Philippa Kay & Luke Sanders

The Lodge, 178 Bearwood Road, Wokingham

Drainage Strategy

Drainage Strategy

Issue/Revision	Revision 1	Revision 2	Revision 6	Revision 7
Remarks	Planning Issue	Updated Issue	Updated Drainage Strategy	Updated Drainage Strategy
Date	27.11.23	03.10.25	11.11.25	03.12.25
Prepared by	Robbie Parnham	Josiah Jones	Josiah Jones	Josiah Jones
Checked by	Paul Sloan	Robbie Parnham	Robbie Parnham	Robbie Parnham
File reference	19721-R02-B	19721-R02-E	19721-R02-H	19721-R02-I

CONTENTS

Appendices

EXECUTIVE SUMMARY

Tumu Consulting Ltd have been appointed by Philippa Kay & Luke Sanders to undertake a Drainage Strategy for the demolition of an existing dwelling and construction of a replacement dwelling, at The Lodge 178 Bearwood Road.

Item	Response
Site location	The site is located at The Lodge, 178 Bearwood Road. The postcode for the site is RG41 4SH and the grid reference for the site is 478390, 168580.
Size and Current Land Use	The current land use of the site is for a dwelling. The area under consideration is 0.38ha
Fluvial (rivers) Flood Risk	Low risk.
Tidal Flood Risk	Low risk.
Surface Water Flood Risk	Very low risk.
Groundwater Flood Risk	Low risk.
Sewer Flood Risk	Low risk.
Reservoirs, canals & other artificial sources	Low risk.
Historical Flooding	No historic flood events.
Proposed Development	The existing dwelling is to be demolished. A replacement dwelling is to be constructed on the footprint of the site.
NPPF Flood Risk Vulnerability	More Vulnerable

The risk of flooding to the proposed development has been assessed in accordance with the NPPF. It is concluded that the development can be undertaken in a sustainable manner without increasing the flood risk to the proposed development.

1 INTRODUCTION

Tumu Consulting Ltd have been appointed by Philippa Kay & Luke Sanders to undertake a Drainage Strategy for an existing dwelling which is to be demolished and redeveloped at The Lodge, 178 Bearwood Road, Wokingham. The report has been compiled to accompany a planning application, for the construction of a replacement dwelling.

1.1 Site Location

The site is located at The Lodge, 178 Bearwood Road, Wokingham. The postcode for the site is RG41 4SH and the grid reference for the site is 478390, 168580. The local planning authority for the area is Wokingham Borough Council.

Figure 1-1 Site Location Plan

1.2 Existing Site Usage

The site currently contains a dwelling with a landscaped driveway to the south. The Lodge, is the focus of this drainage strategy, and its area is outlined in the ownership area drawing in Appendix A.

The existing site is currently used as a dwelling for Philippa Kay and Luke Sanders, it is accessed from Bearwood Road, with a private access drive running past 178 Bearwood Road. There are 2 ponds to the west, however these are located within the adjacent properties site boundary. There is no hardstanding driveway to the dwelling, but soft landscaping to which they park their vehicles. This leads on from a shared hardstanding driveway, which is utilised by both properties.

1.3 Topography

A topographic survey has been undertaken, shown as an existing block plan of the site in appendix B, with drawing reference 641-PA-02, created in June 2022. The survey found that the site generally falls from west to east to the lower level undeveloped land.

The existing dwellings finished floor level (FFL) is shown to be approximately 81.75mAOD. The current impermeable area of the dwelling within the applicant's ownership boundary is 0.012ha. The total ownership area for is 0.38ha.

1.4 Geology & Hydrogeology

According to the BGS viewer, the bedrock geology consists of Bagshot formation. A series of sands and clays. The BGS viewer also highlights superficial deposits of Head, made of mix of gravel, sand, silt and clay. According to the residents the dwelling sits on a very clayey band of strata. It is likely this site sits on ripples of permeable gravel within a clayey strata.

The site is not located within an Environment Agency (EA) Source Protection Zone (SPZ) for groundwater.

1.5 Hydrology

There are 2 private ponds to the west of the dwelling, formed in an old gravel pits. The southern one is kept as a pond (static water level) for amenity value whilst the other, to the north, dries up/ fills up depending on the season. In the time the family has occupied this premises, since the 1950s, they have advised that this pond has never filled up past the banks.

The nearest EA main river is Emm Brook, approximately 1.5km to the east of the site.

Bearwood Lakes are present to the west of the site (part of the Bearwood lakes Golf Club complex).

1.6 Existing Drainage

The roof of the existing dwelling is pitched. Half of the rainwater, on the northern pitch, discharges through rainwater pipes to a water butt located to the east of the dwelling. This is used for gardening purposes. When the water level gets too high, the rainwater discharges to the east of the dwelling into the ground, at a lower elevation than the house.

The Southern pitch of the roof discharges to a sump to the south of the building, which pumps water to the eastern field area, where it is eventually infiltrated into the ground using a pipe discharging into soakaways below ground. These soakaways do not have any upstream chambers, and their location and build up is unknown.

This sump and pump also intercepts and discharges overland flows which may arrive from the west towards the dwelling. The southern sump is connected to a backup sump pump to the north of the dwelling, which runs from a manual switch in heavy rainfall events, to alleviate the pressure on the primary pump.

