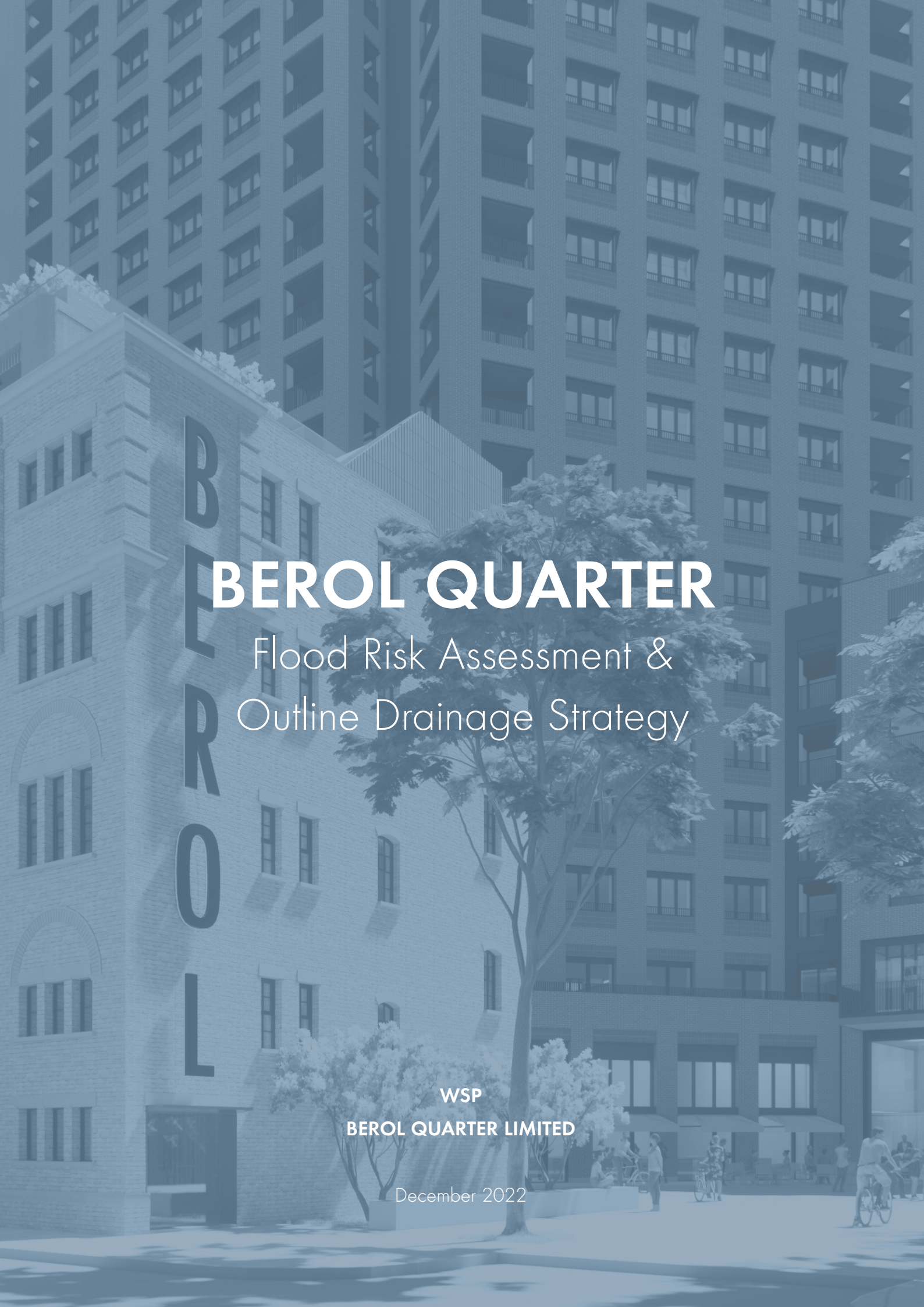


An architectural rendering of the Berol Quarter development. The image shows a mix of building styles: a historic brick building on the left with arched windows and a modern high-rise with a grid of windows in the background. In the foreground, there are trees, a paved plaza, and people walking and cycling. The entire image has a blue tint.

BEROL QUARTER

Flood Risk Assessment & Outline Drainage Strategy

WSP

BEROL QUARTER LIMITED

December 2022



Berol Quarter Limited

FLOOD RISK ASSESSMENT AND OUTLINE DRAINAGE STRATEGY

BEROL QUARTER

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Berol Quarter Limited

FLOOD RISK ASSESSMENT AND OUTLINE DRAINAGE STRATEGY

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CONTENTS

1.	INTRODUCTION	1
1.1.	APPOINTMENT AND BRIEF	1
1.2.	OBJECTIVE OF STUDY & METHODOLOGY	1
2.	POLICY AND GUIDANCE	3
2.1.	NATIONAL PLANNING POLICY / GUIDANCE	3
	NATIONAL PLANNING POLICY FRAMEWORK (UPDATED JULY 2021)	3
	FLOOD RISK AND COASTAL CHANGE PLANNING GUIDANCE (UPDATED AUGUST 2022)	3
	FLOOD RISK ASSESSMENTS: CLIMATE CHANGE ALLOWANCES (UPDATED MAY 2022)	4
	DEFRA NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS (MARCH, 2015)	5
2.2.	REGIONAL PLANNING POLICY / GUIDANCE	5
	THE LONDON PLAN (2021)	5
	THAMES WATER CATCHMENT FLOOD MANAGEMENT PLAN (CFMP)	6
2.3.	LOCAL PLANNING POLICY / GUIDANCE	6
	HARINGEY COUNCIL SFRA LEVEL 2 (2015)	6
	LOCAL PLAN - STRATEGIC POLICES 2013-2026	7
	HARINGEY DEVELOPMENT MANAGEMENT DPD (ADOPTED ON JULY 2017)	7
3.	EXISTING SITE	8
3.1.	SITE LOCATION & ACCESS	8
3.2.	EXISTING SITE DESCRIPTION	9
3.3.	TOPOGRAPHY	9
3.4.	GEOLOGY AND HYDROGEOLOGY	9
3.5.	EXISTING WATERCOURSES, FLOOD DEFENCES AND STRUCTURES	12
3.6.	FLOOD DEFENCES AND STRUCTURES	12

3.7.	EXISTING SEWERS/ DRAINAGE INFRASTRUCTURE	13
3.8.	ARTIFICIAL WATERCOURSES	14
3.9.	HISTORIC FLOOD RECORDS	14
4.	THE PROPOSED DEVELOPMENT	15
4.1.	SUMMARY OF THE PREVIOUS PLANNING HISTORY OF THE SITE	15
4.2.	CONTEXT FOR NEW APPLICATION	15
4.3.	PROPOSED DEVELOPMENT	16
4.4.	VULNERABILITY CLASSIFICATION	17
4.5.	SEQUENTIAL AND EXCEPTIONS TESTS	17
4.6.	LOCAL DEVELOPMENT AND FLOOD RISK POLICY	17
5.	FLOOD HAZARDS	18
5.1.	INTRODUCTION	18
5.2.	SOURCES AND MECHANISMS OF FLOODING	18
5.3.	FLOODING FROM COASTAL AND TIDAL SOURCES	18
5.4.	FLOODING FROM FLUVIAL SOURCES	18
5.5.	GROUNDWATER FLOODING	19
5.6.	SEWER AND DRAINAGE INFRASTRUCTURE FLOODING	20
5.7.	SURFACE WATER FLOODING	20
5.8.	ARTIFICIAL SOURCES OF FLOODING	22
6.	CLIMATE CHANGE	24
6.1.	BACKGROUND INFORMATION	24
6.2.	DEVELOPMENT LIFESPAN	24
6.3.	IMPACT OF CLIMATE CHANGE ON THE PROPOSED DEVELOPMENT	25
7.	FLOOD RISK MITIGATION MEASURES	26
7.1.	GENERAL COMMENTS	26
7.2.	FINISHED FLOOR LEVELS	26
	BEROL HOUSE	26

	2 BEROL YARD	26
7.3.	INTERNAL EVACUATION ROUTE AND SAFE REFUGE	26
7.4.	PROPOSED FLOOD MITIGATION MEASURES	27
8.	OUTLINE SURFACE WATER DRAINAGE STRATEGY	28
8.1.	OVERVIEW	28
8.2.	EXISTING DRAINAGE REGIME	29
8.3.	SURFACE WATER MANAGEMENT APPROACH	29
8.4.	SURFACE WATER MODELLING AND RESULTS	30
8.5.	WATER QUALITY	33
8.6.	OVERLAND FLOW AND EXCEEDANCE	35
8.7.	DRAINAGE MAINTENANCE AND MANAGEMENT STRATEGY	35
9.	OFFSITE EFFECTS	39
9.1.	INTRODUCTION	39
9.2.	PUBLIC DRAINAGE NETWORK	39
9.3.	FLUVIAL AND TIDAL EFFECT	39
10.	RESIDUAL FLOOD RISK	40
11.	FOUL WATER STRATEGY	41
11.1.	EXISTING DRAINAGE NETWORKS	41
11.2.	PROPOSED POINT OF DISCHARGE	41
11.3.	IMPACT OF THE PROPOSED DEVELOPMENT ON THE EXISTING DRAINAGE INFRASTRUCTURE	41
11.4.	PUBLIC DRAINAGE NETWORK	41
11.5.	FOUL WATER DRAINAGE MAINTENANCE AND OPERATION	41
12.	CONCLUSIONS	42

TABLES

Table 2-1 - Environment Agency Climate Change Allowances, Peak River Inflows (London Management Catchment peak river flow allowances)	4
Table 2-2 - Environment Agency Climate Change Allowances; Peak Rainfall Intensity (London Management Catchment peak rainfall allowances)	5
Table 3.1 Summary of Ground Conditions	10
Table 3-2 – Summary of Ground Conditions	13
Table 8-1 – Total Impermeable Areas to Drain in the Proposed Drainage Strategy	30
Table 8-2 – Potential Attenuation Volumes	32
Table 8-3 – Assessment of pollution hazard	33
Table 8-4 – Minimum SuDS Route Requirement for Residential Roofs Pollution Mitigation	34
Table 8-5 – Minimum SuDS Route Requirement for Pedestrian Areas, Access Roads and Residential Car Parks	34
Table 8-6 – Maintenance Requirements for Green Roofs	36
Table 8-7 – Maintenance Requirements for Bioretention Systems (Tree pits with bioretention)	37
Table 8-8 – Maintenance Requirements for Trees (Tree pits with bioretention)	37
Table 8-9 – Maintenance Requirements for Geocellular Storage	38

APPENDICES

APPENDIX A

EXISTING SITE PLANS

APPENDIX A.1

SITE LOCATION PLAN

APPENDIX A.2

TOPOGRAPHICAL SURVEY

APPENDIX A.3

THAMES WATER RECORDS

APPENDIX A.4

DRAINAGE SURVEYS



APPENDIX A.5

WSP DISCHARGE OF CONDITIONS DRAINAGE STRATEGY

APPENDIX B

PROPOSED SITE PLANS

APPENDIX B.1

LANDSCAPE ARCHITECT'S PLAN

APPENDIX B.2

ARCHITECT'S BEROL HOUSE GROUND FLOOR PLAN

APPENDIX B.3

ARCHITECT'S 2 BEROL YARD GROUND FLOOR PLAN

APPENDIX C

STAKEHOLDER CORRESPONDENCE

APPENDIX C.1

THAMES WATER

APPENDIX D

DRAINAGE STRATEGY

APPENDIX D.1

HR WALLINGFORD GREENFILED RUNOFF RATE CALCULATION

APPENDIX D.2

SOURCE CONTROL QUICK STORAGE ESTIMATE

APPENDIX D.3

SOURCE CONTROL MODELLING

APPENDIX D.4

DRAINAGE STRATEGY LAYOUT DRAWING

APPENDIX D.5

LLFA PROFORMA



EXECUTIVE SUMMARY

WSP has undertaken this Flood Risk Assessment (FRA) and prepared this Outline Drainage Strategy (ODS) on behalf of Berol Quarter Limited to support the full planning application for a residential and commercial development located at Berol Quarter, adjacent to Ashley Road. ('the Site'), located in Greater London, London Borough of Haringey (LBH), Greater London (nearest Post Code: N17 9LJ). The Site comprises an area of 0.5 ha and the OS Grid Reference for the approximate centre of the Site is TQ 34434 89653.

The proposal involves the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.

This FRA investigates flood risk on-site and in the immediate vicinity outlining the mitigation measures proposed to ensure the sustainable and safe development of the Site in line with the requirements of the National Planning Policy Framework (NPPF), the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the Environment Agency's (EA) Standing Advice.

Consulting the current Environment Agency Flood Maps for Planning (July 2022), the Site is entirely located Flood Zone 2 where the annual probability of river flooding is between 1 in 100 and 1 in 1,000. As the site is in Flood Zone 2, a Flood Risk Assessment is required for a Planning Application.

A Flood Risk Assessment and Outline Drainage Strategy was produced by WSP | Parsons Brinckerhoff in 2017 to support a hybrid planning application (HGY/2027/2044), obtaining consent from the London Borough of Haringey (LBH) with conditions.

The drainage strategy developed in this Flood Risk Assessment (FRA) and Outline Drainage Strategy (ODS) follows the same principles as previous assessment complying with LBH policies incorporating Sustainable Drainage Systems (SuDS) features in the form of blue and green roofs and tree pits combined with underground geo-cellular attenuation tanks. The Site's surface water is to be attenuated and discharged to an existing Thames Water surface water sewer within Ashley Road.

Regarding the Foul Water Drainage Strategy, it proposes a connection to the existing Thames Water Foul Water oval 686mm sewer crossing the Site on the eastern area for the 2 Berol Yard building, involving Thames Water sewers diversion works. For the Berol House, it is proposed to reuse the existing foul water drainage connections.

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1. INTRODUCTION

1.1. APPOINTMENT AND BRIEF

- 1.1.1. WSP has been commissioned by Berol Quarter Limited to undertake this Flood Risk Assessment (FRA) and Outline Drainage Strategy (ODS) to accompany the full planning application for the construction of a mixed use development (hereafter referred to as the 'Proposed Development') located in Berol Quarter on Ashley Road, London Borough of Haringey (LBH), Greater London (nearest Post Code: N17 9LJ).
- 1.1.2. The Proposed Development is for the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.
- 1.1.3. This report relates solely to the above-mentioned Site. WSP shall not be liable for any use of the report for any reasons other than that for which the report was originally prepared and provided.
- 1.1.4. Although this report was prepared using the degree of skill and care ordinarily exercised by engineers practicing under similar circumstances, WSP cannot take responsibility for errors in the information provided by third parties.

1.2. OBJECTIVE OF STUDY & METHODOLOGY

- 1.2.1. The aim of this FRA is to identify flood risks to the Site and those that may arise as a result of the Proposed Development. Where risks are identified, mitigation measures are proposed to manage the risks over the lifetime of the Proposed Development, including accounting for the effects of climate change. This includes presentation of an outline surface water drainage strategy for the Proposed Development.
- 1.2.2. The report has been produced in line with the requirements of the NPPF and the Environment Agency (EA) Standing Advice, as well as through consultation with Thames Water.
- 1.2.3. The following documents and policies have been reviewed to inform this report:
 - A desk study and data research including review of:
 - The National Planning Policy Framework (NPPF), last updated July 2021;
 - The NPPF Flood Risk and Coastal Change Planning Practice Guidance (PPG), last updated August 2022;
 - Flood Risk Assessments: Climate Change Allowances, last updated May 2022;
 - Non-statutory technical standards for sustainable drainage systems, DEFRA 2015;
 - The SuDS Manual (CIRIA C753), CIRIA 2015;
 - Thames River Basin District River Basin Management Plan, updated December 2015;
 - Thames Catchment Flood Management Plan (CFMP), December 2009;
 - Greater London Authority – The London Plan , The Spatial Development Strategy for Greater London, March 2021;
 - Greater London Authority – Sustainable Design and Construction Supplementary Planning Guidance (2014);
 - North London Strategic Flood Risk Assessment (Level 1), August 2008;

- Haringey Council Strategic Flood Risk Assessment (Level 2), Draft Report, February 2015;
 - Local Flood Risk Management Strategy, August 2019;
 - Haringey's Local Plan Strategic Policies 2013-2021, March 2013 (with alterations 2017);
 - Haringey Local SuDS Standards, December 2015;
 - Haringey SuDS Design Requirements for LLFA Technical Assessment, Version 1.0 DRAFT, May 2016;
 - London Borough of Haringey Sustainable Drainage Systems Design & Evaluation Guide, 2018;
 - Haringey Sequential Testing – Core Strategy Identified Areas of Development, March 2011;
 - Thames Water Asset Records (2022) and Historic Sewer Flooding Records (2022);
 - British Geological Society (BGS) Online Viewer, 1:50,000 Bedrock and Superficial deposits; Boreholes Records;
 - DEFRA's online Magic Map;
 - GOV.UK's online Long Term Flood Maps;
 - Statutory Main River Map;
 - AES F07 Waterfront Studios– Berol House Ashley Rd, London N17 9LJ, Topographical Survey (June 2022);
 - WSP|PB Flood Risk Assessment and Outline Drainage Strategy, June 2017; ('The 2017 WSP FRA');
 - WSP Berol Yard drainage strategy to discharge Planning Condition 23 (LPA Planning Ref No.: HGY/2017/2044) dated 06/07/2020;
 - WSP Section 96A Application - Berol Yard – Discharge of Planning Condition 24 (Drainage) and Condition 44 (LPA Planning Ref No.: HGY/2017/2044) dated 19/08/2020;
 - Heyne Tillet Steel (HTS) 2778 - 2 Berol Yard Feasibility Report, March 2022
- Consultation with regulatory bodies and third parties, including:
 - Thames Water Utilities Limited.
- 1.2.4. In undertaking this study, the local policies discussed in Section 2 have also been considered.
- 1.2.5. This report makes use of third party information and contains EA information © Environment Agency.
- 1.2.6. The insurance industry applies its own assessments to properties in terms of determining premiums and the insurability for flood risk. Those intending to undertake development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencement.
- 1.2.7. WSP does not warrant that the advice in this flood risk assessment will guarantee the availability of flood insurance either now or in the future.

