



THE COURTYARD, ICKLEFORD BURY, HITCHIN SG5 3UW

FOR: CLEAR ARCHITECTS

FLOOD RISK ASSESSMENT



Revision	Report Name	Date	Comment	By
P1	1646-FRA-260709-P1	14.07.2026	Issued for Draft Information	S.Kanadia
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Executive Summary

This Flood Risk Assessment (“**FRA**”) has been carried out by Spillways Limited to support a detailed planning application for the construction of a detached dwelling referred to as “The Courtyard” on the wider grounds of Ickleford Bury situated off Arlesey Road in Hitchin uniquely positioned in proximity of the River Purwell. The proposed development plot measures 388m² and falls under the planning authority of North Hertfordshire District Council (“**NHDC**”).

Residential development is classed as ‘more vulnerable’ development as per table 2 (*Flood Risk Vulnerability Classification table*) of the online Planning Practice Guidance (“**PPG**”).

The proposed development is on land categorised as Flood Zone 1. The area of land on which the development is proposed as:

- Flood Zone 1 - Land assessed as having a less than 1 in 1,000 annual probabilities of river or sea flooding (<0.1%); This land is at very low risk of flooding from Rivers and Seas.

The proposed development which is identified as a ‘more vulnerable’ type is considered to be appropriate on the plot of land with a Flood Zone 1, in accordance with table 3 (*Flood Risk Vulnerability and Flood Zone Compatibility table*) of the online PPG. No Sequential or exception test is required to be applied and demonstrated as part of the planning application as the development has been appropriately located on a very low risk ground.

This FRA will also include the surface water management strategy design. The post-developed surface water run-off rates for the proposed development has been restricted to a bettered brownfield run-off rate. A number of Sustainable Drainage Systems (“**SuDS**”) devices have been explored using the SuDS hierarchy table.

This report has been written in accordance with the relevant best local and strategic practice and policy guidance. The recommendations made herewith, if fully incorporated as part of the development will allow the site to present itself as low risk from sources of flooding. Where breach events occur; the development has been designed to remain a safe place for occupants. The development will also prove to be sustainable without causing an adverse impact to the local surroundings from a hydrogeological perspective. Equally, the development is proposed to bring ecological, biodiversity and architectural benefits which have been assessed by other consultants.

Should the development incorporate the measures as set out within this report then the development is considered to be at low risk from all sources of flooding and therefore an acceptable form of development in terms of flood risk.



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1. Introduction

1.1 Scope of Flood Risk Assessment

- 1.1.1 This FRA has been carried out by Spillways Limited to support a detailed planning application for the construction of a detached dwelling referred to as “The Courtyard” on the wider grounds of Ickleford Bury situated off Arlesey Road Way in Hitchin uniquely positioned in proximity of the River Purwell.
- 1.1.2 This report has been produced to address the requirements of the National Planning Policy Framework (“**NPPF**”), updated on 7th February 2025 and the National Planning Policy Guidance (“**NPPG**”) updated on 14th February 2024.
- 1.1.3 The FRA aims to identify any potential flood risk sources and surface water management issues related to the development site that may warrant further consideration. This has been based on readily available information, including the Strategic Flood Risk Assessment, Environment Agency Flood Maps and third party mapping data sets.
- 1.1.4 The FRA aims to identify any flood risk issues and outline mitigation measures, where appropriate, in order for the proposed development to be made safe in terms of flood risk and in accordance with the NPPF and its supporting Technical Guidance.

1.2 Policy Context

- 1.2.1 This FRA has been prepared in accordance with the following national, regional, and local planning policy documents and statutory authority guidance:
 - (i) National policy regarding flood risk as contained within the NPPF updated February 2025, issued by Communities and Local Government.
 - (ii) North Hertfordshire District Council – Strategic Flood Risk Assessment Update (2016)
 - (iii) North Hertfordshire District Council – Local Plan 2011 – 2031 - Adopted 2022.

2. Existing Site and Proposals

2.1 Site Description

- 2.1.1 The site is situated within the village of Ickleford in North Hertfordshire District of Hertfordshire. It lies immediately north of the town of Hitchin.
- 2.1.2 Access into the site (Blue Line Site Boundary) is solely via Arlesey Road which forms a junction to Ickleford Bury; a private road into the estate of Ickleford Bury. The wider site is entirely a residential setting which gives space to the main dwelling positioned centrally to the site referred to as Ickleford Bury. A second dwelling referred to as Bury Lodge is situated to the North-East East end of the wider site. The area of proposed development (Red Line Site Boundary) is situated far East of the site which is currently a concrete covered parcel along with garages and enclosed by a brick wall. Hereon; this proposed development area will be referred to as the development site.
- 2.1.3 To the immediate north of the development site is Bury Lodge; a detached dwelling and further North is the River Purwell which flows in an Eastern Direction. To the east of the development site is the Riverside Lodge; a neighbouring property and is outside of the wider site boundary. To the south of the development site is a private access road leading to Riverside Lodge and further east are fields leading to allotments. To the west of the development site is Ickleford Bury; the private access road leading towards the development site. Further west is an industrial unit which is thought to be currently vacant.
- 2.1.4 Figure 1 (below) illustrates the site location with reference to its surroundings. The extract below has been taken from publicly available mapping data from ‘Google Maps’.



Figure 1 - Site Location Plan (Extract 'Google Maps')

2.1.5 The development site redline boundary measures 0.039 hectares (388m²).

2.1.6 A copy of the existing site plan can be found in Appendix A of this report.

2.2 Proposed Development

2.2.1 A copy of the proposed development can be found in Appendix B of this FRA.

2.2.2 The proposed development includes the construction of a two-storey detached dwelling with habitable rooms situated at both ground level and first floor level. The dwelling introduces a partial greenroof and rainwater butts for irrigation as part of sustainable urban drainage systems.

2.2.3 Access to the development site will be via Ickleford Bury which is proposed to remain as per existing however the access to the development will include separate gates.

2.2.4 The development will introduce soft landscaped areas to the northern and eastern ends of the dwelling. A small hardstanding courtyard will exist to the southeast corner of the development site. A space for two vehicles has been provided to the southern side of the development site.

2.2.5 The overall risk of pollution being generated from this development site is very low.

2.3 Topography

2.3.1 A detailed topographical survey was conducted for the development site and the wider site by 'Simply Accurate Surveys' on July 2023. A copy of the topographical survey can be found in Appendix C of this FRA.

2.3.2 The development site is generally flat in nature with some localised low spots where gullies are situated. The highest land level within the development site is to the southwestern corner at 52.20m and the lowest level is 51.97m which is found at two gullies generally centrally positioned.

2.3.3 A mound feature is shown to exist just outside the Southwestern corner of the development site which runs parallel with the wider site boundary.

2.3.4 There is a small area of land south of the development site boundary which is shown to slope away in a southerly direction.

2.3.5 There is a small portion of the existing access road which is land to fall towards the development. Surface water flows likely to enter from outside of the development site will be factored into the surface water management strategy.

2.3.6 The fall arrows on the contour plan in Figure 2 (right) confirms that the topography promotes the flow of surface water in the direction of the existing gullies on site. It is assumed that the gullies discharge in a northern direction towards existing surface water chambers. A large majority of the surface water captured within this redline site boundary is routed into the below ground system.

