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**FLOOD RISK AND DRAINAGE ASSESSMENT FOR A PROPOSED
POULTRY UNIT ON LAND TO THE WEST OF GIBBET FEN, FEN ROAD,
DONINGTON, SPALDING, LINCOLNSHIRE, PE11 4XE**

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Signed:

Date: 3rd May 2022

Approved by: J Gibson, MEng (Hons), CEng, CWEM MCIWEM
Civil Engineering Director



Signed:

Date: 3rd May 2022

Issue	Revision	Revised by	Approved by	Revised Date
A	Agricultural dwellings omitted/EA flood data added/flood mitigation measures updated	AD	JAG	28.04.22

For the avoidance of doubt, the parties confirm that these conditions of engagement shall not and the parties do not intend that these conditions of engagement shall confer on any party any rights to enforce any term of this Agreement pursuant to the Contracts (Rights of third Parties) Act 1999.

The Appointment of Alan Wood & Partners shall be governed by and construed in all respects in accordance with the laws of England & Wales and each party submits to the exclusive jurisdiction of the Courts of England & Wales.

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1.0 **INTRODUCTION**

1.1 **Background**

1.1.1 Alan Wood & Partners were commissioned by Clarke Group Construction Ltd to prepare a Flood Risk and Drainage Assessment for a proposed poultry unit development on land to the west of Gibbet Fen, Fen Road to the west of Donington, Spalding, Lincolnshire in support of an application for planning consent.

1.1.2 A Flood Risk and Drainage Assessment (FRDA) for the proposed development is required to assess the development's risk from flooding and the suitability of the site in terms of drainage.

1.2 **Layout of Report**

1.2.1 Section 1 provides an introduction to the FRDA, explains the layout of this FRDA and provides an introduction to flood risk and the latest guidance on development and flood risk in England.

1.2.2 Section 2 provides an introduction to the site. The site description is based upon a desktop study and information provided by the developer. In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency.

1.2.3 Section 3 of this report details the development proposals and considers the development proposals in relation to the current planning policy on development and flood risk in England (and what type of development is considered appropriate in different flood risk zones). National Planning Policy Framework (NPPF): and its associated Technical Guidance (Communities and Local Government, July 2021) is the current planning policy on flood risk in England, and an introduction to NPPF is provided below.

1.2.4 Section 4 considers the drainage arrangements for the proposed development.

1.2.5 Section 5 considers the operation and maintenance requirements for the proposed development.

1.2.6 Section 6 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on the latest planning policy and utilises all the information gathered in the preparation of the report.

1.2.7 Section 7 of this report provides details of any recommendations for further work to mitigate against possible flooding.

1.2.8 Section 8 of this report provides a summary of the report.

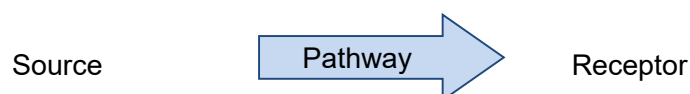
1.3 Flood Risk

1.3.1 Flood risk takes account of both the probability and the consequences of flooding.

1.3.2 Flood risk = probability of flooding x consequences of flooding

1.3.3 Probability is usually interpreted in terms of the return period, e.g. 1 in 100 and 1 in 200 year event, etc. In terms of probability, there is a 1 in 100 (1%) chance of one or more 1 in 100 year floods occurring in a given year. The consequences of flooding depends on how vulnerable a receptor is to flooding.

The components of flood risk can be considered using a source-pathway-receptor model.



1.3.4 Sources constitute flood hazards, which are anything with the potential to cause harm through flooding (e.g. rainfall extreme sea levels, river flows and canals). Pathways represent the mechanism by which the flood hazard would cause harm to a receptor (e.g. overtopping and failure of embankments and flood defences, inadequate drainage and inundation of floodplains). Receptors comprise the people, property, infrastructure and ecosystems that could potentially be affected should a flood occur.

1.4 National Planning Policy Framework

1.4.1 General

1.4.1.1 NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate sites with respect to flood risk.

1.4.1.2 A summary of the requirements of NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 NPPF requires an assessment to flood risk to consider all forms of flooding and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table1: Forms of flooding

Flooding from Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding from the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.

Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall, and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and /or as a result of dam or bank failure.

1.4.3 Flood Zones

- 1.4.3.1 For river and sea flooding, the NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2: Flood zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

1.4.4 Vulnerability

1.4.4.1 The NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3: Flood risk vulnerability classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- Essential utility infrastructure including electricity generating power stations and grid and primary substations - Wind turbines
Highly Vulnerable	- Police stations, ambulance stations, fire stations, command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use.
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. - Sites used for holiday or short-let caravans and camping.
Less Vulnerable	- Building used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. - Land and buildings used for agriculture and forestry.
Water Compatible	- Docks, marinas and wharves. - 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.

- 1.4.4.2 Based on the vulnerability of a development, NPPF states within what Flood Zones(s) the development is appropriate. The flood risk vulnerability and Flood Zone 'compatibility' of developments is summarised in Table 4.

Table 4: Flood risk vulnerability and flood zone compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	x	Exception Test	✓
	3b	Exception Test	✓	x	x	x

1.4.5 The Sequential Test, Exception Test and Sequential Approach

- 1.4.5.1 The Sequential Test is a risk-based test that should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Planning Authority by means of a Strategic Flood Assessment (SFRA).
- 1.4.5.2 The SFRA and NPPF may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate that:
- There are sustainability benefits that outweigh the flood risk and;
 - The new development is safe and does not increase flood risk elsewhere.
- 1.4.5.3 The Sequential Approach is also a risk based approach to development. In a development site located in several Flood Zones or with other flood risk, the sequential approach directs the most vulnerable types of development towards areas of least risk within the site.

1.4.6 Climate Change

- 1.4.6.1 There is a planning requirement to account for climate change in the proposed design. The recommended allowances should be based on the most relevant guidance from the Environment Agency and the Lead Local Flood Authority.

