

Technical Note

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Oakley Green Lodge, Oakley Green

23-100-TNO-001 Rev A

Flood Risk and Drainage Statement

January 2024

Rev	Issue Purpose	Author	Checked	Reviewed	Approved	Date
-	Draft for comment	TSH	GAC	TSH	GAC	January 2024
A	Final	TSH	GAC	TSH	GAC	January 2024

1 Introduction

1.1 Overview

- 1.1.1 Charles & Associates Consulting Engineers Ltd (C&A) have been commissioned by Westbourne Homes (WH) to prepare a Flood Risk and Drainage Statement for a proposed redevelopment of land at Oakley Green Lodge, Oakley Green Road, Oakley Green, Berkshire.
- 1.1.2 Westbourne Homes will be submitting a detailed planning application to the Royal Borough of Windsor and Maidenhead (RBWM) for four residential units with associated access, vehicle parking and landscaping. Hereafter referred to as the Site. Refer to Appendix A for the Proposed Site Layout.
- 1.1.3 This Drainage Statement has been prepared to support a detailed planning application and as a means of demonstrating that flooding and surface and foul water drainage issues would not constrain the redevelopment of the Site. Nor would redevelopment have any adverse effects on existing public foul water drainage systems, watercourses, or ground water source protection zones.

1.1.4 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, C&A Consulting Engineers cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

2 Existing Site

2.1 Site Location

- 2.1.1 The site is located to the south of Oakley Green Road, west of Oakley Green, Berkshire. The site is bound to the east and south by agricultural fields, to the west by existing residential dwellings and gardens and to the north by an existing property known as Oakley Green Lodge and beyond Oakley Green Road.
- 2.1.2 The entire site within the redline boundary is approximately 0.89 hectares and is currently used as a repair and refurbishment yard for heavy goods vehicles. It is therefore classified as a brownfield site. Refer to **Figure 2.1** below for a Site Location Plan.



Figure 2.1: Site Location Plan

2.2 Topography

2.2.1 Topographical survey information has been obtained for the site. Refer to **Appendix B**. The highest recorded level is 80.22m AOD (metres above ordnance datum) and is located on the southern boundary. From here the site falls towards the north with the low point of the site being recorded on the northern boundary at 74.65m AOD. The site is brownfield in nature and consists of predominantly hardstanding, concrete with several buildings.

2.3 Geology and Hydrogeology

2.3.1 Published geological data from the British Geological Survey (BGS) indicates the site is underlain by a bedrock of London Clay which comprises clay, silt, and sand. There is no information available for superficial deposits. Refer to **Figure 2.2** below.

Figure 2.2: BGS Geology Map



- 2.3.2 A review of the Department for Environment, Food & Rural Affairs (Defra) "Magic Map" confirms that the site is not within a Groundwater Source Protection Zone or underlain by an aquifer nor is the site within a Nitrate Vulnerable Zone.
- 2.3.3 A Soil Infiltration Assessment was undertaken by Aviron Associates Limited (Aviron) in January 2024 (report reference – 24-131.01 Version 1). As part of this assessment soil logs were taken from the site. The soil logs demonstrate the presence of the Made Ground above London Clay up to 5m deep.
- 2.3.4 Due to the presence of London Clay and high groundwater levels infiltration testing was abandoned. Aviron have stated in the report that "conventional shallow soakaway drainage is not considered to be suitable…". Deep bore soakaways are also stated to be unsuitable due to ground water levels. Refer to Appendix C for the full report.

3 Flood Risk Policy

3.1 National Policy

- 3.1.1 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.
- 3.1.2 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.
- 3.1.3 NPPF sets out a robust approach to the Sequential Test and is intended to provide a rigorous understanding of flood risk. Its aim is to steer new development to areas at the lowest probability of flooding (i.e., Flood Zone 1). The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF).
- 3.1.4 As the site is located within Flood Zone 1, is less than 1 hectare in area, not identified as having critical drainage problems (by the Environment Agency), not on land identified in RBWM's Strategic Flood Risk Assessment as being at increased flood risk in the future or on land subject to other sources of flooding the NPPF states a Flood Risk Assessment (FRA) is not required and the site has passed the sequential test.
- 3.1.5 However, a summary has been provided in Section 4 of this report to demonstrate that the site is not at risk from flooding, nor will it increase flood risk downstream post development thus further demonstrating the sites suitability for redevelopment in terms of flood risk.

3.2 Royal Borough of Windsor and Maidenhead Strategic Flood Risk Assessment

- 3.2.1 A Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) has been produced for RBWM in June 2017 and April 2018, respectively.
- 3.2.2 The aim of the Level 1 SFRA is to collate and present information to define flood risk within the borough and make recommendations for policies and guidance for the effective management of flood risk to property and life. The Level 2 SFRA provides detailed flood risk evidence on the sites identified by RBWM as being potential allocation sites.
- 3.2.3 The redevelopment site is not identified within the SFRAs as a site at risk of flooding now or in the future and therefore redevelopment is suitable for this site in accordance with the SFRAs.

3.3 Royal Borough of Windsor and Maidenhead Borough Local Plan

- 3.3.1 RBWM produced a Borough Local Plan (BLP) which was adopted in February 2022. The aim of the document is to guide the future development of the borough. It sets out a spatial strategy and policies for managing development and infrastructure to meet the environmental, social, and economic opportunities and challenges facing the area up to 2033. The BLP is used to make decisions on planning applications.
- 3.3.2 There are several policies relating to drainage and flood risk identified within the BLP. The following section demonstrates the compliance of the proposed development in relation to the BLP policies.
- 3.3.3 Policy SP2 of the BLP relates to Climate Change and states:

"All development will demonstrate how they have been designed to incorporate measures to adapt to and mitigate climate change. The following measures shall be incorporated into development:

- a. Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;
- b. Proposals involving both new and existing building shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls etc;
- c. Use of trees and other planting, where appropriate as part of green and blue infrastructure schemes, to provide shading of amenity areas, buildings, and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and
- d. All development shall minimise the impact of surface water runoff from the development in the design of the drainage system and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change.
- 3.3.4 The strategy proposed for the redevelopment significantly reduces surface water runoff from the site from brownfield flows to greenfield flows. Refer to Section 5 for further details. Due to the reduction in runoff the redevelopment reduces flood risk to the site as well as downstream of the site. Therefore, compliant with Policy SP2 of the BLP.

3.3.5 Policy QP2 of the BLP relates to Green and Blue Infrastructure and states:

"1. In order to secure multiple biodiversity, recreational, health and well-being and environmental benefits, development proposals will be required to contribute to the maintenance, enhancement, and, where possible, enlargement, of the Borough's existing green and blue infrastructure network, in terms of both quantity and quality. The level of provision of green and blue infrastructure on individual development sites will be expected to conform to the standards set out in the Council's Green and Blue Infrastructure SPD, or a subsequent successor document.

2. Within intensifying urban areas, especially town centres, all forms of development will be expected to incorporate innovative, exemplar quality green and blue infrastructure at both ground floor and upper levels.

3. Development proposals will be expected to pay particular attention to the provision of blue infrastructure in their proposals. This could include (but is not limited to) improving and restoring the quality and quantity of existing natural water features, as well as introducing man-made features and Sustainable Drainage Systems (SuDS)."

- 3.3.6 The site, as it currently exists, does not have any blue and green corridors nor does it contain any natural water features. The proposals, as demonstrated in Section 5, do include the provision of blue and green corridors. Furthermore, the proposals will provide an improvement to water quality leaving the site therefore the proposal will comply with Policy QP2 of the BLP.
- 3.3.7 Policy NR1 of the BLP relates to Managing Flood Risk and Waterways and states:

"1. Flood zones are defined in the National Planning Practice Guidance and the Council's Strategic Flood Risk Assessment (Level 1). Within designated Flood Zones 2 and 3 (and also in Flood Zone 1 on sites of 1 hectare or more in size and in other circumstances as set out in the NPPF) development proposals will only be supported where an appropriate flood risk assessment has been carried out and it has been demonstrated that development is located and designed to ensure that flood risk from all sources of flooding is acceptable in planning terms.

2. The sequential test is required for all development in areas at risk of flooding, except for proposed developments on sites allocated in this plan or in a made Neighbourhood Plan which accord with the provisions of those Plans so far as material to the application. In applying this test development proposals should show how they have had regard to:

- a. the availability of suitable alternative sites in areas of lower flood risk
- b. the vulnerability of the proposed use and the Flood Zone designation
- c. the present and future flood risk

- d. the scale of potential consequences
- e. site evacuation plan in the event of potential flooding.

Only water compatible uses and essential infrastructure development will be supported in the area defined as functional floodplain. The exception test will still apply.

3. The sequential approach should be followed by developers for all development so that the most vulnerable development is located in the lowest risk flood areas within a site, taking account of all sources of flood risk.

4. Development proposals should include an assessment of the impact of climate change using appropriate climate change allowances over the lifetime of the development so that future flood risk is taken into account.

5. In all cases, development should not itself, or cumulatively with other development, materially:

- a. impede the flow of flood water
- b. reduce the capacity of the floodplain to store water
- c. increase the number of people, property or infrastructure at risk of flooding
- d. cause new or exacerbate existing flooding problems, either on the proposal site or elsewhere.
- e. reduce the waterway's viability as an ecological network or habitat for notable species of flora or fauna.
- 6. Development proposals should:
 - a. increase the storage capacity of the floodplain where possible
 - b. incorporate Sustainable Drainage Systems in order to restrict or reduce surface water runoff
 - c. reduce flood risk both within and beyond sites wherever practical
 - d. be constructed with adequate flood resilience and resistance measures suitable for the lifetime of the development
 - e. where appropriate, demonstrate safe access and egress and incorporate flood evacuation plans.

7. The exception test will need to be applied in accordance with national policy and guidance in the NPPF and PPG, including on sites allocated in the development plan. This should demonstrate how flood risk would be managed on the site, including that the sustainability benefits of the site outweigh the flood risk and that the development will be safe for its lifetime, taking into account the vulnerability of its users and that it will not increase flood risk elsewhere. Where possible, development will reduce flood risk overall.

8. Development proposals will be required to incorporate appropriate comprehensive flood risk management measures as agreed with the Environment Agency of the Council as Local Lead Flood Authority.

9. Development proposals near rivers (including culverted rivers) should retain or provide an undeveloped 8 metre buffer zone alongside main rivers and, where practicable and appropriate, ordinary watercourses. This buffer zone should be on both sides of the watercourse and be measured from the top of the river bank at the point at which the bank meets the level of the surrounding land.

10. Further development land associated with strategic flood relief measures will be safeguarded, including the proposed River Thames Scheme and the flood relief channel from Datchet to Wraysbury. Development should facilitate the improvement and integration of waterways in Maidenhead, including the completion of the Maidenhead Waterway Project."

3.3.8 The site, as previously stated, is in Flood Zone 1, is less than 1 hectare in area and is not at risk of flooding from any sources. The development proposals incorporate SuDS and reduce runoff from the development and is therefore compliant with Policy NR1 of the BLP.

4 Evaluation of Flood Risk

- 4.1.1 NPPF identifies potential sources of flooding that could affect sites.
 - Flooding from the sea or tidal flooding.
 - Flooding from rivers or fluvial flooding.
 - Flooding from land or pluvial.
 - Flooding from groundwater.
 - Flooding from sewers.
 - Flooding from reservoirs, canals, and other artificial sources.

4.2 Flooding from Rivers and The Sea (Fluvial and Tidal Flooding)

4.2.1 The site has been identified as being in Flood Zone 1. Therefore, the site is considered to be at very low risk of flooding from rivers or the sea. Refer to **Figure 4.1** below.

Figure 4.1: Government Flood Maps for Planning – Rivers and Sea



4.3 Flooding from Land (Pluvial Flooding)

4.3.1 Intense rainfall, often of short duration, which is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. Increased run-off from developed areas consisting of impermeable surfaces can increase overland flows. If the flow paths of these overland flows are not carefully considered during the detail design and planning stages, flooding from overland flows could occur.

4.3.2 The surface water flood maps show the site is has very small amounts of pluvial flooding, the majority of which is adjacent to the eastern boundary on the adjoining field. The pluvial flooding that is generated from this site is not an overland flow path emanating from upstream. Therefore, due to the introduction of the re-development and a new drainage regime for the site the surface water flooding will be reduced within the site, if not eradicated. Refer to Figure 4.2 below.