The foul water from the dwelling discharges from a soil vent pipe (SVP) to the south of the building, to a sewage treatment plant (STP) further south. This discharges treated water to an infiltration field to the east of the STP.

There are no public sewers in the immediate vicinity of the site and therefore all sewage is managed on site as noted above.

2 DEVELOPMENT PROPOSALS

2.1 Description of the Proposed Works

It is proposed to demolish the existing dwelling and replace with a new dwelling. Constructed on the footprint of the existing. The area of the proposed hardstanding development is 0.035ha the new driveway is also to be configured as part of the development with a permeable finish. Refer to appendix C for the Proposed Site Plan.

2.2 Flood Risk Vulnerability Classification

In accordance with table D2 of the NPPF, the development is classified as ‘more vulnerable’ as figure 2-1 shows below.

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Figure 2-1 Annex 3 of the NPPF Flood Risk Vulnerability Classification

2.3 Design Life

As the nature of the redevelopment is a dwelling it is anticipated that the design life will be approximately 100 years.

3 ASSESSMENT OF FLOOD RISK

3.1 Flood Map for Planning

Figure 3-1, the EA's Flood Map for Planning, shows the risk of fluvial (rivers) and tidal (flooding) for the development. As is shown in the below figure, the site is located in Flood Zone 1. This is the lowest classification of flood risk and describes the developments probability of flooding from tidal and fluvial sources, of less than 0.1%.

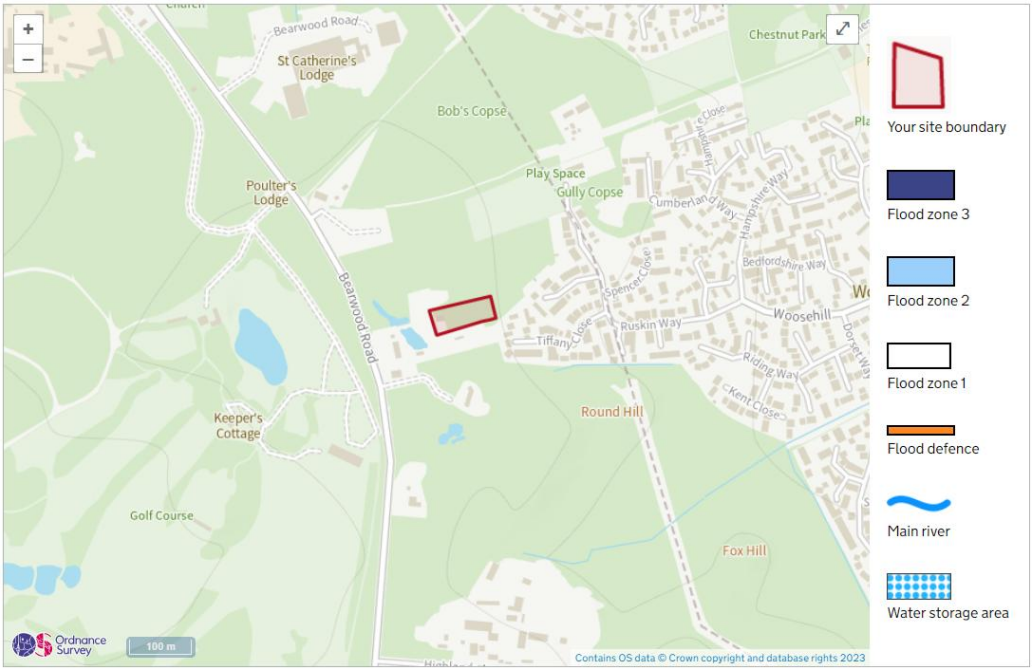

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Figure 3-1 Flood Map for Planning

Considering the site is in Flood Zone 1, it can be concluded the site is at **low** risk of flooding from fluvial and tidal sources.

As per government guidance, as the site is less than 1.0ha and in Flood Zone 1, a Flood Risk Assessment is not required. However, this section will briefly discuss common sources of flood risk.

3.2 Surface Water Flood Risk

The UK Government's Surface Water Flood Risk Mapping, available online, identifies the site to be at a very low risk (corresponding to a chance of flooding of <0.1%) for the building and external areas.