1.4.7 Sustainable Drainage

- 1.4.7.1 The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objectives, and NPPF and Part H of the Building Regulations (DTLR 2002) direct developers towards the use of SuDS wherever possible.
- 1.4.7.2 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

2.0 EXISTING SITE DESCRIPTION

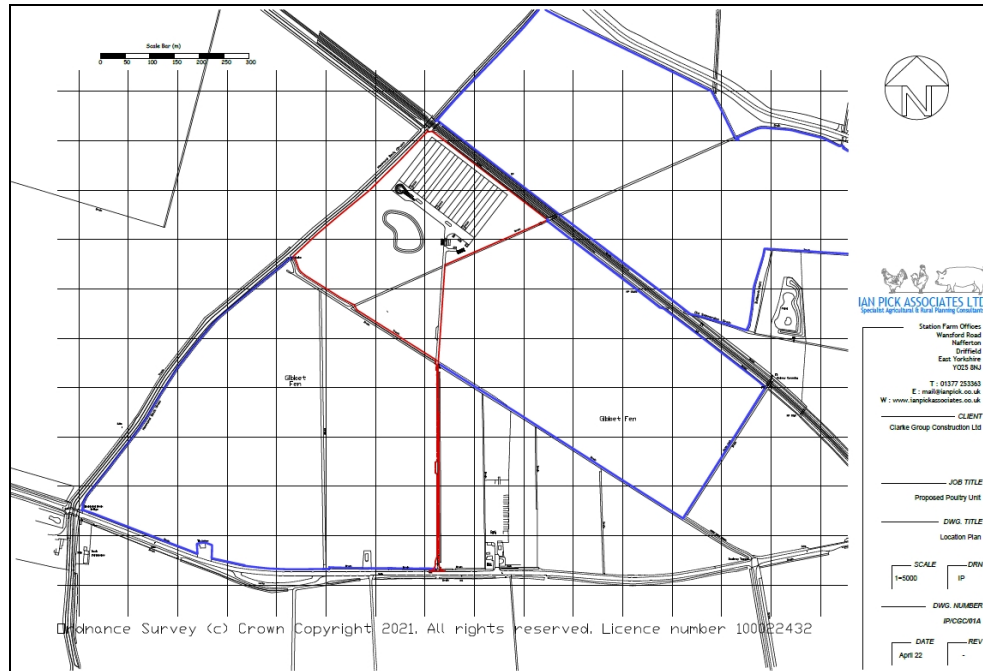
2.1 Location

- 2.1.1 The site occupies land to the west of the village of Donington, Lincolnshire.
- 2.1.2 The site lies approximately 1.8km to the west of the centre of the village of Donington, approximately 8.7km to the south east of the village of Heckington, approximately 13km to the north west of Spalding and approximately 15km to the south west of Boston.
- 2.1.3 An aerial photograph and location plan are included in Figures 1 and 2 below, which identify the location of the site.

Figure 1: Aerial Photograph



Figure 2: Site Location Plan



2.1.4 The Ordnance Survey grid reference for the centre of the site development is approximately 519060, 335995.

2.2 Existing Site Description

2.2.1 The site currently comprises an area of agricultural land extending to approximately 10.5 hectares in area.

2.3 Surrounding Features

2.3.1 The site lies within an area of extensive agricultural land.

2.3.2 The A52 is situated approximately 0.7km to the south of the development, which will provide access to the site.

2.3.3 There is a small open drainage ditch along the northern site boundary adjacent to the Spalding to Sleaford railway lines.

2.3.4 There is an open agricultural drainage ditch to the south west of the development site.

2.3.5 There is an open agricultural drainage ditch crossing the site (Old Swimmer Dam Drain).

- 2.3.6 There is a large open drain along the north western site boundary (Hammond Beck).
- 2.3.7 South Forty Foot Drain is situated approximately 1.5km to the west of the site.
- 2.3.8 The River Welland is situated approximately 12km to the south east of the site.
- 2.3.9 The River Witham is situated approximately 15km to the north east of the site.
- 2.3.10 The coastline of The Wash is situated approximately 20km to the east of the site.

2.4 Topography

- 2.4.1 A topographic survey of the development site has not been undertaken at this stage.
- 2.4.2 However, Lidar data covering the area of the development site has been obtained.
- 2.4.3 Over the full area of the development, existing ground levels are shown to vary from approximately 1.74m to 2.65m OD(N).
- 2.4.4 Over the footprint of the new buildings, the existing ground levels are shown to vary from approximately 1.53m to 2.28m OD(N), with an average ground level of approximately 1.80m OD(N).

2.5 Ground Conditions

- 2.5.1 A desktop study of the British Geological Survey map reveals that the local geology comprises superficial deposits of Alluvium – Clay, Silt and Sand overlying bedrock comprising Peterborough Formation – Mudstone.
- 2.5.2 Local borehole records reveal the underlying strata to comprise glacial clays extending to a depth of 30m below ground level.

-
- 2.5.3 The ground conditions are therefore unsuitable for soakaways/infiltration methods to be utilised for the disposal of surface water run-off from the development.
- 2.5.4 A study of the groundwater maps in the region shows that the proposed development does not overlay an aquifer. The groundwater vulnerability in the area of the development is classed as 'unproductive'.

3.0 **PROPOSED DEVELOPMENT**

3.1 **Proposed Development**

3.1.1 The proposed development comprises the construction of a new poultry unit to include the following:-

- 6 new poultry buildings with control room annexes
- Amenity building
- Plant room
- Dead bird store
- Water tank
- Gas tanks
- Generator
- Feed Bins
- Concrete paving
- Unsurfaced hardstanding for access, car parking and vehicle manoeuvres
- Improvements to site access

3.1.2 Indicative layout drawings of the proposed development are included in Appendix A.

3.2 **Flood Risk**

3.2.1 In terms of flood risk vulnerability, the construction of buildings to be used for agriculture is classed as 'Less Vulnerable' development (Table 3).

3.2.2 In terms of flood zone compatibility, the construction of 'Less Vulnerable' development is considered appropriate in Flood Zone 1, Flood Zone 2 and Flood Zone 3a. (Table 4).