Figure 4.2: Government Flood Maps for Planning – Surface Water Flooding



4.4 Flooding from Sewers

- 4.4.1 Local urban drainage should be considered, as every drainage system has a design capacity, which at some point can be exceeded. Sewer and surface water flooding generally results in localised short-term flooding caused by intense rainfall events which overload the capacity of sewers or runs off adjacent land as sheet flow. Flooding can also occur as a result of blockage, poor maintenance, or structural failure.
- 4.4.2 The existing sewers on the site are privately maintained. Following the redevelopment, the existing sewer system will be replaced with new independent foul and surface water networks constructed to the latest technical standards and specifications. Therefore, the risk of sewer flooding is considered to be very low.

4.5 Flooding from Groundwater

- 4.5.1 Groundwater flooding generally occurs when water levels in the ground rise above surface elevations. Severe storm events could cause groundwater levels to rise above ground level. Underlying geology is the principal factor that effects groundwater flooding. Groundwater flooding most commonly occurs in low lying areas which are underlain by permeable rocks or aquifers. The site is low lying and is underlain by aquifers so there is a medium to high risk of ground water flooding.
- 4.5.2 In reference to **Appendix C** the Soil Infiltration Assessment shows that groundwater was encountered at approximately 3m deep. The groundwater that was encountered was identified as perched in fissures of the clay strata / sandy partings. This is supported by the SFRA which does not highlight any groundwater flooding incidents in or around the site.
- 4.5.3 Groundwater monitoring wells were installed upto 5m deep, the monitoring showed ground water levels at 0.82m below ground level. However, this was expected to be resultant of surface water which has entered the well following recent heavy rainfall and is perched within the underlying and surrounding clay.

4.6 Flooding from Reservoirs, Canals, and other Artificial Sources

- 4.6.1 The main cause for flooding from a reservoir would be a structural failure in the walls of the reservoir or some form of accident-causing significant damage to the structure of the reservoir. This is highly unlikely.
- 4.6.2 Reservoir flood maps are available from the government website and in this case show the site is clear of the maximum extent of flooding from reservoirs. Therefore, the site is considered to be at very low risk from flooding from artificial sources.

5 Surface Water Management Proposals

5.1 Development Proposal

5.1.1 The proposed development is for four residential dwellings including, access from Oakley Green Road, sustainable drainage systems, landscaping, and all associated infrastructure. A site masterplan illustrating the layout of the development has been prepared by Ascot Design and is provided within **Appendix A**.

5.2 Climate Change

- 5.2.1 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 surface water drainage designs for proposed developments.
- 5.2.2 Having reviewed the Climate Change Allowance map the site lies within Maidenhead and Sunbury Management Catchment. **Figure 5.1** below summarises climate change allowances within this catchment.



Figure 5.1: DEFRA Climate Change Allowance Map

Maidenhead and Sunbury \bigotimes Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	25%	35%

1% annual exceedance rainfall event

Epoch		
	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	40%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022 5.2.3 The proposed surface water drainage strategy will be designed to cater for the upper allowance for the 2070s epoch, thus providing a suitable surface water drainage solution for the lifetime of the development. All events up to and including the 100 year + 40% climate change event will be catered for within the proposed system. Further analysis will be undertaken to establish the effect on the system for the 1 in 30 year + 35% climate change event.

5.3 Proposed Surface Water Drainage Strategy

- 5.3.1 A comprehensive sustainable drainage system will be implemented to prevent runoff from this development increasing flood risk to other areas. Due the sites existing use as a heavy goods vehicle repair and refurbishment yard the redevelopment will provide significant betterment to the area in terms of water quality and flow.
- 5.3.2 This will be fully detailed at the detail drainage design stage of the proposed redevelopment, although an indicative strategy to demonstrate that SuDS can be delivered is described below.
- 5.3.3 There are several options available to impose surface water restrictions on proposed development plots such as attenuation ponds, oversized sewers, below ground storage tanks, pervious paving, infiltration systems etc. NPPG and Approved Document Part H sets out a hierarchy for surface water disposal, which encourages a sustainable approach.
 - An adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable.
 - A Watercourse, or where that is not reasonably practicable.
 - to a surface water sewer, highway drain, or other drainage system.
 - to a combined sewer.
- 5.3.4 As described in **Section 2** above, a site investigation has been undertaken. It has been determined that discharging to ground is not appropriate for this site due to the cohesive nature of the soils (London Clay). Surface water flows emanating from the development will discharge into an existing ditch located to the north of the site, east of the site access.
- 5.3.5 Refer to **Appendix D** for the Proposed Surface Water Drainage Strategy. The strategy is further explained below.

5.4 Surface Water Network and Proposed SuDS

- 5.4.1 The surface water network will collect all surface water run-off from the private drives, and roofs of the garages and houses. The surface water will initially be collected by a traditional piped system before flowing to a proposed swale and filter drain arrangement along the eastern edge of the access road. The access road itself it will be designed to fall and drain into the swale.
- 5.4.2 The swale and filter drain will treat, convey, and store surface water runoff from the redevelopment prior to discharging to the existing ditch, to the east of the access road, at restricted rates. An attenuation tank has been provided beneath the access road to provide additional storage of the treated water to enable the restricted discharge rate. The discharge will be controlled and restricted through the use of a vortex flow control (Hydrobrake or similar).

5.5 Existing Discharge Rates

5.5.1 Pre-development brownfield run-off rates have been calculated for the existing site. This is based on an existing impermeable area of 0.333 ha measured from the topographical survey. The brownfield rates are summarised in Table 5.5.1 below. The brownfield calculations are provided in Appendix E.

Return Period	Run-Off Rate (I/s)
1 in 2 year	45.8
1 in 30 year	110.5
1 in 100 year	141.8

5.5.2 Greenfield run off rates have been established for the site. These have been included in **Appendix F** and summarised in Table 5.5.2 below.

Table 5.5.2: Greenfield Run-off rates

Return Period	Run-Off Rate (I/s)
1 in 1 year	3.3
QBAR	3.9
1 in 30 year	8.9
1 in 100 year	12.5

5.6 Proposed Discharge Rates

- 5.6.1 To provide a surface water strategy that complies with national and regional policy, as listed above, the surface water drainage strategy for the development proposes to restrict flows from the redevelopment to a maximum of 3.9l/s for all storm events up to and including the 100 year plus 40% CC with all runoff being attenuated on site prior to discharge to the existing ditch.
- 5.6.2 A check was undertaken for the 30 year + 35% CC event in accordance with the Maidenhead and Sunbury Management Catchment requirements, see 5.2 above. The full set of design calculations are included in **Appendix G** demonstrating the reduced discharge can be achieved and the proposed strategy is suitable for the redevelopment.
- 5.6.3 As has been demonstrated above the proposed discharge rates are significantly lower than the existing discharge rates providing significant betterment and reducing the potential for offsite flooding and reducing overall flood risk.

6 Foul Water Proposals

- 6.1.1 The sewerage undertaker for the site is Thames Water. The foul water drainage proposal intends to connect to the existing public sewer owned and maintained by Thames Water. Existing records of Thames Water's network within the area are included within Appendix H of this report.
- 6.1.2 As can be seen there is an existing foul water sewer running in Oakley Green Road to the north of the development.
- 6.1.3 A foul water drainage strategy for the site has been produced and has been included in Appendix I of this report. This shows that it is possible to drain the entire site to the connection point via gravity and that a foul water pumping station will not be required.

6.1.4 Due to the recently introduced Infrastructure Charges a fee will be payable to Thames Water for each property connecting into the public sewer (this is also applicable for water supply). The infrastructure charges paid to Thames Water will cover the costs of any upgrades required to serve the site.

7 Conclusion

- 7.1.1 C&A have prepared this Flood Risk and Drainage Statement, on behalf of Westbourne Homes, to demonstrate that flooding and surface and foul water drainage issues would not constrain the redevelopment of the Site. The site is a brownfield site located to the west of Oakley Green, Berkshire.
- 7.1.2 As has been demonstrated with this Technical Note and associated appendices the proposed redevelopment at Oakley Green Lodge, Oakley Green can be drained in a sustainable manner.
- 7.1.3 The proposals described above significantly reduce surface water runoff flows from the site, improve the quality of the surface water runoff, reduce flood risk to the site and downstream of the site and therefore complies with the relevant planning policy for the area.
- 7.1.4 The redevelopment provides significant betterment to the area in terms of flood risk and drainage and therefore, there is no reason for this site not to be granted planning permission in terms of flood risk and foul and surface water drainage.

Appendix A Masterplan

A Charles & Associates





Appendix B Topographical Survey

Charles & Associates

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176300 N

176280 N +

_176260 N +

76240 N





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407 202	
\mathbb{N}	LEGEND FEATURE STYLES FEATURE ARREVIATIONS
\wedge	SURVEY CONTROL A AV Air Valve
	FENCE BS Bus Stop BT British Telecom BW Brick Wall
	HEDGE CB Conc Bollard CL Cover Level
_176380 N	SWS EC Electric Cover
	WATERw FH Fire Hydrant FL Floor level
	POWER LINE G Gully (OVERHEAD) GM Gas Meter
	GV Gas Valve TELECOM LINET IL Invert Level (OVERHEAD) IC Inspection Chamber
	ELECTRIC MAIN E KLS Keep Left Sign KO Kerb Offlet LB Letter Box
	GAS MAING KRR Marker
	EMBANKMENT V V MB Metal Bollard
	'' P Post PI Petrol Interceptor RG Road Gully
	RNB Road Name Board RS Road Sign BW Betaining Wall
	BWR Barbed Wire SC Stopcock
	CI Corrugated Iron TP Telegraph Pole CL Chain Link TCB Telephone Box
	CPL Conc Panel TJB Tel.Junc.Box CP Chestnut Paling TL Traffic Light CW Chicken Wire V Valve
176360 N	IW Interwoven VP Vent Pipe IR Iron Railing WL Water Level OB Openboard WM Water Meter
+ -	PR Post and rail WO Water Outlet PW Post and Wire WV Water Valve
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	HEDGE	E	<u> </u>	BW Brick Wall CB Conc Bollard CL Cover Level	
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,176220 N	SWS WATER	w_		EC Electric Cover EP Electricity Pole FH Fire Hydrant	
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		т-		GV Gas Valve IL Invert Level	
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	EMBANKMENT			MP Metal Post MH Manhole	
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	CB Close Bo Cl Corrugate Cl Chain Liu	oard ed Iron ok		SV Sluice Valve TP Telegraph Pole TCB Telephone Box	
	CPL Conc Pa CP Chestnut	nel Paling		TJB Tel.Junc.Box TL Traffic Light	
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	FENCE/	BS Bus Stop BT British Telecom BW Brick Wall
	HEDGE	CB Conc Bollard CL Cover Level
	SWS	EB Electric Box EC Electric Cover
	WATER	FH Fire Hydrant FL Floor level
_1/6060 <u>N</u>	POWER LINE (OVERHEAD)	G Gully GM Gas Meter GV Gas Valve
	(OVERHEAD)	IL Invert Level IC Inspection Chamber KLS Keep Left Sign
		KO Kerb Offlet LB Letter Box LP Lamp Post
		MKR Marker MP Metal Post MH Manhole
		MB Metal Bollard P Post Pl Petrol Interceptor
		RG Road Gully RNB Road Name Board RS Road Sian
	FENCE TYPES BWR Barbed Wire	RW Retaining Wall SA Soakaway SC Stopcock
	CB Close Board Cl Corrugated Iron CL Chain Link	SV Sluice Valve TP Telegraph Pole TCB Telephone Box
	CPL Conc Panel CP Chestnut Paling CW Chicken Wire	TJB Tel.Junc.Box TL Traffic Light V Valve
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Appendix C Soil Infiltration Assessment

SOIL INFILTRATION ASSESSMENT

Client	Westbourne Homes Limited
Site	Oakley Green Lodge, Oakley Green Road, Windsor, SL4 4PZ

Project	Version	Date
24-131.01	1	16 January 2024

1.0 INTRODUCTION

At the instruction of Westbourne Homes Limited (the Client), Aviron Associates Limited (Aviron) has undertaken a desk-based review and site investigation to appraise the viability of surface water drainage via infiltration devices.

	Table 1: The Site						
Site Location	The site is located off Oakley Green Road, to the rear of Oakley Green Lodge, in Oakley						
	Green, approximately 4 kilometres (km) to the west of Windsor town centre.						
Current Land Use	The site comprised a commercial vehicle maintenance facility (Global Commercials						
	Mechanics) with a large central workshop, smaller northern workshop and office and						
	eastern stable block used as a store. Numerous vehicles, predominantly HGVs are stored						
	across the site.						
Surrounding	The site is bound by residential properties, located along Oakley Green Road, to the north						
Land Use	and west of the site. A disused, overgrown field is situated to the south of the site and an						
	agricultural field can be found to the east.						
Proposed Land	It is proposed to residentially redevelop the site and enclosed within Appendix I is Figure 1,						
Use	which provides a Proposed Development Plan.						

