Sustainable Drainage System Strategy

Site Address
Dun Elms
Nelsons Lane
Hurst
Wokingham
RG10 0RR

Client

WS Planning & Architecture

Report Reference
SWDS - 2025 - 000034

Prepared By
STM Environmental Consultants Ltd

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1 Document Control

Sustainable Drainage System Strategy

Site Address:	Dun Elms Nelsons Lane Hurst Wokingham RG10 0RR
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2 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
SuDS	Sustainable Drainage Systems
GWSPZ	Groundwater Source Protection Zone

3 Disclaimer

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4 Executive Summary

BACKGROUND			
Location	Dun Elms, Nelsons Lane, Hurst, Wokingham, RG10 0RR Grid reference: 480758, 172693		
Site Area	4610 m^2		
Proposed Development	Change of use of land for the stationing of mobile homes to form 5 no. additional Gypsy and Traveller pitches, the erection of 3 no. day rooms and 1 no. building to form a stable following demolition of the existing stables, and associated changes in site layout and hard and soft landscaping.		
Current Site and Surrounding Uses	The site currently comprises a caravan park with hard standing and scalpings. It is located within a mainly agricultural area to the south of Hurst.		
Topography	The topographic survey indicates that the site slopes slightly from east to west, ranging from 38.86mAOD to 39.4mAOD.		
Hydrology	A number of unnamed, partially culverted channels and drains were identified in the vicinity of the site, all of which appear to be tributaries of the River Loddon, with the closest being located 210m east and 295m west of the site.		
Geology	BGS information indicates that there are no superficial deposits underlying the site, while the bedrock is classified as belonging to the London Clay.		
Source Protection Zone	The site is partially located within SPZ 3.		
Hydrogeology	BGS information indicates that the site is situated upon an Unproductive bedrock aquifer.		
Permeability	BGS information indicates that the bedrock is classified as highly variable.		
Infiltration Potential	BGS information indicates that there are opportunities for bespoke infiltration SuDS. Infiltration testing failed in TP01. In TP03, the infiltration rate was 1.23x10-6 m/s (0.0063 m/hr), which can be classified as a 'Moderate' rate of infiltration. Within the shallow pits TP02 and TP04, the infiltration rate ranged between 2.71x10-6 m/s (0.0097 m/hr) and 1.23x10-6 m/s (0.0044 m/hr), which can also be classified as 'Moderate'.		
Fluvial Flood Risk	Low – the site lies within EA Flood Zone 1.		
Surface Water Flood Risk	Low – Small sections along the front boundary of the site are indicated to be at 'High' risk of flooding during the 2040-2060 climate change scenario, while an area to the rear of the site is indicated to be at 'Low' risk. The rest of the site remains dry, however. Depths of up to 0.3m may be witnessed on site.		
Groundwater Flood Risk	Low - the BGS mapping does not indicate the potential for groundwater to occur on site. However, groundwater is likely to be less than 3mbgl for at least part of the year.		
Existing and Proposed Site Layout	**Ground Cover**	**Existing (m^2)**	**Proposed (m^2) (Without SuDS)**
	Buildings	319	915
	Driveways/Patio	1487	3695
	Gardens/ Soft landscaping	2804	0
	Total Impermeable Area	**1806**	**4610**

Changes in Impermeable	Without SuDS, the proposed development would increase the impermeable area of the site by 2804m^2 and therefore increase the post-development runoff rate and volume.
PROPOSED SUDS	
SuDS Target Requirement	The proposal should aim to achieve the greenfield runoff rate all storm events. Due to size of the development proposal, maintain Qbar discharge rate for all storm events is not possible. The post development discharge rate during the 1% AEP plus CC event is 4.9 l/s during the critical storm scenario.
Drainage Hierarchy	The proposed development will partially discharge to ground and to the existing ditch to the northwest of the site.
Storage Required to meet Planning Requirement	The development is estimated to require 277m^3 of attenuation storage in order to meet the greenfield runoff rate.
SuDS Strategy	The proposal will mimic the natural drainage conditions as much as possible. The proposal will introduce porous tarmac, rain gardens and a series of bioretention areas will provide 405m^3 of attenuation. The proposal will allow for partial infiltration across the site but all alternative permeable areas will be supported with underdrainage channels to convey stormwaters along the SuDS management chain. The use of porous tarmac across the site will form a large permeable aggregate sub-base that covers almost all of the development site. Excess stormwater will be diverted via a perforated pipe within the bioretention strips at the rear western corner of the blueline boundary, from where it will discharge to a small ditch to the northwest of the site.
Foul Drainage	The proposed pitches will be served by a package sewage treatment plant, such as the Tricel Maxus Commercial Treatment Plant, sized for an occupancy of 4–6 persons per pitch (40–60 PE) and an estimated foul flow of approximately 6.0–10.8 m³/day. Treated effluent will discharge partly to ground and, where appropriate, to a seasonally dry watercourse, subject to the securing of a bespoke Environmental Permit and detailed design to ensure no adverse environmental or flood risk impacts.
Conclusion	With the proposed SuDS mitigation measures which have been introduced into the scheme, we believe that the proposed development will reduce local flood risk and therefore be in compliance with the LLFA's current planning policy and the NPPF.

5 Introduction

STM Environmental Consultants Limited have been appointed by WS Planning & Architecture to undertake a Sustainable Drainage System (SuDS) Strategy for a proposed development at Dun Elms, Nelsons Lane, Hurst, Wokingham, RG10 0RR.

5.1 Proposed Development

The SuDS report is required to support a planning application (Reference: 243193) for "Full application for the proposed change of use of land for the stationing of mobile homes to form 5 no. additional Gypsy and Traveller pitches, the erection of 3 no. day rooms and 1 no. building to form a stable following demolition of the existing stables, and associated changes in site layout and hard and soft landscaping."

