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Conceptual Drainage Scheme for Land Adjacent to New House Lane, Garstang, PR3 0JT

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Report QA Number: - QA24/017

March 2024

Contents

Plans:

Appendices

1.0 Introduction

1.1 Background

Peak Associates Environmental Consultants Limited (Peak Associates) was commissioned by Anthony Rimmer to conduct a Sustainable Drainage Scheme (SuDS) to support the planning application associated with the land adjacent to New House Lane, Garstang, PR3 0JT.

The aim of this report is to produce a RIBA Stage 2 Conceptual Drainage Strategy for the site to support a planning application for the proposed development complying with the National Planning Policy SuDS Hierarchy. This report is based upon observations made on-site during a walkover undertaken on the 13th of February 2024 and upon data-driven research. This SuDS report includes the analysis of historical maps, geological, hydrogeological, and hydrological data, and other relevant Third-Party environmental information, including the Environment Agency's (EA) detailed flood risk maps. This data is freely available and can be requested from GOV.UK.

Peak Associates can accept no liability for any inaccuracies contained within the Third-Party information referenced. It should be noted that where screenshots of online mapping tools have been used, these contain public sector information licensed under the Open Government Licence v3.0.

1.2 Description of the Proposed Site

The proposed development involves the construction of a Stable Barn and two horse Paddocks. One Paddock will be a Grass Turn-out Paddock, and the other an exercise menage constructed of sand or other open loose, porous and permeable material. The site is currently an empty grass field. According to The National Planning Policy Framework (NPPF), the proposed use of the site for outdoor sports and/or recreation is a 'water-compatible development'. However, it would be worthwhile to consider this a 'less vulnerable development' to ensure the animal's welfare is protected to a high standard (Ref 1). The total site area is approximately 14,800 m^2. The development area is approximately 1,598 m^2, of which only 180 m^2 is accounted for by the Stable Barn, which has a roof and associated drainage system.

Photographs of the site in its existing condition can be found in Appendix 2. The site resides between 14.0 mAOD and 15.5 mAOD (see Appendix 3 for LiDAR map). The site is accessed via New House Lane, off both Broad Lane and Bells Bridge Lane which join to the B5272. The site is located near a small brook which is part of a wider network. There are also numerous ponds located in various places surrounding the site (see Appendix 1). The small brook has the name Lee Brook and it borders the site. It is located approximately 150m South-East of the intended development area. Lee Brook borders the Eastern edge of the site, and part of the Southern edge of the site (see Appendix 1). The intended development area is located in the Western part of the field. There is one pond located approximately 200m North-East of the intended development area. A second pond is located approximately 275m North-East of the intended development area. Black Pool is located approximately 500m North of the site. The Lancaster Canal is located approximately 570m East of the site, and the River Wyre is located approximately 1.85km East of the site (see Appendix 1).

1.3 Geology

The geology of the area was investigated using the Geology of Britain Viewer from the British Geological Survey (Ref 2). The bedrock geology of the site is composed of Sherwood Sandstone Group. This sedimentary bedrock formed between 272.3 and 237 million years ago during the Permian and Triassic periods. The hydrology of the area is formed across the superficial geology, and the site is underlain by largely impervious Glacial Till. This is, Devensian - Diamicton in age. These deposits formed between 116 and 11.8 thousand years ago during the Quaternary period. Locally the soils and subsoils formed appear to be clays and silty clays.

The soil type was investigated using the Soilscapes Viewer from LandIS (Ref 3). The soil type of the area is described as "slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. The texture is described as "loamy and clayey". The area has impeded drainage and drains to a stream network.

1.4 Existing Drainage

As Lee Brook is too small to be a 'main river' the area is located formally on Flood Zone 1. The EA's surface water flood maps (based on levels taken from LiDAR data) have, however, usefully identified low-lying points in the area where surface water is most likely to accumulate. In the absence of fluvial modelling this pluvial model data is well suited to assessing flood risk and drainage options.

The proposed development site resides between 14.0 mAOD and 15.5 mAOD. Lee Brook resides between 14.5 mAOD on the Southern edge to 15.0 mAOD on the eastern edge of the proposed development site.

Figure 2 shows that surface water naturally flows through the site from the North and accumulates where Lee Brook starts to border the site. Figure 3 highlights the direction where the water naturally drains to and accumulates at the unnamed brook along the Southern edge of the site.

Lee Brook is shown in Figure 3 to flow Southwards, towards the land owned by the neighbouring house, 'The Poplars'. However, the patch of accumulated surface water on the field itself has an opposing direction of flow arrows. This indicates that the water doesn't easily flow entirely into the brook, and may pool in this area.

2.0 Sources of Flooding

Flooding can occur from various sources, including fluvial, surface water (pluvial), groundwater, and reservoirs. The site is located in fluvial Flood Zone 1 (see Figure 1) and as such, has a Very Low probability of flooding from rivers and the sea (Ref 4). The property has a Very Low (less than 0.1% chance) risk of fluvial flooding each year (Ref 5).

When considering the pluvial (surface water) flood data, the site has a variable flood risk ranging from Low (in some areas) to High risk (between 0.1% and greater than 3.3% chance) risk of surface water flooding each year, at the lowest part of the site.

There is no risk of reservoir flooding at the site location. Flooding from canals poses a low risk, provided adequate management of canal embankments is continued.

The Stable Barn and Paddocks proposed are situated at 15.25 mAOD and, as such, well above the 14.0 mAOD area that is at risk of surface water flooding. During the site walkover, it was noted that the ground was, in general, very muddy and boggy, and in certain low-lying areas, there were (as expected and predicted) surface streams of water crossing the development site on route towards Lee Brook (see Photo 13 in Appendix 2). The walkover occurred after a period of particularly heavy rainfall.

There were two patches of water on the surface of the development site (see Photos 10-12 and 14 of Appendix 2), one we were informed had not appeared before, and we believe is due to the ground being heavily saturated (Photo 14). One patch we were informed of occurred regularly, and we believed this was a minor flood event from the backing up of Lee Brook, causing water to flow onto the field in the low-lying area (Photos 10-12). We do not believe the development requires a Flood Risk Assessment for planning purposes because it is located in Flood Zone 1, is smaller than 1 hectare, and because the development area is high enough above the flood risk area to ensure its safety.

There have been no reported incidents by residents of flooding on New House Lane.

