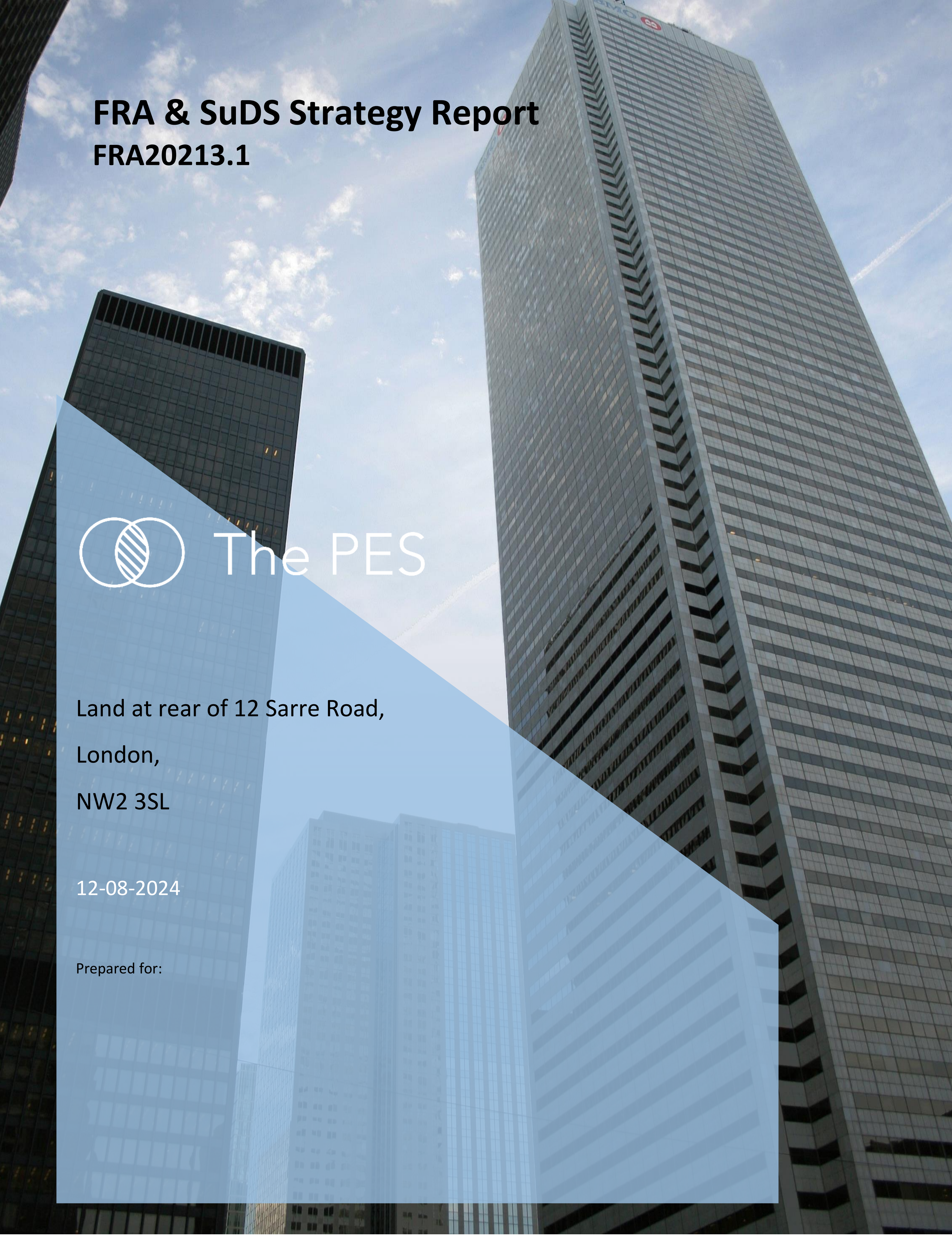

FRA & SuDS Strategy Report
FRA20213.1

The PES

Land at rear of 12 Sarre Road,

London,

NW2 3SL

12-08-2024

Prepared for:

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1. Executive Summary

The PES was commissioned to produce a FRA and SuDS Strategy Report in support of a planning application for the proposed development of land within the rear garden of 12 Sarre Road, London, NW2 3SL. The development proposal is for the erection of a two storey single family residential dwelling with a rear garden, bin and bike store fronting onto Gondar Gardens.

This FRA and SuDS report has been prepared as a desk top study based on the architectural drawings supplied and gathered data available within the public domain. It summarises the SuDS design process for the proposed development and demonstrates that the development complies with planning policy on flood risk – National Planning Policy Framework (NPPF) and supports Planning Practice Guidance (PPG) as well as the local London Borough of Camden Policies and guidelines including associated SuDS requirements.

The design process began with a review and analysis of the proposed development and the existing site conditions relating to surface water drainage and flood risk. It included a study of both hydrology and hydrogeology for the site. Mitigation for groundwater flooding is provided.

The proposed SuDS design strategy provides for mainly source control techniques of permeable paving and rainwater harvesting butt system for water reuse. Surface water will be discharged into the adjacent existing adjacent Thames Water surface water sewer.

Associated hydraulic and attenuation calculations are based on greenfield runoff rates for both pre and post development along with impermeable areas and a description of the proposed surface water management, SuDS scheme for the site is prepared accordingly. Hydraulic design was an iterative process to provide for flow controls sized and used to allow a practicable maintenance regime to be incorporated within it and to allow for attenuation drain down times. A minimum sized 15mm diameter orifice flow control system will control the discharge from site to a greenfield discharge of 0.4 l/s for the 1 in 100yr+40% cc. The 0.4 l/s controlled discharge requires a total of $2m^3$ attenuation for the 1 in 100yr +40%cc runoff scenarios. The required attenuation is provided within the permeable pavement, attenuation crates and the drainage network itself.

The SuDS provides a surface water management solution that reduces the surface water run off that leaves the site and shows that the proposed development does not result in an increase to the risk of flooding on or off site.

Permeable paving is provided on site for permeable conveyance and passive treatment techniques to collect, convey, attenuate and treat storm / surface water prior to discharge via crated attenuation systems into the existing Thames Water surface water network on the site. It will also take the first 5mm of rainfall.

Landscaping areas are provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration.

A rainwater harvesting water butt system is also included at rainwater down pipes adjacent landscaped areas for source control for low rainfall events, to accommodate an element of water reuse bioretention, and stimulate biodiversity and amenity value for the landscaped areas.

Surface water from the site is to be connected to the adjacent Thames Water combined sewer system. Thames Water application is to be made.

This report provides a management and a maintenance regime statement for the SuDS surface water management of the new development.

2. Introduction

Brief

The PES was commissioned to produce a FRA and SuDS Strategy Report in support of a planning application for the proposed development of land within the rear garden of 12 Sarre Road, London, NW2 3SL. The development proposal is for the erection of a two storey single family residential dwelling with a rear garden, bin and bike store fronting onto Gondar Gardens.

This desk study report is produced to identify an appropriate SuDS for the development extension that mirrors the natural drainage pattern of the development site and restricts flows to greenfield runoff conditions if possible, for the site. The SuDS will provide a surface water management solution to reduce the surface water run off that leaves the site and show that the proposed development will not result in an increase to the risk of flooding on or off site. Where required, it recommends mitigation to any potential flooding issues associated with the proposed development. The SuDS solution follows the requirements of the Environment Agency (EA), The London Borough of Barnet and Thames Water.

The SuDS solution is developed using information supplied by others. The PES Ltd in good faith has used it as deemed accurate, without guarantee but as best information available at the time of completion of the SuDS design and associated report.

The purpose of this report is to summarise the SuDS strategy design process for the proposed development and demonstrate that the development complies with national planning policy on flood risk as well as the local London Borough of Barnet Policy and guidelines including associated SuDS requirements.

Report Structure

These works are discussed in the following sections. The structure of this report is summarised as follows:

- Section 3: Describes site conditions with respect to topography, hydrology, hydrogeology, drainage and potential design proposals as well as identifying National and local planning Policies and guidance;
- Section 4: Provides a commentary on how flood risk from a range of potential sources may or may not constrain development proposals and influence the SuDS solution;
- Section 5: Provides a surface water drainage statement;
- Section 6: Provides a management and a maintenance regime statement for the surface water drainage/ SuDS surface water management;
- Section 7: Presents a summary of the report and identifies the main conclusions that can be drawn.

3. Site Conditions and Planning Policy

Existing Conditions

The proposed development site is within the rear garden of 12 Sarre Road, London, NW2 3SL and is located within a residential urban setting. The garden plot opens out onto Gondar Gardens next 5b Gondar Gardens.

There is no ordinary watercourse on or next to the site.

The existing site and neighbourhood is served by a Thames Water combined sewer network located within the Gondar Gardens.

Proposed development

The development proposal is for the erection of a two storey single family residential dwelling with a rear garden, bin and bike store fronting onto Gondar Gardens.

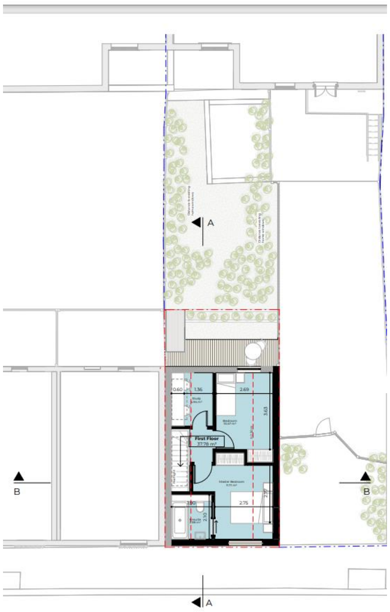
The site location plan can be seen in Figure 1 below.

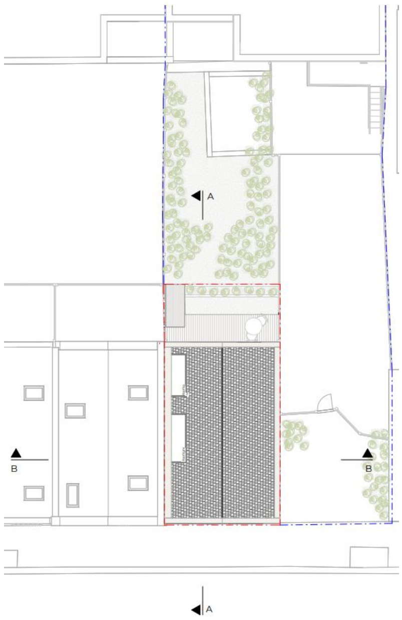
Figure 1 - Site Location for the Existing & Proposed Development at the rear of 12 Sarre Road, London, NW1 3SL

The existing & proposed block plan and proposed ground floor, first floor & roof plans, front, rear, north & south Side Elevations, sections AA & BB and front, rear & front pedestrian Visualisations for the proposed development at the rear of 12 Sarre Road, London, NW1 3SL are shown below in figures 2, 3, 4 and 5 respectively.