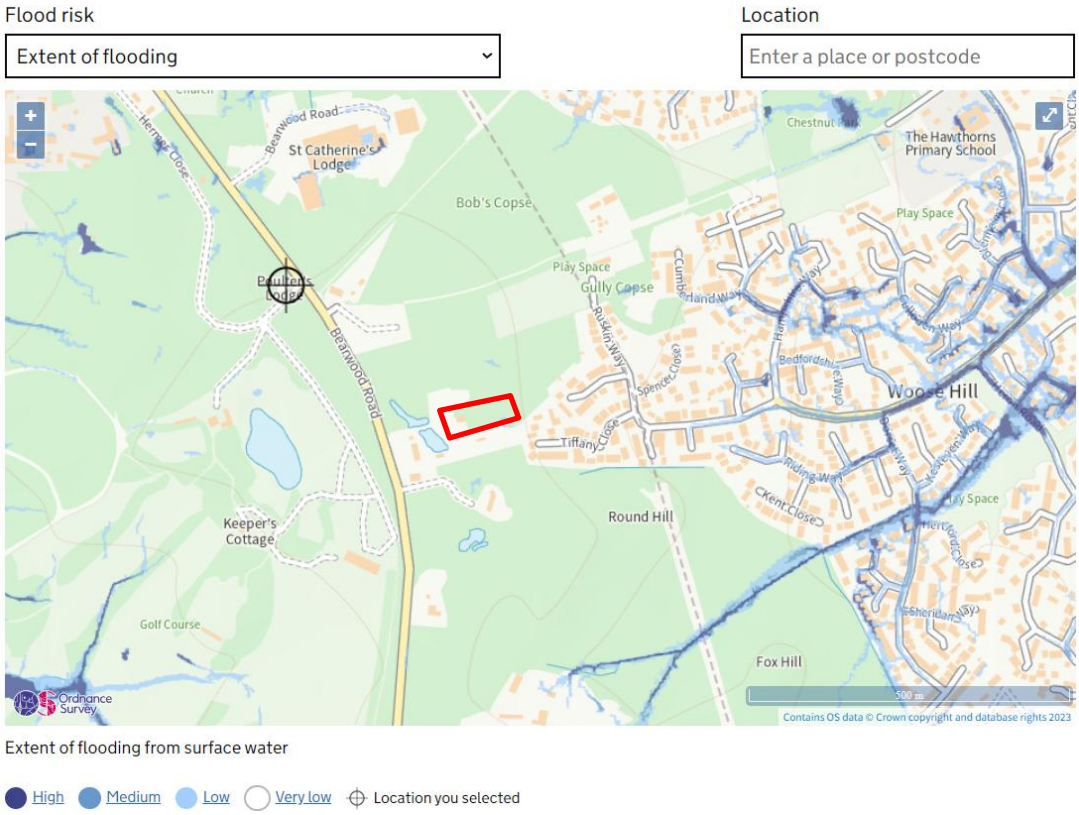


Figure 3-2 Surface Water Flood Risk Map

Using the surface water flood mapping above, the risk of the site flooding from surface water sources is **very low.**

3.3 Groundwater Flood Risk

Groundwater flooding is caused when the underlying water table gets so high that it flows above the ground level. The EA long term flood risk data suggests that groundwater flooding is unlikely. The groundwater flood risk for the site can be considered **low**.

3.4 Reservoirs, Canals & Other Artificial Sources

According to the governments long term flood risk maps, as shown in figure 3-3, the site is not in an area at risk of flooding from reservoirs, canals and other artificial sources. The flood risk can therefore be considered **low.**

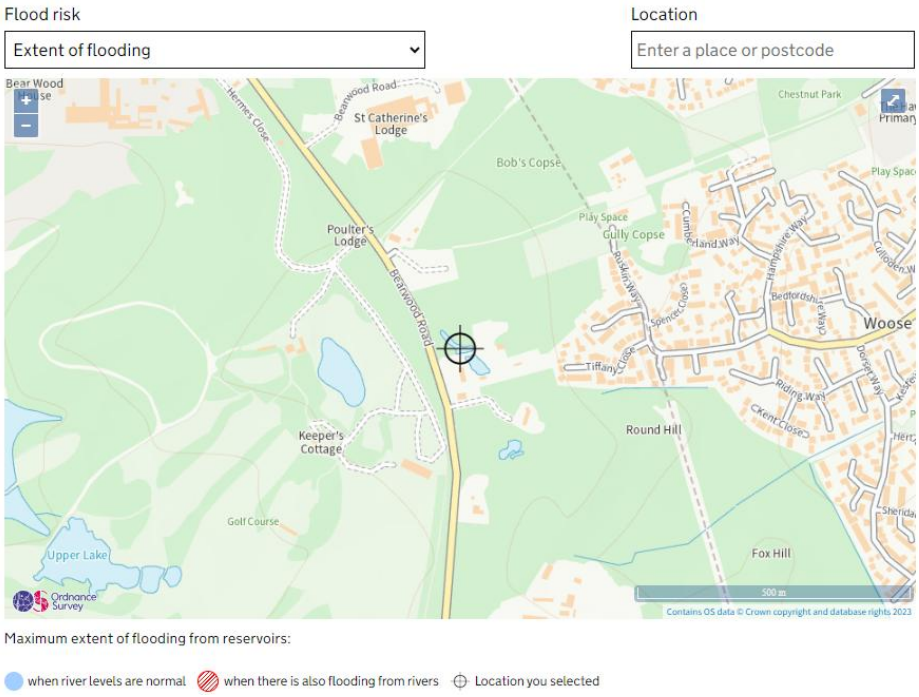


Figure 3-3 Reservoir Flood Risk Map

3.5 Sequential and Exception Test

In accordance with table 3 of the Technical Guidance to the NPPF, the development vulnerability is compatible with the flood risk as figure 3-4 shows below. The site is therefore considered sequentially preferable and no exception test is required.

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Figure 3-4 Table 3 of the Technical Guidance to the NPPF – Flood Risk Vulnerability and Flood Zone Compatibility

4 SURFACE WATER DRAINAGE STRATEGY

The surface water drainage strategy has been developed up in accordance with the relevant design standard and guidance, including but not limited to; CIRIA C753 The SuDS Manual, The Approved Documents: Building Regulations 2010 Part H: Drainage and Waste Disposal, and the Non-Statutory Technical Standards for SuDS (NTSS).

