GeoSmart Information

SuDSmart Plus

Sustainable Drainage Assessment

Site Address

The Coach House, North Court, the Ridges, Finchampstead, Wokingham, Berkshire, RG40 3SH

Grid Reference

480104, 163713

Report Prepared for

John Jones, the Coach House, New Court, the Ridges, Finchampstead, Wokingham, RG40 3SH, GBR

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01/10/2025

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28/05/2025

Report Status

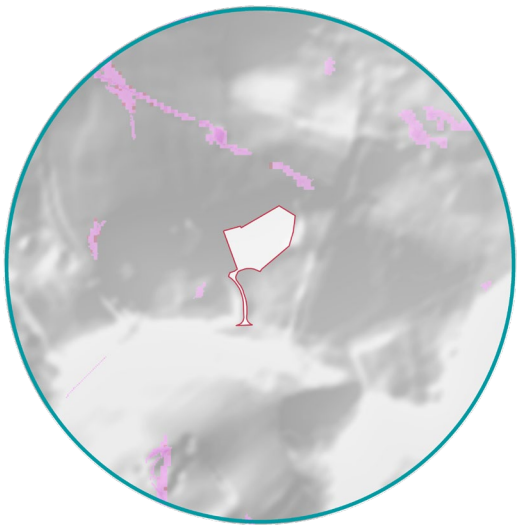
FINAL

Site Area

5095 m^2

Report Reference

84759.00.01R2



Infiltrate to ground

The proposed Sustainable Drainage Scheme (SuDS) strategy is comprised of a rainwater harvesting butt, unlined permeable paving and a soakaway to attenuate surface water runoff during the 1 in 100 plus 40% climate change event.

A site investigation should be conducted to confirm the infiltration capacity of the ground in line with BRE 365 guidelines to confirm the infiltration rate and the groundwater level.

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1 Executive summary

This report assesses the feasibility of a range of Sustainable Drainage Scheme (SuDS) options in support of the Site development process. A SuDS strategy is proposed to ensure surface water runoff can be managed effectively over the lifetime of the development.

SuDS suitability

Risk	Issue	Result
Discharge Location	What is the infiltration potential at the Site?	High
	What is the potential to discharge to surface water features?	Medium
	What is the potential to discharge to sewers?	Low
	What is the potential to discharge to highway drains?	Low
Flooding	What is the river (fluvial) flood risk at the Site?	Very Low
	What is the surface water (pluvial) flood risk at the Site?	Very Low
	What is the groundwater flood risk at the Site?	Negligible
Pollution	Is the groundwater a protected resource?	No
	Is the surface water feature a protected resource?	No

Summary of existing and proposed development

The Site is currently used within a residential capacity. At present there is a single dwelling with associated outbuildings, car parking and landscaped areas. Development proposals comprise the construction of a new dwelling within a landscaped area with an associated garage and driveway.

National Standard 1: Runoff Destinations

Priority 1: collection for non-potable use

In line with DEFRA's national guidance, the potential for the collection of rainwater for non-potable use across the proposed development has been considered.

Rainwater harvesting butts are proposed at the base of the downpipes of the development in order to provide rainwater re-use potential at the Site, as well as to provide biodiversity and amenity benefits. Captured water will be used to water vegetation and ensure their long-term viability as sustainable amenity features. Due to the limited storage capacity and

requirement to retain captured rainwater for non-potable use, the volume of runoff which could be attenuated has not been considered within the report.

Priority 2: infiltration to ground

GeoSmart's SuDS Infiltration Potential (SD50) map indicates the Site has a High potential for infiltration, primarily due to the high permeability of the underlying geology (River Terrace Deposits and Camberley Sand Formation). Infiltration to ground is therefore feasible, subject to confirmation via infiltration testing.

Priority 3: discharge to above ground surface water body

OS mapping indicates an unnamed drainage ditch is located c. 50 m north of the Site. Another drainage ditch is located c. 75 m north-west. According to the client, this drainage ditch is utilised by adjacent land and a bridle path to the east. An investigation into the feasibility of discharging runoff to these drainage ditches is recommended should a Site investigation confirm the underlying ground conditions are not conducive to infiltration.

Priority 4: discharge to surface water sewer

The asset location plan included in Appendix C confirms that there are no public surface water sewers within the vicinity of the Site that could feasibly be discharged to. As such, discharge to surface water sewer is not considered to be feasible.

Priority 5: discharge to combined sewer

The asset location plan included in Appendix C confirms that there are no public combined sewers within the vicinity of the Site that could feasibly be discharged to. As such, discharge to combined sewer is not considered to be feasible.

Runoff rate and attenuation requirements

Discharging via infiltration requires 31.96 m^3 of attenuation to be provided to ensure there is no flooding as a result of the development in all storm events up to and including the 1 in 100 year including a 40% allowance for climate change. This volume is subject to the results of infiltration testing and would ensure runoff is not increased above the greenfield scenario.

Discharging off-Site requires 47.31 m^3 of attenuation to be provided to ensure there is no flooding within the development in all storm events up to and including the 1 in 100 year including a 40% allowance for climate change. This volume is subject to the discharge rate being restricted to 2 l/s (as close to the Greenfield 1 in 1 year rate as possible, without increasing the potential for blockages).

Proposed SuDS strategy

SuDS features comprised of a rainwater harvesting butt, unlined permeable paving and a soakaway are proposed to attenuate a minimum of 31.96 m^3 of surface water runoff. Although the soakaway is located outside of the Site boundary, it is located within the ownership boundary. The SuDS features would provide some water quality benefits

(interception and filtration) prior to infiltrating to ground. Focused infiltration features should be sited at least 5m from building foundations and 2-3m from adjacent highways.

The proposed SuDS strategy would ensure surface water runoff is stored within the ownership boundary in SuDS features for the 1 in 100 year event including a 40% allowance for climate change and will not cause flooding to the proposed development in accordance with DEFRAs non-statutory technical standards (DEFRA, 2015).

SuDS & drainage network maintenance

The management and maintenance of the SuDS features, in line with the details and schedules outlined in Section 10 of this report, will be undertaken by contractors appointed by the owners and occupiers of the new residential building, where payments for the works will form part of the property deeds and / or rental agreements.

Recommendations / Next steps

A site investigation is required to confirm the infiltration capacity of the ground in line with BRE 365 guidelines to confirm the infiltration rate and the groundwater level. This could be controlled by planning condition in the event of a grant of planning permission.

Where Site investigation confirms the underlying ground conditions are not conducive to infiltration, the condition and capacity of the nearby ditches should be confirmed and permission should be obtained from the Local Council for proposed outfalls and any other permits required.

Consultation with neighbouring properties should be undertaken prior to development.

2 Proposed SuDS strategy

The most suitable SuDS options are outlined below and a SuDS strategy schematic is shown overleaf. Supporting information is provided in subsequent sections.

Table 1. Proposed SuDS type, features, discharge location and rate restriction

SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Rainwater harvesting butt, soakaway and permeable paving.
Discharge location	Infiltration.
Discharge rate	1x 10^{-5} m/s (the worst-case infiltration rate for 'slightly silty, slightly clayey sand' soil types, taken from Table 25.1 of the CIRIA SuDS manual (C753) (2015) – to be confirmed via infiltration testing).

Table 2. Proposed SuDS sizing (dimensions) and attenuation volumes

Rainwater Harvesting	A rainwater harvesting butt should be established for the proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the preliminary SuDS strategy.
Soakaway	A soakaway with a width of 5.75 m, length of 6.00 m and depth of 1.00 m, filled with geo-cellular crates with a 95% void ratio, is proposed. This soakaway will provide c. 31.96 m^3 attenuation. Although the soakaway is located outside of the Site boundary, it is located within the ownership boundary.
Permeable paving	A 334 m^2 area of permeable paving (underlain with a Type 3 aggregate material) is proposed for the hardstanding areas at the Site, such as the driveway. This area will be designed to exclusively drain itself and is therefore not included within the attenuation volumes.
Total Attenuation Provided	31.96 m^3

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Figure 1. Proposed SuDS scheme

- Soakaway
- Rainwater harvesting butt
- Unlined permeable paving
- Surface water drainage network
- Exceedance flow routes
- Site boundary

Surface water from the proposed dwelling will be conveyed into the rainwater harvesting butt, where overflows will be directed towards the soakaway for infiltration into ground.

Unlined permeable paving is proposed for the driveway. This will be an unfocused infiltration feature, reducing the total area of impermeable surfaces and mimicking Greenfield conditions. As these areas will exclusively drain themselves and will not be used for attenuation, the attenuation volume has not been considered.

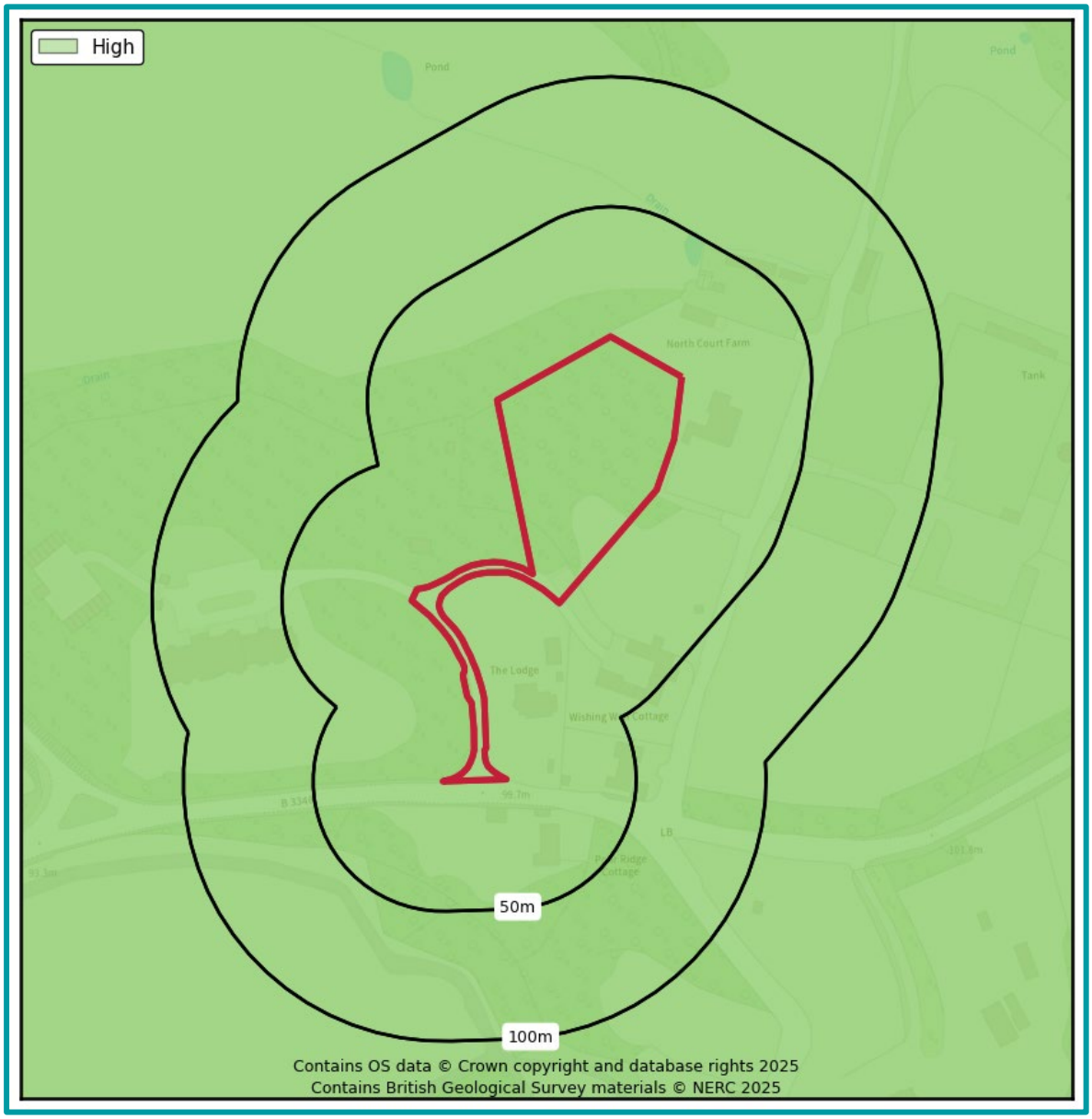
This SuDS system should be designed so that all runoff is contained within the ownership boundary. Exceedance flows are directed towards non-essential, vacant areas on Site. The SuDS system recommended for the Site should provide enough storage that this method would only be utilised during a worst-case scenario.

3 Site analysis

Site location

Figure 2. Aerial Imagery (Bluesky, 2025)

Figure 3. SuDS infiltration suitability (SD50) map (GeoSmart, 2025)



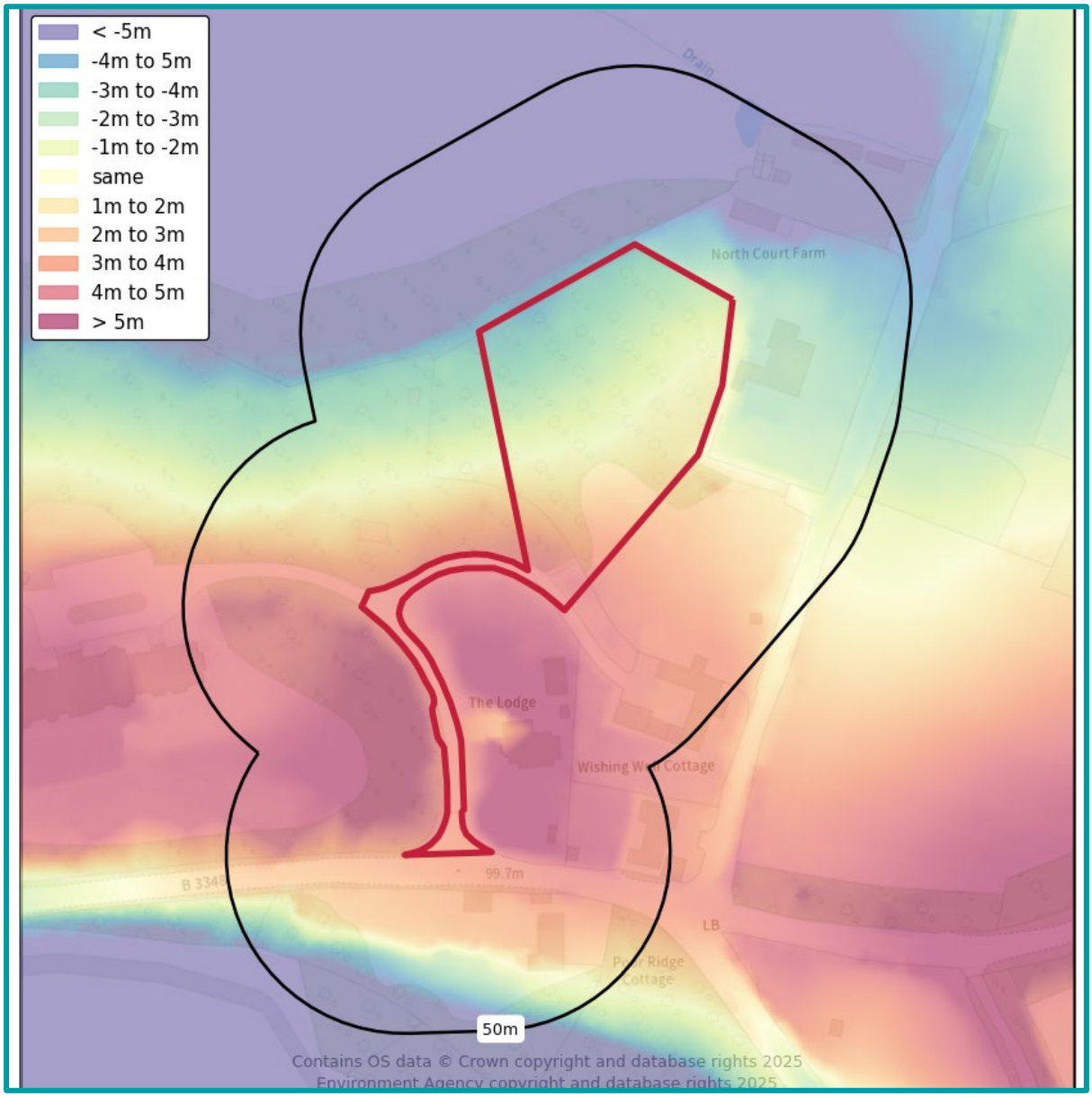
The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual Site drainage design and the planning of further Site investigation.