2. POLICY AND GUIDANCE

2.1. NATIONAL PLANNING POLICY / GUIDANCE

NATIONAL PLANNING POLICY FRAMEWORK (UPDATED JULY 2021)

- 2.1.1. The NPPF requires that an FRA should be undertaken:
- All proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has a critical drainage problem; and,
 - Where proposed development or a change of use (e.g. from commercial to residential) to a more vulnerable class may be subject to other sources of flooding (e.g. surface water drains, reservoirs).
- 2.1.2. The Environment Agency's Flood Map for Planning indicates that the Site is located within Flood Zone 2. The Site covers an area of approximately 0.5 ha.
- 2.1.3. Consequently, an FRA would be required to support a planning application for the Proposed Development in order to *'demonstrate that the Proposed Development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall'*.
- 2.1.4. The NPPF also requires development to be allocated towards areas at lowest risk of flooding (The Sequential Test), and if necessary the development proposals would be subject to satisfying the requirements of the Exception Test.

FLOOD RISK AND COASTAL CHANGE PLANNING GUIDANCE (UPDATED AUGUST 2022)

- 2.1.5. The NPPF is supported by the National Planning Practice Guidance (PPG). The Flood Risk and Coastal Change PPG states that an FRA must outline the following:
- whether a proposed development is likely to be affected by current or future flooding from any source;
 - whether it will increase flood risk elsewhere; and,
 - whether the measures proposed to deal with these effects and risks are appropriate.
- 2.1.6. The NPPF Flood Risk and Coastal Change PPG states that the lifespan of residential development should be considered as 100 years and therefore climate change has been considered for this timescale.
- 2.1.7. Within Table 2 (Flood Risk Vulnerability Classification) of the NPPF Flood Risk and Coastal Change PPG, the Proposed Development is classified as 'Less Vulnerable'.
- 2.1.8. As stated above, the Site is located within Flood Zone 2, and as stated in the PPG, a Sequential Test is required unless it has been already done. To facilitate this, LBH has carried out Sequential Tests in the identified areas of development in the Local Plan (Growth Areas or Areas of Change)
- 2.1.9. This Site is within the Tottenham Hale Growth Area, and in the document Haringey Sequential Testing, Core Strategy Identified Areas of Development (March 2011), the proposed land uses are included in the Table 5.1 of this document, and it is concluded that the Sequential Test is passed, because there are no sites with similar size likely to have the appropriate capacity to fully replace the identified need. Therefore, the Exception Test does not need to be applied for this development.

FLOOD RISK ASSESSMENTS: CLIMATE CHANGE ALLOWANCES (UPDATED MAY 2022)

- 2.1.10. In February 2016, the Environment Agency released '*Flood risk assessments: climate change allowances*' guidance to support the NPPF (updated in May 2022). The climate change allowances relevant to the Site are summarised in Table 2-1 and Table 2-2.

Table 2-1 - Environment Agency Climate Change Allowances, Peak River Inflows (London Management Catchment peak river flow allowances)

Climate Change Estimate	for the '2020s' (2015 to 2039)	for the '2050s' (2040 to 2069)	for the '2080s' (2070 to 2115)
Fluvial Flows: Upper End (90 th Percentile)	+ 26% (peak river flow)	+30% (peak river flow)	+54% (peak river flow)
Fluvial Flows: Higher Central	+14% (peak river flow)	+14% (peak river flow)	+27% (peak river flow)
Fluvial Flows: Central	+10% (peak river flow)	+7% (peak river flow)	+17% (peak river flow)

Table 2-2 - Environment Agency Climate Change Allowances; Peak Rainfall Intensity (London Management Catchment peak rainfall allowances)

% Annual Exceedance Rainfall Event	Climate Change Estimate	for the '2050s' (2040 to 2060)	for the '2070s' (2061 to 2125)
3.3 % Annual Exceedance	Rainfall: Upper End	+35% (peak rainfall intensity)	+35% (peak rainfall intensity)
3.3 % Annual Exceedance	Rainfall: Central	+20% (peak rainfall intensity)	+20% (peak rainfall intensity)
1 % Annual Exceedance	Rainfall: Upper End	+40% (peak rainfall intensity)	+40% (peak rainfall intensity)
1 % Annual Exceedance	Rainfall: Central	+20% (peak rainfall intensity)	+25% (peak rainfall intensity)

DEFRA NON-STATUTORY TECHNICAL STANDARDS FOR SUSTAINABLE DRAINAGE SYSTEMS (MARCH, 2015)

- 2.1.11. The Non-statutory technical standards for sustainable drainage systems, published by the Department of Environment, Food and Rural Affairs, sets out the technical standards for the design of sustainable drainage systems (SuDS).
- 2.1.12. The standards state that for developments that have been previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

2.2. REGIONAL PLANNING POLICY / GUIDANCE

THE LONDON PLAN (2021)

- 2.2.1. The London Plan 2021 sets out the new spatial development strategy for Greater London and consolidates all of the alterations to the London Plan since 2016. The London Plan sets out an integrated economic, environmental, transport and social framework for the development of London

over a 20-25 year period (to 2046). The following policies are considered relevant to this assessment:

- Policy SI 12 Flood Risk Management. Flood risk reduction from all sources is encouraged through collaboration between all the main authorities having a main role, developing actions and policies in a cost-effective way.
- Policy SI 13 Sustainable Drainage. It is encouraged the use of SuDS and the reduction the surface water run-off as much as possible to the greenfield runoff rates. The previous London Plans drainage hierarchy is encouraged.

THAMES WATER CATCHMENT FLOOD MANAGEMENT PLAN (CFMP)

- 2.2.2. The Thames Catchment Flood Management Plan (CFMP) has been one of the principal influential documents in preparing the Haringey SFRA. The key objective of a CFMP is to develop complementary policies for long-term management of flood risk within the catchment that take into account the likely impacts of changes in climate, the effects of land use and land management, deliver multiple benefits and contribute towards sustainable development (CFMP: volume I – policy guidance, 2004).
- 2.2.3. As part of the CFMP process each CFMP area was divided up into broad areas (known as 'policy units'), which represent areas of similar characteristics, similar flood mechanisms and similar flood risks. Each policy unit was then assessed to decide which policy will provide the most appropriate level and direction of flood risk management both now and in the future.
- 2.2.4. One of six standard flood risk management policies has been applied to each policy unit:
 - Policy 1 – No active intervention (including flood warning and maintenance). Continue to monitor and advise.
 - Policy 2 – Reduce existing flood risk management actions (accepting that flood risk will increase over time).
 - Policy 3 – Continue with existing or alternative actions to manage flood risk at the current level.
 - Policy 4 – Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).
 - Policy 5 – Take further action to reduce flood risk.
 - Policy 6 – Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation)

2.3. LOCAL PLANNING POLICY / GUIDANCE

HARINGEY COUNCIL SFRA LEVEL 2 (2015)

- 2.3.1. The Haringey's SFRA provides local evidence of all forms of flooding including fluvial, surface water, groundwater, sewers and reservoirs.
- 2.3.2. It was concluded in the North London SFRA that Haringey was at risk from fluvial, sewer and pluvial flooding but not groundwater or tidal flooding.

LOCAL PLAN - STRATEGIC POLICES 2013-2026

- 2.3.3. Policy SP5 states that LBH Council requires that all development in Haringey must be water efficient during construction and operation, reducing all forms of flood risk. All development shall:
- Improve the water environment, water quality and drainage systems;
 - Minimise water use and illustrate how development would contribute to reducing general and flash flooding;
 - Take account of flood risk vulnerability classification as set out in paragraph 100 of the NPPF and apply the NPPF Sequential Test and Exception Test;
 - Implement measures to prevent (or mitigate as last resort) local surface water and downstream flooding;
 - Implement Sustainable Drainage Systems from strategic to individual site level to improve water attenuation, quality and amenity;
 - Restore and enhance the Blue Ribbon Network including Pymmes Brook, Moselle Brook, the River Lee Navigation and its tributaries, deculverting wherever feasible, to improve water quality and amenity of these waterways and to help reduce flood risk (in line with London River Action Plan); and
 - Require higher resilience and levels of flood protection for critical infrastructure to ensure the protection of essential services such as water and power.

HARINGEY DEVELOPMENT MANAGEMENT DPD (ADOPTED ON JULY 2017)

- 2.3.4. Within the pre submission version of the development management DPD the following policy requirements relate to the Proposed Development with respect to flood risk and drainage:
- Policy DM24
 - All proposals for new development within Flood Zone 2 and 3a to provide sufficient evidence for the council to assess whether the requirements of the Sequential Test and Exception Test, where required (which has been satisfied, as detailed in Section 2.1);
 - Where appropriate mitigation measures will be incorporated on site to manage residual flood risk (which is detailed within this report in Section 7);
 - Policy DM25 – requires regard for the following hierarchy;
 - All major development proposals will be required to reduce surface water flows to a greenfield run-off rate for a 1 in 100 year critical storm event;
 - All minor development proposals should aim to achieve a greenfield run-off rate and, at a minimum, achieve a 50 per cent reduction on existing site run-off rates;
 - For all development where a Greenfield run-off rate cannot be achieved justification must be provided to demonstrate that the run-off rate has been reduced as much as possible (which is detailed within the Outline Drainage Strategy, Appendix G, where applicable); and
 - Policy DM29
 - Demonstrate local public sewer network has adequate capacity or provide suitable alternative (which is detailed within the Outline Drainage Strategy, Appendix D.4).

3. EXISTING SITE

3.1. SITE LOCATION & ACCESS

- 3.1.1. Berol Quarter is located in Tottenham Hale, almost in the eastern edge of the LBH.
- 3.1.2. To the north of the site lies the Cannon Factory, located off Ashley Road, which is owned by Notting Hill Genesis and has permission for new homes and commercial space. To the north east lies the Gessner which was delivered by Berkeley Square Developments, Watermead Way and the Lee Valley Railway Line. To the south of the site is Tottenham Hale Station and the Tottenham Hale District Centre, which mainly comprises Tottenham Hale Retail Park on the opposite side of Ferry Lane. To the west on the opposite side of Ashley Road are the development plots of Ashley Gardens, Ashley House and Ashley Park which will provide new residential accommodation. Down Lane Park is located further west and to the north west of the site and is within minutes walking distance.
- 3.1.3. The surrounding area is currently undergoing transformational change. It is a former industrial area, with a number of remaining warehouse-type buildings, however, there are several approved planning permissions for mixed-use development in the immediate surroundings, some of which are built or under construction. In the coming years, the area will be residential with a mix of commercial and employment uses across much of the ground floor.
- 3.1.4. The approximate Site location is shown in **Figure 3-1** below:



Figure 3-1 – Indicative Site Location Plan

3.2. EXISTING SITE DESCRIPTION

- 3.2.1. The existing site comprises 2 Berol Yard, a currently vacant plot of land on Watermead Way, and Berol House, the former Berol pencil factory which is now an existing office building, that runs north-south along Ashley Road.

3.3. TOPOGRAPHY

- 3.3.1. The topographical survey shows that the site levels are generally flat with very slight slope from northeast to southwest across certain areas, with levels ranging from 8.43m AOD to 8.83m AOD, being commonly around 8.65m AOD. There are smooth local depressions in the northern access and a slight fall in the southwest access to Asley Road.
- 3.3.2. Refer to **Appendix A.2** for the Topographical Survey.

3.4. GEOLOGY AND HYDROGEOLOGY

- 3.4.1. Reference to the BGS published mapping identifies the site to be underlain by the following bedrocks:
- 3.4.2. London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.
- 3.4.3. The above can be seen on **Figure 3-2**:

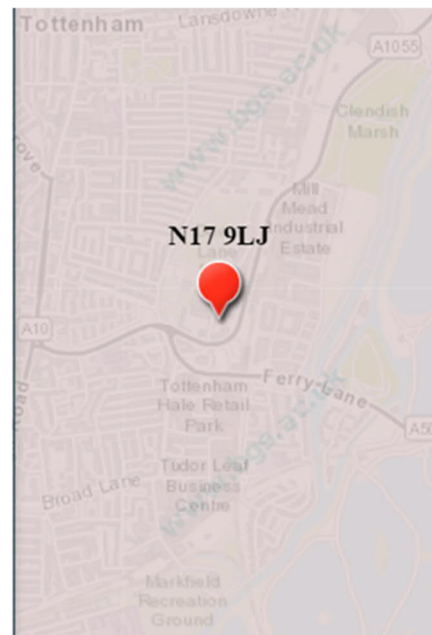
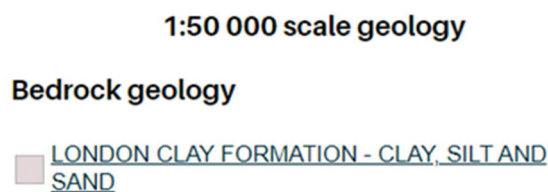


Figure 3-2 – BGS Geology Bedrock Map Extract

- 3.4.4. Superficial Deposits of Head, 1 clay silt and gravel are identifiable on the site area, as shown in **Figure 3-3**.

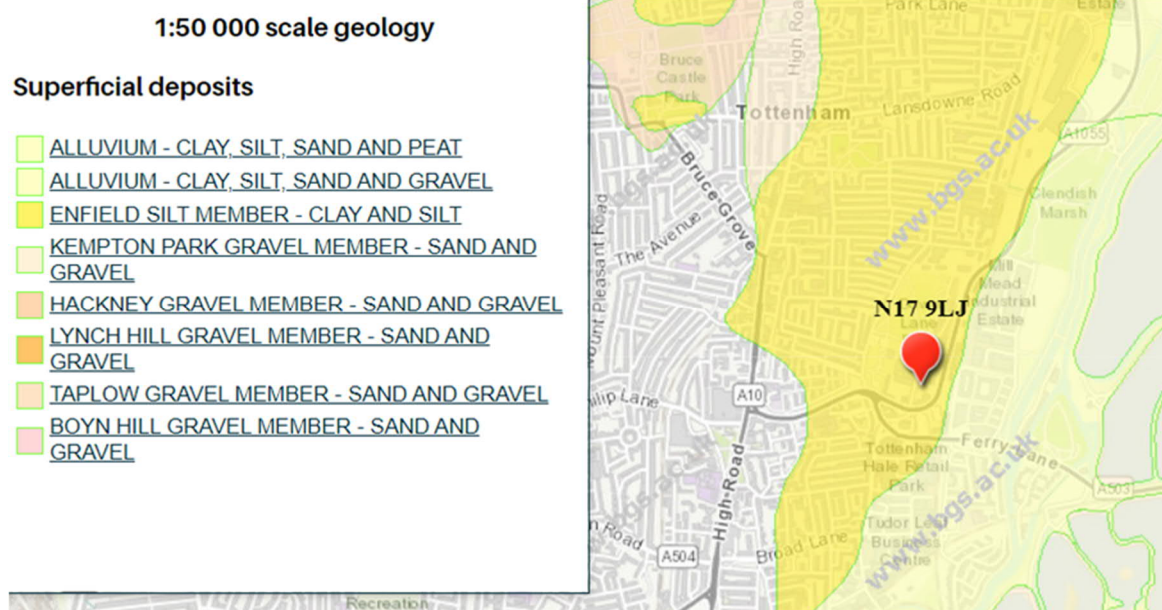


Figure 3-3 – BGS Geology Superficial Deposits Map Extract

- 3.4.5. Enfield Silt Member - Clay and silt. Sedimentary superficial deposit formed between 116 thousand years ago and the present during the Quaternary period. The thickness is between 1 to 5m, with an average of 2m in thickness.
- 3.4.6. Borehole data obtained from BGS (British Geological Survey) shows five existing boreholes located within the site boundary and its vicinity. Borehole TQ38NW488 located within the site boundary has a depth of 6.6m. Boreholes TQ38NW487 and TQ38NW486 located North, outside the site boundary has a depth of 7.5m and 7m respectively. Borehole TQ38NW69 and TQ38NW103 to the West and South have a depth of 9.75m and 23.06m respectively. No information on where surface water struck depth could be found on those records.

