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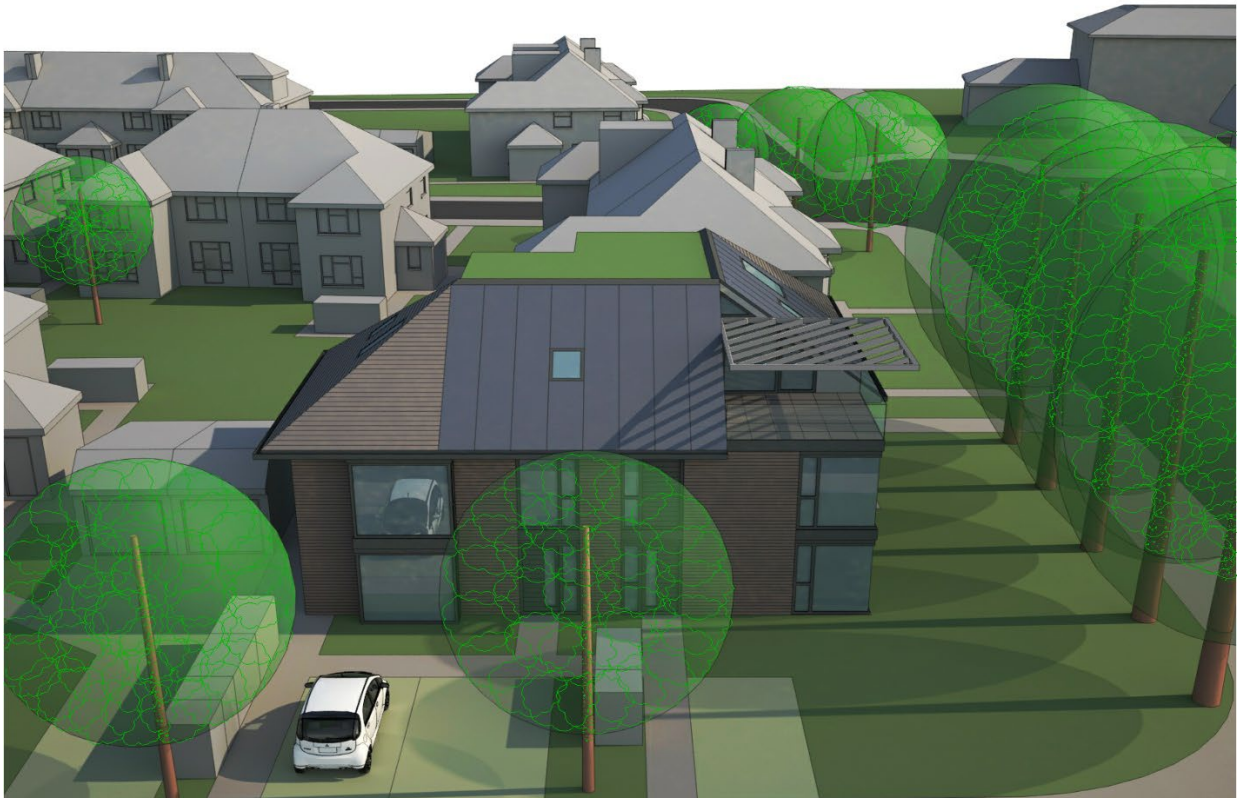

Proposed development of three maisonettes. Land at junction of Roseleigh Close and Cambridge Park, Twickenham TW1 2JT

Flood Risk, Surface Water, SuDS and Water Storage Assessments

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Job Number: **29876**

Date	Revision	Notes/Amendments/Issue Purpose
3rd December 2021	1	For Information
9th February 2022	2	For Information
28th February 2023	3	Minor amendments – issued for Information
6th March 2023	4	Minor amendments – issued for Information
21st March 2023	5	Minor amendments – issued for Information

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Appendices:

Acronyms	
AOD	Above Ordnance Datum
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
FRA	Flood Risk Assessment
LBR	London Borough of Richmond upon Thames
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
NSTS-SUDS	Non-statutory Technical Standards for SuDS
PPG	Planning Practice Guidance
SUDS	Sustainable Drainage Systems
TW	Thames Water

1 Introduction

Price & Myers have been commissioned to undertake a surface water drainage assessment for the proposed development at the site on the corner of Roseleigh Close and Cambridge Park in East Twickenham. The site falls within the jurisdiction of Richmond Upon Thames Council.

This assessment has been carried out in accordance with DEFRA's Non-statutory Technical Standards for Sustainable Drainage Systems (NSTS-SuDS), the London Plan, National Planning Policy Framework (NPPF) and the London Borough of Richmond (LBR) guidance on SuDS for new developments.

The NPPF states that an appropriate Flood Risk Assessment (FRA) will be required for all development proposals of 1 ha or greater in Flood Zone 1 and for any development within Flood Zones 2 or 3.

The Environment Agency's (EA) indicative floodplain map shows that the site is in Flood Zone 1 and the total site area is less than 1 ha, therefore an FRA is not required. This assessment will focus on available opportunities for surface water drainage from the proposed development, aiming to promote the use of Sustainable Drainage Systems (SuDS).

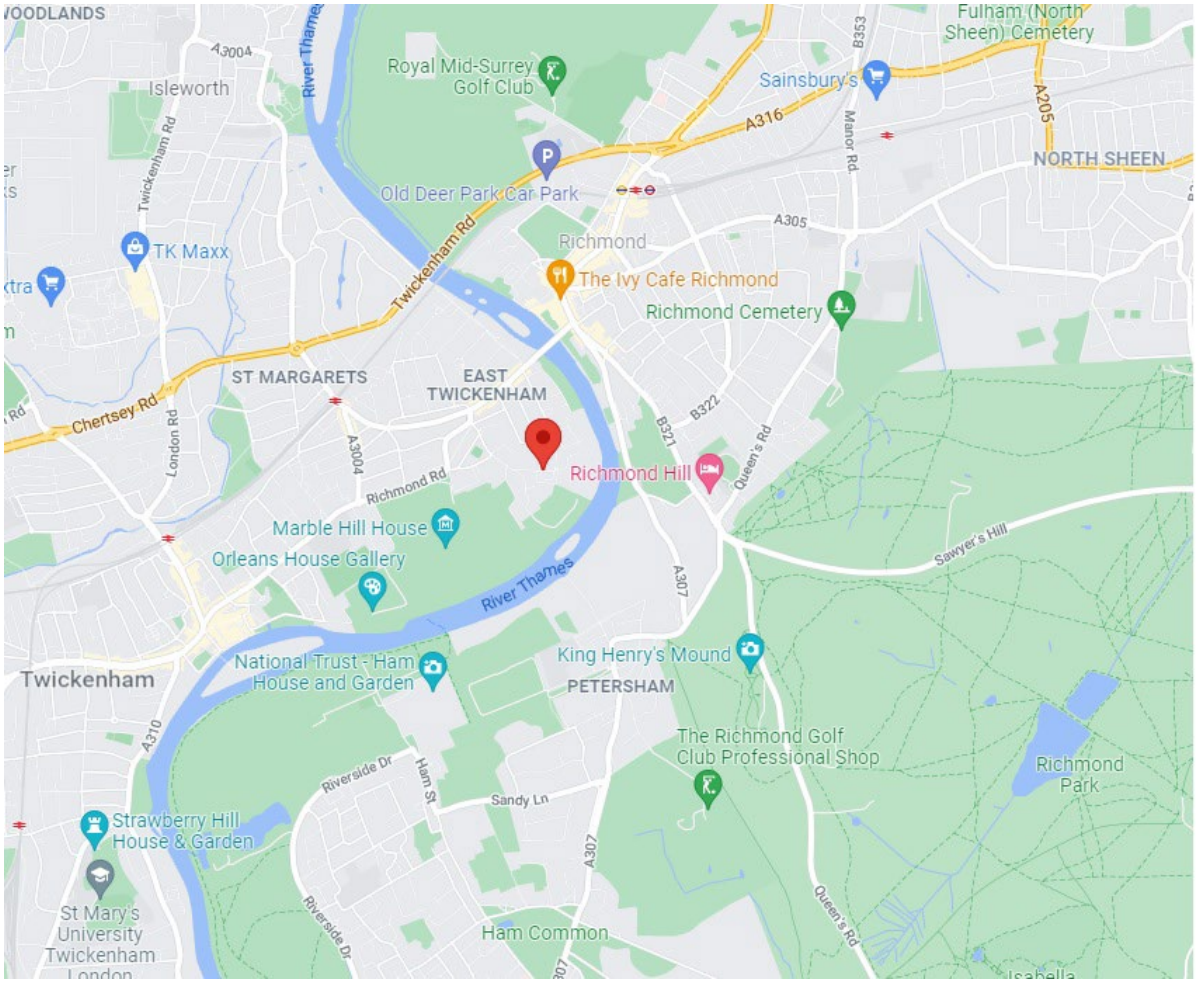


Figure 1.1: Site Location (Google 2021)

