Civil Engineers & Transport Planners

Honeypot Cottage

Flood Risk Assessment & Drainage Strategy

December 2023

231740/FRA/OR/RS/01

Civil Engineers & Transport Planners

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1 INTRODUCTION

1.1 General

1.1.1 Lanmor Consulting Ltd has been commissioned to provide a Flood Risk Assessment and Drainage Strategy report for the proposed development of Honeypot Cottage, Binfield Road, Binfield, Bracknell, RG42 4LY.

1.1.2 Figure 1.1 below indicates the site location.

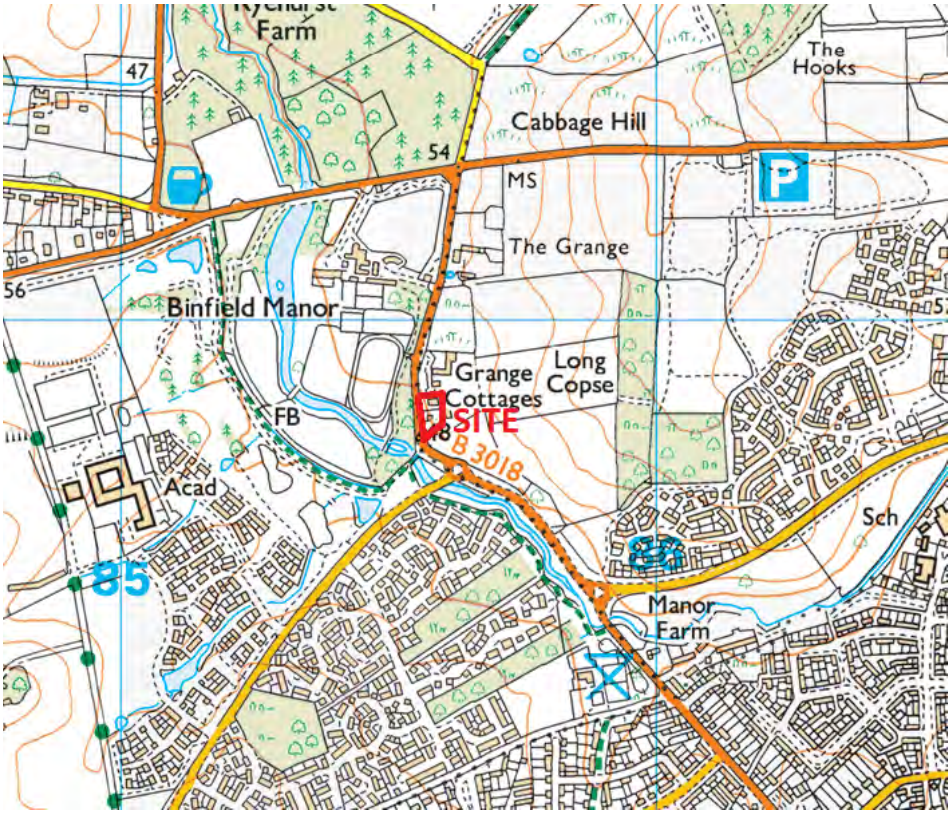

Figure 2.1 – Site Location

1.2 Scope

1.2.1 This report describes the sites existing conditions, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its technical guidance. This report will consider the following:

- Development proposals
- Sources of flooding and flood defences

- Flooding extents, depth and climate change predictions
- Impact of flooding on the development
- Dangers presented by flooding

1.2.2 This report has been prepared in accordance with the requirements of the governments National Planning Policy Framework (NPPF) and its planning practice guidance and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding area.

1.2.3 This report will also consider the proposed drainage regime for the site. It will assess the site's current Greenfield and Brownfield runoff rates, suitable methods of discharging the runoff from the development and set the drainage strategy for the proposed development, including discharge rates and any requirements for attenuation.

2 SITE CONDITIONS AND PROPOSED DEVELOPMENT

2.1 Existing Site

2.1.1 The site is considered a brownfield site and is located on the outskirts of the village of Binfield in the county of Berkshire. The site is located on Binfield Road (B3018) just north of the junction with Temple Way. On the other side of Binfield Road is a watercourse named The Cut. In the vicinity of the site the river is wide and deep, and the gradient is relatively flat.

2.2 Regional Geology

2.2.1 The British Geological Survey (BGS) contains mapped data of the geology of different regions. Using the BGS, it is indicated that the site is underlain by London Clay Formation, which is made up of Clay, Silt and Sand. The sedimentary bedrock contained within the site was formed between 56 and 47.8 million years ago during the Palaeogene period.

2.2.2 Due to the nature of clay, surface water infiltration into the ground will not be a viable solution due to the low permeability of the soil.

2.3 Proposed Development

2.3.1 The proposed development on the site is for the construction of a new cottage containing a total of four bedrooms and four bathrooms. The development also includes vehicular access off the existing driveway leading to a detached garage which contains car parking and cycle storage.

2.3.2 A copy of the proposed site layout, drawing 2653/08, is included in Appendix A.

3 SOURCES OF FLOODING

3.1 Fluvial / Tidal Flooding

3.1.1 The NPPF and PPG define the Flood Zones as follows:

- Zone 1: 'Low Probability' This zone comprises land assessed as having a less than a 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.

- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year.

- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

- Zone 3b: 'The Functional Floodplain' – This zone comprises land where water must flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

3.1.2 The application site is shown to be within Flood Zone 1. This means that there is less than 1 in 1000 chance of fluvial flooding per year.

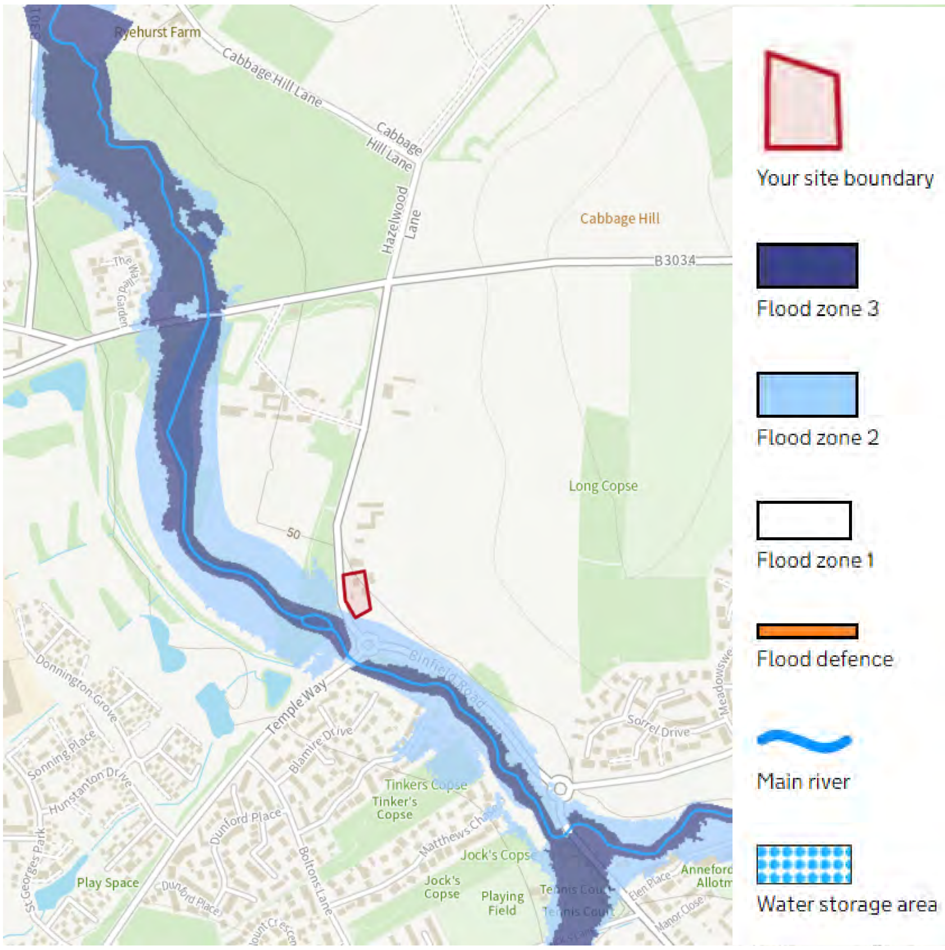

Figure 3.1 – EA Fluvial Flood Map

3.1.3 The light blue area shows the places which are at medium risk of flooding (Flood Zone 2) and the dark blue area shows the places at high risk of flooding (Flood Zone 3). Figure 3.1 shows that the site falls within Flood Zone 1, but sits very closely to a Flood Zone 2 area.