4.0 **DRAINAGE ASSESSMENT**

4.1 **General**

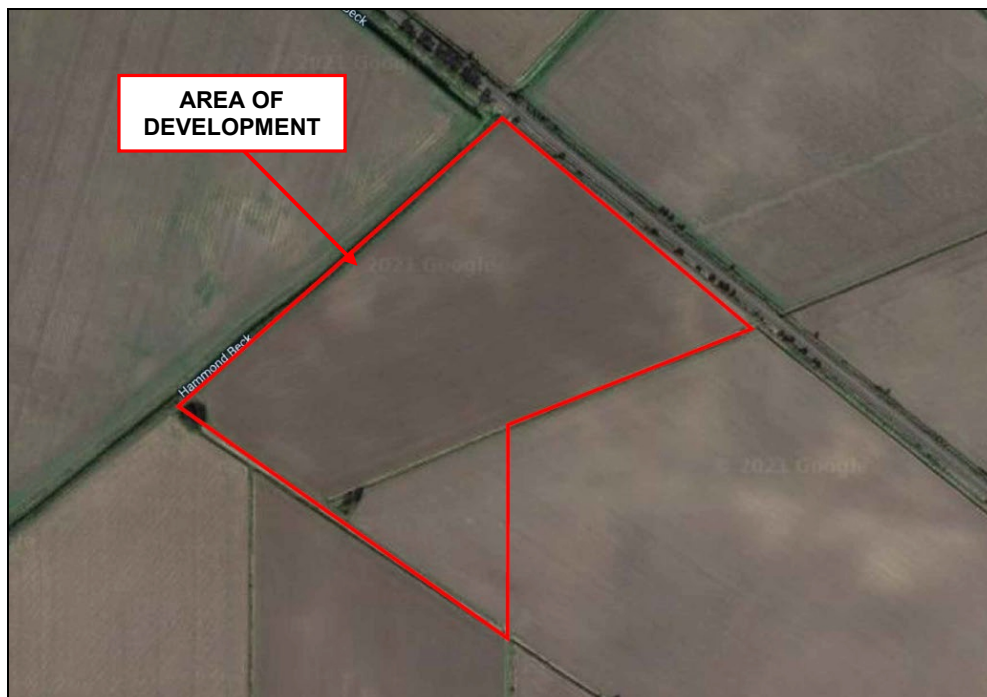
- 4.1.1 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

4.2 **Surface Water Drainage**

4.2.1 **Existing Site**

- 4.2.1.1 From the aerial photograph included in Figure 3, it can be seen that the area of the development site currently comprises agricultural land, which will discharge surface water at an agricultural run-off rate.

Figure 3: Aerial Photograph



4.2.2 **Run-off Destination**

- 4.2.2.1 Requirement H3 of the Building Regulations establishes a preferred hierarchy for disposal of surface water. Consideration should firstly be given to soakaway, infiltration, watercourse, surface water sewer and combined sewer in that priority order.

- 4.2.2.2 The existing ground conditions are considered to be unsuitable for the disposal of surface water run-off to soakaways/infiltration trenches (See Section 2.5).
- 4.2.2.3 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.
- 4.2.2.4 Investigations have revealed that there is an open drainage ditch in proximity to the development site into which the surface water run-off could be discharged.
- 4.2.2.5 It is therefore proposed that the surface water run-off from the development is discharged into this drainage ditch, which lies within the jurisdiction of Black Sluice Internal Drainage Board, for which formal consent will be required.

4.2.3 Flood Risk

- 4.2.3.1 For new developments, the current design criteria required for the surface water drainage will need to be based upon a 1 in 100 year storm event, with an additional allowance to account for climate change resulting from global warming. There should be no above ground flooding for the 1 in 30 year return period and no property flooding or off site flooding from the critical 1 in 100 year storm event, with the additional allowance to account for climate change.

4.2.4 Climate Change

- 4.2.4.1 An additional allowance of 40% has been included in the design to account for climate change resulting from, global warming in accordance with Lincolnshire County Council SuDS guidelines.

4.2.5 Urban Creep

- 4.2.5.1 The project is an agricultural development under the control of a single owner and consequently there is no requirement to allow an additional 10% to the calculated impermeable areas for urban creep within the drainage design.

4.2.6 Peak Flow Control

- 4.2.6.1 Based upon the site layout drawing, the developable site area becoming impermeable in the form of roofs and areas of paving which will need to be positively drained has been calculated at approximately 1.86 hectares, with the remainder of the site discharging at an agricultural run-off rate.
- 4.2.6.2 It is assumed that the surface water run-off from the small area of surfacing to the site entrance will drain onto the adjacent ground.
- 4.2.6.3 The uncontrolled surface water run-off from the new development could be approximately 258 litres per second, based on BS EN 752 calculations, using a rainfall intensity of 50mm/hour. However, to meet the flood risk planning requirements, it is unacceptable to discharge flows freely from the proposed development site at an unrestricted rate. Therefore, flows from the proposed development are normally limited to the greenfield runoff rate, established as 1.4 litres per second per ha, based on the impermeable contributing area of the site. For this development this would equate to approximately 2.6 litres per second and consequently this discharge rate has been used for design purposes.
- 4.2.6.4 In order to ensure the discharge of surface water will not increase the risk of flooding to other properties, it will be necessary to attenuate the drainage by restricting the discharge and providing storage as required.
- 4.2.6.5 The design will need to be based upon the critical 100 year storm event with the required additional allowance of 40% to account for climate change.
- 4.2.6.6 Based upon the design criteria set out above, a hydraulic model study has been undertaken in order to determine the pipe sizes and gradients and to assess the required volume of storage which will need to be provided.
- 4.2.6.7 The model output shows that the pipe sizes required will vary from 100mm to 750mm in diameter.

4.2.6.8 A summary of the storage volumes required is set out in Table 5 below.

Table 5: Volume of Surface Water Storage Required

Storm Event	30 Year Storm	100 Year Storm + 40%
Storage Volume Required	704m ³	1565m ³
Additional Storage Volume Required	Nil	861m ³

4.2.6.9 The required storage will be provided within an attenuation lagoon located to the south of the new poultry unit.

4.2.6.10 A copy of the hydraulic model study calculations is included in Appendix B.

4.2.7 Drawing

4.2.7.1 Indicative drainage layout drawings showing the proposed drainage strategy for the development are included in Appendix C.

4.2.8 Volume Control

4.2.8.1 SuDS guidance advises that the run-off volume from the developed site for the 1 in 100 year 6-hour rainfall event should not exceed the greenfield run-off volume for the same event.

4.2.8.2 A greenfield discharge rate has been used for design purposes and therefore this criteria has been satisfied.

4.2.8.3 We consider that the impact on the receiving watercourse has been minimised as far as is reasonably practicable.

4.2.9 Pollution Control

4.2.9.1 It is a requirement to ensure that the quality of any receiving body is not adversely affected by the development.

4.2.9.2 Investigations have revealed that the development site does not overlay an aquifer and lies within a groundwater vulnerability zone classified as 'unproductive'.

4.2.9.3 In order to minimise the risk of pollution to the final watercourse, clean roof water drainage should discharge directly into the sealed drainage network (i.e. not via gullies) and then directly towards the watercourse.

