

Cundy Street Quarter

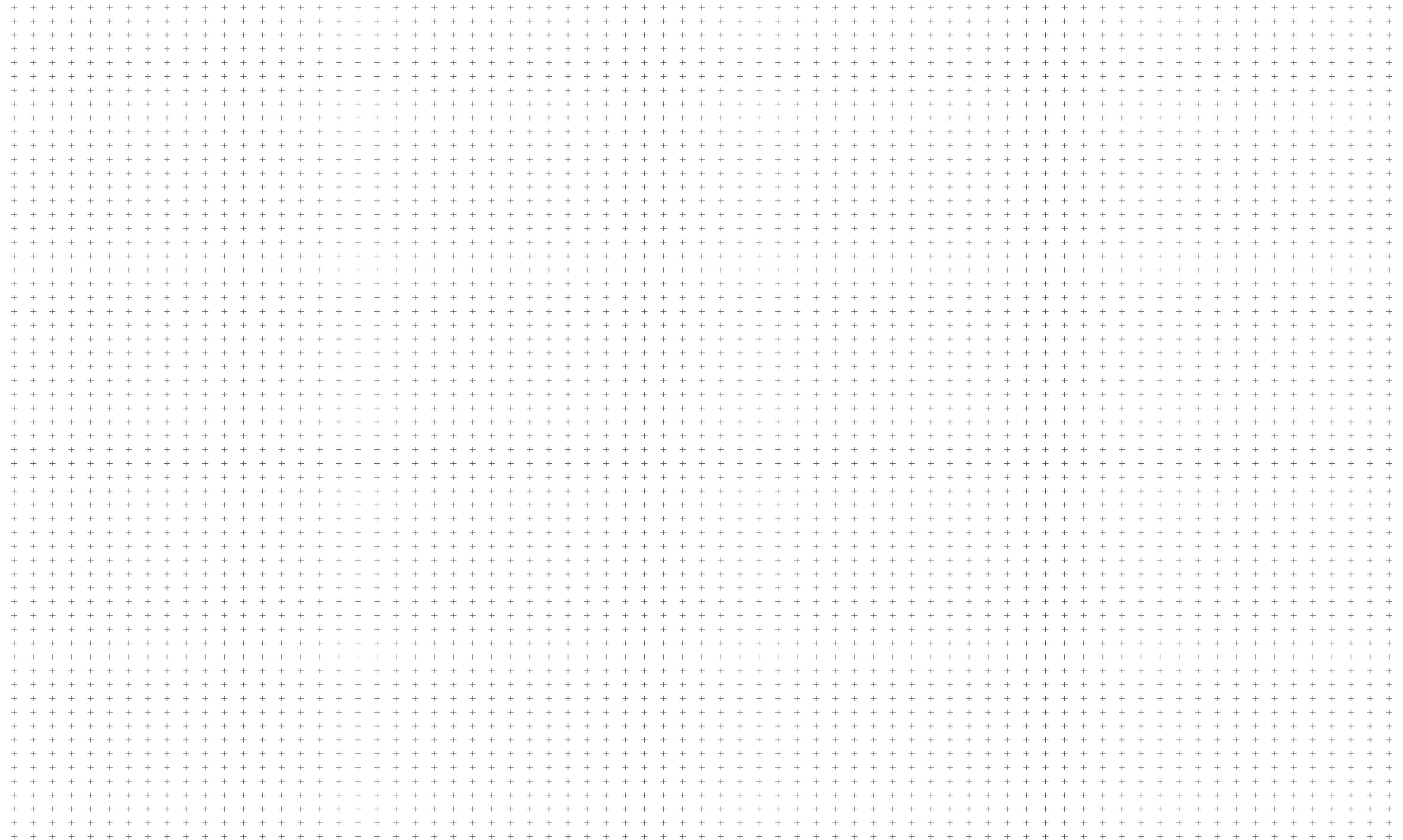
Flood Risk Assessment and Sustainable Drainage Strategy Report

Prepared by HTS

May 2020

2068 – Cundy Street Quarter

Flood Risk Assessment & Sustainable Drainage Strategy Report



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01. Introduction

This Drainage Strategy Report has been prepared by Heyne Tillett Steel to support the planning application submitted to Westminster City Council (WCC) in relation to the Proposed Development at the Cundy Street Quarter.

The report aims to incorporate and demonstrate compliance with the following national, regional and local planning policy guidance and statutory requirement as far as reasonably possible.

- + National Planning Policy Framework (NPPF) – 2019
- + National Planning Policy Guidance (NPPG) – 2019
- + The London Plan – 2016
- + Draft New London Plan
- + Westminster Strategic Flood Risk Assessment (SFRA) – 2019
- + Westminster’s City Plan – 2016

2. Site Description

2.1 Site Location

The site is bounded by Ebury Street, Pimlico Road, Avery Farm Row, Ebury Square and Cundy Street. Known as the 'Cundy Street Quarter' or 'the Site'. The site is 550m south-west of Victoria station and 500m north of The River Thames.

The application site has an approximate area of 1.77 ha (17,720m²). It is located at the National Grid reference of 528396 E, 178499 N and has a postcode of SW1W 8LJ, the site location can be seen in Image 01.

2.2 Existing Development

Below shows a summary of the existing building uses on the Site.

Cundy Street Flats: One hundred and eleven residential flats within four 1950's cruciform style buildings each seven storeys in height.

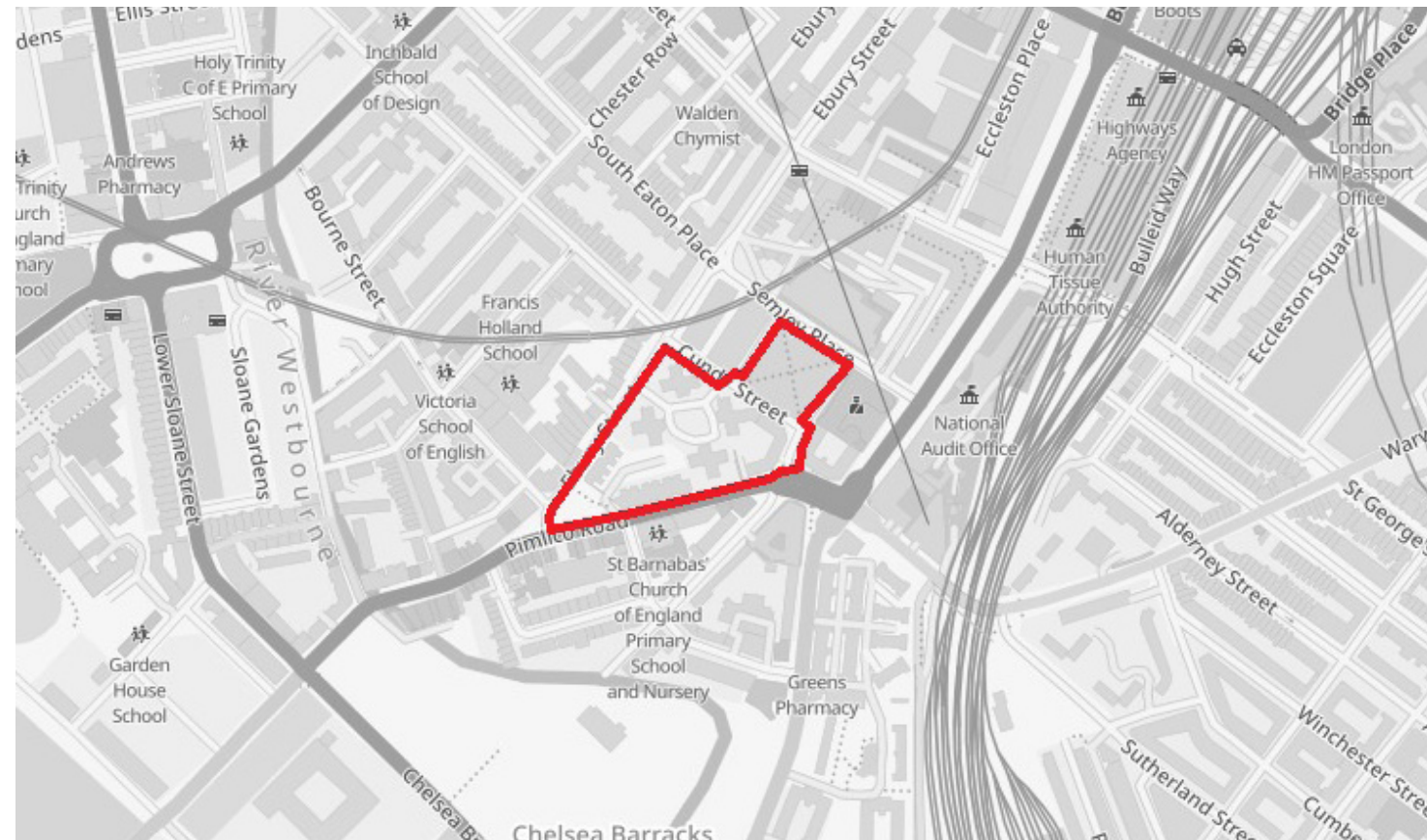


Image 01 – Site Location Plan

Walden House: Forty flats within a five storey 1920's building.

Coleshill Flats: Two Grade II Listed buildings framing the southwestern end of the site with a surface car park between them. Within the listed Coleshill buildings, the upper parts remain untouched, along with the ground floor retail units facing Ebury Street / Pimlico Road. The nine flats in the basement do form part of the Site and are accessed from the rear of the properties.

Coleshill Car Park: 17 space tarmac car parks with space for up to 24 cars

The Site sits in land outside of the groundwater source protection zones as shown in Image 02.

Extracts from the existing site information is contained in Appendix A.

2.3 Proposed Development

The proposals seek to erect three mansion block buildings varying in height from 5 to 11 storeys. Specialist accommodation for older people will be provided in a new building at the corner of Ebury Street and Cundy Street, whilst market housing and affordable housing would be provided in buildings on Pimlico Road and Ebury Street. The ground floor frontages will include the introduction of a range of complementary commercial units including a food store, retail, restaurants/cafes, drinking establishments, a cinema, and a community facility. The basement level of the Coleshill buildings will be used as affordable retail and/or offices. The proposals will also deliver improved public realm at ground floor level, and at Ebury Square and Orange Square, along with dedicated playspace.

Extracts from the architects proposed layouts are contained in Appendix B.

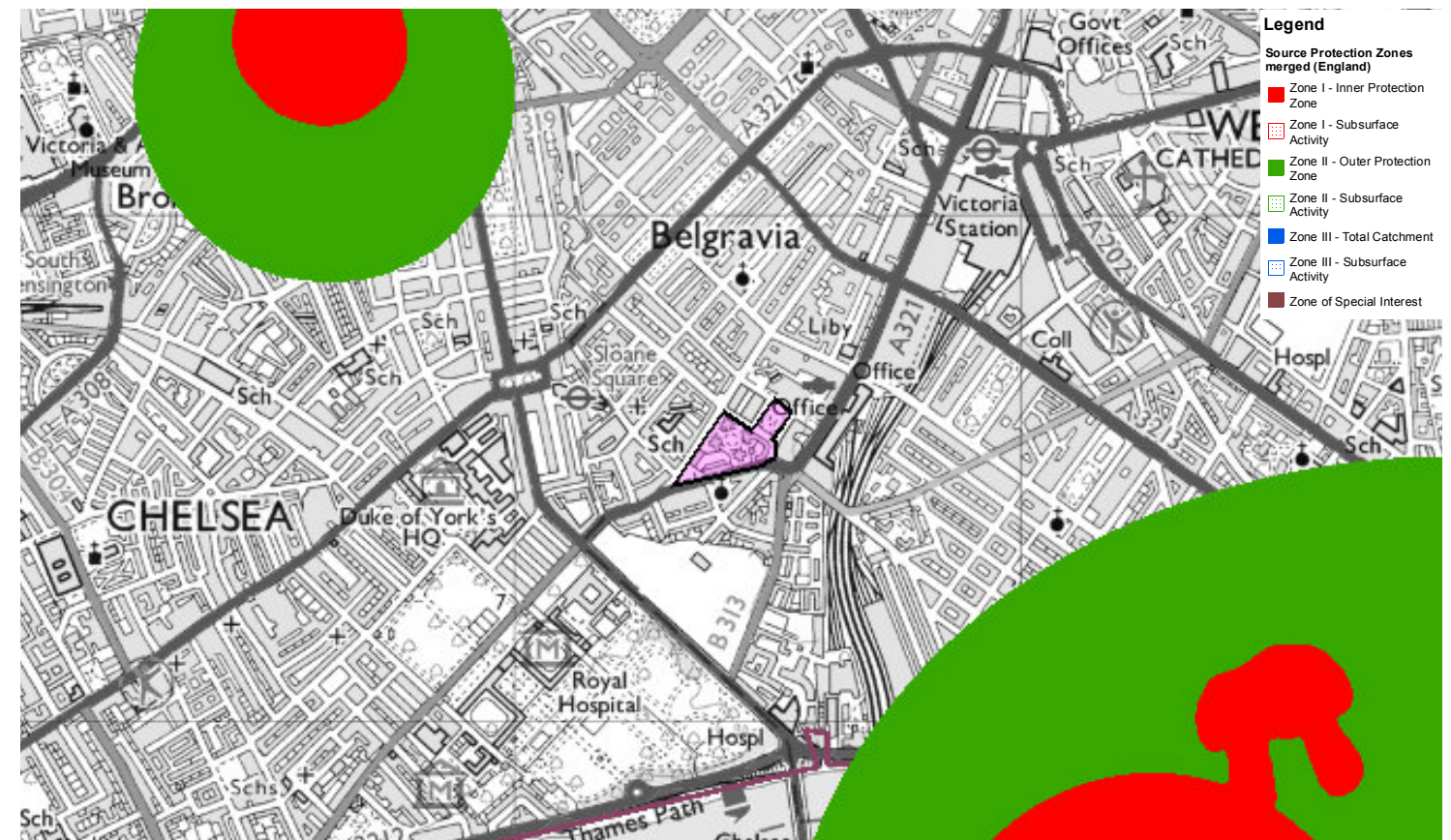


Image 02 – Source Protection Zone

3. Flood Risk

In order to determine the risk of flooding for the development site, the Environment Agency (EA)'s website was referenced as well as flood maps published by the WCC, including information contained in the Strategic Flood Risk Assessment (SFRA) and Surface Water Management Plan (SWMP).

3.1 Flood Risk from Rivers and/or the Sea

As shown in Image 03, the site lies in Flood Zone 1 which confirms that it is at low risk of flooding from rivers and sea. Flood Zone 1 is defined as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). As the site lies in the Flood Zone 1, the sequential and exception tests are not required.

As the site lies in the Flood Zone 1, all development is appropriate and therefore the sequential and exception tests are not required. Therefore, flood risk from rivers or sea is considered low.

3.2 Flood Risk from Surface Water and Overland Flows

Surface water flooding occurs when rainwater neither drains away through the in-situ drainage system nor soaks into the ground. It instead ponds locally or flows over the ground. Surface water flooding is typically associated with topographical low points.

The SFRA confirms that the site is not located within a Critical Surface Water Location.

Image 04 presents the surface water flood risk in the vicinity of the Proposed Development according to the EA's website. There is no surface water flooding within the site for up to the 1 in 1,000-year event.

The WCC SFRA contains a map of Flood Risk Zones, and the site is not located within of this area.

Additionally, the redevelopment of the site will introduce sustainable drainage systems (SuDS) which will provide a betterment of the surface water management at the site. Therefore, the surface water flood risk to the proposed site is considered low.

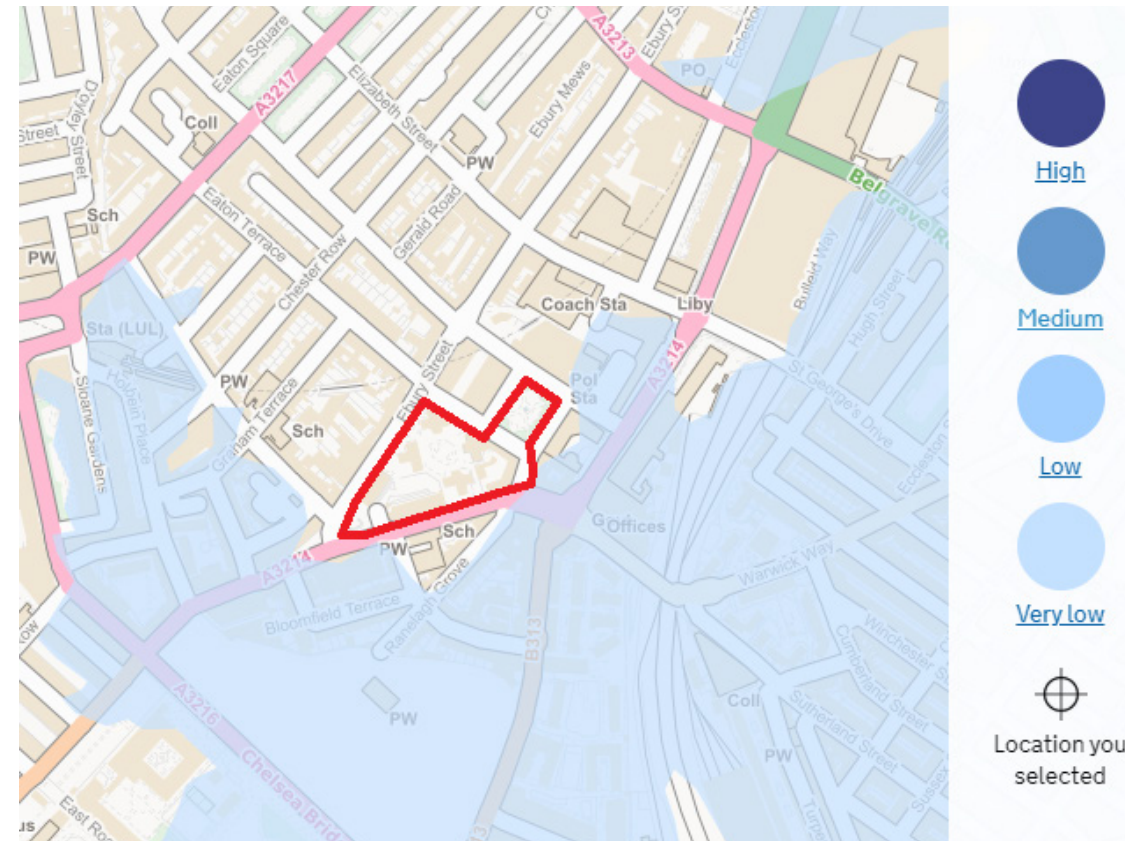


Image 03 – Flood Risk from Rivers and/or the Sea (extract from EA website)

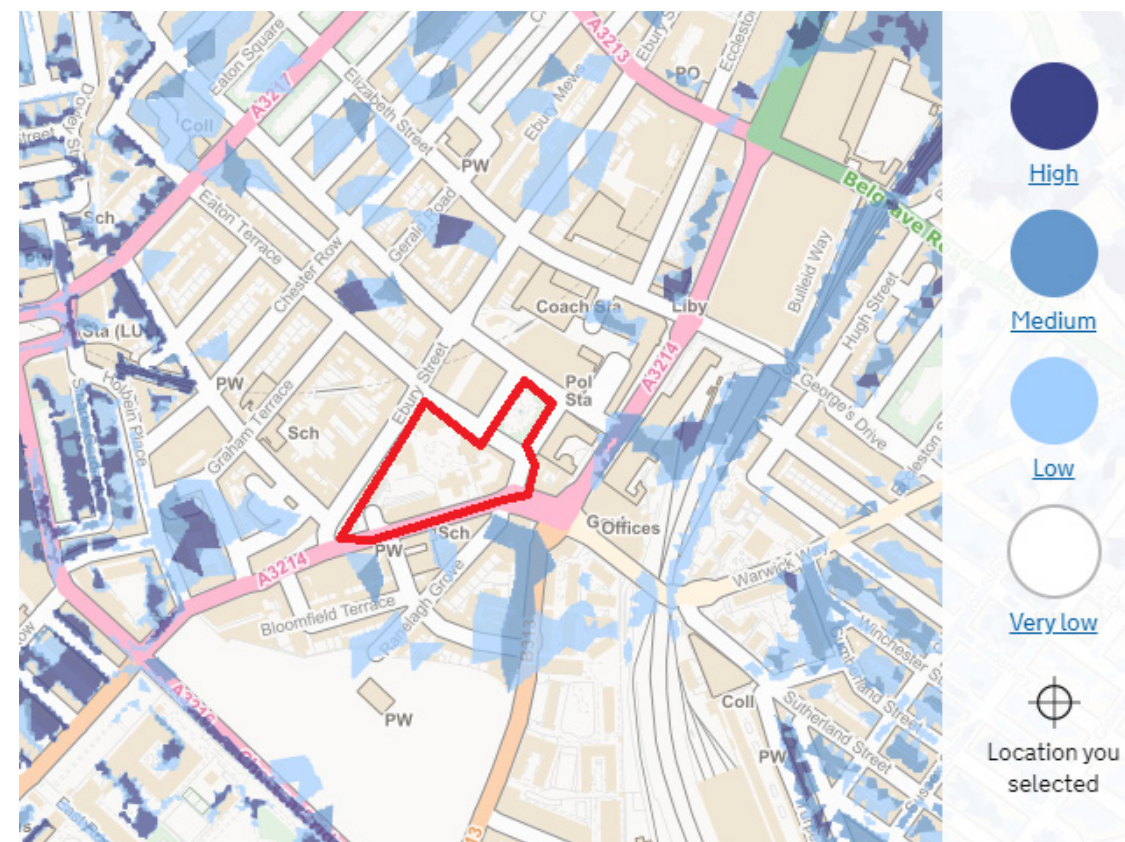


Image 04 - Flood Risk from Surface Water (extract from EA website)

3.3 Flood Risk from Sewers

The WCC SFRA contains a map of Thames Water (TW) register of sewer flooding records, which shows that there have been cases of external sewer flooding within the SW1 0 postcode area in the last 10 years. The known invert levels of the public sewer serving the site are ~3m below the existing ground level.

The Proposed Development will introduce a basement. To protect against surcharge of the neighbouring Thames Water (TW) sewer, all drainage within this level will be discharged via a pumped system. Drainage from above ground level will be routed towards the outfall at high level to reduce the reliance on pumped discharge.

