Report

Flood Risk Assessment and Drainage Strategy (SuDS)

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Watts Close

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1 Introduction

Sweco UK Ltd (Sweco) were appointed by Pellings LLP on behalf of Haringey Council to undertake a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) to support the proposals at Watts Close and its adjacent land, N15 5DW located within the London Borough (LB) of Haringey.

This report has been prepared for the sole use of Haringey Council and Pellings LLP and the contents should not be relied upon by others without the express written authority of Sweco. If any unauthorised third party makes use of this report they do so at their own risk and Sweco owes them no duty of care or skill.

This report provides an assessment of all sources of flood risk to the site from on and off-site sources, and an assessment of flood risks to off-site receptors caused by the proposals at the site. This report provides recommendations and mitigation measures to ensure that the proposals and its users are safe with respect to all sources of flood risk, including residual risks, now, and for their lifetime by accounting for increased flood risks as a result of climate change. This report also demonstrates how the proposals will not increase the risks of flooding off-site.

This report has been completed in accordance with the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (PPG) as well as London Borough of Haringey Level 1 and Level 2 Strategic Flood Risk Assessments. The report is an assessment of flood risk to the development, from on and off-site sources, and to off-site receptors caused by the proposed development.

The review of the Environment Agency (EA) Flood map for planning (see Figure 1) shows that the site lies in Flood Zone 1 (low risk). Flood Zone 1 is classified as the ‘low risk’ flood zone, with <0.1% annual risk of flooding from rivers and seas.

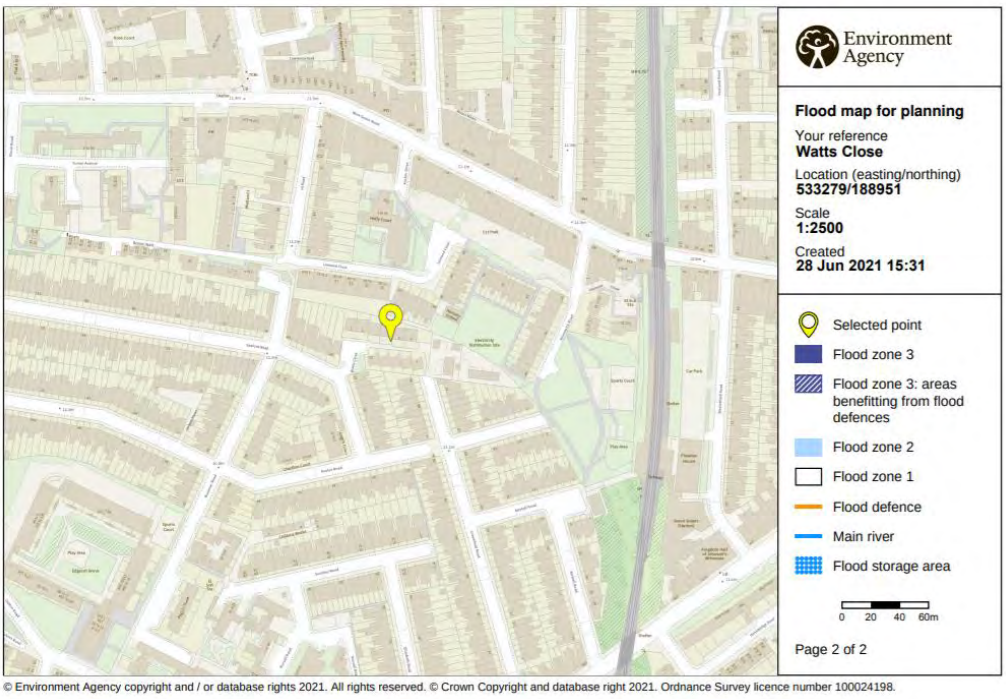

Figure 1 – EA Flood map for planning

The overall aim of the Sequential Test is to steer new developments to Flood Zone 1. The two-part Exception Test is required to justify development outside of Flood Zone 1.

According to Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' of the Planning Practice Guidance of the NPPF, all land uses are permitted in Flood Zone 1, subject to assessment and avoidance of flood risks from other sources.

Given that the site is located entirely within Flood Zone 1, Sequential and Exception Tests are not required for this site.

The report concludes that in flood risk context, the proposals are safe and appropriate and do not cause increased flood risk.

2 Policy Context

2.1 National Planning Policy Framework (July 2021)

The NPPF was enacted in March 2012 and updated in July 2021. Chapter 14 establishes the Planning Policy relating to flood risk management. The PPG (March 2014) provides details on policies relating to flood risk.

2.2 Flood and Water Management Act (2010)

The Flood and Water Management Act 2010 defines clearer roles and responsibilities for the implementation of Sustainable Drainage Systems (SuDS) in developments, by requiring drainage systems to be approved against a set of draft National standards.

In December 2014 the government set out changes to planning that apply to major development from April 2015. This change confirmed that in considering planning applications, the Local Planning Authority (LPA) should consult the relevant Lead Local Flood Authority (LLFA) on the management of surface water to satisfy themselves that the proposed minimum standards of operation are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

In April 2015, the LLFA became a statutory consultee on surface water and SuDS proposals.

2.3 London Borough of Haringey Level 1 and Level 2 Strategic Flood Risk Assessment (2015)

The London Borough of Haringey (LBH) Level 1 and Level 2 Strategic Flood Risk Assessments (SFRA) aim to collate and analyse the most up to date readily available flood risk information for all sources of flooding, to provide an overview of flood risk issues across the study area.

2.4 London Borough of Haringey Surface Water Management Plan (2011)

The London Borough of Haringey (LBH) Level 1 and Level 2 Strategic Flood Risk Assessments (SFRA) aim to collate and analyse the most up to date readily available flood risk information for all sources of flooding, to provide an overview of flood risk issues across the study area.

2.5 London Plan (March 2021)

The London Plan sets out the spatial development strategy for Greater London. It sets out a framework for London for the next 20-25 years. The Plan is part of the statutory development plan for London, meaning that the policies in the plan should inform decisions on planning cross the capital.

Chapter 9 of the Plan sets out policies relating to Sustainable Infrastructure. Policy SI12 Flood Risk Management and Policy SI 13 Sustainable Drainage set out the policies for flood risk and surface water run-off and how these matters should be addressed within planning.

Policy SI12 Flood Risk Management (extract)

- Development should ensure flood risk is minimised and mitigated and that residual risk is addressed

Policy SI 13 Sustainable Drainage (extract)

- Development proposals should aim to achieve greenfield run-off rates. There should be a preference for green over grey features in line with the drainage hierarchy.

Drainage should be designed and implemented in ways that promote multiple benefits

2.6 Haringey Sustainable Design and Construction (SPD) (March 20123)

Section 5 of the SPD identifies sources of flood risk within the borough. It sets out requirements relating to flood risk and drainage to minimise risks to the development and reduce the amount of surface water entering the sewer system. SuDS should be utilised as near to source as possible to mimic the natural environment.

3 Site Description

3.1 Site context

The site is in a predominantly residential area and is located on the edge of a Haringey Council estate very close to Seven Sisters Station (See Figure 2 below).

The site is centred on approximate Ordnance Survey (OS) grid reference 533279, 188951. The site redline boundary is shown in Figure 3 (See Appendix A for the existing site location plan).

Figure 2 – Site Redline Boundary

The site is bounded to the north by Lomond Close. From Lomond Close there is a small disused community hall which will be demolished as part of the development. The Watts Close part of the site is occupied by 11 bungalows currently being used as temporary housing.

3.2 Toporaphy

The topographical survey shows the site is generally flat with levels gradually falling from north-east to south-west, from 11.7 metres Above Ordnance Datum (mAOD) to 10.9 mAOD.

3.3 Geology

British Geological Survey (BGS) mapping shows that the geology underlying the site comprises London Clay Formation (Clay, Silt and sand) which is classified as Unproductive Strata. No superficial deposits are present on site.

3.4 Hydrology

There are no surface water features within 250 m of the site. The nearest watercourse is the River Lea, which is classified as a main river, which lies approximately 1.2 km to the east of the site at its nearest point.

3.5 Proposed Development

Demolition of 11 existing bungalows and community building to deliver 18 new homes for council rent. The proposed development will comprise of six, two-storey family houses (three and four bedrooms) and 12 apartments (one and two bedrooms) in two, three-storey blocks including two wheelchair user dwellings. The proposals also make provision on-site for two wheelchair parking spaces, amenity and play space, landscaping and cycle and refuse/recycling storage.

4 Flood Risk

The NPPF requires flood risk from the following sources to be assessed:

- Tidal and fluvial sources (sea and river flooding);
- Pluvial sources (flooding resulting from overland flows);
- Groundwater sources;
- Artificial sources, canals, reservoirs etc., and;
- Increased surface water discharge.

Each of the sources are addressed separately below.

4.1 Tidal and fluvial flooding

The site is shown on the EA Flood Map for Planning (see Figure 1 above) to lie in the low probability of flooding from fluvial and tidal sources (Flood Zone 1). The GOV.UK extent of flooding from rivers or the sea map also confirms that the site is at very low risk from fluvial and tidal sources (Figure 4).

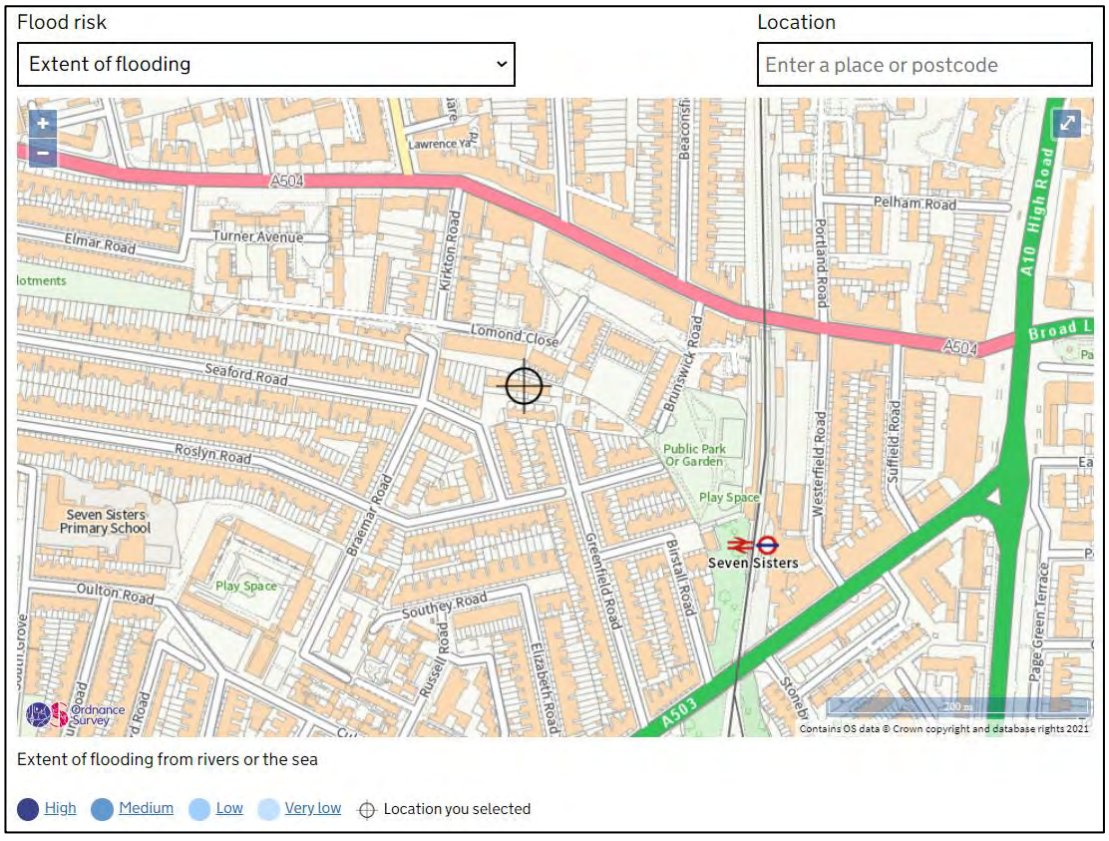

Figure 3 – EA Extent of Flooding from Rivers or the Sea

Therefore, the site is not at risk of flooding from fluvial or tidal sources.

4.2 Pluvial flooding

There is always a potential risk of surface water flooding from very high intensity rainfall events exceeding the capacity of drainage systems and causing flooding, especially in urban areas. Considering the local geology of the LBH is predominantly London Clay, there is little opportunity for surface water to infiltrate the ground, resulting in increased volumes of surface water runoff. The extent of surface water is controlled by the topography as well as the permeability of the land surface. Low-lying impermeable areas are more susceptible to surface water flooding in the form of ponding.

Surface water run-off can be channelled either by natural features such as valley lines or by artificial features such as highways, to low points in the topography. If surface water is not able to flow away from the low points then pluvial flooding can occur.

The LBH Surface Water Management Plan (SWMP) completed an analysis of the number of properties at risk of flooding for the 1 in 100 year rainfall event and reviewed the potential number of properties with surface water flooding of a depth greater than 300 mm. The review coupled with local knowledge of the study area identified the site to be within a Critical Drainage Area (CDA) (Group 4-057).

The GOV.UK Extent of flooding from surface water mapping (see Figure 4) indicates that the majority of the site is having a low probability of surface water flooding.