2.0 DESK BASED RESEARCH

The British Geological Survey (BGS) GeoIndex has been used to determine the listed geology, which is reported within table 2.

Table 2: Anticipated Geology								
Superficial	None reported							
Geology								
Solid Geology	London Clay Formation (LCF)							
Typically, brown, blue, grey Clay								
	Lambeth Group (LMB)							
	Typically multi-coloured Clay and Sand							
	Chalk Groups (CHK)							
	Typically, white Chalk with flint nodules.							
Aquifer Status	LCF - Unproductive Strata (formerly non-aquifer)							

A local borehole log has been accessed from the BGS website and is enclosed within Appendix II.

The borehole was drilled at Fifield House, Oakley Green Road, Windsor, SL4 4QF approximately 1,600m to the west of the site between December 2004 and January 2005 by HD Drilling Limited to a depth of 80m below ground level (bgl). The BGS ID is 15624791 and BGS Reference is SU97NW407. Enclosed within **Appendix I** is **Figure 2** which provides a BGS Borehole Location Plan.

Aviron Associates Limited - Head Office Badgemore House – Badgemore Park – Gravel Hill – Henley on Thames – RG9 4NR Contacts T; 01491 413 722 - M: 07787 771 686 - F: 01491 413 722 - E: james@aviron.co.uk - W: www.aviron.co.uk Registered Office Herschel House, 58 Herschel Street, Slough, Berkshire, SL1 1PG Company no. 06471253 - VAT no. 929 5083 96 A summary of ground conditions encountered within the 'BGS' borehole is presented in table 3.

Table 3: Summary of Local 'BGS' BH Log				
Description	From	То		
	(bgl)	(bgl)		
Topsoil	GL	0.2m		
Soft blue and brown CLAY	0.2m	2.2m		
CLAYSTONE	2.2m	2.4m		
Firm blue and brown CLAY	2.4m	4.0m		
Stiff blue CLAY with layers of Claystone	4.0m	13.0m		
Blue silty CLAY with shells and pebbles	13.0m	15.0m		
Stiff multi-coloured CLAY	15.0m	20.0m		
Grey ROCK	20.0m	20.1m		
Stiff multi-coloured CLAY with bands of Sand	20.1m	25.0m		
Brown Sand	25.0m	27.0m		
Very stiff blue brown CLAY				
Light grey SAND	34.7m	36.0m		
Green silty SAND	36.0m	38.0m		
Grey silty SAND	38.0m	39.0m		
Very hard grey silty CLAY with flint and pebbles	39.0m	40.0m		
Chalk with lots of flints	40.0m	60.0m		
Very hard CHALK	60.0m	60.6m		
Firm white CHALK with lots of flints and some bands of hard Chalk	60.6m	80.0m		
Water struck at 46.0m bgl				
Water resting at 9.45m bgl				
	Table 3: Summary of Local 'BGS' BH LogDescriptionTopsoilSoft blue and brown CLAYCLAYSTONEFirm blue and brown CLAYStiff blue CLAY with layers of ClaystoneBlue silty CLAY with shells and pebblesStiff multi-coloured CLAYGrey ROCKStiff multi-coloured CLAY with bands of SandBrown SandVery stiff blue brown CLAYLight grey SANDGreen silty SANDGrey silty SANDVery hard grey silty CLAY with flint and pebblesChalk with lots of flintsVery hard CHALKFirm white CHALK with lots of flints and some bands of hard ChalkWater resting at 9.45m bgl	Table 3: Summary of Local 'BGS' BH LogDescriptionFrom (bgl)TopsoilGLSoft blue and brown CLAY0.2mCLAYSTONE2.2mFirm blue and brown CLAY2.4mStiff blue CLAY with layers of Claystone4.0mBlue silty CLAY with shells and pebbles13.0mStiff multi-coloured CLAY15.0mGrey ROCK20.0mStiff multi-coloured CLAY with bands of Sand20.1mBrown Sand25.0mVery stiff blue brown CLAY34.7mGreen silty SAND36.0mGrey silty SAND38.0mVery hard grey silty CLAY with flint and pebbles39.0mChalk with lots of flints40.0mVery hard CHALK60.0mFirm white CHALK with lots of flints and some bands of hard Chalk60.6mWater resting at 9.45m bgl		

GL = Ground Level

3.0 GROUND INVESTIGATION

3.1 Drilling of Boreholes and installation of Monitoring Wells

Window sample boreholes WS1 to WS5 were drilled using a Dando Terrier drilling rig on 11 September 2018 with WS1 located in the north of the site, WS2 the centre and WS3-WS4 the south.

The locations of the window sample boreholes are illustrated in Figure 3, which is included as Appendix I.

The purpose of the window sampling was to evaluate ground conditions to depths of up to 5m bgl for the purpose of evaluating ground conditions and also determining groundwater levels.

The action of window sampling enables the installation of monitoring wells to undertake standing groundwater levels and falling head infiltration testing for which, a test following the general practices of the Building Research Establishment [BRE] Digest D365 - 2016, 'Soakaway Design' (BRE D365) can be completed.

Standard Penetration Tests (SPTs) were also undertaken at 1m intervals to depths of up to 5m bgl within the boreholes in accordance with BS EN SO 22476-3 "Standard Penetration Test 2005". Disturbed soil samples were also collected from bored arisings for geotechnical material property laboratory tests to determine Volume Change Potential (VCP) of Clay.

3.2 Ground Conditions Encountered

The **exploratory hole logs** and **photographs** are presented in **Appendix III** and generally ground conditions are summarised in table 5.

	Table 5: Summary of Ground Conditions Encountered						
Unit	Description	From (bgl)	To (bgl)				
Surfacing	Surfacing of CONCRETE at WS1 and WS2	GL	0.12m				
Made Ground	All locations and generally a grey, black re-worked gravelly Clay with type 1	GL	0.3/0.45m				
LCF	Brown, grey slightly sandy CLAY with occasional yellow Sand partings	0.3/0.45m	>5.0m				
Groundwater	Encountered within WS2 at 3.0m, WS3 at 3.0m and WS5 at 3.0m and within Clay fissures/sandy partings.	d expected to	be perched				
GL = Ground Level	·						

3.3 Monitoring Well Installation and Groundwater Standing Level Monitoring

Three window sample boreholes were converted to monitoring wells to enable standing level groundwater level and falling head infiltration tests. Wells were installed into 101mm diameter window sample boreholes using 63mm external diameter and 50mm internal diameter HDPE standpipe. Table 6 describes the construction of the wells.

		iction	
Location	Depth of plain pipe	Response zone; depths of	Purpose
	and bentonite seal	slotted pipe with gravel screen	
WS1	GL-1.0m	1.0m – 5.0m	To enable falling head testing within the
WS2	GL-1.0m	1.0m – 5.0m	underlying Clay, and groundwater
WS3	GL-1.0m	1.0m – 5.0m	standing level monitoring.

An Aviron technician returned to site to complete groundwater standing level monitoring and falling head infiltration testing on 15 January 2024.

Table 7 provides standing level groundwater 'dips' during monitoring.

Table 7: Standing Groundwater Levels					
Location	Depth bgl				
	15 January 2024				
WS1	1.06m				
WS2	0.82m				
WS3	0.98m				

Groundwater was encountered within monitoring wells is expected to be resultant of surface water which has entered the wells (following recent heavy rain) and is perched within the underlying and surrounding unit of Clay.

4.0 LABORATORY TESTING

Disturbed samples were collected where appropriate from the boreholes. A programme of geotechnical laboratory testing was undertaken at K4 Soils Laboratory. Testing was completed using the clay soils encountered.

The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of geotechnical testing are provided in table 8.

Table 8: Soil Geotechnical Testing						
Test	Standard	Number of Samples				
Atterberg Limits (and Moisture Content) To determine the volume change potential of fine (clay and silt) soils and the influence of trees on the proposed development	BS1377:1990:Part 2:Clause 4.3 & 5.3	12 (20)				

Atterberg limits tests conducted on the soils beneath the site at depths of between 1.0m and 5.0m bgl indicate that the fine soils of the London Clay Formation comprise inorganic clays of high and very high plasticity (CH/CI), with a modified plasticity index of between 35% and 54%.

For the purposes of this assessment and in accordance with NHBC Standards Chapter 4.2, Building Near Trees, the CLAY strata anticipated at foundation formation of 1.5m bgl across the site are classified as being of high volume change potential.

The results of Atterberg limits testing results are enclosed within Appendix V.

5.0 INFILTRATION TESTING

Falling head infiltration tests were abandoned due to the high groundwater levels indicating negligible permeable Clay strata.

6.0 INFILTRATION SOAKAWAY DRAINAGE OPINION

6.1 Shallow Soakaway Drainage

Conventional shallow soakaway drainage is not considered to be suitable for any new development as the London Clay Formation is typically of negligible permeability and perched was levels of at a level which would not provide the necessary freeboard.

An alternative method of surface water disposal to conventional shallow soakaway drainage should be sought.

6.2 Deep Bore Soakaways

Deep bore soakaways are not considered suitable. The sub-crop of typically permeable Chalk strata is circa 40m bgl and rest water level is 9.45m bgl as thus surface water would be discharge into relatively shallow groundwater which has risen under artesian pressure from within the underlying Chalk aquifer, circa 40m deep.

An alternative method of surface water disposal to deep bore soakaway drainage should be sought.

7.0 CONCLUSIONS

The results of this assessment should be presented to the appointed drainage consultant to enable their drainage strategy to be prepared.

We trust that you find the above to be satisfactory, however should you require any further information please do not hesitate to contact the undersigned.

Prepared by	Approved by
Orlando Blackwell BEng (Hons) MSc (Eng)	James Burkitt BEng (Hons) CEnv MRICS
Principal Engineer	Managing Director

Appendix I

Figure 1 – Proposed Development Plan Figure 2 – BGS Borehole Location Plan

Figure 3 – Exploratory Hole Location Plan

	571			~	N 040107	
British Geological Survey	HYDR	OGEOLOC	Y RES	SEARC	en grou	л Р ?/
Form WR-38 (BGS)	BOREH	OLE RECOR	D	S	Ugy NW/	407
A SITE DETAILS						
Borehole drilled for Location NGR (8 fig.)	Mr A Benr Fifield F	House Farm, Oakl	ey Green R	oad, Winds Please attac	or, Berks SL4	4QF
Ground Level (if known)	30 m A O	D	Dercen.			
Drilling Company	H.D. Deil	ling Itd	Def 1	0220		
Date of Drilling	Commenced	December 2004	Nei 1	Completed	January 2005	
B CONSTRUCTION DE	TAILS			1	cultury need	
(point from which all measure Borehole drilled diameter	ments of depth ar	e taken e.g. flange, edg 300 mm fro 250 mm fro	m bel re of chamber, - om <u>G L</u> om <u>16.0</u>	ow GL etc.) to _16.0 to _41.0	_ m/depth _ m/depth	
		mm fro	m _41.0	to 80.0	m/depth	
Casing material and type (e.g. if plain steel, pl	diameter astic slotted)	mm fro	m	to	_ m/depth	(0
Plain steel	_diameter	_200 mm fro	m0.5	to _44.0	m/depth	14
	diameter	mm fro	m	to	m/depth	
	diameter	mm fro	m	to	m/depth	
Grouting details		Class Gl nea	t cement g	rout from	0.5 to 41.0 m	BGL
Water struck at		46.0	m (depth belo	w datum -	mbd)	
Rest water level on complet	ion	9.45	mbd			
and a second second our possibles						
C TEST PUMPING SUN	IMARY (Please	e supply full details (on Forms WR	-39)		

for

Date(s) of measurements 4th & 5th July 2005 Please supply chemical Analysis if available.