Table 3.1 Summary of Ground Conditions

Geological Unit/Stratum	Generic Description	Depth to base of stratum (m below ground level)*	EA Aquifer Designation
Made Ground	Variable	0.6 – 0.8	Not applicable
Enfield Silt Member	Varies from silt to clay, commonly yellow-brown	0.8 – 1.8	Unproductive
Kempton Park Gravel Member	Sand and gravel, locally with lenses of silt, clay or peat	4.5 – 5.5	Secondary (A)
London Clay Formation	Blue-grey or grey-brown, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay	(22.9)	Unproductive
Lambeth Group Formation	Vertically and laterally variable sequences mainly of clay, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.	Not encountered	Secondary (A)

Thanet Formation	Pale yellow-brown, fine-grained sand that can be clayey and glauconitic. Nodular flint at base	Not encountered	Secondary (A)
White Chalk Subgroup	Chalk with flints: discrete marl seams, nodular chalk, sponge-rich and flint seams throughout.	Not encountered	Principal

() Brackets indicate unproven depth.

* Taken from BGS borehole records TQ38NW103, TQ38NW69, TQ38NW486, TQ38NW487 and TQ38NW488.

- 3.4.7. Consulting the DEFRA Magic Map, the Proposed Development is located in the outer zone (Zone 2) of a groundwater Source Protection Zone (SPZ2) as defined by the EA, as shown in **Figure 3-6**.
- 3.4.8. No Licensed groundwater abstractions were found within 500m of the Proposed Development,



Figure 3-4 –Source Protection Zones

- 3.4.9. Groundwater is likely to be present in the Kempton Park Gravel Member, which could be in continuity with nearby surface water features. The underlying London Clay Formation is likely to act as an aquitard to prevent vertical movement of groundwater between the Kempton Park Gravel Member and the underlying Lambeth Group Formation

SITE SPECIFIC DETAIL

- 3.4.10. Based on the CSJF and Berol Yard – Ground Conditions and Contamination Environmental Statement Chapter L which considers Geotechnical Site Assessments conducted on neighbouring development sites the following is understood within the local area, as stated in the 2017 WSP FRA:
- 3.4.11. Ground conditions were found to comprise:
- Made Ground to a maximum depth of 1.2m - 2.0 m below ground level Made Ground was described as typically cohesive with granular matrix. Possible asbestos containing material was

recorded at one location. Ash and black hydrocarbon staining was also recorded, as well as chrysotile asbestos cement board was recorded at one location.

- Enfield Silt Member to a maximum depth of 2.1m - 2.50 m below ground level The Enfield Silt was described as soft yellow-brown sandy clay.
- Kempton Park Gravel Member proven to a maximum depth of 4.5m - 6.8 m below ground level. The Kempton Park Gravel was typically described as orangish brown sandy flint gravel. Black hydrocarbon staining was recorded at three locations. A slight organic odour was also noted.
- The London Clay Formation was recorded to a maximum depth of 16.3 m below ground level and was encountered as a stiff to very stiff, fissured dark brownish grey clay.
- The Lambeth Group Formation was proven to a maximum depth of 30 m below ground level The Upper Mottled Beds, Laminated Beds and Lower Mottled Beds were recorded during the investigation.

3.4.12. Water strikes were recorded in the Kempton Park Gravels between 2.3 and 5.0 m below ground level, and in the Lambeth Group formation at 29.0 m below ground level Interpretation of subsequent groundwater monitoring was considered to indicate a south-easterly groundwater flow direction in the Kempton Park Gravels. Subsequent monitoring recorded groundwater within the Kempton Park Gravels at a depth of between 2.37 – 2.60 m below ground level.

3.4.13. No Light Non-Aqueous Phase Liquid (LNAPL) was recorded during groundwater monitoring. It is noted that the nearest monitoring wells (WS106 and WS108) refused on concrete and gravels respectively, and did not record a water strike. However, no LNAPL was recorded in BH103 located is down the hydraulic gradient of the UST.

3.4.14. A number of soil samples were found with contaminants, with asbestos fibres and debris recorded. Within the groundwater localised contamination was noted. Potential pollutant linkages were present and such issues will be further considered and discussed within the 'CSJF and Berol Yard – Ground Conditions and Contamination Environmental Statement Chapter L'.

3.5. EXISTING WATERCOURSES, FLOOD DEFENCES AND STRUCTURES

3.5.1. The site is located approximately 600m south of Moselle Brook, also known as Carbuncle Ditch (in the LBH SFRA), which is a culverted watercourse which drains into Pymmes Brook. Pymmes Brook is located approximately 300m east of the Site with the River Lee Navigation located immediately adjacent to Pymmes Brook on the east. All above noted rivers are main rivers, which are the responsibility of the EA, and lead onto the River Thames.

3.6. FLOOD DEFENCES AND STRUCTURES

3.6.1. Based on data provided by the EA through correspondence from the EA's Asset Information Management System (AIMS), on the 2017 WSP FRA, both the Pymmes Brook and River Lee Navigation have existing flood defences as detailed within **Table 3-2**:

Table 3-2 – Summary of Ground Conditions

Watercourse / Location	EA Asset ID	Type	Design Standard of Protection	Downstream Crest Level (m AOD)	Upstream Crest Level (m AOD)	Condition
Pymmes Brook / West Bank	142742	High Ground – Concrete Lined Channel	100 years	8.29	10.48	3
Pymmes Brook / West Bank	42033	In-situ Concrete Box Culvert	**5 years	n/a	n/a	3
Pymmes Brook / West Bank	142741	High Ground – Concrete Wall, lined channel	**5 years	9.92	9.68	3
Lee Navigation / West Bank	100435	Steel sheet piled defence with steel strapping – Concrete Lined Channel	200 years	8.65	8.46	3
Mossell Brook	12914	Precast Concrete Culvert	1000 years	n/a	n/a	5

**The asset design standard of protection is noted as 5 years for asset 142741 which covers the same length of embankment and more as asset 42033. This is expected to underestimate the standard of protection available based on flood model results; correspondence with the EA has identified that the recorded design standard of protection 'may be incorrect in some locations, however other information about the defences is correct. This does not have an impact of model outlines as the information used in models comes from multiple sources and uses crest levels as well'.

- 3.6.2. Further consultation with the EA identified the 'With regards to the design SOP of the Pymmes scheme, it is 1 in 100 and not 1 in 5'... 'with the additional crest heights just representing the freeboard included in the scheme'. From this it can be assessed that the inbuilt freeboard allowances prevent flooding up to and including the modelled 1 in 1000 year return period fluvial event as detailed within the flood mapping, which shows no flooding up to and including the 1 in 1000 year return period fluvial event.
- 3.6.3. Refer to Section 5 of this report for a thorough review of the expected probability of flooding at the sites.

3.7. EXISTING SEWERS/ DRAINAGE INFRASTRUCTURE

- 3.7.1. Detail of the TW assets can be found in **Appendix A.3** The main drainage infrastructure close to the site is the following:
- 1372mm diameter public trunk combined sewer which runs from south to north along Ashley Road on the opposite side with an invert level of approximately 8.5 – 8.9m below ground level.
 - 229mm diameter which has an end connection close to the northwest of the Site within the close side of Ashley Road, with manhole 4705 (invert level 1.37m below ground level) adjacent to the site.

- A 152mm diameter public surface water sewer starts at the junction with Burdock Road and continues down Ashley Road which turns into a 229mm diameter sewer along Ashley Road. Adjacent to the site manhole 3702 has an invert level 0.95m below ground level.
- There is a 4100mm by 2000mm culverted watercourse which falls from west to east through Down Lane Park and Burdock Road, manhole 4702 on Burdock Road has been buried with manhole 281B in the south west corner of Down Lane Park (invert level of 2.9m below ground level.). The culverted watercourse appears to discharge into Pymmes Brook. The culverted watercourse known to be owned by the local authority.
- A 686mm public foul sewer is shown to run towards the west edge of the Site, and, as it is stated in the abovementioned 'Heyne Tillet Steel (HTS) 2778 - 2 Berol Yard Feasibility Report, March 2022', this sewer crosses the site boundary and will need to be diverted, based on CCTV surveys.

3.8. ARTIFICIAL WATERCOURSES

- 3.8.1. A network of reservoirs are located east of the site, the closest of which is approximately 600m east of the site.
- 3.8.2. As stated in the abovementioned 2017 Flood Risk Assessment, the EA online record notes that the following reservoirs could affect this Site:
- William Girling;
 - Lockwood;
 - King George V; and
 - Banbury.

3.9. HISTORIC FLOOD RECORDS

- 3.9.1. At the moment of editing this FRA & ODS, there are no flood records data on the vicinity of the site as consulted with Thames Water in **Appendix C.1**.

4. THE PROPOSED DEVELOPMENT

4.1. SUMMARY OF THE PREVIOUS PLANNING HISTORY OF THE SITE

- 4.1.1. The Site was granted planning permission (HGY/2017/2044), as part of a wider hybrid application for 1 Berol Yard, 2 Berol Yard (college site) and Berol House, on 8 June 2018. The description of development was as follows:
- Full planning permission for the demolition of the existing buildings within the Berol Yard site and retention of Berol House. Erection of two buildings between 8 and 14 storeys providing 166 residential units, 891 sqm (GEA) of commercial floorspace (Class A1/A3/B1/D1), 7,275 sqm (GEA) of education floorspace (Class D1), car and cycle parking, open space, landscaping and other associated works.
 - Outline proposals (all matters reserved) for the alteration/conversion of ground, first and second floors of Berol House with up to 3,685 sqm (GEA) of commercial floorspace (A1/A3/B1/D1) and the introduction of a two storey roof level extension introducing up to 18 residential units, cycle parking and other associated works. Amendments to scheme including replacement of accommodation with "build-to-rent" and reconfiguration of internal residential and commercial layout.
 - Reserved Matters for appearance, landscaping, layout, scale and access in relation to Berol House (pursuant to Condition 1 of planning permission HGYP/2017/2044) were approved under application ref. HGYP/2020/0080, granted 31 March 2020.
 - The residential component at 1 Berol Yard (now known as the Gessner) has been completed and has been in operation since 2021. The remaining two plots of the original hybrid planning application, the development of which has not commenced, comprise 2 Berol Yard (the college site approved for education floorspace) and Berol House (approved for commercial floorspace and some residential in a roof level extension).

4.2. CONTEXT FOR NEW APPLICATION

- 4.2.1. The original intention was for the 2 Berol Yard plot to provide a new campus for ADA: National College for Digital Skills. Since the granting of the hybrid permission, the College has unfortunately pulled out of the scheme. BSD subsequently appointed leading agent Knight Frank and their specialist education and life sciences team, to undertake extensive marketing in an attempt to secure an alternative academic or life science occupant / operator for the college site. Unfortunately, after 16 months of national marketing, no other prospective operator has shown an interest in the development of an education or life sciences facility at the Site.
- 4.2.2. As a result, BSD is revisiting planning permission ref. HGYP/2017/2044 in the context of the loss of the ADA college and the subsequent marketing exercise. A new full planning application at the Berol Quarter site is now proposed comprising comprehensive refurbishment and extension of Berol House to provide high quality workspace and retail accommodation, alongside a new mixed use building accommodating Build to Rent (BtR) homes alongside commercial/retail space at the 2 Berol Yard plot.
- 4.2.3. The removal of the college from the scheme has been discussed with LBH and the GLA and the principle of a mixed use residential and commercial scheme is supported.

4.3. PROPOSED DEVELOPMENT

- 4.3.1. The Proposed Development's layout is illustrated in Figure 4-1 below. Further architect plans are included in **Appendices B.1, B.2 and B.3**. This FRA & ODS has been produced for the full planning permission for the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.

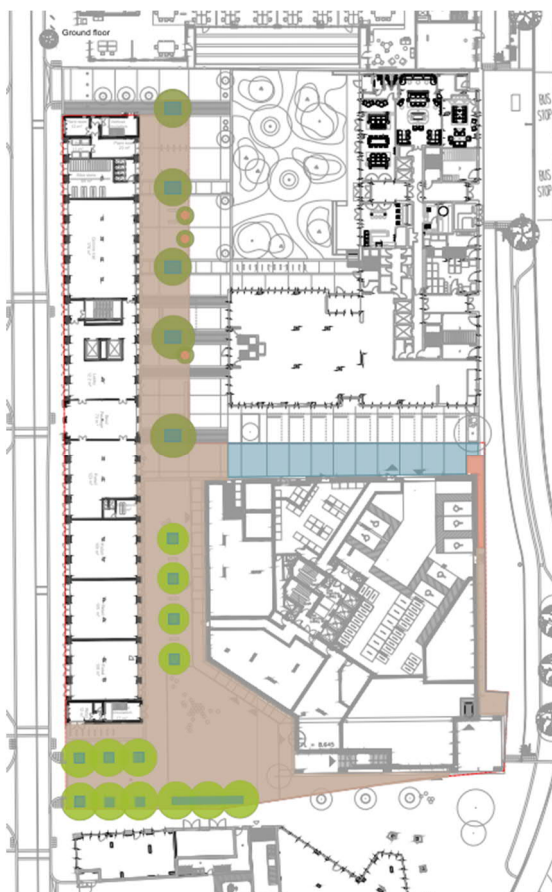


Figure 4-1 – Proposed Development

- 4.3.2. The Proposed Development are planned over a gross area of circa 0.5ha.

4.4. VULNERABILITY CLASSIFICATION

- 4.4.1. In accordance with Table 2 - Flood risk vulnerability classification within 'Flood risk and coastal change' guidance¹ of the UK government environmental guidance, Flood Zone and flood risk tables, the Site falls within the vulnerability classification of **'More Vulnerable'** due the proposed residential use within it. This prevails over the secondary use of the Site as offices and commercial areas, which falls under the 'Less Vulnerable' classification.

4.5. SEQUENTIAL AND EXCEPTIONS TESTS

- 4.5.1. LBH development management DPD Policy DM24 states the requirement for 'sufficient evidence for the council to assess whether the requirements of the Sequential Test and Exception Test, where required' have been satisfied. The compliance of this policy is detailed below.
- 4.5.2. Ashley Road South has been allocated within the Tottenham Area Action Plan as Site Allocation TH6, which this site falls within.
- 4.5.3. The LBH SFRA 'Sequential and Exception Tests of the Sites allocated in the Site Allocations DPD & Tottenham Area Action Plan' states that 'this site is entirely in Flood Zone 2. No highly vulnerable uses are allocated and there is a lack of suitable sites in Flood Zone 1. The allocation passes the sequential test'.
- 4.5.4. More specifically it indicate that the site is appropriate for:
- commercial and residential use;
 - more and less vulnerable development;
- 4.5.5. The document also states that development is acceptable, 'although a Flood Risk Assessment' (i.e. this document) 'will need to be submitted with any planning application'.

4.6. LOCAL DEVELOPMENT AND FLOOD RISK POLICY

- 4.6.1. Justification of compliance to the abovementioned policies was presented in the 2017 WSP FRA

¹ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables>

5. FLOOD HAZARDS

5.1. INTRODUCTION

5.1.1. The following section provides an overview of flood risk to the Application Site, and risk arising to and from the Proposed Development. An assessment has been undertaken for each possible source that could affect the Proposed Development in accordance with the NPPF Flood Risk and Coastal Change Planning Practice Guidance (PPG).

5.1.2. Flood risks have been qualitatively assessed on the following basis:

- Negligible risk;
- Very Low risk;
- Low risk;
- Moderate risk;
- High risk; and,
- Very High risk.

5.2. SOURCES AND MECHANISMS OF FLOODING

5.2.1. Reference to LBH's SFRA and SWMP is made where appropriate in the following sections with relevant maps included the 2017 WSP FRA.

5.2.2. References to correspondence with TW is included in Appendix C.1.

5.2.3. UK Government Flood Mapping has been used in this section of the report to identifying fluvial, tidal, reservoir, and surface water flooding and can be located at: <https://flood-map-for-planning.service.gov.uk/>, <https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode>.

5.3. FLOODING FROM COASTAL AND TIDAL SOURCES

5.3.1. Tidal flooding is caused by elevated sea levels or overtopping by wave action.

5.3.2. The Haringey Council Strategic Flood Risk Assessment (Level 2), Draft Report, February 2015, based on the North London SFRA, states that there is no risk from tidal flooding; consequently, the risk of flooding posed to the Site and the Proposed Development from this source is **negligible**.

5.4. FLOODING FROM FLUVIAL SOURCES

5.4.1. Fluvial flooding is caused by rivers, watercourses or ditches overflowing.

5.4.2. The Environment Agency's Flood Map for Planning, shown in **Figure 5-1**, shows the Site to lie entirely within Flood zone 2. Flood zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (Land shown in light blue on the Flood Map).