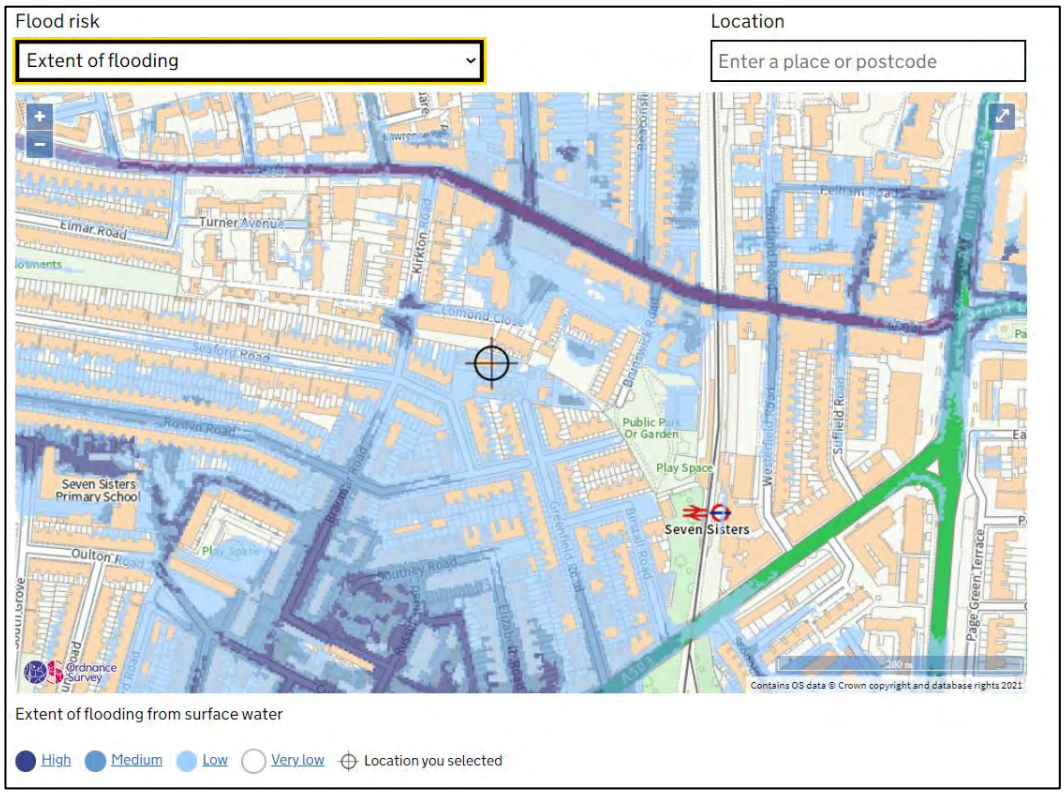

Figure 4 – GOV.UK Flood risk – Extent of flooding map from surface water

The GOV.UK maps show further detail in relation to the likelihood of surface water flooding surrounding the site. The categories are labelled high (3.3%), medium (1%) and low (0.1%) annual exceedance probabilities. These maps have been reviewed and the risk is summarised in Table 1.

It is worth noting that the mapping does not take account of any local drainage features which may be present on site.

Table 1 – Risk of surface water flooding across and surrounding the site

Risk	Depth (mm)
Low	Majority of the site 300 to 900 mm
Medium	No flooding shown
High	No flooding shown

A review of the velocity mapping shows that the surface water flood risk at the site is mainly due to local run-off and flows away in a south easterly direction.

It is recommended the finished floor levels of the buildings are raised above surrounding land where possible to route any overland flow away from entrances, subject to the requirements of Part M of the Building Regulations regarding access to dwellings. Openings into the buildings should not be situated in potential flow paths of surface water run-off.

As stated in the LBH SWMP, the preferred mitigation option for proposed developments within Group 4-057 CDA is to apply local improvements to the flow conveyance of surface water runoff. It is recommended to implement appropriate SuDS measures across the site to route surface water flows around the edge of the proposed buildings. This may help to reduce runoff at source in the long term.

It is also recommended to implement flood resilience and resistance measures to properties at high flood risk. Guidance on resilience measures can be found in the document ‘Improving the Flood Performance of New Buildings, Flood Resilient Construction’ published by The Department for Communities and Local Government (CLG).

Provided that the recommendations above are implemented the risk of flooding from this source is considered to be low.

4.3 Groundwater

Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth.

The Online BGS map and the MAGIC website indicate the site is directly underlain by Unproductive Strata associated with the bedrock deposits of London Clay Formation.

Unproductive Strata are rock layers or drift deposits with low permeability that have significance for water supply or river base flow. The site is not shown to be in an area of groundwater vulnerability.

The Level 2 SFRA states that that LBH is not identified to be at risk of groundwater flooding.

Therefore, the site is considered to be at low risk of flooding from groundwater.

4.4 Water bodies

Although there are no lakes, large ponds, or reservoirs etc shown within the immediate vicinity of the site, the site is likely to be at risk from reservoir flooding.

The GOV.UK Flood risk from reservoirs – Extent of flooding online mapping (see Figure 5) shows that the site is at risk of flooding from the failure of reservoirs with flood depths likely to be below 300 mm (Figure 6).

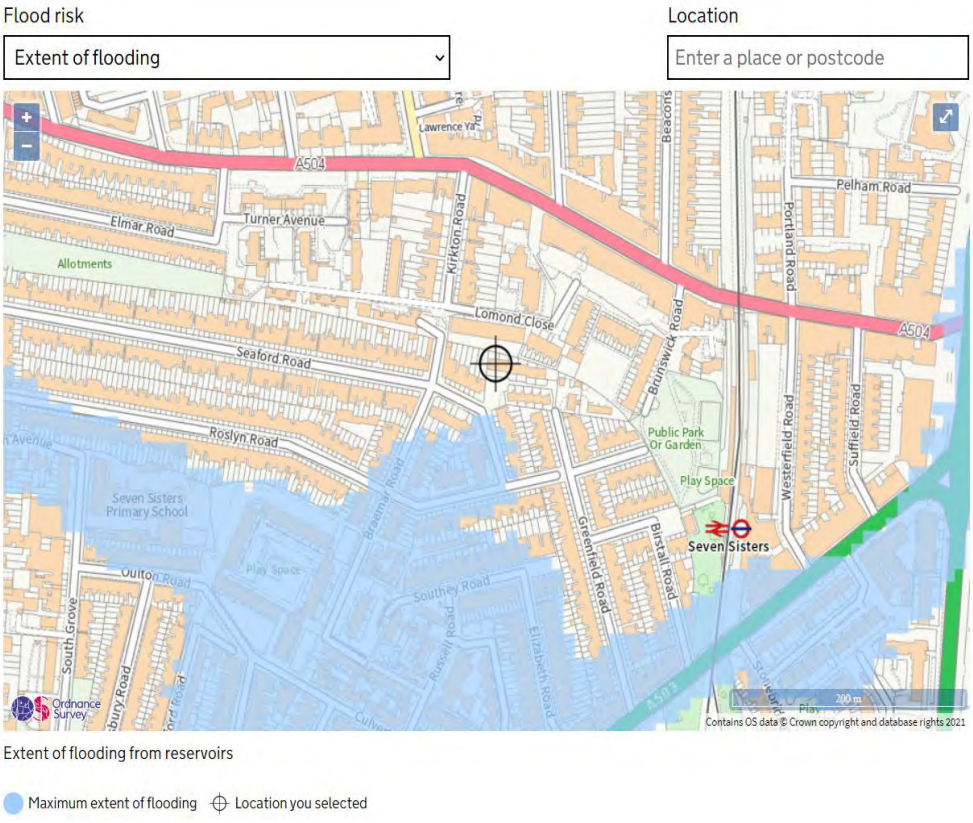

Figure 5 – GOV.UK Flood risk – Extent of flooding map from reservoirs

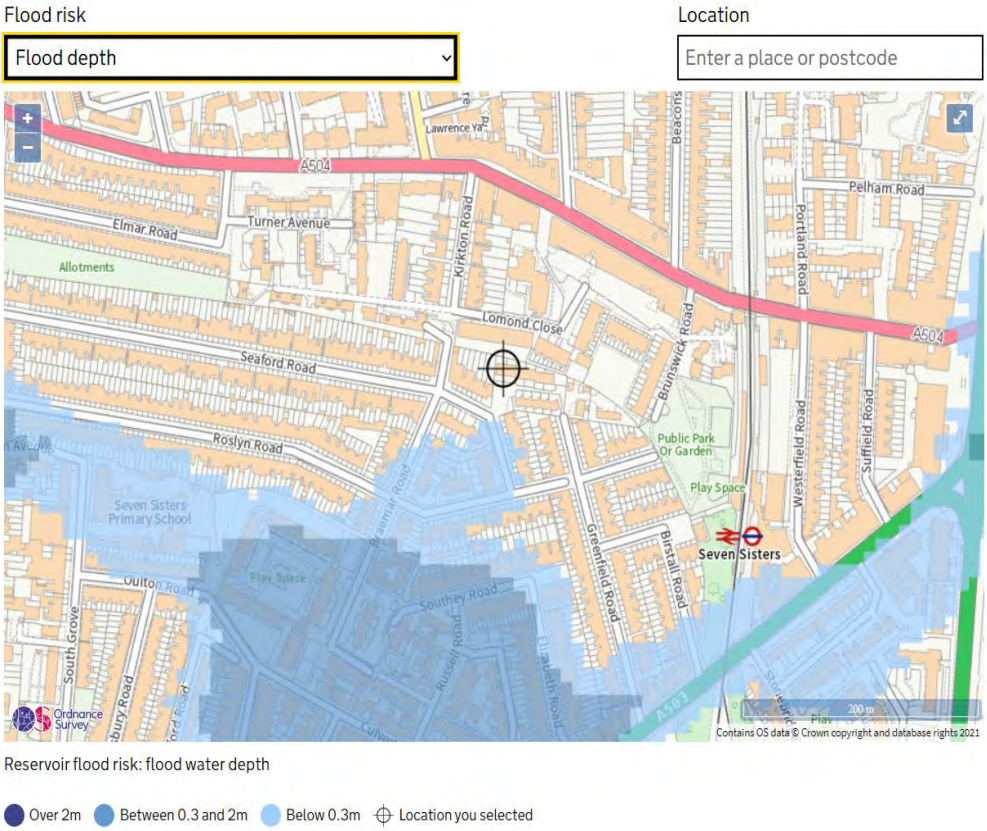

Figure 6 – GOV.UK Flood risk – Reservoir Flood Depth

There are a few small, covered reservoirs located within the LBH, however the SFRA suggests that the risk to the borough from dam failure comes from outside of the borough boundary. A number of large reservoirs are located adjacent to the River Lee within the LB of Waltham Forest. As such, the sudden failure of these dams could potentially have catastrophic consequences for LBH due to a surge in water being released into the downstream catchment.

To mitigate risk of reservoir flooding to the proposed development, it is recommended to ensure the finished floor levels for the proposed buildings are raised above ground level as per surface water run-off mitigation measures. It is also recommended to implement appropriate flood resilient and resilience measures to ensure the proposed buildings withstand flooding.

Assuming the above recommendations are followed, in the unlikely event of reservoir breach the consequences of flooding to the proposed development would be minimal.

4.5 Infrastructure flooding

Sewer systems are typically designed and constructed to accommodate rainfall events with a 3.3% AEP or less. Therefore, rainfall events with a return period of frequency greater than 3.3% AEP would be expected to result in surcharging of some of the sewer systems. If surcharging or blockage of the off-site sewers/drains did occur it is possible that there may be localised surface flooding in areas surrounding the site.

The SWMP suggests that the majority if sewer flooding incidents are clustered in the south of the borough. The SWMP lists the number of Thames Water sewer flood records within the borough using a four digit post code. Reviewing the Thames Water records indicates that three sewer flooding incidents have been recorded within and in the vicinity of the site area.

It is recommended to have the finished floor levels designed above the surrounding ground levels to ensure there are no significant flood risk on the site from overland or blocked sewers or drains. It is also recommended to implement appropriate SuDS measures to ensure the amount of surface water entering the sewer system is managed.

Assuming the recommendations above are followed, the site is considered to be at low risk of flooding from this source.

4.6 Increased surface water discharge

As the proposed changes will redevelop the site the surface water drainage infrastructure will provide attenuation and controlled discharge and there will therefore be a reduced discharge rate form the site.

6 Surface Water Drainage Strategy

6.1 Existing surface water drainage

The utilities survey (see Appendix A) shows surface water infrastructure located within the site which connect into the adjacent TW surface water sewers located in the highways adjacent to the site (see TW sewer records in Appendix B). There does not appear to be any existing on-site attenuation or flow control.

6.2 Proposed surface water drainage

The proposed development will slightly increase the impermeable area at the site which in turn would increase surface water run-off generated by the site, however, surface water run-off will be managed in order to not increase off-site flood risk and comply with planning requirements.

The London Plan Policy SI 13 states that there should be preference for green over grey SuDS features for proposed developments, in line with the following drainage hierarchy; Table 3 discusses how this development complies. Further information on the SuDS selected for the site is shown in Table 4.

Table 2 – The London Plan drainage hierarchy compliance

The London Plan Drainage Hierarchy	Compliance
rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)	The scheme has been designed to the requirements as set out in the Haringey Surface Water Management Plan policy 1. The presence of green roofs will reduce the volume of water available for collection and reuse, however it is still proposed to provide water butts to the properties. Green roofs have been specified for the wider environmental benefits to the site (see no.3 below).
rainwater infiltration to ground at or close to source	Infiltration is not deemed to be viable due to the underlying geology of London Clay which is of low permeability.
rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	Attenuation is proposed in permeable paving and attenuation crates. Green roofs are proposed on buildings with the extent to be confirmed once space requirements for other plant are confirmed. This is balanced with competing demands for energy efficient plant and PV's.
rainwater discharge direct to a watercourse (unless not appropriate)	There are no nearby watercourses suitable for the discharge of surface water run-off.

The London Plan Drainage Hierarchy	Compliance
controlled rainwater discharge to a surface water sewer or drain	It is proposed to discharge surface water run-off to the TW surface water sewer located adjacent to the site, as per the existing regime, via existing lateral pipe. The proposed surface water drainage strategy is shown on drawing 65202627-SWE-ZZ-XX-DR-C-0110 in Appendix C.
controlled rainwater discharge to a combined sewer.	Not required.

The Haringey SuDS Proforma is provided in Appendix D to support the proposed drainage strategy.

6.2.1 Proposed discharge rates

As the site is situated in London the requirements of Policy SI 13 *Sustainable drainage* are relevant to the site. This states that the re-development of the site should aim to reduce the surface water run-off from the site to greenfield run-off rates. The greenfield run-off discharge rates have been calculated for the impermeable areas of the three proposed phases of development. Greenfield run-off was calculated using the method described in the Institute of Hydrology report 124 'Flood Estimation for Small Catchments' (see Greenfield Calculations in Appendix C). The greenfield rates applicable to the site are summarised in Table 4 below.

Table 3 – Greenfield Run-off rates

Contributing area	Greenfield rate (l/s)			
	1 year	Qbar	30 year	100 year
0.135	0.4	0.5	1.2	1.6

Table 4 – Brownfield Run-off rates

Contributing area	Greenfield rate (l/s)			
	1 year	Qbar	30 year	100 year
0.135	13.1	n/a	45.5	71.1

It is proposed to restrict discharge of surface water run-off from the site to the 1% AEP greenfield run-off rate in all events up to and including the 1% AEP rainfall event inclusive of 40% climate change event. Discharge will be limited by flow control devices.

The proposals therefore reduce the existing run-off rate in line with the London Plan and the Haringey SWMP.

6.2.2 Attenuation

Attenuation has been included in the indicative scheme to show how this could be provided within the site to manage the temporary run-off storage required for rainfall events up to and including the 1% AEP annual probability event inclusive of 40% climate change. It is proposed that the attenuation is to be provided using cellular attenuation crates below ground located in grassed areas and by permeable paving to the communal area to the south of the proposed dwellings.

The half drain times are met as all are less than 1440 minutes (24 hours), see calculations in Appendix C.

