BJ & PM GOODERHAM

LOWER BARN FARM, GARBOLDISHAM

AMMONIA EMISSIONS: IMPACT ASSESSMENT

September 2026

Report Ref: 01.0325.001 v6

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Registered in England and Wales No. 9150373

CONTENTS

1.0 INTRODUCTION

Isopleth Ltd has been commissioned by Harrison Pick Ltd, on behalf of BJ & PM Gooderham, to carry out a detailed assessment of ammonia impacts associated with a proposed extension to an existing poultry operation at Lower Barn Farm, Diss Road, Garboldisham, IP22 2HW. The site lies within Breckland Council.

1.1 Existing Site

Permission for existing 4 house broiler farm was validated on 24th June 2020 and granted on 26th January 2021. This site was in full operation by 2022.

> *3PL/2020/0647/F Erection of four poultry buildings and associated infrastructure. (the application is also accompanied by an Environmental Impact Statement The Town and Country Planning (Environmental Impact Assessment Regulations 2017). Land South of the A1066, Diss Road IP22 2HW*

1.2 Development Proposals

When complete, it is planned that the site capacity will change from:

- 194,000 birds in 4 broiler sheds (48,500 per shed, 38kg/m^2); to
- 274,800 birds in 8 broiler sheds, comprising:
    - 137,400 birds in the existing 4 broiler sheds (34,350 per shed, 30kg/m^2); and
    - 137,400 birds in 4 new broiler sheds (34,350 per shed, 30kg/m^2) fitted with Munters Lavamatic XL scrubbing units.

The reason for the stocking reduction in each of the existing sheds is required to meet the stocking maximum of 'RSCPA assured' higher welfare accommodation for broilers. This also results in benefits in terms of ammonia emissions. The site layout can be seen in Appendix A.

1.3 Report Status

Planning application Reference Number: **PL/2024/1047/FMAJ** for the current development proposals was validated on 15th November 2024. The application was supported with an Environmental Statement prepared by Harrison Pick Ltd and included technical assessments including:

> *BJ & PM Gooderham. Lower Barn Farm, Garboldisham. Ammonia Emissions: Impact Assessment. October 2024. Report Ref: 01.0325.001 v2*

Also:

> *BJ & PM Gooderham. Lower Barn Farm, Garboldisham. Odour Impact Assessment. October 2024. Report Ref: 01.0325.001 v1*

Comments on the application (and technical assessments) were received from Statutory Consultees and third party objectors during 2025 and these are available on the Breckland Council website.

Since the application was validated, there have been changes made to the proposed scheme (including the installation of scrubbers on the new buildings), changes to ammonia assessment guidance and revised emission factors.

This ammonia assessment therefore represents a 2026 update to the earlier October 2024 report, which is now superseded. This assessment also includes information aimed at addressing some of the comments received on the 2024, where they remain relevant.

1.4 Scope and Limitations

An assessment of ammonia impacts against critical levels and critical loads (for nutrient nitrogen) has therefore been completed:

- Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.
- Critical loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

The type, source and significance of potential impacts from the existing and proposed farm layouts have been identified and detailed modelling undertaken in line with Natural England and Environment Agency Guidance.

Predicted ground level concentrations of ammonia and nutrient nitrogen deposition for both site layouts are compared with relevant air quality standards and guidelines for the protection of sensitive habitats and the differences presented.

2.0 APPROACH

2.1 General Approach

Results from detailed dispersion modelling have been interpreted using the following guidance from the Environment Agency (EA) and Natural England (NE):

- Guidance: Intensive farming risk assessment for your environmental permit[1] (22 August 2025); and
- Guidance: Air pollution and development: advice for local authorities[2] (16 October 2025).

The BREEZE AERMOD model has been used. Predicted ground level concentrations of ammonia and nutrient nitrogen are compared with relevant air quality standards and guidelines for the protection of sensitive habitats.

2.2 Consultation

Ms Hayley Dean, Ecological Consultant at Place Services (Essex Couty Council) which provides ecological advice on behalf of Breckland Council, confirmed on 2nd January 2025 that she had reviewed the ammonia assessment and concluded that:

> *'We are satisfied that there is sufficient ecological information available to support determination of this application.'*

Also:

> *'This provides certainty for the LPA of the likely impacts on designated sites, protected and Priority species & habitats and, with appropriate mitigation measures secured, the development can be made acceptable.'*

Natural England stated on 16th December 2024 confirmed that it had no comment to make on this application.

