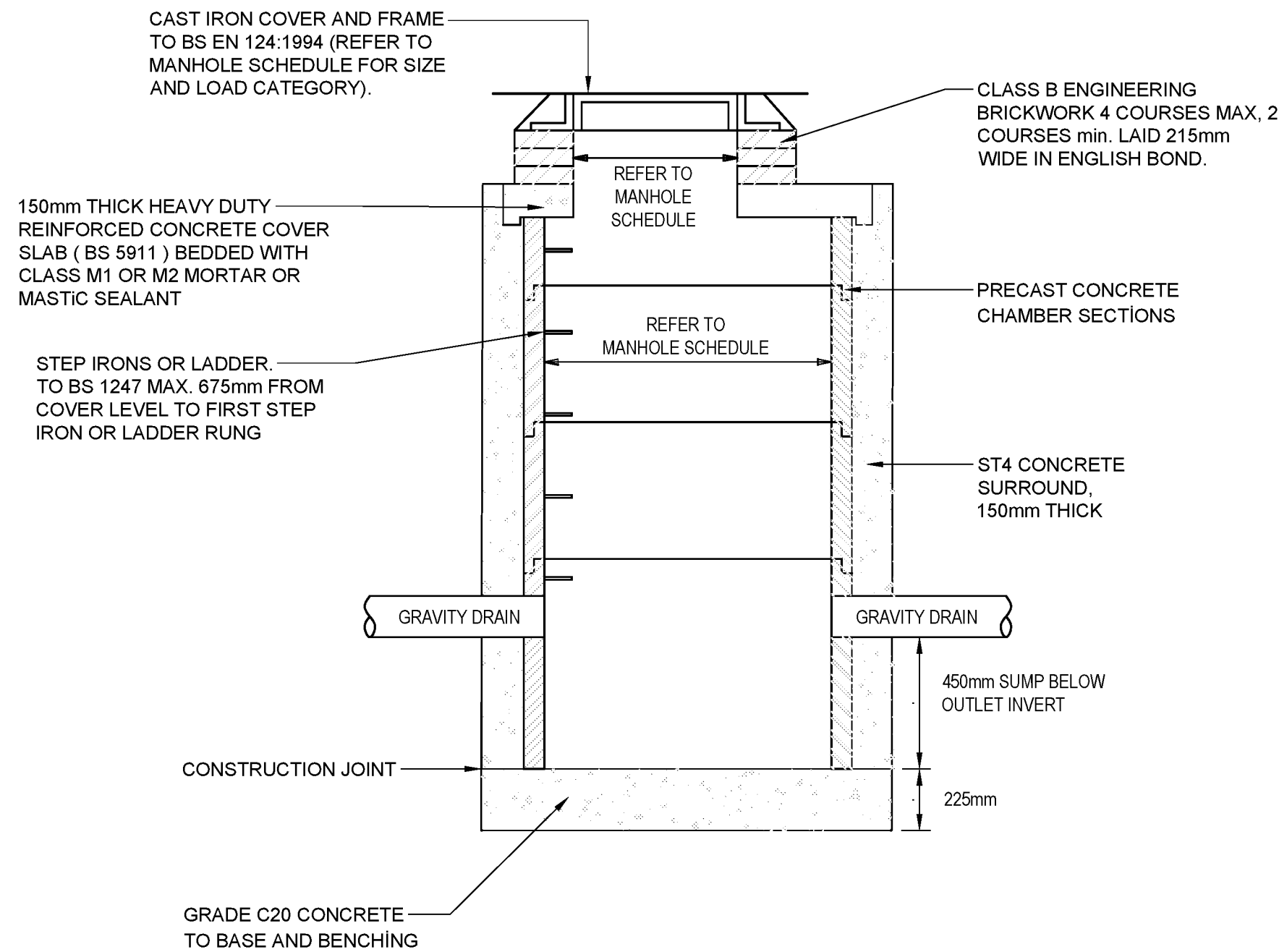
EXTERNAL RAINWATER PIPE TO DRAIN

(SCALE 1:20)



TYPICAL TRAPPED AND RODDABLE YARD GULLY DETAIL

(SCALE 1:20)



CATCHPIT MANHOLE

(SCALE 1:20)

CHAMBER COVER DETAILS		
SURFACE / LOCATION	CLASS (LOADING IN KN)	USAGE
Roads	D400	Frequent Vehicle Usage
Footway & Driveways	B125	Occasional Vehicle Usage
Gradens & Soft Landscaped Areas	A15	Pedestrian Only

DO NOT SCALE OFF THIS DRAWING

NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE MANUAL FOR CONTRACT DRAWINGS, VOLUME 1, 'SEWERS FOR ADOPTION 7TH EDITION - A DESIGN GUIDE FOR DEVELOPERS AND ALL OTHER RELATED DRAWINGS ISSUED.
- MANHOLE CHANNEL INVERTS TO HAVE A GRADIENT NOT LESS THAN THAT OF THE OUTGOING PIPE.
- THE CENTRELINE OF THE MANHOLE IS NOT NECESSARILY COINCIDENTAL WITH THE CENTRELINE OF THE MAIN PIPE.
- POSITION OF MANHOLE COVER SLAB AND STEP RUNGS TO BE DIRECTED ON SITE.
- WHERE PIPES OF DIFFERENT DIAMETERS ARE BUILT INTO THE MANHOLE, THEY SHOULD BE LAID TO COMMON SOFFIT UNLESS OTHERWISE STATED.
- MINIMUM GULLY PIPE GRADIENT TO BE 1:80
- WHERE A SEWER IS 150mmØ ALL CONNECTIONS AT MANHOLES TO BE MADE USING OBLIQUE (45°) CHANNEL JUNCTIONS WITH CHANNEL/CHANNEL ENLARGER BENDS AS NECESSARY.
- AT SIGNIFICANT CHANGES IN DIRECTION, THE LARGEST PRACTICAL RADIUS OF CHANNEL JUNCTIONS SHALL BE USED.
- ALL MORTAR TO BE CLASS 1 UNLESS NOTED OTHERWISE.
- BRICKS TO BE ENGINEERING CLASS B TO BS EN 771-1, LAID IN ENGLISH BOND ON CLASS (i) MORTAR TO CLAUSE 2404, SPECIFICATION FOR HIGHWAY WORKS. ANY OVER EXCAVATION TO BE MADE GOOD.
- CONNECTIONS TO CARRIER DRAINS TO BE BY MEANS OF 'Y' JUNCTIONS UNLESS OTHERWISE AGREED.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
- FINISH TO INTERNAL CONCRETE TO BE F1 ON FORMED SURFACES OR U2 ON UNFORMED SURFACES.
- PERMITTED MATERIAL FOR PIPES ARE SHOWN IN PART E, SEWERS FOR ADOPTION 6th EDITION.
- ALL CONCRETE AND CONCRETE PRODUCTS TO BE SULPHATE RESISTING.

Revision History

Rev	FOR INFORMATION	Comment	AH	BL	DT	27.10.2021
Rev			By	Chkd	Appr	Date
Current Revision						
P01	FOR INFORMATION		AH	BL	DT	27.10.2021
Rev			By	Chkd	Appr	Date

PRELIMINARY

SRC RECYCLING



TRANSPORT PLANNING AND ENGINEERING

Project

SRC RECYCLING

Drawing Title

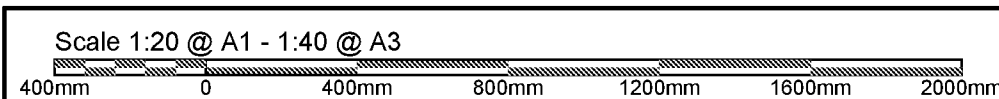
DRAINAGE DETAILS

SHEET 2 OF 3

Markides Associates reference: 20293

1:20

20293-MA-XX-XX-DR-C-5001 - P01



Markides Associates Ltd										Page 1																																																																																																																																					
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																															
Date 29/10/2021 16:27 File SW and FW drainage_27.1...							Designed by Markides Associates Checked by																																																																																																																																								
Innovyze							Network 2020.1.3																																																																																																																																								
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for Storm</u> Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>2</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>19.200</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>1.500</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits												Return Period (years)	2	PIMP (%)	100	M5-60 (mm)	19.200	Add Flow / Climate Change (%)	0	Ratio R	0.350	Minimum Backdrop Height (m)	0.200	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500	Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200	Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00	Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																								
Return Period (years)	2	PIMP (%)	100																																																																																																																																												
M5-60 (mm)	19.200	Add Flow / Climate Change (%)	0																																																																																																																																												
Ratio R	0.350	Minimum Backdrop Height (m)	0.200																																																																																																																																												
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500																																																																																																																																												
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200																																																																																																																																												
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00																																																																																																																																												
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																												
<u>Network Design Table for Storm</u> <table><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>I.Area (ha)</th><th>T.E. (mins)</th><th>Base Flow (l/s)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th><th>Section Type</th><th>Auto Design</th></tr><tr><td>SW1.000</td><td>17.885</td><td>0.089</td><td>201.0</td><td>0.022</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.001</td><td>26.492</td><td>0.132</td><td>200.0</td><td>0.016</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.002</td><td>11.784</td><td>0.059</td><td>198.4</td><td>0.023</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.003</td><td>13.142</td><td>0.064</td><td>205.3</td><td>0.008</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW2.000</td><td>12.478</td><td>0.125</td><td>100.0</td><td>0.000</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW2.001</td><td>9.606</td><td>0.166</td><td>57.9</td><td>0.000</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.004</td><td>12.941</td><td>0.064</td><td>203.7</td><td>0.012</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.005</td><td>17.008</td><td>0.085</td><td>200.0</td><td>0.007</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.006</td><td>12.470</td><td>0.180</td><td>69.2</td><td>0.018</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>SW1.007</td><td>10.495</td><td>0.180</td><td>58.2</td><td>0.000</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr></table>												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	SW1.000	17.885	0.089	201.0	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit		SW1.001	26.492	0.132	200.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit		SW1.002	11.784	0.059	198.4	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit		SW1.003	13.142	0.064	205.3	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit		SW2.000	12.478	0.125	100.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit		SW2.001	9.606	0.166	57.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit		SW1.004	12.941	0.064	203.7	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit		SW1.005	17.008	0.085	200.0	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit		SW1.006	12.470	0.180	69.2	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit		SW1.007	10.495	0.180	58.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
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																																																																																																																																				
SW1.000	17.885	0.089	201.0	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.001	26.492	0.132	200.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.002	11.784	0.059	198.4	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.003	13.142	0.064	205.3	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW2.000	12.478	0.125	100.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																					
SW2.001	9.606	0.166	57.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																					
SW1.004	12.941	0.064	203.7	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.005	17.008	0.085	200.0	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.006	12.470	0.180	69.2	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
SW1.007	10.495	0.180	58.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit																																																																																																																																					
<u>Network Results Table</u> <table><tr><th>PN</th><th>Rain (mm/hr)</th><th>T.C. (mins)</th><th>US/IL (m)</th><th>Σ I.Area (ha)</th><th>Σ Base Flow (l/s)</th><th>Foul (l/s)</th><th>Add Flow (l/s)</th><th>Vel (m/s)</th><th>Cap (l/s)</th><th>Flow (l/s)</th></tr><tr><td>SW1.000</td><td>50.00</td><td>5.32</td><td>12.220</td><td>0.022</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.92</td><td>36.5</td><td>2.9</td></tr><tr><td>SW1.001</td><td>50.00</td><td>5.80</td><td>12.131</td><td>0.038</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.92</td><td>36.6</td><td>5.1</td></tr><tr><td>SW1.002</td><td>50.00</td><td>6.02</td><td>11.999</td><td>0.061</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.92</td><td>36.8</td><td>8.3</td></tr><tr><td>SW1.003</td><td>50.00</td><td>6.26</td><td>11.939</td><td>0.069</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.91</td><td>36.1</td><td>9.3</td></tr><tr><td>SW2.000</td><td>50.00</td><td>5.27</td><td>12.850</td><td>0.000</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.77</td><td>6.0</td><td>0.0</td></tr><tr><td>SW2.001</td><td>50.00</td><td>5.43</td><td>12.755</td><td>0.000</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.01</td><td>8.0</td><td>0.0</td></tr><tr><td>SW1.004</td><td>50.00</td><td>6.49</td><td>11.875</td><td>0.081</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.91</td><td>36.3</td><td>11.0</td></tr><tr><td>SW1.005</td><td>50.00</td><td>6.80</td><td>11.812</td><td>0.088</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.92</td><td>36.6</td><td>12.0</td></tr><tr><td>SW1.006</td><td>50.00</td><td>6.93</td><td>11.727</td><td>0.106</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.57</td><td>62.6</td><td>14.3</td></tr><tr><td>SW1.007</td><td>50.00</td><td>7.04</td><td>11.546</td><td>0.106</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.72</td><td>68.3</td><td>14.3</td></tr></table>												PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	SW1.000	50.00	5.32	12.220	0.022	0.0	0.0	0.0	0.92	36.5	2.9	SW1.001	50.00	5.80	12.131	0.038	0.0	0.0	0.0	0.92	36.6	5.1	SW1.002	50.00	6.02	11.999	0.061	0.0	0.0	0.0	0.92	36.8	8.3	SW1.003	50.00	6.26	11.939	0.069	0.0	0.0	0.0	0.91	36.1	9.3	SW2.000	50.00	5.27	12.850	0.000	0.0	0.0	0.0	0.77	6.0	0.0	SW2.001	50.00	5.43	12.755	0.000	0.0	0.0	0.0	1.01	8.0	0.0	SW1.004	50.00	6.49	11.875	0.081	0.0	0.0	0.0	0.91	36.3	11.0	SW1.005	50.00	6.80	11.812	0.088	0.0	0.0	0.0	0.92	36.6	12.0	SW1.006	50.00	6.93	11.727	0.106	0.0	0.0	0.0	1.57	62.6	14.3	SW1.007	50.00	7.04	11.546	0.106	0.0	0.0	0.0	1.72	68.3	14.3											
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)																																																																																																																																					
SW1.000	50.00	5.32	12.220	0.022	0.0	0.0	0.0	0.92	36.5	2.9																																																																																																																																					
SW1.001	50.00	5.80	12.131	0.038	0.0	0.0	0.0	0.92	36.6	5.1																																																																																																																																					
SW1.002	50.00	6.02	11.999	0.061	0.0	0.0	0.0	0.92	36.8	8.3																																																																																																																																					
SW1.003	50.00	6.26	11.939	0.069	0.0	0.0	0.0	0.91	36.1	9.3																																																																																																																																					
SW2.000	50.00	5.27	12.850	0.000	0.0	0.0	0.0	0.77	6.0	0.0																																																																																																																																					
SW2.001	50.00	5.43	12.755	0.000	0.0	0.0	0.0	1.01	8.0	0.0																																																																																																																																					
SW1.004	50.00	6.49	11.875	0.081	0.0	0.0	0.0	0.91	36.3	11.0																																																																																																																																					
SW1.005	50.00	6.80	11.812	0.088	0.0	0.0	0.0	0.92	36.6	12.0																																																																																																																																					
SW1.006	50.00	6.93	11.727	0.106	0.0	0.0	0.0	1.57	62.6	14.3																																																																																																																																					
SW1.007	50.00	7.04	11.546	0.106	0.0	0.0	0.0	1.72	68.3	14.3																																																																																																																																					
©1982-2020 Innovyze																																																																																																																																															

Markides Associates Ltd											Page 2		
9th Floor, The Tower Building 11 York Road London, SE1 7NX													
Date 29/10/2021 16:27 File SW and FW drainage_27.1...						Designed by Markides Associates							
						Checked by							
Innovyze						Network 2020.1.3							
<u>Network Design Table for Storm</u>													
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		
SW3.000	44.165	0.366	120.7	0.018	5.00	0.0	0.600	o	150	Pipe/Conduit			
SW3.001	12.794	0.067	190.0	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit			
SW3.002	11.055	0.326	34.0	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit			
SW1.008	5.830	0.029	200.0	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit			
SW1.009	15.593	0.078	200.0	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit			
SW1.010	19.409	0.589	33.0	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit			
SW4.000	9.548	0.460	20.8	0.087	5.00	0.0	0.600	o	225	Pipe/Conduit			
SW5.000	19.565	0.240	81.5	0.010	5.00	0.0	0.600	o	225	Pipe/Conduit			
SW4.001	38.996	0.957	40.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit			
SW6.000	19.030	0.532	35.8	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit			
SW4.002	21.442	0.283	75.8	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit			
SW7.000	41.584	0.776	53.6	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit			
SW7.001	10.704	1.014	10.6	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit			
SW8.000	8.543	0.091	93.9	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit			
<u>Network Results Table</u>													
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)			
SW3.000	50.00	5.81	12.200	0.018	0.0	0.0	0.0	0.91	16.1	2.5			
SW3.001	50.00	6.10	11.834	0.028	0.0	0.0	0.0	0.73	12.8	3.8			
SW3.002	50.00	6.21	11.767	0.040	0.0	0.0	0.0	1.73	30.6	5.4			
SW1.008	50.00	7.14	11.366	0.159	0.0	0.0	0.0	0.92	36.6	21.6			
SW1.009	50.00	7.42	11.337	0.162	0.0	0.0	0.0	0.92	36.6	21.9			
SW1.010	50.00	7.56	11.259	0.169	0.0	0.0	0.0	2.29	90.9	22.9			
SW4.000	50.00	5.06	12.610	0.087	0.0	0.0	0.0	2.88	114.7	11.8			
SW5.000	50.00	5.22	12.390	0.010	0.0	0.0	0.0	1.45	57.6	1.4			
SW4.001	50.00	5.54	12.150	0.098	0.0	0.0	0.0	2.06	81.7	13.2			
SW6.000	50.00	5.19	11.890	0.012	0.0	0.0	0.0	1.69	29.8	1.6			
SW4.002	50.00	5.78	11.193	0.144	0.0	0.0	0.0	1.50	59.8	19.5			
SW7.000	50.00	5.50	13.200	0.015	0.0	0.0	0.0	1.38	24.3	2.0			
SW7.001	50.00	5.56	12.424	0.030	0.0	0.0	0.0	3.12	55.1	4.0			
SW8.000	50.00	5.14	11.700	0.016	0.0	0.0	0.0	1.04	18.3	2.1			
©1982-2020 Innovyze													

Markides Associates Ltd											Page 3	
9th Floor, The Tower Building 11 York Road London, SE1 7NX												
Date 29/10/2021 16:27 File SW and FW drainage_27.1...						Designed by Markides Associates Checked by						
Innovyze						Network 2020.1.3						
<u>Network Design Table for Storm</u>												
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	
SW8.001	7.931	0.199	39.9	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit		
SW7.002	19.184	0.425	45.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit		
SW4.003	22.921	0.115	200.0	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit		
SW4.004	10.033	0.050	200.0	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit		
SW9.000	14.327	0.093	154.1	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit		
SW4.005	29.243	0.078	375.0	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit		
SW4.006	13.865	0.037	375.0	0.027	0.00	0.0	0.600	o	375	Pipe/Conduit		
SW10.000	14.326	0.098	146.2	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit		
SW10.001	31.592	0.211	150.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit		
SW10.002	14.795	0.148	100.0	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit		
SW4.007	21.515	0.057	377.5	0.021	0.00	0.0	0.600	o	375	Pipe/Conduit		
SW1.011	6.990	0.014	499.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit		
SW11.000	13.684	0.578	23.7	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit		
<u>Network Results Table</u>												
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)		
SW8.001	50.00	5.22	11.609	0.025		0.0	0.0	0.0	1.60	28.3	3.4	
SW7.002	50.00	5.77	11.410	0.063		0.0	0.0	0.0	1.50	26.5	8.5	
SW4.003	50.00	6.19	10.910	0.225		0.0	0.0	0.0	0.92	36.6	30.5	
SW4.004	50.00	6.38	10.795	0.236		0.0	0.0	0.0	0.92	36.6	31.9	
SW9.000	50.00	5.30	11.076	0.011		0.0	0.0	0.0	0.81	14.3	1.4	
SW4.005	50.00	6.90	10.745	0.255		0.0	0.0	0.0	0.93	102.7	34.5	
SW4.006	50.00	7.15	10.657	0.281		0.0	0.0	0.0	0.93	102.7	38.1	
SW10.000	50.00	5.29	11.320	0.019		0.0	0.0	0.0	0.83	14.6	2.6	
SW10.001	50.00	5.93	11.222	0.030		0.0	0.0	0.0	0.82	14.5	4.1	
SW10.002	50.00	6.18	11.011	0.044		0.0	0.0	0.0	1.00	17.8	6.0	
SW4.007	50.00	7.54	10.630	0.347		0.0	0.0	0.0	0.93	102.3	47.0	
SW1.011	50.00	7.71	10.573	0.516		0.0	0.0	0.0	0.80	88.8	69.9	
SW11.000	50.00	5.14	13.620	0.000		0.0	0.0	0.0	1.59	12.5	0.0	
©1982-2020 Innovyze												

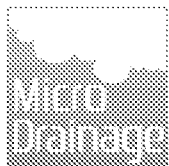
Markides Associates Ltd										Page 4			
9th Floor, The Tower Building 11 York Road London, SE1 7NX													
Date 29/10/2021 16:27 File SW and FW drainage_27.1...						Designed by Markides Associates Checked by							
Innovyze						Network 2020.1.3							
<u>Network Design Table for Storm</u>													
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		
SW12.000	22.805	0.228	100.0	0.015	5.00	0.0	0.600	o	100	Pipe/Conduit			
SW11.001	28.623	0.276	103.6	0.022	0.00	0.0	0.600	o	100	Pipe/Conduit			
SW11.002	26.423	0.268	98.4	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit			
SW11.003	7.510	0.090	83.1	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit			
SW11.004	4.464	0.100	44.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit			
<u>Network Results Table</u>													
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)			
SW12.000	50.00	5.49	13.270	0.015	0.0	0.0	0.0	0.77	6.0	2.1			
SW11.001	50.00	6.13	13.042	0.037	0.0	0.0	0.0	0.76	5.9	5.0			
SW11.002	50.00	6.56	12.716	0.051	0.0	0.0	0.0	1.01	17.9	7.0			
SW11.003	50.00	6.67	12.447	0.067	0.0	0.0	0.0	1.10	19.5	9.1			
SW11.004	50.00	6.72	12.357	0.067	0.0	0.0	0.0	1.51	26.7	9.1			
©1982-2020 Innovyze													

Markides Associates Ltd								Page 5		
9th Floor, The Tower Building 11 York Road London, SE1 7NX										
Date 29/10/2021 16:27 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by					
Innovyze					Network 2020.1.3					
Manhole Schedules for Storm										
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
SW1	13.420	1.200	Open Manhole	1200	SW1.000	12.220	225			
SW2	13.470	1.339	Open Manhole	1200	SW1.001	12.131	225	SW1.000	12.131	225
SW3	13.660	1.681	Open Manhole	1200	SW1.002	11.999	225	SW1.001	11.999	225
SW4	13.790	1.851	Open Manhole	1200	SW1.003	11.939	225	SW1.002	11.939	225
SW5	14.080	1.200	Open Manhole	1200	SW2.000	12.880	100			
SW6	14.090	1.245	Open Manhole	1200	SW2.001	12.755	100	SW2.000	12.755	100
SW7	13.640	1.765	Open Manhole	1200	SW1.004	11.875	225	SW1.003	11.875	225
								SW2.001	12.589	100
SW8	13.520	1.708	Open Manhole	1200	SW1.005	11.812	225	SW1.004	11.812	225
SW9	13.390	1.663	Open Manhole	1200	SW1.006	11.727	225	SW1.005	11.727	225
SW10	13.390	1.844	Open Manhole	1200	SW1.007	11.546	225	SW1.006	11.546	225
SW11	13.400	1.200	Open Manhole	1200	SW3.000	12.200	150			
SW12	13.290	1.456	Open Manhole	1200	SW3.001	11.834	150	SW3.000	11.834	150
SW13	13.460	1.693	Open Manhole	1200	SW3.002	11.767	150	SW3.001	11.767	150
SW14	13.390	2.024	Open Manhole	1200	SW1.008	11.366	225	SW1.007	11.366	225
								SW3.002	11.441	150
SW15	13.260	1.943	Open Manhole	1200	SW1.009	11.337	225	SW1.008	11.337	225
SW16	13.190	1.931	Open Manhole	1200	SW1.010	11.259	225	SW1.009	11.259	225
SW17	14.010	1.400	Open Manhole	1200	SW4.000	12.610	225			
SW18	13.530	1.200	Open Manhole	1200	SW5.000	12.390	225			
SW19	13.990	1.750	Open Manhole	1200	SW4.001	12.150	225	SW4.000	12.150	225
								SW5.000	12.150	225
SW20	13.000	1.200	Open Manhole	1200	SW6.000	11.600	150			
SW21	13.400	2.207	Open Manhole	1200	SW4.002	11.193	225	SW4.001	11.193	225
								SW6.000	11.268	150
SW22	14.000	0.800	Open Manhole	450	SW7.000	13.200	150			
SW23	13.290	0.806	Open Manhole	450	SW7.001	12.424	150	SW7.000	12.424	150
SW24	13.170	1.470	Open Manhole	1200	SW8.000	11.700	150			
SW25	13.190	1.581	Open Manhole	1200	SW8.001	11.609	150	SW8.000	11.609	150
SW26	13.230	1.820	Open Manhole	1200	SW7.002	11.410	150	SW7.001	11.410	150
								SW8.001	11.410	150
SW27	13.000	2.090	Open Manhole	1200	SW4.003	10.910	225	SW4.002	10.910	225
								SW7.002	10.985	150
SW28	12.800	2.005	Open Manhole	1200	SW4.004	10.795	225	SW4.003	10.795	225
SW29	12.170	1.100	Open Manhole	1200	SW9.000	11.070	150			
SW30	12.360	1.755	Open Manhole	1500	SW4.005	10.745	375	SW4.004	10.745	375
								SW9.000	10.977	150
SW31	12.580	1.913	Open Manhole	1500	SW4.006	10.667	375	SW4.005	10.667	375
©1982-2020 Innovyze										