Green roofs are proposed on some buildings which can provide benefits in terms of reducing peak flow rates to the site drainage system for small and medium-sized events, as well as biodiversity benefits. As described in C753, their impact tends to be most significant in summer, where intense short duration events may generate very little run-off from the roof. However, the reduction in the volume of run-off from a green roof for an extreme event is unlikely to impact on downstream attenuation storage requirements.

6.3 Surface water treatment

Legislation requires that surface water drainage systems are designed to provide an adequate level of treatment pollution. The level of treatment required depends on the pollution hazard indices for the land uses; it must be demonstrated that the proposed pollution mitigation indices exceed the required pollution hazard indices in accordance with C753. Table 6 below assesses suitability of SuDS features for the site based upon C753.

Table 5 – SuDS site suitability

SuDS Component	Suitability	Description
Green roofs	✓	Proposed on some roof areas.
Soakaways	✗	Not suitable due to ground conditions.
Rainwater harvesting systems	✓	Could be utilised for WC flushing etc. to reduce the use of potable water for the development, subject to financial viability.
Filter strips	✗	Not proposed due to space requirements.
Filter trench/drain	✗	Not proposed due to space requirements.
Infiltration trenches	✗	Not suitable due to ground conditions.
Swales	✗	Not proposed due to space requirements.
Bioretention	✓	Could be integrated into the site design.

Permeable paving	✓	Proposed in some courtyard/public open space.
Geocellular systems	✓	Proposed for the temporary storage of surface water run-off.
Infiltration basins	✗	Not suitable due to space restrictions.
Attenuation basins	✗	Not suitable due to space restrictions.
Ponds	✗	Not suitable due to space restrictions.
Stormwater wetlands	✗	Not suitable due to space restrictions.
Proprietary devices	✓	Proposed to provide suitable treatment to surface water run-off.
Rain gardens	✓	Proposed in some public open space areas.

The final selection of SuDS will be decided at detailed design. By implementing measures such as green roofs, permeable paving and a treatment device, run-off is reduced and multiple benefits are provided to London's amenity, biodiversity and better water quality in line with the London Plan.

An example of how treatment will work at this site, in line with Chapter 26 of C753, is provided below.

The site is proposed for residential use; the appropriate pollution hazard indecies for the land uses from Table 26.2 of C753 are shown in Figure 7 below:

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 7 – Table 26.2 of CIRIA C753

The maximum pollution hazard indices are therefore:

- 0.5 for TSS,
- 0.4 for Metals and
- 0.4 for Hydrocarbons.

Mitigation should be achieved through the use of SuDS and based on the SuDS Mitigation Indices given in Table 26.3 of C753 (see Figure 8). Green roofs and permeable paving are proposed on parts of the site which will provide additional treatment to some surface water run-off, however, not all surface water will pass through these SuDS features (i.e. highway run-off) and as such a proprietary device is proposed at each outfall to provide sufficient treatment.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 8 – Table 26.3 of CIRIA C753

A proprietary device (Hydro Downstream Defender) data sheet is provided in Appendix C which gives an example of the mitigation indecies provided by such a device. These are:

- 0.5 for TSS,
- 0.4 for Metals and
- 0.8 for Hydrocarbons.

The proposed mitigation therefore provides a sufficient level of treatment from the sources identified in Table 26.2. Additional treatment is also provided by permeable paving and greenroofs as described above, however, not all surface water run-off passes through all components.

6.4 Management & Maintenance

It is expected that the SuDS measures included within the development will remain private; maintenance of the SuDS will therefore be the responsibility of a management company.

7 Conclusions

The EA Flood map for planning shows that the site lies in Flood Zone 1.

The site is shown to lie in an area affected by pluvial flooding and is located within a critical drainage area. In the high and medium risk scenarios the site is shown to not be affected by flooding, however in the low risk scenario there could be between 300 and 900 mm of flooding at the site.

It is recommended the finished floor levels of the buildings are raised above existing ground levels with falls away from any openings to minimise the risk of flooding at the site. In addition, flood resilient construction techniques should be utilised to minimise the disruption in the event of flooding at the site.

Risk of flooding from all other sources is considered to be low.

Surface water drainage will utilise SuDS techniques to improve water quality and to provide attenuation on site to reduce the unrestricted discharge rate from the site to the 1% AEP greenfield run-off rate as a maximum for all storm events up to and including the 1% AEP rainfall event inclusive of 40% climate change.

The report concludes that in flood risk context, the proposals are safe and appropriate and do not cause increased flood risk.

Appendix A – Existing Site

Newground Architects drawing 21095-SK-001 – Location Plan

Randall Surveys drawing 16156/SW/1A – Existing Site & Services Layout

Turkington Martin – TM-495-LA-101 - Landscaping Strategy

N

1:625

0 6.25 12.5 31.25 m

Notes

- Do not scale from this drawing.
- Verify all dimensions on site.
- Any discrepancy to be reported to the architect for clarification.
- Drawing and specifications to be read in conjunction with information from all other design consultants and contractors.
- Drawings and specifications to be read in conjunction with Designer's Hazard and Environment Assessment Record in accordance with current CDM regulations.

Application boundary

rev	details	date
-		11/06/21

project
Watts Close

drawing
Location Plan

job no	series no	drawing no	rev
21095	SK	001	-

status
Sketch

date	scale @ A1	scale @ A3
23/06/21	1 : 625	1 : 1250

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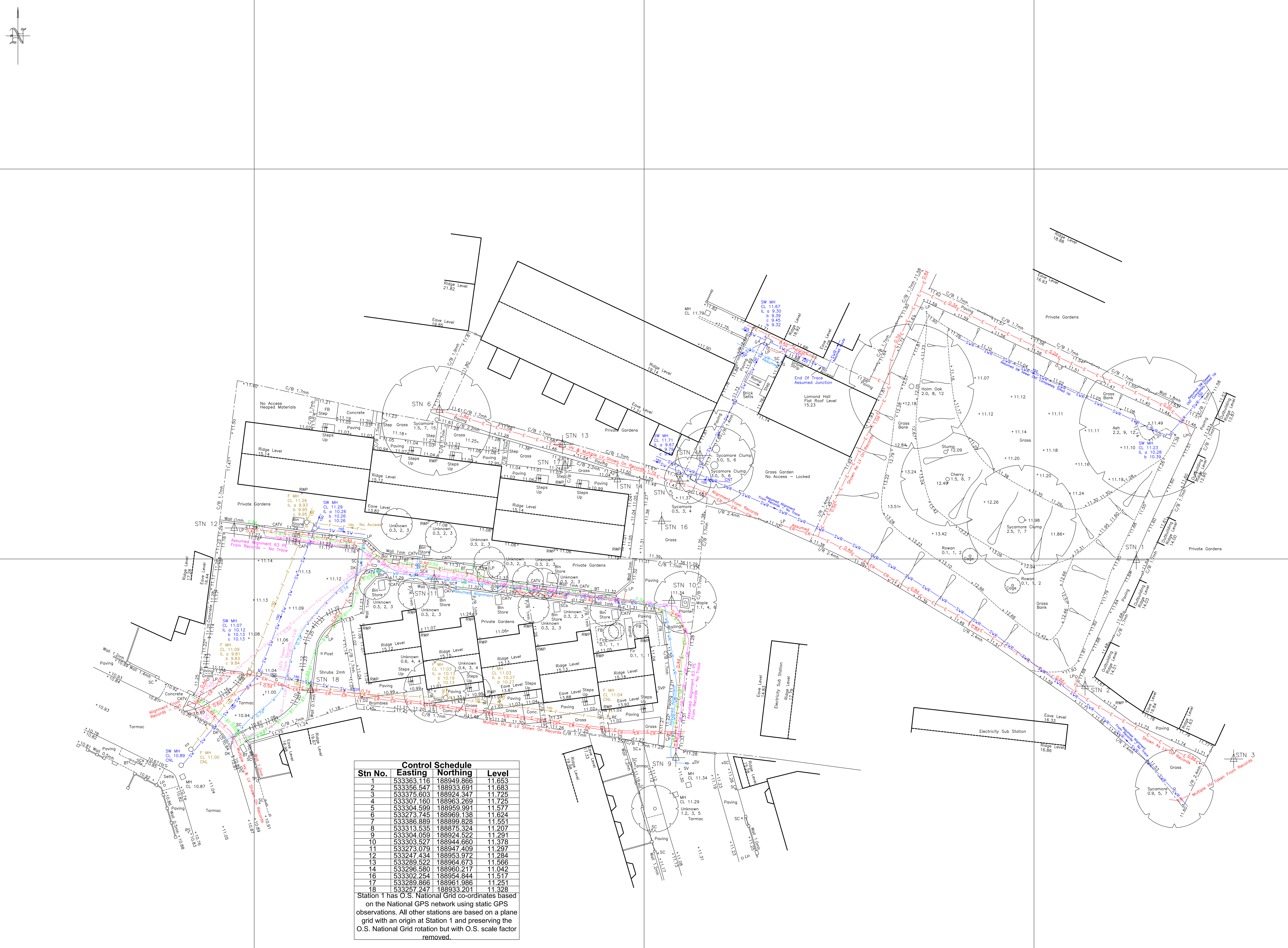

Control Schedule

Stn No.	Easting	Northing	Level
1	533363.116	188949.866	11.653
2	533356.547	188933.691	11.683
3	533375.603	188924.347	11.725
4	533307.160	188963.269	11.725
5	533304.599	188959.991	11.577
6	533273.745	188969.138	11.624
7	533386.889	188899.828	11.551
8	533313.535	188875.324	11.207
9	533304.059	188924.522	11.291
10	533303.527	188944.660	11.378
11	533273.079	188947.409	11.297
12	533247.434	188953.972	11.284
13	533289.522	188964.673	11.566
14	533296.580	188960.217	11.042
16	533302.254	188954.844	11.517
17	533289.866	188961.986	11.251
18	533257.247	188933.201	11.328

Station 1 has O.S. National Grid co-ordinates based on the National GPS network using static GPS observations. All other stations are based on a plane grid with an origin at Station 1 and preserving the O.S. National Grid rotation but with O.S. scale factor removed.

Statutory Service Records Provided	No	Yes	Partial
British Telecom		☑	
CATV		☑	
Electric		☑	
Foul Sewer		☑	
Gas		☑	
Surface Water Sewer		☑	
Water		☑	

Whilst record drawings have been received for Foul Sewer no services are shown on them within the survey area

CONTROL DATA
Survey stations — STN
Boundary posts — BP

LEVEL DATA
Spot levels +43.62
Contours — 43 —
Steep slopes

TREES
1,4,7 Girth (Circumference) , spread (radius), height
Cmp Clump
Trees shown on this drawing have been identified to the best of the surveyors' ability. Where guaranteed identification of tree species may become important in the project design we would strongly recommend that the services of a specialist arboriculturist be employed. It should be noted that Randall Surveys LLP are not specialists in the field of tree identification.

Datum used : Newlyn. All units are metric.

FEATURES
Fences shown thus
Walls shown thus
Hedges shown thus
Undefined Boundary
Gates

OVERHEAD CABLES
British Telecom
Electric

FENCE TYPES

B/W	Barbed wire	I/R	Iron railing
C/B	Close boarded	P/F	Picket fence
C/I	Corrugated iron	P/R	Post and rail
C/L	Chain link	P/W	Post and wire
C/P	Chestnut paling	W/F	Wooden fence
C/W	Chicken Wire		

ABBREVIATIONS

AV Air valve	ER Earth rod	Ret. Retaining
BB Beleisha beacon	FB Flower bed	RS Road sign
BD Back drop	FE Final effluent	RWP Rain water pipe
BH Borehole	FH Fire hydrant	SC Stop cock
Bol Bollard	FL Floodlight	SL Sump level
BT British Telecom cover	G Gully	SP Sign post
BTJB BT junction box	GV Gas valve	ST Stand pipe
CATV Cable TV cover	IC Inspection cover	SV Stop valve
CDP Cable draw pit	IL Invert level	SVP Soil vent pipe
CL Cover level	JB Junction box	TCB Telephone call box
CM Cable marker	KO Kerb outlet	TCP Tactile paving
CNF Could not find	LP Lamp post	TL Traffic light
CNL Could not lift	MH Manhole	TP Telegraph pole
CNT Could not trace	Mkr Marker	TPL Top of pipe level
CPL Coping level	NB Name board	TS Traffic signal
DC Drainage Channel	OF Outfall	VP Vent pipe
DK Drop kerb	PB Post box	WL Weir level
EJB Elec. junction box	PM Parking meter	WO Washout
EOR End of record	PS Paving slabs	WM Water meter
EOT End of trace	RC Rising cable	WSC Water stop cock
EP Electricity pole	RE Rodding eye	

IMPORTANT NOTES

The details and information shown hereon relating to underground drains, cables etc, are as obtained by normal field survey observations subject to the restrictions listed in the NJHSC guidelines. Service Co. and sewer records will only have been consulted on specific request and, although all reasonable effort will have been made, no guarantee of accuracy of these records can be given.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed. Where precise sewer details will be critical to the project design we would recommend that entry into the chamber be undertaken using a specialist team, appropriately qualified for confined space entry. These teams can be supplied upon request.

The pipe and cable routes shown on this drawing have been located using electronic surface detection equipment and/or ground penetrating radar, no trial holes have been dug in order to confirm their presence and position. Whilst the information presented is believed to be correct at the time of the survey due care must be taken when any excavation is undertaken on the site. Trace depths are quoted in metres.

The portrayal of a service on this drawing may indicate the presence of multiple cables/pipes. The exact number will only be indicated where this could be accurately determined.

Hatching denotes an area containing possible services which could not be traced electronically or by GPR, where used, but have been abstracted from service drawings.

The plan position and depth of any service portrayed on this drawing is accurate to +/- 10% of the depth of that service.

Where the precise location and/or depth of a service is critical to design and/or construction, trial holes are recommended to confirm the details provided on this drawing.

This drawing should be read in conjunction with any record drawings available from the statutory authorities.

UNDERGROUND SERVICES – TRACED		UNDERGROUND SERVICES – NOT TRACED	
TV	CATV	TVR	CATV
E	Electric	ER	Electric
W	Water	WR	Water
T	Telemetry	TR	Telemetry
G	Gas	GR	Gas
O	Others	OR	Others
BT	British Telecom	BTR	British Telecom
GPR	Ground Probe Radar Trace	FR (F MH)	Foul Sewer
F (F MH)	Foul Sewer	SWR (SW MH)	Surface Water Sewer
SW (SW MH)	Surface Water Sewer	CR (C MH)	Combined Sewer
C (C MH)	Combined Sewer	OFR (OF MH)	Overflow Sewer
OF (OF MH)	Overflow Sewer	UR (MH)	Undetermined Sewer
U (MH)	Undetermined Sewer	PMR	Pumping Main
PM	Pumping Main	WWR	Washwater
WW	Washwater		

Where underground services have not been traced electronically or by GPR they have either been abstracted from record drawings or are assumptions based on local site conditions.

