2-4 RINGERS ROAD

London Borough of Bromley

OUTLINE SUSTAINABLE DRAINAGE ASSESSMENT

Ringers Road Properties Ltd

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WATER | ENVIRONMENT

Water Environment Limited
6 Coppergate Mews
103 Brighton Road
Surbiton
London
KT6 5NE

Tel: 020 8545 9720

www.WaterEnvironment.co.uk

This report was commissioned by Substantia Group on the behalf of Ringers Properties Ltd in October 2020 to develop a Sustainable Drainage Strategy for the proposed residential and commercial development at 2-4 Ringers Road and 5 Ethelbert Road in Bromley, London. The design and report was revised in June 2021 due to design changes with the proposed development.

Prepared by:

Claire Burroughs
MSc DIC, MEng (Hons)
MCIWEM

Reviewed by:

Laura Sleightholme
MSc DIC, BSc (Hons) Geol
MCIWEM FGS

Approved by:

Guy Laister
MScEng BScEng (Civil)
CEng CEnv C.WEM MCIWEM
Director

for and on behalf of Water Environment Limited

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A	16th July 2021	Revised Design and Updated Report	CB	GL
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D	20th September 2021	Revised drawings	CB	GL

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GLOSSARY

AOD	Above Ordnance Datum
BGL	Below Ground Level
BGS	British Geological Survey
DEFRA	Department for Environment Food and Rural Affairs
EA	Environment Agency
FEH	Flood Estimation Handbook
LBB	London Borough of Bromley
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
PPG	Planning Practice Guide
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SPZ	Source Protection Zone

EXECUTIVE SUMMARY

This report considers the management of surface water in relation to proposed development at 2-4 Ringers Road (which fronts Ringers Road and Ethelbert Road) and 5 Ethelbert Road in Bromley, London. The development proposals are for the demolition of existing buildings and construction of a mixed use development comprising residential units, ancillary residents' facilities (including co-working space) and commercial floor space (Use Class E) across two blocks, along with associated hard and soft landscaping, amenity spaces, cycle and refuse storage.

The site is located above the permeable Harwich Formation, which is highly likely to support infiltration-based Sustainable Drainage Systems (SuDS). No on-site ground investigation has been undertaken to confirm the composition beneath the site or the depth to the groundwater. Nearby boreholes indicate the depth to groundwater is approximately 3.5m below ground and therefore traditional infiltration devices should be practicable. Infiltration from broader devices such as permeable paving and from bioretention systems may also be possible.

The site is located in Source Protection Zone 1 (SPZ1). Under the Environment Agency's Approach to Groundwater Protection document, any SuDS which discharge to ground (other than clean roof water) are required to undertake a hydrogeological risk assessment to ensure the SuDS systems does not become a pathway for contaminates to the groundwater supply. No on-site ground investigation has been undertaken and, as such, an assessment cannot be undertaken at this time. This must be undertaken at detailed drainage design stages to ensure no detrimental effect on the groundwater body.

In developing an outline drainage strategy for the site, the sustainable drainage hierarchy and discharge hierarchy have been used. There are no suitable surface waterbodies in close proximity of the site. The recommended strategy includes the use of combination green blue roofs across both proposed blocks and Silva Cells in the courtyard as part of a system which has a controlled discharge to the existing surface water sewer in Ringers Road or Ethelbert Road. In addition, it is recommended that bioretention areas and rain gardens are used within the landscaping to provide source control, as well as potential communal rainwater harvesting systems. The site is not suitable for open storage features due to spatial constraints. All paved areas should be permeable paved as per the requirements of the London Plan and could also provide surface water storage within a porous sub-base.

Calculations show that it is possible to contain the 100 year return period rainfall event including an allowance for climate change within blue roof and underground storage when controlling the peak discharge rate to 5 l/s. This discharge rate has been approved by Thames Water. The calculations for the design presented conservatively ignore any contribution to re-use, storage and attenuation that could be provided by any rainwater harvesting and bio-retention systems.

The drainage strategy presented herein is designed not to flood in the 100 year return period event including an allowance for climate change of 40%.

Subject to the implementation of a suitable SuDS strategy within the parameters detailed in this report, the proposed development would have an overall positive impact on the risk of flooding in the area by reducing on-site and off-site flood risk.

The report sets out details of a potential SuDS strategy for the site and requirements for surface water management including maintenance. Full details of the surface and foul water drainage strategies will be completed at detailed design stage. Detailed management and maintenance plans will be confirmed at this further stage, and the freeholder will be responsible for upholding them.

1 INTRODUCTION

General Information

1.1 This sustainable drainage assessment is carried out in relation to the site of proposed development at 2-4 Ringers Street in Bromley and 5 Ethelbert Road. The site falls within the planning jurisdiction of the London Borough of Bromley (LBB). The site is currently occupied by a number of properties and is predominantly hard standing.

1.2 The development proposed at the site is for a residential scheme with two blocks, comprising of 108 units. Due to the number of units proposed, the development is classified as "Major Development", and as a result, an assessment is required to demonstrate that Sustainable Drainage Systems (SuDS) have been considered.

1.3 The Lead Local Flood Authority (LLFA) role for this site is fulfilled by the LBB which develops, and controls policy related to SuDS and surface water management which must be considered. This report is compiled in accordance with the relevant LBB policies and guidance, and includes within the appendix, the LBB SuDS proforma.

Scope of Study

1.4 The main objectives of this study are to:

- Consider the pre- and post-development drainage schemes and calculate pre- and post-development run-off rates and volumes based on standard methodologies;
- Consider potential future climate change over the lifetime of the proposed development;
- Provide outline design for drainage system elements and appropriate connection locations;
- Consider the SuDS hierarchy and sustainable discharge hierarchy;
- Confirm future management and maintenance requirements for proposed SuDS elements; and
- Provide advice and guidance on the management of surface water run-off at the site to ensure the risk of surface water flooding on the site and on nearby sites does not increase following development.

2 SITE DESCRIPTION

Location

2.1 The proposed development site is located at 2-4 Ringers Road and 5 Ethelbert Road. The site fronts Ringers Road and Ethelbert Road. The area is located at the juxtaposition of the commercial area of Bromley and the start of the residential area. As a result, the density of residential development is relatively high, with local facilities mixed with housing. The position of the development is shown in Figure 1.

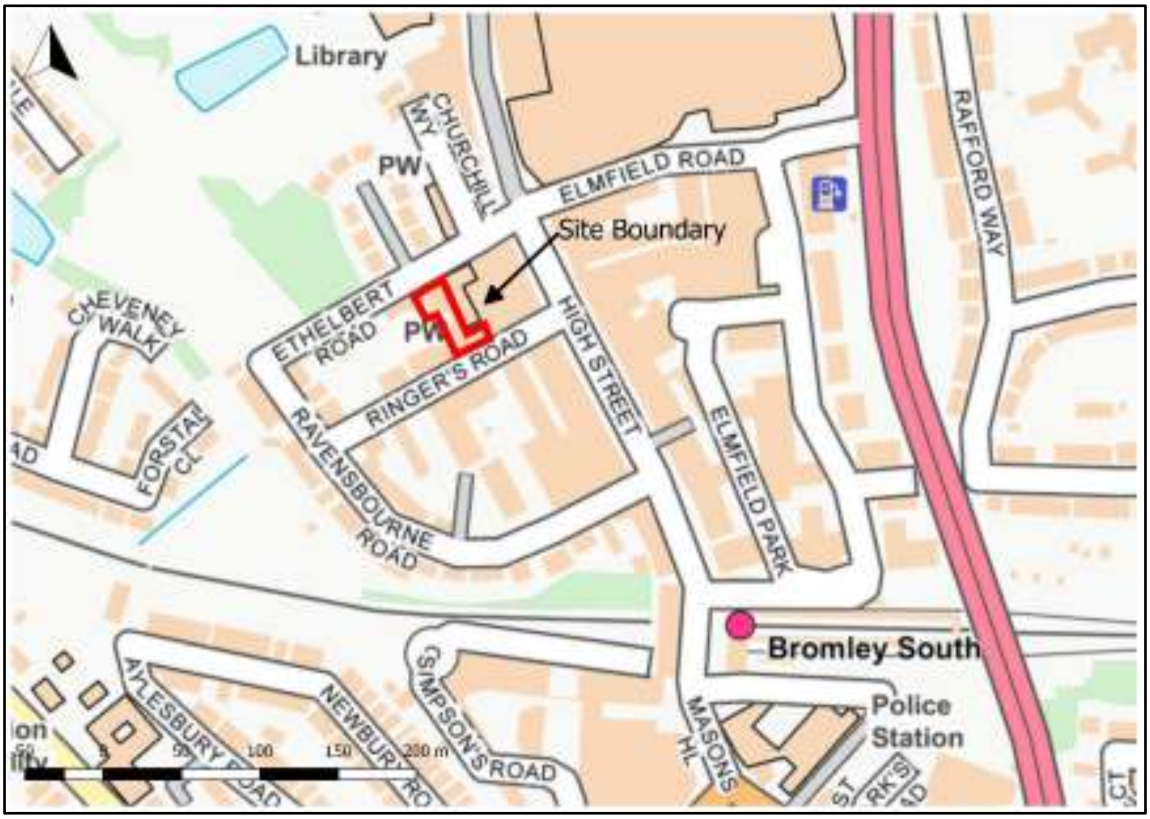


Figure 1 - Location of the development site[1]

Existing Development

2.2 A topographic survey of the site was undertaken by GM Surveys Limited in October 2020 and is included in Appendix A. The survey is referenced to the Ordnance Survey (OS) National Grid. The site topography has a distinct fall from north to south, with maximum levels of 57.59 m AOD on the northern boundary on Ethelbert Road, falling to 56.58m AOD on the southern boundary of the site on Ringers Road. There is also a slight fall from east to west with levels on Ethelbert Road being 300mm lower than on the eastern boundary compared to the western boundary.