2 Site Description and Location

The site is located on the corner of Roseleigh Close and Cambridge Park in East Twickenham. It is bounded by Roseleigh Close to the west, Cambridge Park to the south, garages to the north and no. 34 Cambridge Park to the East. The site is currently greenfield and occupies an area of 562m^2 (0.056 Ha). The nearest watercourse is the River Thames, located approximately 0.25km to the east of the site location. The site's grid reference is OS 517703/173996.

Figure 2.1: Aerial View of Site taken from Google Maps, (Google 2021)

2.1 Existing Drainage

The site is currently undeveloped and therefore it has no drainage networks. Greenfield run-off from the site drains towards the road, thus discharges to the public sewers via the road gullies.

3 Development Proposal

The proposals involve the erection of a two-storey building with a loft and basement which will accommodate three maisonettes. Parking spaces for the maisonettes will be accessed from Roseleigh Close. The proposals also include modifications in the landscaped areas, providing for refuse and cycle storage, ASHP's, footpaths, lawns, ponds and planting. Refer to Figure 3.1 below for the proposed site layout.

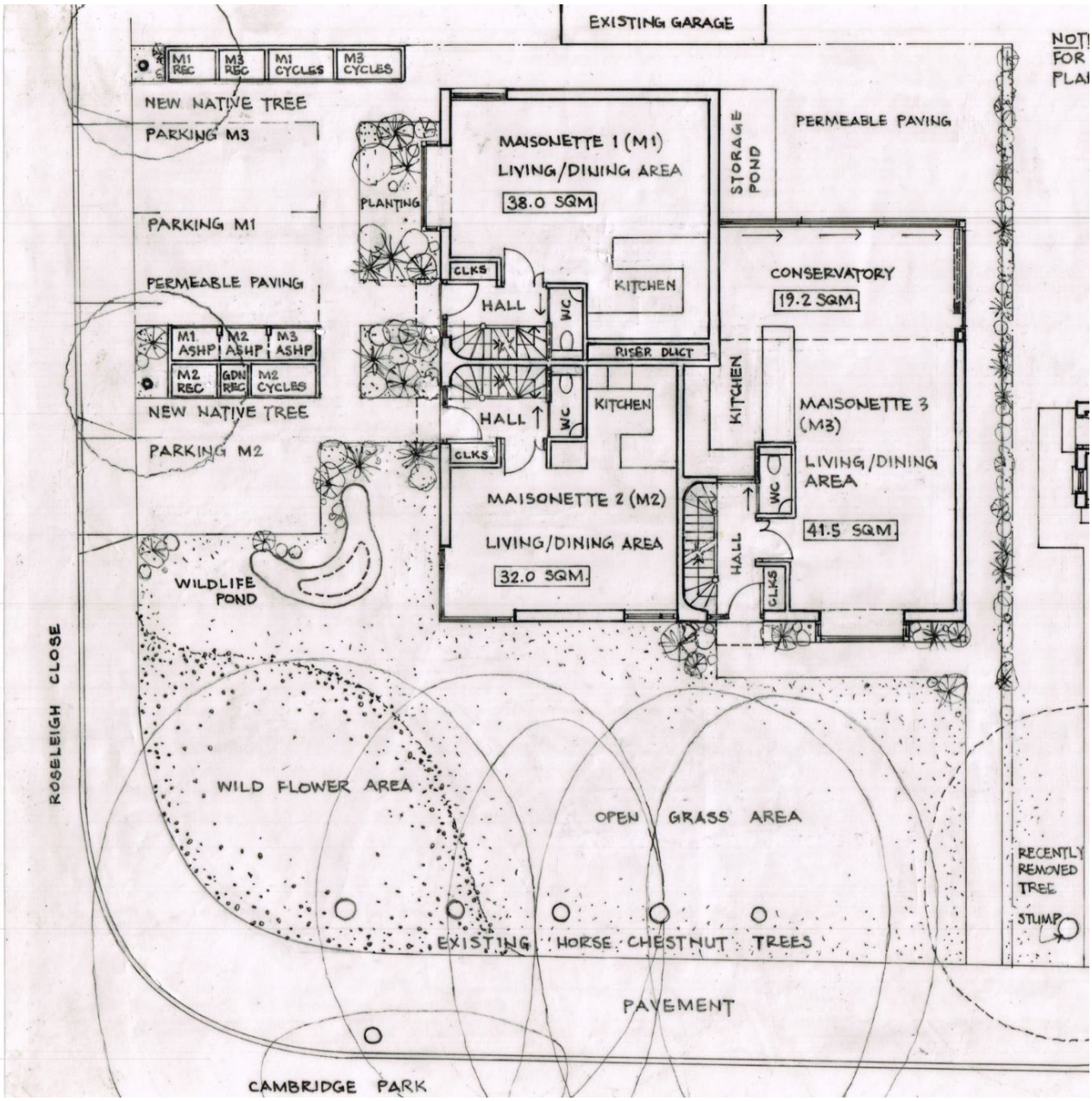


Figure 3.1: Proposed Ground Floor and Site Layout (Deon Lombard Architects)

4 Flood Risk Assessment

The EA's flood map for planning shows that the site is located in Flood Zone 1 and this is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding. Therefore, the site is at very low risk of flooding from watercourses and/or the sea as shown in Figure 4.1 and a FRA for planning purposes is not required.

Developments in this flood zone do not have any restrictions, provided they do not increase the risk of flooding elsewhere.