The planning condition states as follows:

5. Prior to the commencement of development, full details of the drainage system for the site have been submitted to and approved in writing by the LPA. The details shall include:

1. Calculations indicating the existing runoff rate from the site.
2. BRE 365 test results demonstrating whether infiltration is achievable or not.
3. Use of SuDS following the SuDS hierarchy, preferably infiltration.
4. Full calculations demonstrating the performance of soakaways or capacity of attenuation features to cater for 1 in 100-year flood event with a 40% allowance for climate change and runoff controlled at existing rates, or preferably better.
5. If connection to an existing surface water sewer is proposed, we need to understand why other methods of the SuDS hierarchy cannot be implemented and see confirmation from the utilities supplier that their system has got capacity and the connection is acceptable.
5. Details of a scheme to dispose of foul water from the site.
6. Groundwater monitoring confirming seasonal high groundwater levels in the area.
7. A drainage strategy plan indicating the location and sizing of SuDS features, with the base of any SuDS features located at least 1m above the seasonal high water table level.
8. Details demonstrating how any SuDS for this development would be managed throughout the lifespan of the development and who will be responsible for maintenance.

The approved scheme shall be implemented prior to the first occupation of the development and shall be maintained in the approved form for as long as the development remains on the site.

Copies of the development plans are presented in Appendix 1. The development is considered to be a non-minor development.

5.2 Report Aims and Objectives

This report sets out the proposed drainage strategy that will be employed in the designs to meet the requirements of the planning condition and the National Planning Policy Framework.

5.3 Legislative and Policy Context

5.3.1 Legislative Context

Section H3 of the Building Regulations 2010 requires that adequate provision is made for rainwater to be carried from the building roofs and paved areas. and be preferentially discharged to soakaways or some other adequate infiltration system. Where that is not reasonably practicable, a watercourse; or sewer can be used.

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

5.3.2 Policy Context

The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England. The policies set out in this framework apply to the preparation of local and neighbourhood plans and to decisions on planning applications.

The latest version of the NPPF can be view online here. The below text it extracted from the online document from paragraphs 170 – 186.

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

- Applying the sequential test and then, if necessary, the exception test as set out below;
- Safeguarding land from development that is required, or likely to be required, for current or future flood management;
- Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
- Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

A sequential risk-based approach should also be taken to individual applications in areas known to be at risk now or in future from any form of flooding, by following the steps set out below.

Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test.

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

Applications for some minor development and changes of use (62) should also not be subject to the sequential test, nor the exception test set out below, but should still meet the requirements for site-specific flood risk assessments set out in footnote (63).

Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.

The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

- b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the exception test should be satisfied for development to be allocated or permitted.

Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

Paragraph 181 of the National Planning Policy Framework (NPPF) states that:

When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment (See Note 1) Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location
- the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
- it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- any residual risk can be safely managed; and
- safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Paragraph 182 states that:

Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:

- a) take account of advice from the Lead Local Flood Authority;
- b) have appropriate proposed minimum operational standards; and
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.

A major development is defined as:

- a residential development: 10 dwellings or more or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known
- a non-residential development: provision of a building or buildings where the total floor space to be created is 1000 square metres or more or where the floor area is not yet known, a site area of 1 hectare or more.

Coastal Change

In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

- a) be clear as to what development will be appropriate in such areas and in what circumstances; and
- b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.

- Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:
- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
- b) the character of the coast including designations is not compromised;
- c) the development provides wider sustainability benefits; and
- d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast [64].

Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

Footnote 62 - This includes householder development, small non-residential extensions (with a footprint of less than 250m2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

Footnote 63 - A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

(*Footnote 64 - As required by the Marine and Coastal Access Act 2009.*

5.4 Wokingham Borough Council

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

1) Maintain or enhance the high quality of the environment;

2) Minimise the emission of pollutants into the wider environment;

3) Limit any adverse effects on water quality (including ground water);

4) Ensure the provision of adequate drainage;

5) Minimise the consumption and use of resources and provide for recycling;

6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;

7) Avoid areas of best and most versatile agricultural land;

8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;

9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);

10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;

11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and

12) Contribute towards the goal of reaching zero-carbon developments as soon as possible by:

a) Including appropriate on-site renewable energy features; and

b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

6 Site Characteristics

6.1 Location and Area

The site is centred at national grid reference 480758, 172693 and has an area of 4610 m^2.

It falls within the jurisdiction of Wokingham Borough Council in terms of the planning consultation process on flood risk and surface water management. The LLFA is also Wokingham Council.

Figure 1 provides the site location map and aerial imagery.

6.2 Current Site and Surrounding Uses

The site currently comprises a caravan park with hard standing and scalpings. It is located within a mainly agricultural area to the south of Hurst.