Existing Block Plan

Proposed Block Plan





Proposed Ground Floor

Proposed First Floor

Proposed Roof Plan

Figure 2 - Existing & Proposed Block Plan and Proposed Ground Floor, First Floor & Roof Plans for the Development at the rear of 12 Sarre Road, London, NW1 3SL

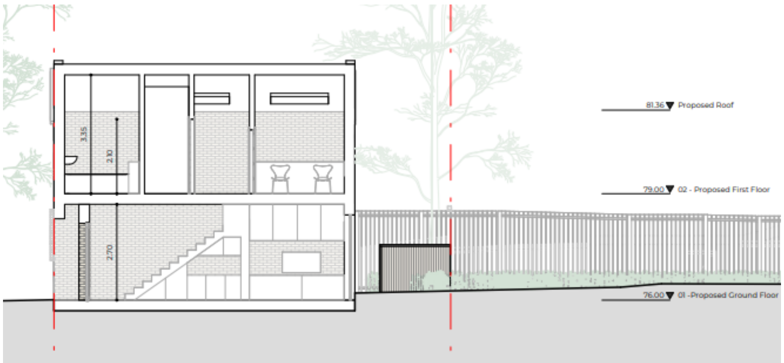
Proposed Front Elevation

Proposed Rear Elevation

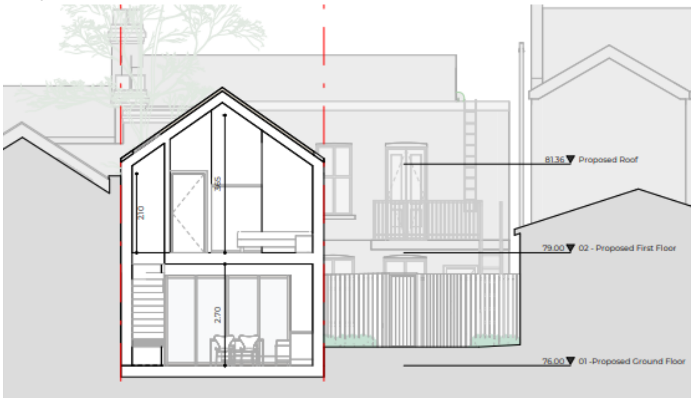
Proposed Norh Side Elevation

Proposed South Side Elevation

Figure 3 - Front, Rear, North & South Side Elevations for the Proposed Development at the rear of 12 Sarre Road, London, NW1 3SL



Proposed Section AA



Proposed Section BB

Figure 4 - Sections AA & BB for the Proposed Development at the rear of 12 Sarre Road, London, NW1 3SL

Proposed Front Visualisation

Proposed Rear Visualisation

Proposed Front Pedestrian Visualisation

Figure 5 - Front, Rear & Front Pedestrian Visualisations for the Proposed Development at the rear of 12 Sarre Road, London, NW1 3SL

Topography

The proposed rear of 12 Sarre Road development site fronts onto Gondar Gardens. The level of the Gondar Gardens footway falls from north to the south from 76.19mAOD to 75.82mAOD across the front of the plot. The finished floor level of the ground floor is proposed to be 76.00mAOD.

Existing Site Drainage / Thames Water Sewers

A Thames Water asset location plan provided in Appendix B shows a combined sewer network that serves the existing Rear of 12 Sarre Road. The combined sewer is located within Gondar Gardens and Sarre Road highways adjacent to the site.

Hydrology

The rear garden development site at 12 Sarre Road, London, NW1 3SL lies within the Environment Agency's (EA) Thames river basin district.

There are no drainage ditches or watercourses on or adjacent to the site.

Surface water runoff at the 12 Sarre Road site drains into Thames Water combined public sewers located within the adjacent Godar Gardens and Sarre Road highways.

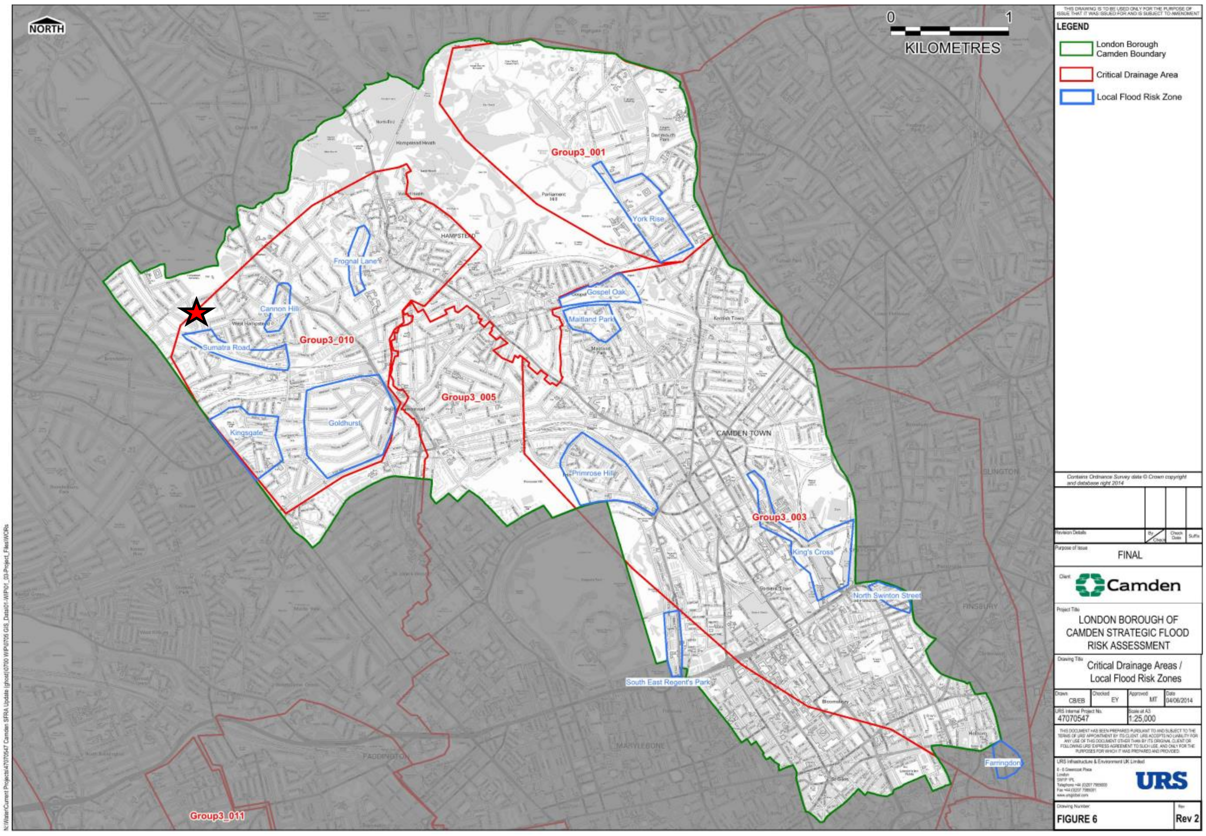
Exceedance flows at the site pond on site till they evaporate or drain down or to the Gondar Gardens Highway.

Critical Drainage Area

A Critical Drainage Area (CDA) is defined within the London Borough of Camden Strategic Flood Risk Assessment (SFRA) July 2014 as "a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones (LFRZ) during severe weather thereby affecting people, property or local infrastructure." A LFRZ is defined as a discrete area of flooding that does not exceed the national criteria for a 'Flood Risk Area' but still affects houses, businesses or infrastructure. It is an actual spatial extent of predicted flooding in a single location.

The London Borough of Camden Strategic Flood Risk Assessment (SFRA) July 2014 Figure 6 Critical Drainage Areas / Local Flood Risk Zones shows designated CDAs within the London Borough and can be seen in Figure 6 below. The proposed development at the rear garden of 12 Sarre Road is located within CDA Group3_010-West Hampstead.

Figure 7 below shows the rear garden of 12 Sarre Road development site is located within CDA Group 3_010-West Hampstead.

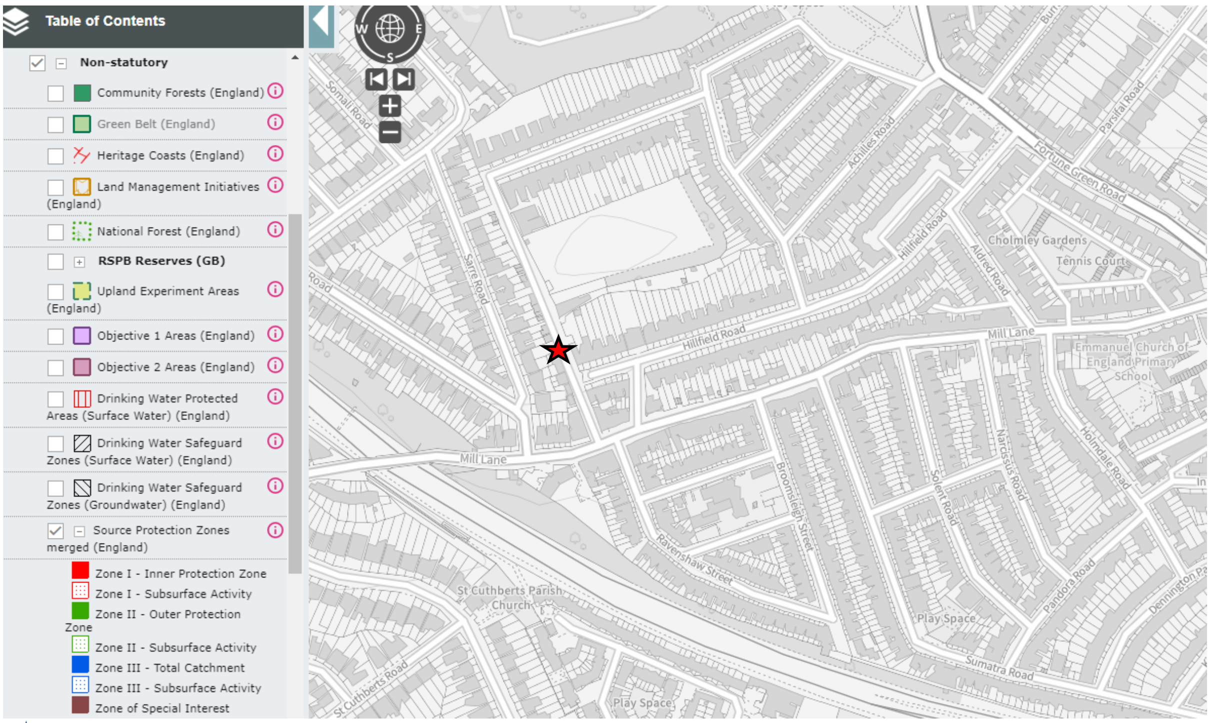


★ Location of the development.