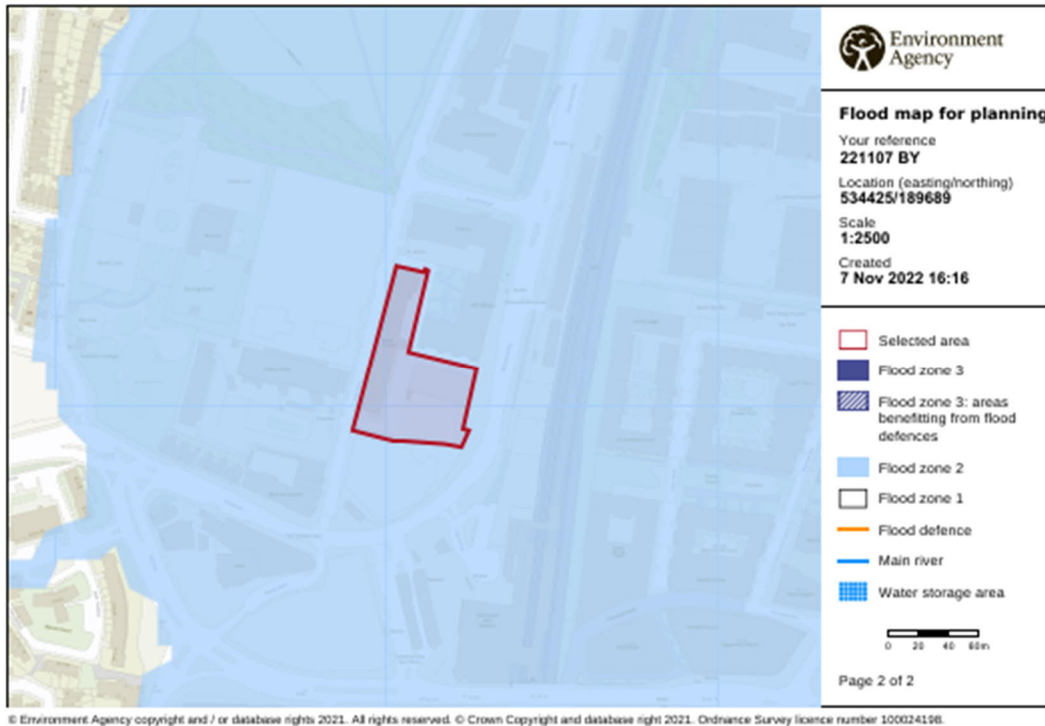


Figure 5-1 – Flood Zones Map

- 5.4.3. In the 2017 WSP FRA, there is a discussion about fluvial flooding related to the various watercourses in the area, which are not tidally influenced. Those culverted watercourses, the Moselle Brook and Pymmes Brook and Lee Navigation ‘have been modified heavily so although they are all within close proximity, it is unlikely that they will ever have similar flows and levels’, as stated by the EA in their correspondence in the 2017 WSP FRA.
- 5.4.4. Irrespective of the design standard of protection from the flood defences, or a breach event, the site is not at risk of flooding from the predicted modelled 1 in 1000 year event as the topographical site levels are located above the maximum flood level modelled within the Pymmes Brook and Lee Navigation (where it can be noted that the Proposed Development site has an approximate existing ground level typically of circa +8.8m AOD).
- 5.4.5. Based on the information available the probability of fluvial flooding from all watercourses in the area for the site is considered **low**; this is due to local topography and presence of existing flood defences.

5.5. GROUNDWATER FLOODING

- 5.5.1. The SFRA strategic site summary table states that the Site falls within a 1km grid cell that has been designated as having <25% susceptibility to groundwater flood emergence from superficial deposits.
- 5.5.2. The North London SFRA states that Haringey is at risk from fluvial, sewer and pluvial flooding, but not groundwater flooding. This is consistent with groundwater mapping provided by the EA which notes that the groundwater elevation is approximately 18-20m below ground level within bedrock deposits.

- 5.5.3. Historic flooding records within the SWMP and SFRA, which are based on EA records, note that there are no known recorded groundwater flooding incidents which have occurred within near vicinity of the Site.
- 5.5.4. Based on the existing geology and hydrogeology information for the general Ashley Road South macro-area, water strikes were recorded within boreholes in the Kempton Park Gravel Member and the Lambeth Group Formation. However, the Lambeth Group is present below a confining layer of London Clay and is therefore not considered likely to be a source of groundwater flooding. Superficial groundwater is noted within the surrounding area of the site and has been recorded at depths circa 2.5 m below ground level within the Kempton Park Gravel Member. It is considered that the observed levels are not likely to cause above ground groundwater flooding however should be considered for basement development.
- 5.5.5. Groundwater within the Kempton Park Gravel maybe recharged from the Down Lane Park, located up the hydraulic gradient to the north-west. However it is noted that the wider local area is heavily developed, and the immediate area of the site is covered by hardstanding surfaces or buildings. Therefore the potential for groundwater flooding from the Kempton Park Gravels is considered to be limited.
- 5.5.6. Based on the information available the probability of groundwater flooding above the Site ground level is considered **low**.

5.6. SEWER AND DRAINAGE INFRASTRUCTURE FLOODING

- 5.6.1. Sewer flooding occurs as a result of a number of influencing factors. It's most likely to occur during storms, when large volumes of rainwater enter the sewers, however, it may also occur when pipes become blocked or damaged.
- 5.6.2. Correspondence with Thames Water has confirmed that there is no record of any sewer flooding having affected the site.
- 5.6.3. However, as it is shown in in Product 4 in the EA correspondence of the HTS 2778 – Berol Yard, Feasibility Report, dated March 2022, the area has records of fluvial flooding in 1947. The probability of sewer flooding is similar to that from fluvial flooding in this location.
- 5.6.4. Consequently, the probability of sewer flooding is considered **low**.

5.7. SURFACE WATER FLOODING

- 5.7.1. Surface water flooding occurs when intense rainfall or overland flow is unable to drain away by traditional means such as into drainage systems or infiltrating into the ground. This excess water could run off quickly off land and result in localised flooding.
- 5.7.2. The GOV.UK's Risk of Flooding from Surface Water mapping identifies the site area as low risk.

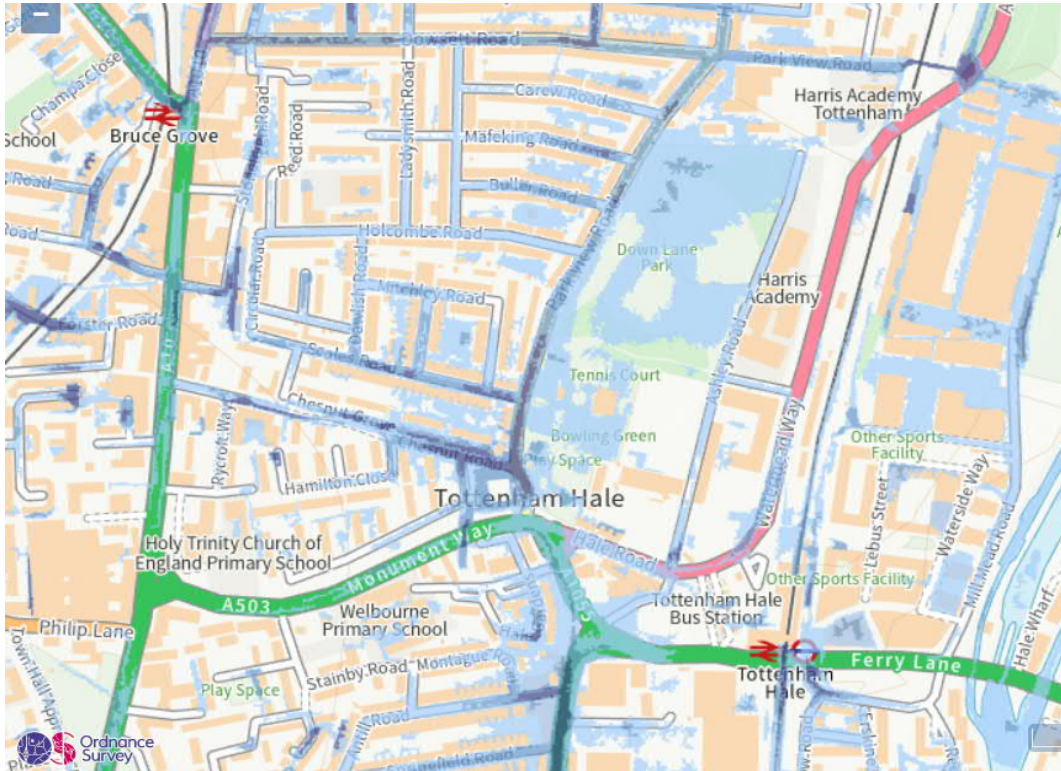


Figure 5-2 - UK Government Risk of Flooding from Surface Water map

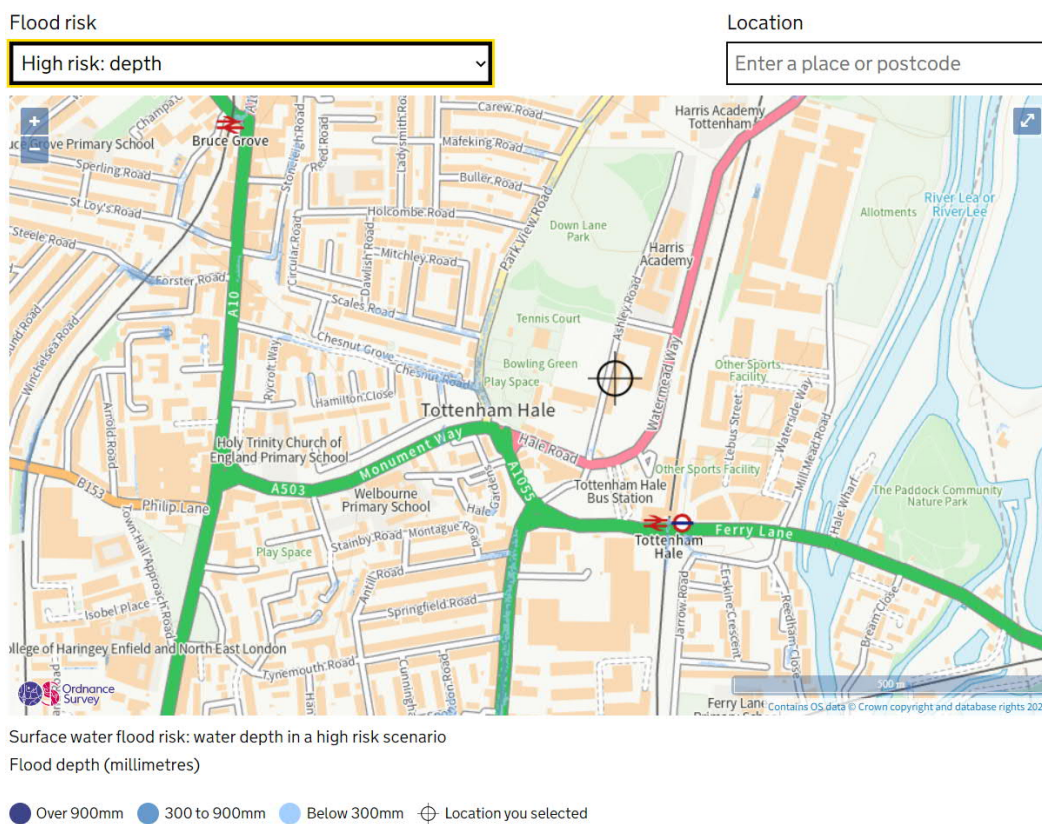
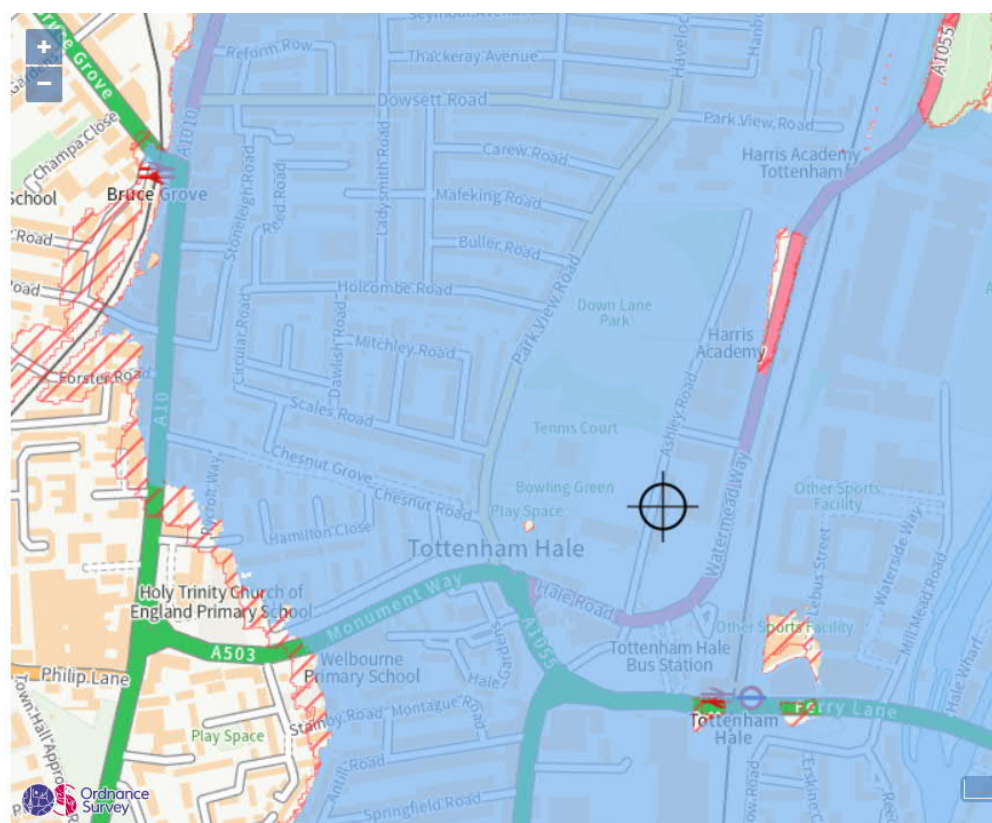


Figure 5-3 - UK Government Water Depth in High-Risk Scenario map

- 5.7.3. Looking at the above mentioned GOV.UK's maps, and the existing and proposed levels of the Proposed Development, the Site is always higher than this highway adjacent depressed area, as a minimum 0.50m more in the lower parking area, and
- 5.7.4. Based on the available information, the probability of flooding from surface water can be assessed as **Low**.
- 5.7.5. The proposed drainage strategy will detail how the scheme design will manage surface water flood risk resulting from the Proposed Development through the development of a SuDS strategy.

5.8. ARTIFICIAL SOURCES OF FLOODING

- 5.8.1. According to the online GOV.UK's Long Term Flood Risk Map, despite there being a risk of flooding from reservoirs in the site vicinity, flooding from reservoirs is extremely unlikely. An area is considered at risk if peoples' lives could be threatened in the event of a dam or reservoir failure. In the event of flooding from reservoirs, the extent will surpass the site and the surrounding area as shown in **Figure 5-4** below:



Maximum extent of flooding from reservoirs:

● when river levels are normal
 ▨ when there is also flooding from rivers
 ⊕ Location you selected

Figure 5-4 - UK Government Risk of Flooding from Reservoirs

- 5.8.2. Since spring 2009 all reservoirs, under the 1975 Reservoir Act, require the development of a Flood Plan and associated inundation mapping along with governing their maintenance and management. As such the risk of flooding from a reservoir is low and is being managed on a strategic level under the 1975 Reservoir Act.
- 5.8.3. Based on the information available the probability of flooding from artificial sources is considered **low**.

6. CLIMATE CHANGE

6.1. BACKGROUND INFORMATION

- 6.1.1. As explained in the Climate Change Adaptation Sub-Committee Progress Report 2014, increased flood risk is the greatest threat to the UK from climate change. Models of the climate system suggest floods of the type experienced in England and Wales in autumn 2000, and between December 2013 and February 2014, have become more likely as a consequence of increased concentrations of greenhouse gases in the atmosphere.
- 6.1.2. More frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall could be expected. Sea levels are also expected to continue to rise.
- 6.1.3. New EA guidance “Flood risk assessments: climate change allowances” issued in 2016 and updated last time on 10th May 2022 provides up to date information on expected changes in rainfall, river flows and sea level rise as a consequence of climate change.
- 6.1.4. A key change from the previous guidance is that the climate change allowances for peak river flows now are shown as variable on a regional basis; allowances are also now based on percentiles, whereby a percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level (e.g. a 50% percentile means that the allowance has 50% chances of not being exceeded).
- 6.1.5. Sea levels allowances reflect the previous guidance and vary on a regional basis and for each epoch as shown in Table 3 of the EA guidance.
- 6.1.6. The EA have provided guidance to assess the impact of climate change on fluvial flooding. Technical assessment of climate change impacts on fluvial flooding appropriate for new developments depending on their scale and location (see following section).
- 6.1.7. For peak rainfall the EA Guidance provides an upper end and central allowance depending on epoch; the guidance recommends assessing both the central and upper end allowances to understand the range of possible impacts. These allowances are detailed in Table 2 (Peak rainfall intensity allowance in small and urban catchments) of the EA guidance.

6.2. DEVELOPMENT LIFESPAN

- 6.2.1. A typical lifespan for a residential development is 100 years.
- 6.2.2. Based on this and as previously outlined, considering the Site as more vulnerable infrastructure, the contingency peak rainfall allowances for climate change that are potentially applicable to the drainage design of the Site are:
 - Upper End – 40% increase in peak rainfall by 2115;
 - Central – 25% increase in peak rainfall by 2115.
- 6.2.3. These climate change allowances have been obtained from the Environment Agency Climate Change Allowances, Peak Rainfall Intensity (London Management Catchment peak rainfall allowances), as found in **Table 2-2** above.