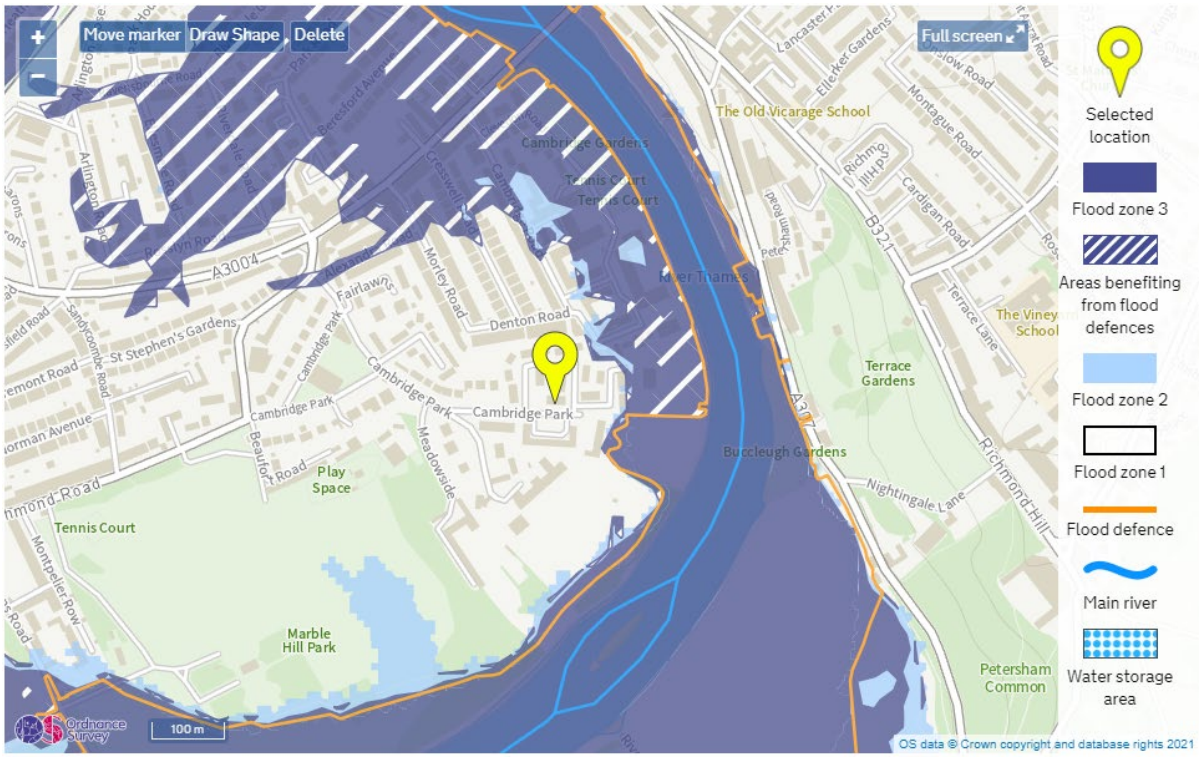


Figure 4.1 - Environment Agency Flood Map for Planning (Gov.uk)

The EA's flood risk from surface water maps show that the site is not at risk of flooding from surface water.

The EA's flood risk from reservoir failure map shows that the site is not at risk of flooding from reservoirs. However, the same map shows that the site will be at risk of flooding from reservoirs, if reservoir failure occurs during an extreme storm event with a return period higher than 1 in 100 years. The EA's information states that reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Reservoir Act of 1975 ensures that reservoirs are inspected regularly and essential safety work is carried out. While there is a risk of flooding from reservoir failure, the risk is extremely low as it will only flood the site if an extreme flood from the River Thames occurs at the same time and the chances of reservoir failure are extremely low.

Engineering techniques such as basement waterproofing and cavity drainage systems will be used to reduce the flood risk from groundwater to low.

5 Surface Water Run-off Assessment

5.1 Existing Run-off

The total site area is approximately 562m^2 or 0.056 Ha and it is all greenfield. Therefore, the site currently generates greenfield run-off rates. The existing Greenfield run-off rates for storm events of several different return periods were calculated using the Greenfield Runoff Estimator tool from ukSuDS.com as shown below. Supporting documentation is contained in Appendix A. It must be noted that the ukSuDS spreadsheet requires a minimum area of 0.1 ha. Therefore, the peak flow rates for the site have been interpolated.

$Q1_{ex\ Gr}$ = 0.07 l/sec
$Q30_{ex\ Gr}$ = 0.175 l/sec
$Q100_{ex\ Gr}$ = 0.24 l/sec

5.2 Climate Change

The current EA guidance states that for the years 2070 to 2115 there is a 50% chance the peak rainfall intensity will increase by 20% or more and that there is a 10% chance it will increase by 40% or more. For this building/development, which is classed as "More Vulnerable" with a design life of 100 years an allowance of an additional 40% is considered appropriate. The climate change allowance is included in the volume calculations for the design of SuDS measures.

5.3 Proposed Run-off

In accordance with the London Plan, EA guidelines, the SFRA, and CIRIA documents, surface water run-off should be managed as close to its source as possible. The London Plan states that all new developments should aim to reduce run-off to greenfield rates "utilising SuDS unless there are practical reasons for not doing so".

The possibility of implementing SuDS at the site was assessed using the following drainage hierarchy:

1. Store rainwater for later use.
2. Use infiltration techniques, such as porous surfaces in no-clay areas.
3. Attenuate rainwater in open water features, tanks or sealed water features for gradual release.
4. Discharge rainwater to a surface water sewer/drain; and
5. Discharge rainwater to a combined sewer.

The following paragraphs discuss the various methods in order of that hierarchy and evaluate the site's suitability for each method.

5.4 Store rainwater for later use

Rainwater harvesting is often considered a suitable solution in cities and highly urbanised areas where there is limited space for other SuDS. These systems can reduce surface water run-off from developments, also reducing the water demand by recycling rainwater within the building or for irrigation. However, the capacity of rainwater harvesting systems to attenuate rainwater depends on water use. If there is no water usage and the harvester is full, no attenuation will be provided during a subsequent storm event. In the worst-case scenario, the rainwater harvester will provide no attenuation.

A rainwater harvesting system is proposed for this development with water storage for garden irrigation and possible WC flushing purposes. However, this system has been excluded from the calculations to allow for the worst-cast scenario.

5.5 Infiltration

Infiltrating surface water to the ground is preferable as it mimics existing pre-development conditions and promotes groundwater recharge. Infiltration systems depend greatly on-site specific parameters, mainly the permeability of the ground and other factors such as the groundwater level, presence of made ground and landscaping proposals.

The British Geological Survey (BGS) Maps of the Roseleigh site and its nearing boreholes depict sand and gravel Superficial deposits, with groundwater being encountered at depths of 2.5m as shown in Figures 5.1 and 5.2 respectively. This indicates that infiltration systems would be feasible at shallow depths. Additionally, as the site has not been developed, made ground should not be encountered which could prevent the use of infiltration systems. Therefore, SuDS such as permeable pavement, filter drains, ponds and swales would be suitable for surface water disposal from the proposed development.