3.2 Surface Water Flooding

3.2.1 The surface water flood mapping provided by the EA is considered to be the best available source of national information of surface water flooding it is a starting point for understanding patterns and probability of surface water flooding. The EA accept that the mapping has limitations and state that *“these maps cannot definitely show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level.”*

3.2.2 Figure 3.2 below shows that the site is at "very low" risk of surface water flooding for a 1 in 100 year event.

Figure 3.2 – Surface water flood risk

3.2.3 According to the above map, the site is not susceptible to either 1 in 100 or 1 in 30 surface water flooding events.

3.3 Groundwater Flooding

3.3.1 On Bracknell Forest Council's (BFC), which is the local council for this site, they provided a preliminary flood risk assessment report for BFC dated in July 2011. This suggests that the site is at a less than 25% risk of groundwater flooding.

3.3.2 Due to the impermeable nature of the ground it is unlikely for there to be any groundwater emergence occurring at the site, and the risk of groundwater flooding is considered to be very low.

3.4 Flooding from Reservoirs

3.4.1 As indicated in Figure 3.5 below, provided by the EA, the site is not likely to be susceptible to flooding in the event of a dam breach or failure.

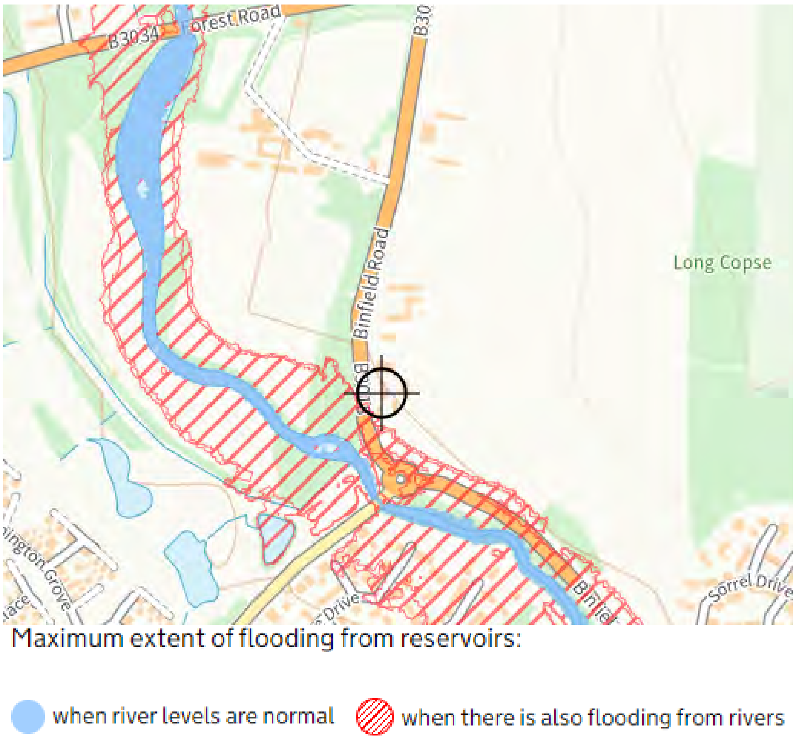

Figure 3.5 – Reservoir Flood Map

4 MODELLED FLOOD LEVELS AND CLIMATE CHANGE

4.1 Modelled Flood Levels

4.1.1 The nearest source of fluvial flooding to the site is from The Cut, which at its closest point is located approximately 75 metres to the southwest of the site.

4.1.2 The Environment Agency have provided flood data which includes flood water levels for the 1.0% (1 in 100 year) event plus 20% climate change allowance. The water level in The Cut for this event was 47.73m AOD (Point 1). A topographical survey of the site found the ground levels along the western boundary to be 48.28m AOD at their lowest, meaning that flood waters would not reach the site during this event with a freeboard of 0.55m.

4.1.3 The EA have also provided flood data for the 0.1% AEP event (1 in 1000 years). The flood level for The Cut in the vicinity of the site is 48.12m AOD (Point 1). Even in this event, there still would be roughly 0.16m freeboard between the flood water level and the site ground level.

4.1.4 Figure 4.1 on the next page shows the detailed flood modelling map in the vicinity of the site with the extent of 1% AEP +CC flood waters in dark blue, and the extent of 0.1% AEP flood waters in light blue. The mapping clearly shows the entire site will be free of flooding for both these events, proving that the site is located in Flood Zone 1.

4.1.5 Tables 4.1 and 4.2 provide the flood levels and river flows extracted from the EA's flood modelling for the 3 points identified on the mapping.