A large number of comments have been received from the general public however these are largely general in nature and can be summarised as general objections to the farming of animals. A specific objection has been raised by the 'Coalition Against Factory Farming' (CAFF), an organisation which describes itself as follows:

> *'We support and empower individuals and communities to go through the process of challenging factory farm applications while moving towards national legislation change.'*
>
> *'Factory farming is one of the most harmful industries on Earth. It causes immense suffering to animals, contributes significantly to climate breakdown, pollutes our air*

[1] https://www.gov.uk/guidance/intensive-farming-risk-assessment-for-your-environmental-permit

[2] https://www.gov.uk/guidance/air-pollution-and-development-advice-for-local-authorities

and water, fuels pandemics, increases the risk of antibiotic resistance and destroys the environment.'

Whilst there is no formal definition for a 'factory farm' it is assumed that this relates to intensive agriculture generally (including those regulated by the Environment Agency, for example).

The CAFF objection, prepared by Dr Michael Bull, states that in relation to ammonia impacts:

'The farm's proximity (2-10 km) to several Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation (SACs), including the Waveney and Little Ouse Valley Fens, is a major concern. The absence of a Habitats Regulations Assessment to evaluate the consequences of ammonia [and particulate deposition] is a critical oversight, rendering the application unacceptable.'

There was no objection relating to the ammonia assessment itself and impacts of ammonia and nutrient nitrogen deposition at the Blo' Norton and Thelnetham Fens SSSI / Waveney & Little Ouse Valley Fens SAC were included.

The assessment methods and inputs used in this January 2026 report are therefore consistent with the earlier ammonia assessment prepared for application PL/2024/1047/FMAJ, with updates as necessary to reflect current guidance and knowledge as well as the updated site layout.

2.3 Critical Levels

Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding UK air quality regulations.

Table 2-1
Ammonia Critical Level

Concentration (µg/m³)	Habitat and Averaging Period
1	Annual mean. Sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity
3	For all higher plants (all other ecosystems)

It is important to note that, as the lower critical level applies only where lichens and bryophytes they form a key part of the ecosystem integrity, it should not be applied at all sites, or even sites where lichens or bryophytes are present.

2.4 Critical Loads

Critical loads are set for the deposition of various substances to sensitive ecosystems. Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with each designated site as derived from the UK Air Pollution Information System (APIS) website[3]. The contribution to critical loads for Nitrogen deposition are recorded as KgN/ha/yr.

Deposition rates were calculated using dispersion modelling results processed by following empirical methods recommended by the Environment Agency in AQTAG and summarised below.

Firstly, calculate dry deposition flux using the following equation:

> *Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)*

The applied deposition velocity for ammonia is 0.020 for grassland and 0.030 for woodland. This may be adapted based on the overall concentration of ammonia as a process contribution however this value is appropriate for concentrations below 10 µg/m^3.

The units are then converted from µg/m^2/s to units of kg/ha/year by multiplying the dry deposition flux by a standard conversion factor for ammonia of 259.7.

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow and is not considered significant over short distances compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered.

2.5 Significance: Interpretation of Results

The results of the assessment may be interpreted as detailed below.

2.5.1 Breckland Council

Breckland Council does not have any guidance for the assessment of ammonia impacts on ecological sites.

2.5.2 Natural England Threshold of Insignificance

The Natural England Guidance released 16th October 2025 presents a five step assessment approach:

- Step 1: check if emissions will reach a protected site;
- Step 2: check relevant 'critical loads' and 'critical levels';
- Step 3: check if agricultural developments can use an emissions reduction approach;

[3] www.apis.ac.uk

- Step 4: consider the proposal in combination with other projects;
- Step 5: completing a detailed air quality assessment.

Importantly, this Guidance defines the Process Contribution of a development:

> *You will need to check the 'process contribution' of each air pollutant the proposal will release. The process contribution is the additional pollution produced as a result of the proposed development.* [my emphasis]

Step 2 of the approach requires that:

> *If the proposal's process contribution is 1% or more of any critical level or load, you will need to continue to:*
>
> - *step 3 if you're assessing an agricultural development*
> - *step 5 for all other developments*
>
> *If the process contribution is under 1% of all critical levels or loads, continue to step 4.*

Step 3 relates to 'emission reduction', which includes factors such as considering whether the current activity on the site causing pollution would continue even if the proposal was not approved.

Step 4 requires that the Joint Nature Conservation Committee (JNCC) 'decision-making thresholds' (DMT) as a reason for not completing an in-combination assessment[4].

The DMT as % of Critical Load/Level:

- NH_3 (lichens/bryophytes): 0.00079 µg/m^3;
- NH_3 (higher plants): 0.0024 µg/m^3;
- N deposition (woodland): 0.013 kg-N/ha/yr; and
- N deposition (grassland): 0.0093 kg-N/ha/yr.

An impact of 0% means that the development will be 'nitrogen neutral' and there will be no change to the existing or future background as a result of the development.

An impact of less than 0% represents a potential 'betterment' in relation to the existing situation. For a designated site where ammonia and / or nutrient nitrogen levels are currently in exceedance of limits the development would therefore be entirely consistent with the conservation objectives for that designated site.