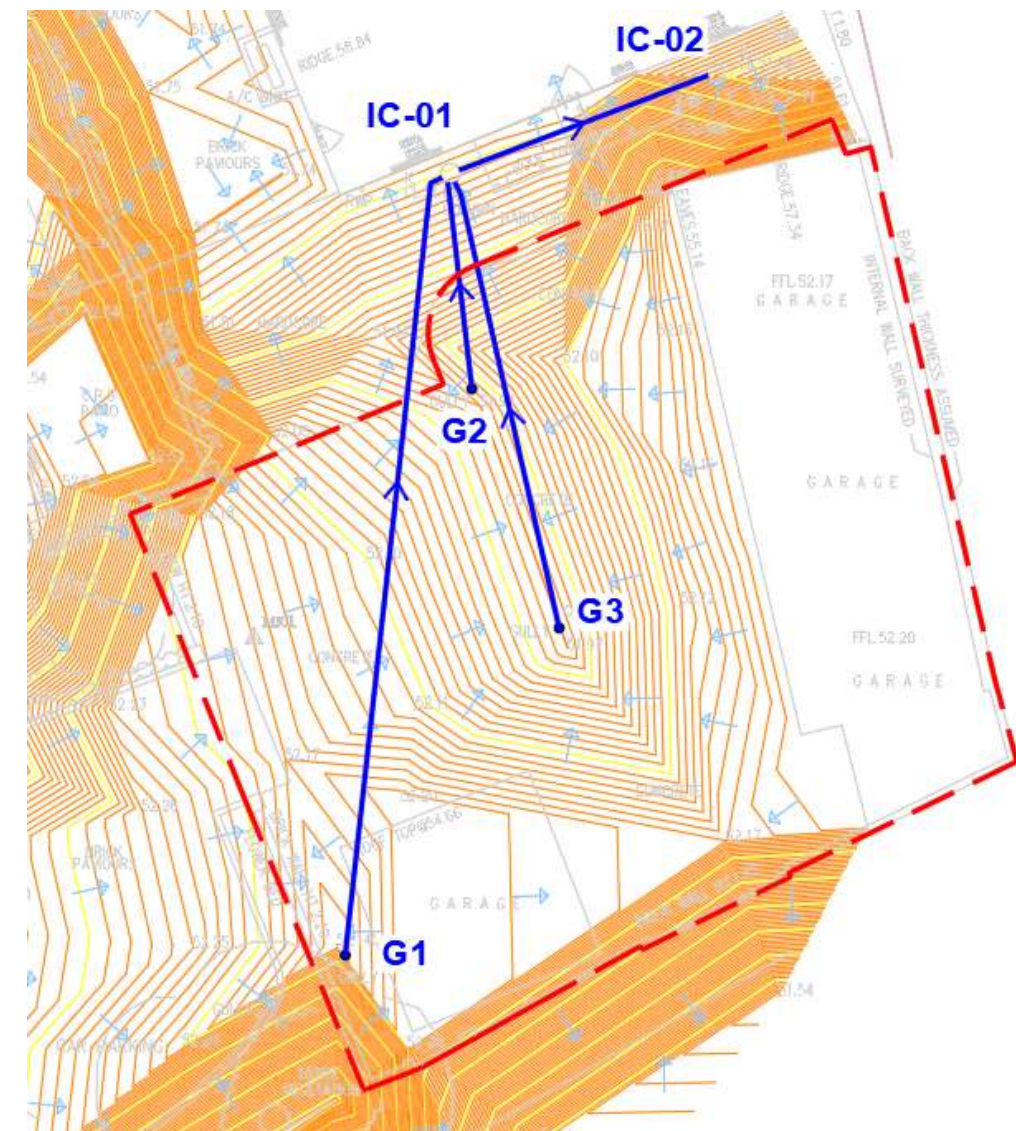


Figure 2 - Site Contour Plan and Drainage Route Assumption

2.4 Private Drainage

2.4.1 The topographical survey identifies three gullies within the development site along with an additional inspection chamber cover. A site drainage mark-up showing the route of surface and foul water was made available at the time of preparing this FRA. A copy of this mark-up has been presented as Figure 3 (overleaf); note that the mark-up was done over the topographical survey and was done independently of that survey.

2.4.2 A separate foul and surface water sewer exists as part of the wider site boundary. The disposal of both foul and surface water are into the River Purwell. Surface water is disposed by way of a head outfall to the northwest of the wider side boundary and foul water is disposed by way of a head outfall north west of the wider site boundary. Further details such as the depth of chambers, size of pipework, pipe material and condition of the drainage system is unknown at the time of preparing this drawing.

- 2.4.3** The route for drainage connectivity has been shown in Figure 2 (preleaf). All references and annotations shown in the figure are independent of the topographical survey and have been done for the purposes of hydraulic modelling for this FRA only. The pipes illustrated are assumed to be 100mm diameter and inspection chambers are assumed to be 450mm diameter.



Figure 3 - Private Below Ground Drainage Mark-Up

- 2.4.4** The drainage within the proposed development site is the head of the run meaning it is the first point within the drainage network where surface water enters the system. As there are no upstream contributing catchments, the site receives runoff only from its own impermeable areas. Consequently, the proposed development will not influence or increase flood risk to upstream properties, and any effect on the downstream drainage network is limited to the site's own discharge. By incorporating appropriate sustainable drainage measures and restricting discharge rates, the development can ensure that downstream drainage infrastructure is not adversely affected and, where attenuation is provided, will reduce peak flows entering the receiving network.
- 2.4.5** Bury Lodge has been confirmed to have foul water pumped to a chamber close to Ickleford Bury due to the invert levels of the drainage downstream being too shallow. It is very likely that the foul water from the proposed development site will need to be pumped too; this will be detailed further in Section 6 of this FRA.
- 2.4.6** It is recommended that a full trace scan and CCTV survey is carried out prior to the detail design being undertaken post planning.

2.5 Public Sewers

- 2.5.1** Anglian Water are the local sewerage undertaker for the area which means they are responsible for the operation and maintenance of the infrastructure.
- 2.5.2** Anglian Water sewerage mapping was obtained, and a copy can be found in Appendix D of this FRA. A copy of the mapping has been reproduced in Figure 4 (below).

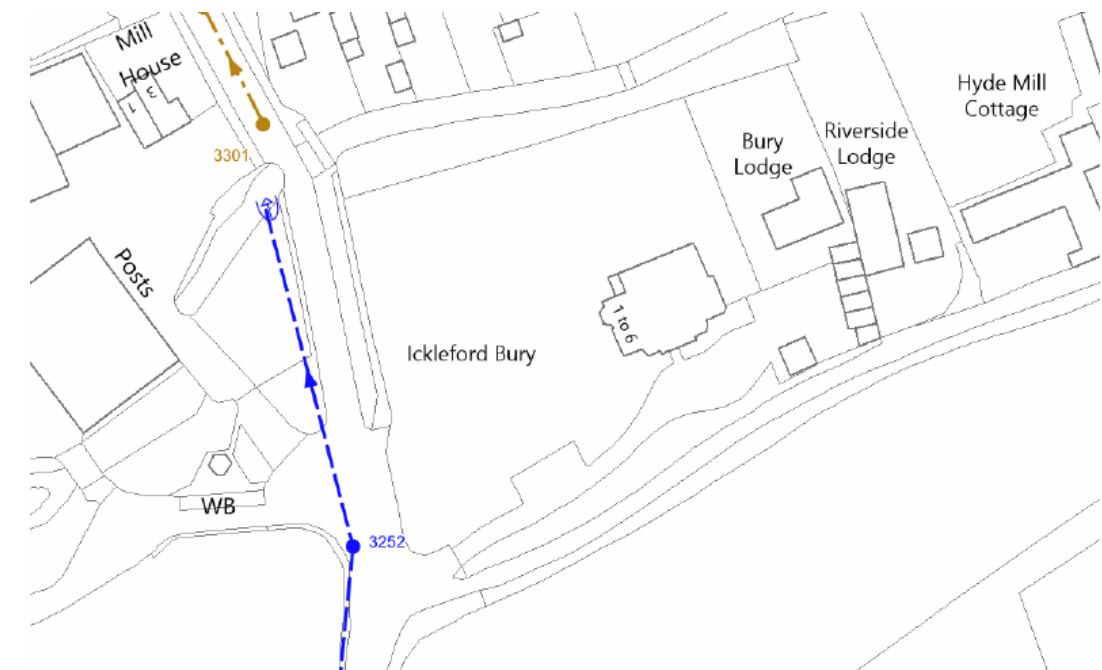


Figure 4 - Anglian Water Sewer Record Extract

- 2.5.3** A separate surface water sewer is shown to existing partly under Arlesey Road and laid to fall in a northern direction towards the River Purwell. There is a head outfall as its final disposal point. An Anglian Water surface water manhole is shown to exist in close proximity to the junction between Arlesey Road and Ickleford Bury with an Anglian Water reference number of 3252. No further details of this chamber are currently available.
- 2.5.4** There are no foul or combined water sewers shown to the south side of the River Purwell.

2.6 Hydrology – Water Courses and Flood Defences

- 2.6.1** The River Purwell is a chalk stream located further north of the development site. This River is identified to be a connected ordinary watercourse within the NHDC Strategic Flood Risk Assessment. The River Purwell originates from natural springs and runs through the Purwell Ninespings and Purwell Meadows nature reserve before joining the River Hiz in Walsworth.
- 2.6.2** The River Purwell is subject to flooding and will be explored in greater detail within the FRA.

2.7 Geology and Groundwater

- 2.7.1 A geotechnical site investigation report or geo-environmental report were unavailable at the time of writing this report.
- 2.7.2 The geology of the site has therefore been assessed using the publicly available data from the British Geological Survey [www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer] website.
- 2.7.3 The British Geological Survey (“BGS”) viewer suggests the development site has superficial deposits which are classed as Alluvium-Clay, silt, sand and gravel. These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river. In turn; the bedrock is known as Gault Formation-Mudstone. These sedimentary rocks are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.
- 2.7.4 It is recommended that a ground investigation survey is undertaken post-planning to understand the exact ground type prior to detail design. The survey works should aim to capture the groundwater table where possible. Recommendations from the geotechnical engineers should be incorporated into the design of the development site.
- 2.7.5 The ground investigation report should also explore the feasibility of infiltration in accordance with BRE365 however due to the proximity of the development site to the River and likely ground type expected in this area; the use of infiltration is very likely to be unfeasible.

3. Hydrogeology

3.1 Source Protection Zone

- 3.1.1 Source Protection Zones (“SPZs”) are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction. This is part of an initial screening process in assessing impacts to groundwater resources. Zones around location sites are defined by groundwater travel time to an abstraction. The site is confirmed to be outside of a SPZ.

3.2 Drinking Water Safeguard Zones (Groundwater) (England)

- 3.2.1 Drinking Water Groundwater Safeguard Zones (“SgZs”) are established around public water supplies where additional pollution control measures are needed. The Water Framework Directive requires that drinking water protected areas are identified and that they are given the necessary protection with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. The site is confirmed to be outside of a SgZs

3.3 Groundwater Vulnerability Zone

- 3.3.1 The Environment Agency’s Groundwater Vulnerability Map shows the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties.
- 3.3.2 The Groundwater Vulnerability Map shows the entire development site to be in a Medium-High risk area.