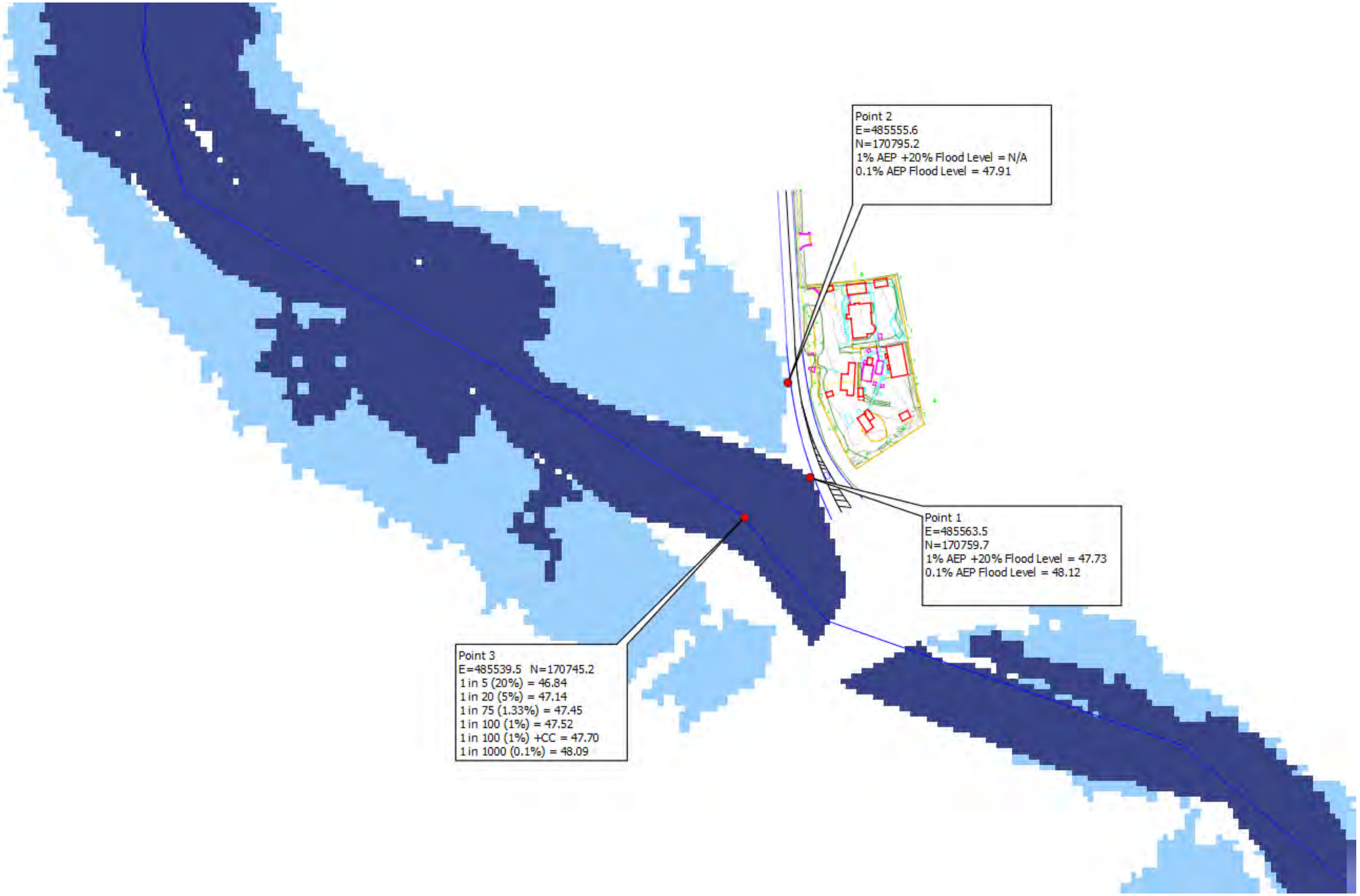

Figure 4.1 – Detailed FRA Map for Honeypot Cottage

Node Label	Model	Easting	Northing	20% AEP	5% AEP	1.33% AEP	1% AEP	1% AEP +20% CC	1% AEP +35% CC	0.1% AEP
Point 1		485564	170760	46.87	47.17	47.47	47.55	47.73	47.81	48.12
Point 2		485556	170795	n/a	n/a	n/a	n/a	n/a		47.91
Point 3		485540	170745	46.84	47.14	47.45	47.52	47.70	47.78	48.09

Table 4.1 – Modelled Flood Levels (mAOD)

Node Label	Model	Easting	Northing	20% AEP	5% AEP	1.33% AEP	1% AEP	1% AEP +20% CC	1% AEP +35% CC	0.1% AEP
Point 1		485564	170760							
Point 2		485556	170795							
Point 3		485540	170745	0.74	1.09	1.52	1.66	2.04	2.33	3.52

Table 4.2 – Modelled River Flows (m^3/s)

Data in BLACK text has been taken from the EA Product 6. Data in RED text has been calculated by Lanmor using a Discharge Rating Curve.

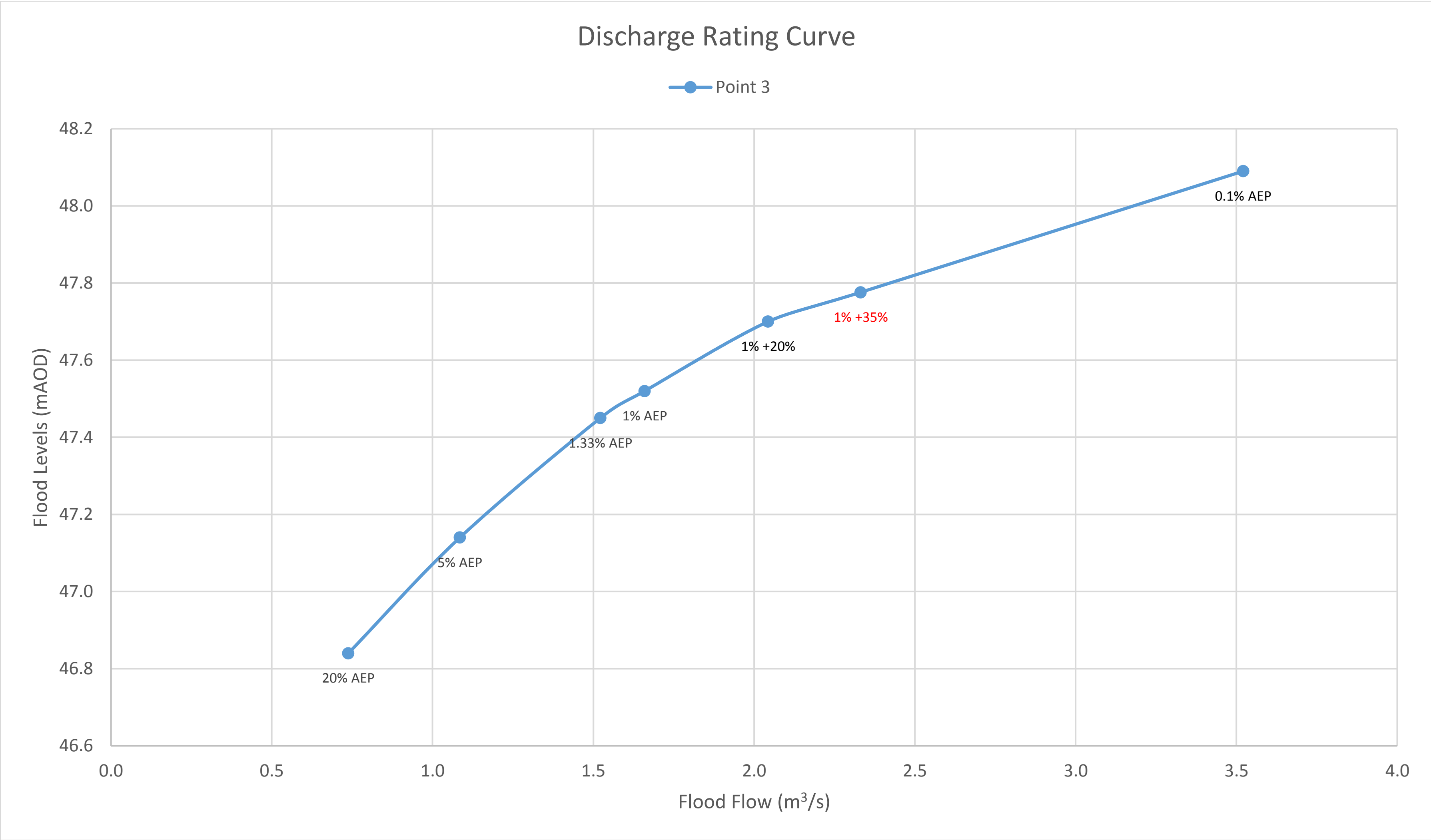

Figure 4.2 – Discharge Rating Curve

4.2 Climate Change Allowances

4.2.1 For river flow allowances, the development is classified as 'More Vulnerable' use and is located within Flood Zone 1. Therefore, the Central Allowance will be used for the 2080 epoch, which states a 35% increase in river flow must be considered. However, the EA's flood modelling has only included a 20% increase in river flows to account for future climate change. Therefore, a Discharge Rating Curve has been constructed in order to estimate the flood levels for the 1% AEP +35% CC.

4.2.2 The curve indicates there will be an increase in flood levels of approx. 80mm as a result of the higher climate change allowance, giving a flood level of 47.81m AOD for the 1% AEP +35% CC. This still leaves a freeboard of 470mm before the flood waters would enter the site. Therefore, this report has shown that even when the effects of future climate change are considered, the site will remain free of flood waters and fully within Flood Zone 1.

4.3 Impact on Flood Waters

4.3.1 The EA flood modelling has shown the site to be entirely within Flood Zone1, so the development will not have any impact on the free flow of flood waters for an event with a probability of 1.0% +35% CC or greater.

4.4 Impact on Storage Volumes

4.4.1 The proposed development is located above the flood level for an event with a probability of 1.0% +CC or greater. Given the site is above the highest estimated flood level it will not displace any flood storage volumes associated with an event of 1.0% AEP +35% CC.