4.2.9.4 Discharge to a watercourse enables dilution to take place at the discharge point and thus reduces the likelihood of pollution occurring.

4.2.9.5 In order to minimise the risk of pollutants entering the watercourse, it is recommended that the final inspection chamber prior to the outfall to the watercourse should contain a silt trap.

4.2.9.6 The run-off from the areas of paving will need to pass through a filter trench prior to the outfall.

4.2.9.7 On this basis the risk of pollutants being discharged to the watercourse is extremely remote.

4.2.10 Wash – Down

4.2.10.1 The drainage run-off from the external paved area discharges directly to 2 No. SSAFO Regulated sealed storage tanks during clean-down operations, for which an Environmental Permit will be in place.

4.2.11 Designing for Exceedance

4.2.11.1 Overland flood risk from exceedance flows and from off-site sources will be mitigated to a large extent by the creation of the new surface water sewerage system as described above. Where possible proposed ground levels will be set to channel flows away from the proposed building.

4.2.11.2 Furthermore, the ground floor construction level for the new buildings will be raised above the finished ground level, which will provide additional clearance above any likely overland flooding.

4.2.11.3 The existing overland flow routes should generally be maintained within the final layout of the development site without increasing the flood risk to off-site parties.

4.2.11.4 Any existing flood risk may reduce by the creation of a formal surface water drainage system but cannot be entirely removed.

4.2.11.5 A drawing showing the anticipated overland surface water exceedance flood routing resulting from the development is included in Appendix D.

4.2.12 Highways Drainage

4.2.12.1 The development does not incorporate any formal highway drainage.

4.2.13 Water Quality

4.2.13.1 The water quality from the development via the surface water drainage system has been assessed in accordance with the simple index approach set out in Chapter 26 of the CIRIA SuDS Manual C753.

4.2.13.2 The output shows that the water quality from the roof areas and areas of external paving is of an acceptable standard without any further treatment.

4.2.13.3 A copy of the matrix outputs from the assessment is included in Appendix E.

4.3 Foul Water Drainage

4.3.1 The new amenity block incorporates WC and waste water facilities and consequently a separate foul water drainage network will be required.

4.3.2 As there are no public foul water sewers in the vicinity of the development, it will be necessary for an appropriate domestic sized waste water treatment plant to be provided, which will ultimately discharge the treated waste to the local watercourse.

5.0 OPERATION AND MAINTENANCE

- 5.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.
- 5.2 All gullies or drainage channel systems serving areas of hardstanding will need to be regularly inspected to ensure the system remains operable. See Table 6 below.
- 5.3 The inspection chambers should be regularly inspected to ensure the system is free-flowing. See Table 6 below.

Table 6: Operation and Maintenance Requirements for Silt Traps/Trapped Gullies (Based on CIRIA C753 Table 14.2)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	6 monthly
	Inspect filter media and establish appropriate replacement frequencies	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

- 5.4 On the basis that a Hydro-Brake® Vortex Flow Control Device needs to be provided, then this should be maintained as set out in Table 7 below.

Table 7: Operation and Maintenance Requirements for Hydro-Brake® Vortex Flow Control Device (Based on Manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Monthly during the first three months, then every 6 months
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

5.5 Operation and maintenance requirements for the attenuation lagoon are set out in Table 8 below.

Table 8: Operation and Maintenance Requirements for Attenuation Lagoon

Maintenance schedule	Required action	Typical frequency*
Routine maintenance	Remove litter and debris	6 monthly
	Vegetation management	As required
Occasional maintenance	Clean inlet/outlet pipe	As required
Remedial actions	Repair/re-construct damaged component/structure	As required
	Remove silt and debris	As required
Monitoring	Inspect for evidence of damage or erosion	6 monthly
	Inspect sediment accumulation	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

5.6 Operation and maintenance requirements for the filter trenches are set out in Table 9 below.

Table 9: Operation and Maintenance Requirements for Filter Trenches

Maintenance schedule	Required action	Typical frequency*
Regular maintenance	None	
Occasional maintenance	Remove silt and debris from inspection chamber	As required
Remedial actions	Re-construct filter trench if evidence of heavy siltation or failure	As required
Monitoring	Inspect downstream PPIC for evidence of siltation and to ensure system is free-flowing	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

5.7 Operation and Maintenance requirements for the waste water treatment plant are set out in table 10 below:-

Table 10: Operation and Maintenance Requirements for Package Sewage Treatment Plant

Maintenance schedule	Required action	Typical frequency*
Monitoring	Check air blower is operational	Weekly
	Check beacon is not flashing, if flashing call service engineer	Weekly
Routine maintenance	Air blower - inspect intake filter, clean or replace	6 monthly
	Kiosk - visual inspection for damage repair or replace	6 monthly
	Aeration chamber - visual inspection for damage, repair or replace	6 monthly
	Outlet pipe - check for blockages, clean as necessary	6 monthly
	Alarm - test alarm is functioning, repair or replace	6 monthly
Occasional maintenance	Air blower - install service kit and filter kit (new diaphragms)	18 monthly
	De-sludging - inspect level of solid settlement. De-sludge when volume exceeds 70%	6 monthly
*During the first year of operation, inspections should be carried out at least monthly to ensure that the system is functioning as designed and that no damage is evident.		

- 5.8 The sludge storage tanks are to be fitted with an automatic alarm, located in a nearby suitable location, such that it can be easily seen and operated by those responsible for the operation and maintenance of the tanks in compliance with the requirements of the Environmental Permit.
- 5.9 The sludge storage tanks should be regularly inspected and tested to ensure the integrity of the system is maintained. See Table 11 below.