6.3 Site Topography

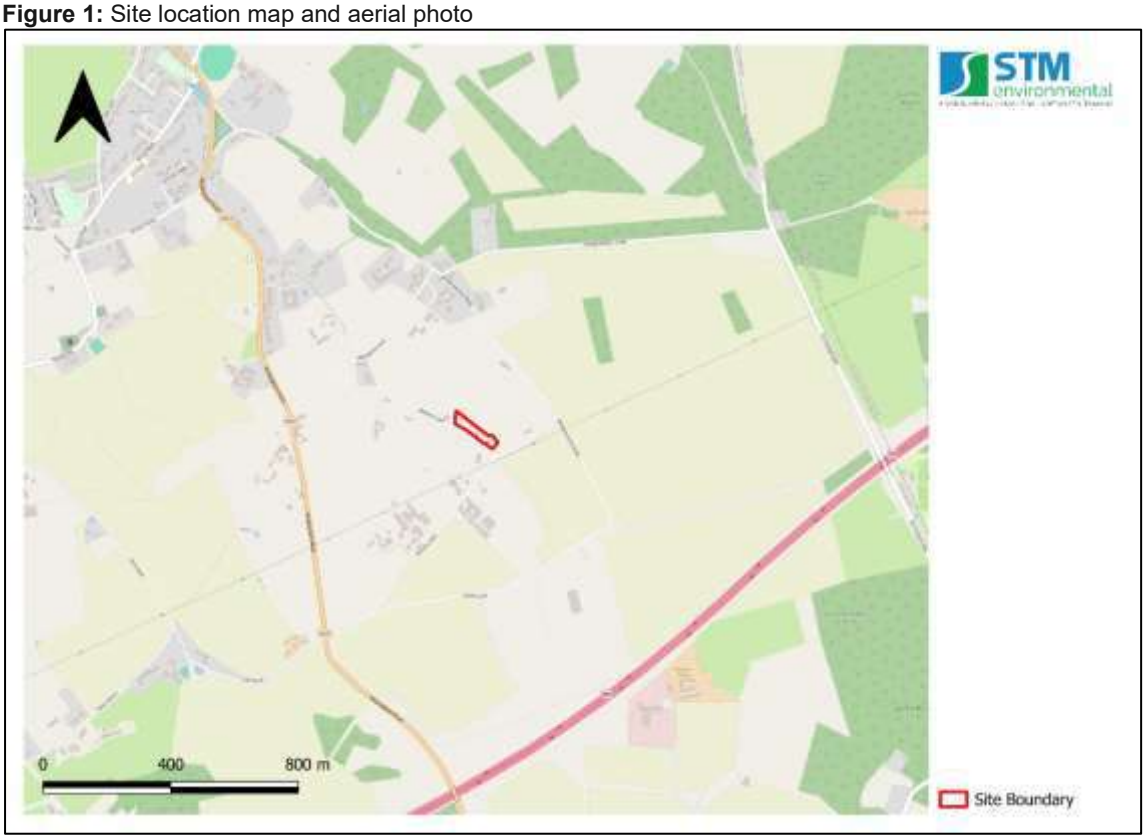
The mapping provided in Appendix 2 shows the 1m LiDAR DTM (2022) ground elevations within the site. A topographical survey is also available in Appendix 2.

The topographic survey indicates that the site slopes slightly from east to west, ranging from 38.86mAOD to 39.4mAOD. The site is indicated to slope up from the rear towards the front boundary of the site, which forms the highest point, and the adjacent roadway (Nelson Lane). The surrounding area slopes from north to south.

Within the wider blue line boundary, the LIDAR mapping indicates that the elevations slope generally towards the northwestern corner. A small ditch is indicated to run adjacent to the rear of the blue line boundary, from where the elevations continue to slope towards the north.

The LIDAR mapping indicates a slightly higher ground level overall, with an average level of approximately 39.12mAOD.

Figure 1: Site location map and aerial photo



6.4 Geological and Hydrogeological Summary

The site is indicated to be situated on a bedrock of London Clay and which is indicated to have potential for bespoke infiltration methods.

The site is surrounded by drainage ditches, these are located along the blueline boundary on all sides apart from the western hedgerow.

The unnamed drainage ditches do not have constant flow.

The drainage ditch that are located to the northern boundary follow the existing natural topography and overland flow routes flows away and off site to the north west.

The drainage ditches within the site and surrounding area flow towards and form Kayersbridge Brook.

6.5 Nearby Surface Water Bodies

A number of unnamed, partially culverted channels and drains were identified in the vicinity of the site, the closest named feature being Kayersbridge Brook. all of which appear to be tributaries of the River Loddon, with the closest “main river” being located 210m east and 295m west of the site.

There are on field drainage ditches located within along the eastern and western boundaries of the blue line boundary.

6.6 On Site Trees – Root Protection Areas

The trees within the site have been surveyed and are all outlined the proposed development plan available in Appendix 1.

6.7 Site Investigation Summary

The ground investigation works were carried out between 01/09/2025 and 03/09/2025.

2no. boreholes were drilled to a maximum depth of 6mbgl to determine the underlying geological conditions and groundwater table depth. Groundwater monitoring wells were installed.

4no. trial pits were hand excavated to a maximum depth of 1.5mbgl for the purpose of undertaking infiltration testing in general accordance with the BRE 365 DG methodology.

2no. trial pits were hand excavated to a maximum depth of 0.7mbgl for the purpose of undertaking field drainage testing in general accordance with the BS 5977.

