WtFR Ltd

Flood Risk Assessment

Development at

Heron Farm, Bunwell Road, Besthorpe, NR17 2LN

On behalf of

Ben Allison

Date: 2nd May 2023

Reference: WTFR-FRA-2023/04/Q22

Issue sheet

Revision	Prepared by	Date	Checked by	Date
0	JS	01/05/23	JH	02/05/23

1. Introduction

WtFR Ltd has been commissioned to undertake a Flood Risk Assessment (FRA) in connection with the planning application for the proposed development at Heron Farm, Bunwell Road, Besthorpe, NR17 2LN.

This FRA has been produced to demonstrate how risks from all sources of flooding to the site and flood risk to others from the development will be managed, in order to satisfy the requirements, set out in the National Planning Policy Framework (NPPF).

A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development has been considered as part of this analysis.

Data has been gathered from a number of other sources including: the Environment Agency (EA), the British Geological Society (BGS), National Soil Research Institute (NSRI), aerial photographs, Ordnance Survey (OS), commercially available historical mapping and relevant strategic documents developed by the Breckland District Council and Norfolk Council in their capacity as the Local Planning Authority and Lead Local Flood Authority.

2. Site Description

Area Size: 7000m^2 (impermeable)

Grid reference: TM 08366 95263

The proposals are for an aggregates and soil recovery facility at Heron Farm, Bunwell Road, Besthorpe, NR17 2LN.

Figures 1 and 2 below show location details of the development site. Figure 3 shows an oblique aerial photograph of the development site.

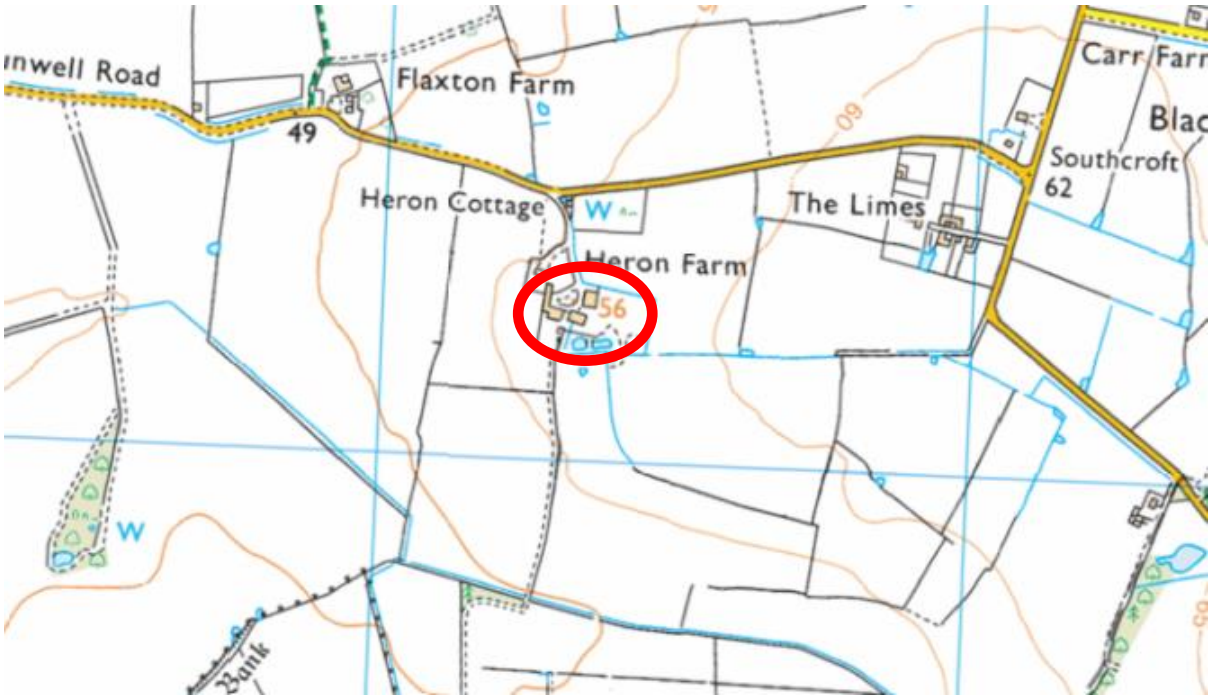

Figure 1 – Location of the site, highlighted.

Figure 2 –detailed location of the development site, highlighted.

Figure 3 – aerial photograph of the development site.

3. Flood Risk Assessment

3.1 National Planning Policy

Paragraph 167 of the NPPF states "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[50]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan".

Footnote 55 states "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use".

Furthermore paragraph 30 of the Planning Practice Guide on Flood Risk and Climate Change states "A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

The objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- evidence for the local planning authority to apply (necessary) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable".

Continuing paragraph 31 of the Planning Practice Guidance quotes "The information provided in the flood risk assessment should be credible and fit for purpose. Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agency's web site.

A flood risk assessment should also be appropriate to the scale, nature and location of the development. For example, where the development is an extension to an existing house (for which planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, the local planning authority would generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the local planning authority would need a more detailed assessment".

3.2 Local Planning Policy

Local Authorities consider flood risk through relevant environmental and climate change policies which enforce the requirements of the NPPF. Relevant local policy, as outlined by Breckland District Council and Norfolk Council, is contained within the;

i) Strategic Flood Risk Assessment
ii) Local Flood Risk Management Strategy

The Strategic Flood Risk Assessment (SFRA) and the Local Flood Risk Management Strategy (LFRMS) are key sources of flood risk specific information for the area. The SFRA provides a more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF.

3.3 Flood Risk Zones, Vulnerability and Classification

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning available on the Environment Agency's web site, as indicated in the table below.