The most likely reason for sewer flooding onsite is due to capacity issues during heavy rainfalls within the TW network. The development will reduce surface water runoff rates, as indicated in Section 5.2. Hence it will contribute towards reducing the risk of flooding from sewer within the neighbouring area.

The risk from public sewer flooding is considered low.

3.4 Flood Risk from Artificial Sources

The closest watercourse to the site is the River Thames. It enters WCC from west to the east and flows through the whole of central London.

The water level within the River Thames is controlled by the Thames Barrier and the Embankment wall, which together provides a 1:1,000 flood defence. WCC SFRA confirms that the risk of flooding as a result of overtopping or breaching of the canal is low. Therefore, the risk of flooding from this section of the river is considered low.

Additionally, the EA’s flood maps were reviewed to assess the risk of flooding from reservoirs. The map indicates that the site is not at risk from reservoirs flooding.

The flood risk from artificial sources is considered to be low.

3.5 Flood Risk from Groundwater

WCC SFRA states that Westminster sits above a regional chalk aquifer covered with gravels and clay. This type of build-up experiences some of the largest seasonal variations in groundwater. Although the same document does confirm that groundwater flooding in Westminster is low.

A review of the ground conditions has been undertaken. The site sits on Kempton Park Gravel to around 6–8m deep, and then London Clay to depth. Groundwater monitoring suggested groundwater stabilised at around 6–7m depth. See Appendix J for full site investigation.

A basement impact assessment within the Structural Methodology Statement report, has been prepared as part of this application submission to ensure minimum impact on groundwater. The risk from groundwater flooding is considered low.

3.6 Summary

A thorough review of flood data published by the EA and WCC was undertaken. Site specific surveys were also reviewed. This exercise confirmed that the Proposed Development is at low risk of flooding from all sources.

4. Existing Drainage Arrangements

4.1 Public Drainage Network

There are Thames Water (TW) combined sewers in vicinity of the Proposed Development. They run within the highway surrounding the site. A copy of the sewer records is contained in Appendix C and an extract is shown in Image 05.

The east of the Site, fronting onto Avery Farm Row, discharges into a 305mmø combined water (CW) sewer. The TW sewer runs from the north of Avery Farm Row, with levels falling from 3.33m AOD to 2.3m AOD it travels 40m south (approximately a gradient of 1 in 40).

The south of the site, fronting onto Pimlico Road, discharges into a 1524x762m CW sewer. The TW sewer runs from the west of Pimlico Road, joining with the combined water network from Avery Farm Row.

4.2 On-site Drainage Network

The proposals are to demolish the existing buildings on site, with the current drainage becoming redundant. If possible, the 300 diameter outfall to the TW network will be re-used, requirements for additional new connections will also be reviewed at later stages of development, subject to TW approval.

4.3 Existing Surface Water Rates

The area of the site that this Drainage Strategy will cover is approximately 0.99 ha (9,977m²) and is approximately 80% hardstanding, meaning 0.79 ha (7,982m²) is hardstanding and will be the area used to calculate the sites run-off rates.

Table 1 summarises the existing peak run-off rate for the 1 in 1 year, 1 in 30 years, 1 in 100 years rainfall events calculated using the modified rational method.

Return Period	Run-off Rate (L/s)	
	Rainfall Intensity (15-minute storm)	Existing (unmitigated)
1 in 1	33 mm/hr	72 l/s
1 in 30	82 mm/hr	177 l/s
1 in 100	107 mm/hr	230 l/s

Table 01 – Existing Surface Water Run-off Rates

4.4 Existing Foul Water Rates

The existing foul water discharge rate was calculated based on the 160 residential properties. The sewers for adoption (SFA) methodology was used to determine the existing peak flow rate. This gave an existing peak foul water flow rate of 7.41 l/s.

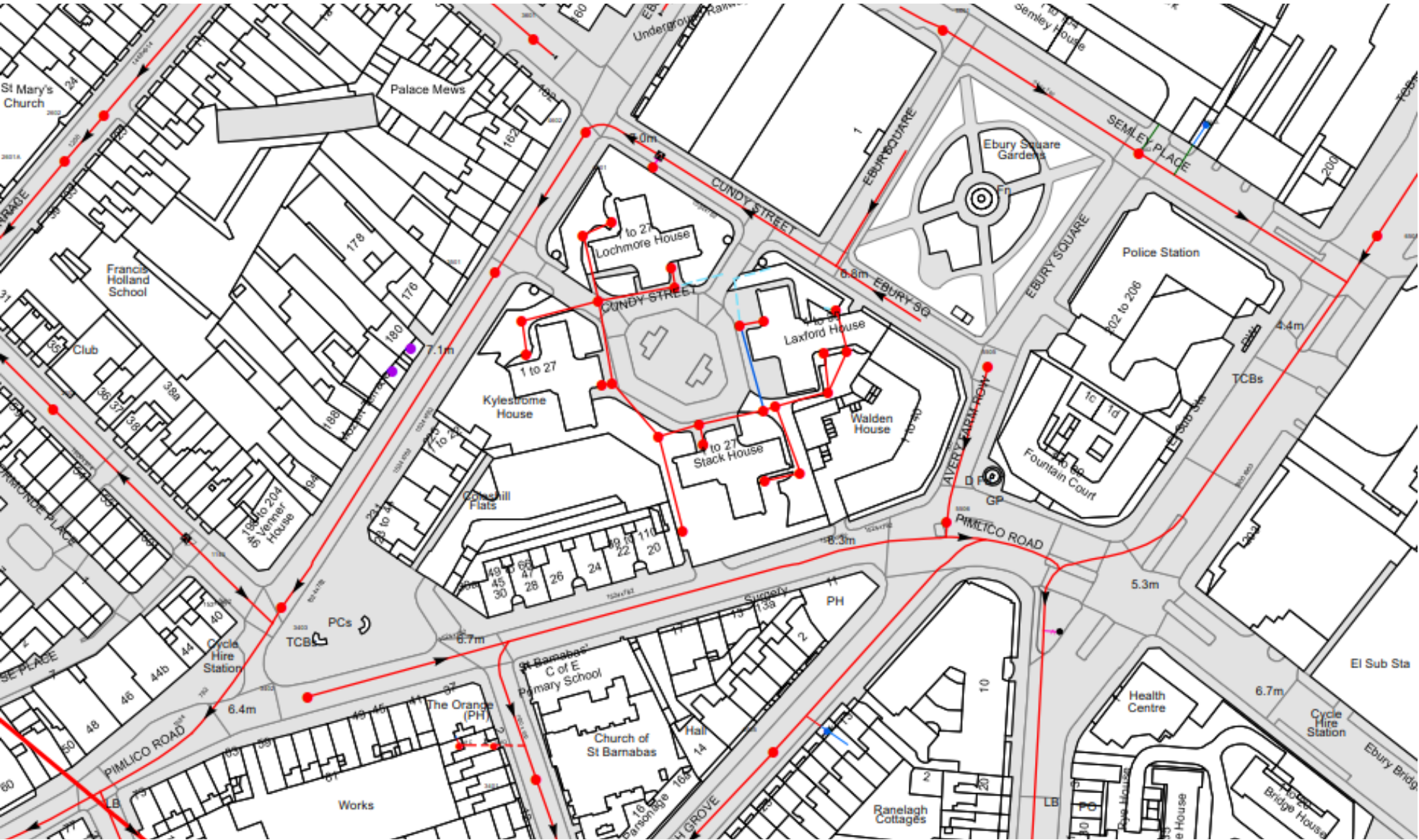


Image 05 – Extract of sewer records

5. Proposed Drainage Arrangements

It is proposed to retain the existing TW connections to the public combined sewer. All new networks will be designed in accordance with Building Regulations Part H.

5.1 Catchment Areas

For the purposes of this drainage strategy, the planning application site has been divided into a number of catchments, as shown in Image 06 (Appendix M).

The 'Ebury Square' catchment consists entirely of green landscaping and is assumed to not require any drainage, additionally it is cut off from the rest of the site by public highway (Cundy Street).

The 'highway ownership' catchment is made up of the surrounding roads, footpaths and the Orange Square. The proposals for these areas in terms are very limited and should be separate from the on-site drainage strategy due to different ownership and required standards. The 'existing drainage arrangements' catchment highlights an area of existing structures for which drainage arrangements are retained as part of the development.

The 'drainage strategy report' catchment is the area on which the drainage strategy will focus. It covers 9,977m² and consists of the new buildings and landscaping.

5.2 Surface Water Drainage Proposals

A SuDS Assessment will be carried out using guidance set out in WCC's SuDS Design and Evaluation Guide and with reference to the London Plan and Draft New London Plan.

In accordance with the London Plan, Draft New London Plan and WCC policy the surface water drainage network will be designed in coordination with the architects and landscape architects and aims to incorporate SuDS into the fabric of the building and landscaped areas. Priority was given to SuDS which provide multi-functional benefits.

Table 2 presents the drainage hierarchy, taken from Policy SI13 of the draft New London Plan and assesses feasibility of incorporating different SuDS into the development proposals.

As can be seen in Table 2, there is a variety of SuDS proposed for this development. Where possible, SuDS will be incorporated into the landscaping for example tree pits.

SuDS Technique		Feasible	Explanation
1	Rainwater harvesting (including blue roof for irrigation)	✓	Green/blue roofs will be used and utilise the blue roof storage for irrigation purposes. There is also potential for rain-water harvesting tanks.
2	Rainwater infiltration to ground at or close to source	X	The conditions onsite do not allow for infiltration due to soil conditions and basements located beneath the external areas.
3	Rainwater attenuation in green infrastructure features are gradual release	✓ X	Green roofs will be used across the site. Rain gardens and tree pits will be used where possible to convey surface water. But there is not sufficient space to provide ponds or open water features within the development.
4	Rainwater discharge direct to a watercourse (unless not appropriate)	X	There is no watercourse in the close enough vicinity to the site to make it a viable option.
5	Controlled surface water discharge to a surface water drain or drain	X	There are no surface water sewers in the vicinity of the site.
6	Controlled rainwater discharge to the combined sewer	✓	There are combined sewers in the area, hence this discharge method is feasible.

Table 02 – Surface Water Drainage Hierarchy (Policy SI13 draft New London Plan)



Image 06 - Extract of Drainage Strategy

Multi-Functional Benefits

In accordance with the NPPF and WCC’s SuDS policy, the aim of the SuDS design has been to provide multi-functional benefits with a focus on water quality, biodiversity and amenity as well as reducing the peak run-off.

The inclusion of green/blue roofs will improve the water quality as the system will help filtrate the rainwater as it passes through. Green and blue roofs provide biodiversity benefits reduce volume of runoff for short storm durations and help reduce the ‘heat island’ effect. The amenity space on site has been enhanced and improved by the integrated approach that has been taken with SuDS for this development.

Roof No:	Contributing Area (m²)	Blue Roof Area (m²)	Depth (mm)	Discharge Rate
Roof 1	1049	487	150	6
Roof 2	1317	545	235	2
Roof 3	704	435	150	1.2
Roof 4	432	354	150	0.3
Roof 5	305	210	150	0.4
Roof 6	463	166	235	1.1
Roof 7	809	574	150	0.9
Roof 8	1036	481	235	1
Roof 9	283	61	150	4.4
Roof 10	486	278	85	2.4
Roof 11	204	204	150	0.3
Roof 12	228	79	235	0.6
Paved Area	1214	-	-	1
External Area	844	-	-	1
Planting	603	-	-	0
Total	9977	3874	-	22.6

Table 03 – Summary of Blue Roof Areas

Blue Roofs

Following detailed coordination with the architects’ and a hydraulic design optioneering exercise, 12 roofs were identified as suitable areas to house blue roofs. See Table 3 showing blue roof areas.

Calculations of blue roofs are included in Appendix E.

Return Period	Run-off Rate (L/s)			Reduction
	Rainfall Intensity (15-minute storm)	Existing (unmitigated)	Proposed	
1 in 1*	33 mm/hr	72 l/s	22.6	67%
1 in 30	82 mm/hr	177 l/s	22.6	81%
1 in 100	107 mm/hr	230 l/s	22.6	90%
1 in 100 +40%	149 mm/hr	322 l/s	22.6	93%

Table 04 – Comparison of Existing and Proposed Run-off Rates

Flow Control

The reduced run-off from the blue roofs will be achieved using orifices that will be detailed by experienced specialist Polypipe, sizes shown in Appendix F. The remaining areas of the site will discharge separately. It is assumed that the paved and external areas will discharge at a rate of 2 l/s. This combined with the green/blue roof discharge rate of 20.6 l/s results in a total discharge of the site to 22.6 l/s for the 1 in 100-year rainfall event + 40% climate change allowance.

Paving Storage Area

There is potential within the paving area to hold additional rainwater storage. There would be room for storage crates to be installed beneath the paving slab, which would allow for further restriction to the discharge rates. This method will be explored in further detail at a later stage.

Runoff rates

The aim for this development is to use the combination of green/blue roofs to reduce the peak run-off for the 1 in 100-year rainfall event (+40% climate change) to as close as possible to greenfield run-off rates, in accordance with WCC’s ‘SuDS Design and Evaluation Guide’.

The Qbar rate for the site (9,977m²) was calculated as 1.55 l/s.

Due to number of blue roofs and their minimum discharge rates (as shown in Table 03), the total discharge rate from site can only be limited to 22.6 l/s. Further reduction is not possible without introduction of pumped attenuation – which is discouraged due to environmental considerations and current best practice.

TW have been contacted regarding the proposed discharge rates and we are currently awaiting their response. Correspondence with TW can be found in Appendix G.

It is important to note these rates are based on preliminary layouts and may change as the detailed design develops.

Summary

SuDS have been incorporated into the Proposed Development, in line with the requirements set out in the draft New London Plan and WCC’s SuDS Design and Evaluation Guide. The effective storage of the site will be provided in the 12 green/blue roofs.

It is important to note that this strategy is based on preliminary information and may change as the project progresses.

A summary of the various run-offs in question for the development site are presented in Table 4. As can be seen, the SuDS interventions proposed result in a significant reduction to the peak SW run-off from the development site to a 93% betterment.

5.3 Foul Water Drainage Proposals

TW have confirmed they have capacity for the Proposed Development. Correspondence can be found in Appendix H.

5.4 Drainage Inspection and Maintenance Strategy

A maintenance strategy has been compiled in accordance with WCC’s guidance entitled “*Westminster Local Flood Risk Management Strategy*”. In line with the requirements of this document, maintenance was a key consideration in the strategy. The maintenance strategy is included in Appendix F and is expected to be read in conjunction with this report.

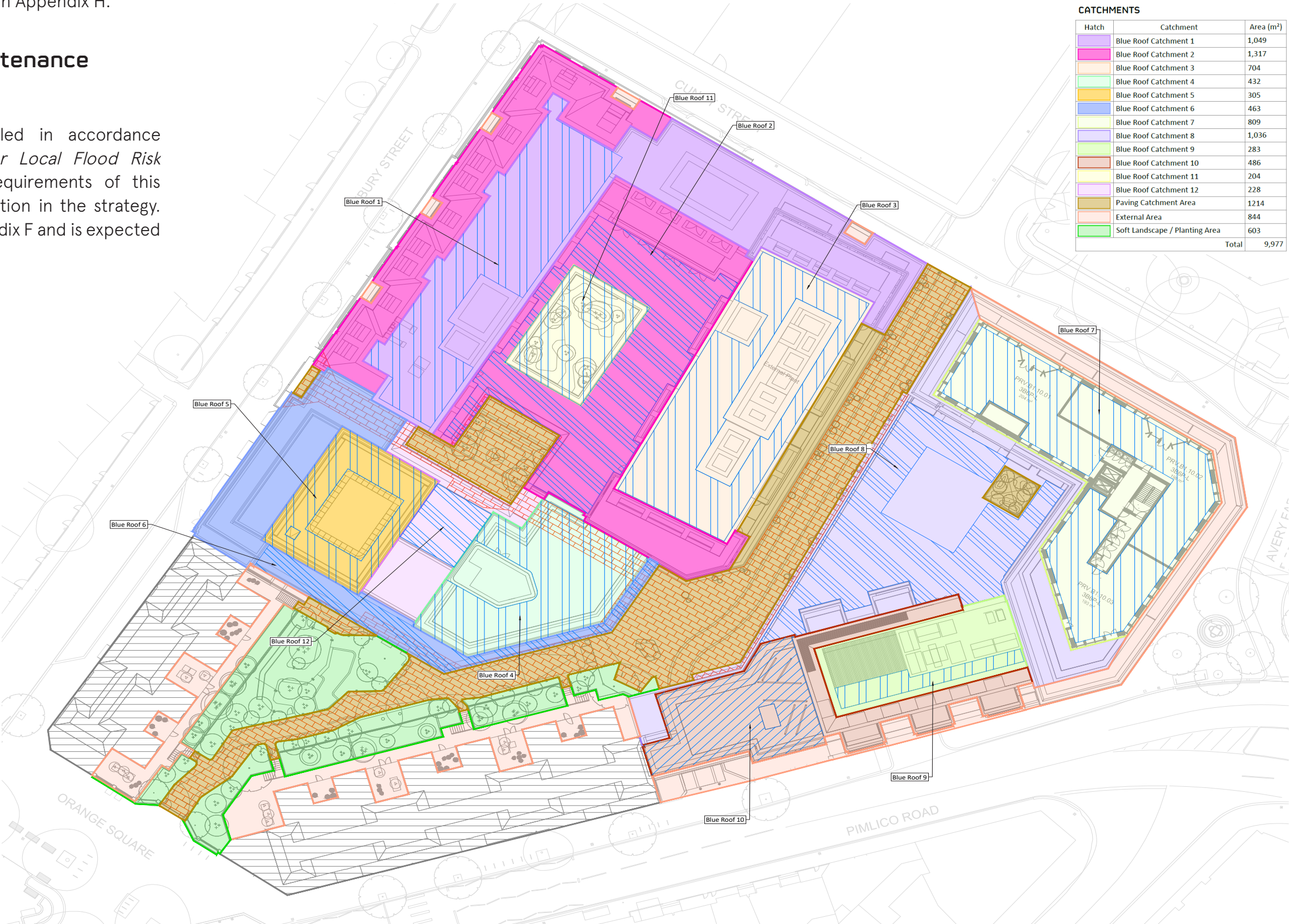


Image 07 – Extract of Drainage Strategy

6. Conclusion

This Drainage Strategy report has been prepared in accordance with local and national planning policy and guidance documents including WCC's and SuDS Design and Evaluation Guide, the London Plan (2016), the draft New London Plan, the NPPF (2019) and local policy. The Proposed Development complies with local and national planning policy from a sustainable drainage point of view.

The flood risk from all sources was evaluated and is considered to be low.

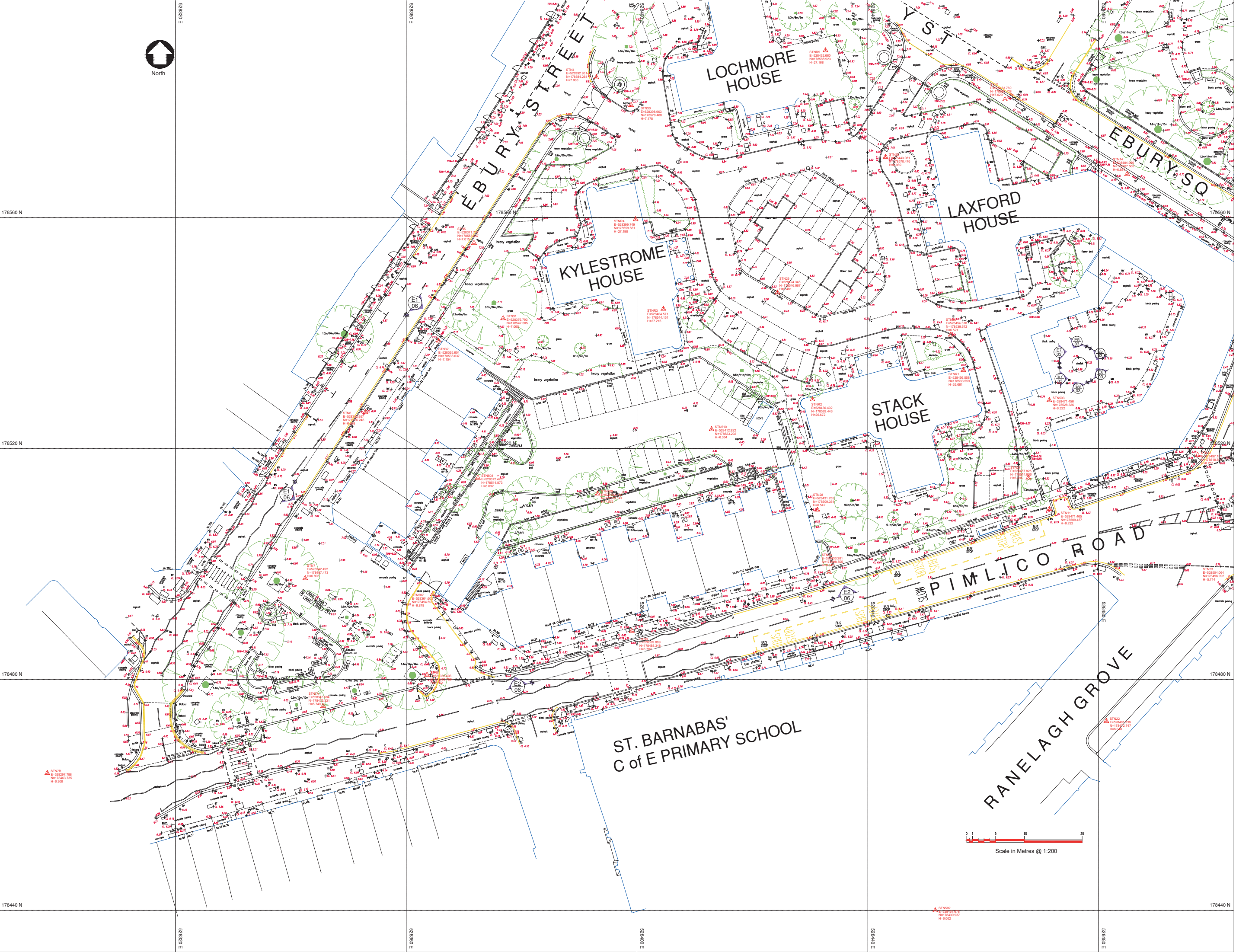
The development proposes to utilise SuDS such as blue roofs and rainwater harvesting techniques across the Site to control the runoff rate and volume of surface water being discharged towards the neighbouring sewer.