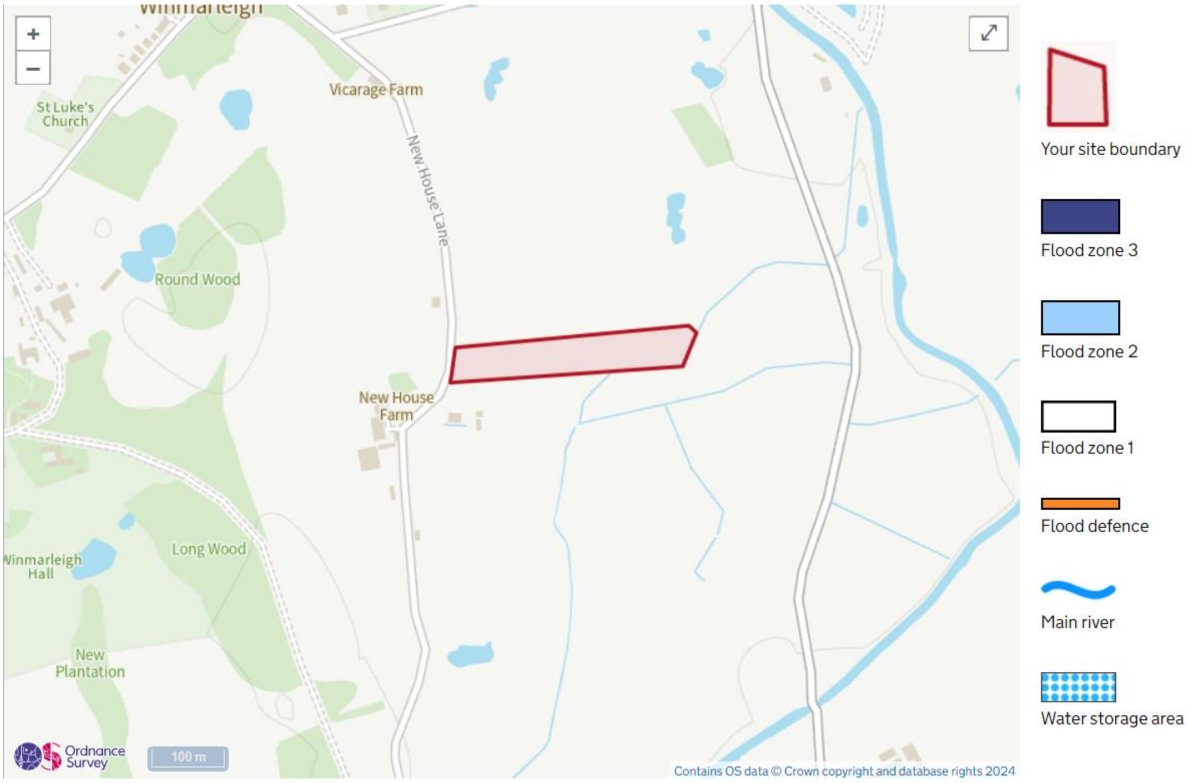


Figure 1 – Flood Zone Map for Site (Ref 4)

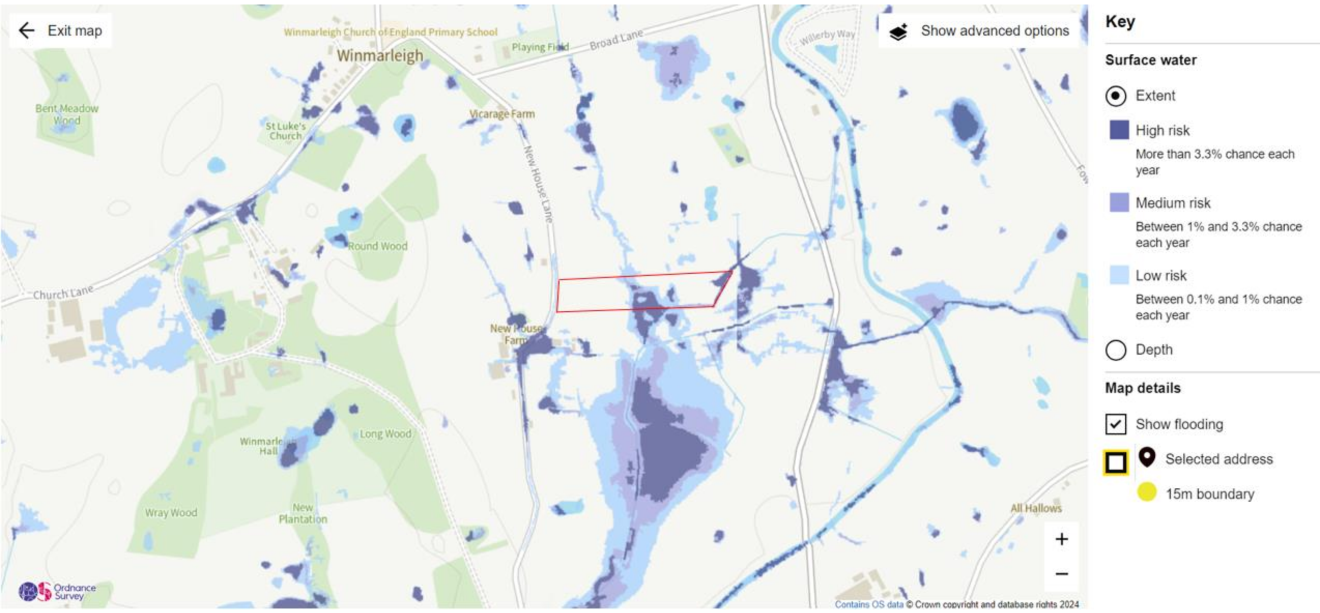


Figure 2 – Extent of Surface Water Flooding (Ref 5)

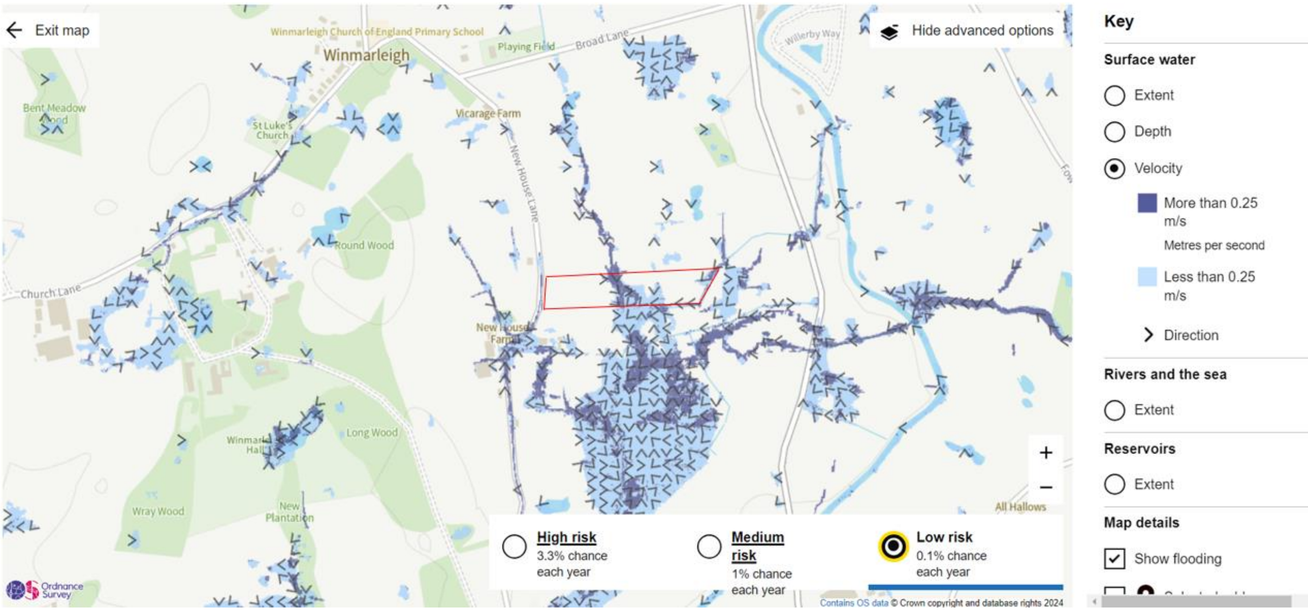


Figure 3 – Low Risk Surface Water Velocity Map (Ref 5)