Table 1 – Flood Zones

Flood Zone	**Definition**
Zone 1 *Low Probability*	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 *Medium Probability*	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a *High Probability*	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b *The Functional Floodplain*	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2 – Flood Risk Vulnerability Classification

Essential Infrastructure
• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable
• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable
• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable
• Police, ambulance and fire stations which are **not** required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water Compatible Development
• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

* Landfill as defined in Schedule 10 to the Environmental Permitting (England and Wales) Regulations 2010.

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

Flood Zones	**Flood Risk Vulnerability Classification**				
	Essential Infrastructure	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**	**Water Compatible**
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a†	Exception Test required†	✗	Exception Test required	✓	✓
Zone 3b*	Exception Test required*	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;

- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

4. Sources of flooding

4.1 Fluvial/Tidal

The Environment Agency's Flood Map for Planning (Rivers and Sea) identifies fluvial and tidal flood zones, and provides an indication of whether or not these zones are protected, due to the presence of flood defences (also highlighted). Figure 4, below, presents the Flood Map for the surrounding area.

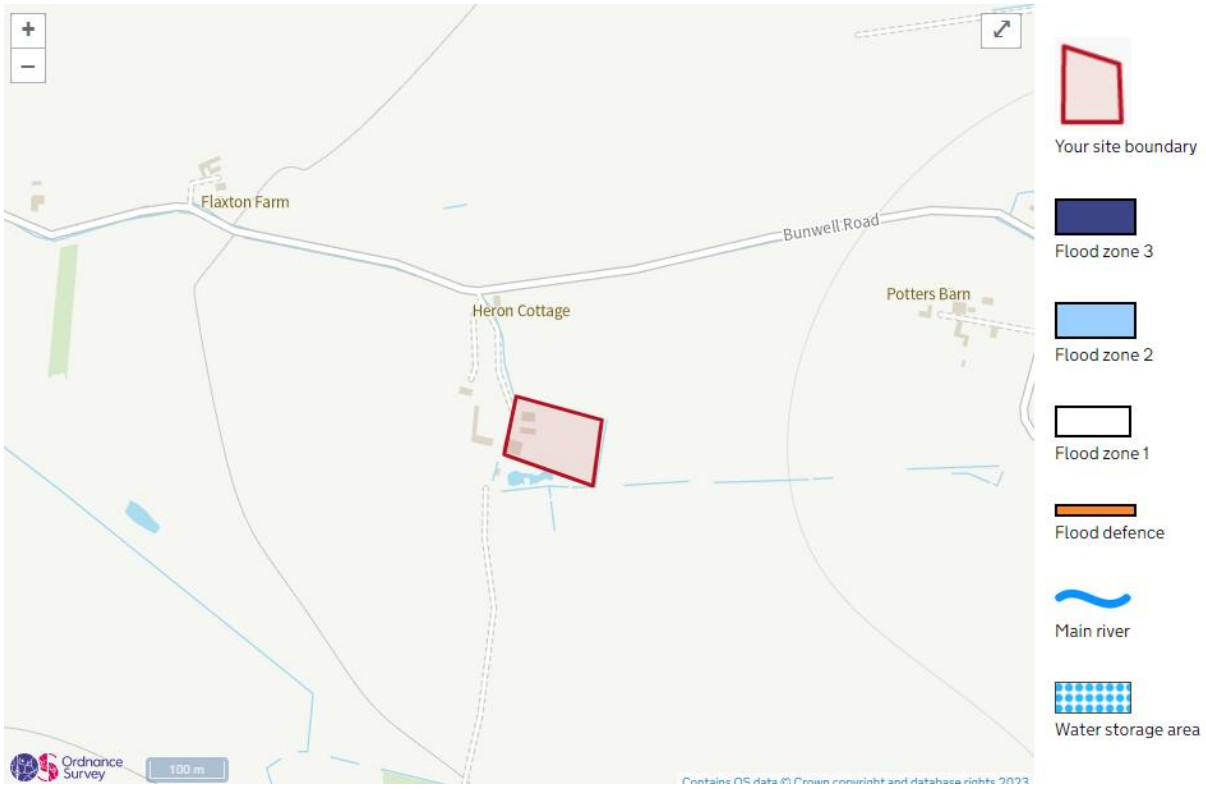

Figure 4 – Fluvial flood risk – EA Flood Map.

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

4.2 Historic Flooding

Analysis of strategic flood risk documents developed by the Breckland District Council and Norfolk Council does not indicate historic flooding at the development site.

4.3 Surface Water Flooding

The Environment Agency's updated Flood Map for Surface Water (uFMfSW) identifies pluvial flood risk. Figure 5, below, presents the uFMfSW for the development site and the surrounding area.