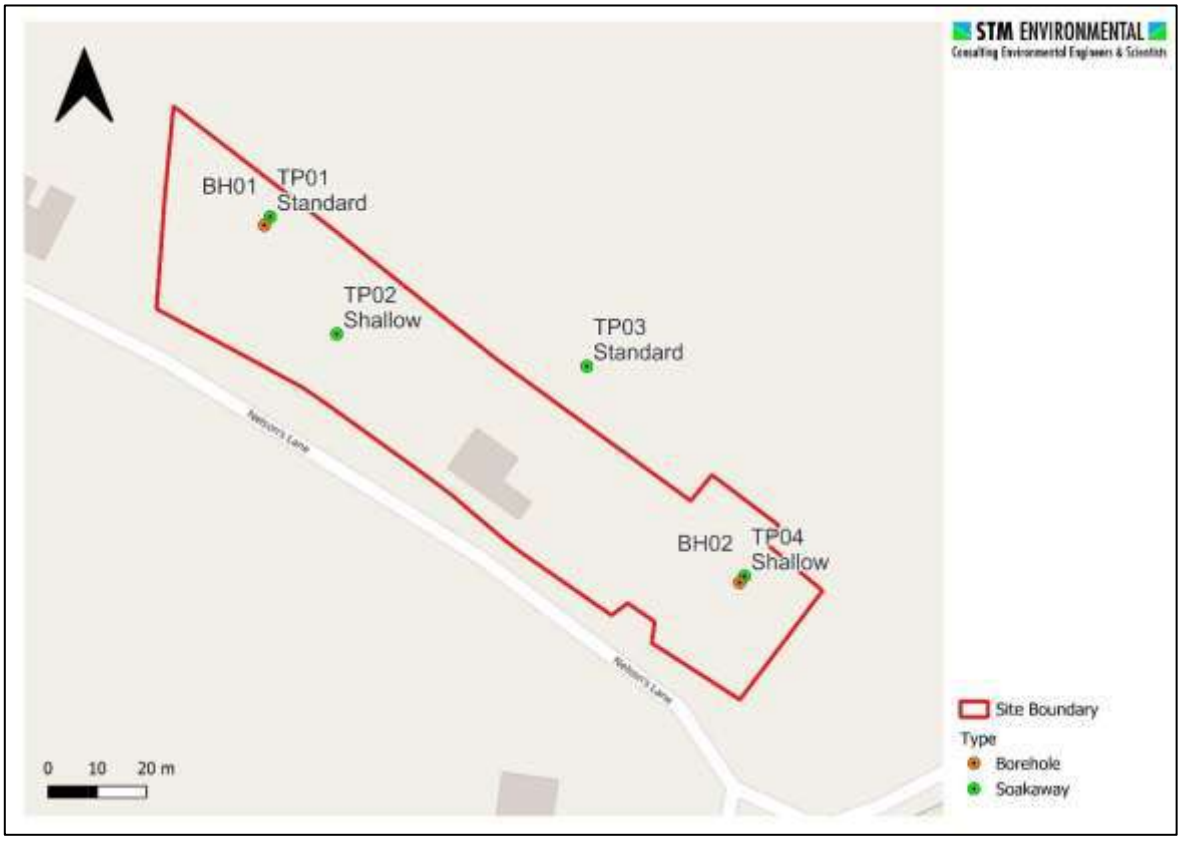


Figure 2: Ground Investigation Map

1no. groundwater monitoring visit was undertaken during the winter months (Oct – Mar) on the 13th of October 2025.

Pictures, results tables and graphs of the site investigation and walk over are available in Appendix 2.2.

6.7.1 Geological Findings

The geology encountered within the trial pits consisted of Made Ground (dark brown, dark grey sandy SILT) to a maximum depth of 0.5m (within TP04). This was underlain by dark brown, orange sandy SILT. In TP03, light brown, orange, slightly sandy Clay was encountered to a depth of 1.5mbgl.

6.7.2 Infiltration Testing

Infiltration testing in general accordance with the methodology outlined in BRE Digest 365 was conducted in TP01 – TP04.

The trial pits were rapidly filled with water from a 1.2m^2 water bowser and left to drain. The water level was continuously monitored using a water level logger and manual measurements.

Table 1: Infiltration testing results

TP	Dimension L & W / ø (m)	Depth (m)	Infiltration Rate (m/hr)	Infiltration Rate (m/s)	Classification
TP01	1.6 x 0.5	1.5	-	-	Failed
TP02 (Shallow)	0.5 x 0.5	0.5	0.004	1.23E-06	Moderate
TP03	1.6 x 0.5	1.5	0.006	1.75E-06	Moderate
TP04 (Shallow)	0.5 x 0.5	0.5	0.009	2.71E-06	Moderate

Infiltration testing failed in TP01. In TP03, the infiltration rate was 1.23x10^{-6} m/s (0.0063 m/hr), which can be classified as a 'Moderate' rate of infiltration.

Within the shallow pits TP02 and TP04, the infiltration rate ranged between 2.71x10^{-6} m/s (0.0097 m/hr) and 1.23x10^{-6} m/s (0.0044 m/hr), which can also be classified as 'Moderate'.

6.7.3 Field Drainage

2no. trial pits were excavated to a depth of 0.6m for the purpose of field drainage testing near to BH01.

At the base of the trial pit, 2no. 300mm x 300mm trial holes were filled with water and allowed to drain.

The field drainage testing failed, as the water level within the pits failed to drain below 50% within 6-hours; as such the result Vp values was greater than 100.

6.7.4 Groundwater

Groundwater encountered at 4.5mbgl in BH01 and 3.1mbgl in BH02 during the investigation.

Groundwater levels were monitored on the 13th of October monitored at 4.8mbgl (BH01) and 3.5mbgl (BH02).

7 Flood Risk

7.1 Summary

The overall flood risk to the site is considered to be low. The site within the redline boundary is generally at 'Low' risk of surface water flooding and very low risk of fluvial flooding.

The south west boundary, which forms a hedge row along the Nelsons Lane, indicated to be at 'High' risk of witness surface water ponding during the present day and climate change precipitation events.

The redline boundary to the south west is partially within Flood Zone 2. The flood zone 2 extent only partially impacts the site, no climate change flood extents are available.

7.1.1 Pluvial – Precipitation Events

The redline boundary to the south west is partially within Flood Zone 2. The flood zone 2 extent only partially impacts the site, no climate change flood extents impact the site.

7.1.2 Pluvial – Precipitation Events

Redline Boundary

The surface water flood extent overlaps slightly with the front boundary of the site, which is therefore indicated to be at 'High' risk of flooding. This appears to be due to

a depressed strip of land parallel to the boundary (forming an unmapped drainage ditch), which lies between the site and the adjacent roadway (Nelsons Lane). Flood depths of up to 0.3m may be witnessed in this area; however, it is considered unlikely that this will significantly impact the site itself.

The access into the site forms a culverted section of this drainage ditch.

Figure 3: Access and drainage ditch along Nelson Lane

A small extent at the rear of the site, which includes part of the proposed stables, is indicated to be at ‘Low’ risk of flooding to a depth of less than 0.2m. The rest of the site remains dry.

Blueline Boundary

Surface water flooding within the blue line boundary during the extreme events covers a large proportion of the greenfield.

Figure 4: Surface Water Flooding Risk Overview

The existing stormwater flow route within the blueline boundary follows the natural land drainage over land flow routes; the gradual sloping nature of the site towards to the north/ north west of the site.

7.1.3 Groundwater

The site is not indicated to be susceptible to groundwater flooding. However, the groundwater table is indicated to be less than 3mbgl. Groundwater was encounter during the SI at 3.1mbgl (1st of September 2025). The flood risk maps area available in Appendix 3.