The NTSS states that for a previously developed site, the rate of discharge should never exceed the rate pre redevelopment. The NTSS also states that flooding should not occur to any part of the site in the 1 in 30 year event, and no flooding to buildings or utility plant should occur in the 1 in 100 year event with an allowance for climate change.

Surface water is currently managed on site by collection to a water butt for re-use. Any excess surface water discharges to the eastern area of open space, where it infiltrates to ground.

This approach will be maintained, however, it will be formalised with the introduction of a trench soakaway to the east, which will provide an additional SuDS treatment benefit, as well as attenuating runoff during intense rainfall events.

In addition to the above, a new rainwater harvesting plant will be introduced, which will increase the capacity of rainwater collection and reuse on-site. Any excess flow from the rainwater harvesting tank will discharge into the abovementioned infiltration system.

The proposed trench soakaway will collect runoff from the proposed dwellings and infiltrates through the strata. The infiltration rate assumed for the site is $1x10^{-5}$m/s however this is subject to infiltration testing. Refer to appendix D for the proposed drainage strategy.

As the site's usage is a dwelling, a lifespan of 100 years should be considered. Therefore, when developed (approximately 2025), the end of life can be estimated as 2125. According to government guidance, a building with a lifespan beyond 2100 should use a 'upper end' allowance for a 2070s epoch when considering rainfall climate change allowances. For the Loddon and Tributaries Management Catchment area, the climate change allowance to consider should be 40% for a 1% AEP event, and 35% for a 3.3% AEP event, as shown in figure 4-1 below.

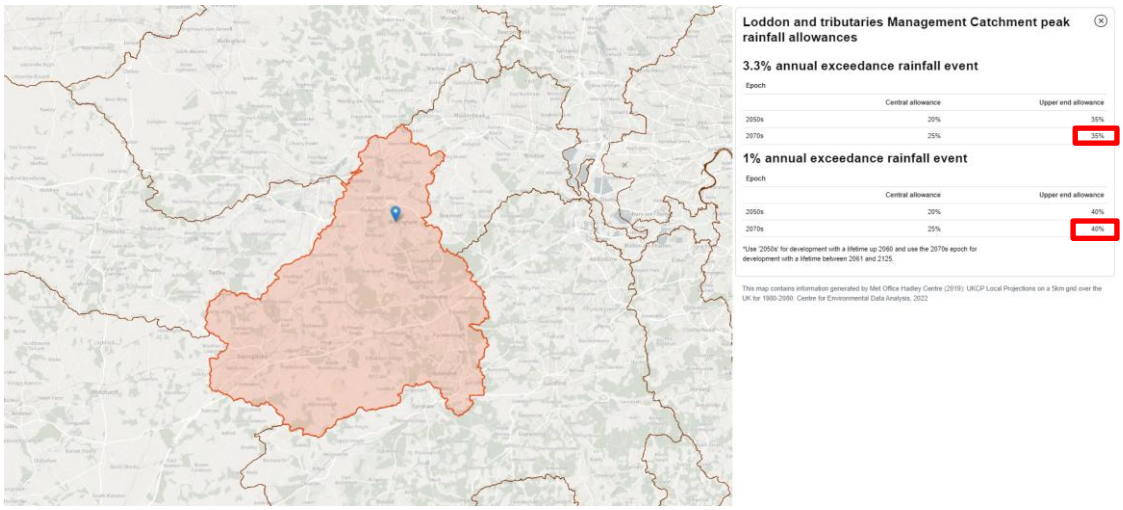


Figure 4-1 Loddon and Tributaries Management Catchment Rainfall Allowances

The trench soakaway has been sized to be 23m x 2.5m x 0.9m with a porosity of 0.3, based on an infiltration rate of $1x10^{-5}$m/s and a 30 year storm with an 35% allowance for climate change, where the site does not flood. In the 100 year storm with a 40% allowance of climate change,

flooding to a maximum volume of 4.8m^3, which will be retained on site. Refer to appendix E for the MicroDrainage Source Control calculations.

4.1 Flood Exceedance Flow Routing

In the event that the surface water drainage system is overwhelmed by surface water 30 year rainfall event or fails, the drainage will discharge east of the trench soakaway where a small bund will be formed 270mm high to retain flows and prevent discharge off site. The flows entering the area will pond in the higher intensity event, and remain as a marsh until the surface water can naturally drain away to the ground.

4.2 Maintenance Arrangements

All surface water drainage pipework will be privately managed and maintained by the occupant and maintenance will be undertaken in accordance with the recommendations outlined in the SuDS Manual (CIRIA C753), provided in tables 4-1, 4-2 and 4-3.

