Site Drainage Strategy (Sustainable Drainage Systems SuDS)

32 Ferndale Crescent, Uxbridge, Middlesex UB8 2AX

Project Ref: QFRA 2550

Version: 1.0

Date: 15/08/2024

UK Flood Risk
Unit 019 The Base
Dartford Business Park
Victoria Road
Dartford DA1 5FS

Tel: 020 3797 6380

Email: ukfloodrisk@gmail.com
www.ukfloodrisk.co.uk

Revision Records

Issued	Report Version	Comments	Issued to
August 2024	1.0	1st Issue	Mr Darrell DeSouza

Prepared by	SG	Senior Flood Risk Consultant	15/08/2024

Issue Date: 15/08/2024

DISCLAIMER

This document has been prepared solely as a Technical Report for the owner of this site. UK Flood Risk Consultants accepts no responsibility or liability for any use that is made of this document other than by the owner for the purpose for which it was originally commissioned and prepared.

UK Flood Risk
Unit 019 The Base
Dartford Business Park
Victoria Road
Dartford DA1 5FS

Executive Summary

UK Flood Risk Consultants has been commissioned to prepare a Sustainable Drainage Systems (SuDS) Strategy in support of a proposal consisting of garage conversion and rear and side extensions to the residential dwelling located at 32 Ferndale Crescent, Uxbridge, Middlesex UB8 2AX.

The main sources of information to develop the SuDS strategy are the guidelines of the National Planning Policy Framework (NPPF, December 2023) and the Environment Agency's Flood Risk Assessment (FRA) Guidance Notes along with the best practice guidance in flood risk and drainage including the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015).

The overall risk of surface water flooding to the site is 'low' to 'high' with the maximum flood depth less than 300mm.

The surface runoff will be improved by implementing appropriate SuDS measures.

Due to underlying soil condition mostly composed of silt and clay with low infiltration capacity, the potential for a Soakaway to discharge the surface runoff from the site is low.

An open ground pond will not be feasible at the site due to the limited space available. Therefore, in line with the SuDS drainage hierarchy policy, a rainwater recycling with water butt along with a small rain garden are proposed.

The landowners will be fully responsible for the repair and management of the implemented SuDS throughout the lifetime of the proposed development.

UK Flood Risk
Flood Risk Consultants

Contents

Appendices

Abbreviations

Abbreviation	Description
mAOD	Metres Above Ordnance Datum
EA	Environment Agency
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
PFRA	Preliminary Flood Risk Assessment
SuDS	Sustainable Drainage Systems

1.0 Background

UK Flood Risk Consultants has been commissioned to prepare a Sustainable Drainage Systems (SuDS) Strategy in support of a proposal consisting of garage conversion and rear and side extensions to the residential dwelling located at 32 Ferndale Crescent, Uxbridge, Middlesex UB8 2AX.

This Sustainable Drainage Systems (SuDS) Strategy has been developed in accordance with the guidelines and the requirements of the National Planning Policy Framework (NPPF, December 2023) and the Environment Agency's Flood Risk Assessment (FRA) Guidance Notes along with the best practice guidance in flood risk and drainage including the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015).

2.0 Surface Water Drainage Requirements

A surface water drainage assessment should be undertaken to demonstrate that surface water runoff from the proposed development can be effectively managed without increasing flood risk elsewhere. Sustainable Drainage Systems (SuDS) are designed to manage surface water runoff sustainably, mitigating flood risks and protecting water quality.

SuDS should be designed to reduce runoff rates and volumes, ideally mimicking natural hydrology by capturing, storing, and slowly releasing water. Systems should aim to reduce the peak flow rate during storm events, reducing the risk of flooding downstream.

SuDS should prevent pollution by treating surface water before it is discharged. The system should be capable of removing pollutants such as heavy metals, oils, and suspended solids from the runoff before it reaches water bodies.

Where feasible, infiltration techniques should be used to recharge groundwater, but they must ensure that they do not cause pollution of groundwater. The use of impermeable surfaces should be minimized to enhance infiltration and reduce runoff.

