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Jepco Norfolk House

Farm Salad Storage & Dispatch Upgrade

Gedney Marsh Spalding PE 12 9PB, UK

Drainage Design Assessment

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1. INTRODUCTION

This report has been prepared in support of a planning application for the proposed upgrade of the existing salad storage and dispatch facilities at JE Piccaver & Co's Norfolk House Farm, Gedney Marsh, Lincolnshire.

The proposed development will provide a temperature-controlled crop-intake and administration area, additional chilled storage, a dedicated temperature-controlled dispatch area, tray-return and washing facilities, refrigeration plant rooms, improved internal vehicle access and hardstanding, and surface-water attenuation. The purpose of the scheme is to improve cold-chain integrity, operational efficiency and site circulation; it will not increase crop production, processing throughput or the volume of goods handled at the site.

The assessment considers the drainage systems for the contained upgrade of an established rural food-production facility. It addresses the site's location within Flood Zone 3, the influence of the surrounding Internal Drainage Board network and coastal defences, safe operation and access, flood resilience, surface-water management, attenuation, discharge control, climate-change allowance and the need to avoid increasing flood risk elsewhere. The listed impermeable surfaces total 3,703 m²: 3,273 m² will drain to the proposed overground attenuation area, while the 250 m² intake roof and 180 m² canopy roof will remain on the existing drainage system. The assessment should be read with the submitted drainage layout, access drawing and Appendix A calculations.

- The development should not be at a significant risk of flooding and should not be susceptible to damage due to flooding.
- The development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, is threatened.
- Normal operation of the development should not be susceptible to disruption as a result of flooding.
- Safe access to and from the development should be possible during flood events.
- The development should not increase flood risk elsewhere.
- The development should not prevent safe maintenance of water courses or maintenance and operation of flood defenses.
- The development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined.
- Future users of the development should be made aware of any flood risk issues relating to the development.
- The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.
- The development should not lead to degradation of the environment.
- The development should meet all of the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

This report is undertaken with due consideration of these sustainability aims. The key objectives of this report are:

- to assess the flood risk to the proposed development and to demonstrate the feasibility of appropriately designing the development such that any residual flood risk to the development and its users would be acceptable.
- to assess the potential impact of the proposed development on flood risk elsewhere and to demonstrate the feasibility of appropriately designing the development such that the development would not increase flood risk elsewhere

1.1. Flood Risk Appraisal

The flood-risk assessment has been prepared in accordance with current national planning policy, Planning Practice Guidance on flood risk and coastal change, Environment Agency standing advice, and relevant local planning and Lead Local Flood Authority requirements. The assessment considers both the flood risk to the proposed development and the effect of the development on people, property and flood risk elsewhere. Its scope reflects the scale, nature and location of the proposed works.

This report has been prepared for the sole use of the named client and consequently, is confidential to the client and his professional advisors. The Contracts (Rights of Third Parties) Act 1999 does not apply, nothing in this report confers or purports to confer on any third party any benefit or right. No responsibility whatsoever is accepted to any other person than the named client and, consequently, the contents of this report should not be relied upon by third parties for the whole or any part of its contents.

2. SOURCES OF INFORMATION

General information on the site and local hydrology was obtained from Ordnance Survey mapping, Local Authority information, Environment Agency flood mapping and available Internal Drainage Board information.

3. DESCRIPTION OF THE SITE

3.1. Site Location

JEPKO occupies over 300 hectares of essentially flat and fertile land approximately 2.5km from the Lincolnshire coast and the Wash, an expansive protected area designated as a Special Area of Conservation, Special Protection Area and Site of Special Scientific Interest bordering the site to the North and East.

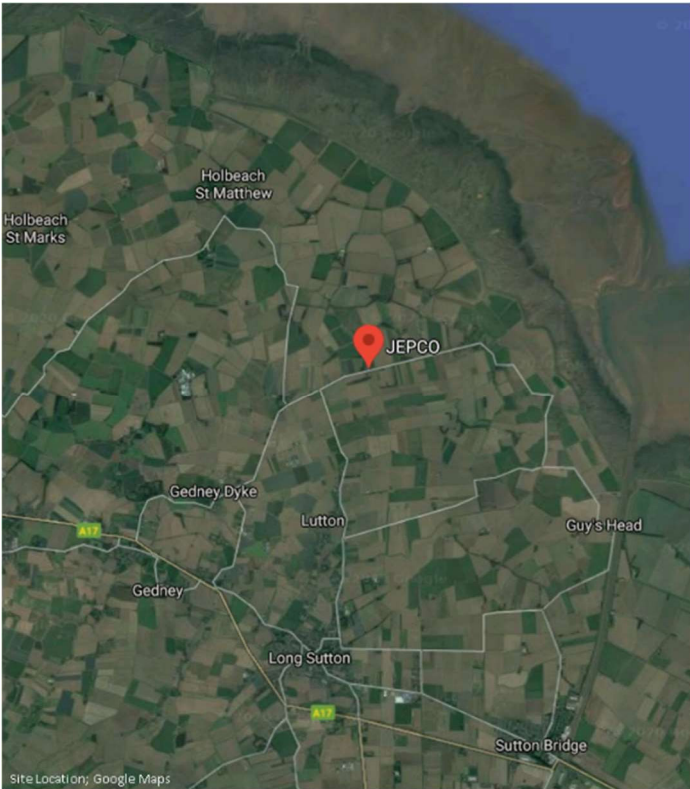


Figure 1 Site Location.