- 6.2.4. The contingency peak river flow allowances, that are potentially applicable to the site to account for the impact of climate change, are as set out in Table 1 of the EA's "Flood risk assessments: climate change allowances" advice are:
- Upper End – 40% increase in peak rainfall by 2115;
 - Central – 25% increase in peak rainfall by 2115.
- 6.2.5. These climate change allowances have been obtained from the Environment Agency Climate Change Allowances, Peak River Flow (London Management Catchment peak river flow allowances), as found in **Table 2-1** above.

6.3. IMPACT OF CLIMATE CHANGE ON THE PROPOSED DEVELOPMENT

- 6.3.1. In order to consider the impact of climate change on fluvial flooding at the Site an intermediate approach was indicated as acceptable by the EA in the previous 2017 WSP FRA; such approach; based on the existing modelled flood and flow data, allows a stage-discharge rating curve to be interpolated to determine a flood level for the relevant climate change allowances (i.e. 25% and 35% in this instance).
- 6.3.2. However, as stated in the abovementioned document, for the purpose of this study and due to the complexity of the river network in the area, the 1 in 1000 year return period fluvial event has been considered as representative of the extreme flood water level with an additional freeboard added to define proposed finished floor levels as discussed below.
- 6.3.3. Surface water runoff could in theory represent a risk to the Site, especially when the effects of climate change are considered. However, an outline drainage strategy has been produced as part of this study which takes into account the potential impact of climate change.
- 6.3.4. The surface water outline drainage strategy has been designed to cater for surface water runoff during the 1 in 100 year return period plus 40% climate change rainfall . This assessment shows that the proposed SuDS including tree pits (bioretention systems), geocellular storages, and green and blue roofs will attenuate the additional surface water runoff; with a 1 in 100 years greenfield runoff rate limiting discharge rate into the receiving existing Thames Water surface water sewer. The details of the Outline Drainage Strategy are discussed within **Chapter 8**, and it will need to be re-assessed at the detailed design stage and any necessary approvals sought.

7. FLOOD RISK MITIGATION MEASURES

7.1. GENERAL COMMENTS

- 7.1.1. As discussed in the previous pages no significant sources of flood risk for the site have been identified; any potential risk is further reduced through the proposed design measures as discussed below.

7.2. FINISHED FLOOR LEVELS

BEROL HOUSE

- 7.2.1. The ground floor consists of commercial/ retail use and ancillary use (e.g. bike storage). Therefore less vulnerable based on the NPPF and associated PPG, the location of all usage can be seen in **Appendix B.2**. The rest of the floors have no residential use, being mainly offices.
- 7.2.2. The existing ground floor is proposed for commercial/ retail use and ancillary use (bike storage, access etc.); and will remain at the existing level of +8.6m AOD. This is slightly higher than land surrounding the site and provides a raised threshold for the less vulnerable usage of 50mm above the maximum modelled 0.1% annual probability fluvial event, 1 in 1000 year return period fluvial flood water level modelled in the area (8.55m AOD). The proposed finished floor level is also 110mm above the 1% annual probability, 1 in 100 year return period fluvial flood water level plus 20% allowance for climate change (8.49m AOD).
- 7.2.3. This existing building has a slightly raised ground finished floor level relative to Ashley Road. This provides increased resilience to the potential residual risk of overland surface water flows.
- 7.2.4. To increase the resilience against surface water flooding, the landscaped levels are proposed to have nominal slopes of approximately 1 in 40 to 1 in 50 falling away from building thresholds / entrances.

2 BEROL YARD

- 7.2.5. The ground floor consists of class E land uses (including retail units) a car parking, bike stores, apart from other uses such as reception, refuse collection, electrical equipment, and access areas. Therefore, less vulnerable uses are only located at the ground floor based on the NPPF and associated PPG, the location of all uses can be seen in **Appendix B.3**. Residential units (more vulnerable) are then located at the first floor (above the mezzanine floor) and above.
- 7.2.6. The proposed ground level finished floor level for all units are set to +8.645 m AOD. This is slightly higher than land surrounding the site and provides a raised threshold of 95mm above the maximum modelled 0.1% annual probability fluvial event, 1 in 1000 year return period fluvial flood water level modelled in the area (8.55m AOD).

7.3. INTERNAL EVACUATION ROUTE AND SAFE REFUGE

- 7.3.1. There are no proposed residential ground floor units, and there are no basements in the Proposed Development, therefore it is not necessary neither an internal evacuation route nor a safe refuge for the buildings.

- 7.3.2. The Proposed Development site will sign up to the EA flood warning service, in order to be alerted when flooding on site may be possible, this will help ensure that residents and managers on site can take the necessary actions and ensure people remain safe.
- 7.3.3. As shown in **Figures 5-1** in Chapter 5, there are no formal flood defences benefitting the Proposed Development.

7.4. PROPOSED FLOOD MITIGATION MEASURES

- 7.4.1. The risk of the Proposed Development exacerbating flood risks from tidal/coastal, groundwater, sewage and drainage infrastructure and artificial sources to neighbouring property is assessed to be Negligible or Low. Therefore, no mitigation measures are considered necessary for inclusion within the Proposed Development for these sources.

8. OUTLINE SURFACE WATER DRAINAGE STRATEGY

8.1. OVERVIEW

- 8.1.1. It is essential for any new development that surface water is managed effectively to limit the risk off-site as well as on site.
- 8.1.2. As stated in Chapter 2, the main sources for designing this drainage strategy are the National Planning Policy Framework (NPPF)(July 2021), the NPPF Flood Risk and Coastal Change Planning Practice Guidance (PPG) (August 2022), the Flood Risk Assessments: Climate Change Allowances (May 2022), the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015), The London Plan (March 2021), the Haringey Council Strategic Flood Risk Assessment (Level 2) , and the Haringey's Local Plan Strategic Policies 2013-2026 (March 2013). All the main principles used for that are exposed below.
- 8.1.3. As a commonly accepted good practice, the proposed surface water drainage strategy should seek to replicate the site's existing hydrology.
- 8.1.4. Any proposed development may create a larger impermeable area, resulting in higher runoff volume and rates. Any increases in volume and rate of surface water discharge from the development could increase the risk of flooding downstream to off-site properties.
- 8.1.5. A fundamental principle of sustainable development in terms of flood defences is the reduction of surface water runoff from new developments and it is therefore best practice that the surface water drainage arrangement for any development site should be such that the volumes and peak flow rates of surface water leaving a new development site are no greater or volumes than the rates prior to the Proposed Development. Any increase in runoff above the discharge limit should be stored or attenuated on site.
- 8.1.6. Overland flow routes must also be considered, as should also flood routes in times of exceedance, such that these are mitigated or directed away from more vulnerable areas.
- 8.1.7. Regarding the surface drainage hierarchy, the order of preference as means of runoff discharge, it is as follows:
- Use of rainwater harvesting; or, where not reasonably practicable,
 - Discharge to ground (infiltration); or, where not reasonably practicable,
 - Discharge to a nearby watercourse; or, where not reasonably practicable,
 - Discharge to a surface water sewer or highway drainage or other drainage system; where not reasonably practicable,
 - Discharge to a combined sewer
- 8.1.8. The flow rate discharged from the drainage network must be reduced as far as practical to the greenfield runoff rates.
- 8.1.9. Regarding the requirements terms of the drainage network performance, it must have no surcharge for the 1 in 1 year storm events, no flood in any part of the site for the 1 in 30 years storm events, no flood for any part of the site susceptible to water for the 1 in 100 years storm events. The flood must be contained within the site for any storm event up to the 1 in 100 years return period, plus climate change allowances.

- 8.1.10. Pumping of surface water is considered to be unsustainable and is unlikely to be accepted by regulatory bodies at this site when other options are not available. However, this may be the only alternative in flat areas.

8.2. EXISTING DRAINAGE REGIME

- 8.2.1. As it is shown in Appendix A.1, 'Record of Tracing, Mapping and CCTV survey of Drainage', drawing PH01, produced by Spaflo Ltd in 2013, **Appendix A.2**, before producing the 2017 WSP FRA, there were private surface water and foul water drainage networks in the area. Thames Water Records in **Appendices A.3 and A.4** shows existing surface water, foul water and combined sewers in the area, where all this previous site drainage is supposed to be connected. Based on that, a drainage strategy was produced in the abovementioned FRA, particularizing it, and evolving to what is shown in **Appendix A.5** to discharge conditions, for Building 4 (The Gessner Building) and the external paved areas, and assumed already constructed. Based on all of this, the best option is to retain as much as it is feasible the drainage for the external paved areas.

8.3. SURFACE WATER MANAGEMENT APPROACH

- 8.3.1. The drainage strategy proposed in this section demonstrates that for this Full Planning Application, it is possible to adhere to the criteria for the management of surface water as set out in the previous paragraphs of this report. The proposals outlined are an option for surface water management and these proposals seek to set general parameters for restricting and storing surface water; the exact details, arrangement of SuDS or means of surface water disposal could change during the reserved matters and detailed design stages and are subject to the final layout of the masterplan. Following the abovementioned regulatory and guidance documents, the following approaches have been considered (in order of preference):
- Rainwater harvesting
- 8.3.2. Complexity, economic, and space constraints with the Proposed Development layout do not allow for the implementation of a rainwater harvesting system at the site.
- Infiltration to ground via soakaway or soil infiltration system.
- 8.3.3. The LBH SWMP (Fig11, 2011) gives a general idea of where infiltration is suitable or unsuitable within the borough. In paragraph 3.4.7. of this document it is explained that the Site is in Source Protection Zone 2 (SPZ2) and, as stated in the 2017 WSP FRA, some contaminants have been identified within the ground. Therefore, infiltration is not a feasible option on this Site.
- Discharge to a watercourse.
- 8.3.4. A culverted watercourse is located under Burdock Road which is assumed to discharge into the Pymmes Brook. This watercourse is a potential discharge recipient, from the CSJF site, however this is not the most feasible option because it is further north to the Site Boundary, significant works would be required to connect to it and, as shown in the Thames Water records in **Appendix A.3**, there is no information about the invert levels.
- Discharge to an existing surface sewer/highway drain. There are several options:
 - As stated above, as shown in **Appendix A.4**, the Site had already an internal surface drainage network. However, the survey does not show where they are discharging, and it may be silted

or damaged, as a result of a poor maintenance when constructing adjacent developments. Therefore, not having further information, this is not the best option.

- As said before, the paved areas of the Site have an already constructed surface drainage, as result of discharging planning conditions for a wider area. Nonetheless, this drainage is not to be used for other additional areas, because it has been designed to attenuate with a maximum flow rate only for the area for discharging those planning conditions.
- Drainage records obtained from Thames Water for the Site, as shown in **Appendix A.3**, indicates that there are existing surface water, foul water, and combined sewers very close to the Site. The best option in terms of surface water is a flat shallow Ø229 surface water sewer beneath Ashley Road, close to the eastern carriageway edge, being the preferred option to connect downstream of SW MH 3601.

- Discharge to a combined sewer.

8.3.5. Having chosen the option of connecting to a SW sewer, as stated above, although it may be better in terms of levels to connect to the Ashley Road Ø229 combined sewer, because it is deeper, this is the last option in the drainage hierarchy, and therefore, it must be discarded.

8.4. SURFACE WATER MODELLING AND RESULTS

8.4.1. As the main option for surface drainage is discharging to nearby surface water sewer, an outline Microdrainage Source Control model has been produced to replicate the proposed drainage strategy and size the main drainage elements.

Catchment Areas

8.4.2. As stated above, the paved areas included in this Planning Application are supposed to be drained by a drainage system already constructed after discharging planning conditions for adjacent areas. Therefore, it is not the first option to design a drainage network to drain them when they already have one. However, because the location of Berol House and 2 Berol Yard buildings, the surface drainage and attenuation are likely to use the Berol Walk, Berol Square and the southwestern access form Ashley Road (see Appendix A.4). Therefore, these areas need to be included, resulting in the areas shown in **Table 8.1** below:

Table 8-1 – Total Impermeable Areas to Drain in the Proposed Drainage Strategy

Designation	Area (m ²)
External Paved Areas (Berol Walk, Berol Square & Access)	1,026
Berol House Building	1,251
2 Berol Yard Roof Area	1,600
2 Berol Yard Building Podium Garden	417
TOTAL IMPERMEABLE AREAS	4,298

Drainage Networks

- 8.4.3. The building roofs are designed to have green roofs, including blue roof storage where practicable beneath the green roof, as it can be seen in **Appendix B.1**.
- 8.4.4. The external paved areas are designed to collect the water using tree pits and linear drains, as shown in the Landscape Architects drawing in **Appendix B.1**.
- 8.4.5. To simplify the system, the drainage system has been designed to collect all the above drainage to an only main geocellular storage, complementing the upstream attenuation in blue roofs and surrounding the tree pits, having a downstream flow control device before sending it to the TW SW sewer beneath Ashley Road.
- 8.4.6. As stated above, some hardstanding areas with a surface drainage already constructed (car parking area and access from Gessner Lane) will be excluded in this drainage strategy, because their drainage system will be retained. Therefore, from this point forward, they will be omitted.

Maximum Flow Rates

- 8.4.7. The maximum flow rate for the drainage system has been calculated using the HR Wallingford website tool to calculate Greenfield Runoff Rates, as shown in **Appendix D.1**, having a result of 5.72 l/s for the 1 in 100 years return period for the proposed drainage catchment area of 4,297m².
- 8.4.8. Although the criterion to attenuate brownfield areas for the Berol Yard site (as applied within the 2017 WSP FRA and consented in subsequent planning conditions discharges) was to restrict the runoff to three times the greenfield runoff rate, the planning policies have change since then. For the purpose of this Outline Drainage Strategy, and for simplicity in the flow control design, the runoff flow rate is to be restricted to the greenfield runoff rate for the 1 in 100 years return period, being in this case **5.7l/s**.

Potential attenuation volumes

- 8.4.9. As shown in **Appendix D.3**, using The Microdrainage Source Control tool Quick Storage Estimate, in **Appendix D.2**, the required attenuation to restrict the water flow to 17.l/s for the critical event of 1 in 100 years return period plus climate change is **395m³**.
- 8.4.10. The main means of attenuation proposed in this drainage strategy are as follows:
 - Blue roofs: placing them beneath the green roof of the podium garden, with up to 100 mm depth of attenuation, but being only useful 92mm for the critical storm, as it can be seen in **Appendix D.2** when calculating storage required per area unit: $918\text{m}^3/1\text{ha} = 0.092\text{m} = 92\text{mm}$.
 - Tree pits and surrounding geocellular storage, with limited use due to the small areas provided for that and the site constraints
 - Main geocellular storage tank, beneath Berol Square, comprising most of the attenuation volume
- 8.4.11. Potential storage volumes as modelled by software analysis are outlined in Table 8-1.

Table 8-2 – Potential Attenuation Volumes

SuDS Feature	Depth (m)	Area (m ²)	Modelled Attenuation Volume Required for 1:100yr+40% CC (m ³)
Blue Roof (Podium Garden)	0.092*	417	38
Geocellular Storage + Tree Pits	0.4	130	48
Main Geocellular Storage	1.0	344	309
Total			395

*Effective attenuation depth for the 1 in 100 years +CC critical storm

Level Constraints

- 8.4.12. The proposed surface drainage system discharges to an existing shallow Ø229mm Thames Water surface sewer with an estimated invert level at the point of connection of 7.55m AOD using a Ø150mm pipe. The minimum level of an attenuation storage for a gravity system will be higher than that for two reasons:
- Soffit to soffit Connection: 79mm higher
 - Minimum gradient of 1:100 for self-cleansing conditions for a Ø150mm pipe. For an estimated length of 20m, this will be 200mm
- 8.4.13. Therefore, the minimum bed level for a geocellular storage for a gravity system will **be 7.829m AOD**.
- 8.4.14. As it can be seen in **Appendix B.1**, the minimum proposed ground level where the geocellular storage is proposed is 8.400m AOD
- 8.4.15. Being an area that can be occasionally trafficked by emergency vehicles, the assumed depths for the pavement construction will be as follows from top to bottom:
- Modular block paving: 80mm
 - Laying course: 30mm
 - Asphalt base course: 100mm
 - Reinforced slab for trafficked areas: 250mm
 - Gravel course over geocellular storage: 100mm
- 8.4.16. This means a total depth of 560mm that subtracted to the minimum cover level of 8.400m AOD results in a maximum geocellular storage level **7.840m AOD**, leaving only 11mm of depth for attenuation. **Therefore, attenuation by gravity is not possible in the paved areas and there is no other option than a pumped system.**
- 8.4.17. Assuming a minimum cover depth for a lightly traffic area of 0.9m, a minimum finished ground level of +8.400m AOD and a geocellular storage average depth of 1.0m, the invert level of the main geocellular storage to the flow control device and to the pump will be +6.300m AOD, requiring to pump it to more than +7.648m AOD.

