Ammonia Assessment

Land at Airfield Farm, Feltwell Farm and Methwold Farm

Client: Crown Chicken Ltd and Wayland Farms Ltd

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Prepared by	Pearl Hutchinson	Pearl Hutchinson		
Position	Associate Director	Associate Director		
Reviewed by	Jethro Redmore	Ger Parry		
Position	Director	Director		
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Serendipity Labs, Building 7, Exchange Quay, Salford, M5 3EP

info@red-env.co.uk | 0161 706 0075 | www.red-env.co.uk

Executive Summary

Redmore Environmental Ltd was commissioned by Crown Chicken Ltd and Wayland Farms Ltd to undertake an Ammonia Assessment in support of an Environmental Permit Variation Application for a pig and poultry installation on land at Airfield Farm, Feltwell Farm and Methwold Farm.

The proposals have the potential to cause changes in pollutant levels at ecological receptors in the vicinity of the site. An Ammonia Assessment was therefore undertaken in order to assess potential effects.

Potential ammonia releases were defined based on the size and nature of the permitted and proposed installations. Impacts at ecological receptors were quantified using dispersion modelling and the results compared with relevant standards.

The results indicated the proposed installation is predicted to reduce pollutant levels at all ecological receptors in the vicinity of the site. Impacts are therefore not considered to be significant and further emission reduction measures are not required.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by to undertake an Ammonia Assessment in support of an Environmental Permit Variation Application for a pig and poultry installation on land at Airfield Farm, Feltwell Farm and Methwold Farm.

1.1.2 The proposed Environmental Permit Variation has the potential to cause changes in pollutant levels at ecological receptors in the vicinity of the site. An Ammonia Assessment was therefore undertaken in order to assess potential effects.

1.2 Site Location and Context

1.2.1 The installation is located on an existing holding occupied by three farms known as Airfield Farm, Feltwell Farm and Methwold Farm. Operations are regulated through an Environmental Permit issued by the Environment Agency (EA) (number: EPR/XP3632QE). This allows for the intensive rearing of the following livestock and their progeny:

- Feltwell Farm - 16,074 production pigs;
- Methwold Farm - 1,360 sows; and,
- Airfield Farm - 4,874 production pigs.

1.2.2 The Environmental Permit also allows for slurry storage in four lagoons referred to as Lagoon A, B, C and D.

1.2.3 An Environmental Permit Variation Application has been submitted to the EA to authorise a change in rearing operations at the farms. The proposed installation comprises:

- Feltwell Farm - Rearing of 14,000 production pigs within 14 livestock houses and associated storage of farmyard manure (FYM) and slurry; and,
- Methwold Farm - Rearing of 870,000 broilers.

1.2.4 Airfield Farm will cease to operate as result of the Environmental Permit Variation.

1.2.5 The Environmental Permit Application Variation Application was submitted in 2023. The EA responded on 3rd May 2024[1] seeking clarification on several points relating to emissions. An Ammonia Assessment[2] was therefore undertaken to address the comments and provide further detailed information relating to ammonia (NH_3) releases and impacts associated with the permitted and proposed installations.

1.3 Report Amendments

1.3.1 The Ammonia Assessment[3] was submitted on 28th June 2024. The EA responded on 22nd July 2024 seeking confirmation of the emission reduction techniques that will be used to minimise NH_3 releases from pig houses at the site with fully slatted floor (FSF) systems. An updated Ammonia Assessment has been undertaken to address the comments and provide further information relating to NH_3 releases from the relevant buildings.

1.3.2 It should be noted that Airfield Farm will be retained in the Environmental Permit in order to provide an area for pig rearing activities during construction of the new buildings at Feltwell Farm. Following completion, operations at Airfield Farm will cease. However, the updated assessment assumed emissions from all three farms which form the proposed installation occur concurrently, as required for regulatory purposes. The methodology and results are provided in the following report.

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[1] EPR/XP3632QE/V003, EA, 2024.

[2] 3894-3r1 - Ammonia Assessment - Land at Airfield Farm, Feltwell Farm and Methwold Farm, Redmore Environmental Ltd, 2024.

[3] 3894-3r1 - Ammonia Assessment - Land at Airfield Farm, Feltwell Farm and Methwold Farm, Redmore Environmental Ltd, 2024.

2.0 METHODOLOGY

2.1 Introduction

2.1.1 The proposals have the potential to cause changes in NH_3 concentrations and nitrogen and acid deposition rates at ecological receptors in the vicinity of the site. An assessment was therefore undertaken in order to assess potential effects. The associated methodology is outlined in the following Sections.

2.2 Dispersion Modelling

2.2.1 Dispersion modelling was undertaken using ADMS-6.0 (v6.0.2.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-6 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

2.2.2 The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

2.3 Modelling Scenarios

2.3.1 The scenarios considered in the dispersion modelling assessment are:

- Permitted Installation - Emissions from the pig rearing houses and slurry lagoons, as well as associated FYM heaps, as authorised in the existing Environmental Permit; and,
- Proposed Installation - Emissions from the pig and poultry rearing houses, slurry lagoons, FYM storage building and FYM heaps, as described in the Environmental Permit Variation Application.

2.3.2 The output parameters summarised in Table 1 were predicted for each scenario.

Table 1   Modelling Scenarios

Parameter	Modelled As	
	Long Term	**Short Term**
NH$_3$	Annual mean	-
Nitrogen deposition	Annual deposition	
Acid deposition	Annual deposition	

2.3.3   Predicted pollutant concentrations were summarised in the following format:

- Permitted Installation Process Contribution (PC) - Predicted pollutant level as a result of emissions from the permitted installation only; and,
- Proposed Installation PC - Predicted pollutant level as a result of emissions from the proposed installation only.

2.3.4   Predicted ground level NH$_3$ concentrations and deposition rate PCs were compared with relevant critical levels and loads.

2.4   Emission Sources

Permitted Installation

2.4.1   There is potential for emissions from the following sources associated with the permitted installation:

- Releases from the pig houses at Feltwell Farm, Methwold Farm and Airfield Farm;
- Releases from four covered slurry lagoons at Feltwell Farm and Methwold Farm; and,
- Releases from FYM heaps at Feltwell Farm and Airfield Farm.

2.4.2   Reference should be made to Figure 1 for the permitted installation emission source locations.

Proposed Installation

2.4.3   There is potential for emissions from the following sources associated with the proposed installation:

- Stacks serving the pig and poultry houses at Feltwell Farm and Methwold Farm, respectively;
- Gale breaker curtains on the pig houses at Feltwell Farm which will be opened during hot weather;
- Releases from the FYM storage building at Feltwell Farm;
- Releases from two covered slurry lagoons at Feltwell Farm; and,
- Releases from the pig houses at Airfield Farm and associated FYM heaps.

2.4.4 As stated previously, operations at Airfield Farm will cease following construction of the new pig and poultry buildings. However, for the purpose of the assessment and to allow Airfield Farm to be retained within the Environmental Permit, it was assumed that releases from all three farms occur concurrently.

2.4.5 Reference should be made to Figure 2 for the proposed installation emission source locations.

2.5 Process Conditions and Emissions

Permitted Installation

Housing

2.5.1 Emission rates for livestock associated with the permitted installation are summarised in Table 2, as provided by the Permitting Consultant for the project based on discussions with the EA.

Table 2 Permitted Installation: NH₃ Emission Rates

Livestock Type	Housing System	Emission Rate (kgNH$_3$/place/year)	Emission Rate Source
Weaners	FSF with vacuum system for frequent slurry removal every 10 weeks, depth less than 800mm	0.43	EA
Growers	Straw	2.00	ADHB
Finishers	FSF with vacuum system for frequent slurry removal every 10 weeks, depth less than 800mm	2.00	EA

Livestock Type	Housing System	Emission Rate (kgNH$_3$/place/year)	Emission Rate Source
Finishers	Straw	2.00	ADHB
Farrowers	FSF/Partly Slatted Floor (PSF) with combination of water and manure channel (FSF/PSF)	2.80	EA
Sows	PSF with reduced manure pit	2.41	EA
Sows	FSF with vacuum system for frequent slurry removal	2.26	EA
Boars	-	5.72	EA

2.5.2   Gross emission rates for the livestock buildings were calculated by multiplying the relevant values provided in Table 2 by the total numbers of animals housed. The results for Feltwell Farm are summarised in Table 3.

Table 3   Permitted Installation: NH$_3$ Emission Rates - Feltwell Farm Housing

Source Reference	Livestock Type	Housing System	Ventilation System	Livestock Numbers	Gross Emission Rate (g/s)
FF1	Growers	Straw	Natural/capped ridge	3,215	0.2039
FF2	Weaners	FSF	Natural/capped fans	4,700	0.0641
FF3	Growers	Straw	Natural/capped ridge	6,429	0.4077
FF4	Weaners	FSF	Natural/capped fans	2,350	0.0320
FF5	Finishers	FSF	Natural/capped fans	2,028	0.1286
FF6	Finishers	FSF	Natural/capped fans	3,120	0.1979
FF7	Finishers	FSF	Natural/capped ridge	1,272	0.0807

2.5.3   The results for Methwold Farm are summarised in Table 4.

Table 4 Permitted Installation: NH₃ Emission Rates - Methwold Farm Housing

Source Reference	Livestock Type	Housing System	Ventilation System	Livestock Numbers	Gross Emission Rate (g/s)
ME1	Farrowers	FSF/PSF	Side ventilation with fans and roof inlets	104	0.0092
ME1	Sows	PSF with reduced manure pit	Side ventilation with fans and roof inlets	262	0.0200
ME1	Boars	-	Side ventilation with fans and roof inlets	10	0.0018
ME2	Farrowers	FSF/PSF	Side ventilation with fans and roof inlets	104	0.0092
ME2	Sows	PSF with reduced manure pit	Side ventilation with fans and roof inlets	262	0.0200
ME3_1	Farrowers	FSF/PSF	Side ventilation with fans and roof inlets	52	0.0046
ME3_1	Sows	FSF with vacuum system	Side ventilation with fans and roof inlets	262	0.0188
ME3_2	Farrowers	FSF/PSF	Side ventilation with fans and roof inlets	52	0.0046
ME3_2	Sows	FSF with vacuum system	Side ventilation with fans and roof inlets	262	0.0188

2.5.4 The results for Airfield Farm are summarised in Table 5.

Table 5 Permitted Installation: NH₃ Emission Rates - Airfield Farm Housing

Source Reference	Livestock Type	Housing System	Ventilation System	Livestock Numbers	Gross Emission Rate (g/s)
AF1	Growers/Finishers	Straw	Natural/capped ridge	2,437	0.1546
AF2	Growers/Finishers	Straw	Natural/capped ridge	2,437	0.1546

2.5.5 Releases from the houses and capped ridge fans at Feltwell Farm were represented by several volume and point sources in the model. The gross emission rate shown in Table 3 was apportioned equally to the houses and fans.

2.5.6 Releases from the houses with capped ridges or side fans were represented by volume sources in the model to represent poor emission dispersion from the structures.

2.5.7 The volume source model input data is summarised in Table 6.

Table 6   Permitted Installation: Volume Source Model Input Data

Source Reference	Source Depth (m)	Source Temp. (°C)	Source Volume (m³)	Modelled Emission Rate (g/m³/s)
FF1	4.5	Ambient	5,684	0.0000359
FF2	3.0	Ambient	6,777	0.0000047
FF3	4.5	Ambient	12,852	0.0000317
FF4	3.0	Ambient	3,050	0.0000053
FF5	3.0	Ambient	4,800	0.0000134
FF6	3.0	Ambient	10,627	0.0000093
FF7	3.0	Ambient	4,049	0.0000199
ME1	3.0	Ambient	4,966	0.0000063
ME2	3.0	Ambient	5,492	0.0000053
ME3_1	3.0	Ambient	3,315	0.0000071
ME3_2	3.0	Ambient	2,922	0.0000080
AF1	3.0	Ambient	5,018	0.0000308
AF2	3.0	Ambient	5,018	0.0000308

2.5.8 The point source model input data is summarised in Table 7.

Table 7   Permitted Installation: Point Source Model Input Data

Source Reference	Number of Sources	Source Height (m)	Source Temp. (°C)	Source Diameter (m)	Efflux Velocity (m/s)	Modelled Emission Rate (g/s)
FF2 1-3	3	4	20	2.0	0.1	0.0107
FF4 1-3	3	4	20	2.0	0.1	0.0053
FF5 1-3	3	4	20	2.0	0.1	0.0214

Source Reference	Number of Sources	Source Height (m)	Source Temp. (°C)	Source Diameter (m)	Efflux Velocity (m/s)	Modelled Emission Rate (g/s)
FF6 1-3	3	4	20	2.0	0.1	0.0330

2.5.9 Emissions from the houses were assumed to be constant 24-hours per day, 365-days per year.

<u>Slurry Lagoons</u>

2.5.10 Releases from the covered slurry lagoons were represented by five area sources in the model. The relevant input data is shown in Table 8.

Table 8   Permitted Installation: Slurry Lagoon Model Input Data

Source Reference	Source Area (m²)	Source Temp. (°C)	EA Emission Rate (kg/m²/year)	Modelled Emission Rate (g/m²/s)
FFLAGA	2,426.5	Ambient	0.56	0.0000178
FFLAGB1	2,050.4	Ambient	0.56	0.0000178
FFLAGB2	1.615.4	Ambient	0.56	0.0000178
MFLAGC	2,153.7	Ambient	0.56	0.0000178
MFLAGD	6,266.0	Ambient	0.56	0.0000178

2.5.11 Emissions from the covered slurry lagoons were assumed to be constant 24-hours per day, 365-days per year.

<u>Manure Heap</u>

2.5.12 Releases from the FYM heaps were represented by three volume sources in the model. The relevant input data is shown Table 9.

Table 9   Permitted Installation: FYM Heap Model Input Data

Source Reference	Source Depth (m)	Source Volume (m³)	FYM (Tonnes)	EA Emission Rate (kg/t/year)	Modelled Emission Rate (g/m³/s)
FMMAN	3.0	599	100	1.49	0.0000079
AFMAN1	3.0	1,950	300	1.49	0.0000073
AFMAN2	3.0	1,500	250	1.49	0.0000079

2.5.13   Emissions from the FYM heaps were assumed to be constant 24-hours per day, 365-days per year.

2.5.14   Reference should be made to Figure 1 for the permitted installation emission source locations.

Proposed Installation - Feltwell Farm and Methwold Farm

<u>Housing</u>

2.5.15 NH_3 emissions rates for the pig and poultry facilities associated with the proposed installation were obtained from the Pre-Application Report[4] provided by the EA on 28th July 2022 and EA guidance[5], respectively.

2.5.16   Heat exchangers will be installed on all broiler sheds. These have the potential to reduce emissions by 27.5%[6]. The EA NH_3 release rate of 0.034kg/NH_3/year was therefore multiplied by a factor of 0.725 to represent reduced emissions as result of the installation of heat exchangers on all poultry buildings.

2.5.17   Releases associated with each livestock category were calculated by multiplying the relevant emission rate by the total numbers of animals housed. The results are summarised in Table 10.

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4   Pre-application Report, EPR/XP3632QE/V003, EA, 2022.

5   Intensive farming: pollution inventory reporting, EA, 2024.

6   VERA Verification Statement, Agro Clima Unit (ACU) Clima+ 200, type 2.5, ETA-Danmark, 2019 .

Table 10   Proposed Installation: Gross NH₃ Emission Rates

Livestock Type	Housing System	Emission Rate (kgNH₃/place/yr)	Livestock Number	Gross Emission Rate (kg/yr)	Gross Emission Rate (g/s)
Finishers	Solid straw based system	2.0	14,000	28,000	0.8878
Broilers	Litter-based system with circulating fans and a heat exchanger	0.02465	870,000	21,446	0.6800

2.5.18   The gross emission rates were apportioned between the number of modelled point sources, which were defined to represent releases from the stacks serving the proposed houses. The results are summarised in Table 11, along with other model input data.

Table 11   Proposed Installation: Stack Model Input Data

Livestock Type	Number of Point Sources	Source Diameter (m)	Source Height (m)	Source Efflux Velocity (m/s)	Source Temp. (°C)	Modelled Emission Rate (g/s)
Finishers	84	0.82	12.25	10.0	20	0.010569931[a]
Broilers	120	0.72	7.5	12.0	22	0.005666936

Note: Reduced to 0gNH₃/s when the ambient temperature is equal to or above 30 °C.

2.5.19   The proposed pig houses feature gale breaker curtains which will be used as air inlets throughout the growing cycle. During hot weather conditions when the ambient temperature is equal to or above 30°C these will be opened further to facilitate cross ventilation and provide cooling to the animals. Emissions during these periods were represented by 28 volume sources in the model. A summary of the inputs is provided in Table 12.

Table 12   Proposed Installation: Gale Breaker Curtain Model Input Data

Livestock Type	Number of Volume Sources	Source Depth (m)	Source Height (m)	Source Volume (m³)	Emission Rate Per Source (g/s)	Modelled Emission Rate Per Source (g/m³/s)(b)
Finishers	28	2.0	3.0	366	0.0317[a]	0.000086639

Note: (a) Derived from 100% of the gross emission rate for finishers in order to provide a worst case assessment of dilution and dispersion of NH_3 from the houses when the temperature is equal to and above 30 °C.

(b) Reduced to 0gNH_3/s when the ambient temperature is below 30 °C.

2.5.20 Emissions from the houses were assumed to be constant 24-hours per day, 365-days per year.

FYM Storage Building

2.5.21 Releases from the FYM storage building were represented by a volume source in the model. The relevant input data is shown in Table 13.