There is a High potential for infiltration SuDS across the Site. It is likely that the underlying geology at the Site has high permeability and an infiltration SuDS scheme should be possible at the Site.

Groundwater levels are expected to be sufficiently deep at the Site. However, a Site Investigation is recommended to confirm the infiltration capacity and the depth to

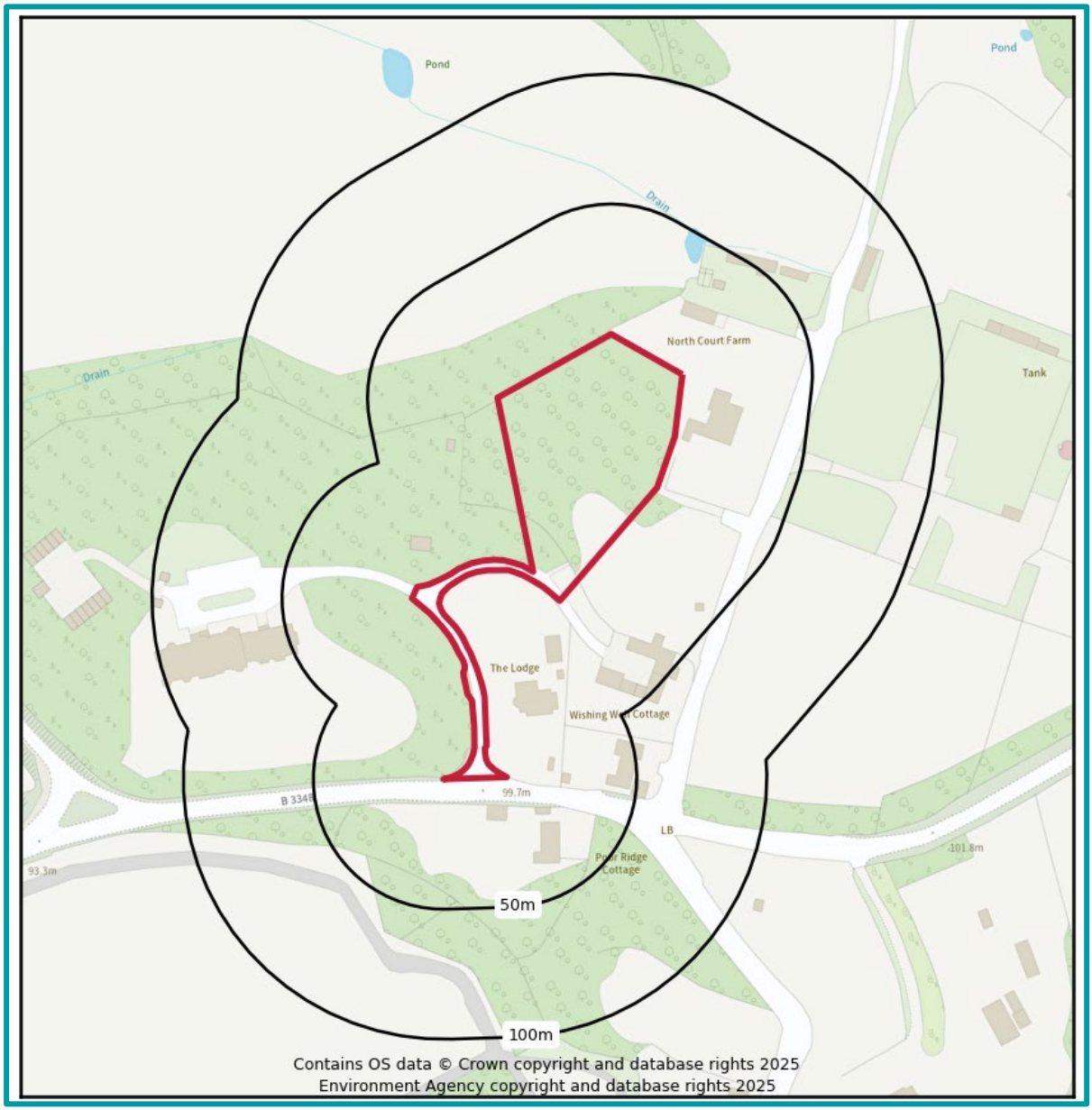
groundwater. Various options can be considered for infiltration SuDS and these include infiltration trenches, soakaways, swales and permeable pavements.

Figure 4. Site topography (GeoSmart, 2025)



An assessment of the topography at the Site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localised depressions. The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area. The mapping confirms the overall Site is generally falling in a northerly direction.

Figure 5. Source protection zone map (EA, 2025)

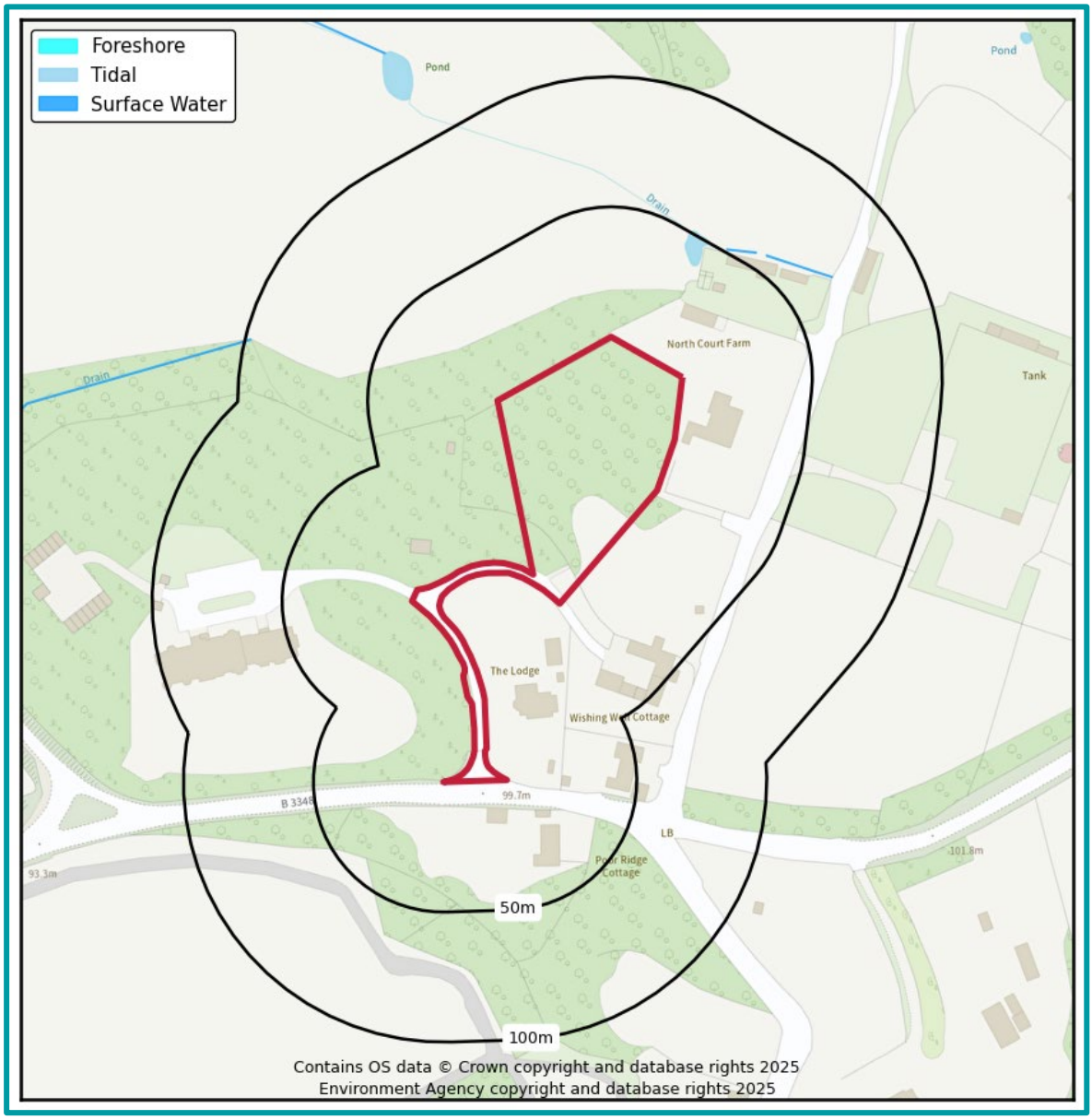


An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site is not located within an SPZ.

Infiltration, if possible, is likely to be acceptable providing risk screening identifies suitable mitigation measures, if required, to prevent an impact on water quality from the proposed or historical land use and contaminated land.

If further analysis is required, this would involve a review of Site specific contaminated land data. If hazards are identified, it is recommended that the Local Authority and the Environment Agency are contacted to confirm the susceptibility of any SPZs within the wider area.

Figure 6. Surface water features map (EA, 2025)

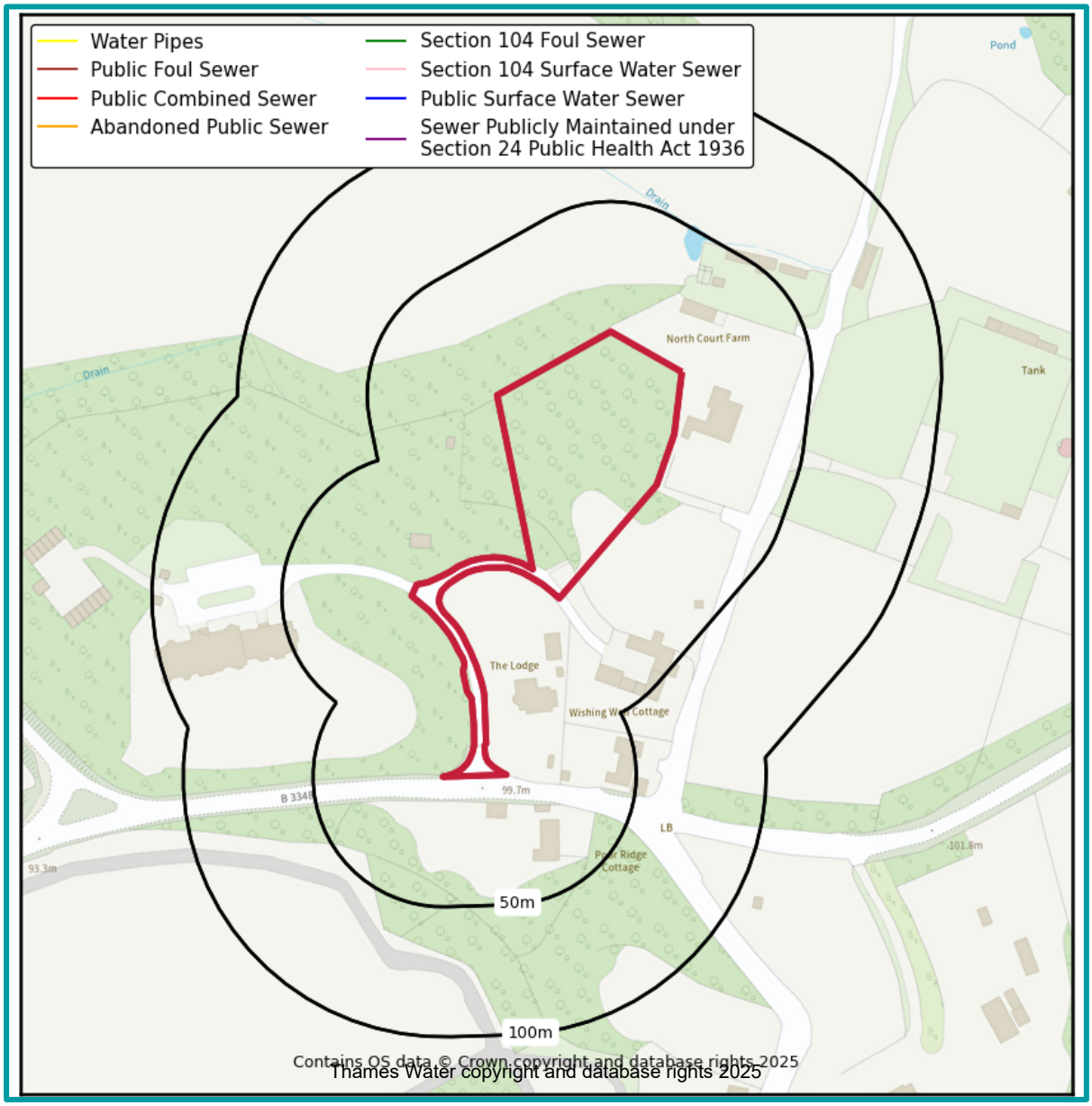


OS mapping indicates an unnamed drainage ditch is located c. 50 m north of the Site. Another drainage ditch is located c. 75 m north-west. According to the client, this drainage ditch is utilised by adjacent land and a bridle path to the east. An investigation into the feasibility of discharging runoff to these drainage ditches is recommended should a Site investigation confirm the underlying ground conditions are not conducive to infiltration.

According to DEFRA's Magic Map, the Site is not within 250m of a SSSI or SPA.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency (EA) to confirm the presence, location and condition of any mapped or additional unmapped surface water features.