[4] https://jncc.gov.uk/resources/

Once these calculations have been completed and in-combination sources considered:

- If the air pollution caused by all proposals at the protected site combined is above 1% of any critical load or level, continue to step 5.
- If it is below 1% in combination with other proposals, you do not need to complete any further air pollution assessment.

If screening shows you cannot rule out a likely significant effect on a habitats site or adverse effect on a SSSI, a detailed air quality assessment will be required.

2.5.3 EA Screening Thresholds

The EA[5] also presents thresholds for livestock developments in relation to European sites (RAMSAR, SPA and SAC) and SSSIs:

Table 2-2
Ammonia screening thresholds

Nature conservation site designation)	Lower threshold %	Upper threshold %
Special protection areas (SPAs), special areas of conservation (SACs), Ramsar sites	1	No upper threshold
Sites of special scientific interest (SSSIs)	20	50
National nature reserves (NNRs), local nature reserves (LNRs), local wildlife sites (LWS), ancient woodland (AW)	100	100

These screening levels may be interpreted as follows:

- If the simple screening predicts that emissions from a farm will be less than the lower threshold of the relevant critical level or load there is no need to do detailed modelling.
- If the simple screening predicts that ammonia emissions from a farm will be more than the upper threshold of the relevant critical level or load there is a requirement to do detailed modelling.

Where impacts are in the range between lower and upper thresholds, there may be a requirement to consider in-combination sources.

[5] https://www.gov.uk/guidance/intensive-farming-risk-assessment-for-your-environmental-permit

3.0 SITE SETTING AND OPERATIONS

3.1 Site Setting

The proposed new buildings are located adjacent to the existing poultry farm buildings at Lower Barn Farm, Diss Road, Garboldisham, IP22 2HW.

The site access is to the north off the A1066, Diss Road, Garboldisham. Beyond the northern boundary is a mixed plantation woodland/ tree belt. The east, south and west boundaries are defined by mature hedgerows with interspersed matures trees and with dry ditches on the western and eastern boundaries. The location of the site can be seen in Drawing AQ1.

3.2 Description

Permission for existing 4 house broiler farm was validated on 24th June 2020 and granted on 26th January 2021.

> *3PL/2020/0647/F Erection of four poultry buildings and associated infrastructure. (the application is also accompanied by an Environmental Impact Statement The Town and Country Planning (Environmental Impact Assessment Regulations 2017). Land South of the A1066, Diss Road IP22 2HW*

The site operates under an Environmental Permit granted by the Environment Agency (ref: EPR/DP3447QS) in November 2020.

The applicant is now seeking planning permission to increase the number of buildings whilst reducing the stocking density. The broilers will be brought in as day old chicks at a 50-50 mix of males and females. For the comfort and productivity of the birds the temperature within the houses must be regulated. The buildings use high speed ridge fans for ventilation. The fans operate at a variable rate dependent upon the age of the birds and will only be switched off when the sheds are vacant. There is sufficient fan capacity (including back-up systems) to ensure that the comfort of the birds is maintained even in the event that the outside ambient temperature rises above 30ºC. The ammonia emitted from the site will be higher towards the end of the cycle than the start when the birds are small and litter relatively clean. Gable fans on each building will only used as a backup in the event of extreme weather, as required by welfare Regulations.

The new buildings will each be fitted with Munters Reventa Lavamatic XL units, capable of treating the 110,000 m^3/hour of air per building now required for houses stocked at a maximum of 30kg/m^2 (i.e. 34,350 per house).

A technical sheet for the Munters Reventa Lavamatic XL unit is included as Appendix C. The DLG report for this unit states that:

> *In the test, the exhaust air purification system achieved "Lavamatic" achieved a minimum separation efficiency for total dust of 74.3% in winter and 80.3 % in summer. Particulate matter PM_{10} was at least 72.5% in winter and at least 72.8% in summer. Chemical reactions (formation of ammonium sulphate) remove at least 85.1% of*

ammonia in winter and at least 80.5% in summer. In summer, 84.8% and 83.5% of the nitrogen was removed from the system via the wash water (N removal), and 83.2% in winter. The measurement of the aerosol discharge remained unremarkable and fulfilled the requirements of the DLG test framework. The results are summarised in Table 1.

The DLG report therefore shows a significantly greater abatement performance than is required for the DLG test framework, the certification requiring at least 70% mitigation. The modelling assumes that the system will meet the requirements of the DLG 70% target and therefore represents a 'worst case' approach.