4.5 Flood Impact on Development

4.5.1 As the development is located above the flood level for a storm event with a probability of 1.0% +CC or greater it will not be at risk of flooding from a flood event with a probability of 1.0% AEP +CC and will not put residents at risk.

4.6 Safe Access

4.6.1 Since the proposed development will not be at risk from flooding for an event with a probability of 1.0% AEP +CC, a safe access route can always be provided to and from the development site to the north along Binfield Road.

4.6.2 The residual risk is considered minimal as the site is located in Flood Zone 1.

5 DEVELOPMENT VULNERABILITY AND SEQUENTIAL TEST

5.1 Development Vulnerability Classification

5.1.1 The proposed development will comprise of the construction of a detached residential property. Under Annex 3 of the NPPF and Planning Practical Guidance, the development would be classified as a building used for dwelling houses and therefore considered to have a "More Vulnerable" use.

5.2 Flood Probability

5.2.1 The main source of fluvial flooding to the site is from The Cut. However, the EA's (Environmental Agency) flood map demonstrates that the site is located in a low risk region, with flood modelling demonstrating that the site would not flood for the 1 in 1000 (0.1%) flood event, despite the close proximity to the site.

5.3 Sequential Test

5.3.1 The principal of the Sequential Test is to assess locations and to prioritise development in areas at less risk of flooding. The NPPF suggests that Regional Planning Bodies and Local Planning Authorities should ensure their spatial strategies include a broad consideration of flood risk. Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. They provide the basis for applying the Sequential Test.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✔	✔	✔	✔	✔
Zone 2	✔	Exception Test required	✔	✔	✔
Zone 3a †	Exception Test required †	X	Exception Test required	✔	✔
Zone 3b *	Exception Test required *	X	X	X	✔ *

Key:

✔ Exception test is not required

X Development should not be permitted

Table 5.1 – Flood risk vulnerability and flood zone 'incompatibility'

5.3.2 This report has shown that the proposed dwelling will be located in the Flood Zone 1 area. The site therefore meets the requirements of the Sequential Test to direct development to areas at lower risk of flooding, so the Exception Test is not required, and the Sequential Test is passed.

6 EXISTING DRAINAGE

6.1 Existing Foul Water Drainage

6.1.1 In order to establish the drainage regime for the application site, Thames Water sewer records were requested. This indicated that there was no foul sewer in the vicinity of the site. It is assumed that the site's foul water is drained into a septic tank, which is positioned to the south of the site.

6.2 Existing Surface Water Drainage

6.2.1 The Thames Water sewer records indicate that there is no surface water drainage sewer in the vicinity of this site. However, the topographical survey has identified a ditch running outside the western boundary of the site, along Binfield Road, which connects across the road and discharges into The Cut.

7 PROPOSED DRAINAGE STRATEGY

7.1 Proposed Foul Water Drainage

7.1.1 For the construction of the proposed dwelling, due to the lack of a public foul sewer nearby to the site, it is proposed to construct a treatment plant to treat the foul water on site. The new treatment plant will serve both the new and existing properties, allowing the existing septic tank on site to be removed.

7.2 Proposed Surface Water Drainage

7.2.1 Sustainable Drainage Systems (SuDS) were considered when designing the drainage strategy for the development. The proposed dwelling will have a pitched roof, so the use of green or blue roofs is not viable.

7.2.2 Rainwater harvesting was considered as a means of reusing surface water within the building. However, these systems require a separate network of pipes within the property, as well as tanks and pumps to store rainwater and then distribute it throughout. It was considered impractical to implement rainwater harvesting systems on the site due to site constraints and the excessive cost for the development.

7.2.3 In addition, for these systems to be successfully implemented there must be enough demand for water reuse otherwise this may lead to water quality issues. Furthermore, rainwater harvesting tanks should not be included in the assessment of attenuation required to store runoff from a development as there is no guarantee that the tank will be sufficiently empty to receive another storm.

7.2.4 Should the rainwater harvesting tank be full at the start of a storm, it will not be able to receive any more runoff, therefore additional storage of a similar size would be required to cater for all storm events and the rainwater harvesting tank will provide no benefit in terms of attenuation. For those reasons, and the excessive cost of providing the system, this method has been discounted.

7.2.5 The sites geology is formed by the London Clay Formation which has poor infiltration characteristics and can cause ground/soil heave to nearby structures due to the expansion in the materials volume when infiltrated by water. This means that infiltration as a method of draining surface water will not viable as half drain times will not be compliant with Building Regulations.

7.2.6 The next option on the SuDS hierarchy is discharging the surface runoff water to a watercourse. The survey has identified a ditch adjacent to the site which discharges under Binfield Road and into The Cut (approximately 75m away). Therefore, it is proposed to discharge surface water runoff to the watercourse.

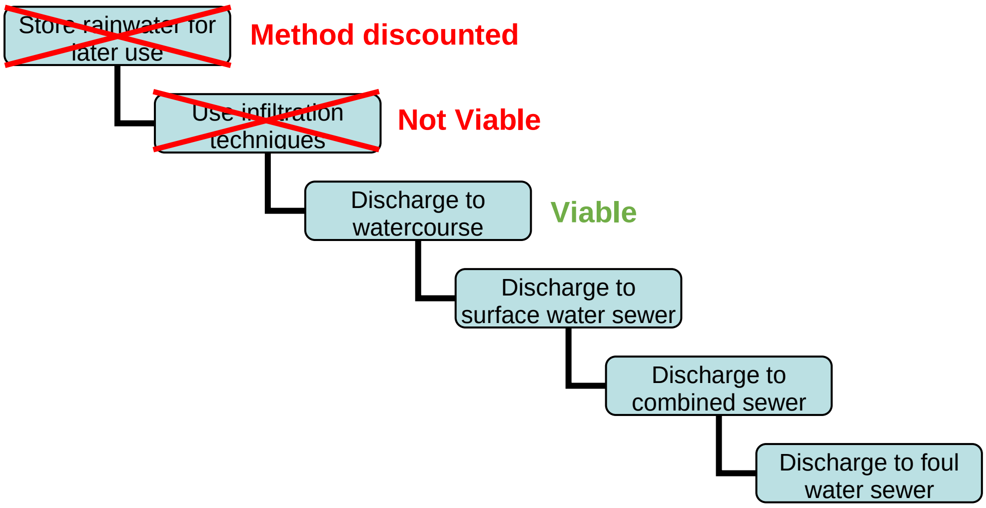

Figure 7.1 – Sustainable Drainage Hierarchy

7.2.7 In order to facilitate draining the surface runoff water and discharging it to the watercourse, it is proposed that the use of permeable paving is implemented across the driveway of the existing and proposed properties. The permeable paving will be drained to the existing ditch which discharges into The Cut.

7.2.8 Calculations have been undertaken to determine the existing Greenfield and Brownfield runoff rates from the site, and to set the proposed discharge rates and storage requirements within the permeable paving sub-base. The results are tabled below.

Return Period	Greenfield rate (l/s)	Brownfield rate (l/s)	Proposed Discharge	% Reduction
Q BAR	0.9	-	-	-
1 in 1 years	0.8	1.9	0.8	58%
1 in 30	2.2	4.6	2.1	54%
1 in 100	3.0	6.0	2.8	53%
1 in 100 +40% CC	-	8.4	3.0	64%

Table 7.1 – Existing and Proposed Discharge Rates

7.2.9 The permeable paving will have a 300mm deep sub-base to store rainwater before it is discharged to the ditch via a control chamber. The control chamber will have a combination of a 30mm diameter orifice plate at a lower level and a HydroBrake with a design flow of 1.7 l/s for a head of 0.24m set at a higher level. Together these will restrict the discharge rate to the Greenfield rate, which is much lower than the existing Brownfield rate. The total peak discharge rate from the site for the 1 in 100 year event plus 40% climate change has been calculated at 3.0 l/s, which is a 64% reduction from the existing Brownfield rate.