Markides Associates Ltd								Page 6	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>Manhole Schedules for Storm</u>									
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	
SW32	12.620	1.300	Open Manhole	1200	SW10.000	11.320	150		
SW33	12.600	1.378	Open Manhole	1200	SW10.001	11.222	150	SW10.000	
SW34	12.980	1.889	Open Manhole	1200	SW10.002	11.011	150	SW10.001	
SW35	12.670	2.040	Open Manhole	1500	SW4.007	10.630	375	SW4.006	
								SW10.002	
SW36	13.670	2.497	Open Manhole	1500	SW1.011	10.573	375	SW1.010	
								SW4.007	
SWFilter drain	13.130	2.631	Open Manhole	0		OUTFALL		SW1.011	
SW37	14.820	1.200	Open Manhole	1200	SW11.000	13.620	100		
SW38	14.470	1.200	Open Manhole	1200	SW12.000	13.270	100		
SW39	14.720	1.678	Open Manhole	1200	SW11.001	13.042	100	SW11.000	
								SW12.000	
SW40	14.610	1.894	Open Manhole	1200	SW11.002	12.716	150	SW11.001	
SW41	13.720	1.273	Open Manhole	1200	SW11.003	12.447	150	SW11.002	
SW42	13.720	1.363	Open Manhole	1200	SW11.004	12.357	150	SW11.003	
SW	13.800	1.543	Open Manhole	0		OUTFALL		SW11.004	
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)			
SW1	494386.412	105849.644	494386.412	105849.644	Required				
SW2	494402.593	105842.023	494402.593	105842.023	Required				
SW3	494427.775	105833.795	494427.775	105833.795	Required				
SW4	494439.052	105830.378	494439.052	105830.378	Required				
SW5	494461.101	105840.875	494461.101	105840.875	Required				
SW6	494457.390	105828.961	494457.390	105828.961	Required				
SW7	494449.895	105822.953	494449.895	105822.953	Required				
©1982-2020 Innovyze									

Markides Associates Ltd						Page 7
9th Floor, The Tower Building 11 York Road London, SE1 7NX						
Date 29/10/2021 16:27 File SW and FW drainage_27.1...			Designed by Markides Associates Checked by			
Innovyze			Network 2020.1.3			
<u>Manhole Schedules for Storm</u>						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW8	494451.050	105810.063	494451.050	105810.063	Required	●
SW9	494445.819	105793.880	494445.819	105793.880	Required	●
SW10	494441.259	105782.273	494441.259	105782.273	Required	●
SW11	494422.425	105819.349	494422.425	105819.349	Required	●
SW12	494409.666	105777.067	494409.666	105777.067	Required	●
SW13	494421.964	105773.541	494421.964	105773.541	Required	●
SW14	494432.692	105776.210	494432.692	105776.210	Required	●
SW15	494433.625	105770.455	494433.625	105770.455	Required	●
SW16	494445.117	105759.916	494445.117	105759.916	Required	●
SW17	494302.152	105781.749	494302.152	105781.749	Required	●
SW18	494303.669	105757.370	494303.669	105757.370	Required	●
SW19	494309.750	105775.966	494309.750	105775.966	Required	●
SW20	494341.523	105747.587	494341.523	105747.587	Required	●
SW21	494347.369	105765.697	494347.369	105765.697	Required	●
SW22	494335.257	105812.365	494335.257	105812.365	Required	●
©1982-2020 Innovyze						

Markides Associates Ltd						Page 8
9th Floor, The Tower Building 11 York Road London, SE1 7NX						
Date 29/10/2021 16:27 File SW and FW drainage_27.1...			Designed by Markides Associates Checked by			
Innovyze			Network 2020.1.3			
<u>Manhole Schedules for Storm</u>						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW23	494363.132	105781.507	494363.132	105781.507	Required	●
SW24	494387.112	105784.307	494387.112	105784.307	Required	●
SW25	494378.573	105784.053	494378.573	105784.053	Required	●
SW26	494373.292	105778.136	494373.292	105778.136	Required	●
SW27	494367.958	105759.708	494367.958	105759.708	Required	●
SW28	494389.230	105751.172	494389.230	105751.172	Required	●
SW29	494392.933	105732.378	494392.933	105732.378	Required	●
SW30	494397.749	105745.872	494397.749	105745.872	Required	●
SW31	494421.777	105729.204	494421.777	105729.204	Required	●
SW32	494491.912	105706.744	494491.912	105706.744	Required	●
SW33	494479.385	105713.694	494479.385	105713.694	Required	●
SW34	494448.061	105717.805	494448.061	105717.805	Required	●
SW35	494434.348	105723.356	494434.348	105723.356	Required	●
SW36	494447.191	105740.618	494447.191	105740.618	Required	●
SWFilter drain	494448.977	105733.860			No Entry	●
©1982-2020 Innovyze						

Markides Associates Ltd						Page 9																																																								
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																														
Date 29/10/2021 16:27 File SW and FW drainage_27.1...			Designed by Markides Associates Checked by																																																											
Innovyze			Network 2020.1.3																																																											
<u>Manhole Schedules for Storm</u> <table><tr><th>MH Name</th><th>Manhole Easting (m)</th><th>Manhole Northing (m)</th><th>Intersection Easting (m)</th><th>Intersection Northing (m)</th><th>Manhole Access</th><th>Layout (North)</th></tr><tr><td>SW37</td><td>494311.991</td><td>105899.895</td><td>494311.991</td><td>105899.895</td><td>Required</td><td></td></tr><tr><td>SW38</td><td>494319.250</td><td>105874.101</td><td>494319.250</td><td>105874.101</td><td>Required</td><td></td></tr><tr><td>SW39</td><td>494325.147</td><td>105896.130</td><td>494325.147</td><td>105896.130</td><td>Required</td><td></td></tr><tr><td>SW40</td><td>494352.395</td><td>105887.368</td><td>494352.395</td><td>105887.368</td><td>Required</td><td></td></tr><tr><td>SW41</td><td>494370.690</td><td>105868.302</td><td>494370.690</td><td>105868.302</td><td>Required</td><td></td></tr><tr><td>SW42</td><td>494375.920</td><td>105873.692</td><td>494375.920</td><td>105873.692</td><td>Required</td><td></td></tr><tr><td>SW</td><td>494379.224</td><td>105870.690</td><td></td><td></td><td>No Entry</td><td></td></tr></table>							MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)	SW37	494311.991	105899.895	494311.991	105899.895	Required		SW38	494319.250	105874.101	494319.250	105874.101	Required		SW39	494325.147	105896.130	494325.147	105896.130	Required		SW40	494352.395	105887.368	494352.395	105887.368	Required		SW41	494370.690	105868.302	494370.690	105868.302	Required		SW42	494375.920	105873.692	494375.920	105873.692	Required		SW	494379.224	105870.690			No Entry	
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)																																																								
SW37	494311.991	105899.895	494311.991	105899.895	Required																																																									
SW38	494319.250	105874.101	494319.250	105874.101	Required																																																									
SW39	494325.147	105896.130	494325.147	105896.130	Required																																																									
SW40	494352.395	105887.368	494352.395	105887.368	Required																																																									
SW41	494370.690	105868.302	494370.690	105868.302	Required																																																									
SW42	494375.920	105873.692	494375.920	105873.692	Required																																																									
SW	494379.224	105870.690			No Entry																																																									
©1982-2020 Innovyze																																																														

Markides Associates Ltd								Page 10
9th Floor, The Tower Building 11 York Road London, SE1 7NX								
Date 29/10/2021 16:27 File SW and FW drainage_27.1...						Designed by Markides Associates Checked by		
Innovyze						Network 2020.1.3		
<u>PIPELINE SCHEDULES for Storm</u>								
<u>Upstream Manhole</u>								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	o	225	SW1	13.420	12.220	0.975	Open Manhole	1200
SW1.001	o	225	SW2	13.470	12.131	1.114	Open Manhole	1200
SW1.002	o	225	SW3	13.680	11.999	1.456	Open Manhole	1200
SW1.003	o	225	SW4	13.790	11.939	1.626	Open Manhole	1200
SW2.000	o	100	SW5	14.080	12.880	1.100	Open Manhole	1200
SW2.001	o	100	SW6	14.090	12.755	1.145	Open Manhole	1200
SW1.004	o	225	SW7	13.640	11.875	1.540	Open Manhole	1200
SW1.005	o	225	SW8	13.520	11.812	1.483	Open Manhole	1200
SW1.006	o	225	SW9	13.390	11.727	1.438	Open Manhole	1200
SW1.007	o	225	SW10	13.390	11.546	1.619	Open Manhole	1200
SW3.000	o	150	SW11	13.400	12.200	1.050	Open Manhole	1200
SW3.001	o	150	SW12	13.290	11.834	1.306	Open Manhole	1200
SW3.002	o	150	SW13	13.460	11.767	1.543	Open Manhole	1200
SW1.008	o	225	SW14	13.390	11.366	1.799	Open Manhole	1200
SW1.009	o	225	SW15	13.280	11.337	1.718	Open Manhole	1200
SW1.010	o	225	SW16	13.190	11.259	1.706	Open Manhole	1200
<u>Downstream Manhole</u>								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	17.885	201.0	SW2	13.470	12.131	1.114	Open Manhole	1200
SW1.001	26.492	200.0	SW3	13.680	11.999	1.456	Open Manhole	1200
SW1.002	11.784	198.4	SW4	13.790	11.939	1.626	Open Manhole	1200
SW1.003	13.142	205.3	SW7	13.640	11.875	1.540	Open Manhole	1200
SW2.000	12.478	100.0	SW6	14.080	12.755	1.145	Open Manhole	1200
SW2.001	9.606	57.9	SW7	13.640	12.589	0.951	Open Manhole	1200
SW1.004	12.941	203.7	SW8	13.520	11.812	1.483	Open Manhole	1200
SW1.005	17.008	200.0	SW9	13.390	11.727	1.438	Open Manhole	1200
SW1.006	12.470	69.2	SW10	13.390	11.546	1.619	Open Manhole	1200
SW1.007	10.495	58.2	SW14	13.390	11.366	1.799	Open Manhole	1200
SW3.000	44.165	120.7	SW12	13.290	11.834	1.306	Open Manhole	1200
SW3.001	12.794	190.0	SW13	13.460	11.767	1.543	Open Manhole	1200
SW3.002	11.055	34.0	SW14	13.390	11.441	1.799	Open Manhole	1200
SW1.008	5.830	200.0	SW15	13.280	11.337	1.718	Open Manhole	1200
SW1.009	15.593	200.0	SW16	13.190	11.259	1.706	Open Manhole	1200
SW1.010	19.409	33.0	SW36	13.070	10.670	2.175	Open Manhole	1500
©1982-2020 Innovyze								

Markides Associates Ltd		Page 11
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:27 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW4.000	o	225	SW17	14.010	12.610	1.475	Open Manhole	1200
SW5.000	o	225	SW18	13.590	12.390	0.975	Open Manhole	1200
SW4.001	o	225	SW19	13.900	12.150	1.525	Open Manhole	1200
SW6.000	o	150	SW20	13.000	11.800	1.050	Open Manhole	1200
SW4.002	o	225	SW21	13.400	11.193	1.982	Open Manhole	1200
SW7.000	o	150	SW22	14.000	13.200	0.650	Open Manhole	450
SW7.001	o	150	SW23	13.230	12.424	0.656	Open Manhole	450
SW8.000	o	150	SW24	13.170	11.700	1.320	Open Manhole	1200
SW8.001	o	150	SW25	13.190	11.609	1.431	Open Manhole	1200
SW7.002	o	150	SW26	13.230	11.410	1.670	Open Manhole	1200
SW4.003	o	225	SW27	13.000	10.910	1.865	Open Manhole	1200
SW4.004	o	225	SW28	12.800	10.795	1.780	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW4.000	9.548	20.8	SW19	13.900	12.150	1.525	Open Manhole	1200
SW5.000	19.565	81.5	SW19	13.300	12.150	1.525	Open Manhole	1200
SW4.001	38.996	40.7	SW21	13.400	11.193	1.982	Open Manhole	1200
SW6.000	19.030	35.8	SW21	13.400	11.268	1.982	Open Manhole	1200
SW4.002	21.442	75.8	SW27	13.000	10.910	1.865	Open Manhole	1200
SW7.000	41.584	53.6	SW23	13.230	12.424	0.656	Open Manhole	450
SW7.001	10.704	10.6	SW26	13.230	11.410	1.670	Open Manhole	1200
SW8.000	8.543	93.9	SW25	13.190	11.609	1.431	Open Manhole	1200
SW8.001	7.931	39.9	SW26	13.230	11.410	1.670	Open Manhole	1200
SW7.002	19.184	45.1	SW27	13.000	10.985	1.865	Open Manhole	1200
SW4.003	22.921	200.0	SW28	12.800	10.795	1.780	Open Manhole	1200
SW4.004	10.033	200.0	SW30	12.300	10.745	1.530	Open Manhole	1500

Markides Associates Ltd		Page 12
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:27 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW9.000	o	150	SW29	12.170	11.070	0.950	Open Manhole	1200
SW4.005	o	375	SW30	12.500	10.745	1.380	Open Manhole	1500
SW4.006	o	375	SW31	12.580	10.667	1.538	Open Manhole	1500
SW10.000	o	150	SW32	12.620	11.920	1.150	Open Manhole	1200
SW10.001	o	150	SW33	12.600	11.222	1.228	Open Manhole	1200
SW10.002	o	150	SW34	12.900	11.011	1.739	Open Manhole	1200
SW4.007	o	375	SW35	12.670	10.630	1.665	Open Manhole	1500
SW1.011	o	375	SW36	13.070	10.573	2.122	Open Manhole	1500
SW11.000	o	100	SW37	14.820	13.620	1.100	Open Manhole	1200
SW12.000	o	100	SW38	14.470	13.270	1.100	Open Manhole	1200
SW11.001	o	100	SW39	14.720	13.042	1.578	Open Manhole	1200
SW11.002	o	150	SW40	14.610	12.716	1.744	Open Manhole	1200
SW11.003	o	150	SW41	13.720	12.447	1.123	Open Manhole	1200
SW11.004	o	150	SW42	13.720	12.357	1.213	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW9.000	14.327	154.1	SW30	12.500	10.977	1.373	Open Manhole	1500
SW4.005	29.243	375.0	SW31	12.580	10.667	1.538	Open Manhole	1500
SW4.006	13.865	375.0	SW35	12.670	10.630	1.665	Open Manhole	1500
SW10.000	14.326	146.2	SW33	12.600	11.222	1.228	Open Manhole	1200
SW10.001	31.592	150.0	SW34	12.900	11.011	1.739	Open Manhole	1200
SW10.002	14.795	100.0	SW35	12.670	10.863	1.657	Open Manhole	1500
SW4.007	21.515	377.5	SW36	13.070	10.573	2.122	Open Manhole	1500
SW1.011	6.990	499.3	SWFilter drain	13.130	10.559	2.256	Open Manhole	0
SW11.000	13.684	23.7	SW39	14.720	13.042	1.578	Open Manhole	1200
SW12.000	22.805	100.0	SW39	14.720	13.042	1.578	Open Manhole	1200
SW11.001	28.623	103.6	SW40	14.610	12.766	1.744	Open Manhole	1200
SW11.002	26.423	98.4	SW41	13.720	12.447	1.123	Open Manhole	1200
SW11.003	7.510	83.1	SW42	13.720	12.357	1.213	Open Manhole	1200
SW11.004	4.464	44.6	SW	13.800	12.257	1.393	Open Manhole	0

Markides Associates Ltd				Page 13		
9th Floor, The Tower Building 11 York Road London, SE1 7NX						
Date 29/10/2021 16:27 File SW and FW drainage_27.1...		Designed by Markides Associates Checked by				
Innovyze		Network 2020.1.3				
<u>Area Summary for Storm</u>						
Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.022	0.022	0.022
1.001	User	-	100	0.016	0.016	0.016
1.002	User	-	100	0.023	0.023	0.023
1.003	User	-	100	0.008	0.008	0.008
2.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.012	0.012	0.012
1.005	User	-	100	0.007	0.007	0.007
1.006	User	-	100	0.018	0.018	0.018
1.007	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.018	0.018	0.018
3.001	User	-	100	0.010	0.010	0.010
3.002	User	-	100	0.012	0.012	0.012
1.008	User	-	100	0.014	0.014	0.014
1.009	User	-	100	0.002	0.002	0.002
1.010	User	-	100	0.008	0.008	0.008
4.000	User	-	100	0.022	0.022	0.022
	User	-	100	0.066	0.066	0.087
5.000	User	-	100	0.010	0.010	0.010
4.001	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.012	0.012	0.012
4.002	User	-	100	0.015	0.015	0.015
	User	-	100	0.019	0.019	0.034
7.000	User	-	100	0.015	0.015	0.015
7.001	User	-	100	0.015	0.015	0.015
8.000	User	-	100	0.016	0.016	0.016
8.001	User	-	100	0.009	0.009	0.009
7.002	User	-	100	0.008	0.008	0.008
4.003	User	-	100	0.018	0.018	0.018
4.004	User	-	100	0.011	0.011	0.011
9.000	User	-	100	0.011	0.011	0.011
4.005	User	-	100	0.008	0.008	0.008
4.006	User	-	100	0.027	0.027	0.027
10.000	User	-	100	0.019	0.019	0.019
10.001	User	-	100	0.011	0.011	0.011
10.002	User	-	100	0.014	0.014	0.014
4.007	User	-	100	0.021	0.021	0.021
1.011	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
12.000	User	-	100	0.015	0.015	0.015
11.001	User	-	100	0.012	0.012	0.012
	User	-	100	0.010	0.010	0.022
11.002	User	-	100	0.015	0.015	0.015
11.003	User	-	100	0.016	0.016	0.016
11.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.584	0.584	0.584
©1982-2020 Innovyze						

Markides Associates Ltd		Page 14
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:27 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW1.011	SWFilter drain	13.190	10.559	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW11.004	SW	13.800	12.257	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Storm Duration (mins)	30
Ratio R	0.350		

©1982-2020 Innovyze

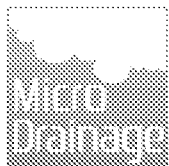
Markides Associates Ltd								Page 15	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
<u>Simulation Criteria</u>									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Online Controls 0 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0									
<u>Synthetic Rainfall Details</u>									
Rainfall Model FEH FEH Rainfall Version 2013 Site Location GB 494200 105650 SU 94200 05650 Data Type Catchment Cv (Summer) 0.750 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status OFF									
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 Return Period(s) (years) 2, 30, 100 Climate Change (%) 0, 0, 0									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW1	15 Winter	2	+0%					12.270
SW1.001	SW2	15 Winter	2	+0%					12.194
SW1.002	SW3	15 Winter	2	+0%					12.081
SW1.003	SW4	15 Winter	2	+0%	100/15 Winter				12.028
SW2.000	SW5	15 Summer	2	+0%					12.880
SW2.001	SW6	15 Summer	2	+0%					12.755
SW1.004	SW7	15 Winter	2	+0%	100/15 Summer				11.971
SW1.005	SW8	15 Winter	2	+0%	100/15 Summer				11.909
SW1.006	SW9	15 Winter	2	+0%	100/15 Summer				11.807
SW1.007	SW10	15 Winter	2	+0%	30/15 Summer				11.624
SW3.000	SW11	15 Winter	2	+0%					12.245
SW3.001	SW12	15 Winter	2	+0%	100/15 Winter				11.897
SW3.002	SW13	15 Winter	2	+0%	100/15 Summer				11.814
SW1.008	SW14	15 Winter	2	+0%	30/15 Summer				11.520
SW1.009	SW15	15 Winter	2	+0%	30/15 Summer				11.476
SW1.010	SW16	15 Winter	2	+0%					11.341
SW4.000	SW17	15 Winter	2	+0%					12.669
©1982-2020 Innovyze									

Markides Associates Ltd							Page 16		
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW1	-0.175	0.000	0.11			3.6	OK	
SW1.001	SW2	-0.162	0.000	0.17			5.9	OK	
SW1.002	SW3	-0.142	0.000	0.29			9.1	OK	
SW1.003	SW4	-0.137	0.000	0.32			10.1	OK	
SW2.000	SW5	-0.100	0.000	0.00			0.0	OK	
SW2.001	SW6	-0.100	0.000	0.00			0.0	OK	
SW1.004	SW7	-0.129	0.000	0.38			11.8	OK	
SW1.005	SW8	-0.128	0.000	0.39			12.6	OK	
SW1.006	SW9	-0.145	0.000	0.28			14.8	OK	
SW1.007	SW10	-0.147	0.000	0.26			14.7	OK	
SW3.000	SW11	-0.105	0.000	0.19			3.0	OK	
SW3.001	SW12	-0.087	0.000	0.37			4.3	OK	
SW3.002	SW13	-0.103	0.000	0.22			6.0	OK	
SW1.008	SW14	-0.071	0.000	0.80			22.2	OK	
SW1.009	SW15	-0.086	0.000	0.70			22.5	OK	
SW1.010	SW16	-0.143	0.000	0.29			23.4	OK	
SW4.000	SW17	-0.166	0.000	0.16			14.8	OK	
©1982-2020 Innovyze									

Markides Associates Ltd								Page 17	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by				
Innovyze					Network 2020.1.3				
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									

Markides Associates Ltd							Page 18		
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by				
Innovyze					Network 2020.1.3				
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									

