

**FLOOD RISK ASSESSMENT AND DRAINAGE
STRATEGY REPORT FOR WALLED GARDEN C/O
DOWER HOUSE, HITCHIN ROAD, PRESTON, HERT,
SG4 7TZ**

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PREPARED BY:



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1. INTRODUCTION

1.1. Appointment

Nimbus Engineering Consultants Ltd have been appointed to provide a solution on the management of Surface Water runoff and to ensure that there is no risk of flooding caused by the proposed six bedroom dwelling development and its associated amenities.

1.2. Objectives

This report will address the concerns raised by the Council and provide details on a suitable Sustainable Urban Drainage System (SuDS) in order to reduce the surface water run-off leaving the site and show that the proposed development will not increase Flood Risk at the site or elsewhere.

1.3. Limitations

The general limitations of this report are:

- A number of data and information sources have been used to prepare this report. Whilst Nimbus Engineering believes them to be trustworthy, Nimbus Engineering is unable to guarantee the accuracy of data and information that has been provided by others.

- This report has been prepared using the best data and information that was available at the time of writing. There is the potential for further information or data to become available, leading to changes in the conclusions drawn by this report, for which Nimbus Engineering cannot be held responsible.

2. SITE DETAIL

Site Name	Walled Garden
Site Address	Walled Garden c/o Dower House, Hitchin Road, Preston, Hert, SG4 7TZ
Purpose of Development	
Existing Land Use	Greenfield
OS NGR	518220E, 225160N
County	Hertfordshire County Council
Country	England
Local Planning Authority	North Hertfordshire District Council

2.1 Existing Site Description

The existing site is a mostly permeable greenfield with small impermeable areas due to access path and a shed.

2.2 Geology of The Area

According to the British Geological Survey, the superficial deposit is Clay with Flint's Formation, consisting of Clay, Silt, Sand and Gravel, as seen in Figure 2 below. The bedrock in the area is of the Lewis Nodular Chalk Formation and Seaford Chalk Formation, consisting of Chalk, as shown in Figure 3 overleaf.

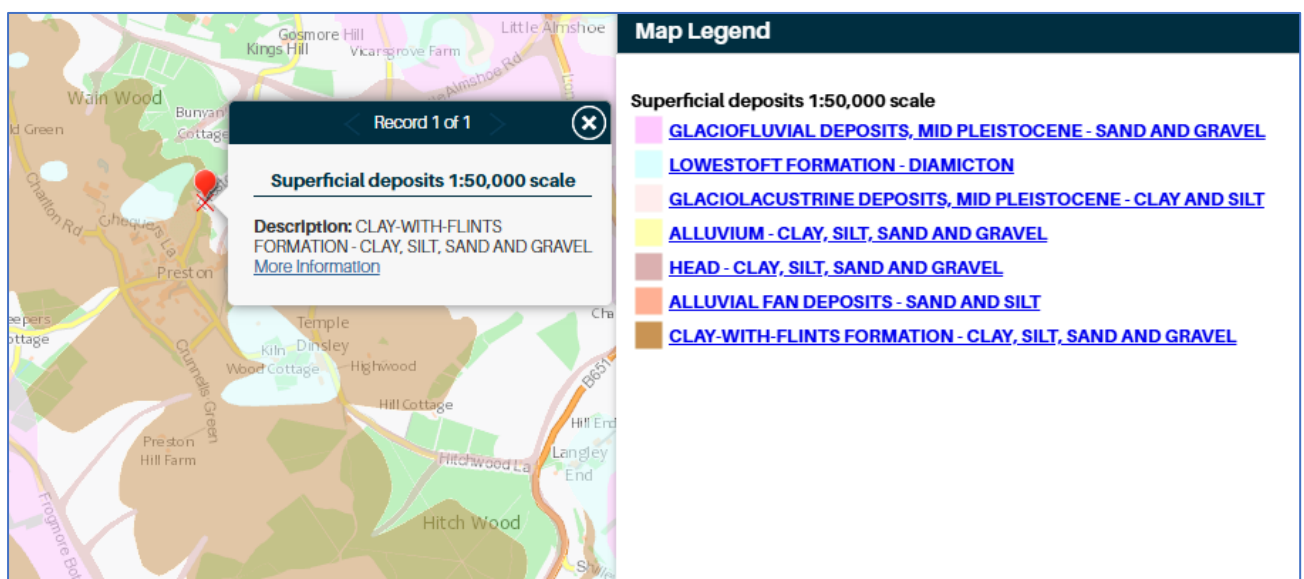


Figure 2- Superficial Deposits at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2024)).