2.3 The 1,020m^2 (0.10ha) site is currently occupied by the commercial restaurant at 2-4 Ringers Road which extends to Ethelbert Road due to the associated annexes. The site also contains 5 Ethelbert Road.

2.4 The only permeable surfacing on the site at present, is the rear garden of 5 Ethelbert Road which is roughly 100m^2. The rest of the site is impermeable hard paved areas and roofs. Thus, the existing site is currently 91% impermeable.

2.5 There is limited evidence of existing formal surface water drainage infrastructure on the site, and the existing building does not have gutters or downpipes. There is a drainage channel noted within the rear garden of 5 Ethelbert Road and a number of manholes across the site. However, there is no indication of the presence or location of a surface water drainage run that serves the existing site(s).

Proposed Development

2.6 The proposed development is for the construction of a mixed use development comprising residential units, ancillary residents' facilities (including co-working space) and commercial floor space (Use Class E) across two blocks, along with associated hard and soft landscaping, amenity spaces, cycle and refuse storage.

2.7 The proposed development incorporates 108 residential units in the form of 1-2 bed apartments to be housed in two blocks. Block A is located on the southern side of the site, adjacent to Ringers Road and has 13 floors. Block B is located on the northern boundary and has 11 floors.

2.8 Both blocks have basements which accomdate bike storages, plant rooms, and co working or event spaces.

2.9 The proposed development is classified as "More Vulnerable" to flood risk under the National Planning Policy Framework (NPPF). However, the site is located in Flood Zone 1 and not in any further areas of known flood risk and therefore the use is appropriate.

2.10 The proposed development incorporates soft landscaping areas including communal gardens. The communal gardens will include shallow rain gardens and raised planters. Both blocks have proposed green roofs.

3 PLANNING POLICY

National Planning Policy Framework

3.1 The National Planning Policy Framework (NPPF) was updated in July 2021[2] and sets out the Government's planning policies for England and how these are expected to be applied. The NPPF requires that "major development" incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate, as required by the House of Commons Written Statement (HCWS161) set down in December 2014. Paragraph 169 requires that all drainage systems should:

a) take account of advice from the lead local flood authority;
b) have appropriate proposed minimum operational standards;
c) have maintenance arrangements in place to ensure an acceptable standard of operation of the lifetime of the development; and
d) where possible, provide multifunctional benefits.

3.2 The accompanying Planning Practice Guidance (PPG) for Flood Risk and Coastal Change introduces the drainage discharge hierarchy (paragraph 080) which prioritises discharge of surface water to the ground and local watercourses over discharge to existing piped networks. The PPG requires consideration of the arrangements for maintenance of drainage systems, and refers ultimately to the Non-statutory Technical Standards for sustainable drainage systems[3] in providing the framework for SuDS design, but does introduce the following exceptions (paragraph 083):

- where compliance with the Standards would be more expensive than simply complying with building regulations, it is considered that it is "unlikely to be reasonably practicable" to comply with the Standards and therefore building regulations would be acceptable; and
- where compliance with the discharge hierarchy would cost more to design (including maintenance) and construct than a discharge route further down the hierarchy (for example connection to the public sewer would cost less than construction of soakaways), then it is normally considered "not reasonably practicable".

Non-statutory Technical Standards for Sustainable Drainage Systems

3.3 The NPPF requires the use of the Non-statutory Technical Standards for all drainage design related to "major development", except where it is "not reasonably practicable" to comply. The Technical Standards set out the required flow and volume restrictions, as well as requirements relating to flood risk, "so far as is reasonably practicable" as follows:

- Peak flows to drains or surface water bodies for the 1 year and 100 year return period rainfall events should never exceed the peak discharge rate prior to development, i.e. should not exceed greenfield peak flows for greenfield sites and should be as close as reasonably practicable to greenfield for previously developed sites.
- Total runoff volumes to drains or surface water bodies in the 100 year return period, 6 hour rainfall event should never exceed the runoff volume prior to development, i.e. should not exceed greenfield volumes for greenfield sites, and should be as close as reasonably practicable to greenfield for previously developed sites. In addition, where it is not possible

[2] Ministry of Housing, Communities and Local Government (July 2021), updated National Planning Policy Framework
[3] Department for Environment, Food and Rural Affairs (March 2015), Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems

to prevent additional volume leaving the site, additional volume must be discharged at a rate that does not affect flood risk.

- Unless specifically designed to hold or convey water above ground, drainage systems must be designed to contain below ground the 30 year return period rainfall event, to prevent any flooding of buildings or susceptible infrastructure in the 100 year return period rainfall event, and to provide exceedance routes for greater return period events that minimise the risks to people and property.
- The drainage system should be designed with sufficient structural integrity for the lifetime of the development for the anticipated loading conditions, should minimise the use of pumps, and should be constructed in such a way to avoid damage to existing drainage systems.

The London Plan

3.4 The site is located within Greater London and as such the development is subject to the requirements of the Mayor of London's strategic plan, 'The London Plan'. The London Plan is the overarching spatial strategy for the Greater London Area, and provides the basic foundation for planning policy in London.

3.5 The adopted London Plan[4] was published by the Mayor on the 3rd March 2021 following consultation between the Mayor of London and the Secretary of State in December 2020.

3.6 Sustainable drainage is considered in the current London Plan under Chapter 9 "Sustainable Infrastructure", and SI 13.

3.7 Policy SI 13; Sustainable Drainage states that:

> *Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:*
>
> *1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)*
>
> *2) rainwater infiltration to ground at or close to source*
>
> *3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)*
>
> *4) rainwater discharge direct to a watercourse (unless not appropriate)*
>
> *5) controlled rainwater discharge to a surface water sewer or drain*
>
> *6) controlled rainwater discharge to a combined sewer.*

3.8 Policy SI 13 also requires that "*impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways."*

3.9 In addition, "*Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation".*

[4] Mayor of London, March 2021, The London Plan, The Spatial Development Strategy for Greater London, Greater London Authority

3.10 The promotion of SuDS is also mentioned in Policy G 5, Urban Greening and it is stated that:

> *"Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage".*

Bromley Local Plan[5]

3.11 The site is located in the jurisdiction of the London Borough of Bromley (LBB). The Bromley Local Plan was adopted on 16th January 2019. The Local Plan sets out the planning policies, site allocations and land designations Borough-wide.

3.12 Policy 115 - Reducing Flood Risk requires collaboration between the Environment Agency, landowners and developers to manage and reduce flood risk from all sources, taking account of the most recent Council and other documents pertaining to local flood risk. The policy additionally states that the Council will apply the sequential and exception tests, will engage in emergency planning for all phases of flood events. The Council will require developers borough-wide to implement SuDS to manage surface water flood risk, and that all proposed flood risk mitigation measures be "effective, viable, attractive and enhance the public realm while ensuring that any residual risk can be safely managed".

Bromley Town Area Action Plan[6]

3.13 The Bromley Town Centre Area Action Plan (BTCAAP) was adopted in October 2010, and continues to be carried out as adopted policy with the exception of the limited policies and designations in the Local Plan which directly relate to the Bromley Town Centre. Under 'Sustainable Design and Construction' the APP 'promotes opportunities for water….' and 'Green roofs and surface water storage to reduce flood risk will be encouraged.' Policy BTC8 Sustainable Design and Construction requires a consideration of sustainable water use.

3.14 Policy BTC9-Flood Risk covers the requirements for flood risk in the action area. The key requirements relating to the proposed development include:

- An appropriate flood risk assessment is required in line with the SFRA and NPPF;
- Developments of over 500m^2 of floor space should reduce the risk of flooding from surface water and its contribution to fluvial flooding and incorporate appropriate flood resilience measures including raised ground floor levels as appropriate;
- Developments should seek to also reduce the risk of flooding from sewers and foul drainage; and
- Development layouts should consider the management of extreme flood events by assessing extreme and exceedance flood flow pathways.

3.15 Policy BTC11-Drainage covers the requirements for surface water drainage and requires that runoff rates from sites are limited to greenfield rates where possible for the 2 year, 30 year and 100 year event, or where this is not possible, to the appropriate London Plan standard.

3.16 Further specific requirements include the requirement to include the latest allowances for climate change across all return periods in drainage design, and to protect discharge to ground within

[5] London Borough of Bromley (January 2019) Local Plan
[6] London Borough of Bromley (October 2010) Bromley Town Centre Area Action Plan

source protection zones. The policy requires that no roof runoff be discharged into the existing surface water pipe network system.

Strategic Flood Risk Assessment

3.17 The Strategic Flood Risk Assessment[7] (SFRA) covers the flood risks within the LBB and includes guidance on managing surface water for development.

3.18 The SFRA outlines SuDS principles and hierarchies which developers must adhere to, within their design.

3.19 The SFRA Appendix F is dedicated to rainfall runoff management. This document outlines the procedure developers should undertake to manage surface water runoff for proposed developments.

3.20 In particular, for sites less than 50ha, The Institute of Hydrology Report 124 Flood Estimation for Small Catchments should be used to determine peak greenfield rates. For detailed design of stormwater runoff, the standard Wallingford Procedure variable UK runoff model should be used.

3.21 In terms of designing for a restricted surface water flow rate from a site, Appendix F of the SFRA recommends that a flow rate of 5 l/s should be used because this provides a satisfactory low flow rate whilst also preventing blockages in the surface water system.

[7] Halcrow Group Ltd, December 2008, London Borough of Bromley Strategic Flood Risk Assessment

4 SURFACE WATER MANAGEMENT

Requirements

4.1 The LLFA is LBB and is currently responsible for consenting on SuDS, and the adopting drainage authority is Thames Water. The LBB SuDS proforma is appended to this report.

4.2 In accordance with the NPPF, surface water runoff rates and volumes should not increase as a result of the proposed development. LBB require major developments to reduce surface water rates post-development to the equivalent greenfield rate, through the use of SuDS wherever reasonably practicable.