7.2 Existing Surface Water Drainage Features

A utility search was undertaken which identified Thames Water as the local sewage undertaker. The drainage plans, which are presented in Appendix 5, do not contain any information on surface or foul water drainage in the vicinity of the site.

8 Hydrological Run-off Assessment

To minimise the impact of the new development on local flood risk, the NPPF requires that the water drainage arrangements for any development site are that the volumes and peak flow rates leaving the site post-development are improved upon those of the existing conditions. The following run-off assessment predicts the Greenfield, pre- and post-development run-off rates and provides the required SuDS necessary for complying with the relevant planning policies.

8.1 Existing and Proposed Ground Cover

Table 2: Breakdown of Ground Cover in the Proposed Development

Ground Cover	Existing Development Area		Proposed Development Area		Difference (m^2)
	m^2	%	m^2	%	
Buildings	319	6.9	915	19.8	596
Hard Standing	1487	32.3	3695	80.2	2208
Soft landscaping	2804	60.8	0	0.0	-2804
Total	4610	100	4610	100	

Table 3: Summary of Permeable and Impermeable Areas

	Impermeable Area		Permeable Area		Total Area
	m^2	%	m2	%	m^2
Existing Site	1806	39.2	2804	60.8	4610
Proposed Site	4610	100.0	0	0.0	4610
Difference	2804	60.8	-2804	-60.8	

The proposed development increases the impermeable area of the site by 61% to 4610m^2. As such this will have a negative impact on the runoff rate without the introduction of SuDS.

When considering the introduction of hard standing, the proposal has significant opportunity to reduce the total increase in impermeable area through the application of alternative surfaces.

8.2 Peak Flow Control

With regard to peak flow control, the non-statutory technical standards for sustainable drainage systems state that:

- S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as

reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

8.3 Volume Control Requirements

With regard to volume control, the non-statutory technical standards for sustainable drainage systems state that:

- S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.
- S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

8.4 Run-off and Storage Calculations

The FEH method was applied to calculate the Greenfield, pre- and post-development run-off rates and target storage volumes including allowances for climate change. The full calculations and results are presented in Appendix 4. The table below gives a summary of the results:

- **Maximum discharge flow rate:** 2.5 (l/s)
- **Outflow orifice diameter:** 44 (mm)
- **Storage base length:** 48 (m)
- **Storage base width:** 24 (m)
- **Storage base area:** 1160 (m^2)
- **Storage total volume:** 474 (m^3)
- **Storage total water volume:** 427 (m^3)

Table 4: Greenfield and Pre / Post Development Discharge Rates

	FEH Greenfield (l/s)	FEH Pre - Development (l/s)	Modelled Post Development (l/s)
Qbar	2.20	2.90	-
1 in 1 or 1 in 2	2.20	2.50	2.00
1 in 30	5.90	6.80	3.30
1 in 100	**7.80**	**9.10**	**4.70**
1 in 100 + CC			**5.20**

The storage volume required to meet the greenfield runoff rate was calculated to be approximately 284m^3.

9 SuDS

9.1 SuDS Hierarchy

The SuDS Hierarchy sets out the preferred method of selecting which Sustainable Drainage System should be used.

- rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation);
- rainwater infiltration to ground at or close to source;
- rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens);
- rainwater discharge direct to a watercourse (unless not appropriate);
- controlled rainwater discharge to a surface water sewer or drain;
- controlled rainwater discharge to a combined sewer;

The table outlined on the page below summarises the available SuDS, there potential suitability and the benefits.

9.2 Drainage Hierarchy Discussion

9.2.1 Rainwater Harvesting

The development has good potential to provide rainwater harvesting; As such this is recommended in the form of rainwater butts and tanks.

9.2.2 Alternative Roofing – Green, brown and Blue

Based on the proposed roof design, which include Pitched roofs, the use of alternative roofing is not deemed to be suitable.

9.2.3 Infiltration To Ground

Infiltration failed in TP01, but was successful in TP02-TP04. However, a relatively slow rate of infiltration was observed in the trial pits.

Typically, to achieve an acceptable infiltration rate that ensures half drainage times of less than 24 hours, the rates need to be 0.01m/hr or greater.

The peak groundwater levels encountered on site were in BH02 on the 1st of September 2025 at 2.85mbgl.

A subsequent groundwater monitoring visit was undertaken within the winter monitoring period between October and March; groundwater levels were monitored on the 13th of October monitored at 4.8mbgl (BH01) and 3.5mbgl (BH02).

Given the site and surrounding area, within a greenfield landscape; dominated by agricultural land uses in the form of grazing, livestock fields and arable land uses, the site should provide a focus on the use of blue green SuDS features to mimic the natural landscape as much as possible. Utilising blue green SuDS within the site and will help contribute to national standards, promoting biodiversity, water quality and achieve a more sustainable design. Given the variable and relative low infiltration rates, any proposed system should

The site is located in SPZ 3. As such, pollution controls will be considered.

9.2.4 Permeable Surfaces and Filter Drains

Approximately 51% of the development will consist of outdoor space, and patios which could be designed to be permeable. Infiltration is partially suitable.

9.3 Appraisal of Potential SuDS Options

9.3.1 SuDS Options

Table 5: SuDS Appraisal; Feasibility of various SuDS and the potential uses on site.