Table 13   Permitted Installation: FYM Storage Building Model Input Data

Source Reference	Source Depth (m)	Source Volume (m³)	FYM (Tonnes)	EA Emission Rate (kg/t/year)	Modelled Emission Rate (g/m³/s)
Manure	4.5	5,684	600	1.49	0.00000498747

2.5.22 Emissions from the FYM storage building were assumed to be constant 24-hours per day, 365-days per year.

Slurry Lagoons

2.5.23 Releases from the covered slurry lagoons were represented by three area sources in the model. The relevant input data is shown in Table 14.

Table 14   Permitted Installation: Slurry Lagoon Model Input Data

Source Reference	Source Area (m²)	Source Temp. (°C)	EA Emission Rate (kg/m²/year)	Modelled Emission Rate (g/m²/s)
FFLAGA	2,426.5	Ambient	0.56	0.0000178
FFLAGB1	2,050.4	Ambient	0.56	0.0000178
FFLAGB2	1.615.4	Ambient	0.56	0.0000178

2.5.24 Emissions from the covered slurry lagoons were assumed to be constant 24-hours per day, 365-days per year.

2.5.25 Reference should be made to Figure 2 for the proposed emission source locations.

Proposed Installation - Airfield Farm

2.5.26 There are 29 volume sources associated with the proposed installation excluding Airfield Farm. These were defined to represent releases from the gale breaker curtains on the new pig houses and the manure storage shed. The maximum number of volume sources that can be included within an ADMS-6 model is 30. As such, in order to predict impacts associated with the operation of all three farms concurrently at relevant receptors, emissions from the rearing buildings and FYM heaps at Airfield Farm were represented by a single volume source.

2.5.27 The pig housing and FYM heap gross emission rates provided in Table 5 and Table 9, respectively, were combined and divided by the source volume in order to define a specific release rate in the model. The results are summarised in Table 15, along with other input data.

Table 15   Proposed Installation: Airfield Farm Model Input Data

Source Reference	Source Depth (m)	Source Volume (m^3)	Gross Emission Rate (g/s)[a]	Modelled Emission Rate (g/m^3/s)
AF1	3.0	18,744	0.3351	0.0000179

(a) Inclusive of emissions from the two pig houses and two FYM heaps on Airfield Farm.

2.5.28 Emissions from Airfield Farm were assumed to be constant 24-hours per day, 365-days per year. Reference should be made to Figure 2 for the source location.

2.6   **Ecological Receptors**

2.6.1   A consultation response prepared by Natural England on 27th May 2021[7] in relation to the planning application for the proposals identified several ecological designations in the vicinity of the site that are sensitive to potential changes in NH$_3$ concentrations as result of emissions associated with pig and poultry rearing operations. These are as follows:

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[7]   353385 EIA Scoping response for Airfield Farm, NE, 2021.

- Breckland Special Area of Conservation (SAC);

- Breckland Special Protection Area (SPA);

- Breckland Farmland Site of Special Scientific Interest (SSSI);

- Breckland Forest SSSI;

- Cranwich Camp SSSI;

- Foulden Common SSSI;

- Gooderstone Warren SSSI;

- Grime's Graves SSSI;

- RAF Lakenheath SSSI;

- Stanford Training Area SSSI;

- The Brinks, Northwold SSSI;

- Wangford Warren and Carr SSSI;

- Weeting Heath SSSI; and,

- Didlington Park Lakes SSSI.

2.6.2   For the purpose of the dispersion modelling, discrete receptors were placed at the closest points of each designation to the installation in order to ensure the maximum potential impact was predicted. These are summarised in Table 16.

Table 16   Discrete Receptor Locations

Receptor		National Grid Reference (NGR) (m)	
		X	Y
E1	Breckland SAC/Wangford Warren and Carr SSSI	575402.7	284329.1
E2	Breckland SAC/Weeting Heath SSSI	575988.0	290373.6
E3	Breckland SAC/Weeting Heath SSSI	575543.9	288225.6
E4	Breckland SAC/Grime's Graves SSSI	580506.2	290105.4
E5	Breckland SAC/Cranwich Camp SSSI	577248.3	294045.8
E6	Breckland SAC/Gooderstone Warren SSSI	578799.0	300655.3
E7	Norfolk Valley Fens SAC/Foulden Common SSSI	574651.6	300111.6
E8	Norfolk Valley Fens SAC/Foulden Common SSSI	575588.9	299890.8
E9	Norfolk Valley Fens SAC/Foulden Common SSSI	576122.2	299298.7
E10	Breckland SPA/Breckland Farmland SSSI	569728.8	289872.5

Receptor		National Grid Reference (NGR) (m)	
		X	Y
E11	Breckland SPA/Breckland Farmland SSSI	572095.4	290622.5
E12	Breckland SPA/Breckland Farmland SSSI	572780.1	290627.3
E13	Breckland SPA/Breckland Farmland SSSI	573575.0	290696.8
E14	Breckland SPA/Breckland Forest SSSI	573903.8	290753.0
E15	Breckland SPA/Breckland Forest SSSI	574657.9	290912.3
E16	Breckland SPA/Breckland Forest SSSI	575327.0	291704.3
E17	Breckland SPA/Breckland Forest SSSI	573866.3	292790.0
E18	Breckland SPA/Breckland Forest SSSI	574569.8	292003.5
E19	Breckland SPA/Breckland Forest SSSI	574407.3	292317.6
E20	Breckland SPA/Breckland Forest SSSI	574060.7	292561.3
E21	Breckland SPA/Breckland Forest SSSI	574016.7	292975.4
E22	Breckland SPA/Breckland Forest SSSI	574503.8	293284.5
E23	Breckland SPA/Breckland Forest SSSI	575168.5	294465.4
E24	Breckland SPA/Breckland Forest SSSI	575142.0	295015.3
E25	Breckland SPA/Breckland Forest SSSI	578267.9	298733.6
E26	Breckland SPA/Breckland Forest SSSI	577976.9	300110.7
E27	Breckland SPA/Breckland Farmland SSSI	577329.2	300884.9
E28	Breckland SPA/Breckland Farmland SSSI	576141.5	300295.6
E29	The Brinks, Northwold SSSI	575049.7	295459.8
E30	Breckland SPA/Breckland Farmland SSSI	575938.9	288865.7
E31	Breckland SPA/Breckland Farmland SSSI	576279.8	290005.5
E32	Breckland SAC/Gooderstone Warren SSSI	579149.4	301187.7
E33	Breckland SAC/RAF Lakenheath SSSI	575508.6	283322.9
E34	Wangford Warren and Carr SSSI	574835.5	284647.8
E35	Didlington Park Lakes SSSI	577497.9	296118.0
E36	Stanford Training Area SSSI	582853.9	294409.0

2.6.3 Reference should be made to Figure 3 for a map of the ecological receptor locations.

2.7 Critical Loads and Levels

2.7.1 Critical loads and levels have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS[8] website was undertaken in order to identify the features within each designation sensitive to NH_3 emissions and nitrogen and acid deposition, as well as the associated critical levels and loads. The relevant data is summarised in Appendix 1.

2.7.2 For the purpose of the dispersion modelling, it was assumed the feature with the lowest critical level and nitrogen/acid critical load is present at each receptor. NE guidance[9] states that many sites are designated for several different qualifying features and not all are present in a given location. As such, the assumption that the most sensitive feature is located at the ecological site boundary closest to the installation is considered to provide a conservative assessment of potential impacts.

2.7.3 The relevant critical levels for annual mean NH_3 concentrations are summarised in Table 17.

Table 17   Critical Levels for Annual Mean NH_3 Concentrations

Receptor		Critical Level for NH_3 (µg/m³)
E1	Breckland SAC/Wangford Warren and Carr SSSI	1
E2	Breckland SAC/Weeting Heath SSSI	1
E3	Breckland SAC/Weeting Heath SSSI	1
E4	Breckland SAC/Grime's Graves SSSI	1
E5	Breckland SAC/Cranwich Camp SSSI	1
E6	Breckland SAC/Gooderstone Warren SSSI	1
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	1
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	1

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[8]   http://www.apis.ac.uk/.

[9]   Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations, NE, 2018.

Receptor		Critical Level for NH$_3$ (µg/m³)
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	1
E10	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E11	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E12	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E13	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E14	Breckland SPA/Breckland Forest SSSI	3
E15	Breckland SPA/Breckland Forest SSSI	3
E16	Breckland SPA/Breckland Forest SSSI	3
E17	Breckland SPA/Breckland Forest SSSI	3
E18	Breckland SPA/Breckland Forest SSSI	3
E19	Breckland SPA/Breckland Forest SSSI	3
E20	Breckland SPA/Breckland Forest SSSI	3
E21	Breckland SPA/Breckland Forest SSSI	3
E22	Breckland SPA/Breckland Forest SSSI	3
E23	Breckland SPA/Breckland Forest SSSI	3
E24	Breckland SPA/Breckland Forest SSSI	3
E25	Breckland SPA/Breckland Forest SSSI	3
E26	Breckland SPA/Breckland Forest SSSI	3
E27	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E28	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E29	The Brinks, Northwold SSSI	3
E30	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E31	Breckland SPA/Breckland Farmland SSSI	Not Sensitive[a]
E32	Breckland SAC/Gooderstone Warren SSSI	1
E33	Breckland SAC/RAF Lakenheath SSSI	1
E34	Wangford Warren and Carr SSSI	1
E35	Didlington Park Lakes SSSI	3

Receptor		Critical Level for NH$_3$ (µg/m³)
E36	Stanford Training Area SSSI	1

Note: Breckland SPA and Breckland Farmland SSSI designated features not sensitive to NH$_3$.

2.7.4   The relevant critical loads for nitrogen deposition are presented in Table 18.

Table 18   Critical Loads for Nitrogen Deposition

Receptor		Feature	Relevant Nitrogen Critical Load Class	Critical Load (kgN/ha/yr)	
				Low	High
E1	Breckland SAC/Wangford Warren and Carr SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland	Inland sand drift and dune with siliceous grassland	5	15
E2	Breckland SAC/Weeting Heath SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Subcom Cornicularia Aculeata-Cladonia Arbuscula	Inland sand drift and dune with siliceous grassland	5	15
E3	Breckland SAC/Weeting Heath SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Subcom Cornicularia Aculeata-Cladonia Arbuscula	Inland sand drift and dune with siliceous grassland	5	15
E4	Breckland SAC/Grime's Graves SSSI	Calluna Vulgaris - Festuca Ovina Heath	Dry heaths	5	15
E5	Breckland SAC/Cranwich Camp SSSI	European dry heaths	Dry heaths	5	15
E6	Breckland SAC/Gooderstone Warren SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland	Inland sand drift and dune with siliceous grassland	5	15
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Valley mires, poor fens and transition mires	5	15
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Valley mires, poor fens and transition mires	5	15
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Valley mires, poor fens and transition mires	5	15

Receptor		Feature	Relevant Nitrogen Critical Load Class	Critical Load (kgN/ha/yr)	
				Low	High
E10	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E11	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E12	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E13	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E14	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E15	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E16	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E17	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E18	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E19	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E20	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E21	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E22	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15

Receptor		Feature	Relevant Nitrogen Critical Load Class	Critical Load (kgN/ha/yr)	
				Low	High
E23	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E24	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E25	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E26	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E27	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E28	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E29	The Brinks, Northwold SSSI	Cynosurus Cristatus - Centaurea Nigra Grassland	Low and medium altitude hay meadows	10	20
E30	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E31	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E32	Breckland SAC/Gooderstone Warren SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland	Inland sand drift and dune with siliceous grassland	5	15
E33	Breckland SAC/RAF Lakenheath SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland	Inland sand drift and dune with siliceous grassland	5	15
E34	Wangford Warren and Carr SSSI	Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland	Inland sand drift and dune with siliceous grassland	5	15
E35	Didlington Park Lakes SSSI	Anas strepera	-(a)	-(a)	-(a)

Receptor		Feature	Relevant Nitrogen Critical Load Class	Critical Load (kgN/ha/yr)	
				Low	High
E36	Stanford Training Area SSSI	Calluna Vulgaris - Deschampsia Flexuosa Heath	Dry heaths	5	15

2.7.5   It should be noted that the nitrogen critical load of 3kgN/ha/yr for Breckland SPA referred to in the EA response[10] to the Environmental Permit Variation Application has been superseded by a recent APIS update. The minimum critical load is now 5kgN/ha/yr, as shown in Table 18.

2.7.6   The relevant acid deposition critical loads are presented in Table 19.

Table 19   Critical Loads for Acid Deposition

Receptors		Feature	Relevant Acidity Critical Load Class	Acid Critical Load (keq/ha/yr)		
				CLMaxS	CLMinN	CLMaxN
E1	Breckland SAC/Wangford Warren and Carr SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E2	Breckland SAC/Weeting Heath SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E3	Breckland SAC/Weeting Heath SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E4	Breckland SAC/Grime's Graves SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E5	Breckland SAC/Cranwich Camp SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537

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[10]   EPR/XP3632QE/V003, EA, 2024.

Receptors		Feature	Relevant Acidity Critical Load Class	Acid Critical Load (keq/ha/yr)		
				CLMaxS	CLMinN	CLMaxN
E6	Breckland SAC/Gooderstone Warren SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Bogs	0.193	0.321	0.514
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Bogs	0.193	0.321	0.514
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	Depressions on peat substrates of the Rhynchosporion	Bogs	0.193	0.321	0.514
E10	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E11	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E12	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E13	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E14	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E15	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536

Receptors		Feature	Relevant Acidity Critical Load Class	Acid Critical Load (keq/ha/yr)		
				CLMaxS	CLMinN	CLMaxN
E16	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E17	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E18	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E19	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E20	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E21	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E22	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E23	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E24	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E25	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536

Receptors		Feature	Relevant Acidity Critical Load Class	Acid Critical Load (keq/ha/yr)		
				CLMaxS	CLMinN	CLMaxN
E26	Breckland SPA/Breckland Forest SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E27	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E28	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E29	The Brinks, Northwold SSSI	Cynosurus Cristatus - Centaurea Nigra Grassland	Calcareous grassland (using base cation)	4.000	0.856	4.856
E30	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E31	Breckland SPA/Breckland Farmland SSSI	Caprimulgus europaeus	Unmanaged Broadleafed/ Coniferous Woodland	0.251	0.142	0.536
E32	Breckland SAC/Gooderstone Warren SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E33	Breckland SAC/RAF Lakenheath SSSI	Barbastella barbastellus	Unmanaged broadleafed/ coniferous woodland	0.252	0.142	0.537
E34	Wangford Warren and Carr SSSI	Festuca Ovina - Hieracium Pilosella - Thymus Preaecox Grassland	Calcareous grassland (using base cation)	4.000	0.856	4.856
E35	Didlington Park Lakes SSSI	Anas strepera	Freshwater	_[a]	_[a]	_[a]
E36	Stanford Training Area SSSI	Calluna Vulgaris - Deschampsia Flexuosa Heath	Dwarf shrub heath	0.230	0.714	0.944

2.8 Background Pollution Levels

2.8.1   Background NH_3 concentrations, as well as nitrogen and acid deposition rates, at each ecological receptor location were obtained from the APIS website[11]. These are summarised in Table 20.

Table 20   Background Pollutant Levels

Receptor		Baseline Annual Mean NH$_3$ Conc. (µg/m^3)	Baseline Deposition Rate	
			Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
E1	Breckland SAC/Wangford Warren and Carr SSSI	1.8	16.5	1.2
E2	Breckland SAC/Weeting Heath SSSI	1.8	16.8	1.2
E3	Breckland SAC/Weeting Heath SSSI	1.8	16.5	1.2
E4	Breckland SAC/Grime's Graves SSSI	1.8	17.6	1.3
E5	Breckland SAC/Cranwich Camp SSSI	2.0	18.1	1.3
E6	Breckland SAC/Gooderstone Warren SSSI	2.2	18.9	1.4
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	2.1	18.4	1.3
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	2.1	18.5	1.3
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	2.2	18.7	1.3
E10	Breckland SPA/Breckland Farmland SSSI	1.7	30.0	2.2
E11	Breckland SPA/Breckland Farmland SSSI	1.7	30.5	2.2
E12	Breckland SPA/Breckland Farmland SSSI	1.7	30.5	2.2
E13	Breckland SPA/Breckland Farmland SSSI	1.7	30.8	2.3
E14	Breckland SPA/Breckland Forest SSSI	1.7	30.8	2.3
E15	Breckland SPA/Breckland Forest SSSI	1.7	31.1	2.3
E16	Breckland SPA/Breckland Forest SSSI	1.8	31.7	2.3
E17	Breckland SPA/Breckland Forest SSSI	1.7	31.1	2.3
E18	Breckland SPA/Breckland Forest SSSI	1.8	31.5	2.3

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[11]   http://www.apis.ac.uk/.

Receptor		Baseline Annual Mean NH₃ Conc. (µg/m³)	Baseline Deposition Rate	
			Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
E19	Breckland SPA/Breckland Forest SSSI	1.8	31.5	2.3
E20	Breckland SPA/Breckland Forest SSSI	1.8	31.5	2.3
E21	Breckland SPA/Breckland Forest SSSI	1.8	31.5	2.3
E22	Breckland SPA/Breckland Forest SSSI	1.8	32.0	2.3
E23	Breckland SPA/Breckland Forest SSSI	1.9	32.9	2.4
E24	Breckland SPA/Breckland Forest SSSI	2.0	33.3	2.4
E25	Breckland SPA/Breckland Forest SSSI	2.3	34.9	2.5
E26	Breckland SPA/Breckland Forest SSSI	2.2	34.9	2.5
E27	Breckland SPA/Breckland Farmland SSSI	2.2	34.9	2.5
E28	Breckland SPA/Breckland Farmland SSSI	2.2	34.7	2.5
E29	The Brinks, Northwold SSSI	2.0	17.9	1.3
E30	Breckland SPA/Breckland Farmland SSSI	1.8	31.0	2.3
E31	Breckland SPA/Breckland Farmland SSSI	1.8	31.7	2.3
E32	Breckland SAC/Gooderstone Warren SSSI	2.1	19.0	1.4
E33	Breckland SAC/RAF Lakenheath SSSI	1.7	16.6	1.2
E34	Wangford Warren and Carr SSSI	1.8	16.4	1.2
E35	Didlington Park Lakes SSSI	2.2	18.7	1.3
E36	Stanford Training Area SSSI	2.0	17.9	1.3

2.9 Terrain Data

2.9.1 Inclusion of terrain data is recommended within the ADMS-6 user guide[12] if the gradient within a modelling area varies by more than 10% (1 in 10). Assessment of changes in elevation throughout the modelling extents using Google Earth indicated the maximum gradient was below this value. As such, terrain data was not included within the model.