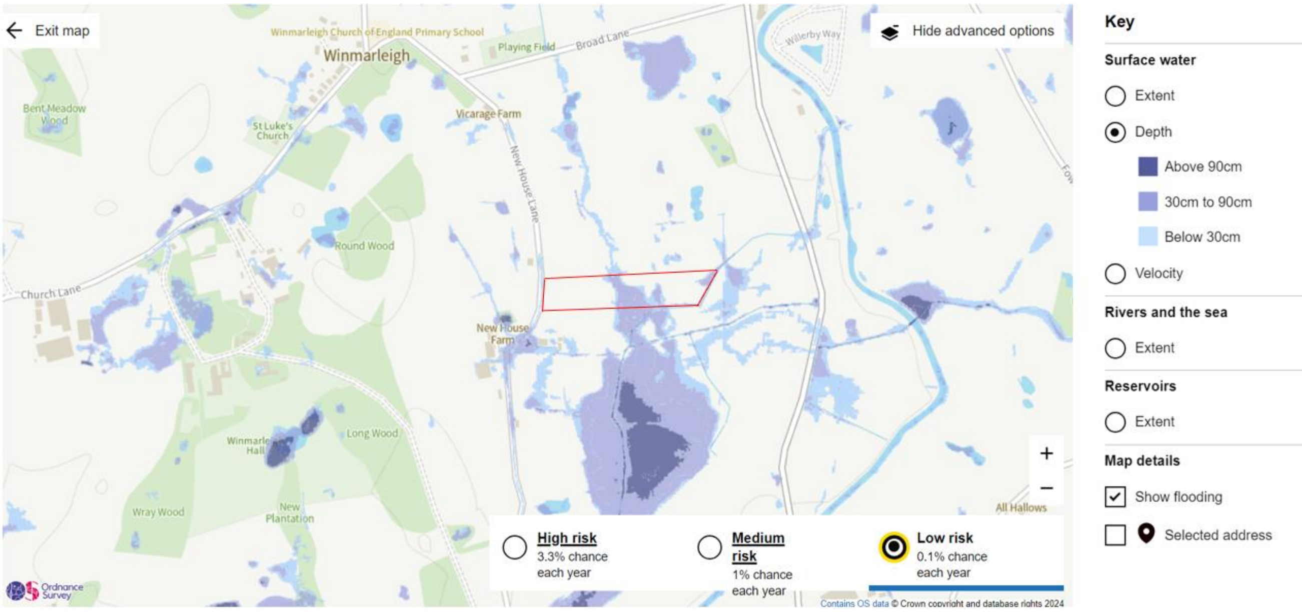


Figure 4 – Low Risk Surface Water Depth Map (Ref 5)

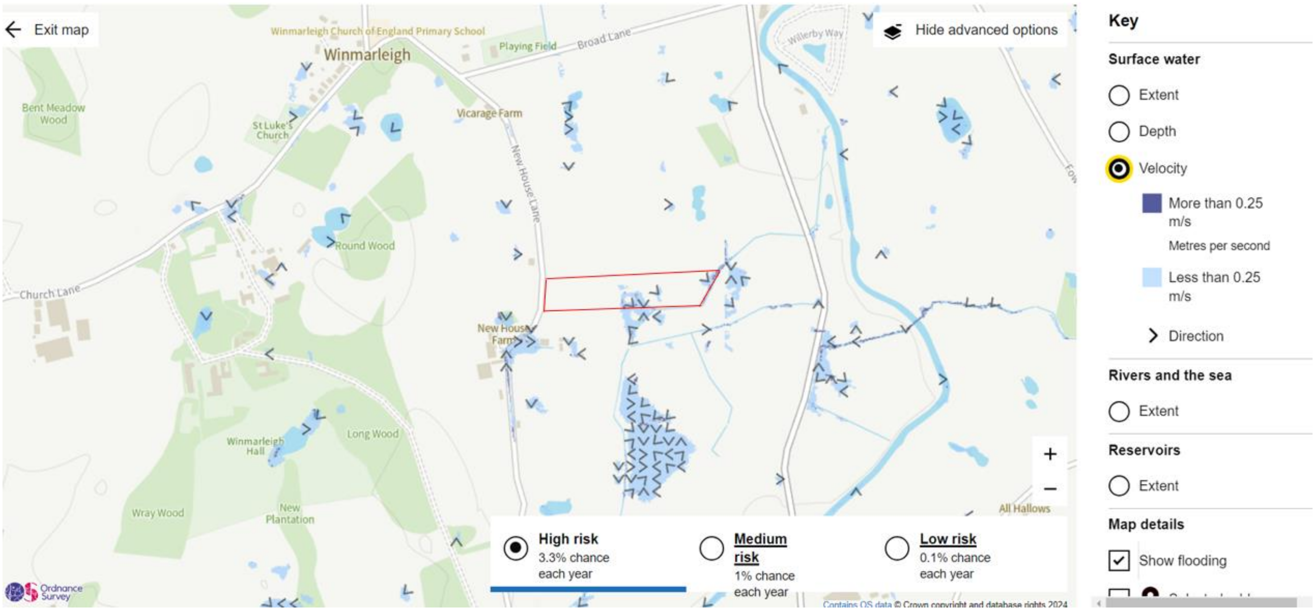


Figure 5 – High Risk Surface Water Velocity Map (Ref 5)

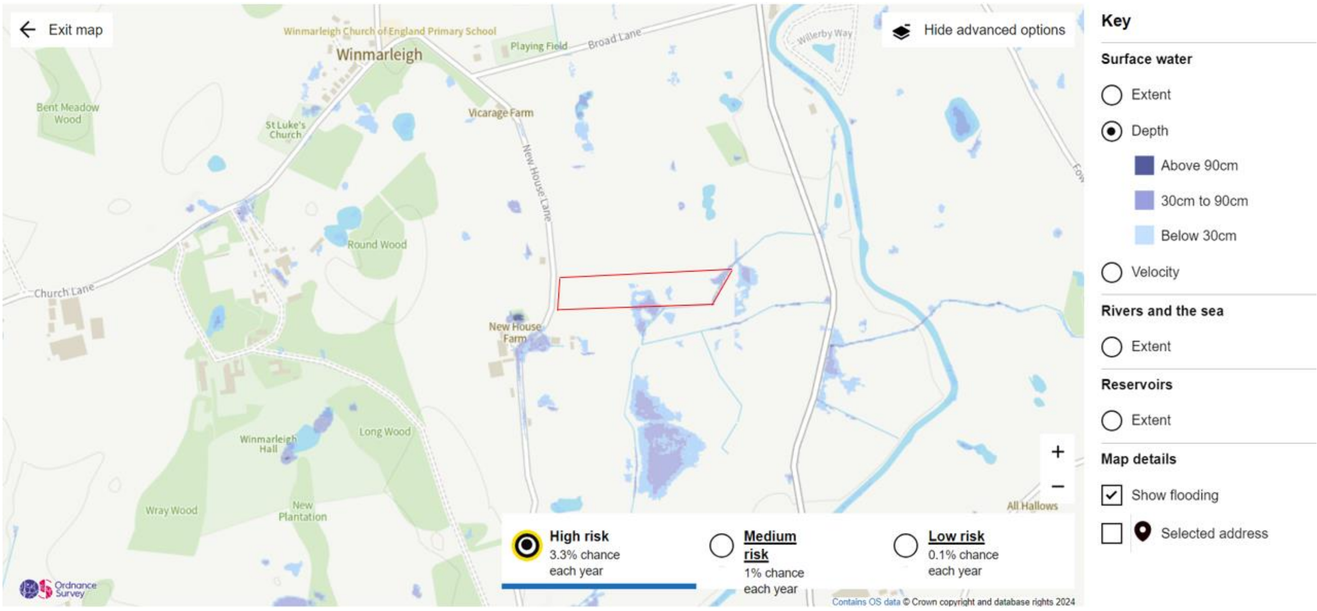


Figure 6 – High Risk Surface Water Depth Map (Ref 5)