3.3 Ecological Receptors

Sites of European interest include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar Sites. Sites of Special Scientific Interest (SSSIs) are of national importance. 'Natural Assets' include as Local Nature Reserves (LNRs), Local Wildlife Sites (LWS) Priority Habitats and Ancient Woodland (AW). The Natural England site screening distance for the existing and proposed sites is 5km for SSSI and 10km for European sites. The following ecological sites are therefore of interest:

Table 3-1
Relevant Ecological Sites

ID	Site		Description
ECO1	Blo' Norton and Thelnetham Fens SSSI / Waveney & Little Ouse Valley Fens SAC	SSSI	M24 - *molinia caerulea - cirsium dissectum* fen meadow
ECO2	Bugg's Hole Fen, Thelnetham	SSSI	*Phragmites Australis - Peucedanum Palustris* Tall-Herb Fen
ECO3	Hopton Fen	SSSI	*Cladium Mariscus* Swamp And Sedge-Beds
ECO4	Redgrave and Lopham Fens	SSSI	*Erica Tetralix - Sphagnum Compactum* Wet Heath
ECO5	Breckland Forest SSSI / Breckland SPA	SSSI / SAC	*Caprimulgus europaeus* (European nightjar)
ECO6	Weston Fen	SSSI	*Alnus glutinosa - Carex paniculata* Woodland
ECO7	Middle Harling Fen	SSSI	*Cynosurus Cristatus - Centaurea Nigra* Grassland
ECO16	Bridgham & Brettenham Heaths / Breckland SAC	SSSI / SAC	*Calluna Vulgaris - Festuca Ovina* Heath

As can be seen in Appendix B, there are no Ancient Woodland sites within 2km.

The existing background ammonia and nutrient nitrogen levels at the ecological receptors have been taken from APIS and are presented below. For nutrient nitrogen the background provided relates to the vegetation type and therefore deposition velocity.

Table 3-2
Baseline Ammonia and Nutrient N

ID	Ammonia ($\mu g/m^3$)	Nutrient N (kgN/ha/yr)
ECO1	2.7	20.8
ECO2	2.6	20.7
ECO3	2.6	21.0
ECO4	2.8	20.8
ECO5	2.6	40.2
ECO6	2.5	38.6
ECO7	2.7	22.1
ECO16	3.0	22.0

Modelling was carried out with discrete receptors representing the ecological sites of interest.

Table 3-3
Ecological Receptor Locations

Receptor	OS Coordinate (Xm)	OS Coordinate (Ym)	Height (m AoD)
ECO1	601582	279142	24.5
ECO2	600724	279159	24.3
ECO3	599284	280097	21.1
ECO4	603972	279391	28.8
ECO5	598976	282748	33.5
ECO6	598700	279079	22.0
ECO7	598864	284692	20.0
ECO16	593717	285673	28.4

The locations of these receptors are shown in Drawing AQ1. The European sites contain multiple SSSI and SSSI sub-units. As such, the features and sensitivity for the relevant SSSI is used in each case, rather than SAC / SPA features that are not present at these locations.

NE guidance requires that baseline levels of pollutants are reviewed to determine if there are any obvious trends. At this site the baseline levels of pollutants show no significant change over the period 2017 – 2021.

Table 3-4
Baseline Pollutant Trends

Year	N Dep (Forest) KgN/Ha/Year	N Dep (Moorland) KgN/Ha/Year	Ammonia $\mu g/m^3$
2021	40.5	21.5	2.8
2020	36.3	20.5	2.5
2019	40.4	22.8	2.7
2018	40.9	23.3	2.8
2017	39.4	22.6	2.6

4.0 ASSESSMENT

Modelling has been completed in line with the requirements of *Guidance on modelling the concentration and deposition of ammonia emitted from intensive farming. Air Quality Modelling and Assessment Unit, 22 November 2010, v3*. The BREEZE AERMOD model has been used.

The model inputs are described below as they relate to the sources, pathway and receptors associated with the existing and proposed developments.

4.1 Scenarios

Two scenarios have been assessed to represent the site proposal and the existing (i.e. baseline) development:

- Scenario 1: 194,000 birds in 4 broiler sheds (48,500 per shed); to
- Scenario 2: 274,800 birds in 8 broiler sheds (34,350), each of the 4 new sheds fitted with Munters Lavamatic XL scrubbers.

4.2 Model inputs: Emissions

The site emissions are as follows for scenario 1. December 2024 DEFRA emissions have been used for broiler birds.

Table 4-1
Scenario 1 Emissions: Existing Buildings

Source	number of birds	emission rate kg/bird/year	Total emission Kg/year	Total emission g/s
Building 1	48500	0.024	1164.0	0.03691
Building 2	48500	0.024	1164.0	0.03691
Building 3	48500	0.024	1164.0	0.03691
Building 4	48500	0.024	1164.0	0.03691
total	**194000**		**4656.0**	**0.14764**

For scenario 2, with the new sheds fitted with Munters Lavamatic XL scrubbers for a further reduction in emissions. One scrubbing unit will be fitted to each new shed, with a maximum flow of 110,000m^3 treated:

- Minimum ammonia reduction of 70% in flows treated through the scrubbers (average of 95% treated); and
- Scrubber bypass of 5% of total flow. This is considered to be a worst case for a broiler house with 34,350 birds per shed in this location.