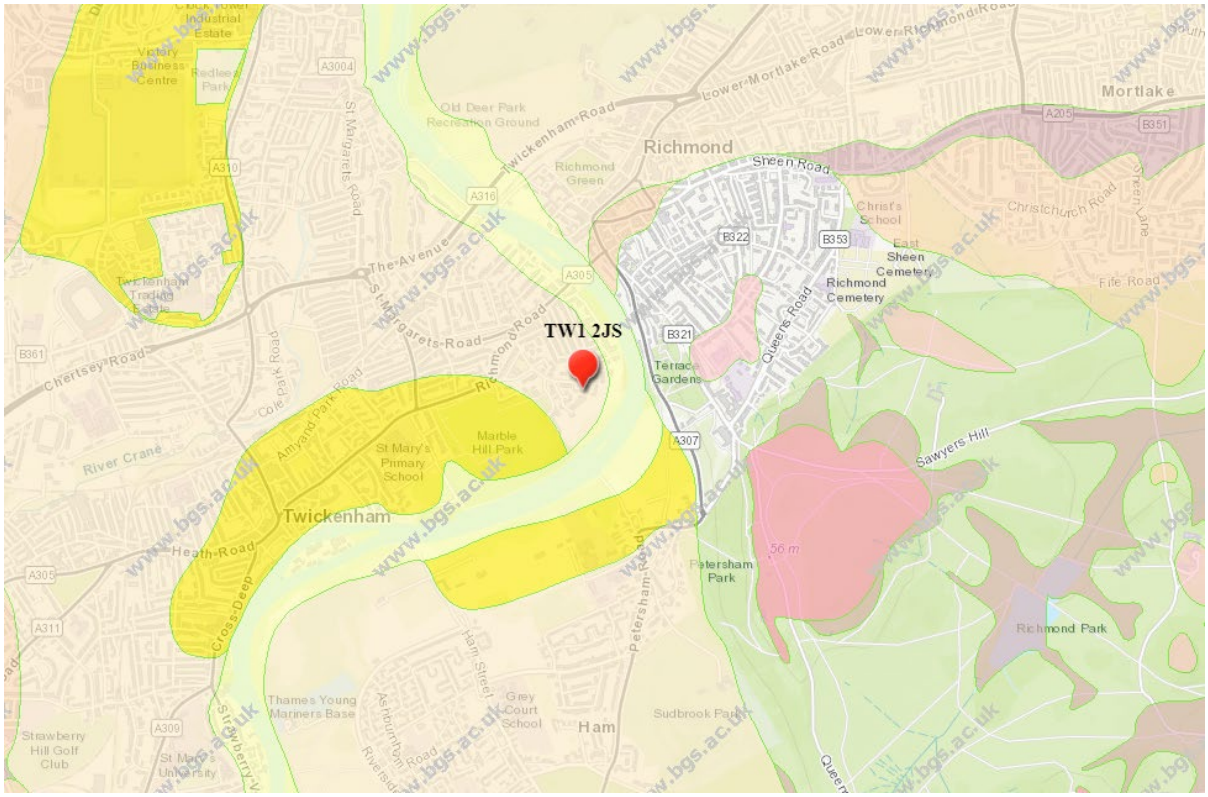


Figure 5.1 – British Geological Survey Superficial surface geology

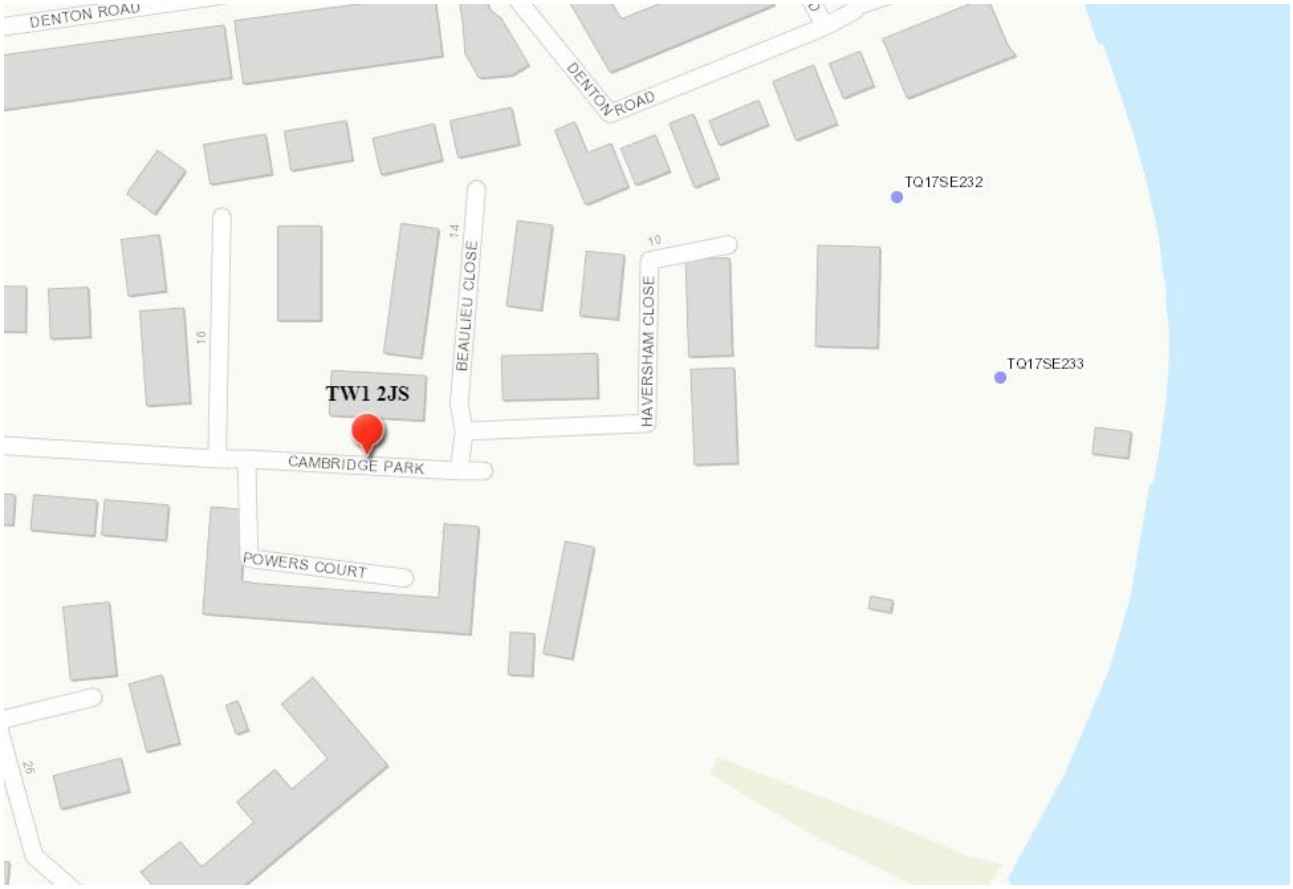


Figure 5.2 – British Geological Survey borehole scans

The proposed development will add approximately 195m^2 of impermeable areas on site. The proposals include car parking spaces and hardstanding areas for pedestrian traffic. Therefore, permeable pavement or porous asphalt can be used in these areas. Permeable paving can be constructed in close proximity to structures, as they allow dispersed infiltration similar to natural vegetation. Surface water from the roofs will be discharged into a 10,000 litre underground storage tank and used for rainwater harvesting purposes, particularly garden irrigation during dry periods and topping up the formal pond. Any overflow beyond these uses will be transferred to the infiltration area set away from the building.

Preliminary calculations using MicroDrainage software and a conservative ground infiltration rate of $1x10^{-5}$ m/s, show that a granular sub-base of 464mm in depth, where infiltration is provided, will be able to accommodate the surface water volumes from the proposed development. The sub-base of the permeable areas where no infiltration is proposed can be 250mm deep.

The sub-base will extend up to 0.594m below ground level, suggesting that the 1m minimum unsaturated zone requirement between the base of the infiltration system and the groundwater level can be met as the boreholes in this location suggest. Therefore, surface water drainage using shallow infiltration is a viable option for this development.

Refer to Appendices B for MicroDrainage calculations.

The proposals will also include a small green roof, a pond and bioretention areas. These systems have not been included in the drainage calculations at this stage. However, it is expected that the thickness of the infiltration system will be reduced once these SuDS are taken into consideration in the calculations. Furthermore, these systems will treat surface water further before discharging to the public sewers.

5.6 Attenuation and discharge to a surface water sewer

If further investigation shows that the ground is not suitable for infiltration techniques, SuDS will be used for attenuation. As there are no watercourses in close proximity, discharge to a surface water sewer is the next preferred option. However, the surface water drainage from the site should ensure that the proposals will not increase flood risk elsewhere.

The surface water drainage system should meet DEFRA's Non-statutory technical standards for SuDS requirements which states that *"for greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.".*

Section 5.1 shows that the site will generate a greenfield run-off rate up to 0.24 l/sec in the 1 in 100 year storm event. The EA's Rainfall Run-off Management for Developments "Report – SC030219" states that "*a practicable minimum limit on the discharge rate from a flow attenuation device is often a compromise between attenuating to a satisfactorily low flow rate while keeping the risk of blockage to an acceptable level*". Building Regulations Part H states that surface water pipes should not be smaller than 75mm to avoid the risk of blockages. Microdrainage calculations confirmed that a 76mm diameter flow control device will be able to restrict the run-off to 2.1 l/sec in storm events up to the 1

in 100 year plus 40% climate change. It is recommended to position the Hydro-Brake in the car park and connect to the surface water sewer located to the west of the site, as depicted in the Thames Water (TW) asset records.

Refer to Appendices B and C for the MicroDrainage calculations and Asset location map respectively. The proposed SuDS strategy drawing can found in Appendix D.

