

Surface water drainage strategy

To accompany a planning application at
**11 Old Bath Road, Sonning,
Reading, RG4 6SZ**

Prepared by

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Scope

Note: this report can only be assessed under the scope it is intended for as set out below:

Town and Country Planning Act 1990

The scope of this report includes the provision of supplementary information in relation to a planning application set under the provision of this Act and is intended to meet the requirements for “particulars” under Section 62; (3) & (4A) of same.

Building Act 1984

Building Regulations 2010 and Statute control

This report **is not** provided in support of any application made under the Building Act 1984 or related Regulations.

Statement of conformity

While this report cannot therefore be lawfully assessed by any persons, in any capacity, for compliance with the above Building Regulations all drainage on this private site, both foul and SW will be subject to full compliance with Part H of the Building Regulations 2010 (as amended 2013).

Hence all construction details, SW runs, pipe diameters etc. as detailed in this report are designed to comply in full with the “Adequate provision” Requirement of Part H and are to be checked, inspected, tested and approved by the Building Control Body of the clients choice at the time of detailed design and construction.

SuDS design additional standards

All SuDS (Sustainable drainage system) on site will also be designed and installed in accordance with CIRIA 753 & CIRIA 768, para 169 of the NPPF, its supporting technical guidance and the DEFRA Non-Statutory Technical standards for sustainable drainage systems (2015).

1 Executive Summary

- A All surface water arising can be managed on site.
- B All surface water arising from roofed areas is controlled by direct infiltration through soakaways.
- C Water butt(s) provide additional SuDS on site.
- D All areas of hard standing on the site will be constructed using a permeable medium.
- E All SuDS on site will be installed with full consideration to long term maintenance.
- F The use of SuDS techniques on site will mitigate and treat the run-off volumes.

2 Introduction

2.1 Site location

The development is on land at 11, Old Bath Road, Sonning, Reading, RG4 6SZ (see Figure 1).

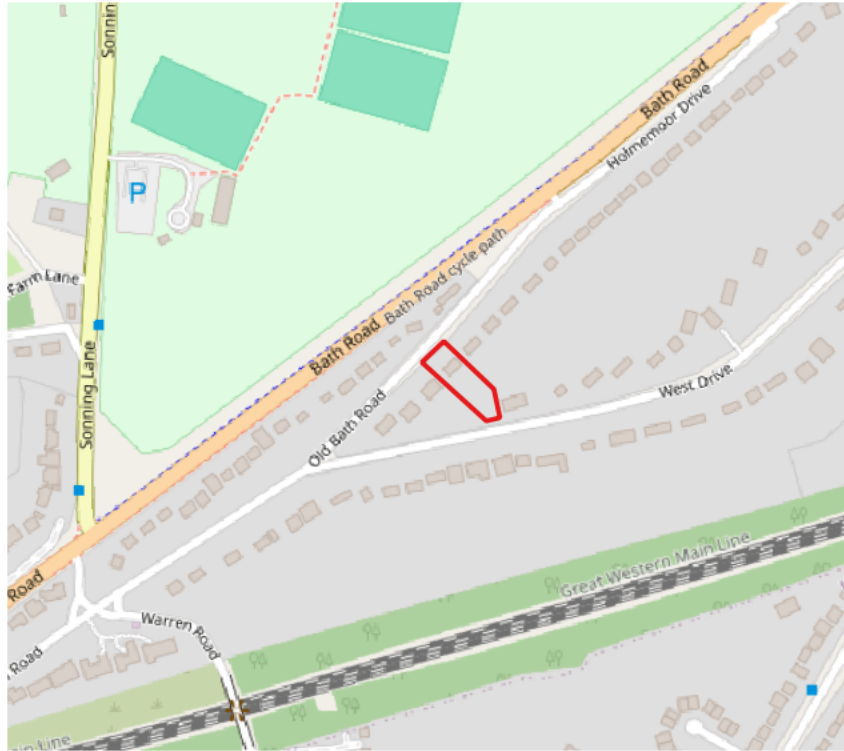


Figure 1: Site location plan, as indicated (source: Open streetmap)

2.2 Proposed development description

The proposal is for a new dwelling following the demolition of the existing dwelling on the site. All plans as submitted with the planning application.

2.3 Site geology

Refer to Geo Insight report at Appendix A.

2.3.1 Infiltration rates

Infiltration rates for the site are based on infiltration testing with a values of $1.7 \times 10^{-5} \text{ ms}^{-1}$ at sub-base depth and $3.9 \times 10^{-5} \text{ ms}^{-1}$ at soakaway operational depth.

Data and analysis at Appendix B.

2.3.2 Water table

Ground water was not encountered within 1m of the base of any infiltration feature.

2.4 Existing flow paths

There is no evidence of SuDS on the existing site.

2.5 Green field rates

This site is less than 50 ha therefore runoff rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments'^[1]. The pro rata method on the size of catchment detailed in table 4.2 of the SuDS manual^[2] has been used.

2.5.1 Formula

For catchments less than 50ha:

$$Q_{BAR50ha} = 1.08 (50/100)^{0.89} * SAAR^{1.17} * SPR^{2.17} \quad (1)$$

$$Q_{BAR} = Q_{BAR50ha} * \frac{A}{50} \quad (2)$$

$$Q_{1yr} = Q_{BAR} * 0.85 \quad (3)$$

$$Q_{100yr} = Q_{BAR} * GC_{100} \quad (4)$$

2.5.2 Variables

$Q_{bar}/Q_{med} = 0.85$

$SAAR = 647\text{mm}$

Hydrological Region 6

Growth curve factors: 30 yr = 2.3; 100 yr = 3.19

$SPR = 0.47$

2.5.3 Calculations

$$\begin{aligned}Q_{BAR50ha} &= 1.08 * 0.5^{0.89} * 647^{1.17} * 0.47^{2.17} \\&= 0.58 * 1944.28 * 0.19 \\&= 220.15\end{aligned}$$

Using Equation 2:

$$\begin{aligned}Q_{BAR} &= \frac{220.15 * 0.19}{50} \\&= 0.85 \text{ l s}^{-1}\end{aligned}$$

Using Equation 3:

$$\begin{aligned}Q_1 &= 0.85 * 0.85 \\&= 0.72 \text{ l s}^{-1}\end{aligned}$$

Using Equation 4:

$$\begin{aligned}Q_{100} &= 0.85 * 3.19 \\&= 2.70 \text{ l s}^{-1}\end{aligned}$$

2.5.4 Peak run-off rates

For the 1 year Return Period event the peak runoff calculates to 0.72 l s^{-1}

For the 30 year Return Period event the peak runoff calculates to 1.95 l s^{-1}

For the 100 year Return Period event the peak runoff calculates to 2.70 l s^{-1}

3 SuDS Principles

In line with the SuDS management train, the following hierarchy has been considered in applying the use of SuDS into the proposed development scheme.

3.1 SuDS design philosophy

The CIRIA SuDS^[2] manual provides the design philosophy:

“SuDS design should, as much as possible, be based around the following:

- using surface water runoff as a resource
- managing rainwater close to where it falls
- managing runoff at the surface
- allowing rainwater to soak into the ground
- promoting evapotranspiration
- slowing and storing run-off to mimic natural runoff characteristics
- reducing contamination of runoff through pollution prevention and controlling the runoff at source
- treating runoff to reduce the risk of urban contaminants causing environmental pollution.”

3.2 Source control

- Sedum roofing.
- Infiltration devices. Typically soakaways.
- Rainwater harvesting.
- Bio-retention planting, rain gardens.
- Permeable paving, porous asphalt. These provide both infiltration and short term storage volumes thus reducing overall un-mitigated run-off volumes.

3.3 “End of pipe” solutions

To be considered only after implementation of the above options.

- Retention tanks with outfall controlled by hydraulic means to limiting discharge rates and volumes to discharge to existing SW flow pathways.

Sections 4.2 to 4.6 consider the viability of a range of these SuDS devices.

4 Appraisal of SuDS options

The primary aim is to meet the requirements of the Local Plan core policies and the SuDS hierarchy so as to manage SW on site.

4.1 Site constraints impacting on SuDS

- No access to adjacent water course or ditch.
- Pitched roof design.

4.2 Infiltration devices

With reference to Section 3.1, soakaways promote the following SuDS design criteria:

- manages rainwater close to where it falls
- allows rainwater to soak into the ground
- slows and stores run-off to mimic natural run-off characteristics
- treats run-off to reduce the risk of urban contaminants causing environmental pollution.

4.3 Permeable hard standing

With reference to Section 3.1, permeable paving promotes the following SuDS design criteria:

- manages rainwater close to where it falls
- manages runoff at the surface
- allows rainwater to soak into the ground
- slows and stores run-off to mimic natural runoff characteristics
- treats runoff to reduce the risk of urban contaminants causing environmental pollution.

4.3.1 Permeable paving

A 30% void ratio is assumed through a 350mm sub-base. This is appropriate for a DOT Type 3 Sub-base hence the storage capacity equates to circa 105mm per 1m² therefore based on a M6 100hr + cc storm of 87mm rainfall the paving offers, without any allowance for infiltration, a circa 1:1.2 drained volume:storage volume capacity. Hence there is no anticipated exceedance flow from the areas of permeable paving.

TSS 0.7, Metals 0.6, Hydrocarbons 0.7 = suitable for trafficked areas

All permeable paving offers sufficient storage volume to accommodate the 5mm event.

4.4 Rainwater harvesting

With reference to Section 3.1, Rainwater harvesting promotes the following SuDS design criteria:

- uses surface water runoff as a resource
- manages rainwater close to where it falls

and:

- stores rainwater for later use

4.4.1 For external use

Rain water harvesting / water butts: These provide additional, “off line”¹ SuDS, and are deemed a suitable SuDS component for small plots^[2], extract at Figure 2. The image shows a water butt in “off-line” configuration using a standard diverter.

¹The term “off-line” refers to the fact that a water butt is a harvesting device that is not “in-line” in the same manner that a pipe is in-line. Water is collected (harvested) until the water butt is full. When full, the rainwater continues down the rainwater pipe. Outflow from the tank is not “automatic” since this would negate the reason to harvest rainwater. Instead, manual drawdown occurs with the harvested water being used for external uses. Since a water butt may be full, the useful volume is not accounted for in storage and run-off calculations.



Figure 10.7 On-plot SuDS (courtesy Ilman Young, Robert Bray Associates)

There are many opportunities for small on-plot SuDS, such as downpipe reconnections to rain gardens, planted rills and water butts.

Figure 2: Use of water butts as provided in the SuDS manual

The collection and re-use of water can reduce run off volumes arising from roofs. The collected water, via readily available diverters (e.g. Web link: [Standard diverter example](#), as per Figure 3), being used for external uses.



Figure 3: Standard rainwater diverter

Rainwater butts can, in part, accommodate the 5mm event dependent on manual drawdown and evaporation.

4.5 Sedum/green roofs.

Due to site constraints these are not found suitable for this site.

4.6 “End of pipe” solutions

Not required.

5 Proposed surface water disposal strategy

The following sections consider the strategy for water arising from the roof areas, driveways and hard standing and areas of landscaping.

5.1 Soakaways

With Reference to Table 26.2 of the SuDS Manual, pollution hazard indices for:

Domestic Roofs are 0.2 (TSS), 0.2 Metals & 0.05 Hydrocarbons.

Mitigation provided = 0.3, 0.3 & 0.3 hence satisfactory for domestic roof run-off.

5.1.1 Front roof area 142m²

All surface water arising from the area of new roofing is controlled by direct infiltration through a soakaway. Notes:

- For this report the drained area to the soakaway(s) arises from the area of new roofing plus a 1.1 allowance for urban creep.
- The soakaway is designed for all events up to and including the M100 6hr event.
- An allowance of x1.4 is made for climate change in line with current best practice.
- FEH22 point rainfall data used.

Designed to CIRIA C753, and to accommodate all surface water arising from a drained area of 142m² requires 1 , 95% void ratio soakaway 3m wide x 4m long with a 0.8m effective depth. See Table 1.

Permeability	3.90E-05	ms ⁻¹
Urban Creep	1.1	
Drained area	142	m ²
Designed drained area	156.2	m ²
Return Period	100	yr
% voids	95	%
Climate change	1.4	
Factor of Safety	1.5	

Design Width, m	3
Design Length, m	4
Design Depth _{eff} , m	0.8
Design Qty	1

Duration, mins	5	10	15	30	60	120	240	360	600	1440
Duration, hrs	0.08	0.17	0.25	0.5	1	2	4	6	10	24
Intensity, mm/hr	154.8	154.2	154.4	101.2	63.6	37.8	22.1	15.9	10.4	4.9
H max, m	0.17	0.33	0.50	0.63	0.73	0.75	0.65	0.52	0.26	-0.25

Max depth, m	0.75
Crit Duration, mins	105
Empty to 50%, hrs	2.32

Table 1: CIRIA C753 Calculation results

The maximum design head with respect to the critical storm duration is shown in Figure 4.

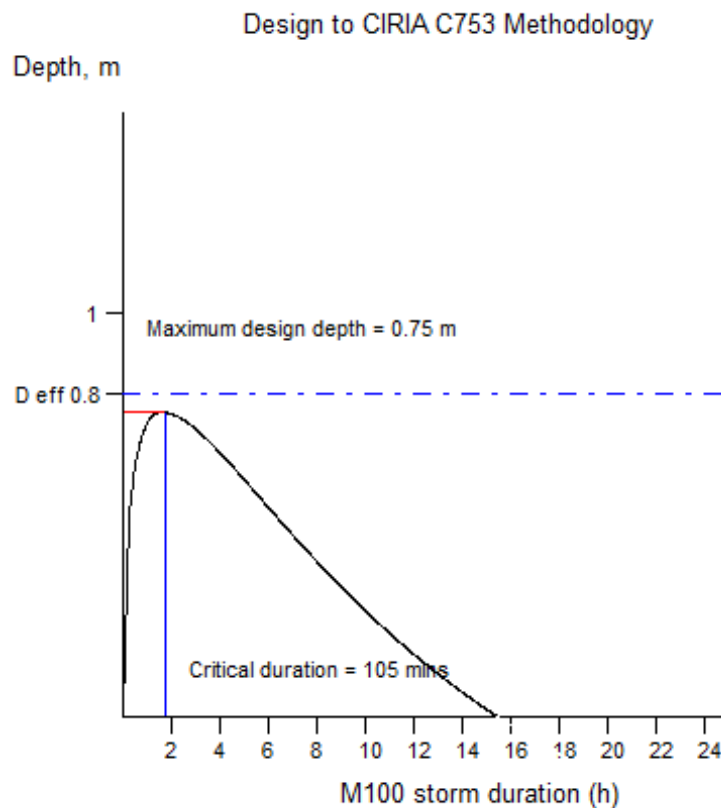


Figure 4: Critical storm duration and max design depth

5.1.2 Soakaway detail

The soakaway is designed to use open crates offering a circa 95% void ratio, encased within a geotextile membrane and provided with circa 450mm minimum cover. A typical detail is shown in Figure 7.

