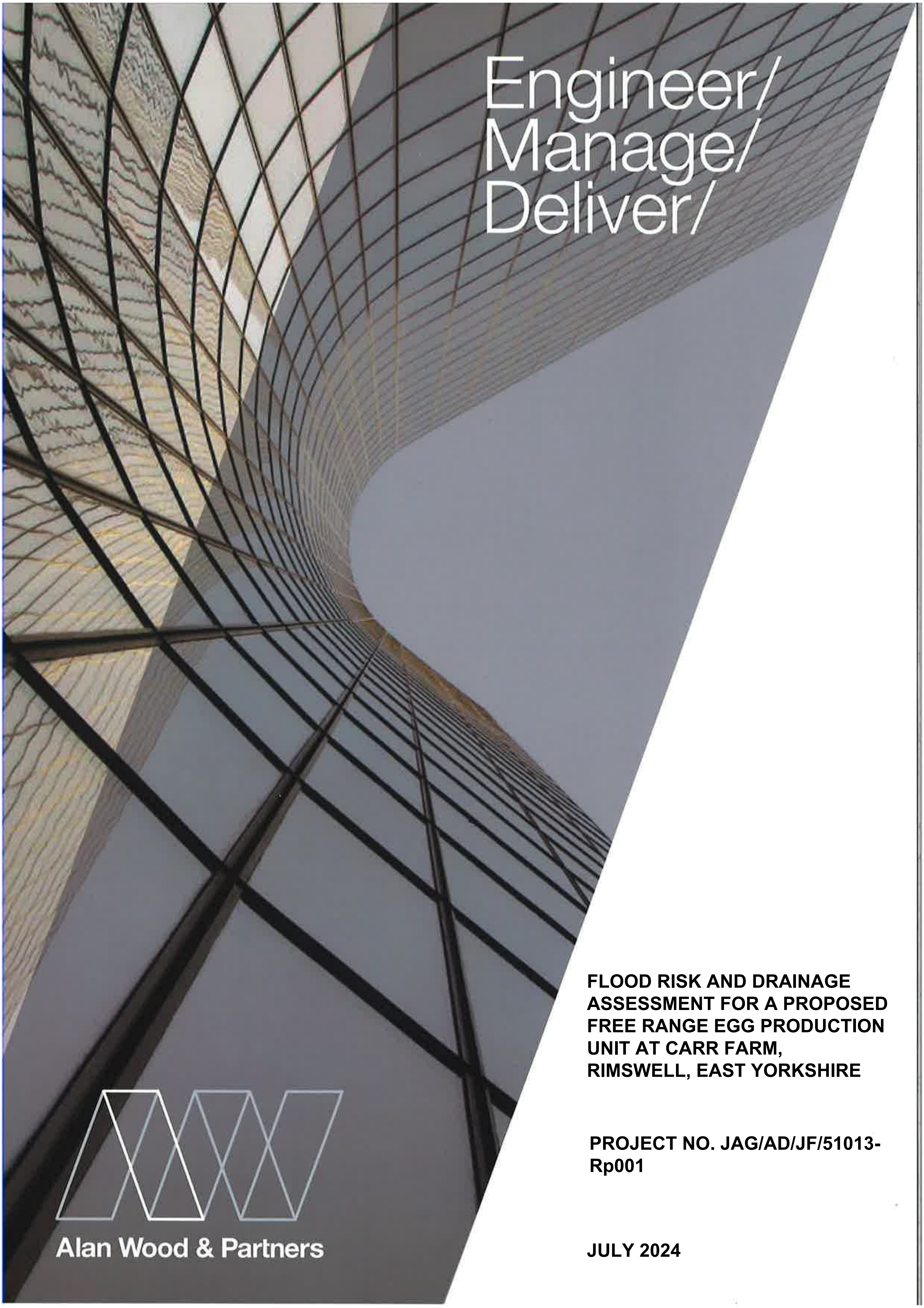

FLOOD RISK AND DRAINAGE ASSESSMENT FOR A PROPOSED FREE RANGE EGG PRODUCTION UNIT AT CARR FARM, RIMSWELL, EAST YORKSHIRE

PROJECT NO. JAG/AD/JF/51013-Rp001

JULY 2024

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Prepared by: A Dunn

Signed: ....
Date: 26th July 2024

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Director

Signed: ....
Date: 26th July 2024

Issue	Revision	Revised by	Approved by	Revised Date

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APPENDICES

1.0 INTRODUCTION

1.1 Background

1.1.1 Alan Wood & Partners were commissioned by K Fresh Ltd to prepare a Flood Risk and Drainage Assessment for a proposed free-range egg production unit on land at Carr Farm, Rimswell, East Yorkshire 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.

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 and the suitability of the site in terms of drainage discharge.

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 surface water 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 uses all the information gathered as part of FRDA. Based on all the work undertaken as part of the FRDA.

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 the NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 The 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.

Table 1: 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 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 foot 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 (2015 Edition) direct developers towards the use of SuDS wherever possible.

2.0 EXISTING SITE DESCRIPTION

2.1 Location

2.1.1 The development occupies land at Carr Farm, approximately 700m to the west of Thirtle Bridge Lane and to the north of the B1362 at Rimswell, East Yorkshire.

2.1.2 The proposed development is located approximately 1.6km to the south east of the village of Roos, approximately 1.9km to the north east of the village of Halsham and approximately 3.8km to the north west of Withernsea.

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

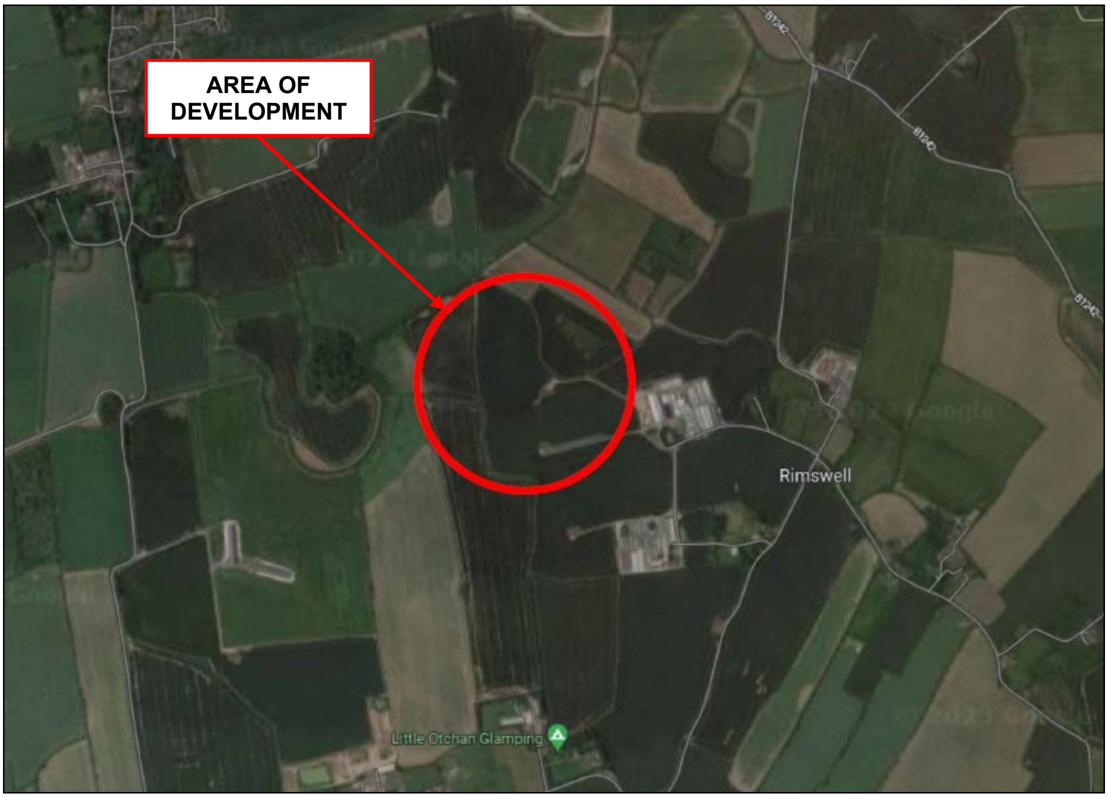
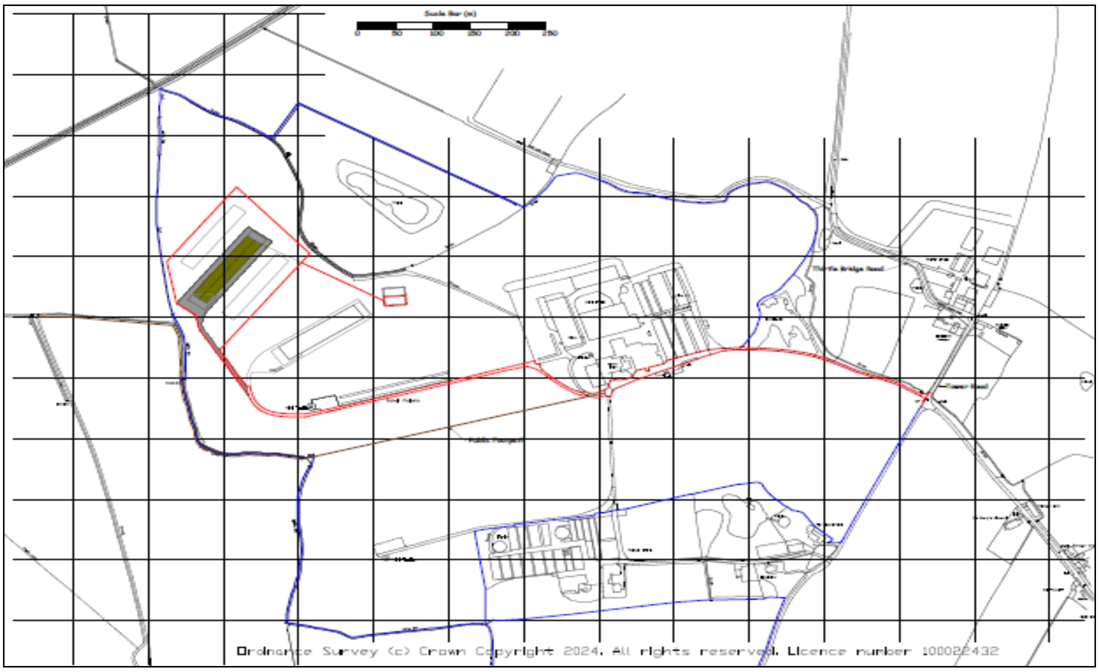