Markides Associates Ltd								Page 19																																																																																																																																																																																				
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																																																																												
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by																																																																																																																																																																																								
Innovyze				Network 2020.1.3																																																																																																																																																																																								
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>																																																																																																																																																																																												
<u>Simulation Criteria</u>																																																																																																																																																																																												
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000																																																																																																																																																																																												
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000																																																																																																																																																																																												
Hot Start Level (mm) 0 Inlet Coefficient 0.800																																																																																																																																																																																												
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000																																																																																																																																																																																												
Foul Sewage per hectare (l/s) 0.000																																																																																																																																																																																												
Number of Input Hydrographs 0 Number of Storage Structures 0																																																																																																																																																																																												
Number of Online Controls 0 Number of Time/Area Diagrams 0																																																																																																																																																																																												
Number of Offline Controls 0 Number of Real Time Controls 0																																																																																																																																																																																												
<u>Synthetic Rainfall Details</u>																																																																																																																																																																																												
Rainfall Model FEH																																																																																																																																																																																												
FEH Rainfall Version 2013																																																																																																																																																																																												
Site Location GB 494200 105650 SU 94200 05650																																																																																																																																																																																												
Data Type Catchment																																																																																																																																																																																												
Cv (Summer) 0.750																																																																																																																																																																																												
Cv (Winter) 0.840																																																																																																																																																																																												
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF																																																																																																																																																																																												
Analysis Timestep Fine Inertia Status OFF																																																																																																																																																																																												
DTS Status OFF																																																																																																																																																																																												
Profile(s) Summer and Winter																																																																																																																																																																																												
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440																																																																																																																																																																																												
Return Period(s) (years) 2, 30, 100																																																																																																																																																																																												
Climate Change (%) 0, 0, 0																																																																																																																																																																																												
<table><tr><th>PN</th><th>US/MH Name</th><th>Storm</th><th>Return Period</th><th>Climate Change</th><th>First (X) Surge</th><th>First (Y) Flood</th><th>First (Z) Overflow</th><th>Overflow Act.</th><th>Water Level (m)</th></tr><tr><td>SW1.000</td><td>SW1</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.295</td></tr><tr><td>SW1.001</td><td>SW2</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.232</td></tr><tr><td>SW1.002</td><td>SW3</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.140</td></tr><tr><td>SW1.003</td><td>SW4</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Winter</td><td></td><td></td><td></td><td>12.092</td></tr><tr><td>SW2.000</td><td>SW5</td><td>15 Summer</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.880</td></tr><tr><td>SW2.001</td><td>SW6</td><td>15 Summer</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.755</td></tr><tr><td>SW1.004</td><td>SW7</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>12.045</td></tr><tr><td>SW1.005</td><td>SW8</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>11.986</td></tr><tr><td>SW1.006</td><td>SW9</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>11.911</td></tr><tr><td>SW1.007</td><td>SW10</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>11.839</td></tr><tr><td>SW3.000</td><td>SW11</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.268</td></tr><tr><td>SW3.001</td><td>SW12</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Winter</td><td></td><td></td><td></td><td>11.942</td></tr><tr><td>SW3.002</td><td>SW13</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>11.846</td></tr><tr><td>SW1.008</td><td>SW14</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>11.776</td></tr><tr><td>SW1.009</td><td>SW15</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>11.653</td></tr><tr><td>SW1.010</td><td>SW16</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>11.388</td></tr><tr><td>SW4.000</td><td>SW17</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.700</td></tr></table>									PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	SW1.000	SW1	15 Winter	30	+0%					12.295	SW1.001	SW2	15 Winter	30	+0%					12.232	SW1.002	SW3	15 Winter	30	+0%					12.140	SW1.003	SW4	15 Winter	30	+0%	100/15 Winter				12.092	SW2.000	SW5	15 Summer	30	+0%					12.880	SW2.001	SW6	15 Summer	30	+0%					12.755	SW1.004	SW7	15 Winter	30	+0%	100/15 Summer				12.045	SW1.005	SW8	15 Winter	30	+0%	100/15 Summer				11.986	SW1.006	SW9	15 Winter	30	+0%	100/15 Summer				11.911	SW1.007	SW10	15 Winter	30	+0%	30/15 Summer				11.839	SW3.000	SW11	15 Winter	30	+0%					12.268	SW3.001	SW12	15 Winter	30	+0%	100/15 Winter				11.942	SW3.002	SW13	15 Winter	30	+0%	100/15 Summer				11.846	SW1.008	SW14	15 Winter	30	+0%	30/15 Summer				11.776	SW1.009	SW15	15 Winter	30	+0%	30/15 Summer				11.653	SW1.010	SW16	15 Winter	30	+0%					11.388	SW4.000	SW17	15 Winter	30	+0%					12.700
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)																																																																																																																																																																																			
SW1.000	SW1	15 Winter	30	+0%					12.295																																																																																																																																																																																			
SW1.001	SW2	15 Winter	30	+0%					12.232																																																																																																																																																																																			
SW1.002	SW3	15 Winter	30	+0%					12.140																																																																																																																																																																																			
SW1.003	SW4	15 Winter	30	+0%	100/15 Winter				12.092																																																																																																																																																																																			
SW2.000	SW5	15 Summer	30	+0%					12.880																																																																																																																																																																																			
SW2.001	SW6	15 Summer	30	+0%					12.755																																																																																																																																																																																			
SW1.004	SW7	15 Winter	30	+0%	100/15 Summer				12.045																																																																																																																																																																																			
SW1.005	SW8	15 Winter	30	+0%	100/15 Summer				11.986																																																																																																																																																																																			
SW1.006	SW9	15 Winter	30	+0%	100/15 Summer				11.911																																																																																																																																																																																			
SW1.007	SW10	15 Winter	30	+0%	30/15 Summer				11.839																																																																																																																																																																																			
SW3.000	SW11	15 Winter	30	+0%					12.268																																																																																																																																																																																			
SW3.001	SW12	15 Winter	30	+0%	100/15 Winter				11.942																																																																																																																																																																																			
SW3.002	SW13	15 Winter	30	+0%	100/15 Summer				11.846																																																																																																																																																																																			
SW1.008	SW14	15 Winter	30	+0%	30/15 Summer				11.776																																																																																																																																																																																			
SW1.009	SW15	15 Winter	30	+0%	30/15 Summer				11.653																																																																																																																																																																																			
SW1.010	SW16	15 Winter	30	+0%					11.388																																																																																																																																																																																			
SW4.000	SW17	15 Winter	30	+0%					12.700																																																																																																																																																																																			
©1982-2020 Innovyze																																																																																																																																																																																												

Markides Associates Ltd							Page 20		
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by				
Innovyze					Network 2020.1.3				
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW1	-0.150	0.000	0.24			7.7	OK	
SW1.001	SW2	-0.124	0.000	0.40			13.7	OK	
SW1.002	SW3	-0.083	0.000	0.70			22.1	OK	
SW1.003	SW4	-0.072	0.000	0.79			24.8	OK	
SW2.000	SW5	-0.100	0.000	0.00			0.0	OK	
SW2.001	SW6	-0.100	0.000	0.00			0.0	OK	
SW1.004	SW7	-0.055	0.000	0.92			28.7	OK	
SW1.005	SW8	-0.051	0.000	0.94			30.6	OK	
SW1.006	SW9	-0.041	0.000	0.63			33.8	OK	
SW1.007	SW10	-0.068	0.000	0.60			34.5	SURCHARGED	
SW3.000	SW11	-0.082	0.000	0.41			6.4	OK	
SW3.001	SW12	-0.042	0.000	0.85			9.9	OK	
SW3.002	SW13	-0.071	0.000	0.51			14.0	OK	
SW1.008	SW14	-0.185	0.000	1.76			48.7	SURCHARGED	
SW1.009	SW15	-0.093	0.000	1.52			49.0	SURCHARGED	
SW1.010	SW16	-0.096	0.000	0.62			50.6	OK	
SW4.000	SW17	-0.135	0.000	0.34			31.9	OK	
©1982-2020 Innovyze									

Markides Associates Ltd								Page 21	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
SW5.000	SW18	15 Winter	30	+0%					12.430
SW4.001	SW19	15 Winter	30	+0%	100/15 Winter				12.258
SW6.000	SW20	15 Winter	30	+0%	30/15 Winter				11.962
SW4.002	SW21	15 Winter	30	+0%	30/15 Summer				11.944
SW7.000	SW22	15 Winter	30	+0%					13.249
SW7.001	SW23	15 Winter	30	+0%					12.472
SW8.000	SW24	15 Winter	30	+0%	30/15 Summer				11.968
SW8.001	SW25	15 Winter	30	+0%	30/15 Summer				11.956
SW7.002	SW26	15 Winter	30	+0%	30/15 Summer				11.939
SW4.003	SW27	15 Winter	30	+0%	2/15 Winter				11.782
SW4.004	SW28	15 Winter	30	+0%	2/15 Summer				11.401
SW9.000	SW29	15 Winter	30	+0%	100/15 Summer				11.193
SW4.005	SW30	15 Winter	30	+0%	30/15 Summer				11.182
SW4.006	SW31	15 Winter	30	+0%	30/15 Summer				11.135
SW10.000	SW32	15 Winter	30	+0%					11.397
SW10.001	SW33	15 Winter	30	+0%	100/15 Summer				11.324
SW10.002	SW34	15 Winter	30	+0%	30/15 Winter				11.185
SW4.007	SW35	15 Winter	30	+0%	30/15 Summer				11.098
SW1.011	SW36	15 Winter	30	+0%	30/15 Summer				11.039
SW11.000	SW37	15 Summer	30	+0%	100/15 Winter				13.620
SW12.000	SW38	15 Winter	30	+0%	30/15 Summer				13.664
SW11.001	SW39	15 Winter	30	+0%	30/15 Summer				13.553
SW11.002	SW40	15 Winter	30	+0%	100/15 Summer				12.819
SW11.003	SW41	15 Winter	30	+0%	30/15 Summer				12.616
SW11.004	SW42	15 Winter	30	+0%	100/15 Summer				12.473
	US/MH		Surcharged	Flooded		Half Drain	Pipe		
	Name	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN		(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
SW5.000	SW18	-0.185	0.000	0.07			3.7	OK	
SW4.001	SW19	-0.117	0.000	0.45			35.2	OK	
SW6.000	SW20	0.012	0.000	0.15			4.3	SURCHARGED	
SW4.002	SW21	0.526	0.000	0.79			42.8	SURCHARGED	
SW7.000	SW22	-0.101	0.000	0.22			5.3	OK	
SW7.001	SW23	-0.102	0.000	0.22			11.0	OK	
SW8.000	SW24	0.118	0.000	0.32			5.2	SURCHARGED	
SW8.001	SW25	0.197	0.000	0.37			9.0	SURCHARGED	
SW7.002	SW26	0.379	0.000	0.68			17.0	SURCHARGED	
SW4.003	SW27	0.647	0.000	1.82			61.2	SURCHARGED	
SW4.004	SW28	0.380	0.000	2.07			63.2	SURCHARGED	
SW9.000	SW29	-0.027	0.000	0.29			3.8	OK	
SW4.005	SW30	0.062	0.000	0.74			67.0	SURCHARGED	
SW4.006	SW31	0.093	0.000	0.99			71.5	SURCHARGED	
SW10.000	SW32	-0.073	0.000	0.51			6.9	OK	
SW10.001	SW33	-0.048	0.000	0.77			10.8	OK	
SW10.002	SW34	0.023	0.000	0.92			15.0	SURCHARGED	
©1982-2020 Innovyze									

Markides Associates Ltd		Page 22
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:27 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

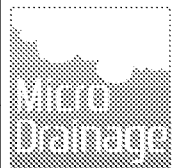
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
SW1.007	SW35	0.098	0.000	1.01			87.3	SURCHARGED	
SW1.011	SW36	0.091	0.000	2.08			137.8	SURCHARGED	
SW11.000	SW37	-0.100	0.000	0.00			0.0	OK	
SW12.000	SW38	0.294	0.000	0.72			4.2	SURCHARGED	
SW11.001	SW39	0.411	0.000	1.58			9.0	SURCHARGED	
SW11.002	SW40	-0.047	0.000	0.79			13.6	OK	
SW11.003	SW41	0.019	0.000	1.13			19.0	SURCHARGED	
SW11.004	SW42	-0.034	0.000	0.95			18.8	OK	

Markides Associates Ltd								Page 23	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
<u>Simulation Criteria</u>									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000									
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000									
Hot Start Level (mm) 0 Inlet Coefficient 0.800									
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000									
Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 0									
Number of Online Controls 0 Number of Time/Area Diagrams 0									
Number of Offline Controls 0 Number of Real Time Controls 0									
<u>Synthetic Rainfall Details</u>									
Rainfall Model FEH									
FEH Rainfall Version 2013									
Site Location GB 494200 105650 SU 94200 05650									
Data Type Catchment									
Cv (Summer) 0.750									
Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF									
Analysis Timestep Fine Inertia Status OFF									
DTS Status OFF									
Profile(s) Summer and Winter									
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440									
Return Period(s) (years) 2, 30, 100									
Climate Change (%) 0, 0, 0									
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
SW1.000	SW1	15 Winter	100	+0%					12.305
SW1.001	SW2	15 Winter	100	+0%					12.247
SW1.002	SW3	15 Winter	100	+0%					12.212
SW1.003	SW4	15 Winter	100	+0%	100/15 Winter				12.177
SW2.000	SW5	15 Summer	100	+0%					12.880
SW2.001	SW6	15 Summer	100	+0%					12.755
SW1.004	SW7	15 Winter	100	+0%	100/15 Summer				12.135
SW1.005	SW8	15 Winter	100	+0%	100/15 Summer				12.082
SW1.006	SW9	15 Winter	100	+0%	100/15 Summer				12.006
SW1.007	SW10	15 Winter	100	+0%	30/15 Summer				11.924
SW3.000	SW11	15 Winter	100	+0%					12.278
SW3.001	SW12	15 Winter	100	+0%	100/15 Winter				11.996
SW3.002	SW13	15 Winter	100	+0%	100/15 Summer				11.940
SW1.008	SW14	15 Winter	100	+0%	30/15 Summer				11.852
SW1.009	SW15	15 Winter	100	+0%	30/15 Summer				11.761
SW1.010	SW16	15 Winter	100	+0%					11.398
SW4.000	SW17	15 Winter	100	+0%					12.712
©1982-2020 Innovyze									

Markides Associates Ltd							Page 24	
9th Floor, The Tower Building 11 York Road London, SE1 7NX								
Date 29/10/2021 16:27 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by			
Innovyze					Network 2020.1.3			
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								

Markides Associates Ltd								Page 25	
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 29/10/2021 16:27 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by					
Innovyze				Network 2020.1.3					
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									

Markides Associates Ltd		Page 26
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:27	Designed by Markides Associates	
File SW and FW drainage_27.1...	Checked by	
Innovyze	Network 2020.1.3	

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
SW4.007	SW35	0.161	0.000	1.18			102.8	SURCHARGED	
SW1.011	SW36	0.135	0.000	2.41			160.0	SURCHARGED	
SW11.000	SW37	0.014	0.000	0.08			0.9	SURCHARGED	
SW12.000	SW38	0.541	0.000	0.85			5.0	SURCHARGED	
SW11.001	SW39	0.612	0.000	1.77			10.2	SURCHARGED	
SW11.002	SW40	0.023	0.000	0.90			15.4	SURCHARGED	
SW11.003	SW41	0.070	0.000	1.28			21.4	SURCHARGED	
SW11.004	SW42	0.019	0.000	1.08			21.4	SURCHARGED	

Markides Associates Ltd							Page 1																																																																																																																																																																											
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																																																																		
Date 29/10/2021 16:18 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by																																																																																																																																																																														
Innovyze				Network 2020.1.3																																																																																																																																																																														
<u>+0%% Sensitivity 100 year Return Period</u> <u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																																																																																																																																																																		
<u>Simulation Criteria</u>																																																																																																																																																																																		
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000																																																																																																																																																																																		
Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Online Controls 0 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0																																																																																																																																																																																		
<u>Synthetic Rainfall Details</u>																																																																																																																																																																																		
Rainfall Model FEH Return Period (years) 100 FEH Rainfall Version 2013 Site Location GB 494200 105650 SU 94200 05650 Data Type Catchment Cv (Summer) 0.750 Cv (Winter) 0.840																																																																																																																																																																																		
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status OFF																																																																																																																																																																																		
Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960 Sensitivity flows(s) (%) 0, +40																																																																																																																																																																																		
<table><tr><th></th><th>US/MH</th><th></th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Water</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>Level</th></tr><tr><td>SW1.000</td><td>SW1</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.305</td></tr><tr><td>SW1.001</td><td>SW2</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.247</td></tr><tr><td>SW1.002</td><td>SW3</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.212</td></tr><tr><td>SW1.003</td><td>SW4</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Winter</td><td></td><td></td><td></td><td>12.177</td></tr><tr><td>SW2.000</td><td>SW5</td><td>15 Summer</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.880</td></tr><tr><td>SW2.001</td><td>SW6</td><td>15 Summer</td><td>+0%</td><td></td><td></td><td></td><td></td><td>12.755</td></tr><tr><td>SW1.004</td><td>SW7</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.135</td></tr><tr><td>SW1.005</td><td>SW8</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.082</td></tr><tr><td>SW1.006</td><td>SW9</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.006</td></tr><tr><td>SW1.007</td><td>SW10</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.924</td></tr><tr><td>SW3.000</td><td>SW11</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Winter</td><td></td><td></td><td></td><td>12.278</td></tr><tr><td>SW3.001</td><td>SW12</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Winter</td><td></td><td></td><td></td><td>11.996</td></tr><tr><td>SW3.002</td><td>SW13</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.940</td></tr><tr><td>SW1.008</td><td>SW14</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.852</td></tr><tr><td>SW1.009</td><td>SW15</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.761</td></tr><tr><td>SW1.010</td><td>SW16</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>11.398</td></tr><tr><td>SW4.000</td><td>SW17</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.712</td></tr></table>									US/MH		Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name	Storm	Change	Surcharge	Flood	Overflow	Act.	Level	SW1.000	SW1	15 Winter	+0%	+40%/15 Summer				12.305	SW1.001	SW2	15 Winter	+0%	+40%/15 Summer				12.247	SW1.002	SW3	15 Winter	+0%	+40%/15 Summer				12.212	SW1.003	SW4	15 Winter	+0%	+0%/15 Winter				12.177	SW2.000	SW5	15 Summer	+0%					12.880	SW2.001	SW6	15 Summer	+0%					12.755	SW1.004	SW7	15 Winter	+0%	+0%/15 Summer				12.135	SW1.005	SW8	15 Winter	+0%	+0%/15 Summer				12.082	SW1.006	SW9	15 Winter	+0%	+0%/15 Summer				12.006	SW1.007	SW10	15 Winter	+0%	+0%/15 Summer				11.924	SW3.000	SW11	15 Winter	+0%	+40%/15 Winter				12.278	SW3.001	SW12	15 Winter	+0%	+0%/15 Winter				11.996	SW3.002	SW13	15 Winter	+0%	+0%/15 Summer				11.940	SW1.008	SW14	15 Winter	+0%	+0%/15 Summer				11.852	SW1.009	SW15	15 Winter	+0%	+0%/15 Summer				11.761	SW1.010	SW16	15 Winter	+0%	+40%/15 Summer				11.398	SW4.000	SW17	15 Winter	+0%	+40%/15 Summer				12.712
	US/MH		Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																																																																																										
PN	Name	Storm	Change	Surcharge	Flood	Overflow	Act.	Level																																																																																																																																																																										
SW1.000	SW1	15 Winter	+0%	+40%/15 Summer				12.305																																																																																																																																																																										
SW1.001	SW2	15 Winter	+0%	+40%/15 Summer				12.247																																																																																																																																																																										
SW1.002	SW3	15 Winter	+0%	+40%/15 Summer				12.212																																																																																																																																																																										
SW1.003	SW4	15 Winter	+0%	+0%/15 Winter				12.177																																																																																																																																																																										
SW2.000	SW5	15 Summer	+0%					12.880																																																																																																																																																																										
SW2.001	SW6	15 Summer	+0%					12.755																																																																																																																																																																										
SW1.004	SW7	15 Winter	+0%	+0%/15 Summer				12.135																																																																																																																																																																										
SW1.005	SW8	15 Winter	+0%	+0%/15 Summer				12.082																																																																																																																																																																										
SW1.006	SW9	15 Winter	+0%	+0%/15 Summer				12.006																																																																																																																																																																										
SW1.007	SW10	15 Winter	+0%	+0%/15 Summer				11.924																																																																																																																																																																										
SW3.000	SW11	15 Winter	+0%	+40%/15 Winter				12.278																																																																																																																																																																										
SW3.001	SW12	15 Winter	+0%	+0%/15 Winter				11.996																																																																																																																																																																										
SW3.002	SW13	15 Winter	+0%	+0%/15 Summer				11.940																																																																																																																																																																										
SW1.008	SW14	15 Winter	+0%	+0%/15 Summer				11.852																																																																																																																																																																										
SW1.009	SW15	15 Winter	+0%	+0%/15 Summer				11.761																																																																																																																																																																										
SW1.010	SW16	15 Winter	+0%	+40%/15 Summer				11.398																																																																																																																																																																										
SW4.000	SW17	15 Winter	+0%	+40%/15 Summer				12.712																																																																																																																																																																										
©1982-2020 Innovyze																																																																																																																																																																																		

Markides Associates Ltd		Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:18 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

+0%% Sensitivity 100 year Return Period
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
SW1.000	SW1	-0.140	0.000	0.29		9.6	OK	
SW1.001	SW2	-0.109	0.000	0.50		17.0	OK	
SW1.002	SW3	-0.011	0.000	0.82		25.7	OK	
SW1.003	SW4	0.013	0.000	0.88		27.4	SURCHARGED	
SW2.000	SW5	-0.100	0.000	0.00		0.0	OK	
SW2.001	SW6	-0.100	0.000	0.00		0.0	OK	
SW1.004	SW7	0.035	0.000	0.99		31.0	SURCHARGED	
SW1.005	SW8	0.046	0.000	0.96		31.4	SURCHARGED	
SW1.006	SW9	0.055	0.000	0.68		36.3	SURCHARGED	
SW1.007	SW10	0.153	0.000	0.64		36.4	SURCHARGED	
SW3.000	SW11	-0.072	0.000	0.51		8.0	OK	
SW3.001	SW12	0.012	0.000	0.99		11.5	SURCHARGED	
SW3.002	SW13	0.023	0.000	0.55		15.3	SURCHARGED	
SW1.008	SW14	0.263	0.000	1.98		54.6	SURCHARGED	
SW1.009	SW15	0.139	0.000	1.70		55.0	SURCHARGED	
SW1.010	SW16	-0.086	0.000	0.70		57.2	OK	
SW4.000	SW17	-0.123	0.000	0.42		39.9	OK	