Table 11: Operation and Maintenance Requirements for Sludge Storage Tank (based on manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Check level of sludge	After each wash-down operation
	Check alarm and controls are functioning correctly	12 monthly
Occasional maintenance	De-sludge tank	As required by appointed waste operator
Monitoring	If alarm sounds arrange immediate sludge removal	As required

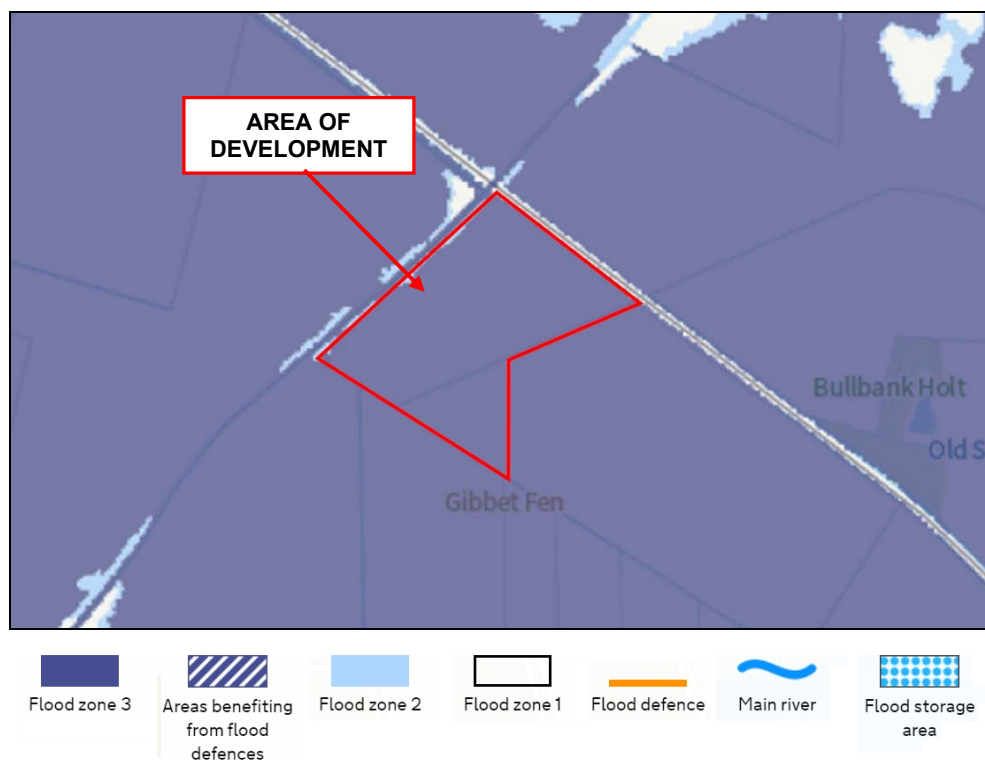
- 5.10 Operation and maintenance requirements of the drainage components, as listed above, should be undertaken in accordance with Chapter 32 of the CIRIA SuDS Manual, along with the relevant tables and any relevant manufacturer's recommendations. See also BS 8582:2013 Code of Practice for Surface Water Management for Development Sites Section 11 and Susdrain Fact Sheet on SuDS Maintenance and Adoption Options (England) dated September 2015.
- 5.11 The personnel undertaking the maintenance should have appropriate experience of SuDS and drainage maintenance and should be capable of keeping sufficiently detailed records of any inspections. If personnel do not have appropriate experience, then specific inspection visits may be necessary. During the first year of operations of SuDS, inspections should usually be carried out at monthly intervals (and after significant storm events).
- 5.12 The responsibility for the operation and maintenance of the drainage and SuDS will lie with Wray Farming, or any subsequent landowner of the site.

6.0 FLOOD RISK ASSESSMENT

6.1 Flood Zone

- 6.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 4 below, which identifies the development site to be located within an area designated as Flood Zone 3, (high probability of flooding), comprising land assessed as having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 year or greater annual probability of flooding from the sea.

Figure 4: Environment Agency Flood Map for Planning dated January 2022



6.2 Sequential Test

- 6.2.1 As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new developments to areas with the lowest probability of flooding.

- 6.2.2 The Flood Map for Planning produced by the Environment Agency (included in Figure 4) shows that the land within the ownership of the development includes a small area of land designated as Flood Zone 1 (low probability of flooding) and Flood Zone 2 (medium probability of flooding), whilst most of the land is shown to lie in Flood Zone 3 (high probability of flooding).
- 6.2.3 Consideration has therefore been given to try to locate the new poultry building within the lower flood risk area.
- 6.2.4 However, due to the scale of the development, it becomes necessary for the new buildings to be located in Flood Zone 3a.
- 6.2.5 Where there are no reasonably available sites in the lower flood risk zone, then the NPPF advises that sites in Flood Zone 3a can be considered, taking into account the flood risk vulnerability of land uses.
- 6.2.6 Table 2 of the NPPF Technical Guidelines Flood Risk Vulnerability Classification categorises the various types of development. Land and buildings used for agriculture and forestry are categorised as 'Less Vulnerable' development.
- 6.2.7 Table 3 of the NPPF Technical Guidelines considers the suitability of developments in terms of their vulnerability, based upon their classification.
- 6.2.8 This advises that 'Less Vulnerable' developments are appropriate in Flood Zone 3a.
- 6.2.9 Table 3 also advises that an Exception Test is only required if the development is classified as 'Essential Infrastructure' or 'More Vulnerable'.
- 6.2.10 The proposed poultry building in this location is therefore categorised as 'appropriate development'.

6.3 Tidal Flooding

- 6.3.1 The development is located approximately 20km to the west of the coastline at The Wash.

6.3.2 However, due to the low-lying nature of the land to the west of the coastline there is a considerable area of land in the vicinity of the development which is shown to be at potential risk of future flooding accounting for sea level rise resulting from global warming.

6.3.3 At a distance of 20km from the source of such a flood event, the resultant depth of flood water at the location of the site should not be significant. Flood mitigation measures will, however, need to be considered to minimise the risk from flooding.

6.3.4 Details of such proposed mitigation measures are included in Section 6 of this report.

6.4 Fluvial Flooding

6.4.1 There is an open agricultural drainage ditch crossing the site (Old Swimmer Dam Drain).

6.4.2 There is a large open drainage ditch along the north western site boundary (Hammond Beck).

6.4.3 South Forty Foot Drain is situated approximately 1.5km to the west of the site.

6.4.4 The River Welland is situated approximately 12km to the south east of the site.

6.4.5 The River Witham is situated approximately 15km to the north east of the site.

6.4.6 The area of the development is shown to be susceptible to flooding from fluvial/tidal flooding as the local watercourse's outfall into The Wash, and consequently there is a risk of them overtopping during periods of high tides.