4.3 Local planning policy also requires the design of drainage systems to follow both the SuDS hierarchy and the discharge hierarchy.

4.4 The site is currently 91% hard standing and permeable surfaces will increase significantly following development, resulting in a reduction in surface water runoff rates and volumes from the site.

Ground Conditions

4.5 DEFRA Magic Maps[8] show the site to be in Source Protection Zone (SPZ) Zone 1. The purpose of SPZ are to provide protection to safeguard drinking water quality, and these are defined around large and public potable groundwater abstraction sites. SPZ1 is the inner zone and the highest value category.

4.6 As the site is within SPZ1, this it means the site lies in an area which is "*defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50-metre radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water-borne disease.*" It is therefore critically important the development does not impact or cause harm to the SPZ.

4.7 The DEFRA Magic Maps shown the site is also located within Secondary A Aquifer classification and the area is at high risk of groundwater vulnerability. The mapping also notes the site is located within an area of soluble rock risk.

4.8 British Geological Survey (BGS) online maps shows the site to be underlain with a bedrock of Harwich Formation. No superficial deposits are recorded by BGS maps.

4.9 Nearby BGS boreholes shows the local area is located on a small layer of made ground or clay followed by sand and gravels. The records are all consistent and BGS TQ46NW26 records groundwater being struck at 14' 0" (approx. 4.2m) and standing water settled at 11' 6" (aprox.3.5m) below ground level (BGL).

4.10 The proposal for the site includes basements for both proposed blocks. The depth of the basement could therefore be similar to the groundwater level in the vicinity of the site. It is recommended that the development ensures the basement element of the scheme includes adequate waterproofing and dewatering techniques may be required during construction.

4.11 The desktop geology and groundwater study suggest that infiltration devices are suitable for the site. A ground investigation with BRE365 rates would need to be undertaken to confirm that infiltration is possible and effective on the site. The ground investigation should also determine

[8] https://magic.defra.gov.uk/MagicMap.aspx

the depth of groundwater beneath the site to ensure a suitable depth between any infiltration devices and the recorded groundwater.

4.12 Formal soakaways are required to be 1m above a recorded groundwater level and be 5m away from a building to ensure correct performance and no interaction with below ground structures. The proposed layout of the site therefore does not allow for formal soakaways to be included. However, it may be possible to design "leaky" permeable paving at a sufficient distance from the proposed buildings, and to allow infiltration from the base of bioretention areas / rain gardens and tree pits, subject to detailed design.

4.13 No site investigation has occurred on the site and thus the exact depth of the groundwater is unknown. As the site is located in SPZ1, the Environment Agency's Approach to Groundwater Protection document requires all SuDS measures that discharge to ground (other than clean roof water) to undertake a hydrogeology risk assessment to ensure the SuDS systems does not become a pathway for contaminates or pollutants to the groundwater supply. As no on-site ground investigation has been undertaken to date, an assessment to determine that there is no risk of infiltration SuDS causing detrimental effect to the groundwater supply could not be undertaken. This assessment should be completed at detailed drainage design stage to confirm the acceptability of infiltration.

Site Runoff Rates

4.14 The 0.10ha site is currently formed mostly of impermeable surfaces, with the exception of an area of garden associated with 5 Ethelbert Road (95m^2). Rain falling on the entire site area is assumed to be collected and discharged into Ringers Road or Ethelbert Road. All calculated discharge rates for the site are presented in Table 1.

4.15 The present-day Greenfield peak runoff rate for the site area of 0.10ha was calculated using the IH124 methodology (UK SuDS greenfield calculation tool) to be 0.1 l/s in the 100 year return period event. The site has a SOIL type of 1, which equates to a percentage runoff (SPR) of 10%.

4.16 Although the survey suggests the presence of formal drainage on the site, there is no detail shown. It is therefore assumed that all surface water from impermeable surfaces currently discharges to Ringers Road or Ethelbert Road, either in formal infrastructure or overland.

4.17 According to the topographic survey, the existing site is formed of 0.09ha impermeable surfaces, which is 91% of the existing site area. The existing site runoff was calculated using design rainfall intensities derived using the Wallingford Procedure[9]. The critical storm duration was estimated to be 9.0 minutes using parameters M5-60 of 20mm and an 'R' value of 0.40, and a site slope of 1 in 100. The time of concentration was determined via SCS Sheet Flow using a surface type of paving and shallow slope. The calculated peak runoff rate for the 100 year return period storm is 31.05 l/s.

4.18 The proposed site has conservatively assumed that the site comprises 0.05ha impermeable surfaces (46%), made up of roof area (non-green roof only), pathways, and patios. The calculated peak runoff rate for the critical storm is 22.58 l/s in the 100 year return period event. However, including an allowance for the impact of future climate change on storm intensities of 40%, this figure rises to 31.61 l/s.

[9] HR Wallingford (2000) The Wallingford Procedure for Europe – Best Practice Guide to urban drainage modelling (CD)

Table 1 – Summary of Estimated Runoff Rates

Return Period:	Q_{bar}	**1 year**	**30 year**	**100 year**
Greenfield Runoff Rate (l/s) – IH124	0.02	0.01	0.04	0.05
Existing Runoff Rate (l/s)		10.08	24.32	31.05
Developed Runoff Rate (l/s)		7.33	17.68	22.58
Future Developed Runoff Rate (+40%) (l/s)		10.26	24.76	31.61

Sustainable Drainage Systems (SuDS)

4.19 The aim of SuDS is to emulate natural drainage processes such that watercourses and storage areas receive the hydrological profiles under which they evolved, and that water quality in local ecosystems is protected or improved. The best practice guide[10] states that SuDS will:

- Reduce the impact of additional urbanisation on the frequency and size of floods;
- Protect or enhance river and groundwater quality;
- Be sympathetic to the needs of the local environment and community; and
- Encourage natural groundwater recharge.

4.20 Figure 2 shows the hierarchy of SuDS techniques. The SuDS techniques that are proposed to manage surface water for the development will be discussed in relation to this hierarchy.

	SUDS Technique	**Flood Reduction**	**Pollution Reduction**	**Landscape & Wildlife**
Most Sustainable	**Green roofs**	✓	✓	✓
	Basins and ponds 1. Constructed wetlands 2. Balancing ponds 3. Detention basins 4. Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices 5. Soakaways 6. Infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains 7. Gravelled areas 8. Solid paving blocks 9. Porous paviors	✓	✓	
Least Sustainable	**Tanked systems** 10. Over-sized pipes/tanks 11. Box storage systems	✓		

Figure 2[11] – SuDS Hierarchy

[10] CIRIA (2001), *CIRIA C523:* Sustainable Drainage Systems – Best practice.
[11] http://www.sustainabledrainagecentre.co.uk/suds-hierarchy_c2236.aspx Retrieved 02/11/2016

4.21 Living roofs are feasible for the development due to the flat roof construction and therefore have been proposed in the design. Living roofs are compatible with photovoltaics. The presence of a living roof with photovoltaics benefits the performance of these devices due to providing an ambient micro-climate.

4.22 In order to provide source control and retain rainwater on site for reuse, it is strongly recommended that vegetated areas are designed as bioretention areas, tree pits and /or rain gardens to retain and utilise rainfall.

4.23 Since the development includes communal garden areas, rainwater harvesting systems could be employed to collect roof-water both for irrigation and / or non-potable water supply. Although it is strongly recommended that source control systems are utilised in the final site design, in a conservative approach to runoff calculation, rainwater harvesting systems were not considered within the calculations.

4.24 Basins, ponds, filter strips and swales are not suitable for use within the development due to a lack of available space. However, a water feature is proposed in the courtyard and if possible, it should be topped up via a rainwater harvesting system.

4.25 Infiltration devices such as formal soakaways are not reasonably practicable due to there not being sufficient space on the site to allow a 5m buffer between a soakaway and the proposed buildings. However, it would be reasonable to allow infiltration through the base of the permeable paving system. Any adopted design could utilise higher infiltration potential by using the results of an on-site BRE365 soakage tests and advice from a geotechnical engineer on diffuse infiltration within 5m of the proposed buildings.

4.26 To ensure conservative calculations in advance of any on-site BRE365 tests, the SuDS strategy calculations have been drawn up under the assumption that infiltration is not possible for this site. The potential for infiltration should be considered at detailed design stage.

4.27 There are some paved areas on the site and as per the London Plan, all paved areas are to be made permeable. These permeable paved areas should be possible to store flows, as well as filter rainwater to improve quality, within a porous sub-base to permeable paving.

Table 2 – Summary of Proposed SuDS Relative to SuDS Hierarchy

SUDS Technique	Practicable	Proposed	Notes
Green roofs, Bioretention areas, Tree pits	✓	✓	Flat roof construction is suitable for green roofs. Bioretention areas and tree pits should be incorporated where possible.
Basins and ponds	×	×	Insufficient space available on the site.
Filter strips and swales	×	×	Insufficient space available on the site.
Infiltration devices	✓	×	Insufficient distance from buildings and basements for traditional infiltration devices, however, permeable paving and bioretention areas should be unlined to allow infiltration where located a sufficient distance from buildings.

Permeable surfaces and filter drains	✓	✓	Permeable paving with sub-base storage is suitable for the site. Permeable paving proposed to reflect London Plan requirements.
Tanked systems	✓	✓	Required to ensure sufficient storage on the site to attenuate surface water prior to discharge into the Thames Water sewers.

4.28 Surface water runoff will be attenuated to Greenfield rates, if feasible, to comply with local policies and ensure no detrimental impact on the frequency and extent of flooding elsewhere because of the development.

4.29 The discharge hierarchy should also be considered, the Planning Practice Guidance states:

"Generally the aim should be discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

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

4.30 Although the geology in the area is expected to be permeable based on local borehole logs, the layout of the development means that traditional infiltration devices are not suitable for the site, and there are no surface water bodies within a reasonably practicable distance to use as an outfall location. Limited infiltration will be promoted and used whenever possible, and there is an existing Thames Water surface water sewer located in the Ringers Road and Ethelbert Road, which will be used to discharge flows. It is assumed that surface water currently already discharges to this location, either through (unconfirmed) on-site drainage infrastructure, or overland.