3.4 Aquifer

- 3.4.1 The Environment Agency define aquifers as underground layers of water-bearing permeable rock or drift deposits from which groundwater can be extracted. Aquifers are designated depending on their importance in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The bedrock for the development site is classed as a Principle Aquifer and is within a very close proximity to bedrock identified as Secondary A. The superficial deposit has been identified to be a Secondary A.
- 3.4.2 Principal Aquifers are critical to large-scale, regional public water supplies. Secondary A Aquifers generally support smaller-scale local needs or private rural supplies. Principal Aquifers have high intergranular and/or fracture permeability, allowing for heavy water extraction. Secondary A Aquifers are permeable but yield less water overall. Both aquifer types are vital for maintaining wetland ecosystems and the baseline flow of surface watercourses, but Principal Aquifers handle larger, strategic volumes
- 3.4.3 A geotechnical site investigation report should be prepared and referred to for further details on the ground and impact to foundations.

4. Consultations with Stakeholders

4.1 Anglian Water

4.1.1 Anglian Water sewer records were obtained via the DIGDAT interface.

4.2 Environment Agency

4.2.1 The Environment Agency were contacted in order to obtain flood modelling data that may have been undertaken for the River Purwell.

4.2.2 Environment Agency Products 4 and 5 were obtained to inform the flood risk assessment. Product 4 provides detailed hydraulic flood modelling data, including modelled flood extents, flood levels, depths, flood defences and other relevant flood risk information. Product 5 comprises the supporting hydraulic and hydrological model reports and technical documentation, enabling the assumptions, methodology and limitations of the flood modelling to be reviewed where necessary. Together, these datasets provide a robust evidence base for assessing flood risk at the site.

5. Flood Risk Evaluation

5.1 Fluvial Flooding

5.1.1 This occurs when a river or stream is unable to take on water draining into it from surrounding land. The additional water causes the water to rise above its banks or retaining structures and subsequently flows onto the land.

5.1.2 The Environment Agency defines the Flood Zone categories as:

- Flood Zone 1 – Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

5.1.3 The EA have provided dataset which has been reproduced in Appendix E of this report and this information has been used to determine the impact from river water levels to the site.

5.1.4 The dataset is derived from the Environment Agency. Data in this table comes from the Hiz NHDC SFRA Climate change model. Level values are shown in mAOD, and flow values are shown in cubic metres per second. Table 1 (below) illustrates the modelled nodes; the table has been condensed to show the two closest nodes to the wider site. Nodes 7 & 8 are the closest nodes and is illustrated in Figure 5 (below). Nodes 7 & 8 will be used for the purposes of site analysis.

Label	Modelled Location ID	Easting	Northing	5% AEP	1% AEP	0.1% AEP
				Level	Level	Level
7	CH.030U	518316	231324	50.61m	50.68m	50.85m
8	CH.030U	518437	231355	49.56m	49.65m	49.86m

Table 1 - Flood Levels at Nodes - EA Hiz NHDC SFRA



Figure 5 - Nodes Reference Plan

5.1.5 The development site is confirmed to be at a level of 51.97m at its lowest level and is confirmed to be 2.11m above the level of the 1 in 1000 year flood event (0.1% AEP). The development site is at a low risk of flooding.

5.2 Groundwater Flooding

- 5.2.1** Occurs when the ground water table rises above normally expected and anticipated levels and intersects with the surface, this is usually after long periods of sustained rainfall. The Envirocheck data reproduced in Appendix F of this report has been used to assess groundwater flooding.
- 5.2.2** Based on the Envirocheck (Landmark Information Group) BGS Flood Data (1:50,000); the development site has potential for Groundwater Flooding to occur at surface
- 5.2.3** Based on the Envirocheck (Landmark Information Group) GeoSmart Groundwater Flood Map (1:50,000); the majority of the development site and surrounding land is at a Medium Risk of groundwater flooding.
- 5.2.4** Measures to protect the dwelling from groundwater flooding should be incorporated into the design.
- (i) The foundations should be designed by a specialist and to take into consideration of the impact of ground water on any materials or integrity of the structure.
 - (ii) Suitable waterproofing measures to both the sub-structure and above ground structure should be designed by a specialist.
 - (iii) The FFL of the dwelling should be at least 150mm higher than the existing surrounding external prevailing ground level.

5.3 Surface Water Flooding

- 5.3.1** Also known as pluvial flooding; surface water flooding results from overland flow before the runoff enters a watercourse or sewer. It is usually the result of high intensity rainfall but can occur with lower intensity rainfall when the land has a low permeability and/or is already saturated, frozen or developed. Surface water flooding is becoming a regular issue due to the high rate of developments creating large impermeable surfaces.
- 5.3.2** The Envirocheck data reproduced in Appendix F of this report has been used to assess the surface water flooding. The dataset includes information on surface water depth, velocity/direction and a surface water hazard rating. A summary of the dataset is as follows:

DEPTH, VELOCITY AND HAZARD

5.3.3 EA/NRW Surface Water 30 Year Return Maps (1:10,000)

- The development site and immediately surrounding land of Ickleford Bury is not shown to experience any surface water flooding.
- Arlesey Road adjacent to Ickleford Bury is shown to experience a small pocket of surface water flooding up to 300mm in height. This flooding presents a low surface water hazard.

5.3.4 EA/NRW Surface Water 100 Year Return Maps (1:10,000)

- The development site and immediately surrounding land of Ickleford Bury is not shown to experience any surface water flooding.
- Arlesey Road adjacent to Ickleford Bury is shown to experience surface water flooding up to 300mm in height. The surface water flows are shown to be routed in a northern direction along Arlesey Road. Depth of flooding further south along Arlesey Road are shallower at between 0mm to 150mm. This flooding presents a low surface water hazard.

5.3.5 EA/NRW Surface Water 1000 Year Return Maps (1:10,000)

- The development site is not shown to experience any surface water flooding however the western portion of the Ickleford Bury site is shown to experience surface water flooding up to 300mm in height. This surface water is shown to overspill from Arlesey Road and encroach into Ickleford Bury and recharge back into the River Purwell by following the natural topography of the site. The flows are shown to be up to 2.00m/s and have a medium to significant surface water hazard rating.
- The private access road to the south of the development site is shown to experience surface water flooding up to 300mm in height however the extent of flooding is shown to be within the extent of the access road. The flows are shown to be up to 0.5m/s and have a low to moderate surface water hazard rating.

5.3.6 Measures to protect the dwelling from surface water flooding should be incorporated into the design.

- (i) The FFL of the dwelling should be at least 150mm higher than the existing surrounding external prevailing ground level.
- (ii) Due to the nature of the site; the below ground drainage and surface water management should be designed to convey all flows up to and including the 1 in 100 year + 40% climate change event without breaching the surface level of the development. This measure allows access and egress area to remain free of flood water during the high return storm events.

5.3.7 The development would be safe from surface water flooding should the above mitigation recommendations be incorporated as part of the development.

5.4 Reservoir Flooding

5.4.1 Reservoir flooding occurs as a consequence of failure in the retaining structure. Public mapping data confirm the site is not within the inundation zone of a reservoir.

5.4.2 Flooding from reservoirs is unlikely in this area

5.5 Canal Failure

5.5.1 Canal failure occurs as a consequence of failure in the banks or defences of the canal.

5.5.2 The site is not at risk of canal failure.

5.6 Sewer Flooding

5.6.1 Sewer flooding occurs then extreme rainfall events overwhelm the sewer systems and cause local flooding. The flooding can occur by lifted manhole covers and gullies.

5.6.2 Based on the available mapping and Hertfordshire flood risk information, Arlesey Road in Hitchin is not within a designated Critical Drainage Area.

5.7 Access and Egress

5.7.1 Access/egress to and from the site are via Arlesey Road. The junction between Arlesey Road and Ickleford Bury entrance are at very similar levels. During higher return storm events, this access and egress route is considered to be unsafe to be used by any occupants due to the velocity and depth of water. It is highly recommended that occupants take refuge within the dwelling which is positioned at an elevated level from flood water until it is safe to do so otherwise.

5.7.2 The site is not located within an Environment Agency Flood Alert or Flood Warning Area and is therefore not covered by the Environment Agency's Flood Warning Service. Consequently, no formal flood warning arrangements are available for the site. As the principal flood risk is from surface water and ground water, it should be noted that the Environment Agency does not provide real-time warnings for surface water flooding. Occupiers should instead monitor severe weather forecasts issued by the Met Office and remain aware of local conditions during periods of intense rainfall.

6. Surface Water Management Strategy

6.1 Approach

6.1.1 The surface water management strategy aims to assess the way in which surface water is captured, conveyed, and disposed from within the proposed development site whilst incorporating measures to manage flood risk.

6.2 Climate Change

6.2.1 In considering flood risk to the site, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development within the mitigation measures. The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change.

6.2.2 Making an allowance for climate change as part of the design will help to minimise vulnerability and provide resilience to flooding and coastal change in the future.

6.2.3 The climate change allowances are predictions of anticipated change for:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

6.2.4 They are based on climate change projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere. There are different allowances for different epochs or periods of time over the next century.

6.2.5 Table 2 (below) is an extract from the Environment Agency – Flooding and Coastal Change guidance. The table is referred to as Table.2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline).

Applied across all of England	Total potential change anticipated for:		
	2015 to 2039	2040 to 2069	2070 to 2115
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 2 - Peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

6.2.6 In accordance with Table 1 (above), a climate change allowance of 40% has been used within the preliminary drainage strategy to allow for an increase in rainfall intensity for the lifetime of the development.