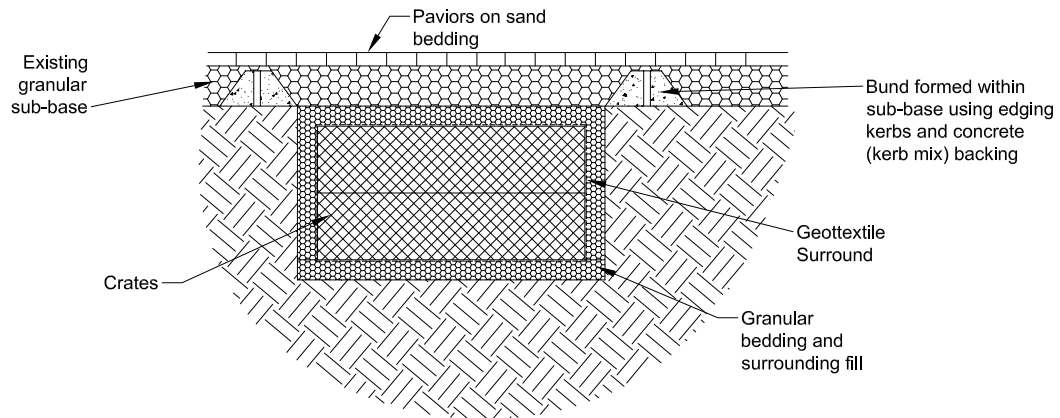


Figure 5: Typical soakaway details

5.1.3 Rear roof area + outbuilding 155m²

All surface water arising from the area of new roofing is controlled by direct infiltration through a soakaway. Notes:

- For this report the drained area to the soakaway(s) arises from the area of new roofing plus a 1.1 allowance for urban creep.
- The soakaway is designed for all events up to and including the M100 6hr event.
- An allowance of x1.4 is made for climate change in line with current best practice.
- FEH22 point rainfall data used.

Designed to CIRIA C753, and to accommodate all surface water arising from a drained area of 155m² requires 1 , 95% void ratio soakaway 3m wide x 4.5m long with a 0.8m effective depth. See Table 2.

Permeability	3.90E-05	ms ⁻¹
Urban Creep	1.1	
Drained area	155	m ²
Designed drained area	170.5	m ²
Return Period	100	yr
% voids	95	%
Climate change	1.4	
Factor of Safety	1.5	

Design Width, m	3
Design Length, m	4.5
Design Depth _{eff} , m	0.8
Design Qty	1

Duration, mins	5	10	15	30	60	120	240	360	600	1440
Duration, hrs	0.08	0.17	0.25	0.5	1	2	4	6	10	24
Intensity, mm/hr	154.8	154.2	154.4	101.2	63.6	37.8	22.1	15.9	10.4	4.9
H max, m	0.16	0.32	0.48	0.61	0.71	0.73	0.63	0.50	0.24	-0.28

Max depth, m	0.73
Crit Duration, mins	90
Empty to 50%, hrs	2.32

Table 2: CIRIA C753 Calculation results

The maximum design head with respect to the critical storm duration is shown in Figure 6.

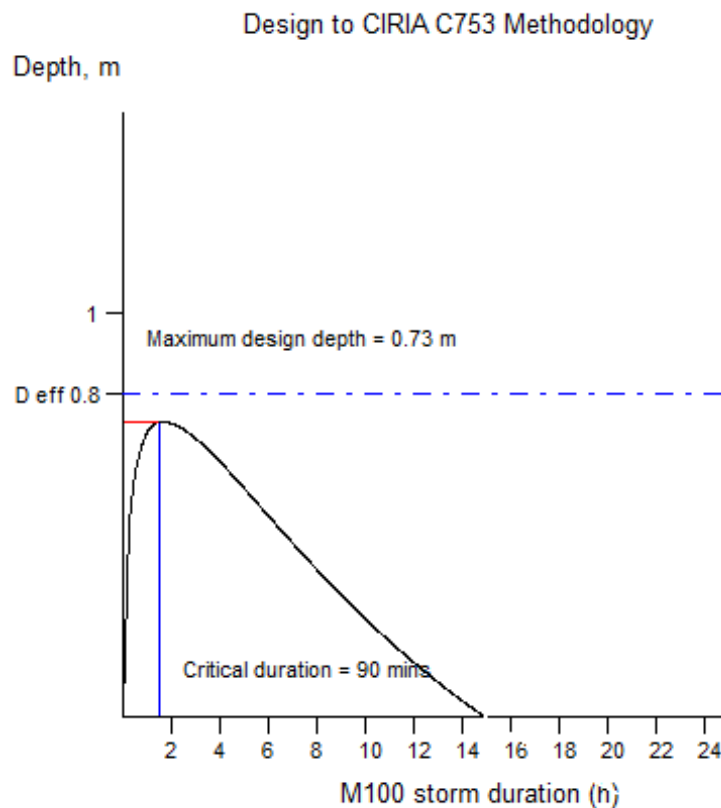


Figure 6: Critical storm duration and max design depth

5.1.4 Sedimentation risk

Generally, roofing carries a very low sediment loading. Worst case $216 \text{ kg} \cdot \text{ha}^{-1} \cdot \text{yr}^{-1}$ - so for this site that equates to circa $6.4 \text{ kg} \cdot \text{yr}^{-1}$ in the worst case. Generally this would reduce the attenuation capacity by circa 2% over 50yrs (all data from the SuDS manual). The design allows for this amount with extra capacity provided to a 100yr design life. The CIRIA C753 method acknowledges this sedimentation and hence the use of a safety factor of 1.5 is used in the calculations.

5.1.5 Minimising sedimentation risk

The developer will fit accessible sumped rainwater gulleys at the base of all RWP's so as to reduce the amount of any sediment entering the soakaway.

The developer will also fit clip-in leaf guards to all roof gutters so as to remove gross solids.

5.1.6 Soakaway detail

The soakaway is designed to use open crates offering a circa 95% void ratio, encased within a geotextile membrane and provided with circa 450mm minimum cover. A typical detail is shown in Figure 7.

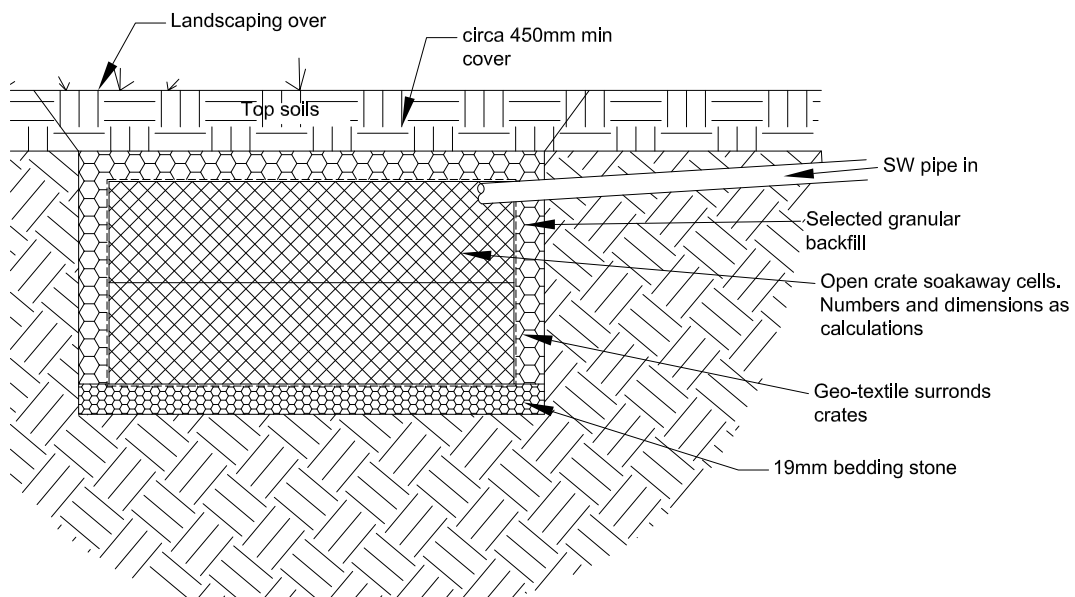


Figure 7: Typical soakaway details

5.2 Rainwater Harvesting

The project team have detailed an “off line” rainwater butt to collect water for external use primarily to reduce potable water demand. This also serves as an additional SuDS feature. Since this is in off-line configuration any exceedance flows are automatically directed back to the downpipes.

5.3 Driveways and hard standing

All areas of hard standing on the site will be constructed using a permeable medium on a DOT/MOT 3 sub-base of 350mm depth (refer to Section 4.3). A suitable option is provided at Appendix C.

5.3.1 Capacity check

Infiltration rates on the site have been found to be no worse than $1.75 \times 10^{-5} \text{ ms}^{-1}$ which equals 63mm.hr^{-1} . A factor of safety of 3 is used which reduces this to 21mm.hr^{-1} . Over 244m^2 plan area, 21mm.hr^{-1} equates to a total outflow rate of 1.423ls^{-1}

Calculation based on CIRIA C753: Eq.25.1 where $h_{\text{max}} = D(Ri-q)/n$.

Designed to accommodate all surface water arising requires a sub-base with an attenuation capacity of 10.0 m^3 per 244m^2 drained area.

Duration (mins)	Intensity (mmhr^{-1}) + 40% CC	Inflow, m^3 (A)	Outflow, m^3 (B)	Balance volume required (A-B), m^3
5	154.22	3.14	0.43	2.7
10	154.22	6.27	0.85	5.4
15	154.22	9.41	1.28	8.1
30	101.22	12.35	2.56	9.8
60	63.56	15.51	5.12	10.4
120	37.82	18.46	10.25	8.2
240	22.08	21.55	20.49	1.1
360	15.92	23.30	30.74	0.0
600	10.41	25.41	51.23	0.0
700	9.14	26.02	59.77	0.0
1440	4.92	28.80	122.95	0.0

Table 3: Balance volume required within sub-base for a range of 1 in 100yr + 1.4% CC storm durations based on an outfall rate of 1.423ls^{-1} per 244m^2 drained area.

This can be achieved by using a 0.35m deep, 30% void ratio, DoT Type 3 sub-base (see Table 4).

Unit area	244m ²	
R	1	C753: $R = A_D / A_b$
Return periods considered	1yr, 30yr, 100yr	
Storm profiles used	50% Summer	75% Winter
Storm coeffs	a = 0.1, b = 0.815	a = 0.06, b = 1.026
Storm range, storm increments	From 5 minutes duration in further 2 min. intervals until critical storm reached	
Rainfall model	FEH 2022	
Critical design storm	60 mins, Winter	
Climate change	1.4	
Factor of Safety	3	
Storm mean intensity	45.4mm.hr ⁻¹	
Design mean intensity	63.6mm.hr ⁻¹	CIRIA C753: i
Calculated maximum head	0.14m	CIIRA C753: h_{max}
Sub-base attenuation volume required per 244m ²	10.01m ³	
Void ratio	30%	CIRIA C753: n
Sub-base attenuation volume provided per 244m ²	26m ³	(0.3 x 244m ² x 0.35m)
Based on a minimum infiltration rate of 21 mmhr ⁻¹		
1 in 1yr min. outfall rate per 244m ²	1.423ls ⁻¹	CIRIA C753: q (See Figure 8.)
1 in 30yr min. outfall rate per 244m ²	1.423ls ⁻¹	(See Figure 9.)
1 in 100yr min. outfall rate per 244m ²	1.423ls ⁻¹	(See Figure 10.)
1 in 100yr Time to peak	53 mins	
1 in 100yr Max head: Time to drop to 50%	0.40 hrs	
Outfall control method	Base Infiltration - Type A	