Table 3 – Summary of Discharge Hierarchy

Outfall	Practicable	Proposed	Notes
Into the ground (infiltration)	✓	✓	Insufficient space for traditional discharge to ground, however infiltration will be promoted from permeable paved areas and bioretention areas.
To a surface water body	×	×	Distance to nearest waterbody is at least 250m through urban development. Cost would not be practicable.
To a surface water sewer, highway drain or another drainage system	✓	✓	Thames Water confirm connection in principle subject to comply with other policy.
To a combined sewer	×	×	Not required.

4.31 Thames Water were contacted for pre-application advice. The formal response confirmed that there is sufficient capacity to accept foul flows into the foul sewer network. In terms of surface water, the response emphasised the need to apply the discharge hierarchy, and to provide evidence to justify any discharge at greater than present-day greenfield rates, which for this site is less than 1 l/s in the 100 year event, whilst also considering the need to discharge at a sufficient rate to prevent blockage, consistent with a site where significant vegetation is proposed. The response confirmed that there is sufficient capacity in the surface water network to receive flows up to 5 l/s subject to the conditions applied above.

Proposed Surface Water Drainage System

4.32 As discussed, the surface water drainage system should include bioretention areas / rain gardens and tree pits, with permeable paving used for all hard paved areas.

4.33 The proposed SuDS strategy therefore comprises the following components:

- Green roofs – totalling 553m^2 on the site with 246m^2 located on Block A and 307m^2 of Block B;
- Blue roofs – ACO RoofBloxx 165 (or similar) located under the green roofs on Block A and Block B which provides up to 165mm of surface water across 553m^2 (91m^3);
- ACO Blue Roof Flow Restrictor (or similar) on each roof to restrict flow to 1l/s;
- Silva Cells (tree pits and surface water attenuation) across 29m^2 to provide 4.75m^3 in the courtyard;
- Permeable areas including shallow rain gardens; landscaping and permeable hardstanding; and
- Discharge at controlled rate to Thames Water sewer. ACO Q-Brake (vortex flow control) used within Microdrainage calculations.

4.34 The strategy was tested using Microdrainage, the calculations presented herein are the worst-case scenario in terms of the required storage.

4.35 The blue roofs were modelled as cellular storage with a depth of 165mm. This depth was determined from the ACO Roofbloxx 165 product. The modelling of the proposed network shows that the cellular storage (blue roofs) only used 115mm and 140mm of the maximum depth of blue roof product (165mm). This means the design has capacity for any exceedance event and could be refined at the detailed design stage.

4.36 An online orifice flow control (ACO) was set at the maximum level depth of the cellular storage/blue roofs. Each roof was restricted to 1 l/s and thus a total of 2 l/s is being discharged at a controlled rate from the two blocks.

4.37 Another cellular storage unit was included in the Microdrainage model downstream of the blue roof storage to determine the remaining surface water storage requirements from ground level external areas. A vortex flow control was placed downstream of this cellular storage at 5 l/s to ensure the site was discharging at 5 l/s. It was found that a 4.75m^3 of storage is required on the site to ensure the 1 in 100 year plus 40% climate change can be stored on the site with a total discharge rate of 5 l/s.

4.38 Silva Cells are to provide the additional surface water storage on the site within the courtyard area of the development. Silva Cells are a modular suspended pavement system that also combine suitable medium for the plant and tree growth.

4.39 Using the Silva Cell sizing spreadsheet, using the minimum depths for the gravel storage, aggregate storage, and no permeable paving subbase, the development requires 29m^2 of Silva Cells to store the additional 4.75m^3 of surface water. Increasing the depth of the substates within the Silva Cell would increases the surface water storage and this can reduce the surface area requirement.

4.40 Approximately 80m^2 of the courtyard is not located above the proposed basements, which means there is sufficient space for the required 29m^2 of Silva Cells on the site. Silva Cell have confirmed that their product can be located adjacent to basements with appropriate waterproofing of the basement.

4.41 The design presented has not included the proposed landscaping or the proposed permeable paved pathways. The development must include permeable paving when feasible to be compliant with the London Plan.

4.42 The design of SuDS on the site could also integrate a gravel subbase beneath the permeable paving to provide additional surface water storage. If this was to be included in the design, it would need to be designed in respect of the basements. For a gravel subbase to provide acceptable infiltration to ground, the base of the paving must extend beyond the depth any made ground that may occur on the site. If there are concerns regarding contamination of the made ground, the sides of the paving should be lined, and the basements tanked.

4.43 FEH rainfall specific to the site was obtained from the FEH Web-Service and used to set the 100 year rainfall profiles, including a 40% allowance or climate change. The Microdrainage and Silva Cell calculations are included within Appendix B.

4.44 The design is preliminary and demonstrates feasibility only, it should be revisited at detailed design stage to ensure all elements of the proposed scheme fall within the required design guidelines. As a result of the conservative assumptions used in this analysis, it is likely that the total volume of storage required will ultimately be less than concluded in this assessment.

4.45 At the detailed design stage, the following considerations should be included:

- Full catchment and network modelling;
- Geotechnical investigations including BRE365 standard soakage testing to refine the design and extent of infiltration components;
- Inclusion of specialist design and detailed specification of green roof, blue roof, rainwater harvesting, bioretention areas, tree pits etc. within detailed network modelling;
- Detailed Quantity Surveyor input to determine financial implications of excavation related to permeable paving depth and extent, and potential partial replacement with crates, and/or refinement of discharge rate;
- Detailed specific management and maintenance plans and agreements;
- Exceedance routes diagram; and
- Final agreement with LBB and TW regarding SuDS approval and final consents (where applicable).

Long Term Storage

4.46 LBB guidance requires the provision of long-term storage to compensate for additional rainfall volume above greenfield in the 100 year return period, 60min storm. The volume above greenfield calculated using equation 24.10 of the SuDS manual[12] is 61.2m^3. This is easily accommodated within the attenuation storage provided for the critical event.

Drainage Exceedance

4.47 The SuDS strategy outlined above is designed to contain the 100 year return period rainfall including a 40% allowance for climate change. It is highly unlikely that this system would fail and cause flooding elsewhere. Total collection system failure would still result in lower discharge from the site in comparison with the existing scenario because of the presence of more storage on the site (green roof, blue roof, Silva Cell and landscaping). Further, where multiple SuDS features are employed, such as green roofs, blue roof bioretention, the impact of failure of any one element is substantially reduced.

4.48 There is a very low chance of system exceedance in more severe events or successive extreme events, which is outside the scope of design. In this case, water would discharge via the site entrance onto either Ringers Road or Ethelbert Road depending on the gradients on the site post-development and follow natural drainage pathways into the highway gullies. This is the same mechanism as currently, however, the volume of discharge in extreme would be significantly reduced by the development as a result of the storage provided on site to attenuate the design event. Consequently, the severity of offsite flooding in these events would be substantially reduced by the proposed development.

Effect on Flood Risk Elsewhere

4.49 Due to the implementation of a suitable SuDS strategy, and by controlling the discharge rates from the site, the overall site discharge of surface water will reduce substantially following development. As a result, pressure on surface water collections systems will reduce.

4.50 The overall effect of the proposed SuDS strategy is a net reduction in flood risk at the site and in the local area.

SuDS Management and Maintenance

4.51 Management and maintenance of the drainage network, including the permeable surfacing and gravel sub-base will be the responsibility of the freeholder and / or management company for the site. Management and maintenance agreements and plans will be arranged prior to completion of development.

4.52 The SuDS Manual (CIRIA Guide) provides details for maintaining SuDS. Guidance on maintenance requirements for green roofs, permeable surfacing and bioretention systems (rain gardens) are presented in proceeding tables.

4.53 The CIRIA guidelines are generic and provide advice only. Management and maintenance of the drainage should be carried out in accordance with the guidance and specification provided by the supplier of each SuDS component.

4.54 The management and maintenance of Silva Cells is also attached to this report.

[12] CIRIA (2015) C753 The SuDS Manual

Table 4 - Maintenance requirements for green roofs

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six months and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of the manufacturer)
	Post establishment replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled cracked or moved, investigate and repair as appropriate	As required

Table 5 - Maintenance requirements for permeable block paving

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required)
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked of broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost joining material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation	Annually

Table 6 - Maintenance requirements for rain gardens (based on CIRIA C753 Table 18.3)

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding and assess standing water levels if appropriate	Quarterly
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
Regular Maintenance	Remove litter and surface debris and weeds	At least Quarterly
	Replace plants to maintain planting density	As required
Occasional Maintenance	Infill any holes or depressions that develop within the sub-base	As required
	Repair accumulations of silt by raking surface mulch, scarifying and replacing mulch	As required
Remedial Actions	Remove and replace sub-base and filter medium, as well as replacing vegetation	As required, likely to be low frequency >20 years

Table 7 - Maintenance requirements for attenuation storage tanks

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risk to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface or filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 The site of proposed development at 2-4 Ringers Road and 5 Ethelbert Road in Bromley is currently occupied by commercial and residential property. The proposals for the site are for the demolition of existing buildings and construction of a mixed use development comprising residential units, ancillary residents' facilities (including co-working space) and commercial floor space (Use Class E) across two blocks, along with associated hard and soft landscaping, amenity spaces, cycle and refuse storage.

5.2 The site is not at significant risk of flooding from any source. The development is classed as "major development", and therefore an assessment of drainage is required, together with a suitable strategy to reduce runoff rates in a sustainable manner, in order to reduce flood risk elsewhere.