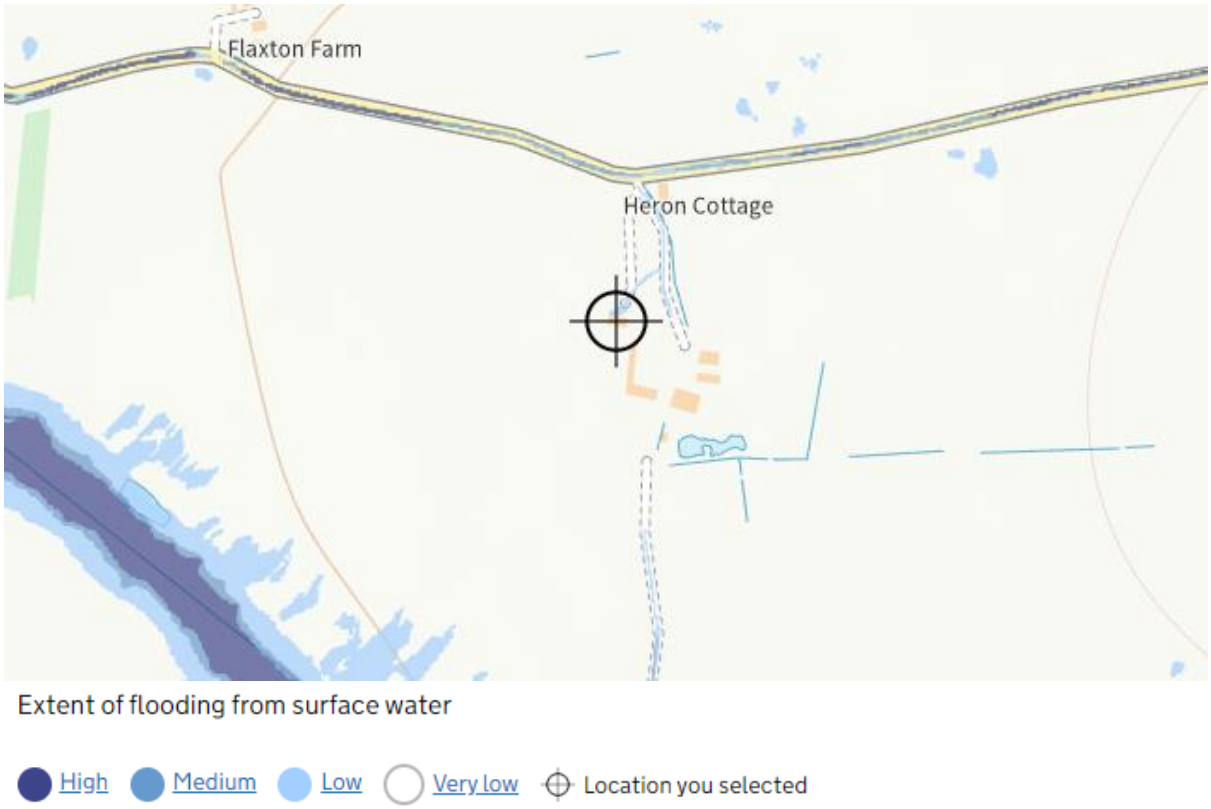

Figure 5 – Flooding from surface water sources, uFMfSW, site highlighted.

The uFMfSW shows that area in the vicinity of the development site is at low risk of surface water flooding. Low risk means that the probability of flooding in any given year is between 1 in 1000 (0.1%) and 1 in 100 (1%).

4.4 Reservoir

The Environment Agency's Risk of Reservoir Flooding Map identifies the maximum extent of flooding that may be expected in the unlikely event that a reservoir dam failed. The development is not at risk of flooding.

4.5 Groundwater

The Environment Agency's Groundwater Vulnerability Map indicates that the development site is situated over a medium risk groundwater vulnerability area, as shown in Figure 6. Further analysis shows that the development site is situated over a Groundwater Source Protection Zone (Zone III) as shown in Figure 7.

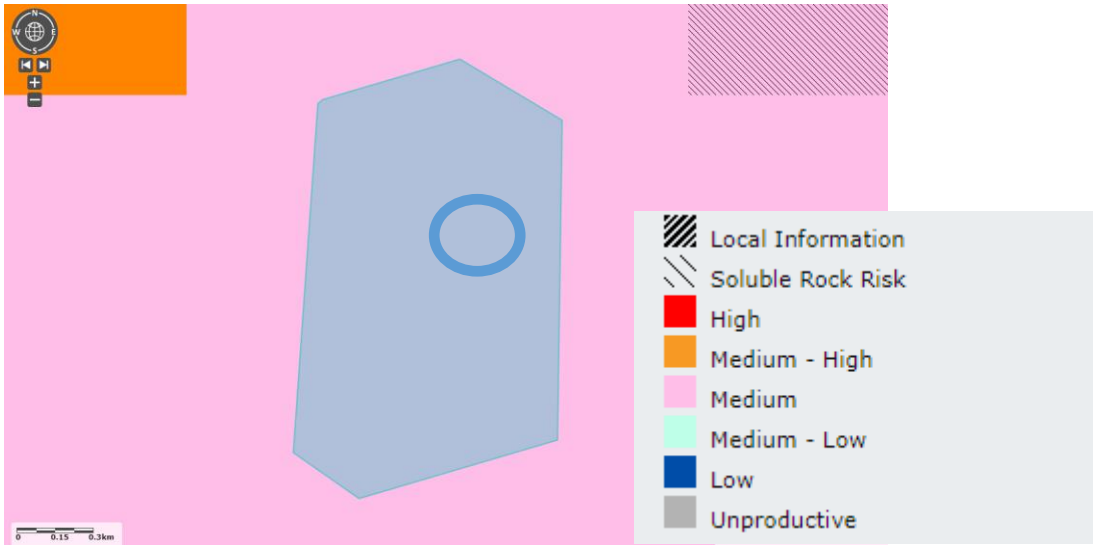

Figure 6 – Groundwater vulnerability map, site highlighted.