Markides Associates Ltd								Page 3																																																																																																																																																																																																																																											
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																																																																																																																																			
Date 29/10/2021 16:18 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by																																																																																																																																																																																																																																														
Innovyze					Network 2020.1.3																																																																																																																																																																																																																																														
<u>+0%% Sensitivity 100 year Return Period</u> <u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																																																																																																																																																																																																																																			
<table><tr><th>PN</th><th>US/MH Name</th><th>Storm</th><th>Climate Change</th><th>First (X) Surcharge</th><th>First (Y) Flood</th><th>First (Z) Overflow</th><th>Overflow Act.</th><th>Water Level (m)</th></tr><tr><td>SW5.000</td><td>SW18</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.460</td></tr><tr><td>SW4.001</td><td>SW19</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Winter</td><td></td><td></td><td></td><td>12.454</td></tr><tr><td>SW6.000</td><td>SW20</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.288</td></tr><tr><td>SW4.002</td><td>SW21</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.270</td></tr><tr><td>SW7.000</td><td>SW22</td><td>15 Winter</td><td>+0%</td><td></td><td></td><td></td><td></td><td>13.255</td></tr><tr><td>SW7.001</td><td>SW23</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>12.478</td></tr><tr><td>SW8.000</td><td>SW24</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.307</td></tr><tr><td>SW8.001</td><td>SW25</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.292</td></tr><tr><td>SW7.002</td><td>SW26</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.274</td></tr><tr><td>SW4.003</td><td>SW27</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.054</td></tr><tr><td>SW4.004</td><td>SW28</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.552</td></tr><tr><td>SW9.000</td><td>SW29</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.281</td></tr><tr><td>SW4.005</td><td>SW30</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.267</td></tr><tr><td>SW4.006</td><td>SW31</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.209</td></tr><tr><td>SW10.000</td><td>SW32</td><td>15 Winter</td><td>+0%</td><td>+40%/15 Summer</td><td></td><td></td><td></td><td>11.433</td></tr><tr><td>SW10.001</td><td>SW33</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.402</td></tr><tr><td>SW10.002</td><td>SW34</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.285</td></tr><tr><td>SW8.007</td><td>SW35</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.166</td></tr><tr><td>SW1.011</td><td>SW36</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>11.083</td></tr><tr><td>SW11.000</td><td>SW37</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Winter</td><td></td><td></td><td></td><td>13.734</td></tr><tr><td>SW12.000</td><td>SW38</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>13.911</td></tr><tr><td>SW11.001</td><td>SW39</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>13.754</td></tr><tr><td>SW11.002</td><td>SW40</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.889</td></tr><tr><td>SW11.003</td><td>SW41</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.667</td></tr><tr><td>SW11.004</td><td>SW42</td><td>15 Winter</td><td>+0%</td><td>+0%/15 Summer</td><td></td><td></td><td></td><td>12.517</td></tr></table>										PN	US/MH Name	Storm	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	SW5.000	SW18	15 Winter	+0%	+40%/15 Summer				12.460	SW4.001	SW19	15 Winter	+0%	+0%/15 Winter				12.454	SW6.000	SW20	15 Winter	+0%	+0%/15 Summer				12.288	SW4.002	SW21	15 Winter	+0%	+0%/15 Summer				12.270	SW7.000	SW22	15 Winter	+0%					13.255	SW7.001	SW23	15 Winter	+0%	+40%/15 Summer				12.478	SW8.000	SW24	15 Winter	+0%	+0%/15 Summer				12.307	SW8.001	SW25	15 Winter	+0%	+0%/15 Summer				12.292	SW7.002	SW26	15 Winter	+0%	+0%/15 Summer				12.274	SW4.003	SW27	15 Winter	+0%	+0%/15 Summer				12.054	SW4.004	SW28	15 Winter	+0%	+0%/15 Summer				11.552	SW9.000	SW29	15 Winter	+0%	+0%/15 Summer				11.281	SW4.005	SW30	15 Winter	+0%	+0%/15 Summer				11.267	SW4.006	SW31	15 Winter	+0%	+0%/15 Summer				11.209	SW10.000	SW32	15 Winter	+0%	+40%/15 Summer				11.433	SW10.001	SW33	15 Winter	+0%	+0%/15 Summer				11.402	SW10.002	SW34	15 Winter	+0%	+0%/15 Summer				11.285	SW8.007	SW35	15 Winter	+0%	+0%/15 Summer				11.166	SW1.011	SW36	15 Winter	+0%	+0%/15 Summer				11.083	SW11.000	SW37	15 Winter	+0%	+0%/15 Winter				13.734	SW12.000	SW38	15 Winter	+0%	+0%/15 Summer				13.911	SW11.001	SW39	15 Winter	+0%	+0%/15 Summer				13.754	SW11.002	SW40	15 Winter	+0%	+0%/15 Summer				12.889	SW11.003	SW41	15 Winter	+0%	+0%/15 Summer				12.667	SW11.004	SW42	15 Winter	+0%	+0%/15 Summer				12.517
PN	US/MH Name	Storm	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)																																																																																																																																																																																																																																											
SW5.000	SW18	15 Winter	+0%	+40%/15 Summer				12.460																																																																																																																																																																																																																																											
SW4.001	SW19	15 Winter	+0%	+0%/15 Winter				12.454																																																																																																																																																																																																																																											
SW6.000	SW20	15 Winter	+0%	+0%/15 Summer				12.288																																																																																																																																																																																																																																											
SW4.002	SW21	15 Winter	+0%	+0%/15 Summer				12.270																																																																																																																																																																																																																																											
SW7.000	SW22	15 Winter	+0%					13.255																																																																																																																																																																																																																																											
SW7.001	SW23	15 Winter	+0%	+40%/15 Summer				12.478																																																																																																																																																																																																																																											
SW8.000	SW24	15 Winter	+0%	+0%/15 Summer				12.307																																																																																																																																																																																																																																											
SW8.001	SW25	15 Winter	+0%	+0%/15 Summer				12.292																																																																																																																																																																																																																																											
SW7.002	SW26	15 Winter	+0%	+0%/15 Summer				12.274																																																																																																																																																																																																																																											
SW4.003	SW27	15 Winter	+0%	+0%/15 Summer				12.054																																																																																																																																																																																																																																											
SW4.004	SW28	15 Winter	+0%	+0%/15 Summer				11.552																																																																																																																																																																																																																																											
SW9.000	SW29	15 Winter	+0%	+0%/15 Summer				11.281																																																																																																																																																																																																																																											
SW4.005	SW30	15 Winter	+0%	+0%/15 Summer				11.267																																																																																																																																																																																																																																											
SW4.006	SW31	15 Winter	+0%	+0%/15 Summer				11.209																																																																																																																																																																																																																																											
SW10.000	SW32	15 Winter	+0%	+40%/15 Summer				11.433																																																																																																																																																																																																																																											
SW10.001	SW33	15 Winter	+0%	+0%/15 Summer				11.402																																																																																																																																																																																																																																											
SW10.002	SW34	15 Winter	+0%	+0%/15 Summer				11.285																																																																																																																																																																																																																																											
SW8.007	SW35	15 Winter	+0%	+0%/15 Summer				11.166																																																																																																																																																																																																																																											
SW1.011	SW36	15 Winter	+0%	+0%/15 Summer				11.083																																																																																																																																																																																																																																											
SW11.000	SW37	15 Winter	+0%	+0%/15 Winter				13.734																																																																																																																																																																																																																																											
SW12.000	SW38	15 Winter	+0%	+0%/15 Summer				13.911																																																																																																																																																																																																																																											
SW11.001	SW39	15 Winter	+0%	+0%/15 Summer				13.754																																																																																																																																																																																																																																											
SW11.002	SW40	15 Winter	+0%	+0%/15 Summer				12.889																																																																																																																																																																																																																																											
SW11.003	SW41	15 Winter	+0%	+0%/15 Summer				12.667																																																																																																																																																																																																																																											
SW11.004	SW42	15 Winter	+0%	+0%/15 Summer				12.517																																																																																																																																																																																																																																											
<table><tr><th>PN</th><th>US/MH Name</th><th>Depth (m)</th><th>Volume (m³)</th><th>Flow / Cap.</th><th>Overflow (l/s)</th><th>Half Drain Time (mins)</th><th>Pipe Flow (l/s)</th><th>Status</th><th>Level Exceeded</th></tr><tr><td>SW5.000</td><td>SW18</td><td>-0.155</td><td>0.000</td><td>0.09</td><td></td><td></td><td>4.7</td><td>OK</td><td></td></tr><tr><td>SW4.001</td><td>SW19</td><td>0.079</td><td>0.000</td><td>0.53</td><td></td><td></td><td>41.4</td><td>SURCHARGED</td><td></td></tr><tr><td>SW6.000</td><td>SW20</td><td>0.338</td><td>0.000</td><td>0.22</td><td></td><td></td><td>6.0</td><td>SURCHARGED</td><td></td></tr><tr><td>SW4.002</td><td>SW21</td><td>0.852</td><td>0.000</td><td>0.88</td><td></td><td></td><td>47.9</td><td>SURCHARGED</td><td></td></tr><tr><td>SW7.000</td><td>SW22</td><td>-0.095</td><td>0.000</td><td>0.28</td><td></td><td></td><td>6.6</td><td>OK</td><td></td></tr><tr><td>SW7.001</td><td>SW23</td><td>-0.096</td><td>0.000</td><td>0.28</td><td></td><td></td><td>13.8</td><td>OK</td><td></td></tr><tr><td>SW8.000</td><td>SW24</td><td>0.457</td><td>0.000</td><td>0.34</td><td></td><td></td><td>5.4</td><td>SURCHARGED</td><td></td></tr><tr><td>SW8.001</td><td>SW25</td><td>0.533</td><td>0.000</td><td>0.44</td><td></td><td></td><td>10.7</td><td>SURCHARGED</td><td></td></tr><tr><td>SW7.002</td><td>SW26</td><td>0.714</td><td>0.000</td><td>0.72</td><td></td><td></td><td>18.0</td><td>SURCHARGED</td><td></td></tr><tr><td>SW4.003</td><td>SW27</td><td>0.919</td><td>0.000</td><td>2.08</td><td></td><td></td><td>69.8</td><td>SURCHARGED</td><td></td></tr><tr><td>SW4.004</td><td>SW28</td><td>0.531</td><td>0.000</td><td>2.37</td><td></td><td></td><td>72.5</td><td>SURCHARGED</td><td></td></tr><tr><td>SW9.000</td><td>SW29</td><td>0.061</td><td>0.000</td><td>0.33</td><td></td><td></td><td>4.3</td><td>SURCHARGED</td><td></td></tr><tr><td>SW4.005</td><td>SW30</td><td>0.147</td><td>0.000</td><td>0.85</td><td></td><td></td><td>77.3</td><td>SURCHARGED</td><td></td></tr><tr><td>SW4.006</td><td>SW31</td><td>0.167</td><td>0.000</td><td>1.15</td><td></td><td></td><td>83.3</td><td>SURCHARGED</td><td></td></tr><tr><td>SW10.000</td><td>SW32</td><td>-0.037</td><td>0.000</td><td>0.64</td><td></td><td></td><td>8.6</td><td>OK</td><td></td></tr><tr><td>SW10.001</td><td>SW33</td><td>0.030</td><td>0.000</td><td>0.88</td><td></td><td></td><td>12.3</td><td>SURCHARGED</td><td></td></tr><tr><td>SW10.002</td><td>SW34</td><td>0.123</td><td>0.000</td><td>0.96</td><td></td><td></td><td>15.6</td><td>SURCHARGED</td><td></td></tr></table>										PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded	SW5.000	SW18	-0.155	0.000	0.09			4.7	OK		SW4.001	SW19	0.079	0.000	0.53			41.4	SURCHARGED		SW6.000	SW20	0.338	0.000	0.22			6.0	SURCHARGED		SW4.002	SW21	0.852	0.000	0.88			47.9	SURCHARGED		SW7.000	SW22	-0.095	0.000	0.28			6.6	OK		SW7.001	SW23	-0.096	0.000	0.28			13.8	OK		SW8.000	SW24	0.457	0.000	0.34			5.4	SURCHARGED		SW8.001	SW25	0.533	0.000	0.44			10.7	SURCHARGED		SW7.002	SW26	0.714	0.000	0.72			18.0	SURCHARGED		SW4.003	SW27	0.919	0.000	2.08			69.8	SURCHARGED		SW4.004	SW28	0.531	0.000	2.37			72.5	SURCHARGED		SW9.000	SW29	0.061	0.000	0.33			4.3	SURCHARGED		SW4.005	SW30	0.147	0.000	0.85			77.3	SURCHARGED		SW4.006	SW31	0.167	0.000	1.15			83.3	SURCHARGED		SW10.000	SW32	-0.037	0.000	0.64			8.6	OK		SW10.001	SW33	0.030	0.000	0.88			12.3	SURCHARGED		SW10.002	SW34	0.123	0.000	0.96			15.6	SURCHARGED																																																							
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded																																																																																																																																																																																																																																										
SW5.000	SW18	-0.155	0.000	0.09			4.7	OK																																																																																																																																																																																																																																											
SW4.001	SW19	0.079	0.000	0.53			41.4	SURCHARGED																																																																																																																																																																																																																																											
SW6.000	SW20	0.338	0.000	0.22			6.0	SURCHARGED																																																																																																																																																																																																																																											
SW4.002	SW21	0.852	0.000	0.88			47.9	SURCHARGED																																																																																																																																																																																																																																											
SW7.000	SW22	-0.095	0.000	0.28			6.6	OK																																																																																																																																																																																																																																											
SW7.001	SW23	-0.096	0.000	0.28			13.8	OK																																																																																																																																																																																																																																											
SW8.000	SW24	0.457	0.000	0.34			5.4	SURCHARGED																																																																																																																																																																																																																																											
SW8.001	SW25	0.533	0.000	0.44			10.7	SURCHARGED																																																																																																																																																																																																																																											
SW7.002	SW26	0.714	0.000	0.72			18.0	SURCHARGED																																																																																																																																																																																																																																											
SW4.003	SW27	0.919	0.000	2.08			69.8	SURCHARGED																																																																																																																																																																																																																																											
SW4.004	SW28	0.531	0.000	2.37			72.5	SURCHARGED																																																																																																																																																																																																																																											
SW9.000	SW29	0.061	0.000	0.33			4.3	SURCHARGED																																																																																																																																																																																																																																											
SW4.005	SW30	0.147	0.000	0.85			77.3	SURCHARGED																																																																																																																																																																																																																																											
SW4.006	SW31	0.167	0.000	1.15			83.3	SURCHARGED																																																																																																																																																																																																																																											
SW10.000	SW32	-0.037	0.000	0.64			8.6	OK																																																																																																																																																																																																																																											
SW10.001	SW33	0.030	0.000	0.88			12.3	SURCHARGED																																																																																																																																																																																																																																											
SW10.002	SW34	0.123	0.000	0.96			15.6	SURCHARGED																																																																																																																																																																																																																																											
©1982-2020 Innovyze																																																																																																																																																																																																																																																			

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 29/10/2021 16:18 File SW and FW drainage_27.1...	Designed by Markides Associates Checked by	
Innovyze	Network 2020.1.3	

+0%% Sensitivity 100 year Return Period
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
SW4.007	SW35	0.161	0.000	1.18			102.8	SURCHARGED	
SW1.011	SW36	0.135	0.000	2.41			160.0	SURCHARGED	
SW11.000	SW37	0.014	0.000	0.08			0.9	SURCHARGED	
SW12.000	SW38	0.541	0.000	0.85			5.0	SURCHARGED	
SW11.001	SW39	0.612	0.000	1.77			10.2	SURCHARGED	
SW11.002	SW40	0.023	0.000	0.90			15.4	SURCHARGED	
SW11.003	SW41	0.070	0.000	1.28			21.4	SURCHARGED	
SW11.004	SW42	0.019	0.000	1.08			21.4	SURCHARGED	

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Detached House_1 x 1.8m...			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 274 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-1.166	0.734	0.1	0.0	0.1	2.3	OK
30 min Summer	-0.930	0.970	0.1	0.0	0.1	3.0	OK
60 min Summer	-0.694	1.206	0.1	0.0	0.2	3.7	OK
120 min Summer	-0.567	1.333	0.1	0.0	0.2	4.1	OK
180 min Summer	-0.531	1.369	0.1	0.0	0.2	4.2	OK
240 min Summer	-0.532	1.368	0.1	0.0	0.2	4.2	OK
360 min Summer	-0.563	1.337	0.1	0.0	0.2	4.1	OK
480 min Summer	-0.609	1.291	0.1	0.0	0.2	4.0	OK
600 min Summer	-0.661	1.239	0.1	0.0	0.2	3.8	OK
720 min Summer	-0.714	1.186	0.1	0.0	0.2	3.7	OK
960 min Summer	-0.819	1.081	0.1	0.0	0.2	3.3	OK
1440 min Summer	-1.001	0.899	0.1	0.0	0.1	2.8	OK
2160 min Summer	-1.201	0.699	0.1	0.0	0.1	2.2	OK
2880 min Summer	-1.320	0.580	0.1	0.0	0.1	1.8	OK
4320 min Summer	-1.446	0.454	0.1	0.0	0.1	1.4	OK
15 min Winter	-1.074	0.826	0.1	0.0	0.1	2.5	OK
30 min Winter	-0.806	1.094	0.1	0.0	0.2	3.4	OK
60 min Winter	-0.536	1.364	0.1	0.0	0.2	4.2	OK
120 min Winter	-0.380	1.520	0.1	0.0	0.2	4.7	OK
180 min Winter	-0.327	1.573	0.1	0.1	0.2	4.8	OK
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	2.4	25			
30 min Summer	95.480	0.0	3.2	39			
60 min Summer	61.320	0.0	4.1	68			
120 min Summer	36.400	0.0	4.9	124			
180 min Summer	26.725	0.0	5.4	180			
240 min Summer	21.385	0.0	5.8	216			
360 min Summer	15.493	0.0	6.3	276			
480 min Summer	12.267	0.0	6.6	340			
600 min Summer	10.214	0.0	6.9	408			
720 min Summer	8.785	0.0	7.1	476			
960 min Summer	6.916	0.0	7.5	610			
1440 min Summer	4.935	0.0	8.0	870			
2160 min Summer	3.539	0.0	8.6	1236			
2880 min Summer	2.812	0.0	9.1	1588			
4320 min Summer	2.061	0.0	10.0	2332			
15 min Winter	142.240	0.0	2.7	25			
30 min Winter	95.480	0.0	3.6	39			
60 min Winter	61.320	0.0	4.6	66			
120 min Winter	36.400	0.0	5.5	122			
180 min Winter	26.725	0.0	6.1	178			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Detached House_1 x 1.8m...			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	-0.322	1.578	0.1	0.1	0.2	4.9	O K
360 min Winter	-0.372	1.528	0.1	0.0	0.2	4.7	O K
480 min Winter	-0.433	1.467	0.1	0.0	0.2	4.5	O K
600 min Winter	-0.505	1.395	0.1	0.0	0.2	4.3	O K
720 min Winter	-0.581	1.319	0.1	0.0	0.2	4.1	O K
960 min Winter	-0.731	1.169	0.1	0.0	0.2	3.6	O K
1440 min Winter	-0.994	0.906	0.1	0.0	0.1	2.8	O K
2160 min Winter	-1.266	0.634	0.1	0.0	0.1	2.0	O K
2880 min Winter	-1.389	0.511	0.1	0.0	0.1	1.6	O K
4320 min Winter	-1.530	0.370	0.1	0.0	0.1	1.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
240 min Winter	21.335	0.0	6.5	232			
360 min Winter	15.493	0.0	7.0	294			
480 min Winter	12.267	0.0	7.4	368			
600 min Winter	10.214	0.0	7.7	444			
720 min Winter	8.785	0.0	8.0	518			
960 min Winter	6.916	0.0	8.4	662			
1440 min Winter	4.935	0.0	9.0	928			
2160 min Winter	3.539	0.0	9.6	1276			
2880 min Winter	2.812	0.0	10.2	1644			
4320 min Winter	2.061	0.0	11.2	2380			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)	
Date 07/06/2017	Designed by SPS	
File Detached House_1 x 1.8m...	Checked by GAC	
Innovyze		Source Control 2020.1.3

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 494200 105650 SU 94200 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	4320
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.009

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.003	4 8	0.003	8 12	0.003

©1982-2020 Innovyze

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)	
Date 07/06/2017	Designed by SPS	
File Detached House_1 x 1.8m...	Checked by GAC	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 0.000

House Soakaway Structure

Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.800
Infiltration Coefficient Side (m/hr) 0.18000	Number Required 1
Safety Factor 2.0	Cap Volume Depth (m) 1.900
Porosity 0.95	Cap Infiltration Depth (m) 0.600
Invert Level (m) -1.900	

Filtration Outflow Control

Permeability Coefficient (m/s) 0.000050	Area (m ²) 1.100
Safety Factor 2.000	Invert Level (m) -1.900
Bed Depth (m) 1.900	

©1982-2020 Innovyze

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021-West Hemel Hempstead Typical Terraced House single parking (>70m2)				
Date 07/06/2017			Designed by SPS				
File Terraced House 1 x 1.5m...			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 206 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-1.205	0.695	0.1	0.0	0.1	1.5	○ K
30 min Summer	-0.984	0.916	0.1	0.0	0.1	2.0	○ K
60 min Summer	-0.771	1.129	0.1	0.0	0.1	2.4	○ K
120 min Summer	-0.673	1.227	0.1	0.0	0.1	2.6	○ K
180 min Summer	-0.659	1.241	0.1	0.0	0.1	2.7	○ K
240 min Summer	-0.666	1.234	0.1	0.0	0.1	2.6	○ K
360 min Summer	-0.707	1.193	0.1	0.0	0.1	2.6	○ K
480 min Summer	-0.762	1.138	0.1	0.0	0.1	2.4	○ K
600 min Summer	-0.822	1.078	0.1	0.0	0.1	2.3	○ K
720 min Summer	-0.882	1.018	0.1	0.0	0.1	2.2	○ K
960 min Summer	-0.994	0.906	0.1	0.0	0.1	1.9	○ K
1440 min Summer	-1.176	0.724	0.1	0.0	0.1	1.5	○ K
2160 min Summer	-1.337	0.563	0.1	0.0	0.1	1.2	○ K
2880 min Summer	-1.427	0.473	0.1	0.0	0.1	1.0	○ K
4320 min Summer	-1.540	0.360	0.1	0.0	0.1	0.8	○ K
5760 min Summer	-1.610	0.290	0.0	0.0	0.1	0.6	○ K
15 min Winter	-1.117	0.783	0.1	0.0	0.1	1.7	○ K
30 min Winter	-0.865	1.035	0.1	0.0	0.1	2.2	○ K
60 min Winter	-0.619	1.281	0.1	0.0	0.1	2.7	○ K
120 min Winter	-0.495	1.405	0.1	0.0	0.1	3.0	○ K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	1.6	25			
30 min Summer	95.480	0.0	2.1	38			
60 min Summer	61.320	0.0	2.8	66			
120 min Summer	36.400	0.0	3.3	122			
180 min Summer	26.725	0.0	3.6	164			
240 min Summer	21.385	0.0	3.8	194			
360 min Summer	15.493	0.0	4.2	258			
480 min Summer	12.267	0.0	4.4	326			
600 min Summer	10.214	0.0	4.6	394			
720 min Summer	8.785	0.0	4.7	462			
960 min Summer	6.916	0.0	5.0	592			
1440 min Summer	4.935	0.0	5.3	842			
2160 min Summer	3.539	0.0	5.7	1196			
2880 min Summer	2.812	0.0	6.1	1564			
4320 min Summer	2.061	0.0	6.7	2296			
5760 min Summer	1.673	0.0	7.2	3008			
15 min Winter	142.240	0.0	1.8	25			
30 min Winter	95.480	0.0	2.4	39			
60 min Winter	61.320	0.0	3.1	66			
120 min Winter	36.400	0.0	3.7	122			
©1982-2020 Innovyze							

Markides Associates Ltd						Page 2	
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021-West Hemel Hempstead Typical Terraced House single parking (>70m2)				
Date 07/06/2017			Designed by SPS				
File Terraced House 1 x 1.5m...			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	-0.469	1.431	0.1	0.0	0.1	3.1	O K
240 min Winter	-0.486	1.414	0.1	0.0	0.1	3.0	O K
360 min Winter	-0.543	1.357	0.1	0.0	0.1	2.9	O K
480 min Winter	-0.622	1.278	0.1	0.0	0.1	2.7	O K
600 min Winter	-0.708	1.192	0.1	0.0	0.1	2.5	O K
720 min Winter	-0.794	1.106	0.1	0.0	0.1	2.4	O K
960 min Winter	-0.956	0.944	0.1	0.0	0.1	2.0	O K
1440 min Winter	-1.211	0.689	0.1	0.0	0.1	1.5	O K
2160 min Winter	-1.396	0.504	0.1	0.0	0.1	1.1	O K
2880 min Winter	-1.499	0.401	0.1	0.0	0.1	0.9	O K
4320 min Winter	-1.620	0.280	0.0	0.0	0.1	0.6	O K
5760 min Winter	-1.690	0.210	0.0	0.0	0.1	0.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
180 min Winter	26.725	0.0	4.0	176			
240 min Winter	21.385	0.0	4.3	224			
360 min Winter	15.493	0.0	4.7	280			
480 min Winter	12.267	0.0	4.9	356			
600 min Winter	10.214	0.0	5.1	428			
720 min Winter	8.785	0.0	5.3	500			
960 min Winter	6.916	0.0	5.6	636			
1440 min Winter	4.935	0.0	6.0	882			
2160 min Winter	3.539	0.0	6.4	1240			
2880 min Winter	2.812	0.0	6.8	1616			
4320 min Winter	2.061	0.0	7.5	2340			
5760 min Winter	1.673	0.0	8.1	3064			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021-West Hemel Hempstead Typical Terraced House single parking (>70m2)	
Date 07/06/2017 File Terraced House 1 x 1.5m...	Designed by SPS Checked by GAC	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 0.000

House Soakaway Structure

Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.500
Infiltration Coefficient Side (m/hr) 0.18000	Number Required 1
Safety Factor 2.0	Cap Volume Depth (m) 0.000
Porosity 0.95	Cap Infiltration Depth (m) 0.600
Invert Level (m) -1.900	

Filtration Outflow Control

Permeability Coefficient (m/s) 0.000050	Area (m ²) 0.900
Safety Factor 2.000	Invert Level (m) -1.900
Bed Depth (m) 1.900	