SuDS should be integrated into the landscape, enhancing local biodiversity and providing amenity value.

3.0 General Description of the Site and the Proposals

3.1. Description of the site

The proposal site is the residential dwelling located at 32 Ferndale Crescent, Uxbridge, Middlesex UB8 2AX approximately centred on the OS Grid Ref TQ 05163 82803 (**Appendix A Figure 1**). The site is located within the administrative boundary of London Borough of Hillingdon**,** which is also the Lead Local Flood Authority (LLFA) responsible for managing the flood risk from surface water in the area.

The site occupies an area of approximately 375m^2 (**Appendix C**). The area of building footprint including outbuilding is approximately 79m^2. Approximately 40m^2 area is covered by hardstanding. The remainder of the site (i.e. 256m^2) comprises soft landscaping (**Appendix B**).

The British Geological Survey's geological maps are provided in **Appendix C**. The geological maps show that the bedrock of the site comprises London Clay Formation - Clay, Silt and Sand that formed between 56 and 47.8 million years ago during the Palaeogene period. The superficial deposits comprise Alluvium - Clay, Silt, Sand and Gravel that formed between 11.8 thousand years ago and the present during the Quaternary period.

The access to the site is via Ferndale Crescent. The surrounding area consists of predominantly residential use (**Appendix A Figure 2)**.

The Fray's River flows adjacent to the western site boundary, however, the site is located outside of its floodplain. The River is fully defended and the site and the surrounding properties directly benefit from the flood risk management systems in place.

The site has a flat and level topography. Further details about the existing site are provided in **Appendix B**.

3.2. Proposed Development

The proposal comprises garage conversion and rear and side extensions. The footprint area of the proposed extension is approximately 17m^2. Further details about the proposals have been provided in **Appendix B**.

4.0 Sustainable Urban Drainage Systems Policy

4.1. Flood and Water Management Act 2010

The method of drainage of surface water from the site is bound by the Flood and Water Management Act 2010. Schedule 3 Paragraph 5 of the Flood and Water Management Act 2010 states that the following hierarchy is to be applied to surface water runoff in the following order or priority:

- Discharge into the ground (infiltration)
- Discharge to a surface water body (lake, river, drain);
- Discharge to a surface water sewer, highway drain or another drainage system; or Discharge into a combined sewer.

4.2. Drainage Hierarchy

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 in line with the following drainage hierarchy as set out by the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015):

1. rainwater harvesting (including a combination of green and blue roofs),
2. infiltration techniques and green roofs,
3. rainwater attenuation in open water features for gradual release,
4. rainwater discharge direct to a watercourse (unless not appropriate),
5. rainwater attenuation above ground (including blue roofs),
6. rainwater attenuation below ground,
7. rainwater discharge to a surface water sewer or drain,
8. rainwater discharge to a combined sewer.

4.3. Strategic Flood Risk Assessment (SFRA)

The West London Strategic Flood Risk Assessment (West London SFRA) jointly undertaken by the boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow is a comprehensive study that assesses the potential risks and impacts of flooding in the boroughs. The SFRA provides important information to support land use planning, development control, emergency planning, and community resilience. The SFRA considers a range of potential flood risks, including those from rivers, surface water, and groundwater sources. The study includes detailed flood risk maps that identify areas at risk of flooding and the potential consequences of flooding, such as property damage, business disruption, and loss of life.

The SFRA also provides guidance on flood risk management strategies and measures that can be implemented to mitigate the potential impacts of flooding. The SFRA has provided SuDS a high priority. SuDS are designed to manage and reduce the impact of surface water runoff in urban areas. SuDS incorporate several measures to slow down and manage the flow of rainwater. By doing so, they help prevent surface water runoff overwhelming drainage systems and causing flooding downstream.

5.0 Assessment of Surface Runoff Flood Risk

The surface water flooding arises when the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded and the excess rainwater flows overland. The severity of surface water flooding depends on several factors such as the degree of saturation of the soil before the event, the permeability of soils and geology, hill slope steepness and the intensity of land use.