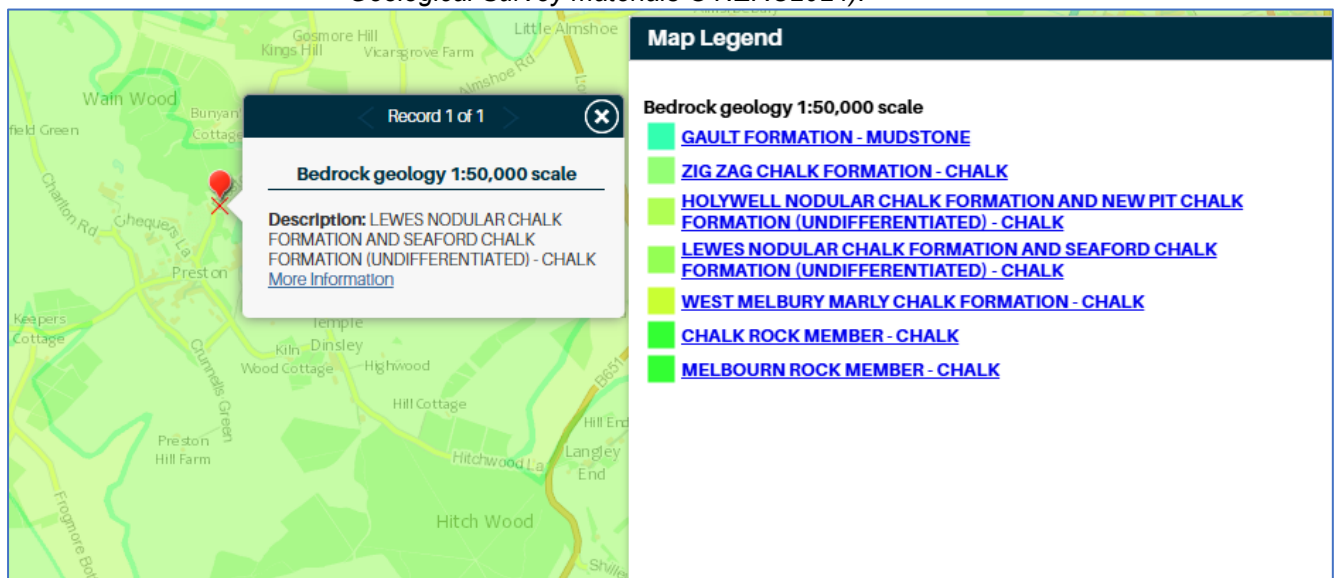


Figure 3- Bedrock at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2024)).

2.3 Proposed Development

The proposals involve the construction of the proposed six bedroom dwelling and associated amenities. The proposed site plans have been provided in Appendix A.

3. PLANNING POLICIES

3.1 National Planning Policy

- NPPF's technical guidance states:

“The effect of development is generally to reduce the permeability of at least part of the site. This markedly changes the Site’s response to rainfall. Without specific measures, the volume of water that runs off the site and the peak run-off flow rate is likely to increase. Inadequate surface water drainage arrangements in new development can threaten the development itself and increase the risk of flooding others.”

3.2 Local Planning Policy

This report has been written in conjunction with the following local planning policy:

- North Hertfordshire District Council Strategic Flood Risk Assessment report
- Hertfordshire County Council A Strategy For The Management Of Local Sources Of Flood Risk

4. FLOOD RISK

The possible causes of flooding set out in NPPF are considered in this section in relation to flood risk to the site itself and the effects of the development of the site on the flood risk elsewhere.