Figure 2: Site Location Plan



2.1.4 The Ordnance Survey grid reference for the centre of the site development is approximately 530120, 429215.

2.2 Topography

2.2.1 LIDAR data has been obtained which shows that the existing ground levels over the area of the new development vary from approximately 4.67m to 7.44m OD(N).

2.2.2 Over the footprint of the new building existing ground levels are shown to vary from approximately 5.39m to 7.08m OD(N), with an average ground level of approximately 6.41m OD(N).

2.3 Ground Conditions

2.3.1 No ground investigation works have been undertaken at this stage of the development.

2.3.2 A desktop study of the British Geological Survey map shows that the local geology comprises superficial deposits of Till Devensian – Diamicton overlaying bedrock comprising Flamborough Chalk Formation – Chalk.

3.0 PROPOSED DEVELOPMENT

3.1 The Proposed Development

3.1.1 The proposed development involves the construction of a new free range egg unit to include:-

- New egg production building.
- Areas of external concrete paving.
- Unsurfaced areas of hardstanding.
- Feed Bins.

3.1.2 Copies of the site layout drawings showing details 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 for agricultural use 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 to be appropriate in Flood Zone 1 (Table 4).

4.0 SURFACE WATER DRAINAGE

4.1 General

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

4.2 Existing Site

4.2.1 From the aerial photograph included in Figure 3 below, it can be seen that the area of the new development currently comprises an area of agricultural land which will discharge rainwater to the ground at the local greenfield run-off rate.

Figure 3: Aerial Photograph

4.3 Run-off Destination

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

4.3.2 The underlying strata in the vicinity of the development is considered to be unsuitable for the disposal of surface water run-off from the development into soakaways or infiltration trenches. (See Section 2.5.)

4.3.3 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.

4.3.4 There is an open drainage ditch located to the north of the proposed development, which drains the adjacent agricultural land.

4.3.5 It is therefore proposed that the surface water run-off from the new development is discharged into this drainage ditch via the existing restricted outfall.

4.4 Flood Risk

4.4.1 For agricultural developments such as this, the current design criteria required for the surface water drainage will need to be based upon the critical 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.

4.5 Climate Change

4.5.1 An additional allowance of 30% has been included in the surface water drainage design to account for the anticipated increase in peak rainfall due to climate change resulting from global warming in accordance East Riding of Yorkshire County Council SuDS Guidance.

4.6 Urban Creep

4.6.1 As the development is agricultural and is under the control of a single developer, it is considered that there is no requirement to include an additional 10% allowance for urban creep within the surface water drainage design.

4.7 Peak Flow Control

4.7.1 Based upon the site layout drawing, the developable site area becoming impermeable in the form of roofs and areas of paving which would need to be positively drained has been calculated at approximately 3522m^2.

4.7.2 The uncontrolled surface water run-off from the new development could be approximately 49l/s, 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 only equate to approximately 0.5l/s which cannot be achieved in practical terms.

4.7.3 It is considered that the minimum discharge rate which can be achieved in practical terms to avoid future blockages and maintenance issues is 3l/s and consequently this has been used for design purposes.

4.7.5 The required restriction to the surface water run-off will be provided by means of a suitable flow control within the final manhole prior to discharge.

4.7.6 The required design criteria for the surface water drainage will need to be based upon a 1 in 100 year storm with an additional allowance to account for climate change resulting from global warming.

4.8 Design Output

4.8.1 Based upon the design criteria set out above, hydraulic model calculations have been undertaken in order to assess the pipe sizes and gradients required and to assess the likely volume of surface water storage volumes which will need to be provided.

4.8.2 The pipe sizes required are shown to vary from 150mm to 225mm in diameter.

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

Table 5: Volume of Surface Water Storage Required

Storm Event	1 in 30 Probability Storm Event	1 in 100 Probability Storm Event + 30%
Storage Volume Required	70m^3	139m^3
Additional Storage Volume Required	Nil	69m^3

4.8.4 For this development, it is proposed that the volume of storage required to accommodate the peak flow from the 1 in 100 probability storm event, including climate change, will be provided by extending the existing attenuation lagoon located to the south east of the building.

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

4.9 Drawing

4.9.1 A drawing showing the proposed surface water drainage strategy for the development is included in Appendix C.

4.10 Volume Control

4.10.1 The run-off volume post development will be more than pre-development by the creation of impermeable areas and the formal drainage systems which must be installed. However, due to the limitations on infiltrations methods of disposal and the fact that the surface water drainage system will be designed and constructed to meet Building Regulations requirements standards, the opportunity to reduce the surface water discharge volume is limited.

4.10.2 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.

4.10.3 However, as detailed above, the minimum discharge rate it is considered can be provided would be 3l/s.

4.10.4 Whilst the greenfield rate will be marginally exceeded at peak flow times, it is considered that additional peak flows will not be sufficient to create any exceedance issues which would affect other parties downstream of the development.

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

4.11 Pollution Control

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

4.11.2 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 to the watercourse via the attenuation lagoon.

4.11.3 Drainage from areas of paving will need to pass through a filter trench and the attenuation lagoon prior to the outfall.

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

4.12 Designing for Exceedance

4.12.1 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.

4.12.2 Furthermore, the ground floor construction level for the building will be raised approximately 300mm above the existing ground level in order to provide additional clearance above any likely flooding.

4.12.3 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.

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

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

4.13 Highways Drainage

4.13.1 The development does not incorporate any formal highway drainage.

5.0 OPERATION AND MAINTENANCE

5.1 Operation and Maintenance

5.1.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.

5.1.2 Operation and maintenance requirements for the silt traps/trapped gullies are set out in 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.		

5.1.3 Operation and maintenance requirements for the attenuation lagoon are set out in Table 7 below.

Table 7: 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.		

5.1.4 Should a vortex flow control valve be required, then this should be maintained as set out in Table 8 below.

Table 8: 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

5.1.5 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.		

5.1.6 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 included within the report 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.

5.1.7 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. An example of a checklist for SuDS maintenance can be found within Appendix B of the CIRIA C753 SuDS Manual v2. 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).