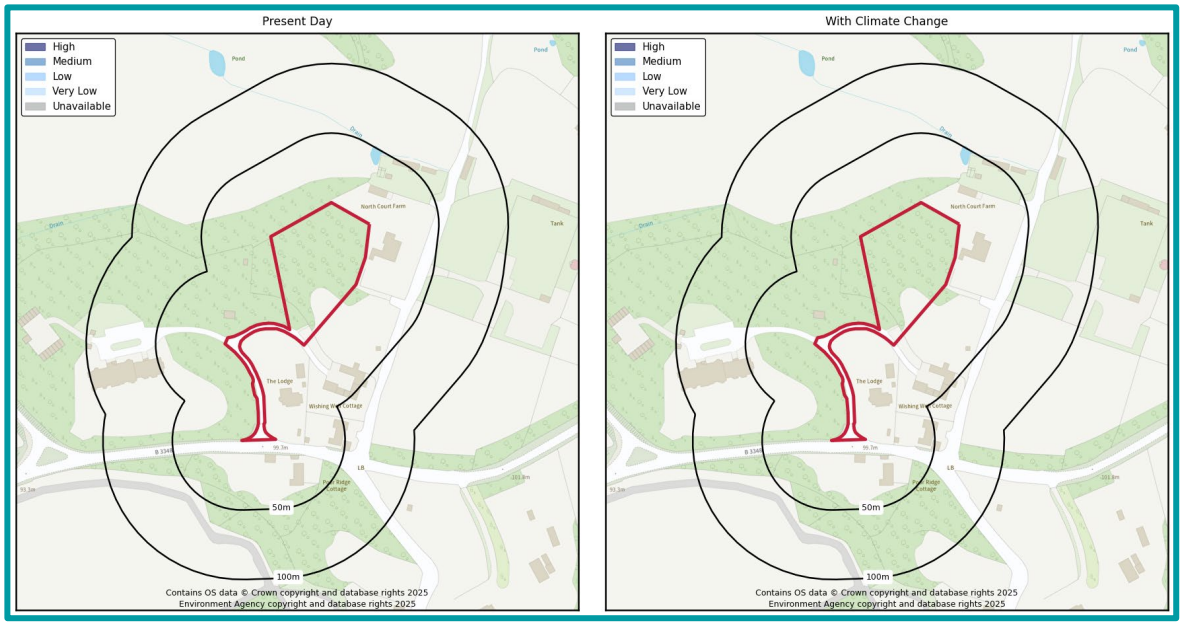
Figure 7. Sewer features map (OS & Thames Water, 2025)



GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the asset location plan undertaken at the Site (Appendix C), there are no public surface water sewer or combined sewers located within the vicinity of the Site. Therefore, discharging runoff to the public sewer network is not feasible.

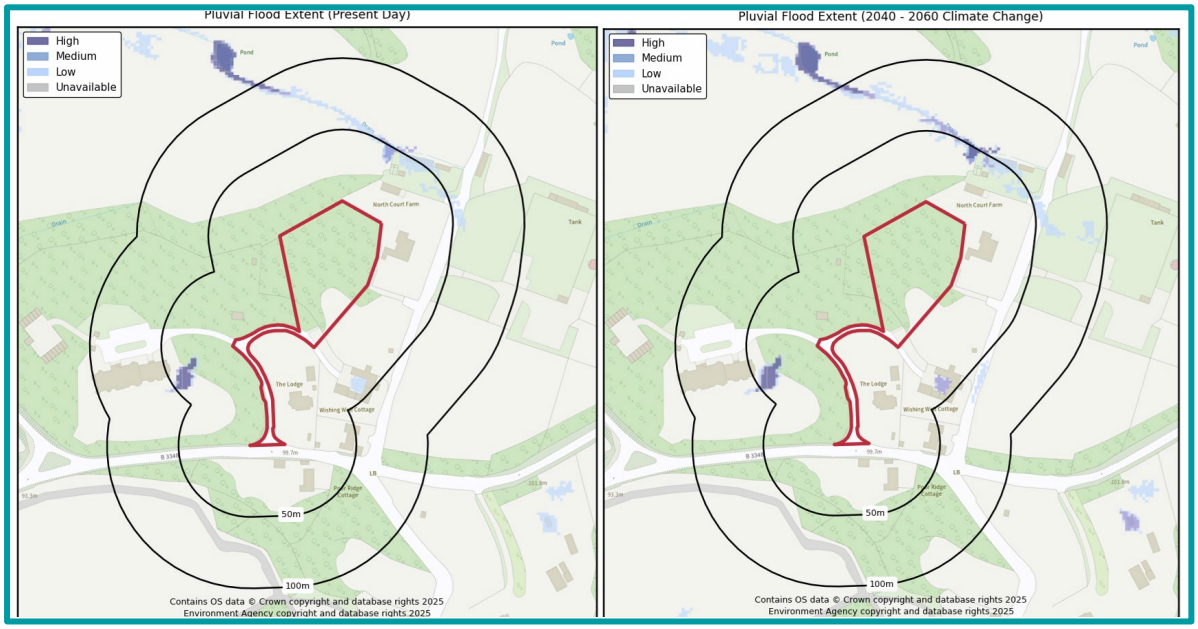
Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider would also be required to determine that sufficient capacity is available to accept the proposed discharge, and to gain permission to connect if required.

Figure 8. Risk of flooding from rivers & sea map (EA, 2025)



According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) map, the Site has a Very Low risk of flooding from fluvial or coastal flooding in both the present day and climate change (2036 to 2069) scenarios, with less than 0.1% annual probability of flooding; therefore, the SuDS design is unlikely to be affected.

Figure 9. Risk of surface water flooding map (EA,2025)

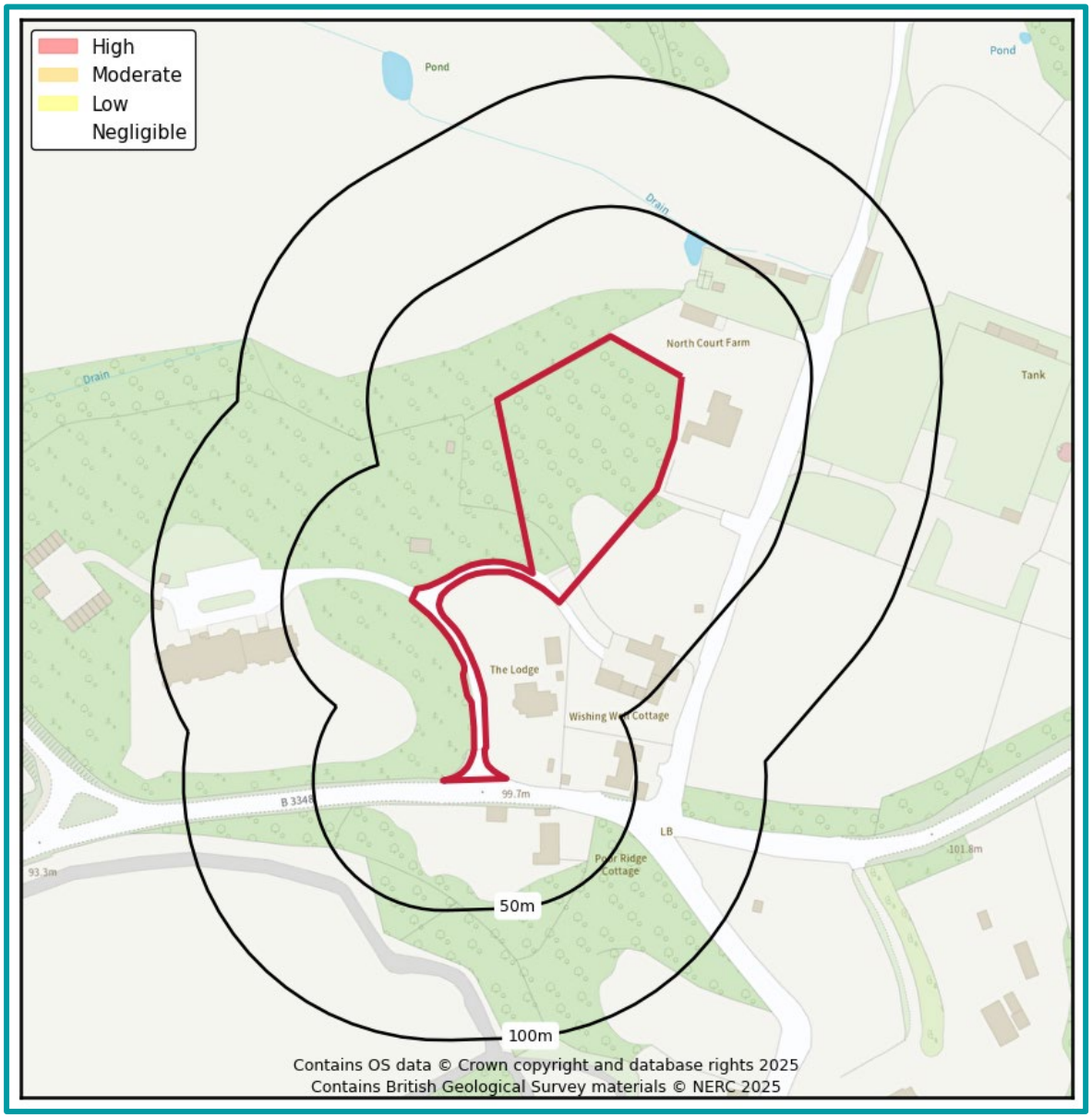


GeoSmart have undertaken an assessment of the risk of flooding from surface water (pluvial) sources within the vicinity of the Site using the EA's Risk of Flooding from Surface Water (RoFSW) mapping. The EA's mapping confirms the Site is considered to be at Very Low risk of surface water flooding in the present day and climate change scenarios.

The above map shows the extent of flooding during the >3.3% annual probability (AEP) (1 in 30 year – High risk), 3.3 – 1% AEP (1 in 100 year – Medium risk) and 1 – 0.1% AEP (1 in 1000 year – Low risk) events. This confirms that there are no areas of the Site which would be affected by surface water flooding.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency to confirm the pluvial flood risk, flood depths and velocities where applicable.

Figure 10. Groundwater flood risk (GW5) map (GeoSmart, 2025)



GeoSmart have undertaken an assessment of the risk of flooding from groundwater within the vicinity of the Site. GeoSmart's Groundwater Flood Risk Screening (GW5) map confirms the Site has a Negligible risk of groundwater flooding during a 1% annual probability (1 in 100 year) event.

4 Site context

Site information

The purpose of this report is to assess the potential for disposing of surface water through a Sustainable Drainage System (SuDS) for the site of the Coach House, North Court, the Ridges, Finchampstead, Wokingham, Berkshire, RG40 3SH (the Site). The Site is located on the outskirts of Finchampstead in a setting of agricultural and residential land use. The land falls to the north-west from 101.33 mAOD to 92.85 mAOD. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±150 mm. According to a Site-specific topographic survey covering approximately 70% of the total Site area, ground levels fall in a northerly direction from 92.80 mAOD to 100.72 mAOD (TC Biggin Architecture, 2024). Site plans and drawings are provided in Appendix A.

Development

The Site is currently used within a residential capacity. At present there is a single dwelling with associated outbuildings, car parking and landscaped areas. Development proposals comprise the construction of a new dwelling within a landscaped area with an associated garage and driveway.

Geology, permeability and thickness

British Geological Survey (BGS) national superficial and bedrock geology mapping confirms the geological formations underlying the Site and each formation may have a range of permeability.

Table 3. Site Geology

Geology present on-Site		Potentially permeable?
Superficial geology (Figure 11)	River Terrace Deposits (RTD8) - sand and gravel (southern 40% of the Site)	✓
	No underlying superficial deposits (northern 60% of the Site)	N/A
Bedrock geology (Figure 12)	Camberley Sand Formation (CMBS) - sand	✓

The permeability of the underlying material at the Site shown within the BGS mapping is high; confirmation of the infiltration capacity is required.

The BGS website was used to extract ground information from the nearest borehole record to the Site (ref: SU86SW2). This borehole is located approximately 430 m to the north-east of the Site at an elevation of 100.9 mAOD. This borehole is located greater than 250 m from the Site and is therefore unlikely to be fully representative of the underlying Site-specific ground conditions; however, it has been included for completion in the absence of more relevant information.

Table 4. BGS borehole information

BGS borehole SU86SW2		
Strata encountered	Depth to base of stratum (m bgl)	Strata composition
Soil	0.1	Stony and sandy
River Terrace Deposits (Eighth Terrace)	1.8	Clayey sandy gravel; gravelly mainly between 0.1 and 0.8 m bgl; sand layer between 0.8 and 1.8 m bgl
Camberley Sand Formation [listed as 'Barton Beds', now obsolete, within borehole record]	>4.8 (base not proven)	Very clayey sand

Infiltration SuDS are proposed directly into permeable bedrock deposits.

The soil infiltration coefficient must be sufficient to accommodate the constraints on the dimensions of the soakaway and its emptying time.

Depth to groundwater

The SuDS system should be designed to operate in periods of extreme groundwater levels.

Groundwater was not encountered during the drilling of BGS borehole ref: SU86SW2. BGS borehole SU86SW359 encountered groundwater at a depth of 12 m bgl in March 2013, subject to seasonal variation. It should be noted that although this borehole is the closest to the Site, 340 m to the south-east, it is located in a different bedrock geology (Windlesham Formation).

According to borehole data and GeoSmart's Groundwater Flood Risk (GW5) map, shallow groundwater is unlikely to be an issue at the Site.

The base of the infiltration system needs to be 1 m above the expected seasonal high-water table. Passage through unsaturated soil is important for improving the quality of infiltrating water before it reaches the water table.