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[12] ADMS 6, Atmospheric Dispersion Modelling System, User Guide, Version 6.0, CERC, 2023.

2.10 Meteorological Data

2.10.1 Meteorological data used in the assessment was taken from RAF Lakenheath meteorological station over the period 1st January 2014 to 31st December 2018 (inclusive). RAF Lakenheath meteorological station is located at NGR: 574637, 282983, which is approximately 9.1km south of the site. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

2.10.2 All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 4 for wind roses of the utilised meteorological values.

2.11 Roughness Length

2.11.1 Roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.3m was used to describe the modelling extents and meteorological site. This value is considered appropriate for the morphology of both areas and is suggested within ADMS-6 as being suitable for 'agricultural areas (max)'.

2.12 Monin-Obukhov Length

2.12.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 1m was used to describe the modelling extents. This value is considered appropriate for the nature of the area and is suggested within ADMS-6 as being suitable for 'rural areas'.

2.12.2 A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-6 as being suitable for 'small towns <50,000'.

2.13 Deposition Calculation

2.13.1 Nitrogen deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate

Assessment for Emissions to Air AQTAG 06'[13]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used for the determination of nitrogen deposition are presented within Table 21.

Table 21   Conversion Factors to Determine Dry Deposition Flux for Nitrogen Deposition

Pollutant	Deposition Velocity (m/s)		Conversion Factor ($\mu g/m^2/s$ to kg/ha/yr of pollutant species)
	Grassland	Forest	
NH_3	0.020	0.030	260

2.13.2   The relevant deposition velocity for each ecological receptor was selected from Table 21 based on the vegetation type present within the designation.

2.13.1   Predicted ground level NH_3 concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken using the standard conversion factors shown in Table 22.

Table 22   Conversion Factors to Determine Dry Deposition Flux for Acid Deposition

Pollutant	Deposition Velocity (m/s)		Conversion Factor ($\mu g/m^2/s$ to keq/ha/yr of pollutant species)
	Grassland	Forest	
NH_3	0.02	0.03	18.5

2.14   Assessment Criteria

2.14.1   The EA guidance 'Intensive farming risk assessment for your environmental permit'[14] provides screening thresholds for the assessment of predicted PCs to atmospheric NH_3 concentrations and nitrogen/acid deposition rates at ecological designations. A summary of the relevant criteria is provided in Table 23

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[13]   Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06, EA, 2014.

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

Table 23   EA Screening Thresholds

Designation	Lower Threshold (%)	Upper Threshold (%)
SACs and SPAs	4	20
SSSIs	20	50

2.14.2   The guidance indicates that if predicted PCs are less than the lower threshold of the relevant critical level or load, no further detailed assessment of potential impacts is required.

2.14.3   If predicted PCs are between the lower and upper thresholds, or above the upper threshold of the relevant critical level or load, additional consideration to potential impacts should be provided.

2.15   Modelling Uncertainty

2.15.1   Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

2.15.2   Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-6 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five annual meteorological data sets from the closest observation site to the installation to take account of local conditions. The assessment was based on the worst-case year for each pollutant and averaging period to ensure maximum concentrations were considered;

- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses and guidance provided by CERC;

- Operating conditions - Information describing the pig and poultry operations and proposed rearing activities for the permitted and proposed installations were provided by the Operator. This was subsequently used to define model inputs; Predicted releases are therefore considered representative of operating conditions;

- Emission rates - Emission rates were derived based on consultation with the EA, relevant industry guidance and ADHB monitoring studies, as well as information describing the relevant operating conditions provided by the Operator. As such, they are considered to be representative of potential releases during operation;

- Baseline levels - Background NH_3 concentrations and nitrogen and acid deposition rates were obtained from the APIS[15] website. These are considered representative of baseline conditions at sensitive locations within the vicinity of the site; and,

- Variability - All model inputs are as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential pollutant concentrations.

2.15.3 Results were considered in the context of the relevant EA criteria. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

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[15]   http://www.apis.ac.uk/.

3.0   ASSESSMENT

3.1   Introduction

3.1.1   Dispersion modelling was undertaken using the input data specified previously. The results are summarised in the following Sections.

3.2   Permitted Installation

Ammonia

3.2.1   Predicted annual mean NH_3 PCs at the ecological receptor locations for the permitted installation are summarised in Table 24.

Table 24   Predicted Annual Mean NH_3 Permitted Installation PCs

Receptor		Predicted Annual Mean NH_3 PC (µg/m³)				
		2014	**2015**	**2016**	**2017**	**2018**
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.0751	0.0615	0.0562	0.0193	0.0323
E2	Breckland SAC/Weeting Heath SSSI	0.2322	0.2649	0.2544	0.1720	0.1418
E3	Breckland SAC/Weeting Heath SSSI	0.1553	0.1486	0.1156	0.0604	0.0740
E4	Breckland SAC/Grime's Graves SSSI	0.0640	0.0789	0.0866	0.0632	0.0387
E5	Breckland SAC/Cranwich Camp SSSI	0.1855	0.3177	0.2836	0.1854	0.1370
E6	Breckland SAC/Gooderstone Warren SSSI	0.0877	0.1130	0.1264	0.0704	0.0517
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1946	0.1529	0.1710	0.0793	0.0951
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1492	0.1545	0.1532	0.0811	0.0880
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1397	0.1713	0.1714	0.0935	0.0880
E10	Breckland SPA/Breckland Farmland SSSI	0.4306	0.4660	0.3709	0.1175	0.2020
E11	Breckland SPA/Breckland Farmland SSSI	0.9073	0.6746	0.5750	0.1421	0.4068
E12	Breckland SPA/Breckland Farmland SSSI	0.9093	0.5696	0.5664	0.1391	0.3883

Receptor		Predicted Annual Mean NH$_3$ PC (µg/m^3)				
		2014	2015	2016	2017	2018
E13	Breckland SPA/Breckland Farmland SSSI	0.7182	0.5603	0.5195	0.1850	0.3174
E14	Breckland SPA/Breckland Forest SSSI	0.6321	0.5679	0.4743	0.2176	0.2974
E15	Breckland SPA/Breckland Forest SSSI	0.4597	0.5044	0.4342	0.2777	0.2823
E16	Breckland SPA/Breckland Forest SSSI	0.4418	0.5073	0.5155	0.3883	0.2602
E17	Breckland SPA/Breckland Forest SSSI	6.4973	8.5839	8.7342	7.5705	5.0329
E18	Breckland SPA/Breckland Forest SSSI	0.8643	0.9818	0.9786	0.7456	0.5218
E19	Breckland SPA/Breckland Forest SSSI	1.0997	1.3921	1.4122	1.0528	0.7060
E20	Breckland SPA/Breckland Forest SSSI	2.1739	2.6797	2.8211	2.1770	1.4135
E21	Breckland SPA/Breckland Forest SSSI	3.0006	3.9484	3.8596	3.1496	2.1049
E22	Breckland SPA/Breckland Forest SSSI	1.1563	1.7700	1.6449	1.1755	0.8270
E23	Breckland SPA/Breckland Forest SSSI	0.6001	0.8332	0.8427	0.6136	0.4284
E24	Breckland SPA/Breckland Forest SSSI	0.5782	0.7249	0.7503	0.5324	0.3433
E25	Breckland SPA/Breckland Forest SSSI	0.1285	0.1589	0.1745	0.1114	0.0715
E26	Breckland SPA/Breckland Forest SSSI	0.1000	0.1308	0.1440	0.0780	0.0606
E27	Breckland SPA/Breckland Farmland SSSI	0.0926	0.1190	0.1215	0.0657	0.0587
E28	Breckland SPA/Breckland Farmland SSSI	0.1226	0.1390	0.1364	0.0743	0.0755
E29	The Brinks, Northwold SSSI	0.5067	0.6325	0.6827	0.4303	0.2956
E30	Breckland SPA/Breckland Farmland SSSI	0.1627	0.1668	0.1338	0.0805	0.0900
E31	Breckland SPA/Breckland Farmland SSSI	0.1911	0.2201	0.2088	0.1399	0.1190
E32	Breckland SAC/Gooderstone Warren SSSI	0.0792	0.1023	0.1144	0.0633	0.0469
E33	Breckland SAC/RAF Lakenheath SSSI	0.0650	0.0517	0.0484	0.0157	0.0274
E34	Wangford Warren and Carr SSSI	0.0868	0.0647	0.0635	0.0187	0.0352
E35	Didlington Park Lakes SSSI	0.1936	0.2618	0.2631	0.1943	0.1320
E36	Stanford Training Area SSSI	0.0525	0.0773	0.0707	0.0478	0.0334

3.2.2   Maximum predicted annual mean NH$_3$ concentrations at the ecological receptor locations are summarised in Table 25.

Table 25   Maximum Predicted Annual Mean NH₃ Permitted Installation PCs

Receptor		Maximum Predicted Annual Mean NH₃ PC (µg/m³)	PC Proportion of Critical Level (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.0751	7.51
E2	Breckland SAC/Weeting Heath SSSI	0.2649	26.49
E3	Breckland SAC/Weeting Heath SSSI	0.1553	15.53
E4	Breckland SAC/Grime's Graves SSSI	0.0866	8.66
E5	Breckland SAC/Cranwich Camp SSSI	0.3177	31.77
E6	Breckland SAC/Gooderstone Warren SSSI	0.1264	12.64
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1946	19.46
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1545	15.45
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1714	17.14
E10	Breckland SPA/Breckland Farmland SSSI	0.4660	-
E11	Breckland SPA/Breckland Farmland SSSI	0.9073	-
E12	Breckland SPA/Breckland Farmland SSSI	0.9093	-
E13	Breckland SPA/Breckland Farmland SSSI	0.7182	-
E14	Breckland SPA/Breckland Forest SSSI	0.6321	21.07
E15	Breckland SPA/Breckland Forest SSSI	0.5044	16.81
E16	Breckland SPA/Breckland Forest SSSI	0.5155	17.18
E17	Breckland SPA/Breckland Forest SSSI	8.7342	291.14
E18	Breckland SPA/Breckland Forest SSSI	0.9818	32.73
E19	Breckland SPA/Breckland Forest SSSI	1.4122	47.07
E20	Breckland SPA/Breckland Forest SSSI	2.8211	94.04
E21	Breckland SPA/Breckland Forest SSSI	3.9484	131.61
E22	Breckland SPA/Breckland Forest SSSI	1.7700	59.00
E23	Breckland SPA/Breckland Forest SSSI	0.8427	28.09
E24	Breckland SPA/Breckland Forest SSSI	0.7503	25.01

Receptor		Maximum Predicted Annual Mean NH$_3$ PC (µg/m^3)	PC Proportion of Critical Level (%)
E25	Breckland SPA/Breckland Forest SSSI	0.1745	5.82
E26	Breckland SPA/Breckland Forest SSSI	0.1440	4.80
E27	Breckland SPA/Breckland Farmland SSSI	0.1215	-
E28	Breckland SPA/Breckland Farmland SSSI	0.1390	-
E29	The Brinks, Northwold SSSI	0.6827	22.76
E30	Breckland SPA/Breckland Farmland SSSI	0.1668	-
E31	Breckland SPA/Breckland Farmland SSSI	0.2201	-
E32	Breckland SAC/Gooderstone Warren SSSI	0.1144	11.44
E33	Breckland SAC/RAF Lakenheath SSSI	0.0650	6.50
E34	Wangford Warren and Carr SSSI	0.0868	8.68
E35	Didlington Park Lakes SSSI	0.2631	8.77
E36	Stanford Training Area SSSI	0.0773	7.73

3.2.3   The NH$_3$ results are summarised as follows:

- The predicted permitted installation PC as a proportion of the relevant critical level was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC;
- The predicted permitted installation PC as a proportion of the relevant critical level was above 20% at Weeting Heath SSSI, Cranwich Camp SSSI and The Brinks, Northwold SSSI and Breckland Forest SSSI; and,
- The predicted permitted installation PC as a proportion of the relevant critical level was below 20% at Wangford Warren and Carr SSSI, Fouldon Common SSSI, Grime's Graves SSSI, Gooderstone Warren SSSI, RAF Lakenheath SSSI, Didlington Park Lakes SSSI and Stanford Training Area SSSI.

3.2.4   As shown above, there is potential for exceedences of the relevant EA criteria at several designations as result of emissions associated with the permitted installation.

Nitrogen Deposition

3.2.5   Predicted annual nitrogen deposition PCs at the ecological receptor locations for the permitted installation are summarised in Table 26.

Table 26   Predicted Annual Nitrogen Deposition Permitted Installation PCs

Receptor		Predicted Annual Nitrogen Deposition Rates PC (kgN/ha/yr)				
		2014	2015	2016	2017	2018
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.39	0.32	0.29	0.10	0.17
E2	Breckland SAC/Weeting Heath SSSI	1.21	1.38	1.32	0.89	0.74
E3	Breckland SAC/Weeting Heath SSSI	0.81	0.77	0.60	0.31	0.38
E4	Breckland SAC/Grime's Graves SSSI	0.33	0.41	0.45	0.33	0.20
E5	Breckland SAC/Cranwich Camp SSSI	0.96	1.65	1.47	0.96	0.71
E6	Breckland SAC/Gooderstone Warren SSSI	0.46	0.59	0.66	0.37	0.27
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	1.01	0.80	0.89	0.41	0.49
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.78	0.80	0.80	0.42	0.46
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.73	0.89	0.89	0.49	0.46
E10	Breckland SPA/Breckland Farmland SSSI	3.36	3.63	2.89	0.92	1.58
E11	Breckland SPA/Breckland Farmland SSSI	7.08	5.26	4.48	1.11	3.17
E12	Breckland SPA/Breckland Farmland SSSI	7.09	4.44	4.42	1.08	3.03
E13	Breckland SPA/Breckland Farmland SSSI	5.60	4.37	4.05	1.44	2.48
E14	Breckland SPA/Breckland Forest SSSI	4.93	4.43	3.70	1.70	2.32
E15	Breckland SPA/Breckland Forest SSSI	3.59	3.93	3.39	2.17	2.20
E16	Breckland SPA/Breckland Forest SSSI	3.45	3.96	4.02	3.03	2.03
E17	Breckland SPA/Breckland Forest SSSI	50.68	66.95	68.13	59.05	39.26
E18	Breckland SPA/Breckland Forest SSSI	6.74	7.66	7.63	5.82	4.07
E19	Breckland SPA/Breckland Forest SSSI	8.58	10.86	11.01	8.21	5.51
E20	Breckland SPA/Breckland Forest SSSI	16.96	20.90	22.00	16.98	11.03
E21	Breckland SPA/Breckland Forest SSSI	23.40	30.80	30.10	24.57	16.42

Receptor		Predicted Annual Nitrogen Deposition Rates PC (kgN/ha/yr)				
		2014	2015	2016	2017	2018
E22	Breckland SPA/Breckland Forest SSSI	9.02	13.81	12.83	9.17	6.45
E23	Breckland SPA/Breckland Forest SSSI	4.68	6.50	6.57	4.79	3.34
E24	Breckland SPA/Breckland Forest SSSI	4.51	5.65	5.85	4.15	2.68
E25	Breckland SPA/Breckland Forest SSSI	1.00	1.24	1.36	0.87	0.56
E26	Breckland SPA/Breckland Forest SSSI	0.78	1.02	1.12	0.61	0.47
E27	Breckland SPA/Breckland Farmland SSSI	0.72	0.93	0.95	0.51	0.46
E28	Breckland SPA/Breckland Farmland SSSI	0.96	1.08	1.06	0.58	0.59
E29	The Brinks, Northwold SSSI	2.64	3.29	3.55	2.24	1.54
E30	Breckland SPA/Breckland Farmland SSSI	1.27	1.30	1.04	0.63	0.70
E31	Breckland SPA/Breckland Farmland SSSI	1.49	1.72	1.63	1.09	0.93
E32	Breckland SAC/Gooderstone Warren SSSI	0.41	0.53	0.59	0.33	0.24
E33	Breckland SAC/RAF Lakenheath SSSI	0.34	0.27	0.25	0.08	0.14
E34	Wangford Warren and Carr SSSI	0.45	0.34	0.33	0.10	0.18
E35	Didlington Park Lakes SSSI	1.01	1.36	1.37	1.01	0.69
E36	Stanford Training Area SSSI	0.27	0.40	0.37	0.25	0.17

3.2.6   Maximum predicted annual nitrogen deposition rates at the ecological receptor locations are summarised in Table 27.