6.3 Pre-Development Surface Water Run-off

- 6.3.1 As mentioned earlier in the FRA; the existing site is predominantly impermeable in nature. The existing impermeable area is in the form of concrete surfaces and the roofs of garage units. Surface water is positively drained as part of a larger private below ground drainage network and therefore classed as brownfield site having been previously developed albeit ancillary in use type.
- 6.3.2 The surface water discharge rate generated off this site has been modelling as brownfield run-off; flow rates based on the current site status. Whilst exact below ground drainage elements are unknown; a model using 100mm diameter pipes have been simulated to reflect a typical below ground drainage model to two node points. The existing assumed drainage connection diagram used for modelling is presented in Figure 6 (below). Note that the inspection chambers have been numbered for the purposes of the model only and ‘G’ represents gully locations.

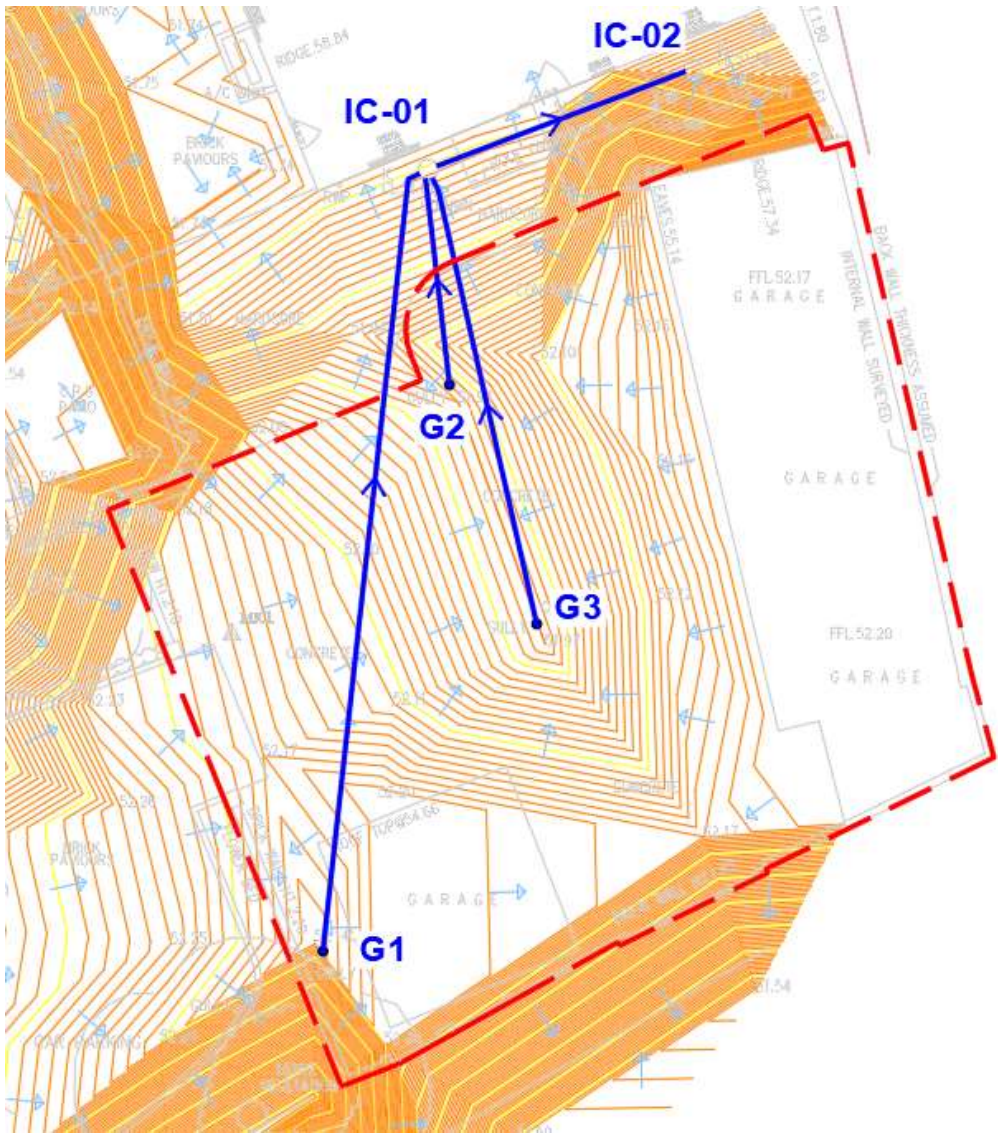


Figure 6 -Site Contour Plan and Drainage Route Assumption

- 6.3.1 The calculations are based on the Flood Estimation Handbook (“FEH”) method. The FEH and associated data enable recognised standard national methods for rainfall and flood estimation, and rainfall-runoff modelling. They are based on calibration to large hydro-meteorological datasets from gauged locations across the UK.
- 6.3.2 The brownfield run-off has been simulated using industry approved modelling software (PDS FLOW). Whilst drainage information is shown on the topographical survey; details of the existing surface water network is limited and therefore cannot be modelled in full. The brownfield run-off has been simulated using the Modified Rational Method using the likely impermeable area based on the information presented on the topographical survey. The calculations are based on an impermeable area of 0.039ha.
- 6.3.3 Table 3 (Below) summarises a typical brownfield run-off; the full hydraulic model analysis is produced in Appendix H of this report.

Return Period (Years)	Discharge Rate (Litres / second)	Note
2 Yr	6.4 l/s	OK
10 Yr	12.1 l/s	Part Surcharged
30 Yr	15.0 l/s	Flood Risk (Water 300mm from external ground level)
50 Yr	15.9 l/s	Flood Risk (Water 300mm from external ground level)
100 Yr	16.4 l/s	Flood – 0.24m³ breach from Gully G1

Table 3 – Brownfield Run-off Rate

- 6.3.4 Any breaches within the private drainage system would cause overland flood flows which would be promoted by way of the natural topography of the site to an area lower in level. It is important to note that this development is likely to exist at the head of the private drainage network. Any improvements made to this development site will result in an overall betterment in the capacity of the private drainage network.
- 6.3.5 For North Hertfordshire, the principal local planning policy relating to Sustainable Drainage Systems (SuDS) is Policy NE8 – Sustainable Drainage Systems of the adopted North Hertfordshire Local Plan 2011–2031. Hertfordshire County Council is the Lead Local Flood Authority (“LLFA”) is generally only required for major development, the policy applies to all development where surface water drainage is affected, including many minor developments.
- 6.3.6 The key local policy requirements are as follows:

Local Plan Policy NE8 – Sustainable Drainage Systems

Planning permission will be granted where development demonstrates that:

- (i) the most appropriate SuDS solution has been selected, taking account of technical constraints, viability and good design;

- (ii) the drainage design seeks to reduce the risk of surface water flooding;
- (iii) SuDS provide, where possible, additional benefits for water quality, biodiversity and public amenity;
- (iv) the drainage strategy mimics natural drainage patterns and processes as far as practicable; and
- (v) the design follows the recognised surface water drainage hierarchy.

The drainage hierarchy is:

- (i) Infiltration to ground (soakaways, infiltration basins, infiltration trenches).
- (ii) Discharge to a surface water body.
- (iii) Discharge to a surface water sewer.
- (iv) Discharge to a combined sewer only where no other option is feasible.

6.4 Post-Development Surface Water Run-off

6.4.1 The proposed development has been designed in accordance with Policy NE8 (Sustainable Drainage Systems) of the North Hertfordshire Local Plan 2011–2031. The policy requires development to utilise the most appropriate Sustainable Drainage System (SuDS), following the surface water drainage hierarchy and seeking to mimic natural drainage processes wherever practicable. The proposed drainage strategy has been developed to ensure that surface water runoff does not increase flood risk on or off the site whilst providing opportunities for wider environmental benefits where feasible. The proposal also has regard to the North Hertfordshire Sustainability Supplementary Planning Document (2024), which promotes the incorporation of SuDS into all appropriate development to improve flood resilience, water quality, biodiversity and amenity.

6.4.2 The proposed development results in a reduction of the impermeable surface types and therefore by default the surface water run-off will decrease compared to the existing site conditions if SuDS or other control techniques are not applied. Table 4 (below) summarises the difference between existing and proposed catchment surfaces. The greenroof and other positively drained permeable surfaces are taken to be impermeable as part of the catchment.

	Total impermeable area (m ²)	Total permeable area (m ²)	Total site area (m ²)
Existing Site	388 m ²	0 m ²	388 m ²
Proposed site	240 m ²	57m ²	388 m ²

Table 4 – Catchment Area Type Summary

6.4.3 Given the encountered superficial geology; the permeability of Alluvium-Clay, Silt and Gravel Clay is of very poor nature. The presence of clay and silt causes the soil to clog, severely impeding water percolation. Equally the Gault Formation mudstone

is generally not good for soakaways. Because it is primarily a highly cohesive, dense clay, its permeability is exceptionally low, meaning water will not infiltrate into the ground fast enough and therefore infiltration techniques such as soakaways or other similar devices which allow water to recharge as part of the groundwater will be unfeasible for this site. Based on information available; there is no need for a BRE365 test to be undertaken unless otherwise requested by the LLFA.

6.4.4 The existing private drainage system as part of the wider site is assumed to discharge into the River Purwell however it is recommended that a full trace scan and CCTV survey is carried out prior to the detail design being undertaken post planning. Disposal into the existing waterbody would be the preferred solution.

6.4.5 SuDS should be introduced to mimic natural processes. SuDS help to drain surface water and encourage groundwater recharge to reduce the flow of surface water from a developed site to something akin to that of an undeveloped site. This principle will be used as the forefront of achieving the reduced surface water run-off rates.

6.4.6 The Environment Agency SuDS hierarchy table will be used to explore the various SuDS options available as part of the development site and their justification for use on this site. The assessment is shown Table 5 (overleaf) along with the surface water discharge hierarchy shown in Table 6 (overleaf).