5.7 Water Quality

CIRIA C753 The SuDS Manual, Chapter 26 sets out the 'simple index approach' to water quality risk management.

Step 1 of the simple index approach is to identify the pollution hazard indices for the proposed land use. The proposed residential roofs are considered to have a 'Very Low' pollution hazard level and the car parks a "Low" pollution hazard level. Table 5.1 below shows the associated pollution hazard indices.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	Low	0.5	0.4	0.4

Table 5.1 Pollution Hazard Indices (Table 26.2 of the SuDS Manual)

Step 2 of the simple index approach is to select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index. As the principal destination of the runoff is to groundwater, the groundwater pollution mitigation indices should be used as shown in Table 5.2.

The indicative surface water pollution mitigation indices for the proposed SuDS are shown in Table 5.2 below:

Type of SuDS Component	TSS	Metals	Hydrocarbons
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Pond	0.7	0.7	0.5

Table 5.2 Surface Water Pollution Mitigation Indices (Table 26.3 of The SuDS Manual)

Provided that the mitigation indices of the treatment techniques are greater than or equal to the hazard indices for the proposed development then there should be no reduction in the overall water quality within the receiving watercourse or groundwater body. Therefore, the incorporation of permeable paving, bioretention systems and a pond will provide suitable prevention from pollution to groundwater or the surface water sewer.

6 Surface Water Maintenance Strategy

The successful implementation and operation of a SuDS system depends on a robust and clear maintenance strategy being implemented. The following measures should form part of the site's proposed management plan.

It is envisaged that the majority of the site drainage will be maintained by the maisonettes' owners.

SuDS Element	Maintenance		
	Activity	**Required Action**	**Typical Frequency**
Rainwater Harvesting	**Regular Maintenance**	Inspection of the tank for debris and sediment build-up, inlets/outlets/ withdrawal devices, overflow areas, pumps, filters	Annually and following poor performance
		Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	
	Occasional Maintenance	Cleaning and/or replacement of any filters	Three monthly, or as required
	Remedial Actions	Repair of overflow erosion damage or damage to tank	As required
		Pump repairs	
Green Roofs	**Monitoring / Inspections**	Inspect all components including soil substrate, vegetation, drains, irrigation systems, 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	
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	
		Inspect underside of roof for evidence of leakage	
	Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Half yearly and annually or as required
		During establishment i.e. year one, replace dead plants as required	Monthly -but usually responsibility of manufacturer
		Post establishment, replace dead plants where > 5% of coverage	Annually in autumn
		Remove fallen leaves and debris from deciduous plant foliage	Half yearly or as required

SuDS Element	Maintenance		
	Activity	**Required Action**	**Typical Frequency**
		Remove nuisance and invasive vegetation, including weeds	
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	
	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	
		Remove sediment from pre-treatment system when 50% full	
		Relevel uneven surfaces and reinstate design levels	
Bioretention Systems	**Monitoring / Inspections**	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain to determine if maintenance is necessary	Quarterly
		Assess plants for disease infection, poor growth, invasive species etc. and replace as necessary	
		Inspect inlets and outlets for blockage	
		Check operation of underdrains by inspection of flows after rain	Annually
	Regular Maintenance	Remove litter and surface debris and weeds	Quarterly
		Replace any plants, to maintain planting density	As required
		Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to half yearly
	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
Permeable Paving	**Monitoring / Inspections**	Initial inspection	Monthly for three months after installation
		Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hours after large storms in first six months

SuDS Element	Maintenance		
	Activity	**Required Action**	**Typical Frequency**
		Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	Annually
	Regular Maintenance	Brushing and vacuuming -standard cosmetic sweep over whole surface	Once a year after autumn leaf fall
		Rubbish and litter removal	As required
	Remedial Actions	Remediate any landscaping which through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
		Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
		Realignment of rip-rap	
		Repair/rehabilitation of inlets, outlets and overflows	
		Relevel uneven surfaces and reinstate design levels	
Ponds and Wetlands	**Regular Maintenance**	Remove litter and debris	Monthly, or as required
		Cut the grass – public areas	Monthly during growing season
		Cut the meadow grass	Half yearly – before nesting season in spring and in autumn
		Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly, at start, then as required
		Inspect inlets, outlets, banksides, structures, pipework etc. for evidence of blockage and/or physical damage	Monthly
		Inspect water body for signs of poor water quality	Monthly from May – October
		Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
		Check any mechanical devices, e.g. penstocks	

SuDS Element	Maintenance		
	Activity	**Required Action**	**Typical Frequency**
		Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
		Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	
		Tidy all dead growth before start of growing season	
		Remove sediment from any forebay.	Every 1–5 years, or as required
		Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
	Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%.	With effective pre-treatment, this will only be required rarely, e.g. every 25–50 years
	Remedial Actions	Repair erosion or other damage	As required
		Replant, where necessary	
		Aerate pond when signs of eutrophication are detected	
		Realign rip-rap or repair other damage	
		Repair / rehabilitate inlets, outlets and overflows.	

Table 6.1 SuDS Maintenance Strategy (CIRIA SuDS Manual)

Effective SuDS design must assess all foreseeable risks during construction and maintenance. These must be mitigated during the detailed design stages where effective design will aim to avoid, reduce and mitigate risks.

This process will also require input from the principal contractor who will ensure the construction of SuDS components are carried out in a safe and sustainable manner.

7 Conclusions

I. The EA's flood risk from watercourses map shows that the site is at low risk of flooding from rivers and the sea. Furthermore, the site area is smaller than 1 Ha. Therefore, a FRA for planning purposes is not required.

II. The flood risk from surface water, reservoir failure and groundwater is also considered low.

III. The BGS maps show that superficial deposits underly the site. Furthermore, boreholes near this location suggest that the groundwater table is approximately 2.5m below ground level. Therefore, shallow infiltration systems should be effective at this location.

IV. Permeable pavement, a pond, green roof, a rainwater tank and bioretention will be used for surface water drainage.

V. The drainage system will be designed for the 1 in 100 year plus 40% storm event.

VI. If further investigation show that the ground conditions are not suitable for infiltration techniques, surface water from the proposed SuDS will discharge to the surface water public sewer in Roseleigh Close. A flow control device will be used for surface water attenuation, aiming to achieve rates as close to greenfield as possible, also ensuring the device is of sufficient size and therefore not prone to blockages. Microdrainage calculations show that surface water can be attenuated to 2.1 l/sec in order to meet these requirements.

Appendix A
Greenfield Runoff Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dimitris Linardatos
Site name:	Roseleigh Close
Site location:	Twickenham

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

Site Details

Latitude:	51.45273° N
Longitude:	0.30738° W
Reference:	1560698882
Date:	Nov 29 2021 13:02

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	599	599
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0.15	0.15
1 in 1 year (l/s):	0.13	0.13
1 in 30 years (l/s):	0.35	0.35
1 in 100 year (l/s):	0.48	0.48
1 in 200 years (l/s):	0.57	0.57