By incorporating number of blue roofs at different levels of the proposed structure, a total Site discharge rate of 22.6 l/s can be achieved. This provides a betterment of up to 93 % for all events up to and including the 1:100-yr + 40% climate change scenario.

A TW pre-development application has been submitted to confirm capacity in neighbouring sewer networks. The application and response can be found in Appendix H. Also, a SuDS proforma will be provided in compliance with the Greater London Authority and Westminster (shown in Appendix I).

Appendix A

Existing Site Drawings + Topographical Survey



Notes		
Ceiling Height		Arch
Level	+20.00	Radiator
Floor Level	+20.00 FL	Station
Ceiling Level	+20.00 CL	Hedge
Soffit Level	+20.00 SL	Steep slope
False Ceiling Level	+20.00 FCL	
Floor to cill height	c-1234	Fence
Cill to head height	h-1234	Foul pipe
Door height	DH 2000	Storm pipe

Levels
Please note that the levels shown on this drawing are as follows;

- ☐ Arbitrary and related to a temporary bench mark
- ☐ Related to an Ordnance Survey Bench Mark
- ☒ Related to the Ordnance Survey National GPS Network

Trees

All trees sizes are approximate and should be checked on site before using information. Where guaranteed tree species become important the services of a tree expert should be employed

Notation : diameter of trunk / Height / Spread

Notes

Revision	Date	By
A Shop drawings, road markings, bins and benches added 20a Pineda Rd building line. Doors off Orange Sq Elevation lines added to fountain and obelisk	LCC	24/07/15
B Levels adjusted NE of Stack House.	MAR	31/07/15
C Culvert Flats Topo added	CSD	23/08/15



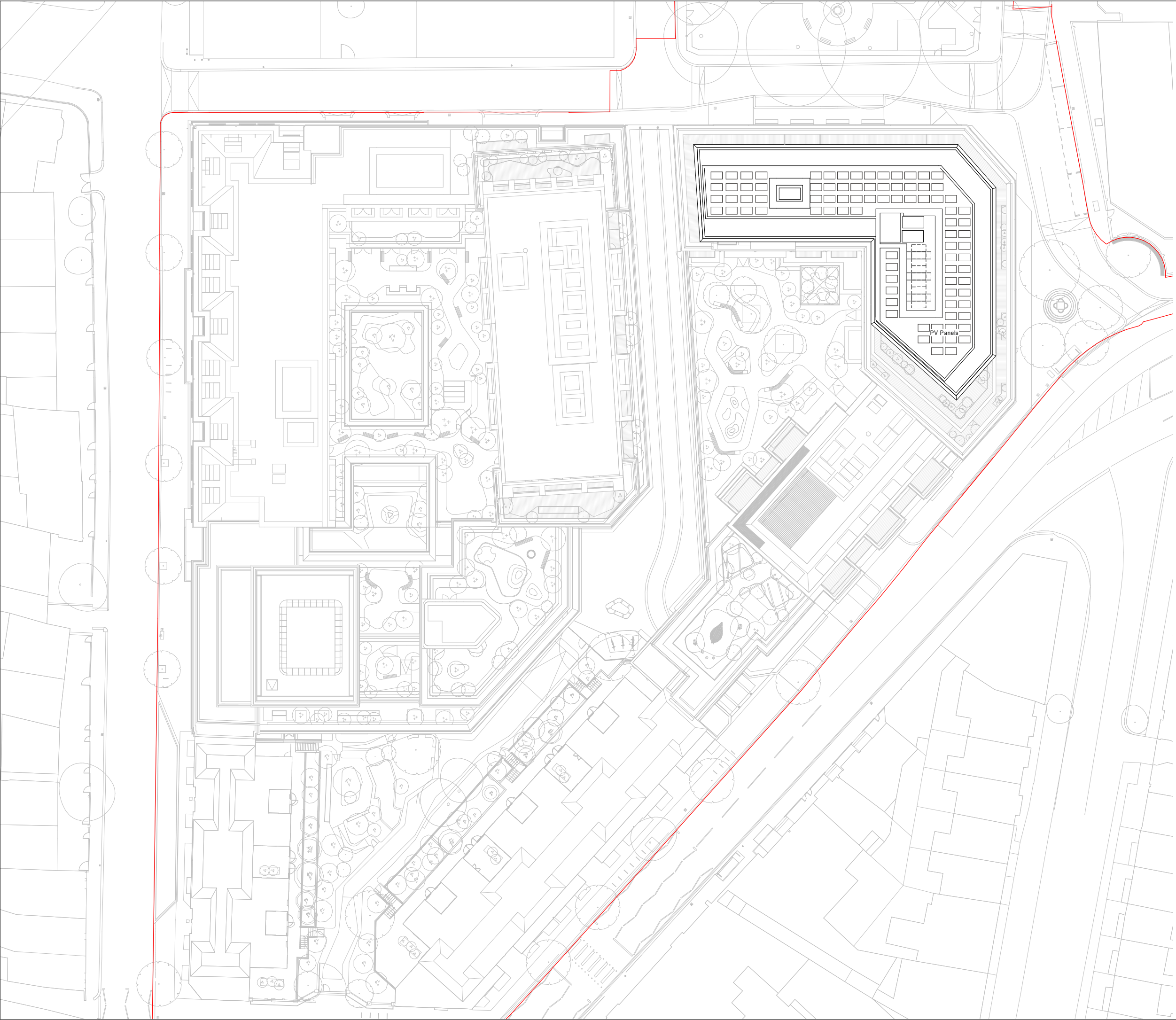
Client
Gardiner & Theobald LLP

Drawing Title
Topographical Survey

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Appendix B

Architect's Proposed Plans



GENERAL NOTES:

The internal layouts within residential apartments and ancillary areas of buildings will be subject to design development.

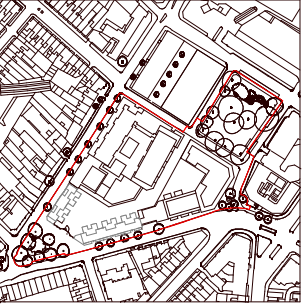
The precise location of walls, internal doors, columns, risers and the detailed layout of bathroom and kitchen areas will be the subject of non-material changes and may vary from the internal layouts set out in these plans.

These minor alterations will not affect the position and arrangements of external doors and windows nor will they affect the relative relationship between habitable rooms and windows.

Landscape proposals are indicative only, refer to Landscape Architect information for details.

Plant layouts are indicative only.

All materials shown or highlighted are indicative only and may be subject to changes made during detailed design development.



Site Key Plan (NTS)

PLANNING

rev	date	author / check	comments
DSDHA 357 Kennington Lane London SE11 5QY T 020 7703 3555 F 020 7703 3890 E info@dsdha.co.uk W www.dsdha.co.uk			
project Cundy Street Quarter London, SW1			
drawing title Proposed Roof Plan			
drawn	size	date	scale
MRP	A1	15/05/20	1 : 250
drawing number			revision
288 _P20.111			
REPORT DISCREPANCIES DO NOT SCALE FROM THIS DRAWING COPYRIGHT DSDHA		USE LATEST REVISION CHECK DIMENSIONS ON SITE	



Appendix C

Thames Water Sewer Records

Asset location search



Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
45BA	n/a	n/a
45AJ	n/a	n/a
45AI	n/a	n/a
6501	4.62	2.21
45AH	n/a	n/a
4601	n/a	n/a
5602	6.16	2.51
4602	6.96	n/a
561A	n/a	n/a
5601	6.8	2.95
4608	n/a	n/a
6701	5.93	2.92
471B	n/a	n/a
571D	n/a	n/a
471A	n/a	n/a
5701	6.35	3.3
571C	n/a	n/a
571B	n/a	n/a
6703	6.38	n/a
571A	n/a	n/a
5704	6.7	3.13
4704	6.88	3.46
43AH	n/a	n/a
43AJ	n/a	n/a
4401	5.39	2.08
4405	6.15	2.6
441A	n/a	n/a
45CC	n/a	n/a
5506	6.04	2.3
45BF	n/a	n/a
45BG	n/a	n/a
45CA	n/a	n/a
45CB	n/a	n/a
45BJ	n/a	n/a
45BI	n/a	n/a
45BH	n/a	n/a
45CD	n/a	n/a
45BD	n/a	n/a
45BE	n/a	n/a
5505	6.43	3.33
45CE	n/a	n/a
45CF	n/a	n/a
45CI	n/a	n/a
45CJ	n/a	n/a
45CG	n/a	n/a
45BC	n/a	n/a
3301	4.7	-28.95
3304	5.01	2.56
33BB	n/a	n/a
33BC	n/a	n/a
43AI	n/a	n/a
531A	n/a	n/a
331A	n/a	n/a
43AF	n/a	n/a
43AG	n/a	n/a
531B	n/a	n/a
331B	n/a	n/a
3601	n/a	n/a
2603	n/a	n/a
2606	n/a	n/a
2605	n/a	n/a
2607	n/a	n/a
2604	n/a	n/a
3609	n/a	n/a
361B	n/a	n/a
3608	n/a	n/a
361A	n/a	n/a
3607	n/a	n/a
3602	6.87	3.11
161B	6.72	5.93
161A	6.72	6
1614	6.42	2.75
2705	n/a	n/a
3704	6.75	3.82
2702	6.89	3.22
3705	6.94	3.44
15CB	n/a	n/a
15AG	n/a	n/a
15BJ	n/a	n/a
15BB	n/a	n/a
15AI	n/a	n/a
15BD	n/a	n/a
15BE	n/a	n/a
15AJ	n/a	n/a
15BF	n/a	n/a
15BG	n/a	n/a
1518	5.07	3.04
1520	5.4	2.04
2504	6.7	2.72
3502	n/a	n/a
2502	6.04	3.11

Manhole Reference	Manhole Cover Level	Manhole Invert Level
35AE	n/a	n/a
3503	n/a	n/a
35AD	n/a	n/a
3501	7.06	3.19
1603B	6	2.23
2601A	6.64	2.64
2602	n/a	n/a
1609	6.18	2.3
3306	5.88	2.53
1303	5.13	n/a
231A	n/a	n/a
131A	n/a	n/a
3305	5.96	2.34
2401	5.26	2.59
141A	n/a	n/a
3401	6.25	3.25
341C	n/a	n/a
341D	n/a	n/a
241A	n/a	n/a
24BB	n/a	n/a
3402	6.37	3.1
24BC	n/a	n/a
24BD	n/a	n/a
24BE	n/a	n/a
2406	4.9	2.78
24BF	n/a	n/a
14AF	n/a	n/a
3403	6.64	2.86
14AG	n/a	n/a
14AH	n/a	n/a
14AI	n/a	n/a

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.

Appendix D

UK SuDS Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

George Westgarth

Site name:

Cundy Street

Site location:

Cundy Street

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.49128° N

Longitude:

0.15163° W

Reference:

3114077868

Date:

Apr 15 2020 09:16

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):

0.9977

Methodology

Q_{BAR} estimation method:

Calculate from SPR and SAAR

SPR estimation method:

Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	<div>2</div>	<div>2</div>
HOST class:	<div>N/A</div>	<div>N/A</div>
SPR/SPRHOST:	<div>0.3</div>	<div>0.3</div>

Hydrological characteristics

	Default	Edited
SAAR (mm):	<div>610</div>	<div>610</div>
Hydrological region:	<div>6</div>	<div>6</div>
Growth curve factor 1 year:	<div>0.85</div>	<div>0.85</div>
Growth curve factor 30 years:	<div>2.3</div>	<div>2.3</div>
Growth curve factor 100 years:	<div>3.19</div>	<div>3.19</div>
Growth curve factor 200 years:	<div>3.74</div>	<div>3.74</div>

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	<div>1.55</div>	<div>1.55</div>
1 in 1 year (l/s):	<div>1.32</div>	<div>1.32</div>
1 in 30 years (l/s):	<div>3.56</div>	<div>3.56</div>
1 in 100 year (l/s):	<div>4.94</div>	<div>4.94</div>
1 in 200 years (l/s):	<div>5.79</div>	<div>5.79</div>

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

Appendix E

Blue Roof Calculations

Project: Cundy Street Quarter
Client: Polypipe
Location: London

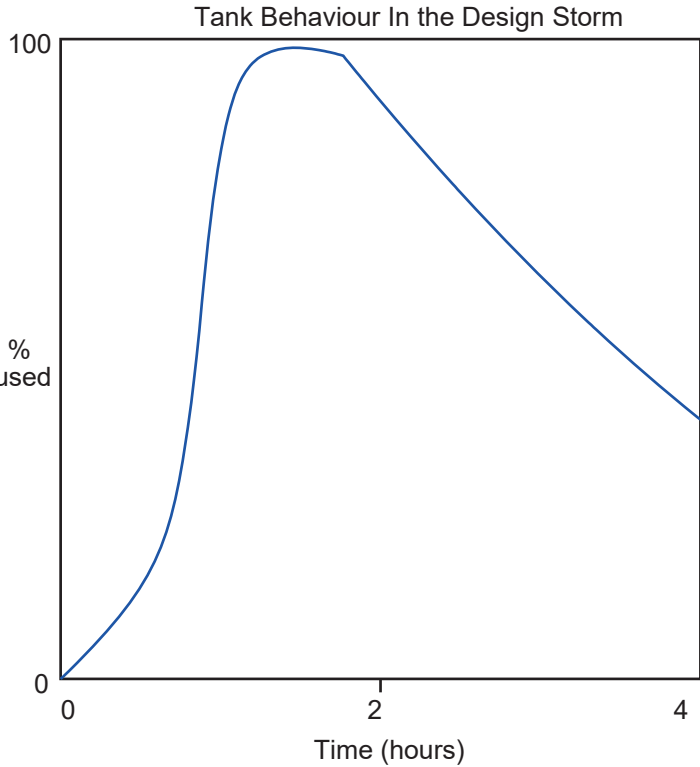
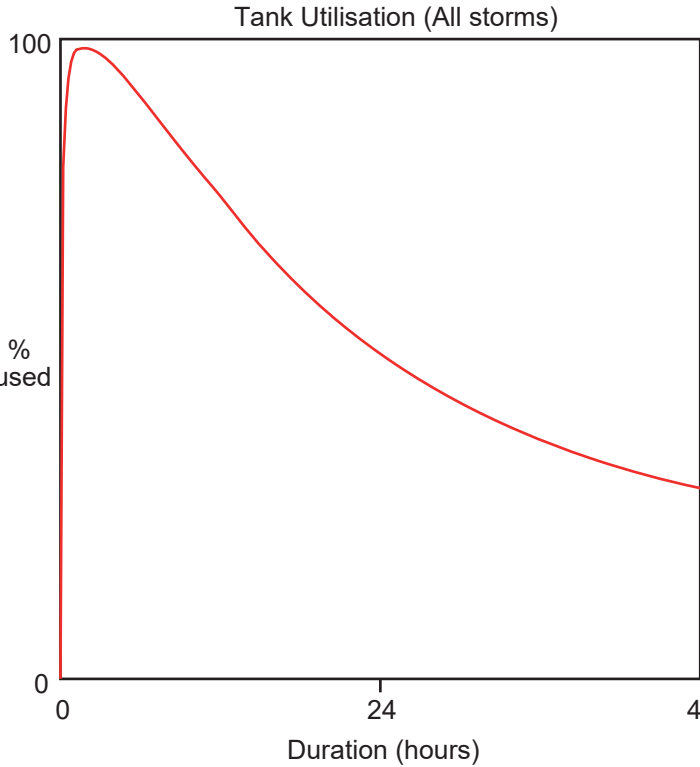
Catchment Details: Roof 1			
Buildings	1049	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	996.55	m²	

Storage Details:	
Length	487 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.15 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d2	0.267	d3	0.242
e	0.33	f	2.537
Summer Storm Profile			
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	63.764
45 min	76.1	101.4	66.570
60 min	80.8	80.8	67.864
2 hours	93.2	46.6	68.385
6 hours	117.1	19.5	63.139
24 hours	149.8	6.2	35.259

Outflow Details:	
Design Flow	6 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	85 mm
Number of Outlets	1
Flow per Outlet	5.99 l/s

Results:	
Outcome	Pass
Critical Storm Duration	1.78 hrs
Critical Rainfall Rate	51.1 mm/h
Hmax	0.148 m
Time to half empty	1.6 hrs
Volume Required	68.472 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

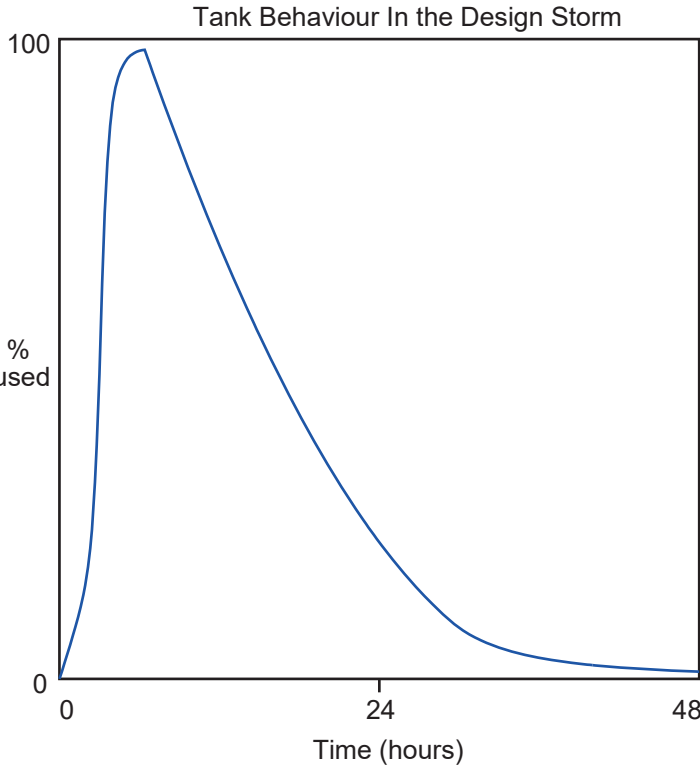
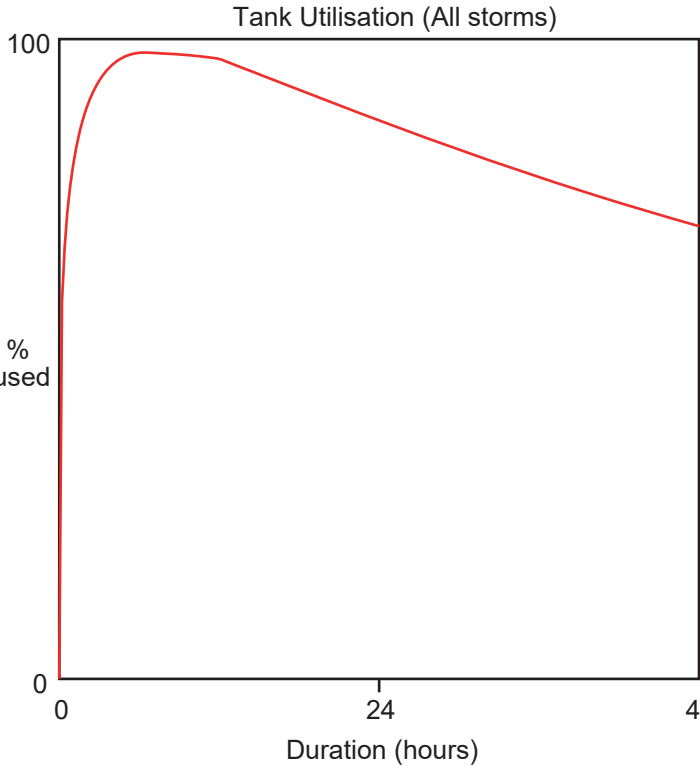
Catchment Details: Roof 2			
Buildings	1317	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	1251.15	m²	

Storage Details:	
Length	545 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.235 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d2	0.267	d3	0.242
e	0.33	f	2.537
Summer Storm Profile			
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	85.682
45 min	76.1	101.4	92.318
60 min	80.8	80.8	97.095
2 hours	93.2	46.6	108.215
6 hours	117.1	19.5	119.065
24 hours	149.8	6.2	106.198

Outflow Details:	
Design Flow	2 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	44 mm
Number of Outlets	1
Flow per Outlet	2 l/s

Results:	
Outcome	Pass
Critical Storm Duration	6.42 hrs
Critical Rainfall Rate	18.5 mm/h
Hmax	0.23 m
Time to half empty	8.3 hrs
Volume Required	119.082 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

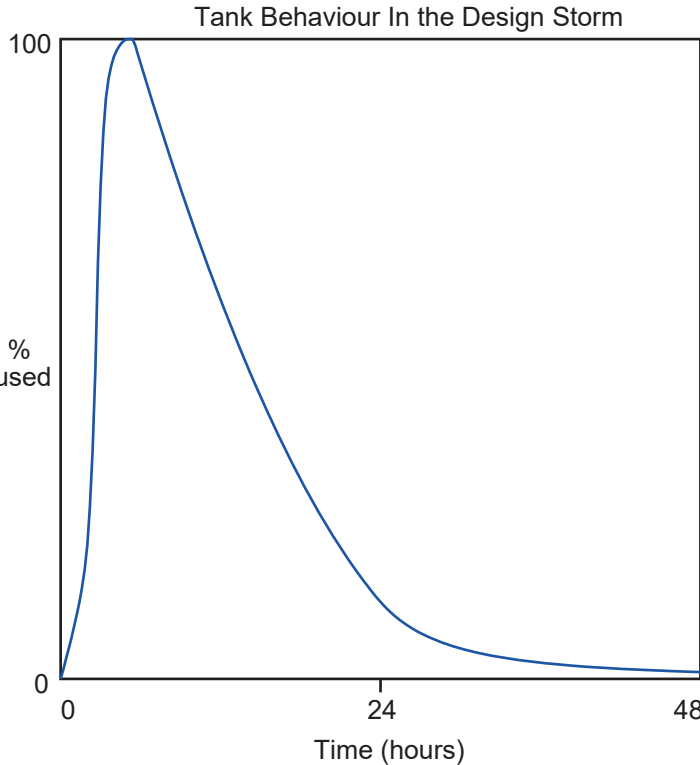
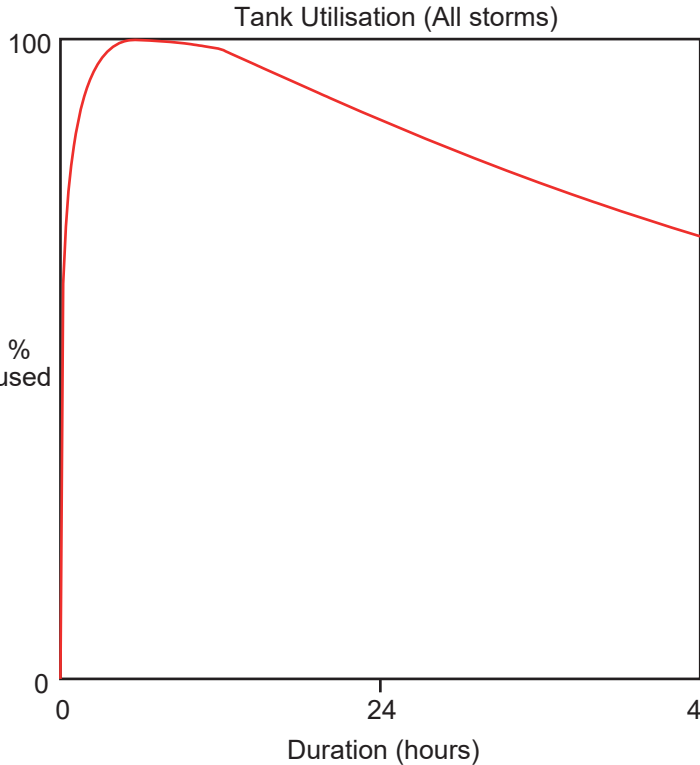
Catchment Details: Roof 3			
Buildings	704	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	668.8	m²	