Maintenance schedule	**Required action**	**Typical frequency**
Regular Maintenance	Inspect surface structures, removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
	Remove cover and inspect, ensuring water is flowing freely and that the exit route for water is unobstructed. Remove any debris and silt. Undertake inspection after leaf fall in autumn.	Annually
	Jet the pipes leading from overflow structures and check water is going through the overflow	Annually
Remedial actions	Repair physical damage	As required

Table 4-1 Maintenance Requirements for Inlets, Outlets, Controls and Inspection Chambers

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect for sediment and debris in pre-treatment components ad 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 inspection)
	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 action	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 soakaways to ensure emptying is occurring	Annually

Table 4-2 Maintenance Requirements for soakaways

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

Table 4-3 Maintenance Requirements for Rainwater Harvesting Systems

5 FOUL WATER DRAINAGE STRATEGY

As previously mentioned, the dwelling currently discharges foul flows to a private sewage treatment plant to the east of the dwelling. Once treated, the ‘cleaned’ water will infiltrate through drainage fields to the south east of the dwelling.

With the redevelopment, the dwelling will look to follow the existing drainage strategy. The Lodge will discharge foul flows to sewage treatment plant which is to be moved east because of the positioning of the new dwelling.

Refer to Appendix D for the Proposed Drainage Strategy.

6 CONCLUSION

- The site is located in a Flood Zone 1 designation, therefore the annual risk of flooding from fluvial and tidal sources is <0.1%, the lowest classification of fluvial and tidal flood risk.

- The site is shown to be for the majority at a very low risk of surface water flooding.

- The site is considered to be at low risk groundwater and reservoir flooding.

- The site currently has little formal surface water drainage with surface water either going into a water butt or sumps which pump the water eastwards into an eastern soakaway, although its exact build up and position is not confirmed.

- As a result of the development, the site will discharge surface water flows through a trench soakaway with an assumed discharge rate of $1x10^{-5}$ m/s. This will retain and infiltrate surface water from the dwelling for rainfall events up to and including the 1 in 30 year with a 35% allowance for climate change. In the 1 in 100 year rainfall event with a 40% allowance for climate change, $4.8m^3$ of flooding can be expected. However, this will flow away from development towards a bund to the east, where it will pond temporarily before eventually infiltrating into the ground.

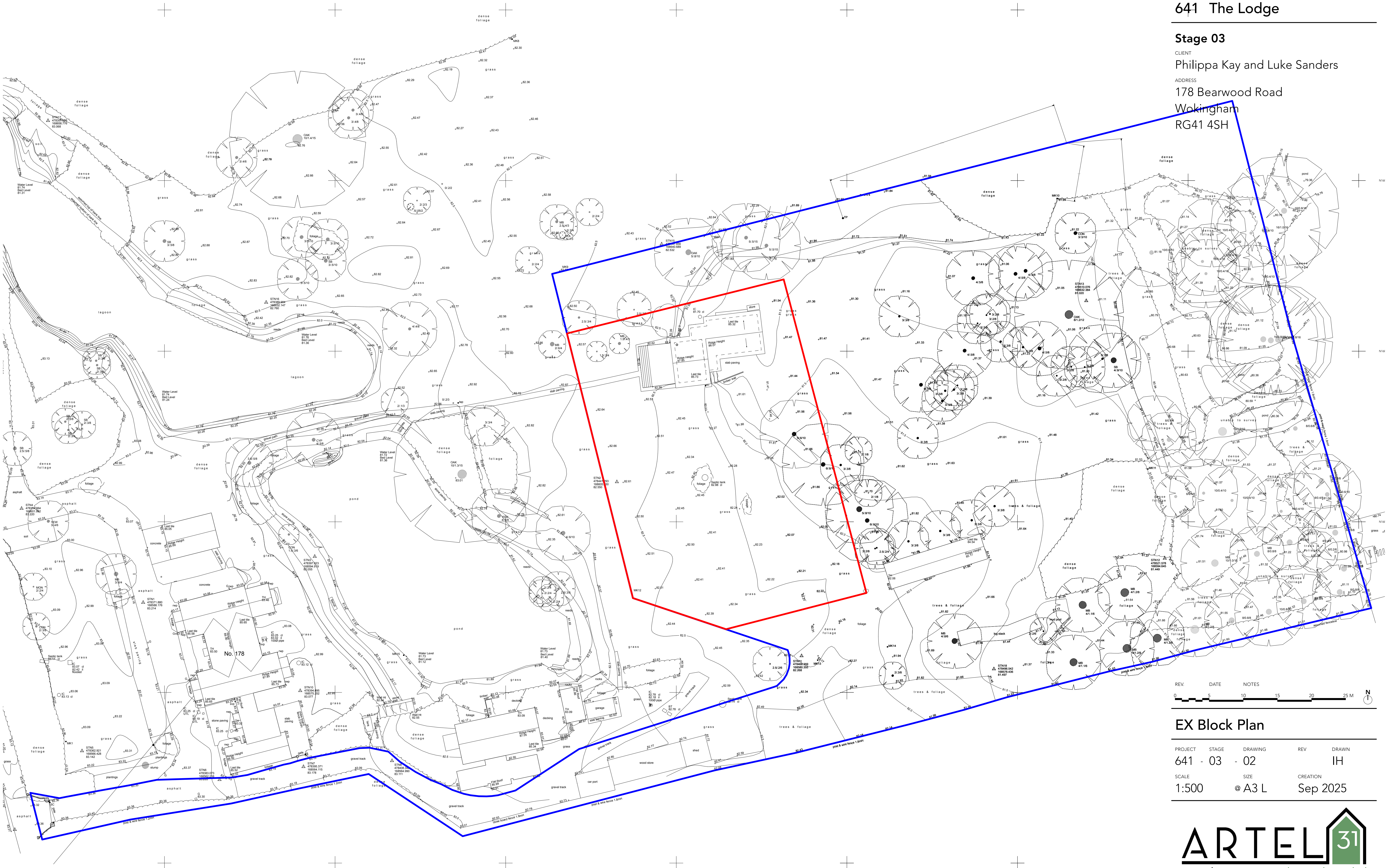
- The proposed infiltration ditch, water butt and rainwater harvesting plant act as SuDS treatment for the property.