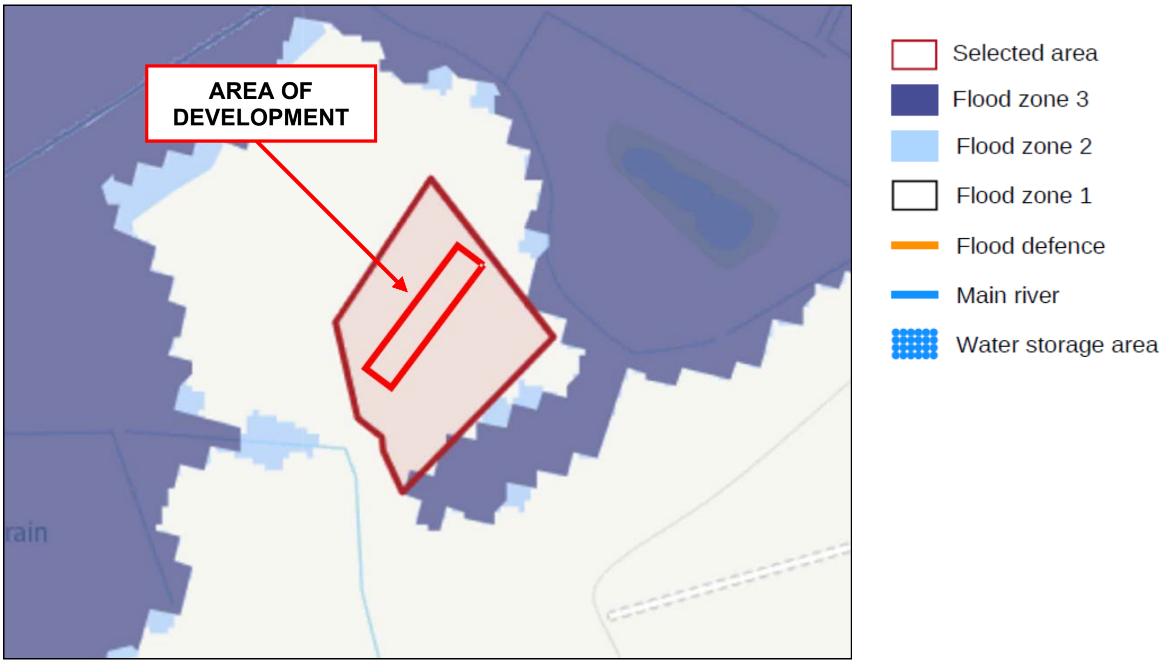
5.1.8 The responsibility for the operation and maintenance of the drainage and SuDS will lie with K Fresh Ltd, or any subsequent landowner of the site.

6.0 FLOOD RISK ASSESSMENT

6.1 Flood Zone

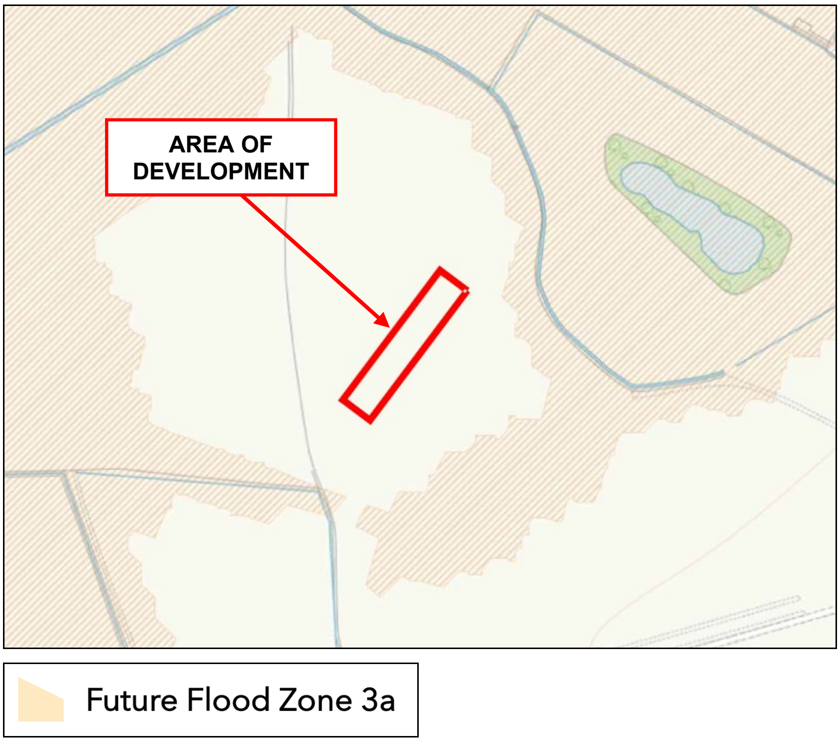
6.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 4 below which identifies the development site to be located within an area designated as Flood Zone 1, (low probability of flooding), with a less than 1 in 1000 annual probability of flooding in any year.

Figure 4: Environment Agency Flood map for planning dated July 2024



6.1.2 A copy of the map showing Future Flood Zone 3 with the East Riding of Yorkshire Council SFRA is included in Figure 5 below.

Figure 5: East Riding of Yorkshire Council Strategic Flood Risk Assessment Future Flood Zone 3a dated July 2024

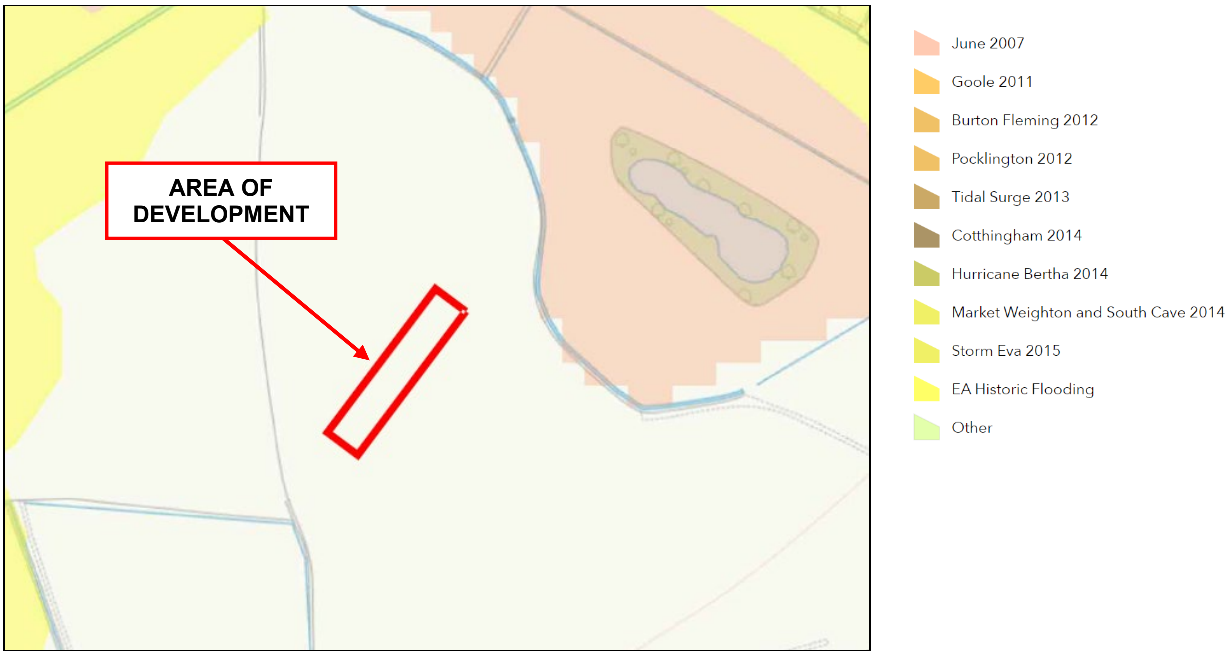


6.1.3 The map shows that the site is not considered to be at risk from flooding resulting from future climate change.

6.2 Historic Flooding

6.2.1 An abstract from the historic flood extent map incorporated in the East Riding of Yorkshire Council Strategic Flood Risk Assessment is included in Figure 6 below.

Figure 6: East Riding of Yorkshire Council's SFRA map showing the Extent of Historic Flooding



6.2.2 The map shows that the site has not been affected by historical flood events

6.3 Fluvial Flooding

6.3.1 There are no fluvial flood sources in the region which could pose a risk of flooding to the development.

6.3.2 The potential risk of flooding to the site from this potential source is therefore considered to be low and acceptable.

6.4 Flooding from Open Drainage Ditches

6.4.1 There are a number of agricultural drainage ditches in the vicinity of the development site which drain the surrounding land to the River Humber.

6.4.2 There is an open agricultural drainage ditch located approximately 130m to the south and approximately 180m to the west of the proposed development.

6.4.3 There is an open drainage ditch located approximately 150m to the north of the proposed development.

6.4.4 This ditch outfalls into Roos Drain to the north west of the site approximately 900m from the proposed development site. This in turn drains into Keyingham Drain, eventually outfalling into the River Humber at Stone Creek.

6.4.5 The drainage system outfalls at periods of low tide within the River Humber and consequently, with the outfall being tidally influenced, water levels can rise within the drainage system during periods of heavy rainfall.