The site emissions for scenario 2 are shown in Table 4-2 for the existing buildings, with reduced stocking.

Table 4-2
Scenario 2 Emissions: Existing Buildings

Source	number of birds	emission rate kg/bird/year	Total emission Kg/year	Total emission g/s
Building 1	34350	0.024	824.4	0.02614
Building 2	34350	0.024	824.4	0.02614
Building 3	34350	0.024	824.4	0.02614
Building 4	34350	0.024	824.4	0.02614
total	**137400**		**3297.6**	**0.10457**

The site emissions for scenario 2 are shown in Tables 4-3 for the scrubbed flow from the new buildings (95% of total flow, 70% scrubbed):

Table 4-3
Scenario 2 Emissions: New Buildings (Scrubbers)

Source	number of birds	emission rate kg/bird/year	Total emission Kg/year	Total emission g/s
Building 5	32633	0.0072	235.0	0.00745
Building 6	32633	0.0072	235.0	0.00745
Building 7	32633	0.0072	235.0	0.00745
Building 8	32633	0.0072	235.0	0.00745
total	**130530**		**939.8**	**0.02980**

The site emissions for scenario 2 are shown in Tables 4-4 for the bypass flow from the new buildings (5% of total flow, unscrubbed):

Table 4-4
Scenario 2 Emissions: New Buildings (Bypass)

Source	number of birds	emission rate kg/bird/year	Total emission Kg/year	Total emission g/s
Building 5	1718	0.024	41.2	0.00131
Building 6	1718	0.024	41.2	0.00131
Building 7	1718	0.024	41.2	0.00131
Building 8	1718	0.024	41.2	0.00131
total	**6870**		**164.9**	**0.00523**

The mass of ammonia emitted under the proposed layout (4402.3 kg/year) is therefore predicted to be 95% of the existing site (4656.0 kg/year), representing an emissions reduction.

4.3 Layout

The buildings have been modelled as 5.111m and the stack height has been taken as 5.411m. The modelling has therefore assumed that stacks would be 30cm higher than the ridge, which is the minimum that would typically be the case for poultry housing. Assuming this height therefore represents a 'worst case' approach for the dispersion modelling (i.e. greatest downwash influence).

Table 4-5
Modelling Inputs

Stack ID	Height (m)	Efflux Velocity (m/s)
Existing: Ridge	5.411	6.0
Proposed: Ridge	5.411	6.0
Proposed: Scrubber	5.2	4.15

The existing building (EB) ridge stack locations have been modelled as shown below.

Table 46
Existing Buildings: Stack Locations

Stack ID	Location (OS Xm)	Location (OS Ym)	Basal Height (mAoD)
EB1S1	601780.3	281095.8	33
EB1S2	601787.2	281064.9	33
EB1S3	601794.3	281033.9	33
EB2S1	601809.9	281102.4	33
EB2S2	601816.8	281071.5	33
EB2S3	601823.9	281040.5	33
EB3S1	601841.5	281109.3	33
EB3S2	601848.4	281078.4	33
EB3S3	601855.5	281047.4	33
EB4S1	601870.2	281116.2	33
EB4S2	601877.1	281085.3	33
EB4S3	601884.2	281054.3	33

Modelling inputs for the ridge stacks on the new buildings at the Lower Barn Farm site are shown in Table 4-7 below.

Table 4-7
Proposed Buildings: Stack Locations

Stack ID	Location (OS Xm)	Location (OS Ym)	Basal Height (mAoD)
PB1S1	601809.9	280977.4	33
PB1S2	601816.8	280946.5	33
PB1S3	601823.9	280915.5	33
PB2S1	601837.8	280983.8	33
PB2S2	601844.7	280952.9	33
PB2S3	601851.8	280921.9	33
PB3S1	601870.5	280991.8	33
PB3S2	601877.4	280960.9	33
PB3S3	601884.5	280929.9	33
PB4S1	601899.2	280999.3	33
PB4S2	601906.1	280968.4	33
PB4S3	601913.2	280937.4	33

The Munters Lavamatic XL scrubber units buildings have been modelled as 2.289m and the stack height has been taken as 5.2m. The scrubber unit stack locations have been modelled as shown below.

Table 4-8
Scrubbers: Stack Locations

Stack ID	Location (OS Xm)	Location (OS Ym)	Basal Height (mAoD)
B5SC1	601827.4	280893.8	33
B5SC2	601830.9	280894.8	33
B6SC1	601855.8	280900.9	33
B6SC2	601859.4	280901.7	33
B7SC1	601888.1	280908.7	33
B7SC2	601891.6	280909.5	33
B8SC1	601916.4	280915.6	33
B8SC2	601919.9	280916.4	33

4.4 Emission Temperature

The temperature of the flows from the fan units has been assumed at 23ºC, which is at the lower end of the range for the entire cycle (the younger birds will typically be housed at a temperatures above this).