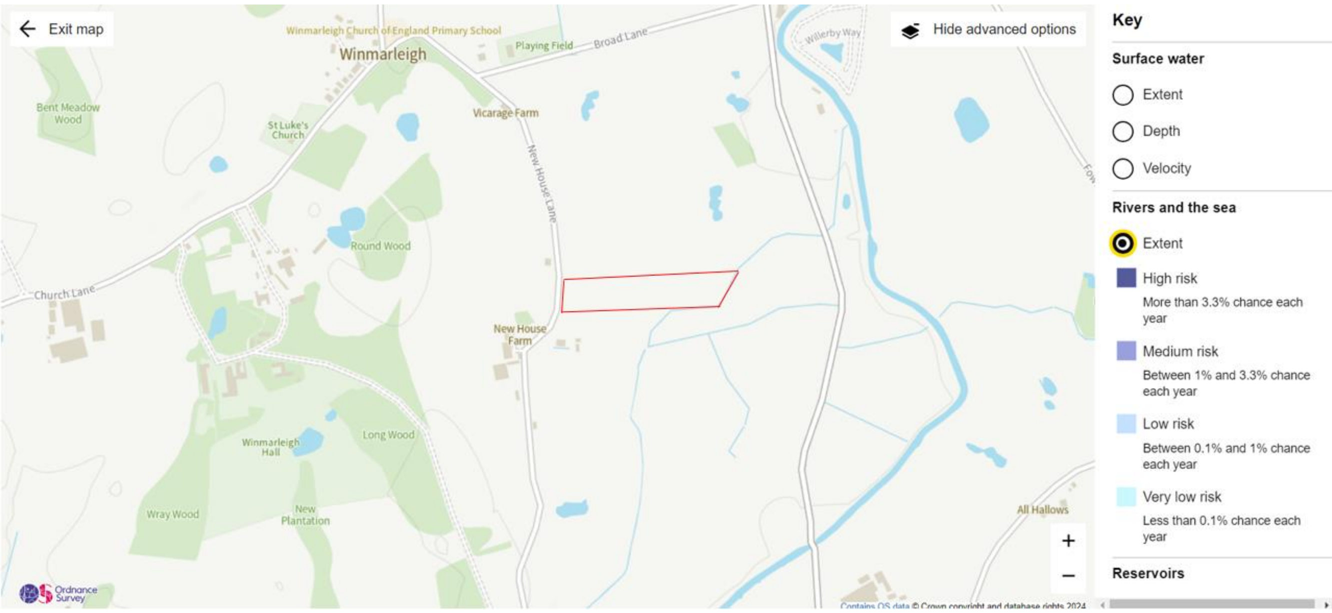


Figure 7 – Extent of Flooding from Rivers and the Sea (Ref 5)

3.0 Proposed Sustainable Drainage Scheme

Sustainable drainage systems are designed to maximise the opportunities and benefits we can secure from surface water management (Ref 6).

The Key principles influencing planning and SuDS design, as listed by the SuDS manual are:

- Storing runoff and releasing it slowly (attenuation)
- Allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- Filtering out pollutants - Allowing sediments to settle out by controlling the flow of the water.

The conceptual design shown in Plan 2, for the proposed development site intends to follow the principles of water attenuation, infiltration, and conveyance. The proposed development must ensure that the design is in line with the National Planning Policy Framework (Ref 1). This requires the site not to be at risk of flooding, not increase flood risks elsewhere, have a greenfield runoff rate, not change the hydrogeological regime of the area, reduce flood risks where possible, and pass the exception test should it be required.

Several models can calculate the various storage volumes required for SuDS designs. In this case, the IH124 method was utilised, indicating that the proposed development required 5 m³ of storage.

The site is located in an area projected to receive 61 mm of rainfall for the 1:100-year, 6-hour event, with a climate change factor of 1.4 also included. The impermeable area of the site, which includes the Stable Barn, is 180 m^2. This means that out of the total site area (which is 1.48 ha), approximately 1.2% is impermeable. The total area of the site that needs to be drained is 1,598 m^2, which is 10.8% of the total area. The model will only run when the impermeable area is 50% or more of the total area. To account for this the model was run as if the Stable Barn was 100% of the impermeable area. However, the model does not run for area sizes below 0.02 ha. Because of this, the model was run with a total area of 0.04 ha and the impermeable area made up 100% of this (see Appendix 4). This is beneficial as the storage volume result accounts for an impermeable development double the size of the Stable Barn; therefore, if the developer wants to do further construction, for example, a car parking space or storage shed, the change in permeability is already accounted for.

Using these figures, the proposed development requires a Storage Volume of 5m^3 for the 1/100-year flooding event (see Table 1).

Table 1: Site Parameters and Storage Requirement.

Site Parameter	Value
Total Area (ha)	0.04
Impermeable Area (m^2)	0.04
Permeable Area (m^2)	0
Storage Requirement (m^3)	5

3.1 French Drain

It is recommended that a French Drain be installed along the Southern edge of the proposed development site, to account for storage requirement needed by the Stable Barn. The purpose of a French Drain is to manage excess water through the key principles of attenuation, conveyance, and infiltration. The French Drain will store water from the proposed development area and any excess surface water runoff and transport it to Lee Brook, where it can leave the site. A French Drain consists of digging a trench into the ground and backfilling it with gravel and a perforated pipe, and adding a layer of topsoil at the surface. The gravel allows water to percolate downwards to reach the pipe easily and also acts as a storage for the water. The perforated pipe is able to remove water at a faster rate. French Drains are beneficial in clay-based areas, as drainage is naturally impeded, so excess water is more easily removed. Figure 1 shows a cross-section diagram of a French Drain. Proposed dimensions are provided in Appendix 5.

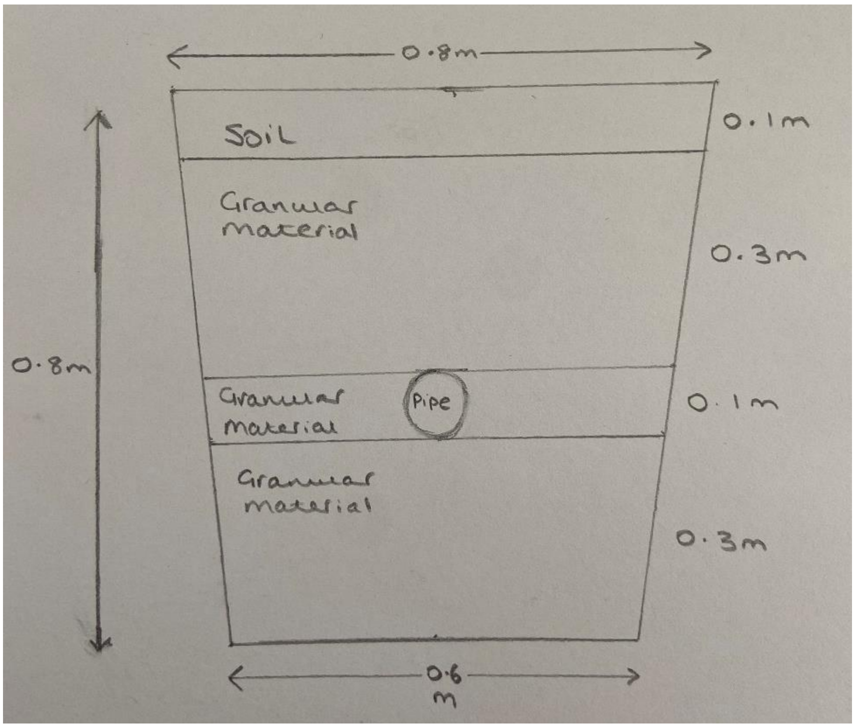


Figure 1: A Cross-Section Diagram of a French Drain

At the end of the French Drain, the perforated pipe should be connected to a regular PVC pipe, which will convey the water to Lee Brook. A manhole should be installed at this connection point. This will help grant easy access to the pipes should they need maintenance. A concrete or stone outfall structure needs to be built around the pipe discharging into Lee Brook. A consent is not required to build this structure as the Brook is managed by the site owner. In order to reach a good fall, the French Drain needs to have a slope of at least 1%, allowing gravity to take water from the Stable Barn to the outfall pipe. The drainage system is considered a minor drainage route related to the below-ground route or the sewer system. As recommended in BS EN 752 (Ref 7), "the system should be designed not to flood any part of the site in a 1:30 year return period design storm".