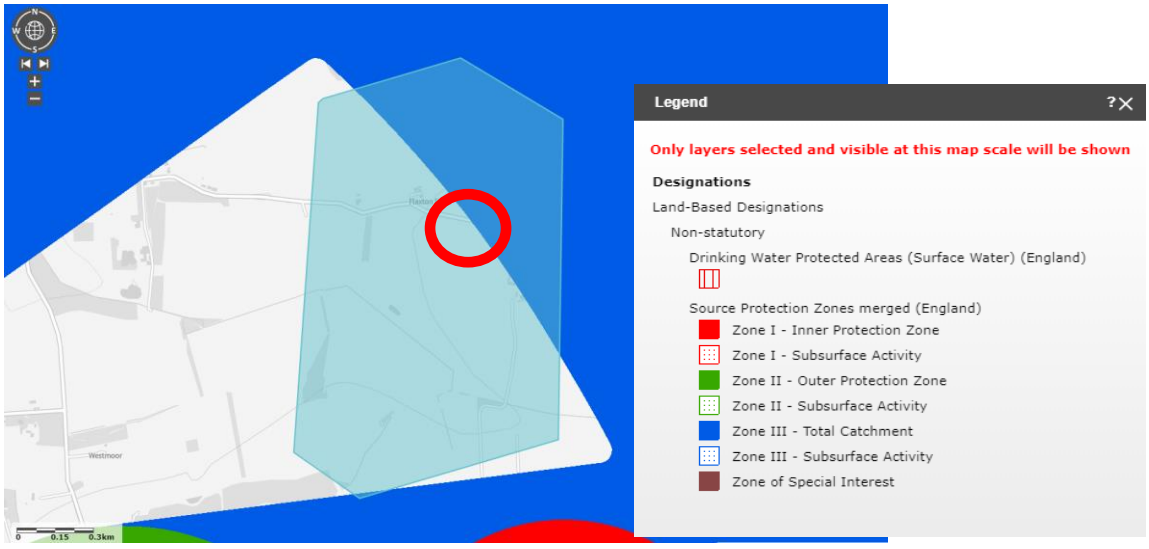

Figure 7 – Groundwater source protection zones, site highlighted.

Due to the minimal groundworks required for this development the impact on groundwater is considered to be negligible.

However, it is recommended that a groundwater mitigation plan is developed that may be implemented if groundwater is encountered during constriction.

4.6 Geology

Figures 8 and 9 present information from the British Geological Survey.

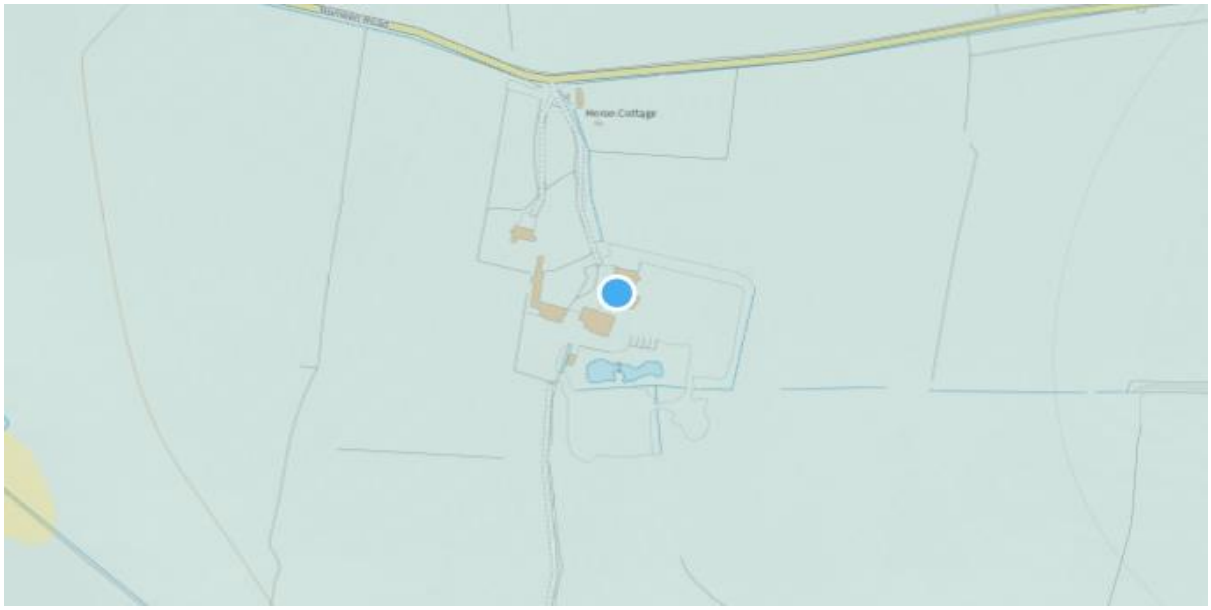

Figure 8 – Superficial Geology of the development.