4.5 Topography

Information relating to the topography of the area surrounding the site has been used to assess the impact of terrain features on the dispersion of emissions from the site. Topographical data has been obtained in digital (.ntf) format and incorporated into the assessment.

4.6 Building Effects

The movement of air over and around buildings and other structures generates areas of flow re-circulation that can lead to increased ground level concentrations of pollutants close to the source. Where the stack height is less than 2.5 times the height of any nearby building (within 5 stack heights), downwash effects and entrainment can be significant.

The Lower Barn Farm site details have been provided by the applicant and a detailed dispersion model constructed on this basis.

4.7 Meteorological Data

In accordance with current guidance, 5 years of meteorological data has been used. The site at Tibenham is the closest representative site with a >90% complete data set. The following meteorological data parameters have been used for the site:

- Albedo: 0.2634;
- Bowen Ratio: 0.970; and
- Surface Roughness: 0.2625.

5.0 RESULTS

The results of the modelling assessment are shown below. As described above, Natural England guidance confirms that the 'process contribution' is the additional pollution produced as a result of the proposed development, that being the difference in impacts should a development be approved, or refused.

5.1 Scenario 1: Existing Layout

5.1.1 Ammonia: Critical Level

The dispersion modelling results for the existing site are shown in the tables below.

Table 5-1
Results: Ammonia

ID	Conc (µg/m^3)	Critical Level	% of C.L.
ECO1	0.038	1.0	**3.8%**
ECO2	0.040	1.0	**4.0%**
ECO3	0.022	1.0	**2.2%**
ECO4	0.019	1.0	**1.9%**
ECO5	0.015	3.0	0.5%
ECO6	0.016	1.0	**1.6%**
ECO7	0.010	1.0	1.0%
ECO16	0.003	1.0	0.3%

Impacts from the existing sheds are above 1% of the relevant critical level at the sites with results in bold type.

5.1.2 Nutrient Nitrogen Critical Load

The nutrient nitrogen critical load results for the existing buildings are shown in table 5-2 below.

Table 5-2
Results: N Deposition

ID	kg/ha/yr	Lower C.L	% of C.L.
ECO1	0.196	15.0	**1.3%**
ECO2	0.210	15.0	**1.4%**
ECO3	0.113	15.0	0.8%
ECO4	0.100	5.0	**2.0%**
ECO5	0.117	5.0	**2.3%**
ECO6	0.122	10.0	**1.2%**
ECO7	0.051	10.0	0.5%
ECO16	0.015	5.0	0.3%

As for critical levels, impacts from the existing sheds are above 1% of the relevant critical load at sites with results in bold type. All impacts are however below the EA thresholds for livestock developments as shown in Table 2-2 of this report.

5.2 Scenario 2: Proposed Layout

5.2.1 Critical Level

The dispersion modelling results for the proposed buildings and stocking rate are shown in the table 5-3 below.

Table 5-3
Results: Ammonia

ID	Conc (µg/m^3)	Critical Level	% of C.L.
ECO1	0.035	1.0	**3.5%**
ECO2	0.038	1.0	**3.8%**
ECO3	0.020	1.0	**2.0%**
ECO4	0.018	1.0	**1.8%**
ECO5	0.014	3.0	0.5%
ECO6	0.015	1.0	**1.5%**
ECO7	0.009	1.0	0.9%
ECO16	0.003	1.0	0.3%

As for the baseline scenario, impacts from the existing sheds are above 1% of the relevant critical level at the sites with results in bold type.

5.2.2 Nutrient Nitrogen Critical Load

The nutrient nitrogen critical load results are shown in table 5-4 below.

Table 5-4
Results: N Deposition

ID	kg/ha/yr	Lower C.L	% of C.L.
ECO1	0.184	15.0	**1.2%**
ECO2	0.198	15.0	**1.3%**
ECO3	0.103	15.0	0.7%
ECO4	0.095	5.0	**1.9%**
ECO5	0.108	5.0	**2.2%**
ECO6	0.113	10.0	**1.1%**
ECO7	0.048	10.0	0.5%
ECO16	0.014	5.0	0.3%

Impacts from the existing sheds are above 1% of the relevant critical load at all sites. All impacts are below the EA thresholds for livestock developments as shown in Table 2-2 of this report.

5.3 Scenario Comparison

The impacts for the proposed scheme are comparable with those for the existing site at all ecological receptors, as shown below. These tables show the Process Contribution (the additional pollution produced as a result of the proposed development).