To minimise the perforated pipe clogging with fine sediment from the trench walls, topsoil, or external sources on the surface, it is recommended to line the trench with a geotextile filter membrane and vary the gravel size from coarse at the centre around the pipe to finer at the outside. This helps reduce sediment build-up in the perforated pipe. It may also be beneficial to install rodding points along the French Drain for easy clearance of any blockages. When building the French Drain, it is important to ensure no obstacles that could block the route, such as trees or pipes, are in the way.

Table 2: Storage Volumes Calculated as Part of the SuDS Design

SuDS Element	Storage Capacity (m^3)
French Drain	5.46
Total Storage Capacity	**5.46**

3.2 Stable Barn

The proposed development includes a 15 m x 12 m Stable Barn. This is the only area of the proposed development site changing from a permeable surface area to an impermeable surface area. The roof of the Stable Barn will have gutters to collect and convey rainwater and positively drain into a land drainage network. It is important that these gutters be maintained and kept clear of debris to ensure they don't block and overflow. These gutters should connect to an underground PVC pipe that conveys the water to the French Drain (see Plan 2). Water Butts can be connected via diverter pipes to the gutter around the building. Whilst the French Drain will provide enough storage to compensate for the area becoming impermeable, Water Butts will provide additional storage and allow water to be easily reused for the horses.

To reduce the risk of surface water flooding on the Stable Barn, we recommend building the Stable Barn up slightly instead of setting it into the ground. This could involve laying concrete slabs of a couple of centimetres in thickness on the ground, which will both level out the surface and provide extra height. Whilst the intended development area of the Stable Barn is at a low (less than 0.1% per year) risk of surface water flooding, taking extra precautions to prevent the barn from flooding will ensure the continued welfare of the horses in the event of heavy rainfall events.

3.3 Paddocks

The proposed development includes a 15 m x 30 m Grass Turn-out Paddock. This area will remain permeable and match the greenfield rate of infiltration. The development also includes a 22 m x 42 m Sand Paddock. To help drain these areas, both Paddocks should be built upwards slightly, reusing the soil from the French Drain, and land drains should be installed underneath. The sand in the Sand Paddock also contributes to the site's interception area. The French drain system has connection points for any enhanced drainage under the Paddocks with ample storage and retention well above that required for the stable barn.

3.4 Lee Brook

During the walkover, we observed that Lee Brook had water overflowing its bank in the low-lying area of the field, causing an extensive pool of water to spread across the field. It is important to keep the brook clear and free of debris to prevent this from happening. It was noted that Lee Brook did not seem to be flowing away from the site along the edge of the neighbouring house, 'The Poplars'. Whilst a blockage could be further downstream, it is worth asking the neighbouring house to keep Lee Brook clear of overgrowth and debris to help reduce the likelihood of fluvial overflow onto the development field. As the drain pipe from the French Drain will be flowing into Lee Brook, it is necessary to keep the Brook flowing as best as possible, or else the pipe risks becoming full of water.

3.5 Turn-Out Areas and Pond

In order to account for the low-lying area of the development field having a high risk of surface water flooding (greater than 3.3% each year), a fence could be installed across the development field. This fence would be built before the low-lying area and would establish two different seasonal turnout areas. The first field, in the higher portion of the development field and closest to the Barn and Paddocks, would serve as a winter turnout, so the horses are easier to collect and would be kept away from the boggy, high surface water area. The low-lying area of the development field will naturally accumulate surface water in the winter but, in the summer months, will dry out as the temperature rises and rainfall subsides. This area of the field could be opened up to operate as a summer turnout area. Repurposing the field into two different seasonal turnout zones will allow the grass time to replenish in the season that area isn't as highly utilised. This decision would be at the discretion of the owner of the intended development site.

In addition to this, a pond or wetland area could be established in the low-lying area of the field. This pond wouldn't need to act as surface water storage for the Stable Barn and Paddocks but instead could help drain the excess surface water flooding. Land drains could be installed through this area and run into a pond or wetland area, which can help hold the water and slow down the surface water movement before it leaves the pond through a PVC pipe into Lee Brook. This can also help to reduce surface water flood events as it can allow for high volumes of water to drain downstream from Lee Brook before the additional surface water reaches it. This would be an additional storage and a way to help slow the movement of water on the site, in order to try and make the drainage more effective. An outfall structure for a pipe from the pond would need to be built, but a consent permit is not required.

4.0 Conclusions and Recommendations

The SuDS scheme currently at RIBA 2 (Conceptual Design) has been designed to account for the necessary protection for the site. The technical specification in Appendix 5 is, however, to a developed design (RIBA 3) level. This is based on the topography and hydrology observed during a walkover of the site. The choice of surface water infiltration, storage, and conveyance is considered suitable due to the negligible removal of the site's storage capacity.

The site is at a low-high risk of Surface water flooding due to its clay-based soil and impeded drainage. It is, therefore, important that Lee Brook be well maintained and kept free of debris to allow surface water to drain from the site freely.

Land drains across the Paddocks will help drain the areas, making them suitable for use. The French Drain has been designed to store more water than the IH124 method recommends due to the site's impeded drainage. To reduce the likelihood of surface water flooding, the finished floor levels of the development area should be raised slightly instead of setting the development into the ground.

A pond or wetland area could be established in the low-lying zone of the development field, at 14 mAOD, with accompanying land drains, to help drain excess surface water buildup.

The drainage network will need to be monitored and maintained to ensure it is kept free of debris.

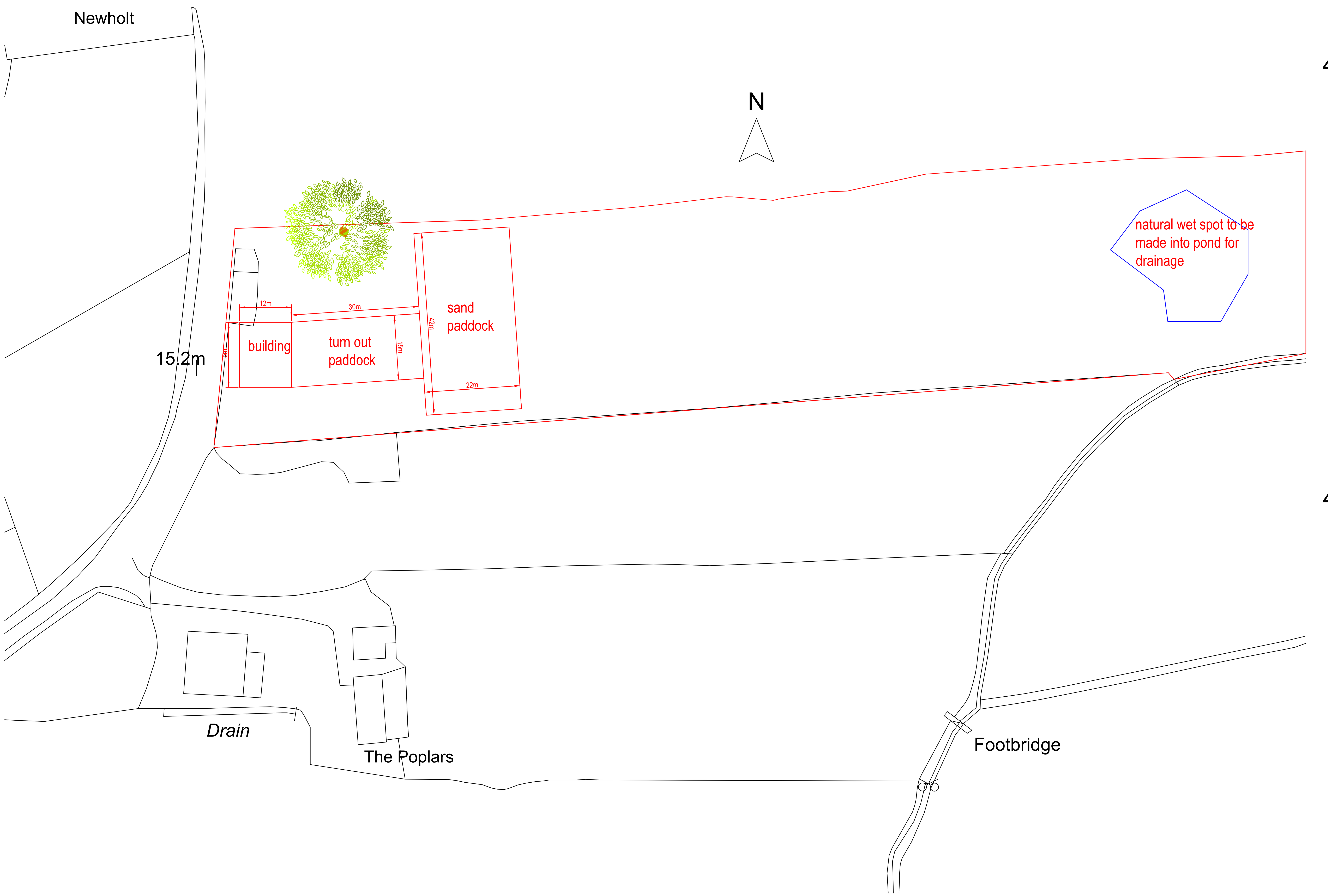
A Flood Risk Assessment is not necessary at this site; however, to ensure the continued welfare of the animals, the site owner should monitor warning systems for the area to prepare for any extended periods of rainfall or short-sharp downbursts.