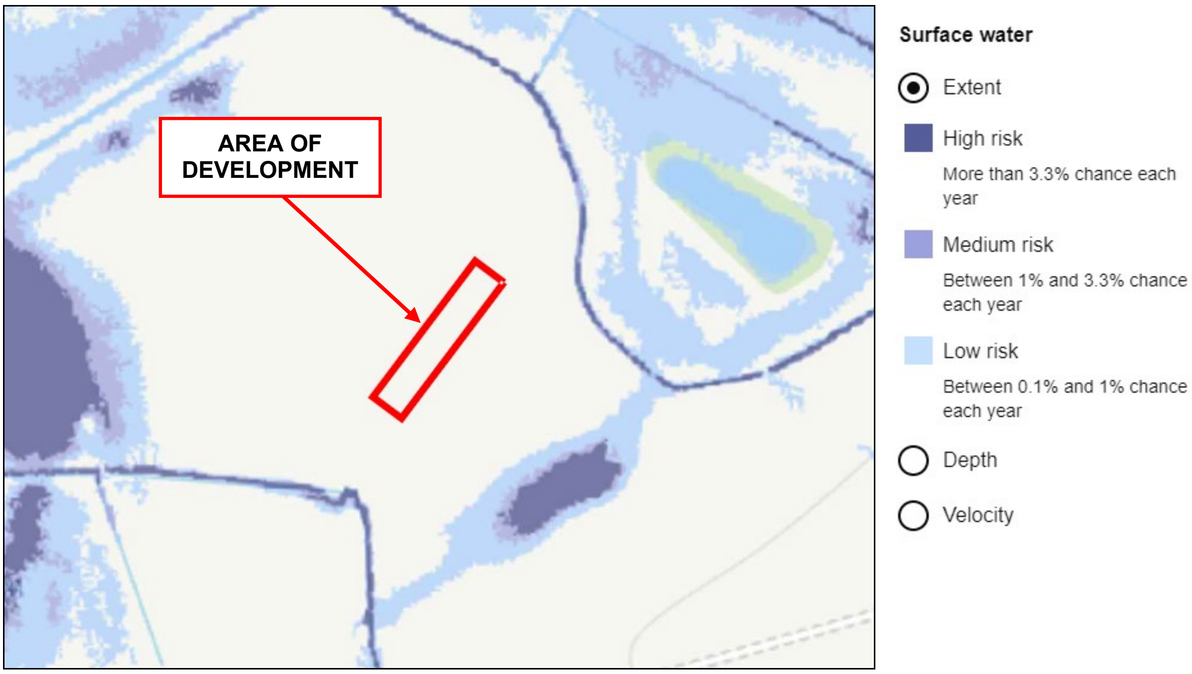
6.4.6 Should the volume of water exceed the capacity of the watercourse, the ditches can overtop their banks and flood the adjacent land.

6.4.7 This is generally reflected on the maps produced by the Environment Agency showing the extent of flooding from overland surface water in Section 6.5 below.

6.5 Surface Water Flooding

6.5.1 A copy of the Environment Agency map showing the extent of flooding from surface water is included in Figure 7 below.

Figure 7: Environment Agency map dated July 2024 showing the extent of flooding from surface water



6.5.2 The map shows that the development lies in an area which is not considered to be at risk from surface water flooding.

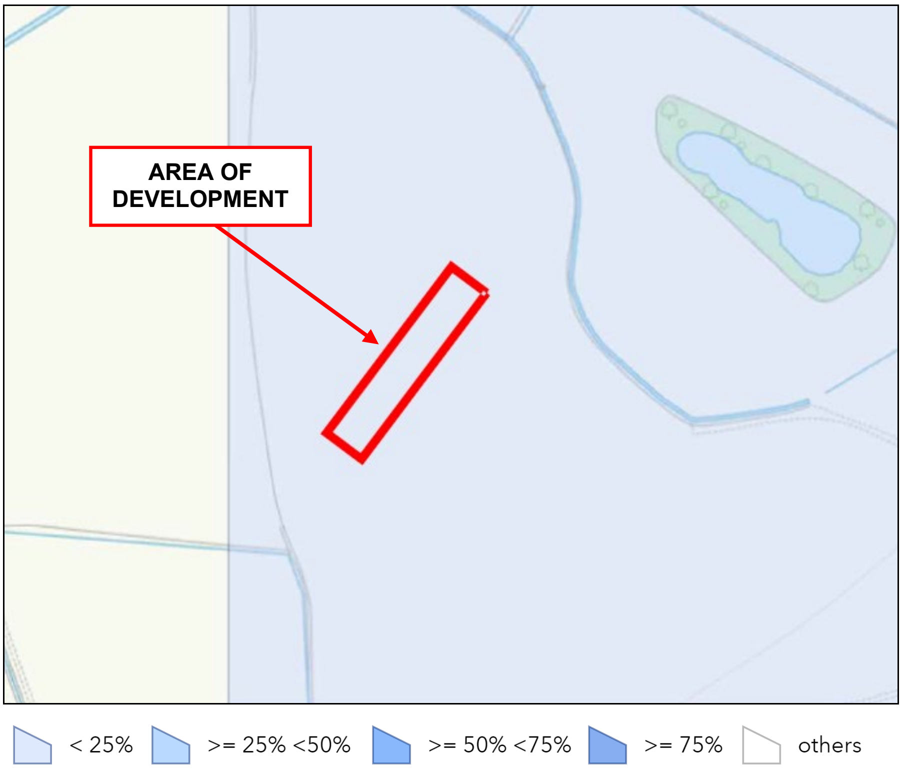
6.5.3 The risk to the development from this potential flood source is considered to be low and acceptable.

6.6 Groundwater Flooding

6.6.1 Groundwater flooding can occur when the sub-surface water levels are high and emerges above ground level.

6.6.2 The map produced with the East Riding of Yorkshire Council Strategic Flood Risk Assessment showing areas susceptible to groundwater flooding is included in Figure 8 below.

Figure 8: Abstract from East Riding of Yorkshire Council's SFRA groundwater flooding map



6.6.3 The map shows that the site lies in an area where the groundwater susceptibility is <25%.

6.6.4 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.

6.7 Flood Risk from Existing Water Mains

6.7.1 There are no existing water mains present within the local vicinity of the proposed development.

6.7.2 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

6.8 Flood Risk from Existing Sewers

6.8.1 There are no existing sewers present within the local vicinity of the proposed development.

6.8.2 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

6.9 Flood Risk from New Drainage Services

6.9.1 The new drainage will be designed to the required standards (as detailed in Section 4) and therefore the risk of flooding to the development or to other parties beyond the curtilage of the site will be adequately addressed.

6.9.2 The risk to the development from this potential source is therefore considered to be low and acceptable.

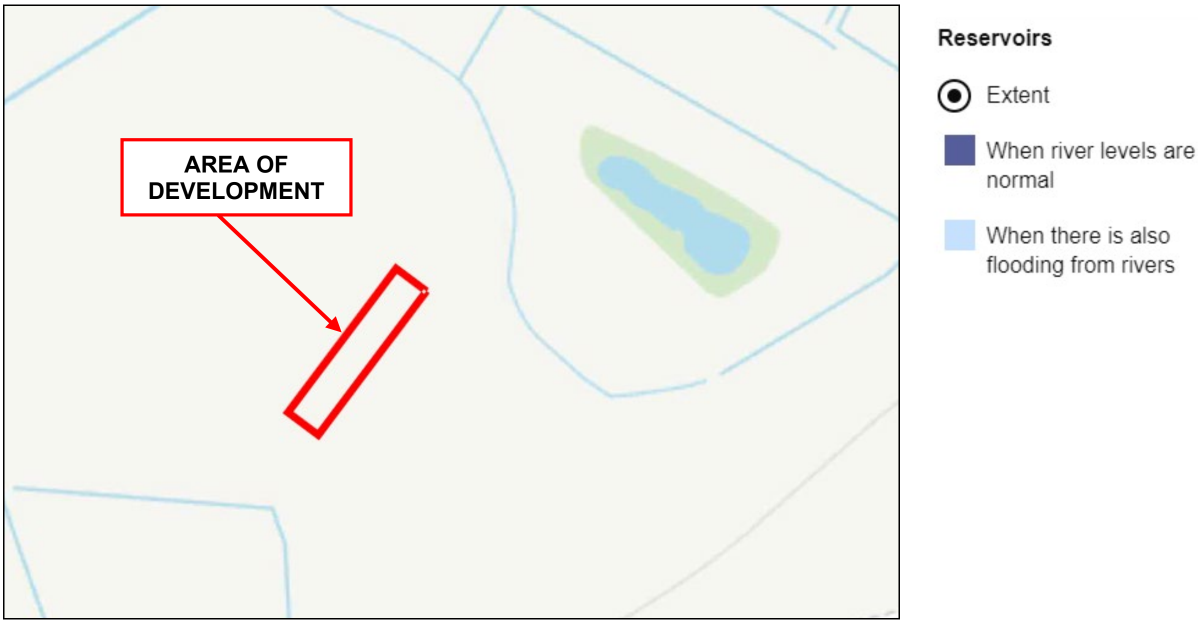
6.10 Flooding from Reservoirs, Canals and Other Artificial Sources

6.10.1 A study of the local area shows that there are a number of small water features in the vicinity of the development.

6.10.2 However, due to their small scale these water features are not considered to pose any risk of flooding to the development should they overtop during an extreme rainfall event.

6.10.3 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 July 2024 showing the extent of flooding from reservoirs



6.10.4 The map shows that the development site is not considered to be at risk from reservoir flooding.

6.10.5 The risk to the development from reservoir flooding is considered to be low and acceptable.

6.10.6 The risk to the development from any such potential flood source is considered to be low and acceptable.

7.0 FLOOD MITIGATION MEASURES

7.1 The development is shown to lie within an area shown to be at low probability of flooding on the Flood Map for Planning produced by the Environment Agency.