Table 4: Summary of sub-base attenuation capacity

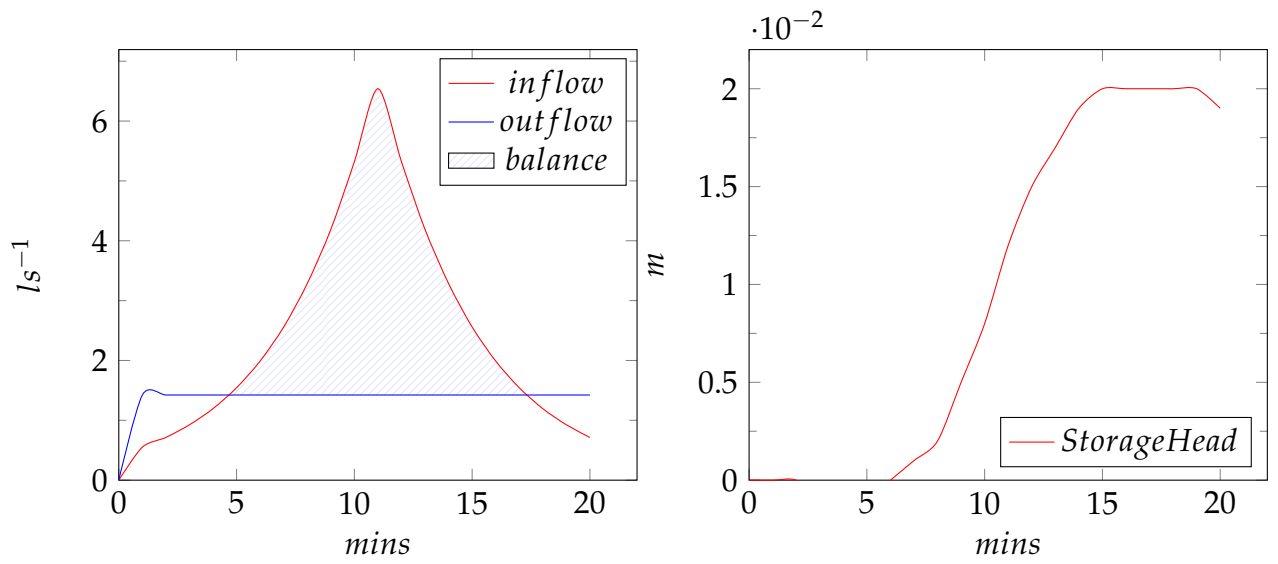


Figure 8: 1 in 1 year critical storm event

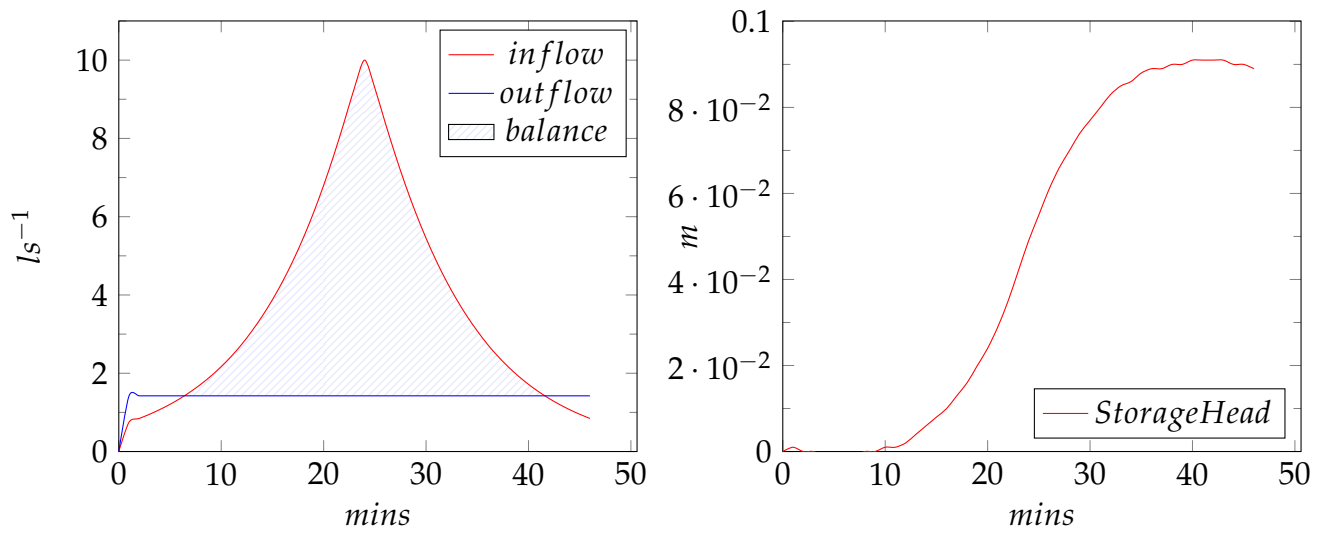


Figure 9: 1 in 30 year critical storm event

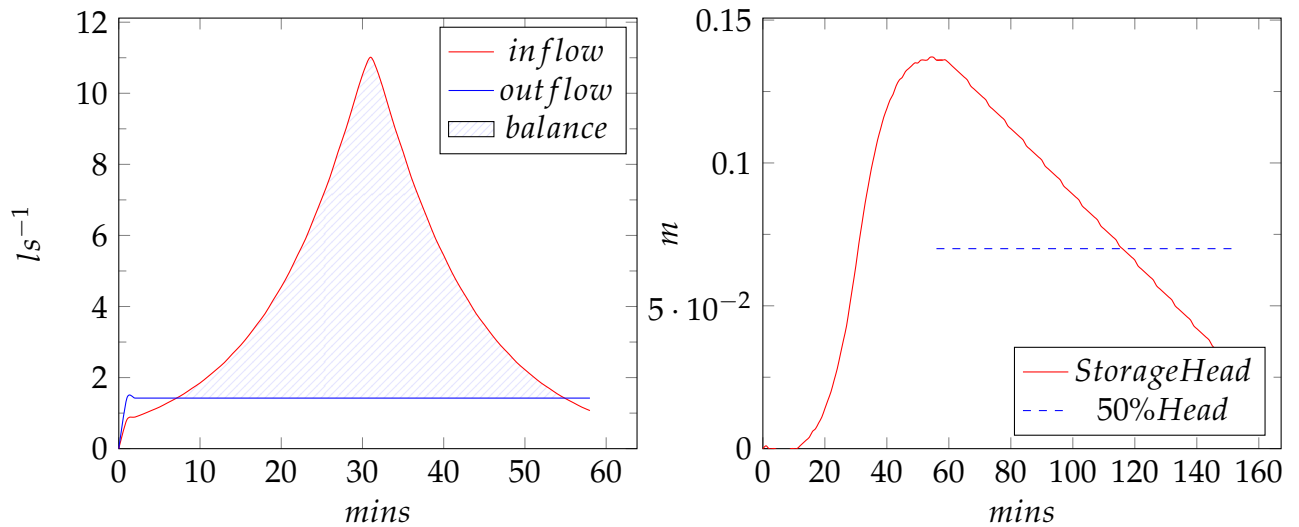
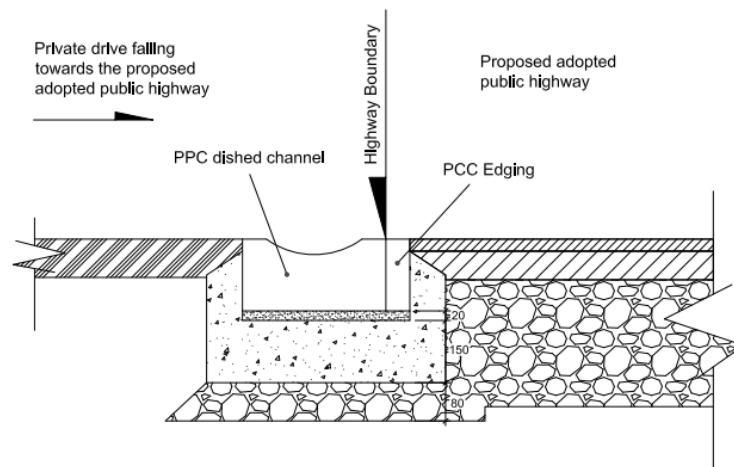


Figure 10: 1 in 100 year critical storm event

Exceedance flows (flows over the 1.2 x M1006hr + CC event) will be conveyed at the surface via a channel drain placed across the entrance as per detail at Figure 11.



Notes:

1. Dished channels shall be installed between any areas of private land that fall towards the proposed adopted highway
2. The precast concrete dished channel shall fall to a soakaway or piped connexion to the private system on the site, no private water will be permitted into or on to the proposed adopted public highway.
3. The dished channel shall be laid on 20mm of class 1 mortar to allow a suitable fall to be created.

Figure 11: Channel drain at site entrance.

5.4 Landscaped areas

Typical domestic planting.

5.5 Drainage layout

Please refer to the drainage layout showing SuDS features at Appendix D.

5.6 Pipe sizing

Flow will be conveyed via 100mm diameter drainage runs laid at no less than 1:80 falls giving a maximum design capacity of 6.6 ls^{-1} (Part H design chart, Figure 12).

1 in 100yr max mean intensity storm = 110 mm hr^{-1}

Drained area to one pipe = 155 m^2

Required pipe capacity = $155 \times 0.1102 / 3.6 = 4.7 \text{ ls}^{-1}$

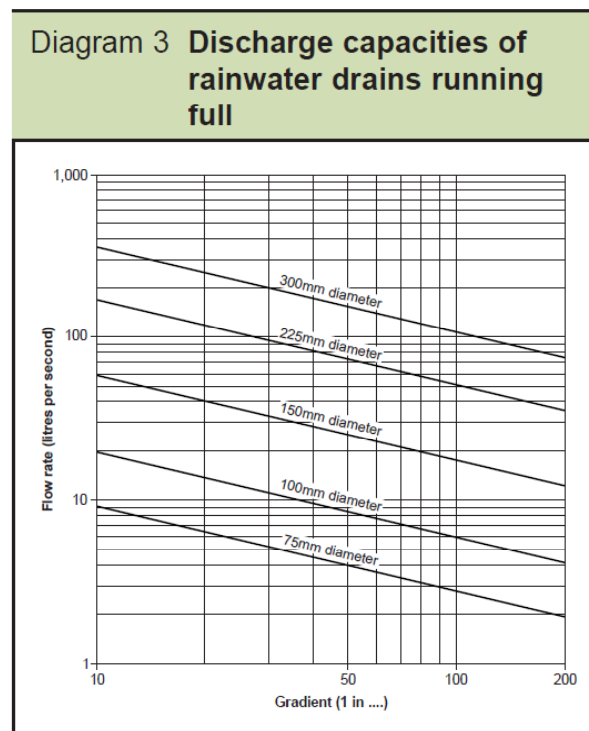


Figure 12: Part H drainage design chart

5.7 Exceedance flow routes

Water butt(s) if installed - when full, the water is diverted back into the rainwater down pipe.

Soakaway cells - designed to 100yr + 40% climate change event. Given the location of these units are within a domestic garden and driveway any exceedance flows will manifest as a wet lawn to the rear into the “spare” sub- base capacity to the front and in doing so no persons or property are at risk.

Any localised short term ponding will cause no hazard or inconvenience to the owners.

Permeable surface - Any exceedance flows at the surface will be channelled via surface mounted channels (ACO or similar) to the adjacent planting areas (or to the front soakaway).

Garden planting - No anticipated exceedance flows.

There are no design overland exceedance flow paths other than as noted above.

5.8 Timetable for implementation

5.8.1 Site clearing phase

During the site clearing phase, rainwater will be managed in line with the requirements under the CDM regulations using existing SW gullies with measures in place to prevent contaminants entering the network (sand bag bunds etc).

Any existing redundant SW drains will then be grubbed out and capped off.

5.8.2 Construction phase

The DoT Type 3 to areas of hardstanding is to be placed early in the project to allow site access. This will be protected with either a 50mm wearing course or a 150mm layer of sacrificial crushed concrete placed on a geo-textile layer over the Type 3.

Soakaways will also be installed early in the project under the remit of the ground-works operations.

Prior to installation of the paved areas either the wearing course will be core drilled, 100mm diameter, at 1m staggered centres with core holes filled with granular fill, or, the layer of crushed concrete and geotextile removed with the Type 3 repaired as required prior to new geotextile layer and final paving.

Any permeable paving, or similar pervious surfaces, will only be installed when all construction activities are either complete, or near completion so as to minimise blockage of the surface.

5.8.3 Post construction phase

Water butts will be installed prior to final completion as part of the final landscaping. Areas of landscaping and boundary planting will be undertaken as the project nears completion.

6 Maintenance of SuDS

Ultimate responsibility for the long term maintenance with SuDS in this environment lay with the home owner.

All SuDS on site will be installed with full consideration to long term maintenance. The following guidance applies:

6.1 Rainwater harvesting

The maintenance plan for the rainwater harvesting will include:

- Monthly cleaning of pre-filters;
- Monthly checking of high water level warning devices;
- Six monthly /seasonal gutter clearance.

6.2 Soakaways (and pre treatment sediment sumps)

Figure 13^[2] provides details maintenance operations required for a soakaway system.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Figure 13: Maintenance operations for soakaway

6.3 Pervious pavements

The maintenance plan for permeable paving will include:

- Monthly litter removal;
- Bi-Annual jet washing/sweeping as/if required.
- Annual inspection and repairs as/if required.

6.4 Inspection/control chambers

The maintenance plan for these will include:

- Regular inspection of silt traps, IC's, pipework and pre-treatment devices (safe access provision required)
- Removal of sediments and debris as required.

6.5 Summary

All surface water arising can be managed on site using SuDS. There is no design exceedance outfall away from the site. Exceedance flows and flows arising from system failure can be accommodated on site within areas of garden planing, soakaway crates and the sub-base to the hard standing.

The use of SuDS techniques on site, as detailed above and when installed in line with best practice (I.e. CIRIA 753 & CIRIA 768), will reduce and treat the run-off volumes in line with the core policies.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD

Date: 23rd August, 2024

References

- [1] DCW Marshall & AC Bayliss. Flood estimation for small catchments. Technical Report No. 124, Institute of Hydrology, June 1994.
- [2] CIRIA. The SUDS manual. Technical report, CIRIA, 2015.

A Geo Insight report



Groundsure
LOCATION INTELLIGENCE

Geo
Insight

11, OLD BATH ROAD, SONNING, WOKINGHAM, RG4 6SZ

Order Details	Site Details
Date: 23/08/2024	Location: 475830 174497
Your ref: 242747	Area: 0.2 ha
Our Ref: GS-S5B-OC7-ITC-FQG	Authority: Wokingham Borough Council ↗



Summary of findings	p. 2 >	Aerial image	p. 5 >
OS MasterMap site plan	p.10 >	Insight User Guide ↗	

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Summary of findings

Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
11 >	1.1 >	10k Availability >	Identified (within 500m)				
12 >	1.2 >	Artificial and made ground (10k) >	0	0	3	2	-
14 >	1.3 >	Superficial geology (10k) >	1	0	1	2	-
15	1.4	Landslip (10k)	0	0	0	0	-
16 >	1.5 >	Bedrock geology (10k) >	1	0	2	1	-
17	1.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
18 >	2.1 >	50k Availability >	Identified (within 500m)				
19 >	2.2 >	Artificial and made ground (50k) >	0	0	2	1	-
20	2.3	Artificial ground permeability (50k)	0	0	-	-	-
21 >	2.4 >	Superficial geology (50k) >	1	0	1	1	-
22 >	2.5 >	Superficial permeability (50k) >	Identified (within 50m)				
22	2.6	Landslip (50k)	0	0	0	0	-
22	2.7	Landslip permeability (50k)	None (within 50m)				
23 >	2.8 >	Bedrock geology (50k) >	1	1	1	0	-
24 >	2.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
24	2.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes >	On site	0-50m	50-250m	250-500m	500-2000m
25 >	3.1 >	BGS Boreholes >	0	0	3	-	-
Page	Section	Natural ground subsidence >					
27 >	4.1 >	Shrink swell clays >	Moderate (within 50m)				
28 >	4.2 >	Running sands >	Very low (within 50m)				
29 >	4.3 >	Compressible deposits >	Negligible (within 50m)				
30 >	4.4 >	Collapsible deposits >	Very low (within 50m)				
31 >	4.5 >	Landslides >	Very low (within 50m)				
32 >	4.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				



Page	Section	Mining and ground workings >	On site	0-50m	50-250m	250-500m	500-2000m
34	5.1	BritPits	0	0	0	0	-
35 >	5.2 >	Surface ground workings >	0	0	16	-	-
35	5.3	Underground workings	0	0	0	0	0
36	5.4	Underground mining extents	0	0	0	0	-
36 >	5.5 >	Historical Mineral Planning Areas >	0	0	0	1	-
36 >	5.6 >	Non-coal mining >	1	0	0	1	4
37 >	5.7 >	JPB mining areas >	Identified (within 0m)				
38	5.8	The Coal Authority non-coal mining	0	0	0	0	-
38	5.9	Researched mining	0	0	0	0	-
38	5.10	Mining record office plans	0	0	0	0	-
38	5.11	BGS mine plans	0	0	0	0	-
39	5.12	Coal mining	None (within 0m)				
39	5.13	Brine areas	None (within 0m)				
39	5.14	Gypsum areas	None (within 0m)				
39	5.15	Tin mining	None (within 0m)				
39	5.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes >	On site	0-50m	50-250m	250-500m	500-2000m
40	6.1	Natural cavities	0	0	0	0	-
41 >	6.2 >	Mining cavities >	0	0	0	0	1
41	6.3	Reported recent incidents	0	0	0	0	-
41	6.4	Historical incidents	0	0	0	0	-
42	6.5	National karst database	0	0	0	0	-
Page	Section	Radon >					
43 >	7.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
45 >	8.1 >	BGS Estimated Background Soil Chemistry >	2	1	-	-	-
45	8.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
45	8.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-



Page	Section	Railway infrastructure and projects >	On site	0-50m	50-250m	250-500m	500-2000m
46 >	9.1 >	Underground railways (London) >	0	0	1	-	-
47	9.2	Underground railways (Non-London)	0	0	0	-	-
47	9.3	Railway tunnels	0	0	0	-	-
47 >	9.4 >	Historical railway and tunnel features >	0	0	5	-	-
47	9.5	Royal Mail tunnels	0	0	0	-	-
48	9.6	Historical railways	0	0	0	-	-
48 >	9.7 >	Railways >	0	0	5	-	-
48 >	9.8 >	Crossrail 1 >	0	0	1	0	-
49	9.9	Crossrail 2	0	0	0	0	-
49	9.10	HS2	0	0	0	0	-



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Date: 23 August 2024



Recent aerial photograph



Capture Date: 30/04/2022

Site Area: 0.2ha



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info@groundsure.com 
01273 257 755

Date: 23 August 2024

5

Recent site history - 2019 aerial photograph



Capture Date: 29/06/2019

Site Area: 0.2ha



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info@groundsure.com
01273 257 755

Date: 23 August 2024

6

Recent site history - 2013 aerial photograph



Capture Date: 08/07/2013

Site Area: 0.2ha



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Date: 23 August 2024



Recent site history - 2010 aerial photograph



Capture Date: 22/09/2010

Site Area: 0.2ha



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info@groundsure.com
01273 257 755