NOTES

1. Station 1 has O.S. National Grid co-ordinates based on the National GPS network using static GPS observations. All other stations are based on a plane grid with an origin at Station 1 and preserving the O.S. National Grid rotation but with O.S. scale factor removed.
2. Levels are related to the O.S. National GPS network.
3. Refer to Drawing No.s 16156/MC/2 & 3 for the Elevations.
4. Revision A - Additional survey data added (17-12-2020).

PLAN PRODUCTION BY

RANDALL SURVEYS LLP

SURVEY & DESIGN CENTRE
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Land and Hydrographic Surveyors
Architectural Building Surveyors
Underground Services Location

THE SURVEY ASSOCIATION — QMS ISO 9001 REGISTERED FIRM — RICS

PROJECT NAME

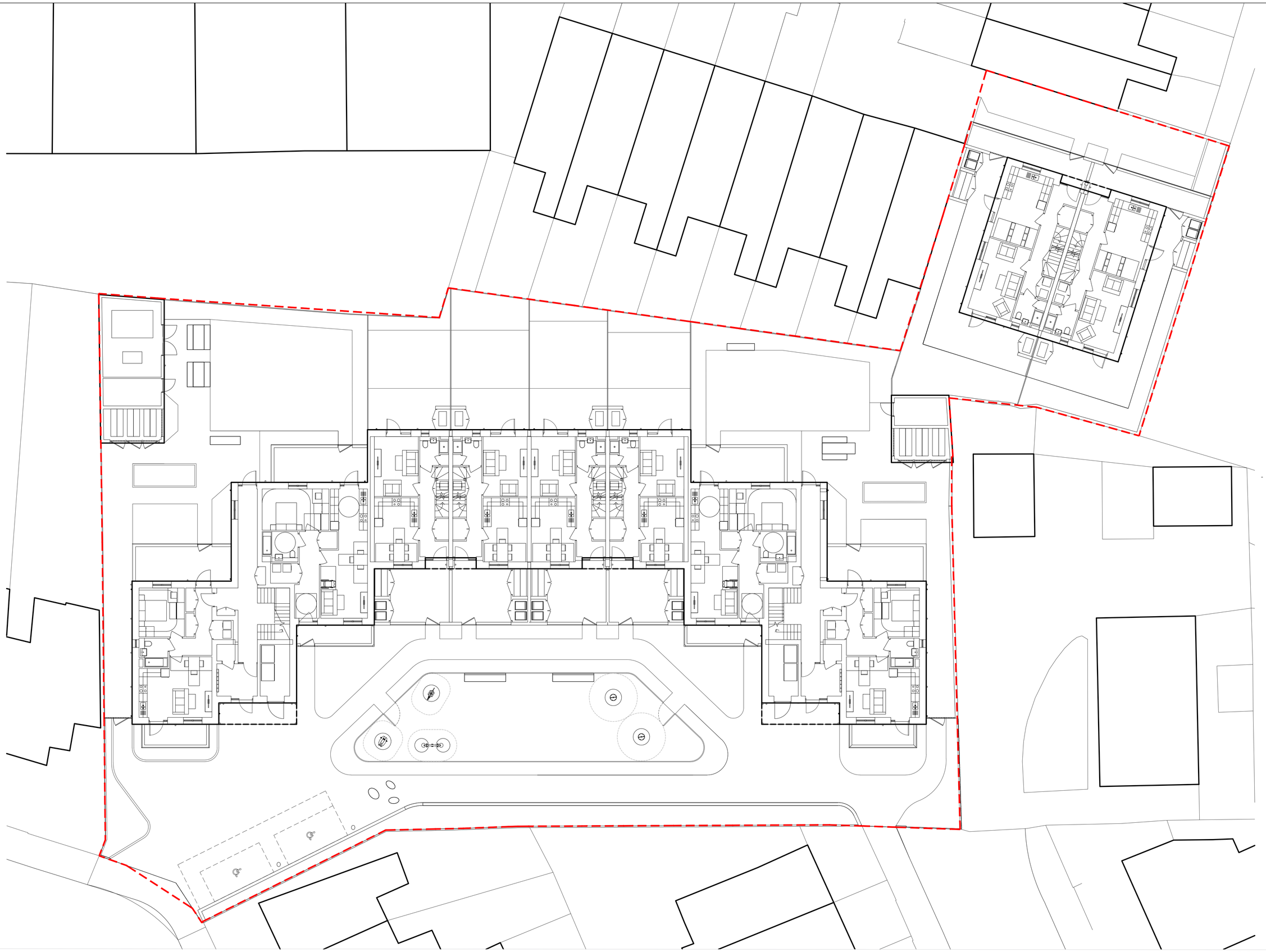
WATTS CLOSE, LONDON N15

DRAWING TITLE

EXISTING SITE & SERVICES LAYOUT

SCALE	1/200	DRAWN	SCW	PAPER SIZE	A0
DATE	October 2020	CHECKED	DRD	REVISION	A

Dwg No. 16156/SW/1A



N

0 1250 3125 6250 9375

Scale Bar in mm 1:125

DATE	DRAWN	DESCRIPTION OF REVISION	REVISION LETTER	CHECKED BY
00/00/00	XX	Description	#	YY

CLIENT
Haringey Council
PROJECT TITLE
Watts Close

DRAWING TITLE
Illustrative GA
DRAWING STATUS
Preliminary

DRAWING SCALE :	DRAWN BY :	DRAWN DATE :
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PAPER SIZE :	CHECKED BY :	CHECKED DATE :
A1	JT	Nov 21

DRAWING NUMBER :
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REVISION :
#

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Appendix B – Thames Water Sewer Plans

Asset location search

Property Searches

Sweco
IPSWICH
IP2 8PN

Search address supplied Watts Close
London
N15 5DW

Your reference 65202627

Our reference ALS/ALS/24/2021_4505133

Search date 16 September 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

Thames Water Property Searches

Search address supplied: Watts Close, London, N15 5DW

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

Asset location search

Thames Water Property Searches

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.

Asset location search

Property Searches

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

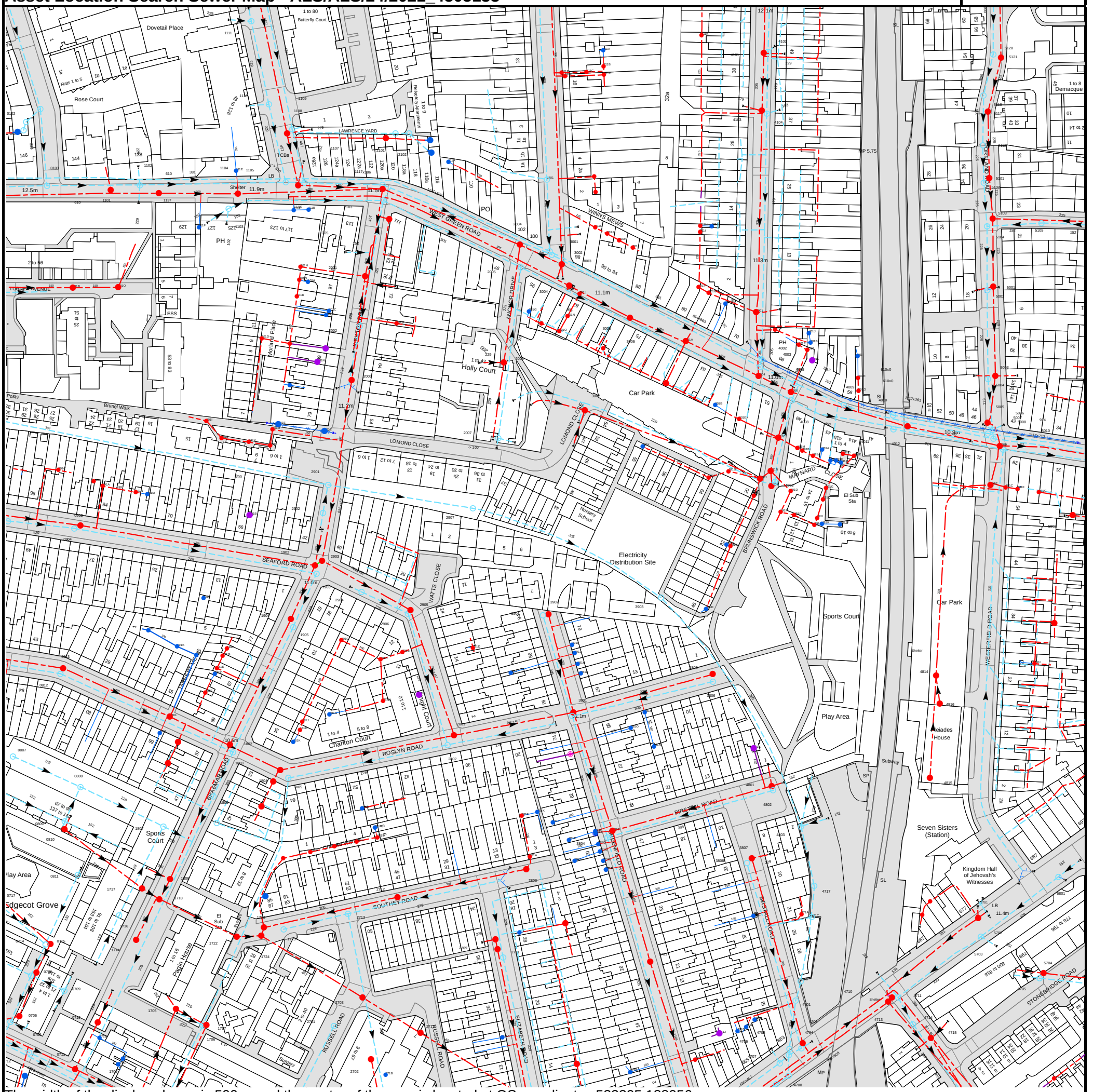
Clean Water queries

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/24/2021_4505133



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 533305,188956

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
01YT	n/a	n/a
01ZP	n/a	n/a
01ZQ	n/a	n/a
0102	12.78	11.56
111E	n/a	n/a
2101	11.4	9.63
1107	11.52	9.72
1105	11.66	9.73
211A	n/a	n/a
21YS	n/a	n/a
21XZ	n/a	n/a
21XX	n/a	n/a
21YQ	n/a	n/a
1108	11.88	8.01
21YP	n/a	n/a
1109	11.8	10.13
1110	12.02	11.14
1111	12.53	11.45
311I	n/a	n/a
311G	n/a	n/a
311J	n/a	n/a
311H	n/a	n/a
3107	n/a	n/a
3101	11.06	9.84
3108	n/a	n/a
4104	11.76	10.6
4103	11.8	9.86
311E	n/a	n/a
311D	n/a	n/a
311F	n/a	n/a
311C	n/a	n/a
311B	n/a	n/a
4101	11.97	10.1
4102	11.93	10.94
311A	n/a	n/a
311K	n/a	n/a
001B	n/a	n/a
0103	12.36	10.22
1101	12.28	11.05
101O	n/a	n/a
1102	12.08	10
1137	n/a	n/a
111F	n/a	n/a
1103	n/a	n/a
1104	11.87	10.68
101D	n/a	n/a
101C	n/a	n/a
111A	n/a	n/a
101B	n/a	n/a
1106	11.64	7.65
101G	n/a	n/a
101H	n/a	n/a
101A	n/a	n/a
111B	n/a	n/a
101N	n/a	n/a
201F	n/a	n/a
201D	n/a	n/a
201C	n/a	n/a
2002	11.94	10.48
2001	11.93	10.43
2102	11.49	7.54
2103	11.33	9.57
21YV	n/a	n/a
201H	n/a	n/a
20VZ	n/a	n/a
2006	11.19	9.74
5003	10.98	9.44
401I	n/a	n/a
5002	10.99	9.61
5001	11.01	9.2
5104	11.1	9.05
5105	10.74	9.94
5103	11.1	9.75
5102	11.16	9.33
5101	11.13	9.83
5118	11.25	9.42
5117	11.4	9.98
5119	11.5	9.5
5121	12.15	10.13
5120	12.15	9.63
391F	n/a	n/a
391G	n/a	n/a
301K	n/a	n/a
301E	n/a	n/a
3007	11.24	10.19
301B	n/a	n/a
3027	n/a	n/a
3028	n/a	n/a
301A	n/a	n/a
301O	n/a	n/a
3006	10.9	9.38