©1982-2020 Innovyze

Markides Associates Ltd					Page 1		
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Block of flats_165m2.SRCX			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 4 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.111	0.011	0.0	0.1	0.1	0.0	OK
30 min Summer	0.104	0.004	0.0	0.1	0.1	0.0	OK
60 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	OK
120 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	OK
180 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	OK
240 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
360 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
480 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
600 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
720 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
960 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
1440 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
2160 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
2880 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
4320 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
5760 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
7200 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
8640 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
10080 min Summer	0.100	0.000	0.0	0.0	0.0	0.0	OK
15 min Winter	0.114	0.014	0.0	0.1	0.1	0.1	OK
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	5.600	0.0	0.2	19			
30 min Summer	2.800	0.0	0.2	26			
60 min Summer	1.400	0.0	0.2	0			
120 min Summer	0.700	0.0	0.2	0			
180 min Summer	0.467	0.0	0.2	0			
240 min Summer	0.350	0.0	0.2	0			
360 min Summer	0.233	0.0	0.2	0			
480 min Summer	0.175	0.0	0.2	0			
600 min Summer	0.140	0.0	0.2	0			
720 min Summer	0.117	0.0	0.2	0			
960 min Summer	0.088	0.0	0.2	0			
1440 min Summer	0.058	0.0	0.2	0			
2160 min Summer	0.039	0.0	0.2	0			
2880 min Summer	0.029	0.0	0.2	0			
4320 min Summer	0.019	0.0	0.2	0			
5760 min Summer	0.015	0.0	0.2	0			
7200 min Summer	0.012	0.0	0.2	0			
8640 min Summer	0.010	0.0	0.2	0			
10080 min Summer	0.008	0.0	0.2	0			
15 min Winter	5.600	0.0	0.2	19			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Block of flats_165m2.SRCX			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.106	0.006	0.0	0.1	0.1	0.0	○ K
60 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	○ K
120 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	○ K
180 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
240 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
360 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
480 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
600 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
720 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
960 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
1440 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
2160 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
2880 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
4320 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
5760 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
7200 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
8640 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
10080 min Winter	0.100	0.000	0.0	0.0	0.0	0.0	○ K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
30 min Winter	2.800		0.0	0.2	26		
60 min Winter	1.400		0.0	0.2	0		
120 min Winter	0.700		0.0	0.2	0		
180 min Winter	0.467		0.0	0.2	0		
240 min Winter	0.350		0.0	0.2	0		
360 min Winter	0.233		0.0	0.2	0		
480 min Winter	0.175		0.0	0.2	0		
600 min Winter	0.140		0.0	0.2	0		
720 min Winter	0.117		0.0	0.2	0		
960 min Winter	0.087		0.0	0.2	0		
1440 min Winter	0.058		0.0	0.2	0		
2160 min Winter	0.039		0.0	0.2	0		
2880 min Winter	0.029		0.0	0.2	0		
4320 min Winter	0.019		0.0	0.2	0		
5760 min Winter	0.015		0.0	0.2	0		
7200 min Winter	0.012		0.0	0.2	0		
8640 min Winter	0.010		0.0	0.2	0		
10080 min Winter	0.008		0.0	0.2	0		
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)	
Date 07/06/2017 File Block of flats_165m2.SRCX	Designed by SPS Checked by GAC	
Innovyze Source Control 2020.1.3		
</		

Markides Associates Ltd		Page 4																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																	
Date 07/06/2017	Designed by SPS																	
File Block of flats_165m2.SRCX	Checked by GAC																	
Innovyze	Source Control 2020.1.3																	
<u>Model Details</u> Storage is Online Cover Level (m) 2.000 <u>House Soakaway Structure</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Infiltration Coefficient Base (m/hr) 0.00000</td> <td style="width: 50%;">Pit Width (m) 1.500</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr) 0.18000</td> <td>Number Required 2</td> </tr> <tr> <td>Safety Factor 2.0</td> <td>Cap Volume Depth (m) 1.900</td> </tr> <tr> <td>Porosity 0.95</td> <td>Cap Infiltration Depth (m) 0.600</td> </tr> <tr> <td>Invert Level (m) 0.100</td> <td></td> </tr> </table> <u>Filtration Outflow Control</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Permeability Coefficient (m/s) 0.000050</td> <td style="width: 50%;">Area (m²) 5.600</td> </tr> <tr> <td>Safety Factor 2.000</td> <td>Invert Level (m) 0.100</td> </tr> <tr> <td>Bed Depth (m) 1.900</td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.500	Infiltration Coefficient Side (m/hr) 0.18000	Number Required 2	Safety Factor 2.0	Cap Volume Depth (m) 1.900	Porosity 0.95	Cap Infiltration Depth (m) 0.600	Invert Level (m) 0.100		Permeability Coefficient (m/s) 0.000050	Area (m ²) 5.600	Safety Factor 2.000	Invert Level (m) 0.100	Bed Depth (m) 1.900	
Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.500																	
Infiltration Coefficient Side (m/hr) 0.18000	Number Required 2																	
Safety Factor 2.0	Cap Volume Depth (m) 1.900																	
Porosity 0.95	Cap Infiltration Depth (m) 0.600																	
Invert Level (m) 0.100																		
Permeability Coefficient (m/s) 0.000050	Area (m ²) 5.600																	
Safety Factor 2.000	Invert Level (m) 0.100																	
Bed Depth (m) 1.900																		
©1982-2020 Innovyze																		

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Block of flats_220m2.SRCX			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 182 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.971	0.871	0.2	0.2	0.5	5.4	○ K
30 min Summer	1.246	1.146	0.2	0.3	0.5	7.1	○ K
60 min Summer	1.502	1.402	0.2	0.3	0.5	8.6	○ K
120 min Summer	1.597	1.497	0.2	0.3	0.5	9.2	○ K
180 min Summer	1.595	1.495	0.2	0.3	0.5	9.2	○ K
240 min Summer	1.574	1.474	0.2	0.3	0.5	9.1	○ K
360 min Summer	1.500	1.400	0.2	0.3	0.5	8.6	○ K
480 min Summer	1.412	1.312	0.2	0.3	0.5	8.1	○ K
600 min Summer	1.323	1.223	0.2	0.3	0.5	7.5	○ K
720 min Summer	1.243	1.143	0.2	0.3	0.5	7.0	○ K
960 min Summer	1.100	1.000	0.2	0.3	0.5	6.2	○ K
1440 min Summer	0.875	0.775	0.2	0.2	0.5	4.8	○ K
2160 min Summer	0.664	0.564	0.2	0.2	0.4	3.5	○ K
2880 min Summer	0.544	0.444	0.2	0.2	0.4	2.7	○ K
4320 min Summer	0.393	0.293	0.1	0.2	0.3	1.8	○ K
5760 min Summer	0.300	0.200	0.1	0.2	0.3	1.2	○ K
7200 min Summer	0.239	0.139	0.0	0.2	0.2	0.9	○ K
8640 min Summer	0.194	0.094	0.0	0.2	0.2	0.6	○ K
10080 min Summer	0.162	0.062	0.0	0.2	0.2	0.4	○ K
15 min Winter	1.084	0.984	0.2	0.3	0.5	6.1	○ K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	5.9	25			
30 min Summer	95.480	0.0	7.9	38			
60 min Summer	61.320	0.0	10.1	66			
120 min Summer	36.400	0.0	12.0	122			
180 min Summer	26.725	0.0	13.2	156			
240 min Summer	21.385	0.0	14.1	188			
360 min Summer	15.493	0.0	15.3	254			
480 min Summer	12.267	0.0	16.2	322			
600 min Summer	10.214	0.0	16.9	390			
720 min Summer	8.785	0.0	17.4	458			
960 min Summer	6.916	0.0	18.3	588			
1440 min Summer	4.935	0.0	19.5	840			
2160 min Summer	3.539	0.0	21.0	1196			
2880 min Summer	2.812	0.0	22.3	1564			
4320 min Summer	2.061	0.0	24.5	2296			
5760 min Summer	1.673	0.0	26.5	3008			
7200 min Summer	1.437	0.0	28.5	3744			
8640 min Summer	1.277	0.0	30.3	4488			
10080 min Summer	1.161	0.0	32.2	5152			
15 min Winter	142.240	0.0	6.6	25			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017 File Block of flats_220m2.SRCX			Designed by SPS Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	1.397	1.297	0.2	0.3	0.5	8.0	O K
60 min Winter	1.695	1.595	0.2	0.3	0.5	9.8	O K
120 min Winter	1.822	1.722	0.2	0.3	0.5	10.6	Flood Risk
180 min Winter	1.822	1.722	0.2	0.3	0.5	10.6	Flood Risk
240 min Winter	1.795	1.695	0.2	0.3	0.5	10.4	Flood Risk
360 min Winter	1.700	1.600	0.2	0.3	0.5	9.9	Flood Risk
480 min Winter	1.582	1.482	0.2	0.3	0.5	9.1	O K
600 min Winter	1.461	1.361	0.2	0.3	0.5	8.4	O K
720 min Winter	1.344	1.244	0.2	0.3	0.5	7.7	O K
960 min Winter	1.135	1.035	0.2	0.3	0.5	6.4	O K
1440 min Winter	0.822	0.722	0.2	0.2	0.4	4.4	O K
2160 min Winter	0.580	0.480	0.2	0.2	0.4	3.0	O K
2880 min Winter	0.444	0.344	0.1	0.2	0.3	2.1	O K
4320 min Winter	0.282	0.182	0.1	0.2	0.2	1.1	O K
5760 min Winter	0.190	0.090	0.0	0.2	0.2	0.6	O K
7200 min Winter	0.132	0.032	0.0	0.2	0.2	0.2	O K
8640 min Winter	0.100	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	0.100	0.000	0.0	0.2	0.2	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	95.480	0.0	8.8	38			
60 min Winter	61.320	0.0	11.3	66			
120 min Winter	36.400	0.0	13.4	120			
180 min Winter	26.722	0.0	14.8	174			
240 min Winter	21.385	0.0	15.8	198			
360 min Winter	15.493	0.0	17.2	274			
480 min Winter	12.267	0.0	18.1	350			
600 min Winter	10.214	0.0	18.9	422			
720 min Winter	8.785	0.0	19.5	494			
960 min Winter	6.916	0.0	20.5	630			
1440 min Winter	4.935	0.0	21.9	880			
2160 min Winter	3.539	0.0	23.5	1240			
2880 min Winter	2.812	0.0	24.9	1616			
4320 min Winter	2.061	0.0	27.4	2340			
5760 min Winter	1.673	0.0	29.7	3056			
7200 min Winter	1.437	0.0	31.9	3752			
8640 min Winter	1.277	0.0	34.0	0			
10080 min Winter	1.161	0.0	36.1	0			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 4																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																	
Date 07/06/2017	Designed by SPS																	
File Block of flats_220m2.SRCX	Checked by GAC																	
Innovyze	Source Control 2020.1.3																	
<u>Model Details</u> Storage is Online Cover Level (m) 2.000 <u>House Soakaway Structure</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Infiltration Coefficient Base (m/hr) 0.00000</td> <td style="width: 50%;">Pit Width (m) 1.800</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr) 0.18000</td> <td>Number Required 2</td> </tr> <tr> <td>Safety Factor 2.0</td> <td>Cap Volume Depth (m) 1.900</td> </tr> <tr> <td>Porosity 0.95</td> <td>Cap Infiltration Depth (m) 0.600</td> </tr> <tr> <td>Invert Level (m) 0.100</td> <td></td> </tr> </table> <u>Filtration Outflow Control</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Permeability Coefficient (m/s) 0.000050</td> <td style="width: 50%;">Area (m²) 6.700</td> </tr> <tr> <td>Safety Factor 2.000</td> <td>Invert Level (m) 0.100</td> </tr> <tr> <td>Bed Depth (m) 1.900</td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.800	Infiltration Coefficient Side (m/hr) 0.18000	Number Required 2	Safety Factor 2.0	Cap Volume Depth (m) 1.900	Porosity 0.95	Cap Infiltration Depth (m) 0.600	Invert Level (m) 0.100		Permeability Coefficient (m/s) 0.000050	Area (m ²) 6.700	Safety Factor 2.000	Invert Level (m) 0.100	Bed Depth (m) 1.900	
Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 1.800																	
Infiltration Coefficient Side (m/hr) 0.18000	Number Required 2																	
Safety Factor 2.0	Cap Volume Depth (m) 1.900																	
Porosity 0.95	Cap Infiltration Depth (m) 0.600																	
Invert Level (m) 0.100																		
Permeability Coefficient (m/s) 0.000050	Area (m ²) 6.700																	
Safety Factor 2.000	Invert Level (m) 0.100																	
Bed Depth (m) 1.900																		
©1982-2020 Innovyze																		

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017 File Block of flats_250m2.SRCX			Designed by SPS Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 206 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.834	0.734	0.3	0.2	0.5	6.1	O K
30 min Summer	1.066	0.966	0.3	0.3	0.5	8.1	O K
60 min Summer	1.288	1.188	0.3	0.3	0.5	10.0	O K
120 min Summer	1.383	1.283	0.3	0.3	0.5	10.7	O K
180 min Summer	1.390	1.290	0.3	0.3	0.5	10.8	O K
240 min Summer	1.376	1.276	0.3	0.3	0.5	10.7	O K
360 min Summer	1.323	1.223	0.3	0.3	0.5	10.2	O K
480 min Summer	1.256	1.156	0.3	0.3	0.5	9.7	O K
600 min Summer	1.187	1.087	0.3	0.3	0.5	9.1	O K
720 min Summer	1.120	1.020	0.3	0.3	0.5	8.5	O K
960 min Summer	1.003	0.903	0.3	0.3	0.5	7.6	O K
1440 min Summer	0.819	0.719	0.3	0.2	0.5	6.0	O K
2160 min Summer	0.647	0.547	0.2	0.2	0.4	4.6	O K
2880 min Summer	0.542	0.442	0.2	0.2	0.4	3.7	O K
4320 min Summer	0.406	0.306	0.1	0.2	0.3	2.6	O K
5760 min Summer	0.321	0.221	0.1	0.2	0.3	1.9	O K
15 min Winter	0.928	0.828	0.3	0.2	0.5	6.9	O K
30 min Winter	1.193	1.093	0.3	0.3	0.5	9.2	O K
60 min Winter	1.450	1.350	0.3	0.3	0.5	11.3	O K
120 min Winter	1.572	1.472	0.3	0.3	0.6	12.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	6.7	25			
30 min Summer	95.480	0.0	8.9	38			
60 min Summer	61.320	0.0	11.5	66			
120 min Summer	36.400	0.0	13.7	122			
180 min Summer	26.725	0.0	15.0	164			
240 min Summer	21.385	0.0	16.0	194			
360 min Summer	15.493	0.0	17.4	258			
480 min Summer	12.267	0.0	18.4	326			
600 min Summer	10.214	0.0	19.1	394			
720 min Summer	8.785	0.0	19.8	462			
960 min Summer	6.916	0.0	20.7	594			
1440 min Summer	4.935	0.0	22.2	848			
2160 min Summer	3.539	0.0	23.9	1212			
2880 min Summer	2.812	0.0	25.3	1588			
4320 min Summer	2.061	0.0	27.8	2300			
5760 min Summer	1.673	0.0	30.1	3056			
15 min Winter	142.240	0.0	7.5	25			
30 min Winter	95.480	0.0	10.0	39			
60 min Winter	61.320	0.0	12.9	66			
120 min Winter	36.400	0.0	15.3	122			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017			Designed by SPS				
File Block of flats_250m2.SRCX			Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	1.592	1.492	0.3	0.3	0.6	12.5	O K
240 min Winter	1.568	1.468	0.3	0.3	0.6	12.3	O K
360 min Winter	1.501	1.401	0.3	0.3	0.5	11.7	O K
480 min Winter	1.413	1.313	0.3	0.3	0.5	11.0	O K
600 min Winter	1.318	1.218	0.3	0.3	0.5	10.2	O K
720 min Winter	1.226	1.126	0.3	0.3	0.5	9.4	O K
960 min Winter	1.054	0.954	0.3	0.3	0.5	8.0	O K
1440 min Winter	0.794	0.694	0.3	0.2	0.5	5.8	O K
2160 min Winter	0.586	0.486	0.2	0.2	0.4	4.1	O K
2880 min Winter	0.462	0.362	0.2	0.2	0.4	3.0	O K
4320 min Winter	0.312	0.212	0.1	0.2	0.3	1.8	O K
5760 min Winter	0.223	0.123	0.1	0.2	0.2	1.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
180 min Winter	26.725	0.0	16.8	176			
240 min Winter	21.385	0.0	18.0	218			
360 min Winter	15.493	0.0	19.5	278			
480 min Winter	12.267	0.0	20.6	354			
600 min Winter	10.214	0.0	21.5	428			
720 min Winter	8.785	0.0	22.1	500			
960 min Winter	6.916	0.0	23.2	638			
1440 min Winter	4.935	0.0	24.9	892			
2160 min Winter	3.539	0.0	26.8	1260			
2880 min Winter	2.812	0.0	28.3	1640			
4320 min Winter	2.061	0.0	31.2	2376			
5760 min Winter	1.673	0.0	33.7	3112			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)	
Date 07/06/2017	Designed by SPS	
File Block of flats_250m2.SRCX	Checked by GAC	
Innovyze		Source Control 2020.1.3

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 494200 105650 SU 94200 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	5760
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.025

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.008		0.008		0.008

©1982-2020 Innovyze

Markides Associates Ltd		Page 4																																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																																	
Date 07/06/2017	Designed by SPS																																	
File Block of flats_250m2.SRCX	Checked by GAC																																	
Innovyze	Source Control 2020.1.3																																	
<u>Model Details</u> Storage is Online Cover Level (m) 2.000 <u>House Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Pit Width (m)</td> <td>2.100</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.18000</td> <td>Number Required</td> <td>2</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Infiltration Depth (m)</td> <td>0.600</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.100</td> <td></td> <td></td> </tr> </table> <u>Filtration Outflow Control</u> <table> <tr> <td>Permeability Coefficient (m/s)</td> <td>0.000050</td> <td>Area (m²)</td> <td>6.780</td> </tr> <tr> <td>Safety Factor</td> <td>2.000</td> <td>Invert Level (m)</td> <td>0.100</td> </tr> <tr> <td>Bed Depth (m)</td> <td>1.900</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Pit Width (m)	2.100	Infiltration Coefficient Side (m/hr)	0.18000	Number Required	2	Safety Factor	2.0	Cap Volume Depth (m)	0.000	Porosity	0.95	Cap Infiltration Depth (m)	0.600	Invert Level (m)	0.100			Permeability Coefficient (m/s)	0.000050	Area (m ²)	6.780	Safety Factor	2.000	Invert Level (m)	0.100	Bed Depth (m)	1.900		
Infiltration Coefficient Base (m/hr)	0.00000	Pit Width (m)	2.100																															
Infiltration Coefficient Side (m/hr)	0.18000	Number Required	2																															
Safety Factor	2.0	Cap Volume Depth (m)	0.000																															
Porosity	0.95	Cap Infiltration Depth (m)	0.600																															
Invert Level (m)	0.100																																	
Permeability Coefficient (m/s)	0.000050	Area (m ²)	6.780																															
Safety Factor	2.000	Invert Level (m)	0.100																															
Bed Depth (m)	1.900																																	
©1982-2020 Innovyze																																		