5.3 The site is located in Source Protection Zone 1 (SPZ1) which requires, under the Environment Agency's Approach to Groundwater Protection document, that any SuDS which discharge to ground (other than clean roof water) to undertake a hydrogeology risk assessment to ensure the SuDS systems does not become an enabler of contaminates to the groundwater supply. No on-site ground investigation has been undertaken at this time, and as such an assessment cannot be undertaken. This should be completed at detailed drainage design stages.

5.4 By applying the SuDS and discharge hierarchies, it has been determined that the best strategy for surface water management is to discharge using a combination of interception (via green roofs), attenuation (blue roof) and bio-retention (via Silva cells) with a controlled discharge to the public sewer in Ringers Road or Ethelbert Road.

5.5 To provide a robust and conservative assessment, based on information available at this time, no permeable landscaped areas and infiltration through permeable paving were included in the model. As a result, the calculations presented herein are the worst-case scenario in terms of the required storage within the permeable paving. The use of green roofs, blue roofs across both blocks and Silva Cell biorientation devices within the courtyard were shown to be sufficient to reduce surface water rates to 5 l/s. The green roof and Silva Cells provide some of the required attenuation storage, as well as filtering runoff with consequent benefits on water quality in line with Simple Index methods within the SuDS Manual.

5.6 The overall outline SuDS design presented in this report would prevent surface flooding in the 100 year return period rainfall event, including a 40% allowance for climate change.

5.7 Subject to detailed design, the proposed development would result in a net benefit by reducing the rates and volumes of runoff from the site, compared to the existing site. This would therefore the risk of flooding elsewhere. Associated benefits including improved quality of surface runoff, as well as biodiversity and habitat gains (from inclusion of green roofs and rain gardens) would result from the development.

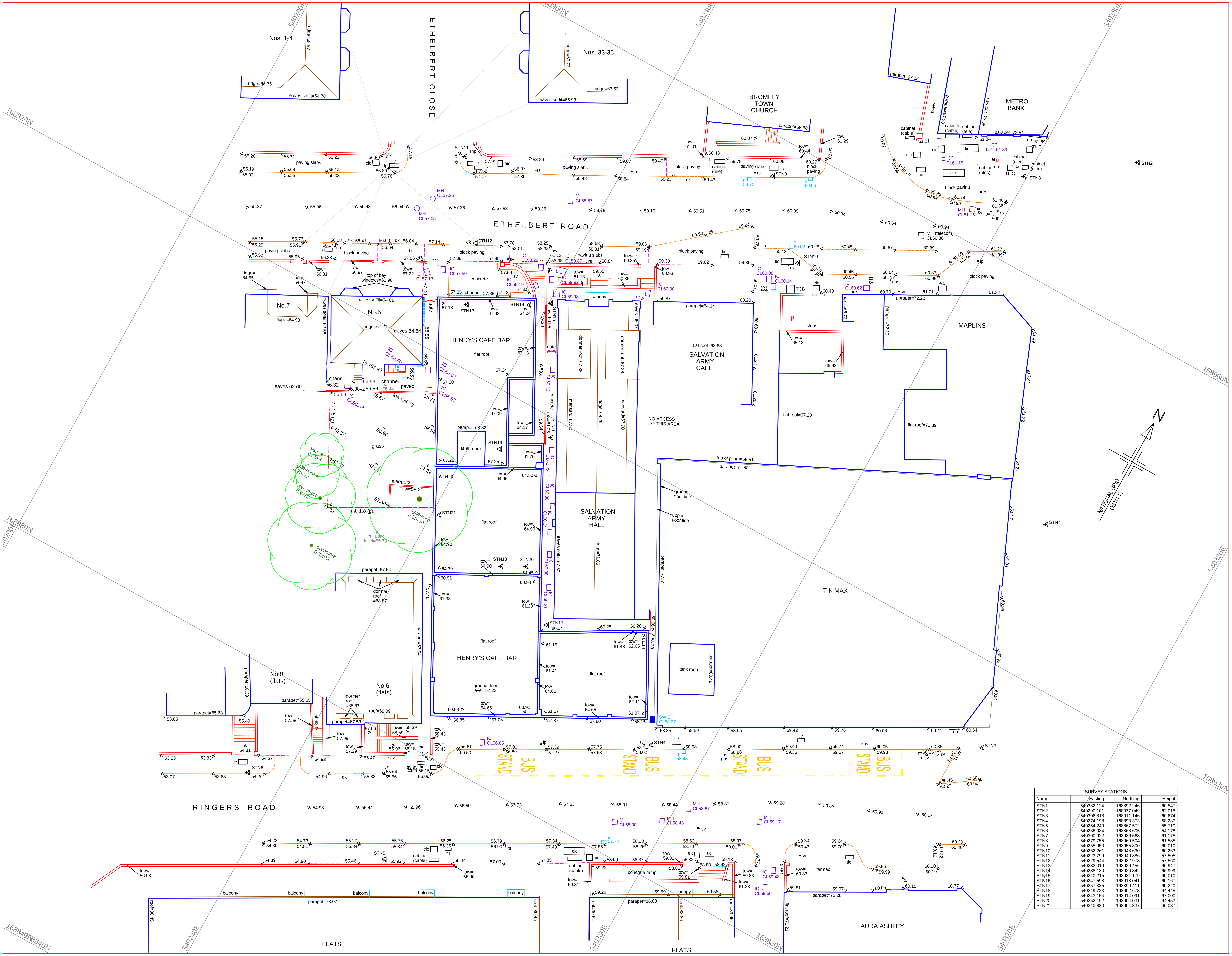
5.8 Management and maintenance of the drainage network, including the permeable surfacing and gravel sub-base would be the responsibility of the freeholder and / or management company for the site. Management and maintenance agreements and plans will be arranged prior to completion of development.

APPENDIX A - DRAWINGS

(1) Topographic Survey

(2) Proposed Site Plan including Landscaping

(3) SuDS Strategy Drawing



SURVEY STATIONS			
Name	Easting	Northing	Height
STN1	540332.124	168892.246	60.547
STN2	540290.101	168977.049	62.015
STN3	540306.818	168911.146	60.674
STN4	540274.198	168893.373	58.287
STN5	540254.249	168867.572	55.710
STN6	540236.084	168868.605	54.178
STN7	540300.922	168936.563	61.175
STN8	540279.755	168969.504	61.585
STN9	540255.050	168955.800	60.010
STN10	540262.261	168948.630	60.263
STN11	540223.799	168940.886	57.505
STN12	540229.544	168932.978	57.560
STN13	540232.019	168926.456	66.947
STN14	540238.180	168929.842	66.999
STN15	540240.215	168931.179	60.010
STN16	540247.598	168918.041	60.167
STN17	540257.385	168899.411	60.220
STN18	540249.723	168902.673	64.445
STN19	540243.154	168914.091	67.000
STN20	540252.192	168904.031	64.453
STN21	540240.830	168904.337	66.087

Legend

SERVICES & STREET FURNITURE

bo	bollard	lp	lamp post
BS	bus stop	MH	manhole
bu	bush	mk	marker
ctv	cable connection	pb	pillar box
cic	cable inspection cover	pi	pipe
CL	cover level	po	post
eic	electricity inspection cover	re	rodding eye
ep	power pole	rnp	road nameplate
er	earth rod	rs	road sign
fh	fire hydrant	rwp	rain water pipe
g	gully	sv	stop valve or other water meter
gv	gas valve	svp	sewer vent pipe
IC	inspection cover	TCB	telephone call box
IL	invert level	tic	telecom inspection cover
jb	junction box	TL	traffic light
ko	kerb outlet	tow	top of wall
LB	litter bin	tp	telegraph pole
		UTL	unable to lift

WALLS AND FENCES

c\b	closeboard fence	b\w	brick wall
ch\lk	chain link fence	bl\w	block wall
ch\plg	chestnut paling	co\w	concrete wall
cor\ir	corrugated iron fence	ret\w	retaining wall
i\rlg	iron railings		
l\lap	larch lap fence		
o\b	open boarded fence		
p\w	post & wire fence		
po\rl	post and rail fence		
po\ch	post and chain fence		
w\msh	wire mesh fence		
wov	woven fence		

BOUNDARY CONDITIONS

vg	very good	p	poor
g	good	b	bad
f	fair	vb	very bad

TREES

tree bu bush sap sapling

Trees are listed with species, trunk diameter and estimated height Canopy spreads are shown graphicallly and are an average of the radius measured in the four cardinal directions. Where a canopy is grossly misshapen the symbol is distorted to represent this.

Please note that, while every care is taken, GM Surveys Ltd. do not accept responsibility for incorrect identification of trees. If trees are likely to have any effect over construction it is recommended that an Arboriculturalist is employed to confirm species and condition.

LINES / COLOURS

- building
- overhead canopy
- roof line
- 25.0 contour line (1.0m intervals)
- 25.50 contour line (intermediate)
- drainage line (foul)
- drainage line (surface water)
- drainage line (unidentified)
- drainage line (surface water channel)
- fence
- wall
- dk drop kerb
- kerbline
- road markings
- top/bottom of bank
- steps
- change of surface
- edge of foliage
- hedge
- overhead electric line
- overhead telephone line

GRID AND LEVEL DATA

Survey grid related to OS National Grid (OSTN 15) and levels to OSGM 15.

Site centred on STN 1
Scale factor is 1.0000

GPS data captured using Trimble R8-2 GPS receiver.

DO NOT SCALE FROM THIS DRAWING
All dimensions should be verified on site and any discrepencies must be reported to GM Surveys immediately.