7.2 No specific flood risk to the development has been identified during the preparation of this report.

7.3 It is therefore considered that no specific flood mitigation measures will need to be incorporated into the design of the development.

7.4 The building can therefore be constructed at traditional levels of construction (normally approximately 150mm above ground level).

7.5 Finished ground levels around the building will generally be set to divert water away from the building towards the adjacent soft ground.

7.6 As the building is an agricultural poultry building there are no internal finishes which could suffer from flood damage should flood waters affect the building in the future.

7.7 All access roads in the vicinity of the development are shown to lie in Flood Zone 1 and therefore there will be no restriction with access to the site resulting from flooding issues should a major flood situation arise in the area.

8.0 SUMMARY

8.1 This report has been prepared to assess the flood risk implications for a new free range egg production unit at Carr Farm, which is located to the west of Rimswell, East Yorkshire.

8.2 The site is shown to lie in Flood Zone 1 (low probability of flooding) on the Environment Agency Flood Map for Planning and the proposals are considered to be 'Less Vulnerable' in terms of flood risk vulnerability which is considered to be appropriate development in this location.

8.3 This report has considered potential sources of flooding to the site, including fluvial, surface water, groundwater, existing sewers, water mains and other artificial sources.

8.4 No specific risk of flooding to the development has been identified in the preparation of this report.

8.5 Overall, this report demonstrates that the flood risk to the site is reasonable and acceptable.

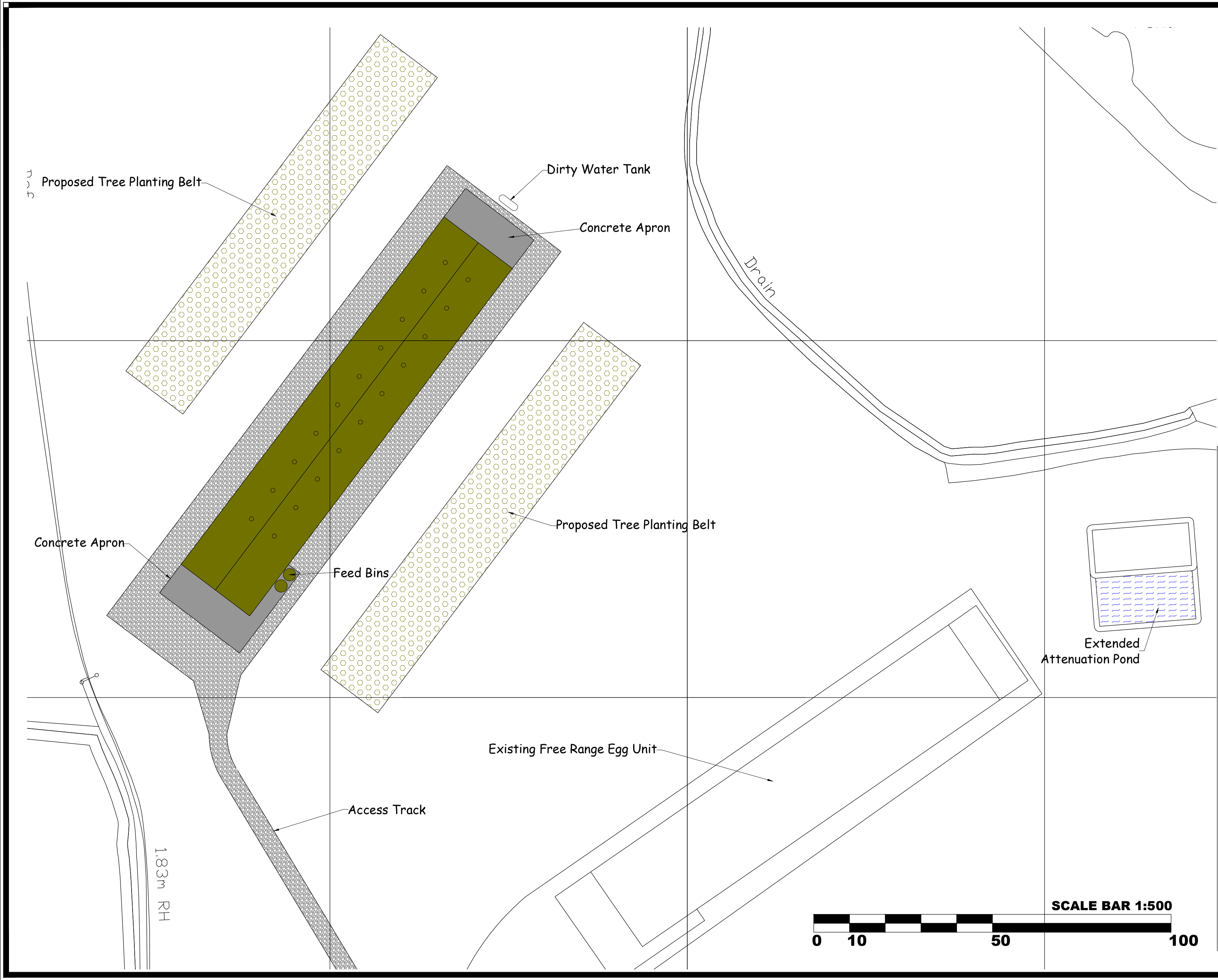
8.6 This report also demonstrates that the site can be suitably drained, with the drainage network serving the development designed and constructed to the required standards in compliance with local and national planning policies.

8.7 Surface water run-off from the development will be discharged to an open drainage ditch to the north east of the development via the existing restricted outfall discharge with adequate storage provided by extending the existing attenuation lagoon.

8.8 Based on the details incorporated within our report it is considered that planning consent for the proposed development can be granted in terms of the flood risk and drainage aspects of the project.