Rank	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Comment
1	Living Roofs	✓	✓	✓	A partial green roof has been proposed on the dwelling
2	Basins and Ponds Construction Wetlands Balancing Ponds Detention Basins Retention Ponds	✓	✓	✓	The site layout and configuration does not allow the effective use of such above ground SuDS devices. Also; the site being upstream as part of a wider site; any failure of the SuDS type will cause overland flows and a potential increase in the risk to downstream properties. Flood flow exceedance will not be suitably manage and therefore excluded at this stage.
3	Filter Strips and Swales	✓	✓	✓	The geology of the site does not promote this type of SuDS.
4	Infiltration Devices Soakaways Infiltration trenches and basins	✓	✓	✓	Infiltration techniques have been excluded at this stage due to the geology.
5	Permeable Surfaces and filter drains Gravelled Areas Solid Paving Blocks Porous Pavors	✓	✓		Permeable surfaces have been proposed for the access route with slab finishes.
6	Tanked systems Over-sized pipes/tanks Storm-cells	✓			Below ground attenuation tanks will be feasible.

Table 5 - Environment Agency SuDS Hierarchy

6.4.7 The aim is to use the principles higher up the rank unless there are reasons against as shown in table 6 (below).

Rank	Discharge Option	Reason
1	Into the ground (infiltration)	Infiltration techniques have been excluded at this stage due to the geology.
2	To a surface water body	An existing connection into the River Purwell is likely to exist. This is proposed to be re-used.
3	To a surface water sewer, highway drain, or another drainage system	There is a surface water sewer under Arlesey Road however it is unlikely for a connection to exist.
4	To a combined sewer	There are no combined water sewers that the site could connect to.

Table 6 - Planning Practice Guidance Surface Water Discharge Hierarchy

6.5 Design Principles for Surface Water Management

6.5.1 Key design principles in the following guidance documents steer the approach to managing surface water runoff at the site:

- (i) Building Regulations hierarchy of drainage (H3);
- (ii) Interim Code of Practice for SuDS;
- (iii) CIRIA best practice guidance, including the use of the 'SuDS management train';
- (iv) Flood and Water Management Act 2010 (part 1 – clause 27 (1)); and
- (v) Flood and Water Management Act 2010 (part 1 – clause 9 (1)).

6.6 Surface Water Management and SuDS features

6.6.1 A copy of the proposed drainage strategy is produced in Appendix G of this report and has been used to describe the principles of the below ground drainage design. A supporting hydraulic model has been produced in Appendix I of this report.

6.6.2 Rainwater is proposed to be captured on impermeable surfaces such as roofs and low level hardstanding surfaces and be conveyed to the nearest intercepting units such as gullies, channels and gutters. Hereon; the surface water enters the below ground drainage system and will be conveyed by a series of pipework to the flow control chamber. Flows will be controlled to a total of 2 l/s using a Hydrobrake or other similar flow control device. Where the flow rate within the system is higher than that controlled by the flow control device; surface water will surcharge and this volume of surcharged water is allowed to safely store within appropriately sized attenuation tanks provided below ground. Surface water will attenuate until the water has emptied into the private surface water sewer. A sub-surface level open graded crushed rock layer under the property entrance route will also act as a form of

attenuation and also a permeable surface to capture storm water to manage it at source.

6.6.3 The below ground drainage system has been designed to convey rainfall up to and including the 1 in 100 Year + 40% climate change event without sewer flooding. This approach eliminates overland run-off for hardstanding areas keeping access and egress areas useable for site users.

6.6.4 Table 7 (below) numerically illustrates the betterment in discharge rates as a result of the proposed development which indirectly better the discharge into the River Purwell.

	Existing Site Discharge Rate (l/s)	Proposed Site Discharge Rate (l/s)	Betterment (%)
2 Year	6.4 l/s	2.0 l/s	69 %
10 Year	12.1 l/s	2.0 l/s	83 %
30 Year	15.0 l/s	2.0 l/s	87 %
50 Year	15.9 l/s	2.0 l/s	87 %
100 Year	16.4 l/s	2.0 l/s	88 %

Table 7 - Site Discharge Rate Betterment

6.6.5 The disposal of surface water will be to a point akin to the pre-developed site.

6.6.6 SuDS devices which are appropriate will be assessed against the 4 key pillars as shown in Figure 7 (below).

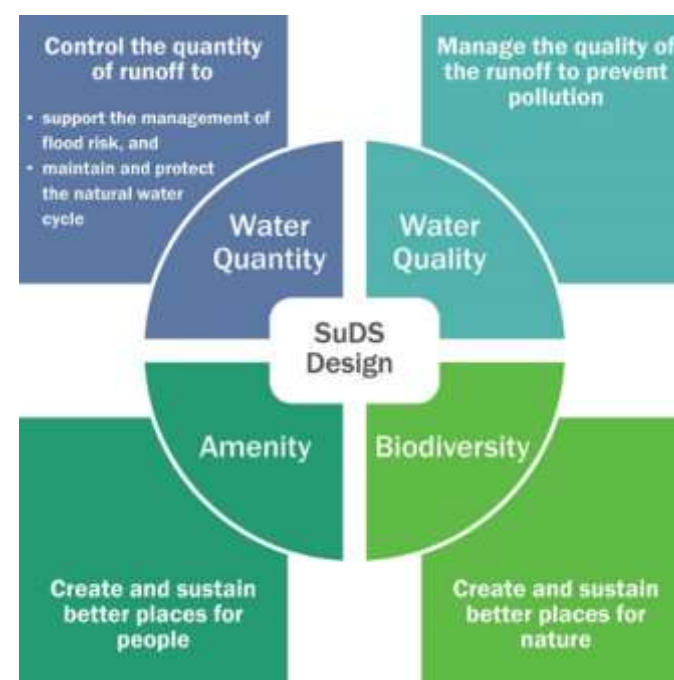


Figure 7 - 4 Pillars of SuDS

6.6.7 The following SuDS Devices are proposed to be incorporated into the development site:

(i) **Tanked Systems**

- (1) Water Quality – Attenuation tanks do not provide any form of treatment of surface water run-off and they therefore are combined with other management trains of water cleansing to remove pollutants. The removal of coarse sediment has been provided in the form of manhole sumps and catchpits.
- (2) Water Quantity – The size of the tank has been designed to the 1 in 100 Year + 40% climate change storm event. A factor of safety of 2 has been allowed for the tank design. Further capacity has been provided within the tank for flows above and beyond the 1 in 100 Year + 40% climate change event.
- (3) Amenity – The attenuation tank provides no direct amenity benefit however, indirectly by way of allowing water to be stored below ground; land above ground can be dedicated to amenity space in the form of soft useable landscape. To ensure a half drain time of less than 24 hours is adhered to; the re-use of water within the tank has been excluded due to the nature of the site. The failure in the performance of the tank will cause a risk of the occupants downstream of the site. The attenuation tank is proposed to fully drain after each rainfall event.
- (4) Biodiversity – Storage tank systems do not have any biodiversity value for this development site.

(ii) **Rainwater Butts**

- (1) Water Quality – Roof run-off is significantly less polluted than run-off from the road surfaces. Nevertheless; roofs may still generate pollutants such as sediment, PAH's and metals due to atmospheric deposition and run-off entrainment. Maintenance of the system is essential to prevent debris, sediment and other pollutants that accumulate in the filters from being discharged downstream, and to ensure the long-term performance of the system
- (2) Water Quantity – The system is designed to capture and retain part of the design rainfall. The butts will only contribute to volumetric and flow reduction during the period where the butts are filling and or have capacity to take on volumetric run-off. Once the butts are full or are inherently full; there will be no advantages to the water quantity; peak flows will enter the main below ground drainage system.
- (3) Amenity – Water butts provide indirect amenity value by supporting the resilience of developments and their landscape to changes in climate and water resource availability. They can also provide direct amenity value as they exist above ground level; clever visual interest

can be integrated with landscape features and/or combined with educational initiatives.

- (4) Biodiversity – There are no bio-diversity values with water butts however they can reduce flows on the downstream system and can this can help to facilitate biodiversity in those areas. Also; active use of the water butt to encourage recharge of rainwater as part of active irrigation will promote biodiversity in landscaped areas.

(iii) Permeable paving

- (1) Water Quality – Permeable pavement drainage has been shown to have decreased concentrations of a range of surface water pollutants when compared to impermeable surface drainage including heavy metals oil and grease sediment and some nutrients. Treatment processes occur within pervious pavements include
 - (A) filtration of silt and the attached pollutants the majority of silt is trapped within the top 150mm of gravel and or the first 30mm between the blocked paving
 - (B) biodegradation of organic pollutants such as petrol and diesel within the pavement construction
 - (C) adsorption of pollutants which depend on factors such as texture aggregate structure and moisture content
 - (D) settlement and retention of solids
- (2) Water Quantity – Permeable pavements helped reduce flow rates from a site providing attenuation storage. The available storage volume is provided by the void space in the sub base.
- (3) Amenity – Pervious pavements can provide amenity in the form of both the usefulness and visual aspects of the surface materials. However there are no specific design requirements to achieve amenity over and above the choice of surface as part of the overall planning architectural or landscape design.
- (4) Biodiversity – pervious pavements do not provide any direct biodiversity benefits although they are very useful for treating and controlling water to maximise the biodiversity in any downstream receiving waterbodies.