7.2.10 An indicative drainage layout for the proposed development has been prepared and is included in Appendix C as drawing 231740/DS/01. Drainage calculations have been prepared using MicroDrainage in order to establish the depth of water within the permeable paving sub-base, and to calculate the peak discharge rates from the site. The calculations have been completed for all storm events up to the 1 in 100 year plus 40% climate change, and shown there will be a greater than 50% reduction in the peak flow rate for all return periods without resulting in flooding on site or in the surrounding area. Full calculations for the permeable paving have been included in Appendix C.

8 SURFACE WATER/ SUDS MAINTENANCE AND TREATMENT

8.1 Surface Water / SuDS Maintenance

8.1.1 Regularly inspecting the surface water drainage network for blockages and clearing unwanted debris / silt from the system should improve the performance of the surface water network and decrease the need for future repairs. In the event that road gullies become blocked, high pressure water jets can be used to clear the gully and ensure they are functioning correctly, this should be undertaken by certified trained professionals.

8.1.2 The level and frequency of maintenance required on site is dependent on the type of facility. The type of maintenance will fall into one of three categories "regular maintenance", "occasional maintenance" and "remedial maintenance".

8.1.3 Regular maintenance of the drainage and SuDS features will include, inspections, removal of litter / debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs and infiltration reconditioning if required.

8.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.

8.1.5 The drainage will be owned and managed by the freeholder. They will be responsible for the drainage and SuDS used on site.

8.1.6 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

Pipes and Manholes

8.1.7 For drainage pipes and manhole, the following maintenance is recommended.

Manhole / Pipe Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 8.1 – Manhole, Catchpit and Pipes Maintenance

Permeable Paving

8.1.8 For permeable paving areas, the following maintenance is recommended.

Permeable Paving Maintenance Schedule		
	Required Action	**Typical Frequency**
Regular maintenance	Remove debris and leaves etc.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required- once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting etc	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate frequencies for rehabilitation	Annually
	Monitor inspection chambers	Annually

Table 8.2 – Permeable Paving Maintenance Schedule

8.2 SuDS Treatment

8.2.1 As part of the CIRIA SuDS Manual C753, Section 26 provides guidance regarding methods for managing pollution risks from surface water runoff.

8.2.2 Part of the assessment is to determine which land use classification the proposed development falls under, Table 26.1 of the CIRIA Report C753 sets the approaches to water quality risk management. For this site the Simple Index Approach will be used.

8.2.3 Table 26.2 in C753 reproduced as Table 8.3, shows the potential hazard associated with different land uses the hazard indices. The development will consist of residential properties, it is concluded that the site should be classed within the sections shown in Table 8.3 below.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 8.3 – CIRIA SuDS Manual C753 (Land use classifications)

8.2.4 The roofs of the residential building is considered to have a "very low" pollution hazard, generating 0.2 total suspended solids, 0.2 metals and 0.05 hydro-carbons. The access and parking area is considered to have a "low" pollution hazard, generating 0.5 total suspended solids, 0.4 metals and 0.4 hydro-carbons.

8.2.5 The proposed development will incorporate permeable paving for storage with a control chamber for the discharge of runoff from site. Suitable treatment measures offered by SuDS features are set out in CIRA report.

8.2.6 Table 26.3 of C753 reproduced below as Table 8.4 sets out the mitigation indices provided by SuDS features for discharge to surface waters.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 8.4 – CIRIA SuDS Manual C753 (Mitigation Indices to Surface Water)

8.2.7 The permeable paving will provide mitigation of 0.7 for total suspended solids, 0.6 for metals and 0.7 for hydrocarbons. These are all greater than the pollution hazard indices identified in Table 8.3 above.

9 SUMMARY AND CONCLUSION

9.1.1 Lanmor Consulting has been commissioned to provide a Flood Risk Assessment and Drainage Strategy report for the proposed development at Honeypot Cottage, Binfield Road, RG42 4LY. The proposals are for the construction of a detached dwelling with vehicular access off the existing driveway.

9.1.2 The site is considered a brownfield site and is located on the outskirts of Binfield in the county of Berkshire. The site is located on Binfield Road (B3018) close to a watercourse named 'The Cut'.

9.1.3 The Environment Agency's flood mapping shows the site is located within Flood Zone 1 and is at low risk of flooding from all other sources. When climate change allowances are factored into the flood modelling the application site is still free from flood water for the 1 in 100 year event (1% AEP) plus 35% climate change.

9.1.4 This report has shown that the proposed dwelling will have no impact on the flow of flood waters or flood storage volumes and will not be impacted by flood water from a 1 in 100 year event including allowances for climate change. A safe access can be provided along Binfield Road to the north at all times during a flooding event of this probability.

9.1.5 A SuDS assessment has found that discharge to a watercourse is the most sustainable method of discharging surface water runoff from the site. The use of permeable paving to store rainfall within the sub-base will allow the discharge rate to be restricted to Greenfield rates, whilst provided water quality benefits.

9.1.6 This report has demonstrated that the proposed dwelling will not have any impact on the current flood risk in the area, and that suitable foul and surface water drainage can be provided without increasing the risk of flooding. Therefore we see no reason why the application should be refused on the grounds of flood risk or drainage.

APPENDIX A

7526/01 – Topographical Survey

LEGEND

FEATURE STYLES

- SURVEY CONTROL
- FENCE
- HEDGE
- FWS
- SWS
- WATER
- POWER LINE (OVERHEAD)
- TELECOM LINE (OVERHEAD)
- ELECTRIC MAIN
- GAS MAIN
- EMBANKMENT

FENCE TYPES

BWR Barbed Wire
CB Close Board
CI Corrugated Iron
CL Chain Link
CPL Conc Panel
CP Chestnut Paling
CW Chicken Wire
IW Interwoven
IR Iron Railing
OB Openboard
PR Post and rail
PW Post and Wire

FEATURE ABREVIATIONS

AV Air Valve
BS Bus Stop
BT British Telecom
BW Brick Wall
CB Conc Bollard
CL Cover Level
CTO cable TV outlet
EB Electric Box
EC Electric Cover
EM Electric Meter
EP Electricity Pole
FH Fire Hydrant
FL Floor level
G Gully
GM Gas Meter
GV Gas Valve
IL Invert Level
IC Inspection Chamber
KLS Keep Left Sign
KO Kerb Offlet
LB Letter Box
LP Lamp Post
MKR Marker
MP Metal Post
MH Manhole
MB Metal Bollard
P Post
PI Petrol Interceptor
RG Road Gully
RNB Road Name Board
RS Road Sign
RW Retaining Wall
SA Soakaway
SC Stopcock
SV Sluice Valve
TP Telegraph Pole
TCB Telephone Box
TJB Tel.Junc.Box
TL Traffic Light
V Valve
VP Vent Pipe
WL Water Level
WM Water Meter
WO Water Outlet
WV Water Valve

DATUM
GRID – ORDNANCE SURVEY NATIONAL GRID (OSTN15)
LEVELS – ORDNANCE SURVEY (OSGM15)

SURVEY CONTROL

STN	–E–	–N–	–Z–
1	485592.986	170825.279	50.270
2	485572.406	170826.965	49.476
3	485589.929	170805.922	49.732
4	485592.651	170790.764	49.358
5	485595.027	170784.308	49.197
6	485575.298	170787.411	48.908
7	485561.177	170824.897	48.886
8	485560.680	170766.980	48.603