APPENDIX A

Site Layout Drawings



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CLIENT

KFresh
Carr Farm
Rimswell
Withernsea
HU19 2BZ

JOB TITLE

Proposed Free Range Egg Unit

DWG. TITLE

Site Plan A1

SCALE 1=500

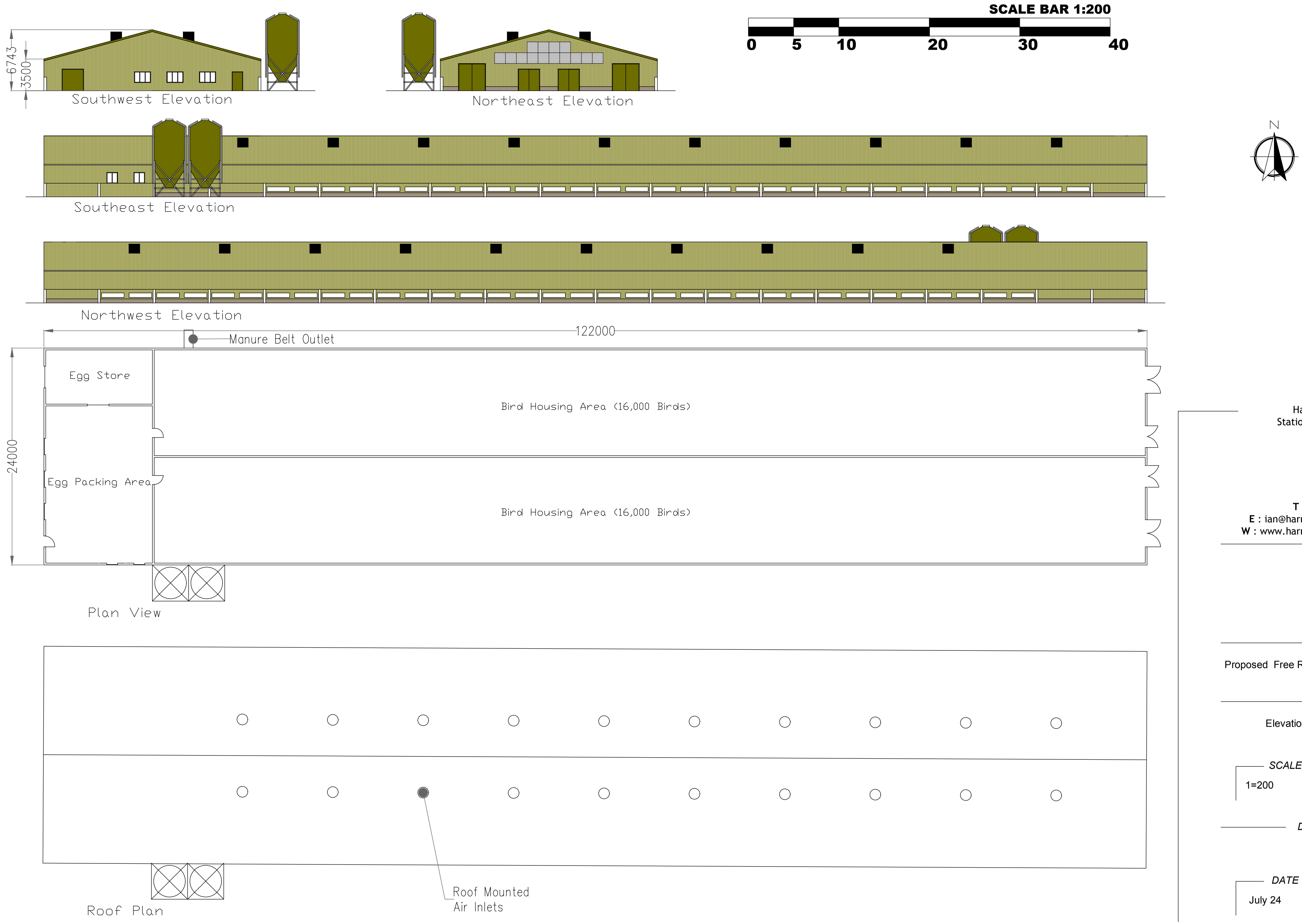
DRN IP

DWG. NUMBER

IP/KF/02

DATE July 24

REV -



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JOB TITLE

Proposed Free Range Egg Unit

DWG. TITLE

Elevations and Plan A1

SCALE	*DRN*
1=200	IP

DWG. NUMBER

IP/KF/03

DATE	*REV*
July 24	-

APPENDIX B

Hydraulic Model Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.381	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	22.066	0.221	99.8	0.035	1.00	0.0	0.600		o	300	Pipe/Conduit	
S1.001	74.524	0.596	125.0	0.081	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.002	65.530	0.385	170.0	0.065	0.00	0.0	0.600		o	300	Pipe/Conduit	
S2.000	9.649	0.077	125.3	0.012	1.00	0.0	0.600		o	150	Pipe/Conduit	
S3.000	9.904	0.079	125.4	0.012	1.00	0.0	0.600		o	150	Pipe/Conduit	
S2.001	4.500	0.036	125.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.002	13.490	0.108	125.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	7.242	0.192	37.7	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	1.23	5.650	0.035	0.0	0.0	0.0	1.57	111.2	4.8
S1.001	50.00	2.12	5.429	0.116	0.0	0.0	0.0	1.40	99.3	15.8
S1.002	50.00	3.03	4.833	0.181	0.0	0.0	0.0	1.20	85.0	24.6
S2.000	50.00	1.18	5.650	0.012	0.0	0.0	0.0	0.90	15.8	1.6
S3.000	50.00	1.18	5.650	0.012	0.0	0.0	0.0	0.90	15.8	1.6
S2.001	50.00	1.27	5.571	0.024	0.0	0.0	0.0	0.90	15.9	3.2
S2.002	50.00	1.52	5.535	0.024	0.0	0.0	0.0	0.90	15.9	3.2
S1.003	50.00	3.07	4.448	0.205	0.0	0.0	0.0	2.57	181.7	27.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	67.475	0.540	125.0	0.081	1.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	72.772	0.428	170.0	0.065	0.00	0.0	0.600		o	300	Pipe/Conduit	
S4.002	26.924	0.377	71.4	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.004	75.631	0.252	300.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.005	75.631	0.252	300.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.006	30.770	0.103	300.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.007	13.874	0.046	301.6	0.000	0.00	0.0		0.030	→_/		Pond/Tank	
S1.008	20.205	0.067	301.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.009	4.820	0.020	241.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	1.96	5.750	0.081	0.0	0.0	0.0	1.17	46.5	11.0
S4.001	50.00	2.97	5.135	0.146	0.0	0.0	0.0	1.20	85.0	19.8
S4.002	50.00	3.21	4.707	0.146	0.0	0.0	0.0	1.86	131.7	19.8
S1.004	49.84	4.61	4.255	0.352	0.0	0.0	0.0	0.90	63.8	47.5
S1.005	44.39	6.01	4.003	0.352	0.0	0.0	0.0	0.90	63.8	47.5
S1.006	42.54	6.57	3.751	0.352	0.0	0.0	0.0	0.90	63.8	47.5
S1.007	42.17	6.70	3.648	0.352	0.0	0.0	0.0	1.89	27270.7	47.5
S1.008	41.07	7.07	3.602	0.352	0.0	0.0	0.0	0.90	63.6	47.5
S1.009	40.84	7.15	3.535	0.352	0.0	0.0	0.0	1.01	71.3	47.5

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	5.500	3.515	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Simulation Criteria for Storm

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.381		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S17, DS/PN: S1.009, Volume (m^3): 4.8

Unit Reference	MD-SHE-0070-3000-2000-3000
Design Head (m)	2.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	70
Invert Level (m)	3.535
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	3.0
Flush-Flo™	0.310	2.2
Kick-Flo®	0.630	1.8
Mean Flow over Head Range	-	2.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.6	7.000	5.4
0.200	2.1	1.400	2.5	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.1	8.000	5.7
0.400	2.2	1.800	2.9	4.500	4.4	8.500	5.9
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.1	5.500	4.8	9.500	6.2
0.800	2.0	2.400	3.3	6.000	5.0		
1.000	2.2	2.600	3.4	6.500	5.2		

Storage Structures for Storm

Tank or Pond Pipe: S1.007

Manning's N 0.030 Invert Level (m) 3.648

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	18.0	1.852	198.5

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.381
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+0%					5.703
S1.001	S2	15 Summer	1	+0%					5.504
S1.002	S3	15 Winter	1	+0%	100/15 Summer				4.931
S2.000	S4	15 Summer	1	+0%	100/15 Summer				5.691
S3.000	S5	15 Summer	1	+0%	100/15 Summer				5.691
S2.001	S6	15 Summer	1	+0%	100/15 Summer				5.638
S2.002	S7	15 Summer	1	+0%	100/15 Summer				5.592
S1.003	S8	15 Winter	1	+0%	30/15 Summer				4.536
S4.000	S9	15 Summer	1	+0%	100/15 Summer				5.843
S4.001	S10	15 Summer	1	+0%	100/15 Winter				5.233
S4.002	S11	15 Summer	1	+0%	100/15 Summer				4.785
S1.004	S12	15 Winter	1	+0%	30/15 Summer				4.427
S1.005	S13	15 Winter	1	+0%	30/15 Summer				4.165
S1.006	S14	120 Winter	1	+0%	1/60 Winter				4.109
S1.007	S15	120 Winter	1	+0%					4.109
S1.008	S16	120 Winter	1	+0%	1/15 Summer				4.109
S1.009	S17	120 Winter	1	+0%	1/15 Summer				4.159

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.247	0.000	0.07			6.6	OK	
S1.001	S2	-0.225	0.000	0.12			11.9	OK	
S1.002	S3	-0.202	0.000	0.23			18.4	OK	
S2.000	S4	-0.109	0.000	0.16			2.2	OK	
S3.000	S5	-0.109	0.000	0.16			2.2	OK	
S2.001	S6	-0.083	0.000	0.36			4.2	OK	
S2.002	S7	-0.093	0.000	0.30			4.4	OK	
S1.003	S8	-0.211	0.000	0.19			20.9	OK	
S4.000	S9	-0.132	0.000	0.31			14.2	OK	
S4.001	S10	-0.202	0.000	0.22			17.8	OK	
S4.002	S11	-0.222	0.000	0.15			17.6	OK	
S1.004	S12	-0.128	0.000	0.57			35.2	OK	
S1.005	S13	-0.138	0.000	0.53			32.4	OK	
S1.006	S14	0.057	0.000	0.21			12.4	SURCHARGED	
S1.007	S15	-1.391	0.000	0.00			10.9	OK	
S1.008	S16	0.207	0.000	0.06			3.3	SURCHARGED	
S1.009	S17	0.324	0.000	0.05			2.2	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.381
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+0%					5.734
S1.001	S2	15 Summer	30	+0%					5.562
S1.002	S3	15 Winter	30	+0%	100/15 Summer				5.018
S2.000	S4	15 Summer	30	+0%	100/15 Summer				5.719
S3.000	S5	15 Summer	30	+0%	100/15 Summer				5.719
S2.001	S6	15 Summer	30	+0%	100/15 Summer				5.690
S2.002	S7	15 Summer	30	+0%	100/15 Summer				5.633
S1.003	S8	15 Winter	30	+0%	30/15 Summer				4.904
S4.000	S9	15 Summer	30	+0%	100/15 Summer				5.915
S4.001	S10	15 Summer	30	+0%	100/15 Winter				5.305
S4.002	S11	15 Summer	30	+0%	100/15 Summer				4.837
S1.004	S12	15 Winter	30	+0%	30/15 Summer				4.767
S1.005	S13	240 Winter	30	+0%	30/15 Summer				4.693
S1.006	S14	240 Winter	30	+0%	1/60 Winter				4.687
S1.007	S15	240 Winter	30	+0%					4.684
S1.008	S16	240 Winter	30	+0%	1/15 Summer				4.684
S1.009	S17	240 Winter	30	+0%	1/15 Summer				4.742