Appendix B
MicroDrainage Calculations

Infiltration & Attenuation

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 683 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.248	0.248	0.3	14.2	O K
30 min Summer	0.280	0.280	0.3	15.9	O K
60 min Summer	0.312	0.312	0.3	17.8	O K
120 min Summer	0.341	0.341	0.3	19.5	O K
180 min Summer	0.355	0.355	0.3	20.2	O K
240 min Summer	0.361	0.361	0.3	20.6	O K
360 min Summer	0.364	0.364	0.3	20.7	O K
480 min Summer	0.358	0.358	0.3	20.4	O K
600 min Summer	0.350	0.350	0.3	19.9	O K
720 min Summer	0.342	0.342	0.3	19.5	O K
960 min Summer	0.330	0.330	0.3	18.8	O K
1440 min Summer	0.306	0.306	0.3	17.4	O K
2160 min Summer	0.270	0.270	0.3	15.4	O K
2880 min Summer	0.237	0.237	0.3	13.5	O K
4320 min Summer	0.165	0.165	0.3	9.4	O K
5760 min Summer	0.112	0.112	0.3	6.4	O K
7200 min Summer	0.076	0.076	0.3	4.3	O K
8640 min Summer	0.055	0.055	0.3	3.1	O K
10080 min Summer	0.047	0.047	0.3	2.7	O K
15 min Winter	0.279	0.279	0.3	15.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	223.928	0.0	19
30 min Summer	127.106	0.0	34
60 min Summer	72.148	0.0	64
120 min Summer	40.953	0.0	122
180 min Summer	29.404	0.0	182
240 min Summer	23.245	0.0	242
360 min Summer	16.691	0.0	360
480 min Summer	13.195	0.0	480
600 min Summer	10.996	0.0	536
720 min Summer	9.474	0.0	592
960 min Summer	7.541	0.0	712
1440 min Summer	5.468	0.0	980
2160 min Summer	3.964	0.0	1384
2880 min Summer	3.156	0.0	1788
4320 min Summer	2.204	0.0	2548
5760 min Summer	1.709	0.0	3224
7200 min Summer	1.403	0.0	3888
8640 min Summer	1.194	0.0	4496
10080 min Summer	1.041	0.0	5144
15 min Winter	223.928	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.315	0.315	0.3	17.9	O K
60 min Winter	0.351	0.351	0.3	20.0	O K
120 min Winter	0.386	0.386	0.3	22.0	O K
180 min Winter	0.403	0.403	0.3	23.0	O K
240 min Winter	0.412	0.412	0.3	23.5	O K
360 min Winter	0.419	0.419	0.3	23.9	O K
480 min Winter	0.416	0.416	0.3	23.7	O K
600 min Winter	0.409	0.409	0.3	23.3	O K
720 min Winter	0.399	0.399	0.3	22.7	O K
960 min Winter	0.382	0.382	0.3	21.8	O K
1440 min Winter	0.349	0.349	0.3	19.9	O K
2160 min Winter	0.296	0.296	0.3	16.9	O K
2880 min Winter	0.245	0.245	0.3	13.9	O K
4320 min Winter	0.140	0.140	0.3	8.0	O K
5760 min Winter	0.071	0.071	0.3	4.1	O K
7200 min Winter	0.047	0.047	0.3	2.7	O K
8640 min Winter	0.040	0.040	0.2	2.3	O K
10080 min Winter	0.035	0.035	0.2	2.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	127.106	0.0	33
60 min Winter	72.148	0.0	62
120 min Winter	40.953	0.0	120
180 min Winter	29.404	0.0	180
240 min Winter	23.245	0.0	238
360 min Winter	16.691	0.0	352
480 min Winter	13.195	0.0	464
600 min Winter	10.996	0.0	572
720 min Winter	9.474	0.0	676
960 min Winter	7.541	0.0	762
1440 min Winter	5.468	0.0	1068
2160 min Winter	3.964	0.0	1512
2880 min Winter	3.156	0.0	1932
4320 min Winter	2.204	0.0	2676
5760 min Winter	1.709	0.0	3240
7200 min Winter	1.403	0.0	3744
8640 min Winter	1.194	0.0	4416
10080 min Winter	1.041	0.0	5144

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 516400 174850 TQ 16400 74850
C (1km)	-0.025
D1 (1km)	0.298
D2 (1km)	0.322
D3 (1km)	0.230
E (1km)	0.307
F (1km)	2.530
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.03600	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 68 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.229	0.229	0.0	2.1	2.1	13.0	O K
30 min Summer	0.244	0.244	0.0	2.1	2.1	13.9	O K
60 min Summer	0.244	0.244	0.0	2.1	2.1	13.9	O K
120 min Summer	0.229	0.229	0.0	2.1	2.1	13.1	O K
180 min Summer	0.212	0.212	0.0	2.1	2.1	12.1	O K
240 min Summer	0.194	0.194	0.0	2.1	2.1	11.0	O K
360 min Summer	0.160	0.160	0.0	2.1	2.1	9.1	O K
480 min Summer	0.133	0.133	0.0	2.1	2.1	7.6	O K
600 min Summer	0.113	0.113	0.0	2.1	2.1	6.4	O K
720 min Summer	0.098	0.098	0.0	2.0	2.0	5.6	O K
960 min Summer	0.083	0.083	0.0	1.8	1.8	4.7	O K
1440 min Summer	0.066	0.066	0.0	1.4	1.4	3.8	O K
2160 min Summer	0.054	0.054	0.0	1.1	1.1	3.1	O K
2880 min Summer	0.047	0.047	0.0	0.9	0.9	2.7	O K
4320 min Summer	0.039	0.039	0.0	0.6	0.6	2.2	O K
5760 min Summer	0.034	0.034	0.0	0.5	0.5	1.9	O K
7200 min Summer	0.030	0.030	0.0	0.4	0.4	1.7	O K
8640 min Summer	0.028	0.028	0.0	0.3	0.3	1.6	O K
10080 min Summer	0.026	0.026	0.0	0.3	0.3	1.5	O K
15 min Winter	0.259	0.259	0.0	2.1	2.1	14.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	223.928	0.0	14.3	18
30 min Summer	127.106	0.0	16.3	31
60 min Summer	72.148	0.0	18.6	54
120 min Summer	40.953	0.0	21.1	86
180 min Summer	29.404	0.0	22.8	118
240 min Summer	23.245	0.0	24.0	152
360 min Summer	16.691	0.0	25.9	216
480 min Summer	13.195	0.0	27.3	276
600 min Summer	10.996	0.0	28.4	332
720 min Summer	9.474	0.0	29.4	390
960 min Summer	7.541	0.0	31.2	504
1440 min Summer	5.468	0.0	33.9	746
2160 min Summer	3.964	0.0	36.9	1104
2880 min Summer	3.156	0.0	39.1	1468
4320 min Summer	2.204	0.0	40.8	2200
5760 min Summer	1.709	0.0	42.0	2936
7200 min Summer	1.403	0.0	43.0	3640
8640 min Summer	1.194	0.0	43.7	4376
10080 min Summer	1.041	0.0	44.3	5080
15 min Winter	223.928	0.0	16.1	18

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.278	0.278	0.0	2.1	2.1	15.8	O K
60 min Winter	0.280	0.280	0.0	2.1	2.1	16.0	O K
120 min Winter	0.258	0.258	0.0	2.1	2.1	14.7	O K
180 min Winter	0.231	0.231	0.0	2.1	2.1	13.2	O K
240 min Winter	0.204	0.204	0.0	2.1	2.1	11.6	O K
360 min Winter	0.153	0.153	0.0	2.1	2.1	8.7	O K
480 min Winter	0.116	0.116	0.0	2.1	2.1	6.6	O K
600 min Winter	0.094	0.094	0.0	2.0	2.0	5.3	O K
720 min Winter	0.082	0.082	0.0	1.8	1.8	4.7	O K
960 min Winter	0.069	0.069	0.0	1.5	1.5	3.9	O K
1440 min Winter	0.055	0.055	0.0	1.1	1.1	3.1	O K
2160 min Winter	0.045	0.045	0.0	0.8	0.8	2.6	O K
2880 min Winter	0.040	0.040	0.0	0.7	0.7	2.3	O K
4320 min Winter	0.032	0.032	0.0	0.5	0.5	1.8	O K
5760 min Winter	0.028	0.028	0.0	0.4	0.4	1.6	O K
7200 min Winter	0.025	0.025	0.0	0.3	0.3	1.4	O K
8640 min Winter	0.023	0.023	0.0	0.2	0.2	1.3	O K
10080 min Winter	0.022	0.022	0.0	0.2	0.2	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	127.106	0.0	18.3	31
60 min Winter	72.148	0.0	20.9	58
120 min Winter	40.953	0.0	23.7	92
180 min Winter	29.404	0.0	25.6	130
240 min Winter	23.245	0.0	27.0	164
360 min Winter	16.691	0.0	29.1	228
480 min Winter	13.195	0.0	30.6	286
600 min Winter	10.996	0.0	31.9	334
720 min Winter	9.474	0.0	33.0	394
960 min Winter	7.541	0.0	35.0	510
1440 min Winter	5.468	0.0	38.0	750
2160 min Winter	3.964	0.0	41.4	1100
2880 min Winter	3.156	0.0	43.8	1468
4320 min Winter	2.204	0.0	45.8	2204
5760 min Winter	1.709	0.0	47.2	2896
7200 min Winter	1.403	0.0	48.3	3552
8640 min Winter	1.194	0.0	49.1	4328
10080 min Winter	1.041	0.0	49.8	5040