8.5. WATER QUALITY

- 8.5.1. Additionally, the sustainable drainage systems must take consider the pollution hazard level depending on the land use, as is stated in Table 26.2 of the C753 CIRIA SuDS Manual.
- 8.5.2. This assessment focuses on the both the source and likelihood of pollution generation but also the sensitivity of the receptor.
- 8.5.3. Surface water generated from the Site can be categorised based on its pollution hazard potential as follows, using the abovementioned table:
- Very Low Risk – Residential Roofs
 - Low Risk – Pedestrian Areas, Access Roads, Residential Car Parks
- 8.5.4. The system has been designed with the following pollution mitigation routes:
- All the roof drainage, consisting or not on green roofs and/or blue roofs (Berol house, Berol Yard building) will be collected by main carrier drains to the tree pits which form a bio retention system.
 - The hard standing areas runoff will be collected by linear drains, connected to the tree pits
 - The tree pits are surrounded and connected to geocellular storage, finally connected to the main geocellular storage beneath Berol Square.
 - The tree pits will have depth enough to place an overflow pipe connector pipe that will discharge directly to the surrounding geocellular storage, bypassing the treatment train for highest rainfall intensities in the most extreme storms, where the pollution hazard indices are likely to be very low
- 8.5.5. **Table 8-3** outlines the assessment for **The Berol Quarter**

Table 8-3 – Assessment of pollution hazard

Pollution Hazard Indices				
Land Use	Pollution Hazard Level	TSS	Metals	Hydro-carbons
Residential Roofs	Very Low	0.20	0.20	0.05
Pedestrian Areas, Access Roads, Residential Car Parks	Low	0.50	0.40	0.40

Taken from Table 26.2 of CIRIA SuDS Manual

- 8.5.6. Looking at the table above, as stated before, it makes sense to have two independent drainage circuits, which will have critical pollution routes, as stated in **Tables 8-3** and **8-4** below.
- 8.5.7. These pollution hazard risks cannot be eliminated, but they can be mitigated by using Sustainable Drainage Systems (SuDS), being one of their main functions. The degree of pollution mitigation of each SuDS feature is different, as indicated in Table 26.3 of the C753 CIRIA SuDS Manual, and, using them appropriately within the drainage network, they can act effectively against these risks (refer to Table 8-5).

Table 8-4 – Minimum SuDS Route Requirement for Residential Roofs Pollution Mitigation

SuDS Pollution Mitigation Indices				
SuDS Type		TSS	Metals	Hydro-carbons
Tree Pits (Bioretention System)	100% effectiveness	0.80	0.80	0.80
Total SuDS Mitigation Index		0.80	0.80	0.80
Outcome				
Overall Mitigation Index		+0.60	+0.60	+0.85
Pollution Mitigation Result		Pass	Pass	Pass

Taken from Table 26.3 of CIRIA SuDS Manual

Table 8-5 – Minimum SuDS Route Requirement for Pedestrian Areas, Access Roads and Residential Car Parks

SuDS Pollution Mitigation Indices				
SuDS Type		TSS	Metals	Hydro-carbons
Tree Pits (Bioretention System)	100% effectiveness	0.80	0.80	0.80
Total SuDS Mitigation Index		0.80	0.80	0.80
Outcome				
Overall Mitigation Index		+0.30	+0.40	+0.40
Pollution Mitigation Result		Pass	Pass	Pass

Taken from Table 26.3 of CIRIA SuDS Manual

- 8.5.8. As shown by the assessment, the proposed drainage system mitigates the pollution hazards effectively.
- 8.5.9. Furthermore, there is another SuDS not mentioned above, the use of extensive green roofs, as shown in the Architect's layout drawing in **Appendix B.2**.

8.6. OVERLAND FLOW AND EXCEEDANCE

- 8.6.1. Looking at Figures 5-3 and 5-4 above in this document, although there is a risk of having flood from surface water within the Site, that risk is low, being only small areas to be shallowly flooded on the existing terrain on Site. Those areas are likely to be the previous or existing lowest areas, as it can be counterchecked in the topographical survey in **Appendix A.1**. The main overland flows follow the surrounding streets layout.
- 8.6.2. As it is shown in the Proposed Drainage Strategy Layout drawing, in **Appendix D.4**, the drainage system for the external paved areas has been designed.
- 8.6.3. As the proposed drainage system has been designed such that rainfall events up to and including the 1 in 100 year event plus 40% for climate change will be attenuated and accommodated within the volume provided by SuDS features, it is possible that larger storm events could result in localised flooding. The Proposed Development external terrain levels, are similar to the existing levels, having the lower areas of the site in the car parking and Site access. Therefore, as shown in the flow exceedance routes in the proposed drainage layout drawing in **Appendix D.4**, all this water will be conveyed to these points, being collected by linear drains .

8.7. DRAINAGE MAINTENANCE AND MANAGEMENT STRATEGY

- 8.7.1. The attenuation shall be maintained as per **Tables 8-5** and **8-6** below from the CIRIA 753 SuDS manual Chapters 12, 18, 19 and 20. All the surface water drainage will be owned and maintained by a Private Maintenance Company.

Table 8-6 – Maintenance Requirements for Green Roofs

TABLE 12.5	Operation and maintenance requirements for green roofs		
	Maintenance schedule	Required action	Typical frequency
	Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
		Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
		Inspect underside of roof for evidence of leakage	Annually and after severe storms
	Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
		During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
		Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
	Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table 8-7 – Maintenance Requirements for Bioretention Systems (Tree pits with bioretention)

TABLE 18.3 Operation and maintenance requirements for bioretention systems		
Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Table 8-8 – Maintenance Requirements for Trees (Tree pits with bioretention)

TABLE 19.3 Operation and maintenance requirements for trees (after CRWA, 2009)		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Table 8-9 – Maintenance Requirements for Geocellular Storage

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

9. OFFSITE EFFECTS

9.1. INTRODUCTION

- 9.1.1. The outline surface water drainage strategy demonstrates that the drainage network at the Site is designed to accommodate runoff during all events up to and including the 100 year plus 40% climate change allowance and therefore prevents potential exceedance flows off-site, refer to **Appendix D.4** for the exceedance flow routes plan and **Appendix D.3** for the calculations using Microdrainage Source Control.

9.2. PUBLIC DRAINAGE NETWORK

- 9.2.1. Thames Water has answered to the submitted Pre-Development enquiry that written approval is required from the Lead Local Flood Authority (LLFA) (LBH), stating that the hierarchy of disposal methods for surface water has been followed, before Thames Water can consider the surface Water needs of the Proposed Development.

9.3. FLUVIAL AND TIDAL EFFECT

- 9.3.1. Although we do not have information about where the existing surface drainage system is collected to, on the part of the site that the area that has not been redeveloped, we can conclude that the Proposed Development is highly likely to significantly reduce the surface water runoff, attenuating the water flows to the existing Thames Water surface water sewer, and collecting any runoff out of the site. Therefore, it means an improvement in fluvial flooding.

10. RESIDUAL FLOOD RISK

- 10.1.1. As stated in chapter 5, when assessing the sources of flood risk, the vast majority of them were evaluated as low, only being negligible the tidal origin. As discussed in the previous sections, the proposed design solutions detailed in the ODS minimise any residual risk linked to potential extreme rainfall events and source flooding.
- 10.1.2. The ODS demonstrates that the drainage network at the Site is designed to accommodate runoff during all events up to and including the 100 year plus a climate change allowance preventing potential exceedance flows off-site. Drainage exceedance routes have also been considered and allowed for as part of the development of parameters to ensure that any surface water runoff exceeding the drainage network capacity would naturally be retained within the Site Boundary. Refer to **Appendix D.4** for exceedance flow routes.
- 10.1.3. Berol House will keep the same ground floor finished floor level, +8.600m AOD, slightly higher than land surrounding the Site, providing a threshold or the less vulnerable usage of 50mm above the maximum modelled 0.1% annual probability fluvial event, 1 in 1000 year return period fluvial flood water level modelled in the area (8.55m AOD), as stated in the 2017 WSP FRA.
- 10.1.4. The building proposed on 2 Berol Yard will have a ground floor finished floor level (FFL) of +8.645m AOD, as shown in the Allies and Morrison LLP Ground Floor Plan General Arrangement drawing shown in **Appendix B.3**, slightly higher than the FFL proposed for the Berol House ground floor.
- 10.1.5. The Proposed Development will not have a negative impact on floodplain storage capacity irrespective of the size; this is because the site is not located within an active floodplain.
- 10.1.6. In order to mitigate any residual risk, no residential accommodation is proposed lower than the second floor; apartments would act as safe refuge for the residents.
- 10.1.7. The surface water drainage strategy allows for the impact of climate change.
- 10.1.8. A Flood Warning and Evacuation Plan will be produced before residential occupancy ensuring appropriate emergency procedures are in place for the residential element of the scheme further reducing the vulnerability of the occupants.
- 10.1.9. The surface water drainage design ensures that there is a significant reduction in water flows. Surface water runoff is discharged to the Thames Water surface sewer beneath Ashley Road to the west, which represent a significant improvement over the existing situation.

11. FOUL WATER STRATEGY

11.1. EXISTING DRAINAGE NETWORKS

- 11.1.1. As stated above, and as shown in **Appendix A.3**, the site has existing Thames Water foul water sewers crossing or close to the eastern edge of the Site, and there are combined foul water sewers running southwards beneath Ashley Road.
- 11.1.2. Apart from that, as it is shown in **Appendix A.4**, there is a previous foul water drainage network from the previous site use, connected to the southeastern edge, where there is a Ø300mm foul water sewer running southwards, recently diverted close and parallel to the eastern edge of the Site, that collects downstream another Ø300mm. Downstream, the sewer turns right and left, becoming a Ø600mm brick sewer, point where it collects an important part of the existing or previous Site foul drainage.

11.2. PROPOSED POINT OF DISCHARGE

- 11.2.1. Following the foul water drainage hierarchy and the previous foul drainage strategy explained in the 2017 WSP FRA and the subsequent discharge of conditions strategies, the proposed point of connection for the proposed residential building at 2 Berol Yard will be the sewer running east of the Site, connecting at two points:
- North of TW MH 4603, from the proposed car parking bays access, out of the Site
 - Downstream of TW MH 4603, as a secondary connection for a smaller part of the building drainage
- 11.2.2. For Berol House, the existing foul water drainage connections will be reused.

11.3. IMPACT OF THE PROPOSED DEVELOPMENT ON THE EXISTING DRAINAGE INFRASTRUCTURE

- 11.3.1. Looking at the existing foul drainage infrastructure in **Appendices A.3 and A.4**, the proposed 2 Berol Yard building foundations would clash with the TW FW sewer in the southeastern corner, being necessary in that case a further S185 Application to divert the sewer again, as noted in the Thames Water Pre-Planning Enquiry response letter in Appendix C.1
- 11.3.2. In addition to that, the proposed Berol House and mainly 2 Berol Yard buildings will increase significantly the foul loads of the network, comparing it with the current land use. Consequently Thames Water must be consulted before.

11.4. PUBLIC DRAINAGE NETWORK

- 11.4.1. Thames Water has responded to the Pre-Development enquiry for the Proposed Development confirming sufficient capacity at the proposed points of connection, as shown in **Appendix C.1**.

11.5. FOUL WATER DRAINAGE MAINTENANCE AND OPERATION

- 11.5.1. All the foul and surface water drainage will be owned and maintained by a Private Maintenance Company.

12. CONCLUSIONS

- 12.1.1. This FRA and ODS has been prepared on behalf of Berol Quarter Limited to support the full planning permission for the refurbishment and extension of Berol House to include Use Class E floorspace and the redevelopment of 2 Berol Yard to provide new residential homes, Use Class E floorspace and associated landscaping, public realm improvements, car and cycle parking and other associated works.
- 12.1.2. The Site is half an hectare in size (and is wholly located within Flood Zone 2. Land in Flood Zone 2 has a less than 0.1% and 1% annual probability of river flooding.
- 12.1.3. The flood risk to the Proposed Development from coastal and tidal, fluvial, groundwater, sewers & drainage and artificial sources is negligible or low.
- 12.1.4. Consequently, no mitigation measures are considered necessary to safeguard the Proposed Development and its occupants from these flood sources over the development lifetime.
- 12.1.5. In order to minimise the risk of flooding attributable to the Proposed Development, a surface water drainage strategy is proposed which includes SuDS to provide runoff pollution mitigation and/or attenuation, such as green and blue roofs, tree pits as a bioretention system and geocellular storage. The surface water is attenuated to the 1 in 100 years greenfield runoff rate, before discharging it to an existing Thames Water surface water sewer beneath Ashley Road. Thames Water has been consulted, requiring the LLFA approving that the surface drainage disposal hierarchy has been followed, before considering any surface water needs.
- 12.1.6. A foul water drainage strategy is provided to collect the flows form the Proposed Development to the existing Thames Water drainage infrastructure, having Thames Water confirmed capacity.
- 12.1.7. Therefore, the FRA and ODS approach is acceptable in line with the current policies and it can be concluded that there are no flood risk, surface or foul water drainage grounds on which to refuse this application.

Appendix A

EXISTING SITE PLANS



Appendix A.1

SITE LOCATION PLAN





DO NOT SCALE

P01					
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: S0 - WORK IN PROGRESS



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T+ 44 (0) 1256 318 800, F+ 44 (0) 1256 318 700
wsp.com

CLIENT: BERKELEY SQUARE DEVELOPMENTS

ARCHITECT: JOHN McASLAN+PARTNERS

SITE/PROJECT: BEROL QUARTER

TITLE: LOCATION PLAN

SCALE @ A1:	1:1000	CHECKED:	KM	APPROVED:	JO
PROJECT NO:	70094918	DESIGNED:	APG	DRAWN:	AW
				DATE:	October 22

DRAWING No:	LOCATION PLAN_221025	REV:	P01
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File name: \\UK.WSPGROUP.COM\CENTRAL\DATA\PROJECTS\70094918\DRAWINGS\LOCATION PLAN_221025.DWG, printed on 25 October 2022 12:24, by Newbold, Olivia

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Appendix A.2

TOPOGRAPHICAL SURVEY





Topographical Surveys

Trees are drawn to scale showing the average canopy spread.
Descriptions and heights should be used as a guide only.
All critical dimensions and connections should be checked and verified prior to starting work.
Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Apex Engineering Services immediately.

The accuracy of the digital data is commensurate with the RICS standards. All dimensions are in meters unless otherwise stated. All pipe diameters are in millimeters.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use. A true OSG83 coordinate has been established near to the site center via a transformation using the OSG83 & OSG85 transformation models. The survey has been conducted to this point and a further one or more OSG83 points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

The indicated contour lines are with a spacing of 1m and 0.1m for intermediate contour lines.

The background information has been taken from drawing "F01, ASHLEY ROAD, SITE SURVEY", received on 16.05.2022 and indicated in grey.

This survey was carried out on 07/06/2022 using a Leica Totalstation 1200 Series, and a Leica GNSS/GPS.

© Apex Engineering Services holds the copyright to all the information contained within this document and their written consent must be obtained before copying or using the data other than for the purpose it was originally supplied.

Do not scale from this drawing.

Legend:

- ACDm(centre)
- Building (Lines)
- BrickPaving
- CATV
- Concr BaseTop
- Concrete Edge
- Control Line
- Cable
- DishChannel-CL
- Drop And
- FlowerBed
- Fence
- Footpath
- GAS Low
- GAS High
- Handrail
- Kerb(Top-Back)
- Kerb(Bottom-Front)
- PavingSlabs
- RAMP
- Road Line
- Stl Furniture
- Signage/Boards
- Steps
- Timber Beam
- Tactile Pav
- Vent
- Window
- Wall
- Wheel Stop
- CATV cover
- ControlsRETROS
- Door Double
- Door
- Earth Rod
- Gate
- Gully
- Gas Valve
- Kerb Cheese
- Tree
- Water Valve
- Bollard
- BOX
- BT Cover
- CABIN
- CATV Cover
- CCTV Cover
- Down Pipe
- Empty Duct
- Electric Cvt
- Elect Box
- Flower Bed
- Flower Bed
- F-Hydrant
- Gully
- Gully
- Inspect Cover
- Intercom Post
- Lamp Post
- POLE
- Street Furniture
- Spotlight

Survey Control Stations				
Point ID	Easting	Northing	Height	Description
AES1	534510.172	189652.354	8.255	P.P. Nail
AES2	534418.407	189658.944	8.272	P.P. Nail
AES3	534465.401	189658.333	8.279	P.P. Nail
AES4	534474.152	189658.498	8.303	P.P. Nail
AES5	534488.461	189738.309	8.281	P.P. Nail
R1	534527.752	189654.180	11.128	Ref Target
R2	534405.894	189667.228	18.080	Ref Target
R3	534411.304	189692.552	10.352	Ref Target
R4	534407.751	189703.014	11.871	Ref Target
R5	534428.151	189731.894	10.597	Ref Target
R6	534439.894	189732.703	10.696	Ref Target
R7	534509.184	189636.766	10.394	Ref Target
R8	534557.868	189646.040	11.106	Ref Target
R9	534572.398	189650.935	10.875	Ref Target
R10	534460.583	189640.768	10.555	Ref Target
R11	534460.248	189740.334	16.353	Ref Target
R12	534449.248	189661.853	11.180	Ref Target
R13	534478.707	189658.854	10.756	Ref Target
R14	534488.551	189692.933	10.527	Ref Target
R15	534400.447	189658.953	10.470	Ref Target
R16	534425.503	189703.323	11.744	Ref Target
R17	534461.512	189745.071	10.713	Ref Target

REV	DATE	DESCRIPTION
0	07.06.2022	Original issue



F07 Waterfront Studios
1 Bank Road
London
E14 4AP
Tel: 02070 161555 Fax: 02070 084025

CLIENT
Berkeley Square Developments

PROJECT
**Berol House
Ashley Rd
London N17 9LJ**

TITLE
Topographical Survey

SCALE: DATE SURVEYED DRAWN QA REF
1:200@A0 07.06.2022 KR/DH LK KR

Level datum
Grid orientation
**O.D.N. (Datum Newlyn)
O.S. GB36 (15)**

Job number
Drawing No.
**13243
13243-TOPO-001**

Rev.
0

Comments
This plan should only be used for its original purpose.
Apex Engineering Services accepts no responsibility for this plan if supplied to any party other than the original client.
All dimensions should be checked on site prior to design and construction.
The survey control listed is only to be used for its original purpose.
All control must be checked against the primary control points and verified prior to use.
Apex Engineering Services holds the copyright to all the information contained within this document and their written consent must be obtained before copying or using the data other than for the purpose it was originally supplied.