Table 27   Maximum Predicted Annual Nitrogen Deposition Permitted Installation PCs

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.39	7.81
E2	Breckland SAC/Weeting Heath SSSI	1.38	27.55
E3	Breckland SAC/Weeting Heath SSSI	0.81	16.16

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E4	Breckland SAC/Grime's Graves SSSI	0.45	9.00
E5	Breckland SAC/Cranwich Camp SSSI	1.65	33.04
E6	Breckland SAC/Gooderstone Warren SSSI	0.66	13.14
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	1.01	20.23
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.80	16.07
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.89	17.82
E10	Breckland SPA/Breckland Farmland SSSI	3.63	72.69
E11	Breckland SPA/Breckland Farmland SSSI	7.08	141.53
E12	Breckland SPA/Breckland Farmland SSSI	7.09	141.85
E13	Breckland SPA/Breckland Farmland SSSI	5.60	112.04
E14	Breckland SPA/Breckland Forest SSSI	4.93	98.60
E15	Breckland SPA/Breckland Forest SSSI	3.93	78.69
E16	Breckland SPA/Breckland Forest SSSI	4.02	80.42
E17	Breckland SPA/Breckland Forest SSSI	68.13	1362.54
E18	Breckland SPA/Breckland Forest SSSI	7.66	153.16
E19	Breckland SPA/Breckland Forest SSSI	11.01	220.30
E20	Breckland SPA/Breckland Forest SSSI	22.00	440.09
E21	Breckland SPA/Breckland Forest SSSI	30.80	615.95
E22	Breckland SPA/Breckland Forest SSSI	13.81	276.13
E23	Breckland SPA/Breckland Forest SSSI	6.57	131.47
E24	Breckland SPA/Breckland Forest SSSI	5.85	117.05
E25	Breckland SPA/Breckland Forest SSSI	1.36	27.22
E26	Breckland SPA/Breckland Forest SSSI	1.12	22.47
E27	Breckland SPA/Breckland Farmland SSSI	0.95	18.96

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E28	Breckland SPA/Breckland Farmland SSSI	1.08	21.68
E29	The Brinks, Northwold SSSI	3.55	35.50
E30	Breckland SPA/Breckland Farmland SSSI	1.30	26.01
E31	Breckland SPA/Breckland Farmland SSSI	1.72	34.33
E32	Breckland SAC/Gooderstone Warren SSSI	0.59	11.90
E33	Breckland SAC/RAF Lakenheath SSSI	0.34	6.76
E34	Wangford Warren and Carr SSSI	0.45	9.02
E35	Didlington Park Lakes SSSI	1.37	-
E36	Stanford Training Area SSSI	0.40	8.04

3.2.7 The nitrogen deposition results are summarised as follows:

- The predicted permitted installation PC as a proportion of the relevant critical load was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC;
- The predicted permitted installation PC as a proportion of the relevant critical load was above 20% at Weeting Heath SSSI, Cranwich Camp SSSI, Fouldon Common SSSI, The Brinks, Northwold SSSI, Breckland Farmland SSSI and Breckland Forest SSSI; and,
- The predicted permitted installation PC as a proportion of the relevant critical load was below 20% at Wangford Warren and Carr SSSI, Grime's Graves SSSI, Gooderstone Warren SSSI, RAF Lakenheath SSSI and Stanford Training Area SSSI.

3.2.8 As shown above, there is potential for exceedences of the relevant EA criteria at several designations as result of emissions associated with the permitted installation.

Acid Deposition

3.2.9 Predicted annual acid deposition PCs at the ecological receptor locations from the permitted installation are summarised in Table 28.

Table 28 Predicted Annual Acid Deposition Permitted Installation PCs

Receptor		Predicted Annual Acid Deposition Rates PC (keq/ha/yr)				
		2014	2015	2016	2017	2018
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.04	0.03	0.03	0.01	0.02
E2	Breckland SAC/Weeting Heath SSSI	0.13	0.15	0.14	0.10	0.08
E3	Breckland SAC/Weeting Heath SSSI	0.09	0.08	0.06	0.03	0.04
E4	Breckland SAC/Grime's Graves SSSI	0.04	0.04	0.05	0.04	0.02
E5	Breckland SAC/Cranwich Camp SSSI	0.10	0.18	0.16	0.10	0.08
E6	Breckland SAC/Gooderstone Warren SSSI	0.05	0.06	0.07	0.04	0.03
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.07	0.06	0.06	0.03	0.04
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.06	0.06	0.06	0.03	0.03
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.05	0.06	0.06	0.03	0.03
E10	Breckland SPA/Breckland Farmland SSSI	0.24	0.26	0.21	0.07	0.11
E11	Breckland SPA/Breckland Farmland SSSI	0.50	0.37	0.32	0.08	0.23
E12	Breckland SPA/Breckland Farmland SSSI	0.50	0.32	0.31	0.08	0.22
E13	Breckland SPA/Breckland Farmland SSSI	0.40	0.31	0.29	0.10	0.18
E14	Breckland SPA/Breckland Forest SSSI	0.35	0.32	0.26	0.12	0.17
E15	Breckland SPA/Breckland Forest SSSI	0.26	0.28	0.24	0.15	0.16
E16	Breckland SPA/Breckland Forest SSSI	0.25	0.28	0.29	0.22	0.14
E17	Breckland SPA/Breckland Forest SSSI	3.61	4.76	4.85	4.20	2.79
E18	Breckland SPA/Breckland Forest SSSI	0.48	0.54	0.54	0.41	0.29
E19	Breckland SPA/Breckland Forest SSSI	0.61	0.77	0.78	0.58	0.39
E20	Breckland SPA/Breckland Forest SSSI	1.21	1.49	1.57	1.21	0.78
E21	Breckland SPA/Breckland Forest SSSI	1.67	2.19	2.14	1.75	1.17
E22	Breckland SPA/Breckland Forest SSSI	0.64	0.98	0.91	0.65	0.46
E23	Breckland SPA/Breckland Forest SSSI	0.33	0.46	0.47	0.34	0.24
E24	Breckland SPA/Breckland Forest SSSI	0.32	0.40	0.42	0.30	0.19
E25	Breckland SPA/Breckland Forest SSSI	0.07	0.09	0.10	0.06	0.04

Receptor		Predicted Annual Acid Deposition Rates PC (keq/ha/yr)				
		2014	2015	2016	2017	2018
E26	Breckland SPA/Breckland Forest SSSI	0.06	0.07	0.08	0.04	0.03
E27	Breckland SPA/Breckland Farmland SSSI	0.05	0.07	0.07	0.04	0.03
E28	Breckland SPA/Breckland Farmland SSSI	0.07	0.08	0.08	0.04	0.04
E29	The Brinks, Northwold SSSI	0.19	0.23	0.25	0.16	0.11
E30	Breckland SPA/Breckland Farmland SSSI	0.09	0.09	0.07	0.04	0.05
E31	Breckland SPA/Breckland Farmland SSSI	0.11	0.12	0.12	0.08	0.07
E32	Breckland SAC/Gooderstone Warren SSSI	0.04	0.06	0.06	0.04	0.03
E33	Breckland SAC/RAF Lakenheath SSSI	0.04	0.03	0.03	0.01	0.02
E34	Wangford Warren and Carr SSSI	0.03	0.02	0.02	0.01	0.01
E35	Didlington Park Lakes SSSI	0.07	0.10	0.10	0.07	0.05
E36	Stanford Training Area SSSI	0.02	0.03	0.03	0.02	0.01

3.2.10   Maximum predicted annual acid deposition rates at the ecological receptor locations are summarised in Table 29.

Table 29   Maximum Predicted Annual PC Acid Deposition Permitted Installation PCs

Receptor		Maximum Predicted Annual Acid Deposition Rate PC (keq/ha/yr)	PC Proportion of Critical Load (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.04	7.76
E2	Breckland SAC/Weeting Heath SSSI	0.15	27.38
E3	Breckland SAC/Weeting Heath SSSI	0.09	16.05
E4	Breckland SAC/Grime's Graves SSSI	0.05	8.95
E5	Breckland SAC/Cranwich Camp SSSI	0.18	32.83
E6	Breckland SAC/Gooderstone Warren SSSI	0.07	13.06
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.07	14.00

Receptor		Maximum Predicted Annual Acid Deposition Rate PC (keq/ha/yr)	PC Proportion of Critical Load (%)
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.06	11.12
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.06	12.34
E10	Breckland SPA/Breckland Farmland SSSI	0.26	48.25
E11	Breckland SPA/Breckland Farmland SSSI	0.50	93.94
E12	Breckland SPA/Breckland Farmland SSSI	0.50	94.15
E13	Breckland SPA/Breckland Farmland SSSI	0.40	74.37
E14	Breckland SPA/Breckland Forest SSSI	0.35	65.45
E15	Breckland SPA/Breckland Forest SSSI	0.28	52.23
E16	Breckland SPA/Breckland Forest SSSI	0.29	53.38
E17	Breckland SPA/Breckland Forest SSSI	4.85	904.38
E18	Breckland SPA/Breckland Forest SSSI	0.54	101.66
E19	Breckland SPA/Breckland Forest SSSI	0.78	146.22
E20	Breckland SPA/Breckland Forest SSSI	1.57	292.11
E21	Breckland SPA/Breckland Forest SSSI	2.19	408.84
E22	Breckland SPA/Breckland Forest SSSI	0.98	183.28
E23	Breckland SPA/Breckland Forest SSSI	0.47	87.26
E24	Breckland SPA/Breckland Forest SSSI	0.42	77.69
E25	Breckland SPA/Breckland Forest SSSI	0.10	18.07
E26	Breckland SPA/Breckland Forest SSSI	0.08	14.91
E27	Breckland SPA/Breckland Farmland SSSI	0.07	12.58
E28	Breckland SPA/Breckland Farmland SSSI	0.08	14.39
E29	The Brinks, Northwold SSSI	0.25	5.20
E30	Breckland SPA/Breckland Farmland SSSI	0.09	17.27
E31	Breckland SPA/Breckland Farmland SSSI	0.12	22.79
E32	Breckland SAC/Gooderstone Warren SSSI	0.06	11.82

	Receptor	Maximum Predicted Annual Acid Deposition Rate PC (keq/ha/yr)	PC Proportion of Critical Load (%)
E33	Breckland SAC/RAF Lakenheath SSSI	0.04	6.72
E34	Wangford Warren and Carr SSSI	0.03	0.66
E35	Didlington Park Lakes SSSI	0.10	-
E36	Stanford Training Area SSSI	0.03	3.03

3.2.11 The acid deposition results are summarised as follows:

- The predicted permitted installation PC as a proportion of the relevant critical load was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC;

- The predicted permitted installation PC as a proportion of the relevant critical load was above 20% at Weeting Heath SSSI, Cranwich Camp SSSI, Breckland Farmland SSSI and Breckland Forest SSSI; and,

- The predicted permitted installation PC as a proportion of the relevant critical load was below 20% at Wangford Warren and Carr SSSI, Grime's Graves SSSI, Gooderstone Warren SSSI, Fouldon Common SSSI, The Brinks, Northwold SSSI, RAF Lakenheath SSSI and Stanford Training Area SSSI.

3.2.12 As shown above, there is potential for exceedences of the relevant EA criteria at several designations as result of emissions associated with the permitted installation.

3.3 Proposed Installation

Ammonia

3.3.1 Predicted annual mean NH_3 PCs at the ecological receptor locations for the proposed installation are summarised in Table 30.

Table 30   Predicted Annual Mean NH₃ Proposed Installation PCs

Receptor		Predicted Annual Mean NH₃ PC (µg/m³)				
		2014	2015	2016	2017	2018
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.0496	0.0405	0.0399	0.0167	0.0302
E2	Breckland SAC/Weeting Heath SSSI	0.1136	0.1441	0.1558	0.1451	0.1069
E3	Breckland SAC/Weeting Heath SSSI	0.0886	0.0804	0.0709	0.0519	0.0607
E4	Breckland SAC/Grime's Graves SSSI	0.0439	0.0543	0.0636	0.0581	0.0346
E5	Breckland SAC/Cranwich Camp SSSI	0.1197	0.1755	0.1744	0.1620	0.1166
E6	Breckland SAC/Gooderstone Warren SSSI	0.0656	0.0822	0.0879	0.0641	0.0474
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1189	0.0956	0.1100	0.0708	0.0812
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.0987	0.0985	0.1009	0.0722	0.0749
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.0961	0.1105	0.1102	0.0814	0.0749
E10	Breckland SPA/Breckland Farmland SSSI	0.2235	0.2320	0.2071	0.0811	0.1453
E11	Breckland SPA/Breckland Farmland SSSI	0.3909	0.2890	0.3103	0.1065	0.2891
E12	Breckland SPA/Breckland Farmland SSSI	0.3628	0.2657	0.3024	0.1028	0.2697
E13	Breckland SPA/Breckland Farmland SSSI	0.2877	0.2511	0.2490	0.1344	0.2234
E14	Breckland SPA/Breckland Forest SSSI	0.2637	0.2396	0.2325	0.1542	0.2061
E15	Breckland SPA/Breckland Forest SSSI	0.1969	0.2322	0.2358	0.2201	0.1843
E16	Breckland SPA/Breckland Forest SSSI	0.2020	0.2481	0.2822	0.2931	0.1893
E17	Breckland SPA/Breckland Forest SSSI	1.9345	2.4038	2.2754	2.7967	1.9625
E18	Breckland SPA/Breckland Forest SSSI	0.3534	0.4423	0.4951	0.5266	0.3450
E19	Breckland SPA/Breckland Forest SSSI	0.4778	0.5914	0.6476	0.7342	0.4684
E20	Breckland SPA/Breckland Forest SSSI	0.9819	1.2416	1.2823	1.5464	1.0211
E21	Breckland SPA/Breckland Forest SSSI	1.3200	1.6512	1.5760	1.8643	1.3130
E22	Breckland SPA/Breckland Forest SSSI	0.6212	0.8237	0.7907	0.8745	0.6033
E23	Breckland SPA/Breckland Forest SSSI	0.3287	0.4443	0.4410	0.4413	0.3057

Receptor		Predicted Annual Mean NH₃ PC (µg/m³)				
		2014	2015	2016	2017	2018
E24	Breckland SPA/Breckland Forest SSSI	0.3135	0.3929	0.3838	0.3720	0.2533
E25	Breckland SPA/Breckland Forest SSSI	0.0907	0.1108	0.1170	0.0980	0.0639
E26	Breckland SPA/Breckland Forest SSSI	0.0732	0.0921	0.0968	0.0700	0.0543
E27	Breckland SPA/Breckland Farmland SSSI	0.0685	0.0827	0.0830	0.0595	0.0523
E28	Breckland SPA/Breckland Farmland SSSI	0.0852	0.0914	0.0916	0.0666	0.0653
E29	The Brinks, Northwold SSSI	0.2875	0.3461	0.3447	0.3116	0.2189
E30	Breckland SPA/Breckland Farmland SSSI	0.0890	0.0923	0.0838	0.0727	0.0702
E31	Breckland SPA/Breckland Farmland SSSI	0.0970	0.1234	0.1314	0.1208	0.0911
E32	Breckland SAC/Gooderstone Warren SSSI	0.0602	0.0756	0.0810	0.0583	0.0433
E33	Breckland SAC/RAF Lakenheath SSSI	0.0443	0.0354	0.0354	0.0140	0.0260
E34	Wangford Warren and Carr SSSI	0.0552	0.0424	0.0443	0.0164	0.0326
E35	Didlington Park Lakes SSSI	0.1297	0.1662	0.1695	0.1690	0.1096
E36	Stanford Training Area SSSI	0.0398	0.0548	0.0549	0.0451	0.0319

3.3.2 Maximum predicted annual mean NH₃ concentrations at the ecological receptor locations are summarised in Table 31.

Table 31   Maximum Predicted Annual Mean NH₃ Proposed Installation PCs

Receptor		Maximum Predicted Annual Mean NH₃ PC (µg/m³)	PC Proportion of Critical Level (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.0496	4.96
E2	Breckland SAC/Weeting Heath SSSI	0.1558	15.58
E3	Breckland SAC/Weeting Heath SSSI	0.0886	8.86
E4	Breckland SAC/Grime's Graves SSSI	0.0636	6.36
E5	Breckland SAC/Cranwich Camp SSSI	0.1755	17.55
E6	Breckland SAC/Gooderstone Warren SSSI	0.0879	8.79

Receptor		Maximum Predicted Annual Mean NH₃ PC (µg/m³)	PC Proportion of Critical Level (%)
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1189	11.89
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1009	10.09
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.1105	11.05
E10	Breckland SPA/Breckland Farmland SSSI	0.2320	-
E11	Breckland SPA/Breckland Farmland SSSI	0.3909	-
E12	Breckland SPA/Breckland Farmland SSSI	0.3628	-
E13	Breckland SPA/Breckland Farmland SSSI	0.2877	-
E14	Breckland SPA/Breckland Forest SSSI	0.2637	8.79
E15	Breckland SPA/Breckland Forest SSSI	0.2358	7.86
E16	Breckland SPA/Breckland Forest SSSI	0.2931	9.77
E17	Breckland SPA/Breckland Forest SSSI	2.7967	93.22
E18	Breckland SPA/Breckland Forest SSSI	0.5266	17.55
E19	Breckland SPA/Breckland Forest SSSI	0.7342	24.47
E20	Breckland SPA/Breckland Forest SSSI	1.5464	51.55
E21	Breckland SPA/Breckland Forest SSSI	1.8643	62.14
E22	Breckland SPA/Breckland Forest SSSI	0.8745	29.15
E23	Breckland SPA/Breckland Forest SSSI	0.4443	14.81
E24	Breckland SPA/Breckland Forest SSSI	0.3929	13.10
E25	Breckland SPA/Breckland Forest SSSI	0.1170	3.90
E26	Breckland SPA/Breckland Forest SSSI	0.0968	3.23
E27	Breckland SPA/Breckland Farmland SSSI	0.0830	-
E28	Breckland SPA/Breckland Farmland SSSI	0.0916	-
E29	The Brinks, Northwold SSSI	0.3461	11.54
E30	Breckland SPA/Breckland Farmland SSSI	0.0923	3.08
E31	Breckland SPA/Breckland Farmland SSSI	0.1314	4.38

Receptor		Maximum Predicted Annual Mean NH₃ PC (µg/m³)	PC Proportion of Critical Level (%)
E32	Breckland SAC/Gooderstone Warren SSSI	0.0810	8.10
E33	Breckland SAC/RAF Lakenheath SSSI	0.0443	4.43
E34	Wangford Warren and Carr SSSI	0.0552	5.52
E35	Didlington Park Lakes SSSI	0.1695	5.65
E36	Stanford Training Area SSSI	0.0549	5.49

3.3.3 The NH₃ results are summarised as follows:

- The predicted proposed installation PC as a proportion of the relevant critical level was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC; and,

- The predicted proposed installation PC as a proportion of the relevant critical level was below 20% at all SSSIs, with the exception of Breckland Forest SSSI.