Figure 6 - LB Camden SFRA Figure 6 Critical Drainage Areas / Local Flood Risk Zones

Groundwater

The Rear of 12 Sarre Road site is not located within a source protection zone as is shown in Figure 7 below magic.defra.gov.uk - Source Protection Zones merged (England).



★ Location of the development.

Figure 7 - magic.defra.gov.uk - Source Protection Zones merged (England)

Hydrogeology

The British Geological Survey site describes the site bedrock geology as London Clay Formation - Clay, Silt and Sand. A sedimentary bedrock formed in the Palaeogene Period. Local environment previously dominated by deep seas. Detrital comprising of course to fine grained slurries of debris. The bedrock at the Rear garden site at 12 Sarre Road identified by the British Geological Survey site is shown in Figure 8 below.

Figure 8 - BGS Bedrock Geology 1 in 50,000 (Source: British Geological Society Website (Contains British Geological Survey materials © URKI [2019]. Base mapping is provided by ESRI)

There are no records of superficial deposits geology at the site shown in the British Geological Survey site.

There are no recorded boreholes at or near the site.

From current available data for the desk study, it is considered that a source control infiltration / soak away system would not be appropriate at this location.

Flood Zone

The land at the rear of 12 Sarre Road, London, NW1 3SL development site is within a Flood Zone 1 area as shown in Figure 9 below.

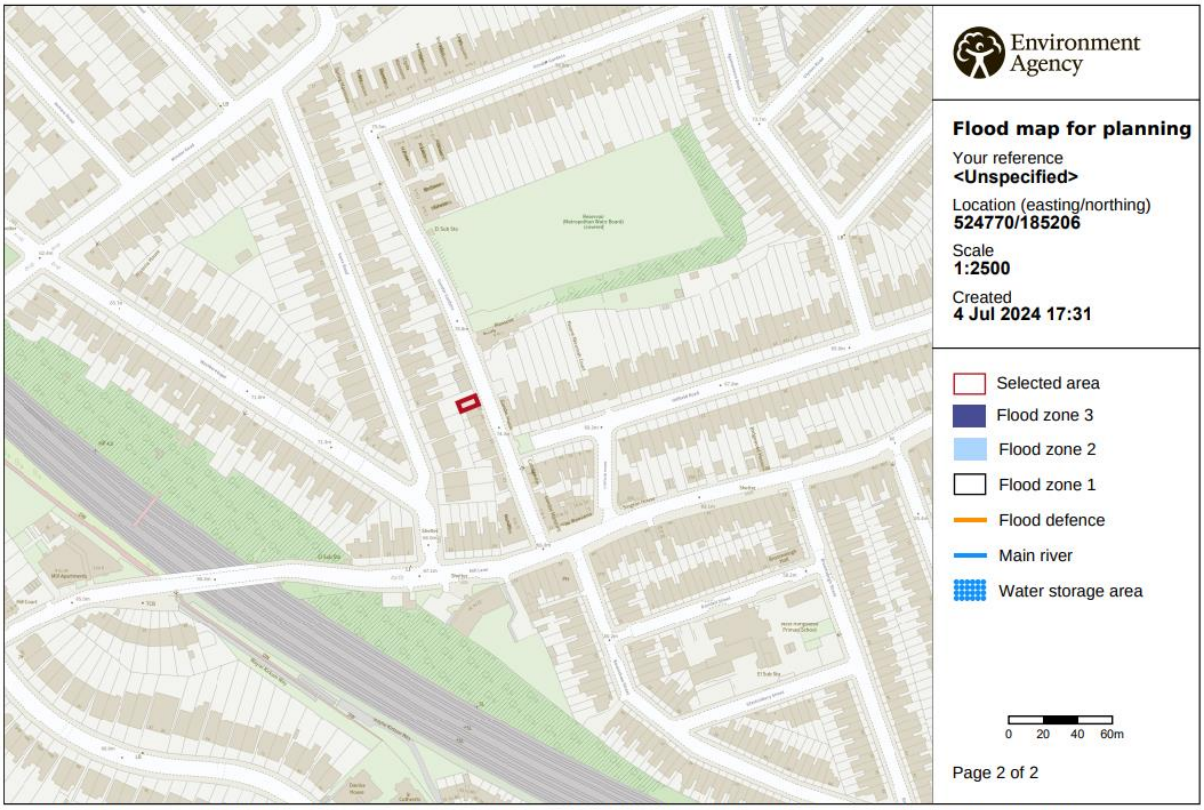


Figure 9 - EA Flood Map for Planning

Planning Policy

The National Planning Policy Framework (NPPF) currently sets out the Government's planning policies for England and defines Flood Zones, Flood Risk vulnerability classification and their compatibility in the tables below.

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)

Flood Zone	Definition
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Table 1 – Table 1 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

Table 2: Flood risk vulnerability classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.

• Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 2 – Table 2 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

The proposed development at land at the rear of 12 Sarre Road classification is more vulnerable.

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

Table 3 – Table 3 from Planning Policy Guidance (Flood Risk and Coastal Change) 06 03 2014

More vulnerable developments are acceptable within a Flood Zone 1.

Reference

This FRA & SuDS Strategy takes into account and makes reference to the NPPF and the National Planning Practice Guidance (NPPG) as well as the local polices and guidance provided within the London Plan; Surface Water Management Plan for London Borough of Camden; Preliminary flood risk assessment: London Borough of Camden (2011) & Addendum (2017); London Borough of Camden Strategic Flood Risk Assessment (SFRA) July 2014: Water and Flooding CPG (2019); Managing flood risk in Camden, The London Borough of Camden flood risk management strategy.

It also makes reference to consultations with the EA and Thames Water as well the Susdrain website, CIRIA753 The SuDS Manual and Government Non-statutory technical standards for sustainable – practice guidance and the design, maintenance and operation of SuDS.

4. Flooding

Introduction

There are a wide range of potential mechanisms which can cause flooding. Each potential source of flooding is discussed individually below.

Tidal or River Flooding

The EA plans show that the rear garden of 12 Sarre Road, London, NW2 3SL site is within an area where the flood risk from rivers or the sea at this location is less than very low as shown in the Environment Agency flood risk map showing "Extent of flooding from rivers or the sea" provided below in Figure 10 – Flood Risk from Rivers or the sea.

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

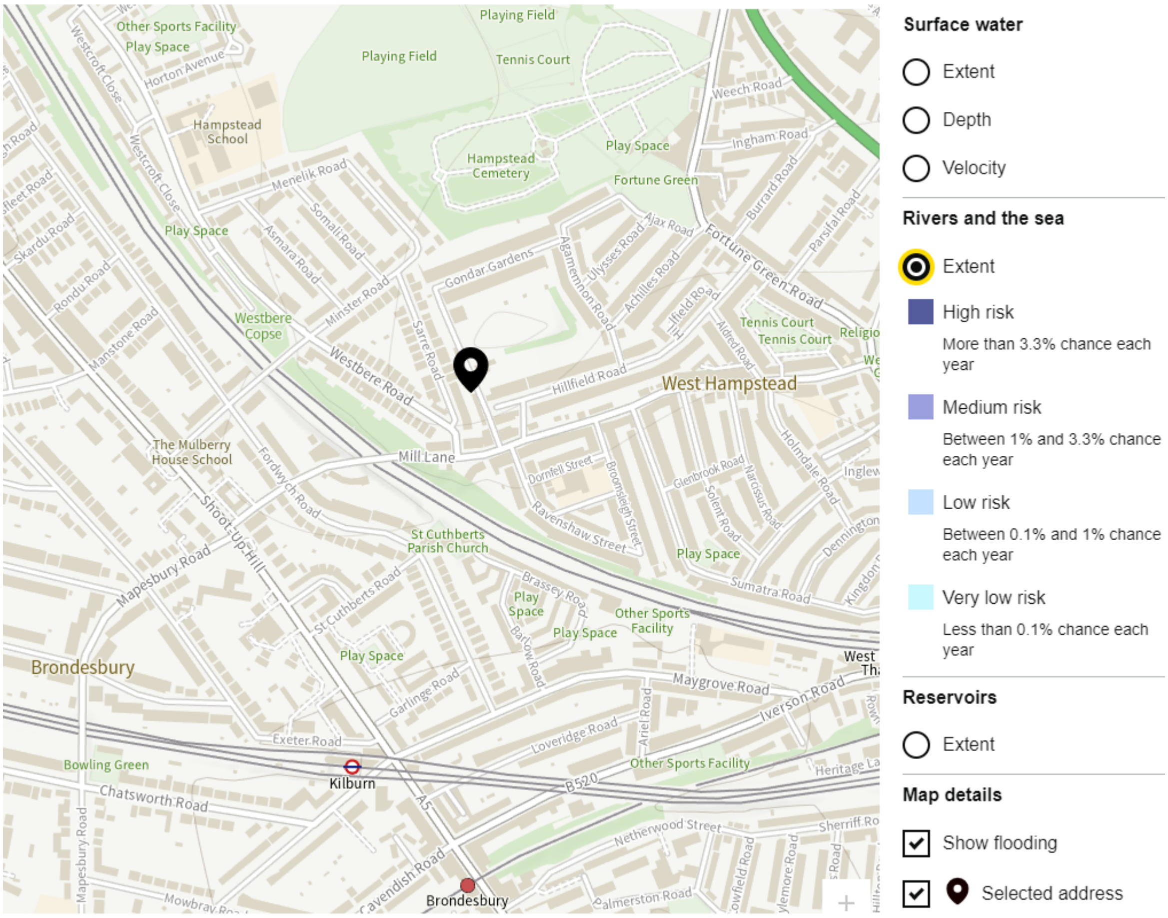


Figure 10 – Flood Risk from Rivers or the sea

There is no historical record of fluvial flooding at the site.

Surface Water Flooding

Surface water flooding can occur during high intensity rainfall events as sheet run off from fields or hard paved areas. The rear garden of 12 Sarre Road, London, NW2 3SL site sits within an area of very low risk of flooding from surface water as shown in the Environment Agency flood risk map "Extent of flooding from surface water" provided below in Figure 11 - Flood Risk from Surface Water.

Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

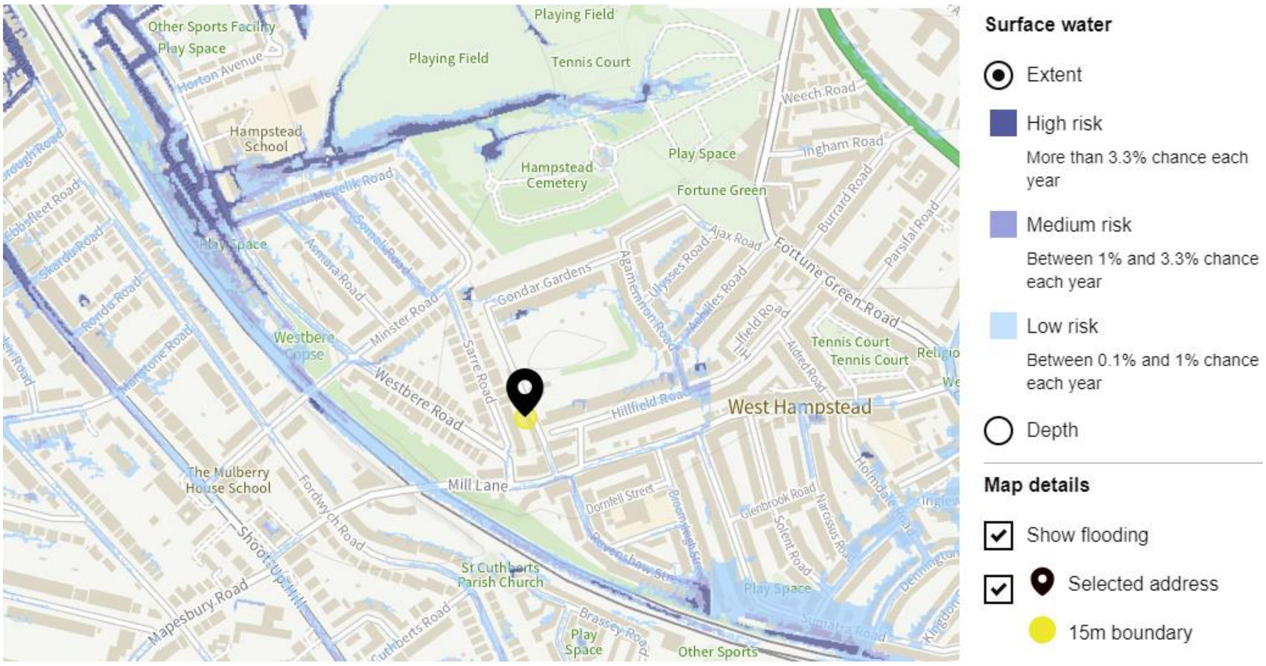


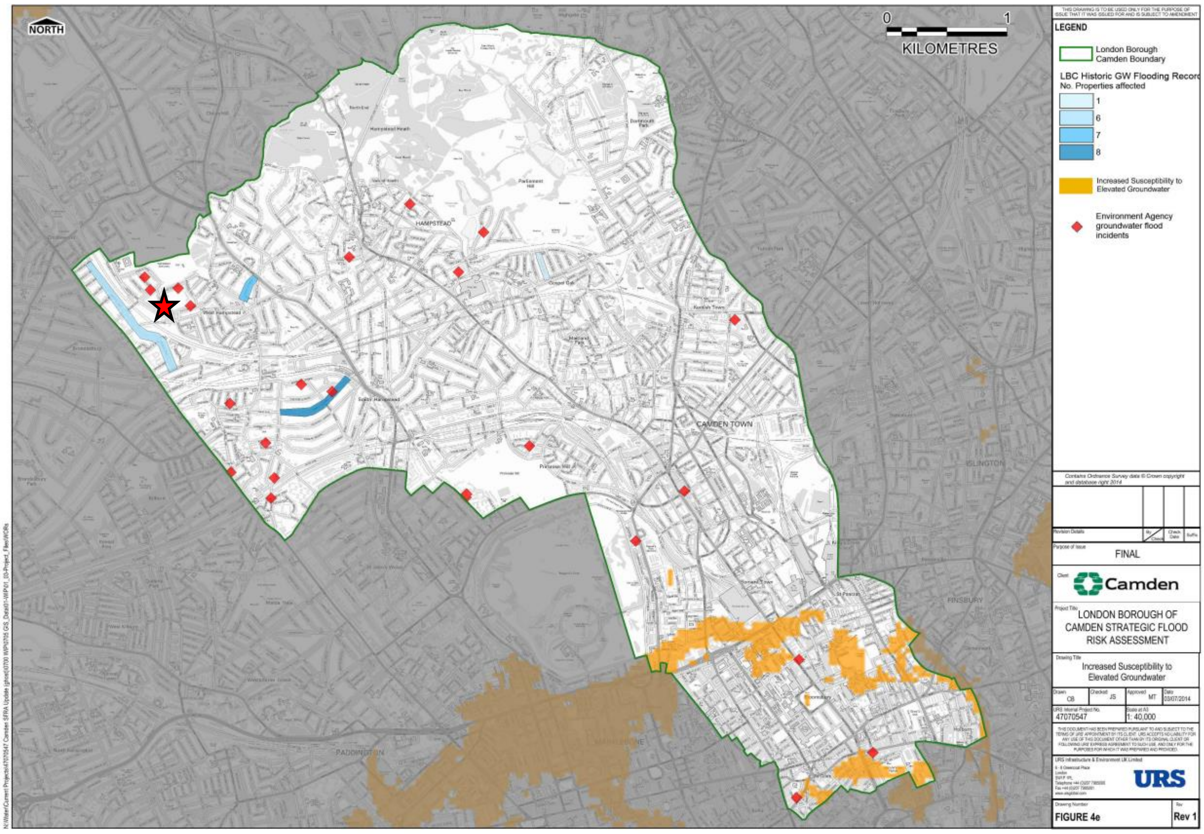
Figure 11 - Flood risk from Surface Water

There is no record of historical flooding at these properties.

The SuDS Strategy solution will provide for the surface water runoff from the site.

Groundwater Flooding

A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface.



★ *Site Location*

Figure 12 - LB Camden SFRA Figure 4e Increased Susceptibility to Elevated Groundwater

Figure 12 above shows the site location marked on the LB Camden SFRA Figure 4e Increased Susceptibility to Elevated Groundwater. The LB Camden SFRA Figure 4e Increased Susceptibility to Elevated Groundwater indicates that the land at the rear of 12 Sarre Road site is not within an area that is indicated as having an increased susceptibility to elevated groundwater.

There are records of historical flooding within the area but the proposed 12 Sarre Road, London, NW2 3SL development site has no recorded groundwater flooding.

Flood Risk from Sewers

Thames Water has a sewerage network within the vicinity that services the development site for both foul sewage and surface water drainage. The Thames Water asset plans are shown in Appendix A.

Thames Water have confirmed that their flooding records indicate that there have been no incidents of internal flooding as a result of surcharging / overloaded public sewers at the application site. Please see the Thames Water correspondence in Appendix A.

Thames Water referencing for properties at risk of flooding from sewers include the following:

• A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

• "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

• "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.

• Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At-Risk Register.

• Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.

• Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.

It is expected that the sewers and water distribution networks in the vicinity of this site are well maintained as Thames Water is a highly professional company having planned operations and maintenance regimes for their sewerage, drainage and potable water main network systems.

It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Thames Water. Their report excludes flooding from private sewers and drains and Thames Water makes no comment upon this matter.

Flood Risk from other Sources

In rare occasions, a development may be subject to flood risk from upstream features such as reservoirs or other sources, where there is a theoretical risk of failure. An area is considered at risk if peoples' lives could be threatened by an uncontrolled release of water from a reservoir.

The proposed rear garden of 12 Sarre Road, London, NW2 3SL development site is not at risk of flooding from the failure of a reservoir or other sources as is shown in the Environment Agency flood risk map "Extent of flooding from reservoirs" provided below in Figure 13 - Flood Risk from Reservoirs.

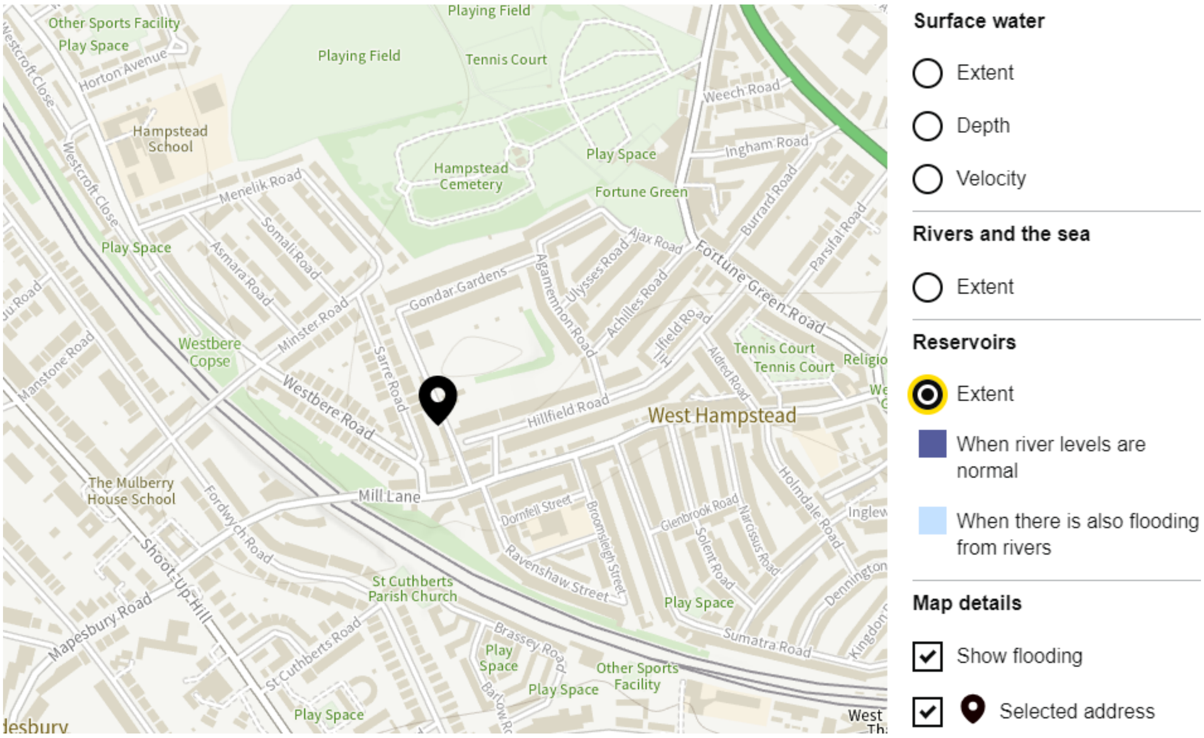


Figure 13 - Flood Risk from Reservoirs

Flood Risk Summary

Data from the Environment Agency's flood maps and information provided by Thames Water corresponds with that included within the London Borough of Barnet's maps.