Figure 11. Superficial Geology (BGS, 2025)

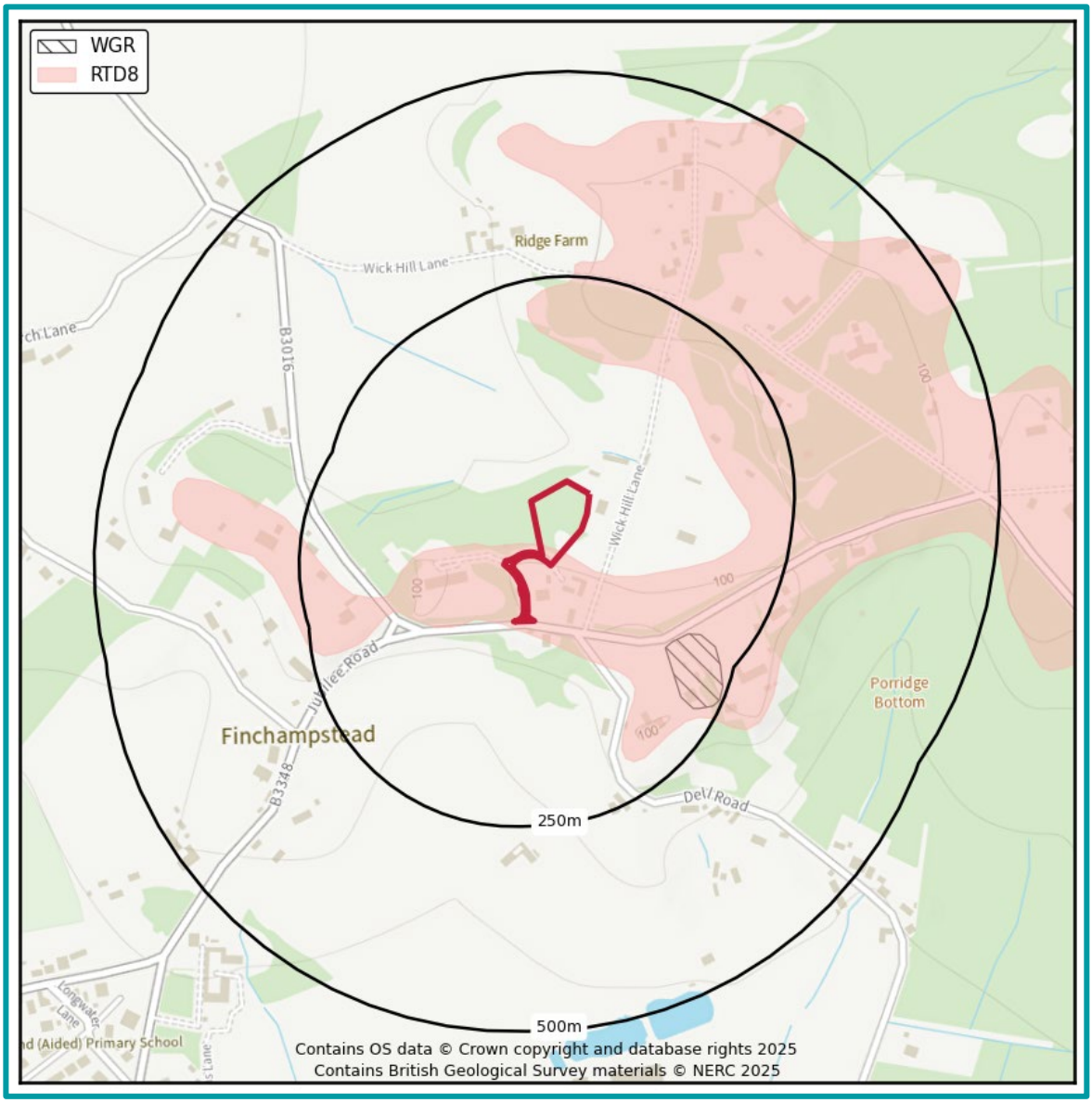
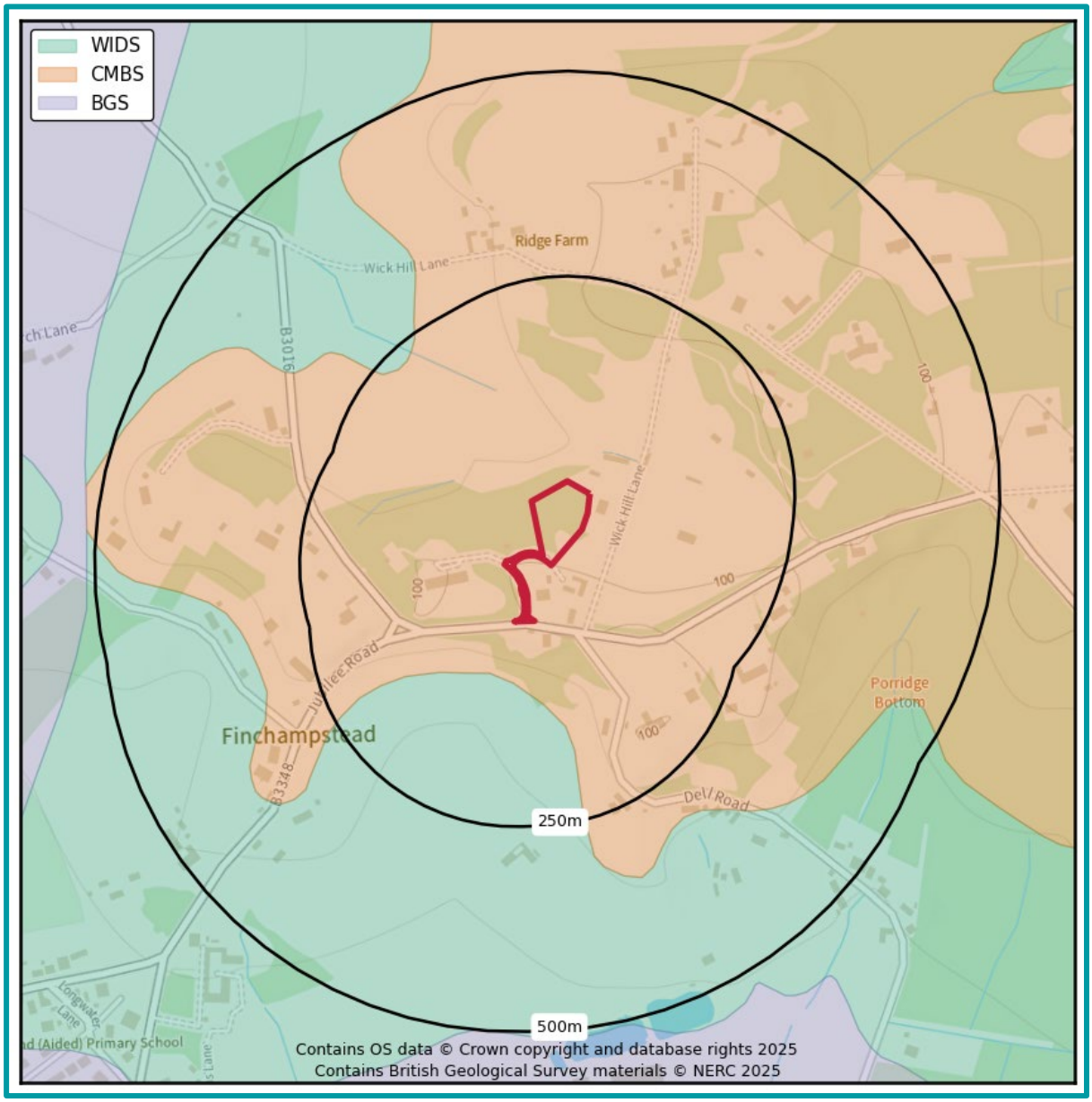


Figure 12. Bedrock Geology (BGS, 2025)



Ground conditions

Infiltration SuDS are proposed within permeable sandstone bedrock. Therefore, a detailed review of underlying ground conditions is recommended to ensure focused infiltration does not cause ground instability as a result of landslide or collapse associated with running sand.

Soakaways should be a minimum of 5m away from the foundations of a building and local guidance may recommend a greater distance, such as 10m on some areas of the Chalk.

Water quality

The Site does not lie within an SPZ. The infiltrated water quality should be of sufficient quality that it does not give rise to pollution of the underlying groundwater. Further consultation with the water company is unlikely to be required.

Infiltration systems should not be used where there is a risk of contaminating groundwater by infiltrating polluted runoff or where receiving groundwater is particularly sensitive.

The influence of surface runoff on water quality will depend on whether there is a source of contamination on-Site and the sensitivity of the receiving environment, either groundwater or surface water. The intervening pathway from source to receptor including mitigation and natural attenuation will determine the final impact.

The impact of contaminants on the groundwater will be reduced by travel and natural attenuation through the unsaturated soil zone. A greater depth of unsaturated zone and the presence of significant clay and organic material will provide greater protection for the underlying groundwater. Rapid flow through fractures will provide less protection than intergranular flow around soil and rock particles.

5 National & local policy context

National Guidance

DEFRA - National standards for sustainable drainage systems (SuDS) (2025)

Standard 1: runoff destinations

A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body
- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

Note 1: priority 1 is the highest priority and priority 5 is the lowest.

Note 2: for the purposes of this standard, a combined sewer is a sewer intended to receive both foul sewage and surface runoff and does not include a sewer intended to receive only foul sewage, even if it has the capacity to accommodate additional flows or has an element of surface water in it already.

To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable. Higher cost alone shall not be a reason to utilise lower priority final destinations.

Where more than one final destination is utilised, each final destination's ability to accept runoff shall be maximised in order of priority.

Standard 2: management of everyday rainfall (interception)

Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems.

Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6).

Standard 3: management of extreme rainfall and flooding

A 'SuDS approach' shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep to:

- protect people and property on the development from flooding of the surface water drainage system
- mitigate any increased flood risk to people and property adjacent to or downstream of the development
- protect the receiving water body from morphological damage or minimise the impact on sewer capacity

When discharging to an infiltration feature, the system shall be appropriately sized to accommodate the design event based on ground conditions and contributing areas.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff (rate and volume) for the 1% annual exceedance probability (AEP) event shall be controlled to ensure the runoff from the development does not increase flood risk elsewhere.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water runoff rate for the 50% AEP event shall be controlled to ensure development runoff from an event of this magnitude has no negative impact.

Any flooding from the surface water drainage system for events up to the 1% AEP event shall be managed within the development.

Any flooding from off-site sources for the 1% AEP event should be managed on site or safely routed through the site, ensuring any downstream risks are not increased compared to the pre-development scenario.

The risks (both on and off the development) associated with flooding from the surface water drainage system for exceedance events greater than the 1% AEP event shall be appropriately managed.

Standard 4: water quality

Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development.

The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance or other quantitative assessment as agreed with the approving body and permitting requirements.

Standard 5: amenity

A 'SuDS approach' shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.

Standard 6: biodiversity

A 'SuDS approach' shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

The surface water drainage system shall add biodiversity value by:

- creating diverse, self-sustaining, resilient local ecosystems which contribute to net gains in biodiversity
- supporting and promoting natural local habitat and species, for example, through local nature recovery strategies (LNRS)
- contributing to the delivery of local biodiversity strategies
- contributing to habitat connectivity

Standard 7: design of drainage for construction, operation, maintenance, decommissioning and structural integrity

A 'SuDS approach' shall be adopted to ensure that surface water drainage systems are designed so they can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.

The designer shall provide a management and maintenance plan that supports the design objectives detailed in standards 1 to 6 and ensures the performance of the surface water drainage system with regards to runoff destinations, everyday and extreme rainfall, water quality, amenity and biodiversity is maintained throughout the lifetime of the development.

Surface water drainage design shall examine for the likelihood and consequences of potential failure scenarios that may occur during the operation phase and safely manage the associated risks.

The surface water drainage system shall be designed to ensure structural integrity of all components under anticipated loading conditions for the design life of the development so that it does not affect the structural integrity of any existing or proposed components within, or adjacent to, the development.

Urban Creep

Within developments an urban creep uplift factor shall be applied by adding a percentage increase to the calculated area of the impermeable area within the property curtilages. This shall be 10% for all developments unless there are no external private permeable spaces, for example, flats and apartments, when it shall be 0%.

Ministry of Housing, Communities & Local Government – National Planning Practice Guidance: Flood risk assessments: climate change allowances (2022)

The Peak rainfall intensity allowances section provides advice on the increased rainfall effects on river levels and land and urban drainage systems. As of May 2022, the applicable climate

change allowance is defined by specific Management Catchment for the 1 in 30 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event.

As the Site is located within the Loddon and tributaries Management Catchment the following climate change allowances are applicable.

Table 5. Loddon and tributaries Management Catchment peak rainfall allowances

Loddon Management Catchment	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	2050s	2070s	2050s	2070s
Central	20%	25%	20%	25%
Upper end	35%	35%	40%	40%

The drainage system should be designed to make sure there is no increase in the rate of runoff discharged from the Site for the upper end allowance.

Where on-Site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant flood hazard to people from on-Site flooding for the central allowance.

Local Policy

Wokingham SuDS Strategy: Guidance on the use of sustainable drainage systems (Wokingham Borough Council, 2017)

The most relevant local policies are included below:

- WokBC-LS4: All proposals to discharge to a water body, public or private sewer shall be accompanied with correspondence confirming acceptance of the proposal from the receiving network owner and that the receiving network has the necessary capacity to receive additional flows and/or that required reinforcement works will be provided.
- WokBC-LS5: In addition to the requirements of S2, Wokingham requires demonstration that discharges from the proposed development for all return periods from the 1 in 1 through to the 1 in 100 year (inclusive), do not exceed their corresponding greenfield/previously developed discharge rates. Demonstration of this is required for the 1 in 1 year, 1 in 30 year, 1 in 100 year and 1 in 100 year including allowances for climate change.

- WokBC-LS11: Long term storage must be provided to limit the volume of runoff from the 1 in 100 year event with an allowance for 40% climate change, unless discharge rates have been restricted to QBar.
- WokBC-LS15: The drainage system must be designed so that the capacity of the drainage system takes account of the likely impacts of climate change and likely changes in impermeable area within the development over the design life of the development. To allow for future urban expansion within the development (urban creep), an increase in paved surface area of 10% should be used, unless this would produce a percentage impermeability greater than 100%.
- WokBC-LS24: All infiltration systems must be sited so that they do not compromise the structural stability of buildings or roads. They must not be situated within 5m of any building or road and if situated on chalk geology they must be sited in accordance with CIRIA C754 – Engineering in Chalk.
- WokBC-LS41: The drainage system must be designed so that surface runoff not collected for use must be discharged to one or more of the following, listed in order of priority:
    - discharge into the ground (infiltration); or where not reasonably practicable,
    - discharge to a surface water body; or where not reasonably practicable,
    - discharge to a surface water sewer, highway drain, or another drainage system; or where not reasonably practicable,
    - discharge to a combined sewer.

6 Storage, volume and peak flow rate

Suggested minimum and aspirational storage requirements for an infiltration and attenuation SuDS scheme for the development footprint are set out below, with more detail provided in subsequent sections. Storage volumes may be reduced (but not below the minimum level) if the design incorporates off-Site discharge.

Table 6. Storage requirements at the proposed development Site (Discharge runoff via infiltration)

Attenuation scenario	Attenuation required (m^3)	Explanation
1 in 100 year including 40% CC	31.96*	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year event including a 40% allowance for climate change. Calculations are based on an assumed infiltration rate of $1x\ 10^{-5}$ m/s (the worst-case infiltration rate for 'slightly silty, slightly clayey sand' soil types, taken from Table 25.1 of the CIRIA SuDS manual (C753) (2015) – to be confirmed via infiltration testing).

*Subject to confirmation through infiltration testing.

Table 7. Storage requirements at the proposed development Site (Discharge runoff to watercourse)

Attenuation scenario		Attenuation required (m^3)	Explanation	
Discharge runoff to watercourse	1 in 30 year	21.10	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 30 year (1 hour, Critical Storm Duration) event*. Flooding of the Site of 8.57 m^3 should be contained within permeable landscaped areas within the Site to ensure no flooding of internal areas during the 1 in 100 year storm event.	A further 17.63 m^3 should be managed within overland flow routes to ensure there is no increase in flood risk in all events up to the 1 in 100 year including 40% allowance for climate change.
	1 in 100 year	29.68	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (2 hour, Critical Storm Duration) event*.	
	1 in 100 year including 40% CC	47.31	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year (2 hour, Critical Storm Duration) event including a 40% allowance for climate change*.	