REV A: 13/10/2020
Survey detail to rear of No 5 Ethelbert Road added

GM SURVEYS LIMITED

Lockheed House
Green Lane Business Park
New Eltham
London
SE9 3TL

Tel/Fax: 0208 859 6319
Mobile: 07973 209970
e-mail: mail@gmsurveys.co.uk

Project: HENRY'S CAFE BAR 2-4 RINGERS ROAD BROMLEY

Title: TOPOGRAPHIC SURVEY

Client: PAYE HOMES

CAD File: 2267/01

Date	Scale	Sheet No.	Rev.	Surveyor
NOV 2016	1:200 @ A1	1 of 1	A	GAM

Site Boundary
Demolition

R1	Alterations to internal layouts	LC	21.07.07
R2	General amendments following comments from fire consultant	LC	21.09.10

Hollaway

London | 10a Acton Street | London | WC1X 9NG
T +44 (0) 20 7096 5425 | **E** london@hollawaystudio.co.uk | **W** www.hollawaystudio.co.uk

Kent | The Tramway Stables | Rampart Road | Hythe | Kent | CT21 5BG
T +44 (0)1303 260 515 | **E** kent@hollawaystudio.co.uk | **W** www.hollawaystudio.co.uk

Project | Ringers Road
Bromley

Client | The Substantia Group

Title | Proposed Lower Ground Floor Site Plan

Status | PRELIMINARY

Scale@A1 | 1:200 **Date** | 21.01.21 **Drawn** | GG **Chk'd** | LC

Project Number
18.085
Bim Number

Drawing Number
100.03

Revision
R2

Site Boundary
Demolition

R1	Alterations to internal layouts	LC	21.07.07
R2	General amendments following comments from fire consultant	LC	21.09.10

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London | 10a Acton Street | London | WC1X 9NG
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T +44 (0)1303 260 515 | **E** kent@hollawaystudio.co.uk | **W** www.hollawaystudio.co.uk

Project | Ringers Road Bromley

Client | The Substantia Group

Title | Proposed Ground Floor Site Plan

Status | PRELIMINARY

Scale@A1 | 1:200 **Date** | 21.01.21 **Drawn** | GG **Chk'd** | LC

Project Number 18.085 Bim Number

Drawing Number 100.04

Revision R2

Do not scale from this drawing.

N

LEGEND

Site application boundary

HARD LANDSCAPE

Proposed path (Town Action Plan)
White Permeable Resin Bound Gravel or similar approved.

Proposed path 2
Titan Silver Permeable Resin Bound Gravel or similar approved.

Path for private building access
Aquata red colour permeable clay paver from hardscape or similar approved.

Maintenance access path
Ares colour permeable clay paver from hardscape or similar approved.

Custom timber seat to act as informal play
Custom timber seating with carved leaf design or similar approved.
Timber from a certified sustainable source.

Water feature
Rill Channel water feature. Custom made pre-cast concrete frame.

Bollard Lighting
Low glare exterior lighting bollard.

SOFT LANDSCAPE

Amenity grass

Understory planting

Raised Planters
0.6m high timber raised bed.Timber from a certified sustainable source.

Shallow raingarden

Climbers in timber planter bed with wires

TREES

Proposed trees

Trees to be removed

Existing trees to be retained and protect
Please refer to Chartwell Tree Consultants Ltd Agricultural Report, Dated 11 November 2020

TEMPORARY FEATURES

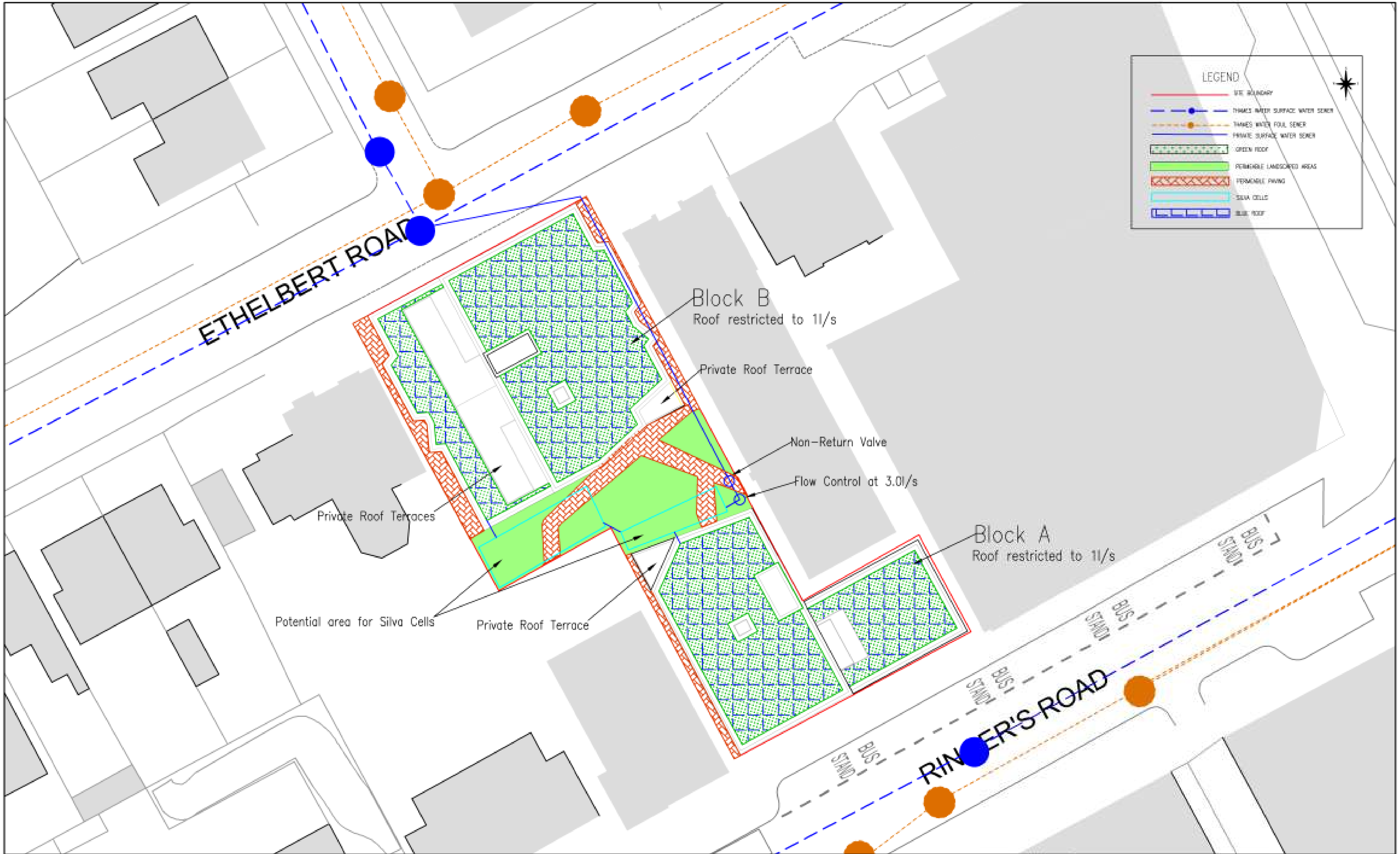
Temporary fence with planter boxes

ETLA
Eleanor Trenfield Landscape Architects Ltd
www.etla.studio

Ringers Road
Block A and B Landscape Plan

Landscape Plan

Drawing No	RRB-ETL-XX-00_DR-L-0100
Status	Final
Date	16.07.2021
Scale	1:400@A3
Revision	V1



WATER | ENVIRONMENT

6 Coppergate Mews · 103 Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email:contact@waterenvironment.co.uk · web:www.waterenvironment.co.uk

Notes
1. This drawing is for planning only. Not for construction.
2. This drawing is not to be scaled
3. Drawing to be read in conjunction with Water Environment SuDS Strategy Report 20108
4. Site layout as per: Hollaway Studio Drawing No: 18.086 100.04 R1 and ETLA Drawing No:RRB-ETL-XX-00-DR-L-0201
5. Surface water drainage strategy designed using MicroDrainage Source Control and Silva Cell outline design spreadsheet. Calculations do not include infiltration of permeable paving or permeable areas.
6. All pipes shown are indicative and subject to detailed design
7. Thames Water asset details taken from Thames Water asset plans

Rev	Date	Amendments	Drawn	Approved
A	23.06.21	Layout for site updated	CB	

Client	Substonia Group
Job Title	2-4 Ringers Road
Drawing Title	Outline SuDS Scheme
Drawing No	20108-SK01
Rev	A
Scale	DNS
Date	23/03/21
Drawn by	CB
Checked by	LS
Approved by	GL

APPENDIX B – SUPPORTING INFORMATION

(1) Surface Water Calculations (D21 Runoff Calculations Rev H)

(2) Microdrainage Output

(3) Silva Cell Outline Design Spreadsheet

(4) LBB SuDS Proforma

(5) Thames Water Correspondence

WATER | ENVIRONMENT

IH124 : Greenfield Peak Runoff	20108	2-4 Ringers Road	
	Calculations By: CB	Checked By: GL	Date: 22.06.21

Catchment Area	AREA	ha	0.102
Drained Area	AREA	ha	0.102
Standard average annual rainfall 1941 - 1970	SAAR	mm	669
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.1

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1ASOIL1 + 0.3ASOIL2 + 0.37ASOIL3 + 0.47ASOIL5 + 0.53ASOIL5}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5
AREA	0.102	0	0	0	0
SPR	0.1	0.3	0.37	0.47	0.53

SOIL:
0.1

$QBAR = 0.00108 . (0.01AREA)^{0.89} . SAAR^{1.17} . SOIL^{2.17}$

* The site area is less than 50ha. Since the IoH124 methodology is not calibrated for sites less than 50ha in area, the calculation should be undertaken based on a 50ha site area and proportionately adjusted based on the ratio of the site size to 50ha.