(iv) Greenroof Systems

Water Quality – The substrate used the build-up of greenroofed systems typically should not add pollutants to the rainfall that percolates through it in a way that some traditional roofing materials do. Through a variety of physical, biological and chemical treatment processes, within the soil and root uptake zone, which filter airborne pollutants and pollutants entrained within rainwater, green roofs can help to reduce the amount of pollution delivered to the local drainage system and ultimately, to receiving waters.

Greenroofs can provide further benefits in terms of moderating the temperature of the run-off.

Water Quantity – The performance of greenroof from reducing or preventing run-off from the normal rainfall events is usually very significant in the summer due to the evapotranspiration processes and temporary storage provided by the roof. All greenroofs can be assumed to meet interception requirements in the summer, based on their retention of 5mm of rainfall.

Amenity – Greenroofs can be used to provide valuable amenity if the roof is intended to be accessible or is overlooked. They can improve the roofscape for the surrounding community of office occupiers as well as users of the green roof space itself, with the variety of planting and habitats creating a more colourful aesthetically pleasing and natural environment, particularly in dense urban areas.

Biodiversity – Roofs can be designed to provide high ecological value. They can help to conserve valuable habitat and biodiversity and provide an oasis of life in an otherwise sterile urban environment. They can also contribute to networks, clusters and corridors of green space that connect previously fragmented habitats. A green roofs designed for efficient maintenance means that habitats are less likely to be disturbed and with appropriate design, they can provide habitat for a wide range of vulnerable plants and ground-nesting birds.

6.7 Preliminary Foul Water Drainage Strategy

- 6.7.1 A copy of the preliminary drainage strategy is produced in Appendix F of this report.
- 6.7.2 Foul water generated from this development site is proposed to be conveyed by gravity into a foul water package sewage treatment plant by Klargestor or similar approved. The product specified at the time of design is a Bio-Disc 6 person unit which is specified to treat water to level suitable to discharge into a watercourse. It is specifically designed to produce an effluent suitable for discharge to a surface water (such as a river or stream), provided the installation complies with the Environment Agency's requirements. The unit is manufactured to the relevant British Standard (BS EN 12566-3), which is one of the key requirements for a treatment plant discharging to a watercourse. Key details of the sewage treatment plant can be found in Appendix G of this report.
- 6.7.3 The discharge of the foul water will be pumped at this stage due to the likely invert level difference between the development site and the downstream drainage however this is subject to change once the drainage survey has been completed.
- 6.7.4 EA binding rules must be followed, and these are:
 - (i) The discharge must be domestic sewage only.
 - (ii) The discharge must be 5 m³/day or less (a 6-person dwelling is well below this).
 - (iii) The receiving watercourse must have flow throughout the year (not just a seasonal ditch).

- (iv) There must not be a reasonably available public foul sewer within the applicable distance.
- (v) The treatment plant must be installed, operated and maintained in accordance with the manufacturer's instructions.
- (vi) The discharge must not cause pollution.

7. Maintenance Strategy

- 7.1.1** The site will require regular maintenance to ensure continuing operation to design performance standards. Maintenance responsibility for the surrounding area should always be placed with a responsible organisation. Litter and debris removal should be undertaken as part of the general landscape maintenance for the site and before any other SuDS management task.
- 7.1.2** Generic health and safety guidance should be designed to ensure that all maintenance risks have been identified, eliminated and/or controlled where appropriate. This will need to be determined at detail design stages and the information to be presented as part of the health and safety file.

Attenuation Tanks

- 7.1.3** Attenuation tanks will allow storage of surface water during certain storm events. The location of the attenuation tanks have been shown in the drainage strategy drawing. The anticipated maintenance of attenuation tanks can be found in Table 7 (below).

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets vents and overflows to ensure they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 8 - Tank Maintenance Schedule

Flow Control Devices

- 7.1.4** The vortex flow control unit regulates the flow of surface water. It is entirely self-activating and requires no manual intervention unless blockages occur. The location of the vortex flow control device has been shown in the drainage strategy drawing. The anticipated maintenance of vortex flow control device can be found in Table 8 (Overleaf).

Schedule	Action	Frequency
Inspections	• Lift access cover and check for debris or silt accumulation at base.	Monthly
	• Check visible fixing bolts to ensure they are not corroded or unsecure	Six Monthly
	• Check to see if vortex flow control is not damaged	Six Monthly
	• Check for any blockages of the outlet	Monthly
	• Check flow of water is freely leaving the vortex flow control unit	Monthly
	• Check wire cable for emergency drain down is operating with ease	Monthly
Maintenance	• Remove any Silt or debris accumulation	As required

Table 9 – Flow Control Device Maintenance Schedule

Greenroof System

7.1.5 Extensive greenroof system have a low substrate depth, simple planting and a general lower maintenance regime. The greenroof will cover the entire area with hardy planting which will establish slowly but the long-term biodiversity is proposed to be of high value. The Growing medium will be typically 20-150mm thick which will provide water retention assumed for the 5mm of rainwater that lands on it.

7.1.6 Maintenance of greenroof is carried out at roof level and caution needs to be exercised working at height. A specialist company is required to obtain all necessary health and safety measures and a suitable method statement to carry out the work. The manufacturer specification and recommendations will need to be incorporated into the maintenance strategy. The anticipated maintenance of the Greenroof system can be found in Table 10 (below).

Schedule	Action	Frequency
Regular Inspections	• Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	• Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	• Inspect drain inlets or ensure unrestricted run-off from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	• Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	• Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	• During establishment (i.e year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	• Post establishment, replace dead plants as required (where >5% coverage)	Annually (in autumn)

	• Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	• Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	• Mow grasses, prune shrubs and manage other planting as required. Clippings should be removed and not allowed to accumulate.	Six monthly or as required
Remedial Actions	• If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	• If drain inlet has settled, cracked or moved, investigate and repair as appropriate.	As required

Table 10 - Greenroof Maintenance Schedule

Permeable Paving

7.1.7 Many of the specific maintenance activities for pervious pavements can be undertaken as part of general site cleaning and landscaping maintenance works. The area of permeable systems have been shown on the preliminary drainage in Appendix F. The anticipated maintenance of permeable paving can be found in Table 11 (overleaf).

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds and management of invasive vegetation	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip has raised 50mm above level of paved area	As required
	Remedial works to any depressions, rutting to paved zone which may be hazardous or detrimental to the performance of the system	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required where water does not permeate through
Monitoring	Initial inspection	Monthly for three months
	Inspect for evidence of poor operation and or weedgrowth	Three monthly, 48 hrs after heavy rainfall in first 6 months
	Inspect for silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 10 – Permeable Paving Maintenance Schedule

Foul Water Storage Tank – Foul Water Treatment Plant

7.1.8 The maintenance schedule is representative of the routine maintenance requirements for a Klargestar BioDisc sewage treatment plant serving a single dwelling. Actual maintenance frequencies may vary depending on occupancy, loading and the manufacturer's recommendations. Desludging and servicing should be undertaken by suitably qualified personnel, and maintenance records should be retained to demonstrate ongoing compliance with the Environment Agency's General Binding Rules and the manufacturer's operating instructions.

7.1.9 The location of the cesspit has been shown on the preliminary drainage in Appendix F. The anticipated maintenance of permeable paving can be found in Table 12 (right).

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Visually inspect the treatment plant for signs of damage, excessive noise, vibration, odours or flooding.	Monthly
	Check that the rotating discs are operating correctly and that the drive motor is functioning.	Monthly
	Inspect the inlet and outlet chambers to ensure flows are unobstructed and there are no blockages.	Monthly
	Confirm that the final effluent is clear and free from excessive suspended solids, foam or sewage solids.	Monthly
	Remove accumulated debris, grease or floating matter from chambers where necessary.	Quarterly
	Check electrical components, alarms and control panel operation (where fitted).	Quarterly
	Inspect ventilation pipework to ensure vents remain unobstructed.	Quarterly
	Empty accumulated sludge from the primary settlement chamber using a licensed waste contractor.	Approximately every 12 months (or as recommended following inspection)
	Arrange a full service by a competent maintenance engineer, including inspection of mechanical and electrical components.	Annually
Monitoring	Record maintenance visits, desludging events, servicing and any operational issues in a maintenance log.	After each inspection or maintenance visit
	Observe the receiving watercourse for evidence of pollution, discolouration or odour downstream of the discharge point.	Monthly and after significant maintenance
	Review plant performance following prolonged power outages or unusually high inflows.	As required
Remedial Action	Clear any blockages from inlet, outlet or pipework if reduced flows or backing-up are observed.	As required
	Repair or replace damaged mechanical or electrical components, including the drive motor or control equipment.	As required
	Investigate and rectify persistent odours, poor effluent quality or evidence of solids carry-over.	As required
	Desludge the plant earlier than the routine interval where excessive sludge accumulation is identified.	As required
	Repair damaged covers, access chambers or pipework to maintain safe operation and prevent ingress of surface water.	As required

Table 11 - Foul Treatment Maintenance Schedule

7.1.10 This maintenance strategy has been prepared for planning purposes and for understanding the anticipated maintenance regime associated with the site. Spillways Limited accepts no liability for any use of this document other than by its client and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of

Spillways Limited. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole.