3.2 Site Context

The application site lies within the existing Norfolk House Farm complex on the B1359, between Gedney Drove End and Gedney Dyke. It comprises the existing chill-store and dispatch building on the eastern side of the established operational complex, together with the immediately adjoining land required for the proposed extensions, hardstanding, internal roadway connection and surface-water attenuation.



Figure 2 Existing Site.

The site is used as JEPCO’s main processing facility. It is bounded to the north, east and west by further JEPCO landholdings and to the south by the B1359. The wider holding is essentially flat, lies approximately 2.5 km from the Lincolnshire coast and The Wash, and is served by the local Internal Drainage Board drainage network.

4 PROPOSED DEVELOPMENT

The proposal upgrades the existing salad storage and dispatch operation by enclosing a dedicated chilled crop-intake and product-administration area on the south side of the existing building cluster, providing additional chilled storage within the existing envelope, and creating a separate temperature-controlled dispatch area on the north side. It also includes tray-return and washing facilities, refrigeration plant rooms, truck hardstanding, an internal access roadway and surface-water attenuation.



Figure 3 Proposed Site

Harvested produce will be unloaded directly into the temperature-controlled intake area for administration, quality control and weighing, after which it will remain within controlled conditions throughout storage and handling. At dispatch, refrigerated vehicles will seal against the dedicated loading area so that the cold chain is maintained until the load reaches its destination.

The scheme is a proportionate extension and alteration of an established facility. It is intended to consolidate existing operations and improve product quality, hygiene, resilience and operational efficiency without increasing production or dispatch throughput.

The proposal does not seek a new primary access or the access works associated with the separately approved hydroponic grow-centre development. Its only connection with that scheme is the proposed use of the approved entrance road as an egress route for dispatch vehicles, linked to the upgraded facility by an internal site road.

All vehicle movements associated with the facility already occur as part of JEPCO's established operations. The proposal will not increase staff cars, service vehicles, deliveries or HGV movements above current levels. The internal road and outbound egress arrangement will improve circulation and reduce interaction between departing HGVs and other yard movements without adding trips to the B1359 or wider highway network.

4.1 Proposed Drainage System

The proposed drainage works will manage runoff from the 1,600 m² yard, 480 m² internal road, 645 m² dispatch roof, 288 m² store roof and 260 m² returns-area roof. These surfaces form a 3,273 m² catchment draining to the proposed overground attenuation area and controlled outfall. The 250 m² intake roof and 180 m² canopy roof, totalling 430 m², will remain connected to the existing drainage system, subject to survey confirmation of capacity and lawful outfall. Final storage geometry, discharge-control details, outfall arrangements and maintenance responsibilities shall be confirmed by the detailed drainage design.

- Proposed Attenuation Catchment and Existing-System Roof Drainage

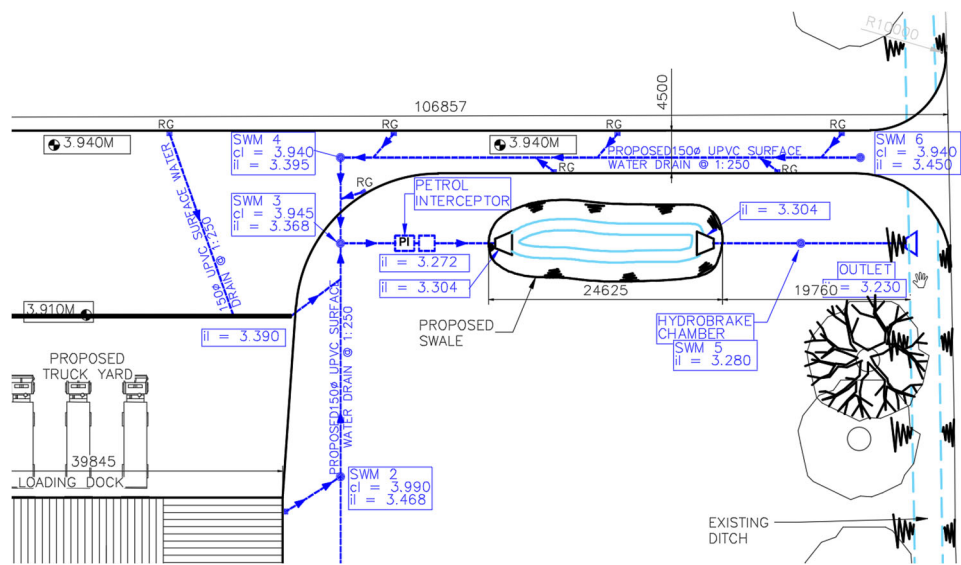
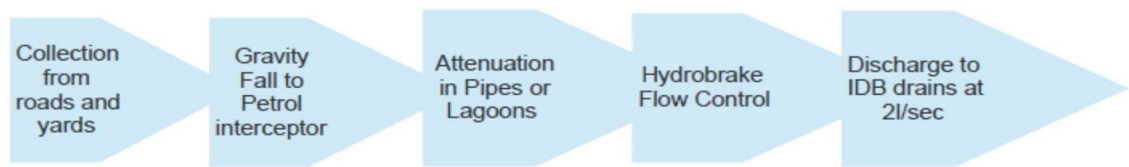