3.3.4 As shown above, there is potential for exceedences of the relevant EA criteria at several ecological designations as result of emissions associated with the proposed installation. Further assessment was therefore undertaken in order to determine the predicted change in PCs at receptors as result of the Environmental Permit Variation. The results are summarised in Section 5.0.

Nitrogen Deposition

3.3.5 Predicted annual nitrogen deposition PCs at the ecological receptor locations for the proposed installation are summarised in Table 32.

Table 32   Predicted Annual Nitrogen Deposition Proposed Installation PCs

Receptor		Predicted Annual Nitrogen Deposition Rates PC (kgN/ha/yr)				
		2014	2015	2016	2017	2018
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.26	0.21	0.21	0.09	0.16
E2	Breckland SAC/Weeting Heath SSSI	0.59	0.75	0.81	0.75	0.56

Receptor		Predicted Annual Nitrogen Deposition Rates PC (kgN/ha/yr)				
		2014	2015	2016	2017	2018
E3	Breckland SAC/Weeting Heath SSSI	0.46	0.42	0.37	0.27	0.32
E4	Breckland SAC/Grime's Graves SSSI	0.23	0.28	0.33	0.30	0.18
E5	Breckland SAC/Cranwich Camp SSSI	0.62	0.91	0.91	0.84	0.61
E6	Breckland SAC/Gooderstone Warren SSSI	0.34	0.43	0.46	0.33	0.25
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.62	0.50	0.57	0.37	0.42
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.51	0.51	0.52	0.38	0.39
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.50	0.57	0.57	0.42	0.39
E10	Breckland SPA/Breckland Farmland SSSI	1.74	1.81	1.62	0.63	1.13
E11	Breckland SPA/Breckland Farmland SSSI	3.05	2.25	2.42	0.83	2.25
E12	Breckland SPA/Breckland Farmland SSSI	2.83	2.07	2.36	0.80	2.10
E13	Breckland SPA/Breckland Farmland SSSI	2.24	1.96	1.94	1.05	1.74
E14	Breckland SPA/Breckland Forest SSSI	2.06	1.87	1.81	1.20	1.61
E15	Breckland SPA/Breckland Forest SSSI	1.54	1.81	1.84	1.72	1.44
E16	Breckland SPA/Breckland Forest SSSI	1.58	1.94	2.20	2.29	1.48
E17	Breckland SPA/Breckland Forest SSSI	15.09	18.75	17.75	21.81	15.31
E18	Breckland SPA/Breckland Forest SSSI	2.76	3.45	3.86	4.11	2.69
E19	Breckland SPA/Breckland Forest SSSI	3.73	4.61	5.05	5.73	3.65
E20	Breckland SPA/Breckland Forest SSSI	7.66	9.68	10.00	12.06	7.96
E21	Breckland SPA/Breckland Forest SSSI	10.30	12.88	12.29	14.54	10.24
E22	Breckland SPA/Breckland Forest SSSI	4.85	6.43	6.17	6.82	4.71
E23	Breckland SPA/Breckland Forest SSSI	2.56	3.47	3.44	3.44	2.38
E24	Breckland SPA/Breckland Forest SSSI	2.45	3.06	2.99	2.90	1.98
E25	Breckland SPA/Breckland Forest SSSI	0.71	0.86	0.91	0.76	0.50
E26	Breckland SPA/Breckland Forest SSSI	0.57	0.72	0.75	0.55	0.42
E27	Breckland SPA/Breckland Farmland SSSI	0.53	0.64	0.65	0.46	0.41
E28	Breckland SPA/Breckland Farmland SSSI	0.66	0.71	0.71	0.52	0.51

Receptor		Predicted Annual Nitrogen Deposition Rates PC (kgN/ha/yr)				
		2014	2015	2016	2017	2018
E29	The Brinks, Northwold SSSI	1.50	1.80	1.79	1.62	1.14
E30	Breckland SPA/Breckland Farmland SSSI	0.69	0.72	0.65	0.57	0.55
E31	Breckland SPA/Breckland Farmland SSSI	0.76	0.96	1.03	0.94	0.71
E32	Breckland SAC/Gooderstone Warren SSSI	0.31	0.39	0.42	0.30	0.23
E33	Breckland SAC/RAF Lakenheath SSSI	0.23	0.18	0.18	0.07	0.14
E34	Wangford Warren and Carr SSSI	0.29	0.22	0.23	0.09	0.17
E35	Didlington Park Lakes SSSI	0.67	0.86	0.88	0.88	0.57
E36	Stanford Training Area SSSI	0.21	0.29	0.29	0.23	0.17

3.3.6 Maximum predicted annual nitrogen deposition rates at the ecological receptor locations are summarised in Table 33.

Table 33   Maximum Predicted Annual Nitrogen Deposition Proposed Installation PCs

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.26	5.16
E2	Breckland SAC/Weeting Heath SSSI	0.81	16.20
E3	Breckland SAC/Weeting Heath SSSI	0.46	9.21
E4	Breckland SAC/Grime's Graves SSSI	0.33	6.61
E5	Breckland SAC/Cranwich Camp SSSI	0.91	18.25
E6	Breckland SAC/Gooderstone Warren SSSI	0.46	9.14
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.62	12.36
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.52	10.49
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.57	11.49
E10	Breckland SPA/Breckland Farmland SSSI	1.81	36.19

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E11	Breckland SPA/Breckland Farmland SSSI	3.05	60.99
E12	Breckland SPA/Breckland Farmland SSSI	2.83	56.60
E13	Breckland SPA/Breckland Farmland SSSI	2.24	44.88
E14	Breckland SPA/Breckland Forest SSSI	2.06	41.13
E15	Breckland SPA/Breckland Forest SSSI	1.84	36.79
E16	Breckland SPA/Breckland Forest SSSI	2.29	45.73
E17	Breckland SPA/Breckland Forest SSSI	21.81	436.28
E18	Breckland SPA/Breckland Forest SSSI	4.11	82.15
E19	Breckland SPA/Breckland Forest SSSI	5.73	114.54
E20	Breckland SPA/Breckland Forest SSSI	12.06	241.23
E21	Breckland SPA/Breckland Forest SSSI	14.54	290.83
E22	Breckland SPA/Breckland Forest SSSI	6.82	136.43
E23	Breckland SPA/Breckland Forest SSSI	3.47	69.30
E24	Breckland SPA/Breckland Forest SSSI	3.06	61.30
E25	Breckland SPA/Breckland Forest SSSI	0.91	18.26
E26	Breckland SPA/Breckland Forest SSSI	0.75	15.09
E27	Breckland SPA/Breckland Farmland SSSI	0.65	12.94
E28	Breckland SPA/Breckland Farmland SSSI	0.71	14.29
E29	The Brinks, Northwold SSSI	1.80	18.00
E30	Breckland SPA/Breckland Farmland SSSI	0.72	14.40
E31	Breckland SPA/Breckland Farmland SSSI	1.03	20.50
E32	Breckland SAC/Gooderstone Warren SSSI	0.42	8.43
E33	Breckland SAC/RAF Lakenheath SSSI	0.23	4.61
E34	Wangford Warren and Carr SSSI	0.29	5.75

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate PC (kgN/ha/yr)	PC Proportion of Low Critical Load (%)
E35	Didlington Park Lakes SSSI	0.88	-
E36	Stanford Training Area SSSI	0.29	5.71

3.3.7   The nitrogen deposition results are summarised as follows:

- The predicted proposed installation PC as a proportion of the relevant critical load was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC; and,
- The predicted proposed installation PC as a proportion of the relevant critical load was below 20% at all SSSIs, with the exception of Breckland Farmland SSSI and Breckland Forest SSSI.

3.3.8   As shown above, there is potential for exceedences of the relevant EA criteria at several ecological designations as a result of emissions associated with the permitted installation. Further assessment was therefore undertaken in order to determine the predicted change in PCs at receptors as result of the Environmental Permit Variation. The results are summarised in Section 5.0.

Acid Deposition

3.3.9   Predicted annual acid deposition PCs at the ecological receptor locations for the proposed installation are summarised in Table 34.

Table 34   Predicted Annual Acid Deposition Proposed Installation PCs

Receptor		Predicted Annual Acid Deposition Rates PC (keq/ha/yr)				
		2014	2015	2016	2017	2018
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.03	0.02	0.02	0.01	0.02
E2	Breckland SAC/Weeting Heath SSSI	0.06	0.08	0.09	0.08	0.06
E3	Breckland SAC/Weeting Heath SSSI	0.05	0.04	0.04	0.03	0.03

Receptor		Predicted Annual Acid Deposition Rates PC (keq/ha/yr)				
		2014	2015	2016	2017	2018
E4	Breckland SAC/Grime's Graves SSSI	0.02	0.03	0.04	0.03	0.02
E5	Breckland SAC/Cranwich Camp SSSI	0.07	0.10	0.10	0.09	0.06
E6	Breckland SAC/Gooderstone Warren SSSI	0.04	0.05	0.05	0.04	0.03
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	0.04	0.04	0.03	0.03
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	0.04	0.04	0.03	0.03
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	0.04	0.04	0.03	0.03
E10	Breckland SPA/Breckland Farmland SSSI	0.12	0.13	0.11	0.05	0.08
E11	Breckland SPA/Breckland Farmland SSSI	0.22	0.16	0.17	0.06	0.16
E12	Breckland SPA/Breckland Farmland SSSI	0.20	0.15	0.17	0.06	0.15
E13	Breckland SPA/Breckland Farmland SSSI	0.16	0.14	0.14	0.07	0.12
E14	Breckland SPA/Breckland Forest SSSI	0.15	0.13	0.13	0.09	0.11
E15	Breckland SPA/Breckland Forest SSSI	0.11	0.13	0.13	0.12	0.10
E16	Breckland SPA/Breckland Forest SSSI	0.11	0.14	0.16	0.16	0.11
E17	Breckland SPA/Breckland Forest SSSI	1.07	1.33	1.26	1.55	1.09
E18	Breckland SPA/Breckland Forest SSSI	0.20	0.25	0.27	0.29	0.19
E19	Breckland SPA/Breckland Forest SSSI	0.27	0.33	0.36	0.41	0.26
E20	Breckland SPA/Breckland Forest SSSI	0.54	0.69	0.71	0.86	0.57
E21	Breckland SPA/Breckland Forest SSSI	0.73	0.92	0.87	1.03	0.73
E22	Breckland SPA/Breckland Forest SSSI	0.34	0.46	0.44	0.49	0.33
E23	Breckland SPA/Breckland Forest SSSI	0.18	0.25	0.24	0.24	0.17
E24	Breckland SPA/Breckland Forest SSSI	0.17	0.22	0.21	0.21	0.14
E25	Breckland SPA/Breckland Forest SSSI	0.05	0.06	0.06	0.05	0.04
E26	Breckland SPA/Breckland Forest SSSI	0.04	0.05	0.05	0.04	0.03
E27	Breckland SPA/Breckland Farmland SSSI	0.04	0.05	0.05	0.03	0.03
E28	Breckland SPA/Breckland Farmland SSSI	0.05	0.05	0.05	0.04	0.04
E29	The Brinks, Northwold SSSI	0.11	0.13	0.13	0.12	0.08

Receptor		Predicted Annual Acid Deposition Rates PC (keq/ha/yr)				
		2014	2015	2016	2017	2018
E30	Breckland SPA/Breckland Farmland SSSI	0.05	0.05	0.05	0.04	0.04
E31	Breckland SPA/Breckland Farmland SSSI	0.05	0.07	0.07	0.07	0.05
E32	Breckland SAC/Gooderstone Warren SSSI	0.03	0.04	0.04	0.03	0.02
E33	Breckland SAC/RAF Lakenheath SSSI	0.02	0.02	0.02	0.01	0.01
E34	Wangford Warren and Carr SSSI	0.02	0.02	0.02	0.01	0.01
E35	Didlington Park Lakes SSSI	0.05	0.06	0.06	0.06	0.04
E36	Stanford Training Area SSSI	0.01	0.02	0.02	0.02	0.01

3.3.10   Maximum predicted annual acid deposition rates at the ecological receptor locations are summarised in Table 35.

Table 35   Maximum Predicted Annual PC Acid Deposition Proposed Installation PCs

Receptor		Maximum Predicted Annual Acid Deposition Rate PC (keq/ha/yr)	PC Proportion of Critical Load (%)
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.03	5.13
E2	Breckland SAC/Weeting Heath SSSI	0.09	16.10
E3	Breckland SAC/Weeting Heath SSSI	0.05	9.16
E4	Breckland SAC/Grime's Graves SSSI	0.04	6.57
E5	Breckland SAC/Cranwich Camp SSSI	0.10	18.14
E6	Breckland SAC/Gooderstone Warren SSSI	0.05	9.09
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	8.56
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	7.26
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.04	7.95
E10	Breckland SPA/Breckland Farmland SSSI	0.13	24.02
E11	Breckland SPA/Breckland Farmland SSSI	0.22	40.48

Receptor		Maximum Predicted Annual Acid Deposition Rate PC (keq/ha/yr)	PC Proportion of Critical Load (%)
E12	Breckland SPA/Breckland Farmland SSSI	0.20	37.57
E13	Breckland SPA/Breckland Farmland SSSI	0.16	29.79
E14	Breckland SPA/Breckland Forest SSSI	0.15	27.30
E15	Breckland SPA/Breckland Forest SSSI	0.13	24.42
E16	Breckland SPA/Breckland Forest SSSI	0.16	30.35
E17	Breckland SPA/Breckland Forest SSSI	1.55	289.58
E18	Breckland SPA/Breckland Forest SSSI	0.29	54.53
E19	Breckland SPA/Breckland Forest SSSI	0.41	76.02
E20	Breckland SPA/Breckland Forest SSSI	0.86	160.12
E21	Breckland SPA/Breckland Forest SSSI	1.03	193.04
E22	Breckland SPA/Breckland Forest SSSI	0.49	90.55
E23	Breckland SPA/Breckland Forest SSSI	0.25	46.00
E24	Breckland SPA/Breckland Forest SSSI	0.22	40.69
E25	Breckland SPA/Breckland Forest SSSI	0.06	12.12
E26	Breckland SPA/Breckland Forest SSSI	0.05	10.02
E27	Breckland SPA/Breckland Farmland SSSI	0.05	8.59
E28	Breckland SPA/Breckland Farmland SSSI	0.05	9.49
E29	The Brinks, Northwold SSSI	0.13	2.64
E30	Breckland SPA/Breckland Farmland SSSI	0.05	9.56
E31	Breckland SPA/Breckland Farmland SSSI	0.07	13.61
E32	Breckland SAC/Gooderstone Warren SSSI	0.04	8.37
E33	Breckland SAC/RAF Lakenheath SSSI	0.02	4.58
E34	Wangford Warren and Carr SSSI	0.02	0.42
E35	Didlington Park Lakes SSSI	0.06	-
E36	Stanford Training Area SSSI	0.02	2.15

3.3.11 The acid deposition results are summarised as follows:

- The predicted proposed installation PC as a proportion of the relevant critical load was above 4% at Breckland SAC, Breckland SPA and Norfolk Valley Fens SAC; and,
- The predicted proposed installation PC as a proportion of the relevant critical load was below 20% at all SSSIs, with the exception of Breckland Farmland SSSI and Breckland Forest SSSI.

3.3.12 As shown above, there is potential for exceedences of the relevant EA criteria at several designations as a result of emissions associated with the permitted installation. Further assessment was therefore undertaken in order to determine the predicted change in PCs at receptors as result of the Environmental Permit Variation. The results are summarised in Section 5.0.

4.0 FURTHER ASSESSMENT

4.1 Introduction

4.1.1 The dispersion modelling results indicated potential for exceedences of the relevant EA criteria at several designations. The permitted installation and proposed installation PCs were therefore compared in order to determine the predicted change in annual mean NH_3 concentrations and nitrogen and acid deposition rates at ecological receptors as a result of the Environmental Permit Variation. The results are provided in the following Sections.