4.1 Flood Zones

The Environment Agency has developed a flood risk map which shows the relative risk of flooding for different return periods. Flood zones assume that no defenses are present and so where these do exist, they are only indicative of the potential for flooding.

The Environment Agency's Flood Map for Planning (Rivers and Sea), shown in Figure 3, indicates the site is in Flood Zone 1, and not at risk of flooding from rivers or the sea.

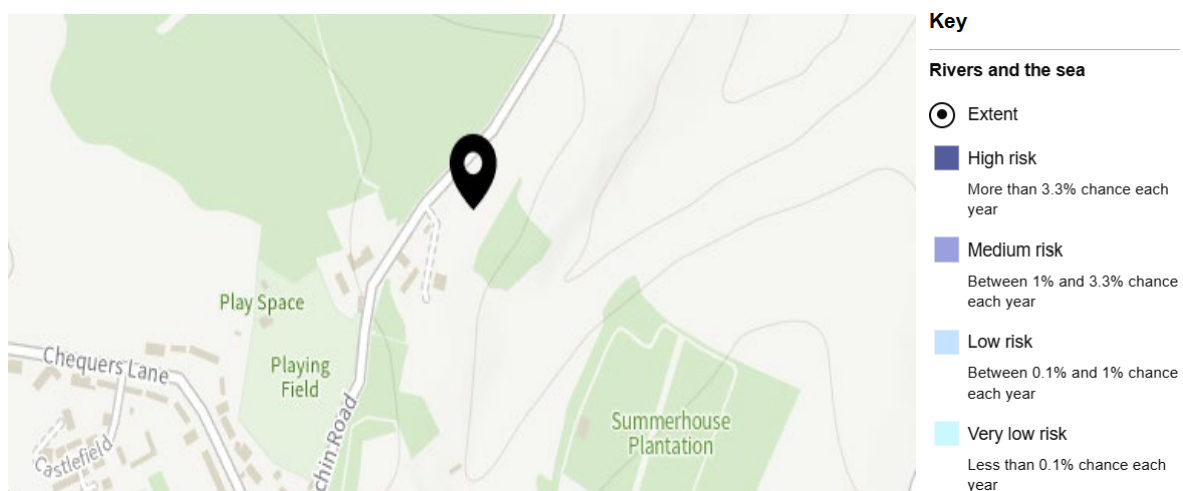


Figure 3 – Environment Agency Flood Map for flooding extent from rivers and sea for the proposed development

4.2 Flooding from Land (Overland Flow)

The proposed development site is at a very low risk of surface water flooding, as can be seen in the Environmental Agency's flood map in Figure 4 below.

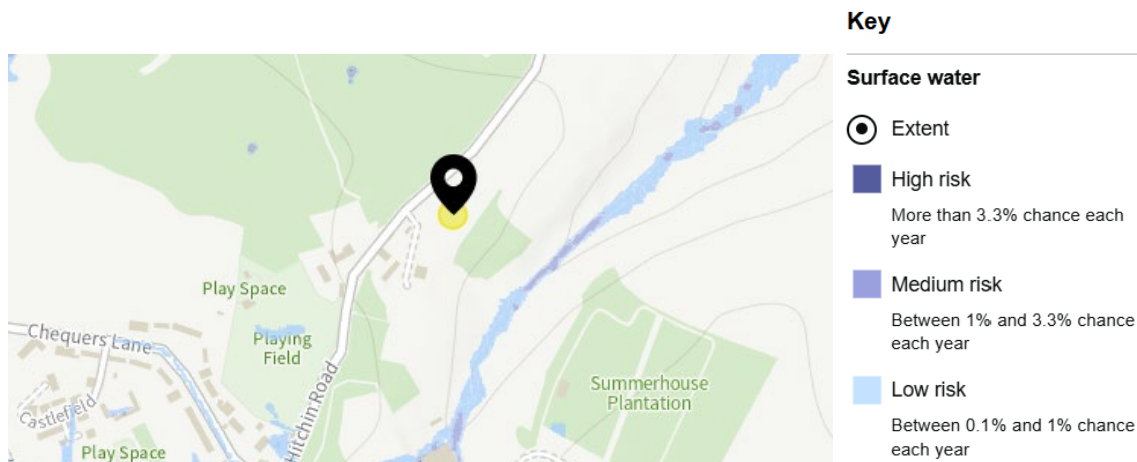


Figure 4 – Environment Agency Surface Water Flood Map for the proposed development.