Key	H	M	L	Y	?	N	N/A
Details	High Impact	Medium	Low Impact	Yes	Maybe	No	Not Applicable

Main Category	SuDS Features	Total Suspended Solids Removal	Heavy Metals Removal	Nutrient Removal	Bacteria Removal	Dissolved Pollutants	Runoff Volume Reduction	Flow Rate Control / Events			Site Potential	Included	Discussion / Details	Potential Storage Provided
								1-2 Years	10 - 30 Years	100 Years				
Source Control Measure	Green / Brown Roof	NA	NA	NA	NA	H	H	H	H	L	N	N	Poorly compatible with proposed;	0
	Rain Water harvesting	M	L	L	L	NA	M	M	H	L	Y	Y	Rainwater Butts	-
Infiltration Methods	Infiltration trench	H	H	H	M	H	H	H	H	L	Y	N	Conveyance route to rear;	0
	Permeable Pavement	H	H	H	H	H	H	H	H	H	Y	Y	Good potential	210
	Infiltration basin	H	H	H	M	H	H	H	H	H	Y	N	Limited Space	0
	Soakaway	H	H	H	M	H	H	H	H	L	Y	N	Slow Infiltration Rates	0
Filtration	Filtration Surface sand	H	H	H	M	H	L	H	H	L	Y	N	Limited Space	0
	Sub-surface sand filter	H	H	H	M	H	L	H	H	L	Y	N	Limited Space	0
	Perimeter sand filter	H	H	H	M	H	L	H	H	L	Y	N	Limited Space	0
	Bioretention/filter strips	H	H	H	M	H	L	H	H	L	Y	Y	Good Potential along Rear Boundary	196
	Filter trench	H	H	H	M	H	L	H	H	L	Y	N	Limited Space	0
Channels Features (Open)	Open channels Conveyance	H	M	M	M	H	M	H	H	H	Y	N	Limited Space	0
	Enhanced dry swale	H	H	H	M	H	M	H	H	H	Y	N	Limited Space	0
	Enhanced wet swale	H	H	M	H	H	L	H	H	H	Y	N	Limited Space	0
Wet SuDS	Wetland Shallow wetland	H	M	H	M	H	L	H	M	L	N	N	Poorly compatible with Proposed	0
	Extended detention wetland	H	M	H	M	H	L	H	M	L	N	N	Limited Space/Poorly compatible with Proposed	0
	Pond / wetland	H	M	H	M	H	L	H	M	L	N	N	Limited Space/Poorly compatible with Proposed	0
	Pocket wetland	H	M	H	M	H	L	H	M	L	N	N	Limited Space/Poorly compatible with Proposed	0
	Submerged gravel wetland	H	M	H	M	H	L	H	M	L	N	N	Limited Space/Poorly compatible with Proposed	0
	Wetland channel	H	M	H	M	H	L	H	M	L	N	N	Limited Space/Poorly compatible with Proposed	0
Retention	Retention pond	H	M	M	M	H	L	H	H	H	N	N	Limited Space/Poorly Comptable with Proposed	0
Detention	Detention basin	M	M	L	L	L	L	H	H	H	N	N	Limited Space/Poorly Comptable with Proposed	0
Tank Storage	Sub-surface storage (Tank)	L	L	L	L	L	L	H	H	H	Y	N	Good potential, least susitainable.	0
														406

9.4 SuDS Strategy

9.4.1 SuDS Options

The site is situated within a rural landscape, with the site being surrounded by small country lanes, farms, and greenfields. As such, the proposal will aim to introduce a blue green SuDS design to mimic the natural drainage conditions of the site as much as possible.

The proposal will introduce alternative permeable surfaces across suitable areas of the site, which will work in combination with flow through structures in the form of rain gardens, filtration trenches and bio-retension

The paddock within the blue line boundary will be landscape to provide shallow stormwater detention basis. The and system will provide 405m^3 of attenuation and will mimic the natural drainage conditions of the site

The bespoke system will utilise infiltration SuDS where possible; however given the relative low rates of infiltration this cannot be relied upon to ensure suitable half drain times.

Excess stormwater will discharge into the drainage ditches that surround the site; The maximum discharge witnessed post development is 5.2 l/s during all storm events.

Table 6: Proposed SuDS

Location	Proposed Area (m^2)	SuDS Option	Estimated Storage Provided (m^3)
Ground Cover across compound	2030	300mm Sub-base	183
Conveyance routes / Compound to Bio-Retention	94	400mm Permeable Sub-base / Perforated pipe.	10
Rain Garden / Bio Retention Areas	1089	400mm Sub-base	224
Total			**416**

The drainage layout, model sections and model results are available in Appendix 7

The descriptions of the proposed SuDS and how they interact with the different features is outlined below.

9.4.2 Rainwater Butt

All buildings will have rainwater harvesting butts (200 litre) will be fitted to the downpipes to allow for rainwater re-use around the site.

Once at capacity the excess will discharge into the rain gardens or permeable paving.

9.4.3 Porous Tarmac – Ultra porous

Porous Tarmac is an alternative hardstanding surface which is fully and permeable and is SuDS complainant. It is designed to allow rainfall to percolate immediately through the surface near to where the raindrop lands – so surface ponding is completely eradicated without the need for an additional channel drainage system.

The construction will consist of 50mm thick 10mm porous asphalt, with a 80mm underlying bedding layer of Open Grade Course 20mm course; UTILIFLOW porous a 300mm sub-base consisting of a graded aggregate (MOT Type 3 fines removed) with a porosity of 0.30. This 450mm construction depth will provide CBR value of <5% which will be designed for cars and light vans. This construction over 2030m^2 will provide approximately 182m^3 of interception, attenuation, and treatment storage and will allow for partial infiltration.

The area will be supported with drainage channels (under drains) and infiltration trenches which will ensure suitable conveyance routes are provided around the site.

9.4.4 Rain Garden and Bio-retention SuDS Features

Due to the relatively small change in surface elevations across the site, and the variable infiltration rates on the site, a bespoke partial infiltration SuDS system it to be introduced which will contribute towards the SuDS approach in assuring amenity, bio-diversity and water quality are achieved across the site.

Rain gardens and bio-retention features are largely the same, however bio-retention features are typically more engineered, larger and provide additional benefits.

Rain Gardens

Small rain gardens will be introduced around the compound. They will be strategically located to accept stormwater runoff directly from proposed rooftops (or rainwater butts). The rain gardens will form relatively small areas within close proximity so rooftop runoff can discharge directly onto the surface.

A rain garden is a shallow area of ground which receives run-off from roofs and other hard surfaces. A rain garden is planted with plants that can stand waterlogging for up to 48 hours at a time, but would typically drain completely within 12 - 24 hours.