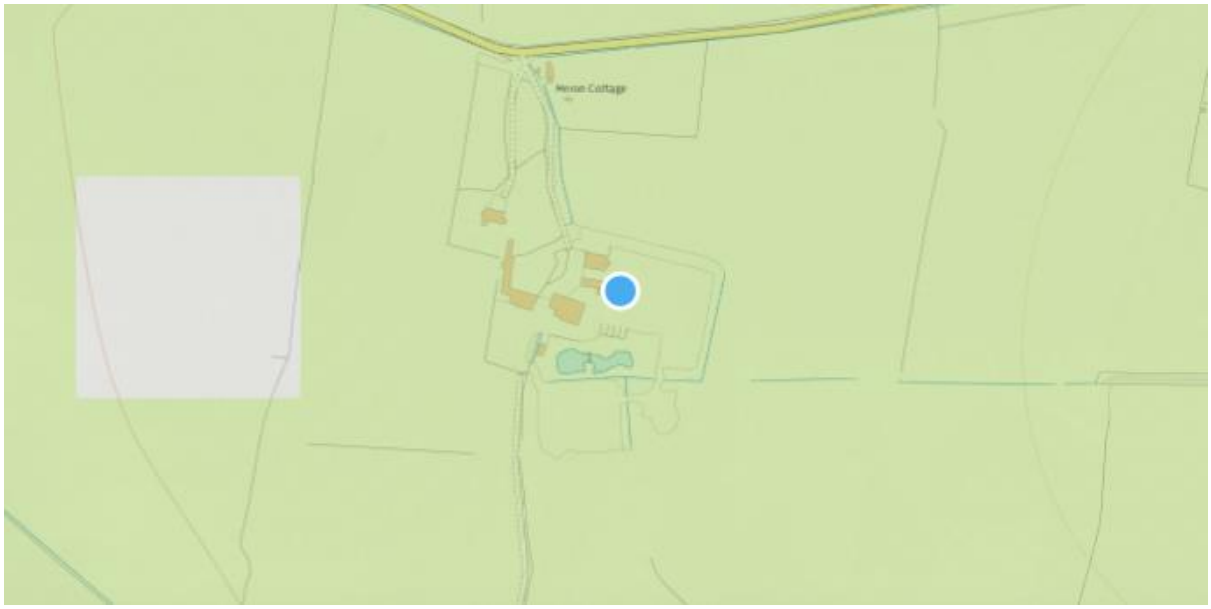

Figure 9 – Bedrock geology of the development.

The superficial deposit records at the development site are described as Lowestoft Formation - Diamicton. Sedimentary superficial deposit formed between 480 and 423 thousand years ago during the Quaternary period.

With regards to the bedrock, the site is underlain by the Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations - Chalk. Sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period.

5. Proposed development

This FRA is prepared to support a planning application for an aggregates and soil recovery facility at Heron Farm, Bunwell Road, Besthorpe, NR17 2LN.

The development is classified as being **Less Vulnerable** development within Table 2 of the Planning Practice Guidance. Less Vulnerable developments within Flood Zone 1 are acceptable.

Figure 10 shows the proposed layout.

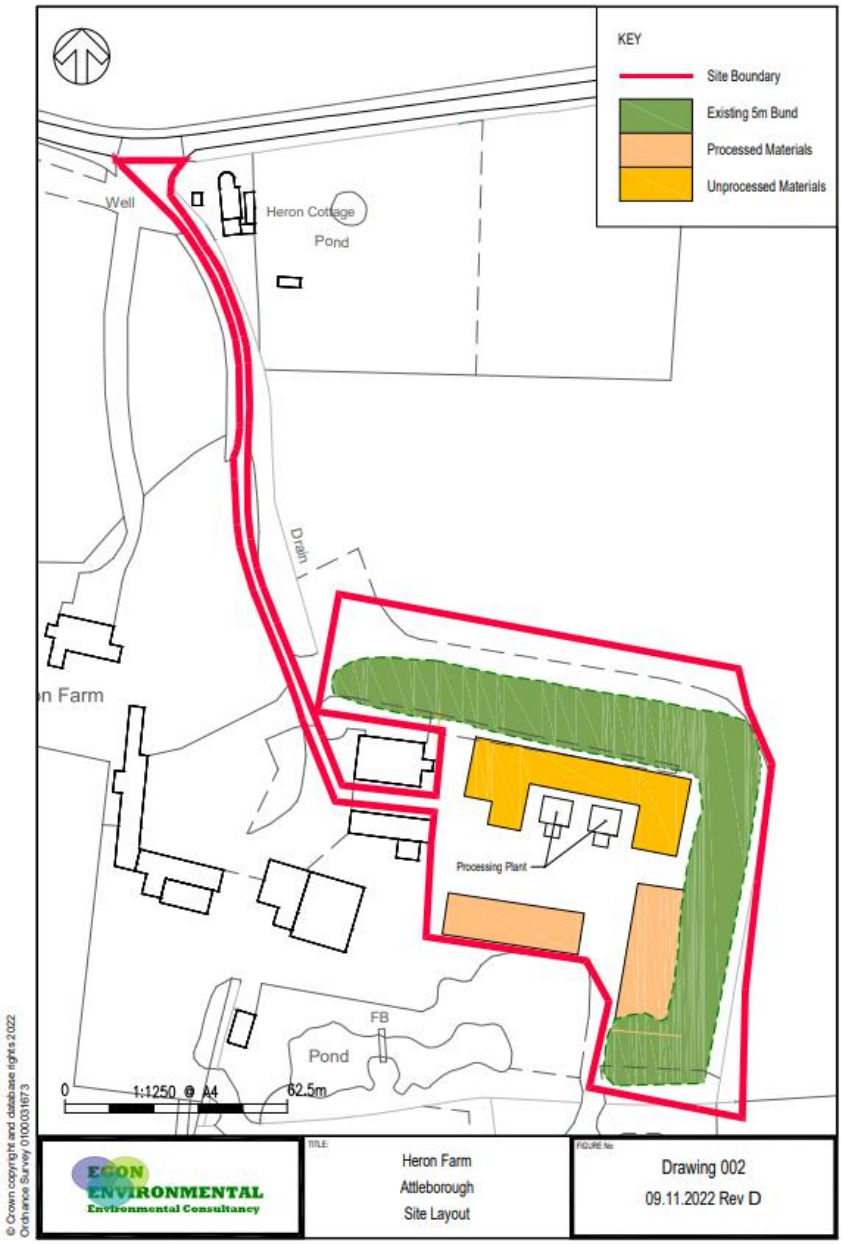

Figure 10 – Proposed layout.

6. Surface Water Drainage

The greenfield runoff rate has been calculated using IH124 methodology. Table 4 below shows the calculations to determine the existing greenfield runoff rate.