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3026	n/a	n/a
3005	10.95	9.78
301N	n/a	n/a
201G	n/a	n/a
301M	n/a	n/a
301L	n/a	n/a
301G	n/a	n/a
301F	n/a	n/a
3004	11	9.89
2005	10.94	9.57
3003	10.97	8.79
3002	10.91	9.74
3001	10.93	10.27
301I	n/a	n/a
2004	11.05	8.59
301H	n/a	n/a
301J	n/a	n/a
491D	n/a	n/a
491G	n/a	n/a
4904	11.21	9.81
4903	11.23	10.24
4901	11.2	9.92
491N	n/a	n/a
491M	n/a	n/a
491C	n/a	n/a
491L	n/a	n/a
491A	n/a	n/a
491O	n/a	n/a
491B	n/a	n/a
401A	n/a	n/a
401M	n/a	n/a
401C	n/a	n/a
4009	10.89	9.12
4008	10.92	9.2
4006	10.98	8.52
4005	11.01	9.23
4004	10.93	8.6
4003	10.94	9.22
401L	n/a	n/a
4002	10.9	9.61
401F	n/a	n/a
401E	n/a	n/a
401B	n/a	n/a
401J	n/a	n/a
401K	n/a	n/a
4001	11.19	8.95
491E	n/a	n/a
401H	n/a	n/a
401G	n/a	n/a
4010	10.62	8.05
4011	10.59	7.97
4012	10.75	8.37
5005	10.89	9.47
5007	10.8	7.5
5004	10.97	9.39
591E	n/a	n/a
5006	10.79	9.47
5008	10.9	9.07
5009	10.91	8.32
5010	10.73	7.52
591C	n/a	n/a
591F	n/a	n/a
591G	n/a	n/a
0904	12.23	10.47
0903	12.25	9.71
0902	12.19	10.58
091C	n/a	n/a
2906	10.92	10.01
2905	10.01	7.11
191I	n/a	n/a
2904	10.92	10.18
1903	10.99	9.93
1902	11.05	9.05
2903	11.02	7.22
191B	n/a	n/a
2902	10.94	9.39
2907	11.82	8.82
191M	n/a	n/a
191N	n/a	n/a
191A	n/a	n/a
2901	10.55	8.96
091A	n/a	n/a
101L	n/a	n/a
101K	n/a	n/a
101J	n/a	n/a
2007	11.35	10.34
201E	n/a	n/a
101M	n/a	n/a
101E	n/a	n/a
101I	n/a	n/a
101F	n/a	n/a
2003	11.94	7.47
59VS	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5902	10.99	10.13
3901	11.29	10.14
3902	11.34	9.75
3802	11.17	9.67
391I	n/a	n/a
391J	n/a	n/a
391K	n/a	n/a
381R	n/a	n/a
381O	n/a	n/a
381N	n/a	n/a
3903	11.62	8.7
391D	n/a	n/a
3805	11.55	9.11
3806	11.49	9.98
391H	n/a	n/a
391E	n/a	n/a
391A	n/a	n/a
491F	n/a	n/a
491P	n/a	n/a
491H	n/a	n/a
491I	n/a	n/a
491K	n/a	n/a
491Q	n/a	n/a
491J	n/a	n/a
4814	n/a	n/a
4816	n/a	n/a
591I	n/a	n/a
2712	10.63	8.89
17WY	n/a	n/a
18XT	n/a	n/a
181G	n/a	n/a
281D	n/a	n/a
281C	n/a	n/a
281B	n/a	n/a
281E	n/a	n/a
18TV	n/a	n/a
18TT	n/a	n/a
1805	10.57	9.6
1803	10.48	9.44
2802	10.81	9.74
181K	n/a	n/a
181H	n/a	n/a
181J	n/a	n/a
281G	n/a	n/a
281H	n/a	n/a
291A	n/a	n/a
191G	n/a	n/a
191F	n/a	n/a
291C	n/a	n/a
1905	10.87	9.77
1904	10.9	8.96
5704	11.37	9.88
5801	11.52	10.31
571A	n/a	n/a
1807	10.14	9.6
1815	n/a	n/a
1801	10.71	7.79
1808	10.17	7.98
191K	n/a	n/a
1814	n/a	n/a
191J	n/a	n/a
181F	n/a	n/a
1806	10.29	9.35
181D	n/a	n/a
18VV	n/a	n/a
181E	n/a	n/a
1802	10.52	8.75
1804	10.69	7.61
281J	n/a	n/a
291B	n/a	n/a
281L	n/a	n/a
2801	11.9	7.06
291D	n/a	n/a
0807	n/a	n/a
0812	11.17	9.81
0813	11.26	8.11
0810	n/a	n/a
0809	n/a	n/a
0811	n/a	n/a
0808	n/a	n/a
1717	10.41	8.97
191L	n/a	n/a
1718	10.18	7.97
181I	n/a	n/a
4707	10.59	8.87
4706	10.65	7.93
4705	10.69	8.26
4704	10.69	8.87
4703	10.77	7.09
4715	10.8	9.18
4714	10.84	9.4
471B	n/a	n/a
4713	10.95	6.47

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4701	10.77	8.34
4711	10.94	9.47
4710	10.99	n/a
471D	n/a	n/a
5705	11.29	10.08
5703	11.29	9.91
5702	11.36	8.34
471C	n/a	n/a
371C	n/a	n/a
4732	n/a	n/a
471A	n/a	n/a
5701	11.28	10.48
4733	n/a	n/a
4717	10.83	8.47
4803	11.4	8.46
4802	11.48	9.78
4801	11.47	8.58
4815	n/a	n/a
381S	n/a	n/a
3702	n/a	n/a
371I	n/a	n/a
371J	n/a	n/a
371D	n/a	n/a
371E	n/a	n/a
3701	10.59	6.79
27YP	n/a	n/a
37WZ	n/a	n/a
381E	n/a	n/a
381A	n/a	n/a
2803	10.85	9.52
3808	11.09	9.47
381B	n/a	n/a
381C	n/a	n/a
3807	11.16	8.36
281A	n/a	n/a
381G	n/a	n/a
381Q	n/a	n/a
381D	n/a	n/a
3804	10.82	9.34
381J	n/a	n/a
381I	n/a	n/a
3803	10.91	6.92
381P	n/a	n/a
281F	n/a	n/a
381K	n/a	n/a
381M	n/a	n/a
3801	11.2	7
281I	n/a	n/a
1704	10.27	8.46
07VW	n/a	n/a
0711	10.33	7.21
171C	n/a	n/a
171A	n/a	n/a
0712	10.36	8.58
171B	n/a	n/a
1707	10.28	8.16
1706	10.29	8.91
0710	10.28	8.68
0705	n/a	n/a
0706	n/a	n/a
1705	10.33	8.26
0709	n/a	n/a
0707	n/a	n/a
0708	n/a	n/a
0714	n/a	n/a
0715	n/a	n/a
1714	10.2	8.98
1722	10.26	7.83
1724	10.21	7.86
1716	n/a	n/a
371G	n/a	n/a
4709	10.51	9.29
4708	10.53	8.27
271B	n/a	n/a
2702	10.18	8.47
271A	n/a	n/a
2717	n/a	n/a
2701	10.3	9.15
2703	10.43	7.77
2711	10.61	9.5
2710	10.57	9.07
2709	10.61	9.18
1725	10.42	9.29

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 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.

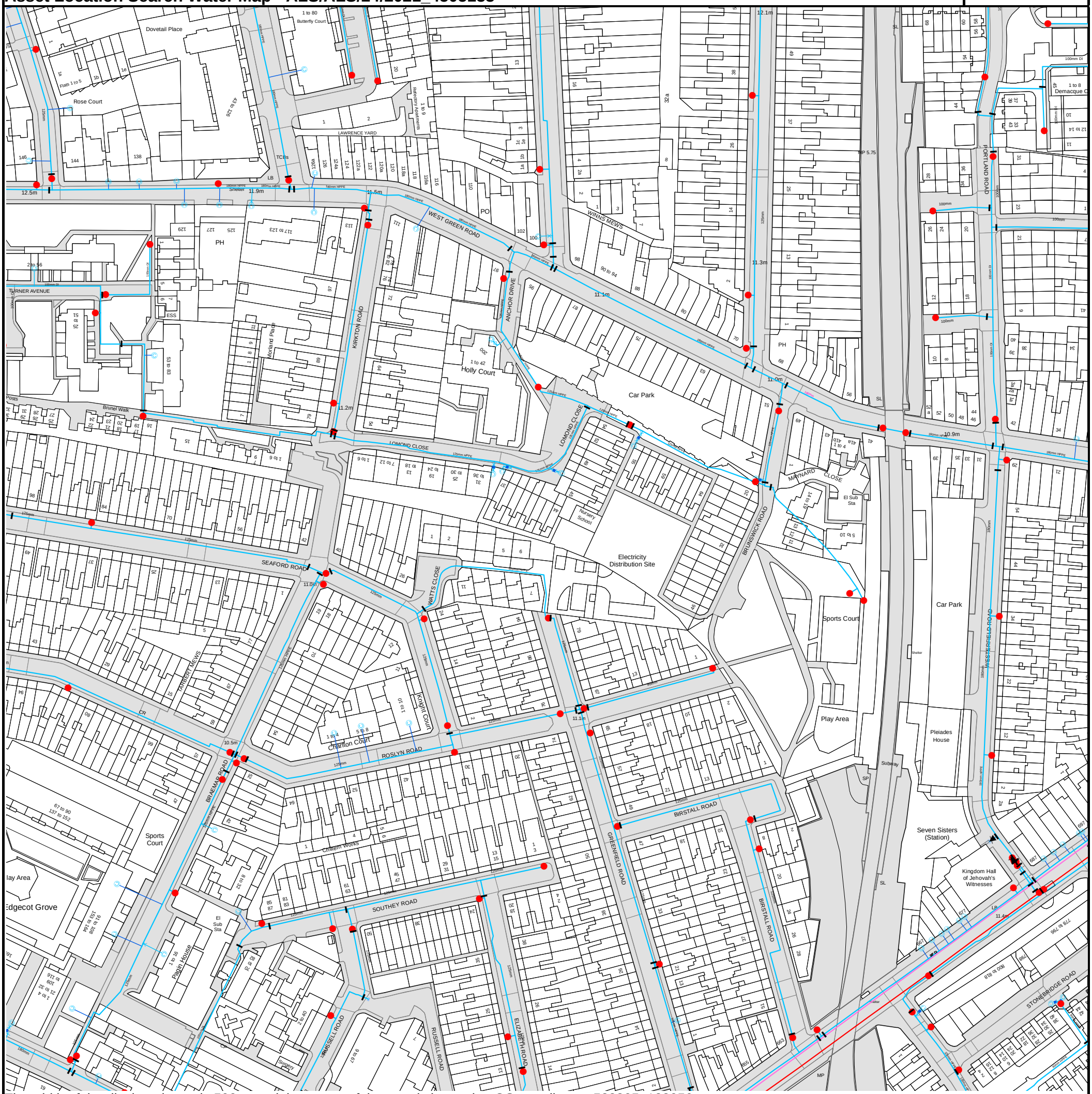
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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/24/2021_4505133



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 533305, 188956.

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 C – Drainage Strategy

Greenfield Calculations

Brownfield Calculations

Drawing 65202627-SWE-ZZ-XX-DR-C-0110 – Foul & Surface Water Drainage Strategy

Microdrainage Calculations

Downstream Defender Datasheet

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.135	Urban	0.000
SAAR (mm)	618	Region Number	Region 6

Results l/s

QBAR Rural	0.5
QBAR Urban	0.5
Q100 years	1.6
Q1 year	0.4
Q30 years	1.2
Q100 years	1.6

SWECO	Project	**Watts Close, London**		Made	Ref 65202627
	Section	**Brownfield Rates**		Checked	Sheet No. 1 of 1
	Rev P01	Date 07.07.21	Description	Made CB	Checked JRC

Ref.	Calculation	Output

1. Brownfield Run-off Calculation

Based on the Modified Rational Method the current discharge rate from the site for the 100%, 3.3% and 1% annual exceedance probability (AEP) events (1, 30 & 100 year) can be calculated as:

Q = 3.61 CiA

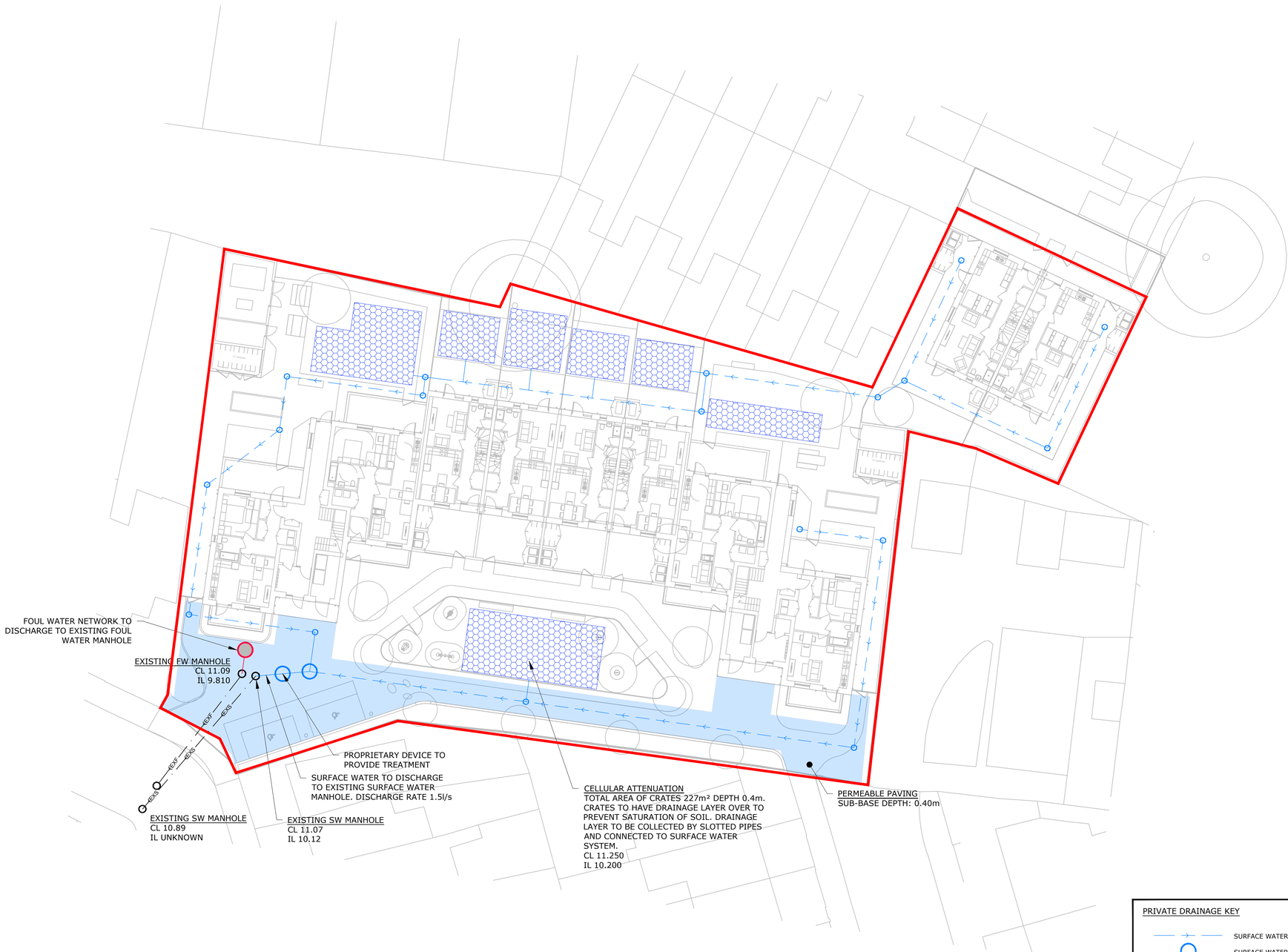
C = Volumetric run-off co-efficient	0.9	
i = Rainfall intensity	see below	mm / hr
A = Contributing Area	0.135	ha

Rainfall intensity taken from MicroDrainage Rainfall Generator

100%	29.848	mm / hr
3.3%	103.719	mm / hr
1%	162.255	mm / hr

Discharge rate

100%	13.092	l / s
3.3%	45.493	l / s
1%	71.167	l / s



PRIVATE DRAINAGE KEY

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- SURFACE WATER PPIC
- FOUL WATER DRAIN
- FOUL WATER MANHOLE
- EXISTING SURFACE WATER DRAIN
- EXISTING FOUL WATER DRAIN
- CELLULAR ATTENUATION CRATES
- PERMEABLE PAVING
- APPROX. SITE BOUNDARY

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.
3. THIS DRAINAGE STRATEGY DRAWING SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON SITE WITH A RESTRICTED OFF-SITE DISCHARGE, FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD EVENT PLUS 40% CLIMATE CHANGE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THE PROPOSED DEVELOPMENT.

   THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT TO MEET CERTAIN TECHNICAL CRITERIA.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

1. IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.

2. TO BE COMPLETED AT DETAILED DESIGN.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.

REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

Rev	Date	Amendment Details	Dr'n	Chk'	App'
P03	22.11.21	LAYOUT UPDATED	JRC	BP	JRC
P02	14.09.21	ATTENUATION AMENDED	JRC	AH	JRC
P01	08.07.21	FIRST ISSUE	CB	JRC	JRC

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IP2 8PN
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Web: www.sweco.co.uk

Client

LONDON BOROUGH OF HARINGEY

Project Title

WATTS CLOSE, LONDON

Drawing Title

FOUL & SURFACE WATER DRAINAGE STRATEGY

Purpose Of Issue	PRELMINARY
Status	S0
Status Description	INITIAL STATUS OR WIP

Designed	Drawn	Checked	Approved
CB	CB	JRC	JRC
Sheet Size	**Scale**	**SWECO Ref**	**Revision**
A1	1:200	65202627	P03

Drawing Number

65202627-SWE-ZZ-XX-DR-C-0110

Summary of Results for 1 year Return Period

Half Drain Time : 162 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	10.229	0.029	0.0	0.3	0.3	6.3	O K
30 min Summer	10.237	0.037	0.0	0.5	0.5	8.0	O K
60 min Summer	10.245	0.045	0.0	0.7	0.7	9.6	O K
120 min Summer	10.251	0.051	0.0	0.8	0.8	11.0	O K
180 min Summer	10.255	0.055	0.0	0.9	0.9	11.8	O K
240 min Summer	10.257	0.057	0.0	0.9	0.9	12.3	O K
360 min Summer	10.260	0.060	0.0	1.0	1.0	12.9	O K
480 min Summer	10.261	0.061	0.0	1.0	1.0	13.1	O K
600 min Summer	10.261	0.061	0.0	1.0	1.0	13.2	O K
720 min Summer	10.261	0.061	0.0	1.0	1.0	13.1	O K
960 min Summer	10.259	0.059	0.0	1.0	1.0	12.7	O K
1440 min Summer	10.254	0.054	0.0	0.9	0.9	11.7	O K
2160 min Summer	10.249	0.049	0.0	0.8	0.8	10.6	O K
2880 min Summer	10.245	0.045	0.0	0.7	0.7	9.7	O K
4320 min Summer	10.239	0.039	0.0	0.5	0.5	8.4	O K
5760 min Summer	10.235	0.035	0.0	0.5	0.5	7.6	O K
7200 min Summer	10.232	0.032	0.0	0.4	0.4	7.0	O K
8640 min Summer	10.230	0.030	0.0	0.3	0.3	6.5	O K
10080 min Summer	10.228	0.028	0.0	0.3	0.3	6.1	O K
15 min Winter	10.233	0.033	0.0	0.4	0.4	7.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.848	0.0	5.5	19
30 min Summer	18.851	0.0	7.3	33
60 min Summer	11.905	0.0	10.1	62
120 min Summer	7.519	0.0	13.1	104
180 min Summer	5.747	0.0	15.2	132
240 min Summer	4.749	0.0	16.8	166
360 min Summer	3.629	0.0	19.4	234
480 min Summer	2.999	0.0	21.5	302
600 min Summer	2.587	0.0	23.2	368
720 min Summer	2.292	0.0	24.7	434
960 min Summer	1.864	0.0	26.8	560
1440 min Summer	1.394	0.0	29.9	808
2160 min Summer	1.042	0.0	34.2	1172
2880 min Summer	0.847	0.0	36.9	1544
4320 min Summer	0.623	0.0	40.2	2252
5760 min Summer	0.501	0.0	43.5	3000
7200 min Summer	0.423	0.0	45.7	3744
8640 min Summer	0.369	0.0	47.4	4416
10080 min Summer	0.328	0.0	48.7	5152
15 min Winter	29.848	0.0	6.3	18

Summary of Results for 1 year Return Period

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	10.242	0.042	0.0	0.6	0.6	9.0	O K
60 min Winter	10.250	0.050	0.0	0.8	0.8	10.8	O K
120 min Winter	10.257	0.057	0.0	0.9	0.9	12.4	O K
180 min Winter	10.261	0.061	0.0	1.0	1.0	13.1	O K
240 min Winter	10.263	0.063	0.0	1.0	1.0	13.6	O K
360 min Winter	10.265	0.065	0.0	1.1	1.1	13.9	O K
480 min Winter	10.264	0.064	0.0	1.0	1.0	13.9	O K
600 min Winter	10.264	0.064	0.0	1.0	1.0	13.7	O K
720 min Winter	10.262	0.062	0.0	1.0	1.0	13.4	O K
960 min Winter	10.258	0.058	0.0	0.9	0.9	12.6	O K
1440 min Winter	10.252	0.052	0.0	0.8	0.8	11.2	O K
2160 min Winter	10.245	0.045	0.0	0.7	0.7	9.7	O K
2880 min Winter	10.241	0.041	0.0	0.6	0.6	8.8	O K
4320 min Winter	10.235	0.035	0.0	0.4	0.4	7.4	O K
5760 min Winter	10.231	0.031	0.0	0.4	0.4	6.6	O K
7200 min Winter	10.228	0.028	0.0	0.3	0.3	6.0	O K
8640 min Winter	10.226	0.026	0.0	0.3	0.3	5.6	O K
10080 min Winter	10.224	0.024	0.0	0.2	0.2	5.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	18.851	0.0	8.3	32
60 min Winter	11.905	0.0	11.5	60
120 min Winter	7.519	0.0	14.8	112
180 min Winter	5.747	0.0	17.1	140
240 min Winter	4.749	0.0	19.0	176
360 min Winter	3.629	0.0	21.9	250
480 min Winter	2.999	0.0	24.2	322
600 min Winter	2.587	0.0	26.1	392
720 min Winter	2.292	0.0	27.8	458
960 min Winter	1.864	0.0	30.2	588
1440 min Winter	1.394	0.0	33.7	838
2160 min Winter	1.042	0.0	38.4	1212
2880 min Winter	0.847	0.0	41.6	1584
4320 min Winter	0.623	0.0	45.4	2292
5760 min Winter	0.501	0.0	49.0	3048
7200 min Winter	0.423	0.0	51.5	3800
8640 min Winter	0.369	0.0	53.5	4448
10080 min Winter	0.328	0.0	55.0	5248

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 533300 188750 TQ 33300 88750
C (1km)	-0.026
D1 (1km)	0.337
D2 (1km)	0.282
D3 (1km)	0.243
E (1km)	0.332
F (1km)	2.477
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.127

Time (mins) From:	To:	Area (ha)
0	4	0.127

Model Details

Storage is Online Cover Level (m) 11.250

Complex Structure

Cellular Storage

Invert Level (m)	10.200	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	227.0	0.0	0.401	0.0	0.0
0.400	227.0	0.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	33.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.650	Cap Volume Depth (m)	0.400

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0063-1600-0800-1600
Design Head (m)	0.800
Design Flow (l/s)	1.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	10.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	1.6
Flush-Flo™	0.246	1.6
Kick-Flo®	0.508	1.3
Mean Flow over Head Range	-	1.4

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

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.3
0.200	1.6	1.400	2.1	3.500	3.1	7.500	4.5
0.300	1.6	1.600	2.2	4.000	3.3	8.000	4.6
0.400	1.5	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.3	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.0		
1.000	1.8	2.600	2.7	6.500	4.2		

Summary of Results for 30 year Return Period

Half Drain Time : 235 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	10.308	0.108	0.0	1.4	1.4	23.3	O K
30 min Summer	10.326	0.126	0.0	1.5	1.5	27.2	O K
60 min Summer	10.344	0.144	0.0	1.5	1.5	31.1	O K
120 min Summer	10.359	0.159	0.0	1.5	1.5	34.3	O K
180 min Summer	10.364	0.164	0.0	1.6	1.6	35.3	O K
240 min Summer	10.366	0.166	0.0	1.6	1.6	35.8	O K
360 min Summer	10.368	0.168	0.0	1.6	1.6	36.2	O K
480 min Summer	10.367	0.167	0.0	1.6	1.6	36.0	O K
600 min Summer	10.365	0.165	0.0	1.6	1.6	35.5	O K
720 min Summer	10.361	0.161	0.0	1.6	1.6	34.8	O K
960 min Summer	10.350	0.150	0.0	1.5	1.5	32.4	O K
1440 min Summer	10.329	0.129	0.0	1.5	1.5	27.9	O K
2160 min Summer	10.305	0.105	0.0	1.4	1.4	22.6	O K
2880 min Summer	10.288	0.088	0.0	1.4	1.4	18.9	O K
4320 min Summer	10.269	0.069	0.0	1.1	1.1	14.8	O K
5760 min Summer	10.258	0.058	0.0	0.9	0.9	12.5	O K
7200 min Summer	10.251	0.051	0.0	0.8	0.8	11.0	O K
8640 min Summer	10.247	0.047	0.0	0.7	0.7	10.0	O K
10080 min Summer	10.243	0.043	0.0	0.6	0.6	9.3	O K
15 min Winter	10.321	0.121	0.0	1.5	1.5	26.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	103.719	0.0	22.8	18
30 min Summer	61.629	0.0	27.4	33
60 min Summer	36.620	0.0	33.6	62
120 min Summer	21.759	0.0	40.1	120
180 min Summer	16.047	0.0	44.5	164
240 min Summer	12.929	0.0	47.9	194
360 min Summer	9.535	0.0	53.1	258
480 min Summer	7.682	0.0	57.0	326
600 min Summer	6.497	0.0	60.3	396
720 min Summer	5.666	0.0	63.1	464
960 min Summer	4.493	0.0	66.7	598
1440 min Summer	3.241	0.0	72.0	852
2160 min Summer	2.337	0.0	78.6	1216
2880 min Summer	1.854	0.0	82.9	1560
4320 min Summer	1.316	0.0	87.6	2288
5760 min Summer	1.032	0.0	92.0	3000
7200 min Summer	0.855	0.0	94.9	3680
8640 min Summer	0.733	0.0	97.2	4416
10080 min Summer	0.643	0.0	99.0	5144
15 min Winter	103.719	0.0	25.7	18

Summary of Results for 30 year Return Period

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	10.342	0.142	0.0	1.5	1.5	30.6	O K
60 min Winter	10.363	0.163	0.0	1.6	1.6	35.1	O K
120 min Winter	10.381	0.181	0.0	1.6	1.6	39.0	O K
180 min Winter	10.387	0.187	0.0	1.6	1.6	40.4	O K
240 min Winter	10.389	0.189	0.0	1.6	1.6	40.7	O K
360 min Winter	10.389	0.189	0.0	1.6	1.6	40.7	O K
480 min Winter	10.386	0.186	0.0	1.6	1.6	40.1	O K
600 min Winter	10.381	0.181	0.0	1.6	1.6	39.0	O K
720 min Winter	10.375	0.175	0.0	1.6	1.6	37.6	O K
960 min Winter	10.357	0.157	0.0	1.5	1.5	33.9	O K
1440 min Winter	10.326	0.126	0.0	1.5	1.5	27.3	O K
2160 min Winter	10.293	0.093	0.0	1.4	1.4	20.1	O K
2880 min Winter	10.276	0.076	0.0	1.2	1.2	16.4	O K
4320 min Winter	10.258	0.058	0.0	0.9	0.9	12.4	O K
5760 min Winter	10.248	0.048	0.0	0.7	0.7	10.4	O K
7200 min Winter	10.243	0.043	0.0	0.6	0.6	9.2	O K
8640 min Winter	10.239	0.039	0.0	0.5	0.5	8.4	O K
10080 min Winter	10.236	0.036	0.0	0.5	0.5	7.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	61.629	0.0	30.9	32
60 min Winter	36.620	0.0	37.8	62
120 min Winter	21.759	0.0	45.1	118
180 min Winter	16.047	0.0	50.0	174
240 min Winter	12.929	0.0	53.8	224
360 min Winter	9.535	0.0	59.6	278
480 min Winter	7.682	0.0	64.0	356
600 min Winter	6.497	0.0	67.7	430
720 min Winter	5.666	0.0	70.9	504
960 min Winter	4.493	0.0	74.9	644
1440 min Winter	3.241	0.0	80.9	908
2160 min Winter	2.337	0.0	88.2	1256
2880 min Winter	1.854	0.0	93.1	1612
4320 min Winter	1.316	0.0	98.5	2324
5760 min Winter	1.032	0.0	103.4	3008
7200 min Winter	0.855	0.0	106.7	3752
8640 min Winter	0.733	0.0	109.3	4472
10080 min Winter	0.643	0.0	111.4	5144

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 533300 188750 TQ 33300 88750
C (1km)	-0.026
D1 (1km)	0.337
D2 (1km)	0.282
D3 (1km)	0.243
E (1km)	0.332
F (1km)	2.477
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.127

Time (mins) From:	To:	Area (ha)
0	4	0.127

Summary of Results for 100 year Return Period

Half Drain Time : 351 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	10.372	0.172	0.0	1.6	1.6	37.0	O K
30 min Summer	10.397	0.197	0.0	1.6	1.6	42.4	O K
60 min Summer	10.422	0.222	0.0	1.6	1.6	47.9	O K
120 min Summer	10.444	0.244	0.0	1.6	1.6	52.7	O K
180 min Summer	10.452	0.252	0.0	1.6	1.6	54.4	O K
240 min Summer	10.454	0.254	0.0	1.6	1.6	54.8	O K
360 min Summer	10.453	0.253	0.0	1.6	1.6	54.6	O K
480 min Summer	10.451	0.251	0.0	1.6	1.6	54.0	O K
600 min Summer	10.447	0.247	0.0	1.6	1.6	53.2	O K
720 min Summer	10.441	0.241	0.0	1.6	1.6	52.1	O K
960 min Summer	10.425	0.225	0.0	1.6	1.6	48.6	O K
1440 min Summer	10.395	0.195	0.0	1.6	1.6	42.0	O K
2160 min Summer	10.357	0.157	0.0	1.5	1.5	33.8	O K
2880 min Summer	10.328	0.128	0.0	1.5	1.5	27.7	O K
4320 min Summer	10.291	0.091	0.0	1.4	1.4	19.5	O K
5760 min Summer	10.273	0.073	0.0	1.2	1.2	15.8	O K
7200 min Summer	10.263	0.063	0.0	1.0	1.0	13.5	O K
8640 min Summer	10.256	0.056	0.0	0.9	0.9	12.0	O K
10080 min Summer	10.251	0.051	0.0	0.8	0.8	11.0	O K
15 min Winter	10.393	0.193	0.0	1.6	1.6	41.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	162.255	0.0	36.6	19
30 min Summer	94.322	0.0	42.8	33
60 min Summer	54.831	0.0	50.9	62
120 min Summer	31.874	0.0	59.4	122
180 min Summer	23.207	0.0	64.9	180
240 min Summer	18.529	0.0	69.2	238
360 min Summer	13.491	0.0	75.6	292
480 min Summer	10.771	0.0	80.5	354
600 min Summer	9.045	0.0	84.5	420
720 min Summer	7.842	0.0	87.9	490
960 min Summer	6.163	0.0	92.1	624
1440 min Summer	4.388	0.0	98.2	882
2160 min Summer	3.125	0.0	105.6	1272
2880 min Summer	2.456	0.0	110.4	1616
4320 min Summer	1.721	0.0	115.4	2296
5760 min Summer	1.337	0.0	120.0	3000
7200 min Summer	1.100	0.0	123.0	3744
8640 min Summer	0.937	0.0	125.3	4416
10080 min Summer	0.819	0.0	127.1	5144
15 min Winter	162.255	0.0	41.1	18