A range of different plants can be included within the garden, as more drought-tolerant plants will be suitable towards the edges. During a storm water fills the depression and then drains.

A sequence of perforated pipes will be lain within the gravel sub-base that will convey surface waters into the rain garden. To ensure half drainage times are always meet, an overflow drainage channel will be formed to connect the surface water into the hedgerow to the west and into the surrounding field.

Bio-Retention Areas

The fence line surrounding the travellers site will support an engineered bio-retention system that will provide water quality, form a large attenuation structure that acts as a conveyance and a filtration medium.

The bioretention structure, will house a 225mm diameter perforated underdrainage pipe; that will run along the entire boundary. It will be covered in a filtration sock, and packaged within a pea gravel surround that will 500mm x 500mm.

The bio-retention structures will be formed from a large gravel sub-base, formed from a permeable gravel aggerate, that will have a depth of 400mm across its length; in total the bioretention area will cover 560m but will be divided at intervals up too allow for field access; The underdrainage will ensure conveyance and connection are

maintained, inspection chambers will be situated at regular intervals to ensure access is provided for maintenance and monitoring.

A filtration fleece will be lain above the permeable sub-base to prevent fines migrating into the aggregate and underdrainage channel.

The filtration medium of the structure will be variable in depth, depending on its upstream or downstream position, will be 0.5 – 0.8m in depth. It will consist of mix of sand, loam, and organic matter that filters and treats runoff, the surface will be covered in mulch layer, which protects the soil and aids pollutant treatment.

The surface layer will be formed from suitable vegetation and planting (trees, shrubs etc) and decorative stone. It will also form a shallow depression which will provide further attenuation during the most extreme storm events.

If any flooding or blockages were caused within the system, the overflow would be directed into the paddock area and would follow the natural overland flow routes.

9.4.5 Detention Basin

The surrounding field, with existing shallow falls towards the northwest corner, forms a natural detention basin before discharge into the existing drainage ditch.

No additional works are required to form the detention basin and no modification will be required as the SuDS measures implement upstream ensure there is an overall reduction in the surface water runoff rate.

9.4.6 Surface Water Discharge Points

The proposal will discharge the excess storm water into the surrounding field via filtration and a protected flow control. The proposal aims to discharge the excess flows overland to provide further reduction in the sites runoff rate by increase the travel distance for stormwater reaching the drainage ditch.

9.5 Water Quality Assessment

The Simple Index Approach to water quality tool was used to ensure suitable water quality treatment has been provided within the proposed SuDS measures.

9.5.1 Treatment of Run-off

Treatment of roof water runoff will be provided through the provision of the permeable paving, rainwater tank filtration unit to intercept gross solids and sediment, guidance will be provided to the developer on appropriate maintenance.

9.5.2 Exceedance Flows

The elevation review of the LIDAR 1m DTM Mapping indicates that in the event of exceedance on the site upon completion, overland flows will flow towards the rear of the site, ensuring that safe access and egress can be maintained during such an event.

9.6 Maintenance and Adoption of SuDS

All SuDS features will be properly installed by competent persons. They will be maintained regularly to ensure that their design capacity and attenuation characteristics provide the required storage volume.

Landscaping and adjacent areas will be designed such that they do not cause soil, mulch and other materials to be washed onto the permeable surfaces and into drains causing clogging.

Owners of the properties/persons responsible for maintenance of SuDS components will be provided with operation and maintenance manuals which will include information such as:

- the location of SuDS components;
- an explanation of design intent and objective of the SuDS;
- the requirements for regular and occasional inspection and maintenance;
- visual indicators that may trigger maintenance.

Regular maintenance of SuDS components is relatively straightforward with the main tasks consisting of:

- Regular visual inspections – checking inlets are not blocked and verifying that clogging has not occurred;
- Litter and debris removal;
- Grass cutting;
- Preventive sweeping;
- Weeding and invasive plant control;
- Oil and stain removal.

Occasional maintenance activities to ensure the long-term performance of the SuDS features include:

- Sediment removal
- Vegetation and plant replacement

These simple measures will ensure that the storage capacity of the system is maintained and that the need for reconstruction and replacement of components is minimised.

Further details on SuDS maintenance measures that will be employed at the site can be found in Appendix 8.

10 Foul Drainage

The site is situated in a location that is not serviced by the public sewage network.

Therefore, the proposal will be required to install a suitable system to discharge the sewage and effluent into a surface water body, into the ground or into a cesspit.

Given the size and scale of the site, the introduction of a cesspit is not recommended.

The general binding rules must be adhered to if you're the operator of a septic tank or small sewage treatment plant.

When the general binding rules cannot be met, then a bespoke Permit Application is required with the Environment agency.

10.1 Daily Discharge Calculator

The proposed development site will form a total of 10no. gipsy and travellers pitches and 4no. day rooms.

For the purpose of this assessment the total daily volumes of discharge have assumed constant occupation of all plots to ensure the correct tank sizing is applied.

The application of the general binding rules are not strictly applicable given that is does not constitute "a small domestic discharge". The anticipated discharge volumes will exceed the general binding rule requirements (ie. greater than $5m^3$ per day).

Daily discharge calculator for domestic properties V2.0 July 2019

Use this calculator to work out how much effluent your septic tank or small sewage treatment plant will discharge a day when it's being used to treat the sewage from one or more houses or flats.

Number of properties	14	Enter the number of properties which are connected to the plant
Number of bedrooms	4	Enter the total number of bedrooms for all of the properties and press return
P value (raw)	32	
P value (adjusted)	26	
Cubic metres a day	3.9	**This is how much treated sewage your plant will discharge a day**

For example, if you have 2 houses sharing a septic tank, one with 3 bedrooms and the other with 4, enter 2 for the number of properties, 7 for the number of bedrooms, and this will give you a result of 1.65 cubic metres a day.