- The existing foul strategy will be maintained, with foul flows discharging to a Sewage Treatment Plant then drainage field.

It is concluded that the development can be undertaken in a sustainable manner without increasing the flood risk to the proposed development or to existing properties/systems.

Appendix A

Topographic Survey



641 The Lodge

Stage 03

CLIENT
Philippa Kay and Luke Sanders

ADDRESS
178 Bearwood Road
Wokingham
RG41 4SH

REV. DATE NOTES

0 5 10 15 20 25 M

EX Block Plan

PROJECT	STAGE	DRAWING	REV	DRAWN
641	03	02		IH

SCALE	SIZE	CREATION
1:500	@ A3 L	Sep 2025

ARTEL 31
architects that build

artel31.co.uk · 01249 445656 · 5 Union Road SN15 1HW

Appendix B

Proposed Site Plan

641 The Lodge

Stage 03

CLIENT
Philippa Kay and Luke Sanders

ADDRESS
178 Bearwood Road
Wokingham
RG41 4SH

REV. DATE NOTES

0 4 9 14 19 24 M N

PR Block Plan

PROJECT	STAGE	DRAWING	REV	DRAWN
641 -	03 -	08		IH

SCALE	SIZE	CREATION
1:500	@ A3 L	Sep 2025

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Appendix C

Proposed Drainage Arrangement

PROPOSED TRENCH SOAKAWAY.
CL 81.33
IL 80.43
LENGTH 13m
WIDTH 5m
DEPTH 0.9m
POROSITY 0.3
INFILTRATION RATE 1x10-5m/s
150mm PERORATED PIPE TO LIE 50mm ABOVE BASE OF TRENCH, RUNNING ACROSS FULL LENGTH.
TRENCH SOAKAWAY TO BE WRAPPED IN PERMEABLE GEOTEXTILE AND FILLED WITH SINGLE SIZE CLEAN STONE 30% VOID.
NO FLOODING IN 1 IN 30 YEAR STORM WITH 35% ALLOWANCE FOR CLIMATE CHANGE.
IN THE 100 YEAR STORM, A MAXIMUM OF 5m³ FLOODING CAN BE EXPECTED. THIS SMALL VOLUME WILL FOLLOW THE FLOOD EXCEEDANCE ROUTING.

SMALL BUND TO BE FORMED
APPROX 15m³ CAPACITY.
270mm HIGH TO RETAIN EXCEEDANCE FLOWS TO A CREST ELEVATION OF 80.90mAOD.
TO REMAINS AS A MARSH AREA IN EXCEEDANCE EVENTS UNTIL AREA NATURALLY DRIES OUT.
1:3 GRADIENT ON BANKS.

ALL SURFACE WATER DRAINAGE PIPEWORK TO BE LOCATED OUTSIDE OF TREE PROTECTION ZONES (TPZs).

TPO EXTENT

ANY EXCEEDANCE FLOWS WILL FALL TOWARDS THE AREA SHOWN TO BE MARSHLAND.

SOAKAWAY SIZING SUBJECT TO INFILTRATION TESTING COMPLIANT TO BRE 365.

PROPOSED RAINWATER HARVESTING TANK. TO FEATURE OVERFLOW FOR ANY EXCESS FLOWS TO ENTER THE SURFACE WATER DRAINAGE SYSTEM.

PROPOSED PRIVATE FOUL TO MAINTAIN FOUL STRATEGY.

ACCESS TO BE A GRAVEL PERVIOUS CONSTRUCTION.

TO BE SIZED THROUGH PERCOLATION TESTING AT THE DETAILED DESIGN STAGE.

SEWAGE TREATMENT PLANT

ACCESS TO BE A GRAVEL PERVIOUS CONSTRUCTION.

KEY

- PROPOSED PRIVATE FOUL CHAMBER
- PROPOSED PRIVATE FOUL DRAIN
- PROPOSED PRIVATE SURFACE CHAMBER
- PROPOSED PRIVATE SURFACE DRAIN
- EXISTING CHAMBER/DRAIN TO BE ABANDONED
- EXCEEDANCE FLOW ROUTE

REV.	DESCRIPTION	Date	BY	CHK
I	UPDATED TO MOVE DRAINAGE OUT OF RPA	03.12.25	JJ	RP
H	UPDATED TO MOVE DRAINAGE OUT OF A TPO	11.11.25	JJ	RP
G	UPDATED TO REMOVE OBJECTS FOR DEMOLITION	03.11.25	JJ	RP
F	UPDATED EXISTING TOPO AND RELOCATED FOUL	29.10.25	JJ	RJP
E	UPDATED FOLLOWING NEW SITE PLAN	03.10.25	JJ	RJP
D	UPDATED IN LINE WITH ARCHITECTS SITE LAYOUT	02.08.24	RJP	SW
C	UPDATED BASED ON EXTENDED TOPO	19.02.24	RJP	SW
B	UPDATED FOLLOWING NEW SITE PLAN	19.12.23	RJP	SW
A	DRAFT ISSUE	27.10.23	RJP	SW