Pumping rate

Recovery to

(from end of pumping)

960 m³/d:1/s

11.41 mbd in30 mins: hrs: days

_____ days/hours

BGS ID: 15624791 : BGS Reference: SU97NW407 EPSG: 27700 : 491140, 176410

Geological	(.6)	Description of strata	CC LI ICI	hickness	Depth
Classification			(30-)		- N.
(BGS only)			~	m	m
	Topsoil			0.2	0.2
	Soft blue and bro	wn clay		2.0	2.2
	Claystone			0.2	2.4
	Firm blue and bro	wn clay		1.6	4.0
	Stiff blue clay w	with layers of claystone		9.0	13.0
	Blue silty clay w	with shells and pebbles		2.0	15.0
	Stiff multi-colou	ured clay		5.0	20.0
	Grey rock			0.1	20.1
	Stiff multi-colou	ured clay with bands of sa	nd	4.9	25.0
	Brown sand		(~0~)	2.0	27.0
	Very stiff blue a	and brown clay		7.7	34.7
	Light grey sand			1.3	36.0
	Green silty sand			2.0	38.0
	Grey silty sand			1.0	39.0
	Very hard grey si	ilty clay with flint and p	ebbles	1.0	40.0
	Chalk with lots of	of flints		20.0	60.0
	Very hard chalk	(· · ·	0.6	60.6
	Firm white chalk	with late of flinte and e	ome hande of	0.0	
	hard chalk	with lots of lines and s	une bands of	19.4	80.0
	END OF BOREHOLE				
	(continue on separate pap	ge if necessary			
	Other comments (e.g. g	as encountered, saline water interce	pted, etc.)		
2					
FOR OFFICIA	L USE ONLY	(_0*)			
FI	Æ	CONSENT NO.	NGS REF NO.		
LIC	C NO.	PURPOSE	NRA REF NO.		
		CODY TO-	ENTERED PV		
DATE REC:		COPT IO:	ENTERED BI:		
	(2)				

Contact BGS: ngdc@bgs.ac.uk

Appendix III Exploratory Hole Logs and Photographs

	-	Ń	Y)		Bo	oreho	ole Log	Borehole No WS 1	0.
Projec	t Name:	Oakley	Oakley Green Lodge Project No. 19.240.04 Co-ords:			Hole Type				
Locatio	on:	Oakley	Green,	Windsor, SL4 4PZ	18-240.01 2Z		Level:		Scale 1:50	
Client:	Client:				Dates:	11/09/2018	Logged By dn	/		
Well	Water Strikes	Sampl	e and li	n Situ Testing	Depth (m)	Level (m)	Legend	Stratum Description	n	
		Depth (m) 0.20 0.45 0.50 1.00 1.00 2.00 2.00 2.00 3	Type ES B SPT U D SPT D SPT D SPT	Results N=8 (1,1/2,2,2,2) N=13 (2,3/3,3,3,4) N=17 (2,3/4,5,4,4) N=19 (2,3/4,4,5,6) N=20 (3,3/4,5,5,6)	(III) 0.12 0.30 1.20 () 1.20 () () () () () () () () () ()			Concrete MADE GROUND black ashy sandy of fragments Firm brown and grey mottled slightly s with yellow sandy partings and rootlet fissured brown and grey mottled sligh with yellow sandy partings End of Borehole at 5.00m	ay with brick sandy CLAY s ing stiff locally tly sandy CLAY	1
Remar	ks: No ç	groundwater e	ncounte	ered					AGS	10

									Borehole N	lo.
1	-		Y	-		Bo	reho	ole Log	WS 2	
		<u>N V</u>						0	Sheet 1 of	1
Proje	ct Name:	Oakley	Green L	_odge	roject No.		Co-ords:		Hole Type	Э
Looot		Oaklay	Crean	Windoor SI 4 4DZ	5-240.01		Level		Scale	
Local	ion:	Oakley	Green,				Level		1:50	
Client	:						Dates:	11/09/2018	Logged By dn	
Well	Water	Sampl	e and Ir	n Situ Testing	Depth	Level	Legend	Stratum Description		
		Depth (m)	Туре	Results	0.12	()		Concrete		
		0.20	ES		0.40			MADE GROUND soft grey stained sar with brick fragments and black patches	idy gravelly clay	
					0.40			Firm greenish grey and brown mottled CLAY with vellow sandy partings and r	slightly sandy ootlets] -
		0.70	ES		0.70			Firm, medium strength, becoming stiff	locally	
		1.00 1.00	D ES					CLAY with yellow sandy partings	y banay	1 -
		1.00	SPT	N=9 (1,1/2,2,2,3)						
B		1.50 - 1.95								
		2 00								2
		2.00	ES SPT	N=14 (2 2/3 4 3 4)						
		2.50	D	11-14 (2,2/0,4,0,4)						
		3.00	D					claystone at 2.90 m		3 -
		3.00	SPI	N=16 (3,3/3,4,4,5)						
		3.50	D							-
								-		
		4.00 4.00	D SPT	N=18 (3,2/4,4,5,5)						4 -
		5.00			5.00					5
		5.00	SPT	N=19 (3,3/4,5,5,5)	5.00			End of Borehole at 5.00m		
										6 -
										-
										7 -
1										
1										
1										8 -
1										
						1				-
1										9 -
						1				-
										10 -
Rema	rks: Grou	undwater enco	ountered	l at 3.0m						
									AGS	5

Project Name: Oakley Green Lodge Project No table View Coards: Hole View Hole View Locator: Oakley Green, Windor, SL 4 PZ Level Scale Scale <t< th=""><th></th><th>_</th><th></th><th>Ø</th><th>)</th><th></th><th>Во</th><th>oreho</th><th>ole Log</th><th>Borehole N WS 3</th><th>√0. ∮ f 1</th></t<>		_		Ø)		Во	oreho	ole Log	Borehole N WS 3	√0. ∮ f 1
Understand Oakley Green, Windsor, SL4 4PZ Level: 1:50 1:50 Clent Same 1:00 Legged By Legged By Legged By 100/2018 Legged By Legged By 100/2018 Image: Bit Comparison Image:	Projec	t Name:	Oakley	Green I	Lodge	Project No.		Co-ords:		Hole Typ	e
Line Line <thline< th=""> Line Line <thl< td=""><td>Locatio</td><td>on:</td><td>Oakley</td><td>Green,</td><td>Windsor, SL4 4PZ</td><td>10 240.01</td><td colspan="2">Level:</td><td>Scale</td><td></td></thl<></thline<>	Locatio	on:	Oakley	Green,	Windsor, SL4 4PZ	10 240.01	Level:		Scale		
	Client:							Dates: 11/09/2018 Logged dn dn dn dn		Logged B dn	3y
Deput (n) (p) (reading of the second of the	Well	Water Strikes	Sampl	e and li	n Situ Testing	Depth (m)	Level (m)	Legend	Stratum Description	on	
Remarks: No groundwater encountered at 3.0m 10			Depth (m) 0.40 1.00 1.00 1.50 1.50 2.00 2.00 2.50 3.00 3.00 3.50 4.00 4.00 4.00 5.00	Type ES D SPT D SPT D SPT D SPT SPT	Results N=8 (1,1/1,2,2,3) N=13 (2,2/3,3,3,4) N=15 (2,3/3,3,4,5) N=21 (25 for 80mm/9,4,4,4) N=21 (4,4/5,5,5,6)	- (m) 0.45 1.50 5.00			MADE GROUND Type 1 with brick a cobbles Firm becoming stiff brown and grey r sandy CLAY with yellow sandy partir Firm to stiff, medium strength, becom fissured brown and grey mottled slig with yellow sandy partings claystone at 4.30 m End of Borehole at 5.000	mottled slightly ngs and rootlets	- 1 - - 2 - 3 - 4 - - 5 - 6 - 7 - 8 - 8 - 9 -
	Remar	ks: No g	groundwater e	ncounte	ered at 3.0m						10 -

-		Ŋ	Ĵ		Во	reho	ole Log	Borehole No. WS 4
Project Name:	Oakley	Green I	Lodge Pr	oject No.		Co-ords:		Hole Type
Location:	Oakley	Green,	Windsor, SL4 4PZ	5-240.01		Level:		Scale 1:50
Client:						Dates:	11/09/2018	Logged By dn
Well Water Strikes	Sample	e and li	n Situ Testing	Depth (m)	Level (m)	Legend	Stratum Description	n
Strikes	Depth (m) 0.30 1.00 1.00 1.50 - 1.95 2.00 2.50 3.00 3.00 3.00 4.00 4.00 4.00 5.00 5.00	Type ES D SPT U D SPT D SPT D SPT	Results N=10 (1,1/2,2,3,3) N=14 (2,3/3,3,4,4) N=17 (3,3/4,4,4,5) N=22 (4,4/5,5,6,6) N=23 (4,5/5,6,6,6)	 (m) 0.20 0.40 2.10 5.00 	(m)		MADE GROUND road planings with b concrete fragments MADE GROUND brick and concrete of Firm, medium strength, becoming stiff grey motiled slightly sandy CLAY with partings and rootlets to 1.5m Stiff locally fissured brown and grey m sandy CLAY with yellow sandy parting claystone at 4.70 m End of Borehole at 5.00m	rick and pobbles f brown and yellow sandy 1 - pottled slightly 3 - 4 - 5 - 6 - 7 - 8 -
Remarks: No ç	groundwater ei	ncounte	red					9 - 10 -

	_		Ŋ	ך		Во	reho	ole Log	Borehole No. WS 5			
Project	Name:	Oakley	Green I	odge P	Project No.		Co-ords:	_	Sheet 1 of 1 Hole Type			
	n:	Oakley	Green	Windsor SI 4 4P7	8-240.01				WS Scale			
Client:		Currey					Dates:	11/09/2018	1:50 Logged By			
Well	Water	Sampl	e and Ir	n Situ Testing	Depth	Level	Legend	Stratum Description				
		Depth (m) 0.20 0.45 1.00 1.00 1.00 2.00 2.00 2.50 3.00 3.00 3.50 4.00 4.00 4.00	Type ES B D ES SPT U D SPT D SPT D SPT D	Results N=11 (1,1/2,3,3,3) N=15 (2,2/3,4,4,4) N=17 (3,3/3,4,5,5) N=20 (3,4/4,5,5,6)	 (m) 0.20 0.30 2.00 5.00 	(m)		MADE GROUND reactions with bic concrete fragments MADE GROUND relic topsoil with bric Firm becoming stiff and medium to hig brown and grey mottled slightly sandy yellow sandy partings and rootlets to 1 Stiff locally fissured brown and grey m sandy CLAY with yellow sandy parting claystone at 3.50 m End of Borehole at 5.00m	rick and k cobbles h strength, CLAY with .4m 1 ottled slightly s 3 4 .5 .6 .7 .6 .7 .8 .9 			
Remark	s: No g	groundwater e	ncounte	red at 3.0m					AGS			

AVIRON ASSOCIATES LIMITED. 01491 413 722. james@aviron.co.uk

PHOTOGRAPHIC LOGSITEOakley Green LodgeDATE11/09/2018PROJECT18-240.01TAKEN BYDN	
	W54
	WS5
AVIRON ASSOCIATES LIMITED 01491 413 722 james@aviron.co.uk	

K	1 SOILS)	Sui	nma	ary of Natural	Moisture Co	ntent, L	iquid	Limit	and Pla	astic L	imit R	esults
Job No.			Project	Name	1						Prog	ramme	
25	179		Oaklev	Greer	Lodae					Samples	received	12/0	9/2018
Droject No.			Oliont							Schedule Droiget at	received	12/0	9/2018
Project No.			Client							Project st	arred	13/0	9/2018
18-2	40.01		Aviron							Testing S	tarted	24/0	9/2018
Hole No.		Sa -	mple	-	Soil Des	cription	Passing 425µm	LL	PL	PI	Rer	narks	
	Ref	l op m	Base m	Туре				%	%	%	%		
WS 1	-	1.00	-	D	Brown silty CLAY	31	100	73	28	45			
WS 1	-	2.00	-	D	Brown silty CLAY with sandy patches	n orangish brown	27	100	69	26	43		
WS 1	-	2.50	-	D	Brown silty CLAY		29						
WS 1	-	3.00	-	D	Brown silty CLAY with orangish brown veins selenite crystals	n bluish grey and , and scattered	28	100	70	28	42		
WS 1	-	3.50	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals		31						
WS 1	-	4.00	-	D	Brown silty CLAY with and scattered selenite	n bluish grey veins e crystals	32	100	76	28	48		
WS 1	-	5.00	-	D	Brown silty CLAY with veins and scattered s	n orangish brown elenite crystals	30						
WS 2	-	1.00	-	D	Brown silty CLAY		35	100	79	28	51		
WS 2	-	2.00	-	D	Brown slty CLAY with orangish brown veins selenite crystals	bluish grey and , and scattered	30	100	71	29	42		
WS 2	-	2.50	-	D	Brown silty CLAY with and scattered selenite	n bluish grey veins e crystals	29						
WS 2	-	3.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins		29	100	67	27	40		
WS 2	-	3.50	-	D	Brown silty CLAY with veins, claystone fragr scattered selenite cry	32							
cia	Test	Method	ls: BS13	877: P	art 2: 1990:	Test F	Report by	K4 SOILS	LABOR	ATORY		Check	ced and
- 🗶 -	Natur	al Moistu	re Conten	t:clau	se 3.2	Ur	hit 8 Olds C	Close Olds	s Appro	ach		Арр	roved
	Atterb	berg Limit	s: clause	4.3, 4.4	and J.U		vvattord Tel: (Email: Ja	nerts WD)1923 711 mes@k4s	288 288.oils.cor	n		Initials Date:	J.P 27/09/2018
	Appr	oved Sid	natories.	K Pha	ure (Tech Mar) I Phaure	(Lab Mar)						Mer	F-5-R1