$QBAR_{50ha}$	l/s	7.97
QBAR/ha	l/s/ha	0.16
$QBAR_{site}$	l/s	**0.02**

Hydrological Area	fig 4.2	6

Return Period (years)	Growth Factor (table 4.3)	Discharge rate l/s
1	0.85	**0.01**
2	0.88	0.01
10	1.62	0.03
30	2.3	**0.04**
50	2.62	0.04
100	3.19	**0.05**

Figures and table references from CIRIA C753 The SUDS Manual © CIRIA 2015

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Wallingford Procedure : Existing Peak Runoff	20108	2-4 Ringers Road	
	Calculations By: CB	Checked By: GL	Date: 22.06.21

Site Characteristics

Site Area	AREA	ha	0.102
Drained Catchment Area	AREA	ha	0.102
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	9%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	91%
Area Weighted Rational Method Runoff Coefficient			0.899

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Time of Concentration

Recommended Tc Method: SCS: Sheet Flow

Tc Method Choice: SCS: Sheet Flow

Sheet Flow			
Surface Description			Paving or Brick
Slope			Shallow
Roughness Coefficient	(Manning's n)		0.018
Flow Length, L		m	100
M2-24hr		mm	37.70
Land Slope		m/m	0.01000
Tc		hr	0.15

Time of Concentration	T_c	min	9.0
Critical Storm Duration (minimum 5min)	T_{crit}	min	9.0

Critical Storm Rainfall and Runoff

$Z1_{TC}$ 0.48 *Wallingford Procedure Figure 3.6

$M5\text{-}T_{crit}$ 9.7

C 0.899

Discharge Rate

Q = 2.78CiA

Return Period (years)	Z2*	Depth (mm)	Intensity (mm/hr)	Discharge Rate l/s
1	0.61	5.9	39.5	**10.08**
2	0.79	7.7	51.0	13.01
10	1.21	11.8	78.4	19.99
30	1.48	14.3	95.4	**24.32**
50	1.63	15.8	105.4	26.87
100	1.89	18.3	121.8	**31.05**

*Wallingford Procedure Table 3.2

WATER | ENVIRONMENT

Wallingford Procedure : Developed Peak Runoff

20108	2-4 Ringers Road	
Calculations By: CB	Checked By: GL	Date: 22.06.21

Site Characteristics

Site Area	AREA	ha	0.102
Drained Catchment Area	AREA	ha	0.102
Approximate Longest Drainage Path	L	m	100
Difference in Ground Levels	ΔH	m	1
Slope	Slope (S)		1: 100
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha	0%
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha	46%
Green Roof of gradient of up to 15°, and depth of 100-150mm , c=		0.4 *	54%
Area Weighted Rational Method Runoff Coefficient			0.65

*in line with Table 10.1 of CIRIA C644

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Time of Concentration

Recommended Tc Method: SCS: Sheet Flow

Tc Method Choice: SCS: Sheet Flow

Sheet Flow			
Surface Description			Paving or Brick
Slope			Shallow
Roughness Coefficient	(Manning's n)		0.018
Flow Length, L		m	100
M2-24hr		mm	37.70
Land Slope		m/m	0.01000
Tc		hr	0.15

Time of Concentration	T_c	min	9.0
Critical Storm Duration (minimum 5min)	T_{crit}	min	9.0

Critical Storm Rainfall and Runoff

$Z1_{TC}$ 0.48 *Wallingford Procedure Figure 3.6

$M5\text{-}T_{crit}$ 9.7

C 0.653

Discharge Rate

Q = 2.78CiA

Return Period (years)	Z2*	Depth (mm)	Intensity (mm/hr)	Discharge Rate l/s	Future Rate l/s
1	0.61	5.9	39.5	**7.33**	**10.26**
2	0.79	7.7	51.0	**9.46**	13.24
10	1.21	11.8	78.4	**14.53**	20.34
30	1.48	14.3	95.4	**17.68**	**24.76**
50	1.63	15.8	105.4	**19.54**	27.35
100	1.89	18.3	121.8	**22.58**	**31.61**

*Wallingford Procedure Table 3.2

WATER | ENVIRONMENT

SUDS Manual Volume Calculation (Proposed)	20108	2-4 Ringers Road	
	Calculations By: CB	Checked By: GL	Date: 22.06.21

Site Characteristics

Site Area	AREA	ha	0.102
Permeable Surfaces (Proposed Case)			0%
Proportion discharging to sewer network or local watercourses	β		0%
*zero if all runoff collected from unpaved surfaces is retained on site or discharged to ground			
Impermeable Surfaces (Proposed Case)	PIMP		100%
Proportion discharging to sewer network or local watercourses	α		100%
*zero if all runoff from paved surfaces remains on site or is collected and discharged to ground			
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.1

*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:

$$SOIL = \frac{0.1A_{SOIL1} + 0.3A_{SOIL2} + 0.37A_{SOIL3} + 0.47A_{SOIL4} + 0.53A_{SOIL5}}{AREA}$$

For smaller sites, use the SPR for the local soil type, as follows:

SOIL TYPE	1	2	3	4	5
AREA	0.102	0	0	0	0
SPR	0.1	0.3	0.37	0.47	0.53

SOIL:
0.1

Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)

60minute, 5 year return period rainfall	M5-60	mm	20
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-	0.40

Volume Calculation for the 100 year return period 6hr storm

$Z1_{6hr}$	1.55	*Wallingford Procedure Figure 3.6
M5-6hr	31.1	
$Z2_{100yr}$	1.97	*Wallingford Procedure Table 3.2
M100-6hr	61.2	
With Climate Change	85.7	40%

Additional volume (m^3) of development runoff over Greenfield runoff:

$$Vol = \mathrm{M100{-}6hr}.AREA.10\left[\frac{PIMP}{100}(0.8\alpha) + \left(1 - \frac{PIMP}{100}\right)SOIL.\beta - SOIL\right]$$

* EQ24.10 CIRIA C753 The SUDS Manual © CIRIA 2015

Additional Rainfall Volume (above Greenfield state) for the developed site: m^3 **61.2**

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	1	59.220	58.320	0.600	Open Manhole	1200
1.001	o	150	1	59.220	58.220	0.850	Open Manhole	1200
2.000	o	300	3	59.220	58.320	0.600	Open Manhole	1200
2.001	o	150	4	59.220	58.220	0.850	Open Manhole	1200
1.002	o	150	2	57.220	55.720	1.350	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	8.627	86.3	1	59.220	58.220	0.700	Open Manhole	1200
1.001	9.445	4.1	2	57.220	55.904	1.166	Open Manhole	1200
2.000	8.773	75.6	4	59.220	58.204	0.716	Open Manhole	1200
2.001	12.167	5.3	2	57.220	55.920	1.150	Open Manhole	1200
1.002	29.835	100.1		58.030	55.422	2.458	Open Manhole	0

Online Controls for Storm

Orifice Manhole: 1, DS/PN: 1.001, Volume (m³): 1.7

Diameter (m) 0.035 Invert Level (m) 58.220
Discharge Coefficient 0.600

Orifice Manhole: 4, DS/PN: 2.001, Volume (m³): 1.7

Diameter (m) 0.035 Invert Level (m) 58.220
Discharge Coefficient 0.600

ACO Q-Brake Manhole: 2, DS/PN: 1.002, Volume (m³): 2.0

Design Head (m) 0.500 Diameter (mm) 106
Design Flow (l/s) 5.0 Invert Level (m) 55.720

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.600	8.9	5.000	15.7
0.200	4.9	1.800	9.4	5.500	16.5
0.300	5.0	2.000	9.9	6.000	17.2
0.400	4.4	2.200	10.4	6.500	17.9
0.500	5.0	2.400	10.9	7.000	18.6
0.600	5.4	2.600	11.3	7.500	19.2
0.800	6.3	3.000	12.2	8.000	19.8
1.000	7.0	3.500	13.1	8.500	20.5
1.200	7.7	4.000	14.0	9.000	21.0
1.400	8.3	4.500	14.9	9.500	21.6

Storage Structures for Storm

Cellular Storage Manhole: 1, DS/PN: 1.001

Invert Level (m) 58.220
Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.90

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	246.0	0.0	0.166	0.0	0.0
0.165	246.0	0.0			

Cellular Storage Manhole: 4, DS/PN: 2.001

Invert Level (m) 58.220
Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.90

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	307.0	0.0	0.166	0.0	0.0
0.165	307.0	0.0			

Cellular Storage Manhole: 2, DS/PN: 1.002

Invert Level (m) 55.720
Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	10.0	0.0	0.501	0.0	0.0
0.500	10.0	0.0			

Time Area Diagram for Green Roof at Pipe Number 1.000 (Storm)

Area (m³) 246 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time Area Diagram for Green Roof at Pipe Number 1.000 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.004470	40	44	0.000605	80	84	0.000082
4	8	0.003660	44	48	0.000495	84	88	0.000067
8	12	0.002997	48	52	0.000406	88	92	0.000055
12	16	0.002453	52	56	0.000332	92	96	0.000045
16	20	0.002009	56	60	0.000272	96	100	0.000037
20	24	0.001645	60	64	0.000223	100	104	0.000030
24	28	0.001346	64	68	0.000182	104	108	0.000025
28	32	0.001102	68	72	0.000149	108	112	0.000020
32	36	0.000903	72	76	0.000122	112	116	0.000017
36	40	0.000739	76	80	0.000100	116	120	0.000014

Time Area Diagram at Pipe Number 1.000 for Storm

Total Area (ha) 0.009

Time From:	(mins) To:	Area (ha)
0	4	0.009

Time Area Diagram for Green Roof at Pipe Number 2.000 (Storm)

Area (m^3) 307 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.005579	40	44	0.000755	80	84	0.000102
4	8	0.004568	44	48	0.000618	84	88	0.000084
8	12	0.003740	48	52	0.000506	88	92	0.000068
12	16	0.003062	52	56	0.000414	92	96	0.000056
16	20	0.002507	56	60	0.000339	96	100	0.000046
20	24	0.002052	60	64	0.000278	100	104	0.000038
24	28	0.001680	64	68	0.000227	104	108	0.000031
28	32	0.001376	68	72	0.000186	108	112	0.000025
32	36	0.001126	72	76	0.000152	112	116	0.000021
36	40	0.000922	76	80	0.000125	116	120	0.000017