The proposed rear garden of 12 Sarre Road, London, NW2 3SL development site is at a low risk of flooding from all sources.

5. Sustainable Drainage Systems Strategy

Philosophy

Sustainable drainage has moved away from the traditional thinking of designing to manage flood risk and where runoff is regarded as a nuisance to a philosophy of surface water being a valuable resource that should be managed for maximum benefit.

Sustainable Drainage systems (SuDS) can contribute to sustainable development overall by improving the places and spaces where we live, work and play as well as balancing the different opportunities and challenges that influence urban design and the development of communities.

The SuDS philosophy is to replicate, as closely as possible the natural drainage from a site before development. SuDS mimic nature and manage rainfall close to where it falls. They can be designed to convey surface water, slow / attenuate runoff before it enters watercourses, provide areas to store water in natural contours and can be used to allow water to infiltrate into the ground or evaporate from the surface and transpired from vegetation.

The "four pillars" of SuDS design philosophy is to meet design objective where surface water runoff is managed for water quantity, water quality, amenity and biodiversity benefits.

Management Train

Adopting a holistic approach towards surface water drainage provides the benefits of combined water quality and quantity control, biodiversity as well as increased amenity value. This is accomplished by managing the increased flows and pollution from surface water runoff that can arise from development

A fundamental concept used in the management / development of SuDS is the management train or treatment train, illustrated in Figure 14 below

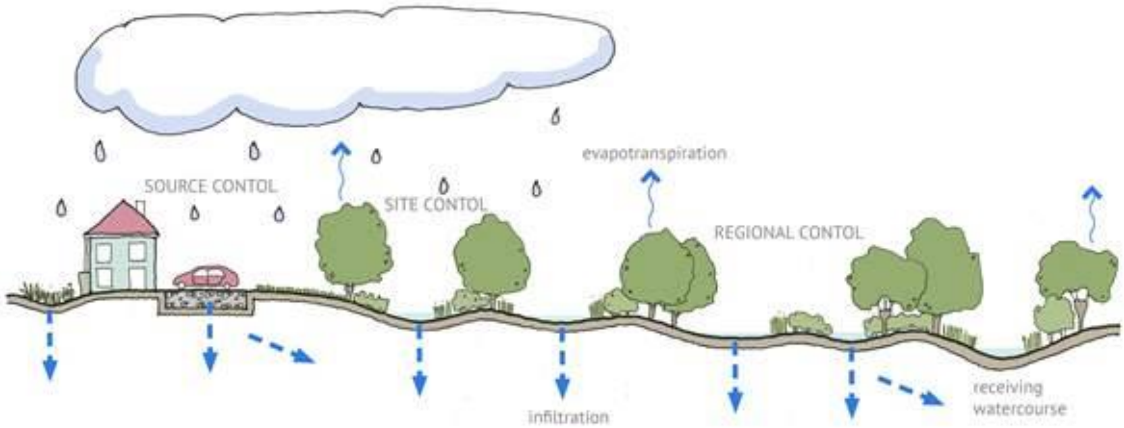


Figure 14 - SuDS Management Train (susdrain)

Just as in a natural catchment, drainage techniques can be used in series to change the flow and quality characteristics of the runoff in stages. The management train starts with prevention (prevent runoff by reducing impermeable areas), or good housekeeping measures for reducing pollution; and progresses through local source controls to larger downstream site and regional controls

They are regarded as a sequence of management practices, control structures and strategies designed to efficiently and sustainably drain surface water, while minimising pollution and managing the impact on water quality of local water bodies. Within the philosophy of the surface water management train each component adds to the performance of the whole drainage system.

Design Requirements

SuDS design proposals should consider the location of discharge as a hierarchy, Planning Practice Guidance states:

"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

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

The current London Plan Policy SI 13 Sustainable drainage states:

"Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

2) rainwater infiltration to ground at or close to source

3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

4) rainwater discharge direct to a watercourse (unless not appropriate)

5) controlled rainwater discharge to a surface water sewer or drain

6) controlled rainwater discharge to a combined sewer.

SuDS design:

- Manage runoff volumes and flow rates from hard surfaces, reducing the impact of urbanisation on flooding
- Provide opportunities for using runoff where it falls
- Protect or enhance water quality (reducing pollution from runoff)
- Protect natural flow regimes in watercourses
- Are sympathetic to the environment and the needs of the local community
- Provide an attractive habitat for wildlife in urban watercourses
- Provide opportunities for evapotranspiration from vegetation and surface water
- Encourage natural groundwater/aquifer recharge (where appropriate)
- Create better places to live, work and play.

Summary of typical SuDS Components:

Source Control

- Good house keeping
- Green Roofs
- Infiltration Basins
- Infiltration trenches
- Permeable pavements / Grasscrete
- Rainwater Harvesting
- Soakaways

Permeable Conveyance Systems

- Filter (or French) Drains
- Swales

Passive Treatment

- Bioretention / Vegetated areas
- Filter Strips
- Detention Basins
- Retention ponds
- Wetlands

Pipes and accessories. A series of conduits and their accessories normally laid underground that convey surface water to a suitable location for treatment and/or disposal. (Although sustainable, these techniques should be considered where other SUDS techniques are not practicable).

Site Considerations

As well as to ensure that the users of the site are not at risk, another key objective is to ensure that the development does not increase the potential of flooding elsewhere. This objective can be achieved by designing a SuDS strategy for the development that will set the strict framework to be followed during the detailed drainage design.

Physical site conditions as described in Section 3 above are taken into account in order to develop a suitable SuDS Strategy for the proposed development. The SuDS strategy will be delivered in accordance with prevailing local and national planning policy and design standards including CIRIA Reports etc.

Currently, the most significant directives influencing the design of the SuDS strategy are the Flood and Water Management Act 2010, the NPPF and the National Planning Practice Guidance (NPPG) as well as the local polices and guidance provided within the London Plan; Surface Water Management Plan for London Borough of Camden; Preliminary flood risk assessment: London Borough of Camden (2011) & Addendum (2017); London Borough of Camden Strategic Flood Risk Assessment (SFRA) July 2014: Water and Flooding CPG (2019); Managing flood risk in Camden, The London Borough of Camden flood risk management strategy.

It also makes reference to consultations with the EA and Thames Water as well the Susdrain website, CIRIA753 The SuDS Manual and Government Non-statutory technical standards for sustainable – practice guidance and the design, maintenance and operation of SuDS.

This strategy sets the guidelines for future detailed design, but more importantly, it demonstrates that a sustainable drainage solution is deliverable at this site, complying with all relevant planning and legislative criteria.

Outline SuDS Strategy Design

The aim of the outline SuDS strategy is to mimic the existing drainage system for the Rear of Sarre Road site and to restrict discharge rates from the site to as close to greenfield rates as is practicable.

The existing greenfield development site sits directly on bedrock described by the BGS as impermeable London Clay Formation. From current available data from the desk study, it is considered that a source control infiltration / soak away system would not be appropriate at this location and has therefore been omitted accordingly.

There are no drainage ditches or watercourses on or adjacent to the proposed development site.

A Thames Water combined sewer is located within the adjacent Godar Gardens highway at the front of the proposed development.

Exceedance Surface water runoff from the rear garden site at Sarre Road adjacent Gondar Gardens site currently drains to ground or ponds on the site till it evaporates or runs off into the adjacent highway.

Thames Water asset drawings provided in Appendix A confirm the location of the combined sewer network in Gondar Gardens as described. Please note that the Thames Water asset plans are not a fully comprehensive record of their assets within the area and private drainage is not shown on their plans. Surface water drainage from the existing residential property discharges into the Thames Water surface water network.

The main flood risk to the site is from potential surface water runoff from the proposed development site itself.

The rear of Sarre Road development site is not within an area that is indicated as having an increased susceptibility to elevated groundwater. Construction materials and techniques should therefore be accordance with normal Building Regulations damp proof standards.

The proposed SuDS strategy will provide for the surface water runoff on the site itself. The exceedance surface water flows off site should be maintained as existing.

In addition to ensuring flood risk on site is not increased the SuDS design for the proposed development considers mitigation in order to protect the site and not to add to offsite flood risk. Drainage flows offsite to the public combined sewer will be reduced from the existing unrestricted flow to a flow based on greenfield runoff / a practicably maintained controlled rate that allows for the associated appropriately sized attenuation drain down rates.

It is the aim of this study to provide a SuDS strategy solution that is pragmatic in both its specification and maintenance. Hydraulic calculations were undertaken using FEH rainfall methodology to identify potential appropriate discharge rate and attenuation design options.

The total area of the existing and proposed development site is 0,50m^2. The existing development is a greenfield site. Hydraulic calculations established greenfield runoff flows for a 1 in 2yr of 0.1 l/s, Qbar of 0.1 l/s, Q30 of 0.3 l/s and Q100 of 0.4 l/s. These calculations are provided in Appendix B.

It is the aim of this study to provide a SuDS strategy solution that is pragmatic in both its specification and maintenance in accordance with site constraints. A practicably maintainable flow control is used to determine a suitable surface water discharge from the proposed development layout. The hydraulic calculation process was an iterative one to assess discharge with appropriate sized flow controls and attenuation drain down times.

A minimum sized orifice flow control of 15mm diameter was used within the SuDS Strategy system. It provides a discharge flow of 0.2 l/s for 1 in 2yr, 0.3 l/s for the 1 in 30yr and 0.4 l/s for the 1 in 100yr +40% cc. The proposed 1 in 100yr+40% cc discharge of 0.4 l/s is greater than greenfield Qbar runoff rate and equals the Q100 greenfield rate. Thames Water have confirmed that there is no record of sewer flooding at the site. The proposed runoff for 1 in 100yr + 40% cc calculations show that an attenuation of 2m^3 is required. The required attenuation is provided within the permeable pavement, attenuation crates and the drainage network itself. These calculations are also provided in Appendix B.