*See Appendix B for associated runoff and discharge calculations. Discharge rates all restricted as close as possible to greenfield rates in their respective events.

Surface water runoff

An increase in impermeable area on-Site will result in greater rainfall runoff. Reduction in runoff will help mitigate flood risk both on and off-Site. Further information on the surface water runoff calculations is provided in Section 12 'Background Information'.

It should be noted that the south-east of the Site, which includes the existing dwelling, is not proposed to be modified as part of the development. These areas are therefore proposed to utilise the existing drainage arrangement and have been excluded from the SuDS strategy.

According to Policy WokBC-LS15 of the Wokingham SuDS Strategy (Wokingham Borough Council, 2017), urban creep should be taken into account as part of the SuDS design. Urban creep accounts for the potential for impermeable areas to increase over the lifespan of a development, such as extensions to proposed building footprints and increases in patio

areas. Therefore, in accordance with the guidance, a 10% urban creep allowance has been applied to the proposed impermeable areas.

Guidance

The Non-Statutory Technical Guidance for SuDS (Defra, March 2015) states:

"Where reasonably practicable, for Greenfield development, 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 should never exceed the Greenfield runoff volume for the same event. 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."

Table 8. Change in impermeable area associated with the development

Total Site area (5095 m^2)		
Impermeable area (and as a percentage of the total area of the proposed development footprint of 4441 m^2)		
Pre-development	Post-development	Post-development (10% urban creep included)
0 m^2 (0%)	712 m^2 (16%)	783 m^2 (18%)
Impermeable land use: None Permeable land use: Landscaped areas	New impermeable land use: 395 m^2 building footprint (dwelling) New permeable land use: 317 m^2 of permeable paving (access road and parking)*	New impermeable land use: 434 m^2 building footprint (dwelling) New permeable land use: 349 m^2 of permeable paving (access road and parking)*

*Please note, while these areas will be utilized for SuDS, for the calculations these areas will be classed as impermeable in order to assess the potential run-off volumes and rates for the Site post-development and the potential holding capability of the proposed SuDS features (secondary strategy only).

Guidance

"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event' and 'flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development"

(Defra, March 2015, non-statutory guidance).

Peak discharge rates

The table below presents peak discharge rates for a range of storm events used to assess the impact of the proposed development and select the maximum permitted discharge rate. Further information on the calculation and control of peak discharge rates is provided in Section 12 'Background Information'.

Table 9. Peak discharge rates associated with the development

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates[1] (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	1.21	N/A	N/A	N/A
6 hour 1 in 1 year	1.03	1.03	2.55	1.52
6 hour 1 in 10 year	1.96	1.96	4.37	2.42
6 hour 1 in 30 year	2.71	2.71	5.58	2.88
6 hour 1 in 100 year	3.85	3.85	6.97	3.12
6 hour 1 in 100 year + 20% CC	N/A	N/A	8.37	4.51
6 hour 1 in 100 year + 40% CC	N/A	N/A	9.76	5.91

[1] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

Relevant national, regional and local planning policy has been consulted in Section 5 to determine restrictions on runoff from previously developed and greenfield sites. In some cases, greenfield rates may be requested, but in practice it is difficult to restrict discharge rates at any one control point to less than 2 l/s, without increasing the risk of any potential blockages occurring in the drainage network.

Total discharge volumes

The table below presents discharge volumes for a range of storm events used to assess the impact of the proposed development and calculate the required storage volumes. Further information on the calculation of total discharge volumes is provided in Section 11 'Methodology and Limitations'.

Table 10. Total discharge volumes associated with the development

Rainfall event	Greenfield runoff volume (m^3)	Existing runoff volume[2] (m^3)	Potential runoff volume without attenuation (m^3)	Potential minus existing (m^3)
QBAR	45.48	N/A	N/A	N/A
6 hour 1 in 1 year	42.33	42.33	55.04	12.71
6 hour 1 in 10 year	73.33	73.33	94.44	21.10
6 hour 1 in 30 year	92.76	92.76	120.61	27.85
6 hour 1 in 100 year	115.81	115.81	150.59	34.78
6 hour 1 in 100 year + 20% CC	N/A	N/A	180.70	64.89
6 hour 1 in 100 year + 40% CC	N/A	N/A	210.82	95.01

[2] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

Critical storm duration and volume requirements

Storage volumes for a range of return periods including the 1 in 30 year, 1 in 100 year and 1 in 100 year plus climate change (40%) events have been calculated to assess the impact of the proposed development. The required storage volumes for attenuation features have been calculated for the critical storm durations, limited to a maximum discharge rate of 2 l/s (as close to the 1 in 1 year Greenfield runoff rate as possible, without increasing the potential for blockages).

Table 11. Critical Storm Duration and Attenuation volume requirements

Return Period	Runoff rate restriction (l/s)	Critical Storm Duration (hr)	Attenuation volume required (m^3)
1 in 30 year	2.00	1.00	21.10
1 in 100 year	2.00	2.00	29.68
1 in 100 year including a 40% climate change	2.00	2.00	47.31

7 Runoff destination

Options for the destination for the runoff generated on-Site have been assessed in line with the prioritisation set out in the Building Regulations Part H document (HM Government, published in 2010 and updated in 2015) and Defra's Non-statutory Technical Standards for SuDS (2015).

Flow attenuation using infiltration SuDS (discharge to ground) is generally the preferred option. If discharge to ground is not available, runoff discharge to surface water is the other preferred method. Only if these two options are impractical should discharge to the sewer network be considered.

Discharge to ground

The Site has High potential for infiltration, with permeable underlying sand and gravel. Based on the available borehole information (subject to confirmation by site investigation) and groundwater flood risk mapping, a shallow groundwater table beneath the Site is unlikely.

There are no known issues identified relating to Site contamination or the presence of a SPZ.

A site investigation comprising trial pits is recommended to confirm the depth to groundwater and allow infiltration tests to be undertaken to confirm the feasibility of an infiltration SuDS scheme.

Discharge to surface watercourse

OS mapping indicates an unnamed drainage ditch is located c. 50 m north of the Site. Another drainage ditch is located c. 75 m north-west. According to the client, this drainage ditch is utilised by adjacent land and a bridle path to the east. An investigation into the feasibility of discharging runoff to these drainage ditches is recommended should a Site investigation confirm the underlying ground conditions are not conducive to infiltration. Should discharge to this watercourse be determined as the most suitable strategy, additional attenuation would be required and discharge rates would need to be restricted to 2 l/s via a flow control device.

Discharge to sewer

GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the asset location plan undertaken at the Site (Appendix C), there are no public surface water sewer or combined sewers located within the vicinity of the Site.

8 Water quality

A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate "train" or sequence of SuDS components that are connected in series. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015). The proposed development is a combination of Very Low (roof water) to Low hazard (runoff from car parking and road). The Site does not lie within an SPZ and therefore additional treatment stages are not required.

Table 12. Level of hazard

Hazard	Source of hazard
Very Low	Residential roof drainage
Low	Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste (incl. scrap-yards).

The recommended minimum number treatment stages suggested for the different runoff waters identified for the proposed development is highlighted in the table below.

Table 13. Minimum number of treatment stages for runoff

		Sensitivity of the receiving water body		
		Low	Medium	High
Hazard	Low	1	1	1
	Med	2	2	2
	High	3	3	3

9 Proposed SuDS strategy

Sustainable drainage systems

DEFRA's non-statutory requirements for SuDS require the below ground drainage systems to have the capacity to accommodate at least the 1 in 30 year event and to manage the 1 in 100 year event without flooding of on-Site buildings and substations. All runoff should be managed within the ownership boundary though for the 1 in 100 year event, accounting for the maximum impacts of climate change to ensure flood risk is not increased to third-parties.

It is assumed that drainage from areas outside the development footprint will continue to use existing drainage arrangements.

A surface water drainage strategy (summarised in Section 2 of this report) includes the following SuDS features to intercept, attenuate and treat surface water runoff.

Primary SuDS Strategy:

Ground conditions at the Site are conducive to infiltration; surface water runoff will be managed within SuDS features and infiltrated to ground. This SuDS system should be designed so that all runoff is contained within the ownership boundary.

Table 14. Proposed SuDS type, features, discharge location and rate restriction

SuDS type	Source control (interception) and infiltration SuDS.
SuDS features	Rainwater harvesting butt, soakaway and permeable paving.
Discharge location	Infiltration.
Discharge rate	1x 10^{-5} m/s (the worst-case infiltration rate for 'slightly silty, slightly clayey sand' soil types, taken from Table 25.1 of the CIRIA SuDS manual (C753) (2015) – to be confirmed via infiltration testing).

Table 15. Proposed SuDS sizing (dimensions) and attenuation volumes

Rainwater Harvesting	A rainwater harvesting butt should be established for the proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the preliminary SuDS strategy.
Soakaway	A soakaway with a width of 5.75 m, length of 6.00 m and depth of 1.00 m, filled with geo-cellular crates with a 95% void ratio, is proposed. This soakaway will provide c. 31.96 m^3 attenuation. Although the

	soakaway is located outside of the Site boundary, it is located within the ownership boundary.
Permeable paving	A 334 m^2 area of permeable paving (underlain with a Type 3 aggregate material) is proposed for the hardstanding areas at the Site, such as the driveway. This area will be designed to exclusively drain itself and is therefore not included within the attenuation volumes.
Total Attenuation Provided	31.96 m^3

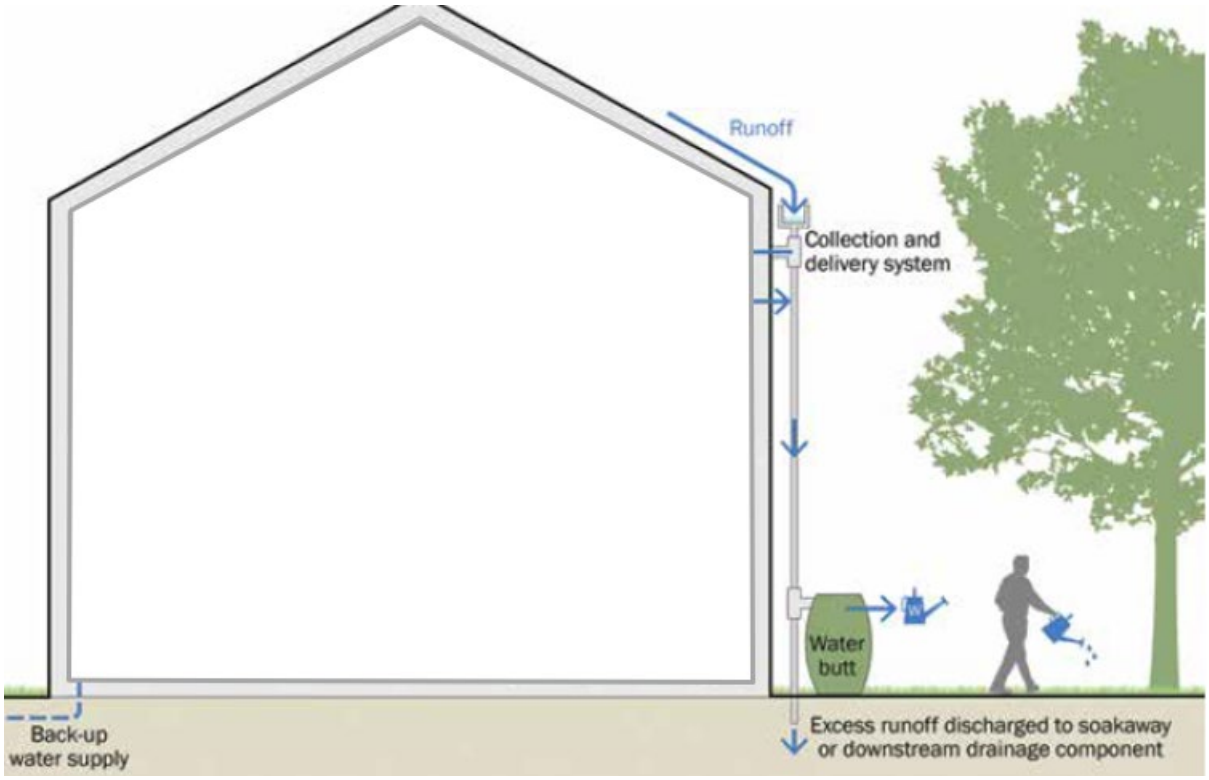
Rainwater harvesting

The run-off from the proposed development roof should be led into a rainwater harvesting butt via rainwater downpipes and guttering. Overflow from the butts should be discharged into the storage system provided by the soakaway.

Due to the relatively insignificant amounts of attenuation provided by the rainwater harvesting butt in this instance and the requirement to retain water for non-potable uses such as garden maintenance, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the report.

As there is an issue with the storage capability of rainwater harvesting tanks, this method should have a fixed attenuation volume and a controlled outlet to discharge into the proposed SuDS feature. An overflow system will be required for implementation on the Site due to exceedance events (where the pumps fail or there is a blockage within the system / or the number of residents and subsequent water usage is reduced).

Roof run-off is generally less polluted than run-off from road surfaces but can still generate pollutants such as sediments. Pollutants would be captured by the collection and filtration system and, by reducing the volume of run-off generated from the Site. Primary screening devices are used to prevent leaves and other debris from entering the butt and first flush devices can be designed to divert the first part of the rainfall away from the main storage tank and can pick up most of the dirt, debris and contaminates that collect on a residential roof.



Modified from Figure 11.3 of the CIRIA SuDS Manual (C753) (2015)

Soakaway

A soakaway should be used to store run-off and infiltrate collected water gradually into the ground. Roof water should be collected and conveyed by underground pipes to the proposed soakaway. The base of the infiltration features should lie at an elevation at least 1 m above the highest winter groundwater levels, to ensure there is sufficient space for surface water to discharge. Soakaway excavation should be outside of the root zone of any protected trees and dimensions will depend on the depth to the sand layer where the soakaway is eventually situated.

Draining via soakaways means that property owners are less likely to pay for the utility company to drain surface water. In terms of future ownership and maintenance, where a soakaway drains a single property, the ownership and maintenance would be the property owner's responsibility. When a soakaway drains several properties, an agreement would have to be made between the property owners with regards to the maintenance. However, in the new sewers for adoption guidance, utility providers may adopt private soakaways and provide the necessary maintenance:

Soakaways: Adoption would normally include the whole structure up to the external face, including any external rubble fill or membrane.