6.4.7 Flood Product Data has been obtained from the Environment Agency in order to assess the risk from flooding.

6.4.8 A copy of the flood product data received is included in Appendix F.

- 6.4.9 The modelled flood output has shown that the predicted maximum water level in South Forty Drain for the 1 in 100 probability flood event including 20% climate change is 3.10m OD(N).
- 6.4.10 With the source of the flooding being approximately 1.5km from the development site, flood waters would spread out over the surrounding land, ponding in the areas of low-lying land, decreasing in depth as they extend outwards from the source of the flood.
- 6.4.11 This situation is reflected on the modelled flood extents map produced by the Environment Agency, which shows that the area of the development would be affected should such a flood event occur.
- 6.4.12 An overlay of the Lidar data levels onto the flood mapping has shown that the outer extent of flooding from the 1 in 100 flood event plus 20% climate change coincides with a ground level of approximately 1.71m OD(N).
- 6.4.13 Government guidance on climate change now advises that more severe rainfall is predicted and should be allowed for in the design of new developments.
- 6.4.14 The flood modelling undertaken by the EA shows that for a 1 in 1000 probability storm plus 20% climate change, the maximum water level in South Forty Foot Drain would rise to 3.13m OD(N) and affect a larger area of the surrounding land.
- 6.4.15 It is considered that this scenario would account for any additional climate change allowance required for the 1 in 100 flood event and consequently this scenario has been considered in respect of this particular development.
- 6.4.16 The flood extent mapping shows that a slightly larger area of the development site would be affected, extending to a ground level of approximately 1.88m OD(N).
- 6.4.17 Flood mitigation measures will need to be considered within the design of the development. Details of such measures are set out in Section 7 of this report.

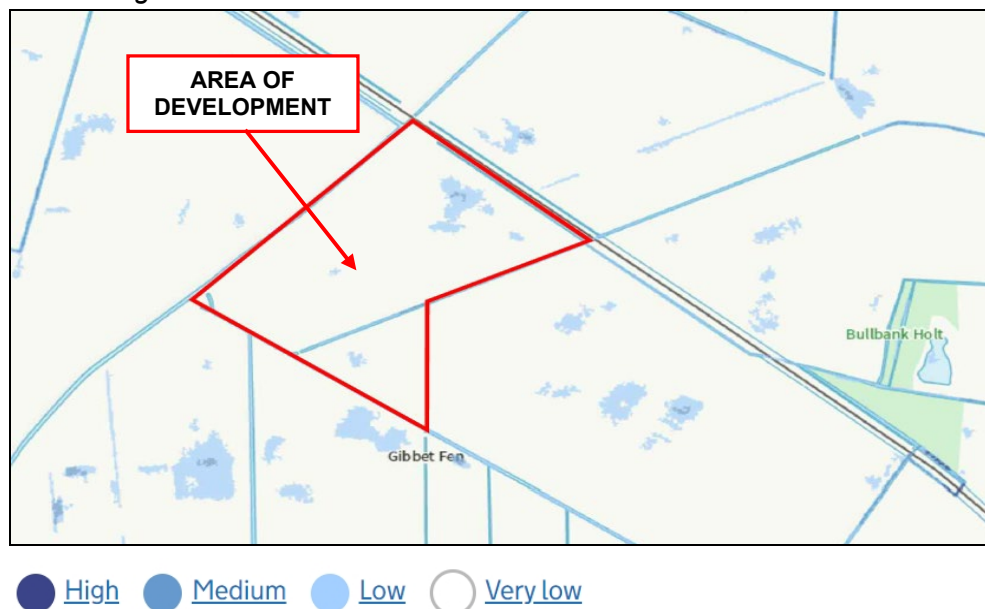
6.5 Flooding from Open Drainage Ditches

- 6.5.1 There are a number of large open drainage ditches in the vicinity of the site which drain the low-lying agricultural land.
- 6.5.2 There is a potential risk that the capacity of these ditches could be exceeded during an extreme rainfall event.
- 6.5.3 Flood mitigation measures proposed to account for fluvial/tidal flooring will adequately address the risk to the development from this potential flood source.
- 6.5.4 The risk to the development from this potential source is therefore considered to be low and acceptable.

6.6 Surface Water Flooding

- 6.6.1 A copy of the Environment Agency map showing the extent of flooding from surface water is included in Figure 5 below.

Figure 5: Environment Agency map dated January 2022 showing the Extent of Flooding from Surface Water



- 6.6.2 The map indicates that the majority of the site is in an area which is considered to be at very low risk of surface water flooding.

6.6.3 Copies of the maps produced by the Environment Agency showing the likely depth of surface water flooding are included in Figures 6, 7 and 8 below.

Figure 6: Environment Agency map dated January 2022 showing the likely depth of flooding from surface water – low risk

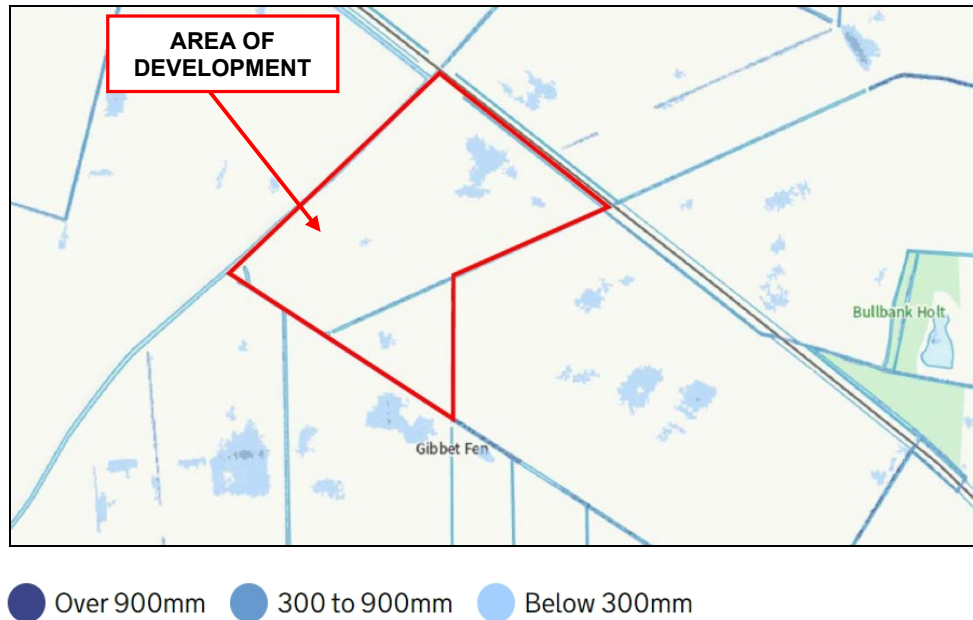


Figure 7: Environment Agency map dated January 2022 showing the Likely Depth of Flooding from Surface Water – Medium Risk