5.0 References

1. National Planning Policy Framework: Annex 3: Flood risk vulnerability classification (Accessed at : https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification)
2. British Geological Survey (Geology of Britain). Available At: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
3. LandIS Soil Data - Soilscapes soil types viewer. Available at: https://www.landis.org.uk/soilscapes/
4. Government website. *Check the long term flood risk for an area in England.* Online at: https://www.gov.uk/check-long-term-flood-risk
5. Government website. *Flood Map for Planning.* Available at: https://flood-map-for-planning.service.gov.uk/flood-zone-results?easting=385340&northing=389908&location=M20%205PB&fullName=%20&recipientemail=%20)
6. The SuDS manual (2015)
7. BS EN 752:2017 Drain and Sewer Systems Outside Buildings. British Standards, 2017.

Plan 1: Site Location Plan

BLOCK PLAN SCALE 1:500



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Telephone 01995 640135.
Mobile 07813 296 287
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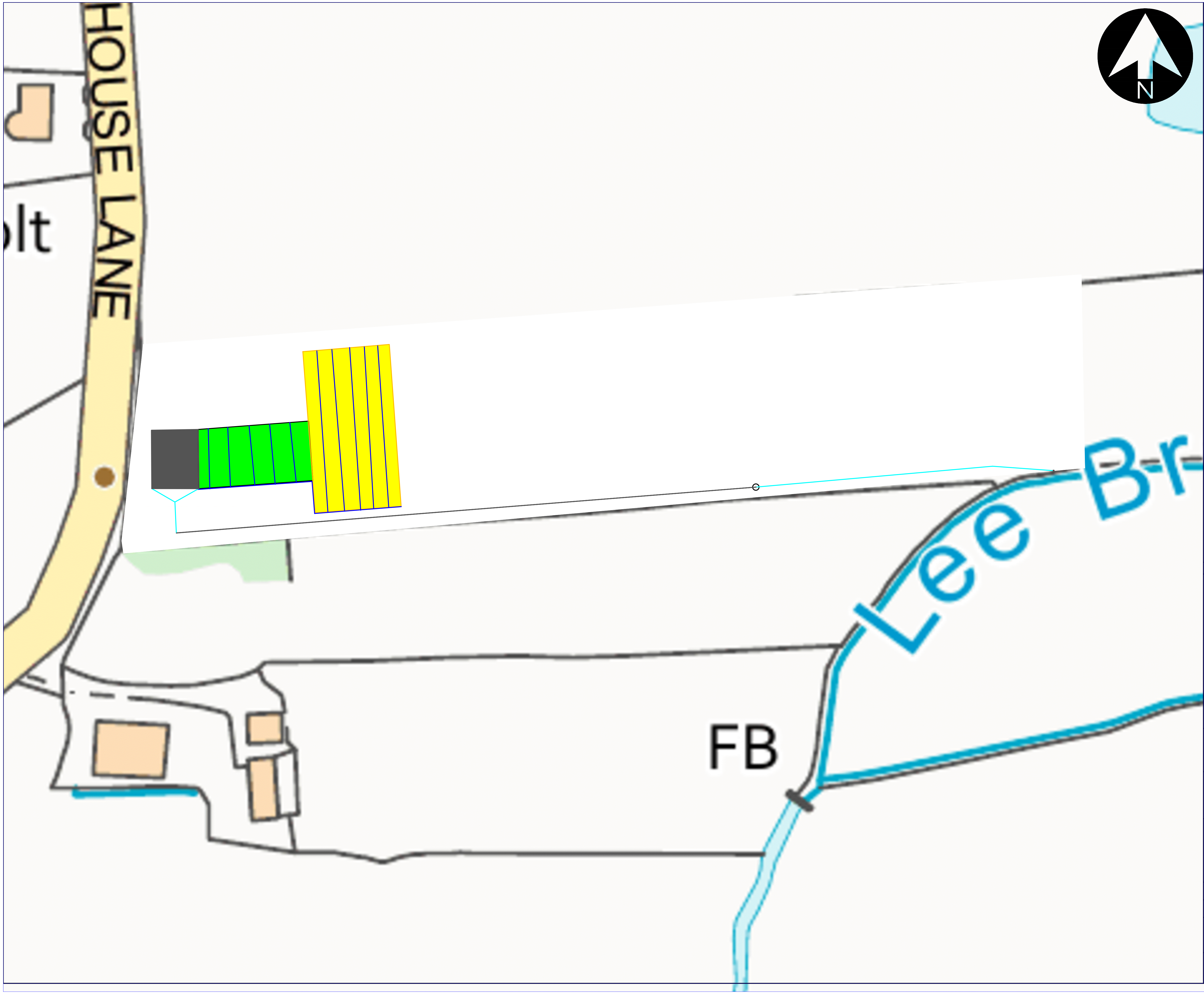
CLIENT: Anthony Rimmer

PROJECT ; Erection of stable block, and change of use of land to form equine sand paddock and turn out area for private use
LOCATION;Land at New House Lane, Winmarleigh, Preston PR3 0JT

DATE:13th February 2024
DWG NO. ML/AR/6313

SCALE: 1:500
A1

Plan 2: Conceptual Drainage Plan



NOTES

A3

1. DO NOT SCALE.
2. This drawing is to be read in conjunction with all other relevant drawings.
3. All boundaries are approximate.