Storage Details:	
Length	435 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.15 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d2	0.267	d3	0.242
e	0.33	f	2.537
Summer Storm Profile			
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	45.682
45 min	76.1	101.4	49.161
60 min	80.8	80.8	51.643
2 hours	93.2	46.6	57.289
6 hours	117.1	19.5	61.891
24 hours	149.8	6.2	54.162

Outflow Details:	
Design Flow	1.2 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	38 mm
Number of Outlets	1
Flow per Outlet	1.21 l/s

Results:	
Outcome	Pass
Critical Storm Duration	5.6 hrs
Critical Rainfall Rate	20.6 mm/h
Hmax	0.15 m
Time to half empty	7.1 hrs
Volume Required	61.987 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

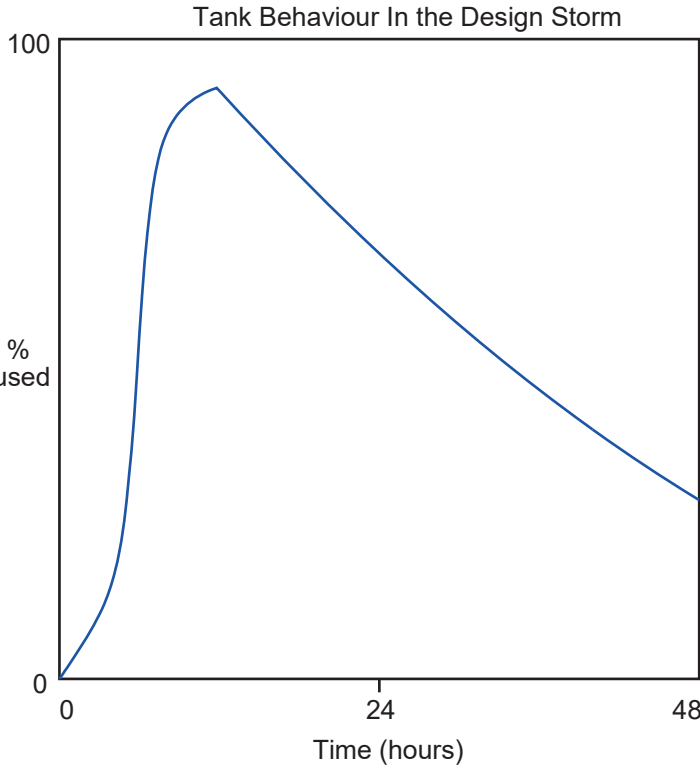
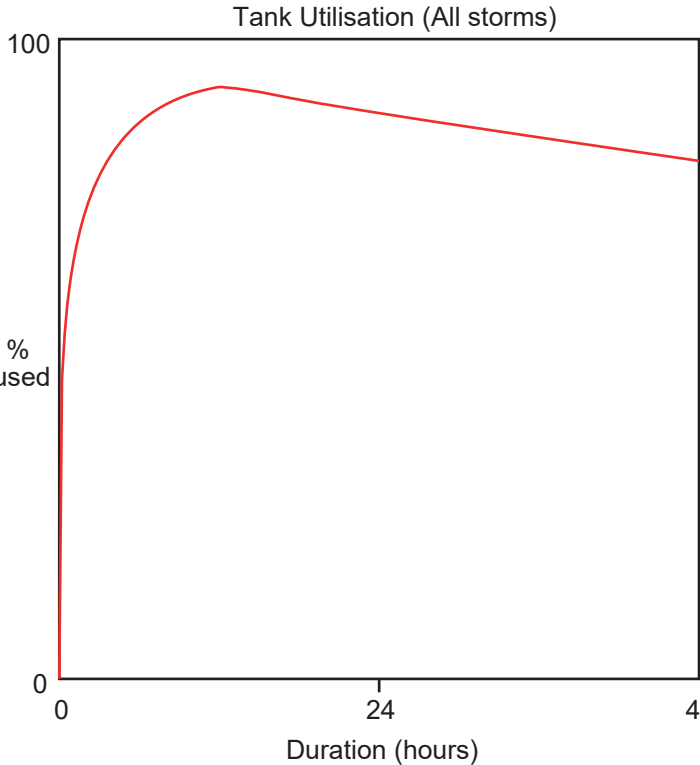
Catchment Details: Roof 4			
Buildings	432	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	410.4	m²	

Storage Details:	
Length	354 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.15 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d2	0.267	d3	0.242
e	0.33	f	2.537
Summer Storm Profile			
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	28.435
45 min	76.1	101.4	30.799
60 min	80.8	80.8	32.558
2 hours	93.2	46.6	37.006
6 hours	117.1	19.5	43.861
24 hours	149.8	6.2	44.610

Outflow Details:	
Design Flow	0.3 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	20 mm
Number of Outlets	1
Flow per Outlet	0.32 l/s

Results:	
Outcome	Pass
Critical Storm Duration	12 hrs
Critical Rainfall Rate	11.3 mm/h
Hmax	0.139 m
Time to half empty	20.2 hrs
Volume Required	46.746 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

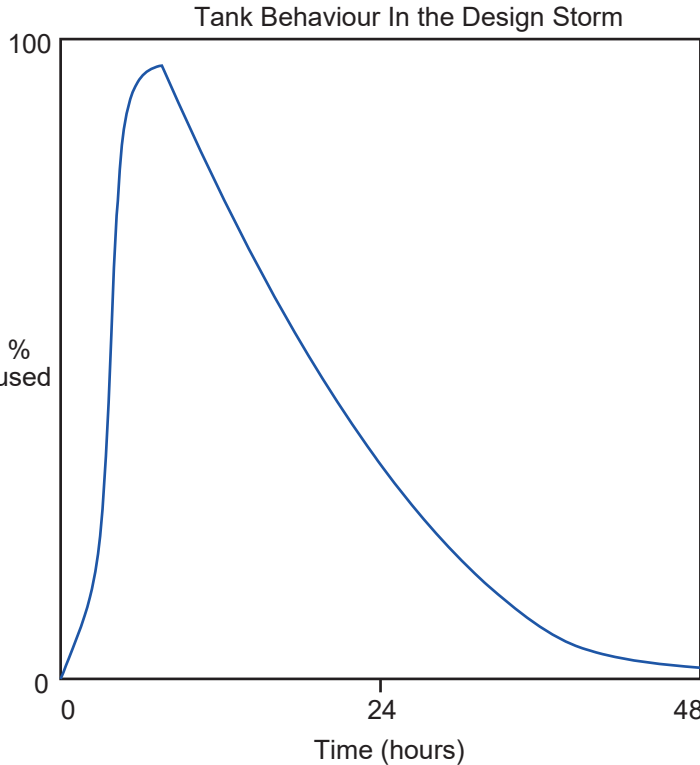
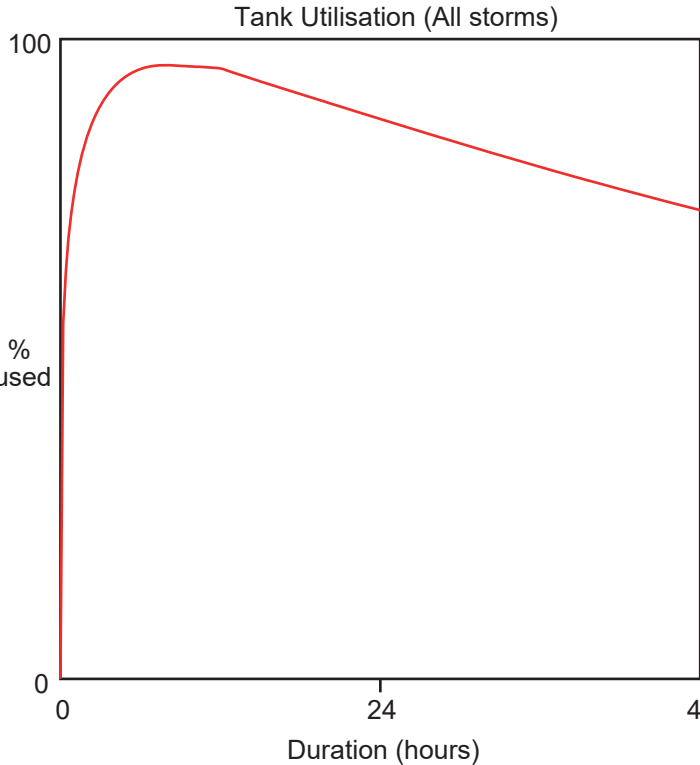
Catchment Details: Roof 5			
Buildings	305	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	289.75	m²	

Storage Details:	
Length	210 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.15 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d3	0.242	e	0.33
Summer Storm Profile		d2	0.267
		f	2.537
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	19.908
45 min	76.1	101.4	21.482
60 min	80.8	80.8	22.627
2 hours	93.2	46.6	25.362
6 hours	117.1	19.5	28.523
24 hours	149.8	6.2	26.189

Outflow Details:	
Design Flow	0.4 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	22 mm
Number of Outlets	1
Flow per Outlet	0.4 l/s

Results:	
Outcome	Pass
Critical Storm Duration	7.8 hrs
Critical Rainfall Rate	15.9 mm/h
Hmax	0.144 m
Time to half empty	10.1 hrs
Volume Required	28.728 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

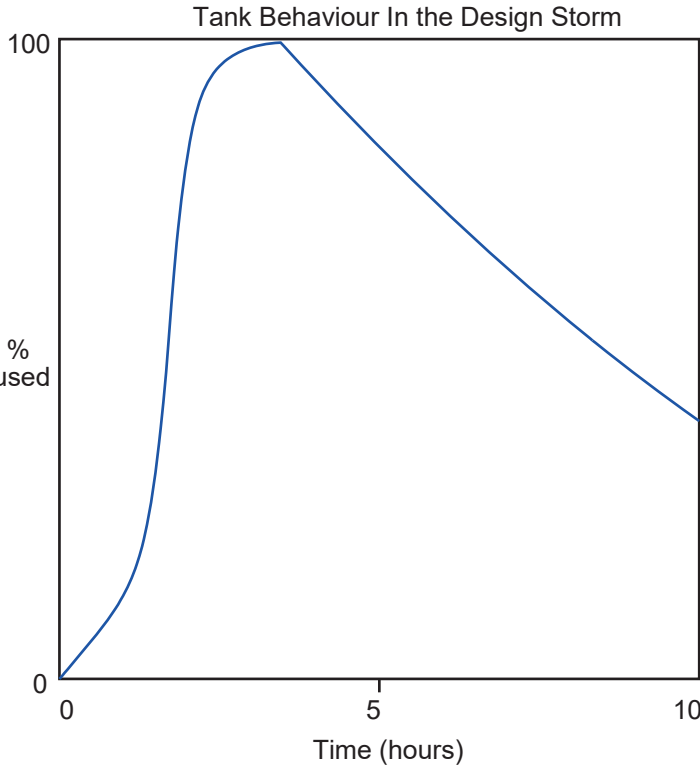
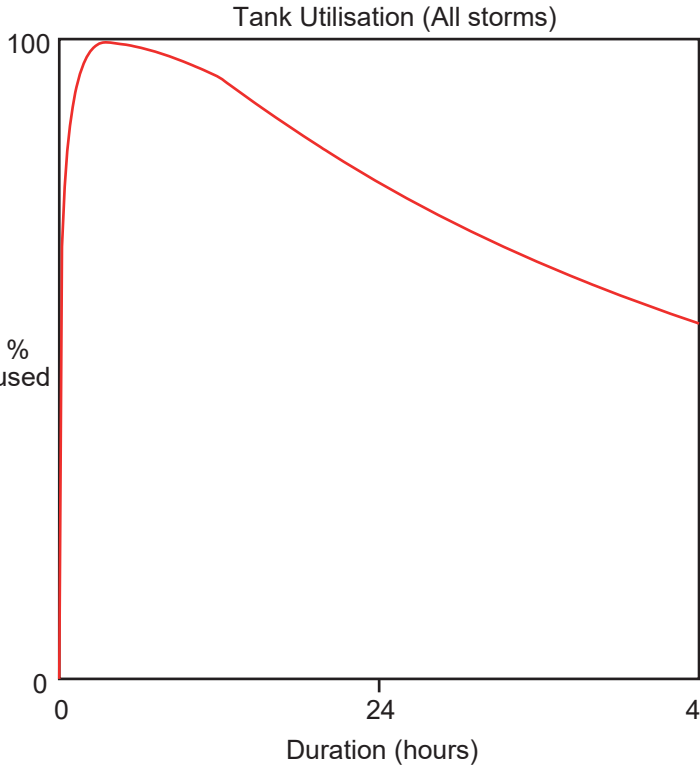
Catchment Details: Roof 6			
Buildings	463	m²	x 95 %
Dense surfacing		m²	x 90 %
Effective Area	439.85	m²	

Storage Details:	
Length	166 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.235 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:			
Return Period		100 years	
Climate Change Factor		40 %	
c	-0.026	d1	0.327
d3	0.242	e	0.33
Summer Storm Profile		d2	0.267
		f	2.537
Duration	Intensity	Required storage(m³)	
	mm	mm/h	
30 min	69.9	139.9	29.640
45 min	76.1	101.4	31.708
60 min	80.8	80.8	33.116
2 hours	93.2	46.6	35.927
6 hours	117.1	19.5	36.581
24 hours	149.8	6.2	28.737

Outflow Details:	
Design Flow	1.1 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	33 mm
Number of Outlets	1
Flow per Outlet	1.14 l/s

Results:	
Outcome	Pass
Critical Storm Duration	3.5 hrs
Critical Rainfall Rate	29.9 mm/h
Hmax	0.234 m
Time to half empty	4.5 hrs
Volume Required	36.902 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

Catchment Details:
Roof 7

Buildings	809	m² x 95 %
Dense surfacing		m² x 90 %
Effective Area	768.55	m²

Storage Details:

Length	574 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.15 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:

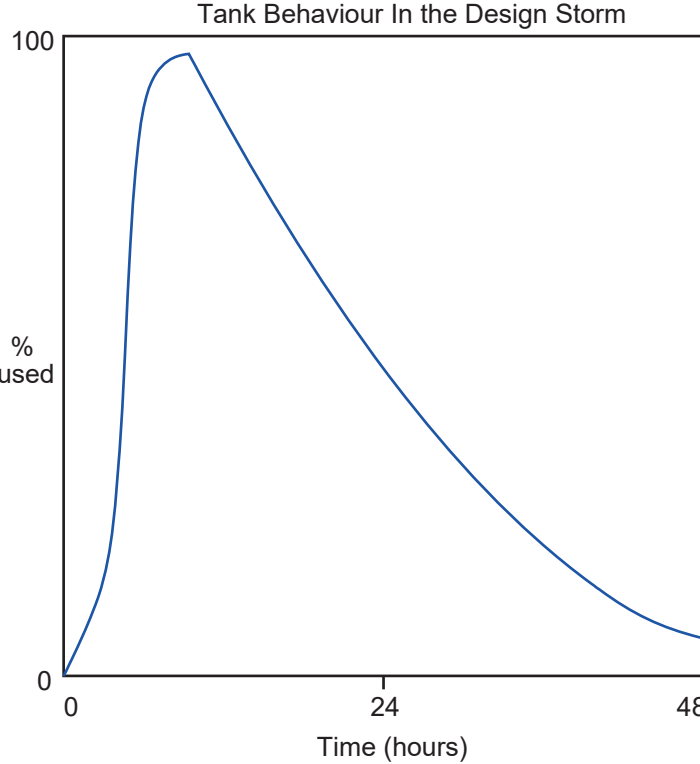
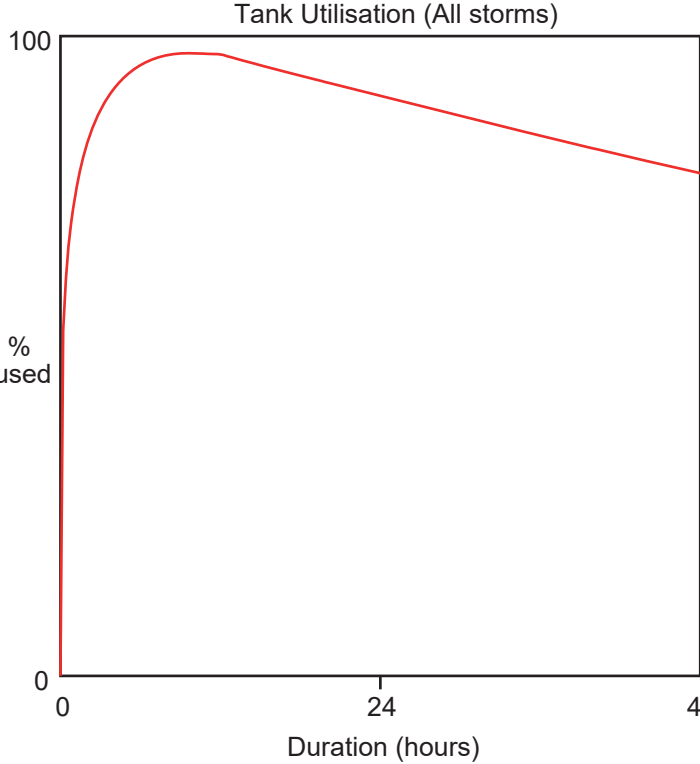
Return Period	100 years				
Climate Change Factor	40 %				
c	-0.026	d1	0.327	d2	0.267
d3	0.242	e	0.33	f	2.537
Summer Storm Profile					
Duration	Intensity		Required storage(m³)		
	mm	mm/h			
30 min	69.9	139.9	52.983		
45 min	76.1	101.4	57.256		
60 min	80.8	80.8	60.392		
2 hours	93.2	46.6	68.055		
6 hours	117.1	19.5	78.075		
24 hours	149.8	6.2	74.162		

Outflow Details:

Design Flow	0.9 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	33 mm
Number of Outlets	1
Flow per Outlet	0.9 l/s

Results:

Outcome	Pass
Critical Storm Duration	9.6 hrs
Critical Rainfall Rate	13.4 mm/h
Hmax	0.146 m
Time to half empty	12.3 hrs
Volume Required	79.614 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

Catchment Details:
Roof 8

Buildings	1036	m² x 95 %
Dense surfacing		m² x 90 %
Effective Area	984.2	m²

Storage Details:

Length	481 m
Bed Slope	Horizontal
Width	1 m
Crossfall	None
Depth	0.235 m
Porosity	95 %
Slope Efficiency	100 %

Rainfall Details - FEH Method:

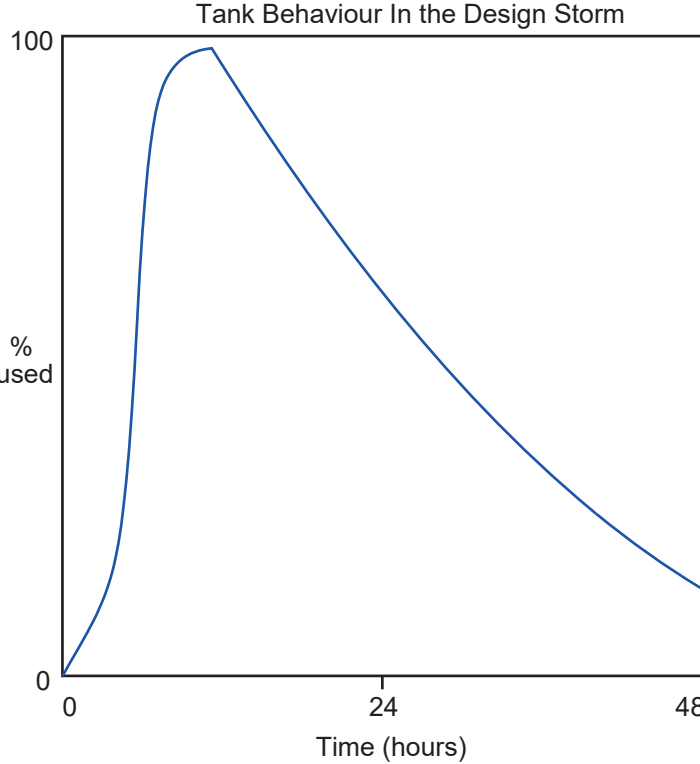
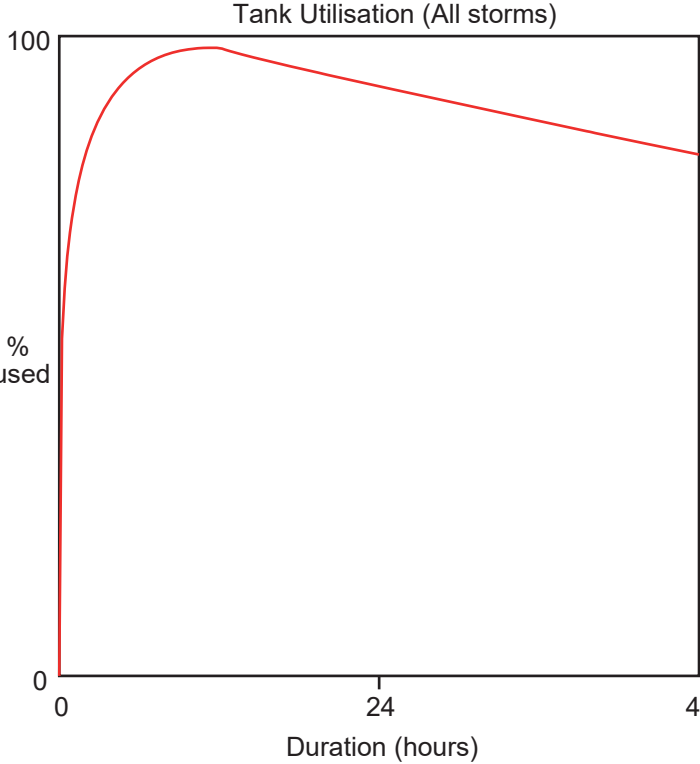
Return Period	100 years				
Climate Change Factor	40 %				
c	-0.026	d1	0.327	d2	0.267
d3	0.242	e	0.33	f	2.537
Summer Storm Profile					
Duration	Intensity		Required storage(m³)		
	mm	mm/h			
30 min	69.9	139.9	67.971		
45 min	76.1	101.4	73.514		
60 min	80.8	80.8	77.605		
2 hours	93.2	46.6	87.738		
6 hours	117.1	19.5	101.941		
24 hours	149.8	6.2	98.953		