Figure 5 Proposed Roof and Yard Drainage

Runoff from the yard, internal road, dispatch roof, store roof and returns-area roof will be collected by the proposed drainage network and conveyed to the overground attenuation area. Runoff from trafficked surfaces will receive sediment and hydrocarbon treatment appropriate to its pollution risk before attenuation; uncontaminated roof runoff should bypass proprietary hydrocarbon treatment where practicable. The intake and canopy roofs will remain on the existing drainage system and shall not be cross-connected to the proposed attenuation network without capacity checks and recalculation.



The proposed overground attenuation area shall receive runoff from 2,080 m² of yard and road and 1,193 m² of roof, giving a total attenuation catchment of 3,273 m². Discharge shall be restricted by a hydro-brake to 2.0 l/s to the existing IDB drainage ditch, subject to the relevant Internal Drainage Board’s written acceptance and consent requirements. Appendix A reserves a minimum of 451 m³ usable operational storage, with final provision governed by the greater of this value and the verified FEH22 critical-duration model result. The connection between the proposed pipework and the receiving ditch shall incorporate a suitable headwall, erosion protection and, where hydraulically required, a stilling arrangement.

Any grille or debris screen shall be designed to minimise blockage risk and permit safe inspection and maintenance by the site operator. The final arrangement shall be agreed with the relevant Internal Drainage Board.

Treatment Train

The surface-water strategy follows a treatment-train approach in which runoff is managed through a sequence of source control, conveyance, treatment, attenuation and controlled discharge measures. The selected measures shall satisfy the water-quality, water-quantity, amenity, biodiversity, operation and maintenance outcomes set out in the National Standards for Sustainable Drainage Systems and CIRIA C753.

Pollution Control

Runoff from trafficked yard and road surfaces shall receive sediment and hydrocarbon treatment proportionate to the pollution risk before entering the attenuation area. A full-retention petrol interceptor, provisionally identified as a Molloy Aswaclear® NS100, is proposed subject to confirmation by the final contributing-flow assessment and CIRIA Simple Index Approach. Uncontaminated roof runoff should bypass proprietary hydrocarbon treatment where practicable.

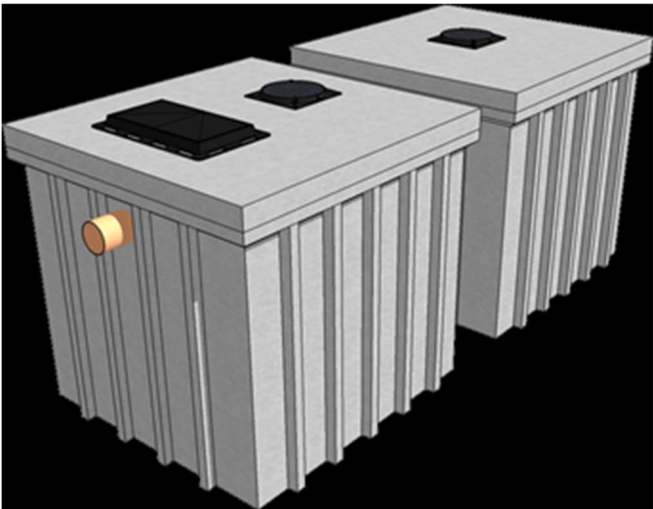


Figure 6 Petrol Interceptor

Attenuation System

The proposed attenuation system will comprise an overground attenuation area sized to manage runoff from the 3,273 m² proposed catchment. Its geometry shall provide at least 451 m³ of usable operational storage below the emergency overflow level, excluding sediment allowance and freeboard, and shall be coordinated with ecological, landscape, access and safety requirements. Final stage-volume data and top-water levels shall be confirmed by the detailed hydraulic model.

- Attenuate runoff from the 480 m² internal road.
- Attenuate runoff from the 1,600 m² yard and the 1,193 m² dispatch, store and returns-area roofs.

For design purposes, the listed impermeable areas are divided by drainage destination as follows:

- Yard and internal road: 2,080 m² draining to the proposed overground attenuation area.
- Dispatch, store and returns-area roofs: 1,193 m² draining to the proposed overground attenuation area.
- Intake and canopy roofs: 430 m² retained on the existing drainage system.

The attenuation catchment will discharge to an overground attenuation area designed to provide the required water quantity, water quality, amenity, biodiversity and maintenance outcomes. The basin layout shall include safe side slopes, maintenance access, freeboard and a defined emergency exceedance route away from buildings, plant, access points and third-party land.

The intake and canopy roofs will continue to discharge through the existing system, subject to survey confirmation that it has adequate capacity and a lawful outfall for the retained 430 m² catchment.