DO NOT SCALE

Appendix A.3

THAMES WATER RECORDS



Asset location search



Property Searches

WSP UK Ltd
Grosvenor House
2 Grosvenor Square
SOUTHAMPTON
SO15 2BE

Search address supplied Ben Tv
Berol House
25
Ashley Road
London
N17 9LJ

Your reference Tottenham

Our reference ALS/ALS/24/2022_4734901

Search date 14 October 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Search address supplied: Ben Tv, Berol House, 25, Ashley Road, London, N17 9LJ

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.



For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

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

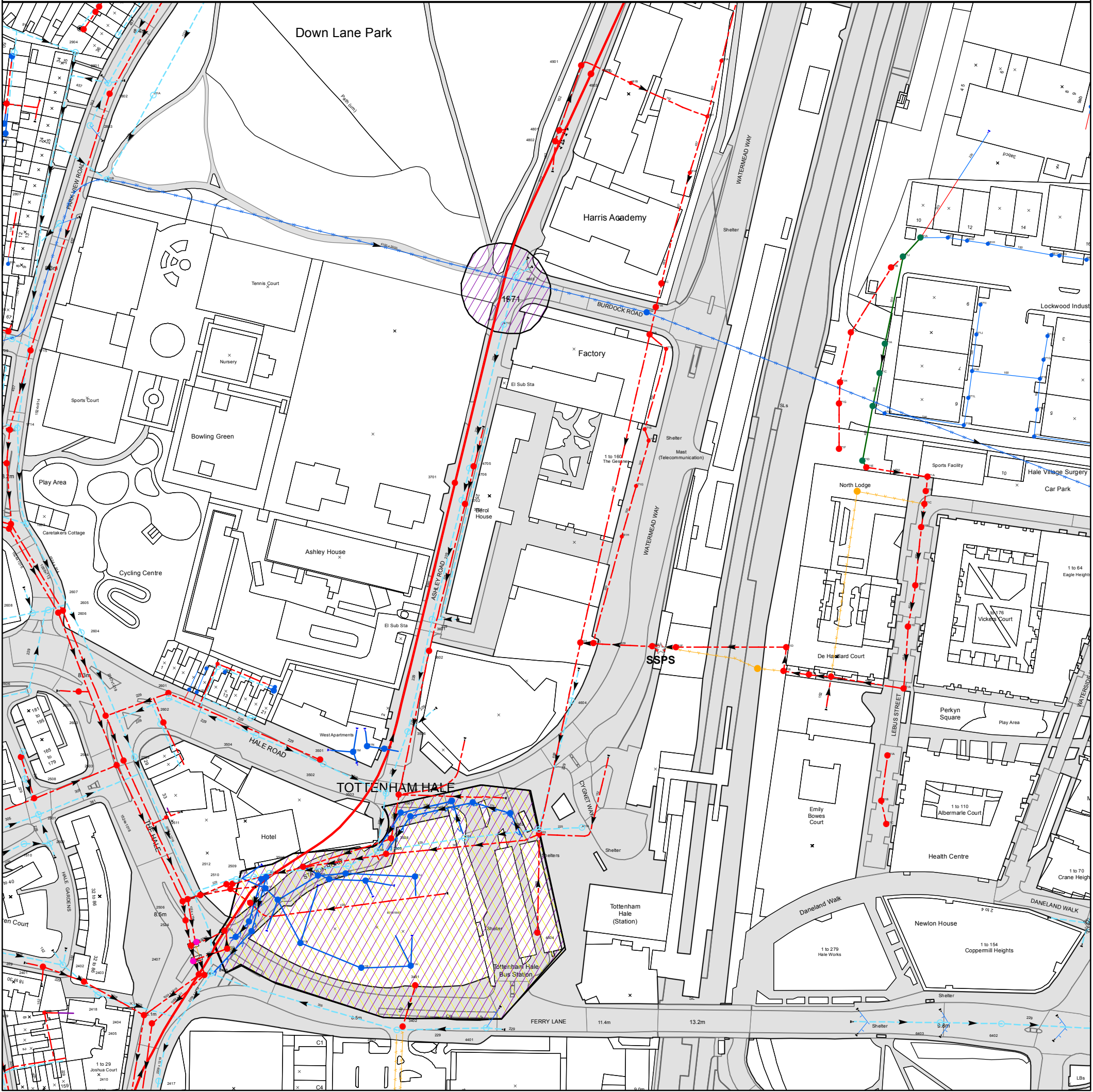
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

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



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 before any works are undertaken. Crown copyright Reserved

Scale: 1:1791
Width: 500m
Printed By: Skrishna1
Print Date: 14/10/2022
Map Centre: 534436,189684
Grid Reference: TQ3489NW

Comments:

ALS/ALS/24/2022_4734901

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
2417	8	6.25
2418	8.14	6.92
2405	7.82	5.22
2406	8.06	5.23
2407	8.03	5.12
241D		
19VT		
29XW		
3505	8.28	5.92
2502	8.15	7.52
1606	8.18	7.17
2604	8.17	6.45
26XS		
26YQ		
3509	8.21	6.98
2503	8.22	5.32
3701	8.67	-0.23
18TT		
1601	8.1	5.32
2505	8.2	6.47
1514	8.41	7.56
3502	8.22	7.36
4501	8.48	7.45
4504		
6402	8.52	
3506	8.4	7.45
4801	8.52	7.82
6403	9.41	
2401	7.87	6.81
18TQ		
2603	8.27	5.44
4901	8.46	7.52
1714	8.14	6.55
2806	8.22	7.27
2802	8.29	6
2508	8.31	6.15
3702	8.77	7.82
2510	8.08	5.87
4604	8.31	7.66
2602	8.34	7.02
2506	8.24	5.23
3703	8.69	7.17
36YX		
2807	9.03	6.67
29XX		
2402	7.8	7.03
4706	8.6	7.95
4705	8.61	7.24
3512	7.97	6.98
3514	7.82	6.54
29XY		
1713	8.13	5.69
3510	8.04	5.72
2803	8.29	7.54
461B		
681J		
571C		
241B		
671F		
671J		
671L		
661B		
661D		
671E		
181A		
571B		
561B		
561D		
671A		
671C		
281B	8.56	5.66
671H		
481A		
261A		
26XP		
241C	8.33	3.42
481B		
571H		
571F		
261B		
681B		

REFERENCE	COVER LEVEL	INVERT LEVEL
2513	8.14	0.1
2523	7.73	4.91
2404	7.76	5.12
2408	8.08	6.29
251A		
3403	8.65	7.04
1709	8.34	6.98
3503	8.19	7.2
1602	8.11	5.42
1603	8.15	6.55
1715	8.23	6.39
4803	8.67	8.01
26YS		
3401		
4401	9.17	7.66
29WW		
1719	8.14	5.66
1708	8.34	6.98
2607	8.21	7.01
1512	8.43	6.58
1510	8.26	7.58
4902	8.35	-1.22
1513	8.37	7.7
4503	8.7	6.31
4903	8.35	-1.22
4802	8.52	7.88
3602	8.5	6.91
2501	8.32	7.41
18TW		
3402	8.73	7.06
3501	8.23	6.98
19VR		
2606	8.28	5.46
2801	8.32	7.08
2511	8.28	6
2504	8.16	5.42
2904	9.03	6.9
2509	8.07	5.65
2601	8.32	6.38
36ZP		
2512	8.09	6.58
4502	8.94	7.84
2609	8.26	6.11
3508	8.22	6.34
3513	8.23	7.08
2605	8.28	5.43
2515	8.05	6.5
2608	8.12	7.05
3504	8.31	7.46
2403	8.22	6.64
2524		
3507	8.22	6.46
3511	8.04	
3601	8.64	7.55
571D		
571A		
571J		
581B		
671I		
671K		
671M		
661C		
671D		
5601		
281A		
561A		
661A		
571E		
671B		
4702		
671G		
5801	8.55	6.57
481C		
36ZR		
2507	8.23	5.38
591A		
461F		
571I		
571G		
681A		
681C		

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 before any works are undertaken. Crown copyright Reserved

ALS/ALS/24/2022_4734901

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
681D		
681G		
4603	8.32	6.3
471B		
261C		
551A		
551C		
471D		
341B		
351C		
351G		
351I		
351K		
351M		
351O		
471F		
461H		

REFERENCE	COVER LEVEL	INVERT LEVEL
681I		
681H		
471A		
471C		
451A	108.95	108.096
551B		
261D		
341A		
351A		
351F		
351H		
351J		
251D	8.35	5.48
351N		
461G		
471G		
471E		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Meter
	Dam Chase
	Vent
	Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary
	Drop Pipe
	Control Valve
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet
	Outfall
	Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator
	Public / Private Pumping Station
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

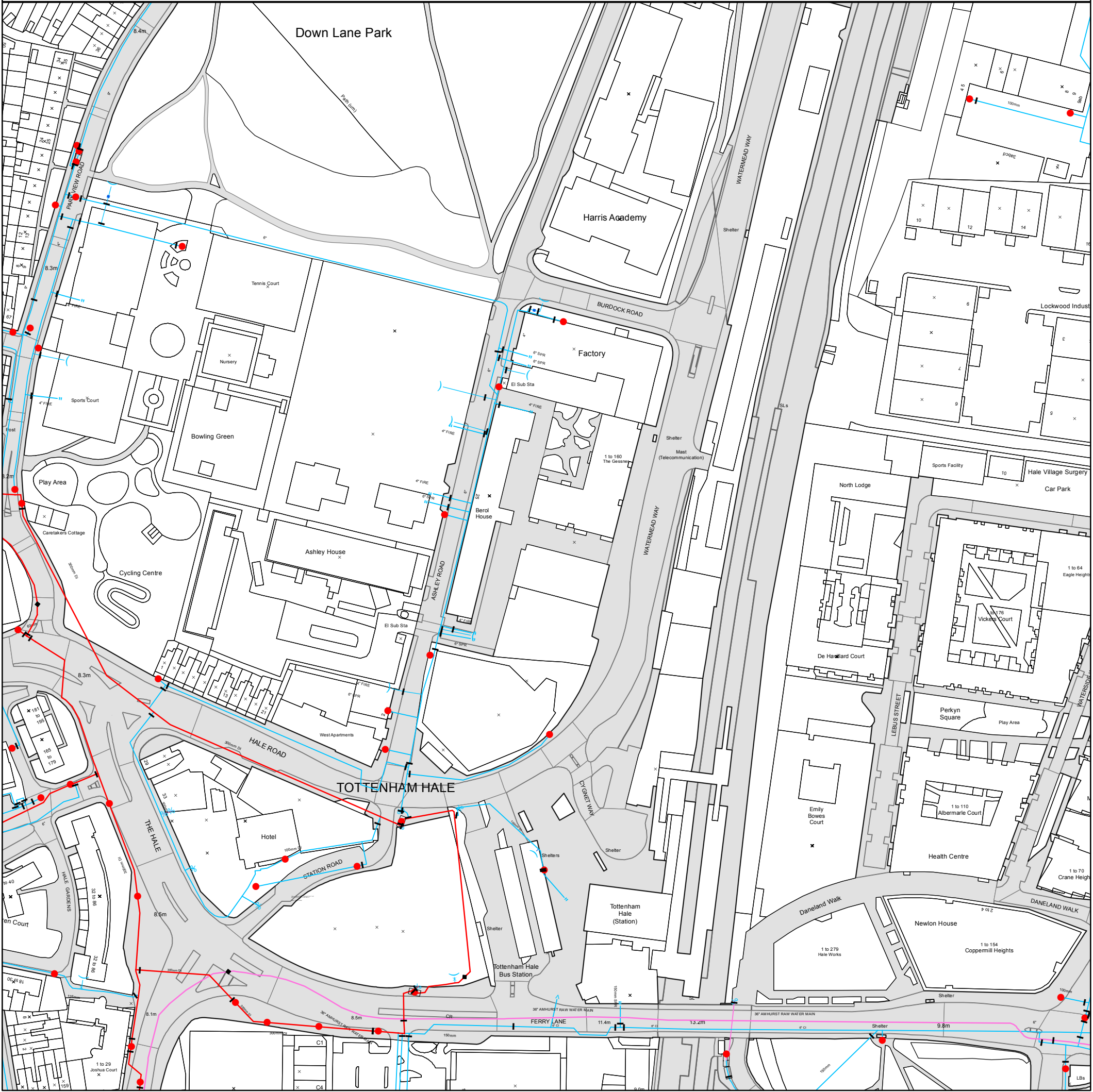
Ducts or Crossings

	Casement
	Conduit Bridge
	Subway
	Tunnel

Ducts may contain high voltage cables. Please check with Thames Water.

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.



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 before any works are undertaken. Crown copyright Reserved

Scale: 1:1791
Width: 500m
Printed By: Skrishna1
Print Date: 14/10/2022
Map Centre: 534436,189684
Grid Reference: TQ3489NW

Comments:



Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

-  **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
-  **Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
-  **Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
-  **Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
-  **Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
-  **Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
-  **Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

-  General Purpose Valve
-  Air Valve
-  Pressure Control Valve
-  Customer Valve

Hydrants

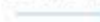
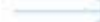
-  Single Hydrant

Meters

-  Meter

End Items

Symbol indicating what happens at the end of a water main.

-  Blank Flange
-  Capped End
-  Emptying Pit
-  Undefined End
-  Manifold
-  Customer Supply
-  Fire Supply

Operational Sites

-  Booster Station
-  Other
-  Other (Proposed)
-  Pumping Station
-  Service Reservoir
-  Shaft Inspection
-  Treatment Works
-  Unknown
-  Water Tower

Other Symbols

-  Data Logger
-  **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

-  **Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
-  **Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0800 009 4540 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

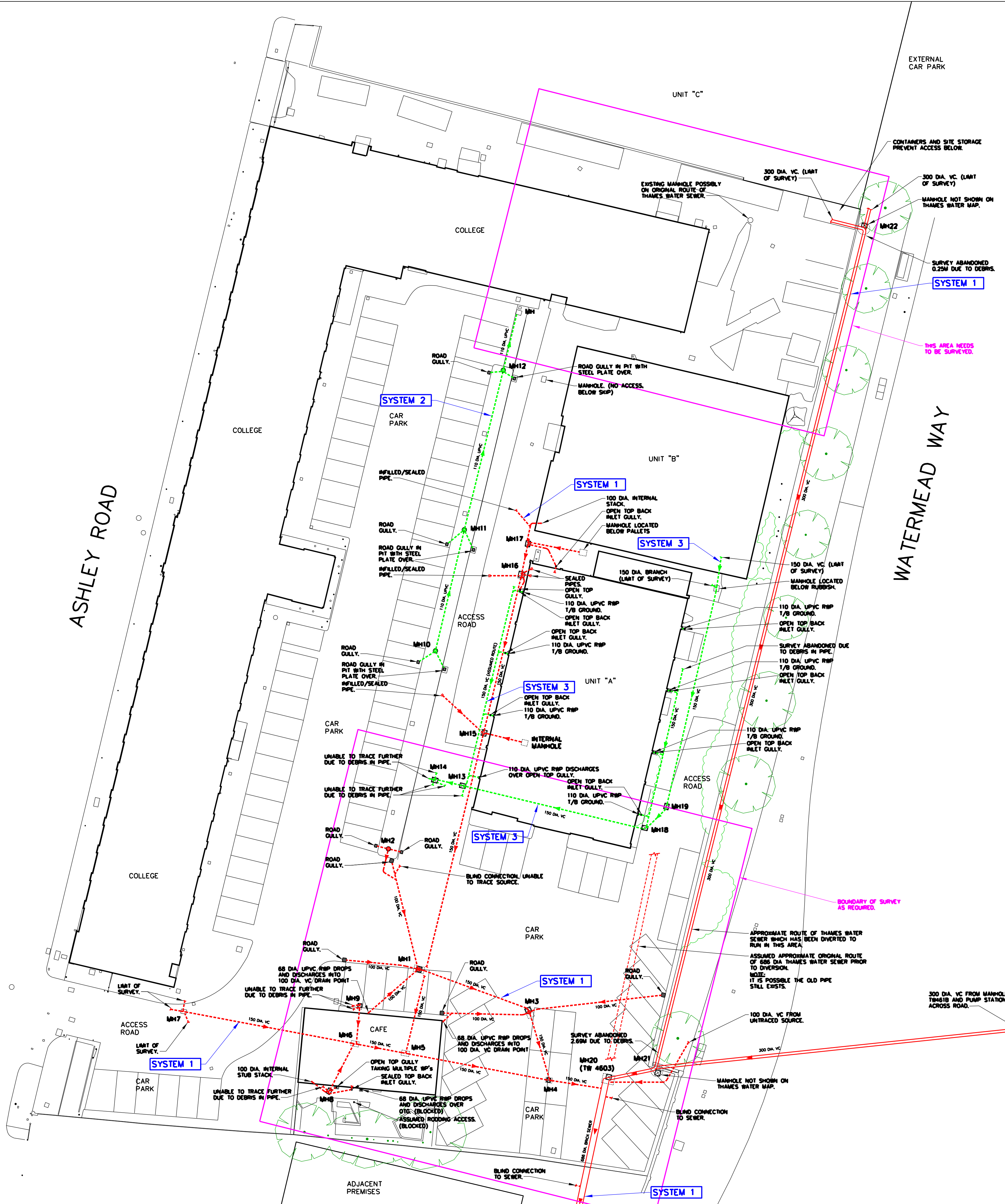
Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix A.4