Outflow Details:

Design Flow	1 l/s
Attenuation Control	Orifice Plate
Orifice Diameter	31 mm
Number of Outlets	1
Flow per Outlet	1 l/s

Results:

Outcome	Pass
Critical Storm Duration	11.38 hrs
Critical Rainfall Rate	11.7 mm/h
Hmax	0.231 m
Time to half empty	14.7 hrs
Volume Required	105.555 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

Catchment Details:
Roof 9 FAIL DUE TO FEH DATA
Buildings 283 m² x 95 %
Dense surfacing m² x 90 %

Effective Area 268.85 m²

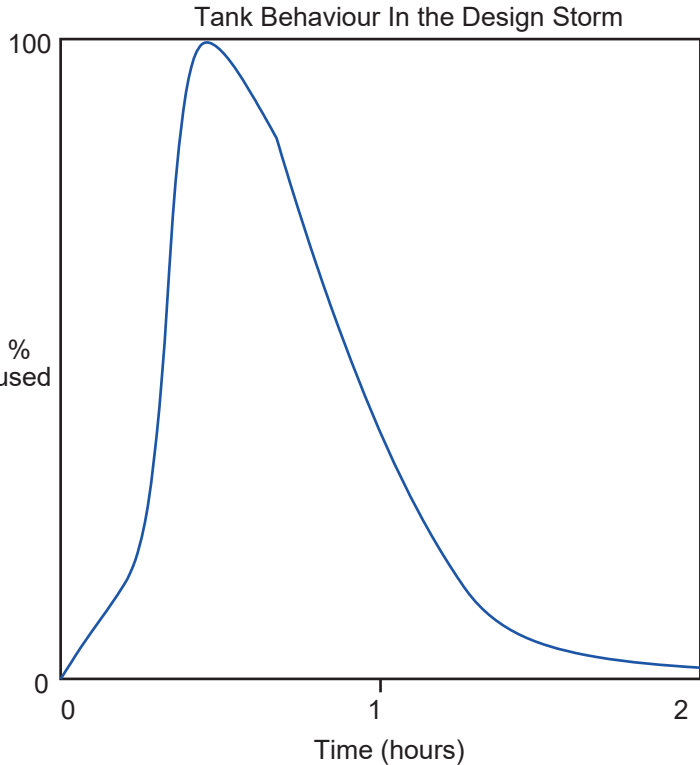
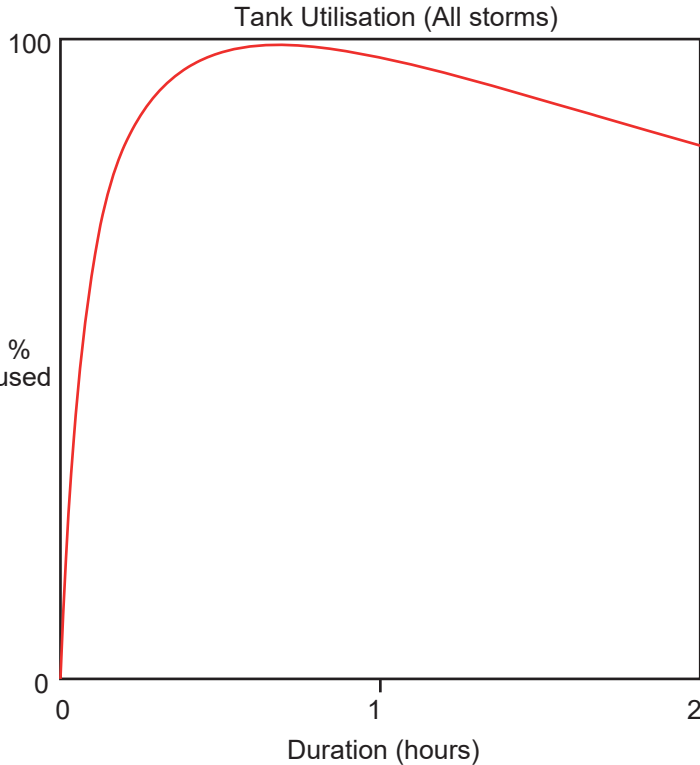
Storage Details:
Length 61 m
Bed Slope Horizontal
Width 1 m
Crossfall None
Depth 0.15 m
Porosity 95 %
Slope Efficiency 100 %

Rainfall Details - FEH Method:
Return Period 100 years
Climate Change Factor 40 %
c -0.026 d1 0.327 d2 0.267
d3 0.242 e 0.33 f 2.537
Summer Storm Profile

Duration	Intensity		Required storage(m³)
	mm	mm/h	
30 min	47.9	95.7	8.508
45 min	54.2	72.3	8.604
60 min	58.7	58.7	8.441
2 hours	69.7	34.8	7.245
6 hours	86.8	14.5	3.868
24 hours	112.1	4.7	1.072

Outflow Details:
Design Flow 4.4 l/s
Attenuation Control Orifice Plate
Orifice Diameter 42 mm
Number of Outlets 3
Flow per Outlet 1.47 l/s

Results:
Outcome Pass
Critical Storm Duration 41 min
Critical Rainfall Rate 77.2 mm/h
Hmax 0.149 m
Time to half empty 16.3 min
Volume Required 8.635 m³



Company:

Project: Cundy Street Quarter
Client: Polypipe
Location: London

Catchment Details:
Roof 10 FAIL DUE TO FEH DATA
Buildings 486 m² x 95 %
Dense surfacing m² x 90 %

Effective Area 461.7 m²

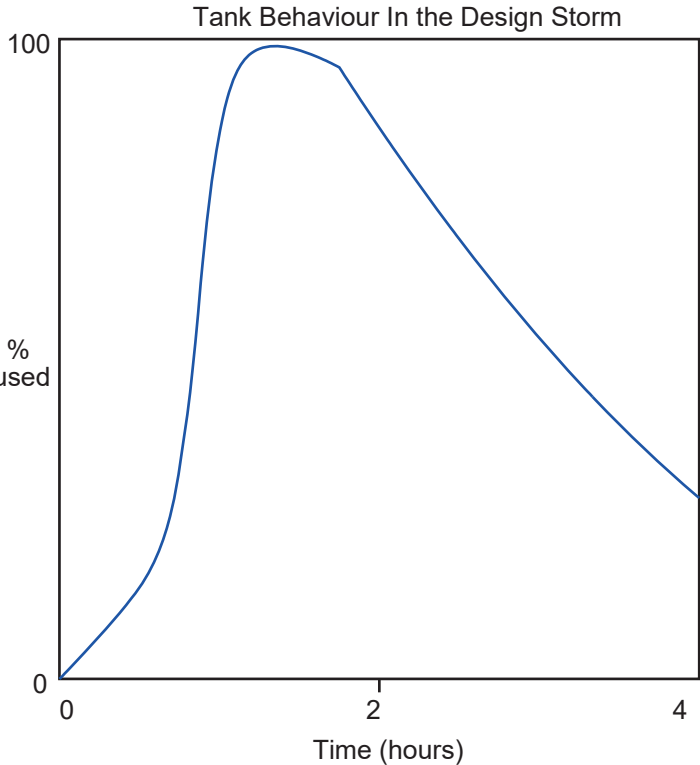
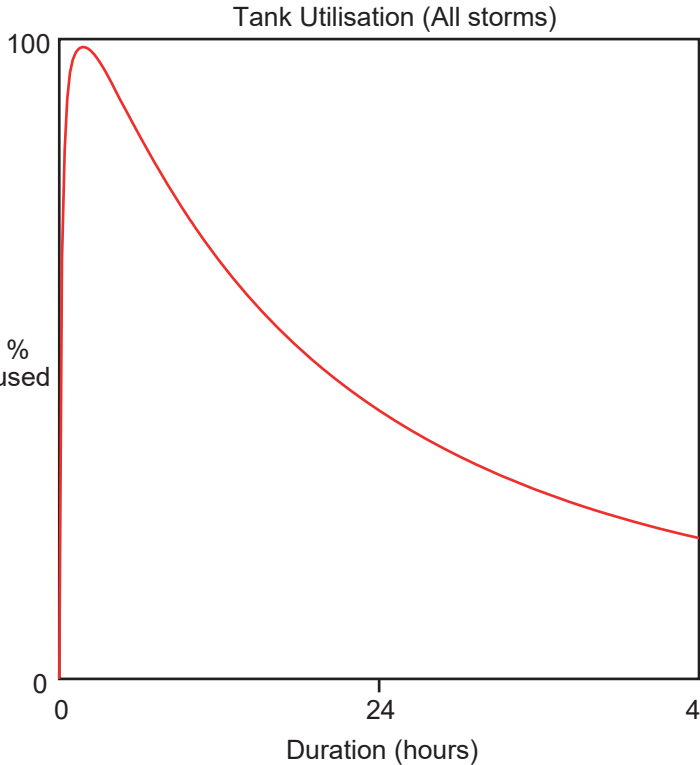
Storage Details:
Length 278 m
Bed Slope Horizontal
Width 1 m
Crossfall None
Depth 0.085 m
Porosity 95 %
Slope Efficiency 100 %

Rainfall Details - FEH Method:
Return Period 100 years
Climate Change Factor 40 %
c -0.026 d1 0.327 d2 0.267
d3 0.242 e 0.33 f 2.537
Summer Storm Profile

Duration	Intensity		Required storage(m³)
	mm	mm/h	
30 min	47.9	95.7	19.608
45 min	54.2	72.3	21.091
60 min	58.7	58.7	21.712
2 hours	69.7	34.8	22.149
6 hours	86.8	14.5	19.080
24 hours	112.1	4.7	9.418

Outflow Details:
Design Flow 2.4 l/s
Attenuation Control Orifice Plate
Orifice Diameter 28 mm
Number of Outlets 5
Flow per Outlet 0.49 l/s

Results:
Outcome Pass
Critical Storm Duration 1.77 hrs
Critical Rainfall Rate 38.3 mm/h
Hmax 0.084 m
Time to half empty 1.3 hrs
Volume Required 22.184 m³



Company:

Project:Cundy Street Quarter

Client:Polypipe

Location:London

Catchment Details:
Roof 11

Buildings204m² x 95 %

Dense surfacingm² x 90 %

Effective Area193.8m²

Storage Details:

Length204 m

Bed SlopeHorizontal

Width1 m

CrossfallNone

Depth0.15 m

Porosity95 %

Slope Efficiency100 %

Rainfall Details - FEH Method:

Return Period100 years

Climate Change Factor40 %

c-0.026d10.327d20.267

d30.242e0.33f2.537

Summer Storm Profile

DurationIntensitymmmm/hRequired storage(m³)

30 min69.9139.913.314

45 min76.1101.414.365

60 min80.880.815.128

2 hours93.246.616.949

6 hours117.119.519.022

24 hours149.86.217.438

Outflow Details:

Design Flow0.3 l/s

Attenuation ControlOrifice Plate

Orifice Diameter20 mm

Number of Outlets1

Flow per Outlet0.27 l/s

Results:

OutcomePass

Critical Storm Duration7.63 hrs

Critical Rainfall Rate16.1 mm/h

Hmax0.099 m

Time to half empty9.8 hrs

Volume Required19.186 m³

Tank Utilisation (All storms)

% used

0100

02448

Duration (hours)

Tank Behaviour In the Design Storm

% used

0100

02448

Time (hours)

Company:

21/04/202012:15:52

Page 11

Project:Cundy Street Quarter

Client:Polypipe

Location:London

Catchment Details:
Roof 12

Buildings228m² x 95 %

Dense surfacingm² x 90 %

Effective Area216.6m²

Storage Details:

Length79 m

Bed SlopeHorizontal

Width1 m

CrossfallNone

Depth0.235 m

Porosity95 %

Slope Efficiency100 %

Rainfall Details - FEH Method:

Return Period100 years

Climate Change Factor40 %

c-0.026d10.327d20.267

d30.242e0.33f2.537

Summer Storm Profile

DurationIntensitymmmm/hRequired storage(m³)

30 min69.9139.914.488

45 min76.1101.415.448

60 min80.880.816.083

2 hours93.246.617.234

6 hours117.119.517.163

24 hours149.86.212.760

Outflow Details:

Design Flow0.6 l/s

Attenuation ControlOrifice Plate

Orifice Diameter25 mm

Number of Outlets1

Flow per Outlet0.65 l/s

Results:

OutcomePass

Critical Storm Duration2.88 hrs

Critical Rainfall Rate34.9 mm/h

Hmax0.232 m

Time to half empty3.7 hrs

Volume Required17.412 m³

Tank Utilisation (All storms)

% used

0100

02448

Duration (hours)

Tank Behaviour In the Design Storm

% used

0100

0510

Time (hours)

Company:

21/04/202012:15:52

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Appendix F

Maintenance Strategy



Drainage Inspection and Maintenance Strategy

This document has been prepared to support the inspection and maintenance of the proposed below ground drainage of the Cundy Street site. The drainage network comprises surface and foul water drainage systems:

- Surface water network will route all the rainwater towards either paving area, unrestricted areas or blue/green roof surface water will feed. This will then discharge straight into the sewer.
- Foul water network from above ground level will be routed towards the outfall manhole via gravity.

In accordance with CIRIA C625 it is recommended that a private SuDS maintenance agreement is undertaken as a simple contract between the property owner and the maintenance provider (the maintainer). It is mainly to facilitate continuing maintenance of the SuDS that are in private ownership. The maintenance requirements are in accordance with the CIRIA C753 SuDS Manual 2015 and product manufacturer’s requirements.

The following Drainage / SuDS measures are proposed within the development:

- General Drainage:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly
	Inspect surface structures and covers removing obstructions and silt as necessary.	Monthly or as required
	Check there is no physical damage.	
	Remove overgrown vegetation 1m min. around structures and keep hard aprons free from silt and debris.	
Occasional Maintenance	Remove sediment from pre-treatment structures (e.g. gullies, channels silt traps).	Six-monthly or as required
	Remove cover and inspect inside, ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually or as required
	Remove debris and silt.	
	Undertake inspection after leaf fall in autumn.	
Remedial Actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required
Monitoring	Inspect all manholes, inspection chambers, inlets, outlets, overflows and vents to ensure they are in good condition and operating as designed.	Annually or after large storms.

- Green / Blue / Brown Roofs:

Maintenance Period	Maintenance Task	Frequency
--------------------	------------------	-----------

Regular Maintenance	During establishment, replace dead plants as required (for 12 months following installation).	Monthly
	Mow grasses (where required) and remove resultant clippings.	Six Monthly
	Remove fallen leaves and debris from deciduous plant foliage.	
	Remove nuisance and invasive vegetation, including weeds.	
	Remove debris & litter to prevent clogging of inlet drains and interference with plant growth.	
	Noxious weed treatment (3 times a year).	
Occasional Maintenance	Replace dead plants as required (typically in the Autumn).	Annually
	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, act where required.	
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources, act where required.	
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system, act where required.	
	Inspect underside of roof for evidence of leakage, act where required.	
Remedial Action	Inspect and document the presence of wildlife.	Following all significant storm events
	Inspect and carry out essential recovery works to return the feature to full working order.	

If problems are experienced, please do not hesitate to contact the company (Hydro International) so that an investigation may be made.

Contact: enquiries@hydro-int.com (+44 (0)118 933 1325)

- Inlets, Outlets and Inspection Chambers:

Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Inspect surface structures and covers removing obstructions and silt as necessary.	Monthly or as required
	Check there is no physical damage. Remove overgrown vegetation 1m min. around structures and keep hard aprons free from silt and debris.	
	Remove cover and inspect inside, ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Annually
Occasional Maintenance	Check topsoil levels are 20mm above edges off baskets and chambers to avoid mower damage.	As necessary
Remedial Work	Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
	Repair physical damage is necessary.	

- Rain Garden / Stormwater Planter:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Litter and debris removal .	Monthly
	Mulching (where required).	
	Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Act where required.	
	Removal of nuisance and invasive vegetation.	Six Monthly
	Pruning and trimming of trees.	Annually
	Inspect and document the presence of wildlife.	
	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where required.	
Remedial Actions	Repair erosion or other damage by re-mulching or re-seeding.	As Required
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface (typically every 60-month period).	
	Remove build-up of sediment, reinstate design levels (typically every 60-month period).	
	Remove and dispose of oils or petrol residues using safe standard practices.	
Monitoring	Inspect and carry out essential recovery works to return the feature to full working order.	Following all significant storm events

- Rainwater harvesting tank:

Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Inspection of the tank for damage and debris/sediment build-up. Inspect inlets/outlets/withdrawal devices, overflow areas, filters.	Annually or following poor performance
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris.	Annually or following poor performance
Occasional Maintenance	Cleaning and/or replacement of any filters.	Three monthly or as required
Remedial Action	Repair / rehabilitation of inlets, outlets, overflows or damage to tank.	As required

Reference shall be made to CIRIA publication C753 (The SuDS Manual) and to the relevant maintenance guidance from the products manufacturers.

Appendix G

TW Pre-Development Enquiry

Pre-planning enquiry

Application form

Please complete this form and return it to us at
developer.services@thameswater.co.uk or
Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, RG1 8DB.



Application for a pre-planning enquiry

Please complete all sections of this form in BLOCK CAPITALS

If you're using this form to request a budget estimate, please note that you should be able to calculate the likely charges involved in your scheme by consulting our guide, 'Charging arrangements for new connection services', on our website.

Are you a: Developer ☐ Consultant ☒ Land promoter ☐ (Please tick one.)

Is your application for: Water ☐ Wastewater ☐ Both ☒ (Please tick one.)

Would you like a water budget estimate? Yes ☒ No ☐

(We can only offer a wastewater budget estimate after modelling, if required).

A - About the person applying

Company name	Heyne Tillett Steel		
Title	Mr <input checked="" type="checkbox"/> Mrs <input type="checkbox"/> Ms <input type="checkbox"/> Miss <input type="checkbox"/> Dr <input type="checkbox"/> Other <input type="text"/>		
First name(s)	George		
Last name	Westgarth		
Preferred contact number	020 7870 8050		
Alternative number	-		
Email address	gwestgarth@hts.uk.com		
Full postal address	Address line 1 4 Pear tree Court		
	Address line 2 Farringdon		
	Town London		
	County London	Postcode	EC1 0DS

B - Nominated contact

Who should we contact to process your application? Applicant ☒ Someone else ☐ (Please tick one.)

If someone else:

Company name	<input type="text"/>
Title	Mr <input type="checkbox"/> Mrs <input type="checkbox"/> Ms <input type="checkbox"/> Miss <input type="checkbox"/> Dr <input type="checkbox"/> Other <input type="text"/>
First name(s)	<input type="text"/>
Last name	<input type="text"/>
Preferred contact number	<input type="text"/>

Alternative number

Email address

Full postal address

Address line 1

Address line 2

Town

County

Postcode

C - Where the work is taking place

What is the address of the property being connected?

Same as applicant

Same as nominated contact

Somewhere else

(Please tick one.)

If somewhere else:

Site name

Cundy Street Quarter

Full postal address

Address line 1

Cundy

Address line 2

Cundy Street

Town

London

County

London

Postcode

SW1W 8LJ

D - About the site

What is the local authority?

westminster

Ordnance Survey grid ref

528377

178512

Type of site

Greenfield

Brownfield

Mixed

How big is the site?

0.9528

hectares

When do you intend to have first occupancy?

MM

YYYY

(Approximate date if necessary)

E - Planning status (if you’ve already started the planning process)

Is the development identified in the local plan?

Yes

No

Don’t know

If Yes, reference number

Does it have outline planning permission?

Yes

No

Don’t know

If Yes, reference number

Does it have full planning permission?

Yes

No

Don’t know

If Yes, reference number

Does the development have building regulations permission?

Yes

No

Don’t know

When do you intend to start on site?

MM

YYYY

F - About the water supply

If you’re proposing a water storage tank, what is its capacity?

m³

When will you want your first domestic connection laid on?

MM

YYYY

For water supplies, what is the estimated flow rate required for your site?

litres/sec

(Not required if applying only for wastewater.)

G - Existing sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	<div></div>	<div></div>
What is the type of discharge method?	<div><div></div>Gravity</div> <div><div></div>Pumped</div>	<div><div></div>Gravity</div> <div><div></div>Pumped</div>
If sewage is pumped, what is the pump rate?	<div><div></div>litres/sec</div>	<div><div></div>litres/sec</div>
Amount of existing impermeable area per connection	N/A	
What are the existing connection points? (For example, ‘X’ number of domestic and commercial properties drain into manhole ‘Y’ / sewer with diameter of ‘Z’.)	The foul water currently drains into the existing TW network and moves south via combined sewers.	The surface water currently drains into the existing TW network and moves south via combined sewers.