TREE SCHEDULE

TREE	GIRTH	HEIGHT	SPREAD	SPECIES
1	3.0	16.0	8.0	ASH
2	2x0.6	10.0	4.0	MAPLE
3	0.9	12.0	4.0	CHERRY
4	2x1.0	16.0	4.0	MAPLE
5	0.6	10.0	3.0	CHERRY
6	1.0	16.0	4.0	SILVER BIRCH
7	1.0	14.0	4.0	CHERRY
8	1.4	16.0	5.5	CHERRY
9	3.0	18.0	8.0	MAPLE
10	5x0.9	12.0	6.0	MAPLE
11	3.0	16.0	7.5	ASH
12	1x0.4/2x0.6	10.0	4.5	ELM
13	2x1.3	16.0	10.0	ASH
14	4x1.0	16.0	6.0	MAPLE
15	2x1.0	12.0	6.0	ASH
16	4x0.4	8.0	3.0	HAWTHORN
17	1.6	16.0	7.0	OAK
18	1x1.3/1x1.6	16.0	7.0	OAK
19	2x0.7	10.0	8.0	MAPLE
20	2x1.0	16.0	3.0	ELM
21	2x0.5	10.0	4.0	MAPLE
22	1.0	14.0	5.0	MAPLE
23	1.0	14.0	4.0	MAPLE
24	0.6	8.0	4.0	DEAD
25	2x0.8	16.0	5.0	MAPLE
26	1.0	18.0	5.0	MAPLE
27	0.8	16.0	2.0	CYPRESS
28	0.6	10.0	4.0	MAPLE
29	1x0.6/1x1.0	14.0	6.0	MAPLE
30	1.0	14.0	6.0	MAPLE
31	2x1.0	14.0	6.0	MAPLE
32	1.0	14.0	4.0	ASH
33	1.0	14.0	6.0	MAPLE

NOTES

Surveyed boundaries are not necessarily the site legal boundaries. Client should refer to the relevant Land Registry document for confirmation of title.

Drainage and service covers that were buried, obscured or not visible at the time of the survey cannot be shown. Sewer connections between manholes are assumed to be straight and only pipes visible from the cover are shown.

Tree canopy measured values are written as maximium spreads.
Tree species and condition to be confirmed by an arboriculturist

SURVEYED BY
groundsurveys ltd
land & engineering surveyors
The Old Forge
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Sonning on Thames
Berkshire
RG4 6UH

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www.groundsurveys.com

CLIENT

IAN BROWN

SITE

HONEYPOT COTTAGE
BINFIELD ROAD
BERKSHIRE
RG42 4LY

TITLE

SITE SURVEY

AS EXISTING

SCALE	DATE
1/200 (A1)	MAY 2021
DRAWING No. 01	JOB No. 7526

2653/08 – Proposed Site Plan

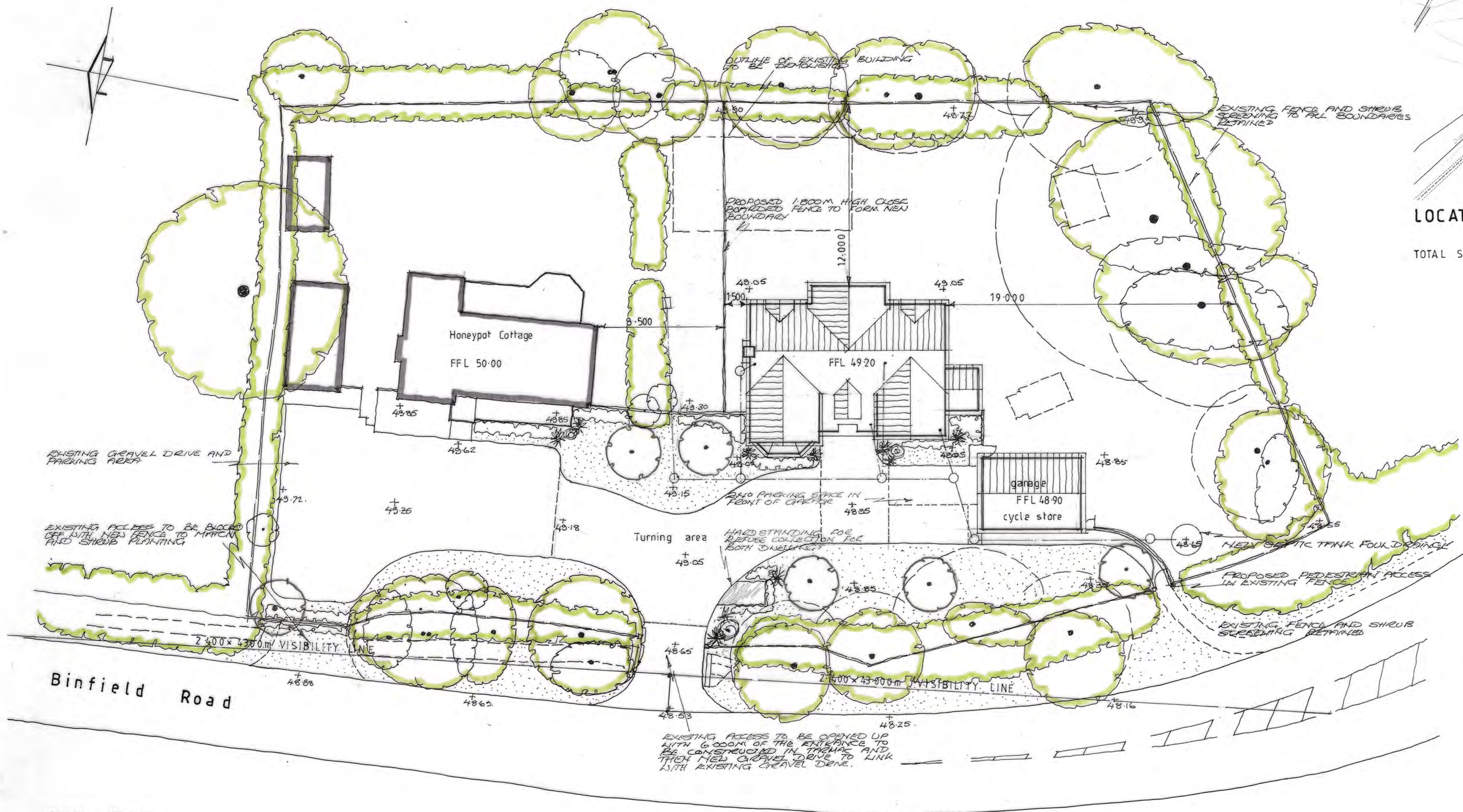
Notes

All dimensions and levels on site are to be checked prior to commencement of work.

SITE SECTION - STREET SCENE

LOCATION PLAN 1:1250

TOTAL SITE AREA = 0·227 ha = 0·562 acres



SITE PLAN

Project	Proposed detached cottage Adjacent Honeypot Cottage Binfield Road BINFIELD Berks
Client	Mr I Brown
Drawing	SITE PLANS
Scale	1:200 at A2
Date	August 2023