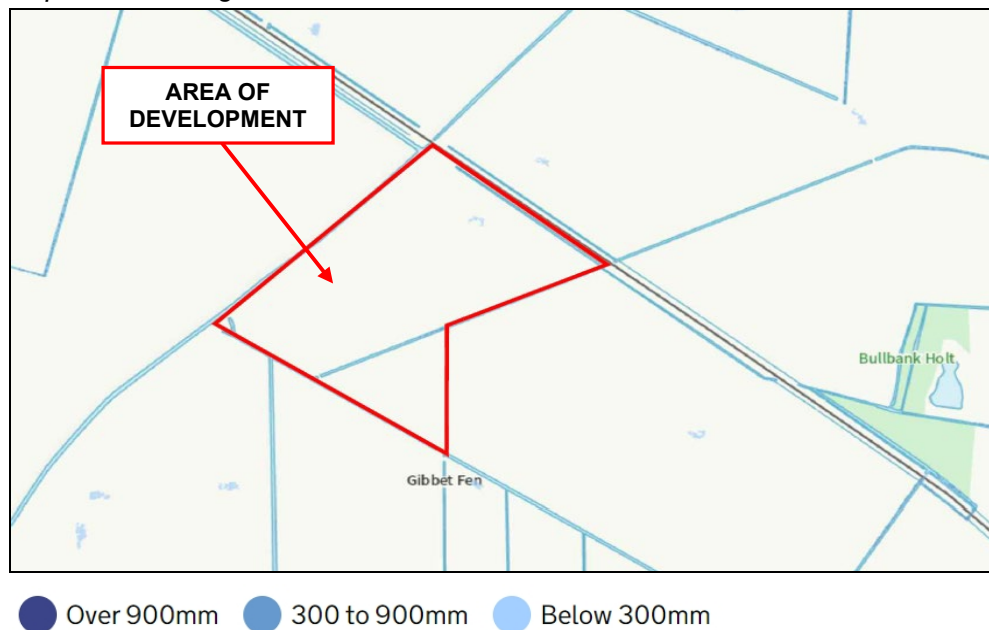
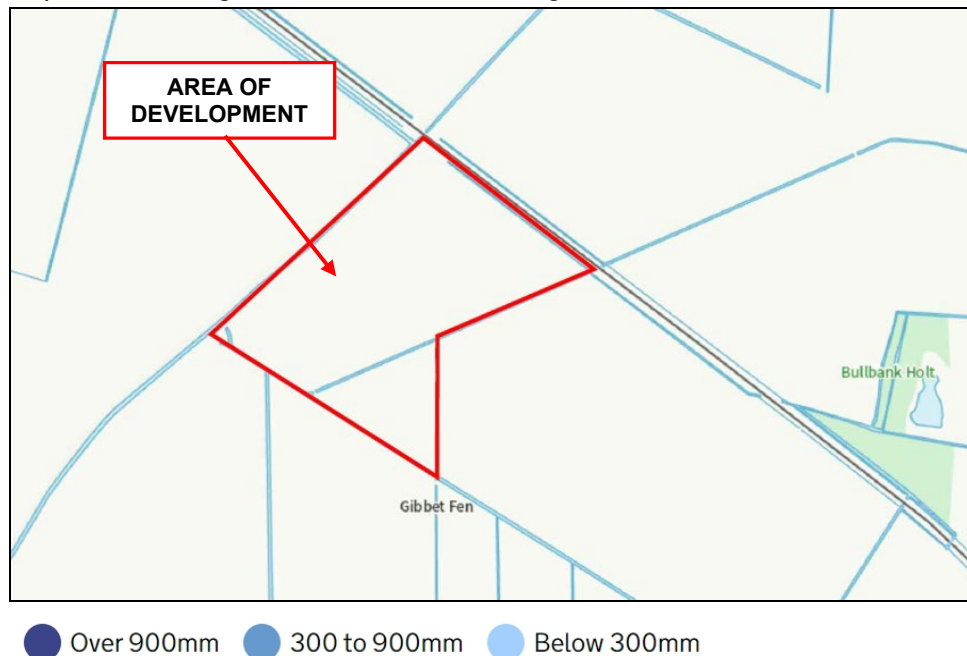


Figure 8: Environment Agency map dated January 2022 showing the Likely Depth of Flooding from Surface Water – High Risk



- 6.6.4 The maps show that for a “low risk” scenario the isolated area of the site is shown to be at risk of flooding up to a depth of less than 300mm.
- 6.6.5 For a “medium risk” scenario the development site is not shown to be at risk of flooding.
- 6.6.6 For a “high risk” scenario the development site is not shown to be at risk of flooding.
- 6.6.7 On this basis, it is considered that the risk to the development from surface water flooding is low and acceptable.

6.7 Groundwater Flooding

- 6.7.1 Groundwater flooding can occur when the sub-surface water levels are high and emerges above ground level.
- 6.7.2 The project will not involve deep excavation works and consequently the risk to the development from this potential flood source is considered to be low and acceptable.

6.8 Flood Risk from Existing Sewers

- 6.8.1 There are no existing sewers in the vicinity of the proposed development.
- 6.8.2 The risk to the development from this potential flood source is considered to be low and acceptable.

6.9 Flood Risk from Water Mains

- 6.9.1 There are no water mains present in the vicinity of the proposed development.
- 6.9.2 The risk to the development from this potential flood source is considered to be low and acceptable.