H - Proposed sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
What is the type of discharge method?	<input checked="" type="checkbox"/> Gravity	<input checked="" type="checkbox"/> Gravity
	<input type="checkbox"/> Pumped	<input type="checkbox"/> Pumped
If sewage is pumped, what is the pump rate?	<input type="text"/> litres/sec	<input type="text"/> litres/sec
What is your proposed approach to surface water drainage?	N/A	<input type="checkbox"/> Traditional piped system
		<input checked="" type="checkbox"/> Sustainable drainage system (SuDS)
Do you propose using separate highway and surface water drainage systems?	N/A	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If the surface water rate is attenuated, to what rate is it attenuated?	N/A	32 litres/sec
Amount of proposed impermeable area per connection	N/A	13,700m2
What are the proposed connection points? (For example, 'X' number of domestic and commercial properties drain into manhole 'Y' / sewer with diameter of 'Z'.)	Surface water is proposed to drain through the sites existing route to TW connections.	Surface water is proposed to drain through the sites existing route to TW connections.

Please note: The developer is expected to follow the local authority’s drainage strategy and be able to demonstrate how the proposed (attenuated) discharge rate of any surface water flows has been calculated. For developments in Greater London, please refer to the London Plan Drainage Hierarchy (Policy 5.13). We will challenge the rates provided if they are not in line with those based on the local drainage strategies.

I - Additional information (where available)

When we’re assessing your development needs, it’s important that we know what buildings (if any) currently exist on the site. It may be, for example, that the infrastructure serving those properties is already sufficient to cater for your proposed development. We realise it may be too early in your process to complete this table, but any information you can provide at this stage will help improve the accuracy of our assessment and could prevent us from requesting data in the future.

Property type	Existing site	Proposed site
General housing (units 3 person+)		48
Flat (units up to 2 person)		200
Primary school (max. pupil capacity)		
Senior school (max. pupil capacity)		
Boarding school (max. pupil capacity)		
Assembly hall (max. capacity)		
Cinema (max. capacity)		142
Theatre (max. capacity)		
Sports hall (max. capacity)		
Hotel (total bedrooms)		
Guest house (total bedrooms)		
Motel (total bedrooms)		
Holiday apartment (capacity)		
Leisure park (capacity)		
Caravan park standard (per space)		
Caravan site standard (per space)		
Camping site standard (per space)		
Camping site serviced (per space)		
Public house (max. capacity)		
Restaurant / Day care centre (max. capacity)		54
Drive in restaurant (max. capacity)		
Hospital (per bed)		
Nursing / Care home (per bed)		
Offices (gross internal area in m²)		461
Shopping centre (gross internal area in m²)		2000
Warehouse (gross internal area in m²)		
Commercial premises (gross internal area in m²)	8100	218
Manufacturing unit (gross internal area in m²)		
Other (please state units and description)		

J - Enclose your documents

Please make sure any attachments are in PDF format and don't exceed a total of 20MB in size per email.

All drawings must be of suitable detail and have a drawing reference number on them.

What we need from you to process your application:

Site location plan	This should show the site with nearby buildings, roads and any sewers.
Scaled site layout	This should show existing and proposed layouts.
Site drainage strategy plan (if available at this stage)	This should show all proposed sewers, pipe sizes and gradients. <small>(Not required if applying only for water.)</small>

Please also let us know if you have a **schedule of planned works** showing how you might phase your development.

Please note, without this information we may need to make assumptions about your requirements when calculating your budget estimate (if requested).

K - How we'll use this information

We'll use the information you give on this application form, and potentially share it with our delivery partners, to provide the service you've requested.

This could include contacting you to discuss your application and/or provide more details, visiting the site where work needs to be carried out, and invoicing you when appropriate. Your feedback is important to us, so we may also use the information to ask for your feedback on how we can improve our performance.

We won't use this information for marketing purposes without contacting you to seek your consent.

You can find Thames Water's privacy policy at thameswater.co.uk/Legal/Privacy.

L - Declaration

I confirm to the best of my knowledge that the information in this application is complete and correct.

Print name	George Westgarth
Position within company	Engineer
Company	Heyne Tillett Steel
Date	20-12-19
Signature	

Submitting your application

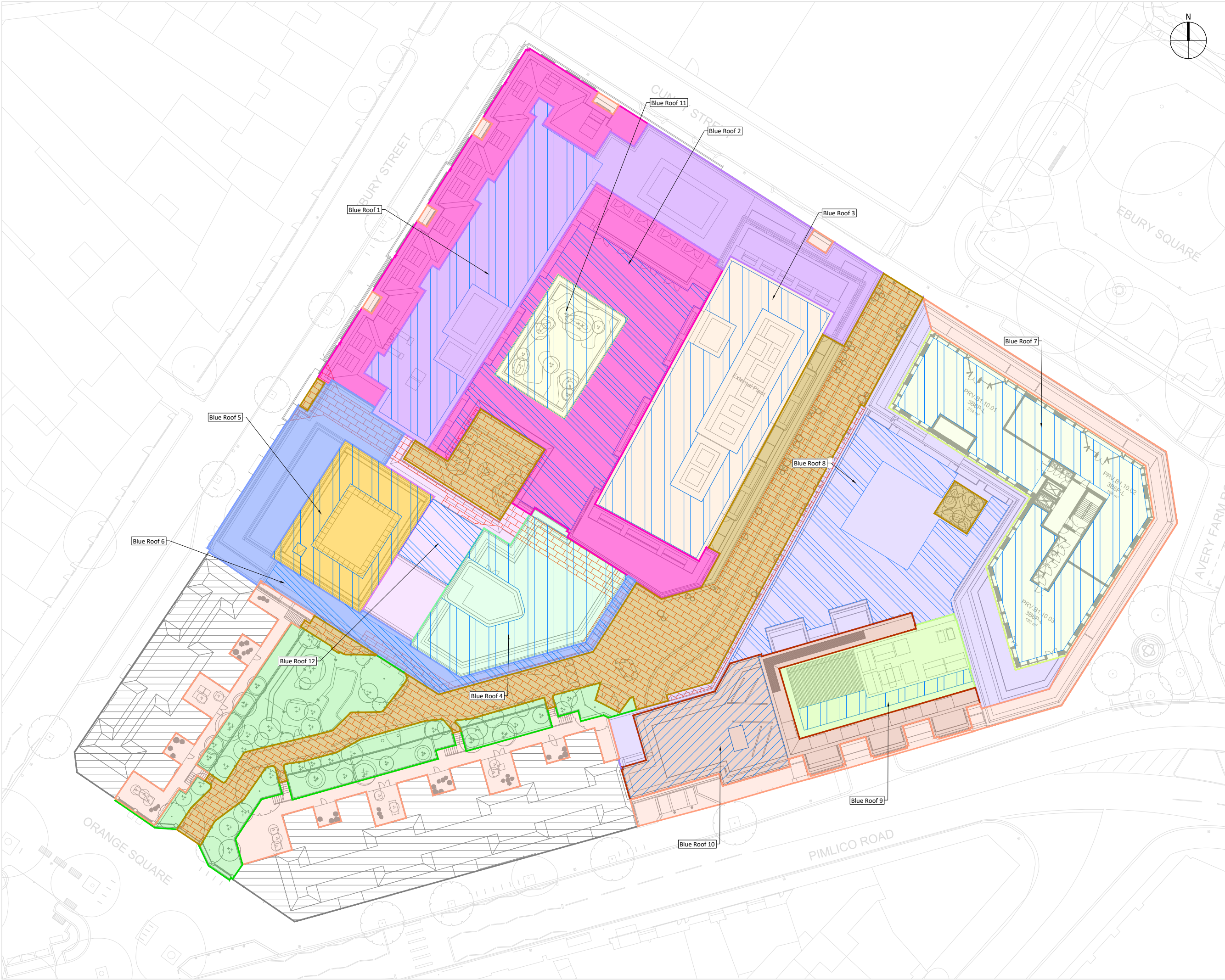
Please email your completed form to developer.services@thameswater.co.uk or send it to Thames Water Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB.

Once we've assessed your application, we'll write to tell you the result within 21 calendar days.

Where we know there's sufficient capacity we'll tell you, but if we're concerned there may not be, we'll advise you of the next steps. We'll also let you know if we need further information from you.

Appendix H

Drainage Strategy Drawing



100mm @ A1 (50mm @ A3)

NOTES

1. This Drawing is to be read in conjunction with all relevant Architect's Engineer's and specialists' drawings and specifications.

2. Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale the above bar should be 100mm long @A1 or 50mm long @ A3.

3. This drawing has been based on the following external inputs:

3.1. Proposed Ground floor Plan, drawing 288 _20.100 Rev L, "Proposed Ground Floor Plan", dated 24th March 2020 provided by DSDHA Architects.

3.2. Proposed Roof Plan, drawing 288 _20.100 Rev H, "Tenth Floor Plan", dated 24th March 2020 provided by DSDHA Architects.

CATCHMENTS

Hatch	Catchment	Area (m²)
	Blue Roof Catchment 1	1,049
	Blue Roof Catchment 2	1,317
	Blue Roof Catchment 3	704
	Blue Roof Catchment 4	432
	Blue Roof Catchment 5	305
	Blue Roof Catchment 6	463
	Blue Roof Catchment 7	809
	Blue Roof Catchment 8	1,036
	Blue Roof Catchment 9	283
	Blue Roof Catchment 10	486
	Blue Roof Catchment 11	204
	Blue Roof Catchment 12	228
	Paving Catchment Area	1214
	External Area	844
	Soft Landscape / Planting Area	603
	Total	9,977

85mm Deep Blue Roofs

Hatch	Blue Roof Number	Area (m²)
	Blue Roof 10 Attenuation	278
	Total	278

150mm Deep Blue Roofs

Hatch	Blue Roof Number	Area (m²)
	Blue Roof 1 Attenuation	487
	Blue Roof 3 Attenuation	435
	Blue Roof 4 Attenuation	354
	Blue Roof 5 Attenuation	210
	Blue Roof 7 Attenuation	574
	Blue Roof 9 Attenuation	61
	Blue Roof 11 Attenuation	204
	Total	2,325

235mm Deep Blue Roofs

Hatch	Blue Roof Number	Area (m²)
	Blue Roof 2 Attenuation	545
	Blue Roof 6 Attenuation	166
	Blue Roof 8 Attenuation	481
	Blue Roof 12 Attenuation	79
	Total	1,271

Paving Storage Area

Hatch	Paving	Area (m²)
	Paving Storage Area	1,344
	Total	1,344

P2	12.05.20	MR	GW	Updated for Issue
P1	20.04.20	MR	GW	First Issue
Rev	Date	By	Eng	Amendments

HEYNE
TILLET
STEEL

STRUCTURAL &
CIVIL ENGINEERS

www.hts.uk.com

Job Name

Cundy Street Quarter

Drawing Title

Surface Water Drainage
Catchment Plan

Purpose of Issue

Preliminary

Scale at A1

1:250

Drg No.

2068-HTS-71-00-DR-C-1001

HTS Job No

2068

Rev

P2

Appendix I

SUDS Proforma

1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Cundy Street Quarter (Epoch)
	Address & post code	SW1W 8LJ
	OS Grid ref. (Easting, Northing)	E 528396 N 178499
	LPA reference (if applicable)	-
	Brief description of proposed work	Redevelopment of mixed-use units.
	Total site Area	9,977 m ²
	Total existing impervious area	7,982 m ²
	Total proposed impervious area	9,374 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	Combined sewer connection
	Designer Name	George Westgarth
	Designer Position	Civil Engineer
Designer Company	Heyne Tillett Steel	

2. Proposed Discharge Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	Clay	
	Bedrock geology classification	Clay	
	Site infiltration rate	m/s	
	Depth to groundwater level	4.2	m below ground level
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		Feasible (Y/N)	Proposed (Y/N)
	1 store rainwater for later use	Y	Y
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	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	N	N
	7 discharge rainwater to the combined sewer.	Y	Y
2c. Proposed Discharge Details			
Proposed discharge location	Cundy Street / Pimlico Road		
Has the owner/regulator of the discharge location been consulted?	Thames Water have been consulted		

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	1.55			
	1 in 1	1.32	72		22.6
	1 in 30	3.56	177		22.6
	1 in 100	4.94	230		22.6
	1 in 100 + CC				22.6
	Climate change allowance used		40%		
	3b. Principal Method of Flow Control		Blue/Green Roofs		
	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		0	0	0
	Blue roofs		7316	3874	671
	Filter strips		0	0	0
	Filter drains		0	0	0
	Bioretention / tree pits		0	0	0
	Pervious pavements		0	0	0
	Swales		0	0	0
	Basins/ponds		0	0	0
	Attenuation tanks		0		0
	Total		7316	3874	671

4. Supporting Information	4a. Discharge & Drainage Strategy	Page/section of drainage report
	Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Appendix L
	Drainage hierarchy (2b)	Section 5 of drainage strategy report
	Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Appendix C and I
	Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	-
	Proposed SuDS measures & specifications (3b)	Section 5 of drainage strategy report
	4b. Other Supporting Details	Page/section of drainage report
	Detailed Development Layout	Appendix B and J
	Detailed drainage design drawings, including exceedance flow routes	-
	Detailed landscaping plans	Appendix B
	Maintenance strategy	Appendix H
	Demonstration of how the proposed SuDS measures improve:	Section 5 of drainage strategy report
	a) water quality of the runoff?	Section 5, page 7 of drainage report
	b) biodiversity?	Section 5, page 7 of drainage report
	c) amenity?	Section 5, page 7 of drainage report

Appendix J

Site Investigation

GROUND INVESTIGATION
REPORT


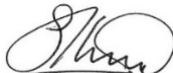

Cundy Street Quarter
London SW1W 9JT

Client: Grosvenor Estates

J19212

October 2019

Document Control

Project title		Cundy Street Quarter, London SW1W 9JT		Project ref	J19212
Report prepared by					
		Alex Taylor BSc MSc FGS Geotechnical Engineer			
Approved checked and approved for issue by					
		Steve Branch BSc MSc CGeol FGS FRGS Managing Director			
Issue No	Status	Amendment Details	Date	Approved for Issue	
1	Final		4 October 2019		

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

✓	Hertfordshire	tel 01727 824666
	Nottinghamshire	tel 01509 674888
	Manchester	tel 0161 209 3032

Geotechnical & Environmental Associates Limited (GEA) disclaims any responsibility to the Client and others in respect of any matters outside the scope of this work. This report has been prepared with reasonable skill, care and diligence within the terms of the contract with the Client and taking account of the manpower, resources, investigation and testing devoted to it in agreement with the Client. This report is confidential to the Client and GEA accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known, unless formally agreed beforehand. Any such party relies upon the report at their own risk. This report may provide advice based on an interpretation of legislation, guidance notes and codes of practice. GEA does not however provide legal advice and if specific legal advice is required a lawyer should be consulted.

This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a site investigation carried out by Geotechnical and Environmental Associates (GEA) on the instructions of Gardiner and Theobald, on behalf of Grosvenor Estates. The work has been carried out with respect to the construction of three new buildings with a single level basement. The purpose of the investigation has been to determine the ground conditions and hydrogeology, to assess the extent of any contamination and to provide information to assist with the design of retaining walls and foundations.

SITE HISTORY

On the earliest map studied, dated 1875, the site is shown to have been occupied by residential properties with associated rear gardens. Two roads are also shown on the site, labelled as Clifford Row and Elizabeth Place. The Metropolitan District railway line is shown about 25 m north of the site and a school was present 30 m to the east. Victoria, Ebury and Commercial wharfs and various other wharfs with cranes and warehouses are also shown 100 m to the east and southeast of the site, adjacent to the Grosvenor Canal. By 1916, part of the Grosvenor Canal had been infilled. By 1940, the central and northern portions of the site are shown to have been cleared, with new residential properties constructed in the southwest of the site and the residential properties remaining in the south, southeast and northwest portions of the site. The 1950 map shows Walden House to have been constructed in the southeast of the site and a large ruin in the centre of the site, probably due to World War II bomb damage. The remainder of the original buildings had been demolished, with the relatively new properties remaining in the southwest of the site. The site had been developed with the existing Cundy Street Flats by the time of the next map studied, dated 1954, and the site has since remained essentially unchanged.

GROUND CONDITIONS

The investigation encountered a variable and generally significant thickness of made ground overlying the Kempton Park Gravel, which in turn was underlain by the London Clay. In areas of soft landscaping the made ground generally comprised an initial horizon of dark brown clayey silty sand with gravel and occasional brick and ash to depths of between 0.45 m and 0.70 m. Below areas of hardstanding, the made ground initially comprised dark brown to pale grey silty clayey sand with abundant gravel, brick and concrete to depths of between 0.50 m and 0.70 m. Below these depths the made ground generally comprised pale grey to brown silty and occasionally slightly clayey sand with gravel, brick, concrete and ash fragments, to depths of between 1.20 m (5.63 m OD) and 3.90 m (2.48 m OD). Horizons of brick and concrete fragments and whole bricks were also noted in multiple boreholes within the made ground. The Kempton Park Gravel generally comprised medium dense gravelly sand and dense becoming medium dense sand and gravel and extended to depths of between 6.80 m (-0.46 m OD) and 8.30 m (-1.37 m OD). This stratum was overlain by an initial layer of stiff brown sandy clay in Borehole Nos 2 and 3, extending to depths of 3.20 m and 2.20 m respectively. The London Clay generally comprised stiff high strength becoming very high strength and locally extremely high strength fissured grey clay to the full depth of the investigation, of 40.00 m (-33.12 m OD). Groundwater was encountered during drilling at depths of 4.20 m (2.50 m OD) and 6.00 m (0.35 m OD) within the Kempton Park Gravel during drilling and was measured at depths of 6.12 m and 6.68 m during a subsequent monitoring visit. Further seepages of water were encountered at depth within the London Clay which were associated with the presence of claystones. Contamination testing has indicated elevated concentrations of lead within two samples and an elevated concentration of total PAH, including benzo(a)pyrene in one sample, while another contained an elevated concentration of benzo(a)pyrene with the concentration of total PAH below the screening value

RECOMMENDATIONS

The proposed basement excavation will extend to a depth of approximately 4.00 m, such that formation level is expected to be within the Kempton Park Gravel. Groundwater should be below the level of the basement excavation and, although this should be checked by ongoing groundwater monitoring. In view of the moderate anticipated loads it should be feasible to use spread foundations to support the proposed building. Moderate width strip or pad foundations bearing on the Kempton Park Gravel at formation level may be designed to apply a net allowable bearing pressure of 275 kN/m². If the loads are such that the use of spread foundations will not be feasible, the use of piled foundations should be considered. A requirement for localised remediation has been identified with respect to the protection of end users through the installation of a BRE cover system in proposed new areas of soft landscaping. Remedial works will also be required to protect site workers during the groundworks and buried services laid within contaminated soil.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates Limited (GEA) has been commissioned by Gardiner and Theobald, on behalf of Grosvenor Estates, to carry out a ground investigation at the site of Cundy Street Quarter, London SW1W 9JT.

The site has previously been the subject of a desk study completed by A-Squared Studio (report ref. 0773-RPT-001-Rev00, dated October 2018) and the findings are referred to where appropriate in this report.

1.1 Proposed Development

It is understood that it is proposed to demolish the existing buildings and subsequently construct three new mixed-use buildings ranging in height from six-storeys to eleven-storeys with a single level basement car park that will extend across the majority of the footprint of the site.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- ❑ to determine the ground conditions and their engineering properties;
- ❑ to provide advice with respect to the design of suitable foundations and retaining walls;
- ❑ to determine the nature of the footings of the existing building;
- ❑ to provide an indication of the degree of soil contamination present; and
- ❑ to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives an intrusive ground investigation was carried out, which comprised, in summary, the following activities:

- ❑ four borehole advanced to a depth of 30.00 m and another to a depth of 40.00 m by a cable percussion rig;
- ❑ a series of ten opendrive percussive sampler boreholes advanced to depths of between 2.00 m and 4.45 m;

- ❑ standard penetration tests (SPTs) carried out at regular intervals within the boreholes to provide quantitative data on the strength of the soils;
- ❑ the installation of four groundwater monitoring standpipes to a depths of between 1.50 m and 8.20 m and a single subsequent monitoring visit;
- ❑ the installation of four vibrating wire piezometers to depths of between 12.00 m and 36.00 m;
- ❑ testing of selected soil samples for contamination and geotechnical purposes; and
- ❑ provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11¹ and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment. However, as a desk study did not form part of the brief for the project the risk assessment process has been subject to assumptions regarding the site history and likely sources of contamination.

The exploratory methods adopted in this investigation have been selected on the basis of the constraints of the site including but not limited to access and space limitations, together with any budgetary or timing constraints. Where it has not been possible to reasonably use an EC7 compliant investigation technique a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted and the number of locations where the ground was sampled. No liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

¹ *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004

2.0 THE SITE

2.1 Site Description

The site is located within the administrative boundaries of the City of Westminster and the Royal Borough of Belgravia, approximately 670 m southwest of Victoria Railway and London Underground Station and 360 m to the east of Slone Square London Underground Station. It is bounded by Ebury Square to the northwest and northeast, Pimlico Road to the south and by Cundy Street to the north and may be additionally located by National Grid Reference 528419, 178565.

A walkover of the site was carried out by a geotechnical engineer from GEA at the time of the fieldwork. The site covers an irregularly shaped area measuring approximately 160 m east-west by 110 m north-south. It is sensibly level and is currently occupied by three developments, Cundy Street Flats, Walden House and Coleshill Apartments. Cundy Street Flats lies in the north of the site and comprises four blocks of flats, each seven-storeys in height, constructed around a central car park with access road to smaller parking areas at the rear of each block and areas of soft landscaping around the rest of the periphery. Walden House occupies the east of the site and comprises a five-storey block of flats constructed in an approximate U-shape with a single storey ancillary building in the west of this portion of the site, with an area of hardstanding in between. Coleshill Apartments comprises two five-storey blocks of flats with retail units at ground level and a car park between the two buildings.

2.2 Summary of Desk Study Findings

On the earliest map studied, dated 1875, the site is shown to have been occupied by residential properties with associated rear gardens. Two roads are also shown on the site, labelled as Clifford Row and Elizabeth Place. The Metropolitan District railway line is shown to run about 25 m north of the site and a school is shown to have been present 30 m to the east. Victoria, Ebury and Commercial wharfs and various other wharfs with cranes and warehouses are also shown 100 m to the east and southeast of the site, adjacent to the Grosvenor Canal. By 1916 part of the Grosvenor Canal is shown to have been infilled.