4.3 Flooding from Groundwater

The Groundwater flooding map shown in Figure 5 below and extracted from the Hertfordshire Council A Strategy For The Management Of Local Sources Of Flood Risk. The maps shows that the site is not susceptibility to groundwater flooding.

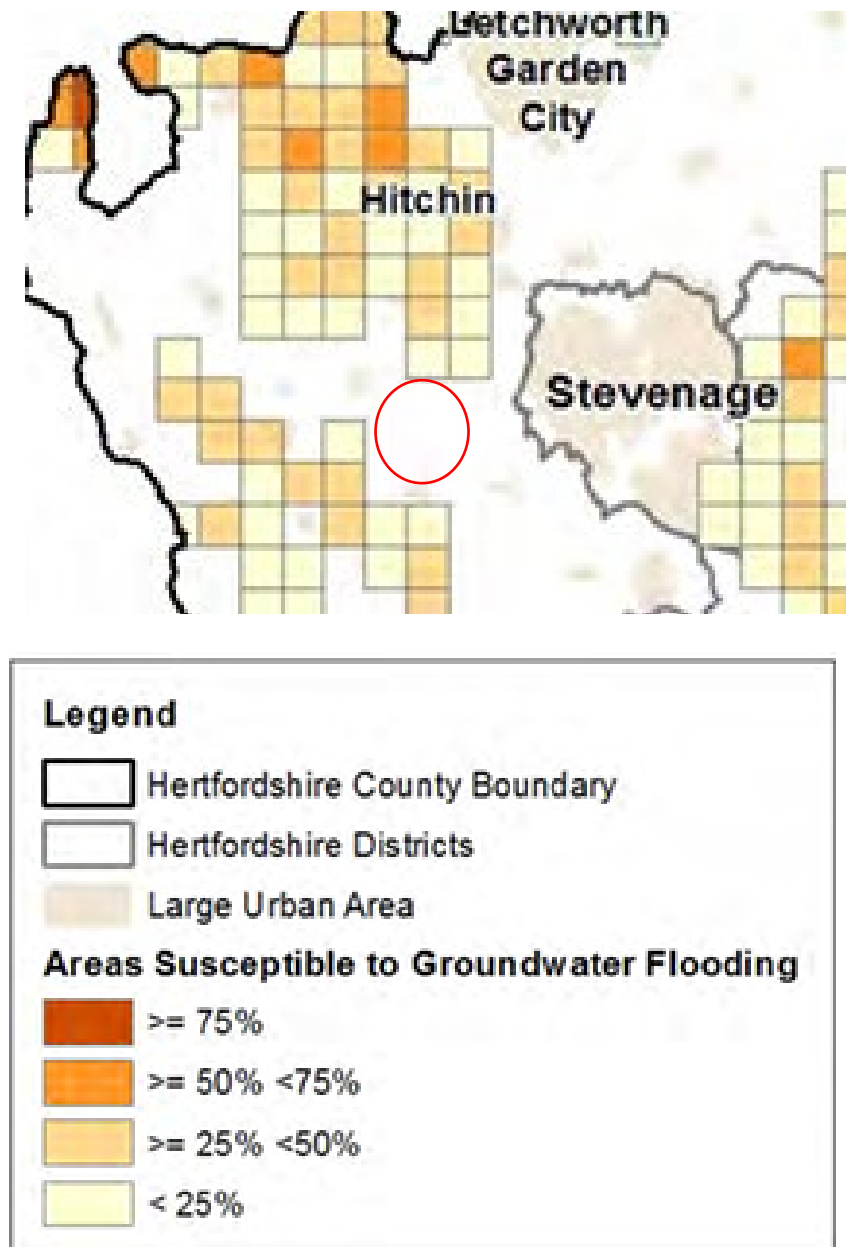


Figure 5 – Susceptibility to Groundwater Flooding Map – Extracted from the Hertfordshire A Strategy
For The Management Of Local Sources Of Flood Risk