10.2 Mains Drainage Connection Feasibility

The site is not directly serviced by the foul sewer network, when reviewing the general guidance for new connection into the public network, the typical allowance of 30m per unit is applied.

There are no identifiable foul assets within 500m of the site. As such the proposal will require an alternative solution.

10.3 Discharge to a Ground

Onsite percolation testing was undertaken in September 2025.

The full details are outline within which is available in Appendix 2.2.

Additional testing is recommended across the blue line boundary to establish if on-site discharge to ground is possible; however this is part of the EA fluvial flood zone.

The percolation tests were completed within 1no. trial pits, which were excavated to 0.6mbgl on site, within the red line boundary

The water level within the trial pit failed to completely drain by 50% in 6 hours; As such the result Vp factor was greater than 100, as such the discharge of effluent to ground is unsuitable in this location.

10.4 Discharge to a Watercourse

There are drainage ditches located along the boundary of the site apart from the western boundary, which forms a hedgerow.

The drainage ditches on and around the site do not have constant flow, as such the site cannot adhered to the general binding rules for new foul water effluent discharges.

Pictures of the stream, located to the bottom of the driveway, are available in Appendix 2.

10.5 Design Load and Requirements

The total design population, with an assumed max capacity 6no people per unit (10no. units) has a total potential occupancy of 60 people.

When designing for the uses of pumping stations or package treatment plants, they must be designed for the fully site to be operating at full capacity.

10.5.1 Volume

An initial design volume used for the assessment = **6.0 – 9.0 m³/day**

Lower End:

QDWF= 60 (PE) × 150 (litres) = 9000 L/day

9000 L/day = 9.0 m³/day

Upper End:

QDWF= 60 (PE) × 180 (litres) = 10,800 L/day

10,800 L/day = 10.8 m³/day

10.5.2 Flow Rate

Lower End:

Average Dry Weather Flow (ADWF): 9.0 m³/day = 0.10 L/s

Upper End:

Average Dry Weather Flow (ADWF): 10.8 m³/day = 0.13 L/s

Table 7: Loads and Flows Summary

Item	Lower	Upper	Notes
Units	10 no.	10 no.	Units
Occupancy per Holiday Home	6 persons	6 persons	People
Design PE	**60 PE**	**60 PE**	10 × 4 / 6
Design flow per head	150 L/hd/day	180 L/hd/day	Britsh Water Flows & Loads
Average daily Volume	**9000 L/day (9 m³/day)**	**10800 L/day (10.8 m³/day)**	257 × 150 / 200
Average flow (L/s)	**0.1 L/s**	**0.13 L/s**	Volume / Seconds per day
Indicative peak flow	**0.3 – 0.6 L/s**	**0.39 – 0.78 L/s**	3–6 × ADWF
BOD load per head	60 g/hd/day	94 g/hd/day	British Water Flows & Loads
Total BOD load	**3.6 kg/day**	**3.6 kg/day**	60 x 60 (BOD in grams) / 1000
NH_4-N load per head	10g/hd/day	10g/hd/day	British Water Flows & Loads
Total NH_4-N load	**0.6 kg/day**	**0.6 kg/day**	60 × 10 (NH4 Grams) / 1000 (Grams to Kilos)

10.6 Proposed Foul Drainage Summary

Based on a design population of 60 people, the development will generate between

To ensure robust year-round performance, the treatment plant should be sized at the upper end, equivalent to a 50 to 100 people. A commercial package treatment works with a hydraulic capacity in the range of 7.5 - 15 m³/day and capable of treating approximately 5 kg BOD/day and 1.0 kg/day of ammonia-nitrogen.

The Tricel Maxus Commercial Treatment Plant will be introduced, it is explicitly designed for variable-load sites such as holiday parks and can is specifically designed to meet the intended PE, variable flow range and anticipated loads for BOD and Ammonia.

It's explicitly designed for > 50 PE, so 250 – 300 PE is well within its intended range.

It's suited to travellers site, due to variable-load sites; Which is considered imported due to the sort of occupancy swing you will witnessed within a travellers site.

The proposal will introduced a large package treatment plant system centrally within the site.

Its "buffer + SAF + clarifier" design ensures stable treatment, even if occupancy (and thus wastewater load) changes significantly day to day or season to season.

The "package plant," installation is simpler than building a bespoke tank/reactor from scratch, reducing site risk and simplifying design and maintenance

The proposal will also introduce a secondary Phos Clear tertiary treatment stage, ensuring up to 95 % TP removal, with effluent TP of 0.8 mg/L achievable under design conditions.

The excess will discharge into the channel drainage that flows around the site.

The standard construction of the system ensures the following reductions:
A 95% reduction in Total Phosphate (**TP**).

BOD removal of 95–96 %, giving typical effluent BOD around 10–12 mg/L under EN test conditions.

NH_4-N removal is typically > 75 %, with independently tested effluent around 8–9 mg/L NH_4-N vs. the typically 20 mg/L consent standard.

10.6.1 Foul Drainage Summary

The proposal comprises 10 traveller pitches with an assumed occupancy of 4–6 persons per pitch (40–60 PE). On this basis, foul flows are estimated at to up to 10.8 m^3/day.

The drainage strategy proposes treatment via a suitably sized package sewage treatment plant, with treated effluent discharged partly to ground via an infiltration system and, where appropriate, to a receiving watercourse/ditch (noting this is seasonally dry).

Given the anticipated discharge volumes exceed the General Binding Rules thresholds for discharges to ground and/or surface water, an Environmental Permit will be secured from the Environment Agency for the relevant groundwater activity and water discharge activity, supported by the requisite risk assessments and detailed design.

11 Conclusion and Recommendations

With the proposed SuDS mitigation measures in place, it is considered that the proposed development will reduce local flood risk and enhance the local environment and will therefore be in compliance with the LLFA's current planning policy and the NPPF.

12 References

1. Communities and Local Government - National Planning Policy Framework NPPF, 2019.
2. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
3. Core Strategy, Wokingham Borough Council, 2010.