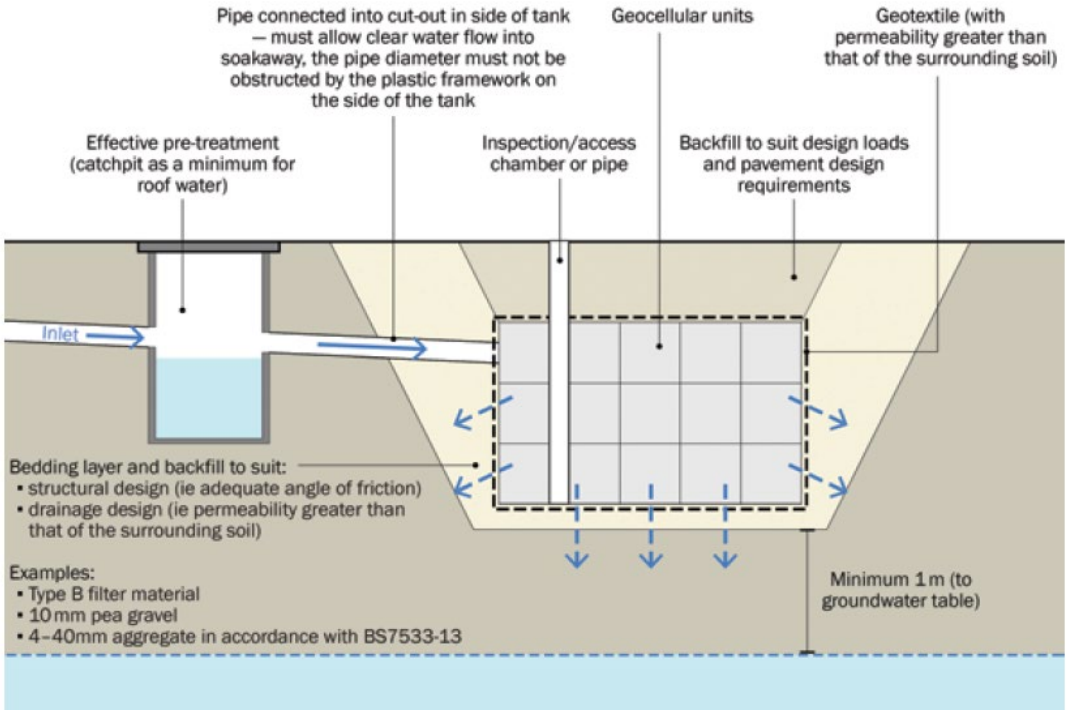


Figure 13.1 of the CIRIA SuDS Manual (C753) (2015)

Permeable paving

Unlined permeable paving is proposed for driveway and parking areas to intercept runoff. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2015) will improve water quality due to their filtration capacity and usually work to a 30% porosity. A geotextile layer will be required for paving underlain by aggregate material to intercept silt/particles. Permeable pavements are multi-layered surfacing systems. The surface layer is constructed out of permeable material allowing infiltration of water through gaps along its surface. A geomembrane isolates stored water from the surrounding soil, especially in contaminated areas and a geotextile layer prevents clogging and damage to the geo-cellular modules.

The geotextile layer works to intercept silt/particles flowing through the system via direct rainfall, or through vehicle use deposited onto the car park area and into the permeable paving. The majority of silt would be trapped within the top 30mm of the joining material between the paving blocks. Rainfall flowing into the permeable paving directly from the development roof/rainwater butts would not contain enough volumes of silt and or particles to cause blockage so will be fed directly into underlying porous substrate via rainwater pipes. Paving could implement an impermeable liner close to the building or creating a separate compartment within the permeable sub-base close to the building to further divert attenuated water away from building foundations.

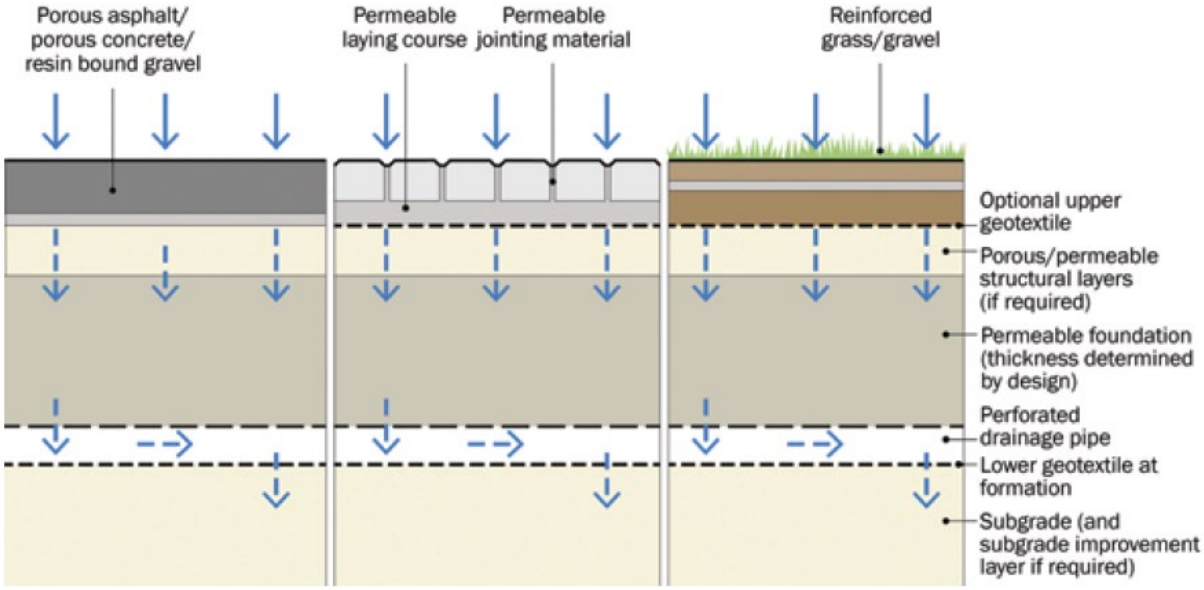


Figure 20.13 of the CIRIA SuDS Manual (C753) (2015)

Exceedance Flows

Exceedance flow routes are included within the proposed SuDS drainage layout. Where possible, exceedance flows should be directed away from buildings and into non-essential areas of the Site such as vacant landscaped areas. The SuDS system recommended for the Site should provide enough storage that this method would only be utilised during a worst-case scenario.

Secondary SuDS strategy:

Where infiltration to ground is not achievable at the Site, an attenuation volume of 41.85 m³ should be stored within SuDS features to accommodate the calculated 2 hour Critical Storm Duration for surface water discharge runoff, restricted to 2 l/s.

The SuDS features listed in the primary recommendations are still applicable to the secondary recommendation the Site.

Table 16. Proposed SuDS type, features, discharge location and rate restriction

SuDS type	Source control (interception) and attenuation SuDS.
SuDS features	Rainwater harvesting butt and lined permeable paving.
Discharge location	Drainage ditch.
Discharge rate	2 l/s (as close to the 1 in 1 year Greenfield runoff rate as possible, without increasing the potential for blockages).

Table 17. Proposed SuDS sizing (dimensions) and attenuation volumes

Rainwater Harvesting	A rainwater harvesting butt should be established for the proposed development. In terms of attenuation storage within this SuDS scheme, the volume of run-off which could be attenuated by rainwater harvesting has not been considered within the preliminary SuDS strategy.
Attenuation tank	An attenuation tank with a width of 4.5 m, length of 5 m and depth of 1 m filled with geo-cellular crates to a 95% void ratio is proposed. This attenuation tank will provide c. 21.38 m^3 attenuation. This tank is proposed to exclusively attenuate the runoff from the dwelling.
Lined permeable paving	A 317 m^2 area of permeable paving (underlain with a Type 3 aggregate material with a 30% porosity) within the proposed driveway areas to a depth of 0.30 m would result in c. 28.53 m^3 attenuation.
Total Attenuation Provided	49.91 m^3
Total Attenuation Required	47.31 m^3
Freeboard Storage Provided	2.60 m^3

Attenuation Tanks

Glass reinforced plastic (GRP) tanks or geo-cellular storage tanks/crates are proposed to provide the storage required. Attenuation tanks provide a below-ground void space for use of temporary storage via controlled release. They can also be modified to suit specific characteristics of a site. DEFRA, 2015 states that the run-off volume from the development to drain to any sewer or surface water body in the 1 in 100 year rainfall event must be constrained to a value as close as is reasonably practical to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development prior to redevelopment from the Site.

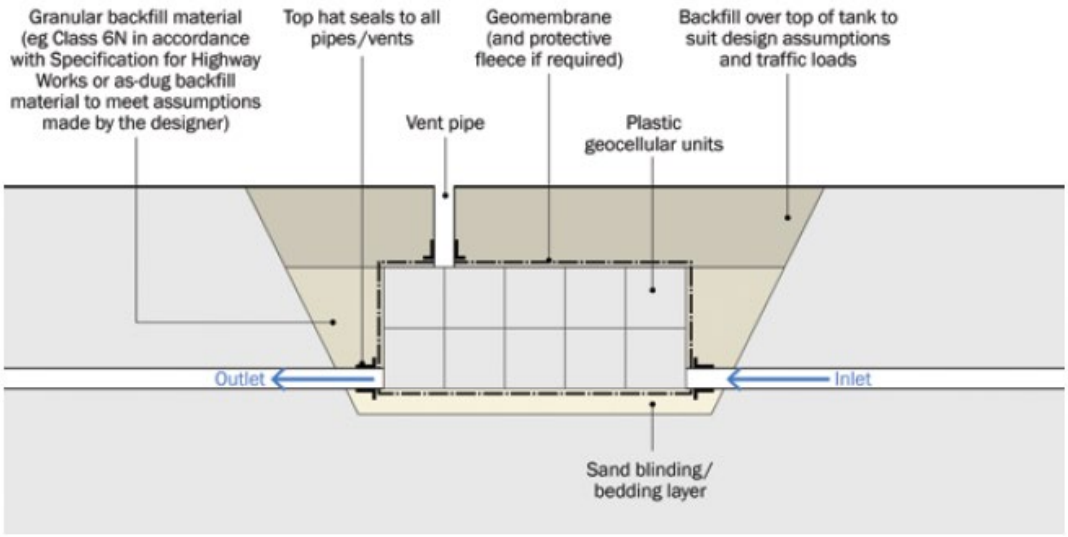


Figure 21.4 of the CIRIA SuDS Manual (C753) (2015)

Flow control devices and systems

Hydrobrake Flow control systems can be used to reduce the runoff rate from the Site. These are usually a device used for controlling water flow into a connecting feature, such as a sewer, to a specific attenuation performance. The design consists of an intake, a volute and an outlet and the configuration is critical to ensure discharge control. For drainage areas which are less than 3 ha, outlet throttle diameters would have to be small (<150mm diameter) to achieve outflow rates which could result in blockage. For most SuDS features, a flow control device will comprise a fixed orifice or a throttle such as a short pipe.

A Vortex Control is usually a self-activating vortex flow device which directs water into a volute to form a vortex. For the Site, rainwater down pipes from the development roof should drain directly into the attenuation feature to reduce infill from potential flood water.

Drainage protection devices

A non-return flap value is recommended for outflow pipes to reduce the risk of backflow from the channel during a large scale rainfall event.

10 SuDS maintenance

Regular maintenance is essential to ensure effective operation of the SuDS features over the intended lifespan of the proposed development. The SuDS Manual (C753) (CIRIA, 2015) provides a maintenance schedule for SuDS with details of the necessary required actions as shown in the Table below.

Table 18. SuDS operation and recommended maintenance requirements

Asset type	Maintenance schedule (and frequency)
Soakaways / attenuation tanks	Regular maintenance: • Remove sediment and debris from pretreatment and inspection chamber. Clean gutters, filters, downpipes. Trim roots prevent blockages (annually). • Reconstruct/ clean if performance deteriorates, replace clogged geotextile (as required) Monitoring: • Inspect inlets/outlets, silt traps – note rate of accumulation (monthly). • Check water levels and emptying time (annually).
Permeable pavements	Regular maintenance: • Brushing and vacuuming (three times per year). • Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required). Monitoring: • Initial inspection (monthly). • Inspect for poor performance and inspection chambers (annually).
Hydro-Brake Flow Control	Low amounts of maintenance required as there are no moving parts within the Hydro-Brake® Flow Control. • Initial monthly inspection at the manhole once the construction phase is over. If blockages occur they normally do so at the intake. Hydro-Brake® Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur. Inspection should be undertaken annually or when a storm event occurs.
Underground drainage pipe network	Regular maintenance: • Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber (annually). • Cleaning of gutters and any filters on downpipes (annually).

Asset type	Maintenance schedule (and frequency)
	• Trimming any roots that may be causing blockages (annually or as required). Monitoring: • Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually).
Rainwater Harvesting	Regular maintenance: • Inspection of tank for debris and sediment build up (annually and following poor performance). • Inspection of inlets, outlets, overflow areas, pumps and filters (annually and following poor performance). • Cleaning of tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required). Remedial actions: • Repair or overflow erosion damage or damage to tank and associated components (as required)

Client checklist

A drainage strategy has been recommended as suitable on the basis of the information provided. Prior to installation of the Site drainage system it is recommended that the client carries out the following checks to confirm the development proposals. GeoSmart would be able to support with any updates required to the drainage scheme, please contact us and we would be happy to provide you with a proposal to undertake the work.

Table 19. Potential SuDS limitations

Conditions in Non-Statutory Technical Standards (Defra, 2015), limitations to infiltration SuDS	Do these conditions arise at the Site?
Is the surface runoff greater than the rate at which water can infiltrate into the ground?	
Is there an unacceptable risk of ground instability?	
Is there an unacceptable risk of mobilising contaminants?	
Is there an unacceptable risk of pollution to groundwater?	
Is there an unacceptable risk of groundwater flooding?	
Is the infiltration system going to create a high risk of groundwater leakage to the combined sewer?	

Table 20. SuDS design considerations

Confirm that potential flooding on-Site in excess of the design storm event and exceedance flow routes have been considered.	
Review options for the control of discharge rates (e.g. hydrobrake).	
Confirm the owners/adopters of the drainage system. Consider management options for multiple owners.	
Is there an unacceptable risk of pollution to groundwater?	
Review access and way leave requirements.	
Review maintenance requirements.	

Health and safety considerations for SuDS

GeoSmart reports may include outline strategies or designs to support with development plans. Any drawings or advice provided do not comprise any form of detailed design. Implementation of any conceptual scheme options may constitute 'Construction Work' as defined by CDM Regulations (2015).

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional.

GeoSmart does not provide health and safety advisory services but we are required to advise you of your general responsibilities under CDM (visit http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/ for more information).

Please remember that detailed design work should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

11 Methodology and limitations of study

This report assesses the feasibility of infiltration SuDS and alternative drainage strategies in support of the Site development process. From April 6th 2015 SuDS are regulated by Local Planning Authorities and will be required under law for major developments in all cases unless demonstrated to be inappropriate. What is considered appropriate in terms of costs and benefits by the Planning Authority will vary depending on local planning policy, and Site setting. The Lead Local Flood Authority will require information as a statutory consultee on major planning applications with surface water drainage implications. The National Planning Policy Framework requires that new developments in areas at risk of flooding should give priority to the use of SuDS and demonstrate that the proposed development does not increase flood risk downstream to third parties.

How was the suitability of SuDS estimated for the Site?

There are a range of SuDS options available to provide effective surface water management that intercept and store excess runoff. When considering these options, the destination of the runoff should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2010) and Defra's National Standards for SuDS (2015):

1. Discharge to the ground;
2. Discharge to a surface water body;
3. Discharge to a surface water sewer;
4. Discharge to a local highway drain; and
5. Discharge to a combined sewer.