Information on the risk of surface water flooding is held by the Environment Agency. The Environment Agency's Surface Water Flood Risk Maps are provided in **Appendix D Figure 1 and Figure 2** which indicate that the risk of surface water flooding to the site varies from 'low' to 'high' with the maximum flood depth less than 300mm.

6.0 Sustainable Urban Drainage Systems (SuDS)

The London Borough of Hillingdon strongly encourages the principles of SuDS on all forms of development. The developer should seek the most sustainable SuDS solution in order to reduce flood risk, improve water quality and improve the environment overall. The Local Authority encourages the developers to provide SuDS on major developments while paying due regard to the National Planning Policy Framework (NPPF), Planning practice guidance, Non-statutory technical standards for sustainable drainage systems and the District local plan policies.

6.1. Existing Drainage

The proposal site comprises existing building along with hardstanding and soft landscaping area. Most of the surface runoff from the soft landscaping area infiltrates into the ground. Most of the surface runoff from the hardstanding area in the rear infiltrates into the soft landscaping area. The excess runoff is discharged into the public sewer located on the road (i.e. Ferndale Crescent). Roof runoff is discharged into the existing sewer on the road via rainwater downpipes and gullies around the building. The excess surface runoff from the hardstanding in the front yard area is also discharged into the existing sewer on the road.

6.2. Greenfield Runoff Estimation

The estimation of the Greenfield Runoff rate has been undertaken using the HR Wallingford's Greenfield Runoff Estimation tool available on the website: http://www.uksuds-.com/greenfieldrunoff_js.htm. The aim of the tool is to provide flow rate information based on a minimum amount of data so that anybody can use the tool. The methodology is built around the concept that a flow rate discharge constraint is needed for storm water runoff from a site, resulting in attenuation volume being needed. In addition, current drainage criteria include the requirement for the 100 year 6hr volume to be controlled. The tool is based on the results of simple model analysis and correlating the results against key known site parameters. As such the results need to be treated as providing indicative information only and should not be used to produce final designs of drainage systems without additional modelling being carried out.

The peak flow estimation can now be estimated using two different formulae.

1) The formula developed in IH124 (IH 1994) and use of the FSSR growth curve information for regions of the UK (FSSR 14),

2) The use of FEH statistical correlation equation revised in 2008.

However, only the IH124 method can be used without providing specific parameter values. Therefore, this method has been used for estimating greenfield runoff rate from the proposed development site.

Details about the parameters used in the estimation are provided in **Appendix F** and the results are summarised in **Table 1** below. A site area of 0.10ha has been used, which is the minimum site area required for this technique.

The proposed development has considered the greenfield runoff rates for addressing surface water discharge requirements from the developed site. The greenfield runoff rates have been utilised for developing the drainage strategy for the site.

Table 1 – Greenfield Runoff Rates

Events	Greenfield runoff rates (l/s) (Estimated)
Qbar	0.16
1 in 1 year	0.14
1 in 30 year	0.37
1 in 100 year	0.51

6.3. Estimation of Permeable and Impermeable Areas

The changes in land cover have been summarised in **Table 2** below. It can be seen that the proposed development will not lead an increase in the impermeable area. This means the surface runoff will not be increased as a result of the proposed development.

Table 2 Changes in Land Cover Areas

Land Cover	Pre-development, m^2	Post-development, m^2	Change, m^2
Impermeable Surface Area			
Hard standing	40	23	
Building footprint	79	96	
Total Impermeable	**119**	**119**	**0**
Permeable Surface Area			
Grass cover	256	256	
Total Permeable	**256**	**256**	**0**
Total Area	375	375	

6.4. Estimation of peak surface runoff rates

The Rational Method has been used in order to estimate the peak surface runoff from the site

The Rational Equation is given by:

Q = Ar x P x Ri

Where, Ar = Effective catchment area, m^2

P= Impermeability factor

Ri= Rainfall Intensity, mm/hr

Q= Peak surface runoff, m^3/s

The peak surface runoff for the existing and proposed site conditions are summarised in **Table 3** below. An impermeability factor of 0.90 has been used for the site. A rainfall intensity of 100 mm per hour has been utilised. The impermeable areas in **Table 2** have been used as effective catchment area. **Table 3** shows that the peak runoff will not be increased as a result of the proposed development.