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.216	0.000	0.17			16.3	OK	
S1.001	S2	-0.167	0.000	0.37			35.5	OK	
S1.002	S3	-0.115	0.000	0.66			54.0	OK	
S2.000	S4	-0.081	0.000	0.39			5.5	OK	
S3.000	S5	-0.081	0.000	0.39			5.5	OK	
S2.001	S6	-0.031	0.000	0.86			10.3	OK	
S2.002	S7	-0.052	0.000	0.74			10.8	OK	
S1.003	S8	0.157	0.000	0.41			45.3	SURCHARGED	
S4.000	S9	-0.060	0.000	0.69			31.1	OK	
S4.001	S10	-0.130	0.000	0.57			46.5	OK	
S4.002	S11	-0.170	0.000	0.38			45.1	OK	
S1.004	S12	0.212	0.000	1.30			79.4	SURCHARGED	
S1.005	S13	0.389	0.000	0.31			19.0	SURCHARGED	
S1.006	S14	0.636	0.000	0.32			18.4	SURCHARGED	
S1.007	S15	-0.816	0.000	0.00			18.2	OK	
S1.008	S16	0.782	0.000	0.07			4.1	SURCHARGED	
S1.009	S17	0.907	0.000	0.05			2.3	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.381
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+30%					5.761
S1.001	S2	15 Winter	100	+30%					5.666
S1.002	S3	15 Winter	100	+30%	100/15 Summer				5.620
S2.000	S4	15 Summer	100	+30%	100/15 Summer				5.808
S3.000	S5	15 Summer	100	+30%	100/15 Summer				5.809
S2.001	S6	15 Summer	100	+30%	100/15 Summer				5.770
S2.002	S7	15 Summer	100	+30%	100/15 Summer				5.688
S1.003	S8	15 Winter	100	+30%	30/15 Summer				5.493
S4.000	S9	15 Summer	100	+30%	100/15 Summer				6.387
S4.001	S10	15 Winter	100	+30%	100/15 Winter				5.560
S4.002	S11	15 Winter	100	+30%	100/15 Summer				5.479
S1.004	S12	15 Winter	100	+30%	30/15 Summer				5.349
S1.005	S13	360 Winter	100	+30%	30/15 Summer				5.206
S1.006	S14	360 Winter	100	+30%	1/60 Winter				5.200
S1.007	S15	360 Winter	100	+30%					5.197
S1.008	S16	360 Winter	100	+30%	1/15 Summer				5.197
S1.009	S17	360 Winter	100	+30%	1/15 Summer				5.260

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.189	0.000	0.28			27.4	OK	
S1.001	S2	-0.063	0.000	0.63			60.3	OK	
S1.002	S3	0.487	0.000	0.81			65.7	SURCHARGED	
S2.000	S4	0.008	0.000	0.63			8.9	SURCHARGED	
S3.000	S5	0.009	0.000	0.63			8.9	SURCHARGED	
S2.001	S6	0.049	0.000	1.33			15.8	SURCHARGED	
S2.002	S7	0.003	0.000	1.06			15.4	SURCHARGED	
S1.003	S8	0.745	0.000	0.65			71.5	SURCHARGED	
S4.000	S9	0.412	0.000	1.12			50.4	FLOOD RISK	
S4.001	S10	0.125	0.000	0.92			75.4	SURCHARGED	
S4.002	S11	0.472	0.000	0.48			57.3	SURCHARGED	
S1.004	S12	0.794	0.000	1.65			101.0	SURCHARGED	
S1.005	S13	0.903	0.000	0.36			22.0	FLOOD RISK	
S1.006	S14	1.149	0.000	0.38			21.8	FLOOD RISK	
S1.007	S15	-0.303	0.000	0.00			21.7	OK	
S1.008	S16	1.295	0.000	0.09			4.8	SURCHARGED	
S1.009	S17	1.425	0.000	0.06			2.7	FLOOD RISK	

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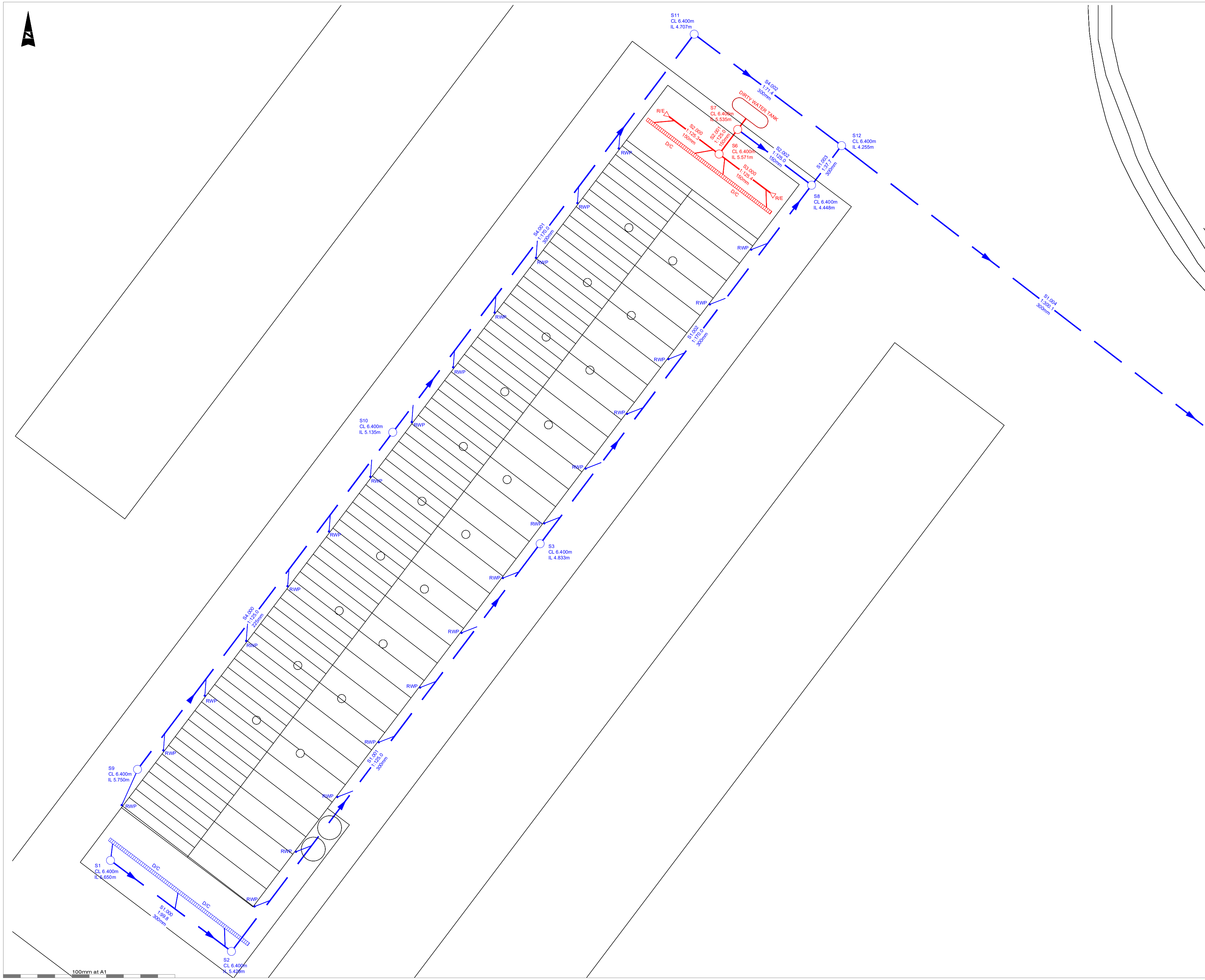
APPENDIX C

Drainage Strategy Drawing



NOTES:

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.
3. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK IS COMMENCED.
4. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTORS SOLE RESPONSIBILITY TO DETERMINE THE ERECTION PROCEDURE AND SEQUENCE AND ENSURE THAT THE BUILDING AND ITS COMPONENTS ARE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS WHICH MAY BE NECESSARY, SUCH MATERIAL REMAINING THE THE PROPERTY OF THE CONTRACTOR ON COMPLETION, AND FOR ENSURING THAT THE WORKS AND ANY ADJACENT PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.