K	Soils)	Su	nma	ary of Natural Moisture Co	ontent, l	iquid	Limit	and Pla	astic L	imit Resu	ılts
Job No.			Project	Name	1				1	Prog	ramme	
25	170		Oaklev	Green	lodge				Samples	received	12/09/20	18
23	175		Carley	Orecr					Schedule	received	12/09/20	18
Project No.			Client						Project st	arted	13/09/20	18
18-2	40.01		Aviron						Testing S	tarted	24/09/20	18
Hole No.		Sa	mple		Soil Description	NMC	Passing 425um	LL	PL	PI	Remark	s
	Ref	Top m	Base m	Туре		%	%	%	%	%		
WS 2	-	4.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	332						
WS 2	-	5.00	-	D	Brown silty CLAY with scattered selenite crystals	33	100	73	30	43		
WS 3	-	1.00	-	D	Brown and orangish brown slightly sandy silty CLAY with rare fm sub- angular gravel	28	98	59	23	36		
WS 3	-	2.00	-	D	Brown silty CLAY with orangish brown veins	35	100	77	31	46		
WS 3	-	2.50	-	D	Brown silty CLAY with bluish grey veins and orangish brown and light grey sandy patches	30						
WS 3	-	3.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins, and scattered selenite crystals	28	100	75	29	46		
WS 3	-	3.50	-	D	Brown silty CLAY with scattered selenite crystals	28						
WS 3	-	4.00	-	D	Brown CLAY with bluish grey veins and scattered selenite crystals	28	100	71	29	42		
WS 4	-	1.00	-	D	Brown silty CLAY with scattered fine claystone fragments	29	99	75	29	46		
WS 4	-	2.00	-	D	Brown silty CLAY with bluish grey and orangish brown veins	31	100	76	30	46		
WS 4	-	2.50	-	D	Brown silty CLAY with bluish grey veins	33						
WS 4	-	3.00	-	D	Brown silty CLAY with bluish grey veins and orangish brown sandy patches	31	100	70	28	42		
dia	Test	Method	ds: BS13	377: Pa	art 2: 1990: Test	Report by	K4 SOILS	LABOR	ATORY		Checked	and
- 💥 -	Natur	al Moistu	re Conten	t:clau	se 3.2	Jnit 8 Olds (Close Old	S Appro	ach		Approve	эd
	Atterb	erg Limit	S: CIAUSE	4.3, 4.4	anu 5.0	Tel: (Email: Ja	nerts WL 01923 711 mes@k4s	288 288 soils.cor	n		Initials Date: 27/	J.P 09/2018
TESTING 2510	Appr	oved Sic	natories:	K Pha	ure (Tech Mar), I Phaure (Lab Mar)						MSE-5-R	1

Job No.			Su	mma	ary of Natural Moisture Co	ontent, L	_iquid	Limit	and Pl	astic L	imit Results.
Job No.			Project	Name					Т	Prog	ramme
25	179		, Oaklev	Greer	lodge				Samples	received	12/09/2018
Drain at Na			Olivit	0.001	- 20030				Schedule	received	12/09/2018
Project No.			Client						Project st	arted	13/09/2018
18-2	40.01		Aviron		1	-			Testing S	tarted	24/09/2018
Hole No.	Def	Sa	mple	Turna	Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Rei	m m		Type		%	%	%	%	%	
WS 4	-	4.00	-	D	Brown silty CLAY with bluish grey veins	31					
WS 4	-	5.00	-	D	Brown silty CLAY with orangish brown sandy patches	27	100	64	27	37	
WS 5	-	1.00	-	D	Brown silty CLAY	35	100	84	30	54	
WS 5	-	2.00	-	D	Brown silty CLAY with orangish brown veins	30	100	78	29	49	
WS 5	-	2.50	-	D	Brown silty CLAY with bluish grey veins	30					
WS 5	-	3.00	-	D	Brown silty CLAY with bluish grey veins	30	100	73	28	45	
WS 5	-	4.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	28	100	72	30	42	
WS 5	-	5.00	-	D	Brown silty CLAY with bluish grey veins and scattered selenite crystals	27					
رستین این معنور	Test	Method	ds: BS13	1 377: P	art 2: 1990: Test	Report bv	K4 SOILS	LABOR	ATORY	1	Checked and
_ 💥 _	Natur	al Moistu	re Conten	t : clau	se 3.2 U	nit 8 Olds (Close Old	s Appro	ach		Approved
	Attert	berg Limit	s: clause	4.3, 4.4	and 5.0	Tel: 01923 711 288 Initials J.P Email: James@k4soils.com Date: 27/09/2018					
	Anni	oved Sic	inatories:	K Pha	ure (Tech Mar) J Phaure (Lab Mar)						MSF-5-R1