Summary of Results for 100 year Return Period

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	10.421	0.221	0.0	1.6	1.6	47.8	O K
60 min Winter	10.451	0.251	0.0	1.6	1.6	54.1	O K
120 min Winter	10.477	0.277	0.0	1.6	1.6	59.7	O K
180 min Winter	10.488	0.288	0.0	1.6	1.6	62.1	O K
240 min Winter	10.492	0.292	0.0	1.6	1.6	63.0	O K
360 min Winter	10.490	0.290	0.0	1.6	1.6	62.6	O K
480 min Winter	10.485	0.285	0.0	1.6	1.6	61.4	O K
600 min Winter	10.478	0.278	0.0	1.6	1.6	60.0	O K
720 min Winter	10.470	0.270	0.0	1.6	1.6	58.3	O K
960 min Winter	10.447	0.247	0.0	1.6	1.6	53.2	O K
1440 min Winter	10.402	0.202	0.0	1.6	1.6	43.5	O K
2160 min Winter	10.348	0.148	0.0	1.5	1.5	31.9	O K
2880 min Winter	10.311	0.111	0.0	1.4	1.4	23.9	O K
4320 min Winter	10.274	0.074	0.0	1.2	1.2	16.0	O K
5760 min Winter	10.259	0.059	0.0	1.0	1.0	12.8	O K
7200 min Winter	10.251	0.051	0.0	0.8	0.8	11.0	O K
8640 min Winter	10.246	0.046	0.0	0.7	0.7	9.8	O K
10080 min Winter	10.242	0.042	0.0	0.6	0.6	9.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	94.322	0.0	48.1	33
60 min Winter	54.831	0.0	57.2	62
120 min Winter	31.874	0.0	66.6	120
180 min Winter	23.207	0.0	72.8	176
240 min Winter	18.529	0.0	77.6	232
360 min Winter	13.491	0.0	84.8	338
480 min Winter	10.771	0.0	90.3	380
600 min Winter	9.045	0.0	94.8	456
720 min Winter	7.842	0.0	98.6	534
960 min Winter	6.163	0.0	103.3	680
1440 min Winter	4.388	0.0	110.2	954
2160 min Winter	3.125	0.0	118.4	1340
2880 min Winter	2.456	0.0	123.9	1676
4320 min Winter	1.721	0.0	129.6	2336
5760 min Winter	1.337	0.0	134.7	3056
7200 min Winter	1.100	0.0	138.1	3744
8640 min Winter	0.937	0.0	140.8	4488
10080 min Winter	0.819	0.0	142.9	5240

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 533300 188750 TQ 33300 88750
C (1km)	-0.026
D1 (1km)	0.337
D2 (1km)	0.282
D3 (1km)	0.243
E (1km)	0.332
F (1km)	2.477
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.127

Time (mins) From:	To:	Area (ha)
0	4	0.127

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

Half Drain Time : 514 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	10.443	0.243	0.0	1.6	1.6	52.4	O K
30 min Summer	10.479	0.279	0.0	1.6	1.6	60.2	O K
60 min Summer	10.517	0.317	0.0	1.6	1.6	68.4	O K
120 min Summer	10.554	0.354	0.0	1.6	1.6	76.4	O K
180 min Summer	10.572	0.372	0.0	1.6	1.6	80.1	O K
240 min Summer	10.580	0.380	0.0	1.6	1.6	82.0	O K
360 min Summer	10.584	0.384	0.0	1.6	1.6	82.9	O K
480 min Summer	10.581	0.381	0.0	1.6	1.6	82.1	O K
600 min Summer	10.576	0.376	0.0	1.6	1.6	81.2	O K
720 min Summer	10.571	0.371	0.0	1.6	1.6	80.0	O K
960 min Summer	10.551	0.351	0.0	1.6	1.6	75.7	O K
1440 min Summer	10.513	0.313	0.0	1.6	1.6	67.4	O K
2160 min Summer	10.462	0.262	0.0	1.6	1.6	56.5	O K
2880 min Summer	10.419	0.219	0.0	1.6	1.6	47.3	O K
4320 min Summer	10.353	0.153	0.0	1.5	1.5	32.9	O K
5760 min Summer	10.312	0.112	0.0	1.4	1.4	24.2	O K
7200 min Summer	10.289	0.089	0.0	1.4	1.4	19.1	O K
8640 min Summer	10.276	0.076	0.0	1.2	1.2	16.4	O K
10080 min Summer	10.268	0.068	0.0	1.1	1.1	14.6	O K
15 min Winter	10.473	0.273	0.0	1.6	1.6	58.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	227.157	0.0	51.8	19
30 min Summer	132.050	0.0	60.4	33
60 min Summer	76.763	0.0	71.7	64
120 min Summer	44.624	0.0	83.6	122
180 min Summer	32.490	0.0	91.3	182
240 min Summer	25.940	0.0	97.3	242
360 min Summer	18.887	0.0	106.3	360
480 min Summer	15.080	0.0	113.2	418
600 min Summer	12.663	0.0	118.8	478
720 min Summer	10.979	0.0	123.6	540
960 min Summer	8.628	0.0	129.4	666
1440 min Summer	6.144	0.0	138.0	936
2160 min Summer	4.375	0.0	148.4	1324
2880 min Summer	3.438	0.0	155.3	1704
4320 min Summer	2.410	0.0	162.6	2420
5760 min Summer	1.872	0.0	168.9	3112
7200 min Summer	1.540	0.0	173.2	3752
8640 min Summer	1.312	0.0	176.7	4488
10080 min Summer	1.146	0.0	179.4	5152
15 min Winter	227.157	0.0	58.2	19

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	10.514	0.314	0.0	1.6	1.6	67.7	O K
60 min Winter	10.558	0.358	0.0	1.6	1.6	77.2	O K
120 min Winter	10.653	0.453	0.0	1.6	1.6	86.4	O K
180 min Winter	10.791	0.591	0.0	1.6	1.6	91.4	O K
240 min Winter	10.866	0.666	0.0	1.6	1.6	94.1	O K
360 min Winter	10.921	0.721	0.0	1.6	1.6	96.1	O K
480 min Winter	10.915	0.715	0.0	1.6	1.6	95.9	O K
600 min Winter	10.878	0.678	0.0	1.6	1.6	94.5	O K
720 min Winter	10.827	0.627	0.0	1.6	1.6	92.7	O K
960 min Winter	10.600	0.400	0.0	1.6	1.6	86.2	O K
1440 min Winter	10.545	0.345	0.0	1.6	1.6	74.4	O K
2160 min Winter	10.469	0.269	0.0	1.6	1.6	58.1	O K
2880 min Winter	10.408	0.208	0.0	1.6	1.6	44.8	O K
4320 min Winter	10.323	0.123	0.0	1.5	1.5	26.4	O K
5760 min Winter	10.284	0.084	0.0	1.3	1.3	18.0	O K
7200 min Winter	10.269	0.069	0.0	1.1	1.1	14.8	O K
8640 min Winter	10.259	0.059	0.0	1.0	1.0	12.8	O K
10080 min Winter	10.253	0.053	0.0	0.8	0.8	11.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	132.050	0.0	67.8	33
60 min Winter	76.763	0.0	80.5	62
120 min Winter	44.624	0.0	93.7	120
180 min Winter	32.490	0.0	102.4	178
240 min Winter	25.940	0.0	109.1	236
360 min Winter	18.887	0.0	119.2	350
480 min Winter	15.080	0.0	126.8	458
600 min Winter	12.663	0.0	133.1	562
720 min Winter	10.979	0.0	138.5	650
960 min Winter	8.628	0.0	145.0	730
1440 min Winter	6.144	0.0	154.6	1024
2160 min Winter	4.375	0.0	166.4	1428
2880 min Winter	3.438	0.0	174.2	1812
4320 min Winter	2.410	0.0	182.4	2468
5760 min Winter	1.872	0.0	189.4	3104
7200 min Winter	1.540	0.0	194.4	3752
8640 min Winter	1.312	0.0	198.3	4496
10080 min Winter	1.146	0.0	201.5	5224

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 533300 188750 TQ 33300 88750
C (1km)	-0.026
D1 (1km)	0.337
D2 (1km)	0.282
D3 (1km)	0.243
E (1km)	0.332
F (1km)	2.477
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) 0.127

Time (mins) From:	To:	Area (ha)
0	4	0.127

Design Data

Downstream Defender®

Advanced Hydrodynamic Vortex Separator

The Downstream Defender® is an advanced hydrodynamic vortex separator for the and reliable removal of particles, oils and from surface water

Its innovative design delivers high across a wide range of in a much smaller footprint than conventional or other swirl-type devices and it is the perfect choice for any catchment likely to convey high quantities of contamination.

1. Access for removal of
2. Inlet pipe.
3. Inlet chute.
4. Centre shaft.
5. Dip plate.
6. Centre cone.
7. Benching skirt.
8. Floatables and oil storage.
9. Isolated sediment storage zone.
10. Outlet pipe.

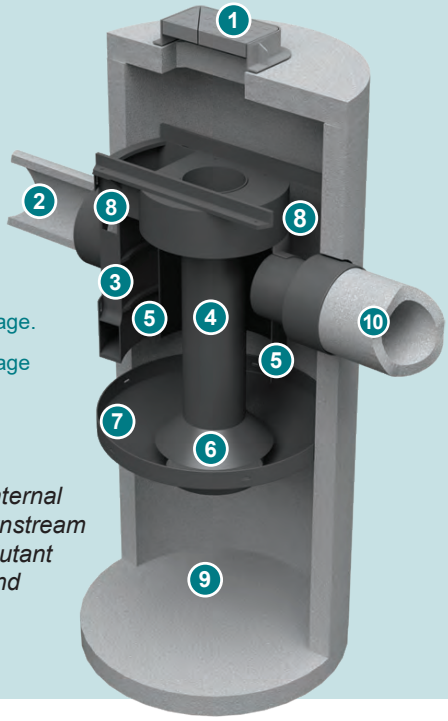


Figure 1 - The unique internal components of the Downstream Defender® enhance pollutant removal performance and prevent wash out.

Unique Flow Modifying Components

The Downstream Defender® consists of a choice of concrete or HDPE chamber with unique modifying internal components. It is these internal components that the Downstream Defender® from catchpits, sedimentation basins or sedimentation sumps. They facilitate advanced hydrodynamic vortex separation by reducing turbulence, lengthening the path to increase chamber residence time and introducing shear planes.

The internal components also ensure that the pollutant storage zones are isolated and protected from high that could cause pollutant re-entrainment or wash out.

Compared to devices that have poorly designed internal components, the Downstream Defender® captures and retains more of the annual pollutant load.

Watch a short video showing the Downstream Defender® components and operation at:

http://www.hydro-int.com/en-gb/products/downstream-defender-0

Repeatable, Reliable Performance

The Downstream Defender® delivers high removal of pollutants through advanced, hydrodynamic separation across a wide range of The device has a proven track record of tackling an assortment of pollutants including:

Sediment (or Total Suspended Solids)

The Downstream Defender® sediment/TSS removal device. It can be sized in a number of ways to suit the application and level of protection required (see Table 1). **SuDS Mitigation Index = 0.5.**

Gross Pollutants

wrappers, Styrofoam cups and drinks cartons

Liquid Hydrocarbons

oil separators according to the BS EN 858-1 and must

required. **SuDS Mitigation Index = 0.8.**

Sediment Bound Hydrocarbons (including Polycylic Aromatic Hydrocarbons - PAHs)

PAHs have low solubility in water and are readily adsorbed

particles will also ensure the removal of many PAHs.

Sediment Bound Heavy Metals and Nutrients

Heavy Metals

Nutrients

Downstream Defender® sediment bound pollutants. **SuDS Mitigation Index (Metals) = 0.4.**

Tel: +44 (0)1275 337955
stormtrain@hydro-int.com

Design Data
Downstream Defender®
Advanced Hydrodynamic Vortex Separator

No Risk of Pollutant Wash Out

The Downstream Defender® has been specially designed to isolate the pollutant storage zones and is proven to prevent pollutant wash out.

Sizing

The Downstream Defender®

For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

Model Diameter (m)	Treatment Flow Rate - Fine (l/s) [a]	Treatment Flow Rate - Coarse (l/s) [b]	Hydraulic Capacity (l/s) [c]	Minimum Oil Storage Capacity (l)	Minimum Sediment Storage Capacity (m^3) [e]	Maximum Headloss at Treatment Flow Rate - Coarse (mm)
1.2	30	38	120	270	0.38	150
1.8	69	85	270	1300	1.04	225
2.55	138	171	542	2450	3.23	300
3.0	190	237	750	4550	3.81	375

Notes:
a) T
size (D_{50}
b) T
median particle size (D_{50}

d)
e) Additional sediment storage capacity can be provided to extend maintenance intervals if required.

Table 1 - Downstream Defender® design information.

Expert Design Service

Hydro International's professional engineers are on hand to provide free support with the correct sizing and selection of the Downstream Defender® within each drainage design.