KEY

- Surface Water Pipes
- Land Drains
- French Drain
- Stable Barn
- Sand Paddock
- Grass Paddock
- Manhole
- Outfall Strucure

DESCRIPTION	REV	DATE	CHKD	APPR

PEAK ASSOCIATES
ENVIRONMENTAL CONSULTANTS LTD

CLIENT
Anthony Rimmer

PLAN NO.
Plan 1

PLAN TITLE
Site Layout

DRAWN	EP	PROJECT ENGINEER	EP
CHECKED	MM	APPROVED	MM
DATE	19/03/2024	SCALE	1:1
DRAWING NUMBER	1034 001	REVISION	-

Appendix 1: Site Location Maps

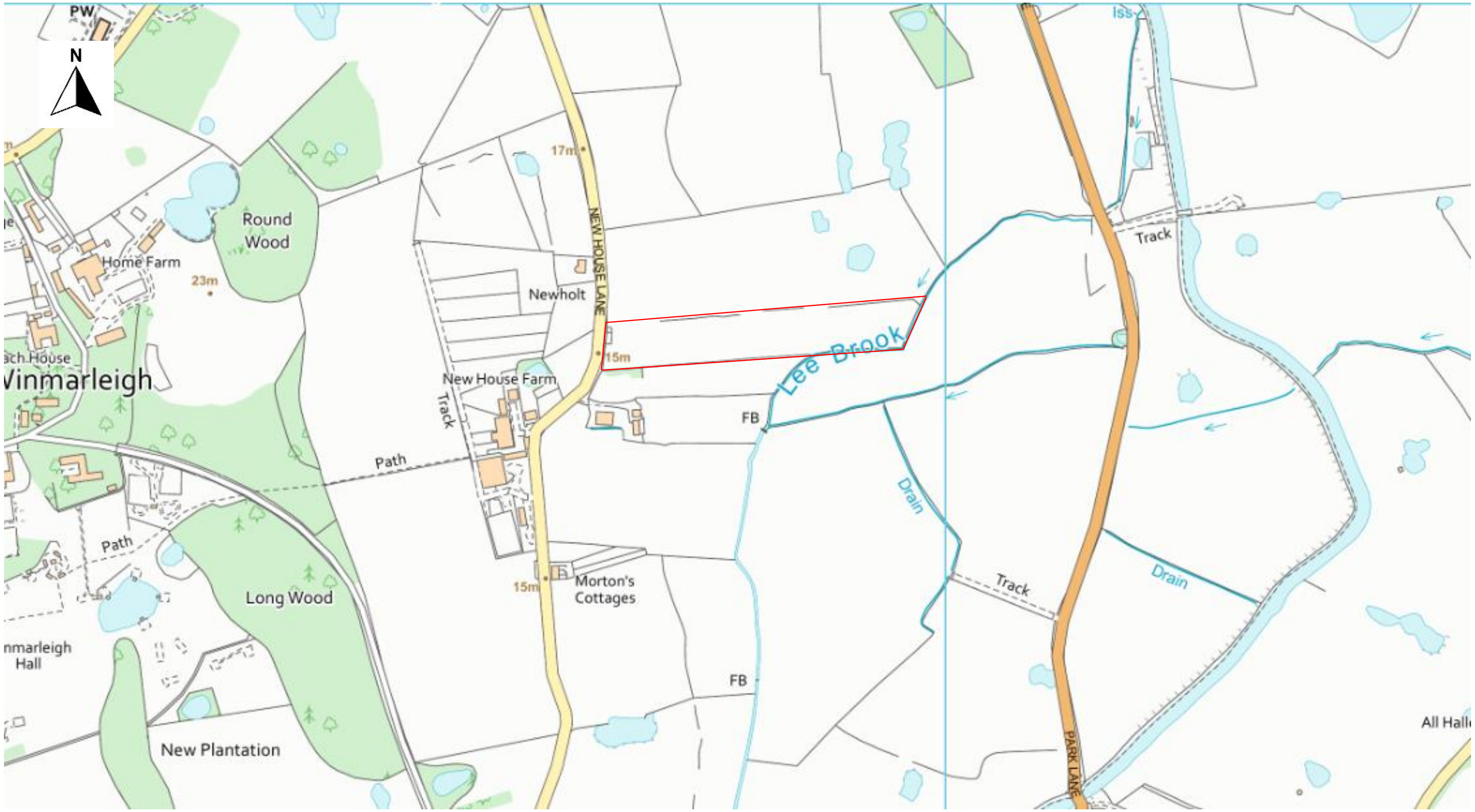


Figure 1: Site Location Map

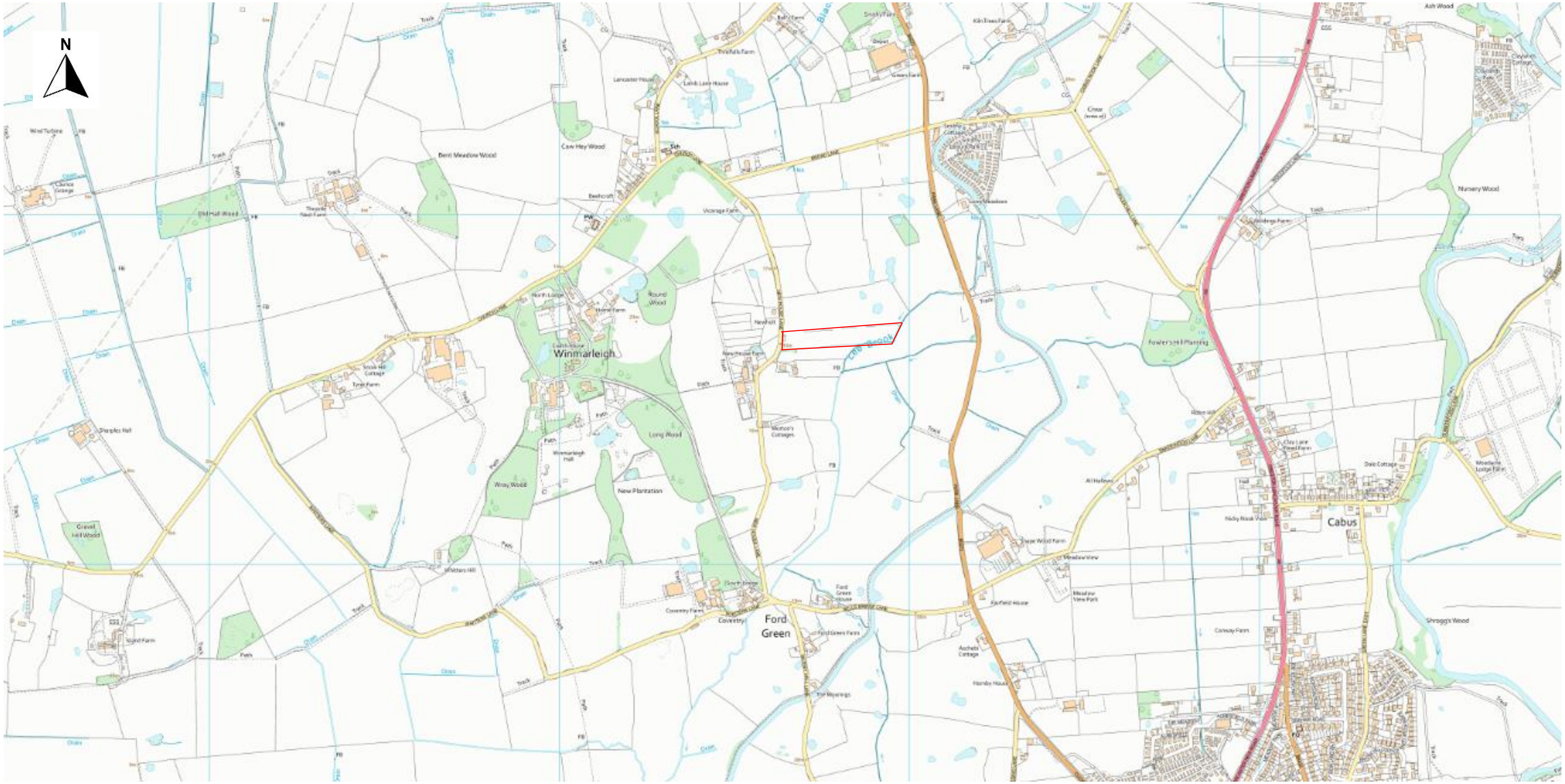


Figure 2: Site Area Map

Appendix 2: Site Photographs

Photo 1: Entrance to the Proposed Site

Photo 2: View from the Southeastern corner of the existing site

Photo 3: View from the Northeastern corner of the existing site

Photo 4: View of the Northeastern part of the existing site

Photo 5: Lee Brook on the Eastern edge of the existing site

Photo 6: The corner of Lee Brook in the Southeastern corner of the site

Photo 7: Lee Brook on the Southern edge of the existing site

Photo 8: Lee Brook where it flows towards the neighbouring house to the site

Photo 9: Lee Brook where the overflow starts

Photo 10: Western view of the overflow

Photo 11: Southern view of the overflow

Photo 12: Eastern view of the overflow

Photo 13: Surface water streams across the existing site

Photo 14: Surface water pooling on the existing site

Appendix 3: LiDAR Topographic Data

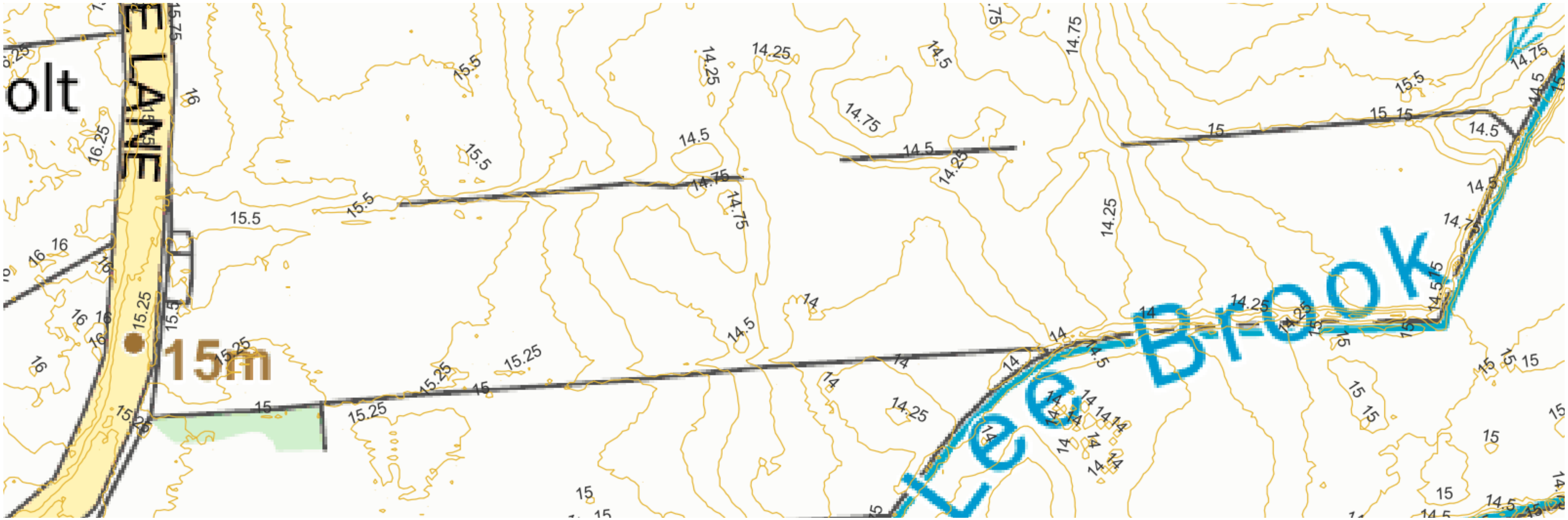


Figure 1: LiDAR-derived topographic map of the proposed development site.

Appendix 4: IH124 Model

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Ellie Pugh
Site name:	New House Lane
Site location:	PR3 0JT

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	53.92246° N
Longitude:	2.79818° W
Reference:	2775315546
Date:	Mar 30 2024 12:00

Site characteristics

Total site area (ha):	0.04
Significant public open space (ha):	0
Area positively drained (ha):	0.04
Impermeable area (ha):	0.04
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.04
Net impermable area for storage volume design (ha):	0.04
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	60
Rainfall 100 yrs 12 hrs:	--	81.03
FEH / FSR conversion factor:	1.11	1.11
SAAR (mm):	1000	1000
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.38	1.38
Growth curve factor 30 year:	1.7	1.7

Design criteria

Climate change allowance factor:	1.4	Growth curve factor 100 years:	2.08	2.08
Urban creep allowance factor:	1.1	Q_{BAR} for total site area (l/s):	0.29	0.29
Volume control approach	Flow control to max of 2 l/s/ha or Qbar	Q_{BAR} for net site area (l/s):	0.29	0.29
Interception rainfall depth (mm):	5			
Minimum flow rate (l/s):	2			

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	5	5
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	5	5

Appendix 5: RIBA 3 Technical Specifications

1. French Drain