Data sets relating to each of the potential discharge options have been analysed to assess the feasibility of each option according to the hierarchy set out above. Hydrogeological characteristics for the Site are assessed in conjunction with the occurrence of SPZ's to assess infiltration suitability. The Site has been screened to determine whether flood risk from groundwater, surface water, fluvial or coastal sources may constrain SuDS. The distance to surface water bodies and sewers has been reviewed gauge whether these provide alternative options.

GeoSmart SuDS Infiltration Suitability Map (SD50)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the suitability for infiltration drainage in different parts of the Site and indicates where further assessment is recommended. In producing the SuDS Infiltration Suitability Map (SD50), GeoSmart used data from the British Geological Survey on groundwater levels, geology and permeability to screen

for areas where infiltration SuDS may be suitable. The map classifies areas into 3 categories of High, Medium and Low suitability for infiltration SuDS. This can then be used in conjunction with additional data on Site constraints to give recommendations for SuDS design and further investigation.

The primary constraint on infiltration potential is the minimum permeability of the underlying material and in some cases the range in permeability may be considerable, ranging down to low. The map classifies these areas as moderate infiltration suitability requiring further investigation. In cases where the thickness of the receiving permeable horizon is less than 1.5 meters then additional Site investigation is recommended. If the Site is at risk of groundwater flooding for up to the 1% annual occurrence the map classifies these areas as moderate infiltration suitability requiring further investigation.

The GeoSmart SuDS Infiltration Suitability Map (SD50) is a national screening tool for infiltration SuDS techniques but a Site specific assessment should be used before final detailed design is undertaken. Further information on the GeoSmart SuDS Infiltration Suitability Map (SD50) is available at geosmartinfo.co.uk

How is the suitability to discharge to sewers and watercourses calculated?

The suitability to discharge to discharge to sewers and watercourses has been calculated using the distance from the Site to both. For example, where the Site is within 50 m of a surface water body. Discharge to surface water is potentially appropriate subject to land access arrangements and a feasibility assessment. Where the Site is within 50 m of a sewer, discharge to sewer is potentially appropriate subject to land access arrangements and a feasibility assessment. The utility company should be contacted to agree connection feasibility and sewer capacity.

Further information relating to sewers available in the area can be found in Appendix C.

What is a Source Protection Zone?

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied. The zones are used to set up pollution prevention measures in areas which are at a higher risk. The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors. Inner zone (Zone 1) is defined as the 50 day travel time from any point below the water table to the source (minimum radius of 50 metres). Outer zone (Zone 2) is defined by a 400 day travel time. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

How was surface water runoff estimated from the Site?

In accordance with The SuDS Manual (C753) (CIRIA, 2015), the Greenfield runoff from the Site has been calculated using the IoH124 method and is assumed representative of the runoff generated on the undeveloped surfaces that are affected by the proposed development. The method used for calculating the runoff complies with the NPPF (MHCLG, 2024). For the impermeable surfaces, it has been assumed that 100% runoff will occur (calculations provided in Appendix B). Rainfall data is derived from the Flood Estimation Handbook (FEH), developed by NERC (2009). Only areas affected by the proposed development are considered in the flow and volume calculations. Permeable areas that remain unchanged are not included in the calculations as it is assumed these will not be actively drained and attenuated.

What is the peak discharge rate?

An estimation of peak runoff flow rate and volume is required to calculate infiltration, storage and discharge requirements. The peak discharge rate is the maximum flow rate at which surface water runoff leaves the Site during a particular storm event, without considering the impact of any mitigation such as storage, infiltration or flow control. Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. If all drainage is to infiltration there will be no discharge off-Site. Discharging all flow from Site at the existing 1 in 100 event would increase flood risk during smaller events. Flow restriction is generally required to limit the final discharge from Site during all events as a basic minimum to the green field QBAR rate. A more complex flow restriction which varies the final discharge rate from the Site depending on the storm event will reduce the volume of storage required on-Site. Drainage to infiltration SuDS is subtracted from the total discharge off-Site to achieve a beneficial net affect.

What is the total discharge volume?

The total discharge volume is calculated on the basis of the surface water runoff that has the potential to leave the Site as a result of the assumed 6 hour duration design storm event. The runoff is related to the underlying soil conditions, impermeable cover, rainfall intensity and duration of the storm event. The total volume generated by the current Site is compared to the potential total volume from the developed Site (not taking into consideration any mitigation). The difference provides the minimum total volume that will need to be stored and infiltrated on-Site or released at a controlled rate. Guidance indicates that the total discharge volume should never exceed the runoff volume from the development Site prior to redevelopment for that event and should be as close as is reasonably practicable to the Greenfield runoff volume.

12 Background SuDS information

SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our website: http://geosmartinfo.co.uk/

Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on-Site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on-Site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the Site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the Site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole Site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns.

According to the guidance in Building Research Establishment (BRE) Digest 365 (2016) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

SuDS maintenance and adoption

Regular maintenance is essential to ensure effective operation of the soakaway(s) over the intended lifespan of the proposed development. A maintenance schedule for SuDs is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website: http://geosmartinfo.co.uk/

13 Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: FloodSmart Report		The FloodSmart Report range provides clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at a Site. Our consultants assess available data to determine the level of risk based on professional judgement and years of experience. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

14 References and glossary

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Ministry of Housing, Communities & Local Government (2022). National Planning Policy Guidance (NPPG).

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Thames Water (2025). Asset Location Plan. Ref: ALS/ALS Standard/2025_5162327

GeoSmart Information

Glossary

General terms

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

The terms included in this glossary have been taken from CIRIA (2015) guidance.

Data Sources

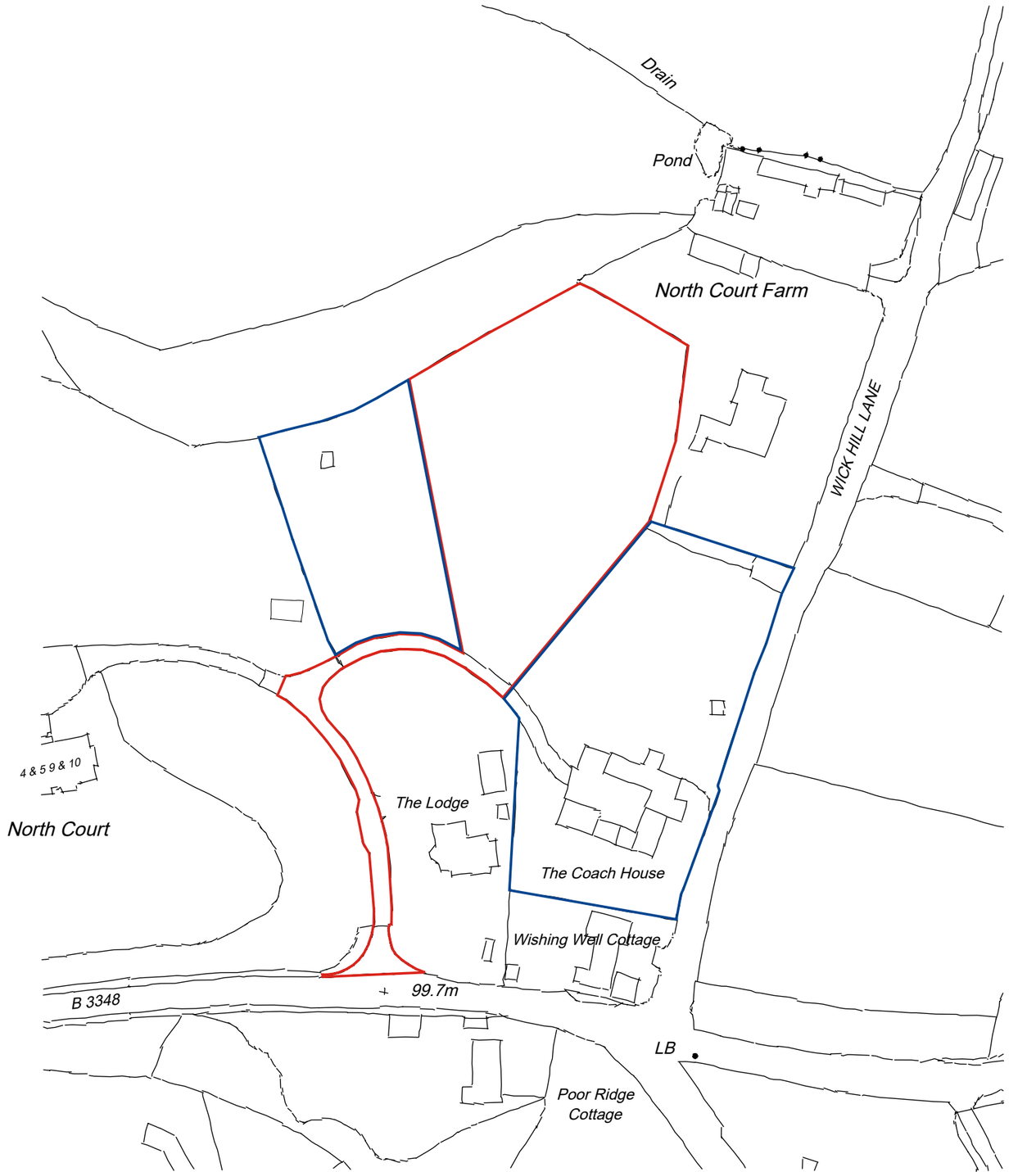
Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2025 BlueSky copyright and database rights 2025
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2025 Ordnance Survey data © Crown copyright and database right 2025
Flood Risk (RoFRS/Pluvial/Surface Water Features/SPZ)	Environment Agency copyright and database rights 2025 Ordnance Survey data © Crown copyright and database right 2025
Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2025) Contains British Geological Survey materials © NERC 2025 Ordnance Survey data © Crown copyright and database right 2025
Sewer Location	Contains Ordnance Survey data © Crown copyright and database right 2025 Contains Thames Water search data 2025
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2025 Environment Agency copyright and database rights 2025

15 Appendices

GeoSmart Information

Appendix A

Site plans



EXISTING LOCATION PLAN 1:1250

1:1250 scale Bar
This Drawing has been produced for printing onto A3 size paper,

0m 6.25m 12.5m 25m 50m 100m

REV	COMMENTS	DATE

TC Biggin Architecture
ARCHITECTURE & PLANNING
www.tcbarchitecture.co.uk • info@tcbarchitecture.co.uk • 07889 218936

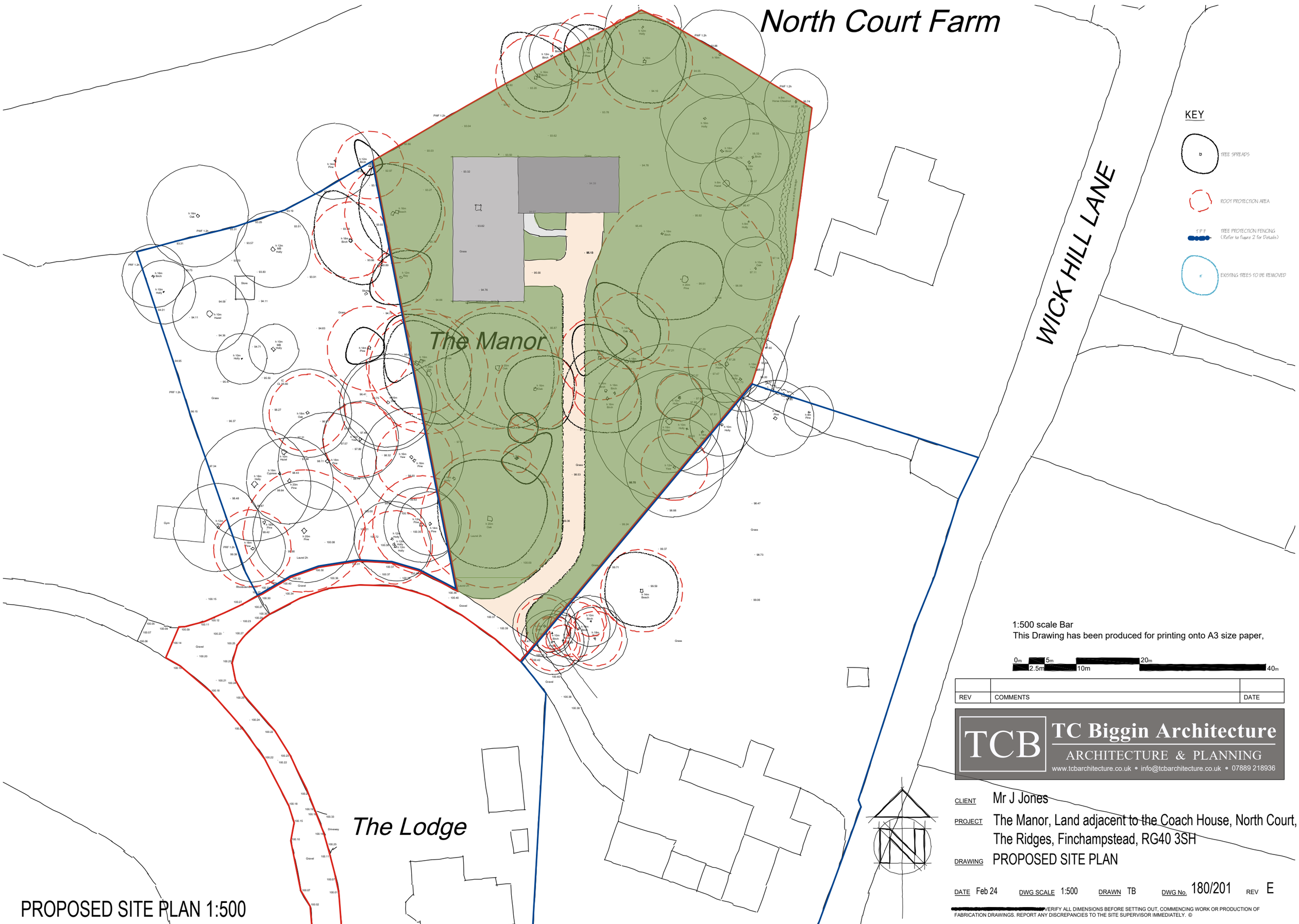
CLIENT Mr J Jones

PROJECT The Manor, Land adjacent to the Coach House, North Court, The Ridges, Finchampstead, RG40 3SH

DRAWING EXISTING LOCATION PLAN

DATE Feb 24 DWG SCALE 1:1250 DRAWN TB DWG No. 180/200 REV E

[redacted] VERIFY ALL DIMENSIONS BEFORE SETTING OUT, COMMENCING WORK OR PRODUCTION OF FABRICATION DRAWINGS. REPORT ANY DISCREPANCIES TO THE SITE SUPERVISOR IMMEDIATELY. ©