DRAINAGE LEGEND:

(blue dashed line)	SURFACE WATER PIPEWORK
(blue circle)	SURFACE WATER MANHOLE
(red dashed line)	DIRTY WATER PIPEWORK
RWP	RAIN WATER PIPE
D/C	DRAINAGE CHANNEL
R/E	RODDING EYE

Rev	Description	Date	By	Chk	App
P1	FIRST ISSUE	19.07.24	HD	AD	--

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Scarborough T. 01723 865484
Sheffield T. 01142 440077
York T. 01904 611594

Project: Carr Farm, Rimswell, Withernsea

Client: K Fresh Ltd

Drawing: Proposed Drainage Layout (Sheet 1 of 2)

Role: Civil Engineer

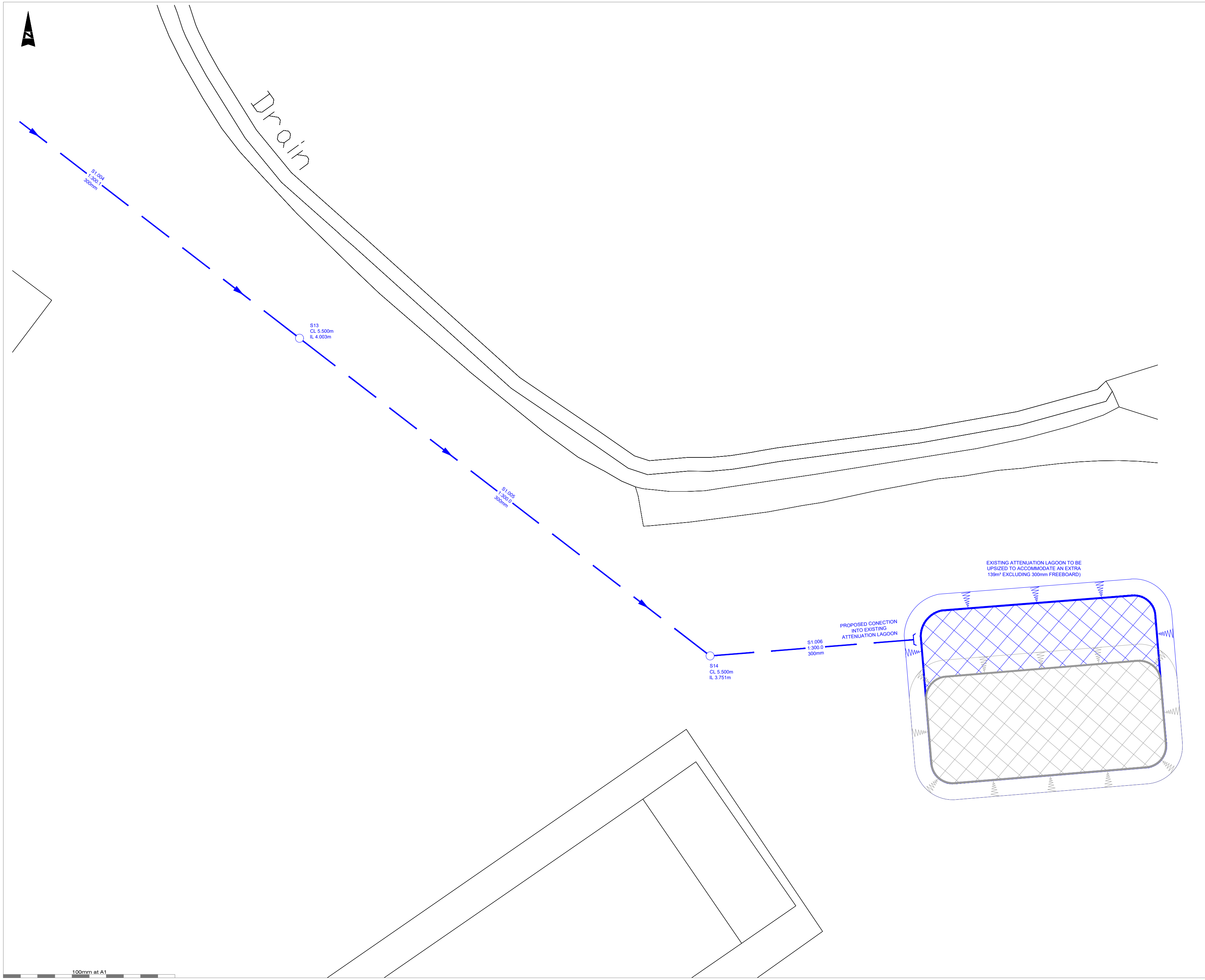
Drawing Status: FOR APPROVAL

Suitability Code: -

Job. no. 51013 | Scale @ A1: 1:250 | Rev. P1

Project - Originator - Volume - Level - Type - Role - Number

CFR - AWP - ZZ - XX - DR - C - 3300



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Project: Carr Farm, Rimswell, Withernsea

Client: K Fresh Ltd

Drawing: Proposed Drainage Layout (Sheet 2 of 2)

Role: Civil Engineer

Drawing Status: FOR APPROVAL

Suitability Code: -

Job. no. 51013 | Scale@ A1: 1:250 | Rev. P1

Project - Originator - Volume - Level - Type - Role - Number

CFR - AWP - ZZ - XX - DR - C - 3301

APPENDIX D

Surface Water Exceedance Flood Routing Drawing

NOTES:

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KEY

= PROPOSED SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

= EXISTING SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

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Project: Carr Farm, Rimswell, Withernsea

Client: K Fresh Ltd

Drawing: Proposed and Existing Surface Water Exceedance

Role: Civil Engineer

Drawing Status: FOR APPROVAL

Suitability Code: -

Job. no. 51013

Scale@ A1: 1:500

Rev. P1

Project - Originator - Volume - Level - Type - Role - Number

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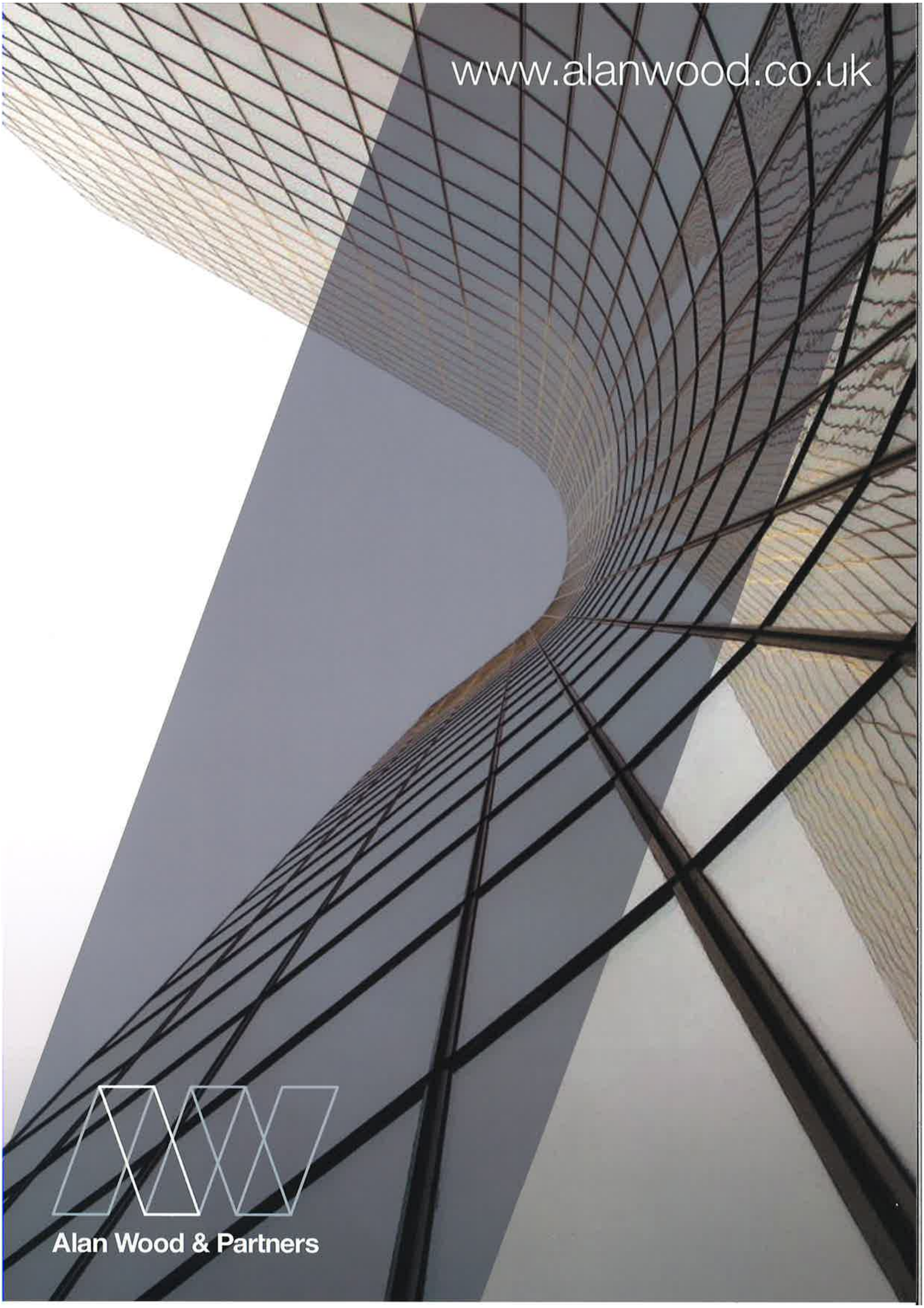
Environmental Accreditation
ISO 14001Registered firm Certificate no.
GB.09/277b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