By 1940 the central and northern portions of the site were shown to have been cleared with new residential properties having been constructed in the southwest of the site and the pre-existing residential properties remaining in the south, southeast and northwest portions of the site. The map dated 1950 shows Walden House to have been constructed in the southeast of the site and a large ruin is labelled in the centre of the site, probably due to World War II bomb damage. The remainder of the original buildings are shown to have been demolished by this time, with the relatively new properties (the existing Coleshill development) in the southwest of the site remaining.

The site had been developed with the existing Cundy Street Flats by the time of the next map studied, dated 1954. The site has since remained essentially unchanged.

There are no landfill sites located within 1 km of the site and additionally, no waste management or waste transfer sites are located within 400 m of the site.

There are no pollution incidents to controlled waters recorded within 400 m of the site.

The site does not lie within an area known to be at risk of surface water flooding or flooding from rivers and the sea.

The British Geological Survey (BGS) map of the area indicates that the site is underlain by Kempton Park Gravel over the London Clay Formation.

GEA has previously carried out a number of investigations in the area, the closest of which was at a property on Eaton Terrace approximately 50 m to the north of the site. The investigation encountered a moderate thickness of made ground, over the Kempton Park Gravel which was underlain by the London Clay. The made ground generally comprised dark brown to orange-brown silty, occasionally clayey, sand with variable amounts of gravel, brick, concrete, ash and rootlets, which extended to depths of between 0.30 m (4.48 m OD) and 0.60 m (4.18 m OD) below lower ground floor level and between 0.30 m (6.20 m OD) and 1.20 m (5.53 m OD) below garden level. The Kempton Park Gravel initially comprised an upper layer of orange-brown clayey or silty sand, becoming gravelly sand, over dense to very dense orange-brown sandy gravel to a depth of 9.50 m (-2.77 m OD). The London Clay comprised an upper layer of stiff brown silty sandy over stiff becoming very stiff fissured high strength silty clay with occasional partings of silt and sand, which extended to the full depth of the investigation, of 15.00 m (-8.27 m OD).

Groundwater was not encountered during drilling, but has subsequently been measured towards the base of the Kempton Park Gravel, at a depth of 8.5 m (-1.77 m OD), during a single monitoring visit carried out approximately three weeks after installation.

The London Clay is classified as an Unproductive Stratum, which refers to rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow, as defined by the EA and the Kempton park Gravel Formation is classified as a Secondary 'A' Aquifer defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Historically the River Westbourne, one of London's "lost rivers"² flowed in a southerly direction adjacent to Lower Sloane Street (A3216) and Chelsea Bridge Road, approximately 200 m to the east of the site, flowing into the River Thames, approximately 625 m to the south of the site.

The site lies within a safeguarding zone of a proposed Crossrail 2 tunnel, the pathway of which is to run beneath the southeastern corner of the site, beneath Walden House.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, a total of five cable percussion boreholes was advanced to depths of 30 m and 40 m and supplemented by a series of ten opendrive percussive sampler boreholes advanced to depths of between 2.00 m and 4.45 m. During boring, disturbed and undisturbed samples were obtained from the boreholes for subsequent laboratory examination and testing. Standard Penetration Tests (SPTs) were carried out at regular intervals to provide additional quantitative data on the strength of soils encountered.

Four groundwater monitoring standpipes have been installed, to depths of between 1.50 m and 8.20 m, to facilitate groundwater monitoring, which has been carried out on a single occasion to date, approximately three weeks after installation. An additional three visits are proposed in

² Barton, N & Meyers, S (2016) *The Lost Rivers of London (revised and extended edition with colour maps)*. Historical Publications Ltd.

due course, the results of which will reported separately. In addition, four vibrating wire piezometers were installed at depths of between 12.00 m and 36.00 m.

A selection of the samples recovered from the borehole was submitted to a soil mechanics laboratory for a programme of geotechnical testing and an analytical laboratory for contamination testing.

All of the above work was carried out under the supervision of a geotechnical engineer from GEA. The borehole and trial pit records are appended, together with a site plan indicating the exploratory positions.

The borehole records are appended, together with a site plan indicating the exploratory positions. The Ordnance Datum (OD) levels on the borehole records have been interpolated from spot levels on a drawing provided by the project management team labelled on a topographical survey drawing (ref. 9579C_04_B, dated 24 July 2019).

3.1 Sampling Strategy

The borehole and trial pit positions were specified by Heyne Tillett Steel, the consulting engineers for the project, and were positioned on site by GEA as close to the specified positions as possible, in accessible areas whilst avoiding buried services.

Seven samples of the made ground were tested for the presence of contamination. The analytical suite of testing was selected to identify hydrocarbon contamination resulting from the former use of the site and a range of typical industrial contaminants for the purposes of general coverage. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols.

The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

4.0 GROUND CONDITIONS

The investigation encountered a variable and generally significant thickness of made ground overlying the Kempton Park Gravel, which in turn was underlain by the London Clay to the full depth of investigation of 40.00 m (-33.12 m OD).

4.1 Made Ground

In areas of existing soft landscaping the made ground generally comprised an initial horizon of dark brown clayey silty sand with gravel and occasional brick and ash fragments extending to depths of between 0.45 m and 0.70 m. In areas of hardstanding, the made ground initially comprised dark brown to pale grey silty clayey sand with abundant gravel or fragments of brick and concrete extending to depths of between 0.50 m and 0.70 m. Below this depths across the site the made ground generally comprised pale grey to brown silty and occasionally slightly clayey sand with variable proportions of gravel, brick, concrete and ash fragments and extended to depths of between 1.20 m (5.63 m OD) to 3.90 m (2.48 m OD). Horizons of brick and concrete fragments and whole bricks were also noted in multiple boreholes within the made ground.

Apart from the presence of fragments of extraneous material noted above, no visual or olfactory evidence of contamination was observed during the fieldwork. Seven samples of the made ground have however been analysed for a range of contaminants as a precautionary measure and the results are summarised in Section 4.5.

4.2 Kempton Park Gravel

The Kempton Park Gravel generally comprised layers of medium dense gravelly sand and dense becoming medium dense fine to coarse sand and fine to coarse sub-angular to sub-rounded gravel and extended to a depth of between 6.80 m (-0.46 m OD) to 8.30 m (-1.37 m OD). This stratum was overlain by an initial layer of stiff brown sandy clay in Borehole Nos 2 and 3 extending to depths of 3.20 m (3.50 m OD) and 2.20 m (4.14 m OD), respectively.

The results of laboratory plasticity index tests indicate the clay layer to be of low to moderate volume change potential.

4.3 London Clay

The London Clay generally comprised stiff fissured grey clay extending to the full depth of the investigation, of 40.00 m (-33.12 m OD).

The results of laboratory plasticity index tests indicate the clay to be of high volume change potential and the results of triaxial undrained compressive strength tests indicate the clay to be of high strength becoming very high strength and locally extremely high strength.

4.4 Groundwater

Groundwater was encountered at depths of 4.20 m (2.50 m OD) and 6.00 m (0.35 m OD) within the Kempton Park Gravel in Borehole Nos 2 and 4, during drilling, but was not encountered elsewhere. However, the necessary addition of water the cable percussion boreholes to assist drilling may have masked inflows in the other boreholes. Further seepages of water were encountered at depth within the London Clay which were associated with the presence of claystones.

Groundwater was measured at depths of between 6.12 m (0.23 m OD) and 6.68 m (0.20 m OD) within the standpipes during a single monitoring visit carried out approximately three weeks after installation. An additional three monitoring visit are proposed and will be reported separately.

4.5 Soil Contamination

The table below sets out the values measured within the seven samples analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	WS1 0.55 m	WS2 0.40 m	WS3 0.30 m	WS5 1.50 m	WS6 0.20 m	TP4 0.40 m	TP4 0.40 m
pH	7.9	8.5	9.4	9.5	8.5	8.2	9.1
Arsenic	9.1	12	7.6	7.2	29	8.8	14
Cadmium	<0.2	0.4	0.4	<0.2	0.9	<0.2	<0.2
Chromium	49	30	18	15	25	19	16
Copper	27	35	33	38	130	12	33

Determinant	WS1 0.55 m	WS2 0.40 m	WS3 0.30 m	WS5 1.50 m	WS6 0.20 m	TP4 0.40 m	TP4 0.40 m
Mercury	<0.3	1.1	<0.3	0.7	4.7	<0.3	1.2
Nickel	34	22	15	14	24	11	14
Lead	25	100	82	190	1300	76	300
Selenium	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	<1.0
Zinc	74	80	130	52	540	32	110
Total Cyanide	<1	<1	<1	<1	<1	<1	<1
Total Phenols	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulphide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.4
Total PAH	<0.80	175	38.0	<0.80	3.48	<0.80	2.57
Benzo(a)pyrene	<0.05	20	4.8	<0.05	0.38	<0.05	0.30
Naphthalene	<0.05	1.7	<0.05	<0.05	<0.05	<0.05	<0.05
TPH	<10	240	930	<10	<10	<10	<10
Total Organic Carbon %	0.6	2.3	2.1	1.2	2.1	0.5	0.7

Note: Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report

4.5.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. Contaminants of concern are those that have a value in excess of a generic human health risk based guideline value, which is either the CLEA Soil Guideline Value where available, a Generic Screening Value calculated using the CLEA UK Version 1.06 software assuming a residential end use, or is based on the DEFRA Category 4 Screening values. The key generic assumptions for this end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be young female children aged zero to six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and indoor dust, and inhalation of indoor and outdoor dust and vapours; and
- that the building type equates to a two-storey small terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site; albeit slightly conservative as the site is to be of mixed residential and commercial use. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where

concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site-specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

The results of the contamination testing have indicated the presence of elevated concentrations of lead within two samples and an elevated concentrations of total PAH, including benzo(a)pyrene in one sample. Another sample contains an elevated concentration of benzo(a)pyrene while the concentration of total PAH remained below the screening value. The significance of these results is considered further in Part 2 of the report.

APPENDIX

Borehole Records



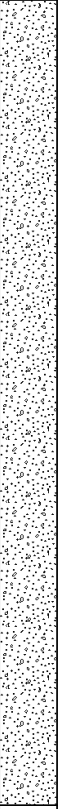

Geotechnical Test Results

SPT & Cohesion/Depth Graph

Contamination Test Results

Generic Risk-Based Soil Screening Values

Site Plan

<div> GEA Geotechnical & Environmental Associates Widbury Barn Widbury Hill Ware SG12 7QE</div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH1
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.50 m		Ground Level (mOD) 6.88		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 06/09/2019-10/09/2019		Engineer Heyne Tillett Steele		Sheet 1/5	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	D1				6.78	0.10	Made Ground (tarmac)		
1.20-1.65 1.20-1.65	SPT(C) N60=32 B2	1.20	DRY	5,13/28		(2.30)	Made Ground (brown clayey sand with gravel, brick and concrete fragments)		
2.00-2.45 2.00-2.45	SPT(C) N60=0 B3	2.00	DRY	12,26/	4.48	2.40	Dense becoming medium dense brown fine to coarse SAND with sub-angular to sub-rounded gravel		
3.00-3.45 3.00-3.45	SPT(C) N60=61 B4	3.00	DRY	7,9/10,12,14,18					
4.00-4.45 4.00-4.45	SPT(C) N60=49 B5	4.00	DRY	6,8/8,10,12,13					
5.00-5.45 5.00-5.45	SPT(C) N60=42 B6	5.00	DRY	5,7/7,9,9,12		(5.30)			
6.00-6.45 6.00-6.45	SPT(C) N60=29 B7	6.00	DRY	4,5/6,6,7,7					
7.45-7.95 7.50-7.95	B8 SPT(C) N60=14	7.50	7.20	1,1/2,2,3,5	-0.82	7.70	Stiff becoming very stiff high strength fissured grey CLAY with occasional pale grey veins		
9.00-9.45 9.00-9.45	SPT N60=28 D9	8.50	DRY	4,4/5,6,7,7		(4.30)			
Remarks Vibrating wire piezometer installed to 36.00 m. Groundwater monitoring standpipe installed to 8.00 m and water measured at a depth of 6.68 m in standpipe on 27/09/2019. Water added to aid drilling at depth of between 2.40 m and 8.00 m. 2 hrs spent standing during piezometer install. 2.5 hrs spent tidying and moving fencing. 0.5 hrs chisselling from 24.60 m to 24.90 m.							Scale (approx) 1:50	Logged By AT	Figure No. J19212.BH1

<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH1
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.50 m		Ground Level (mOD) 6.88		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 06/09/2019-10/09/2019		Engineer Heyne Tillett Steele		Sheet 2/5	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50-10.95	U10								
11.00	D11								
12.00-12.45 12.00-12.45	SPT N60=29 D12	8.50	DRY	4,5/6,6,7,7	-5.12	12.00	Very stiff very high strength fissured grey silty CLAY with rare pyrite and occasional pale grey veins		
13.50-13.95	U13								
14.00	D14								
15.00-15.45 15.00-15.45	SPT N60=31 D15	8.50	DRY	4,5/6,6,7,8					
16.50-16.95	U16					(9.00)			
17.00	D17								
18.00-18.45 18.00-18.45	SPT N60=37 D18	8.50	DRY	5,6/7,8,9,9					
19.50-19.95	U19								
Remarks							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH1		

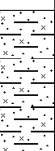

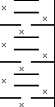

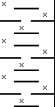

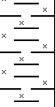
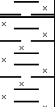
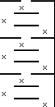


<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH1
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.50 m		Ground Level (mOD) 6.88		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 06/09/2019-10/09/2019		Engineer Heyne Tillett Steele		Sheet 3/5	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00	D20								
21.00-21.45 21.00-21.45	SPT N60=46 D21	8.50	DRY	6,8/8,10,11,12	-14.12	21.00	Very stiff very high and locally extremely high strength fissured grey silty CLAY with rare pyrite, rare shell fragments and occasional pale grey veins		
22.50-22.95	U22								
23.00	D23								
24.00-24.45 24.00-24.45	SPT N60=59 D24	8.50	DRY	8,10/12,13,13,14					
24.90	D25								
25.50-25.95	U26								
26.00	D27								
27.00-27.45 27.00-27.45	SPT N60=65 D28	8.50	DRY	9,10/13,13,15,16					
28.50-28.95	U29								
29.00	D30								
30.00-30.45	SPT N60=68	8.50	DRY	10,11/13,14,16,17					
Remarks							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH1		




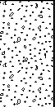


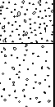



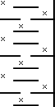
<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH1	
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.50 m			Ground Level (mOD) 6.88		Client Grosvenor Estates		Job Number J19212	
		Location			Dates 06/09/2019-10/09/2019		Engineer Heyne Tillett Steele		Sheet 4/5	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
30.00-30.45	D31			Seepage(1) at 32.50m.		(19.00)			Σ1	
31.50-31.95	U32									
32.00	D33									
33.00-33.45 33.00-33.45	SPT N60=71 D34	8.50	DRY	10,12/14,15,16,18						
34.50-34.95	U35									
35.00	D36									
36.00-36.45 36.00-36.45	SPT N60=74 D37									
37.50-37.95	U38									
38.00	D39									
39.50-39.95 39.50-39.95	SPT N60=75 D40									
Remarks								Scale (approx) 1:50	Logged By AT	
								Figure No. J19212.BH1		

<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH1	
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.50 m		Ground Level (mOD) 6.88		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 06/09/2019-10/09/2019		Engineer Heyne Tillett Steele		Sheet 5/5	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					-33.12	40.00	Complete at 40.00m		
Remarks								Scale (approx)	Logged By
								1:50	AT
								Figure No. J19212.BH1	

<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH2
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.50 m		Ground Level (mOD) 6.70		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 20/08/2019-23/08/2019		Engineer Heyne Tillett Steele		Sheet 1/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				6.63	0.07 (0.23)	Made Ground (tarmac)	Σ1	
					6.40	0.30	Concrete with 6 mm reinforcement		
1.00	D2					(1.50)	Made Ground (brown slightly clayey sand with gravel, brick, concrete and ash fragments)		
1.20-1.65 1.20-1.65	SPT(C) N60=23 B3	1.20	DRY	3,2/4,4,7,5					
1.80	D4				4.90	1.80	Stiff orange-brown and brown slightly gravelly slightly sandy CLAY		
2.00-2.45 2.00-2.45	SPT(C) N60=19 B5	2.00	DRY	2,3/3,5,4,5		(1.40)			
2.70	D6								
3.00-3.45 3.00-3.45	SPT(C) N60=78 B7	3.00	DRY	3,5/9,13,20,27	3.50	3.20	Dense becoming medium dense brown fine to coarse SAND with abundant fine to coarse angular to sub-rounded gravel		
4.00-4.45 4.00-4.45	SPT(C) N60=56 B8	4.00	DRY	3,5/5,7,16,21 Fast Inflow(1) at 4.20m, sealed at 7.50m.		(2.60)			
5.00-5.45 5.00-5.45	SPT(C) N60=34 B9	5.00	DRY	3,4/5,6,7,12					
6.00-6.45 6.00-6.45	SPT(C) N60=26 B10	6.00	DRY	2,3/5,6,7,5	0.90	5.80	Dense brown sandy fine to coarse sub-angular to sub-rounded GRAVEL		
						(1.60)			
7.50-7.95 7.50-7.95	SPT(C) N60=16 B11	7.50	DRY	2,3/2,3,4,5	-0.70	7.40	Stiff becoming very stiff high strength fissured grey silty CLAY		
9.00-9.45 9.00-9.45	SPT N60=33 D12	7.50	DRY	3,5/7,7,7,8					
Remarks Water added to assist drilling at depths of between 2.30 m and 7.50 m. 1 hr spent arranging fencing and sound reducing quilts. 2 hrs spent standing suring piezometer installation. 2 hrs spent tidying and moving fencing. Groundwater monitoring standpipe installed to 7.40 m and groundwater measured in standpipe at 6.24 m on 27/09/2019.							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH2		





<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH2
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.50 m		Ground Level (mOD) 6.70		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 20/08/2019-23/08/2019		Engineer Heyne Tillett Steele		Sheet 2/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50-10.95	U13					(6.60)			
11.00	D14								
12.00-12.45 12.00-12.45	SPT N60=36 D15	7.50	DRY	3,5/7,8,8,9					
13.50-13.95	U16								
14.00	D17				-7.30	14.00	Very stiff very high strength fissured grey silty slightly sandy CLAY with shell fragments and pale grey veins		
15.00-15.45 15.00-15.45	SPT N60=40 D18	7.50	DRY	6,6/7,8,9,11					
16.50-16.95	U19								
17.00	D20					(7.00)			
18.00-18.45 18.00-18.45	SPT N60=41 D21	7.50	DRY	6,6/8,8,9,11					
19.50-19.95	U22								
Remarks							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH2		

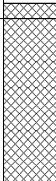
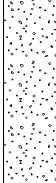
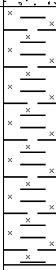
<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH2
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.50 m		Ground Level (mOD) 6.70		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 20/08/2019-23/08/2019		Engineer Heyne Tillett Steele		Sheet 3/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00	D23								
21.00-21.45 21.00-21.45	SPT N60=46 D24	7.50	DRY	6,6/8,9,11,13	-14.30	21.00	Very stiff very high strength fissured grey silty CLAY		
22.50-22.95	U25								
23.00	D26					(5.00)			
24.00-24.45 24.00-24.45	SPT N60=58 D27	7.50	DRY	8,9/11,12,13,15					
25.50-25.95	U28								
26.00	D29				-19.30	26.00	Very stiff very high strength fissured grey silty CLAY with pale grey veins		
27.00-27.45 27.00-27.45	SPT N60=60 D30	7.50	DRY	9,9/10,12,15,16					
28.50-28.95	U31					(4.00)			
29.00	D32								
29.50-29.95 29.50-29.95	SPT N60=63 D33	7.50	DRY	9,10/11,13,16,16					
Remarks									
								Scale (approx) 1:50	Logged By AT
							Figure No. J19212.BH2		




<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH3
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.00 m		Ground Level (mOD) 6.34		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 29/08/2019-02/09/2019		Engineer Heyne Tillett Steele		Sheet 1/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	D1				6.27 6.19 6.04	0.07 (0.15) 0.30	Made Ground (block paving) Made Ground (brown sand) Made Ground (grey crushed stone fragments)		
0.90	D2					(1.30)	Made Ground (brown slightly clayey sand with gravel, brick, concrete and ash fragments)		
1.20-1.65 1.20-1.65	SPT(C) N60=9 B3	1.20	DRY	2,1/1,2,2,3	4.74	1.60 (0.60)	Stiff brown sandy CLAY		
2.00-2.45 2.00-2.45	SPT(C) N60=35 B4	2.00	DRY	3,3/5,8,9,9	4.14	2.20	Dense brown fine to coarse SAND and fine to coarse sub-angular to sub-rounded GRAVEL		
3.00-3.45 3.00-3.45	SPT(C) N60=65 B5	3.00	DRY	5,10/11,13,15,18		(2.50)			
4.00-4.45 4.00-4.45	SPT(C) N60=41 B6	4.00	DRY	4,7/7,8,10,11					
5.00-5.45 5.00-5.45	SPT(C) N60=32 B7	5.00	4.70	3,4/6,7,7,8	1.64	4.70 (2.10)	Dense becoming medium dense orange-brown sandy fine to coarse sub-angular to sub-rounded GRAVEL		
6.00-6.45 6.00-6.45	SPT(C) N60=28 B8	6.00	5.80	2,2/4,6,7,8					
7.20 7.50-7.95	D9 U10				-0.46 -0.76	6.80 (0.30) 7.10	Firm brown fissured CLAY		
8.00	D11						Stiff becoming very stiff high and locally very high strength fissured grey silty CLAY		
9.00-9.45 9.00-9.45	SPT N60=32 D12	7.00	DRY	5,5/6,7,7,8					
Remarks Water added to assist drilling at depths of between 2.80 m and 6.80 m. Groundwater monitoring standpipe installed to 1.50 m which was found to be dry during a monitoring visit on 27/09/2019. Vibrating wire peizometer installed to a depth of 24.00 m. 1 hr spent collecting and returning keys. 0.5 hrs spent erecting fencing. 3 hrs spent tidying and moving fencing. 0.5 hrs spent chisselling on claystone between 10.30 m and 11.00 m. 0.5 hrs spent chisselling on claystone between 22.50 m and 22.90 m.								Scale (approx) 1:50	Logged By AT
							Figure No. J19212.BH2		