Table 5-5
Difference: Ammonia

ID	Difference (µg/m^3)	Critical Level	% of C.L.
ECO1	-0.0023	1.0	-0.23%
ECO2	-0.0024	1.0	-0.24%
ECO3	-0.0018	1.0	-0.18%
ECO4	-0.0009	1.0	-0.09%
ECO5	-0.0012	3.0	-0.04%
ECO6	-0.0011	1.0	-0.11%
ECO7	-0.0007	1.0	-0.07%
ECO16	-0.0002	1.0	-0.02%

As would be expected given the reduction in total ammonia emissions from the site, there is a betterment in ammonia impacts at all assessed ecological receptor locations.

Table 5-6
Difference: N Deposition

ID	Difference kg/ha/yr	Lower C.L	% of C.L.
ECO1	-0.012	15.0	-0.08%
ECO2	-0.013	15.0	-0.08%
ECO3	-0.009	15.0	-0.06%
ECO4	-0.005	5.0	-0.10%
ECO5	-0.009	5.0	-0.18%
ECO6	-0.009	10.0	-0.09%
ECO7	-0.004	10.0	-0.04%
ECO16	-0.001	5.0	-0.02%

As for ammonia, given the reduction in total ammonia emissions from the site, there is a betterment in nutrient nitrogen deposition at all assessed ecological receptor locations.

As described above, Step 2 of the Natural England approach requires that '*If the process contribution is under 1% of all critical levels or loads, continue to step 4.*' Step 4 requires that the Joint Nature Conservation Committee (JNCC) 'decision-making thresholds' (DMT) as a reason for not completing an in-combination assessment:

> *'.. you should check they have correctly followed the JNCC guidance on decision-making thresholds. If this guidance shows they do not need to complete an in-combination assessment, you do not need to complete further air quality assessment.'*

In this case the Process Contribution will be below the DMT.

6.0 CONCLUSIONS

Isopleth Ltd has been commissioned by Harrison Pick Ltd, on behalf of BJ & PM Gooderham, to carry out a detailed assessment of ammonia impacts associated with a proposed extension to an existing poultry operation at Lower Barn Farm, Diss Road, Garboldisham, IP22 2HW.

When complete, it is planned that the site capacity will change from:

- 194,000 birds in 4 broiler sheds (48,500 per shed); to
- 274,800 birds in 8 broiler sheds (34,350), each of the 4 new sheds fitted with Munters Lavamatic XL scrubbers.

The mass of ammonia emitted under the proposed layout (4402.3 kg/year) is predicted to be 95% of the existing site (4656.0 kg/year), representing an emissions reduction.

The type, source and significance of potential impacts have been identified and detailed modelling undertaken in line with relevant guidance from Natural England and the Environment Agency.

Predicted ground level concentrations of ammonia and nutrient nitrogen deposition are compared with relevant air quality standards and guidelines for the protection of sensitive habitats. The proposed site, with scrubbers and reduced stocking rates in each shed, is predicted to result in a betterment at all assessed receptor locations. The Process Contribution (i.e. the additional pollution from the development proposals) is therefore below the JNCC 'decision-making thresholds' (DMT). For this reason, no further assessment is required, including detailed review of in-combination effects.

DRAWING AQ1

EC016
EC07
EC05
EC03
EC06
EC02
EC01
EC04

NOTES

LEGEND

SITE BOUNDARY

ECOLOGICAL RECEPTOR LOCATION

N
W E
S

BJ & PM Gooderham

SITE
Lower Barn Farm, Diss Road, Garboldisham, IP22 2HW

PROJECT
Air Quality Assessment

DRAWING TITLE
Site Setting and Ecological Receptor Locations

DRAWING NUMBER	REVISION
ECO1	1
SCALE	DATE
1:60000 @ A3	05.01.2026

ISOPLETH

APPENDIX A

[Drawing reproduced courtesy of Harrison Pick Ltd.]

Harrison Pick Ltd
PLANNING CONSULTANTS

Drawing

Proposed Site Plan A1

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Driffield, East Yorkshire, YO25 8NJ