Date: 23 August 2024

8

Recent site history - 1999 aerial photograph



Capture Date: 04/09/1999

Site Area: 0.2ha

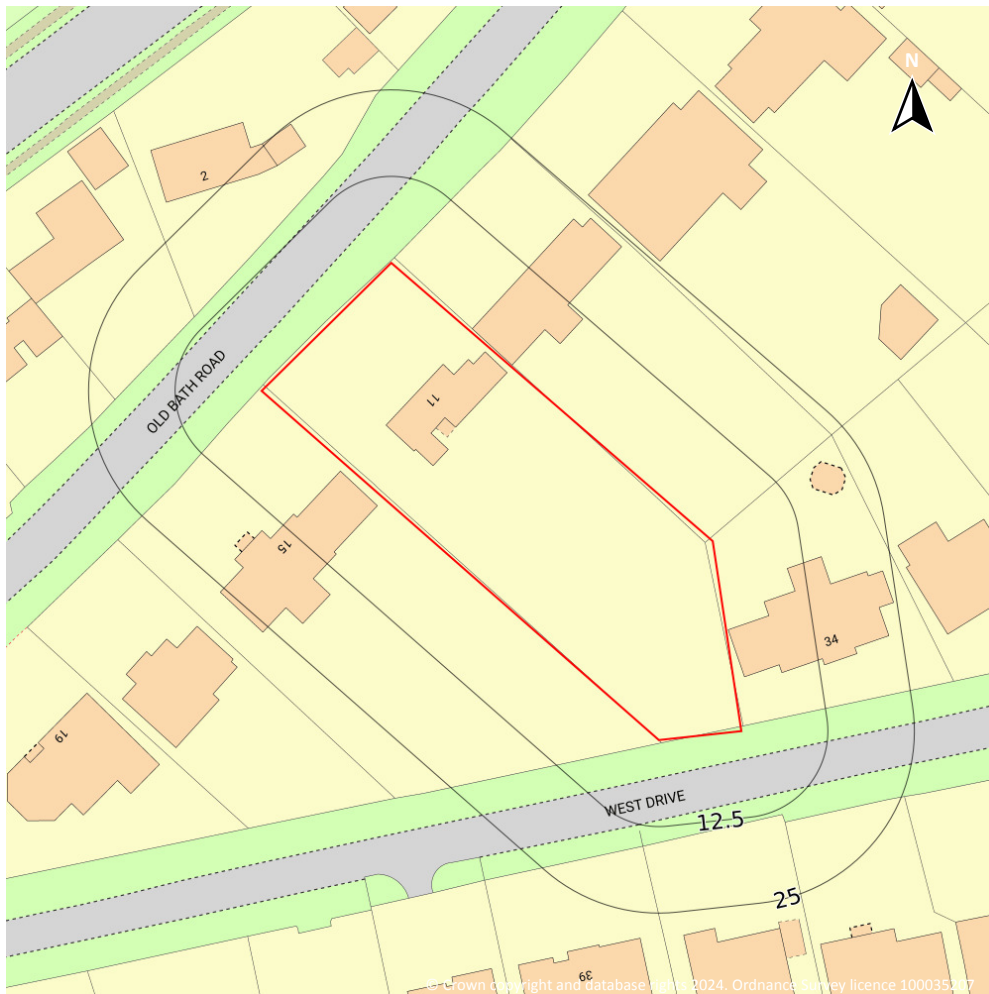


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Date: 23 August 2024

9

OS MasterMap site plan



Site Area: 0.2ha

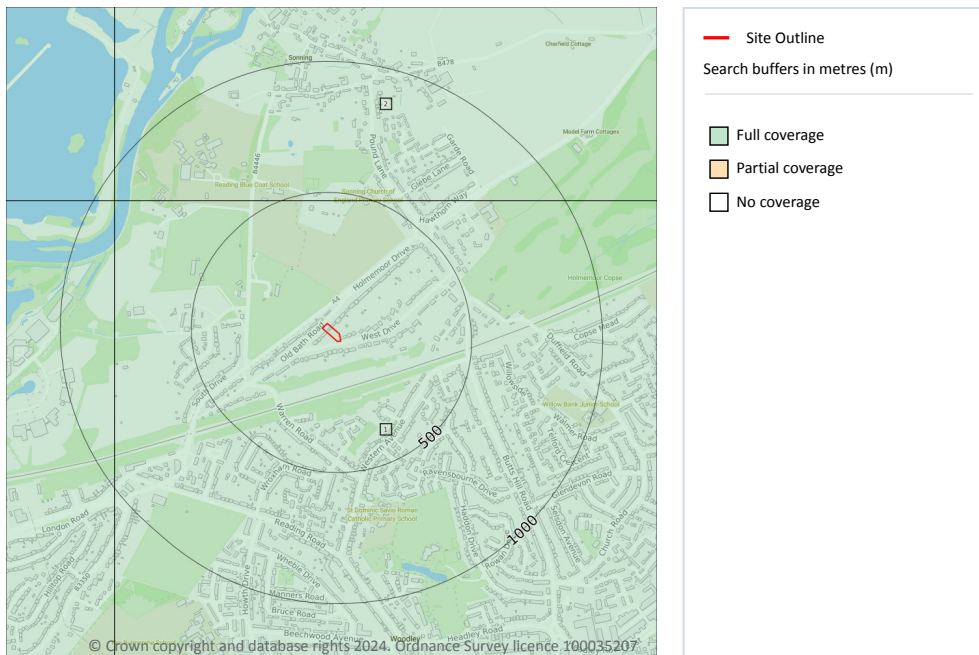


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Date: 23 August 2024



1 Geology 1:10,000 scale - Availability



1.1 10k Availability

Records within 500m

2

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on [page 11](#) >

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	SU77SE
2	468m N	Full	Full	Full	No coverage	SU77NE

This data is sourced from the British Geological Survey.

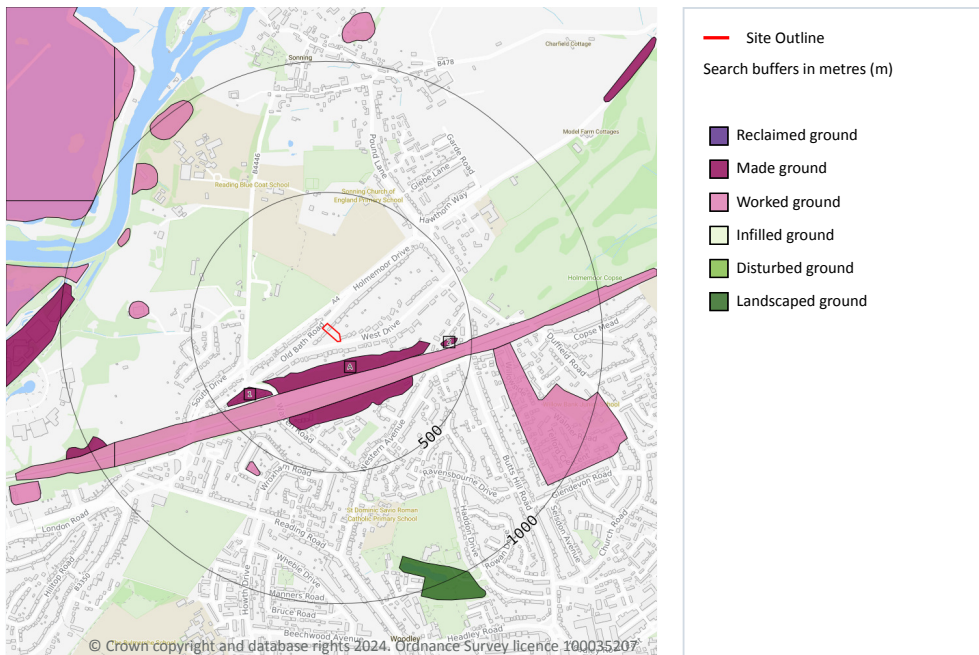


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Geology 1:10,000 scale - Artificial and made ground



1.2 Artificial and made ground (10k)

Records within 500m

5

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on [page 12](#) >

ID	Location	LEX Code	Description	Rock description
A	73m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
A	133m S	WGR-VOID	Worked Ground (Undivided)	Void
A	216m SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
1	312m SW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit



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Date: 23 August 2024





11, OLD BATH ROAD, SONNING,
WOKINGHAM, RG4 6SZ

Ref: GS-S5B-OC7-ITC-FQG
Your ref: 242747
Grid ref: 475830 174497

ID	Location	LEX Code	Description	Rock description
2	382m E	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.

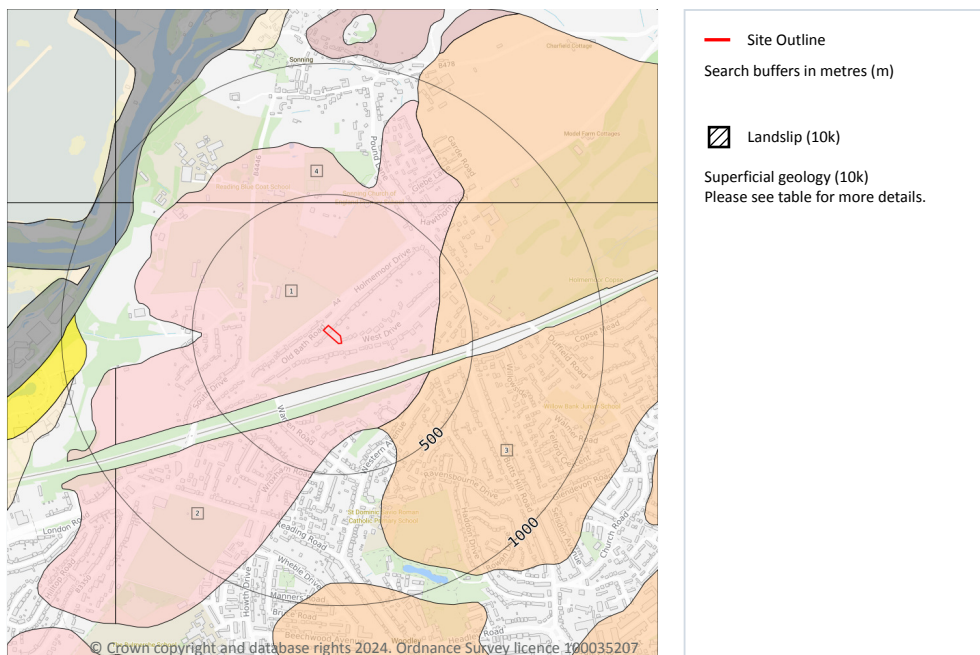


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Geology 1:10,000 scale - Superficial



1.3 Superficial geology (10k)

Records within 500m

4

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on [page 14](#) >

ID	Location	LEX Code	Description	Rock description
1	On site	BHT-XSV	Boyn Hill Gravel Member - Sand And Gravel	Sand And Gravel
2	216m SE	BHT-XSV	Boyn Hill Gravel Member - Sand And Gravel	Sand And Gravel
3	349m SE	RTD4-XSV	River Terrace Deposits, 4 - Sand And Gravel	Sand And Gravel
4	468m N	BHT-XSV	Boyn Hill Gravel Member - Sand And Gravel	Sand And Gravel



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This data is sourced from the British Geological Survey.

1.4 Landslip (10k)

Records within 500m

0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

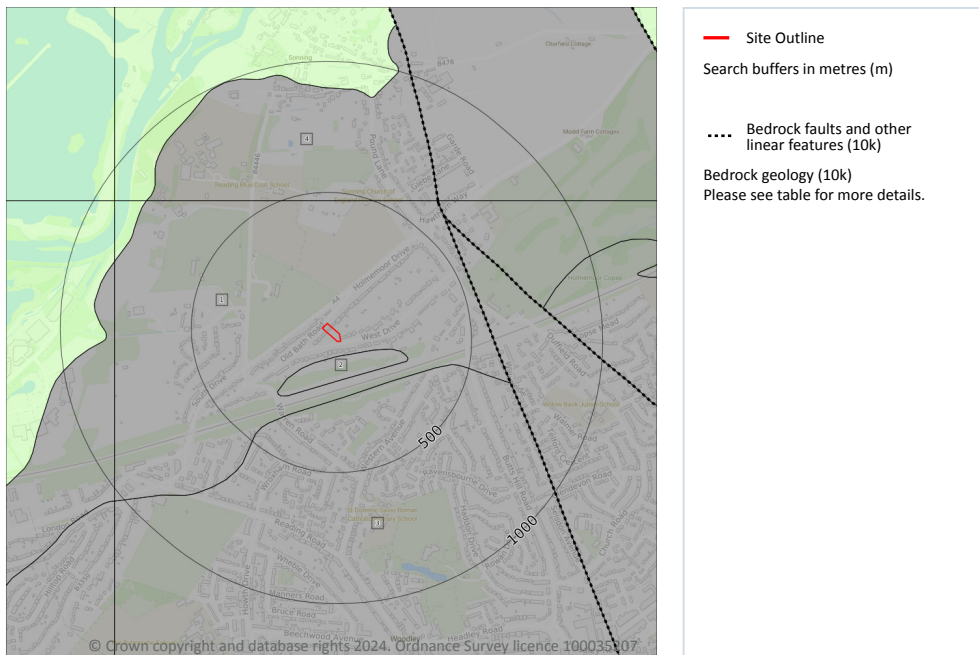


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Geology 1:10,000 scale - Bedrock



1.5 Bedrock geology (10k)

Records within 500m

4

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on [page 16](#) >

ID	Location	LEX Code	Description	Rock age
1	On site	LMBE-CLSISA	Lambeth Group - Clay, Silt And Sand	Paleocene Epoch
2	55m SE	LC-CLSISA	London Clay Formation - Clay, Silt And Sand	Eocene Epoch
3	207m SE	LC-CLSISA	London Clay Formation - Clay, Silt And Sand	Eocene Epoch



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ID	Location	LEX Code	Description	Rock age
4	468m N	LMBE- CLSISA	Lambeth Group - Clay, Silt And Sand	Paleocene Epoch

This data is sourced from the British Geological Survey.

1.6 Bedrock faults and other linear features (10k)

Records within 500m

0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

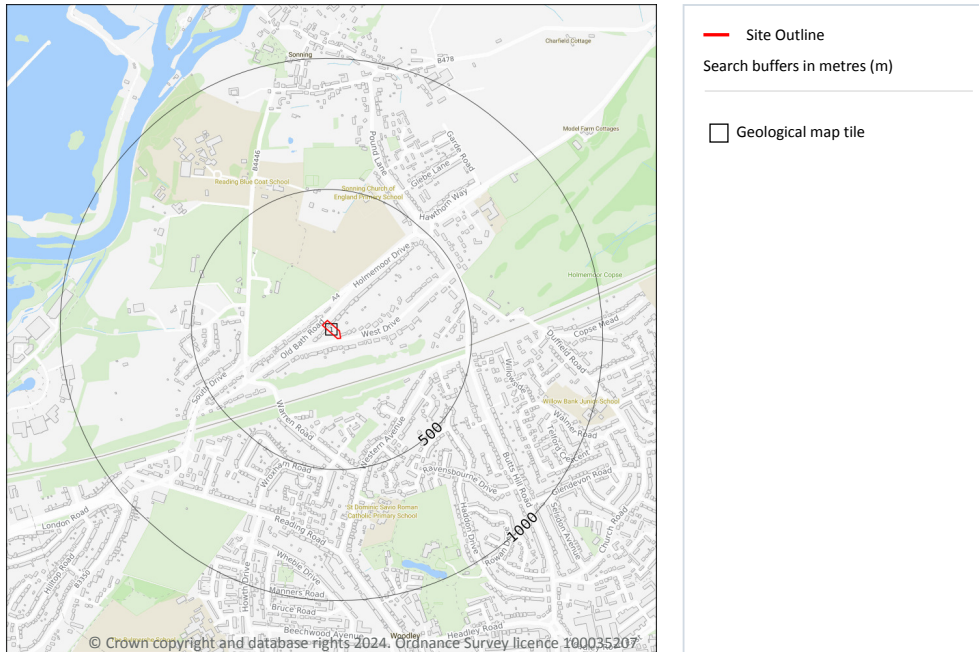


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Date: 23 August 2024



2 Geology 1:50,000 scale - Availability



2.1 50k Availability

Records within 500m

1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on [page 18](#) >

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	EW268_reading_v4

This data is sourced from the British Geological Survey.