We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the StormTrain® Hotline on: 01275 337955 or email stormtrain@hydro-int.com

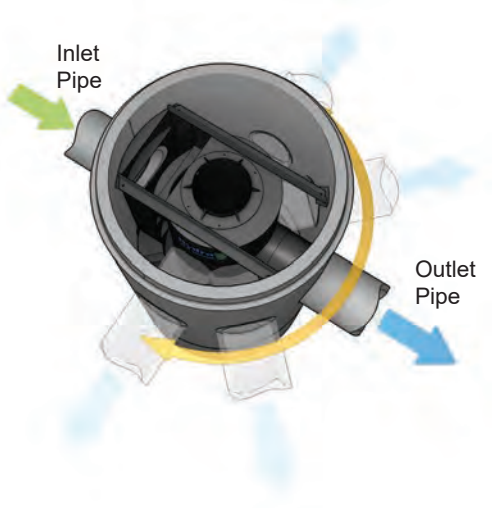
Design Data
Downstream Defender®
Advanced Hydrodynamic Vortex Separator

Setting Out

The Downstream Defender® can accommodate a change in pipe direction to suit site requirements. Combined with the high rate internal bypass, this helps to avoid the need for additional manholes on site. Head loss across the chamber is kept to a minimum (see Table 1). The inlet and outlet pipes should be sized in accordance with Table 2 (opposite), and a minimum of 90 degrees between inlet and outlet is required.

Inlet and outlet pipe connections are at the same invert level.

Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Easy to Install

The Downstream Defender® is delivered to site as a near manhole with internal components already installed. Installation is therefore similar to any other manhole installation on site. Full installation guidelines are available.

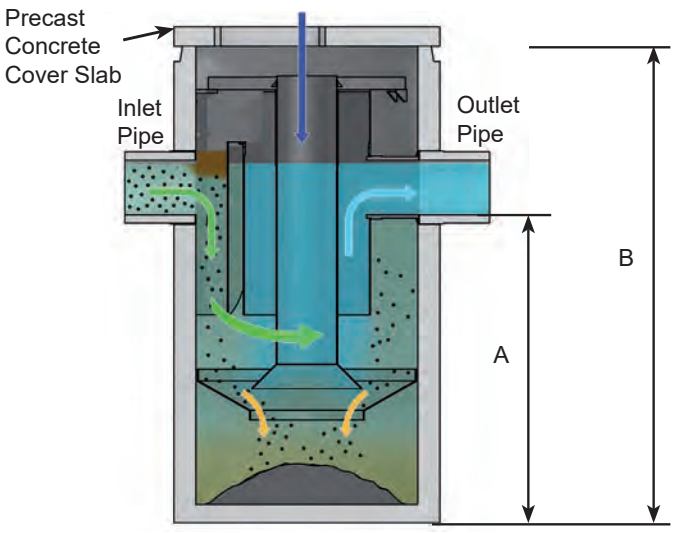
We can provide structural concrete systems for simple plug-and-play installation or choice of lightweight single and twin wall plastic chambers.

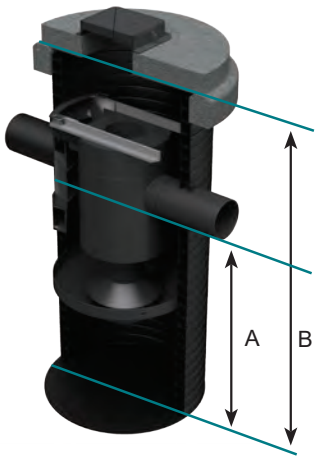
Easy to Maintain

Maintenance of the Downstream Defender® is simple, safe and Maintenance is carried out from the surface, using a standard vacuum tanker and personnel are not required to enter the device.

With a large capacity to store sediments and oils (see Table 1), and with a proven ability to prevent wash out, maintenance intervals can be years rather than months - depending on site conditions. The unit can also be with a Hydro-Logic™ Smart Monitoring system to alert the site operator when maintenance is required and provide peace of mind that the unit is operating normally at other times.

Additional pollutant storage can be built into the chamber to extend maintenance intervals if required.





Tel: +44 (0)1275 337955
stormtrain@hydro-int.com

Design Data
Downstream Defender®
Advanced Hydrodynamic Vortex Separator

Dimensions and Weights

General arrangement drawings of all units are available for download from:
http://www.hydro-int.com/en-gb/products/downstream-defender-0

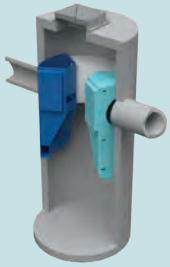
Model	Material	Chamber Diameter - Internal (mm)	Chamber Diameter - External (mm)	Inlet and Outlet ID (mm)	Depth to invert (m) (A) (1)	Chamber Depth (m) (B) (2)	Max Component Lift Weight (kg)
PQL1320.1000	Concrete	1200	1460	300	0.69	2.6	2500
PQL1320.1030	Concrete	1800	2160	450	1.29	3.8	8000
PQL1320.1060	Concrete	2550	2850	600	1.80	4.75	9500
PQL1320.1090	Concrete	3000	3350	750	1.875	5.0	14000
PQL1320.1020	HDPE Single Wall	1200	1360	300	0.74	2.3	200
PQL1320.1050	HDPE Single Wall	1800	1950	450	1.285	3.415	400
PQL1320.1080	HDPE Single Wall	2550	2770	600	1.835	4.78	900
PQL1320.1110	HDPE Single Wall	3000	3220	750	2.17	5.3	1300
PQL1320.1025	HDPE Twin Wall	1200	1500	300	0.68	2.25	400
PQL1320.1055	HDPE Twin Wall	1800	2200	450	1.28	3.75	700

Notes:
1) Minimum depth to invert shown. Depth to invert can be increased if required.
2) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required.

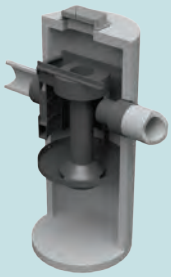
Table 2 - Downstream Defender® unit types, dimensions and weights.

The Hydro StormTrain® Series of Surface Water Treatment Devices

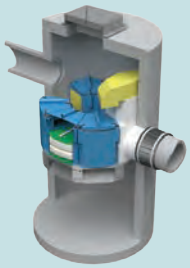
The Downstream Defender® is one of the Hydro StormTrain® Series of surface water treatment devices. Each device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the needs of a site or combined to form a management train. They can be used alongside natural SuDS features to protect, enable or enhance them.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System

Tel: +44 (0)1275 337955 stormtrain@hydro-int.com

Hydro International
Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD

hydro-int.com/stormtrain

Appendix D – SuDS Proforma

The London Sustainable Drainage Proforma

Introduction

This proforma is intended to accompany a drainage strategy prepared for a planning application where required by national or local planning policy. It should be used to summarise the key outputs from the strategy to allow assessing officers at the Lead Local Flood Authority (LLFA) to quickly assess compliance with sustainable drainage (SuDS)

The proforma is divided into 4 sections, which are intended to be used as follows:

1. Site and project information - Provide summary details of the development, site and drainage
2. Proposed discharge arrangement – Summarise site ground conditions to determine potential for infiltration. Select a surface water discharge method (or mix of methods) following the hierarchical approach set out in the London Plan.
3. Drainage strategy – Prioritise SuDS measures that manage runoff as close to source as possible and contribute to the four main pillars of SuDS; amenity, biodiversity, water quality and water quantity.
4. Supporting information – Provide cross references to the page or section of the drainage strategy report where the detailed information to support each element can be found. This may be more than one reference

Policy

Drainage strategies for developments in the London Borough of Haringey need to comply with the following policies on SuDS:

1. London Borough of Haringey Local Plan policies DM24, DM25, DM27 & DM28
2. London Plan policy 5.13 and draft New London Plan policy SI13
3. The National Planning Policy Framework (NPPF)

Technical Guidance

- Post-development surface water discharge rate should be limited to greenfield runoff rates. Proposals for higher discharge rates should be agreed with the LLFA ahead of submission of the Planning Application. Clear evidence should be provided with the Planning Application to show why greenfield rates cannot be achieved.
- Greenfield runoff rate is the runoff rate from a site in its natural state, prior to any development. This should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS
- Attenuation storage volumes required to reduce post-development discharge rates to greenfield rates should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS
- 'CC' refers to climate change allowance from the current Environment Agency guidance.
- An operation and maintenance strategy for proposed SuDS measures should be submitted with the Planning Application and include the details set out in section 32.2 of CIRIA C753 The SuDS Manual. The manual should be site-specific and not directly reproduce parts of The SuDS Manual.
- Other useful sources of guidance are:
  - The Harnigey Sustainable Drainage Evaluation Guide
  - The Harnigey Sustainable Drainage planning guide
  - The London Plan Sustainable Design and Construction SPG
  - DEFRA non-statutory technical standards for sustainable drainage
  - Environment Agency climate change guidance
  - CIRIA C753 The SuDS Manual

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Watts Close
Address & post code	Watts Close, London, N15 5DW
OS Grid ref. (Easting, Northing)	E 533279
	N 188951
LPA reference (if applicable)	n/a
Brief description of proposed work	The proposals are for the development of 17 dwellings at Watts Close, with the demolition of 11 bungalows and a community hall. The proposals are comprised of 6 x 3B houses, 6 x 2B flats and 5 x 1B flats with community and private landscaping and gardens
Total site Area	2720 m^2
Total existing impervious area	1350 m^2
Total proposed impervious area	1350 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	CDA Group4_057
Existing drainage connection type and location	The CCTV survey (see Appendix C) shows private surface water sewers located across the site which connect into the
Designer Name	James Calvert
Designer Position	Associate Director

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	No Superficial deposits
Bedrock geology classification	London Clay
Site infiltration rate	m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

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

2c. Proposed Discharge Details

Proposed discharge location	Thames Water sewer
Has the owner/regulator of the discharge location been	No

	Designer Company	Sweco		consulted?	

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m^3)	Proposed discharge rate (l/s)
Qbar	0.5			
1 in 1	0.4	13.1		1.6
1 in 30	1.2	45.5		1.6
1 in 100	1.6	71.1		1.6
1 in 100 + CC			139	1.6
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Hydrobrake		

3c. Proposed SuDS Measures

	Catchment area (m^2)	Plan area (m^2)	Storage vol. (m^3)
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	669	669	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	120	120	48
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	227		91
Total	**1016**	**789**	**139**

4. Supporting Information

4a. Discharge & Drainage Strategy	Page/section of drainage report
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 3.3 (BGS Mapping)
Drainage hierarchy (2b)	Table 2.
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 6.2.1 & Appendix C
Proposed SuDS measures & specifications (3b)	Section 6.3
4b. Other Supporting Details	**Page/section of drainage report**
Detailed Development Layout	
Detailed drainage design drawings, including exceedance flow routes	Appendix C
Detailed landscaping plans	
Maintenance strategy	Appendix E
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Section 6.3
b) biodiversity?	
c) amenity?	

Appendix E – Management & Maintenance Plan

Surface Water Drainage & SuDS - Management & Maintenance Plan

Project Name: Watts Close, Haringey, London	Author: James Calvert
Project Reference: 65202627	Date: 17 September 2021
Project Manager: JRC	Document Reference: 65202627-SWE-ZZ-XX-RP-C-0002 Revision: 0

Rev.	Date	Reason for issue	Prepared		Reviewed		Approved	
0	17.09.21	First Issue	JRC	17.09.21	KH	17.09.21	JRC	17.09.21

1 Introduction

Sustainable drainage systems (SuDS) are utilised to manage rainfall and use landscape features to deal with surface water. SuDS control the flow rate and volume of water leaving the development area and reduce pollution by intercepting silt and cleaning run-off from hard surfaces.

Like all aspects of drainage systems, SuDS components should be regularly inspected and maintained. This ensures efficient operation and reduces the likelihood of failure.

SuDS and drainage features for the development are to be maintained a maintenance company employed by the owners of the dwellings.

The level of inspection and maintenance will vary depending on the type of SuDS component. Further information on maintenance can be found in The SUDS Manual (CIRIA publication C753).

2 Managing SuDS

The SuDS have been designed for easy maintenance to comprise:

- Regular care – litter collection and checking the inlets and outlets where water enters or leaves the SuDS feature.
- Occasional tasks – removing any silt that builds up, cutting back and clearing excessive vegetation growth, inspection on manholes connecting to attenuation crates.
- Remedial work – repairing damage where necessary.

2.1 Contact

In the event of concern over any matter relating the SuDS, please contact the maintenance company employed by the owners of the dwellings, who is responsible for the management and maintenance of the site.

3 SuDS Maintenance

The SuDS scheme includes landscape features and control structures to manage run-off as it flows to site outfalls. The following lists the SuDS components and extra features which may be found on a site.

- Permeable surfaces as permeable block paving and porous Asphalt that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc.
- Inlet and outlets structures and conveyance pipes. They should be free from obstruction at all times to allow free flow through the SuDS.
- SuDS flow control structures are usually small orifices in control chamber, slots or V-notches in weirs, alternatively they can be specialist flow control devices such as Hydrobrakes. They are usually near the surface, so are accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- Inspection chambers and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

Table 1 below provides a breakdown of the general maintenance requirements; maintenance is to be undertaken by the site owner(s), appropriate to the types of SuDS and surface water drainage systems proposed at this site. Site specific SuDS maintenance is provided in Table 2.

TABLE 1: GENERAL MAINTENANCE REQUIREMENTS

Regular Maintenance		**Frequency**
1	**Litter Management** Check for and pick up litter around the entire site.	Monthly
2	**Inlets and Outlets** Inspect monthly, remove silt from slab aprons and debris, strim 1 m round for access.	Monthly
Occasional Maintenance		**Frequency**
3	**Inspection of Control Chambers** Inspection of chambers for silt build up and visually check pipes appear clear and free flowing. Remove silt as required. Jetting as required.	Annually
4	**Silt management** Inspect filter drain for silt accumulation.	Annually As required
Remedial Work		**Frequency**
5	**Inspect SuDS systems to check for damage or failure** Undertake remedial work as required.	As required

TABLE 2: SPECIFIC SUDS MAINTENANCE

SuDS on Site	Frequency	Typical Tasks
Permeable paving	Monthly	• Cleaning – brush regularly and remove sweepings from all hard surfaces.
	Annually	• Brush and vacuum surface once a year to prevent silt blockage and enhance design life.
	Remedial work, as required	• Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning. • Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.
Attenuation storage tanks	Monthly	• Remove debris from the catchment surface (where it may cause risks to performance).
	Annually	• Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.
	Remedial work, as required	• Repair/rehabilitate inlets, outlet, overflows and vents. • Survey inside of tank for sediment build-up and remove if necessary
Flow control	Monthly for 6 months, then annually	• Inspect sediment accumulation rates and establish appropriate removal frequencies.
	Biannually	• Remove litter and debris and inspect for sediment, oil and grease accumulation. • Inspect for evidence of poor operation. • Inspect filter media and establish appropriate replacement frequencies.
	Remedial work, as required	• Replace malfunctioning parts or structures.
	As recommended by manufacturer	• Change filter media.
Pipes and Manholes	Annually (or as required)	• Inspect all manholes for litter, silt build-up and blockages and remove as required. • Jetting pipes of poor performance to assess requirements for CCTV survey and potential replacement of pipes.