4.2 Ammonia

4.2.1 Predicted changes in annual mean NH_3 PCs at the ecological receptor locations are summarised in Table 36.

Table 36   Predicted Annual Mean NH_3 PC Change

Receptor		Max. Predicted Annual Mean NH_3 PC (µg/m³)		PC Change (µg/m³)	PC Change as a Prop. of Critical Level (%)
		Permitted	Proposed		
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.075	0.050	-0.025	-2.55
E2	Breckland SAC/Weeting Heath SSSI	0.265	0.156	-0.109	-10.92
E3	Breckland SAC/Weeting Heath SSSI	0.155	0.089	-0.067	-6.67
E4	Breckland SAC/Grime's Graves SSSI	0.087	0.064	-0.023	-2.30
E5	Breckland SAC/Cranwich Camp SSSI	0.318	0.176	-0.142	-14.21
E6	Breckland SAC/Gooderstone Warren SSSI	0.126	0.088	-0.038	-3.84
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.195	0.119	-0.076	-7.57
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.154	0.101	-0.054	-5.36
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.171	0.110	-0.061	-6.09

Receptor		Max. Predicted Annual Mean NH₃ PC (µg/m³)		PC Change (µg/m³)	PC Change as a Prop. of Critical Level (%)
		Permitted	Proposed		
E10	Breckland SPA/Breckland Farmland SSSI	0.466	0.232	-0.234	-7.80
E11	Breckland SPA/Breckland Farmland SSSI	0.907	0.391	-0.516	-17.21
E12	Breckland SPA/Breckland Farmland SSSI	0.909	0.363	-0.546	-18.22
E13	Breckland SPA/Breckland Farmland SSSI	0.718	0.288	-0.431	-14.35
E14	Breckland SPA/Breckland Forest SSSI	0.632	0.264	-0.368	-12.28
E15	Breckland SPA/Breckland Forest SSSI	0.504	0.236	-0.269	-8.95
E16	Breckland SPA/Breckland Forest SSSI	0.516	0.293	-0.222	-7.41
E17	Breckland SPA/Breckland Forest SSSI	8.734	2.797	-5.938	-197.92
E18	Breckland SPA/Breckland Forest SSSI	0.982	0.527	-0.455	-15.17
E19	Breckland SPA/Breckland Forest SSSI	1.412	0.734	-0.678	-22.60
E20	Breckland SPA/Breckland Forest SSSI	2.821	1.546	-1.275	-42.49
E21	Breckland SPA/Breckland Forest SSSI	3.948	1.864	-2.084	-69.47
E22	Breckland SPA/Breckland Forest SSSI	1.770	0.875	-0.895	-29.85
E23	Breckland SPA/Breckland Forest SSSI	0.843	0.444	-0.398	-13.28
E24	Breckland SPA/Breckland Forest SSSI	0.750	0.393	-0.357	-11.91
E25	Breckland SPA/Breckland Forest SSSI	0.174	0.117	-0.057	-1.92
E26	Breckland SPA/Breckland Forest SSSI	0.144	0.097	-0.047	-1.57
E27	Breckland SPA/Breckland Farmland SSSI	0.122	0.083	-0.039	-1.29
E28	Breckland SPA/Breckland Farmland SSSI	0.139	0.092	-0.047	-1.58
E29	The Brinks, Northwold SSSI	0.683	0.346	-0.337	-11.22
E30	Breckland SPA/Breckland Farmland SSSI	0.167	0.092	-0.074	-2.48
E31	Breckland SPA/Breckland Farmland SSSI	0.220	0.131	-0.089	-2.95
E32	Breckland SAC/Gooderstone Warren SSSI	0.114	0.081	-0.033	-3.33
E33	Breckland SAC/RAF Lakenheath SSSI	0.065	0.044	-0.021	-2.06
E34	Wangford Warren and Carr SSSI	0.087	0.055	-0.032	-3.15

Receptor		Max. Predicted Annual Mean NH₃ PC (µg/m³)		PC Change (µg/m³)	PC Change as a Prop. of Critical Level (%)
		Permitted	Proposed		
E35	Didlington Park Lakes SSSI	0.263	0.170	-0.094	-3.12
E36	Stanford Training Area SSSI	0.077	0.055	-0.022	-2.24

4.2.2   As shown in Table 36, annual mean NH₃ concentrations are predicted to decrease at all receptors as result of the changes to rearing operations proposed at the site under the Environmental Permit Variation.

4.3   **Nitrogen Deposition**

4.3.1   Predicted nitrogen deposition PC changes at the ecological receptor locations are summarised in Table 37.

Table 37   Predicted Annual Nitrogen Deposition PC Change

Receptor		Max. Predicted Annual Nitrogen Dep. Rate PC (kgN/ha/yr)		PC Change	PC Change as a Prop. Of Low Critical Load (%)
		Permitted	Proposed		
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.39	0.26	-0.13	-2.65
E2	Breckland SAC/Weeting Heath SSSI	1.38	0.81	-0.57	-11.35
E3	Breckland SAC/Weeting Heath SSSI	0.81	0.46	-0.35	-6.94
E4	Breckland SAC/Grime's Graves SSSI	0.45	0.33	-0.12	-2.39
E5	Breckland SAC/Cranwich Camp SSSI	1.65	0.91	-0.74	-14.78
E6	Breckland SAC/Gooderstone Warren SSSI	0.66	0.46	-0.20	-4.00
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	1.01	0.62	-0.39	-7.87
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.80	0.52	-0.28	-5.57

Receptor		Max. Predicted Annual Nitrogen Dep. Rate PC (kgN/ha/yr)		PC Change	PC Change as a Prop. Of Low Critical Load (%)
		Permitted	Proposed		
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.89	0.57	-0.32	-6.33
E10	Breckland SPA/Breckland Farmland SSSI	3.63	1.81	-1.83	-36.50
E11	Breckland SPA/Breckland Farmland SSSI	7.08	3.05	-4.03	-80.54
E12	Breckland SPA/Breckland Farmland SSSI	7.09	2.83	-4.26	-85.25
E13	Breckland SPA/Breckland Farmland SSSI	5.60	2.24	-3.36	-67.16
E14	Breckland SPA/Breckland Forest SSSI	4.93	2.06	-2.87	-57.47
E15	Breckland SPA/Breckland Forest SSSI	3.93	1.84	-2.09	-41.90
E16	Breckland SPA/Breckland Forest SSSI	4.02	2.29	-1.73	-34.69
E17	Breckland SPA/Breckland Forest SSSI	68.13	21.81	-46.31	-926.26
E18	Breckland SPA/Breckland Forest SSSI	7.66	4.11	-3.55	-71.00
E19	Breckland SPA/Breckland Forest SSSI	11.01	5.73	-5.29	-105.76
E20	Breckland SPA/Breckland Forest SSSI	22.00	12.06	-9.94	-198.86
E21	Breckland SPA/Breckland Forest SSSI	30.80	14.54	-16.26	-325.12
E22	Breckland SPA/Breckland Forest SSSI	13.81	6.82	-6.98	-139.70
E23	Breckland SPA/Breckland Forest SSSI	6.57	3.47	-3.11	-62.16
E24	Breckland SPA/Breckland Forest SSSI	5.85	3.06	-2.79	-55.75
E25	Breckland SPA/Breckland Forest SSSI	1.36	0.91	-0.45	-8.96
E26	Breckland SPA/Breckland Forest SSSI	1.12	0.75	-0.37	-7.37
E27	Breckland SPA/Breckland Farmland SSSI	0.95	0.65	-0.30	-6.01
E28	Breckland SPA/Breckland Farmland SSSI	1.08	0.71	-0.37	-7.39
E29	The Brinks, Northwold SSSI	3.55	1.80	-1.75	-17.50
E30	Breckland SPA/Breckland Farmland SSSI	1.30	0.72	-0.58	-11.61
E31	Breckland SPA/Breckland Farmland SSSI	1.72	1.03	-0.69	-13.83
E32	Breckland SAC/Gooderstone Warren SSSI	0.59	0.42	-0.17	-3.47

Receptor		Max. Predicted Annual Nitrogen Dep. Rate PC (kgN/ha/yr)		PC Change	PC Change as a Prop. Of Low Critical Load (%)
		Permitted	Proposed		
E33	Breckland SAC/RAF Lakenheath SSSI	0.34	0.23	-0.11	-2.15
E34	Wangford Warren and Carr SSSI	0.45	0.29	-0.16	-3.28
E35	Didlington Park Lakes SSSI	1.37	0.88	-0.49	-
E36	Stanford Training Area SSSI	0.40	0.29	-0.12	-2.33

4.3.2   As shown in Table 37, annual nitrogen deposition rates are predicted to decrease at all receptors as result of the changes to rearing operations proposed at the site under the Environmental Permit Variation.

4.4   Acid Deposition

4.4.1   Predicted acid deposition PC changes at the ecological receptor locations are summarised in Table 38.

Table 38   Predicted Annual Acid Deposition PC Change

Receptor		Max. Predicted Annual Acid Dep. Rate PC (keq/ha/yr)		PC Change	PC Change as a Prop. Of Critical Load (%)
		Permitted	Proposed		
E1	Breckland SAC/Wangford Warren and Carr SSSI	0.04	0.03	-0.01	-0.03
E2	Breckland SAC/Weeting Heath SSSI	0.15	0.09	-0.06	-0.11
E3	Breckland SAC/Weeting Heath SSSI	0.09	0.05	-0.04	-0.07
E4	Breckland SAC/Grime's Graves SSSI	0.05	0.04	-0.01	-0.02
E5	Breckland SAC/Cranwich Camp SSSI	0.18	0.10	-0.08	-0.15
E6	Breckland SAC/Gooderstone Warren SSSI	0.07	0.05	-0.02	-0.04
E7	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.07	0.04	-0.03	-0.05

Receptor		Max. Predicted Annual Acid Dep. Rate PC (keq/ha/yr)		PC Change	PC Change as a Prop. Of Critical Load (%)
		Permitted	Proposed		
E8	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.06	0.04	-0.02	-0.04
E9	Norfolk Valley Fens SAC/Fouldon Common SSSI	0.06	0.04	-0.02	-0.04
E10	Breckland SPA/Breckland Farmland SSSI	0.26	0.13	-0.13	-0.24
E11	Breckland SPA/Breckland Farmland SSSI	0.50	0.22	-0.29	-0.53
E12	Breckland SPA/Breckland Farmland SSSI	0.50	0.20	-0.30	-0.57
E13	Breckland SPA/Breckland Farmland SSSI	0.40	0.16	-0.24	-0.45
E14	Breckland SPA/Breckland Forest SSSI	0.35	0.15	-0.20	-0.38
E15	Breckland SPA/Breckland Forest SSSI	0.28	0.13	-0.15	-0.28
E16	Breckland SPA/Breckland Forest SSSI	0.29	0.16	-0.12	-0.23
E17	Breckland SPA/Breckland Forest SSSI	4.85	1.55	-3.30	-6.15
E18	Breckland SPA/Breckland Forest SSSI	0.54	0.29	-0.25	-0.47
E19	Breckland SPA/Breckland Forest SSSI	0.78	0.41	-0.38	-0.70
E20	Breckland SPA/Breckland Forest SSSI	1.57	0.86	-0.71	-1.32
E21	Breckland SPA/Breckland Forest SSSI	2.19	1.03	-1.16	-2.16
E22	Breckland SPA/Breckland Forest SSSI	0.98	0.49	-0.50	-0.93
E23	Breckland SPA/Breckland Forest SSSI	0.47	0.25	-0.22	-0.41
E24	Breckland SPA/Breckland Forest SSSI	0.42	0.22	-0.20	-0.37
E25	Breckland SPA/Breckland Forest SSSI	0.10	0.06	-0.03	-0.06
E26	Breckland SPA/Breckland Forest SSSI	0.08	0.05	-0.03	-0.05
E27	Breckland SPA/Breckland Farmland SSSI	0.07	0.05	-0.02	-0.04
E28	Breckland SPA/Breckland Farmland SSSI	0.08	0.05	-0.03	-0.05
E29	The Brinks, Northwold SSSI	0.25	0.13	-0.12	-0.03
E30	Breckland SPA/Breckland Farmland SSSI	0.09	0.05	-0.04	-0.08
E31	Breckland SPA/Breckland Farmland SSSI	0.12	0.07	-0.05	-0.09

Receptor		Max. Predicted Annual Acid Dep. Rate PC (keq/ha/yr)		PC Change	PC Change as a Prop. Of Critical Load (%)
		Permitted	Proposed		
E32	Breckland SAC/Gooderstone Warren SSSI	0.06	0.04	-0.02	-0.03
E33	Breckland SAC/RAF Lakenheath SSSI	0.04	0.02	-0.01	-0.02
E34	Wangford Warren and Carr SSSI	0.03	0.02	-0.01	0.00
E35	Didlington Park Lakes SSSI	0.10	0.06	-0.03	-
E36	Stanford Training Area SSSI	0.03	0.02	-0.01	-0.01

4.4.2   As shown in Table 38, annual acid deposition rates are predicted to decrease at all receptors as result of the changes to rearing operations proposed at the site under the Environmental Permit Variation.

4.5   Summary

4.5.1   The results indicated annual mean NH_3 concentrations and nitrogen and acid deposition PCs are predicted to decrease at all ecological receptors as result of the changes to rearing operations at the site proposed under the Environmental Permit Variation. As such, impacts are not considered to be significant and further emission reduction measures are not required.

5.0   CONCLUSION

5.1.1   Redmore Environmental Ltd was commissioned by Crown Chicken Ltd and Wayland Farms Ltd to undertake an Ammonia Assessment in support of an Environmental Permit Variation Application for a pig and poultry installation on land at Airfield Farm, Feltwell Farm and Methwold Farm.

5.1.2   The proposed Environmental Permit Variation has the potential to cause changes in pollutant levels at ecological receptors in the vicinity of the site. An Ammonia Assessment was therefore undertaken in order to assess potential effects.

5.1.3   Potential NH_3 releases were defined based on the size and nature of the permitted and proposed installations. Impacts at ecological receptors were quantified using dispersion modelling and the results compared with relevant EA criteria.

5.1.4   The results indicated the proposed change to rearing operations at the site described in the Environmental Permit Variation is predicted to reduce pollutant levels at all ecological receptors in the vicinity of the site. Impacts are therefore not considered to be significant and further emission reduction measures are not required.

6.0 <u>ABBREVIATIONS</u>

CERC	Cambridge Environmental Research Consultants
EA	Environment Agency
FYM	Farmyard manure
NE	Natural England
NGR	National Grid Reference
NH_3	Ammonia
PC	Process Contribution
SAC	Special Areas of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
T	Tonne