Markides Associates Ltd							Page 1																																																																																																																																																																																																																																																																																	
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																																																																																																																																																																																																																																																																																					
Date 07/06/2017 File PP_2car parking+RD.SRCX			Designed by SPS Checked by GAC																																																																																																																																																																																																																																																																																					
Innovyze			Source Control 2020.1.3																																																																																																																																																																																																																																																																																					
<u>Summary of Results for 30 year Return Period (+40%)</u> Half Drain Time : 249 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>0.674</td><td>0.574</td><td>0.0</td><td>0.1</td><td>0.1</td><td>1.8</td><td>○ K</td></tr><tr><td>30 min Summer</td><td>0.851</td><td>0.751</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.3</td><td>○ K</td></tr><tr><td>60 min Summer</td><td>1.018</td><td>0.918</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.8</td><td>○ K</td></tr><tr><td>120 min Summer</td><td>1.116</td><td>1.016</td><td>0.0</td><td>0.1</td><td>0.1</td><td>3.1</td><td>○ K</td></tr><tr><td>180 min Summer</td><td>1.133</td><td>1.033</td><td>0.0</td><td>0.1</td><td>0.1</td><td>3.2</td><td>○ K</td></tr><tr><td>240 min Summer</td><td>1.119</td><td>1.019</td><td>0.0</td><td>0.1</td><td>0.1</td><td>3.1</td><td>○ K</td></tr><tr><td>360 min Summer</td><td>1.069</td><td>0.969</td><td>0.0</td><td>0.1</td><td>0.1</td><td>3.0</td><td>○ K</td></tr><tr><td>480 min Summer</td><td>1.019</td><td>0.919</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.8</td><td>○ K</td></tr><tr><td>600 min Summer</td><td>0.973</td><td>0.873</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.7</td><td>○ K</td></tr><tr><td>720 min Summer</td><td>0.930</td><td>0.830</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.6</td><td>○ K</td></tr><tr><td>960 min Summer</td><td>0.850</td><td>0.750</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.3</td><td>○ K</td></tr><tr><td>1440 min Summer</td><td>0.710</td><td>0.610</td><td>0.0</td><td>0.1</td><td>0.1</td><td>1.9</td><td>○ K</td></tr><tr><td>2160 min Summer</td><td>0.546</td><td>0.446</td><td>0.0</td><td>0.1</td><td>0.1</td><td>1.4</td><td>○ K</td></tr><tr><td>2880 min Summer</td><td>0.423</td><td>0.323</td><td>0.0</td><td>0.1</td><td>0.1</td><td>1.0</td><td>○ K</td></tr><tr><td>4320 min Summer</td><td>0.258</td><td>0.158</td><td>0.0</td><td>0.1</td><td>0.1</td><td>0.5</td><td>○ K</td></tr><tr><td>5760 min Summer</td><td>0.162</td><td>0.062</td><td>0.0</td><td>0.1</td><td>0.1</td><td>0.2</td><td>○ K</td></tr><tr><td>7200 min Summer</td><td>0.114</td><td>0.014</td><td>0.0</td><td>0.1</td><td>0.1</td><td>0.0</td><td>○ K</td></tr><tr><td>8640 min Summer</td><td>0.100</td><td>0.000</td><td>0.0</td><td>0.1</td><td>0.1</td><td>0.0</td><td>○ K</td></tr><tr><td>10080 min Summer</td><td>0.100</td><td>0.000</td><td>0.0</td><td>0.1</td><td>0.1</td><td>0.0</td><td>○ K</td></tr><tr><td>15 min Winter</td><td>0.748</td><td>0.648</td><td>0.0</td><td>0.1</td><td>0.1</td><td>2.0</td><td>○ K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>113.508</td><td>0.0</td><td>1.9</td><td>25</td></tr><tr><td>30 min Summer</td><td>75.641</td><td>0.0</td><td>2.6</td><td>39</td></tr><tr><td>60 min Summer</td><td>48.232</td><td>0.0</td><td>3.3</td><td>68</td></tr><tr><td>120 min Summer</td><td>29.143</td><td>0.0</td><td>3.9</td><td>124</td></tr><tr><td>180 min Summer</td><td>21.559</td><td>0.0</td><td>4.4</td><td>180</td></tr><tr><td>240 min Summer</td><td>17.327</td><td>0.0</td><td>4.7</td><td>210</td></tr><tr><td>360 min Summer</td><td>12.620</td><td>0.0</td><td>5.1</td><td>274</td></tr><tr><td>480 min Summer</td><td>10.015</td><td>0.0</td><td>5.4</td><td>340</td></tr><tr><td>600 min Summer</td><td>8.353</td><td>0.0</td><td>5.6</td><td>410</td></tr><tr><td>720 min Summer</td><td>7.194</td><td>0.0</td><td>5.8</td><td>478</td></tr><tr><td>960 min Summer</td><td>5.678</td><td>0.0</td><td>6.1</td><td>614</td></tr><tr><td>1440 min Summer</td><td>4.062</td><td>0.0</td><td>6.6</td><td>882</td></tr><tr><td>2160 min Summer</td><td>2.928</td><td>0.0</td><td>7.1</td><td>1264</td></tr><tr><td>2880 min Summer</td><td>2.339</td><td>0.0</td><td>7.6</td><td>1640</td></tr><tr><td>4320 min Summer</td><td>1.732</td><td>0.0</td><td>8.4</td><td>2340</td></tr><tr><td>5760 min Summer</td><td>1.418</td><td>0.0</td><td>9.2</td><td>3016</td></tr><tr><td>7200 min Summer</td><td>1.229</td><td>0.0</td><td>10.0</td><td>3680</td></tr><tr><td>8640 min Summer</td><td>1.100</td><td>0.0</td><td>10.7</td><td>0</td></tr><tr><td>10080 min Summer</td><td>1.007</td><td>0.0</td><td>11.4</td><td>0</td></tr><tr><td>15 min Winter</td><td>113.508</td><td>0.0</td><td>2.1</td><td>25</td></tr></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	0.674	0.574	0.0	0.1	0.1	1.8	○ K	30 min Summer	0.851	0.751	0.0	0.1	0.1	2.3	○ K	60 min Summer	1.018	0.918	0.0	0.1	0.1	2.8	○ K	120 min Summer	1.116	1.016	0.0	0.1	0.1	3.1	○ K	180 min Summer	1.133	1.033	0.0	0.1	0.1	3.2	○ K	240 min Summer	1.119	1.019	0.0	0.1	0.1	3.1	○ K	360 min Summer	1.069	0.969	0.0	0.1	0.1	3.0	○ K	480 min Summer	1.019	0.919	0.0	0.1	0.1	2.8	○ K	600 min Summer	0.973	0.873	0.0	0.1	0.1	2.7	○ K	720 min Summer	0.930	0.830	0.0	0.1	0.1	2.6	○ K	960 min Summer	0.850	0.750	0.0	0.1	0.1	2.3	○ K	1440 min Summer	0.710	0.610	0.0	0.1	0.1	1.9	○ K	2160 min Summer	0.546	0.446	0.0	0.1	0.1	1.4	○ K	2880 min Summer	0.423	0.323	0.0	0.1	0.1	1.0	○ K	4320 min Summer	0.258	0.158	0.0	0.1	0.1	0.5	○ K	5760 min Summer	0.162	0.062	0.0	0.1	0.1	0.2	○ K	7200 min Summer	0.114	0.014	0.0	0.1	0.1	0.0	○ K	8640 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	○ K	10080 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	○ K	15 min Winter	0.748	0.648	0.0	0.1	0.1	2.0	○ K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	113.508	0.0	1.9	25	30 min Summer	75.641	0.0	2.6	39	60 min Summer	48.232	0.0	3.3	68	120 min Summer	29.143	0.0	3.9	124	180 min Summer	21.559	0.0	4.4	180	240 min Summer	17.327	0.0	4.7	210	360 min Summer	12.620	0.0	5.1	274	480 min Summer	10.015	0.0	5.4	340	600 min Summer	8.353	0.0	5.6	410	720 min Summer	7.194	0.0	5.8	478	960 min Summer	5.678	0.0	6.1	614	1440 min Summer	4.062	0.0	6.6	882	2160 min Summer	2.928	0.0	7.1	1264	2880 min Summer	2.339	0.0	7.6	1640	4320 min Summer	1.732	0.0	8.4	2340	5760 min Summer	1.418	0.0	9.2	3016	7200 min Summer	1.229	0.0	10.0	3680	8640 min Summer	1.100	0.0	10.7	0	10080 min Summer	1.007	0.0	11.4	0	15 min Winter	113.508	0.0	2.1	25
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																	
15 min Summer	0.674	0.574	0.0	0.1	0.1	1.8	○ K																																																																																																																																																																																																																																																																																	
30 min Summer	0.851	0.751	0.0	0.1	0.1	2.3	○ K																																																																																																																																																																																																																																																																																	
60 min Summer	1.018	0.918	0.0	0.1	0.1	2.8	○ K																																																																																																																																																																																																																																																																																	
120 min Summer	1.116	1.016	0.0	0.1	0.1	3.1	○ K																																																																																																																																																																																																																																																																																	
180 min Summer	1.133	1.033	0.0	0.1	0.1	3.2	○ K																																																																																																																																																																																																																																																																																	
240 min Summer	1.119	1.019	0.0	0.1	0.1	3.1	○ K																																																																																																																																																																																																																																																																																	
360 min Summer	1.069	0.969	0.0	0.1	0.1	3.0	○ K																																																																																																																																																																																																																																																																																	
480 min Summer	1.019	0.919	0.0	0.1	0.1	2.8	○ K																																																																																																																																																																																																																																																																																	
600 min Summer	0.973	0.873	0.0	0.1	0.1	2.7	○ K																																																																																																																																																																																																																																																																																	
720 min Summer	0.930	0.830	0.0	0.1	0.1	2.6	○ K																																																																																																																																																																																																																																																																																	
960 min Summer	0.850	0.750	0.0	0.1	0.1	2.3	○ K																																																																																																																																																																																																																																																																																	
1440 min Summer	0.710	0.610	0.0	0.1	0.1	1.9	○ K																																																																																																																																																																																																																																																																																	
2160 min Summer	0.546	0.446	0.0	0.1	0.1	1.4	○ K																																																																																																																																																																																																																																																																																	
2880 min Summer	0.423	0.323	0.0	0.1	0.1	1.0	○ K																																																																																																																																																																																																																																																																																	
4320 min Summer	0.258	0.158	0.0	0.1	0.1	0.5	○ K																																																																																																																																																																																																																																																																																	
5760 min Summer	0.162	0.062	0.0	0.1	0.1	0.2	○ K																																																																																																																																																																																																																																																																																	
7200 min Summer	0.114	0.014	0.0	0.1	0.1	0.0	○ K																																																																																																																																																																																																																																																																																	
8640 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	○ K																																																																																																																																																																																																																																																																																	
10080 min Summer	0.100	0.000	0.0	0.1	0.1	0.0	○ K																																																																																																																																																																																																																																																																																	
15 min Winter	0.748	0.648	0.0	0.1	0.1	2.0	○ K																																																																																																																																																																																																																																																																																	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																				
15 min Summer	113.508	0.0	1.9	25																																																																																																																																																																																																																																																																																				
30 min Summer	75.641	0.0	2.6	39																																																																																																																																																																																																																																																																																				
60 min Summer	48.232	0.0	3.3	68																																																																																																																																																																																																																																																																																				
120 min Summer	29.143	0.0	3.9	124																																																																																																																																																																																																																																																																																				
180 min Summer	21.559	0.0	4.4	180																																																																																																																																																																																																																																																																																				
240 min Summer	17.327	0.0	4.7	210																																																																																																																																																																																																																																																																																				
360 min Summer	12.620	0.0	5.1	274																																																																																																																																																																																																																																																																																				
480 min Summer	10.015	0.0	5.4	340																																																																																																																																																																																																																																																																																				
600 min Summer	8.353	0.0	5.6	410																																																																																																																																																																																																																																																																																				
720 min Summer	7.194	0.0	5.8	478																																																																																																																																																																																																																																																																																				
960 min Summer	5.678	0.0	6.1	614																																																																																																																																																																																																																																																																																				
1440 min Summer	4.062	0.0	6.6	882																																																																																																																																																																																																																																																																																				
2160 min Summer	2.928	0.0	7.1	1264																																																																																																																																																																																																																																																																																				
2880 min Summer	2.339	0.0	7.6	1640																																																																																																																																																																																																																																																																																				
4320 min Summer	1.732	0.0	8.4	2340																																																																																																																																																																																																																																																																																				
5760 min Summer	1.418	0.0	9.2	3016																																																																																																																																																																																																																																																																																				
7200 min Summer	1.229	0.0	10.0	3680																																																																																																																																																																																																																																																																																				
8640 min Summer	1.100	0.0	10.7	0																																																																																																																																																																																																																																																																																				
10080 min Summer	1.007	0.0	11.4	0																																																																																																																																																																																																																																																																																				
15 min Winter	113.508	0.0	2.1	25																																																																																																																																																																																																																																																																																				
©1982-2020 Innovyze																																																																																																																																																																																																																																																																																								

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017 File PP_2car parking+RD.SRCX			Designed by SPS Checked by GAC				
Innovyze			Source Control 2020.1.3				
Summary of Results for 30 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.951	0.851	0.0	0.1	0.1	2.6	OK
60 min Winter	1.145	1.045	0.0	0.1	0.1	3.2	OK
120 min Winter	1.269	1.169	0.0	0.1	0.1	3.6	OK
180 min Winter	1.302	1.202	0.0	0.1	0.1	3.7	OK
240 min Winter	1.295	1.195	0.0	0.1	0.1	3.7	OK
360 min Winter	1.240	1.140	0.0	0.1	0.1	3.5	OK
480 min Winter	1.172	1.072	0.0	0.1	0.1	3.3	OK
600 min Winter	1.105	1.005	0.0	0.1	0.1	3.1	OK
720 min Winter	1.044	0.944	0.0	0.1	0.1	2.9	OK
960 min Winter	0.929	0.829	0.0	0.1	0.1	2.6	OK
1440 min Winter	0.726	0.626	0.0	0.1	0.1	1.9	OK
2160 min Winter	0.494	0.394	0.0	0.1	0.1	1.2	OK
2880 min Winter	0.327	0.227	0.0	0.1	0.1	0.7	OK
4320 min Winter	0.127	0.027	0.0	0.1	0.1	0.1	OK
5760 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	OK
7200 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	OK
8640 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	OK
10080 min Winter	0.100	0.000	0.0	0.1	0.1	0.0	OK
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
30 min Winter	75.641		0.0	2.9	39		
60 min Winter	48.232		0.0	3.6	66		
120 min Winter	29.143		0.0	4.4	122		
180 min Winter	21.559		0.0	4.9	178		
240 min Winter	17.327		0.0	5.2	230		
360 min Winter	12.620		0.0	5.7	288		
480 min Winter	10.015		0.0	6.1	366		
600 min Winter	8.353		0.0	6.3	442		
720 min Winter	7.194		0.0	6.5	518		
960 min Winter	5.678		0.0	6.9	664		
1440 min Winter	4.062		0.0	7.4	944		
2160 min Winter	2.928		0.0	8.0	1340		
2880 min Winter	2.339		0.0	8.5	1704		
4320 min Winter	1.732		0.0	9.4	2336		
5760 min Winter	1.418		0.0	10.3	0		
7200 min Winter	1.229		0.0	11.1	0		
8640 min Winter	1.100		0.0	12.0	0		
10080 min Winter	1.007		0.0	12.8	0		
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3																																																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																																																	
Date 07/06/2017	Designed by SPS																																																	
File PP_2car parking+RD.SRCX	Checked by GAC																																																	
Innovyze		Source Control 2020.1.3																																																
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>30</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 494200 105650 SU 94200 05650</td> </tr> <tr> <td>Data Type</td> <td>Catchment</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.009 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>4</td> <td>8</td> <td>8</td> <td>12</td> </tr> <tr> <td></td> <td>0.003</td> <td></td> <td>0.003</td> <td></td> <td>0.003</td> </tr> </tbody> </table>			Rainfall Model	FEH	Return Period (years)	30	FEH Rainfall Version	2013	Site Location	GB 494200 105650 SU 94200 05650	Data Type	Catchment	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+40	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4	4	8	8	12		0.003		0.003		0.003
Rainfall Model	FEH																																																	
Return Period (years)	30																																																	
FEH Rainfall Version	2013																																																	
Site Location	GB 494200 105650 SU 94200 05650																																																	
Data Type	Catchment																																																	
Summer Storms	Yes																																																	
Winter Storms	Yes																																																	
Cv (Summer)	0.750																																																	
Cv (Winter)	0.840																																																	
Shortest Storm (mins)	15																																																	
Longest Storm (mins)	10080																																																	
Climate Change %	+40																																																	
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)																																													
From:	To:	From:	To:	From:	To:																																													
0	4	4	8	8	12																																													
	0.003		0.003		0.003																																													
©1982-2020 Innovyze																																																		

Markides Associates Ltd		Page 4																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																	
Date 07/06/2017 File PP_2car parking+RD.SRCX	Designed by SPS Checked by GAC																	
Innovyze Source Control 2020.1.3																		
<u>Model Details</u> Storage is Online Cover Level (m) 2.000 <u>House Soakaway Structure</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Infiltration Coefficient Base (m/hr) 0.00000</td> <td style="width: 50%;">Pit Width (m) 0.900</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr) 0.00000</td> <td>Number Required 4</td> </tr> <tr> <td>Safety Factor 2.0</td> <td>Cap Volume Depth (m) 1.900</td> </tr> <tr> <td>Porosity 0.95</td> <td>Cap Infiltration Depth (m) 0.600</td> </tr> <tr> <td>Invert Level (m) 0.100</td> <td></td> </tr> </table> <u>Filtration Outflow Control</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Permeability Coefficient (m/s) 0.000050</td> <td style="width: 50%;">Area (m²) 3.400</td> </tr> <tr> <td>Safety Factor 2.000</td> <td>Invert Level (m) 0.100</td> </tr> <tr> <td>Bed Depth (m) 1.900</td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 0.900	Infiltration Coefficient Side (m/hr) 0.00000	Number Required 4	Safety Factor 2.0	Cap Volume Depth (m) 1.900	Porosity 0.95	Cap Infiltration Depth (m) 0.600	Invert Level (m) 0.100		Permeability Coefficient (m/s) 0.000050	Area (m ²) 3.400	Safety Factor 2.000	Invert Level (m) 0.100	Bed Depth (m) 1.900	
Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 0.900																	
Infiltration Coefficient Side (m/hr) 0.00000	Number Required 4																	
Safety Factor 2.0	Cap Volume Depth (m) 1.900																	
Porosity 0.95	Cap Infiltration Depth (m) 0.600																	
Invert Level (m) 0.100																		
Permeability Coefficient (m/s) 0.000050	Area (m ²) 3.400																	
Safety Factor 2.000	Invert Level (m) 0.100																	
Bed Depth (m) 1.900																		
©1982-2020 Innovyze																		

Markides Associates Ltd						Page 1	
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017 File PP_2car parking.SRCX			Designed by SPS Checked by GAC				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 30 year Return Period (+40%)</u>							
Half Drain Time : 536 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-1.203	0.797	0.0	0.0	0.0	0.6	O K
30 min Summer	-0.949	1.051	0.0	0.0	0.0	0.8	O K
60 min Summer	-0.689	1.311	0.0	0.0	0.0	1.0	O K
120 min Summer	-0.485	1.515	0.0	0.0	0.0	1.2	O K
180 min Summer	-0.390	1.610	0.0	0.0	0.0	1.2	O K
240 min Summer	-0.346	1.654	0.0	0.0	0.0	1.3	O K
360 min Summer	-0.341	1.659	0.0	0.0	0.0	1.3	O K
480 min Summer	-0.377	1.623	0.0	0.0	0.0	1.2	O K
600 min Summer	-0.419	1.581	0.0	0.0	0.0	1.2	O K
720 min Summer	-0.464	1.536	0.0	0.0	0.0	1.2	O K
960 min Summer	-0.552	1.448	0.0	0.0	0.0	1.1	O K
1440 min Summer	-0.690	1.310	0.0	0.0	0.0	1.0	O K
2160 min Summer	-0.844	1.156	0.0	0.0	0.0	0.9	O K
2880 min Summer	-0.965	1.035	0.0	0.0	0.0	0.8	O K
4320 min Summer	-1.151	0.849	0.0	0.0	0.0	0.7	O K
5760 min Summer	-1.292	0.708	0.0	0.0	0.0	0.5	O K
7200 min Summer	-1.396	0.604	0.0	0.0	0.0	0.5	O K
8640 min Summer	-1.481	0.519	0.0	0.0	0.0	0.4	O K
10080 min Summer	-1.549	0.451	0.0	0.0	0.0	0.3	O K
15 min Winter	-1.104	0.896	0.0	0.0	0.0	0.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	113.508	0.0	0.6	26			
30 min Summer	75.641	0.0	0.9	40			
60 min Summer	48.232	0.0	1.1	70			
120 min Summer	29.143	0.0	1.3	128			
180 min Summer	21.559	0.0	1.5	186			
240 min Summer	17.327	0.0	1.6	244			
360 min Summer	12.620	0.0	1.7	360			
480 min Summer	10.015	0.0	1.8	416			
600 min Summer	8.353	0.0	1.9	478			
720 min Summer	7.194	0.0	1.9	542			
960 min Summer	5.678	0.0	2.0	676			
1440 min Summer	4.062	0.0	2.2	952			
2160 min Summer	2.928	0.0	2.4	1364			
2880 min Summer	2.339	0.0	2.5	1764			
4320 min Summer	1.732	0.0	2.8	2552			
5760 min Summer	1.418	0.0	3.1	3304			
7200 min Summer	1.229	0.0	3.3	4048			
8640 min Summer	1.100	0.0	3.6	4832			
10080 min Summer	1.007	0.0	3.8	5552			
15 min Winter	113.508	0.0	0.7	26			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX			16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)				
Date 07/06/2017 File PP_2car parking.SRCX			Designed by SPS Checked by GAC				
Innovyze			Source Control 2020.1.3				
Summary of Results for 30 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	-0.816	1.184	0.0	0.0	0.0	0.9	O K
60 min Winter	-0.520	1.480	0.0	0.0	0.0	1.1	O K
120 min Winter	-0.282	1.718	0.0	0.0	0.0	1.3	Flood Risk
180 min Winter	-0.165	1.835	0.0	0.0	0.0	1.4	Flood Risk
240 min Winter	-0.107	1.893	0.0	0.0	0.0	1.5	Flood Risk
360 min Winter	-0.088	1.914	0.0	0.0	0.0	1.5	Flood Risk
480 min Winter	-0.114	1.886	0.0	0.0	0.0	1.5	Flood Risk
600 min Winter	-0.167	1.833	0.0	0.0	0.0	1.4	Flood Risk
720 min Winter	-0.213	1.787	0.0	0.0	0.0	1.4	Flood Risk
960 min Winter	-0.313	1.687	0.0	0.0	0.0	1.3	O K
1440 min Winter	-0.513	1.487	0.0	0.0	0.0	1.1	O K
2160 min Winter	-0.734	1.266	0.0	0.0	0.0	1.0	O K
2880 min Winter	-0.915	1.085	0.0	0.0	0.0	0.8	O K
4320 min Winter	-1.189	0.811	0.0	0.0	0.0	0.6	O K
5760 min Winter	-1.390	0.610	0.0	0.0	0.0	0.5	O K
7200 min Winter	-1.540	0.460	0.0	0.0	0.0	0.4	O K
8640 min Winter	-1.658	0.342	0.0	0.0	0.0	0.3	O K
10080 min Winter	-1.752	0.248	0.0	0.0	0.0	0.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	75.641	0.0	1.0	40			
60 min Winter	48.232	0.0	1.2	68			
120 min Winter	29.143	0.0	1.5	126			
180 min Winter	21.559	0.0	1.6	182			
240 min Winter	17.327	0.0	1.7	238			
360 min Winter	12.620	0.0	1.8	350			
480 min Winter	10.015	0.0	2.0	456			
600 min Winter	8.353	0.0	2.1	500			
720 min Winter	7.194	0.0	2.2	568			
960 min Winter	5.678	0.0	2.3	722			
1440 min Winter	4.062	0.0	2.5	1028			
2160 min Winter	2.928	0.0	2.7	1472			
2880 min Winter	2.339	0.0	2.8	1884			
4320 min Winter	1.732	0.0	3.1	2692			
5760 min Winter	1.418	0.0	3.4	3472			
7200 min Winter	1.229	0.0	3.7	4248			
8640 min Winter	1.100	0.0	4.0	5008			
10080 min Winter	1.007	0.0	4.3	5664			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3																																																
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)																																																	
Date 07/06/2017	Designed by SPS																																																	
File PP_2car parking.SRCX	Checked by GAC																																																	
Innovyze		Source Control 2020.1.3																																																
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>30</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 494200 105650 SU 94200 05650</td> </tr> <tr> <td>Data Type</td> <td>Catchment</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.003 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>4</td> <td>8</td> <td>8</td> <td>12</td> </tr> <tr> <td></td> <td>0.001</td> <td></td> <td>0.001</td> <td></td> <td>0.001</td> </tr> </tbody> </table>			Rainfall Model	FEH	Return Period (years)	30	FEH Rainfall Version	2013	Site Location	GB 494200 105650 SU 94200 05650	Data Type	Catchment	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+40	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4	4	8	8	12		0.001		0.001		0.001
Rainfall Model	FEH																																																	
Return Period (years)	30																																																	
FEH Rainfall Version	2013																																																	
Site Location	GB 494200 105650 SU 94200 05650																																																	
Data Type	Catchment																																																	
Summer Storms	Yes																																																	
Winter Storms	Yes																																																	
Cv (Summer)	0.750																																																	
Cv (Winter)	0.840																																																	
Shortest Storm (mins)	15																																																	
Longest Storm (mins)	10080																																																	
Climate Change %	+40																																																	
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)																																													
From:	To:	From:	To:	From:	To:																																													
0	4	4	8	8	12																																													
	0.001		0.001		0.001																																													
©1982-2020 Innovyze																																																		

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX	16-021 West Hemel Hempstead Typical Detached House with Double Garage (>120m2)	
Date 07/06/2017 File PP_2car parking.SRCX	Designed by SPS Checked by GAC	
Innovyze Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 0.000

House Soakaway Structure

Infiltration Coefficient Base (m/hr) 0.00000	Pit Width (m) 0.900
Infiltration Coefficient Side (m/hr) 0.00000	Number Required 1
Safety Factor 2.0	Cap Volume Depth (m) 1.900
Porosity 0.95	Cap Infiltration Depth (m) 0.600
Invert Level (m) -2.000	

Filtration Outflow Control

Permeability Coefficient (m/s) 0.000050	Area (m ²) 0.540
Safety Factor 2.000	Invert Level (m) -2.000
Bed Depth (m) 1.900	