DRAINAGE SURVEYS



MH1 C/S 610 + 610 C.I. SPLIT C/O 610 + 610 CH/S 1200 + 760 INLET 800 OUTLET 800 CONST BRICK RENDER COMO GOOD SEAL SINGLE NOTES DEBRIS IN CHANNEL.	MH15 C/S 675 + 525 C.I. INFILL C/O 610 + 480 CH/S 700 + 650 INLET 950 OUTLET 950 CONST BRICK RENDER COMO REASONABLE SEAL SINGLE NOTES DEBRISING FRACTURED.
MH2 C/S 500 DIA. C.I. C/O 440 DIA. CH/S 480 DIA. INLET - OUTLET 510 CONST UPVC COMO GOOD SEAL SINGLE NOTES DEBRIS IN UPPER CHANNELS.	MH16 C/S 685 + 685 C.I. C/O 610 + 610 CH/S 830 + 680 INLET 760 OUTLET 760 CONST BRICK RENDER COMO REASONABLE SEAL SINGLE NOTES DEBRISING BROKEN COVER SLOPING.
MH3 C/S 610 + 610 C.I. SPLIT C/O 610 + 610 CH/S 1200 + 760 INLET 1380 OUTLET 1380 CONST CONCRETE SECTIONS COMO GOOD SEAL SINGLE NOTES DEBRIS IN CHANNEL.	MH17 C/S 675 + 525 C.I. INFILL C/O 610 + 480 CH/S 600 + 580 INLET 750 OUTLET 760 CONST BRICK RENDER COMO REASONABLE SEAL SINGLE NOTES RENDERING CRACKED/BROKEN.
MH4 C/S 455 + 455 C.I. SPLIT C/O 450 + 450 CH/S 780 + 600 INLET 1720 OUTLET 1740 CONST CONCRETE SECTIONS COMO GOOD SEAL SINGLE NOTES RE CAP MISSING.	MH18 C/S 660 + 510 C.I. C/O 600 + 450 CH/S 800 + 500 INLET 800 OUTLET 800 CONST BRICK COMO REASONABLE SEAL SINGLE NOTES -
MH5 C/S - C/O - CH/S - INLET - OUTLET - CONST - COMO - SEAL - NOTES NO ACCESS AT TIME OF SURVEY. MANHOLE LOCATED UNDER TABLES IN CAFE.	MH19 C/S 675 + 525 C.I. INFILL C/O 610 + 480 CH/S 610 + 480 INLET 540 OUTLET 540 CONST BRICK COMO GOOD SEAL SINGLE NOTES -
MH6 C/S - C/O - CH/S - INLET - OUTLET - CONST - COMO - SEAL - NOTES NO ACCESS AT TIME OF SURVEY. MANHOLE LOCATED UNDER COUNTERS IN CAFE KITCHEN.	MH20 C/S 600 + 600 C.I. SPLIT C/O 600 + 600 CH/S 1380 + 1080 INLET 2220 OUTLET 2200 CONST BRICK RENDER COMO GOOD SEAL SINGLE NOTES -
MH7 C/S - C/O - CH/S - INLET - OUTLET - CONST - COMO - SEAL - NOTES OUT OF SURVEY AREA.	MH21 C/S 600 + 600 C.I. SPLIT C/O 600 + 600 CH/S 1400 DIA. INLET 2170 OUTLET 2210 CONST CONCRETE RING COMO GOOD SEAL SINGLE NOTES -
MH8 C/S 600 + 490 C.I. C/O 580 + 450 CH/S 580 + 450 INLET - OUTLET 660 CONST BRICK RENDER COMO POOR SEAL SINGLE NOTES DEBRIS IN CHANNELS. RENDERING CRACKED AND MISSING IN PLACES. DEBRISING CHECKED.	MH22 C/S 530 + 475 C.I. C/O 600 + 450 CH/S 1400 DIA. INLET 2280 TO DEBRIS OUTLET 2280 TO DEBRIS CONST CONCRETE RING COMO REASONABLE SEAL SINGLE NOTES -
MH9 C/S 455 + 455 C.I. SPLIT C/O 450 + 450 CH/S 660 + 480 INLET 750 OUTLET 700 CONST BRICK COMO GOOD SEAL SINGLE NOTES DEBRIS IN CHANNEL.	
MH10 C/S 500 DIA. C.I. C/O 430 DIA. CH/S 470 DIA. INLET - OUTLET 460 CONST UPVC COMO GOOD SEAL SINGLE NOTES -	
MH11 C/S 490 DIA. C.I. C/O 440 DIA. CH/S 450 DIA. INLET 700 OUTLET 710 CONST UPVC COMO GOOD SEAL SINGLE NOTES -	
MH12 C/S 490 DIA. C.I. C/O 440 DIA. CH/S 450 DIA. INLET 920 OUTLET 925 CONST UPVC COMO GOOD SEAL SINGLE NOTES -	
MH13 C/S 675 + 525 C.I. INFILL C/O 610 + 480 CH/S 680 + 600 INLET 570 TO DEBRIS OUTLET 570 TO DEBRIS CONST BRICK RENDER COMO REASONABLE SEAL SINGLE NOTES DEBRIS IN CHANNELS. COVER SLOPING.	
MH14 C/S 675 + 525 C.I. INFILL C/O 610 + 480 CH/S 720 + 630 INLET 670 OUTLET 670 CONST BRICK COMO REASONABLE SEAL SINGLE NOTES DEBRIS IN CHANNELS.	



NOTES:
1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE SPAFLOW LTD REPORT DATED NOVEMBER 2016.

LEGEND:

---	BELOW GROUND (SURFACE WATER)
---	BELOW GROUND (FOUL WATER)
---	ABOVE GROUND (SURFACE WATER)
---	ABOVE GROUND (FOUL WATER)

FH	FIRE HYDRANT	RWP	WASTE VENT PIPE
IV	ISOLATION VALVE	WVP	RAINWATER PIPE
WMT	WATER METER	SVP	SOIL VENT PIPE
GMT	GAS METER	VP	VENT PIPE
WM	WATER MAIN	G	GULLY
GM	GREASE TRAP	RG	ROAD GULLY
GT	GREASE TRAP	OTG	OPEN TOP GULLY
CBP	CABLE PIT	STG	SEALED TOP GULLY
CP	CATCHPIT	BIG	BACK INLET GULLY
MH	MANHOLE	C.I.	CAST IRON
WHB	WASH HAND BASIN	Cu	COPPER
SK	SINK	V.C.	VITRIFIED CLAY
WC	WATER CLOSET	UPVC	UNPLASTICISED POLYVINYL CHLORIDE
UR	URNAL	PF	FIBRE PITCH
RE	RODDING EYE	F.A.	FROM ABOVE
RED.	REDDUNDANT	T.A.	TO ABOVE
H/L	HIGH LEVEL	F.B.	FROM BELOW
M/L	MID LEVEL	T.B.	TO BELOW
L/L	LOW LEVEL		

REV.	DATE	DESCRIPTION	BY	APP.

SPAFLOW

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CLIENT:

**HEYNE TILLET STEEL
4 PEAR TREE COURT
LONDON
EC1R 0DS**

PROJECT:
**ASHLEY ROAD SITE
LONDON**

TITLE:
**RECORD OF TRACING, MAPPING AND
CCTV SURVEY OF DRAINAGE.**

PROJECT REF:	REV:
DRAWN: SWW	DATE: NOV 16
CHECKED: DWH	APPROVED: DWH
CLIENT DRG. No:	CAD O.A.:
MICROFILM REF:	SHEET:
	DRG. No: PH01

Appendix A.5

WSP DISCHARGE OF CONDITIONS
DRAINAGE STRATEGY

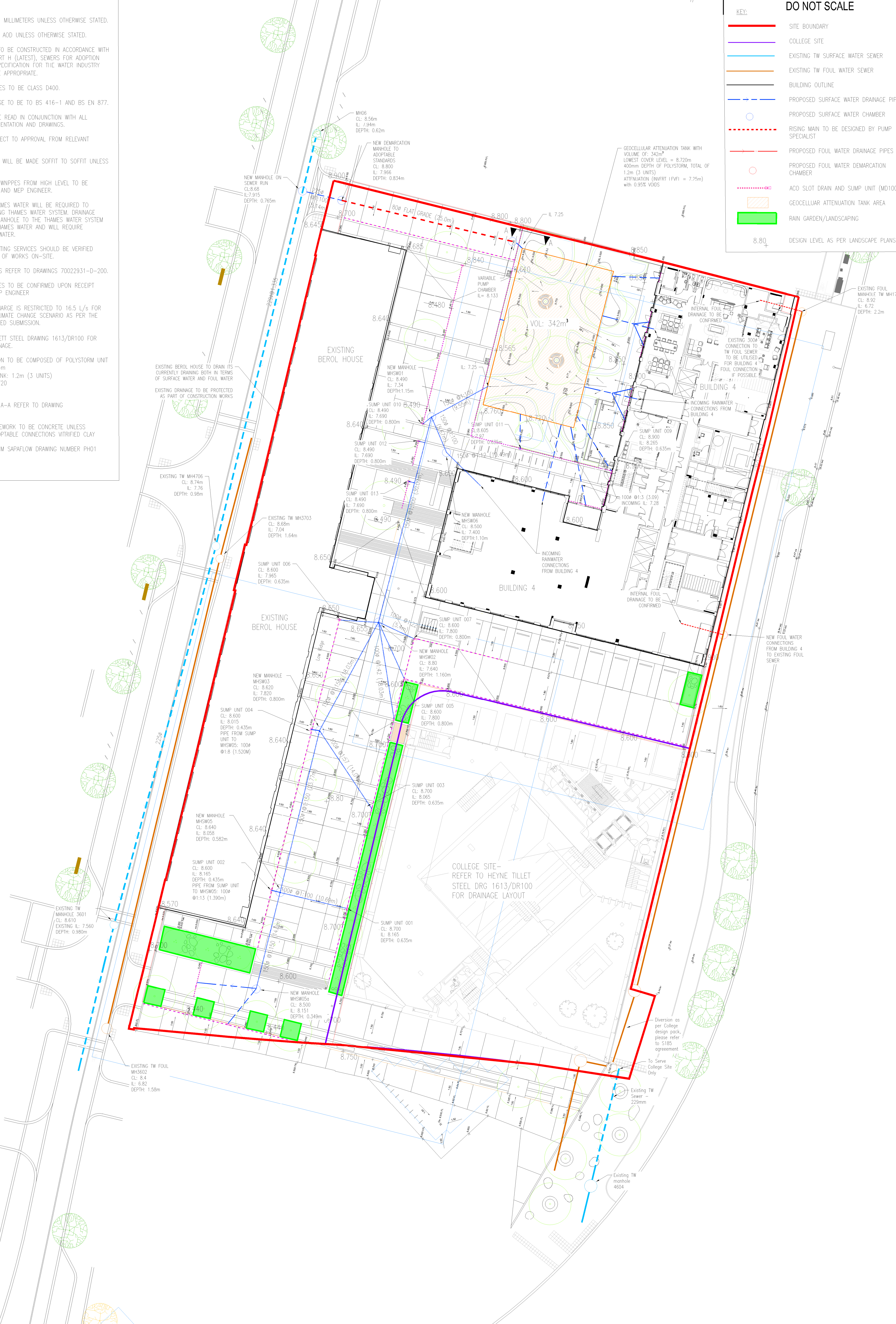


- NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
 2. LEVELS ARE IN METERS AOD UNLESS OTHERWISE STATED.
 3. ALL DRAINAGE WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS PART H (LATEST), SEWERS FOR ADOPTION AND CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (LATEST REVISIONS) WHERE APPROPRIATE.
 4. ALL COVERS AND FRAMES TO BE CLASS D400.
 5. ALL CAST IRON DRAINAGE TO BE TO BS 416-1 AND BS EN 877.
 6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT PROJECT DOCUMENTATION AND DRAWINGS.
 7. DRAINAGE LAYOUT SUBJECT TO APPROVAL FROM RELEVANT APPROVING BODIES.
 8. ALL PIPE CONNECTIONS WILL BE MADE SOFFIT TO SOFFIT UNLESS OTHERWISE SHOWN.
 9. EXACT LOCATION OF DOWNPPES FROM HIGH LEVEL TO BE CONFIRMED BY ARCHITECT AND MEP ENGINEER.
 10. PERMISSION FROM THAMES WATER WILL BE REQUIRED TO CONNECT INTO THE EXISTING THAMES WATER SYSTEM. DRAINAGE FROM THE DEMARCATION MANHOLE TO THE THAMES WATER SYSTEM WILL BE ADOPTABLE BY THAMES WATER AND WILL REQUIRE APPROVAL FROM THAMES WATER.
 11. THE POSITION OF EXISTING SERVICES SHOULD BE VERIFIED PRIOR TO COMMENCEMENT OF WORKS ON-SITE.
 12. FOR STANDARD DETAILS REFER TO DRAWINGS 70022931-D-200.
 13. FOUL WATER PIPE SIZES TO BE CONFIRMED UPON RECEIPT OF FLOW RATES FROM MEP ENGINEER
 14. SURFACE WATER DISCHARGE IS RESTRICTED TO 16.5 L/s FOR THE 1:100 YEAR +40% CLIMATE CHANGE SCENARIO AS PER THE AGREED PLANNING APPROVED SUBMISSION.
 15. REFER TO HEYNE TILLET STEEL DRAWING 1613/DR100 FOR DETAILS OF COLLEGE DRAINAGE.
 16. PERMAVOID ATTENUATION TO BE COMPOSED OF POLYSTORM UNIT CELLS- 1m x 0.5m x 0.4m
DEPTH OF ATTENUATION TANK: 1.2m (3 UNITS)
TOP OF TANK LEVEL: +8.720
VOLUME OF TANK: 342m³
 17. FOR TYPICAL SECTION A-A REFER TO DRAWING 70022931-D-200
 18. PRIVATE DRAINAGE PIPEWORK TO BE CONCRETE UNLESS SPECIFIED OTHERWISE. ADOPTABLE CONNECTIONS VITRIFIED CLAY
 19. DRAINAGE SURVEY FROM SAPAFLOW DRAWING NUMBER PH01 DATED NOVEMBER 16.

KEY:

- SITE BOUNDARY
- COLLEGE SITE
- EXISTING TW SURFACE WATER SEWER
- EXISTING TW FOUL WATER SEWER
- BUILDING OUTLINE
- PROPOSED SURFACE WATER DRAINAGE PIPES
- PROPOSED SURFACE WATER CHAMBER
- RIISING MAIN TO BE DESIGNED BY PUMP SPECIALIST
- PROPOSED FOUL WATER DRAINAGE PIPES
- PROPOSED FOUL WATER DEMARCATION CHAMBER
- ACO SLOT DRAIN AND SUMP UNIT (M0100)
- GEOCELLULAR ATTENUATION TANK AREA
- RAIN GARDEN/LANDSCAPING
- 8.80+ DESIGN LEVEL AS PER LANDSCAPE PLANS

DO NOT SCALE



D	19/08/20	GB	REVISED TO SUIT FINAL LEVELS STRATEGY	GP	GP
C	14/08/20	GB	REVISED TO SUIT NEW LEVELS STRATEGY	GP	GP
B	24/04/18	KS	SECOND ISSUE	GP	GP
REV	DATE	BY	DESCRIPTION	CHK	APP
DRAWING STATUS: S2 - FOR INFORMATION					

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CLIENT: BERKELEY SQUARE DEVELOPMENTS

ARCHITECT: JOHN MCASLAN+PARTNERS

PROJECT: ASHLEY ROAD SOUTH
BEROL YARD

TITLE: PROPOSED SURFACE AND FOUL
WATER DRAINAGE LAYOUT

SCALE @ A1: 1:250

CHECKED: KS

APPROVED: GB

PROJECT No: 70022931

DESIGNED: SL

DRAWN: SL

DATE: August 20

DRAWING No: 70022931-D-101

REV: D

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Appendix B

PROPOSED SITE PLANS



Appendix B.1

LANDSCAPE ARCHITECT'S PLAN