A hydro-brake limiting discharge from the proposed attenuation area to 2.0 l/s at the design head shall be installed at the outfall, as indicated in Figure 7 and the drainage drawings. The selected model, hydraulic curve, blockage risk and maintenance access shall be confirmed at detailed design and agreed with the relevant Internal Drainage Board.



Figure 7 MD 5 Hydro brake

5 FLOOD RISK ASSESSMENT REVIEW

Potential Sources of Flooding — Level 1 Screening Study

It is necessary to consider all forms of flooding for any proposed development. A summary of the potential sources of flooding and a review of the potential risk posed by each source at the application site is presented in Table 1.

TABLE 1 — POTENTIAL RISK POSED BY FLOODING SOURCES			
Potential source	Potential flood risk at application site	Potential source / mechanism	Data source
Fluvial flooding	Yes	Local IDB network	EA
Tidal flooding	Yes	The Wash	EA
Flooding from rising/high groundwater	No reported flooding	Seasonal or extreme-event risk not excluded	EA and ground investigation
Overland flow flooding	Residual risk	Local accumulation if drainage capacity is exceeded	EA and site assessment
Flooding from artificial drainage systems	Residual risk	Blockage, surcharge or system failure	Drainage strategy and Appendix A
Flooding due to infrastructure failure	No specific external source identified	Drainage-system failure addressed through exceedance planning	Site assessment

Fluvial Flooding Sources

A system of local IDB drainage ditches surrounds and drains the site and the adjoining areas.

Tidal Flooding Sources

The site is approximately 2 km from the coast and is therefore potentially exposed to tidal flood risk. The available tidal-hazard mapping indicates that, following a breach of the coastal defences, flood depths at the site may exceed 1.6 m during the 0.5% AEP event and the 0.1% AEP event including climate change.

Groundwater Flooding

Groundwater flooding is most likely in low-lying areas where groundwater levels can rise close to or above ground level. The site-specific assessment therefore considers the available ground-investigation evidence while recognising that short-term



observations do not exclude seasonal or extreme-event groundwater risk.

“Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rock (aquifers).”

Existing ground level at the proposed development site is approximately 3.1 m AOD. The ground-investigation report records layers of silt and clay beneath the topsoil to a depth of approximately 1 m and did not identify groundwater flooding during the investigation. This observation does not, by itself, exclude seasonal or extreme-event groundwater risk.

Flooding from artificial drainage systems

The proposed drainage network will serve the 3,273 m² attenuation catchment comprising the yard, internal road, dispatch roof, store roof and returns-area roof. These flows will be conveyed to the overground attenuation area and discharged at a controlled rate. The 430 m² intake and canopy roofs will remain on the existing drainage system. Detailed design shall demonstrate capacity for both arrangements, including the applicable climate-change allowance, appropriate water-quality treatment and safe exceedance routing.

An emergency overflow and exceedance route shall be defined from the overground attenuation area and directed away from buildings, critical plant, access points and neighbouring land. The overflow level shall be coordinated with finished floor levels, the modelled top-water level and the receiving-ditch level.

Runoff from the 2,080 m² yard and road catchment and the 1,193 m² dispatch, store and returns-area roofs will be collected by the proposed system. Trafficked-surface runoff will receive appropriate treatment before entering the overground attenuation area. Discharge will be limited to 2.0 l/s by the hydro-brake, with at least 451 m³ of usable operational storage reserved at planning stage. The retained 430 m² intake and canopy catchment will continue to use the existing system, subject to capacity and outfall verification.

Overland Flow Flooding

The site is generally flat and is drained by the surrounding IDB network. Although this limits pronounced natural overland flow paths, local surface-water accumulation may still occur if drainage capacity is exceeded or assets become blocked. Final levels and exceedance routes shall therefore direct exceptional flows away from buildings, plant, access points and neighbouring land.