Appendix D Surface Water Drainage Strategy

Appendix E Existing Brownfield Runoff Calculations

A Charles & Associates

	onsult	ing F	ngine	ors I.	+ d								P	ane	1
Landmarl	k Hous	e e	ingriie	CI0 1	cu	Oak	lev G	Freen	Lode	re				ige	±
Station	Road	Hook				Oakley Green								(
Jacron	ro DC	27 01	-			Brownfield Bunoff									- m
	101 (20	27 9H	A			BLO	ianad	ela R		L			N		0
Date II,	/01/20	24 14	:24			Des	ignec	ya r	TSH)rai	nade
File 23-	-100 0	AKLEY	GREE	N BRO	•••	Che	cked	by G.	AC						J
Innovyze	е					Net	work	2020	.1.3						
	STORM SEWER DESIGN by the Modified Rational Method														
Pipe Sizes STANDARD Manhole Sizes STANDARD															
The Sizes Simble Manore Sizes Simble															
FEH Rainfall Model															
	Return Period (years)2FEH Rainfall Version2013														
					Site	Loc	ation	GB 49	92746	17623	6 SU	92746	76236	5	
						Data	Туре						Point		
	M ~ !	m11m m.ª	Maxi	mum Ra	infal	⊥ (mi	m/hr)						50)	
	Maxl	mum T1	UNE OI	Foul S	eware	(1) (1 (1)	m⊥ns) s/ha)						0.000	,)	
			Volu	metric	Runo	ff C	oeff.						0.750)	
						PIM	P (%)						100)	
		Ado	l Flow	/ Clim	ate C	hang	e (%)						C)	
		M	linimum Genimum	Backd	lrop H	eigh	t (m)						0.200)	
	Min D	esian	Depth	for On	timis	atio	n (m)						1.200)	
	Mi	n Vel	for Au	to Des	ign o	nly	(m/s)						1.00)	
		Min Sl	ope fo	r Opti	misat	ion	(1:X)						500)	
	Min Slope for Optimisation (1:X) 500														
Designed with Level Soffits															
				De	signe	d wi	th Lev	vel Sc	offits	3					
			1	De Netwo	rk De	ed wi	th Lev	vel Sc	offits	torm					
			<u>1</u>	De Netwo	rk De	d wi	th Lev n Tak	vel Sc	offits	torm					
PN 1	Length (m)	Fall (m)	l Slope	De Netwo I.Are (ha)	esigne rk De a T. (mi	ed wi	th Lev n Tak Ba:	vel Sc ole f se (1/s)	offits	torm HYD SECT	DIA	Sect	ion T	уре	Auto
PN :	Length (m)	Fall (m)	<u>]</u> Slope (1:X)	De Netwo I.Are (ha)	rk De a T. (mi	ed wi esig E. ns)	th Lev n Tak Ba: Flow	vel Sc ole f se (l/s)	offits for S k (mm)	torm HYD SECT	DIA ! (mm)	Sect	ion T	уре	Auto Design
PN 2	Length (m) 10.000	Fall (m)	<u>l</u> Slope (1:X) 580.0	De <u>Netwo</u> I.Are (ha) 0.33	esigne rk De a T. (mi	ed wi esig E. ns)	th Lev n Tak Bas Flow	vel Sc ole f se (1/s) 0.0	offits for S k (mm)	torm HYD SECT	DIA (mm)	Sect Pipe	ion T	ype uit	Auto Design
PN 3 S1.000 S1.001 1	Length (m) 10.000 102.000	Fall (m) 0.017 0.175	<u>Slope</u> (1:X) 580.0 582.9	De <u>Netwo</u> I.Are (ha) 0.33 0.00	esigne <u>rk De</u> a T. (mi 3 5 0 0	ed wi esig E. ns) .00 .00	n Tak Bas	vel Sc <u>ole f</u> (1/s) 0.0 0.0	offits for S k (mm) 0.600 0.600	torm HYD SECI	DIA (mm) 600 600	Sect Pipe Pipe	ion T /Cond /Cond	ype uit uit	Auto Design
PN 5 51.000 51.001 1	Length (m) 10.000 102.000	Fall (m) 0.017 0.175	Slope (1:X) 580.0 582.9	De Netwo (ha) 0.33 0.00	a T. (mi 3 5 0 0 Jetwo	ed wi esig E. ns) .00 .00 rk H	n Tak Bas Flow	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Ta	offits for S (mm) 0.600 0.600 able	torm HYD SECT	DIA (mm) 600 600	Sect Pipe Pipe	ion T /Cond /Cond	ype uit uit	Auto Design T
PN 2 S1.000 S1.001 1 PN	Length (m) 10.000 102.000 Rai	Fall (m) 0.017 0.175	<u>1</u> Slope (1:X) 580.0 582.9	De <u>Netwo</u> I.Are (ha) 0.33 0.00 <u>N</u> S/IL	esigne <u>rk De</u> a T. (mi 3 5 0 0 Νετwo Σ Ι.Α	ed wi esig E. ns) .00 .00 rk H rea	n Tak Bas Flow Resul	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Ta ase	offits for S (mm) 0.600 0.600 able Foul	HYD SECT	DIA (mm) 600 600 Flow	Sect Pipe Pipe Vel	ion T /Cond /Cond	ype uit uit	Auto Design
PN 2 S1.000 S1.001 1 PN	Length (m) 10.000 102.000 Rai (mm/H	Fall (m) 0.017 0.175 n T nr) (m	<u>1</u> Slope (1:X) 580.0 582.9 .C. U ins)	De <u>Netwo</u> I.Are (ha) 0.33 0.00 <u>N</u> S/IL (m)	rk De a T. (mi 3 5 0 0 Ietwo Σ I.A (ha	ed wi esig E. ns) .00 .00 erk H rea)	th Lev n Tak Bas Flow Resul Σ Ba Flow	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Ta ase (1/s)	offits for S (mm) 0.600 0.600 able Foul (1/s)	HYD SECT	DIA (mm) 600 600 Flow (s)	Sect Pipe Pipe Vel (m/s)	ion T /Cond /Cond Cap (1/s	ype uit uit F	Auto Design P Design
PN : S1.000 S1.001 1 PN S1.00	Length (m) 10.000 102.000 Rai (mm/H	Fall (m) 0.017 0.175 n T nr) (m .00	<u>I</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 74	De <u>Netwo</u> I.Are (ha) 0.33 0.00 <u>N</u> S/II (m) 4.000	esigne <u>rk De</u> a T. (mi 3 5 0 0 Jetwo Σ I.A (ha 0.	d wi esig E. .00 .00 rk H rea) 333	th Lev n Tak Bas Flow Resul Σ Ba Flow	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Tc (1/s) 0.0	offits for S k (mm) 0.600 0.600 able Foul (1/s) 0.0	HYD SECT	DIA (mm) 6000 600 Flow /s) 0.0	Sect Pipe Pipe Vel (m/s) 1.00	ion T /Cond /Cond Cap (1/s 283.	ype uit uit F) (J	Auto Design
PN : S1.000 S1.001 1 PN S1.000 S1.000	Length (m) 10.000 102.000 Rai (mm/H	Fall (m) 0.017 0.175 n T hr) (m .00	<u>l</u> slope (1:X) 580.0 582.9 .C. U ins) 5.17 74 6.86 73	De <u>Netwo</u> I.Are (ha) 0.33 0.00 <u>N</u> S/IL (m) 4.000 3.983	esigne <u>rk De</u> a T. (mi 3 5 0 0 Νετwo Σ Ι.Α (ha 0. 0.	d wi esig E. ns) .00 rk H rea) 333 333	th Lev n Tak Bas Flow Resul Σ Ba Flow	vel Sc ole f se (1/s) 0.0 0.0 ts Ta ase (1/s) 0.0 0.0	offits or S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0	HYD SECT	DIA (mm) 600 600 Flow /s) 0.0 0.0	Sect Pipe Pipe Vel (m/s) 1.00 1.00	ion T /Cond /Cond (1/s 283. 283.	ype uit uit F (] 9 4 1 4	Auto Design 7 10w 1/s)
PN : S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/H 00 50. 01 50.	Fall (m) 0.017 0.175 n T nr) (m .00	<u>1</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 74 6.86 73	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> S/IL (m) 4.000 3.983 Elow	esigne <u>rk De</u> a T. (mi 3 5 0 0 Jetwo Σ I.A (ha 0. 0. 0.	d wi esig E. .00 .00 rk H rea) 333 333	th Lev n Tak Bas Flow Resul Σ Ba Flow	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Ta ase (1/s) 0.0 0.0	offits for S (mm) 0.600 0.600 able Foul (1/s) 0.0	HYD SECT C Add (1,	DIA (mm) 6000 6000 Flow (s) 0.0 0.0	Sect Pipe Pipe (m/s) 1.00 1.00	ion T /Cond /Cond (1/s 283. 283.	ype uit uit F (]) (]) 2 4 1 4	Auto Design
PN : S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/H 00 50. 01 50.	Fall (m) 0.017 0.175 n T nr) (m .00 .00	<u>l</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7 <u>Free</u>	De <u>Netwo</u> I.Are (ha) 0.33 0.00 <u>N</u> S/IL (m) 4.000 3.983 <u>Flow</u>	esigne rk De a T. (mi 3 5 0 0 Netwo (ha 0. 0. 0. 1.1.6	d wi esig E. ns) .00 .00 rk H rea) 333 333 333	th Lev n Tak Bas Flow Resul Σ Ba Flow	vel Sc <u>ole f</u> (1/s) 0.0 0.0 ts Ta (1/s) 0.0 0.0 0.0 0.0 0.0 0.0	offits for S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1s f	HYD SECT Add (1,) or St	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 corm	Sect Pipe Pipe Vel (m/s) 1.00 1.00	ion T /Cond /Cond (1/s 283. 283.	ype uit uit) (] 9 4 1 4	Auto Design
PN : S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/) 00 50. 01 50.	Fall (m) 0.017 0.175 n T hr) (m .00 .00	<u>l</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> Free	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> NS/IL (m) 4.000 3.983 Flow Outfa	esigne <u>rk De</u> a T. (mi 3 5 0 0 <u>Jetwo</u> Σ I.A (ha 0. 0. 0. 1. 1. Δ 0. 0. 0. 1. 1. Δ	d wi essig E. ns) .00 rk I rea) 333 333 Dutf (m)	th Lev n Tak Bas Flow Resul Σ Ba Flow all I	vel Sc ole f se (1/s) 0.0 0.0 ts Ta (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	offits for S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1 N	torm HYD SECT C C Add (1,)) or St tin Level	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 corm D,L	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm)	ion T /Cond /Cond (1/s 283. 283.	ype uit uit) (] 9 4 1 4	Auto Design
PN 5 51.000 51.001 1 PN 51.00 51.00	Length (m) 10.000 102.000 Rai (mm/H 00 50 01 50	Fall (m) 0.017 0.175 n T nr) (m .00 .00 .00	<u>I</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> fall Number	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> 0.5/IL (m) 4.000 3.983 Flow Outfa Nam	esigne <u>rk De</u> a T. (mi 3 5 0 0 <u>Ietwo</u> Σ I.A 0. 0. 0. ing (all C. e	d wi esig E. ns) .00 rk H rea) 333 333 Dutf (m)	th Lev n Tak Bas Flow Resul Σ Ba Flow all I	vel Sc <u>ole f</u> (1/s) 0.0 0.0 <u>ts Ta</u> (1/s) 0.0 <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.0</u> <u>0.</u>	fits for S k (mm) 0.600 able Foul (1/s) 0.0 ls f I.	torm HYD SECT Add (1,) or St fin Level (m)	DIA (mm) 6000 6000 Flow (s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm)	ion T /Cond /Cond (1/s 283. 283.	ype uit uit) (] 9 4 1 4	Auto Design
PN : S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/) 00 50. 01 50.	Fall (m) 0.017 0.175 n T hr) (m .00 .00 .00 .00	<u>l</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> fall Number S1.001	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> NS/IL (m) 4.000 3.983 Flow Outfa Nam	signe <u>rk De</u> a T. (mi 3 5 0 0 <u>Jetwo</u> Σ I.A (ha 0. 0. 1. (ha 0. 0. 1. S	d wi essig E. ns) .00 rk I rea) 3333 333 Dutf (m) 76.0	th Lev n Tak Bas Flow Resul Σ Ba Flow all I rel I.	vel Sc ole f se (1/s) 0.0 0.0 ts Ta (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	offits or S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1 1 I. 8	torm HYD SECT C Add (1,) or St tin Level (m) 0.000	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 corm D,L (mm)	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm) 0	ion T /Cond /Cond (1/s 283. 283.	ype uit i) (1 9 4 1 4	Auto Design
PN 3 S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/1 00 50. 01 50.	Fall (m) 0.017 0.175 n T (m .00 .00 .00 .00	<u>I</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> cfall Number S1.001	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> S/IL (m) 4.000 3.983 Flow Outfa Nam	rk De a T. (mi 3 5 0 0 1etwo Σ I.A 0. 0. 1ing (all C. s	d wi esig E. ns) .00 rk H rea) 333 333 Dutf (m) 76.0	th Lev n Tak Bas Flow Resul Σ Ba Flow all I rel I.	vel Sc <u>ole f</u> (1/s) 0.0 0.0 <u>ts Ta</u> ase (1/s) 0.0 0.0 0.0 <u>Detai</u> (m) 73.802	offits for S (mm) 0.600 0.600 0.600 able Foul (1/s) 0.0 0.0 1 N I. 8	torm HYD SECI C Add (1,) Or St fin Level (m) 0.000	DIA (mm) 6000 6000 Flow (s) 0.0 0.0 0.0 0.0 D,L (mm) 0	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm) 0	ion T /Cond /Cond (1/s 283. 283.	ype uit uit) (] 9 4 1 4	Auto Design
PN : S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/) 00 50. 01 50.	Fall (m) 0.017 0.175 n T hr) (m .00 .00 .00 Pipe	<u>1</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> fall Number S1.001	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> NS/IL (m) 4.000 3.983 Flow Nam	esigne <u>rk De</u> a T. (mi 3 5 0 0 Jetwo Σ I.A (ha 0. 0. 1. (ha 0. 0. 1. S	d wi esig E. ns) .00 rk H rea) 333 333 Dutf (m) 76.0	th Lev n Tak Bas Flow Resul Σ Ba Flow all I rel I.	vel Sc ole f se (1/s) 0.0 0.0 ts Ta (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	offits or S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1 1 1. 8	torm HYD SECT C Add (1,) or St fin Level (m) 0.000	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 corm D,L (mm) 0	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm) 0	ion T /Cond /Cond (1/s 283. 283.	ype uit iit	Auto Design
PN : S1.000 S1.001 1 PN S1.000 S1.000	Length (m) 10.000 102.000 Rai (mm/H 00 50. 01 50.	Fall (m) 0.017 0.175 n T nr) (m .00 .00 .00 Cut Pipe	<u>1</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7. 6.86 7: <u>Free</u> Slope Sl.001	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> NS/IL (m) 4.000 3.983 Flow Outfa Nam	esigne <u>rk De</u> a T. (mi 3 5 0 0 <u>Jetwo</u> Σ I.A 0. 0. 0. ing (all C. e S	d wi esig E. ns) .00 rk H rea) 333 333 Outf (m) 76.0	th Lev n Tak Bas Flow Resul Σ Ba Flow all I rel I.	vel Sc <u>ole f</u> (1/s) 0.0 0.0 <u>ts Ta</u> (1/s) 0.0 0.0 <u>Detai</u> (m) 73.80	offits for S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1 N I. 8	torm HYD SECT C Add (1,) Or St (in Level (m) 0.000	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 D,L (mm) 0	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm) 0	ion T /Cond /Cond (1/s 283. 283.	ype uit uit) (] 9 4 1 4	Auto Design
PN 3 S1.000 S1.001 1 PN S1.00 S1.00	Length (m) 10.000 102.000 Rai (mm/H 00 50 01 50	Fall (m) 0.017 0.175 n T hr) (m .00 .00 .00 .00	<u>l</u> Slope (1:X) 580.0 582.9 .C. U ins) 5.17 7 6.86 7: <u>Free</u> Sl.001	De Netwo I.Are (ha) 0.33 0.00 <u>N</u> NS/IL (m) 4.000 3.983 Flow Outfa Nam	esigne rk De a T. (mi 3 5 0 0 Ietwo Σ I.A (ha 0. 0. ing (all C. e S	d wi esig E. ns) .00 rk H rea) 333 333 Dutf (m) 76.0	th Lev n Tak Ba: Flow Cesul Σ Ba Flow all I rel I.	vel Sc <u>ole f</u> se (1/s) 0.0 0.0 ts Ta ase (1/s) 0.0 0.0 0.0 Detai Levei (m) 73.80	offits for S k (mm) 0.600 0.600 able Foul (1/s) 0.0 0.0 1 N I. 8	HYD SECT C Add (1,) Or St (m) 0.000	DIA (mm) 6000 6000 Flow /s) 0.0 0.0 0.0 Corm D,L (mm) 0	Sect Pipe Pipe Vel (m/s) 1.00 1.00 W (mm) 0	ion T /Cond /Cond (1/s 283. 283.	ype uit uit 9 4 1 4	Auto Design

C & A Consulting Engineers Ltd	r	Page 2
Landmark House	Oakley Green Lodge	
Station Road, Hook	Oakley Green	
Hampshire RG27 9HA	Brownfield Runoff	Mirm
Date 11/01/2024 14:24	Designed by TSH	Drainago
File 23-100 OAKLEY GREEN BRO	Checked by GAC	Diamage
Innovyze	Network 2020.1.3	
Simulatic	on Criteria for Storm	
Volumetric Runoff Coeff C Areal Reduction Factor 1 Hot Start (mins) Hot Start Level (mm) Manhole Headloss Coeff (Global) C Foul Sewage per hectare (l/s) C Number of Input Hydrogra Number of Online Contr Number of Offline Contr	 Additional Flow - % of Total Fl MADD Factor * 10m³/ha Stora Inlet Coefficie Flow per Person per Day (1/per/da S00 Run Time (min O00 Output Interval (min aphs 0 Number of Storage Structures 0 rols 0 Number of Real Time Controls 0 	ow 0.000 ge 2.000 nt 0.800 y) 0.000 s) 60 s) 1
Synthet.	ic Rainfall Details	
Painfall Mode		
Return Period (years	s) 2	
FEH Rainfall Versio	on 2013	
Site Locatio	on GB 492746 176236 SU 92746 76236	
Summer Storm	ns Yes	
Winter Storm	ns Yes	
Cv (Summer	c) 0.750	
Cv (Winter	c) 0.840	
Storm Duration (mins	3) 30	