4.4 Flooding from Sewers

According to the North Hertfordshire's SFRA's Sewer Flooding Records Table, figure 6 below, no record of historic sewer flooding according in the Preston where the site is located

Historic Sewer Flooding Records

Location	Address	Details	Data Source
Baldock	White Horse Street Norton Street	Significant rainfall. Depth of floodwater "quite impassable to pedestrians" (10 July 1884).	Hydrochronology (Newspaper)
Hitchin	Grove Road	None	NHDC
Hitchin	High Down	"Flood was extraordinary and tore up the ground considerably" (25 July 1904). 2.52in (64mm) of rainfall.	Hydrochronology (Anecdotal)
Hitchin	Bridge Street Park Street Tilehouse Street	"Drains overflowed" following summer thunderstorms (May 1911).	Research (Hitchin Journal)
Hitchin	Cooks Way	"Sewer flooding". Possibly due to blockages.	NHDC
Hitchin	Bridge Street	Flooding of shops from highway drainage, possibly emanating from blocked drains on Hitchin Hill (January 2007). Depth of floodwater approximately 7in (178mm).	Comet Newspaper
Letchworth Garden City	Cowslip Hill	Not known.	DG5 (AW)
Letchworth Garden City	Norton Common (Outdoor Pool)	Flooding from surface water sewers or highway drainage. Possible maintenance issue.	NHDC
Letchworth Garden City	Waysmeet	Not known.	DG5 (AW)

Figure 6 – Sewer Flooding Records Table – Extracted from North Hertfordshire District Council
Strategic Flood Risk Assessment report

4.5 Flooding from Reservoirs

The Environment Agency confirms that there is no risk of reservoir flooding at this proposed development site, as shown in Figure 7.

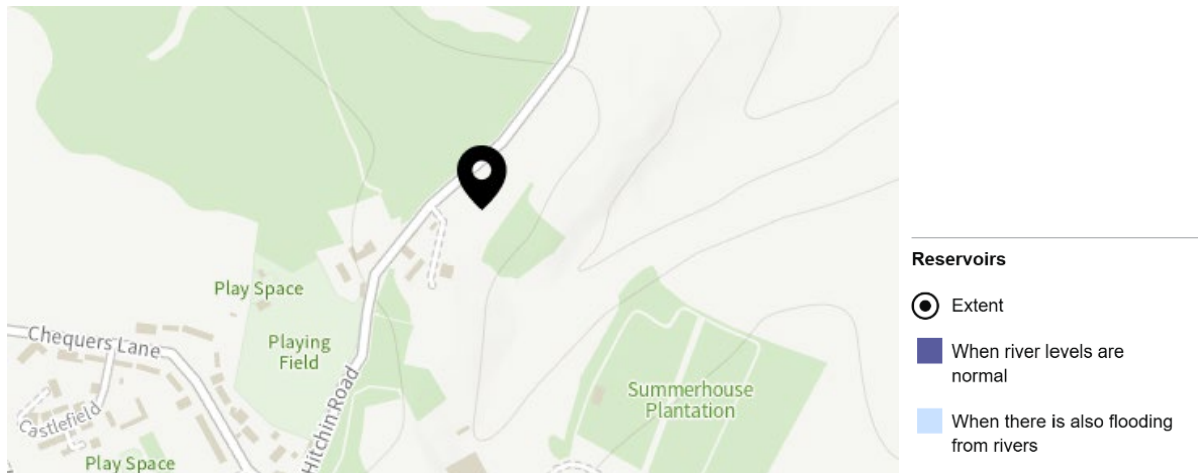


Figure 7 – Environment Agency Flood Map for flooding extent from rivers and sea for the proposed development

5. SUSTAINABLE URBAN DRAINAGE SYSTEMS

Surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development while reducing the flood risk to the site itself and elsewhere while taking climate change into account.