- 7.1.11** The report is based on the drainage design and therefore considers the SuDS devices selected at this stage of the design. This report has been undertaken with the assumption that the site will be developed in accordance with the proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site. No cost has been included within this report. Should estimate costs be required, it is recommended that a quantity surveyor or similarly experienced party to review the contents of this document and price against the proposed drainage strategy. This will provide an indicative figure only and should be used for the purposes of estimates only until the final installation is complete and reviewed by a maintenance engineering company.
- 7.1.12** It is recommended that monitoring and maintenance be initialised immediately via a maintenance regime. A detailed regime should be undertaken post completion of the network design once all design criteria have been obtained and construction details have been prepared. It is anticipated that all construction and site drawings will be shared post completion handover.
- 7.1.13** The handover documents can be used to prepare a maintenance regime for the SuDS devices and this can be carried out by a specialist maintenance management organisation.
- 7.1.14** All maintenance documents should be held on site and copies offsite with a maintenance engineering company.
- 7.1.15** It is recommended that three competitive quotations are obtained for the cost of maintenance.

8. Residual Risk

8.1 Residual Risk

- 8.1.1** It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, it is practicable to minimise the risk by allowing a freeboard (safety margin) and by using suitable construction and management techniques.
- 8.1.2** Danger as a result of flooding to users of the site can be greatly reduced with prior knowledge of such flood events and therefore the owner or occupier of the site is highly recommended to take refuge within the new dwelling which is positioned at an elevated level from flood water until it is safe to do so otherwise.
- 8.1.3** This flood risk assessment has been prepared in accordance with the NPPF and Local Planning Policy. Any recommendations regarding floor levels are based on the relevant British Standards (BS8533), the standing advice provided by the Environment Agency or based on common practice.
- 8.1.4** However, it should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers to seek further guidance prior to commencing development.
- 8.1.5** Spillways do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.
- 8.1.6** The owner/occupier of the property will be required to carry out maintenance on any SuDS devices within the site boundary. It will be the owner's/occupier's responsibility to provide regular upkeep to the drainage network on site throughout the lifetime of the development to ensure that flood risk on and off site is managed effectively.
- 8.1.7** The recommendations in this report are based on source material available at the time of writing this report. It is also recommended that the mitigation measures suggested in this report are incorporated into the proposed development.

8.2 Duties Under Ownership

- 8.2.1** The following items are required to be incorporated in the deeds of the property to ensure that the development remains safe throughout its design life. Please note that the items will be updated upon completion of the construction set information so the detailed elements of maintenance, timescales, manufacturers and maintenance companies can be added:
- (i) Materials, personal possessions, waste or any type of storage is strictly prohibited from blocking gullies, channels or other drainage on site.
 - (ii) All waste outlets, gullies, channels and pipes should be inspected and cleaned every 12 months or that recommended by the manufacturer.

9. Conclusion

9.1 Summary

- 9.1.1** This FRA has been carried out by Spillways Limited to support a detailed planning application for the construction of a detached dwelling referred to as "The Courtyard" on the wider grounds of Ickleford Bury situated off Arlesey Road in Hitchin uniquely positioned in proximity of the River Purwell.
- 9.1.2** Residential development is classed as 'more vulnerable' development as per table 2 (Flood Risk Vulnerability Classification table) of the online PPG
- 9.1.3** The proposed development is on land categorised by the Environment Agency as Flood Zone 1. The area of land on which the development is proposed as:
- (i) Flood Zone 1 - Land assessed as having a less than 1 in 1,000 annual probabilities of river or sea flooding (<0.1%); This land is at very low risk of flooding from Rivers and Seas.
- 9.1.4** The proposed development which is identified as a 'more vulnerable' type is considered to be appropriate on the plot of land with a Flood Zone 1, in accordance with table 3 (Flood Risk Vulnerability and Flood Zone Compatibility table) of the online PPG. No Sequential or exception test is required to be applied and demonstrated as part of the planning application as the development has been appropriately located on a very low risk ground.
- 9.1.5** The following measures are to be incorporated as part of the design:
- (i) The foundations should be designed by a specialist and to take into consideration of the impact of ground water on any materials or integrity of the structure.
 - (ii) Suitable waterproofing measures to both the sub-structure and above ground structure should be designed by a specialist.
 - (iii) The FFL of the dwelling should be at least 150mm higher than the existing surrounding external prevailing ground level.
 - (iv) Due to the nature of the site; the below ground drainage and surface water management should be designed to convey all flows up to and including the 1 in 100 year + 40% climate change event without breaching the surface level of the development. This measure allows access and egress area to remain free of flood water during the high return storm events.
- 9.1.6** Any structural works below ground should account for any groundwater flows or the impact of water on a structure. This should be explored in greater detail by a specialist and any recommendations by geotechnical engineer should be incorporated into the report.
- 9.1.7** It is recommended that a ground investigation survey is undertaken post-planning to understand the exact ground type prior to detail design. The survey works should aim to capture the groundwater table where possible. Recommendations from the

geotechnical engineers should be incorporated into the design of the development site.

- 9.1.8** Given the encountered superficial geology; the permeability of Alluvium-Clay, Silt and Gravel Clay is of very poor nature. The presence of clay and silt causes the soil to clog, severely impeding water percolation. Equally the Gault Formation mudstone is generally not good for soakaways. Because it is primarily a highly cohesive, dense clay, its permeability is exceptionally low, meaning water will not infiltrate into the ground fast enough and therefore infiltration techniques such as soakaways or other similar devices which allow water to recharge as part of the groundwater will be unfeasible for this site. Based on information available; there is no need for a BRE365 test to be undertaken unless otherwise requested by the LLFA.
- 9.1.9** The existing sitewide private drainage network should be surveyed and traced prior to detail design and should be undertaken post planning.
- 9.1.10** The following SuDS Devices are proposed to be incorporated into the development site:
- (i) Attenuation Tank Systems
 - (ii) Permeable Surfaces
 - (iii) Greenroof system
 - (iv) Rainwater Butts
- 9.1.11** SuDS devices are designed to the 1 in 100 Year + 40% climate change storm event. Any measures for flooding above ground should be managed to prevent off-site flooding.
- 9.1.12** The drainage plan illustrated as part of this report is a preliminary strategy only and is subject to change during the design stages. Gullies, pipes, tank sizes, flow control devices do not account for foundations or finalised site layouts. The exact strategy is to be confirmed at design stages. The catchment area is based on a planning level design concept and should be reviewed at detail design using the same design principles. The detail design team should not relieve their duties to ensure the principles set out in this report are adhered to post-planning should any adjustments or alterations that need to be made for the general site levels or other variations.
- 9.1.13** Foul drainage is proposed to discharge to a Klargest BioDisc 6-person sewage treatment plant, certified to BS EN 12566-3 or similar approved product. Treated effluent will discharge to the River Purwell. The proposed system is suitable for direct discharge to surface water, subject to compliance with the Environment Agency's General Binding Rules for small sewage discharges, including installation, operation and ongoing maintenance in accordance with the manufacturer's requirements. An Environmental Permit will be obtained if the General Binding Rules cannot be satisfied.
- 9.1.14** It is highly recommended that occupants take refuge within the dwelling which is positioned at an elevated level from flood water until it is safe to do so otherwise.

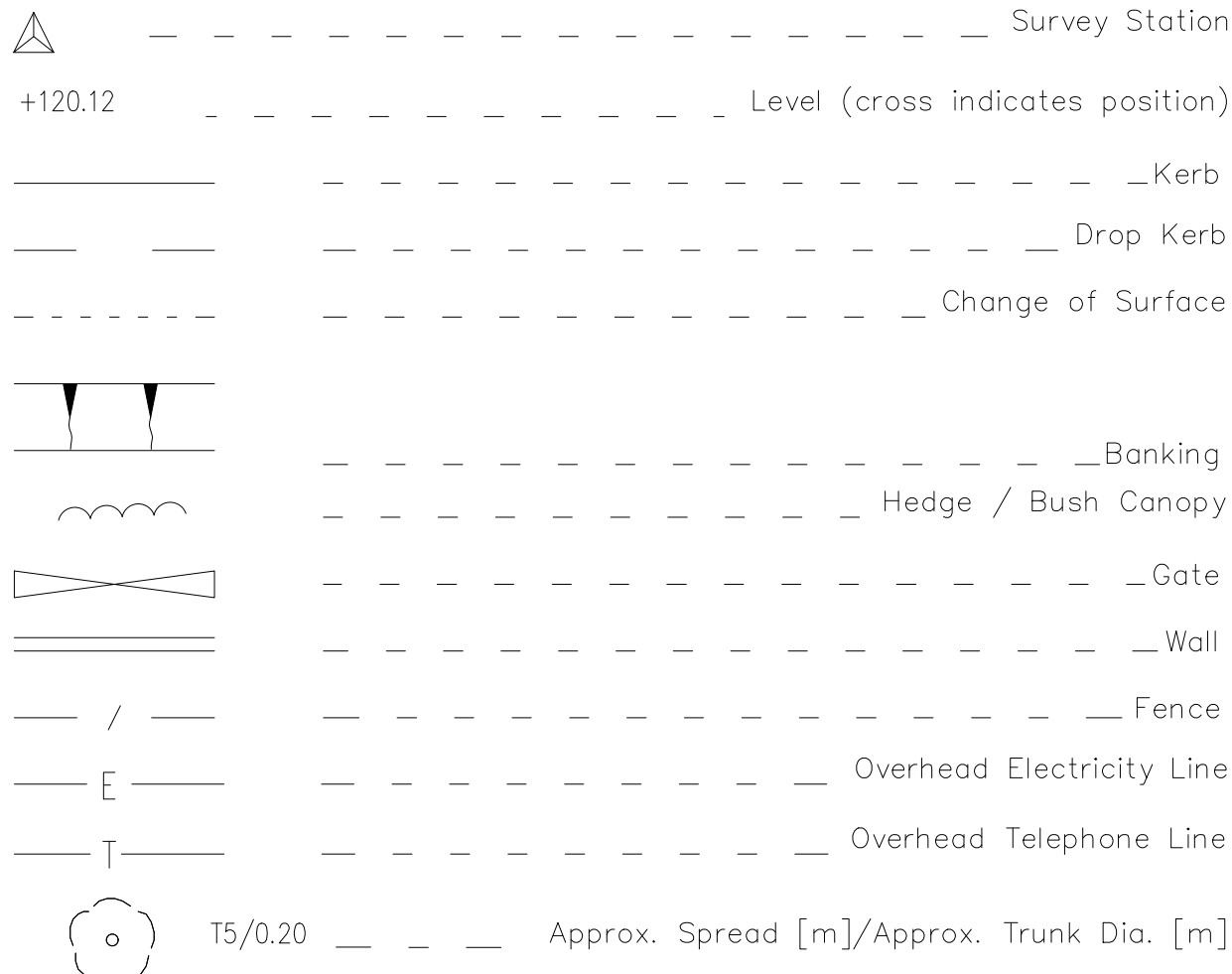
- 9.1.15** Covenants and Duties under land ownership must be accounted for as part of the development. This should be strictly enforced to ensure the effective operation and management of the site.
- 9.1.16** Maintenance of the site should be carried to a minimum level as shown in this FRA. A full maintenance plan should be prepared upon detail design and to be retained as part of the Operation and Maintenance files on site.
- 9.1.17** Should the development incorporate the measures as set out within this report then the development is considered to be at low risk from all sources of flooding and therefore an acceptable form of development in terms of flood risk.