Table 3 Estimation of Peak Runoff Rates from the site based on land cover area

SuDS Measures	Pre-development	Post-development
♯ Rainfall intensity Ri, mm/hr	100	100
Effective catchment area, Ar m^2	119	119
Impermeability factor, P	0.90	0.90
Peak Runoff, m^3/s	(Ar x P x Ri/1000)/3600 = (119 x 0.90 x 100/1000) / 3600 =0.0029m^3/s = 2.97 litres/sec	(Ar x P x Ri/1000)/3600 = (119 x 0.90 x 100/1000) / 3600 =0.0029m^3/s = 2.97 litres/sec

♯ The rule of thumb is to use a constant rainfall intensity of 35mm/hr for initial sizing of conveyance system. 100mm/hr has been used and provides a more conservative solution (see Environment Agency 2003, Rainfall runoff management for developments, Report-SC030219).

6.5. Hierarchy of SuDS Measures

The surface runoff from the site will be improved by implementing appropriate SuDS. The requirements for SuDS will ensure that any redevelopment or new development does not negatively contribute to the surface water flood risk of other properties and instead provides a positive benefit to the level of risk in the area. It will also ensure that appropriate measures are taken to increase the flood resilience of new properties and developments in surface water flood risk areas, such as those identified as being locally important flood risk areas.

The SuDS hierarchy and management train has been discussed in the SuDS Manual (C753) which aims to mimic the natural catchment processes as closely as possible. The general hierarchy of the SuDS measures is provided in **Table 4** below.

Table 4 General Hierarchy of SuDS Measures

Measures	Definition/Description
Prevention	The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater harvesting/reuse).
Source control	Control of runoff at or very near its source (e.g. soakaways, porous and pervious surfaces, green roofs).
Site control	Management of water in a local area on site (e.g. routing water to large soakaways, infiltration or detention basins)
Regional control	Management of runoff from a site or several sites (e.g. balancing ponds, wetlands).

6.6. General Assessment of SuDS Measures for the site

Table 5 below presents the feasibility assessment of several SuDS measures for the site. The

Table 5 General Assessment of SuDS measures for the site

SuDS Measures	Issues/Description	Feasibility for the site
Source Control Porous and pervious materials/soakaways/green roof/infiltration trenches/disconnect downpipes to drain to lawns or infiltrate to soakaway.	Infiltration SuDS such as Soakaway will improve the surface runoff from the site. Rainwater harvesting with rainwater butt helps to harvest and store rainwater for later use. Rain Garden is effective in managing rainwater runoff. It is a shallow, planted depression that absorbs and filters stormwater, preventing it from	No. There is a potential for a Soakaway is low due to the underlying soil composition which comprises London Clay Formation. Yes. There is a potential for a rainwater harvesting using water butt. Yes. There is a potential for a small rain garden in the rear garden area of the site.

	overwhelming drainage systems and reducing the risk of flooding. Rain gardens also help improve water quality by filtering pollutants from the runoff.	
Site and Regional Control Infiltration/detention basins/ balancing ponds/ wetlands/underground storage/swales/retention ponds.	Open surface Balancing pond will not be feasible due to limited space available.	No. The potential for balancing pond is low as there is very limited space available for open ground balancing pond.

6.7. Proposed SuDS

Based on the general assessment of the potential SuDS measures above, a rainwater butt and a rain garden will be implemented in order to improve the surface runoff from the site.