Reducing the rate of surface water discharge from urban sites is one of the most effective ways of reducing and managing flood risk.

Traditional piped surface water systems work by removing the surface water from our developments as quickly as possible; however, this can cause various adverse impacts:

- Increased downstream flooding and sudden rises in flow rates and water levels in local water courses.
- Reduction in groundwater levels dry weather flows in watercourses.
- Reduce amenity and adversely affect biodiversity due to the surface water run-off containing contaminants such as oil, organic matter and toxic materials.

Sustainable Urban Drainage Systems (SuDS) are defined as a sequence of management principles and control structures designed to drain surface water in a more sustainable fashion than conventional piped drainage techniques. SuDS should utilise the environmental, ecological and social benefits.

These include:

- Protection and enhancement of water quality – As well as providing onsite attenuation, SuDS treat the water, resulting in an improved quality of water leaving the site. This is achieved when the water passes through the fine soils and the roots of specially selected plants; pollutants washed off the hard landscaping by rainfall will be safely removed before the water reaches the natural water course.
- A sympathetic approach to the environmental setting by providing opportunities to create habitats for flora and fauna in urban watercourses and open spaces.
- Meeting the amenity and social needs of the local community and residents in the creation of attractive green spaces.

The various types of SuDS include:

Permeable paving	
Soakaways	
Swales and basins;	
Bioretention/ rain gardens;	
Green roofs and rainwater re-use;	

Preferably a combination of these techniques should be used as part of the surface water management train, and it is important for all stakeholders, such as developers, architects, landscape architects and engineers, to work together at the planning stage in order to determine a feasible solution.

6. SuDS PROPOSALS FOR DEVELOPMENT

In accordance with the CIRIA SuDS Manual C753, the SuDS hierarchy has been considered in relation to the site-specific constraints and its surroundings. Table 1 below outlines the hierarchical approach considered for the development at Walled Garden c/o Dower House, Hitchin Road, Preston, Hert, SG4 7TZ.

Sustainable Drainage Proposal	Description	Constraints/Comments	Appropriate
Rainwater Use as a Resource	Use of rainwater runoff for reuse, e.g. Rainwater harvesting tanks, Blue Roofs for irrigation	1 wall-mounted rainwater harvesting tank has been proposed to promote rainwater reuse	Yes
Rainwater Full Infiltration to Ground (Source Control)	Infiltration devices and/or soakaways. Surface water runoff stored on site and gradually percolating into receiving ground	BRE365 Infiltration test was conducted on site by Sub Surface South East Ltd on July 12, 2024. The test results indicate that infiltration is feasible.	No.
Rainwater Partial Infiltration to Ground (Source Control)	Installation of permeable/porous surfacing	Porous Surfacing Block paving is proposed on all hardstanding areas, areas flatter than 1 in 20 gradients throughout the site to allow for partial infiltration in low-intensity storm events.	Yes
Rainwater attenuation in green infrastructure features for gradual release	The onsite storage of all surface water runoff which can then be gradually conveyed to a nearby watercourse, sewer or infiltration into the ground. Forms of green infrastructure features: Green Roofs, Raingardens, Ponds, Swales, Detention basins, Infiltration Trenches and raingarden planters	Green/Sedum roof is proposed on the majority of the dwelling's flat roofs.	Yes

Rainwater discharge direct to a watercourse	All surface water runoff on site discharged at a restricted rate to a nearby watercourse	N/A	No
Controlled rainwater discharge to a surface water sewer or drain	All surface water runoff on site discharged at a restricted rate to a nearby surface water sewer or drain, all rainwater runoff stored in below ground attenuation features. E.g. oversized pipes or geo-cellular tanks	N/A	No
Controlled rainwater discharge to a combined sewer	All surface water runoff on site discharged at a restricted rate to a nearby combined sewer all rainwater runoff stored in below ground attenuation features. E.g. oversized pipes or geo-cellular tanks	N/A	No

Table 1: SuDS Control Measures for Development

7. PROPOSED SUDS SOLUTION

The total site area is 4925m², and the impermeable areas of the existing site are 22m². Following the development at this site, the impermeable areas will have increased to 2850m².