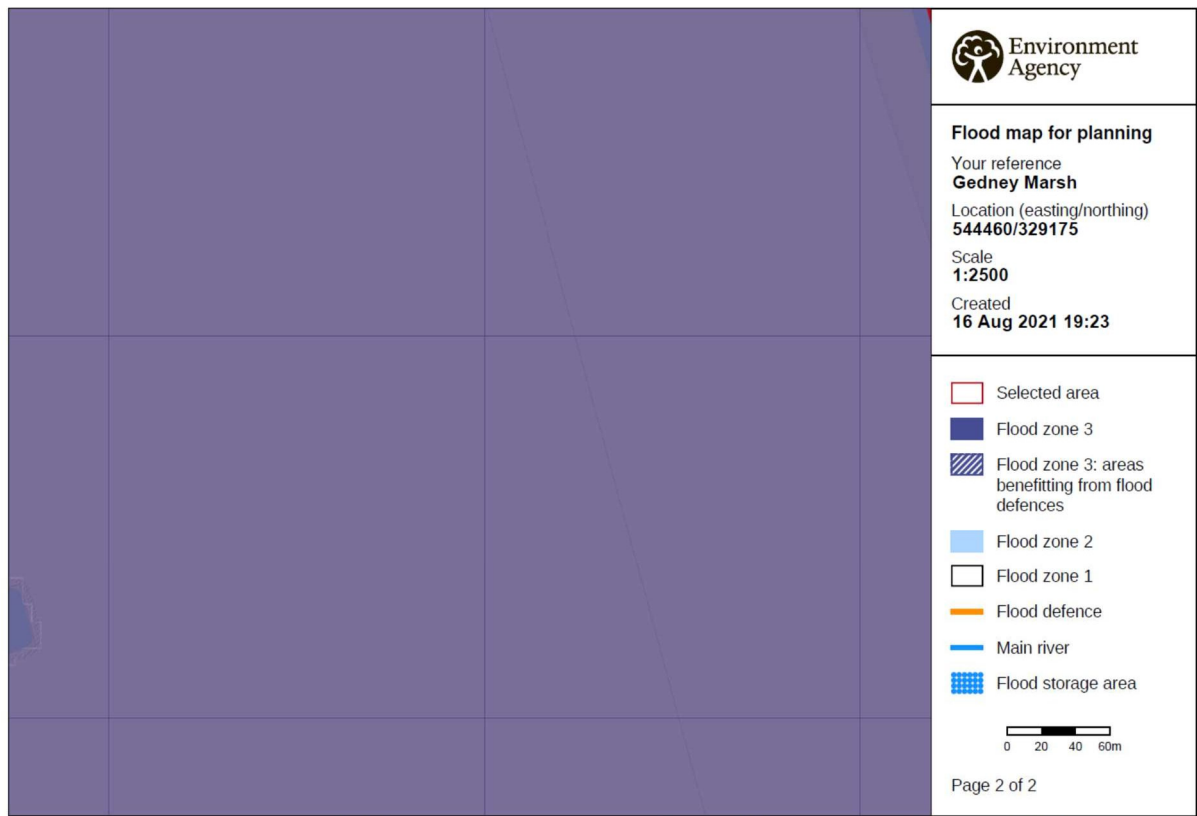
Flooding due to infrastructure failure

Research into the site infrastructure and that of adjoining developments have indicated that there is no infrastructure present which could pose a flood risk. Therefore, infrastructure failure is only considered as part of the surface water back up plan, see 7.1.

Environment Agency Flood Map

A review of the Environment Agency flood map, reproduced as Figure 8 and supported by the mapping included with the submission, indicates that the application site lies within Flood Zone 3.

The Environment Agency mapping indicates that the site lies within Flood Zone 3. The report therefore considers both fluvial and tidal mechanisms, including the local IDB drainage network, The Wash and the residual risk associated with the coastal defences. The applicable flood-zone classification and development requirements are summarised in Table 2.



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Figure 8 Environment Agency Flood Map

The Environment Agency’s flood-zone definitions identify land according to the annual probability of river and sea flooding. These definitions inform the application of the Sequential Test and, where required, the Exception Test under current national planning policy.			
Flood Zone	Probability	Explanation	Appropriate Land use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types are generally acceptable.
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development types are generally acceptable. Exception and Sequential test may be required.
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	Some development types are not acceptable. Exception test may be required.
Zone 3b	Functional Floodplain'	This zone comprises land where water has to flow or be stored in times of flood	Some development types not acceptable, Exception may be required.

Existing and Planned Flood Defence Measures

The entire area is protected by Environment Agency Sea flood defences from the Wash.

Current Flood Risk

The site lies within Flood Zone 3 and is potentially exposed to both tidal and fluvial flood mechanisms associated with The Wash, coastal defences and the local drainage network. The relative contribution of each source and the residual risk following defence breach or overtopping shall be confirmed from the current Environment Agency and local flood-risk evidence.

Therefore, the site as a whole has a high probability of flooding, and a Sequential test is required to assess the suitability of development on the site.

Table D.3²²: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	x	Exception Test required	✓
	Zone 3b ‘Functional Floodplain’	Exception Test required	✓	x	x	x

Key:
✓ Development is appropriate
x Development should not be permitted

The proposed agricultural storage and distribution use is classified as less vulnerable. Subject to confirmation of the applicable flood-zone classification, the Sequential Test and any other requirements of current national planning policy and local flood-risk guidance, this vulnerability classification may be appropriate within Flood Zone 3a.

The listed policy aims for development in this zone are listed as follows:

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems.
- Relocate existing development to land in zones with a lower probability of flooding.
- Create space for flooding to occur by restoring functional flood plain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage

In addition, within the development it must be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.
- The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.
- It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate.
- Any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Compliance with these requirements is demonstrated by the proposed drainage strategy described in Section 4.1 and Appendix A. The listed impermeable surfaces total 3,703 m². The 3,273 m² proposed attenuation catchment comprises 2,080 m² of yard and road and 1,193 m² of dispatch, store and returns-area roofs; the 430 m² intake and canopy roofs remain on the existing drainage system. A minimum of 451 m³ of usable operational attenuation storage is reserved for the 1% AEP planning event with the stated 40% climate-change allowance, subject to confirmation by the final site-specific FEH22 critical-duration model.

Runoff will be retained within the drainage system and released to the existing Internal Drainage Board ditch through a hydro-brake limited to 2.0 l/s. This will control the rate of discharge from the development and avoid increasing flood risk within the receiving drainage network.