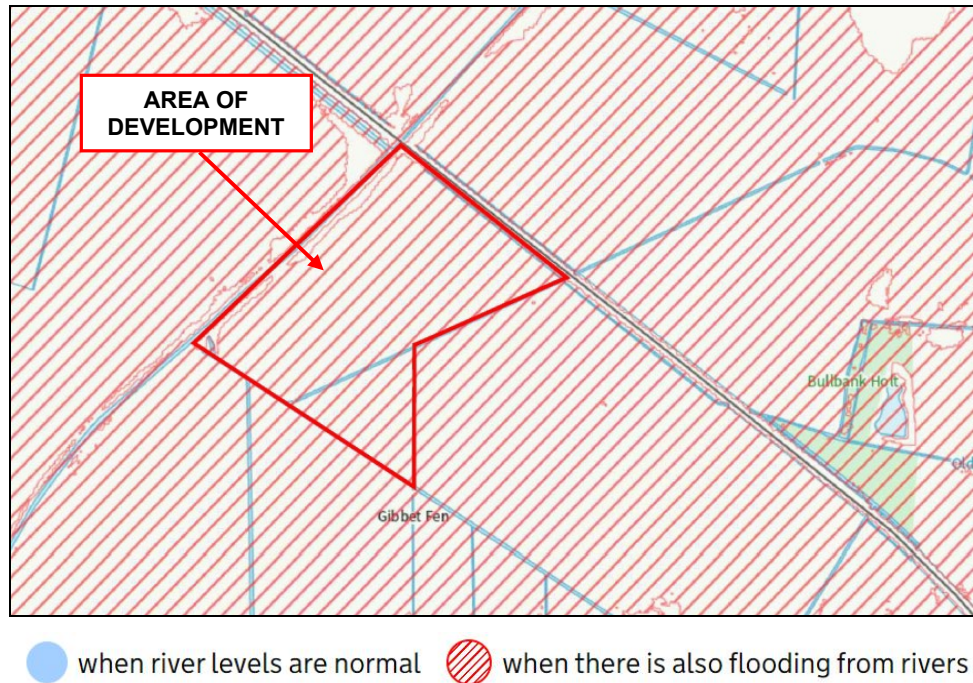
6.10 Flood Risk from Proposed Sewers

- 6.10.1 There are new surface water drainage works involved with the development.
- 6.10.2 The drainage will be installed in accordance with section 4 of this report and will be installed in compliance with current guidelines.
- 6.10.3 The risk of flooding to the development from this potential source is considered to be low and acceptable.

6.11 Flooding from Reservoirs, Canals and other Artificial Sources

- 6.11.1 Investigations indicate that there are no structures or water features in the vicinity of the development which are likely to pose a risk of flooding.
- 6.11.2 A copy of the map produced by the Environment Agency showing the extent of flooding from reservoirs is included in Figure 9 below.

Figure 9: Environment Agency map dated January 2022 showing the Extent of Flooding from Reservoirs



- 6.11.3 The map shows that the development site is not considered to be at risk from reservoir flooding during normal river conditions but is at risk if there is a combined failure of a reservoir.
- 6.11.4 The reservoirs are regularly inspected and maintained by the Environment Agency and the likelihood of a failure of any such reservoir dam is considered to be extremely remote.
- 6.11.5 The risk of flooding to the development from any such potential flood source is considered to be low and acceptable.

7.0 **FLOOD MITIGATION MEASURES**

7.1 **Management**

7.1.1 The development should subscribe to the Environment Agency's early 'Flood Direct' warning service which will alert the development of any likely flood situations. This will then enable a safe evacuation of the development should the need arise.

7.1.2 The development should have a Flood Risk Evacuation Plan in place. Suitable notices should be positioned in common areas to ensure all occupants understand the procedures in place in the event of a flood situation and where to escape to safety, should this prove necessary.

7.2 **Passive Flood Protection**

7.2.1 The development is shown to lie within an area considered to have a high probability of flooding on the Environment Agency's flood map for planning.

7.2.2 For new developments lying within Flood Zone 3 the normal requirement is to elevate the ground floor by a minimum of 600mm above the existing ground level or above the predicted flood level where this information is available.

7.2.3 From the flood modelling data received from the Environment Agency, the predicted flood water level at the location of the development has been calculated at 1.71m OD(N) for the 1 in 100 flood event plus climate change and 1.88m OD(N) for the 1 in 1000 flood event plus climate change.

7.2.4 It is recommended that the floor construction level of the new poultry buildings should be set at a minimum level of 2.20m OD(N), which provides a minimum freeboard of 300mm above the 1 in 1000 probability flood event level which should adequately account for future climate change.

7.2.6 At this level of construction, we consider the risk of flooding to the development from fluvial, overland surface water and tidal flood sources has been adequately reduced.

7.3 Flood Resilience

- 7.3.1 For developments lying within Flood Zone 3(a), it is a requirement to provide flood resilient construction up to a height of 300mm above the elevated ground floor construction level in order to minimise the extent of flood damage, should flood waters enter the building and to enable ease of reconstruction and minimise the timescale of any repair works.
- 7.3.2 For this development this would result in a flood resilient construction level of 2.50m OD(N).
- 7.3.3 The poultry buildings are agricultural and consequently will not incorporate any internal finishes.
- 7.3.4 Providing all electrical or other flood sensitive equipment is elevated to a minimum height of 300mm above the raised floor level, the buildings should not suffer any damage in the event of a major flood event.

7.4 Access/Egress

- 7.4.1 The public road network (A52) lying to the south of the development is shown to lie in Flood Zone 1 (low probability of flooding), which would maintain safe access to and egress from the development in the event of a major flood situation.
- 7.4.2 The existing road levels in this location are shown to be at approximately 2.70m OD(N), indicating that this level of constriction lies above the predicted flood level.
- 7.4.3 Access to/egress from the development site along the new access track will be achievable by farm vehicles should a major flood event occur and consequently there will be no reliance on evacuation measures by the Emergency Services resulting from the development.

8.0 SUMMARY

- 8.1 The report has been prepared to assess the flood risk and drainage implications for a proposed poultry unit development on land to the west of Gibbet Fen to the west of Donington, Spalding, Lincolnshire.
- 8.2 The site falls in Flood Zone 3 (high probability of flooding) on the Environment Agency Planning map.
- 8.3 The new poultry buildings are classed as 'Less Vulnerable' development which is considered appropriate in Flood Zone 3.
- 8.4 The primary risk to the site is considered to be from fluvial/tidal flooding from the local watercourses which outfall into the North Sea during an extreme flood event.
- 8.5 Mitigation measures are proposed which it is considered will reduce the risk of flooding to the development to an acceptable level.
- 8.6 This report has considered other potential sources of flooding to the site, including groundwater, fluvial, existing sewers, water mains and other artificial sources.
- 8.7 Overall, this report demonstrates that the flood risk to the site is reasonable and acceptable providing the mitigation measures detailed in Section 7 are incorporated into the design of the development.
- 8.8 The report also demonstrates that the site can be suitably drained, with the development being designed to the required standards.
- 8.9 It is proposed that the surface water run-off from the development will discharge at the restricted greenfield rate to an existing open drainage ditch located to the south east of the new poultry buildings and the appropriate volume of storage provided within an attenuation lagoon.
- 8.10 It is proposed that the foul waste water from the development will be suitably treated and discharged to the adjacent watercourse.