A BRE365 infiltration test has been conducted at the site by Sub Surface South East Ltd on 12th of July. The results of the tests provided showed that infiltration is feasible on site.

To ensure a feasible solution was proposed, a hydraulic model was built, using Infodrainage, to simulate rainfall events for a 1 in 100 year storm event, with a 45% allowance for climate change and 10% urban creep factor.

In order to ensure that the SuDS management plan is fully considered, a wall-mounted rainwater harvesting tank will be provided, and green/Sedum will be planted on the majority of flat roofs in the proposed development.

All hard standing areas will be formed of permeable surfacing in order to deal with as much of the surface water runoff at the source as possible, underlain by a hydrocarbon-removing geotextile membrane at the car parking and road areas.

All the remaining surface water runoff from the above will then be conveyed into a cellular soakaway at the southwest of the site, which has been sized for a 1 in 100 years plus a 45% climate change storm event and 10% urban creep factor.

8. FOUL DRAINAGE DESIGN

A foul percolation test was conducted at the site by Sub Surface South East Ltd. On the 12th of July.

The proposed layout plan for the foul drainage will convey the foul water from within the property and be pumped north to allow the Waste Water Treatment Plant to be easily accessible. The foul drainage will then flow by gravity towards the east and then the south, where it will be discharged in a foul drainage field.

The Wastewater treatment has been sized to be the Klargestar Biodisc Domestic Waste Water treatment BAX or similar, providing a maximum daily BOD capacity of 540g and PE capacity of 9. This is based on a six bedroom dwelling where Flows and Loads 4 states it should have 8 PE and 480g of Daily BOD of Loading.

9. TIMESCALE AND MAINTENANCE OF DRAINAGE WORKS

All drainage works shall be completed prior to the first occupation, and there shall be no adoption of any of the drainage works within the site. The home owners will be responsible for overseeing the long-term maintenance of all communal drains. The following outline maintenance strategy sets out recommended timescales for maintenance of the proposed drainage works, in line with CIRIA SuDS Design Guide:

- Regular inspection will comprise the inspection and cleaning of catchments chamber to reduce the likelihood of contamination, this is recommended to be carried out every 3 to 6 months.
- Jet washing of permeable surfaces should be undertaken every 3 to 6 months in order to ensure that the system works properly.
- The catchpit chamber to the soakaway should be emptied every 3 months, and after every large storm event to ensure that there are no blockages.
- Periodic inspections & removal of debris of rainwater harvesting tanks and rainwater harvesting tanks that represent blockage risks.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations or clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this is the most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in six months
	Inspect slit accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2: Operation and maintenance requirements for pervious pavements.

Maintenance schedule	Required action	Typical Frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdraw devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters. Withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/ or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

Table 3: Operation and maintenance requirement for rainwater harvesting systems

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

Table 4: Operation and maintenance requirements for soakaway cellular tanks

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

Table 5: Operation and maintenance requirement for green roofs.

10. CONCLUSIONS

The proposed development site has been assessed against the flood risk from all sources, and it can be confirmed that this proposed development is not at risk of flooding.

A drainage strategy has been proposed to ensure, as far as practicable, that the surface water is managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development while reducing the flood risk to the site itself and elsewhere while taking climate change into account.

SuDS have been incorporated into this design, in the form of:

1. All new uncovered hardstanding surfaces being formed of permeable paving.
2. The installation of 1 wall mounted rainwater harvesting tank for rainwater reuse
3. Green/Sedum roofs will be provided on majority of the flat roofs of the dwelling.
4. A soakaway sized for 1 in 100 Year storm event +45% climate change allowance and 10% urban creep factor.