To provide enough storage to make up for the loss in permeability of the Stable Barn the French Drain should be 0.8 m deep. The width at the bottom of the trench should be 0.6 m. The width at the top of the trench should be 0.8 m. A gravel base of 0.3 m should be placed in the trench. On top of the base, a 0.1 m perforated pipe should be lain, surrounded by a layer of coarser gravel. On top of the pipe, a 0.2 m layer of coarse gravel should be placed, followed by a 0.1 m layer of finer gravel. At the top of the trench, a 0.1 m layer of soil should be placed. At an average width of 0.7 m and a depth of 0.8 m, for every meter of drain there will be a storage allowance of 56 l/m. The French Drain should extend from the barn for roughly 130 m, providing 72.8 m^3 of storage (see Table 2). At the end of the French Drain, the perforated pipe should be connected to a regular PVC pipe, which will convey the water to Lee Brook. A manhole should be installed at this connection point. This will help grant easy access to the pipes should they need any maintenance.

2. Paddocks

The area of the Grass Paddock will remain permeable and will match the greenfield rate of infiltration. To keep this area drained, it is recommended that the area be built up slightly instead of setting the development in the ground to reduce the risk of surface water flooding and to allow drains to be installed under the ground. It is recommended that land drains be installed under the surface of the Grass Paddock. Land drains are perforated pipes that allow water to enter through small holes and are highly beneficial to help reduce waterlogging in gardens or other landscaped areas such as sports fields. Land drains act as a collection drain and remove excess water to a suitable collection point. As the underlying soil is highly clay-based, and therefore, drainage is impeded, these drains will help keep the Grass Paddock free of excess surface water and reduce groundwater. The site owner can decide on how many land drains they want to install and what sizes they wish to use. The soil from digging out the French Drain could be reutilised to raise the level and level out the Paddock, and the grass can be reseeded. Additional land drains can be placed at the perimeter of the Paddock. These land drains should also connect to the pipe from the Barn leading to the French Drain.

Similarly to the Grass Paddock, the Sand Paddock should be built upwards slightly, instead of setting into the ground. This will help reduce the risk of surface water flooding on the development and allow for land drains to be installed below the Sand Paddock. As with the Grass Paddock, the soil from the French Drain could be reutilised to level out the ground below the Sand Paddock, and the land drains can be set into this. A membrane should be placed as the base layer of the Sand Paddock to allow for rainwater or excess surface water to infiltrate through to the land drains. Whilst it is important to install the land drains to help keep the Sand Paddock drained and dry, the sand will act as an additional water storage. The land drains should connect to a land drain outside the Sand Paddock fence. This land drain should then connect to the land drain outside the Grass Paddock, ultimately connecting to the PVC pipe that positively drains to the French Drain.