Surface water runoff from the grey roof will be collected and drain via ducting, rainwater pipes and a rainwater harvesting water butt to ground level into a 250mm thick permeable paved rear patio as Formpave / Aquaflow attenuation or similar. The permeable paved area at the rear of the building is connected to 400mm deep attenuation crates beneath them that drain via a 100mm diameter pipe under the new development to a Flow Control Chamber housing the 15mm diameter minimum sized orifice flow control located in the external front access to the new property. The outfall from site is connected to the Thames Water combined sewer in the Gondar Gardens highway.

The proposed SuDS Strategy system as described is shown on Drawings Nos FRA20213-DS-001 provided in Appendix C.

Ground levels provide falls away from the proposed property for exceedance flows to be directed away from it to the landscaped gardens at the rear and onto the highway at the front as existing.

The proposed SuDS design strategy will provide source control permeable paving as Formpave / Aquaflow attenuation system or similar to collect, convey, attenuate and provide an element of passive treatment to storm / surface water prior to discharge into the public sewer network. The permeable pavement will provide for the first 5mm flush rainfall runoff.

Landscaped garden area is provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as provide opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration.

A rainwater harvesting water butt system is also to be included at rainwater down pipes adjacent landscaped areas at the front to accommodate an element of water reuse and stimulate biodiversity and amenity value for the landscaped areas.

Ground levels should allow for exceedance flows from roofs and ground level to be directed away from the development towards the gardens at the rear and frontage.

This strategy has been developed from a desk top study. Site surveys / investigations of the site drainage connections, public sewer network lines and levels should be undertaken to confirm the SuDS Strategy for detailed design.

6. Management and Maintenance

All drainage works are to be completed prior to occupation.
The onsite surface water management system is not eligible for adoption and will remain in the private ownership of the Facilities manager. The Facilities Manager will be responsible for the long-term maintenance of the onsite drainage system.

On Site SuDS

Surface water runoff from the grey roof will be collected and drain via ducting, rainwater pipes and a rainwater harvesting water butt to ground level into a 250mm thick permeable paved rear patio as Formpave / Aquaflow attenuation or similar. The permeable paved area at the rear of the building is connected to 400mm deep attenuation crates beneath them that drain via a 100mm diameter pipe under the new development to a Flow Control Chamber housing the 15mm diameter minimum sized orifice flow control located in the external front access to the new property. The outfall from site is connected to the Thames Water combined sewer in the Gondar Gardens highway.

The proposed SuDS Strategy system as described is shown on Drawings Nos FRA20213-DS-001 provided in Appendix C.

Maintenance

Section 5 above details the SuDS Strategy Philosophy, Site Considerations and Outline SuDS Strategy Design.

The SuDS maintenance strategy and regime are to be in line with the CIRIA SuDS Design Guide and specific manufacturers recommendations. They should include

- inspections required to identify performance issues and plan appropriate maintenance needs
- operation and maintenance of the overall drainage system
- landscape management
- waste management associated with contaminated silt and other waste materials resulting from maintenance.

An Operations & Management Manual for the SuDS should be prepared and supplied to the site operator. It should provide the surface water management strategy and SuDS overall philosophy as well as the function and operation of each component. Manufacturers technical details and maintenance procedures and requirements should be included within the Manual.

General

Regular monthly good housekeeping management with inspections and cleansing should be employed at the whole of the site.

Regular inspection and cleansing of catchment, guttering, pipe inlets, channels, filters and inspection chambers to reduce the likelihood of contamination is required to suit the prevailing operations, usage and circumstances of the development site.

Inspections after extreme rainstorms are essential to ensure that there are no blockages.

Regular inspections & removal of litter, debris and sediment intrusion or other items that represent blockage risks.

Contaminated silts / sediments etc to be disposed of at appropriately licenced tip.

Regular weeding and maintenance should be carried out and more intently during months of growth.

Rainwater Harvesting

An Operations & Management Manual for the Rainwater Harvesting Butt technology to be specified at detail design should be prepared accordingly and supplied to the site operator.

Water Butts

Inspection routines are essential to maintain efficient performance of a rainwater harvesting / Water Butt system and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken following a significant storm and / or within 1 month of installation. Regular (quarterly) inspections to be undertaken over the lifetime as required.

Regular: Inlet and outlet, should be inspected and cleared of any build up or debris.

Keeping the water within a water butt clean should be a priority. Empty water butt completely to allow cleansing of the interior and remove the sludge, algae and grime that builds up on the sides and bottom of the container. There are various ecologically-sound products available to buy which are specifically made for cleaning the interior of water butts and enhancing the quality of the water. They contain non-toxic chemicals, so they are safe for children, wildlife and pets. These products liquids are usually very good at getting rid of smells in water butts and generally raising the quality of the water. Water purification tablets are an option.

The exterior of a butt or rain barrel should receive a wipe over with an appropriate cleaning liquid on a regular basis to stop grime building.

Occasional: Cleansing and reducing volumes of water for winter to prevent the risk of ice forming, expanding, and then cracking or splitting of the container.

Remedial: Any vegetation which has encroached into drainage outlets should be removed immediately.

Structure rehabilitation / repair. Remediate drainage system and structure as required.

Permeable paving maintenance

Inspection routines are essential to maintain efficient performance of permeable paving and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken within 3 months of installation. Occasional but regular inspections to be undertaken over the lifetime as required.

Regular: The catch pit chamber and flow control for the permeable sub-base storage should be checked and emptied regularly to ensure there is no silting up of the system

Vacuum and sweep permeable paving surface to remove litter, debris and contamination as circumstances require. Minimum: seasonally during Spring and at leaf fall in Autumn.

Occasional: Management / removal and disposal of sediment intrusion.

Removal of weeds and invasive plants as circumstance require.

Washdown paving as required.

Remedial: Infiltration surface reconditioning / rehabilitate surface. Sweep in and reapplication of 2-4mm clean gritstone. As Required

Remediate areas of rutting and depressions - structure rehabilitation /repair.

As required Replace broken / damaged blocks.

Crated attenuation system & Flow Control Chamber

Inspection routines are essential to maintain efficient performance of crated attenuation systems and they should be carried out at frequent and regular intervals. An initial inspection of the system should be undertaken following a significant storm and / or within 3 months of installation. Regular (quarterly) inspections to be undertaken over the lifetime as required.

Inspection / control chambers are required to monitor and control the water level within the system. The control chamber provide access for inspection and maintenance for cleansing operations as required etc.

Regular: Each outlet, should be inspected and cleared of any build up or debris. Ensure connection drainage is clear and functioning, remove sediment, litter and other deposits from inspection chambers and check pipe inlets..

Occasional: Following any significant storm event, the outlets & flow controls should be visually inspected to ensure no blockage has occurred. Following any significant traffic or remedial works that take place on or around the tank, each of the outlets should be visually inspected to ensure all drainage holes are clear and free draining.

Remedial: Any vegetation which has encroached into drainage outlets, Inspection chambers and crates should be removed.

Structure rehabilitation / repair. Remediate drainage system and structure as required.

7. Conclusions

The PES was commissioned to produce a FRA and SuDS Strategy Report in support of a planning application for the proposed development of land within the rear garden of 12 Sarre Road, London, NW2 3SL. The development proposal is for the erection of a two storey single family residential dwelling with a rear garden, bin and bike store fronting onto Gondar Gardens.

This FRA and SuDS report has been prepared as a desk top study based on the architectural drawings supplied and gathered data available within the public domain. It summarises the SuDS design process for the proposed development and demonstrates that the development complies with planning policy on flood risk – National Planning Policy Framework (NPPF) and supports Planning Practice Guidance (PPG) as well as the local London Borough of Camden Policies and guidelines including associated SuDS requirements.

The design process began with a review and analysis of the proposed development and the existing site conditions relating to surface water drainage and flood risk. It included a study of both hydrology and hydrogeology for the site. Mitigation for groundwater flooding is provided.

The proposed SuDS design strategy provides for mainly source control techniques of permeable paving and rainwater harvesting butt system for water reuse. Surface water will be discharged into the adjacent existing adjacent Thames Water surface water sewer.

Associated hydraulic and attenuation calculations are based on greenfield runoff rates for both pre and post development along with impermeable areas and a description of the proposed surface water management, SuDS scheme for the site is prepared accordingly. Hydraulic design was an iterative process to provide for flow controls sized and used to allow a practicable maintenance regime to be incorporated within it and to allow for attenuation drain down times. A minimum sized 15mm diameter orifice flow control system will control the discharge from site to a greenfield discharge of 0.4 l/s for the 1 in 100yr+40% cc. The 0.4 l/s controlled discharge requires a total of 2m^3 attenuation for the 1 in 100yr +40%cc runoff scenarios. The required attenuation is provided within the permeable pavement, attenuation crates and the drainage network itself.

The SuDS provides a surface water management solution that reduces the surface water run off that leaves the site and shows that the proposed development does not result in an increase to the risk of flooding on or off site.

Permeable paving is provided on site for permeable conveyance and passive treatment techniques to collect, convey, attenuate and treat storm / surface water prior to discharge via crated attenuation systems into the existing Thames Water surface water network on the site. It will also take the first 5mm of rainfall.

Landscaping areas are provided on site for both source control for low rainfall events and will take the first 5mm of rainfall as well as opportunity for an element of bioretention, treatment, biodiversity and amenity value. They can also provide an opportunity for evapotranspiration.

A rainwater harvesting water butt system is also included at rainwater down pipes adjacent landscaped areas for source control for low rainfall events, to accommodate an element of water reuse bioretention, and stimulate biodiversity and amenity value for the landscaped areas.

Surface water from the site is to be connected to the adjacent Thames Water combined sewer system. Thames Water application is to be made.

This report provides a management and a maintenance regime statement for the SuDS surface water management of the new development.

Appendix A

Thames Water Correspondence

Asset Location Search

Thames Water Property Searches

eb Sustainability
Mira Sol
Crown Road
CWMBRAN
NP44 8UF

Search address supplied	Rear Garden 12 Sarre Road Gondar Gardens London NW2 3SL
Your reference	Gondor Gardens
Our reference	ALS/ALS Standard/2024_5016119
Search date	4 July 2024

Notification of Price Changes

From 1st April 2024 Thames Water Property Searches will be increasing the prices of its CON29DW Residential and Commercial searches along with the Asset Location Search. Costs will rise in line with RPI as per previous years, which is sat at 6%.

Customers will be emailed with the new prices by February 28th 2024.

Any orders received with a higher payment prior to the 1st April 2024 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk.