Figures
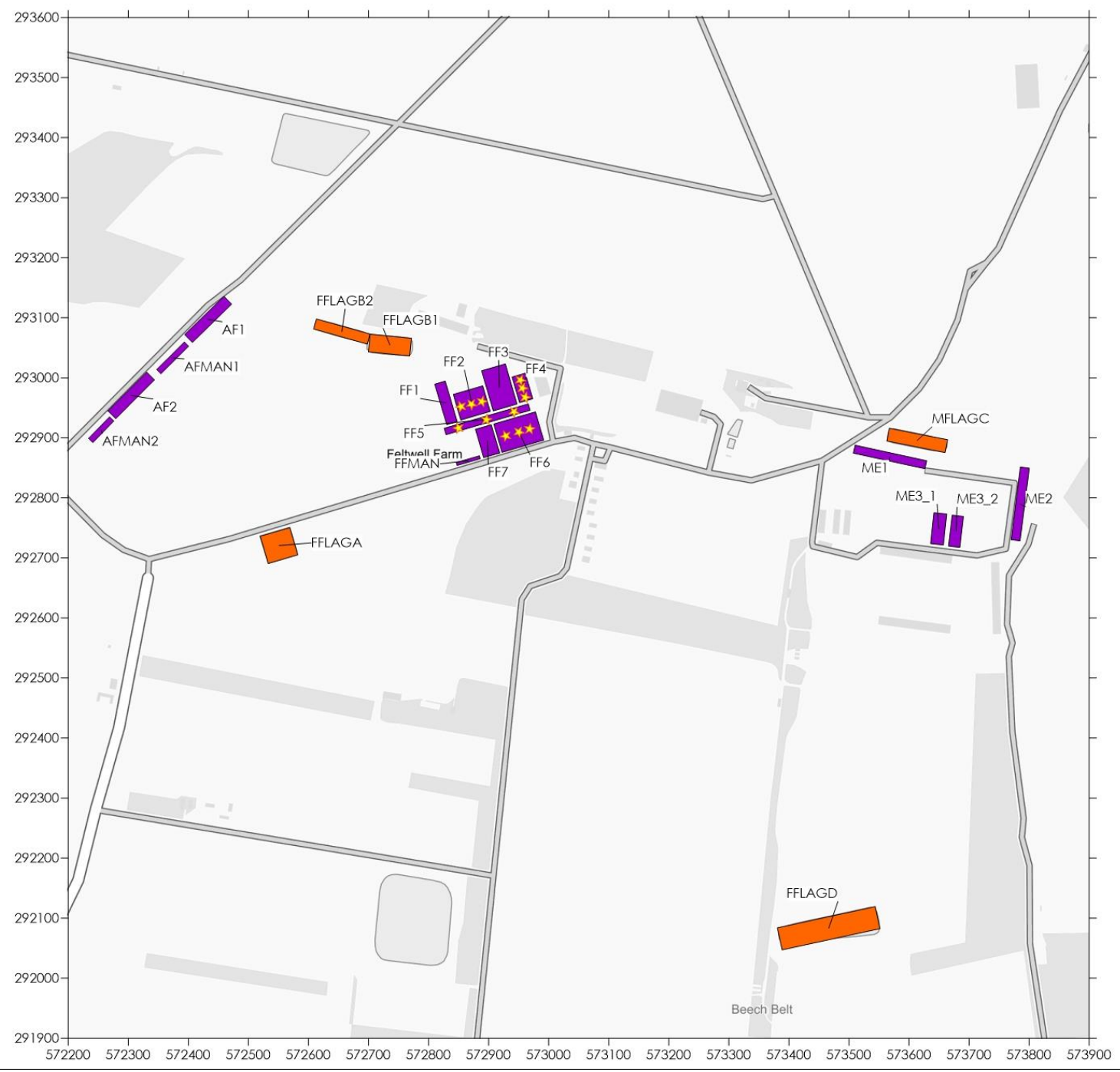
Legend

- Building
- Area Source
- Volume Source
- ★ Point Source

Title
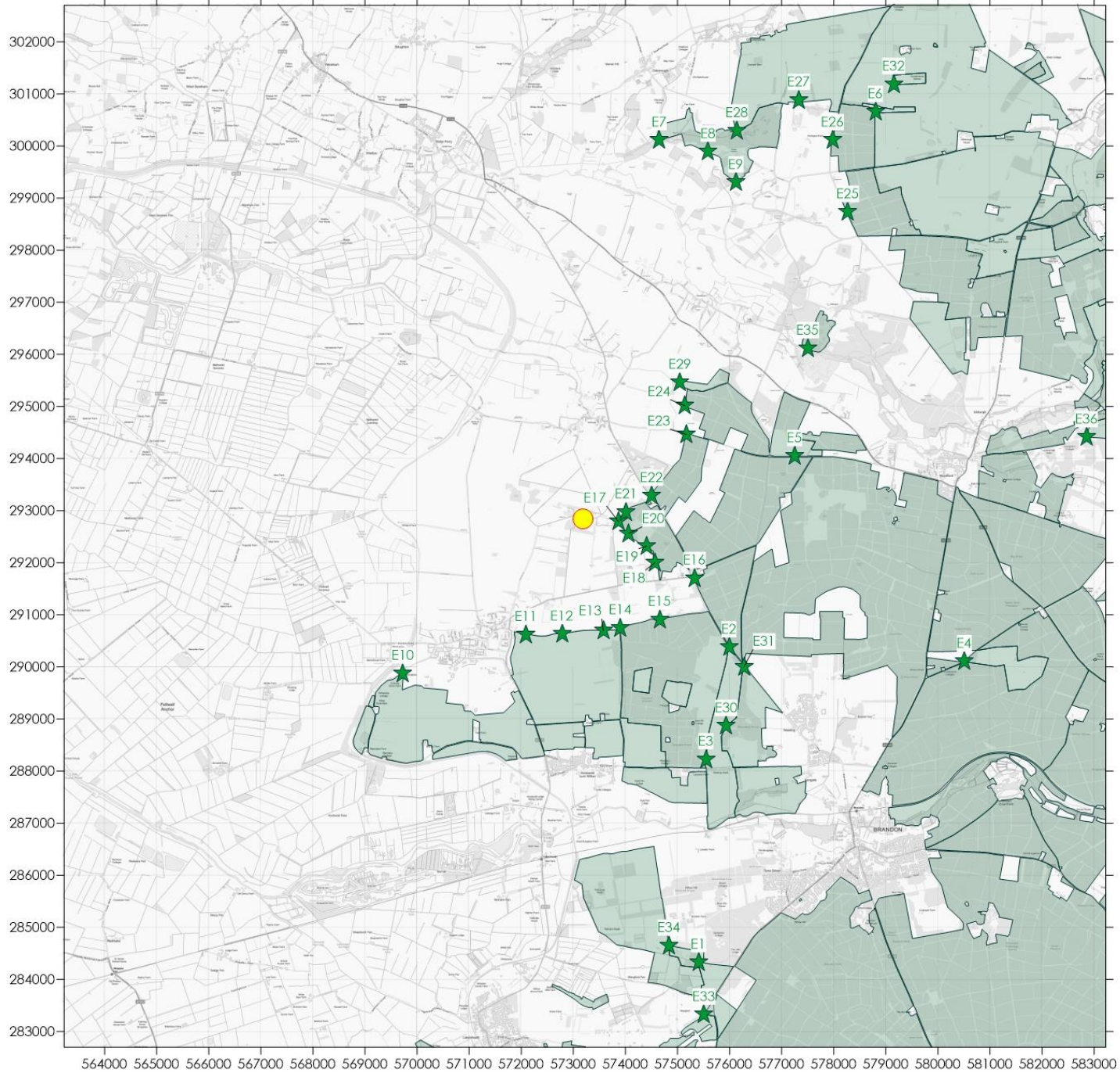Figure 1 - Permitted Installation
ADMS-6 Inputs

Project
Ammonia Assessment
Land at Airfield Farm, Feltwell Farm
and Methwold Farm

Project Reference
3894-3

Client
Crown Chicken Ltd and
Wayland Farms Ltd

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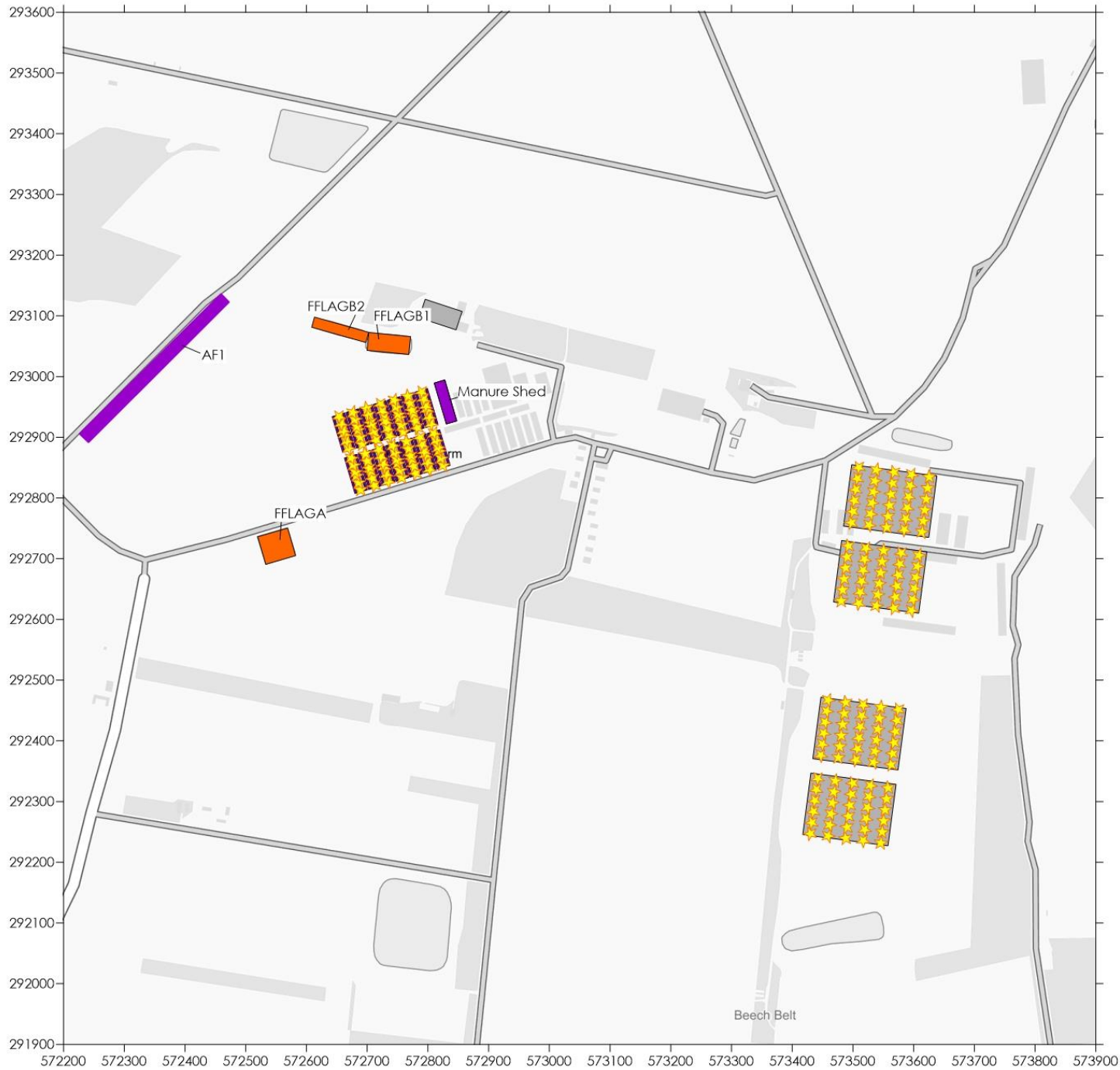
Legend

Building
Area Source
Volume Source
Point Source

Title
Figure 2 - Proposed Installation
ADMS-6 Inputs

Project
Ammonia Assessment
Land at Airfield Farm, Feltwell Farm
and Methwold Farm

Project Reference
3894-3

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Legend

- Installation Location
- Receptor
- Designation

Title
Figure 3 - Discrete Receptor Locations

Project
Ammonia Assessment
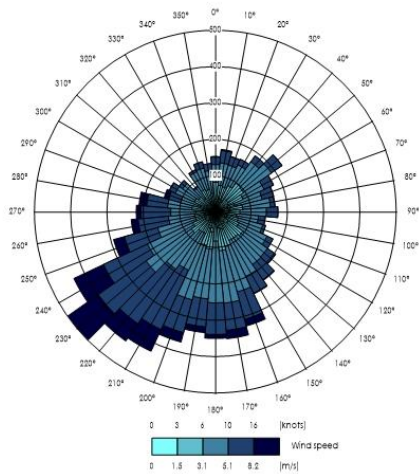Land at Airfield Farm, Feltwell Farm and Methwold Farm

Project Reference
3894-3

Client
Crown Chicken Ltd and Wayland Farms Ltd

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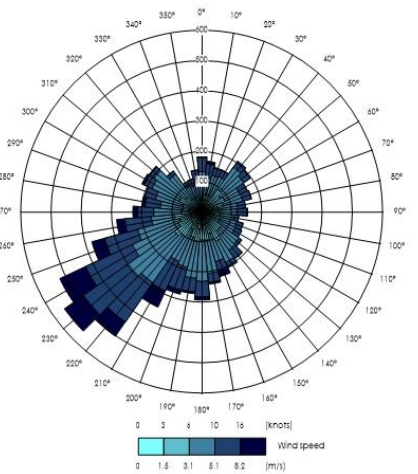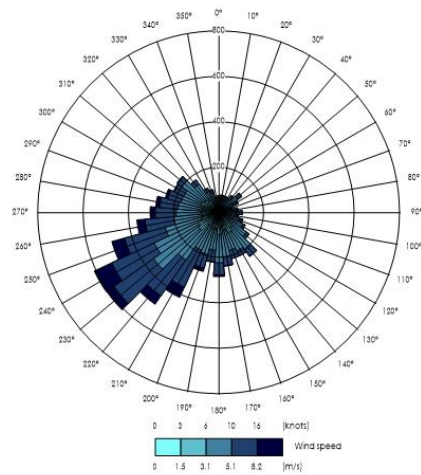
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2014 Meteorological Data
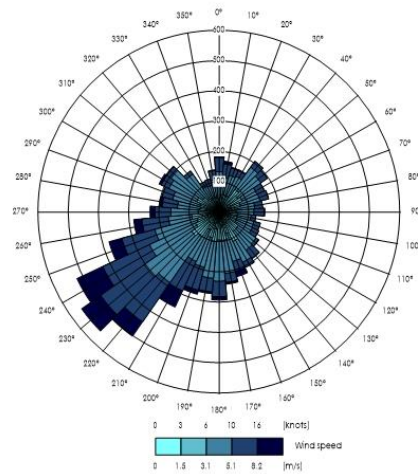
2015 Meteorological Data

2016 Meteorological Data

2017 Meteorological Data
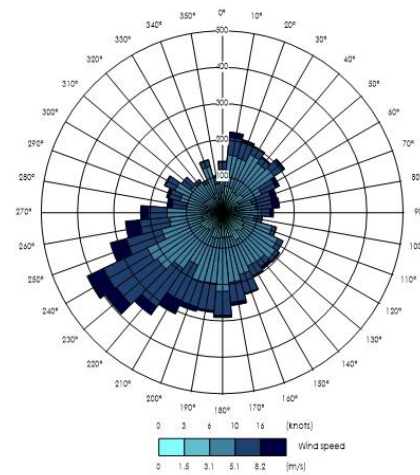
2018 Meteorological Data

Appendix 1 - Critical Levels and Loads

Critical Levels

The NH$_3$ critical levels for Breckland SAC are presented in Table A1.1.

Table A1.1 NH$_3$ Critical Levels - Breckland SAC

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (μg/m^3)
European dry heaths	Yes	Yes	1
Inland dunes with open corynephorus and agrostis grasslands	No	No	3
Semi-natural dry grasslands and scrubland facies on calcareous substrates (festuco-brometalia) (* important orchid sites)	Yes	Yes	1
Barbastella barbastellus	-	-	Not Sensitive
Natural eutrophic lakes with magnopotamion or hydrocharition - type vegetation	No	No	3
Triturus cristatus	-	-	_(a)
Alluvial forests with alnus glutinosa and fraxinus excelsior (alno-padion, alnion incanae, salicion albae)	Yes	Yes	1

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for Breckland SPA are presented in Table A1.2.

Table A1.2 NH$_3$ Critical Levels - Breckland SPA

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (μg/m^3)
Caprimulgus europaeus	-	-	Not Sensitive
Caprimulgus europaeus	-	-	Not Sensitive
Lullula arborea	-	-	Not Sensitive
Lullula arborea	-	-	Not Sensitive
Burhinus oedicnemus (Western Europe - breeding)	-	-	Not Sensitive
Burhinus oedicnemus (Western Europe - breeding)	-	-	Not Sensitive

The NH₃ critical levels for Norfolk Valley Fens SAC are presented in Table A1.3.

Table A1.3 NH₃ Critical Levels - Norfolk Valley Fens SAC

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH₃ Critical Level (µg/m³)
Depressions on peat substrates of the Rhynchosporion	Yes	Yes	1
European dry heaths	Yes	Yes	1
Northern Atlantic wet heaths with Erica tetralix	Yes	Yes	1
Vertigo angustior	-	-	-
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Yes	Yes	1
Vertigo angustior	-	-	1
Alkaline fens	Yes	No	1
Calcareous fens with Cladium mariscus and species of the Caricion davallianae	No	No	3
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Yes	No	1
Lutra lutra	-	-	-
Triturus cristatus	-	-	-(a)
Vertigo moulinsiana	-	-	-
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	Yes	Yes	1

Note: (a) Critical level not assigned for feature on APIS.

The NH₃ critical levels for Breckland Farmland SSSI are presented in Table A1.4.

Table A1.4 NH₃ Critical Levels - Breckland Farmland SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH₃ Critical Level (µg/m³)
Burhinus oedicnemus	-	-	Not Sensitive

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Burhinus oedicnemus	-	-	Not Sensitive
Burhinus oedicnemus	-	-	Not Sensitive

The NH$_3$ critical levels for Breckland Forest SSSI are presented in Table A1.5.

Table A1.5 NH$_3$ Critical Level - Breckland Forest SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Caprimulgus europaeus	-	-	Not Sensitive
Lullula arborea	-	-	Not Sensitive
Caprimulgus europaeus	-	-	Not Sensitive
Lullula arborea	-	-	Not Sensitive
Vascular plant assemblage	-	-	3
Invertebrate assemblage	-	-	-(a)
Artemisia campestris	-	-	3
Filago lutescens	-	-	3
Scleranthus perennis	-	-	3
Veronica spicata	-	-	3
Sciurus vulgaris	-	-	Not Sensitive

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for Cranwich Camp SSSI are presented in Table A1.6.

Table A1.6 NH$_3$ Critical Levels - Cranwich Camp SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Yes	1

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Vascular plant assemblage	-	-	3
Invertebrate assemblage	-	-	-(a)
Herniaria glabra	-	-	3
Phleum phleoides	-	-	3
Silene otites	-	-	3

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for Foulden Common SSSI are presented in Table A1.7.

Table A1.7 NH$_3$ Critical Levels - Foulden Common SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Carex rostrata - potentilla palustris swamp	No	No	3
Alnus glutinosa - carex paniculata woodland	Yes	Yes	3
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	No	No	3
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	No	3
Cladium mariscus swamp and sedge-beds	No	No	3
Juncus subnodulosus - cirsium palustre fen meadow	No	No	3
M24 - molinia caerulea - cirsium dissectum fen meadow	No	No	3
Molinia caerula - cirsium dissectum fen-meadow	No	No	3
Phragmites australis - eupatorium cannabinum tall-herb fen	No	No	3
Schoenus nigricans - juncus subnodulosus mire	Yes	No	1
Invertebrate assemblage	-	-	-(a)

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for Gooderstone Warren SSSI are presented in Table A1.8.

Table A1.8 NH$_3$ Critical Levels - Gooderstone Warren SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m³)
Carex arenaria dune community	No	No	3
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Yes	1
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	No	1

The NH$_3$ critical levels for Grime's Graves SSSI are presented in Table A1.9.

Table A1.9 NH$_3$ Critical Levels - Grime's Graves SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m³)
Calluna vulgaris - festuca ovina heath	Yes	Yes	1
Festuca rubra - galium verum fixed dune grassland	No	No	3
Festuca ovina - agrostis capillaris - rumex acetosella lowland acid grassland	Yes	Yes	1
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Yes	1
Mixed species	-	-	Not Sensitive

The NH$_3$ critical levels for RAF Lakenheath SSSI are presented in Table A1.10.

Table A1.10 NH$_3$ Critical Levels - RAF Lakenheath SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m³)
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Yes	1
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Yes	1
Invertebrate assemblage	-	-	-[a]
Scleranthus perennis	-	-	3

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Vascular plant assemblage	-	-	3

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for Stanford Training Area SSSI are presented in Table A1.11.

Table A1.11 NH$_3$ Critical Levels - Stanford Training Area SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Calluna vulgaris - deschampsia flexuosa heath	Yes	Yes	1
Calluna vulgaris - festuca ovina heath	Yes	Yes	1
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Yes	1
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Yes	1
Festuca rubra - galium verum fixed dune grassland	No	No	3
Festuca ovina - agrostis capillaris - rumex acetosella lowland acid grassland	Yes	Yes	1
Alnus glutinosa - Urtica dioica Woodland	Yes	Yes	1
Cynosurus cristatus - centaurea nigra grassland	No	No	3
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	No	No	3
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	No	1
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Yes	1
Burhinus oedicnemus	-	-	Not Sensitive
Cladium mariscus swamp and sedge-beds	No	No	3
Juncus effusus / acutiflorus - galium palustre rush pasture	No	No	3
Juncus subnodulosus - cirsium palustre fen meadow	No	No	3
Phragmites australis swamp and reed-beds	No	No	3

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Standing waters	No	No	3
Vascular plant assemblage	-	-	3
Invertebrate assemblage	-	-	-(a)
Mixed species	-	-	Not Sensitive
Outstanding dragonfly assemblage	-	-	-(a)
Standing water	-	-	-(a)
Burhinus oedicnemus	-	-	Not Sensitive
Variety of breeding bird species (70)	-	-	Not Sensitive
Variety of wintering bird species (90)	-	-	Not Sensitive

Note: (a) Critical level not assigned for feature on APIS.