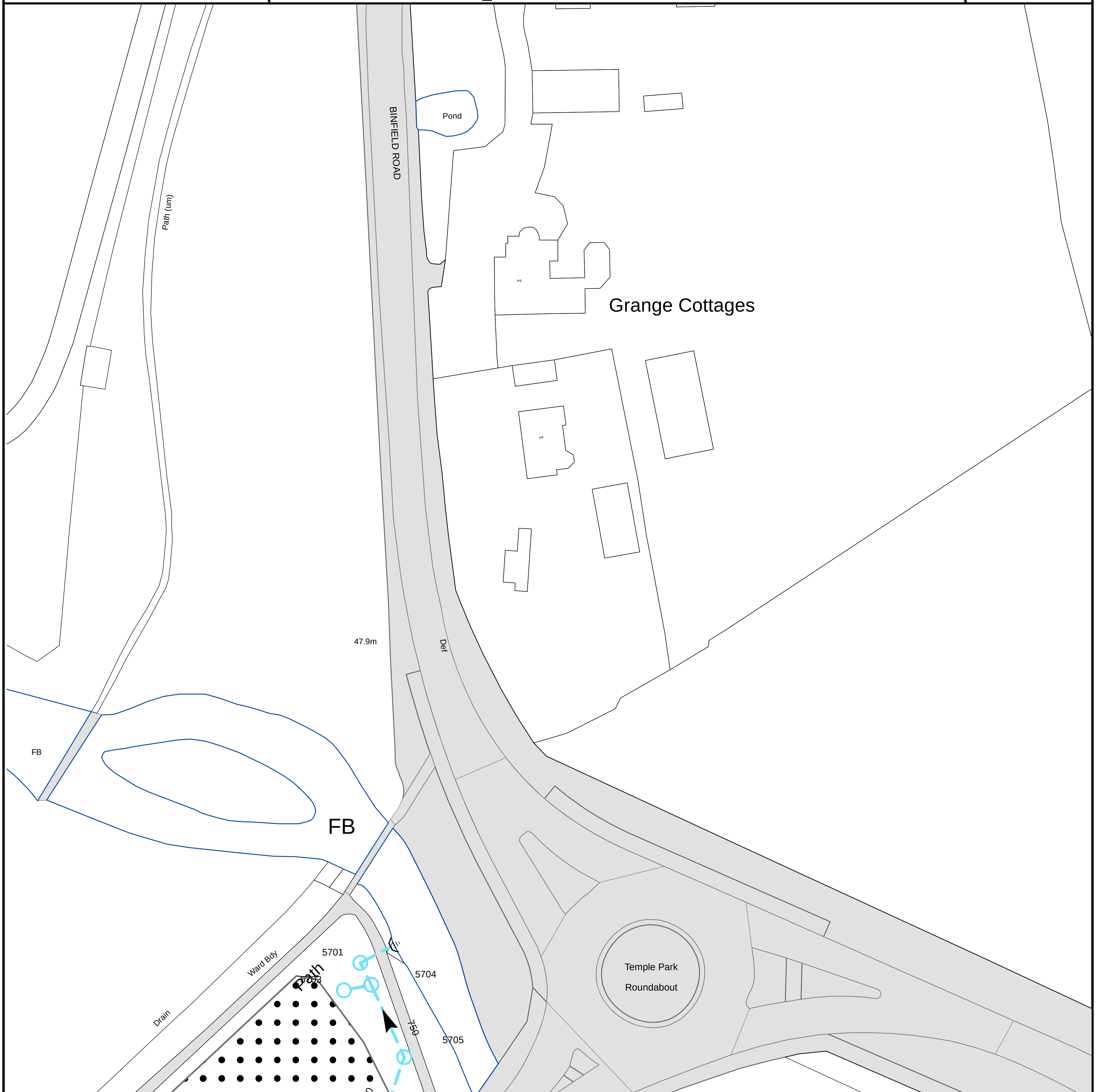
Paul Edwards Architecture
12 Sandy Lane, Barkham, Wokingham, Berks RG41 4DB
Tel: 01189772925 Mob: 07831837415 E-mail: paul@pauledwardsarchitecture.co.uk

Job 2653 Dwg.08

APPENDIX B

Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2023_4892261



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 485584,170799

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5703	47.17	46.49
5701	48.53	46.22
5704	48.53	46.22
5705	48.45	46.32

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

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

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

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

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

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

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

Sewer Fittings

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

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

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement
- Conduit Bridge
- Subway
- Tunnel

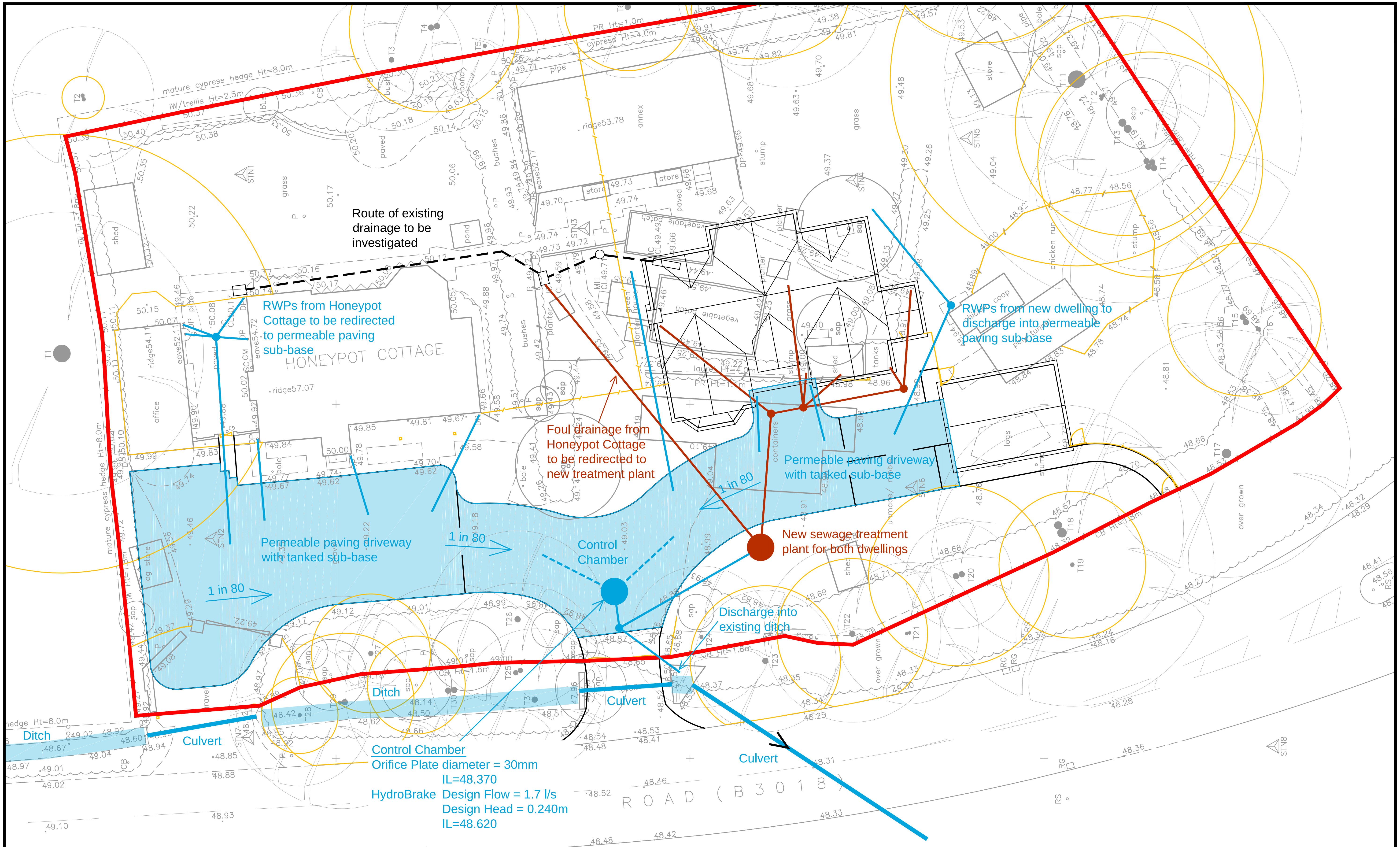
Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

APPENDIX C

231740/DS/01 – Drainage Strategy



Mr Ian Brown

Honeypot Cottage

Binfield Road, Bracknell, RG42 4LY

SCALE 1:200	DRAWN BY OR	PRJ No. 231740	DWG No. 231740/DS/01

LANMOR Consulting
Civil Engineers & Transport Planning
Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW
Telephone: 0208 339 7899 Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
www.lanmor.co.uk

Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	700	Urban	0.000
Area (ha)	0.216	Soil	0.450	Region Number	Region 6

Results l/s

QBAR Rural	0.9
QBAR Urban	0.9
Q100 years	3.0
Q1 year	0.8
Q30 years	2.2
Q100 years	3.0