The proposed pipework network will collect runoff from the yard, internal road, dispatch roof, store roof and returns-area roof. Runoff from trafficked surfaces will receive appropriate pollution treatment before entering the overground attenuation area, while uncontaminated roof runoff should bypass proprietary hydrocarbon treatment where practicable. The intake and canopy roofs will remain on the existing drainage system. Safe exceedance routes will direct exceptional flows away from buildings, plant, access points and neighbouring land.

The administration areas, occupied workspaces, refrigeration plant and electrical or control equipment are the most flood-sensitive elements of the proposal. Finished floor levels and external thresholds shall be coordinated with the verified flood levels and drainage exceedance routes, while critical services and controls shall be located above the relevant design flood level wherever practicable.

Flood-resilient detailing shall be incorporated at vulnerable openings and around critical plant. Refrigeration, electrical and control equipment shall be mounted on suitably elevated plinths or at high level, and materials below the design flood level shall be selected to facilitate safe cleaning, drying and rapid reinstatement following an extreme event.

The adopted planning-stage attenuation volume and the associated design criteria are set out in Appendix A.

Design Basis: 1% AEP Event plus 40% Climate Change

The planning-stage calculation adopts 100% runoff from the 3,273 m² proposed attenuation catchment, a 40% climate-change uplift, a restricted discharge of 2.0 l/s and a conservative 60-minute rainfall depth of 91 mm. On this basis, the calculated minimum operational attenuation provision is 451 m³. This value is a preliminary storage reservation rather than a final design volume and shall be superseded where the verified FEH22 critical-duration model produces a larger requirement.

Accordingly, the proposed drainage system provides a robust planning-stage basis for managing runoff from the attenuation catchment without increasing the rate of discharge to the local IDB network. Final construction design shall verify the existing-system capacity for the retained 430 m² catchment, the critical storm duration, site-specific FEH22 rainfall, the applicable management-catchment climate-change allowance and the 2.0 l/s flow-control performance. The greater of 451 m³ and the verified modelled storage requirement shall be provided.



6 CONCLUSIONS

This Drainage Design Assessment has been prepared in accordance with current national planning policy, Environment Agency standing advice and the relevant local flood-risk and drainage requirements.

The application site lies within Flood Zone 3 and benefits from the wider system of coastal flood defences and Internal Drainage Board watercourses. The proposal is an upgrade of an established agricultural food-storage and distribution use and does not introduce a more vulnerable land use.

The development will add and alter roof and hardstanding areas associated with the crop-intake building, chilled store, dispatch area, tray-return and washing facilities, refrigeration plant rooms and internal vehicle route. The listed impermeable surfaces total 3,703 m². The yard, road, dispatch roof, store roof and returns-area roof, totalling 3,273 m², will drain to the proposed overground attenuation area; the 250 m² intake roof and 180 m² canopy roof will remain on the existing drainage system, subject to capacity and outfall verification.

The proposal will not increase production throughput or vehicle movements. Use of the previously approved entrance road solely as an outbound route for dispatch vehicles will improve internal circulation without changing traffic generation or the wider highway drainage context.

Appendix A provides the planning-stage attenuation calculation for the 3,273 m² proposed catchment and a restricted discharge of 2.0 l/s. On the conservative design basis stated there, a minimum usable operational storage volume of 451 m³ is to be provided within the overground attenuation area. Detailed design shall confirm the site-specific FEH22 depth-duration-frequency rainfall, the applicable Environment Agency management-catchment climate-change allowance, the critical storm duration, the existing-system capacity for the retained 430 m² roof catchment and the relevant IDB consent requirements; storage shall be increased if verification produces a larger requirement.

The development is expected to result in limited displacement of floodwater. The final design shall demonstrate that the building footprint, external levels, attenuation area and exceedance routes do not materially alter flood storage or conveyance or increase flood risk upstream or downstream of the site.

The development has no impact on fluvial or coastal morphology, even after increases in runoff and sea level as a result of long-term climate change are taken into consideration.

The proposed drainage strategy is intended to avoid increasing downstream flood risk or exacerbating existing drainage constraints. This conclusion is subject to verification of the final hydraulic model, the 2.0 l/s discharge control, receiving-ditch levels and capacity, the existing drainage system serving the retained 430 m² roof catchment, and all required approvals and consents identified in Appendix A.

Appendix A – Surface-Water Attenuation Calculation

Purpose and status. This appendix presents a conservative planning-stage attenuation check for the proposed combined roof, yard and road drainage system at Norfolk House Farm, Gedney Marsh, Lincolnshire. The measured impermeable areas listed below total 3,703 m². Of this, 3,273 m² will drain to the proposed overground attenuation area; the 250 m² intake roof and 180 m² canopy roof (430 m² combined) will remain connected to the existing drainage system. This appendix establishes a minimum planning-stage storage reservation but is not a substitute for the final drainage model. Before construction, the designer shall rerun the proposed system using purchased site-specific FEH22 depth-duration-frequency rainfall, the confirmed Environment Agency peak-rainfall allowance for the relevant management catchment, surveyed levels, the selected storage geometry and the manufacturer's hydraulic characteristics for the flow-control device.