The NH$_3$ critical levels for The Brinks, Northwold SSSI are presented in Table A1.12.

Table A1.12 NH$_3$ Critical Levels - The Brinks, Northwold SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Cynosurus cristatus - centaurea nigra grassland	No	No	3
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	No	No	3

The NH$_3$ critical levels for Wangford Warren and Carr SSSI are presented in Table A1.13.

Table A1.13 NH$_3$ Critical Levels - Wangford Warren and Carr SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Carex arenaria - cornicularia aculeata dune community	No	No	3
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Yes	1

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Yes	1

The NH$_3$ critical levels for Weeting Heath SSSI are presented in Table A1.14.

Table A1.14 NH$_3$ Critical Levels - Weeting Heath SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Yes	1
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Yes	1
Burhinus oedicnemus	-	-	Not Sensitive
Vascular plant assemblage	-	-	3
Artemisia campestris	-	-	3
Population of schedule 8 plant - veronica triphyllos, fingered speedwell	-	-	3
Veronica spicata	-	-	3
Burhinus oedicnemus	-	-	Not Sensitive

The NH$_3$ critical levels for Didlington Park Lakes SSSI are presented in Table A1.15.

Table A1.15 NH$_3$ Critical Levels - Didlington Park Lakes SSSI

Habitat	Are Byrophytes Integral for this Habitat?	Are Lichens Integral for this Habitat?	Annual Mean NH$_3$ Critical Level (µg/m^3)
Standing waters	No	No	3
Anas strepera	-	-	-
Standing Water	-	-	-

Nitrogen Critical Loads

The nitrogen critical loads for Breckland SAC are presented in Table A1.16.

Table A1.16 Nitrogen Critical Loads - Breckland SAC

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
European dry heaths	Yes	Dry heaths	5	15
Inland dunes with open corynephorus and agrostis grasslands	Yes	Oceanic to subcontinental inland sand grassland on dry acid and neutral soils	5	15
Semi-natural dry grasslands and scrubland facies on calcareous substrates (festuco-brometalia) (* important orchid sites)	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Barbastella barbastellus	Yes	Broadleaved deciduous woodland	10	15
Natural eutrophic lakes with magnopotamion or hydrocharition - type vegetation	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Triturus cristatus	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Alluvial forests with alnus glutinosa and fraxinus excelsior (alno-padion, alnion incanae, salicion albae)	No	Designated feature/ feature habitat not sensitive to eutrophication	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Breckland SPA are presented in Table A1.17.

Table A1.17 Nitrogen Critical Loads - Breckland SPA

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Caprimulgus europaeus	Yes	Dry heaths	5	15

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Caprimulgus europaeus	Yes	Temperate continental Pinus sylvestris forest	5	15
Lullula arborea	Yes	Dry heaths	5	15
Lullula arborea	Yes	Temperate continental Pinus sylvestris forest	5	15
Burhinus oedicnemus (Western Europe - breeding)	Yes	Low and medium altitude hay meadows	10	20
Burhinus oedicnemus (Western Europe - breeding)	No	Species' broad habitat not sensitive to eutrophication	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Norfolk Valley Fens SAC are presented in A1.18.

Table A1.18 Nitrogen Critical Loads - Norfolk Valley Fens SAC

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Depressions on peat substrates of the Rhynchosporion	Yes	Valley mires, poor fens and transition mires	5	15
European dry heaths	Yes	Dry heaths	5	15
Northern Atlantic wet heaths with Erica tetralix	Yes	Northern wet heath: `L? Erica tetralixdominated wet heath (lowland)	5	15
Vertigo angustior	Yes	Arctic-alpine calcareous grassland	5	10
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Yes	Semi-dry Perennial calcareous grassland (basic meadow steppe).	10	20
Vertigo angustior	Yes	Low and medium altitude hay meadows	10	20
Alkaline fens	Yes	Rich fens	15	25
Calcareous fens with Cladium mariscus and species of the Caricion davallianae	Yes	Rich fens	15	25

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Yes	Moist or wet mesotrophic to eutrophic hay meadow	15	25
Lutra lutra	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Triturus cristatus	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Vertigo moulinsiana	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	No	Designated feature/feature habitat not sensitive to eutrophication	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Breckland Farmland SSSI are presented in Table A1.19.

Table A1.19 Nitrogen Critical Loads - Breckland Farmland SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Burhinus oedicnemus	Yes	Low and medium altitude hay meadows	10	20

The nitrogen critical loads for Breckland Forest SSSI are presented in Table A1.20.

Table A1.20 Nitrogen Critical Loads - Breckland Forest SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Caprimulgus europaeus	Yes	Dry heaths	5	15
Lullula arborea	Yes	Dry heaths	5	15

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Caprimulgus europaeus	Yes	Temperate mountain picea forest, temperate mountain abies forest	10	15
Lullula arborea	Yes	Temperate mountain picea forest, temperate mountain abies forest	10	15
Vascular plant assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Artemisia campestris	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Filago lutescens	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Scleranthus perennis	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Veronica spicata	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Sciurus vulgaris	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Cranwich Camp SSSI are presented in Table A1.21.

Table A1.21 Nitrogen Critical Loads - Cranwich Camp SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Vascular plant assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Herniaria glabra	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Phleum phleoides	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Silene otites	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Foulden Common SSSI are presented in Table A1.22.

Table A1.22 Nitrogen Critical Loads - Foulden Common SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Carex rostrata - potentilla palustris swamp	Yes	Valley mires, poor fens and transition mires	5	15
Alnus glutinosa - carex paniculata woodland	Yes	Broadleaved deciduous woodland	10	15
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Cladium mariscus swamp and sedge-beds	Yes	Rich fens	15	25
Juncus subnodulosus - cirsium palustre fen meadow	Yes	Rich fens	15	25

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
M24 - molinia caerulea - cirsium dissectum fen meadow	Yes	Rich fens	15	25
Molinia caerula - cirsium dissectum fen-meadow	Yes	Rich fens	15	25
Phragmites australis - eupatorium cannabinum tall-herb fen	Yes	Rich fens	15	25
Schoenus nigricans - juncus subnodulosus mire	Yes	Rich fens	15	25
Invertebrate assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Gooderstone Warren SSSI are presented in Table A1.23.

Table A1.23 Nitrogen Critical Loads - Gooderstone Warren SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Carex arenaria dune community	Yes	Coastal dune grasslands (grey dunes)	5	15
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20

The nitrogen critical loads for Grime's Graves SSSI are presented in Table A1.24.

Table A1.24 Nitrogen Critical Loads - Grime's Graves SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Calluna vulgaris - festuca ovina heath	Yes	Dry heaths	5	15

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Festuca rubra - galium verum fixed dune grassland	Yes	Coastal dune grasslands (grey dunes)	5	15
Festuca ovina - agrostis capillaris - rumex acetosella lowland acid grassland	Yes	Non-mediterranean dry acid and neutral closed grassland	6	10
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Mixed species	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for RAF Lakenheath SSSI are presented in Table A1.25.

Table A1.25 Nitrogen Critical Loads - RAF Lakenheath SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Invertebrate assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Scleranthus perennis	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Stanford Training Area SSSI are presented in Table A1.26.

Table A1.26 Nitrogen Critical Loads - Stanford Training Area SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Calluna vulgaris - deschampsia flexuosa heath	Yes	Dry heaths	5	15
Calluna vulgaris - festuca ovina heath	Yes	Dry heaths	5	15
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca rubra - galium verum fixed dune grassland	Yes	Coastal dune grasslands (grey dunes)	5	15
Festuca ovina - agrostis capillaris - rumex acetosella lowland acid grassland	Yes	Non-mediterranean dry acid and neutral closed grassland	6	10
Alnus glutinosa - urtica dioica woodland	Yes	Broadleaved deciduous woodland	10	15
Cynosurus cristatus - centaurea nigra grassland	Yes	Low and medium altitude hay meadows	10	20
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Burhinus oedicnemus	Yes	Low and medium altitude hay meadows	10	20
Cladium mariscus swamp and sedge-beds	Yes	Rich fens	15	25
Juncus effusus / acutiflorus - galium palustre rush pasture	Yes	Moist or wet mesotrophic to eutrophic hay meadow	15	25
Juncus subnodulosus - cirsium palustre fen meadow	Yes	Rich fens	15	25

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Phragmites australis swamp and reed-beds	Yes	Rich fens	15	25
Standing waters	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Mixed species	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Outstanding dragonfly assemblage	Yes	No comparable habitat with established critical load estimate available	-(a)	-(a)
Standing water	Site specific	-(a)	-(a)	-(a)
Burhinus oedicnemus	No	Species' broad habitat not sensitive to eutrophication	-(a)	-(a)
Variety of breeding bird species (70)	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)
Variety of wintering bird species (90)	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for The Brinks, Northwold SSSI are presented in Table A1.27.

Table A1.27 Nitrogen Critical Loads - The Brinks, Northwold SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Cynosurus cristatus - centaurea nigra grassland	Yes	Low and medium altitude hay meadows	10	20

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20

The nitrogen critical loads for Wangford Warren and Carr SSSI are presented in Table A1.28.

Table A1.28 Nitrogen Critical Loads - Wangford Warren and Carr SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Carex arenaria - cornicularia aculeata dune community	Yes	Coastal dune grasslands (grey dunes)	5	15
Festuca ovina - agrostis capillaris - rumex acetosella grassland	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Inland sanddrift and dune with siliceous grassland	5	15

The nitrogen critical loads for Weeting Heath SSSI are presented in Table A1.29.

Table A1.29 Nitrogen Critical Loads - Weeting Heath SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Festuca ovina-agrostis capillaris-rumex acetosella subcom cornicularia aculeata-cladonia arbuscula	Yes	Inland sanddrift and dune with siliceous grassland	5	15
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
Burhinus oedicnemus	Yes	Low and medium altitude hay meadows	10	20
Vascular plant assemblage	Yes	No comparable habitat with established critical load estimate available	-[a]	-[a]

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Artemisia campestris	Not assessed for this feature	No critical load has been assigned to this feature	_(a)	_(a)
Population of schedule 8 plant - veronica triphyllos, fingered speedwell	Not assessed for this feature	No critical load has been assigned to this feature	_(a)	_(a)
Veronica spicata	Not assessed for this feature	No critical load has been assigned to this feature	_(a)	_(a)
Burhinus oedicnemus	No	Species' broad habitat not sensitive to eutrophication	_(a)	_(a)

Note: (a) Critical load not assigned for feature on APIS.

The nitrogen critical loads for Didlington Park Lakes SSSI are presented in A1.30.

Table A1.30 Nitrogen Critical Loads - Didlington Park Lakes SSSI

Feature Name	Is the Feature Sensitive to Nitrogen?	Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Standing waters	Yes	No comparable habitat with established critical load estimate available	_(a)	_(a)
Anas strepera	Yes	No comparable habitat with established critical load estimate available	_(a)	_(a)
Standing Water	Site specific	No critical load has been assigned to this feature	_(a)	_(a)

Note: (a) Critical load not assigned for feature on APIS.

Acid Critical Loads

The acid critical loads for Breckland SAC are presented in Table A1.31.

Table A1.31 Acid Critical Loads - Breckland SAC

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Barbastella barbastellus	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.252	0.537
European dry heaths	Yes	Dwarf shrub heath	0.714	0.192	0.944
Semi-natural dry grasslands and scrubland facies on calcareous substrates (festuco-brometalia) (* important orchid sites)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Triturus cristatus	Yes	Freshwater	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Breckland SPA are presented in Table A1.32.

Table A1.32 Acid Critical Loads - Breckland SPA

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Caprimulgus europaeus	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.251	0.536
Lullula arborea	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.251	0.536
Caprimulgus europaeus	Yes	Dwarf shrub heath	0.499	0.191	0.934
Lullula arborea	Yes	Dwarf shrub heath	0.499	0.191	0.934
Burhinus oedicnemus (Western Europe - breeding)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856

The acid critical loads for Norfolk Valley Fens SAC are presented in A1.33.

Table A1.33 Acid Critical Loads - Norfolk Valley Fens SAC

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Depressions on peat substrates of the Rhynchosporion	Yes	Bogs	0.321	0.193	0.514
European dry heaths	Yes	Dwarf shrub heath	0.499	0.230	0.882
Northern Atlantic wet heaths with Erica tetralix	Yes	Dwarf shrub heath	0.499	0.230	0.882
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Lutra lutra	Yes	Freshwater	-(a)	-(a)	-(a)
Triturus cristatus	Yes	Freshwater	-(a)	-(a)	-(a)
Vertigo angustior	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Vertigo moulinsiana	Yes	Freshwater	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Breckland Farmland SSSI are presented in Table A1.34.

Table A1.34 Acid Critical Loads - Breckland Farmland SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Burhinus oedicnemus	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856

The acid critical loads for Breckland Forest SSSI are presented in Table A1.35.

Table A1.35 Acid Critical Loads - Breckland Forest SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Caprimulgus europaeus	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.251	0.536
Lullula arborea	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.251	0.536
Caprimulgus europaeus	Yes	Dwarf shrub heath	0.714	0.191	0.934
Lullula arborea	Yes	Dwarf shrub heath	0.714	0.191	0.934
Artemisia campestris	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Filago lutescens	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Scleranthus perennis	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Veronica spicata	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Sciurus vulgaris	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Cranwich Camp SSSI are presented in Table A1.36.

Table A1.36 Acid Critical Loads - Cranwich Camp SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Herniaria glabra	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Phleum phleoides	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Silene otites	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Foulden Common SSSI are presented in Table A1.37.

Table A1.37 Acid Critical Loads - Foulden Common SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Alnus glutinosa - carex paniculata woodland	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.830	1.187
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Invertebrate assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Gooderstone Warren SSSI are presented in Table A1.38.

Table A1.38 Acid Critical Loads - Gooderstone Warren SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Carex arenaria dune community	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Grime's Graves SSSI are presented in Table A1.39.

Table A1.39 Acid Critical Loads - Grime's Graves SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Calluna vulgaris - festuca ovina heath	Yes	Dwarf shrub heath	0.892	0.480	1.372
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Festuca rubra - galium verum fixed dune grassland	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Mixed species	Yes	No comparable acidity class	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for RAF Lakenheath SSSI are presented in Table A1.40.

Table A1.40 Acid Critical Loads - RAF Lakenheath SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Scleranthus perennis	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Stanford Training Area SSSI are presented in Table A1.41.

Table A1.41 Acid Critical Loads - Stanford Training Area SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Calluna vulgaris - deschampsia flexuosa heath	Yes	Dwarf shrub heath	0.714	0.230	0.944
Calluna vulgaris - festuca ovina heath	Yes	Dwarf shrub heath	0.714	0.230	0.944
Alnus glutinosa - Urtica dioica Woodland	Yes	Unmanaged broadleafed/ coniferous woodland	0.142	0.861	1.209
Cynosurus cristatus - centaurea nigra grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Festuca ovina - avenula pratensis lowland calcareous grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Burhinus oedicnemus	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Festuca rubra - galium verum fixed dune grassland	Not assessed for this feature	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Standing water	Site specific	No critical load has not assigned for this feature, please seek site specific advice	-(a)	-(a)	-(a)
Standing waters	No	Freshwater	-(a)	-(a)	-(a)
Vascular plant assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Invertebrate assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Mixed species	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Outstanding dragonfly assemblage	Yes	No comparable acidity class	-(a)	-(a)	-(a)
Variety of breeding bird species (70)	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)
Variety of wintering bird species (90)	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for The Brinks, Northwold SSSI are presented in Table A1.42.

Table A1.42 Acid Critical Loads - The Brinks, Northwold SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Cynosurus cristatus - centaurea nigra grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Dry grassland/ scrub transitions (mg1-related, cg2d-related)	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856

The acid critical loads for Wangford Warren and Carr SSSI are presented in Table A1.43.

Table A1.43 Acid Critical Loads - Wangford Warren and Carr SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Carex arenaria - cornicularia aculeata dune community	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Weeting Heath SSSI are presented in Table A1.44.

Table A1.44 Acid Critical Loads - Weeting Heath SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Festuca ovina - hieracium pilosella - thymus preaecox grassland	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Burhinus oedicnemus	Yes	Calcareous grassland (using base cation)	0.856	4.000	4.856
Artemisia campestris	Not assessed for this feature	No critical load has been assigned to this feature	-(a)	-(a)	-(a)

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Population of schedule 8 plant - veronica triphyllos, fingered speedwell	Not assessed for this feature	No critical load has been assigned to this feature	_(a)	_(a)	_(a)
Vascular plant assemblage	Yes	No comparable acidity class	_(a)	_(a)	_(a)
Veronica spicata	Not assessed for this feature	No critical load has been assigned to this feature	_(a)	_(a)	_(a)

Note: (a) Critical load not assigned for feature on APIS.

The acid critical loads for Didlington Park Lakes SSSI are presented in A1.45.

Table A1.45 Acid Critical Loads - Didlington Park Lakes SSSI

Feature Name	Is the Feature Sensitive to Acidity?	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Standing Water	Site specific	No critical load has been assigned to this feature	_(a)	_(a)	_(a)
Standing waters	No	Freshwater	_(a)	_(a)	_(a)
Anas strepera	Yes	Freshwater	_(a)	_(a)	_(a)

Note: (a) Critical load not assigned for feature on APIS.