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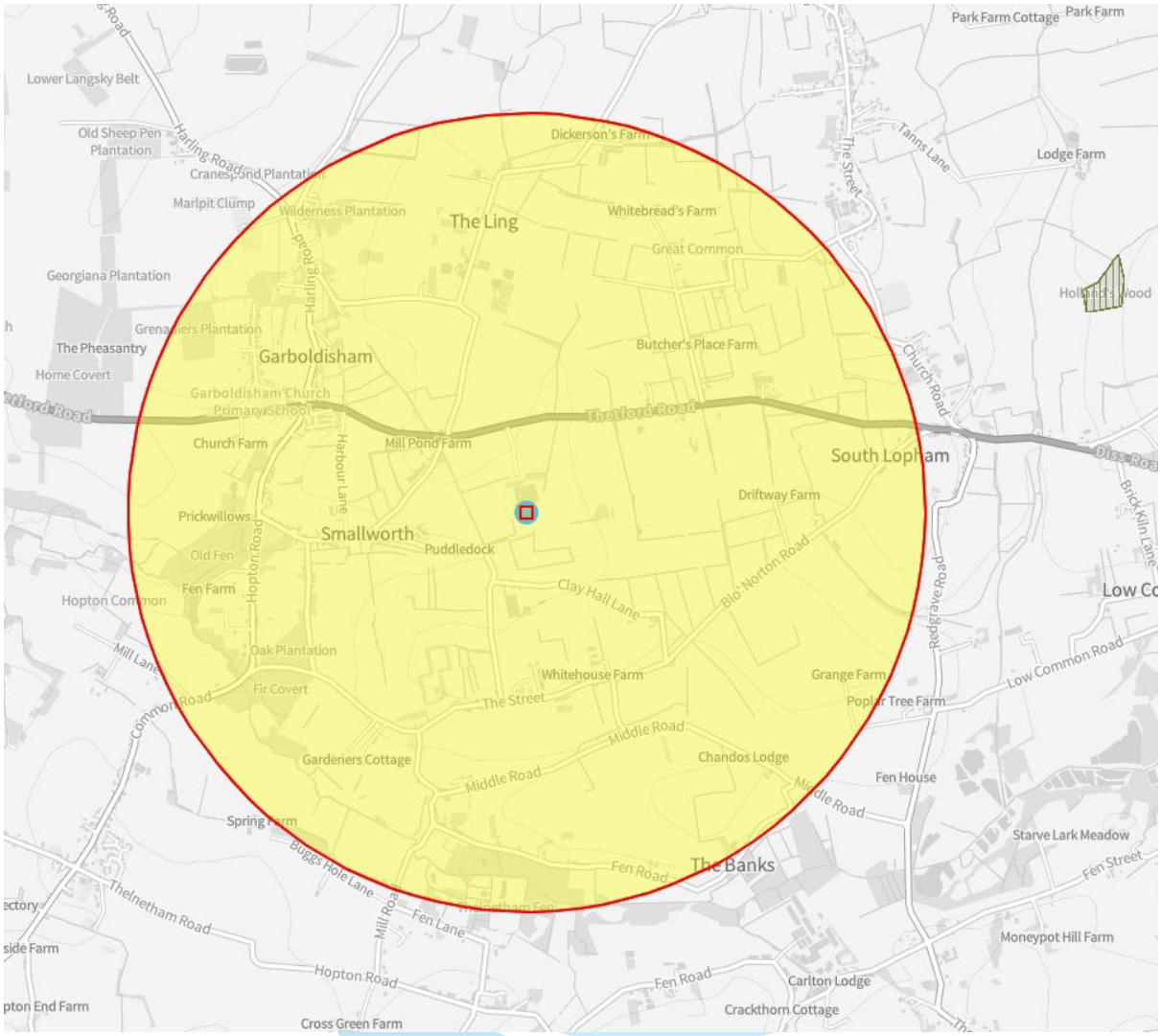
Project

BJ & PM Gooderham - Lower Barn Farm

Scale	1:1000	@ A1
Drw No.	IP/24/LB/03A	Rev: -
Drawn by: IP	Date: Nov 25	

APPENDIX B


Park Farm Cottage
Park Farm
Lower Langsky Belt
Old Sheep Pen Plantation
Harling Road
Cranes Pond Plantation
Marlpit Clump
Wilderness Plantation
The Ling
Dickerson's Farm
Whitebread's Farm
Great Common
Tanns Lane
The Street
Lodge Farm
Georgiana Plantation
Harling Road
Grenadiers Plantation
The Pheasantry
Home Covert
Garboldisham
Butcher's Place Farm
Church Road
Garboldisham Church Primary School
Thetford Road
Church Farm
Mill Pond Farm
South Lopham
Harbour Lane
Driftway Farm
Prickwillows
Smallworth
Puddledock
Old Fen
Hopton Road
Fen Farm
Hopton Common
Clay Hall Lane
Blo' Norton Road
Redgrave Road
Brick Kiln Lane
Low Common Road
Mill Lane
Oak Plantation
Fir Covert
Common Road
Whitehouse Farm
Grange Farm
Poplar Tree Farm
The Street
Middle Road
Gardeners Cottage
Chandos Lodge
Fen House
Middle Road
Spring Farm
Starve Lark Meadow
Bugges Hole Lane
Fen Road
The Banks
Fen Street
Thelnetham Road
Mill Road
Fen Lane
Moneypot Hill Farm
Hopton Road
Fen Road
Carlton Lodge
Crackthorn Cottage
Cross Green Farm

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