DESIGN BY: tumu

CLIENT: PHILIPPA & LUKE KAY

ARCHITECT: ARTEL31

DRAWING STATUS: PLANNING APPLICATION

SCALE @ A1: 0 1:250 12.5 metres

PROJECT: THE LODGE, 178 BEARWOOD ROAD

TITLE: PROPOSED DRAINAGE STRATEGY

PROJECT No:	DRAWING No:	REV:
19721	D03	I

Appendix D

MicroDrainage Source Control Calculations

Summary of Results for 30 year Return Period (+35%)

Half Drain Time : 913 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	80.744	0.314	0.1	6.1	O K
30 min Summer	80.837	0.407	0.1	7.9	O K
60 min Summer	80.932	0.502	0.1	9.8	O K
120 min Summer	81.026	0.596	0.1	11.6	O K
180 min Summer	81.076	0.646	0.2	12.6	Flood Risk
240 min Summer	81.108	0.678	0.2	13.2	Flood Risk
360 min Summer	81.141	0.711	0.2	13.9	Flood Risk
480 min Summer	81.157	0.727	0.2	14.2	Flood Risk
600 min Summer	81.163	0.733	0.2	14.3	Flood Risk
720 min Summer	81.168	0.738	0.2	14.4	Flood Risk
960 min Summer	81.174	0.744	0.2	14.5	Flood Risk
1440 min Summer	81.176	0.746	0.2	14.5	Flood Risk
2160 min Summer	81.163	0.733	0.2	14.3	Flood Risk
2880 min Summer	81.142	0.712	0.2	13.9	Flood Risk
4320 min Summer	81.095	0.665	0.2	13.0	Flood Risk
5760 min Summer	81.050	0.620	0.1	12.1	Flood Risk
7200 min Summer	81.010	0.580	0.1	11.3	O K
8640 min Summer	80.975	0.545	0.1	10.6	O K
10080 min Summer	80.944	0.514	0.1	10.0	O K
15 min Winter	80.782	0.352	0.1	6.9	O K
30 min Winter	80.886	0.456	0.1	8.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Time-Peak (mins)
15 min Summer	93.969	0.0	19
30 min Summer	61.227	0.0	34
60 min Summer	38.189	0.0	64
120 min Summer	23.154	0.0	122
180 min Summer	17.111	0.0	182
240 min Summer	13.753	0.0	242
360 min Summer	10.053	0.0	362
480 min Summer	8.043	0.0	480
600 min Summer	6.763	0.0	560
720 min Summer	5.869	0.0	608
960 min Summer	4.689	0.0	724
1440 min Summer	3.413	0.0	992
2160 min Summer	2.482	0.0	1404
2880 min Summer	1.979	0.0	1816
4320 min Summer	1.436	0.0	2596
5760 min Summer	1.144	0.0	3400
7200 min Summer	0.958	0.0	4176
8640 min Summer	0.829	0.0	4928
10080 min Summer	0.733	0.0	5656
15 min Winter	93.969	0.0	19
30 min Winter	61.227	0.0	33

Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
60 min Winter	80.993	0.563	0.1	11.0	O K
120 min Winter	81.098	0.668	0.2	13.0	Flood Risk
180 min Winter	81.155	0.725	0.2	14.1	Flood Risk
240 min Winter	81.191	0.761	0.2	14.8	Flood Risk
360 min Winter	81.230	0.800	0.2	15.6	Flood Risk
480 min Winter	81.250	0.820	0.2	16.0	Flood Risk
600 min Winter	81.259	0.829	0.2	16.2	Flood Risk
720 min Winter	81.261	0.831	0.2	16.2	Flood Risk
960 min Winter	81.263	0.833	0.2	16.3	Flood Risk
1440 min Winter	81.257	0.827	0.2	16.1	Flood Risk
2160 min Winter	81.227	0.797	0.2	15.5	Flood Risk
2880 min Winter	81.191	0.761	0.2	14.8	Flood Risk
4320 min Winter	81.118	0.688	0.2	13.4	Flood Risk
5760 min Winter	81.055	0.625	0.2	12.2	Flood Risk
7200 min Winter	81.002	0.572	0.1	11.1	O K
8640 min Winter	80.956	0.526	0.1	10.3	O K
10080 min Winter	80.918	0.488	0.1	9.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
60 min Winter	38.189	0.0	62
120 min Winter	23.154	0.0	122
180 min Winter	17.111	0.0	180
240 min Winter	13.753	0.0	238
360 min Winter	10.053	0.0	352
480 min Winter	8.043	0.0	462
600 min Winter	6.763	0.0	570
720 min Winter	5.869	0.0	666
960 min Winter	4.689	0.0	750
1440 min Winter	3.413	0.0	1054
2160 min Winter	2.482	0.0	1512
2880 min Winter	1.979	0.0	1936
4320 min Winter	1.436	0.0	2768
5760 min Winter	1.144	0.0	3576
7200 min Winter	0.958	0.0	4392
8640 min Winter	0.829	0.0	5184
10080 min Winter	0.733	0.0	5944