C & A Consulting Engineers Ltd		Page 3
Landmark House	Oakley Green Lodge	
Station Road, Hook	Oakley Green	
Hampshire RG27 9HA	Brownfield Runoff	Micro
Date 11/01/2024 14:24	Designed by TSH	
File 23-100 OAKLEY GREEN BRO	Checked by GAC	Dialitacje
Innovyze	Network 2020.1.3	
2 year Return Period Summary of	Critical Results by Maximum Leve	el (Rank 1)
	for Storm	
Sir	mulation Criteria	
Areal Reduction Factor	1.000 Additional Flow - % of Total Fl	ow 0.000
Hot Start (mins)	0 MADD Factor * 10m ³ /ha Stora	ge 2.000
Hot Start Level (mm)	0 Inlet Coeffiecie	nt 0.800
Foul Sewage per hectare (1/s) (0.000 Flow per Person per Day (1/per/da 0.000	y) 0.000
Number of Input Hydrogr	aphs 0 Number of Storage Structures 0	
Number of Offline Cont	rols U Number of Time/Area Diagrams O	
	TOTS & Number of Real fime concrois o	
Synthe	tic Rainfall Details	
Rainfall Mode	1 FEH	
Site Locatio	n GB 492746 176236 SU 92746 76236	
Data Typ	e Point	
Cv (Summer) 0.750	
Cv (Winter	0.840	
Margin for Flood Risk V	Jarning (mm) 300.0 DVD Status OFF	
Analys	sis Timestep Fine Inertia Status OFF	
	DTS Status ON	
Profile(s)	Summer and Win	iter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 6 720, 960, 1440, 2160, 2880, 4320, 57	500, 760
	7200, 8640, 10	080
Return Period(s) (years)	2, 30,	100
Climate Change (%)	0, 0	, 0
		Water
US/MH Return Clima	ate First (X) First (Y) First (Z) Overf	low Level
PN Name Storm Period Chan	ge Surcharge Flood Overflow Act	2. (m)
S1.000 S1 15 Winter 2 -	+0%	74.245
S1.001 S2 15 Winter 2 -	+0%	74.163
Surcharged Flooded	Half Drain Pipe	
US/MH Depth Volume F	low / Overflow Time Flow	Level
PN Name (m) (m ³)	Cap. (l/s) (mins) (l/s) Status	Exceeded
S1 000 S1 -0 355 0 000	0.34 51.1 0K	
s1.001 s2 -0.420 0.000	0.17 45.8 OK	
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C & A Consulting Engineers Ltd		Page 4
Landmark House	Oakley Green Lodge	
Station Road, Hook	Oakley Green	
Hampshire RG27 9HA	Brownfield Runoff	Mirm
Date 11/01/2024 14:24	Designed by TSH	Drainago
File 23-100 OAKLEY GREEN BRO	Checked by GAC	Diamacje
Innovyze	Network 2020.1.3	
30 year Return Period Summary o	f Critical Results by Maximum Lev for Storm	el (Rank 1)
SI: Areal Reduction Factor Hot Start (mins) Hot Start Level (mm) Manhole Headloss Coeff (Global) Foul Sewage per hectare (1/s) Number of Input Hydrogr Number of Online Cont Number of Offline Cont	<pre>mulation Criteria 1.000 Additional Flow - % of Total Fl 0 MADD Factor * 10m³/ha Stora 0 Inlet Coeffiecie 0.500 Flow per Person per Day (l/per/da 0.000 aphs 0 Number of Storage Structures 0 rols 0 Number of Time/Area Diagrams 0 rols 0 Number of Real Time Controls 0</pre>	ow 0.000 ge 2.000 nt 0.800 y) 0.000
Synthe Rainfall Mode	etic Rainfall Details	
FEH Rainfall Versio	on 2013	
Site Locatio	on GB 492746 176236 SU 92746 76236	
Data Typ Cv (Summer	e Point c) 0.750	
Cv (Winter	0.840	
Margin for Flood Risk A Analy: Profile(s)	sis Timestep Fine Inertia Status OFF DTS Status ON Summer and Wir	ter
Duration(s) (mins) Return Period(s) (years)	15, 30, 60, 120, 180, 240, 360, 480, 6 720, 960, 1440, 2160, 2880, 4320, 57 7200, 8640, 10 2, 30,	00, 60, 080 100
Ciimate Change (%)	0, 0	, 0
US/MH Return Clim PN Name Storm Period Char	ate First (X) First (Y) First (Z) Overf ge Surcharge Flood Overflow Act	Water Flow Level (m)
S1.000 S1 15 Winter 30	+0%	74.274
Surcharged Flooded US/MH Depth Volume E PN Name (m) (m³)	Half Drain Pipe Ylow / Overflow Time Flow Cap. (l/s) (mins) (l/s) Status	Level Exceeded
S1.000 S1 -0.183 0.000	0.83 123.5 OK	
51.001 52 0.305 0.000	0.42 110.5 01	
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C & A Consulting Engineers Ltd		Page 5
Landmark House	Oakley Green Lodge	
Station Road, Hook	Oakley Green	
Hampshire RG27 9HA	Brownfield Runoff	Micco
Date 11/01/2024 14:24	Designed by TSH	
File 23-100 OAKLEY GREEN BRO	Checked by GAC	nguga
Innovyze	Network 2020.1.3	
-		
100 year Return Period Summary	of Critical Results by Maximum L	evel (Rank
	1) for Storm	
	wilsting Quiteria	
Areal Reduction Factor	1.000 Additional Flow - % of Total Fl	ow 0.000
Hot Start (mins)	0 MADD Factor * 10m ³ /ha Stora	ge 2.000
Hot Start Level (mm)	0 Inlet Coeffiecie	nt 0.800
Manhole Headloss Coeff (Global) (0.500 Flow per Person per Day (l/per/da	y) 0.000
roui sewage per nectare (1/s) (
Number of Input Hydrogr	aphs 0 Number of Storage Structures 0	
Number of Online Cont	rols 0 Number of Time/Area Diagrams 0	
Number of Offline Cont	rols U Number of Real Time Controls U	
Synthe	tic Rainfall Details	
Rainfall Mode	1 FEH	
FEH Rainfall Versio	n 2013	
Data Tvp	e Point	
Cv (Summer) 0.750	
Cv (Winter) 0.840	
Margin for Flood Bisk W	Jarning (mm) 300 0 DVD Status OFF	
Analys	sis Timestep Fine Inertia Status OFF	
	DTS Status ON	
Profile(s)	Summer and Wir	nter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 6	500,
	720, 960, 1440, 2160, 2880, 4320, 57	760 ,
Return Period(s) (years)	2, 30,	100
Climate Change (%)	0, 0), 0
		Water
US/MH Return Clima	ate First (X) First (Y) First (Z) Overf	flow Level
PN Name Storm Period Chan	ge Surcharge Flood Overflow Act	2. (m)
S1 000 S1 15 Winter 100 -	±0%	74 477
S1.001 S2 15 Winter 100 -	+0%	74.322
Construct The had		
US/MH Depth Volume F	Hair Drain Fipe	Level
PN Name (m) (m ³)	Cap. (1/s) (mins) (1/s) Status	Exceeded
S1.000 S1 -0.123 0.000 S1.001 S2 -0.261 0.000	1.06 158.5 OK	
	141.0 OK	
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Appendix F Existing Greenfield Runoff Calculations

A Charles & Associates

C & A Consulting Engineers Ltd		Page 1
Landmark House	Oakley Green Lodge	
Station Road, Hook	Oakley Green	
Hampshire RG27 9HA	Greenfield Runoff	Mirro
Date 11/01/2024 14:54	Designed by MT	Desinado
File	Checked by TSH	Diamage
Innovyze	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return	Period	(y∈	ears)	100		Soil	0.45	50
	Ar	Area (ha)		0.890		Urban	0.00	00
	SA	AR	(mm)	700	Region	Number	Region	6

Results 1/s

QBAR Rural 3.9 QBAR Urban 3.9 Q100 years 12.5 Q1 year 3.3 Q30 years 8.9 Q100 years 12.5

Appendix G Surface Water Design Calculations

Charles & Associates

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	\checkmark
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	х
Maximum Rainfall (mm/hr)	50.0		

<u>Nodes</u>

Name	Area (ha)	T of E (mins)	Add Inflow	Cover Level	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
			(I/s)	(m)				
MH2	0.221	5.00		76.855	1200	35.630	14.530	2.343
MH3	0.000	5.00	0.0	76.717	1200	44.493	31.104	2.231
MH4	0.000	5.00	0.0	76.617	1200	49.175	43.144	2.161
MH5	0.137	5.00	0.0	76.517	1200	53.857	53.846	2.100
MH6	0.095	5.00		76.450	1200	61.884	66.388	2.060
MH7	0.000	5.00	0.0	76.250	1200	68.907	82.441	1.890
MH8	0.037	5.00	0.0	75.800	1200	67.402	98.662	1.533
MH9	0.023	5.00		75.070	1200	66.439	113.080	0.900
Outfall	0.000	5.00	0.0	75.140	1200	74.426	125.920	1.000
Tank	0.000	5.00	0.0	75.000		54.249	107.542	0.830

<u>Links</u>

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	MH2	MH3	10.800	0.600	74.512	74.486	0.026	415.4	450	5.18	50.0
1.001	MH3	MH4	12.100	0.600	74.486	74.456	0.030	403.3	450	5.38	50.0
1.002	MH4	MH5	17.600	0.600	74.456	74.417	0.039	451.3	450	5.69	50.0
1.003	MH5	MH6	11.250	0.600	74.417	74.390	0.027	416.7	450	5.88	50.0
1.004	MH6	MH7	12.350	0.600	74.390	74.360	0.030	411.7	450	6.09	50.0
1.005	MH7	MH8	37.350	0.600	74.360	74.267	0.093	401.6	450	6.70	50.0
1.006	MH8	MH9	39.700	0.600	74.267	74.170	0.097	409.3	450	7.37	50.0
1.007	MH9	Outfall	3.360	0.600	74.170	74.140	0.030	112.0	300	7.41	50.0
2.000	MH9	Tank	8.200	0.600	74.190	74.170	0.020	410.0	450	5.14	50.0

Name	Vel (m/s)	Cap (1/s)	Flow (I/s)	US Depth	DS Depth	Σ Area (ha)	Σ Add Inflow	Pro Depth	Pro Velocity
	(,.,	(-,-,	(1-1	(m)	(m)	(,	(l/s)	(mm)	(m/s)
1.000	0.991	157.6	30.0	1.893	1.781	0.221	0.0	132	0.769
1.001	1.006	160.0	30.0	1.781	1.711	0.221	0.0	131	0.778
1.002	0.950	151.1	30.0	1.711	1.650	0.221	0.0	135	0.745
1.003	0.989	157.4	48.5	1.650	1.610	0.358	0.0	171	0.875
1.004	0.996	158.3	61.4	1.610	1.440	0.453	0.0	194	0.934
1.005	1.008	160.3	61.4	1.440	1.083	0.453	0.0	193	0.944
1.006	0.998	158.8	66.4	1.083	0.450	0.490	0.0	203	0.955
1.007	1.485	104.9	69.5	0.600	0.700	0.513	0.0	178	1.583
2.000	0.998	158.7	0.0	0.430	0.380	0.000	0.0	0	0.000