The proposed scheme will therefore include a water butt (300 litres) along with a small rain garden at the rear garden area. The size of the proposed rain garden is as follows:

Length = 5m, Width = 2m, Depth = 0.50m

The proposed SuDS drainage layout plan has been provided in **Appendix F.**

6.8. SuDS Management and Maintenance Plan

The owners will be fully responsible for regular repair and maintenance of the proposed SuDS measures as required for the lifetime of the development. The SuDS at this site have been designed for easy maintenance to comprise:

Rainwater Harvesting Systems (Water Butt)

The landowners will be fully responsible for regular maintenance of the proposed rainwater harvesting. Rainwater harvesting systems must be inspected to ensure they operate in good working condition and in accordance with the approved design and specifications.

Table 6 provides further details on the regular maintenance of the proposed Rainwater Butt.

Table 6 Regular Maintenance and remedial measures for Rainwater Harvesting System

Routine Maintenance Task	Frequency
Remove leaves and debris from gutters and downpipes	Semi-annually
Remove/clean any algae growth	Semi-annually
Inspect and clean pre-tank filters to protect from unwanted contamination	Quarterly
Inspect and clean storage tank lids	Annually
Inspect and repair any clogging	Annually
Clear overhanging vegetation and trees over roof	Every 2 years
Inspect structural integrity of tank, pipes and repair any damage.	Every 2 years
Clean the storage tank as over time, fine sediment can build up in the storage tank	Every 3 years
Replace damaged or defective system components	As required

Rain Garden

The landowners will be fully responsible for regular maintenance of the proposed Rain Garden. **Table 7** provides further details on the regular maintenance of the proposed Rain Garden.

Table 7 Regular Maintenance and remedial measures for rainwater garden

Routine Maintenance Task	Frequency
The rain garden should be routinely weeded to prevent the build-up of weeds. It is a good practice to make sure that the maintained tree pit is identified with a band of colour ribbon wrapped around the base of the tree to clearly identify that the tree pit is being maintained.	Monthly

• Litter and debris removal • Mulching (where required) • Inspect/check all inlets, outlets, surface and overflows (where required) to ensure that they are in good condition, free from blockages and operating as designed. Take action where required.	
Remove nuisance and invasive vegetation	6 monthly
• Pruning and trimming of trees • Inspect and document the presence of wildlife • Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where required.	Annually
• Repair erosion or other damage by re-mulching or re-seeding • Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required • Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface (typically every 60-month period) • Remove build-up of sediment, reinstate design levels (typically every 60 month period) • Remove and dispose of oils or petrol residues using safe standard practices	As required
Carry out cleaning/maintenance work carefully to ensure that plants are not damaged.	As required
Only hand tools (e.g. a trowel) should be used within the tree pit to avoid damaging tree roots.	As required
Do not raise the soil level around the tree stem which can lead to the death of the tree.	As required
Water the plant/tree especially during the time of prolonged heat or drought.	As required
The soil level around a tree should not be changed from the soil level at which it was planted. Adding soil can smother roots and rot a tree's trunk. Digging soil out can damage shallow roots.	As required
Avoid planting woody perennials which will compete with the tree for water and may impede tree inspections.	As required
Keep garbage and de-icing salt out of the tree pit.	As required

7.0 Conclusion

The proposals comprise garage conversion and rear and side extensions to the residential dwelling located at 32 Ferndale Crescent, Uxbridge, Middlesex UB8 2AX.

The overall risk of surface water flooding to the site is ‘low’ to ‘high’ with the maximum flood depth less than 300mm.

The surface runoff will be improved by implementing appropriate SuDS measures.

Due to underlying soil condition mostly composed of silt and clay with low infiltration capacity, the potential for a Soakaway to discharge the surface runoff from the site is low.

An open ground pond will not be feasible at the site due to the limited space available. Therefore, in line with the SuDS drainage hierarchy policy, a rainwater recycling with water butt along with a small rain garden are proposed.

The landowners will be fully responsible for the repair and management of the implemented SuDS throughout the lifetime of the proposed development.

Appendix A Site Location Maps

Appendix B Existing Site and Proposed Plans

Appendix C Geological Map

Appendix D Surface Water Flood Maps

UK Flood Risk
Flood Risk Consultants

Appendix E Greenfield Runoff Rates

UK Flood Risk
Flood Risk Consultants

Appendix F Outline SuDS Drainage Plan