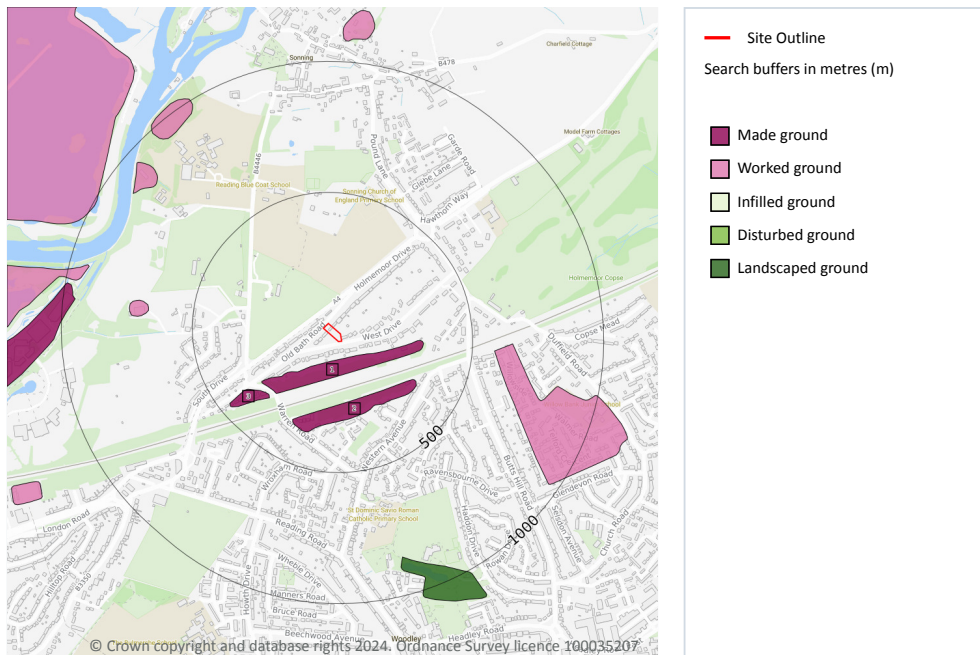


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Date: 23 August 2024



Geology 1:50,000 scale - Artificial and made ground



2.2 Artificial and made ground (50k)

Records within 500m

3

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on [page 19](#) >

ID	Location	LEX Code	Description	Rock description
1	66m SE	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	228m S	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	327m SW	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.



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2.3 Artificial ground permeability (50k)

Records within 50m	0
--------------------	---

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

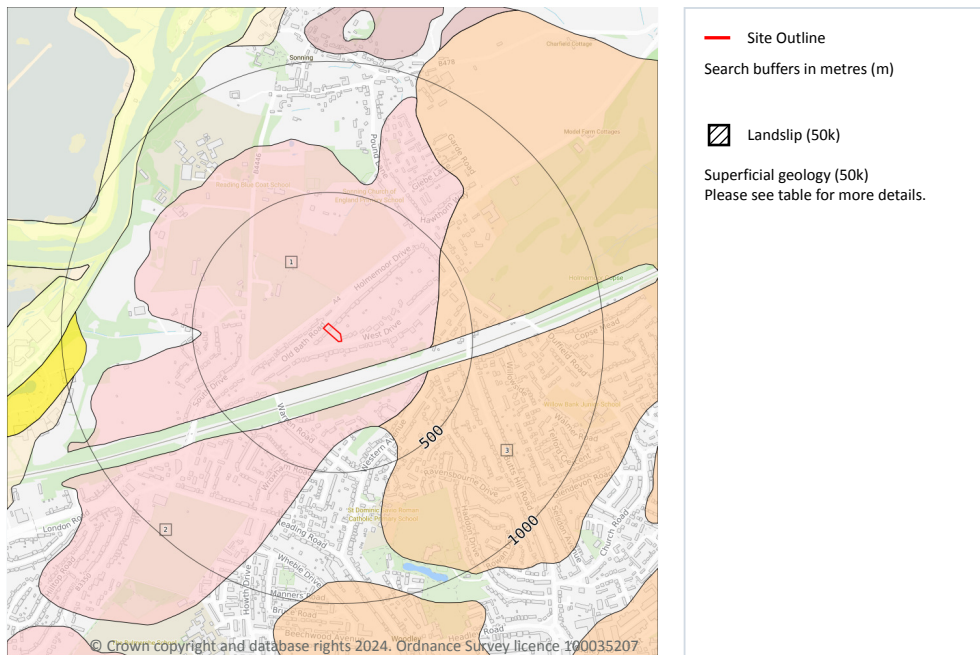


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Geology 1:50,000 scale - Superficial



2.4 Superficial geology (50k)

Records within 500m

3

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on [page 21](#) >

ID	Location	LEX Code	Description	Rock description
1	On site	BHT-XSV	BOYN HILL GRAVEL MEMBER	SAND AND GRAVEL
2	228m S	BHT-XSV	BOYN HILL GRAVEL MEMBER	SAND AND GRAVEL
3	338m E	RTD4-XSV	RIVER TERRACE DEPOSITS, 4	SAND AND GRAVEL

This data is sourced from the British Geological Survey.



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Date: 23 August 2024



2.5 Superficial permeability (50k)

Records within 50m

1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Intergranular	Very High	High

This data is sourced from the British Geological Survey.

2.6 Landslip (50k)

Records within 500m

0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

2.7 Landslip permeability (50k)

Records within 50m

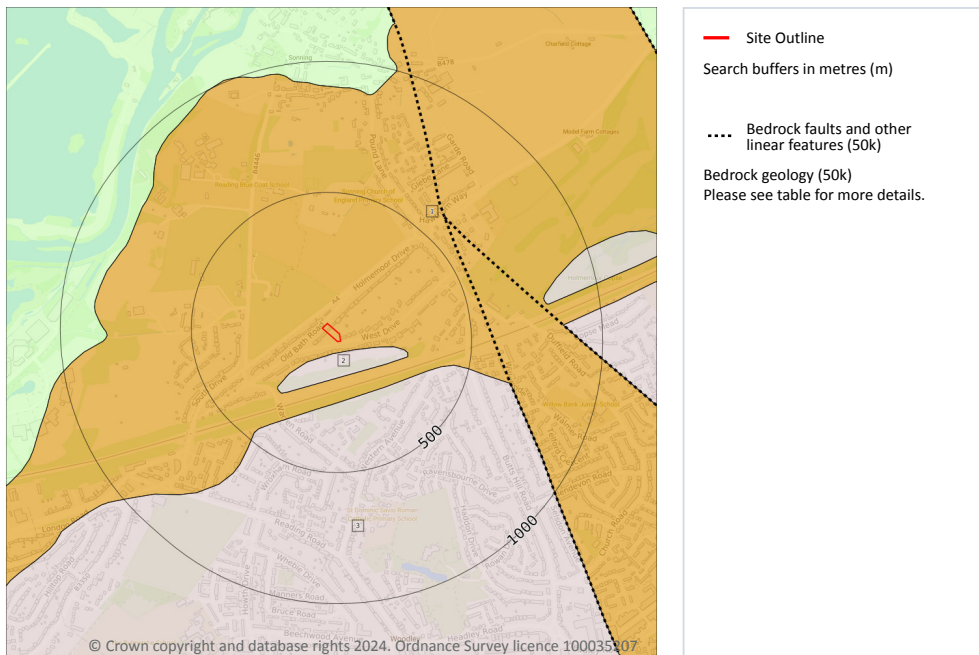
0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Bedrock



2.8 Bedrock geology (50k)

Records within 500m

3

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on [page 23](#) >

ID	Location	LEX Code	Description	Rock age
1	On site	LMBE-XCZS	LAMBETH GROUP - CLAY, SILT AND SAND	THANETIAN
2	42m SE	LC-XCZS	LONDON CLAY FORMATION - CLAY, SILT AND SAND	YPRESIAN
3	220m S	LC-XCZS	LONDON CLAY FORMATION - CLAY, SILT AND SAND	YPRESIAN

This data is sourced from the British Geological Survey.



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2.9 Bedrock permeability (50k)

Records within 50m**2**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	Moderate	Very Low
42m SE	Mixed	Moderate	Very Low

This data is sourced from the British Geological Survey.

2.10 Bedrock faults and other linear features (50k)

Records within 500m**0**

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

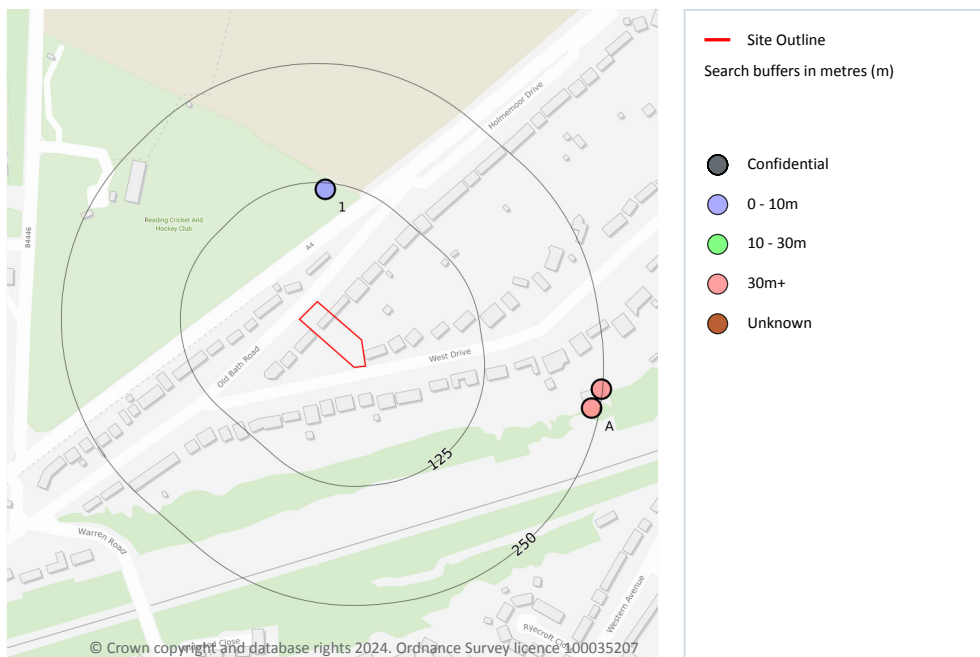


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Date: 23 August 2024



3 Boreholes



3.1 BGS Boreholes

Records within 250m

3

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on [page 25 >](#)

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	118m N	475820 174650	EAST OF HOLME PARK FARM SONNING	5.7	N	427998 ↗
A	242m E	476100 174420	SONNING GOLF LINKS	45.87	N	428140 ↗
A	249m E	476110 174440	SONNING GOLF LINKS	45.87	N	428015 ↗



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Date: 23 August 2024





11, OLD BATH ROAD, SONNING,
WOKINGHAM, RG4 6SZ

Ref: GS-S5B-OC7-ITC-FQG
Your ref: 242747
Grid ref: 475830 174497

This data is sourced from the British Geological Survey.

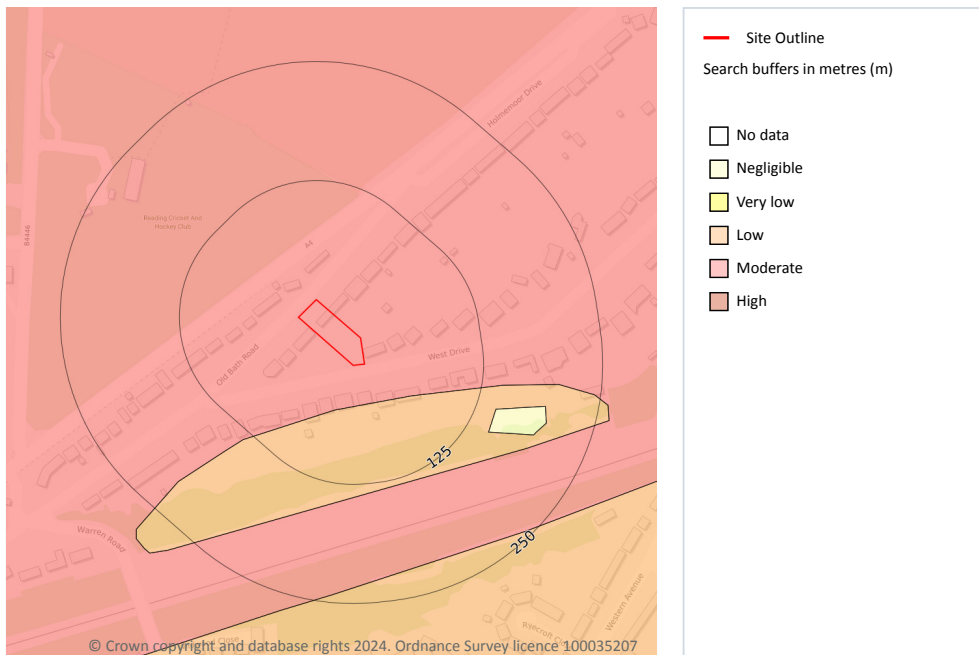


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Date: 23 August 2024



4 Natural ground subsidence - Shrink swell clays



4.1 Shrink swell clays

Records within 50m

2

The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on [page 27 >](#)

Location	Hazard rating	Details
On site	Moderate	Ground conditions predominantly high plasticity.
42m SE	Low	Ground conditions predominantly medium plasticity.

This data is sourced from the British Geological Survey.

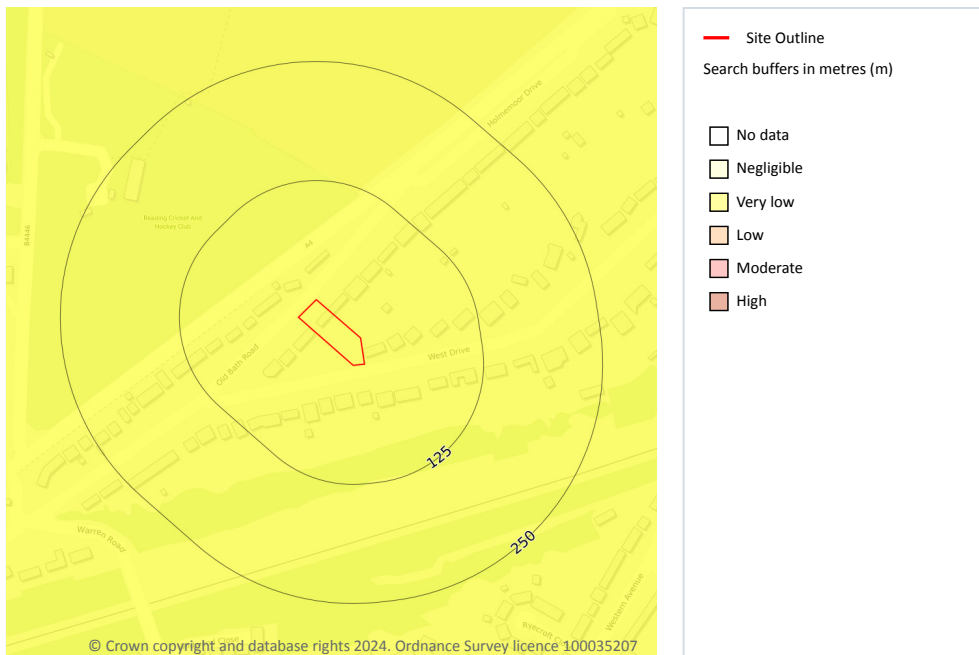


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Date: 23 August 2024



Natural ground subsidence - Running sands



4.2 Running sands

Records within 50m

1

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on [page 28 >](#)

Location	Hazard rating	Details
On site	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

This data is sourced from the British Geological Survey.