<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH4
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.00m		Ground Level (mOD) 6.35		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 23/08/2019-27/08/2019		Engineer Heyne Tillett Steele		Sheet 1/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				6.25 6.10	0.10 (0.15) 0.25	Made Ground (tarmac) Concrete Made Ground (brown slightly clayey sand with gravel, brick, concrete and ash fragments)		
1.00	D2					(1.55)			
1.20-1.65 1.20-1.65	SPT(C) N60=22 B3	1.20	DRY	3,5/5,4,4,6					
2.00-2.45 2.00-2.45	SPT(C) N60=57 B4	2.00	DRY	4,7/8,11,14,17	4.55	1.80	Dense brown sandy fine to coarse angular to sub-rounded GRAVEL		
3.00-3.45 3.00-3.45	SPT(C) N60=32 B5	3.00	DRY	3,4/6,7,7,8		(2.20)			
4.00-4.45 4.00-4.45	SPT(C) N60=34 B6	4.00	DRY	3,5/7,7,8,8	2.35	4.00	Medium dense brown fine to coarse SAND with fine to coarse sub-angular to sub-rounded gravel		
5.00-5.45 5.00-5.45	SPT(C) N60=25 B7	5.00	DRY	3,3/5,5,6,6		(1.90)			
6.00-6.45	B8			Fast Inflow(1) at 6.00m, sealed at 7.00m. 2,2/3,3,3,4	0.45	5.90	Medium dense brown very sandy fine to coarse sub-angular to sub-rounded GRAVEL		Σ1
6.00-6.45	SPT(C) N60=15	6.00	DRY			(1.00)			
7.00	D9				-0.55	6.90	Stiff fissured grey slightly sandy silty CLAY		
7.50-7.95 7.50-7.95	SPT(C) N60=22 D10	7.00	DRY	3,3/4,4,5,6		(1.60)			
9.00-9.45	U11								
9.50	D12				-2.15	8.50	Very stiff high strength fissured grey silty CLAY		
Remarks Water added to assist drilling at depths of between 1.80 m and 7.00 m. Groundwater monitoring standpipe installed to a depth of 7.00 m and groundwater measured at 6.12 m on 27/09/2019. Vibrating wire peizometer installed at a depth of 12.00 m. 1 hr chisselling on claystones at 20.80 m and 22.90 m. 4 hrs spent tidying and moving fencing. 1 hr spent standing during piezometer installation.							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH2		

<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH4
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.00m		Ground Level (mOD) 6.35		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 23/08/2019-27/08/2019		Engineer Heyne Tillett Steele		Sheet 2/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50-10.95 10.50-10.95	SPT N60=29 D13	7.00	DRY	4,5/6,6,7,7					
12.00-12.45	U14								
12.50	D15					(8.40)			
13.50-13.95 13.50-13.95	SPT N60=34 D16	7.00	DRY	5,5/6,7,8,9					
15.00-15.45	U17								
15.50	D18								
16.50-16.95 16.50-16.95	SPT N60=42 D19	7.00	DRY	6,6/8,8,10,11					
18.00-18.45	U20				-10.55	16.90	Very stiff very high and locally extremely high strength fissured grey silty CLAY with occasional pale grey veins and shell fragments		
18.50	D21								
19.50-19.95 19.50-19.95	SPT N60=46 D22	7.00	DRY	6,7/7,10,11,13					
Remarks							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.BH2		

<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH4	
Boring Method Cable Percussion		Casing Diameter 150 mm to 7.00m			Ground Level (mOD) 6.35		Client Grosvenor Estates		Job Number J19212	
		Location			Dates 23/08/2019-27/08/2019		Engineer Heyne Tillett Steele		Sheet 3/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
21.40 21.50-21.95	D23 U24	7.00	DRY	7,8/10,11,14,16		(13.10)	Claystone encountered at 20.80 m			
22.00	D25									
22.50-22.95 22.50-22.95	SPT N60=58 D26									
22.50-22.95										
24.00-24.45	U27	7.00	DRY	8,9/10,11,13,15			Claystone encountered at 22.90 m			
24.50	D28									
25.50-25.95 25.50-25.95	SPT N60=56 D29									
25.50-25.95										
27.00-27.45	U30	7.00	DRY	9,10/11,14,15,16						
27.50	D31									
28.50-28.95 28.50-28.95	SPT N60=63 D32									
28.50-28.95										
29.50-29.95	U33	7.00	DRY							
30.00	D34									
Remarks								Scale (approx)	Logged By	
								1:50	AT	
								Figure No. J19212.BH2		

<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>							Site Cundy Street Quarter, London SW1W 9JT		Borehole Number BH5		
Boring Method Cable Percussion		Casing Diameter 150 mm to 8.30 m		Ground Level (mOD) 6.93		Client Grosvenor Estates		Job Number J19212			
		Location		Dates 03/09/2019-06/09/2019		Engineer Heyne Tillett Steele		Sheet 1/3			
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
0.50	D1	1.20	DRY	1,0/1,0,1,1	5.73	0.10	Made Ground (tarmac)				
						(1.10)	Made Ground (brick and concrete fragments)				
1.10 1.20-1.65 1.20-1.65	D2 SPT(C) N60=3 B3					1.20	5.73			1.20	Made Ground (brown clayey sand with gravel, brick and concrete fragments)
2.00-2.45 2.00-2.45	SPT(C) N60=7 D4					2.00	(2.00)				
3.00-3.45 3.00-3.45	SPT(C) N60=73 B5	3.00	DRY	6,10/12,15,17,20	3.73	3.20	Dense becoming medium dense brown sandy fine to coarse sub-angular to sub-rounded GRAVEL				
4.00-4.45 4.00-4.45	SPT(C) N60=54 B6	4.00	DRY	7,9/11,11,12,14							
5.00-5.45 5.00-5.45	SPT(C) N60=33 B7	5.00	DRY	5,7/7,7,8,7		(5.10)					
6.00-6.45 6.00-6.45	SPT(C) N60=10 B8	6.00	DRY	2,2/1,2,3,3							
7.50-7.95 7.50-7.95	SPT(C) N60=10 B9	7.50	7.20	2,2/1,2,3,3	-1.37	8.30	Stiff becoming very stiff high strength fissured grey silty CLAY with rare pyrite				
8.60	D10										
9.00-9.45	U11										
9.50	D12										
Remarks Vibrating wire piezometer installed to a depth of 30 m Groundwater monitoring standpipe installed to a depth of 8.20 m and groundwater measured at depth of 6.57 m within standpipe on 27/09/2019. Water added to assist drilling at depths of between 3.00 m and 8.30 m. 2 hrs spent standing during piezometer installation. 0.5 hrs spent chisselling on claystone between 22.90 m and 23.90 m. 0.5 hrs spent chisselling on claystone between 25.90 m and 26.90 m. 4 hours spent tidying and moving fencing.								Scale (approx)	Logged By		
								1:50	AT		
								Figure No. J19212.BH5			

<div><div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS1
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.83		Client Grosvenor Estates		Job Number J19212
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.55	D1			6.33	0.50	Made Ground (dark brown slightly clayey silty sand with gravel and occasional brick and ash fragments)		
				6.23	0.60 (0.30)	Made Ground (pale brown slightly sandy clay with gravel and brick fragments)		
1.00-1.45	SPT(C) N60=11	DRY	3,2/3,3,2,2	5.93	0.90	Made Ground (dark brown slightly clayey sand with gravel, brick fragments and occasional ash and chalk fragments)		
						Made Ground (pale grey fine sand with abundant brick and concrete fragments)		
2.00-2.40	SPT(C) 25*/140 50/255	DRY	13,12/13,15,16,6		(1.50)			
				4.43	2.40	Very dense pale yellowish brown fine to coarse SAND with occasional fine to medium sub-angular to sub-rounded gravel		
3.00-3.40	SPT(C) 25*/145 50/250	DRY	14,11/13,15,16,6		(1.05)			
				3.38	3.45	Terminated at 3.45m		
Remarks Groundwater not encountered. Borehole terminated at a depth of 4.45 m due to refusal and side collapse.							Scale (approx) 1:50	Logged By AT
							Figure No. J19212.WS5	

<div><div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS2
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.93		Client Grosvenor Estates		Job Number J19212
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.40	D1				(0.70)	Made Ground (dark brown slightly clayey silty sand with gravel and occasional brick and ash fragments)		
				6.23	0.70	Made Ground (brick and concrete fragments and whole bricks)		
1.00-1.45	SPT(C) N60=5	DRY	1,0/0,1,2,1		(1.20)			
2.00-2.45	SPT(C) N60=22	DRY	2,2/3,3,5,8	5.03	1.90 (0.40)	Made Ground (brown slightly clayey sand with gravel and brick fragments)		
				4.63	2.30	Dense pale orange-brown fine to coarse SAND		
3.00-3.45	SPT(C) N60=40	DRY	4,6/8,8,9,10		(0.70)			
				3.93	3.00 (0.20)	Orange-brown slightly clayey fine to coarse SAND		
				3.73	3.20	Pale orane0brown fine to coarse SAND with fine to coarse sub-angular to sub-rounded gravel		
4.00-4.23	SPT(C) 25*/85 50/145	DRY	21,4/22,28		(0.60)			
				3.13	3.80 (0.20)	Very dense brown sandy fine to coarse angular to sub-rounded GRAVEL		
				2.93	4.00	Terminated at 4.45m		
Remarks Groundwater not encountered. Borehole terminated at a depth of 4.45 m due to refusal and side collapse.							Scale (approx) 1:50	Logged By AT
							Figure No. J19212.WS5	

<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS3	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.59		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30	D1			6.47	0.12 (0.38)	Made Ground (tarmac)			
				6.09	0.50 (0.20)	Made Ground (pale grey slightly clayey sand with gravel and brick and ash fragments)			
				5.89	0.70	Made Ground (pale brown slightly sandy clay with gravel and brick fragments)			
1.00-1.45	SPT(C) N60=11	DRY	1,1/1,1,1,7			Made Ground (crushed brick fragments and whole bricks)			
					(1.60)				
2.00-2.45	SPT(C) N60=24	DRY	2,4/4,5,6,6						
				4.29	2.30 (0.70)	Very dense pale brown fine to coarse SAND with fine to coarse sub-rounded to sub-angular gravel from 2.90 m			
3.00-3.37	SPT(C) 50/220	DRY	11,13/14,18,18	3.59	3.00	Terminated at 3.45m			
Remarks Groundwater not encountered. Borehole terminated at a depth of 3.45 m due to refusal and side collapse.							Scale (approx)	Logged By	
							1:50	AT	
							Figure No. J19212.WS5		


<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS4	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.35		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 22/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
				6.15	(0.20) 0.20	Made Ground (block paving over sand)			
					(0.80)	Made Ground (dark brown silty clayey sand with gravel, brick and concrete fragments)			
				5.35	1.00 (0.60)	Made Ground (brown silty clayey sand with occasional fine brick fragments)			
				4.75	1.60 (0.40)	Medium dense brown fine to coarse SAND and fine to coarse subangular to subrounded GRAVEL			
				4.35	2.00	Complete at 2.00m			
Remarks Groundwater not encountered.							Scale (approx)	Logged By	
							1:50	AT	
							Figure No. J19212.WS5		

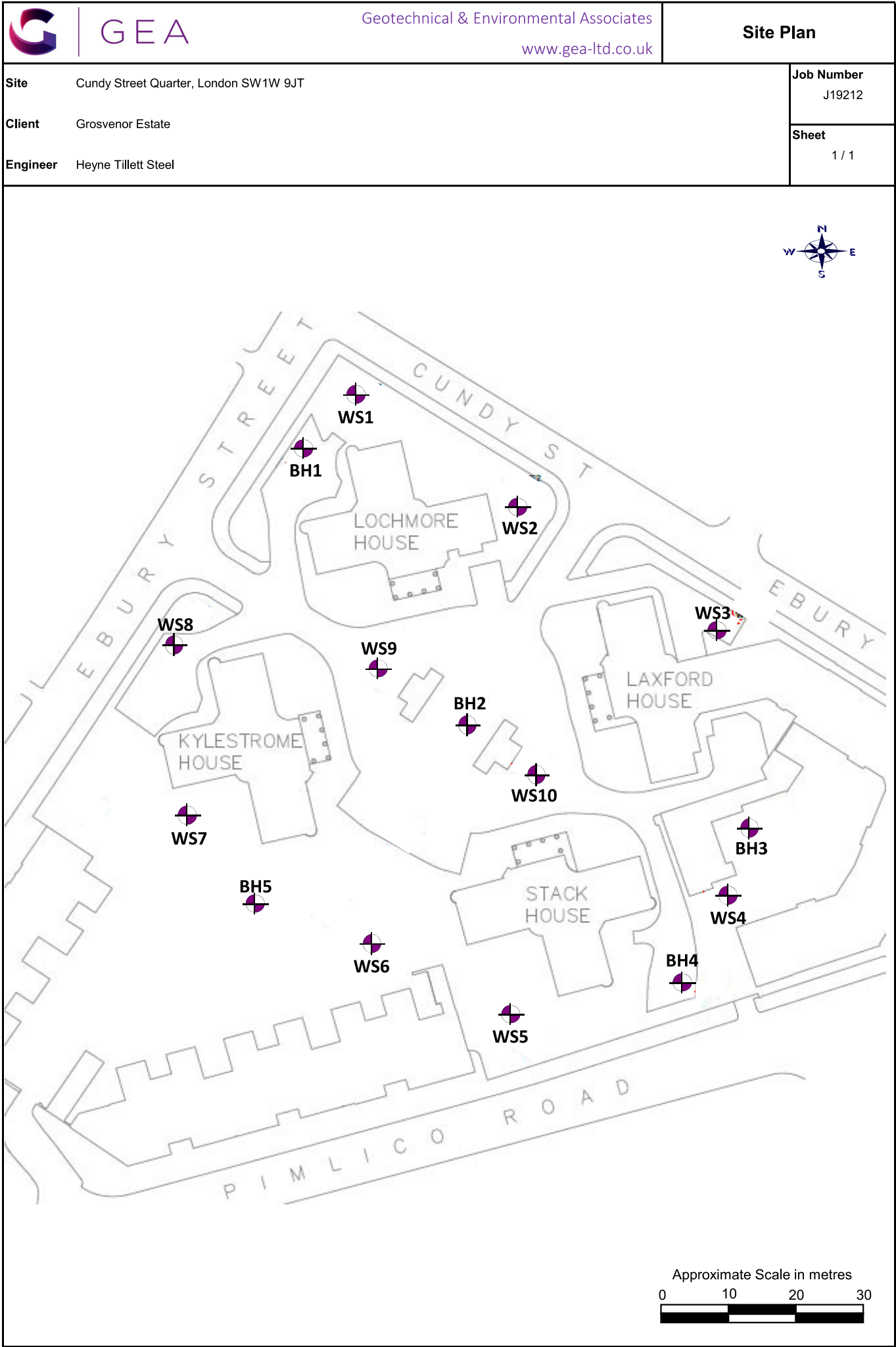
<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS5	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.38		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
1.00-1.45	SPT(C) N60=55	DRY	11,13/12,12,13,11	5.88 5.68	(0.50) 0.50 (0.20) 0.70	Made Ground (brown clayey silty sand with occasional gravel and rootlets) Made Ground (brown slightly sandy clay with gravel, brick and concrete fragments) Made Ground (brown clayey silty sand with gravel, brick, concrete and occasional ash fragments)			
1.50	D1				(1.60)				
2.00-2.45	SPT(C) N60=10	DRY	3,4/3,2,2,2	4.08	2.30 (0.50)	Made Ground (orange-brown sand with fine to coarse gravel and occasional brick fragments)			
3.00-3.45	SPT(C) N60=18	DRY	3,4/8,3,2,3	3.58	2.80 (1.10)	Made Ground (brown clayey silty sand with gravel, brick, concrete and occasional ash fragments)			
4.00-4.32	SPT(C) 25*/120 50/200	DRY	16,9/18,20,12	2.48 1.93	3.90 (0.55) 4.45	Very dense pale brown fine to coarse SAND and fine to medium sub-angular to sub-rounded GRAVEL Terminated at 4.45m			
Remarks Groundwater not encountered. Borehole terminated at a depth of 4.45 m due to UXO detection at this depth.							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.WS5		

<div><div><div></div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS6	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.52		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20	D1			6.47 6.37 6.27 6.02	0.05 0.15 0.25 (0.25) 0.50	Made Ground (tarmac) Made Ground (grey sandy stone fragments) Made Ground (dark blackish brown clayey sandy gravel) Made Ground (brown sandy brick fragments)			
1.00-1.45	SPT(C) N60=13	DRY	2,2/3,2,3,3		(1.20)	Made Ground (brown clayey sand with gravel, brick, chalk and ash fragments)			
2.00-2.45	SPT(C) 48/295	DRY	7,11/13,11,12,12	4.82	1.70 (1.75)	Pale orange-brown fine to coarse SAND with fine to coarse angular to sub-rounded gravel			
3.00-3.36	SPT(C) 50/205	DRY	10,14/16,20,14	3.07	3.45	Terminated at 3.45m			
Remarks Groundwater not encountered. Borehole terminated at a depth of 3.45 m due to refusal and side collapse							Scale (approx) 1:50	Logged By AT	
							Figure No. J19212.WS5		

<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS9	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.83		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 19/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D1			6.73 6.58 6.53	0.10 (0.12) 0.25 0.30 (0.45)	Made Ground (tarmac) Concrete Made Ground (dark grey crushed stone fragments)			
1.00-1.45	SPT(C) N60=0	DRY	0,0/0,0,0,0	6.08 5.63	0.75 (0.45) 1.20	Made Ground (pale grey slightly clayey sand with brick, concrete and ash fragments) Made Ground (brown sand with gravel and brick fragments) Made Ground (brown silty slightly clayey sand with gravel and rare brick and ash fragments)			
2.00-2.45	SPT(C) N60=30	DRY	3,4/5,7,7,7		(1.40)				
3.00-3.45	SPT(C) N60=30	DRY	2,4/5,6,7,8	4.23	2.60	Dense orange-brown fine to coarse SAND with occasional fine to coarse sub-angular to sub-rounded gravel			
4.00-4.32	SPT(C) 16*/120 46/200	DRY	7,9/10,11,12,13		(1.85)				
				2.38	4.45	Terminated at 4.45m			
Remarks Groundwater not encountered. Borehole terminated at a depth of 4.45 m due to side collapse							Scale (approx)	Logged By	
							1:50	AT	
							Figure No. J19212.WS5		

<div><div><div><div></div></div><div><div>GEA</div><div>Geotechnical & Environmental Associates</div><div>Widbury Barn Widbury Hill Ware SG12 7QE</div></div></div></div>						Site Cundy Street Quarter, London SW1W 9JT		Number WS10	
Excavation Method Opendrive Percussive Sampler (Terrier Rig)		Dimensions		Ground Level (mOD) 6.39		Client Grosvenor Estates		Job Number J19212	
		Location		Dates 22/08/2019		Engineer Heyne Tillett Steele		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.40	D1			6.29 6.14	0.10 (0.12) 0.25	Made Ground (tarmac) Concrete			
1.00-1.45	SPT(C) N60=5	DRY	1,0/0,1,1,2		(1.05)	Made Ground (dark brown sandy clay with gravel, brick and ash fragments)			
2.00-2.44	SPT(C) 50/290	DRY	4,9/10,13,14,13	5.09	1.30 (0.80)	Made Ground (brown silty clayey sand with occasional gravel and ash fragments)			
2.50	D2			4.29	2.10 (0.90)	Dense brown very clayey fine to corse SAND and fine to coarse sub-angular to sub-rounded GRAVEL			
3.00-3.31	SPT(C) 25*/140 50/165	DRY	12,13/20,22,8	3.39	3.00 (1.45)	Very dense brown fine to coarse SAND with fine to coarse angular to sub-rounded gravel			
				1.94	4.45	Terminated at 4.45m			
Remarks Groundwater not encountered. Borehole terminated at a depth of 4.45 m due to refusal and side collapse							Scale (approx)	Logged By	
							1:50	AT	
							Figure No. J19212.WS5		

<div><div></div><div><div>Widbury Barn</div><div>Widbury Hill</div><div>Ware</div><div>Herts SG12 7QE</div></div></div>		<div>Generic Risk-Based Soil Screening Values</div>	
<div>SiteCundy Street Quarter, London SW1W 9JT</div>		<div>Job NumberJ19212</div>	
<div>ClientGrosvenor Estates</div>		<div>Sheet2 / 2</div>	
<div>EngineerHayne Tillett Steel</div>			
<div>Proposed End UseResidential with plant uptake</div>			
<div>The key generic assumptions for this end use are as follows;</div> <div><div><div><div></div></div><div>that groundwater will not be a critical risk receptor;</div></div><div><div><div></div></div><div>that the critical receptor for human health will be a young female aged 0 to 6 years old;</div></div><div><div><div></div></div><div>that the exposure duration will be six years;</div></div><div><div><div></div></div><div>that the building type equates to a terraced house.</div></div><div><div><div></div></div><div>that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of home grown produce, consumption of soil adhering to home grown produce, skin contact with soils and dust, and inhalation of dust and vapours</div></div></div> <div><div>Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:</div><div><div><div><div></div></div><div>additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;</div></div><div><div><div></div></div><div>site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or</div></div><div><div><div></div></div><div>soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.</div></div></div></div>			



Appendix K

Drainage Catchment Plan



- 100mm @ A1 (50mm @ A3)
- NOTES**
1. This Drawing is to be read in conjunction with all relevant Architect's Engineer's and specialists' drawings and specifications.
 2. Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale the above bar should be 100mm long @A1 or 50mm long @ A3.
 3. This drawing has been based on the following external inputs:
 - 3.1. Proposed Site Plan, drawing 288_20.001 Rev F, "Proposed Site Plan", dated 2nd March 2020 provided by DSDHA Architects.

CATCHMENTS

Hatch	Catchment	Area (m²)
	Ebury Square - Assumed Permeable	2,736
	Highway Ownership	3,873
	Existing Drainage Arrangements	1,147
	Drainage Strategy Report Area	9,977
Total		17,700

P1	20.04.20	MR	GW	First Issue
Rev	Date	By	Eng	Amendments

HEYNE

TILLET

STEEL

STRUCTURAL & CIVIL ENGINEERS

www.hts.uk.com

Job Name
Cundy Street Quarter

Drawing Title
Surface Water Catchment Areas