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 516400 174850 TQ 16400 74850
C (1km)	-0.025
D1 (1km)	0.298
D2 (1km)	0.322
D3 (1km)	0.230
E (1km)	0.307
F (1km)	2.530
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 0.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.95	Evaporation (mm/day)	3
Invert Level (m)	0.000	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2100-0500-2100
Design Head (m)	0.500
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.1
Flush-Flo™	0.149	2.1
Kick-Flo®	0.345	1.8
Mean Flow over Head Range	-	1.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.1	3.000	4.8	7.000	7.2
0.200	2.1	1.400	3.4	3.500	5.2	7.500	7.4
0.300	2.0	1.600	3.6	4.000	5.5	8.000	7.7
0.400	1.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.1	2.000	4.0	5.000	6.1	9.000	8.2
0.600	2.3	2.200	4.1	5.500	6.4	9.500	8.4
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Appendix C
Asset location map

Asset location search

Property Searches

Price & Myers LLP
37Alfred Place
LONDON
WC1E 7DP

Search address supplied TW1 2JT

Your reference 29876

Our reference ALS/ALS Standard/2021_4549846

Search date 29 November 2021

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

Asset location search

Property Searches

Search address supplied: TW1 2JT

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 searchprovides 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

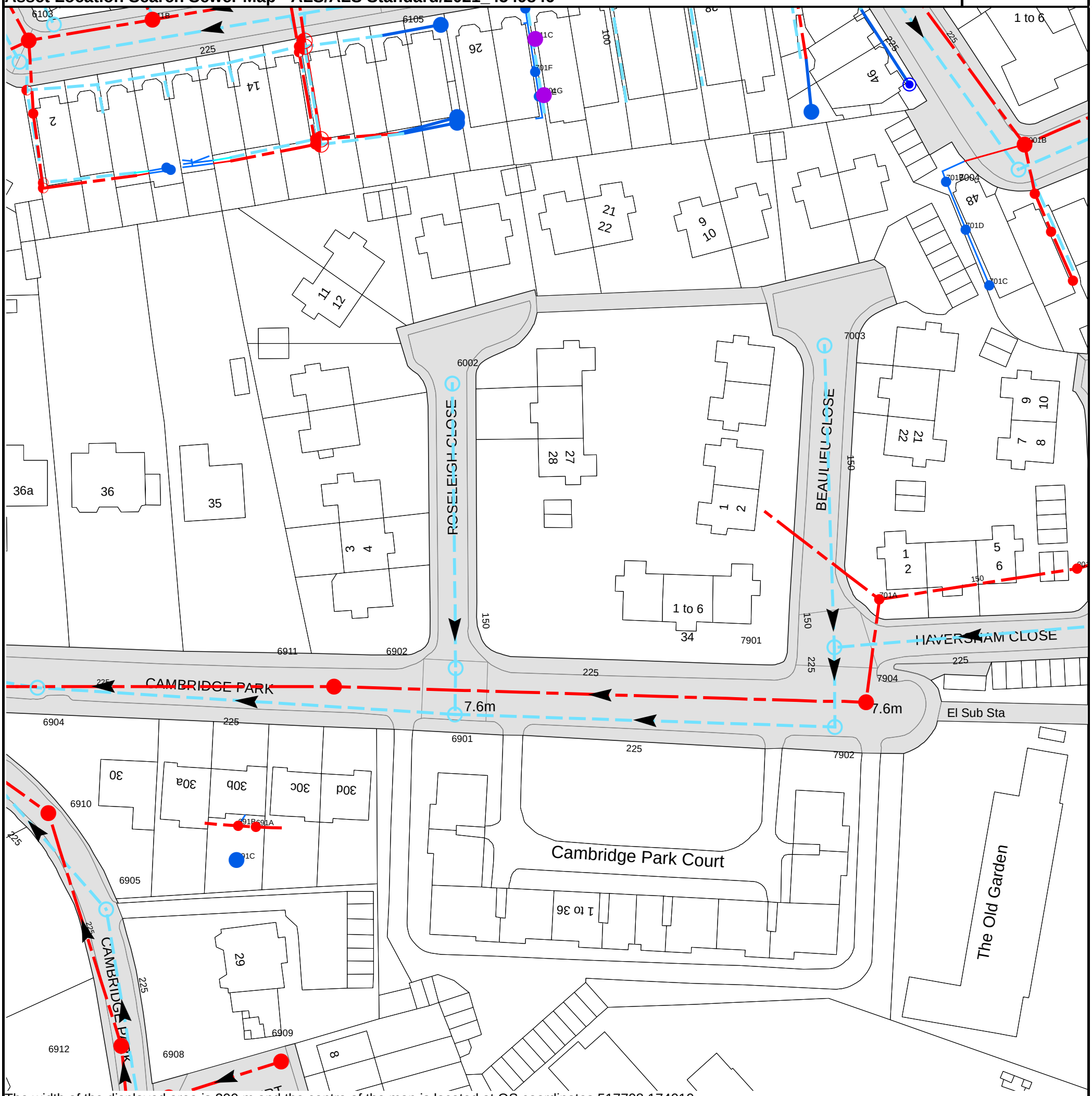
Clean Water queries

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

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4549846



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 517708,174010

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
611B	n/a	n/a
61LJ	n/a	n/a
711B	n/a	n/a
701F	n/a	n/a
711C	n/a	n/a
701E	n/a	n/a
701G	n/a	n/a
60MK	n/a	n/a
6003	7.03	4.57
6103	7.08	4.94
61NC	n/a	n/a
60LF	n/a	n/a
6904	7.12	4.71
60LH	n/a	n/a
60ML	n/a	n/a
6910	7.72	3.74
6905	7.17	5.24
6912	6.97	3.84
691C	n/a	n/a
691B	n/a	n/a
691A	n/a	n/a
701C	n/a	n/a
7004	6.05	3.84
7001B	6.09	4.52
70NH	n/a	n/a
80NK	n/a	n/a
80NL	n/a	n/a
801I	n/a	n/a
60MN	n/a	n/a
60LK	n/a	n/a
6909	n/a	n/a
61LC	n/a	n/a
61NH	n/a	n/a
61MC	n/a	n/a
61LM	n/a	n/a
60MF	n/a	n/a
60LD	n/a	n/a
60ND	n/a	n/a
60NJ	n/a	n/a
6911	7.74	3.98
6002	7.86	6.82
6901	7.74	5
6902	7.62	n/a
60NF	n/a	n/a
60NK	n/a	n/a
70NE	n/a	n/a
7003	7.58	6.41
7901	7.58	6.21
7902	7.53	6.16
7904	7.6	4.5
701A	n/a	n/a
701B	n/a	n/a
701D	n/a	n/a

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

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

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

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.