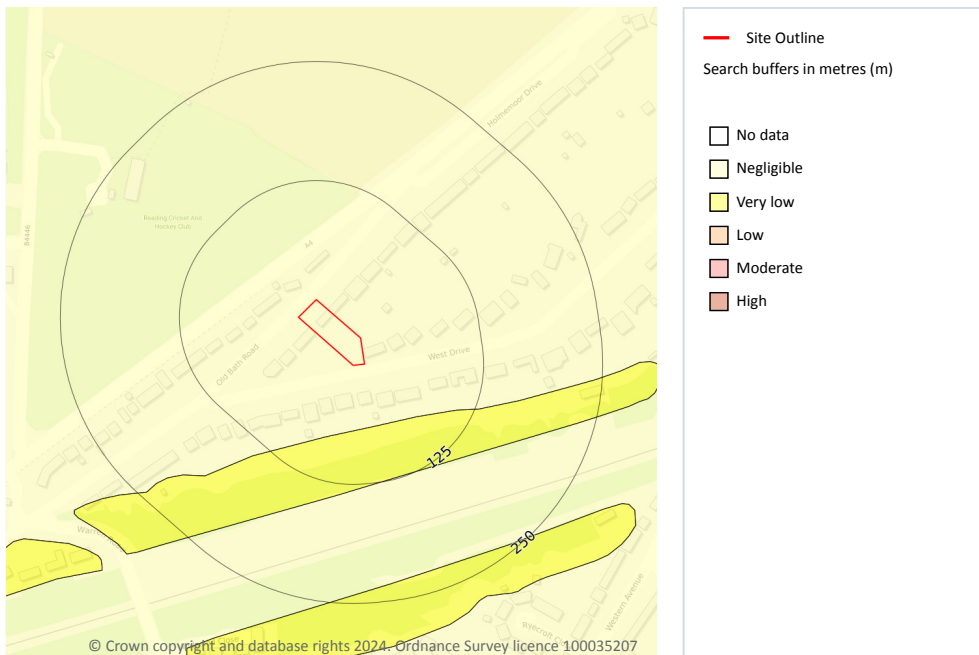


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Date: 23 August 2024



Natural ground subsidence - Compressible deposits



4.3 Compressible deposits

Records within 50m

1

The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on [page 29](#) >

Location	Hazard rating	Details
On site	Negligible	Compressible strata are not thought to occur.

This data is sourced from the British Geological Survey.

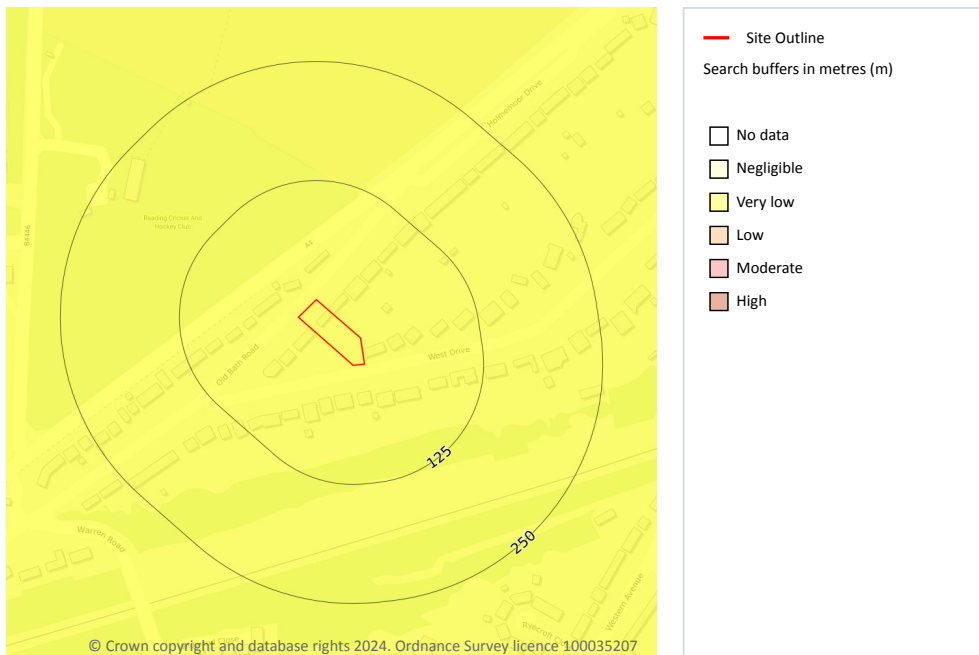


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info@groundsure.com
01273 257 755

Date: 23 August 2024



Natural ground subsidence - Collapsible deposits



4.4 Collapsible deposits

Records within 50m

1

The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on [page 30](#) >

Location	Hazard rating	Details
On site	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.

This data is sourced from the British Geological Survey.



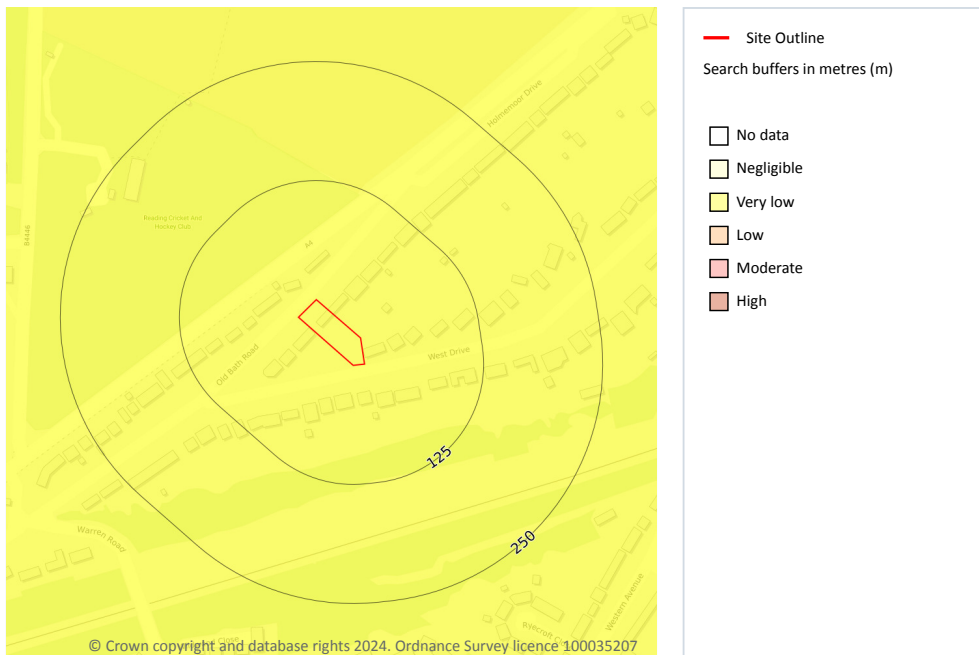
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Natural ground subsidence - Landslides



4.5 Landslides

Records within 50m

1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on [page 31](#) >

Location	Hazard rating	Details
On site	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.

This data is sourced from the British Geological Survey.

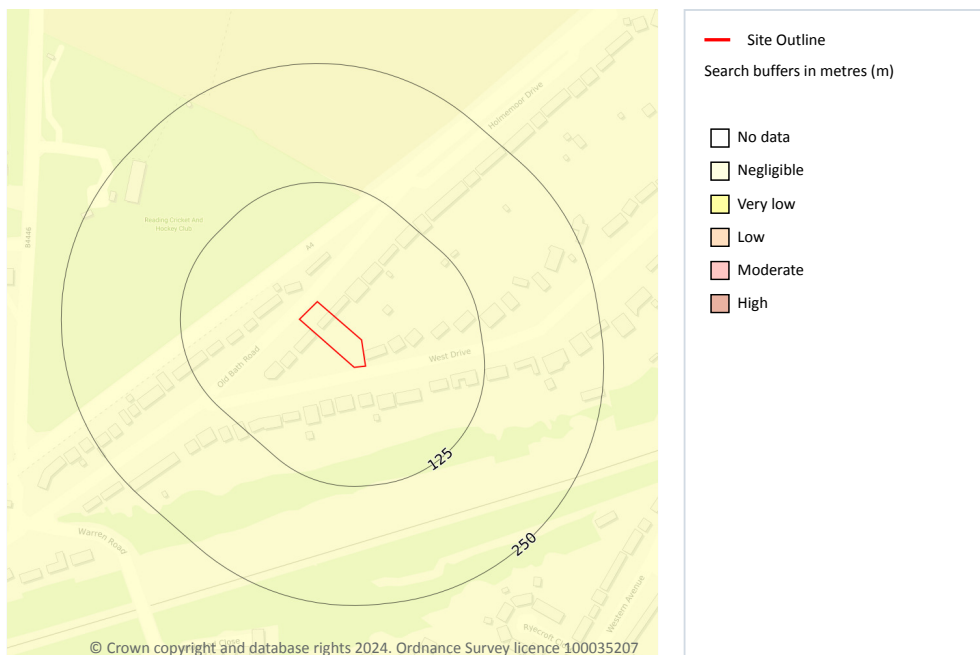


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Natural ground subsidence - Ground dissolution of soluble rocks



4.6 Ground dissolution of soluble rocks

Records within 50m

1

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on [page 32](#) >

Location	Hazard rating	Details
On site	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.



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Ref: GS-S5B-OC7-ITC-FQG
Your ref: 242747
Grid ref: 475830 174497

This data is sourced from the British Geological Survey.

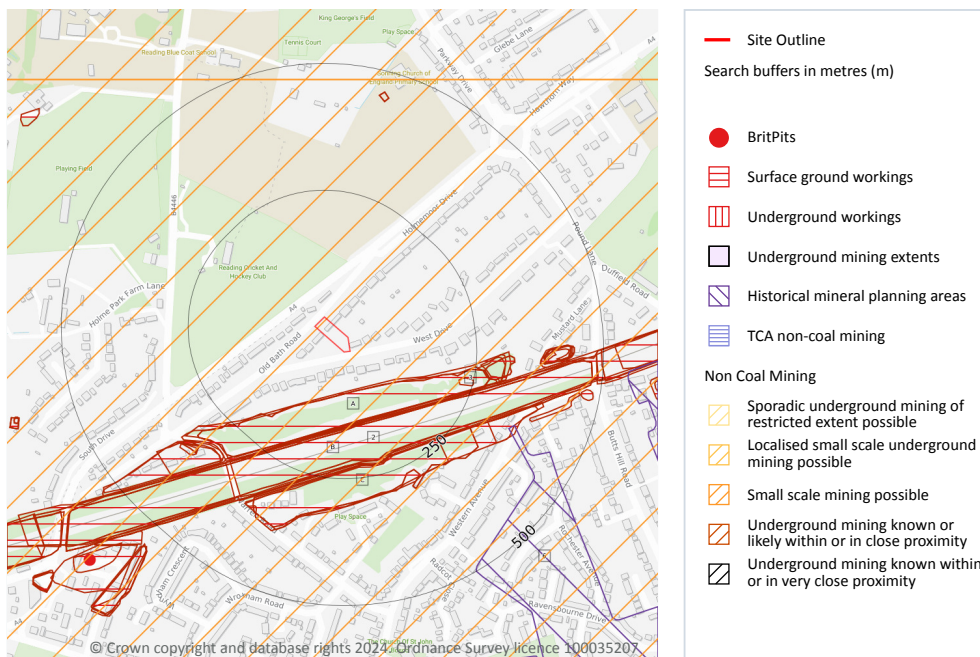


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5 Mining and ground workings



5.1 BritPits

Records within 500m

0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.



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5.2 Surface ground workings

Records within 250m

16

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining and ground workings map on [page 34](#) >

ID	Location	Land Use	Year of mapping	Mapping scale
A	75m SE	Unspecified Heap	1900	1:10560
A	79m SE	Unspecified Heap	1986	1:10000
A	79m SE	Unspecified Heap	1977	1:10000
A	79m SE	Unspecified Heap	1960	1:10560
B	139m SE	Cuttings	1900	1:10560
B	142m SE	Cuttings	1932	1:10560
B	142m SE	Cuttings	1910	1:10560
2	142m S	Cuttings	1900	1:10560
B	146m S	Cuttings	1960	1:10560
B	146m S	Cuttings	1986	1:10000
B	146m S	Cuttings	1977	1:10000
C	220m SE	Unspecified Heap	1900	1:10560
C	220m SE	Unspecified Heap	1986	1:10000
C	220m SE	Unspecified Heap	1977	1:10000
C	222m SE	Unspecified Heap	1960	1:10560
3	222m E	Unspecified Pit	1986	1:10000

This is data is sourced from Ordnance Survey/Groundsure.

5.3 Underground workings

Records within 1000m

0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.



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5.4 Underground mining extents

Records within 500m

0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from Groundsure.

5.5 Historical Mineral Planning Areas

Records within 500m

1

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

Features are displayed on the Mining and ground workings map on [page 34 >](#)

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
6	348m SE	Wheeler's Green	Sand and gravel	Surface mineral working	Refused	Not available

This data is sourced from the British Geological Survey.

5.6 Non-coal mining

Records within 1000m

6

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining and ground workings map on [page 34 >](#)

ID	Location	Name	Commodity	Class	Likelihood
1	On site	Not available	Chalk	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
9	468m N	Not available	Chalk	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.



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ID	Location	Name	Commodity	Class	Likelihood
-	793m W	Not available	Chalk	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
-	811m NW	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	822m W	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
-	829m NW	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

This data is sourced from the British Geological Survey.

5.7 JPB mining areas

Records on site

1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) may have information such as mining plans and maps held within their archive that have occurred within 1km of this property. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk .

This data is sourced from Johnson Poole and Bloomer.



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5.8 The Coal Authority non-coal mining

Records within 500m**0**

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

5.9 Researched mining

Records within 500m**0**

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas of risk have been captured.

This data is sourced from Groundsure.

5.10 Mining record office plans

Records within 500m**0**

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

5.11 BGS mine plans

Records within 500m**0**

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.



5.12 Coal mining

Records on site	0
-----------------	---

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

5.13 Brine areas

Records on site	0
-----------------	---

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

5.14 Gypsum areas

Records on site	0
-----------------	---

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

5.15 Tin mining

Records on site	0
-----------------	---

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

5.16 Clay mining

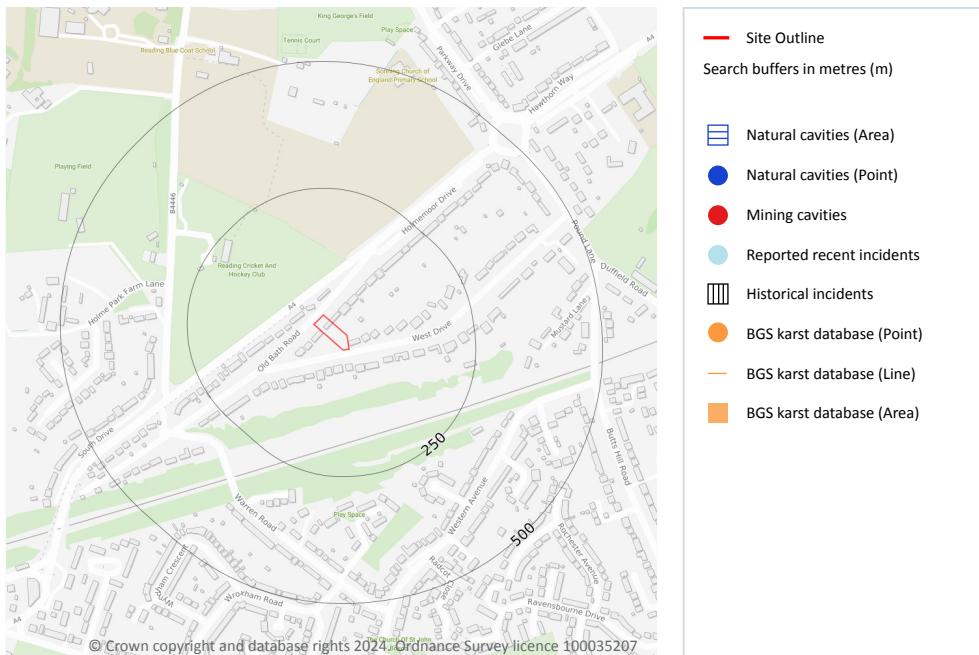
Records on site	0
-----------------	---

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).