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

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

0800 009 4540

Asset Location Search

Thames Water Property Searches

Search address supplied: Rear Garden, 12, Sarre Road, Gondar Gardens, London, NW2 3SL

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

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

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

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

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

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

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

For your guidance:

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

Clean Water Services

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

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

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

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

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

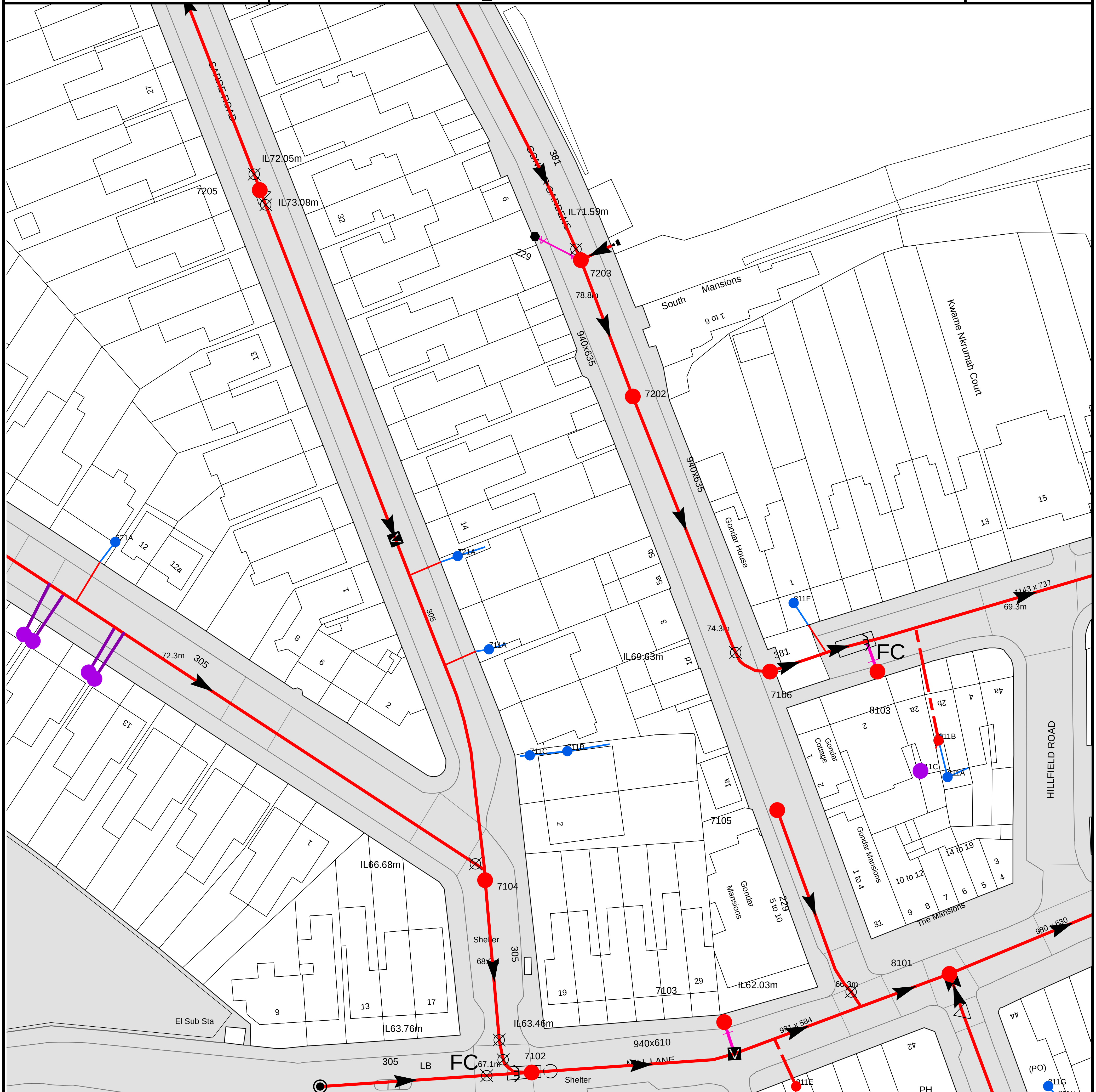
Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2024_5016119



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 524758,185204

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
811E	n/a	n/a
811G	n/a	n/a
7102	66.77	63.12
7103	n/a	n/a
8101	65.68	61.03
7104	69.15	66.06
7105	69.98	68.54
811A	n/a	n/a
811C	n/a	n/a
711C	n/a	n/a
711B	n/a	n/a
811B	n/a	n/a
6104	n/a	n/a
6103	n/a	n/a
7106	n/a	69.13
8103	n/a	n/a
711A	n/a	n/a
6102	n/a	n/a
6101	n/a	n/a
811F	n/a	n/a
721A	n/a	n/a
621A	n/a	n/a
7202	77.6	71.17
7203	78.65	71.54
7205	75.72	n/a

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

Storm Sewer

Sludge Sewer

Foul Trunk Sewer

Surface Trunk Sewer

Combined Trunk Sewer

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Vacuum

Thames Water Proposed

Vent Pipe

Gallery

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

Sewer

Culverted Watercourse

Proposed

Decommissioned Sewer

Content of this drainage network is currently unknown

Ownership of this drainage network is currently unknown

Sewer Fittings

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

Air Valve

Meter

Dam Chase

Vent

Fitting

Operational Controls

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

Ancillary

Drop Pipe

Control Valve

Weir

End Items

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

Inlet

Outfall

Undefined End

Other Symbols

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

Change of Characteristic Indicator

Public / Private Pumping Station

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Chamber

Operational Site

Ducts or Crossings

Casement

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

Conduit Bridge

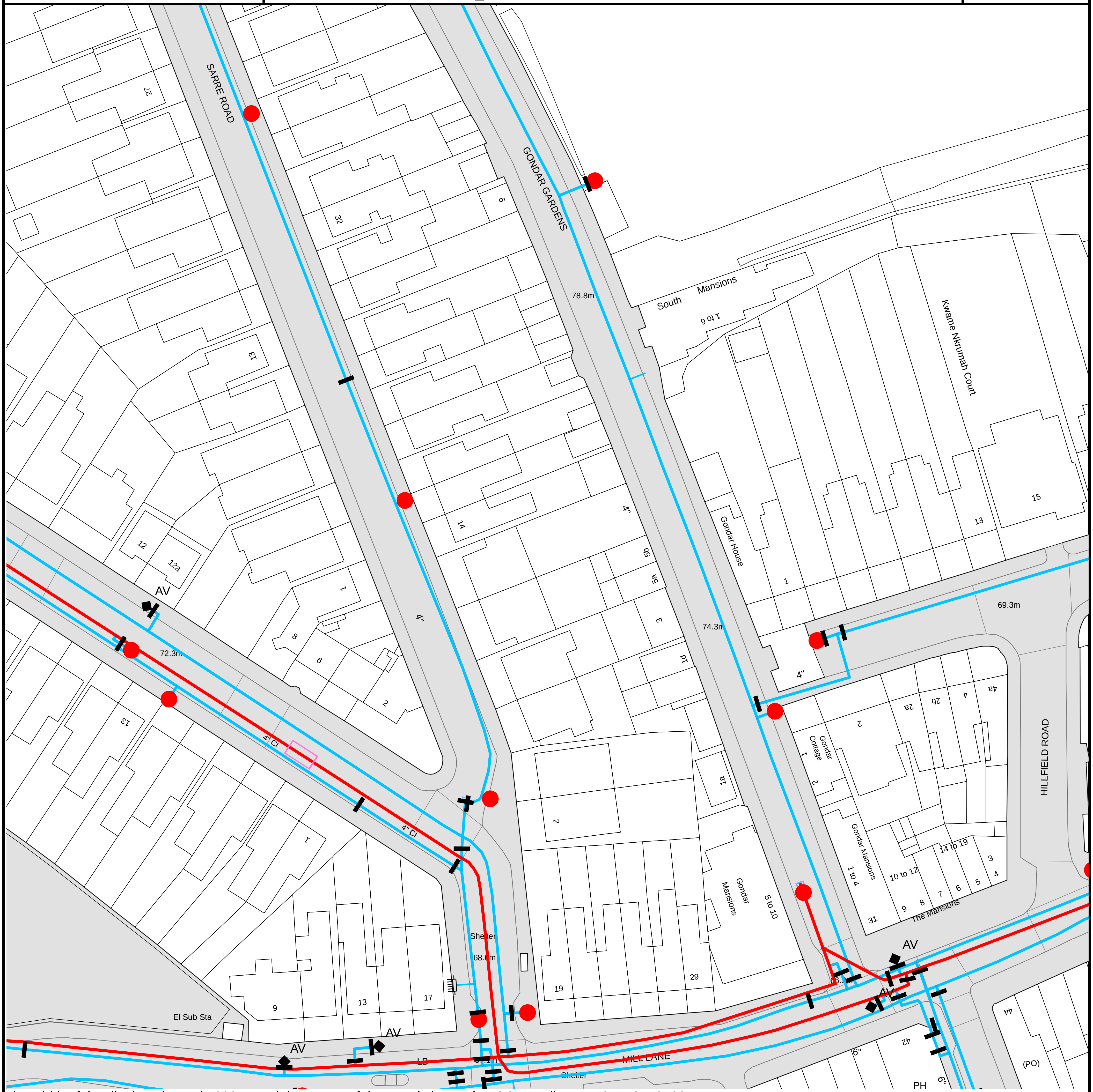
Subway

Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2024_5016119



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 524758, 185204.

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.

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

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

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

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

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

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

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

Valves

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

Hydrants

- Single Hydrant

Meters

- Meter

End Items

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

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

Operational Sites

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

Other Symbols

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

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

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: 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.