Table A1 – Impermeable area schedule and drainage destination

Ref.	Category	Area / element	Dimensions	Calculated area	Drainage destination	Included in attenuation model
1a	External hardstandings and roads	Yard area	40 m × 40 m	1,600 m ²	Proposed overground attenuation area	Yes
1b	External hardstandings and roads	Road	80 m × 6 m	480 m ²	Proposed overground attenuation area	Yes
1	External subtotal	Yard and road	—	2,080 m²	Proposed overground attenuation area	2,080 m²
2a	Roofs	Dispatch	43 m × 15 m	645 m ²	Proposed overground attenuation area	Yes
2b	Roofs	Store	24 m × 12 m	288 m ²	Proposed overground attenuation area	Yes
2c	Roofs	Returns area	20 m × 13 m	260 m ²	Proposed overground attenuation area	Yes
2d	Roofs	Intake area	25 m × 10 m	250 m ²	Existing drainage system	No
2e	Roofs	Canopy	60 m × 3 m	180 m ²	Existing drainage system	No
2	Roof subtotal	All listed roofs	—	1,623 m²	1,193 m ² proposed attenuation; 430 m ² existing system	1,193 m²
—	Overall listed impermeable area	External areas plus roofs	—	3,703 m² (0.3703 ha)	Split between proposed and existing systems	—
—	Proposed attenuation catchment	Yard, road, dispatch, store and returns area	—	3,273 m² (0.3273 ha)	Proposed overground attenuation area	3,273 m²
—	Existing-system catchment	Intake area and canopy	—	430 m² (0.0430 ha)	Existing drainage system	Excluded

Table A2 – Design criteria, statutory bodies and governing documents

Design matter	Criterion / requirement	Body / consultee	Document / approval basis
Drainage hierarchy and SuDS outcomes	Manage runoff as close to source as practicable; demonstrate water quantity, water quality, amenity, biodiversity, construction, operation and maintainability outcomes.	Local Planning Authority; Lincolnshire County Council as Lead Local Flood Authority; Defra	National Standards for Sustainable Drainage Systems (2025); National Planning Policy Framework; Planning Practice Guidance: Flood Risk and Coastal Change; local planning and LLFA drainage guidance.
Design storms and flood	No surface-water flooding for the 3.33% AEP event; contain the 1%	Lead Local Flood Authority; Local	National Standards for SuDS; Planning Practice Guidance;

performance	AEP event plus the applicable climate-change allowance within the drainage system and designated attenuation area, without flooding buildings or increasing off-site risk.	Planning Authority; Environment Agency where consulted	Environment Agency flood-risk-assessment climate-change allowances.
Rainfall and climate change	Use site-specific FEH22 depth-duration-frequency rainfall; test the relevant management-catchment central and upper-end peak-rainfall allowances for the scheme lifetime and adopt the allowance agreed with the reviewing authority.	Environment Agency; Lead Local Flood Authority	Environment Agency Flood Risk Assessments: Climate Change Allowances and Peak Rainfall Climate Change Allowances by Management Catchment; FEH22 rainfall data.
Discharge rate and receiving watercourse	Restrict discharge to 2.0 l/s at design head, subject to written acceptance by the relevant Internal Drainage Board. Confirm receiving-ditch levels, outfall invert, headwall, erosion protection, flap valve if required and access for maintenance.	Relevant Internal Drainage Board; Environment Agency if the receiving channel is Main River	Land Drainage Act 1991; relevant IDB byelaws, consent requirements and discharge policy; Environmental Permitting Regulations where applicable.
Attenuation storage	Model the 3,273 m ² proposed catchment only. Provide the larger of the planning-stage reservation in this appendix and the final critical-duration model result. Usable volume shall exclude sediment, inaccessible volume, structural displacement and freeboard.	Lead Local Flood Authority; Local Planning Authority; relevant Internal Drainage Board	National Standards for SuDS; CIRIA C753 The SuDS Manual; approved drainage strategy and hydraulic model.
Water quality	Apply a treatment train proportionate to pollution risk. Trafficked yard and road runoff shall receive appropriate sediment and hydrocarbon treatment before attenuation; uncontaminated roof runoff should bypass proprietary hydrocarbon treatment where practicable.	Lead Local Flood Authority; Environment Agency; Local Planning Authority	National Standards for SuDS; CIRIA C753, including the Simple Index Approach; environmental-permitting requirements where polluting discharge risk exists.
Existing drainage retained	Confirm by survey that the existing system has capacity and a lawful outfall for the 250 m ² intake roof and 180 m ² canopy roof. These 430 m ² are excluded from the proposed attenuation model and shall not be cross-connected without recalculation.	Site owner; drainage designer; Local Planning Authority / Lead Local Flood Authority as required	Existing drainage records and CCTV/topographical survey; Building Regulations Approved Document H; planning conditions and approved drawings.
Exceedance, levels and safety	Define safe exceedance routes away from buildings, plant, access points and third-party land. Coordinate finished floor levels, thresholds, pond top-water level, emergency overflow and receiving-water level. Provide safe side slopes, access and warning measures appropriate to the overground basin.	Lead Local Flood Authority; Local Planning Authority; site operator	National Standards for SuDS; CIRIA C753; site health-and-safety risk assessment and landscape/ecology requirements.
Adoption, operation and maintenance	Identify the owner and maintaining party for every asset; provide inspection frequencies, sediment and vegetation management, interceptor servicing, flow-control inspection, emergency response and long-term funding/access	Site owner/operator; Lead Local Flood Authority; relevant Internal Drainage Board; any adopting authority	National Standards for SuDS; CIRIA C753; manufacturers' instructions; approved operation and maintenance plan; IDB consent conditions.