SEM			aries&As	sociates Co		Net Mic 15/0	work: S hael Tu 01/202	Storm Net urner 4	work	2001	rage z	
					<u>Pipeline</u>	Schee	<u>lule</u>					
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US (r	iL l n)	US Depth (m)	DS (n	CL 1)	DS IL (m)	DS Depth (m)
1.000	10.800	415.4	450	Circular	76.855	74.	512	1.893	76.7	717	74.486	1.781
1.001	12.100	403.3	450	Circular	76.717	74.	486	1.781	76.6	517	74.456	1.711
1.002	17.600	451.3	450	Circular	76.617	74.	456	1.711	76.5	517	74.417	1.650
1.003	11.250	416.7	450	Circular	76.517	74.	417	1.650	76.4	150	74.390	1.610
1.004	12.350	411.7	450	Circular	76.450	74.	390	1.610	76.2	250	74.360	1.440
1.005	37.350	401.6	450	Circular	76.250	74.	360	1.440	75.8	300	74.267	1.083
1.006	39.700	409.3	450	Circular	75.800	74.	267	1.083	75.0	070	74.170	0.450
1.007	3.360	112.0	300	Circular	75.070	74.	170	0.600	75.2	140	74.140	0.700
2.000	8.200	410.0	450	Circular	75.070	74.	190	0.430	75.0	000	74.170	0.380
	Link	US	Dia	Node	мн		DS	Dia	No	de	МН	
		Node	(mm)	Туре	Туре	1	Node	(mm)	Тур	be	Туре	
	1.000	MH2	1200	Manhole	Adopta	ble	MH3	1200	Man	hole	Adoptal	ole
	1.001	MH3	1200	Manhole	Adopta	ble	MH4	1200	Man	hole	Adoptal	ole
	1.002	MH4	1200	Manhole	Adopta	ble	MH5	1200	Man	hole	Adoptal	ole
	1.003	MH5	1200	Manhole	Adopta	ble	MH6	1200	Man	hole	Adoptal	ole
	1.004	MH6	1200	Manhole	Adopta	ble	MH7	1200	Man	hole	Adoptal	ole
	1.005	MH7	1200	Manhole	Adopta	ble	MH8	1200	Man	hole	Adoptal	ble
	1.006	MH8	1200	Manhole	Adopta	ble	MH9	1200	Man	hole	Adoptal	ole
	1.007	МН9	1200	Manhole	Adopta	ble	Outfall	1200	Man	hole	Adoptal	ole
	2.000	MH9	1200	Manhole	Adopta	ble	Tank		Junct	ion		
					<u>Manhole</u>	<u>Sche</u>	<u>dule</u>					
Nod	le Easti	ng No	orthing (m)	CL (m)	Depth	Dia	Со	nnections	1	Link	IL (m)	Dia (mm)
MH	2 35.6) 30 :	14.530	76.855	2.343	1200		0			(11)	(1111)
							(3				
NALL	2 44 4	0.2	21 104	76 717	2 2 2 1	1200			0 1	.000	74.512	450
IVIT1.	5 44.4	55 .	51.104	/0./1/	2.231	1200		Å	1	.000	74.480	450
							1	/-	0 1	.001	74.486	450
MH	4 49.1	75 4	43.144	76.617	2.161	1200		0	1 1	.001	74.456	450
								5	-			
							(/	Ď	0 1	.002	74.456	450
MH	5 53.8	57 !	53.846	76.517	2.100	1200	(1	Þ T	0 1 1 1	.002 .002	74.456 74.417	450 450
MH	5 53.8	57 !	53.846	76.517	2.100	1200	(1 [/] (1	$\vec{\mathcal{P}}$	0 1 1 1 0 1	.002 .002 .003	74.456 74.417 74.417	450 450 450
MH	5 53.8 6 61.8	57 ! 84 (53.846 66.388	76.517 76.450	2.100 2.060	1200	(1 (1 (1	Þ Þ Å	0 1 1 1 0 1 1 1	.002 .002 .003 .003	74.456 74.417 74.417 74.390	450 450 450 450
MH	5 53.8 6 61.8	57 ! 84 (53.846 66.388	76.517 76.450	2.100	1200 1200		Þ Þ Þ	0 1 1 1 1 1 0 1 1 1 0 1	.002 .002 .003 .003	74.456 74.417 74.417 74.390 74.390	450 450 450 450
MH: MH	5 53.8 6 61.8 7 68.9	57 <u></u> 84 (07 8	53.846 66.388 82.441	76.517 76.450 76.250	2.100 2.060 1.890	1200 1200 1200		Ď Ď Ď	0 1 1 1 0 1 1 1 0 1 1 1 1 1	.002 .002 .003 .003 .004 .004	74.456 74.417 74.417 74.390 74.390 74.360	450 450 450 450 450 450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connectio	ons	Link	IL (m)	Dia (mm)
MH8	67.402	98.662	75.800	1.533	1200		1	1.005	74.267	450
						1	0	1.006	74.267	450
MH9	66.439	113.080	75.070	0.900	1200	0-1	1	1.006	74.170	450
						0-5	0-1	1.007	74.170	300
						1	0-2	2.000	74.190	450
Outfall	74.426	125.920	75.140	1.000	1200		1	1.007	74.140	300
Tank	54.249	107.542	75.000	0.830		o1	1	2.000	74.170	450

Simulation Settings

Rainfall Methodology FEH- Summer CV 0.75 Winter CV 0.84	22 0 0 Drain	Analysis Skip Stead Down Time	Speed N y State x (mins) 2	lormal 40	Addit Ch Che	tional Storage (m³/l eck Discharge Rate eck Discharge Volu	na) 20.0 :(s) x me x				
156018030120240	0 360 0 480	Storm I 600 720 1	Durations 960 2 1440 2	160 880	4320 5760	7200 1008 8640)				
Return Period Climate Change Additional Area Additional Flow											
(years	s) ((CC %)	(A %	2	(u	(%)					
	30	35		0		0					
	100	40		0		0					
	<u>Node N</u>	1H9 Online H	Hydro-Brak	e [®] Cont	rol						
		1									
Flap Valv	ve x		Ob	jective	(HE) Mi	nimise upstream s	torage				
Downstream Lir	nk 1.007		Sump Av	ailable	\checkmark						
Replaces Downstream Lir	nk √		Product N	umber	CTL-SHI	E-0094-3900-1000-	3900				
Invert Level (n	n) 74.170	Min Ou	tlet Diamet	ter (m)	0.150						
Design Depth (n	n) 1.000	Min Nod	le Diametei	r (mm)	1200						
Design Flow (I/	′s) 3.9										
	Node MH	13 Link Surro	ound Stora	ge Struc	<u>ture</u>						
Base Inf Coefficient (m/hr)	0.00000		Poro	sity 0.	.30	Link	1.000				
Side Inf Coefficient (m/hr)	0.00000	Ir	nvert Level	(m) 74	4.486	Surround Shape	(Trench)				
Safety Factor	2.0	Time to half	f empty (m	ins) 2		Diameter (mm)	500				
	Nodo MI	12 Link Curr	und Stora	ao Struc	+						
	Noue Mr	15 LINK SUTT		ge strut	lure						
Base Inf Coefficient (m/hr)	0.00000		Poro	sity 0.	.30	Link	1.000				
Side Inf Coefficient (m/hr)	0.00000	Ir	nvert Level	, (m) 74	4.486	Surround Shape	(Trench)				
Safety Factor	2.0	Time to half	f empty (m	ins) 2		Diameter (mm)	500				
,	I	-		,	1	. ,					

Charles&A	ssociates Consulting	File: 23-100 O	akley Green SW I	Page 4								
CAUSEWAY		Network: Stor	m Network									
		Michael Turn	er									
		15/01/2024		I								
Node MH4 Link Surround Storage Structure												
Base Inf Coefficient (m/hr) 0.000	000	Porosity	0.30	Link	1.001							
Side Inf Coefficient (m/hr) 0.00000 Invert Level (m) 74.456 Surround Shape (Trench)												
Safety Factor 2.0 Time to half empty (mins) 2 Diameter (mm) 500												
Node MH5 Link Surround Storage Structure												
Base Inf Coefficient (m/hr) 0.000	000	Porosity	0.30	Link	1.002							
Side Inf Coefficient (m/hr) 0.000	000 Inv	vert Level (m)	74.417 Surro	ound Shape	(Trench)							
Safety Factor 2.0	Time to half	empty (mins)	2 Diar	neter (mm)	500							
<u>N</u>	lode MH6 Link Surro	und Storage Str	ructure									
Base Inf Coefficient (m/hr) 0.000	000	Porosity	0.30	Link	1 003							
Side Inf Coefficient (m/hr) 0.000	000 Inv	vert Level (m)	74.390 Surro	ound Shape	(Trench)							
Safety Factor 2.0	Time to half	empty (mins)	2 Diar	neter (mm)	500							
Δ	lode MH7 Link Surrou	und Storage Str	ructure									
Base Inf Coefficient (m/br) 0.000	000	Porosity	0.30	Link	1 004							
Side Inf Coefficient (m/hr) 0.000	000 Inv	vert Level (m)	74.360 Surro	ound Shape	(Trench)							
Safety Factor 2.0	Time to half	empty (mins)	2 Diar	neter (mm)	500							
Δ	lode MH8 Link Surrou	und Storage Str	ructure									
Base Inf Coefficient (m/br) 0.000	000	Porosity	0 30	Link	1 005							
Side Inf Coefficient (m/hr) 0.000	000 Inv	vert Level (m)	74.267 Surro	ound Shape	(Trench)							
Safety Factor 2.0	Time to half	empty (mins)	0 Diar	neter (mm)	500							
Δ	lode MH9 Link Surrou	und Storage Str	ructure									
Base Inf Coefficient (m/hr) 0.000	000	Porosity	0.30	Link	1.006							
Side Inf Coefficient (m/hr) 0.000	000 Inv	vert Level (m)	74.170 Surro	ound Shape	(Trench)							
Safety Factor 2.0	Time to half	empty (mins)	0 Diar	neter (mm)	500							
	Node Tank Depth/Ar	<u>ea Storage Stru</u>	<u>icture</u>									
Base Inf Coefficient (m/hr) 0	.00000 Safety Fa	ctor 2.0	Invert	Level (m) 7	4.170							
Side Inf Coefficient (m/hr) 0	.00000 Poro	sity 1.00	Time to half emp	oty (mins) 7								
Depth Area Inf A	rea Depth Are	a Inf Area	Depth Area	Inf Area								
(m) (m²) (m	2) (m) (m ²) (m²)	(m) (m²)	(m²)								
0.000 40.0	0.0 0.400 40.	0 0.0	0.401 0.0	0.0								

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	MH2	12	75 217	0 705	1175	2 1260	0,0000	SURCHARGED
15 minute winter	MH3	12	75 200	0.703	108.4	2.1200	0.0000	SURCHARGED
15 minute winter	MH4	12	75.180	0.724	101.5	1.5289	0.0000	SURCHARGED
15 minute winter	MH5	12	75.153	0.736	166.4	2.8452	0.0000	SURCHARGED
15 minute winter	MH6	12	75.099	0.709	208.1	2.0942	0.0000	SURCHARGED
15 minute winter	MH7	12	75.010	0.650	204.0	1.3217	0.0000	SURCHARGED
15 minute winter	MH8	12	74.819	0.552	219.5	1.9364	0.0000	SURCHARGED
15 minute winter	MH9	12	74.587	0.417	230.4	1.2437	0.0000	SURCHARGED
15 minute summer	Outfall	1	74.140	0.000	3.9	0.0000	0.0000	ОК
15 minute winter	Tank	12	74.506	0.336	226.9	0.0000	0.0000	ОК

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)	Node		Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter	MH2	1.000	MH3	108.4	0.738	0.688	1.7112	
15 minute winter	MH3	1.001	MH4	101.5	0.744	0.634	1.9172	
15 minute winter	MH4	1.002	MH5	100.1	0.632	0.663	2.7886	
15 minute winter	MH5	1.003	MH6	160.7	1.014	1.021	1.7825	
15 minute winter	MH6	1.004	MH7	204.0	1.288	1.289	1.9568	
15 minute winter	MH7	1.005	MH8	203.9	1.287	1.272	5.9179	
15 minute winter	MH8	1.006	MH9	220.9	1.394	1.391	6.1881	
15 minute winter	MH9	Hydro-Brake®	Outfall	3.9				5.3
15 minute winter	MH9	2.000	Tank	226.9	1.641	1.430	1.1279	120.3

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH2	12	75.721	1.209	155.7	3.6479	0.0000	SURCHARGED
15 minute winter	MH3	12	75.691	1.205	142.7	4.1960	0.0000	SURCHARGED
15 minute winter	MH4	12	75.657	1.201	130.6	2.9349	0.0000	SURCHARGED
15 minute winter	MH5	12	75.613	1.196	215.0	5.1772	0.0000	SURCHARGED
15 minute winter	MH6	12	75.524	1.134	267.4	3.6808	0.0000	SURCHARGED
15 minute winter	MH7	12	75.375	1.015	260.1	2.4105	0.0000	SURCHARGED
15 minute winter	MH8	12	75.060	0.793	281.1	3.6797	0.0000	SURCHARGED
15 minute winter	MH9	12	74.674	0.504	293.9	1.6904	0.0000	SURCHARGED
15 minute summer	Outfall	1	74.140	0.000	3.9	0.0000	0.0000	OK
15 minute winter	Tank	12	74.546	0.376	290.0	0.0000	0.0000	ОК

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Upstream Depth)	Node		Node	(I/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute winter	MH2	1.000	MH3	142.7	0.901	0.906	1.7112	
15 minute winter	MH3	1.001	MH4	130.6	0.824	0.816	1.9172	
15 minute winter	MH4	1.002	MH5	128.2	0.809	0.849	2.7886	
15 minute winter	MH5	1.003	MH6	206.2	1.302	1.311	1.7825	
15 minute winter	MH6	1.004	MH7	260.1	1.642	1.643	1.9568	
15 minute winter	MH7	1.005	MH8	260.7	1.646	1.626	5.9179	
15 minute winter	MH8	1.006	MH9	281.2	1.775	1.771	6.2902	
15 minute winter	MH9	Hydro-Brake [®]	Outfall	3.9				5.5
15 minute winter	MH9	2.000	Tank	290.0	1.859	1.828	1.2303	161.2

Appendix H Thames Water Sewer Records

Charles & Associates

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

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

<u>Thames Water Utilities Ltd</u>, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13 T 0845 070 9148 E <u>searches@thameswater.co.uk</u> I <u>www.thameswater-propertysearches.co.uk</u> NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no survey information is available.

Manhole Reference	Manhole Cover Level	Manhole Invert Level				
621B 6201 621A 7301	n/a 28.84 n/a 28.42	n/a 25.6 n/a 25.12				
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Appendix I Proposed Foul Water Drainage Strategy

A Charles & Associates