1:500 scale Bar
This Drawing has been produced for printing onto A3 size paper,

0m 5m 20m
2.5m 10m 40m

REV	COMMENTS	DATE

TC Biggin Architecture
ARCHITECTURE & PLANNING
www.tcbarchitecture.co.uk • info@tcbarchitecture.co.uk • 07889 218936

CLIENT Mr J Jones

PROJECT The Manor, Land adjacent to the Coach House, North Court, The Ridges, Finchampstead, RG40 3SH

DRAWING PROPOSED SITE PLAN

DATE Feb 24 DWG SCALE 1:500 DRAWN TB DWG No. 180/201 REV E

[redacted] VERIFY ALL DIMENSIONS BEFORE SETTING OUT, COMMENCING WORK OR PRODUCTION OF FABRICATION DRAWINGS. REPORT ANY DISCREPANCIES TO THE SITE SUPERVISOR IMMEDIATELY. ©

GeoSmart Information

Appendix B

Rainfall runoff calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Depth (m)
Dwelling	0.040	10.000	1.600

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
30	0	10	0
100	0	10	0
100	40	10	0

Node Dwelling Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	8.400	Depth (m)	1.000
Side Inf Coefficient (m/hr)	0.03600	Time to half empty (mins)	1181	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	5.750	Number Required	1
Porosity	0.95	Pit Length (m)	6.000		

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Dwelling	344	8.598	0.198	1.1	6.5834	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
360 minute winter	Dwelling	Infiltration	0.2

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Dwelling	352	8.907	0.507	2.4	16.8812	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
360 minute winter	Dwelling	Infiltration	0.2

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Dwelling	352	9.055	0.655	3.0	21.8239	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
360 minute winter	Dwelling	Infiltration	0.2

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Dwelling	472	9.359	0.959	3.3	31.9647	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
480 minute winter	Dwelling	Infiltration	0.3

Input parameters for run-off calculations		
Country	England	
Total site area	5095	m^2
Area proposed for development	4441	m^2
Current permeable ground cover	4441	m^2
Current impermeable ground cover	0	m^2
Proposed permeable ground cover	3657.8	m^2
Proposed impermeable ground cover	712	m^2
Urban Creep Allowance	10%	
Final impermeable ground cover	783.2	m^2
SPR	0.37	
SAAR	668	mm
Region	6	
Climate change factor	40%	
Discharge Rate (l/s)	2.0	
Run-off coefficient	100%	

Current impermeable area as % of total	0%
Proposed impermeable area as % of total	18%
Change in permeable area (m2)	-783
Change in impermeable area (m2)	783
Change in impermeable area as % of total	18%

Rainfall event	Greenfield run-off rates (l/s)	Existing run-off rates(l/s)	Potential run-off rates without attenuation (l/s)	Potential minus exisiting (l/s)
QBAR	1.21	N/A	N/A	N/A
6 hour 1 in 1 year	1.03	1.03	2.55	1.52
6 hour 1 in 10 year	1.96	1.96	4.37	2.42
6 hour 1 in 30 year	2.71	2.71	5.58	2.88
6 hour 1 in 100 year	3.85	3.85	6.97	3.12
6 hour 1 in 100 year + 20% CC	N/A	N/A	8.37	4.51
6 hour 1 in 100 year + 40% CC	N/A	N/A	9.76	5.91

Rainfall event	Greenfield run-off volume (m^3)	Existing run-off volume (m^3)	Potential run-off volume without attenuation (m^3)	Potential minus existing (m^3)
QBAR	45.48	N/A	N/A	N/A
6 hour 1 in 1 year	42.33	42.33	55.04	12.71
6 hour 1 in 10 year	73.33	73.33	94.44	21.10
6 hour 1 in 30 year	92.76	92.76	120.61	27.85
6 hour 1 in 100 year	115.81	115.81	150.59	34.78
6 hour 1 in 100 year + 20% CC	N/A	N/A	180.70	64.89
6 hour 1 in 100 year + 40% CC	N/A	N/A	210.82	95.01

Return Period	Runoff rate restriction (l/s)	Critical Storm Duration (hr)	Attenuation Volume Required (m^3)	Volume required above previous return period
1 in 30 year	2.00	1	21.10	N/A
6 hour 1 in 100 year	2.00	2	29.68	8.57
6 hour 1 in 100 year + 40% CC	2.00	2	47.31	17.63

GeoSmart Information

Appendix C

Thames Water Asset Location Plan

Asset Location Search

Property Searches

Geosmart Information Ltd
Suite 9-111st FloorOld Bank Bu
SHREWSBURY
SY1 1HU

Search address supplied The Coach House
North Court
The Ridges
Finchampstead
Wokingham
RG40 3SH

Your reference 84759

Our reference ALS/ALS Standard/2025_5162327

Search date 12 May 2025

Keeping you up-to-date

Notification of price changes

We're changing our report prices from 4th June 2025. The price will increase by 3.5% based on Retail Price Index (RPI).

Find our new prices on our website thameswater.co.uk/property-searches

Any Questions? We're happy to talk through the changes with you – give our Property Searches team a call on 0800 009 4540 .

Thames Water Utilities Ltd
Property Searches,
Clearwater Court, Vastern Road, Reading RG1 8DB

property.searches@thameswater.co.uk
thameswater.co.uk/propertysearches

0800 009 4540

Asset Location Search

Property Searches

Search address supplied: The Coach House, North Court, The Ridges, Finchampstead, Wokingham, RG40 3SH

Dear Sir / Madam

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

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

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

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

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

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

Contact Us

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

Thames Water Utilities Ltd
Property Searches
Clearwater Court
Vastern Road
Reading
RG1 8DB

Email: property.searches@thameswater.co.uk
Web: thameswater.co.uk/propertysearches

Asset Location Search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority. Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners. The public sewer map relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus. The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

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

Clean Water Services

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

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

South East Water

Asset Location Search

Property Searches

Rocfort Road
Snodland
Kent
ME6 5AH

Tel: 0845 301 0845

www.southeastwater.co.uk.

For your guidance:

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

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. You can do this by emailing customer.feedback@thameswater.co.uk with the email subject header 'Enquiry – TWOSA', along with details of the request.

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

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

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

Clean Water queries

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

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

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

Asset Location Search Sewer Map - ALS/ALS Standard/2025_5162327

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 480102,163709

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

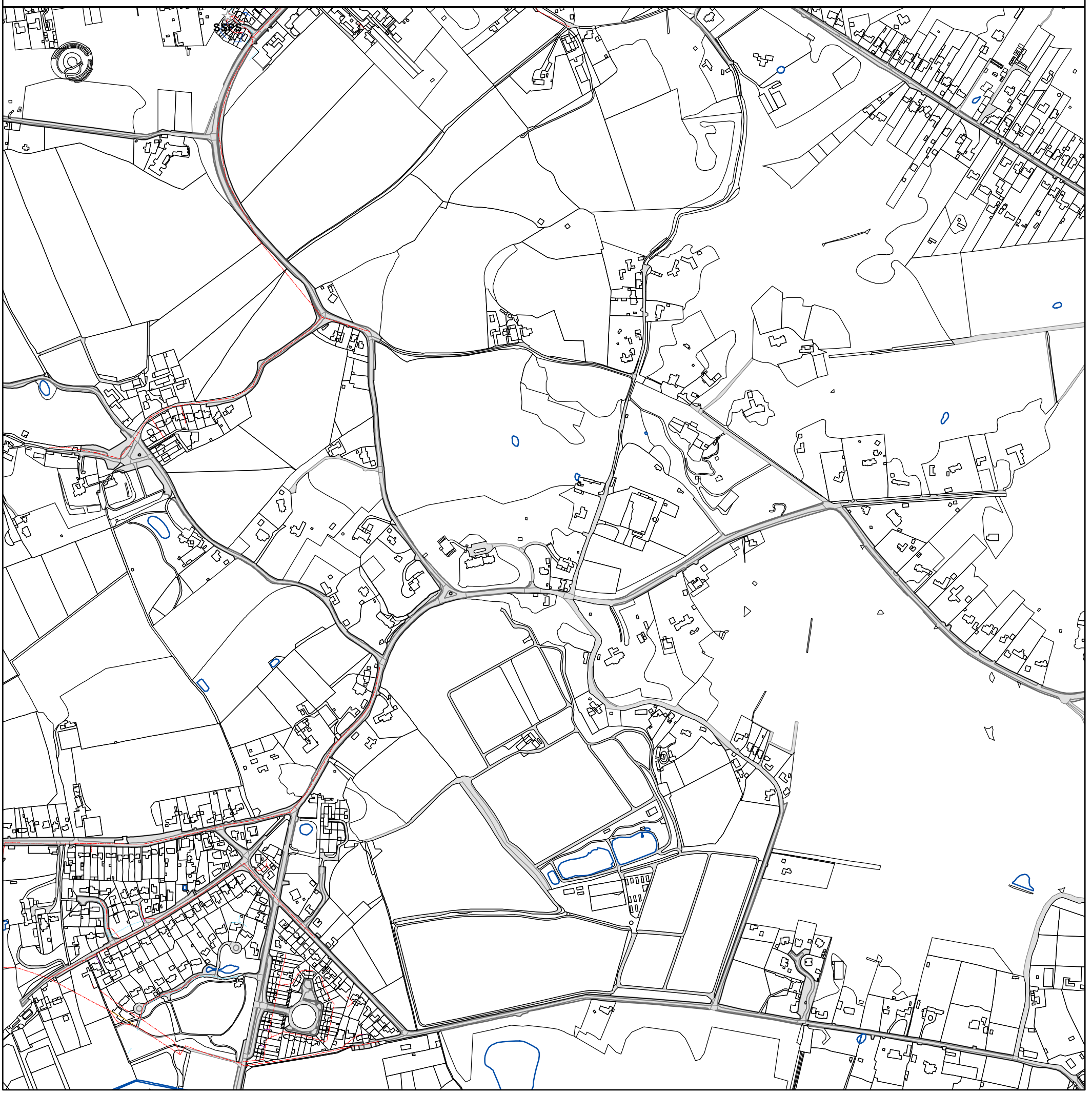
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a

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

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2025_5162327



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	SAshok1
Print Date:	12/05/2025
Map Centre:	480083,163689
Grid Reference:	SU8063NW

Comments:

ALS/ALS Standard/2025_5162327

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
111B		
6902	62.02	60.96
7401	86.33	84.86
7701	56.21	55.51
4805	56.08	54.52
7302	82.29	80.69
6904		
6701	56.7	54.5
3001	59.36	58.03
5704		
5901	80.85	79.27
6801	59.58	57.53
5707	58.29	56.05
5501	70.37	68.61
7702	56.91	55.02
7001	78.92	77.39
3804	55.53	53.95
2951	58.73	57.94
4704		
2953		
4703		
5102	62.7	59.98
4102	64.92	63.45
5701	55.01	53.76
6807	61.95	60.04
2802	98.71	96.71
3806	56.09	54.28
5706	57.84	56.22
2801	56.21	54.37
4401	71.3	69.55
3701		
5201	74.78	72.1
3902	59.27	57.83
3002	60.2	59.14
2101	61.11	59.52
2102	61	59.91
3051	59.38	58.39
4804	56.28	54.72
4101	66.38	64.88
6805	62.05	60.3
6704	58.4	57.12
6301	78.09	76.47
5703		
6001	77.14	75.62
6806	62.11	61.48
4901	56.51	54.89
5902	80.06	78.52
5001	79	77.36
6703	58.53	56.65
7402	86.02	83.99
2801	99.47	96.89
1802	57.21	54.96
3901	88.12	86.76
3807	55.56	53.95
1601		
111A		
761A		
761D		
4901	83.97	82.6
5702	55.04	53.84
281B		
4806	57.14	55.74
5901	57.7	56.32
291A		
2803	96.84	94.75
5652	69.707	67.727
5655	68.57	67.29
561Q		
561C		
561E		
561G		
561J		
461A		
561M		
561O		
561S		
561U		
561W		
461B		
461D		
561Z		

REFERENCE	COVER LEVEL	INVERT LEVEL
111D		
6901	62.08	61.68
4701	54.78	53.43
2902	59.57	57.62
4802	56.07	54.48
7303	80.22	78.48
6101	76.39	73.96
6903	61.96	60.64
2901	57.93	56.05
3903	85.03	83.43
6803		
5601	69.76	67.47
5802		
5801		
3902	87.37	84.49
3101	62.58	61.1
2903	59.46	57.87
3901	58.49	56.95
2051	60.7	59.49
2952	59.33	58.59
2804	93.1	91
2002	60.6	59.14
1901	57.43	54.73
6202	71.22	69.7
3802		
6702	58.49	56.17
3805	56.16	54.38
2050	61.42	60.04
2001	61.26	59.66
3802	56.12	54.35
4801	56.34	54.7
6802	59.74	58.19
1801	57.21	55.15
3808	55	53.76
2103	61.1	59.84
3809		
4001	60.94	59.19
4301	72.72	70.58
5705	57.63	56.31
6804	61.19	59.97
5001	62.18	60.75
3050	60.19	58.89
3705		53.18
5101	68.56	67.14
4803	56.44	54.91
5603	69.44	67.85
5602	69.58	67.78
6905	64.38	62.78
6201	73.77	72.35
6102	76.85	75.2
1801	98.85	97.21
3950		
3801		
3801	90	88.36
0602		
111C		
761B		
761E		
3803	56.15	54.23
7301	84.62	82.8
3003	59.33	58.46
4902	56.66	55.12
561A		
281A		
562C		
5654	68.855	67.352
5651	69.542	67.502
561B		
561D		
561F	68.5	67
561I		
561K		
561L		
561N		
561P		
561T		
561V		
561X		
461C		
461E		
562A		

ALS/ALS Standard/2025_5162327

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
562B		
562E		
681A		
581A		
571A		
781A		
781D		
491B		
491D		
491G		
391B		
381C		
381A		
1101	60.09	58.55
761F		
491A		
301B		
581C		
501A		
501B		
771A		
771D		
291B		
701F		
701D		

REFERENCE	COVER LEVEL	INVERT LEVEL
562D		
591A		
781E		
571B		
781C		
781B		
491A		
491C		
491E		
391A		
381A		
281C		
0101	59.07	57.82
761C		
761G		
301A		
301C		
511A		
501D		
501C		
771B		
771C		
291C		
701E		
562F		

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

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

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

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

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

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

- Conduit Bridge
- Subway
- Tunnel

Notes:

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

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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Further information

Information on confidence levels and ways to improve this report can be provided for any location on written request to info@geosmart.co.uk or via our website. Updates to our model are ongoing and additional information is being collated from several sources to improve the database and allow increased confidence in the findings. Further information on groundwater levels and flooding are being incorporated in the model to enable improved accuracy to be achieved in future versions of the map. Please contact us if you would like to join our User Group and help with feedback on infiltration SuDS and mapping suggestion.

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Liz Lloyd

Finance Manager

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

support@geosmartinfo.co.uk

16 Terms and conditions, CDM regulations and data limitations

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CDM regulations can be found on our website:

http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/

Data use and limitations can be found on our website:

http://geosmartinfo.co.uk/data-limitations/