6 Ground cavities and sinkholes



6.1 Natural cavities

Records within 500m

0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.



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6.2 Mining cavities

Records within 1000m**1**

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

Features are displayed on the Ground cavities and sinkholes map on [page 40](#) >

ID	Location	Mine Address	Mineral	Data source	Publisher
-	923m NW	Holme Park, Sonning, Berkshire	Chalk	THE ENGINEERING GEOMORPHOLOGY OF KARST DEVELOPMENT AND THE PREDICTION OF SUBS..	PHD THESIS, LONDON UNIVERSITY

This data is sourced from Stantec UK Ltd.

6.3 Reported recent incidents

Records within 500m**0**

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

This data is sourced from Groundsure.

6.4 Historical incidents

Records within 500m**0**

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.



6.5 National karst database

Records within 500m	0
---------------------	---

This is a comprehensive database of national karst information gathered from a wide range of sources. BGS have collected data on five main types of karst feature: Sinkholes, stream links, caves, springs, and incidences of associated damage to buildings, roads, bridges and other engineered works.

Since the database was set up in 2002 data covering most of the evaporite karst areas of the UK have now been added, along with data covering about 60% of the Chalk, and 35% of the Carboniferous Limestone outcrops. Many of the classic upland karst areas have yet to be included. Recorded so far are: Over 800 caves, 1300 stream sinks, 5600 springs, 10,000 sinkholes.

The database is not yet complete, and not all records have been verified. The absence of data does not mean that karst features are not present at a site. A reliability rating is included with each record.

This data is sourced from the British Geological Survey.

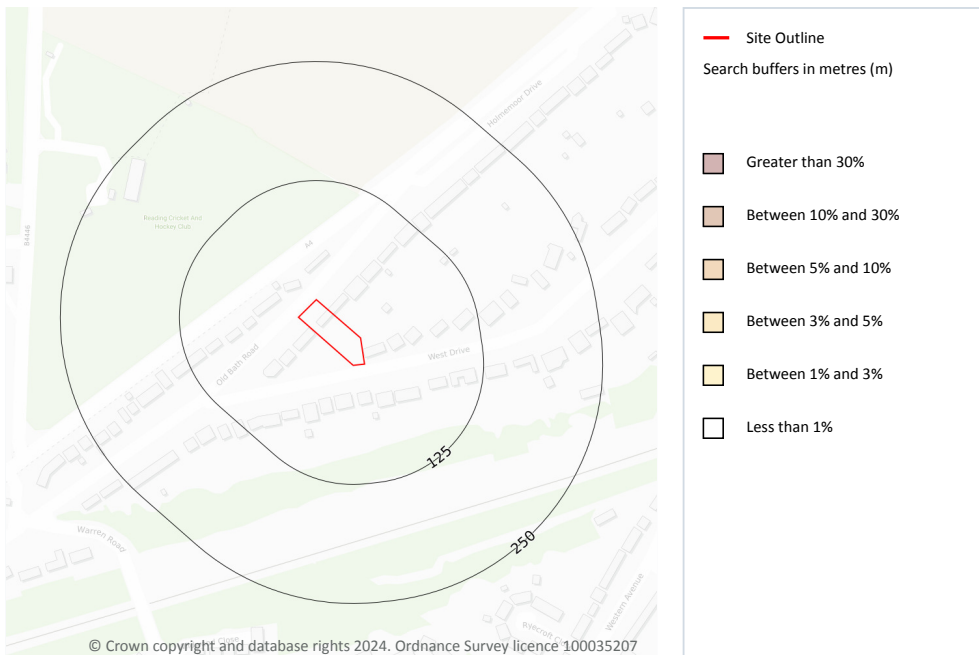


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7 Radon



7.1 Radon

Records on site

1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on [page 43](#) >

Location	Estimated properties affected	Radon Protection Measures required
On site	Less than 1%	None



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Ref: GS-S5B-OC7-ITC-FQG
Your ref: 242747
Grid ref: 475830 174497

This data is sourced from the British Geological Survey and UK Health Security Agency.



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8 Soil chemistry

8.1 BGS Estimated Background Soil Chemistry

Records within 50m

3

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km². In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
42m SE	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

This data is sourced from the British Geological Survey.

8.2 BGS Estimated Urban Soil Chemistry

Records within 50m

0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km²).

This data is sourced from the British Geological Survey.

8.3 BGS Measured Urban Soil Chemistry

Records within 50m

0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km².

This data is sourced from the British Geological Survey.

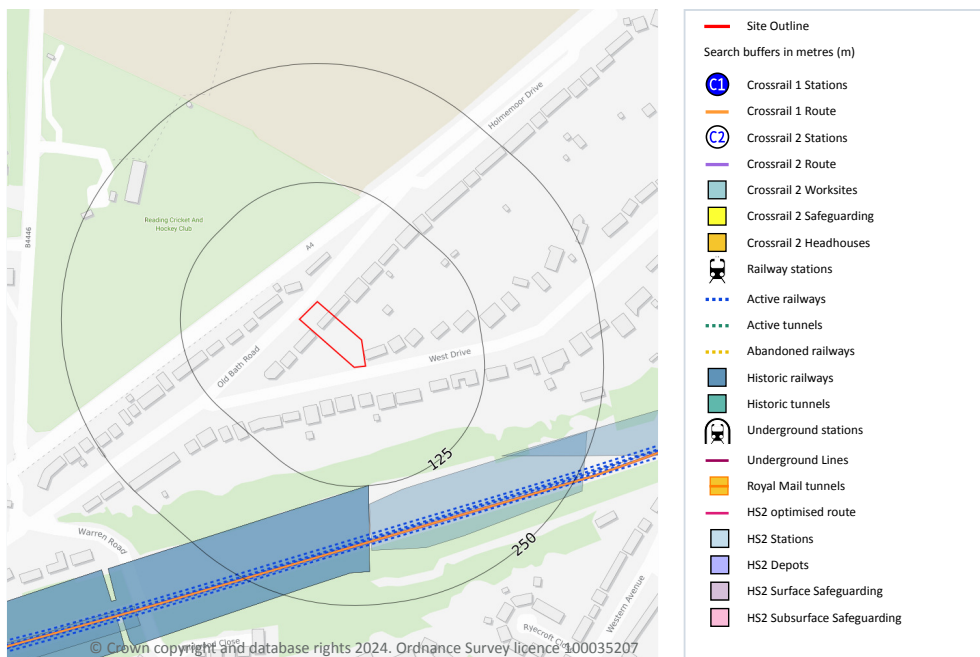


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9 Railway infrastructure and projects



9.1 Underground railways (London)

Records within 250m

1

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

Features are displayed on the Railway infrastructure and projects map on [page 46](#) >

Location	Line Name	Line Section	Track Type	Depth (m bgl)	Operational hours
179m SE	Elizabeth Line	Elizabeth Line	Surface Track	0	Mon-Thu: Early 0500 Late 0111, Fri: Early 0523 then a 24h service until Sun, Sun: Late 0001

This data is sourced from publicly available information by Groundsure.



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9.2 Underground railways (Non-London)

Records within 250m

0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

9.3 Railway tunnels

Records within 250m

0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

9.4 Historical railway and tunnel features

Records within 250m

5

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on [page 46](#) >

Location	Land Use	Year of mapping	Mapping scale
125m S	Railway	1872	-
125m S	Railway	1912	-
125m S	Railway	1933	-
135m SE	Railway	1872	-
171m SE	Railway	1932	-

This data is sourced from Ordnance Survey/Groundsure.

9.5 Royal Mail tunnels

Records within 250m

0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.



This data is sourced from Groundsure/the Postal Museum.

9.6 Historical railways

Records within 250m

0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

9.7 Railways

Records within 250m

5

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

Features are displayed on the Railway infrastructure and projects map on [page 46 >](#)

Location	Name	Type
170m S	Great Western Main Line	rail
174m S	Great Western Main Line	rail
176m S	Not given	Multi Track
178m S	Great Western Main Line	rail
181m S	Great Western Main Line	rail

This data is sourced from Ordnance Survey and OpenStreetMap.

9.8 Crossrail 1

Records within 500m

1

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

Features are displayed on the Railway infrastructure and projects map on [page 46 >](#)

Location	Route Type
178m S	Surface Alignment

This data is sourced from publicly available information by Groundsure.



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9.9 Crossrail 2

Records within 500m	0
---------------------	---

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

9.10 HS2

Records within 500m	0
---------------------	---

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 Ltd.



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Grid ref: 475830 174497

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see <https://www.groundsure.com/sources-reference> ↗.

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: www.groundsure.com/terms-and-conditions-april-2023/ ↗.



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B Site Investigation

Infiltration testing to BRE 365 was conducted on site at both driveway sub-base depth and soakaway operational depth.

B.1 Sub-base depth

Permeability Test Data

Site details: 11 OLD BATH ROAD RG4 6SZ

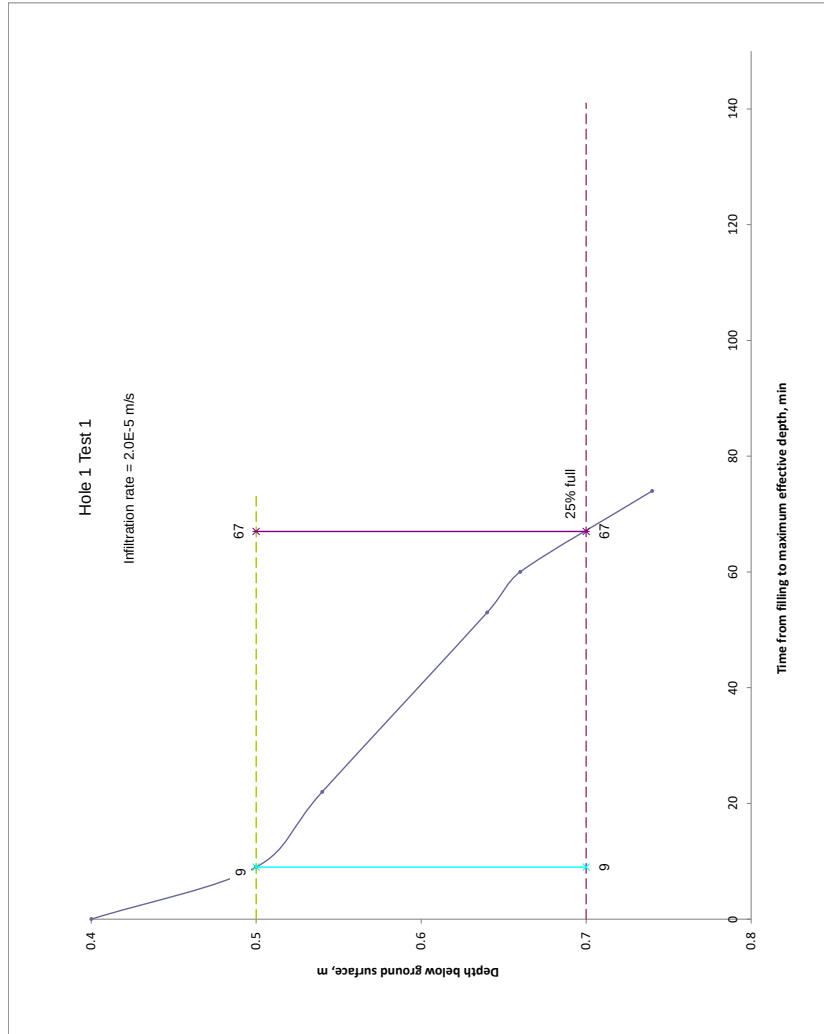
Trial Hole location or reference:
FRONT GARDEN

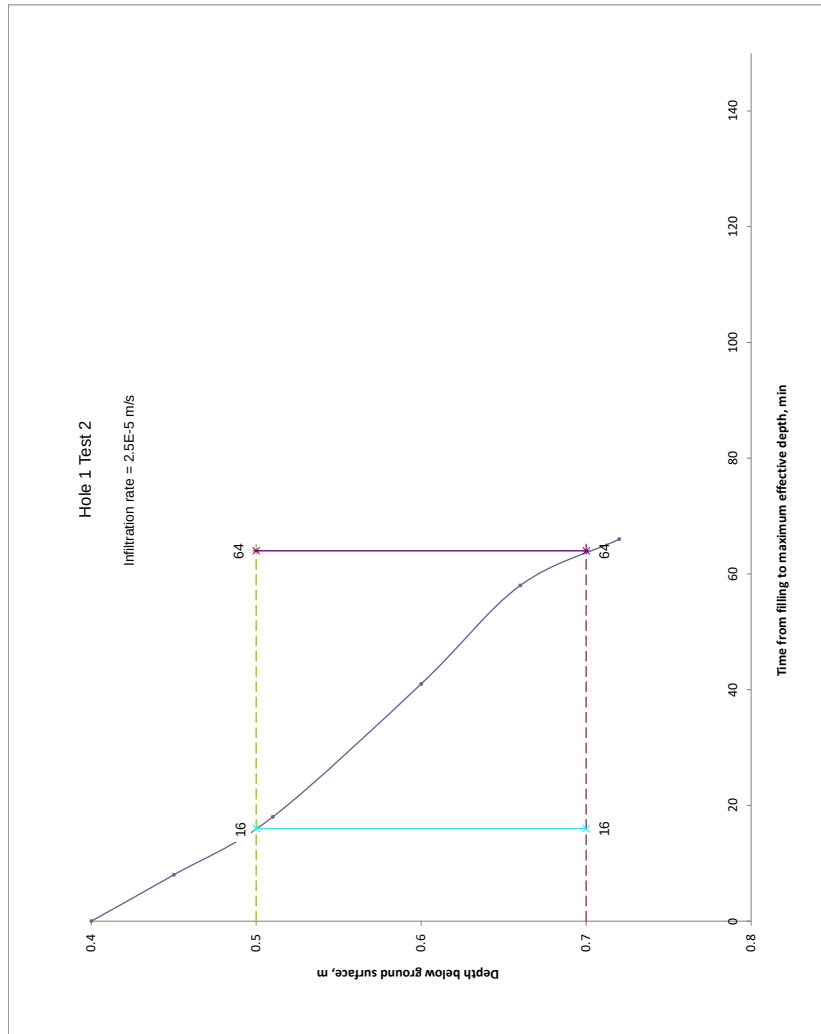
Trial Hole (actual test hole that is filled)		
Width	300 mm	min 300mm
Length	800 mm	min 800mm
Depth b.g.l.	mm	min 1200mm
Depth of water	400 mm	min 400mm