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	James Scott
Site name:	Development site
Site location:	Heron Farm

This is an estimation of the greenfield runoff rates that are used 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). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.51524° N
Longitude:	1.06979° E
Reference:	3219640929
Date:	May 02 2023 17:54

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	620	620
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	0.25	0.25
1 in 1 year (l/s):	0.22	0.22
1 in 30 years (l/s):	0.61	0.61
1 in 100 year (l/s):	0.89	0.89
1 in 200 years (l/s):	1.05	1.05

Table 4 – Greenfield runoff calculations.

The Qbar Greenfield runoff rate is 0.25l/s. It is recommended that post development discharge rates are limited to 5l/s in accordance with industry best practice.

Table 5 below looks at the required attenuation that will be required on site. The figures include an allowance of 1.4 (+40%) for climate change.

The calculations show that 116m^3 of attenuation storage is required, with a restricted rate of 5l/s.

Site characteristics	
Total site area (ha):	0.4
Significant public open space (ha):	0
Area positively drained (ha):	0.4
Impermeable area (ha):	0.2
Percentage of drained area that is impermeable (%):	50
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):	0.4
Net impermable area for storage volume design (ha):	0.22
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.

Design criteria	
Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	5

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:	3	3
SPR:	0.37	0.37

Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	87.78
FEH / FSR conversion factor:	1.14	1.14
SAAR (mm):	620	620
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.65	1.65
Growth curve factor 30 year:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Q_{BAR} for total site area (l/s):	1	1
Q_{BAR} for net site area (l/s):	1	1

Site discharge rates	Default	Edited
1 in 1 year (l/s):	5	5
1 in 30 years (l/s):	5	5
1 in 100 year (l/s):	5	5

Estimated storage volumes	Default	Edited
Attenuation storage 1/100 years (m^3):	116	116
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	116	116

Table 5 – Estimated attenuation calculations.

7. Hierarchy of disposing surface water

The Planning Practice Guidance and part H of the Building Regulations state that "generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer".

7.1 Infiltration

Records from the British Geological Survey show that the proposed development is underlain by the Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations. These generally have a good infiltration coefficient and are generally possible for infiltration.

However, it is recommended that percolation testing is undertaking to confirm the suitability, or otherwise, for disposal of surface water by infiltration. Testing should be carried out in accordance with BRE digest 365 or CIRIA guidance R156.

7.2 Surface Water Body

If infiltration is not a viable option there is a pond to the south the development, it is proposed surface water is discharged into this waterbody.

8. Use of SuDS

The NPPF, Planning Practice Guide and the Ministerial Statement look at the use of SuDS as a priority to aid the disposal of surface water from new developments. Below is a list of different SuDS options and their appropriateness for this development.

An effective SuDS scheme controls both runoff quantity and quality, and can provide amenity value. A range of different SuDS techniques are described below.

Source Control

Rain water harvesting / water butts

This is the direct capture of runoff on site. Rainfall runoff can be extracted for domestic use e.g. flushing toilets. Simple devices such as water butts can be installed for a relatively low cost and are easy to construct, install and operate.

Permeable Paving

Permeable paving provides a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored before infiltration into the ground (which may not be appropriate at this location), reuse, or discharge into a watercourse or other drainage system.

The CIRIA document C753 – The updated SuDS Manual states that permeable paving offers such advantages as "suitable for installation in high density development", "low maintenance" and "eliminates surface ponding and surface ice".

Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping/permeable car parking over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.

The advantages of green roofs are that they can be applied in high density developments, require no additional land take, improve air quality and can insulate buildings against temperature extremes.

Infiltration devices

Soakaways

Soakaways are square or circular excavations, with filled with rubble or lined with brickwork, pre-cast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. Some of the advantages for these devices are that they take a minimal land take, provide groundwater recharge and are generally easy to construct and operate. However, it must be stressed that these are not suitable for poor draining soils.

Infiltration basins

Infiltration basins are vegetated depressions designed to store runoff and infiltrate it gradually into the ground. The advantages of using infiltration basins include they are simple and cost-effective to construct, they reduce the volume of runoff from a drainage area and can be very effective at pollutant removal via filtering through the soils.

Conveyance

Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. Roadside swales can replace conventional gullies and drainage pipes.

Advantages of using swales are that they are easy to incorporate into landscaping, they reduce runoff rates and volumes and that maintenance can be incorporated into general landscape management.

Rills and canals

Rills and canals are open surface water channels with hard edges. They can have a variety of cross sections to suit the urban landscape and can also be planted to provide water treatment. In dense urban developments where space can be at a premium they are an effective way of providing SUDS and can also act as pre-treatment to remove silt before water is conveyed into further SUDS features.

Attenuation features

Detention basins

Detention basins are surface storage basins or facilities that provide flow control through attenuation of storm water runoff. These according to The CIRIA document C697 – The SuDS Manual "can be used where the groundwater is vulnerable, if lined", "simple and easy to construct" and "easy to maintain".

Ponds

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rain event is detained and treated in the pool.

Attenuation is required to control runoff quantity, and could be provided by subsurface storage or, if the levels are suitable and land is available, pocket wetlands. To control the quality of runoff, other components such as filter trenches and permeable paving could be provided upstream of the attenuation to treat the surface water.

Summary of SuDS for the development

It is proposed that permeable paving is used within the development. Measures such as rain water harvesting units, water butts and rainwater gardens are also encouraged, in order to minimise surface water runoff.

9. Management of flood risk

9.1 Fluvial

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

Table 2 of this report details that development is classified as Less Vulnerable; Table 3 of the report shows that Less Vulnerable developments within Flood Zone 1 are acceptable.

9.2 Surface Water

The development is described as being at low risk which means that the probability of flooding in any given year is between 1 in 1000 (0.1%) and 1 in 100 (1%).