Payment 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 within 14 days of the 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. 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'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. 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 980 8800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

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 0300 034 2222 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**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	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

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

Sewer Flooding

History Enquiry

Property Searches

eb Sustainability

Crown Road

Search address supplied	Rear Garden 12 Sarre Road Gondar Gardens London NW2 3SL

Your reference	Gondor Gardens
Our reference	SFH/SFH Standard/2024_5016120
Received date	**4 July 2024**
Search date	**4 July 2024**

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

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

0800 009 4540

Thames Water Property Searches

Search address supplied: Rear Garden,12,Sarre Road,Gondar Gardens,London,NW2 3SL

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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Appendix B

Surface Water Drainage System Associated Hydraulic Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	5	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP	0.005	5.00	76.000		524767.715	185203.464	0.800
FCC			75.990	600	524775.317	185206.375	0.892

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PP	FCC	8.140	0.600	75.200	75.098	0.102	80.0	100	5.16	50.0

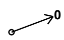
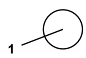
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.861	6.8	0.7	0.700	0.792	0.005	0.0	21	0.549

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	8.140	80.0	100	Circular	76.000	75.200	0.700	75.990	75.098	0.792

Link	US Node	Node Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PP	Junction	FCC	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP	524767.715	185203.464	76.000	0.800		 0	1.000	75.200	100
FCC	524775.317	185206.375	75.990	0.892	600	1 	1.000	75.098	100

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	0.1
Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	0.3
Winter CV	1.000	Additional Storage (m^3/ha)	20.0	100 year (l/s)	0.4
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	40	0	0
1000	0	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	FEH	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.022	Betterment (%)	0
SAAR (mm)	647	QMed	0.1
Host	25	QBar	0.1
BFIHost	0.175	Q 2 year (l/s)	0.1
Region	6	Q 30 year (l/s)	0.3
QBar/QMed conversion factor	1.136	Q 100 year (l/s)	0.4
Growth Factor 2 year	0.88		

Node FCC Online Orifice Control

Flap Valve	x	Invert Level (m)	75.098	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.015		

Node PP Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	75.620
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	84

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	9.0	0.0	0.250	9.0	0.0	0.251	0.0	0.0

Node PP Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	75.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	148

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	2.5	0.0	0.400	2.5	0.0	0.401	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PP	82	75.246	0.046	0.3	0.1145	0.0000	OK
120 minute winter	FCC	82	75.246	0.148	0.3	0.0418	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PP	1.000	FCC	0.3	0.348	0.044	0.0461	
120 minute winter	FCC	Orifice		0.2				1.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PP	50	75.496	0.296	1.3	0.7404	0.0000	SURCHARGED
60 minute winter	FCC	50	75.496	0.398	0.5	0.1126	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	PP	1.000	FCC	0.5	0.385	0.080	0.0637	
60 minute winter	FCC	Orifice		0.3				1.8

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PP	92	75.928	0.728	1.5	1.7199	0.0000	FLOOD RISK
120 minute winter	FCC	92	75.928	0.830	0.7	0.2348	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PP	1.000	FCC	0.7	0.352	0.098	0.0637	
120 minute winter	FCC	Orifice		0.4				4.5

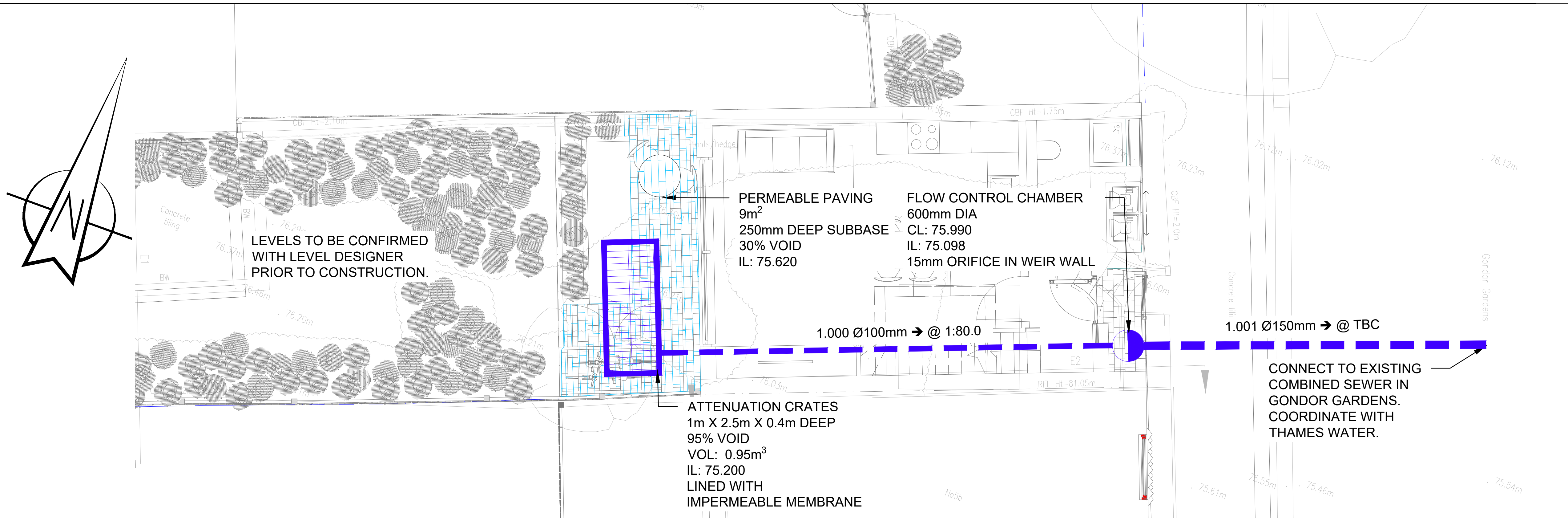
Results for 1000 year Critical Storm Duration. Lowest mass balance: 100.00%

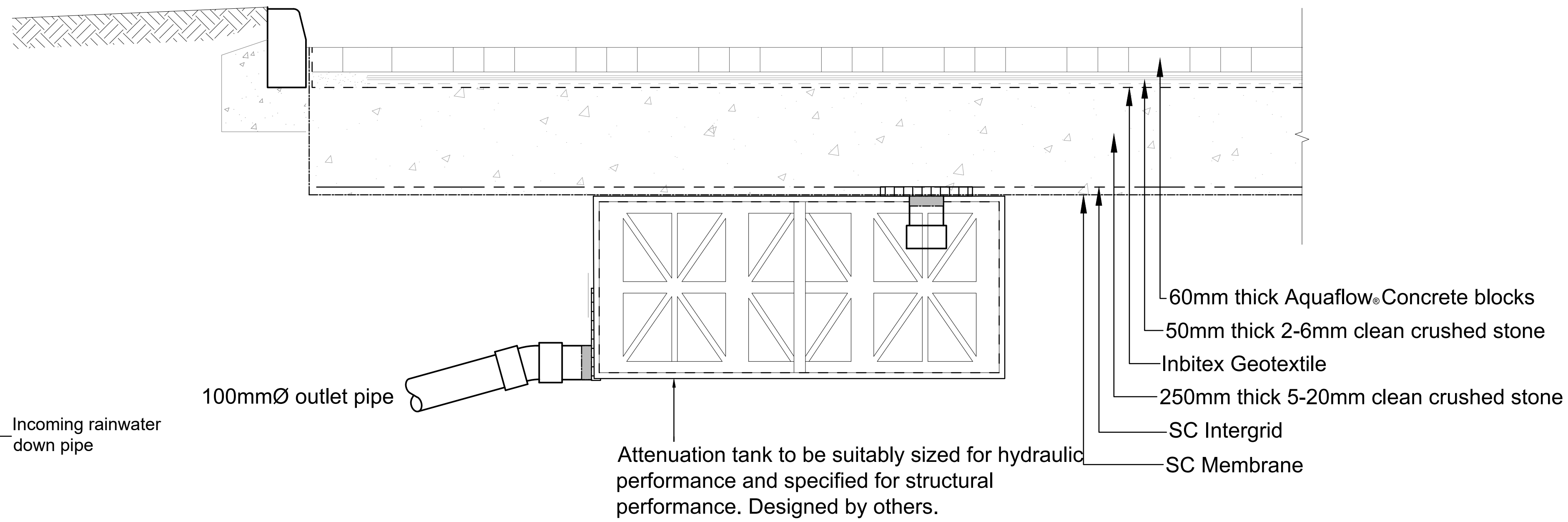
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PP	80	75.993	0.793	1.7	1.7280	0.0000	FLOOD RISK
180 minute winter	FCC	116	75.990	0.892	0.9	0.2524	0.2378	FLOOD

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PP	1.000	FCC	1.1	0.352	0.167	0.0637	
180 minute winter	FCC	Orifice		0.4				5.5

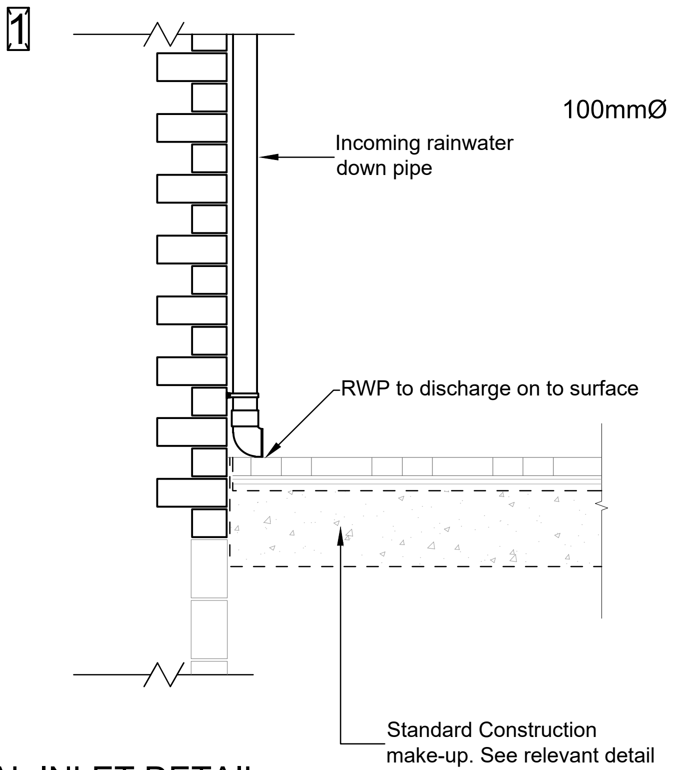
Appendix C

Surface Water Drainage Strategy Drawing No FRA20213-DS-001

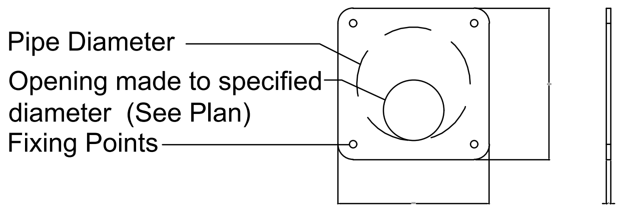




TYPICAL SECTION THROUGH FORMPAVE AQUAFLOW
ATTENUATION SYSTEM OVER ATTENUATION TANK



TYPICAL INLET DETAIL



FLOW CONTROL DEVICE

KEY
PERMEABLE PAVING
ATTENUATION CRATES
SURFACE WATER SEWER
FLOW CONTROL CHAMBER

REV	DETAILS	DRW	CHKD	DATE

The PES
THE Property, Energy & Sustainability Company

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Project
12 SARRE ROAD

Drawing
SUDS STRATEGY:

Date 09.08.2024	Scale 1:100		
Drawn By cda	Checked By DF		
Drawing No. 20213-DS-001	Rev. -		