©1982-2020 Innovyze

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX							
Date 27/10/2021 19:57 File Filter Drain_northwestc...			Designed by Markides Associates Checked by				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 55 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	1.243	1.143	1.7	2.7	4.4	16.6	O K
30 min Summer	1.551	1.451	1.7	3.0	4.6	21.0	O K
60 min Summer	1.712	1.612	1.7	3.1	4.8	23.4	Flood Risk
120 min Summer	1.601	1.501	1.7	3.0	4.7	21.8	O K
180 min Summer	1.478	1.378	1.7	2.9	4.6	20.0	O K
240 min Summer	1.354	1.254	1.7	2.8	4.5	18.2	O K
360 min Summer	1.116	1.016	1.7	2.6	4.3	14.8	O K
480 min Summer	0.907	0.807	1.7	2.4	4.1	11.8	O K
600 min Summer	0.733	0.633	1.7	2.2	3.9	9.3	O K
720 min Summer	0.605	0.505	1.6	2.1	3.7	7.3	O K
960 min Summer	0.399	0.299	1.4	1.9	3.4	4.3	O K
1440 min Summer	0.175	0.075	1.3	1.7	3.0	1.1	O K
2160 min Summer	0.125	0.025	0.6	1.7	2.3	0.4	O K
2880 min Summer	0.106	0.006	0.2	1.7	1.8	0.1	O K
4320 min Summer	0.100	0.000	0.0	1.3	1.3	0.0	O K
5760 min Summer	0.100	0.000	0.0	1.1	1.1	0.0	O K
7200 min Summer	0.100	0.000	0.0	0.9	0.9	0.0	O K
8640 min Summer	0.100	0.000	0.0	0.8	0.8	0.0	O K
10080 min Summer	0.100	0.000	0.0	0.8	0.8	0.0	O K
15 min Winter	1.408	1.308	1.7	2.8	4.5	19.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	21.3	22			
30 min Summer	95.480	0.0	28.7	34			
60 min Summer	61.320	0.0	36.8	54			
120 min Summer	36.400	0.0	43.8	88			
180 min Summer	26.725	0.0	48.1	122			
240 min Summer	21.385	0.0	51.4	156			
360 min Summer	15.493	0.0	55.7	222			
480 min Summer	12.267	0.0	58.9	284			
600 min Summer	10.214	0.0	61.3	344			
720 min Summer	8.785	0.0	63.2	404			
960 min Summer	6.916	0.0	66.4	522			
1440 min Summer	4.935	0.0	71.1	744			
2160 min Summer	3.539	0.0	76.4	1100			
2880 min Summer	2.812	0.0	81.0	1468			
4320 min Summer	2.061	0.0	89.0	0			
5760 min Summer	1.673	0.0	96.3	0			
7200 min Summer	1.437	0.0	103.5	0			
8640 min Summer	1.277	0.0	110.3	0			
10080 min Summer	1.161	0.0	117.1	0			
15 min Winter	142.240	0.0	23.9	23			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2		
9th Floor, The Tower Building 11 York Road London, SE1 7NX									
Date 27/10/2021 19:57 File Filter Drain_northwestc...			Designed by Markides Associates Checked by						
Innovyze			Source Control 2020.1.3						
<u>Summary of Results for 100 year Return Period (+40%)</u>									
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status		
30 min Winter	1.771	1.671	1.7	3.1	4.8	24.2	Flood	Risk	
60 min Winter	1.879	1.879	1.7	3.3	5.0	27.2	Flood	Risk	
120 min Winter	1.829	1.729	1.7	3.2	4.9	25.0	Flood	Risk	
180 min Winter	1.642	1.542	1.7	3.0	4.7	22.3		O K	
240 min Winter	1.454	1.354	1.7	2.9	4.5	19.6		O K	
360 min Winter	1.104	1.004	1.7	2.6	4.2	14.6		O K	
480 min Winter	0.813	0.713	1.7	2.3	4.0	10.4		O K	
600 min Winter	0.604	0.504	1.6	2.1	3.7	7.3		O K	
720 min Winter	0.436	0.336	1.5	2.0	3.4	4.8		O K	
960 min Winter	0.204	0.104	1.3	1.8	3.0	1.5		O K	
1440 min Winter	0.125	0.025	0.6	1.7	2.3	0.4		O K	
2160 min Winter	0.100	0.000	0.0	1.7	1.7	0.0		O K	
2880 min Winter	0.100	0.000	0.0	1.3	1.3	0.0		O K	
4320 min Winter	0.100	0.000	0.0	1.0	1.0	0.0		O K	
5760 min Winter	0.100	0.000	0.0	0.8	0.8	0.0		O K	
7200 min Winter	0.100	0.000	0.0	0.7	0.7	0.0		O K	
8640 min Winter	0.100	0.000	0.0	0.6	0.6	0.0		O K	
10080 min Winter	0.100	0.000	0.0	0.5	0.5	0.0		O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)					
30 min Winter	95.480	0.0	32.1	34					
60 min Winter	61.320	0.0	41.3	58					
120 min Winter	36.400	0.0	49.0	94					
180 min Winter	26.725	0.0	53.9	132					
240 min Winter	21.385	0.0	57.5	168					
360 min Winter	15.493	0.0	62.4	236					
480 min Winter	12.267	0.0	65.9	298					
600 min Winter	10.214	0.0	68.7	358					
720 min Winter	8.785	0.0	70.8	418					
960 min Winter	6.916	0.0	74.4	522					
1440 min Winter	4.935	0.0	79.6	736					
2160 min Winter	3.539	0.0	85.6	0					
2880 min Winter	2.812	0.0	90.7	0					
4320 min Winter	2.061	0.0	99.7	0					
5760 min Winter	1.673	0.0	107.9	0					
7200 min Winter	1.437	0.0	115.9	0					
8640 min Winter	1.277	0.0	123.6	0					
10080 min Winter	1.161	0.0	131.1	0					
©1982-2020 Innovyze									

Markides Associates Ltd		Page 3
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 27/10/2021 19:57 File Filter Drain_northwestc...	Designed by Markides Associates Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 494200 105650 SU 94200 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.080

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.027	4 8	0.027	8 12	0.027

©1982-2020 Innovyze

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 27/10/2021 19:57 File Filter Drain_northwestc...	Designed by Markides Associates Checked by	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 2.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr) 0.18000	Pipe Diameter (m) 0.150
Infiltration Coefficient Side (m/hr) 0.18000	Pipe Depth above Invert (m) 0.500
Safety Factor 2.0	Slope (1:X) 0.0
Porosity 0.30	Cap Volume Depth (m) 0.000
Invert Level (m) 0.100	Cap Infiltration Depth (m) 0.600
Trench Width (m) 4.0	Number of Pipes 1
Trench Length (m) 12.0	

Filtration Outflow Control

Permeability Coefficient (m/s) 0.000050	Area (m²) 67.000
Safety Factor 2.000	Invert Level (m) 0.100
Bed Depth (m) 1.900	

©1982-2020 Innovyze

Markides Associates Ltd							Page 1
9th Floor, The Tower Building 11 York Road London, SE1 7NX							
Date 26/10/2021 21:27 File dry basin SouthEast.SRCX				Designed by Markides Associates Checked by			
Innovyze				Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Half Drain Time : 122 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.577	2.077	2.0	12.7	14.6	118.4	O K
30 min Summer	12.775	2.275	2.0	13.3	15.3	154.3	O K
60 min Summer	12.922	2.422	2.0	13.8	15.7	184.2	Flood Risk
120 min Summer	12.930	2.430	2.0	13.8	15.8	185.9	Flood Risk
180 min Summer	12.902	2.402	2.0	13.7	15.7	180.0	Flood Risk
240 min Summer	12.865	2.365	2.0	13.6	15.6	172.3	Flood Risk
360 min Summer	12.783	2.283	2.0	13.3	15.3	155.9	O K
480 min Summer	12.701	2.201	2.0	13.1	15.0	140.3	O K
600 min Summer	12.620	2.120	2.0	12.8	14.8	125.8	O K
720 min Summer	12.541	2.041	2.0	12.5	14.5	112.4	O K
960 min Summer	12.388	1.888	2.0	12.1	14.0	89.0	O K
1440 min Summer	12.114	1.614	2.0	11.2	13.2	54.3	O K
2160 min Summer	11.784	1.284	2.0	10.1	12.1	25.3	O K
2880 min Summer	11.312	0.812	2.0	8.6	10.6	13.6	O K
4320 min Summer	10.712	0.212	1.6	6.7	8.3	3.6	O K
5760 min Summer	10.529	0.029	0.8	6.1	7.0	0.5	O K
7200 min Summer	10.500	0.000	0.0	6.0	6.0	0.0	O K
8640 min Summer	10.500	0.000	0.0	5.3	5.3	0.0	O K
10080 min Summer	10.500	0.000	0.0	4.8	4.8	0.0	O K
15 min Winter	12.669	2.169	2.0	13.0	14.9	134.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	142.240	0.0	136.1	24			
30 min Summer	95.480	0.0	182.7	37			
60 min Summer	61.320	0.0	234.6	64			
120 min Summer	36.400	0.0	278.6	108			
180 min Summer	26.725	0.0	306.9	140			
240 min Summer	21.385	0.0	327.5	172			
360 min Summer	15.493	0.0	355.4	242			
480 min Summer	12.267	0.0	375.1	308			
600 min Summer	10.214	0.0	390.3	376			
720 min Summer	8.785	0.0	403.2	440			
960 min Summer	6.916	0.0	423.2	566			
1440 min Summer	4.935	0.0	453.2	804			
2160 min Summer	3.539	0.0	487.4	1148			
2880 min Summer	2.812	0.0	516.2	1496			
4320 min Summer	2.061	0.0	567.6	2208			
5760 min Summer	1.673	0.0	614.2	2936			
7200 min Summer	1.437	0.0	659.6	0			
8640 min Summer	1.277	0.0	703.5	0			
10080 min Summer	1.161	0.0	746.3	0			
15 min Winter	142.240	0.0	152.4	24			
©1982-2020 Innovyze							

Markides Associates Ltd							Page 2
9th Floor, The Tower Building 11 York Road London, SE1 7NX							
Date 26/10/2021 21:27 File dry basin SouthEast.SRCX			Designed by Markides Associates Checked by				
Innovyze			Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	12.883	2.383	2.0	13.6	15.6	175.9	Flood Risk
60 min Winter	13.047	2.547	2.0	14.2	16.1	211.8	Flood Risk
120 min Winter	13.072	2.572	2.0	14.2	16.2	217.5	Flood Risk
180 min Winter	13.039	2.539	2.0	14.1	16.1	209.9	Flood Risk
240 min Winter	12.996	2.496	2.0	14.0	16.0	200.1	Flood Risk
360 min Winter	12.885	2.385	2.0	13.6	15.6	176.4	Flood Risk
480 min Winter	12.770	2.270	2.0	13.3	15.3	153.4	O K
600 min Winter	12.655	2.155	2.0	12.9	14.9	132.1	O K
720 min Winter	12.542	2.042	2.0	12.6	14.5	112.6	O K
960 min Winter	12.321	1.821	2.0	11.8	13.8	79.6	O K
1440 min Winter	11.916	1.416	2.0	10.6	12.5	35.3	O K
2160 min Winter	11.194	0.694	2.0	8.3	10.2	11.7	O K
2880 min Winter	10.707	0.207	1.6	6.7	8.3	3.5	O K
4320 min Winter	10.505	0.005	0.1	6.1	6.2	0.1	O K
5760 min Winter	10.500	0.000	0.0	5.0	5.0	0.0	O K
7200 min Winter	10.500	0.000	0.0	4.3	4.3	0.0	O K
8640 min Winter	10.500	0.000	0.0	3.8	3.8	0.0	O K
10080 min Winter	10.500	0.000	0.0	3.5	3.5	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	95.480	0.0	204.5	37			
60 min Winter	61.320	0.0	262.6	64			
120 min Winter	36.800	0.0	311.8	118			
180 min Winter	26.725	0.0	343.6	148			
240 min Winter	21.385	0.0	366.4	186			
360 min Winter	15.493	0.0	398.2	262			
480 min Winter	12.267	0.0	420.2	334			
600 min Winter	10.214	0.0	437.4	404			
720 min Winter	8.785	0.0	451.7	470			
960 min Winter	6.916	0.0	474.0	596			
1440 min Winter	4.935	0.0	507.4	824			
2160 min Winter	3.539	0.0	545.8	1148			
2880 min Winter	2.812	0.0	578.2	1500			
4320 min Winter	2.061	0.0	635.7	2200			
5760 min Winter	1.673	0.0	687.9	0			
7200 min Winter	1.437	0.0	738.7	0			
8640 min Winter	1.277	0.0	787.9	0			
10080 min Winter	1.161	0.0	835.9	0			
©1982-2020 Innovyze							

Markides Associates Ltd		Page 3
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 26/10/2021 21:27 File dry basin SouthEast.SRCX	Designed by Markides Associates Checked by	
Innovyze Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 494200 105650 SU 94200 05650
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.510

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.170	4 8	0.170	8 12	0.170

©1982-2020 Innovyze

Markides Associates Ltd		Page 4
9th Floor, The Tower Building 11 York Road London, SE1 7NX		
Date 26/10/2021 21:27 File dry basin SouthEast.SRCX	Designed by Markides Associates Checked by	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 13.100

Dry Swale Structure

Infiltration Coefficient Base (m/hr)	0.18000	Trench Length (m)	16.0
Infiltration Coefficient Side (m/hr)	0.18000	Trench Infiltration Side (m/hr)	0.18000
Safety Factor	2.0	Trench Porosity	0.30
Porosity	1.00	Side Slope (1:X)	4.0
Invert Level (m)	10.500	Slope (1:X)	0.0
Trench Height (m)	1.200	Cap Volume Depth (m)	0.000
Trench Width (m)	3.5	Cap Infiltration Depth (m)	0.600

Filtration Outflow Control

Permeability Coefficient (m/s)	0.000500	Area (m²)	24.200
Safety Factor	2.000	Invert Level (m)	10.500
Bed Depth (m)	1.900		

©1982-2020 Innovyze

Markides Associates Ltd										Page 1																																																																																																																																																																																					
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																																																																															
Date 27/10/2021 18:44						Designed by Markides Associates																																																																																																																																																																																									
File SW and FW drainage_27.1...						Checked by																																																																																																																																																																																									
Innovyze						Network 2020.1.3																																																																																																																																																																																									
<u>FOUL SEWERAGE DESIGN</u> <u>Design Criteria for Foul water</u> Pipe Sizes STANDARD Manhole Sizes STANDARD <table><tr><td>Industrial Flow (l/s/ha)</td><td>0.00</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Industrial Peak Flow Factor</td><td>0.00</td><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Calculation Method</td><td>EN 752</td><td>Maximum Backdrop Height (m)</td><td>1.500</td></tr><tr><td>Frequency Factor</td><td>0.50</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Domestic (l/s/ha)</td><td>0.00</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Domestic Peak Flow Factor</td><td>6.00</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits												Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0	Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200	Calculation Method	EN 752	Maximum Backdrop Height (m)	1.500	Frequency Factor	0.50	Min Design Depth for Optimisation (m)	1.200	Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00	Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500																																																																																																																																																												
Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0																																																																																																																																																																																												
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200																																																																																																																																																																																												
Calculation Method	EN 752	Maximum Backdrop Height (m)	1.500																																																																																																																																																																																												
Frequency Factor	0.50	Min Design Depth for Optimisation (m)	1.200																																																																																																																																																																																												
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00																																																																																																																																																																																												
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																												
<u>Network Design Table for Foul water</u> <table><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>Area (ha)</th><th>Units</th><th>Base Flow (l/s)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th><th>Section Type</th><th>Auto Design</th></tr><tr><td>FW1.000</td><td>20.589</td><td>0.824</td><td>25.0</td><td>0.000</td><td>5.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.001</td><td>20.931</td><td>0.837</td><td>25.0</td><td>0.000</td><td>1.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.002</td><td>15.109</td><td>0.151</td><td>100.0</td><td>0.000</td><td>7.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.003</td><td>14.879</td><td>0.149</td><td>100.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.004</td><td>34.595</td><td>0.288</td><td>120.0</td><td>0.000</td><td>4.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.005</td><td>13.561</td><td>0.113</td><td>120.0</td><td>0.000</td><td>6.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.006</td><td>11.718</td><td>0.098</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.007</td><td>12.027</td><td>0.100</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.008</td><td>20.403</td><td>0.170</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.009</td><td>8.795</td><td>0.073</td><td>120.0</td><td>0.000</td><td>9.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.010</td><td>8.642</td><td>0.072</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.011</td><td>11.875</td><td>0.099</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.012</td><td>32.214</td><td>0.268</td><td>120.0</td><td>0.000</td><td>0.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.013</td><td>5.948</td><td>0.050</td><td>120.0</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr></table>												PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design	FW1.000	20.589	0.824	25.0	0.000	5.0	0.0	1.500	o	100	Pipe/Conduit		FW1.001	20.931	0.837	25.0	0.000	1.0	0.0	1.500	o	100	Pipe/Conduit		FW1.002	15.109	0.151	100.0	0.000	7.0	0.0	1.500	o	100	Pipe/Conduit		FW1.003	14.879	0.149	100.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.004	34.595	0.288	120.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit		FW1.005	13.561	0.113	120.0	0.000	6.0	0.0	1.500	o	100	Pipe/Conduit		FW1.006	11.718	0.098	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.007	12.027	0.100	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.008	20.403	0.170	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.009	8.795	0.073	120.0	0.000	9.0	0.0	1.500	o	100	Pipe/Conduit		FW1.010	8.642	0.072	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.011	11.875	0.099	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW1.012	32.214	0.268	120.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit		FW1.013	5.948	0.050	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit	
PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design																																																																																																																																																																																				
FW1.000	20.589	0.824	25.0	0.000	5.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.001	20.931	0.837	25.0	0.000	1.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.002	15.109	0.151	100.0	0.000	7.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.003	14.879	0.149	100.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.004	34.595	0.288	120.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.005	13.561	0.113	120.0	0.000	6.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.006	11.718	0.098	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.007	12.027	0.100	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.008	20.403	0.170	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.009	8.795	0.073	120.0	0.000	9.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.010	8.642	0.072	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.011	11.875	0.099	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.012	32.214	0.268	120.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
FW1.013	5.948	0.050	120.0	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																					
<u>Network Results Table</u> <table><tr><th>PN</th><th>US/IL (m)</th><th>Σ Area (ha)</th><th>Σ Base Flow (l/s)</th><th>Σ Units</th><th>Add Flow (l/s)</th><th>P.Dep (mm)</th><th>P.Vel (m/s)</th><th>Vel (m/s)</th><th>Cap (l/s)</th><th>Flow (l/s)</th></tr><tr><td>FW1.000</td><td>13.326</td><td>0.000</td><td>0.0</td><td>5.0</td><td>0.0</td><td>22</td><td>0.86</td><td>1.33</td><td>10.5</td><td>1.1</td></tr><tr><td>FW1.001</td><td>12.496</td><td>0.000</td><td>0.0</td><td>6.0</td><td>0.0</td><td>23</td><td>0.88</td><td>1.33</td><td>10.5</td><td>1.2</td></tr><tr><td>FW1.002</td><td>11.659</td><td>0.000</td><td>0.0</td><td>13.0</td><td>0.0</td><td>41</td><td>0.60</td><td>0.66</td><td>5.2</td><td>1.8</td></tr><tr><td>FW1.003</td><td>11.508</td><td>0.000</td><td>0.0</td><td>15.0</td><td>0.0</td><td>42</td><td>0.61</td><td>0.66</td><td>5.2</td><td>1.9</td></tr><tr><td>FW1.004</td><td>11.359</td><td>0.000</td><td>0.0</td><td>19.0</td><td>0.0</td><td>48</td><td>0.59</td><td>0.61</td><td>4.8</td><td>2.2</td></tr><tr><td>FW1.005</td><td>11.071</td><td>0.000</td><td>0.0</td><td>25.0</td><td>0.0</td><td>51</td><td>0.61</td><td>0.61</td><td>4.8</td><td>2.5</td></tr><tr><td>FW1.006</td><td>10.958</td><td>0.000</td><td>0.0</td><td>27.0</td><td>0.0</td><td>53</td><td>0.62</td><td>0.61</td><td>4.8</td><td>2.6</td></tr><tr><td>FW1.007</td><td>10.860</td><td>0.000</td><td>0.0</td><td>29.0</td><td>0.0</td><td>54</td><td>0.63</td><td>0.61</td><td>4.8</td><td>2.7</td></tr><tr><td>FW1.008</td><td>10.760</td><td>0.000</td><td>0.0</td><td>31.0</td><td>0.0</td><td>55</td><td>0.63</td><td>0.61</td><td>4.8</td><td>2.8</td></tr><tr><td>FW1.009</td><td>10.590</td><td>0.000</td><td>0.0</td><td>40.0</td><td>0.0</td><td>59</td><td>0.65</td><td>0.61</td><td>4.8</td><td>3.2</td></tr><tr><td>FW1.010</td><td>10.517</td><td>0.000</td><td>0.0</td><td>42.0</td><td>0.0</td><td>60</td><td>0.65</td><td>0.61</td><td>4.8</td><td>3.2</td></tr><tr><td>FW1.011</td><td>10.445</td><td>0.000</td><td>0.0</td><td>44.0</td><td>0.0</td><td>61</td><td>0.66</td><td>0.61</td><td>4.8</td><td>3.3</td></tr><tr><td>FW1.012</td><td>10.346</td><td>0.000</td><td>0.0</td><td>44.0</td><td>0.0</td><td>61</td><td>0.66</td><td>0.61</td><td>4.8</td><td>3.3</td></tr><tr><td>FW1.013</td><td>10.077</td><td>0.000</td><td>0.0</td><td>46.0</td><td>0.0</td><td>62</td><td>0.66</td><td>0.61</td><td>4.8</td><td>3.4</td></tr></table>												PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	FW1.000	13.326	0.000	0.0	5.0	0.0	22	0.86	1.33	10.5	1.1	FW1.001	12.496	0.000	0.0	6.0	0.0	23	0.88	1.33	10.5	1.2	FW1.002	11.659	0.000	0.0	13.0	0.0	41	0.60	0.66	5.2	1.8	FW1.003	11.508	0.000	0.0	15.0	0.0	42	0.61	0.66	5.2	1.9	FW1.004	11.359	0.000	0.0	19.0	0.0	48	0.59	0.61	4.8	2.2	FW1.005	11.071	0.000	0.0	25.0	0.0	51	0.61	0.61	4.8	2.5	FW1.006	10.958	0.000	0.0	27.0	0.0	53	0.62	0.61	4.8	2.6	FW1.007	10.860	0.000	0.0	29.0	0.0	54	0.63	0.61	4.8	2.7	FW1.008	10.760	0.000	0.0	31.0	0.0	55	0.63	0.61	4.8	2.8	FW1.009	10.590	0.000	0.0	40.0	0.0	59	0.65	0.61	4.8	3.2	FW1.010	10.517	0.000	0.0	42.0	0.0	60	0.65	0.61	4.8	3.2	FW1.011	10.445	0.000	0.0	44.0	0.0	61	0.66	0.61	4.8	3.3	FW1.012	10.346	0.000	0.0	44.0	0.0	61	0.66	0.61	4.8	3.3	FW1.013	10.077	0.000	0.0	46.0	0.0	62	0.66	0.61	4.8	3.4															
PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)																																																																																																																																																																																					
FW1.000	13.326	0.000	0.0	5.0	0.0	22	0.86	1.33	10.5	1.1																																																																																																																																																																																					
FW1.001	12.496	0.000	0.0	6.0	0.0	23	0.88	1.33	10.5	1.2																																																																																																																																																																																					
FW1.002	11.659	0.000	0.0	13.0	0.0	41	0.60	0.66	5.2	1.8																																																																																																																																																																																					
FW1.003	11.508	0.000	0.0	15.0	0.0	42	0.61	0.66	5.2	1.9																																																																																																																																																																																					
FW1.004	11.359	0.000	0.0	19.0	0.0	48	0.59	0.61	4.8	2.2																																																																																																																																																																																					
FW1.005	11.071	0.000	0.0	25.0	0.0	51	0.61	0.61	4.8	2.5																																																																																																																																																																																					
FW1.006	10.958	0.000	0.0	27.0	0.0	53	0.62	0.61	4.8	2.6																																																																																																																																																																																					
FW1.007	10.860	0.000	0.0	29.0	0.0	54	0.63	0.61	4.8	2.7																																																																																																																																																																																					
FW1.008	10.760	0.000	0.0	31.0	0.0	55	0.63	0.61	4.8	2.8																																																																																																																																																																																					
FW1.009	10.590	0.000	0.0	40.0	0.0	59	0.65	0.61	4.8	3.2																																																																																																																																																																																					
FW1.010	10.517	0.000	0.0	42.0	0.0	60	0.65	0.61	4.8	3.2																																																																																																																																																																																					
FW1.011	10.445	0.000	0.0	44.0	0.0	61	0.66	0.61	4.8	3.3																																																																																																																																																																																					
FW1.012	10.346	0.000	0.0	44.0	0.0	61	0.66	0.61	4.8	3.3																																																																																																																																																																																					
FW1.013	10.077	0.000	0.0	46.0	0.0	62	0.66	0.61	4.8	3.4																																																																																																																																																																																					
©1982-2020 Innovyze																																																																																																																																																																																															