Appropriate SuDS features and measures will be incorporated within the development to minimise surface water discharges.

Figures 11-13 below shows the possible schemes for surface water drainage. Due to the potential underlying geological conditions, infiltration may be possible at this location. Further testing needs to be undertaken to determine the infiltration potential. If infiltration is possible, then surface water can be disposed via a soakaway. If it is not possible, then surface water may be disposed of via the pond to the south of the development. As per section 6, 116m^3 of attenuation storage will be required.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

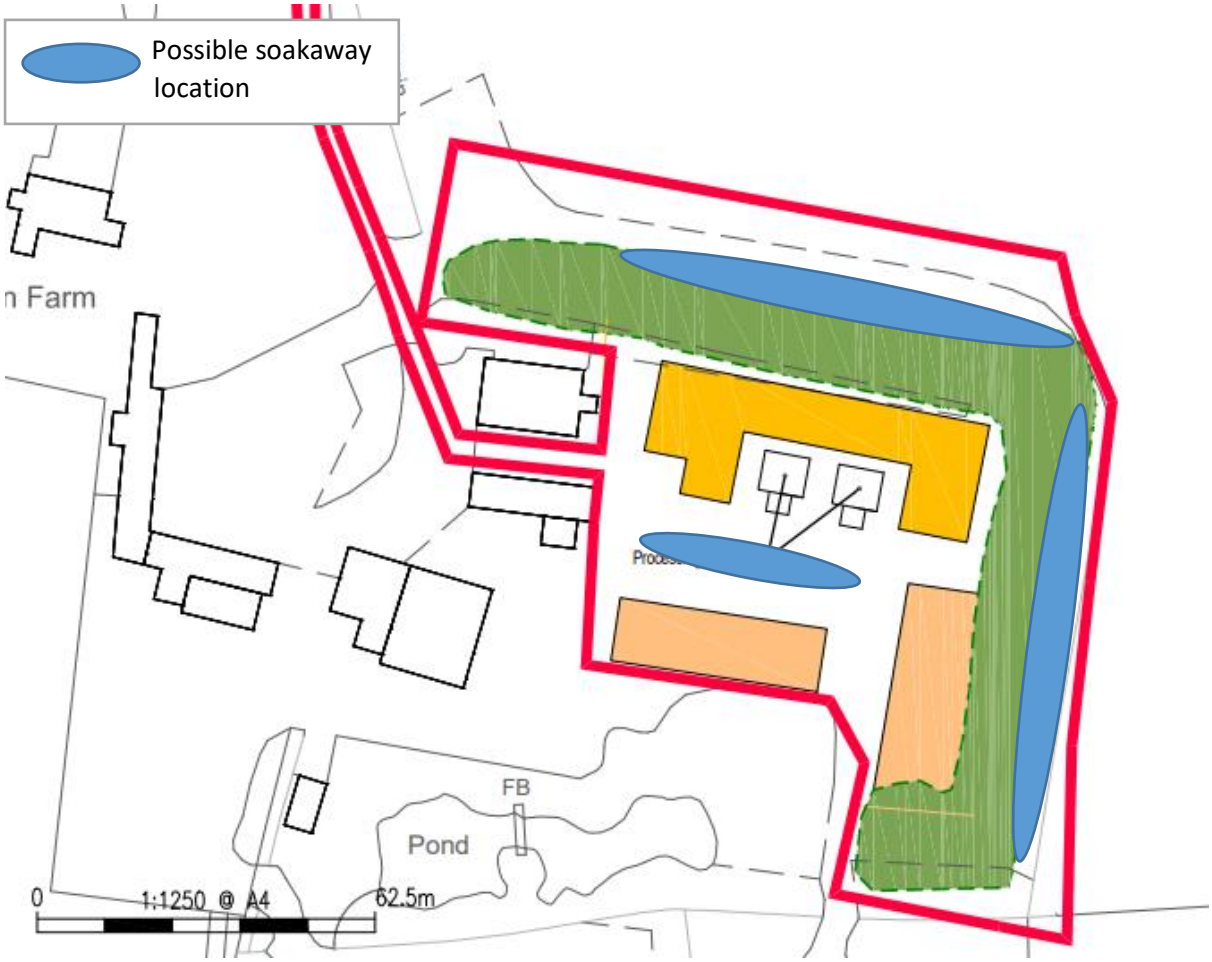

Figure 11 – Schematic of indicative surface water scheme (utilising infiltration).