APPENDIX A – Existing Site Plan

APPENDIX B – Proposed Architects Plans

APPENDIX C – Topographical Survey

LEGEND



Notes:

Local coordinate system used. AOD vertical datum. SASurveys are not trained arboricultural consultants. All spreads are estimated. In some cases it may be prudent to have tree species confirmed by a trained specialist.

Scaled distances taken from this survey should be treated as of low certainty, designers and contractors must take (verify) their own site measurements.

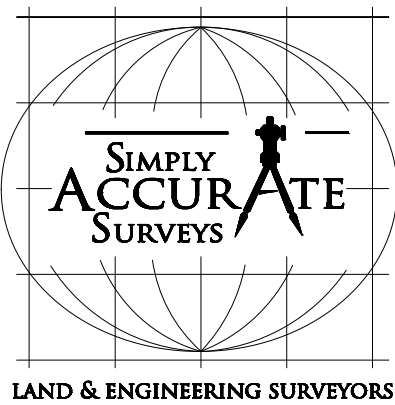
ABBREVIATIONS (Where applicable)

AB_	Air Brick	MH_	Manhole
BG_	Box Gully	MKR_	Marker
BLR_	Retractable Bollard	OB_	Open Boarded Fence
BL_	Bollard	P_	Post
BP_	Boundary Post	PCL_	Post & Chain Link Fence
BS_	Bus Stop	PF_	Panel Fence
BW_	Post & Barbed Wire Fence	PR_	Post & Rail Fence
CB_	Close Boarded Fence	PW_	Post & Wire Fence
CI_	Corrugated Iron Fence	PWM_	Post & Wire Mesh Fence
CP_	Chestnut Paling Fence	RW_	Retaining Wall
CW_	Concrete Wall	SF_	Security Fence
CD_	Cable Duct	STW_	Stone Wall
CL_	Cover Level	PM_	Parking Meter
CM_	Cable Marker	RE_	Rodding Eye
CPS_	Concrete Paving Slabs	RG_	Road Gully
DP_	Down Pipe	RS_	Road Sign
ECB_	Electricity Control Box	RWP_	Rain Water Pipe
ECP_	Electricity Cable Pit	SC_	Stop Cock
EJB_	Electricity Cable Junction Box	SV_	Sluice Valve
EP_	Electricity Pole	T_	Tree
ERP_	Earthing Point	TCB_	Telephone Call Box
FB_	Flower Bed	THL_	Threshold Level
FH_	Fire Hydrant	TIC_	Telephone Inspection Cover

Client: **Nigel Sanders**
Bury Lodge
Old Hale Way
Ickleford
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Drawing
Topographical survey
Ickleford Bury, Old Hale Way, Ickleford, Hitchin,
Herts SG5 3UW

Drawing No.
SAT39323

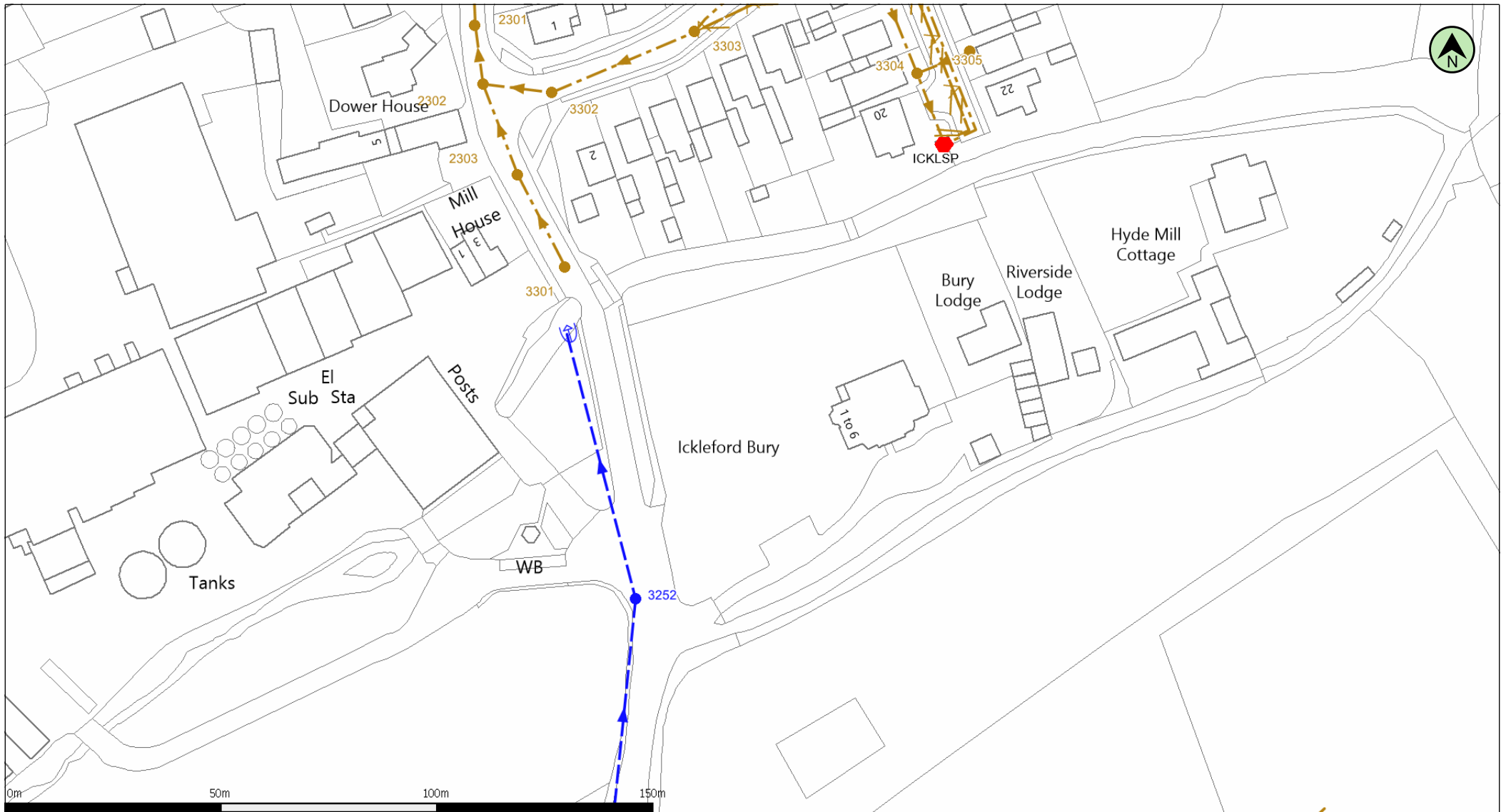
Date:
25/07/2023

Drawing Scale: 1:200@ A1

STATION	EASTING	NORTHING	LEVEL
GPS1	3515.485	1386.500	51.42
GPS2	3469.251	1345.981	51.78
MK1	3516.881	1352.766	52.13
MK2	3472.907	1318.532	52.19

0m 2m 4m 6m 8m 10m 20m
SCALE 1:200

APPENDIX D – Anglian Water Sewer Record



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Foul Sewer	— — — — —	Outfall*	⊕	Sewage Treatment Works	□
Surface Sewer	— — — — —		⊕	Public Pumping Station	●
Combined Sewer	— — — — —	Inlet*	⊕	Decommissioned Pumping Station	●
Final Effluent	— — — — —				
Rising Main*	— — — — —	Manhole*			
Private Sewer*	— — — — —				
Decommissioned Sewer*	— — — — —				

*(Colour denotes effluent type)

sanjay@spillways.co.uk

Ickleford Bury, Old

APPENDIX E – Environment Agency Flood Modelling Data

APPENDIX F – Envirocheck Flood Data

APPENDIX G – Preliminary Drainage Strategy

APPENDIX H – Existing Drainage Hydraulic Model

APPENDIX I - Proposed Drainage Hydraulic Model