Permeable Paving Calculations

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

Half Drain Time : 186 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	48.697	0.327	0.0	1.0	1.5	2.6	13.4	Flood Risk
30 min Summer	48.745	0.375	0.0	1.1	1.7	2.8	16.9	Flood Risk
60 min Summer	48.783	0.413	0.0	1.2	1.7	2.8	19.3	Flood Risk
120 min Summer	48.805	0.435	0.0	1.2	1.7	2.8	20.5	Flood Risk
180 min Summer	48.803	0.433	0.0	1.2	1.7	2.8	20.5	Flood Risk
240 min Summer	48.792	0.422	0.0	1.2	1.7	2.8	19.8	Flood Risk
360 min Summer	48.764	0.394	0.0	1.2	1.7	2.8	18.1	Flood Risk
480 min Summer	48.740	0.370	0.0	1.1	1.7	2.8	16.5	Flood Risk
600 min Summer	48.721	0.351	0.0	1.1	1.7	2.8	15.1	Flood Risk
720 min Summer	48.706	0.336	0.0	1.1	1.7	2.7	14.1	Flood Risk
960 min Summer	48.689	0.319	0.0	1.0	1.4	2.4	12.8	Flood Risk
1440 min Summer	48.668	0.298	0.0	1.0	0.9	1.9	11.3	Flood Risk
2160 min Summer	48.649	0.279	0.0	1.0	0.4	1.3	9.8	Flood Risk
2880 min Summer	48.628	0.258	0.0	0.9	0.0	1.0	8.4	Flood Risk
4320 min Summer	48.570	0.200	0.0	0.8	0.0	0.8	4.9	O K
5760 min Summer	48.527	0.157	0.0	0.7	0.0	0.7	3.0	O K
7200 min Summer	48.495	0.125	0.0	0.6	0.0	0.6	1.9	O K
8640 min Summer	48.472	0.102	0.0	0.6	0.0	0.6	1.3	O K
10080 min Summer	48.455	0.085	0.0	0.5	0.0	0.5	0.9	O K
15 min Winter	48.721	0.351	0.0	1.1	1.7	2.8	15.2	Flood Risk
30 min Winter	48.784	0.414	0.0	1.2	1.7	2.8	19.3	Flood Risk
60 min Winter	48.840	0.470	0.0	1.3	1.7	2.9	22.3	Flood Risk
120 min Winter	48.864	0.494	0.0	1.3	1.7	3.0	23.2	Flood Risk
180 min Winter	48.852	0.482	0.0	1.3	1.7	2.9	22.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	129.843	0.0	14.6	2.4	17
30 min Summer	85.337	0.0	19.7	5.4	31
60 min Summer	53.483	0.0	25.0	8.3	56
120 min Summer	32.428	0.0	30.6	10.9	88
180 min Summer	23.896	0.0	33.9	12.4	122
240 min Summer	19.136	0.0	36.3	13.4	156
360 min Summer	13.890	0.0	39.6	13.8	220
480 min Summer	11.074	0.0	42.1	13.2	284
600 min Summer	9.283	0.0	44.1	12.4	344
720 min Summer	8.033	0.0	45.8	11.6	402
960 min Summer	6.389	0.0	48.6	9.9	524
1440 min Summer	4.620	0.0	52.6	6.7	778
2160 min Summer	3.335	0.0	56.7	2.7	1168
2880 min Summer	2.644	0.0	59.6	0.2	1584
4320 min Summer	1.904	0.0	63.8	0.0	2292
5760 min Summer	1.506	0.0	66.7	0.0	3000
7200 min Summer	1.256	0.0	68.8	0.0	3680
8640 min Summer	1.082	0.0	70.4	0.0	4408
10080 min Summer	0.953	0.0	71.7	0.0	5136
15 min Winter	129.843	0.0	16.5	3.6	17
30 min Winter	85.337	0.0	22.2	6.9	31
60 min Winter	53.483	0.0	28.2	10.0	58
120 min Winter	32.428	0.0	34.4	13.1	92
180 min Winter	23.896	0.0	38.2	14.8	132

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	48.828	0.458	0.0	1.3	1.7	2.8	21.7	Flood Risk
360 min Winter	48.778	0.408	0.0	1.2	1.7	2.8	19.0	Flood Risk
480 min Winter	48.740	0.370	0.0	1.1	1.7	2.8	16.5	Flood Risk
600 min Winter	48.714	0.344	0.0	1.1	1.7	2.8	14.6	Flood Risk
720 min Winter	48.698	0.328	0.0	1.1	1.6	2.6	13.5	Flood Risk
960 min Winter	48.680	0.310	0.0	1.0	1.2	2.2	12.1	Flood Risk
1440 min Winter	48.660	0.290	0.0	1.0	0.6	1.6	10.6	Flood Risk
2160 min Winter	48.638	0.268	0.0	0.9	0.1	1.1	9.1	Flood Risk
2880 min Winter	48.595	0.225	0.0	0.9	0.0	0.9	6.3	Flood Risk
4320 min Winter	48.521	0.151	0.0	0.7	0.0	0.7	2.7	O K
5760 min Winter	48.476	0.106	0.0	0.6	0.0	0.6	1.3	O K
7200 min Winter	48.449	0.079	0.0	0.5	0.0	0.5	0.8	O K
8640 min Winter	48.433	0.063	0.0	0.4	0.0	0.4	0.5	O K
10080 min Winter	48.422	0.052	0.0	0.4	0.0	0.4	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
240 min Winter	19.136	0.0	40.8	15.9	168
360 min Winter	13.890	0.0	44.5	17.2	238
480 min Winter	11.074	0.0	47.4	16.8	300
600 min Winter	9.283	0.0	49.7	15.8	356
720 min Winter	8.033	0.0	51.6	14.6	412
960 min Winter	6.389	0.0	54.6	12.0	538
1440 min Winter	4.620	0.0	59.2	7.0	794
2160 min Winter	3.335	0.0	63.8	1.3	1232
2880 min Winter	2.644	0.0	67.2	0.0	1640
4320 min Winter	1.904	0.0	71.9	0.0	2296
5760 min Winter	1.506	0.0	75.3	0.0	2992
7200 min Winter	1.256	0.0	77.8	0.0	3672
8640 min Winter	1.082	0.0	79.7	0.0	4408
10080 min Winter	0.953	0.0	81.3	0.0	5104

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)	18.900	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.066

Time From:	(mins) To:	Area (ha)
0	4	0.066

Model Details

Storage is Online Cover Level (m) 48.870

Complex Structure

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.3
Max Percolation (l/s)	15.7	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.370	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	19.8
Max Percolation (l/s)	27.5	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.370	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.4
Membrane Percolation (mm/hr)	1000	Length (m)	18.1
Max Percolation (l/s)	37.2	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.510	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 48.370

Hydro-Brake Optimum® Overflow Control

Unit Reference	MD-SHE-0072-1700-0240-1700
Design Head (m)	0.240
Design Flow (l/s)	1.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	72
Invert Level (m)	48.620
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.240	1.7	Kick-Flo®	0.188	1.5
Flush-Flo™	0.102	1.7	Mean Flow over Head Range	-	1.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Hydro-Brake Optimum® Overflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	0.800	2.9	2.000	4.5	4.000	6.2	7.000	8.3
0.200	1.6	1.000	3.2	2.200	4.7	4.500	6.6	7.500	8.6
0.300	1.9	1.200	3.5	2.400	4.9	5.000	7.0	8.000	8.8
0.400	2.1	1.400	3.8	2.600	5.0	5.500	7.3	8.500	9.1
0.500	2.3	1.600	4.0	3.000	5.4	6.000	7.7	9.000	9.4
0.600	2.5	1.800	4.2	3.500	5.8	6.500	8.0	9.500	9.6

Event: 120 min Winter