Markides Associates Ltd											Page 2																																																																																																																																																																																																																																																																																																												
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																																																																																																																																																																																																																																																																							
Date 27/10/2021 18:44 File SW and FW drainage_27.1...						Designed by Markides Associates Checked by																																																																																																																																																																																																																																																																																																																	
Innovyze						Network 2020.1.3																																																																																																																																																																																																																																																																																																																	
<u>Network Design Table for Foul water</u> <table><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>Area (ha)</th><th>Units</th><th>Base Flow (l/s)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th><th>Section Type</th><th>Auto Design</th></tr><tr><td>FW1.014</td><td>8.470</td><td>0.071</td><td>120.0</td><td>0.000</td><td>3.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.015</td><td>11.633</td><td>0.097</td><td>120.0</td><td>0.000</td><td>0.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.016</td><td>18.262</td><td>0.321</td><td>56.9</td><td>0.000</td><td>2.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW2.000</td><td>18.340</td><td>0.459</td><td>40.0</td><td>0.000</td><td>4.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW2.001</td><td>28.304</td><td>0.708</td><td>40.0</td><td>0.000</td><td>4.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW2.002</td><td>16.925</td><td>0.423</td><td>40.0</td><td>0.000</td><td>3.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW2.003</td><td>40.745</td><td>1.019</td><td>40.0</td><td>0.000</td><td>3.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW2.004</td><td>19.880</td><td>0.497</td><td>40.0</td><td>0.000</td><td>5.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.017</td><td>28.960</td><td>0.362</td><td>80.0</td><td>0.000</td><td>6.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.018</td><td>21.774</td><td>0.272</td><td>80.0</td><td>0.000</td><td>0.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.019</td><td>8.445</td><td>0.106</td><td>80.0</td><td>0.000</td><td>0.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>FW1.020</td><td>5.253</td><td>0.066</td><td>80.0</td><td>0.000</td><td>0.0</td><td>0.0</td><td>1.500</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr></table> <u>Network Results Table</u> <table><tr><th>PN</th><th>US/IL (m)</th><th>Σ Area (ha)</th><th>Σ Base Flow (l/s)</th><th>Σ Units</th><th>Add Flow (l/s)</th><th>P.Dep (mm)</th><th>P.Vel (m/s)</th><th>Vel (m/s)</th><th>Cap (l/s)</th><th>Flow (l/s)</th></tr><tr><td>FW1.014</td><td>10.028</td><td>0.000</td><td>0.0</td><td>49.0</td><td>0.0</td><td>64</td><td>0.66</td><td>0.61</td><td>4.8</td><td>3.5</td></tr><tr><td>FW1.015</td><td>9.957</td><td>0.000</td><td>0.0</td><td>49.0</td><td>0.0</td><td>64</td><td>0.66</td><td>0.61</td><td>4.8</td><td>3.5</td></tr><tr><td>FW1.016</td><td>9.886</td><td>0.000</td><td>0.0</td><td>51.0</td><td>0.0</td><td>51</td><td>0.89</td><td>0.86</td><td>6.9</td><td>3.6</td></tr><tr><td>FW2.000</td><td>12.859</td><td>0.000</td><td>0.0</td><td>4.0</td><td>0.0</td><td>24</td><td>0.78</td><td>1.05</td><td>8.3</td><td>1.0</td></tr><tr><td>FW2.001</td><td>12.192</td><td>0.000</td><td>0.0</td><td>8.0</td><td>0.0</td><td>28</td><td>0.78</td><td>1.05</td><td>8.3</td><td>1.4</td></tr><tr><td>FW2.002</td><td>11.484</td><td>0.000</td><td>0.0</td><td>11.0</td><td>0.0</td><td>31</td><td>0.82</td><td>1.05</td><td>8.3</td><td>1.7</td></tr><tr><td>FW2.003</td><td>11.061</td><td>0.000</td><td>0.0</td><td>14.0</td><td>0.0</td><td>32</td><td>0.85</td><td>1.05</td><td>8.3</td><td>1.9</td></tr><tr><td>FW2.004</td><td>10.042</td><td>0.000</td><td>0.0</td><td>19.0</td><td>0.0</td><td>35</td><td>0.89</td><td>1.05</td><td>8.3</td><td>2.2</td></tr><tr><td>FW1.017</td><td>9.545</td><td>0.000</td><td>0.0</td><td>76.0</td><td>0.0</td><td>64</td><td>0.82</td><td>0.74</td><td>5.8</td><td>4.4</td></tr><tr><td>FW1.018</td><td>9.183</td><td>0.000</td><td>0.0</td><td>76.0</td><td>0.0</td><td>64</td><td>0.82</td><td>0.74</td><td>5.8</td><td>4.4</td></tr><tr><td>FW1.019</td><td>8.911</td><td>0.000</td><td>0.0</td><td>76.0</td><td>0.0</td><td>64</td><td>0.82</td><td>0.74</td><td>5.8</td><td>4.4</td></tr><tr><td>FW1.020</td><td>8.805</td><td>0.000</td><td>0.0</td><td>76.0</td><td>0.0</td><td>64</td><td>0.82</td><td>0.74</td><td>5.8</td><td>4.4</td></tr></table>													PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design	FW1.014	8.470	0.071	120.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit		FW1.015	11.633	0.097	120.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit		FW1.016	18.262	0.321	56.9	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit		FW2.000	18.340	0.459	40.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit		FW2.001	28.304	0.708	40.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit		FW2.002	16.925	0.423	40.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit		FW2.003	40.745	1.019	40.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit		FW2.004	19.880	0.497	40.0	0.000	5.0	0.0	1.500	o	100	Pipe/Conduit		FW1.017	28.960	0.362	80.0	0.000	6.0	0.0	1.500	o	100	Pipe/Conduit		FW1.018	21.774	0.272	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit		FW1.019	8.445	0.106	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit		FW1.020	5.253	0.066	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit		PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	FW1.014	10.028	0.000	0.0	49.0	0.0	64	0.66	0.61	4.8	3.5	FW1.015	9.957	0.000	0.0	49.0	0.0	64	0.66	0.61	4.8	3.5	FW1.016	9.886	0.000	0.0	51.0	0.0	51	0.89	0.86	6.9	3.6	FW2.000	12.859	0.000	0.0	4.0	0.0	24	0.78	1.05	8.3	1.0	FW2.001	12.192	0.000	0.0	8.0	0.0	28	0.78	1.05	8.3	1.4	FW2.002	11.484	0.000	0.0	11.0	0.0	31	0.82	1.05	8.3	1.7	FW2.003	11.061	0.000	0.0	14.0	0.0	32	0.85	1.05	8.3	1.9	FW2.004	10.042	0.000	0.0	19.0	0.0	35	0.89	1.05	8.3	2.2	FW1.017	9.545	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4	FW1.018	9.183	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4	FW1.019	8.911	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4	FW1.020	8.805	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4
PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design																																																																																																																																																																																																																																																																																																												
FW1.014	8.470	0.071	120.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.015	11.633	0.097	120.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.016	18.262	0.321	56.9	0.000	2.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW2.000	18.340	0.459	40.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW2.001	28.304	0.708	40.0	0.000	4.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW2.002	16.925	0.423	40.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW2.003	40.745	1.019	40.0	0.000	3.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW2.004	19.880	0.497	40.0	0.000	5.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.017	28.960	0.362	80.0	0.000	6.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.018	21.774	0.272	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.019	8.445	0.106	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
FW1.020	5.253	0.066	80.0	0.000	0.0	0.0	1.500	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																													
PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)																																																																																																																																																																																																																																																																																																													
FW1.014	10.028	0.000	0.0	49.0	0.0	64	0.66	0.61	4.8	3.5																																																																																																																																																																																																																																																																																																													
FW1.015	9.957	0.000	0.0	49.0	0.0	64	0.66	0.61	4.8	3.5																																																																																																																																																																																																																																																																																																													
FW1.016	9.886	0.000	0.0	51.0	0.0	51	0.89	0.86	6.9	3.6																																																																																																																																																																																																																																																																																																													
FW2.000	12.859	0.000	0.0	4.0	0.0	24	0.78	1.05	8.3	1.0																																																																																																																																																																																																																																																																																																													
FW2.001	12.192	0.000	0.0	8.0	0.0	28	0.78	1.05	8.3	1.4																																																																																																																																																																																																																																																																																																													
FW2.002	11.484	0.000	0.0	11.0	0.0	31	0.82	1.05	8.3	1.7																																																																																																																																																																																																																																																																																																													
FW2.003	11.061	0.000	0.0	14.0	0.0	32	0.85	1.05	8.3	1.9																																																																																																																																																																																																																																																																																																													
FW2.004	10.042	0.000	0.0	19.0	0.0	35	0.89	1.05	8.3	2.2																																																																																																																																																																																																																																																																																																													
FW1.017	9.545	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4																																																																																																																																																																																																																																																																																																													
FW1.018	9.183	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4																																																																																																																																																																																																																																																																																																													
FW1.019	8.911	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4																																																																																																																																																																																																																																																																																																													
FW1.020	8.805	0.000	0.0	76.0	0.0	64	0.82	0.74	5.8	4.4																																																																																																																																																																																																																																																																																																													
©1982-2020 Innovyze																																																																																																																																																																																																																																																																																																																							

Markides Associates Ltd									Page 3		
9th Floor, The Tower Building 11 York Road London, SE1 7NX											
Date 27/10/2021 18:44 File SW and FW drainage_27.1...					Designed by Markides Associates Checked by						
Innovyze					Network 2020.1.3						
Manhole Schedules for Foul water											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	
FW1	14.820	1.500	Open Manhole	1200	FW1.000	13.320	100				
FW2	14.120	1.624	Open Manhole	1200	FW1.001	12.496	100	FW1.000	12.496	100	
FW3	13.670	2.011	Open Manhole	1200	FW1.002	11.659	100	FW1.001	11.659	100	
FW4	13.490	1.982	Open Manhole	1200	FW1.003	11.508	100	FW1.002	11.508	100	
FW5	13.570	2.211	Open Manhole	1200	FW1.004	11.359	100	FW1.003	11.359	100	
FW6	13.470	2.399	Open Manhole	1200	FW1.005	11.071	100	FW1.004	11.071	100	
FW7	13.660	2.722	Open Manhole	1200	FW1.006	10.958	100	FW1.005	10.958	100	
FW8	13.790	2.930	Open Manhole	1200	FW1.007	10.860	100	FW1.006	10.860	100	
FW9	13.640	2.880	Open Manhole	1200	FW1.008	10.760	100	FW1.007	10.760	100	
FW10	13.520	2.930	Open Manhole	1200	FW1.009	10.590	100	FW1.008	10.590	100	
FW11	13.330	2.873	Open Manhole	1200	FW1.010	10.517	100	FW1.009	10.517	100	
FW12	13.440	2.995	Open Manhole	1200	FW1.011	10.445	100	FW1.010	10.445	100	
FW13	13.290	2.944	Open Manhole	1200	FW1.012	10.346	100	FW1.011	10.346	100	
FW14	13.170	3.093	Open Manhole	1200	FW1.013	10.077	100	FW1.012	10.077	100	
FW15	13.190	3.162	Open Manhole	1200	FW1.014	10.028	100	FW1.013	10.028	100	
FW16	13.230	3.273	Open Manhole	1200	FW1.015	9.957	100	FW1.014	9.957	100	
FW17	13.000	3.140	Open Manhole	1200	FW1.016	9.860	100	FW1.015	9.860	100	
FW18	14.000	1.350	Open Manhole	1200	FW2.000	12.630	100				
FW19	14.100	1.909	Open Manhole	1200	FW2.001	12.192	100	FW2.000	12.192	100	
FW20	14.060	2.576	Open Manhole	1200	FW2.002	11.484	100	FW2.001	11.484	100	
FW21	13.960	2.839	Open Manhole	1200	FW2.003	11.061	100	FW2.002	11.061	100	
FW22	13.400	3.358	Open Manhole	1200	FW2.004	10.042	100	FW2.003	10.042	100	
FW23	12.800	3.255	Open Manhole	1200	FW1.017	9.545	100	FW1.016	9.545	100	
								FW2.004	9.545	100	
FW24	12.560	3.317	Open Manhole	1200	FW1.018	9.183	100	FW1.017	9.183	100	
FW25	12.560	3.669	Open Manhole	1200	FW1.019	8.911	100	FW1.018	8.911	100	
FW26	12.860	4.055	Open Manhole	1200	FW1.020	8.805	100	FW1.019	8.805	100	
FW	12.370	3.630	Open Manhole	0		OUTFALL		FW1.020	8.740	100	
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)					
FW1	494339.552	105889.434	494339.552	105889.434	Required						
FW2	494357.623	105879.568	494357.623	105879.568	Required						
©1982-2020 Innovyze											

Markides Associates Ltd						Page 4	
9th Floor, The Tower Building 11 York Road London, SE1 7NX							
Date 27/10/2021 18:44 File SW and FW drainage_27.1...			Designed by Markides Associates Checked by				
Innovyze			Network 2020.1.3				
<u>Manhole Schedules for Foul water</u>							
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)	
FW3	494371.295	105863.719	494371.295	105863.719	Required		
FW4	494380.327	105851.607	494380.327	105851.607	Required		
FW5	494392.111	105842.523	494392.111	105842.523	Required		
FW6	494424.816	105831.243	494424.816	105831.243	Required		
FW7	494437.861	105827.542	494437.861	105827.542	Required		
FW8	494447.984	105821.641	494447.984	105821.641	Required		
FW9	494448.811	105809.642	494448.811	105809.642	Required		
FW10	494442.652	105790.191	494442.652	105790.191	Required		
FW11	494438.515	105782.430	494438.515	105782.430	Required		
FW12	494431.381	105777.554	494431.381	105777.554	Required		
FW13	494419.590	105776.139	494419.590	105776.139	Required		
FW14	494389.053	105786.396	494389.053	105786.396	Required		
FW15	494383.276	105787.811	494383.276	105787.811	Required		
FW16	494375.140	105785.453	494375.140	105785.453	Required		
FW17	494369.144	105775.485	494369.144	105775.485	Required		
©1982-2020 Innovyze							

Markides Associates Ltd						Page 5																																																																				
9th Floor, The Tower Building 11 York Road London, SE1 7NX																																																																										
Date 27/10/2021 18:44 File SW and FW drainage_27.1...			Designed by Markides Associates Checked by																																																																							
Innovyze			Network 2020.1.3																																																																							
<u>Manhole Schedules for Foul water</u> <table><tr><th>MH Name</th><th>Manhole Easting (m)</th><th>Manhole Northing (m)</th><th>Intersection Easting (m)</th><th>Intersection Northing (m)</th><th>Manhole Access</th><th>Layout (North)</th></tr><tr><td>FW18</td><td>494328.063</td><td>105818.720</td><td>494328.063</td><td>105818.720</td><td>Required</td><td rowspan="11"></td></tr><tr><td>FW19</td><td>494313.990</td><td>105806.960</td><td>494313.990</td><td>105806.960</td><td>Required</td></tr><tr><td>FW20</td><td>494293.357</td><td>105787.586</td><td>494293.357</td><td>105787.586</td><td>Required</td></tr><tr><td>FW21</td><td>494304.899</td><td>105775.207</td><td>494304.899</td><td>105775.207</td><td>Required</td></tr><tr><td>FW22</td><td>494344.064</td><td>105763.970</td><td>494344.064</td><td>105763.970</td><td>Required</td></tr><tr><td>FW23</td><td>494363.103</td><td>105758.250</td><td>494363.103</td><td>105758.250</td><td>Required</td></tr><tr><td>FW24</td><td>494390.088</td><td>105747.738</td><td>494390.088</td><td>105747.738</td><td>Required</td></tr><tr><td>FW25</td><td>494408.162</td><td>105735.595</td><td>494408.162</td><td>105735.595</td><td>Required</td></tr><tr><td>FW26</td><td>494415.007</td><td>105730.648</td><td>494415.007</td><td>105730.648</td><td>Required</td></tr><tr><td>FW</td><td>494412.378</td><td>105726.100</td><td></td><td></td><td>No Entry</td></tr></table>							MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)	FW18	494328.063	105818.720	494328.063	105818.720	Required		FW19	494313.990	105806.960	494313.990	105806.960	Required	FW20	494293.357	105787.586	494293.357	105787.586	Required	FW21	494304.899	105775.207	494304.899	105775.207	Required	FW22	494344.064	105763.970	494344.064	105763.970	Required	FW23	494363.103	105758.250	494363.103	105758.250	Required	FW24	494390.088	105747.738	494390.088	105747.738	Required	FW25	494408.162	105735.595	494408.162	105735.595	Required	FW26	494415.007	105730.648	494415.007	105730.648	Required	FW	494412.378	105726.100			No Entry
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)																																																																				
FW18	494328.063	105818.720	494328.063	105818.720	Required																																																																					
FW19	494313.990	105806.960	494313.990	105806.960	Required																																																																					
FW20	494293.357	105787.586	494293.357	105787.586	Required																																																																					
FW21	494304.899	105775.207	494304.899	105775.207	Required																																																																					
FW22	494344.064	105763.970	494344.064	105763.970	Required																																																																					
FW23	494363.103	105758.250	494363.103	105758.250	Required																																																																					
FW24	494390.088	105747.738	494390.088	105747.738	Required																																																																					
FW25	494408.162	105735.595	494408.162	105735.595	Required																																																																					
FW26	494415.007	105730.648	494415.007	105730.648	Required																																																																					
FW	494412.378	105726.100			No Entry																																																																					
©1982-2020 Innovyze																																																																										

Markides Associates Ltd								Page 6
9th Floor, The Tower Building 11 York Road London, SE1 7NX								
Date 27/10/2021 18:44 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by				
Innovyze				Network 2020.1.3				
PIPELINE SCHEDULES for Foul water								
Upstream Manhole								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
FW1.000	o	100	FW1	14.820	13.820	1.400	Open Manhole	1200
FW1.001	o	100	FW2	14.120	12.496	1.524	Open Manhole	1200
FW1.002	o	100	FW3	13.670	11.659	1.911	Open Manhole	1200
FW1.003	o	100	FW4	13.490	11.508	1.882	Open Manhole	1200
FW1.004	o	100	FW5	13.570	11.359	2.111	Open Manhole	1200
FW1.005	o	100	FW6	13.470	11.071	2.299	Open Manhole	1200
FW1.006	o	100	FW7	13.690	10.958	2.622	Open Manhole	1200
FW1.007	o	100	FW8	13.790	10.860	2.930	Open Manhole	1200
FW1.008	o	100	FW9	13.640	10.760	2.780	Open Manhole	1200
FW1.009	o	100	FW10	13.520	10.590	2.930	Open Manhole	1200
FW1.010	o	100	FW11	13.390	10.517	2.773	Open Manhole	1200
FW1.011	o	100	FW12	13.440	10.445	2.895	Open Manhole	1200
FW1.012	o	100	FW13	13.290	10.346	2.844	Open Manhole	1200
FW1.013	o	100	FW14	13.170	10.077	2.993	Open Manhole	1200
FW1.014	o	100	FW15	13.190	10.028	3.062	Open Manhole	1200
FW1.015	o	100	FW16	13.230	9.957	3.173	Open Manhole	1200
FW1.016	o	100	FW17	13.000	9.866	3.034	Open Manhole	1200
FW2.000	o	100	FW18	14.000	12.690	1.250	Open Manhole	1200
FW2.001	o	100	FW19	14.100	12.192	1.809	Open Manhole	1200
FW2.002	o	100	FW20	14.060	11.484	2.476	Open Manhole	1200
Downstream Manhole								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
FW1.000	20.589	25.0	FW2	14.120	12.496	1.524	Open Manhole	1200
FW1.001	20.931	25.0	FW3	13.670	11.659	1.911	Open Manhole	1200
FW1.002	15.109	100.0	FW4	13.490	11.508	1.882	Open Manhole	1200
FW1.003	14.879	100.0	FW5	13.570	11.359	2.111	Open Manhole	1200
FW1.004	34.595	120.0	FW6	13.470	11.071	2.299	Open Manhole	1200
FW1.005	13.561	120.0	FW7	13.690	10.958	2.622	Open Manhole	1200
FW1.006	11.718	120.0	FW8	13.790	10.860	2.930	Open Manhole	1200
FW1.007	12.027	120.0	FW9	13.640	10.760	2.780	Open Manhole	1200
FW1.008	20.403	120.0	FW10	13.520	10.590	2.930	Open Manhole	1200
FW1.009	8.795	120.0	FW11	13.390	10.517	2.773	Open Manhole	1200
FW1.010	8.642	120.0	FW12	13.440	10.445	2.895	Open Manhole	1200
FW1.011	11.875	120.0	FW13	13.290	10.346	2.844	Open Manhole	1200
FW1.012	32.214	120.0	FW14	13.170	10.077	2.993	Open Manhole	1200
FW1.013	5.948	120.0	FW15	13.190	10.028	3.062	Open Manhole	1200
FW1.014	8.470	120.0	FW16	13.230	9.957	3.173	Open Manhole	1200
FW1.015	11.633	120.0	FW17	13.000	9.860	3.040	Open Manhole	1200
FW1.016	18.262	56.9	FW23	12.800	9.545	3.155	Open Manhole	1200
FW2.000	18.340	40.0	FW19	14.100	12.192	1.809	Open Manhole	1200
FW2.001	28.304	40.0	FW20	14.060	11.484	2.476	Open Manhole	1200
FW2.002	16.925	40.0	FW21	13.900	11.061	2.739	Open Manhole	1200
©1982-2020 Innovyze								

Markides Associates Ltd								Page 7
9th Floor, The Tower Building 11 York Road London, SE1 7NX								
Date 27/10/2021 18:44 File SW and FW drainage_27.1...				Designed by Markides Associates Checked by				
Innovyze				Network 2020.1.3				
<u>PIPELINE SCHEDULES for Foul water</u>								
<u>Upstream Manhole</u>								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
FW2.003	o	100	FW21	13.900	11.061	2.739	Open Manhole	1200
FW2.004	o	100	FW22	13.400	10.042	3.258	Open Manhole	1200
FW1.017	o	100	FW23	12.800	9.545	3.155	Open Manhole	1200
FW1.018	o	100	FW24	12.500	9.183	3.217	Open Manhole	1200
FW1.019	o	100	FW25	12.500	8.911	3.569	Open Manhole	1200
FW1.020	o	100	FW26	12.800	8.805	3.955	Open Manhole	1200
<u>Downstream Manhole</u>								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
FW2.003	40.745	40.0	FW22	13.400	10.042	3.258	Open Manhole	1200
FW2.004	19.880	40.0	FW23	12.800	9.545	3.155	Open Manhole	1200
FW1.017	28.960	80.0	FW24	12.500	9.183	3.217	Open Manhole	1200
FW1.018	21.774	80.0	FW25	12.500	8.911	3.569	Open Manhole	1200
FW1.019	8.445	80.0	FW26	12.800	8.805	3.955	Open Manhole	1200
FW1.020	5.253	80.0	FW	12.370	8.740	3.530	Open Manhole	0
<u>Free Flowing Outfall Details for Foul water</u>								
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)		
FW1.020	FW	12.370	8.740	0.000	0	0		
©1982-2020 Innovyze								

APPENDIX F – WATER QUALITY ASSESSMENT

Table 1: Pollution hazard indices for different land use classifications

(land use in bold applicable for the development).

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Table 2: Indicative SuDS mitigation indices for discharges to surface waters (bold text is applicable to this development).

	Mitigation indices		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain/Soakaway	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 3: SuDS mitigation indices provided

For surface water discharge from Individual Residential Roofs			
	Required mitigation indices		
Source	TSS	Metals	Hydrocarbons
Very Low	0.2	0.2	0.05
Type of SuDS component provided			
Filter Drain/Soakaway	0.4	0.4	0.4
Check	+0.2	+0.2	+0.35

Table 4: SuDS mitigation indices provided			
For surface water discharge from Individual Property Driveways			
	Required mitigation indices		
Source	TSS	Metals	Hydrocarbons
Low	0.5	0.4	0.4
Type of SuDS component provided			
1 Catchpit + Dry basin	0.6	0.5	0.6
2 Catchpit + Filter Drain	0.5	0.4	0.4
3 Permeable pavements	0.7	0.6	0.7
Check 1	+0.0	+0.1	+0.2
Check 2	0.0	0.0	0.0
Check 3	+0.2	0.2	0.3

APPENDIX G – SUDS MANAGEMENT & MAINTENANCE PLAN

SuDS MANAGEMENT PLAN

This long-term Management Plan of the Sustainable Drainage System (SuDS) should be implemented at **Land at LRC, Eastergate** to ensure that the drainage network functions as designed. This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the foul and stormwater structures.

Stormwater Runoff Quality

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Drainage System

Maintenance and cleaning of surface water drainage and SuDS components will assure adequate performance. This maintenance program is outlined below;

Maintenance Program

The Site Management Team will conduct the operation and maintenance plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file at the property and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, swales, and soft landscaping.

Regular maintenance should include;

- Inspect permeable paving and outlets - remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the drainage is working in their intended fashion and that they are free of debris; quarterly, inspect gully sumps and bottom of drain manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
- Inspection of external areas for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.

Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

Drainage Operation and Maintenance Log

Site Maintenance Supervisor: _____ Date: _____

☐ Routine ☐ Response to rainfall event __ in ☐ Other: _____

BMP	Frequency	Date Performed	Comments
Gullies and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Pavement Areas (parking, driveways, service areas)	Monthly Sweeping		
	Rubbish & Litter Removal as Necessary		
Landscaped & Vegetated Areas	Maintenance as necessary		