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 81.330

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	5.0
Infiltration Coefficient Side (m/hr)	0.03600	Trench Length (m)	13.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	80.430	Cap Infiltration Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1065 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	80.851	0.421	0.1	8.2	O K
30 min Summer	80.981	0.551	0.1	10.7	O K
60 min Summer	81.114	0.684	0.2	13.3	Flood Risk
120 min Summer	81.242	0.812	0.2	15.8	Flood Risk
180 min Summer	81.310	0.880	0.2	17.2	Flood Risk
240 min Summer	81.330	0.900	0.2	18.0	FLOOD
360 min Summer	81.331	0.901	0.2	18.8	FLOOD
480 min Summer	81.332	0.902	0.2	19.2	FLOOD
600 min Summer	81.332	0.902	0.2	19.4	FLOOD
720 min Summer	81.332	0.902	0.2	19.4	FLOOD
960 min Summer	81.332	0.902	0.2	19.5	FLOOD
1440 min Summer	81.332	0.902	0.2	19.4	FLOOD
2160 min Summer	81.331	0.901	0.2	18.9	FLOOD
2880 min Summer	81.331	0.901	0.2	18.2	FLOOD
4320 min Summer	81.293	0.863	0.2	16.8	Flood Risk
5760 min Summer	81.230	0.800	0.2	15.6	Flood Risk
7200 min Summer	81.175	0.745	0.2	14.5	Flood Risk
8640 min Summer	81.127	0.697	0.2	13.6	Flood Risk
10080 min Summer	81.085	0.655	0.2	12.8	Flood Risk
15 min Winter	80.902	0.472	0.1	9.2	O K
30 min Winter	81.047	0.617	0.1	12.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	126.078	0.0	19
30 min Summer	82.894	0.0	34
60 min Summer	52.002	0.0	64
120 min Summer	31.583	0.0	122
180 min Summer	23.307	0.0	182
240 min Summer	18.689	0.4	242
360 min Summer	13.582	1.3	362
480 min Summer	10.822	1.7	480
600 min Summer	9.073	1.8	596
720 min Summer	7.853	1.9	642
960 min Summer	6.247	2.0	760
1440 min Summer	4.519	1.9	1010
2160 min Summer	3.264	1.3	1424
2880 min Summer	2.588	0.7	1816
4320 min Summer	1.864	0.0	2596
5760 min Summer	1.476	0.0	3400
7200 min Summer	1.230	0.0	4176
8640 min Summer	1.060	0.0	4928
10080 min Summer	0.934	0.0	5656
15 min Winter	126.078	0.0	19
30 min Winter	82.894	0.0	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
60 min Winter	81.196	0.766	0.2	14.9	Flood Risk
120 min Winter	81.330	0.900	0.2	17.8	FLOOD
180 min Winter	81.332	0.902	0.2	19.3	FLOOD
240 min Winter	81.333	0.903	0.2	20.2	FLOOD
360 min Winter	81.334	0.904	0.2	21.3	FLOOD
480 min Winter	81.334	0.904	0.2	21.9	FLOOD
600 min Winter	81.335	0.905	0.2	22.2	FLOOD
720 min Winter	81.335	0.905	0.2	22.3	FLOOD
960 min Winter	81.335	0.905	0.2	22.2	FLOOD
1440 min Winter	81.334	0.904	0.2	21.9	FLOOD
2160 min Winter	81.333	0.903	0.2	20.9	FLOOD
2880 min Winter	81.332	0.902	0.2	19.7	FLOOD
4320 min Winter	81.324	0.894	0.2	17.4	Flood Risk
5760 min Winter	81.237	0.807	0.2	15.7	Flood Risk
7200 min Winter	81.164	0.734	0.2	14.3	Flood Risk
8640 min Winter	81.103	0.673	0.2	13.1	Flood Risk
10080 min Winter	81.052	0.622	0.1	12.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
60 min Winter	52.002	0.0	62
120 min Winter	31.583	0.2	122
180 min Winter	23.307	1.7	180
240 min Winter	18.689	2.7	238
360 min Winter	13.582	3.8	354
480 min Winter	10.822	4.3	468
600 min Winter	9.073	4.6	578
720 min Winter	7.853	4.8	686
960 min Winter	6.247	4.7	884
1440 min Winter	4.519	4.3	1096
2160 min Winter	3.264	3.3	1552
2880 min Winter	2.588	2.1	1988
4320 min Winter	1.864	0.0	2768
5760 min Winter	1.476	0.0	3576
7200 min Winter	1.230	0.0	4392
8640 min Winter	1.060	0.0	5184
10080 min Winter	0.934	0.0	5944

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins) From:	To:	Area (ha)
0	4	0.035

Model Details

Storage is Online Cover Level (m) 81.330

Trench Soakaway Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	5.0
Infiltration Coefficient Side (m/hr)	0.03600	Trench Length (m)	13.0
Safety Factor	1.5	Slope (1:X)	0.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	80.430	Cap Infiltration Depth (m)	0.000