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

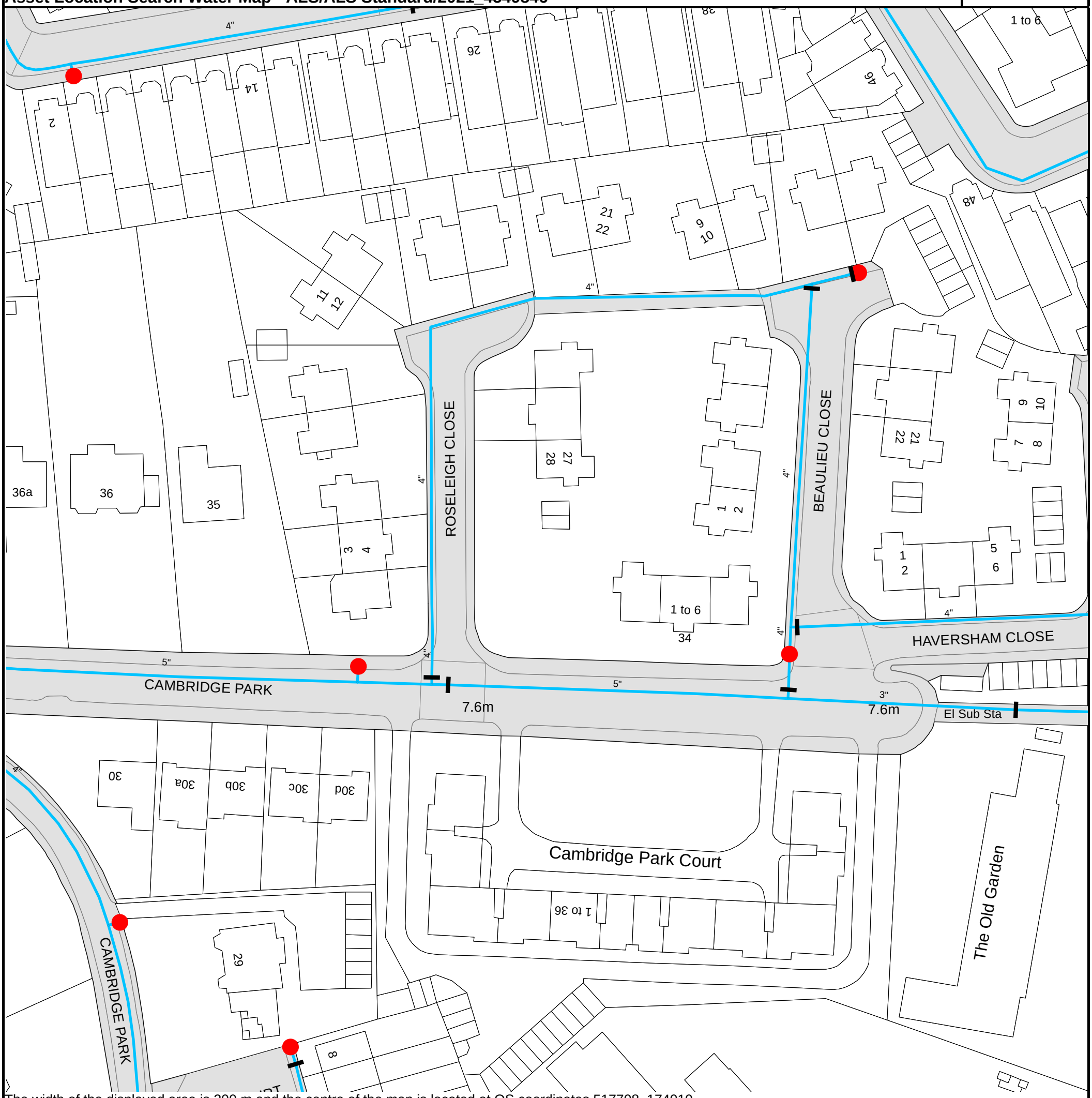
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

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

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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 present on the plan, please contact a member of Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2021_4549846



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 517708, 174010.

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

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

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.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

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.

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

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')

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: Indiates 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 D
SuDS & Water Storage Strategy

EXISTING GARAGE

M1 REC | M3 REC | M1 CYCLES | M3 CYCLES

NEW NATIVE TREE

PARKING M3

PARKING M1

PERMEABLE PAVING

M1 ASHP | M2 ASHP | M3 ASHP

M2 REC | GDN REC | M2 CYCLES

NEW NATIVE TREE

PARKING M2

WILDLIFE POND

PLANTING

DP

RE

MAISONETTE 1 (M1)

LIVING/DINING AREA

38.0 SQM

CLKS

HALL

WC

KITCHEN

RISER DUCT

HALL

WC

KITCHEN

CLKS

MAISONETTE 2 (M2)

LIVING/DINING AREA

32.0 SQM.

STORAGE POND

PERMEABLE PAVING

10,000L. UNDERGR'ND WATER STORAGE TANK

CONSERVATORY

19.2 SQM.

INTENSIVE GREEN ROOF AREA ABOVE

KITCHEN

MAISONETTE 3 (M3)

LIVING/DINING AREA

41.5 SQM.

WC

HALL

CLKS

ROSELEIGH CLOSE

WILD FLOWER AREA

OPEN GRASS AREA

EXISTING HORSE CHESTNUT TREES

RECENTLY REMOVED TREE STUMP

PAVEMENT

CAMBRIDGE PARK

KEY

AREA OF PERMEABLE PAVING = 130 SQ.M.

AREA OF INFILTRATION SYSTEMS = 60 SQ.M.

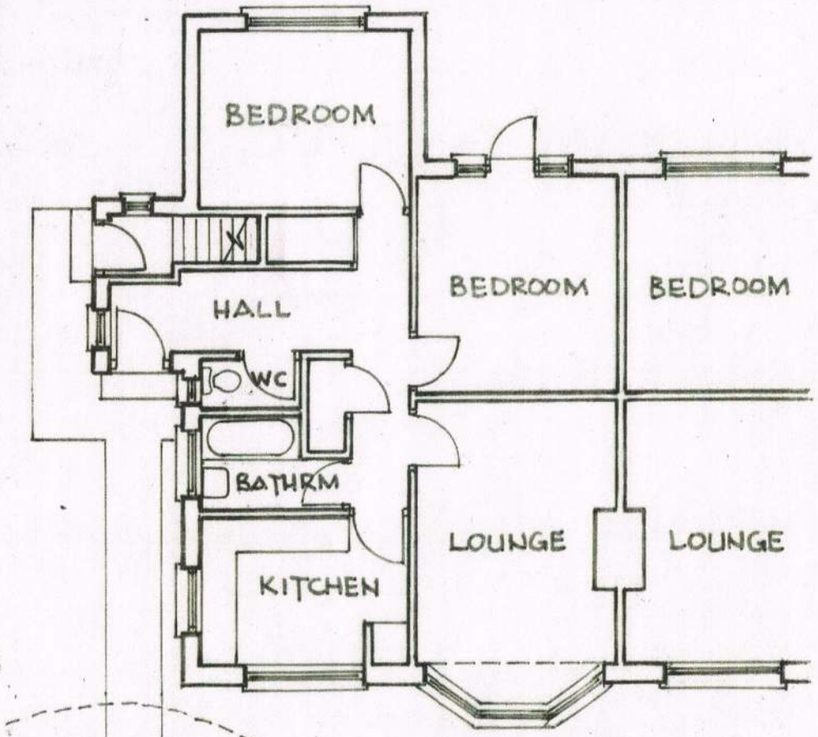
AREA OF 'INTENSIVE' GREEN ROOF = 30 SQ.M.

N

0M. 2 4 6 8 10

SCALE 1:100 @ A3

RAINWATER COLLECTION FROM ROOF



EXISTING MAISONETTES 34 CAMBRIDGE PARK

GROUND FLOOR & BLOCK PLAN

PRICE & MYERS

Job No.	29876	Page	SK 600	Rev	3
Date	01/10/2021	Eng	DLin	Chd	DLin
Job	Roseleigh Close, Twickenham				

DRAWING No. 19.001_P2RS

SUDS & WATER STORAGE STRATEGY