arrangements.		
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A1. Calculation Method

The preliminary storage requirement is calculated by the rational volumetric difference method. For the proposed attenuation catchment area $A = 3,273 \text{ m}^2$, storm depth P (mm) and duration t (hours): gross runoff volume $= A \times P \div 1,000$; climate-adjusted runoff volume $= A \times P \times 1.40 \div 1,000$; permitted discharge volume $= 2 \times 3,600 \times t \div 1,000 = 7.2t \text{ m}^3$; and required active storage $=$ climate-adjusted runoff volume minus permitted discharge volume. The 430 m^2 intake and canopy catchment is excluded because it remains on the existing drainage system.

Worked 60-minute design event: baseline rainfall depth $= 91 \text{ mm}$; climate-adjusted depth $= 91 \times 1.40 = 127.4 \text{ mm}$. Gross runoff volume $= 3,273 \times 0.1274 = 416.98 \text{ m}^3$. Permitted discharge during 1 hour $= 2 \text{ l/s} \times 3,600 \text{ s} \div 1,000 = 7.20 \text{ m}^3$. Net active storage $= 416.98 - 7.20 = 409.78 \text{ m}^3$. Applying a 10% planning contingency gives $409.78 \times 1.10 = 450.76 \text{ m}^3$, rounded up to **451 m³ minimum operational storage**.

Storage provision: provide not less than 451 m^3 of usable attenuation volume below the overflow level for the $3,273 \text{ m}^2$ proposed catchment. This is active water-storage volume and excludes sediment sumps, benching, inaccessible volume, structural displacement and freeboard. If a pond is used, freeboard shall be provided above the modelled 1% AEP plus climate-change water level. The final provision shall be the greater of 451 m^3 and the verified critical-duration hydraulic-model requirement.

Table A3 – Sensitivity check for alternative rainfall depths

Baseline 1% AEP depth	Climate-adjusted runoff	Outflow during storm	Net storage before contingency
80 mm over 1 hour	366.58 m ³	7.20 m ³	359.38 m ³
91 mm over 1 hour	416.98 m ³	7.20 m ³	409.78 m ³
100 mm over 1 hour	458.22 m ³	7.20 m ³	451.02 m ³

A2. Detailed Design and Acceptance Criteria

- The drainage model shall test summer and winter design storms across a sufficient duration range to identify the governing storage volume, including short-duration peaks and long-duration volume events.
- No flooding shall occur from the drainage system in the 3.33% AEP event. The 1% AEP event, including the applicable climate-change allowance, shall be contained within the drainage system and designated storage without flooding buildings, blocking safe access or increasing flood risk off site.
- The flow-control structure shall limit discharge to 2.0 l/s at the design head. A protected bypass or exceedance route shall not permit uncontrolled discharge below the defined emergency overflow level.
- The adopted hydro-brake model, design head, orifice equivalent, minimum opening, blockage risk and maintenance access shall be stated on the drainage drawings and supported by the manufacturer's hydraulic curve.
- The attenuation model shall include only the $3,273 \text{ m}^2$ proposed catchment comprising the yard, road, dispatch roof, store roof and returns-area roof. The 430 m^2 intake and canopy roofs shall remain on the existing drainage system unless capacity checks or later design changes require the model to be revised. Any additional connected impermeable area requires recalculation.
- Runoff from trafficked yard areas shall receive appropriate pollution treatment upstream of attenuation and discharge. Roof runoff should be kept separate from polluted runoff where practicable, or the combined treatment train shall be sized for the full flow.
- An emergency exceedance route shall direct flows away from buildings, plant, access points and third-party land. Finished floor levels, storage top-water level, overflow level and receiving-ditch level shall be coordinated.
- The final submission shall include FEH22 rainfall data, model input and output summaries, critical-duration results, storage stage-volume data, pipe capacity checks, surcharge/flood results, discharge-control details and an inspection and maintenance schedule.

Design conclusion. The listed impermeable surfaces total $3,703 \text{ m}^2$. The proposed overground attenuation area will receive runoff from $3,273 \text{ m}^2$, while the 430 m^2 intake and canopy roofs remain on the existing system. A minimum of 451 m^3 active attenuation storage is reserved for planning on the stated conservative basis. Final construction design shall verify the existing-system capacity, lawful outfalls, the site-specific FEH22 rainfall, the applicable Environment Agency management-catchment and epoch allowance, the critical storm duration, the 2.0 l/s flow-control performance, water-quality treatment and IDB consent requirements. The larger of 451 m^3 and the verified modelled requirement shall govern.