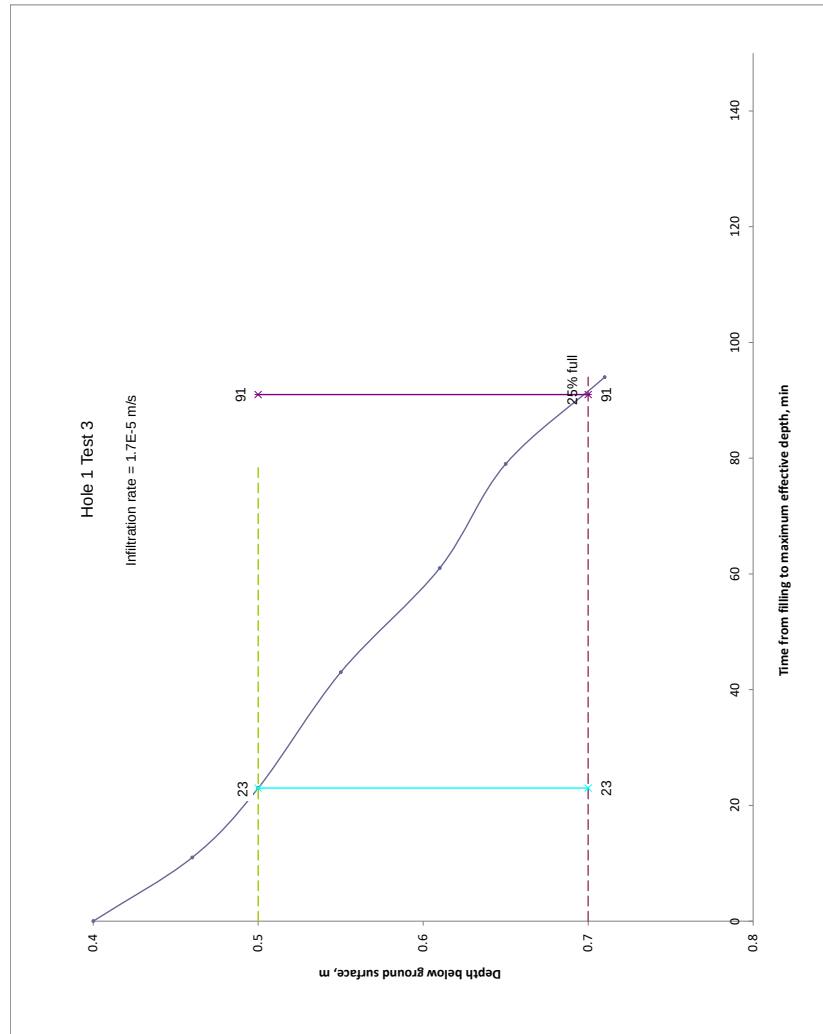
	Test 1		Test 2		Test 3		Example!!
	Time	Depth of water	Time	Depth of water	Time	Depth of water	Time depth
Start							10.00AM 400
Reading 1	13:19	400	14:34	400	15:42	400	10.05 350
Reading 2	13:28	300	14:42	350	15:53	340	10.15 325
Reading 3	13:41	260	14:52	290	16:05	300	10.28 290
Reading 4	14:12	160	15:15	200	16:25	250	11.07 198
Reading 5	14:19	140	15:32	140	16:43	190	12.22 130
Reading 6	14:33	60	15:40	80	17:01	150	13.14 115
Finish	14:33	60	15:40	80	17:16	90	14.45 85

Notes: Use one sheet per test hole. Conduct three tests per hole. Email copy of completed sheet(s) to rob@innervision-design.co.uk
The last reading MUST be below 25% of start depth (e.g. less than 100mm in a 400mm test hole)

Site Notes:







B.2 Soakaway operational depth

Permeability Test Data

Site details: 11 OLD BATH ROAD RG4 6SZ

Trial Hole location or reference: FRONT GARDEN

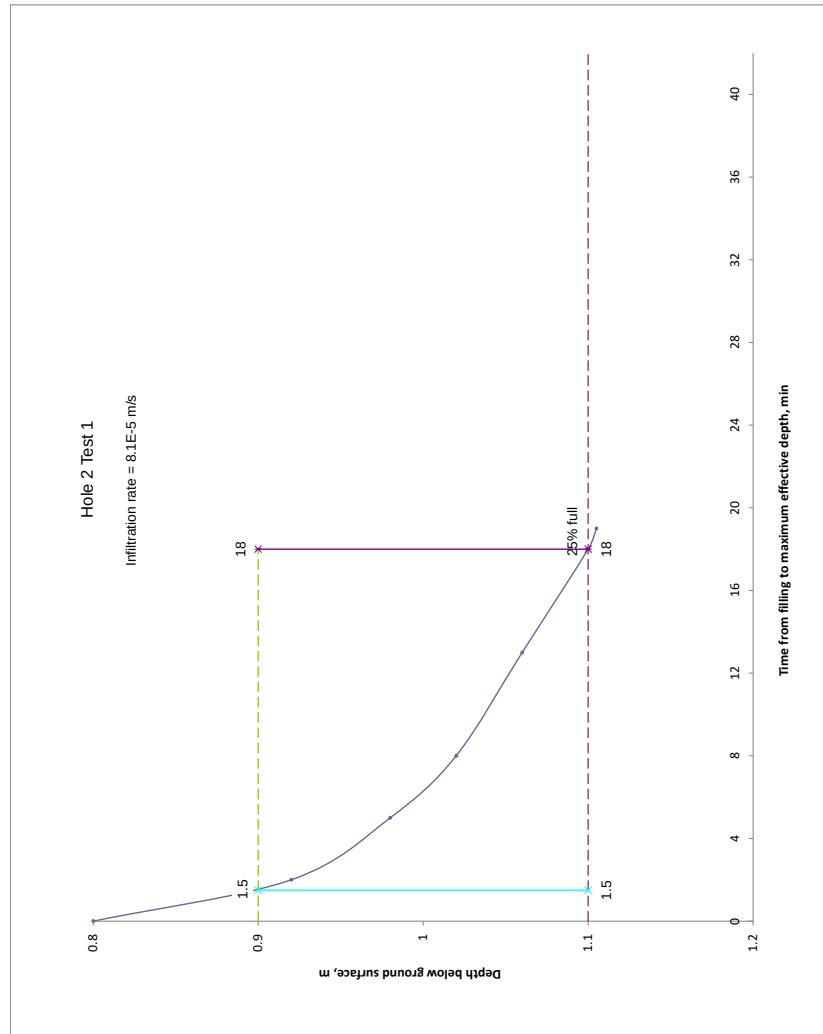
Trial Hole (actual test hole that is filled)	
Width	mm 400 min 300mm
Length	mm 800 min 800mm
Depth b.g.l.	mm 200 min 1200mm
Depth of water	mm 400 min 400mm

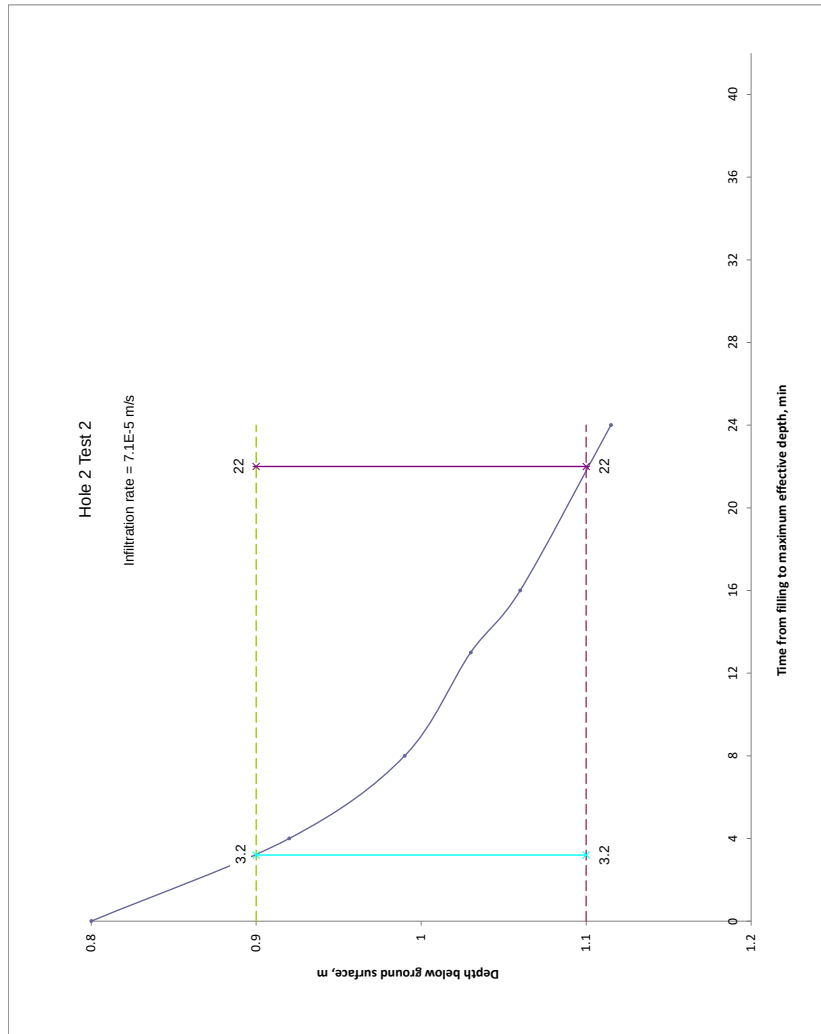
	Test 1		Test 2		Test 3		Example!!
	Time	Depth of water	Time	Depth of water	Time	Depth of water	Time depth
Start							10.00AM 400
Reading 1	10:17	400	10:38	400	11:04	400	10.05 350
Reading 2	10:19	280	10:42	280	11:08	310	10.15 325
Reading 3	10:22	220	10:46	210	11:13	260	10.28 290
Reading 4	10:25	180	10:51	170	11:19	215	11.07 198
Reading 5	10:30	140	10:54	140	11:28	170	12.22 130
Reading 6	10:35	100	11:02	85	11:45	100	13.14 115
Finish	10:36	95	11:07	85	11:45	85	14.45 85

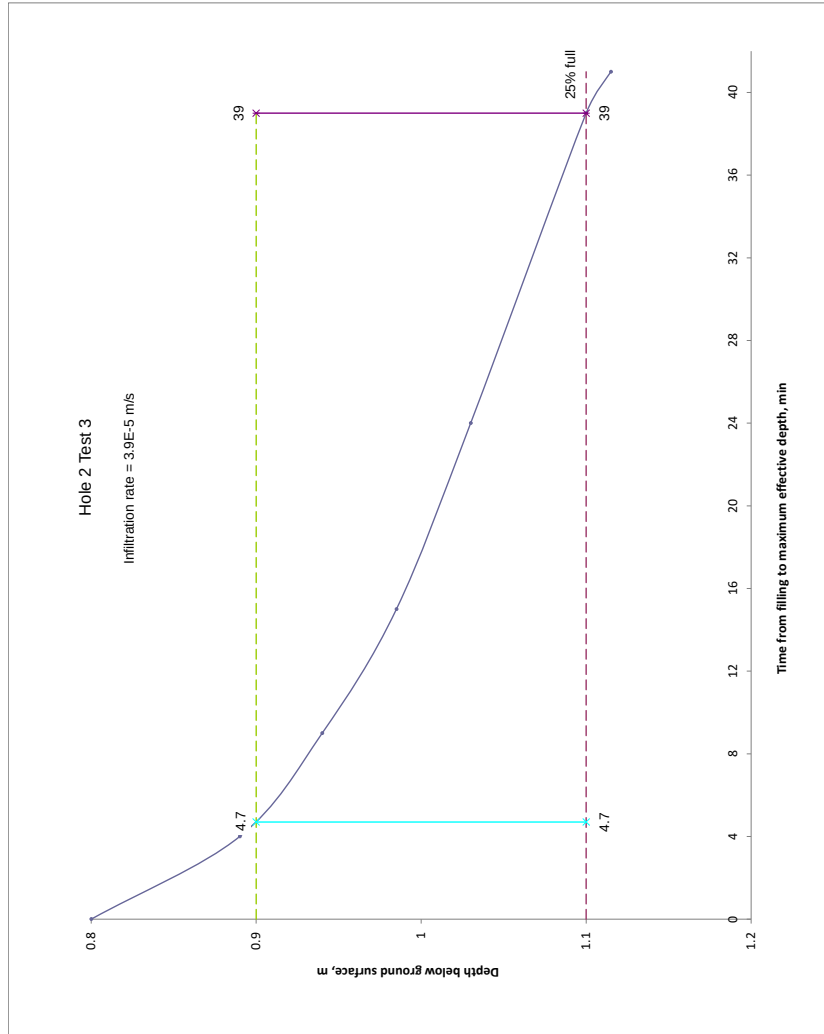
Notes: Use one sheet per test hole. Conduct three tests per hole. Email copy of completed sheet(s) to rob@innervision-design.co.uk

The last reading MUST be below 25% of start depth (e.g. less than 100mm in a 400mm test hole)

Site Notes:

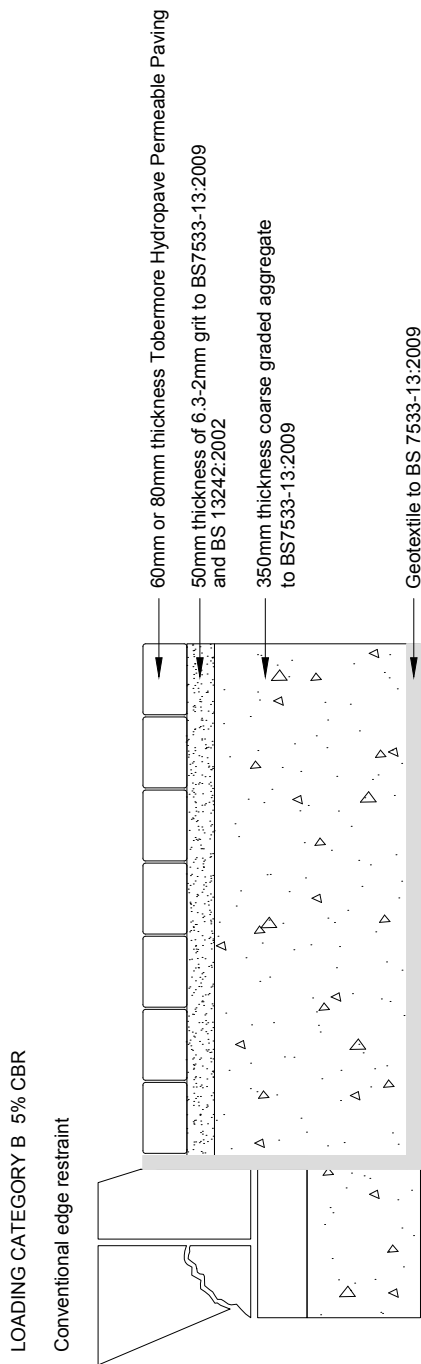






C Paving

C.1 Type A system



Disclaimer:

- These design cross-sections and suggested build-ups are provided for illustration only and are intended to depict an idealised situation.
- In all instances, local design solutions are preferred and should be checked to ensure suitability with ground conditions and planned traffic usage.
- Refer to BS 7533 Part 13 for depths of capping layers.
- All references are to latest edition of BS 7533. Tobermore can provide a project specific solution if required.

TOBERMORE CONCRETE PRODUCTS
INFILTRATION DESIGN
LOADING CATEGORY B 5% CBR

D Indicative SuDS layout