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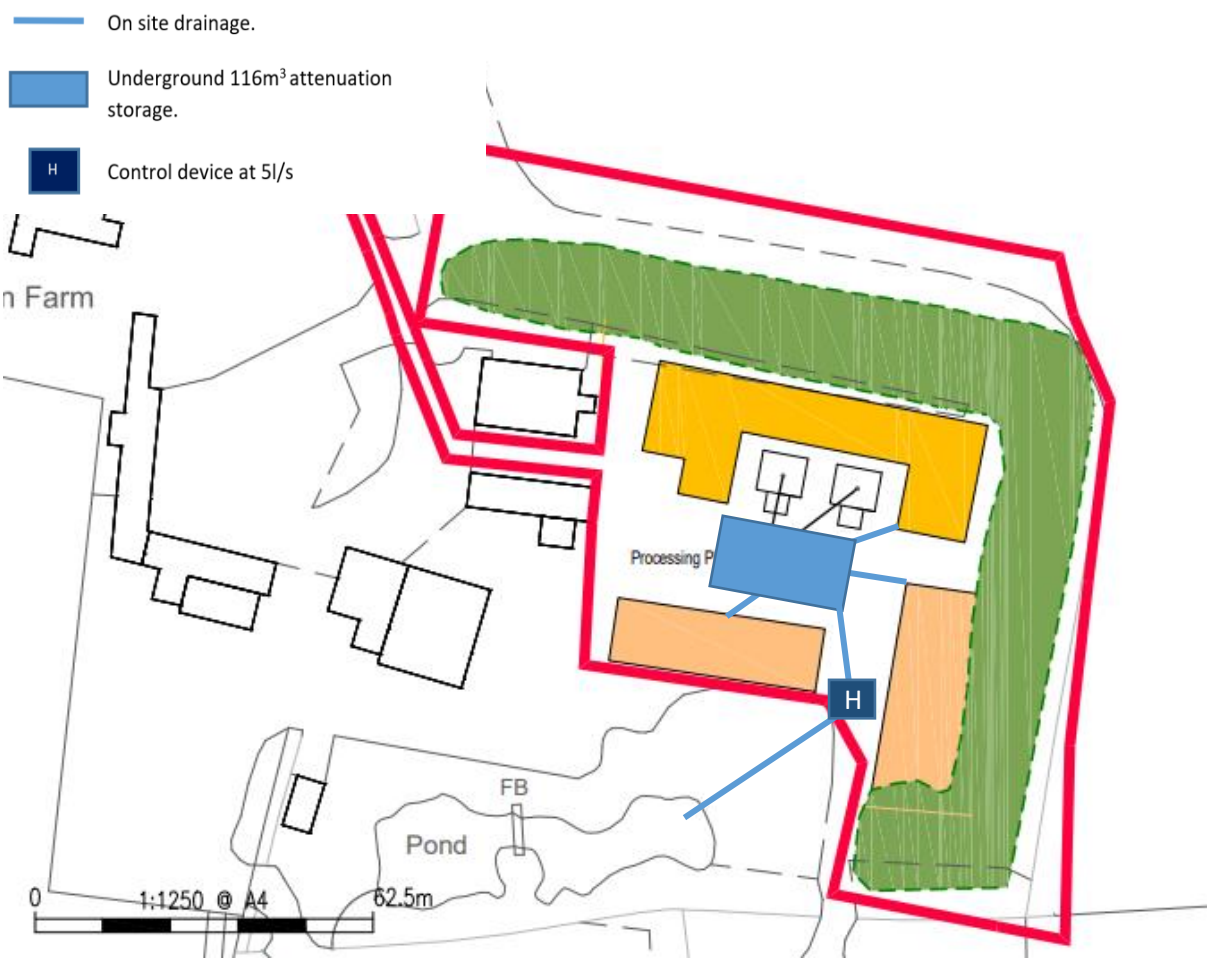

Figure 13 – Schematic of indicative surface water scheme (utilising attenuation and pond).

With regards to maintenance of the surface water system on site, we make reference to the House of Commons Ministerial Statement (HCWS161) on Sustainable Drainage Systems. "in considering planning applications, local planning authorities should consult the relevant lead local flood authority on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development".
Therefore, we expect a condition to be inserted regarding the surface water drainage. However, a maintenance schedule has been produced. This can be found in Table 6 below.

SuDS Feature	Maintenance sched	Requirement	Frequency	Responsibilty
Waterbutts	Regular maintenance	Clearing of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters and other debris	Annual (or following poor performance)	Landowner
	Occasional maintenanc	Replacement of any filters	As required	Landowner
	Remedial actions	Repair any erosion damage, or damage to tank	As required	Landowner
	Monitoring	Inspection of tank for debris and sediment build up	Annual (or following poor performance)	Landowner
		Inspection of inlets, outlets and withdrawal devices	Annual (or following poor performance)	Landowner
		Inspection of areas receiving overflow, for evidence of erosion	After extreme storms	Landowner
		Inspection of roof drain filters	Annual (or following poor performance)	Landowner
Permeable paving	Regular maintenance	Brushing and vacuuming	Three times/year at end of winter, mid-summer, after autumn leaf fall - or as required	Landowner
	Occasional maintenanc	Removal of weeds	As required	Landowner
	Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazad to users	As required	Landowner
		Rehabiliation of surface and upper surface sub-structure	As required	Landowner
	Monitoring	Initial inspection	Monthly for three months after installation	Landowner
		Inspect for evidence of poor operation and/or wed growth. If required take remedial action.	3-monthly, 48 hour after large storms	Landowner
		Inspect silt accumulation rates and establish brushing frequencies	Annually	Landowner
		Monitor inspection chambers	Annually	Landowner

Table 6 – suggested surface water scheme maintenance.

10. Conclusions

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

Table 2 of this report details that development is classified as Less Vulnerable; Table 3 of the report shows that Less Vulnerable developments within Flood Zone 1 are acceptable.

The development is described as being at low risk which means that the probability of flooding in any given year is between 1 in 1000 (0.1%) and 1 in 100 (1%).

Records from the British Geological Survey show that the proposed development is underlain by the Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations. These generally have a decent infiltration coefficient and are possibly appropriate for infiltration.

It is recommended that percolation testing is undertaking to confirm the suitability, or otherwise, for disposal of surface water by infiltration. Testing should be carried out in accordance with BRE digest 365 or CIRIA guidance R156.

If infiltration is not a viable option there is a pond to the South the development, it is proposed surface water is discharged into this waterbody.

The calculations show that 116m^3 of attenuation storage is required, with a restricted rate of 5l/s.

Appropriate SuDS features and measures should be incorporated within the development to minimise surface water discharges.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

There is no evidence of historic flooding of the development site.

The development is not at risk from reservoir failure.

Based on the likely flooding risk, it is considered that the proposed development can be operated safely in flood risk terms, without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF.

Disclaimer

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