Time Area Diagram at Pipe Number 2.000 for Storm

Total Area (ha) 0.018

Time Area Diagram at Pipe Number 2.000 for Storm

Time From:	(mins) To:	Area (ha)
0	4	0.018

Time Area Diagram at Pipe Number 1.002 for Storm

Total Area (ha) 0.019

Time From:	(mins) To:	Area (ha)
0	4	0.019

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	5
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 540233 168902 TQ 40233 68902
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	100.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	2, 100
Climate Change (%)	0, 40

PN	**US/MH Name**	**Storm**	**Return Period**	**Climate Change**	**First (X) Surcharge**	**First (Y) Flood**	**First (Z) Overflow**	**Overflow Act.**
1.000	1	15 Summer	100	+40%				
1.001	1	480 Summer	100	+40%				
2.000	3	15 Summer	100	+40%				
2.001	4	600 Summer	100	+40%				
1.002	2	30 Summer	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	58.410	-0.210	0.000	0.20		15.7	OK	
1.001	1	58.335	-0.035	0.000	0.01		0.8	OK	
2.000	3	58.435	-0.185	0.000	0.31		26.8	OK	
2.001	4	58.363	-0.007	0.000	0.01		0.9	OK	
1.002	2	56.184	0.314	0.000	0.29		5.0	SURCHARGED	

deeproot

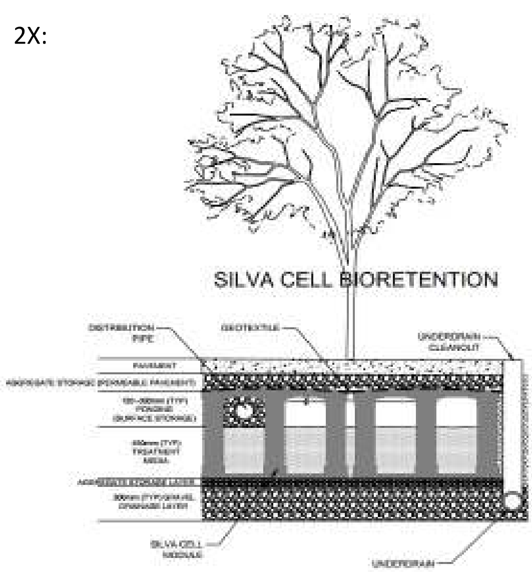
Silva Cell® Stormwater Design Tool
Only enter data in shaded cells
Outputs for design

Design Parameter	Input
Project name:	20108 Ringers Road
Project location & address:	2-4 Ringers Road, Bromley
Purpose for Silva Cell design:	Attenuation of surface water with landscaping
Your name:	Claire Burroughs
Contact email:	Water Environment Ltd

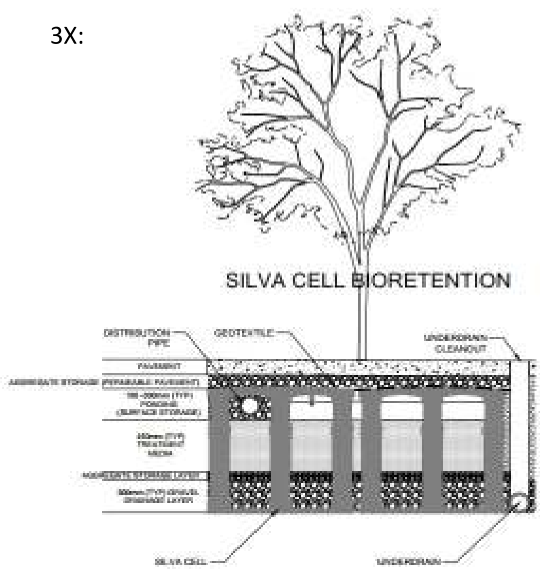
Design Parameter	Value	Notes
Drainage Area, DA (ha)	0.02	DA from project plans (1 ha is 10,000 m^2)
Treatment Volume, T_V (m^3)	6	T_V from stormwater calculations
Silva Cell Configuration	2X	Select one: 2X, 3X
Ponding / Surface Storage (mm)	0	Select value between 0mm and 300mm
Treatment Media Depth (mm)	784	Determined by SC configuration and surface storage
Permeable Paving Storage (mm)	0	Min 0mm, Max. 300mm
Aggregate Storage (mm)	0	Min 0mm, Max. 300mm
Gravel Drainage Layer Depth (mm)	0	Minimum 0mm depth

General section of Silva Cell® System designed for bioretention

2X:



3X:



Credits / Accountable in design	Value	Notes
Permeable Paving Storage	Yes	Select 'Yes' if layer is accepted as part of credit calculation
Aggregate Storage	Yes	Select 'Yes' if layer is accepted as part of credit calculation
Ponding / Surface Storage	Yes	Select 'Yes' if layer is accepted as part of credit calculation
Treatment Media	Yes	Select 'Yes' if layer is accepted as part of credit calculation
Gravel Drainage Layer	Yes	Select 'Yes' if layer is accepted as part of credit calculation

Void Ratios (V_R)	Value	Notes
Permeable Paving Storage	0.35	Typical value used - 0.35
Aggregate Storage	0.40	Typical value used - 0.40
Ponding / Surface Storage	0.92	See SC2 Tech Sheet for additional documentation
Treatment Media	0.25	Typical value used - 0.25
Gravel Drainage Layer	0.40	Typical value used - 0.40

Design Parameter	Value	
Design Storage Depth (mm)	196.0	Surface Storage + Aggregate Storage
Design Surface Area, SA (m^2)	29	T_V / Design Storage Depth
Number of Silva Cell Units (ea)	33	Each SC unit = 0.88 m2
SA/DA percentage	15.4%	Percentage area of Silva Cell (SA) to drainage area (DA)
Soil Volume (m^3)	23	Calculated from Surface Area and Filter Media Depth

***This sizing tool is for conceptual and planning purposes ONLY. Outputs from this tool are not intended for use in final designs or permitting decisions. Outputs from this tool may used as supporting documentation for the designer's basis for design and report. Designers should complete and check their own calculations and proposed designs.*

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	2-4 Ringers Road and 5 Ethelbert Road
Address & post code	2-4 Ringers Road,BR1 1HT and 5 Ethelbert Road, BR1 1HU
OS Grid ref. (Easting, Northing)	E 540249 N 168915
LPA reference (if applicable)	
Brief description of proposed work	Creation of 108 residential units in two blocks with amenity courtyard
Total site Area	1020 m^2
Total existing impervious area	920 m^2
Total proposed impervious area	600 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Free draining or overland flow to the highways gullies/Thames Water surface water sewer
Designer Name	Claire Burroughs
Designer Position	Senior Environmental Engineer
Designer Company	Water Environment Ltd

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	None recorded
Bedrock geology classification	Harwich Formation
Site infiltration rate	m/s
Depth to groundwater level	4.2 m below ground level
Is infiltration feasible?	Partial

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	Y	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	Y	N

2c. Proposed Discharge Details

Proposed discharge location	Thames Water Surface Water Sewer
Has the owner/regulator of the discharge location been consulted?	TW Approved - Connection with 5l/s

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.02			
1 in 1	0.01	10.08		5
1 in 30	0.04	24.32		5
1 in 100	0.05	31.05		5
1 in 100 + CC				5
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Flow controls with SuDS features upstream.		

3c. Proposed SuDS Measures	*Catchment area (m^2)*	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	822	533	N/A
Blue roofs	822	533	86
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	220	29	4.75
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	35		64
Total	**1899**	**1095**	**154.75**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Chapter 4 of Outline SuDS Report by Water Environment Ltd
Drainage hierarchy (2b)	Chapter 4 of Outline SuDS Report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Chapter 4 of Outline SuDS Report
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix of SUDs Report
Proposed SuDS measures & specifications (3b)	Chapter 4 of SuDS Report
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix of SUDs Report
Detailed drainage design drawings, including exceedance flow routes	Appendix of SUDs Report
Detailed landscaping plans	Appendix of SUDs Report
Maintenance strategy	Chapter 4 of SuDS Report
Demonstration of how the proposed SuDS measures improve:	Chapter 4 of SuDS Report
a) water quality of the runoff?	Chapter 4 of SuDS Report
b) biodiversity?	Chapter 4 of SuDS Report
c) amenity?	Chapter 4 of SuDS Report

Claire Burroughs

Water Environment Ltd
6 Coppergate Mews
Brighton Road
Surbiton
KT6 5NE

Wastewater pre-planning
Our ref DS6082180

23 March 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 2-4 Ringers Road, Bromley, London BR1 1JY

Dear Claire,

Thank you for providing information on your development.

Proposed site: Flats (108 units)
Proposed foul water discharge by gravity into manhole TQ40682808 for 55 units and into manhole TQ40682910 for 53 units.
Proposed surface water discharge at 5.0 l/s into surface water manhole TQ40682860 and/or TQ40682960.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

When developing a site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SuDS/Storage to reduce the surface water discharge from the site as much as possible.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. store rainwater for later use.
2. use infiltration techniques where possible.
3. attenuate rainwater in ponds or open water features for gradual release.
4. attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. discharge rainwater direct to a watercourse.
6. discharge rainwater to a surface water sewer/drain.
7. discharge rainwater to the combined sewer.
8. discharge rainwater to the foul sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 5.0 l/s, then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

Source Protection Zone

The development site boundary falls within a Source Protection Zone for groundwater abstraction. These zones may be at particular risk from polluting activities on or below the land surface. To prevent pollution, the Environment Agency and Thames Water (or other local water undertaker) will use a tiered, risk-based approach to regulate activities that may impact groundwater resources, this may potentially affect your drainage or surface water strategies where deep or infiltration systems are proposed. The applicant is encouraged to read the Environment Agency's approach to groundwater protection (available at https://www.gov.uk/government/publications/groundwater-protection-position-statements and may wish to discuss the full implications for their development with a suitably qualified environmental consultant.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0800 009 3921.

Kind Regards,

Hemlata Gurung
Developer Services – Technical Coordinator, Sewer Adoptions Team
Tel: 0800 009 3921
hemlata.gurung@thameswater.co.uk

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk