Title:	**Environmental Risk Assessment**
Report Reference:	**HWD-R02-F1**
Client:	**Beck House Poultry Farm**
Submitted To:	**Environment Agency**
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Report Issue History

Report Reference	*Details*
HWD-R02-D1	18-08-25 Draft for internal review
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Contents

1 Introduction

1.1 Background

This environmental risk assessment (ERA) has been carried out in support of an Environmental Permit Variation application for Mr & Mrs H Mitchinson, applying to vary their Intensive Farm Permit at Beck House Farm. The Environment Agency Pre-Application Refence Number related to this application is EPR/LP3530UB/P001.

The ERA systematically evaluates any potential environmental risks and associated impacts of the varied site activities. The methodology and results documented below are to be read in conjunction with all the relevant application documentation.

1.2 Summary of Varied Operations

The changes requiring a variation to existing 'Permitted' operations, are:

- The erection of two new broiler sheds with the capacity for 40,000 birds each.
- Increase in the Permitted Boundary of Site 2 to accommodate the sheds.
- New houses are fitted with high velocity ridge fans, baffled gable end fans and heat exchanger.
- Installation of a Standby Generator of Site 2.
- Addition of emission points for soakaways for domestic effluent on Site 1 and Site 2.

A detailed description of the varied operations has been provided within the application report referenced HWD-R01-F1: Installation Information.

1.3 Report Approach & Guidance

The ERA undertaken follows current Environment Agency (EA) guidance for undertaking ERA's in support of permit applications Risk assessments for your environmental permit - GOV.UK (www.gov.uk) . This ERA follows the EA methodology by:

- Identifying and considering potential environmental risks for the varied operations on site, and the sources of the potential environmental risks.
- Identifying the potential receptors (people, animals, property and anything else that could be affected by the hazard) at risk from the varied site operations.
- Identifying the possible pathways from the sources of the potential risks to the identified receptors.
- Assessing the potential risks relevant to the specific activity and evaluating whether they are acceptable and can be screened out.
- Detailing risk control measures if the potential environmental risks are considered too high.

In summary, the following risks and associated impacts were evaluated when undertaking the ERA:

- Amenity (litter / vermin / mud / fire / flood).
- Odour.
- Noise.

- Fugitive Air Releases (dust / bioaerosols).
- Surface Water.
- Groundwater.
- Air.
- Waste Produced.
- Global Warming Potential (GWP) / Photochemical Ozone Creation Potential (POP).

1.4 Report Format

This ERA follows the format detailed below:

- Introduction.
- Initial Assessment.
- Sensitive Receptors.
- Environmental Risk Assessments.
- Environmental Impact Evaluations.
- Conclusions and Improvements.

2 Initial Assessment

2.1 Methodology

The initial assessment, considers the potential environmental risks and impacts for both normal operations and abnormal/accident situations from the varied operations. Tables 2.2.1 and 2.2.2 below detail the results of the initial assessments and have been used to determine which combinations of operations and potential impacts require a further detailed assessment.

Where it is assessed that there is minimal or no potential for an environmental impact to occur, a brief explanation has been provided for each impact criterion and activity. For those potential risks and impacts that cannot immediately be effectively controlled further evaluation is required.:

'**RA**' indicates - further evaluation for assessing environmental risk has been undertaken as detailed in Section 4 of this report, for normal operations, abnormal operations or accident situations.

'**IA**' indicates- where more detailed evaluation of emissions is required and has been undertaken as detailed in Section 5 of this report.

2.2 Initial Assessment

Table 2.2.1 Initial Assessment – Normal Operations

Impact / Process – Operations	Transportation of Livestock	Livestock Housing	Litter and Dirty Water Removal	Generator
Amenity (litter / vermin / mud / fire)	Pest control in place as part of the site assurance scheme. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean. No foreseeable fire risk from transport operations.	Pest control in place as part of the site assurance scheme. Broiler unit and feed systems contained and kept clean to ensure compliance with animal welfare requirements, therefore, no potential amenity issues. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean.	Pest control in place as part of assurance scheme site works to. Litter removed from the shed during clean down and loaded into trailers which are covered prior to dispatch from site. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean.	No foreseeable amenity issues from the operation of a generator at site under normal operations.

Table 2.2.1 Initial Assessment – Normal Operations				
Impact / Process – Operations	**Transportation of Livestock**	**Livestock Housing**	**Litter and Dirty Water Removal**	**Generator**
		No foreseeable fire risk under normal operation from the housing of livestock.	No foreseeable fire risk under normal operation from litter / dirty water removal.	
Odour	**RA**	**RA**	**RA**	Given low potential for odour from operation of the generator and the distance of sensitive receptors from generator >500 metres, no further assessment required.
Noise	**RA**	**RA**	**RA**	Given low potential for noise from operation of the generator and the distance of sensitive receptors from generator >500 metres, no further assessment required.
Fugitive Air Releases (Dust / Bioaerosols)	No risk of dust / bioaerosol from reception / removal of livestock as all operational areas covered in concrete / hardstanding and bird transfers are relatively infrequent.	**RA**	**RA**	No plausible dust / bioaerosol issues from the operation of an generator at site under normal operations.
Surface Water	No risk to surface waters from the transfer of birds under normal operations as livestock handling systems are contained.	No risk to surface water from livestock housing under normal operations as livestock buildings are contained.	No risk to surface water from litter removal under normal operations as livestock buildings are contained and litter removed in suitable containment.	No foreseeable risk to surface water from the operation of a generator at site under normal operations.
Groundwater	No risk to ground waters from the transfer of birds under normal operations as livestock handling systems are contained.	No risk to ground water from livestock housing under normal operations as livestock buildings are contained.	No risk to ground water from litter removal under normal operations as livestock buildings are contained and litter removed in suitable containment.	No foreseeable risk to ground water from the operation of a generator at site under normal operations.

Table 2.2.1 Initial Assessment – Normal Operations				
Impact / Process – Operations	**Transportation of Livestock**	**Livestock Housing**	**Litter and Dirty Water Removal**	**Generator**
Air	No point source emissions to air from bird transfers that site have direct control over.	**IA**	No point source emissions to air from litter / dirty water removal that site have direct control over.	**IA**
Waste	No waste generated from bird transfers under normal operations.	**IA**	No waste generated under normal operations.	No waste generated under normal operations.
GWP / POP	No point source / fugitive emissions to air from bird transfers that site have direct control over.	No point source / fugitive emissions to air from bird housing that site have direct control over.	No point source / fugitive emissions to air from litter / dirty water transfers that site have direct control over.	**IA**

Table 2.2.2 Initial Assessment – Abnormal Operations				
Impact / Process – Operations	**Transportation of Livestock**	**Livestock Housing**	**Litter and Dirty Water Removal**	**Generator**
Amenity (litter / vermin / mud / fire)	Pest control in place as part of the site assurance scheme. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean. No foreseeable fire risk from transport operations.	Pest control in place as part of the site assurance scheme. Broiler unit and feed systems contained and kept clean to ensure compliance with animal welfare requirements, therefore, no potential amenity issues. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean. Fire - **RA**	Pest control in place as part of the site assurance scheme. Litter removed from the shed during clean down and loaded into trailers which are covered prior to dispatch from site. No risk of mud and litter as all operational areas covered in concrete / hardstanding and kept clean. No foreseeable fire risk under abnormal operation from litter / dirty water removal.	No foreseeable amenity issues from the operation of a generator at site under normal operations. Fire - **RA**

Table 2.2.2 Initial Assessment – Abnormal Operations				
Impact / Process – Operations	**Transportation of Livestock**	**Livestock Housing**	**Litter and Dirty Water Removal**	**Generator**
Odour	**RA**	**RA**	**RA**	Given low potential for odour from operation of the generator and the distance of sensitive receptors from generator >500 metres, no further assessment required.
Noise	**RA**	**RA**	**RA**	Given low potential for noise from operation of the generator and the distance of sensitive receptors from generator >500 metres, no further assessment required.
Fugitive Air Releases (dust / bioaerosols)	No risk of dust / bioaerosol from reception / removal of livestock as all operational areas covered in concrete / hardstanding and bird transfers are relatively infrequent.	**RA**	**RA**	No plausible dust / bioaerosol issues from the operation of the generator at site under normal operations.
Surface Water	**RA**	**RA**	**RA**	**RA**
Groundwater	**RA**	**RA**	**RA**	**RA**
Air	No point source emissions to air from bird transfers that site have direct control over.	**RA**	**IA**	**RA**
Waste	**RA**	**RA**	**RA**	**RA**
GWP / POP	No point source / fugitive emissions to air from bird transfers that site have direct control over.	No point source / fugitive emissions to air from bird housing that site have direct control over.	No point source / fugitive emissions to air litter dirty water transfers that site have direct control over.	**RA**

3 Sensitive Receptors

3.1 Site Location

The installation is located at: Beck House Poultry Farm, Southwaite, Carlisle, Cumbria, CA4 0PY and is split into two sites. The National Grid Reference (NGR) for the centre of:

- Site 1 is NY 42388 47396;
- Site 2 is NY 42346 46919.

Site plans outlining the location of the installation and the receptors identified below can be found in the supporting report referenced HWD-R05-F1: Site Drawings.

3.2 Sensitive Receptors

Given operations have only been varied at Site 2, Table 3. 1 below details sensitive receptors identified within a 2 kilometre radius (unless otherwise specified), of Site 2's proposed installation boundary. For clarity only the closest receptor in each direction is listed.

Table 3.1 – Sensitive Receptors

Receptor Classification	Compass Direction	Approx Distance from the Proposed Installation [1]	Plan Reference[2]
Human Occupied Receptors (within 1 km)			
Human Occupied including Residential / Industrial / Commercial / Offices	NE	c.0.39 km	R1 – Note, farm owned property used by staff.
	SE	c.0.85 km	R2
	SSE	c.0.55 km	R3
	N	c.0.03km	R4 - Note, farm owned property used by staff.
Habitat Receptors[3]			
Ramsar (England) (within 5km)	None identified within 5 km.		
River Eden and Tributaries SSSI - Site of Special Scientific Interest (SSSI)	W	c.3.95km	Not marked on the plan due to the distance from site.
River Eden - Special Areas of Conservation (England) (within 5km)	W	c.3.95km	Not marked on the plan due to the distance from site.
Special Protection Areas (England) (within 5km)	None within 5km.		
Local Nature Reserve (England)	None within 5km.		
National Nature Reserve (England)	None within 5km.		

Table 3.1 – Sensitive Receptors			
Receptor Classification	**Compass Direction**	**Approx Distance from the Proposed Installation [1]**	**Plan Reference[2]**
Ancient Woodland	NE	c.1.29 km	H1
	SE	c.1.74 km	H2
Priority Habitat Inventory Deciduous Woodland	N	c.1.49km	H3
	NE	c.1.29 km	H1
	SE	c.0.22 km	H4
	S	Adjacent	H5
	NW	c.0.84 km	H6
Water Resource Receptors (within 1 km)			
Land Drain	W	c. 0.01 km	W1
Land Drain	E	c. 0.62 km	W2
Land Drain	SE	c. 0.92 km	W3
Land Drain	S	c. 0.75 km	W4
Ground Water[3]	The site is located on a Secondary Aquifer.		
	The site is not within a Source Protection Zone.		
	The site is not within a Drinking Water Safeguard Zones (Groundwater).		
	The site is not within a Nitrate Vulnerable Zone.		
Other Receptors			
Highways and Transportation[4]	E	Adjacent	T1
	N	Adjacent	T2
Air Quality Management Areas[5]	Site is not located within an Air Quality Management Area.		
Scheduled Monuments (within 1km)	None identified within 1 km.		

Table Notes:

*: Closest receptor identified from the Permit Boundary.

1: Distance shown measured using Ordnance Survey data provided by Promap.

2: Locations shown on Sensitive Receptor Plan, Report HWD-R05-F1: Site Drawings.

3: Habitat / Groundwater Source Protection Zones areas identified using the MAGIC Website, August 2025.

4: Closest local road network only.

5: AQMA locations reviewed through DEFRA's website – August 2025.

4 Environmental Risk Assessment

4.1 Methodology

The risk assessment has been undertaken for each potential environmental risk identified in the tables set out in section 2.2 above, for normal operations, abnormal operations and accident situations, where **RA** has been stated. The risk classification assigned has been evaluated by assessing the likelihood of an incident occurring and the severity of impact should it occur, using the following methodology.

Table 4.1 – Environmental Risk Scoring Matrix		
Score	**Description**	**Definition**
Probability of an event occurring		
1	Very Low	Extremely unlikely to occur (<1 per 10 years)
2	Low	Unlikely to occur (<1 per year)
3	Moderate	Could occur (1 per year)
4	High	Could occur frequently (>1 per year)
5	Very High	Could occur continuously
Severity of impact should the event occur		
1	Very Low	Negligible impact
2	Low	Minor impact (contained in localised area on site & recoverable)
3	Moderate	Medium impact (contained within site boundary & recoverable)
4	High	Major impact (spread off site &/or difficult to recover)
5	Very High	Major impact (spread off-site & long term/permanent damage)

The Probability (P) and Severity (S) scores assigned to each item are then multiplied together to provide a total risk assessment score (R):

Risk = Probability x Severity

R =P x S.

Scores are considered to be high or low risk using the following risk classification:

< 10 – Low Risk – Insignificant

≥10 – High Risk - Significant Risk

Where the residual risks are found to be significant a more detailed assessment will be undertaken, or improvements i.e. additional control measures implemented, to mitigate the risks will be recommended within the conclusions section of this report.

4.2 Pre-Requisite Policies and Procedures

The procedures and policies to be implemented at the site to minimise the potential for environmental risk that form part of the sites Environmental Management System are summarised within the report reference: HWD-R04-F1 EMS Summary. These policy and procedures, along with the identified impact control measures, have been considered when calculating the residual risk.

4.3 Risk Assessment Key

The tables set out below detail the risk assessments undertaken based on the methodology outlined above, for all activities and associated impacts recorded as a 'RA' in Tables 2.2.1 and 2.2.2.

Table 4.3 below summaries the abbreviations and notes associated with the risk assessments.

Table 4.3 – Table Key	
Letter / Symbol	**Abbreviation**
P	Probability
S	Severity (Impact / Consequence)
R	Risk Level
N	Normal
A	Abnormal
E	Emergency (accident).

General Notes –

1. This is an Environmental Risk Assessment. No account of Health and Safety risk assessments (human receptors) have been considered in the tables below.
2. All contingency planning requirements are dealt with in the Environmental Accident Management Plan and associated procedures.

4.4 Risk Assessment Tables

Table 4.4.1: Transportation of Livestock						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Odour > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Odours from livestock and associated transport vehicles.	N / A / E	• Livestock delivered and removed from site are clean in line with animal welfare requirements. • Livestock transport vehicles kept clean, in line with animal welfare requirements.	1	4	**4**
Noise > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Noise from livestock and associated transport vehicles.	N / A / E	• Transport vehicles maintained under service contract. • Site speed limit. • Site access road well maintained. • Livestock handled by trained stockmen to ensure they are not startled.	2	3	**6**
Surface Water > Ground / Groundwater > Watercourses Closest watercourse is adjacent to the installation boundary.	Livestock vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels and oils that escape off site into surface waters.	A / E	• Site speed limit enforced. • Vehicles maintained under surface contract. • Livestock vehicles on site for only a brief period of time.	1	4	**4**
	Fuel leaks from parked vehicles that escape off site into surface waters.	A / E	• Vehicles maintained under surface contract. • Livestock vehicles on site for only a brief period.	2	4	**8**
Ground Water > Groundwater	Livestock vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels and oils that	A / E	• Site speed limit enforced. • Vehicles maintained under surface contract. • Vehicles on site for only a brief period.	1	4	**4**

Table 4.4.1: Transportation of Livestock						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Underlying ground / groundwater. Site is not located within and NVZ, is on a Secondary Aquifer and not within a Source Protection of Drinking Water safeguard zone.	escape off site to ground / groundwater.					
	Fuel leaks from parked vehicles that escape off site into ground / groundwater.	A / E	• Vehicles maintained under surface contract. • Livestock vehicles on site for only a brief period.	2	4	**8**
Waste > Production of Waste	Waste generated from the clean-up of spilt fuels / oils from transport vehicles.	A / E	• Staff trained in spill containment and control procedures. • Dedicated containers used for the clean-up and handling of waste to ensure waste generation is kept to a minimum.	2	3	**6**

Table 4.4.2: Livestock Housing						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Odour > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Odours from broiler units.	N / A / E	• Livestock kept clean as per animal welfare requirements. • Units ventilated and systems maintained under service contract to ensure comfortable temperature for livestock is maintained in the shed / quality of litter to minimise	1	4	**4**

Table 4.4.2: Livestock Housing						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Noise > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Noise from broiler units.	N / A / E	• Housing units are contained. • Livestock handled by trained stockmen to ensure they are not startled. • Livestock welfare at the unit monitored by a dedicated stockman. • Operations on site undertaken in such a manner as to not startle livestock.	3	2	**6**
	Noise from feed / fuel delivery vehicles.	N / A / E	• Site speed limit enforced. • Vehicles maintained under surface contract.	2	3	**6**
Fugitive Releases – Dust / Bio Aerosols > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Dust / bioaerosols from the broiler units and associated feed systems.	N / A / E	• Units ventilated and systems maintained under service contract. • Feed stored internally. • Feed distribution systems contained. • Spillages of feed cleaned promptly. • Broiler units are contained. • Housing and livestock kept clean to ensure animal welfare requirements are met. • Stocking density in line with animal welfare requirements.	3	3	**9**
Surface Water > Ground / Groundwater > Watercourses	Failure of housing and dirty water systems leading to significant loss of materials, including litter, feed and wash waters. Materials enter ground / surface water.	A / E	• Floor of the broiler units is impermeable and resistant to spoiled litter. • Wash water collection sumps and associated drains are impermeable, corrosion resistant and form part of the	1	4	**4**

Table 4.4.2: Livestock Housing						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Closest watercourse is adjacent to the installation boundary.			Infrastructure Monitoring Programme implemented on site. • Only dry feeds are used on site.			
	Feed delivery vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels and oils, feed that escape off site to ground / groundwater.	A / E	• Site speed limit enforced. • Vehicles maintained under surface contract. • Vehicles on site for only a brief period. • Only dry feed used on site.	1	4	**4**
	Fuel leaks from parked vehicles that escape off site into ground / groundwater.	A / E	• Vehicles maintained under surface contract. • Livestock vehicles on site for only a brief period.	2	4	**8**
Ground Water > Groundwater Underlying ground / groundwater. Site is not located within and NVZ, is on a Secondary Aquifer and not within a Source Protection of Drinking Water safeguard zone.	Failure of housing and dirty water systems leading to significant loss of materials, including litter, feed and wash waters. Materials enter ground / surface water.	A / E	• Floor of the broiler units is impermeable and resistant to spoiled litter. • Wash water collection sumps and associated drains are impermeable, corrosion resistant and form part of the Infrastructure Monitoring Programme implemented on site. • Only dry feeds are used on site.	1	4	**4**
	Feed delivery vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels	A / E	• Site speed limit enforced. • Vehicles maintained under surface contract. • Vehicles on site for only a brief period. • Only dry feed used on site.	1	4	**4**

Table 4.4.2: Livestock Housing						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
	and oils that escape off site to ground / groundwater.					
	Fuel leaks from parked vehicles that escape off site into ground / groundwater.	A / E	• Vehicles maintained under surface contract. • Livestock vehicles on site for only a brief period.	2	4	**8**
Point Source Air Releases > Atmosphere > Habitats Priority Habitat Inventory Deciduous Woodland adjacent to site.	Failure / malfunction of site ventilation systems resulting in poor dispersion of livestock unit air, impacting on atmosphere / identified habitats.	A / E	• Ventilation systems maintained under service contract. • Performance of ventilation systems monitored daily by operatives.	1	5	**5**
Waste > Production of Waste	Waste generated from the clean-up of spilt fuels / oils / feed from feed delivery vehicles.	A / E	• Staff trained in spill containment and control procedures. • Dedicated containers used for the clean-up and handling of waste to ensure waste generation is kept to a minimum.	2	3	**6**

Table 4.4.3: Litter and Dirty Water Removal						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Odour > Air > Humans	Odours from litter / wash water removal.	N / A / E	• Litter removed from sheds and directly off site during clean down. • Collected litter removed in sheeted trailer.	2	2	**4**

Table 4.4.3: Litter and Dirty Water Removal						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Closest human occupied receptor is c.30 metres from the installation boundary.			• Dirty water collected in wash water tanks and removed in sealed bowsers.			
Noise > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Noise from vehicles collecting litter / dirty water.	N / A / E	• Transport vehicles maintained under service contract. • Site speed limit. • Site access road well maintained.	2	3	**6**
Fugitive Releases – Dust / Bio Aerosols > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Dust / bioaerosols from litter transport vehicles.	N / A / E	• Litter removed from sheds and directly off site during clean down. • Litter trailers cover and not overfilled prior to removal from farm.	3	2	**6**
Surface Water > Ground / Groundwater > Watercourses Closest watercourse is adjacent to the installation boundary.	Failure of dirty water tank leading to significant loss of materials. Materials enter ground / surface water.	A / E	• Dirty water collection tank is impermeable. • Dirty water collected in enclosed tankers prior to transfer off-site.	2	3	**6**
	Litter / dirty water collection vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels and oils, litter / wash waters that escape off site to ground / groundwater.	A / E	• Site speed limit enforced. • Litter trailers / dirty water collection tankers not overfilled prior to removal from farm. • Vehicles maintained under surface contract. • Vehicles on site for only a brief period.	1	4	**4**

Table 4.4.3: Litter and Dirty Water Removal						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
	Fuel leaks from parked vehicles that escape off site into ground / groundwater.	A / E	• Vehicles maintained under surface contract. • Vehicles on site for only a brief period.	2	4	**8**
Ground Water > Groundwater Underlying ground / groundwater. Site is not located within and NVZ, is on a Secondary Aquifer and not within a Source Protection of Drinking Water safeguard zone.	Failure of dirty water tank leading to significant loss of materials. Materials enter ground / surface water.	A / E	• Dirty water collection tank is impermeable. • Dirty water collected in enclosed tankers prior to transfer off-site.	2	3	**6**
	Litter / dirty water collection vehicle fuel containment failure, or collision leading to significant spillage of materials, including vehicle fuels and oils, litter / wash waters that escape off site to ground / groundwater.	A / E	• Site speed limit enforced. • Litter trailers / dirty water collection tankers not overfilled prior to removal from farm. • Vehicles maintained under surface contract. • Vehicles on site for only a brief period.	1	4	**4**
	Fuel leaks from parked vehicles that escape off site into ground / groundwater.	A / E	• Vehicles maintained under surface contract. • Vehicles on site for only a brief period.	2	4	**8**
Waste > Production of Waste	Waste generated from the clean-up of spilt fuels / oils / litter from transport vehicles.	A / E	• Staff trained in spill containment and control procedures. • Dedicated containers used for the clean-up and handling of waste to ensure waste generation is kept to a minimum.	2	3	**6**

Table 4.4.4: Generator						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Amenity > Air > Humans Closest human occupied receptor is c.30 metres from the installation boundary.	Malfunction of the generator resulting in fire.	A / E	• Generator maintained under service contract. • Generator tested weekly on full load.	1	5	**5**
Surface Water > Ground / Groundwater > Watercourses Closest human occupied receptor is c.30 metres from the installation boundary.	Fuel spill during delivery, from vehicle collision, during filling or overfilling of fuel tank, resulting in the escaped materials entering ground / surface water.	A / E	• Spills cleaned up immediately. • Site speed limit. • Generator included as part of the site's infrastructure monitoring programme.	2	3	**6**
	Generator poorly maintained leading to tank / pipe work failure, resulting in the escaped materials entering ground / surface water.	A / E	• Generator maintained under service contract.	1	4	**4**
Ground Water > Groundwater Underlying ground / groundwater. Site is not located within and NVZ, is on a Secondary Aquifer and not within a Source Protection of Drinking Water safeguard zone.	Fuel spill during delivery, from vehicle collision, during filling or overfilling of fuel tank, resulting in the escaped materials entering ground / surface water.	A / E	• Spills cleaned up immediately. • Site speed limit. • Generator included as part of the site's infrastructure monitoring programme.	2	3	**6**
	Generator poorly maintained leading to tank / pipe work failure, resulting in the escaped materials entering ground / surface water.	A / E	• Generator maintained under service contract.	1	4	**4**

Table 4.4.4: Generator						
Potential Risks[1]			**Control Measures**	**Assessment**		
Environmental Risk > Pathway > Receptors	**Initiating Event**	**Condition N/A/E**	**Risk Management Controls[2]**	**Residual Risk**		
				P	**S**	**R**
Point Source Air Releases > Atmosphere > Habitats / GWP Priority Habitat Inventory Deciduous Woodland adjacent to the installation boundary.	Failure / malfunction of generator, resulting in release to atmosphere of gases following incomplete combustion of fuel.	A / E	• Generator maintained under service contract.	1	5	**5**
Waste > Production of Waste	Waste generated from the clean-up of spilt fuels / oils / litter from fuel delivery vehicles.	A / E	• Staff trained in spill containment and control procedures. • Dedicated containers used for the clean-up and handling of waste to ensure waste generation is kept to a minimum.	2	3	**6**

5 Detailed Impact Assessments

5.1 Introduction

The screening assessment detailed above sets out those activities and associated emissions that require a detailed Impact Assessment of their potential impacts under normal operations. Detailed Impacts for the following emissions:

- Air – Ammonia releases from expanded livestock operations and combustion emissions from the standby generator.
- Waste – Waste produced from expanded livestock operations.
- Global Warming Potential (GWP) and Photochemical Ozone Creation Potential (POCP) from site's varied operations.

5.2 Releases to Air

5.2.1 Ammonia

The pre-application response provided by the Environment Agency within the document referenced 'Pre-application number: EPR/LP3530UB/P001' set out that detailed ammonia modelling is required.

The River Eden SAC a has been identified as a receptor within the Environment Agency's Pre-Application Report as requiring detailed modelling. The Environment Agency state that *'For SACs, SPAs and/or Ramsar sites a permit may be issued where either:*

- *the ammonia screening tool indicates that the process contribution is <4% of the CLe and/or Clos; or*

- *detailed modelling indicates that the installation process contribution is < 1 % of the relevant CLe/CLos or, where relevant, the incremental increase from relevant background is < 1 % of the relevant CLe/Clos; or*

- *detailed modelling indicates the process contribution plus contributions from other relevant sources plus background is below the relevant CLe or CLo AND additional checks* during determination are acceptable*

Detailed ammonia modelling was undertaken by AS Modelling & Data Ltd. A copy of the modelling report has been provided within Appendix 1. The detailed modelling found that:

- At all AWs and the LWS identified, the process contributions to annual mean ammonia concentration and nitrogen deposition are and would be below the Environment Agency threshold of 100% of the Critical Level and Critical Load.

- There are currently and would be exceedances of the Environment Agency lower threshold of 1% of the relevant Critical Level and Critical Load at: River Eden SAC. The increases due to the proposed development are less than 1% of the Critical Level and Critical Load.

- There are currently and would continue to be, no exceedances of 1% of the relevant Critical Level or Load at Cumbrian Marsh Fritillary SAC.

- At all SSSIs considered, the process contribution to annual mean ammonia concentration and nitrogen deposition would be below the Environment Agency threshold of 20% of the Critical Level and Critical Load.

- There would be exceedances of the 1% screening criterion of the relevant Critical Level and/or Critical Load at: Cumwhitton Moss SSSI and River Eden and Tributaries SSSI.

Therefore, the ammonia impact at the identified receptors are permissible.

5.2.2 Combustion Sources

The only combustion source on site is –

- A Standby Generator with a thermal input rating of 0.3 MWth.

Given the fact that the size of the Generator can only result in negligible emissions, this emission source is considered to be insignificant and no further detailed assessment is required.

5.3 Waste

5.3.1 Assessment of Wastes

Table 5.1 below identifies changes to the waste streams produced on-site and assesses their potential for environmental impact. The potential for environmental impact of the recovery routes selected for the wastes identified have been assessed, including scoring them following Environment Agency guidance as set out on .gov.uk - https://www.gov.uk/guidance/select-a-waste-recovery-or-disposal-method-for-your-environmental-permit. Although classed as Animal By-Products / non-wastes, litter, fallen stock and wash waters have been included within the assessment below for completeness.

Table 5.1 – Waste Assessment

EWC / Origin / Nature	Annual Volume	Description / Hierarchy	EA Hazard Rating	EA Impact Score	Hazard Rating x Impact Score	Assessment
02 01 06 – Litter from sheds. Non-Hazardous.	Slight Increase on existing.	D10 - Incineration (with energy recovery).	4	10	40	Material is an ABP and incinerated in line with ABP and biosecurity requirements. Only recovery to land for agricultural benefit would represent a better environmental option, however, this would require a suitable land bank close to site which is not available. Material is currently sent off-site for incineration, therefore considered as insignificant in terms of environmental impact.
02 01 06 – Wash waters Non-Hazardous.	Slight Increase on existing.	R10 - Land treatment resulting in benefit to agriculture or ecological improvement.	4	4	16	Recovery to land represents the best available environmental option for the material. Therefore, considered as insignificant in terms of environmental impact.
02 01 02 - Fallen stock. Non-Hazardous.	Slight Increase on existing.	D10 - Incineration without energy recovery.	4	20	80	Materials is an ABP and incinerated in line with ABP and biosecurity requirements. Therefore, considered as insignificant in terms of environmental impact.

5.3.1 Conclusion

The majority of materials detailed above are either sent for incineration or for recovery to land for agricultural benefit, which is considered the best available environmental options for the streams. It is anticipated that all other streams produced will be at levels below Permit reporting thresholds. On this basis, all waste streams produced, and their associated disposal / recovery routes are considered to be insignificant in terms of environmental impact.

5.4 Global Warming Potential (GWP) and Photochemical Ozone Creation Potential (POCP)

5.4.1 Introduction

Both the direct emissions from the facility and the indirect emissions from the use of energy have global warming potential (GWP) and these need to be calculated along with the Photochemical Ozone Creation Potential (POCP) of the varied operations on site. These have been calculated following the Environment Agency guidance note on .gov.uk - https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming#identify-greenhouse-gas-emissions.

5.4.2 Assessment

The table below outlines the GWP and POCP of the varied operations, based on the estimated energy consumption under normal operations. Increased energy consumption sources and levels are estimated as follows -

- Electricity – 95 MWh.
- Gas Oil – c. 527 kg / yr.
- LPG - 70 MWh.

Table 5.1 – Global Warming Potential Assessment

Energy Source	Quantity of Fuel Used	Delivered Energy (MWh)	Primary Energy (MWh)	GWP CO_2 (tonnes)	N_2O (GWP t CO_2 equivalent)	VOC (GWP as t CO_2 equivalent)	Total GWP (t / yr CO_2 Equivalent)	Total POCP (kg / yr)
Electricity		95	228	38			38	
Gas Oil	527	-	6	1.5	0.006	0.002	1.5	0.003
LPG	5485 kg	-	70	16	0.34	0.03	16	0.03
Reference Factors								
Electricity	Electricity converted to primary energy factor of 2.4;							
	Electricity converted to CO_2 apply EA's H1 factor 0.166 t / MWh Primary							
Gas Oil	Usage estimated at 624 litres / year) 12 litres an hour at full load / used for 1 hour a week for testing.)							
	Gas Oil litres converted to k.g. using DEFRA's 2023 GHG Conversion Factors for Company Reporting factor of 842.46 kg/m^3.							
	Gas Oil k.g. converted to MWh using DEFRA's 2023 GHG Conversion Factors for Company Reporting factor of 42.6 MJ/kg.							
	Gas Oil converted to CO_2 by applying EA's factor of 0.25 t / MWh Primary;0.005							
	Gas Oil N_2O emissions based on AP 42 factor of 0.036 g N_2O/ kg , and EA GWP factor of 310 t $C0_2$ equivalent / t N_2O;							
	Gas Oil VOC emissions based on AP42 factor of 0.11 g NMVOC / kg + 0.039 g CH_4 / kg. As a conservative calculation, it is assumed that all VOCs are methane and therefore the methane EA GWP factor of 21 $C0_2$ equivalent / t VOC has been applied.							
LPG	LPG converted to kg using DEFRA's 2023 GHG Conversion Factors for Company Reporting 531.10 kg/m^3.							
	LPG converted to MWh using DEFRA's 2023 GHG Conversion Factors for Company Reporting factor of 45.96 MJ/kg.							
	LPG converted to CO2 by applying EA's factor of 0.23 t / MWh Primary;							
	LPG N_2O emissions based on AP 42 factor of 0.2 g N_2O/ kg , and EA GWP factor of 310 t $C0_2$ equivalent / t N_2O;							

Table 5.1 – Global Warming Potential Assessment	
	LPG emissions based on AP42 factor of 0.24 g NMVOC / kg + 0.045 g CH_4 / kg. As a conservative calculation, it is assumed that all VOCs are methane and therefore the methane EA GWP factor of 21 $C0_2$ equivalent / t VOC has been applied.
POCP	VOCs released by the facility have the potential to be involved in ground level ozone creation. As a conservative calculation, it is assumed that all VOCs are methane and therefore the methane H1 POCP factor of 0.6 kg / kg VOC has been applied.
DEFRA GHG	These emission conversion factors are for use by UK and international organisations to report on greenhouse gas emissions for the year stated.
AP 42	The 'AP42 Compilation of Air Pollutant Emission Factors', has been published since 1972 as the primary compilation of the Environmental Protection Agencies' emission factor information.

6 Conclusion

The Environmental Risk Assessment identified that the addition of the incinerator to site operations has limited potential to create an environmental impact on identified environmentally sensitive receptors, under normal, abnormal and emergency (accident) scenarios.

The results of the Environmental Risk Assessment has been summarised in Table 6.1 below.

Table 6.1 Environmental Risk Assessment Summary	
Impact	**Significance / Further Assessment**
Amenity (litter / vermin / mud / fire / flood).	Insignificant impact - no further assessment required.
Odour.	Insignificant impact - no further assessment required.
Noise.	Insignificant impact -no further assessment required.
Fugitive Air Releases (dust / bioaerosols).	Insignificant impact - no further assessment required.
Surface Water.	Insignificant impact - no further assessment required.
Groundwater.	Insignificant impact - no further assessment required.
Air.	Ammonia – Impacts shown to be Permittable. Combustion Equipment - Insignificant impact - no further assessment required.
Waste Produced.	Insignificant impact - no further assessment required.
Global Warming Potential (GWP) / Photochemical Ozone Creation Potential (POP).	Values calculated. No further assessment required.

Appendix 1 - AS Modelling & Data Ltd Ammonia Modelling Report

A Report on the Modelling of the Dispersion and Deposition of Ammonia from the Proposed Broiler Chicken Rearing Houses at Beck House Poultry Farm, near Southwaite in Cumbria

AS Modelling & Data Ltd.

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This report has been prepared by AS Modelling & Data Ltd. on behalf of the Client, based on the information provided by the client and/or agent. In preparing this report, AS Modelling & Data Ltd. has exercised all reasonable skill and care, taking into account the agreed scope of works with the Client. AS Modelling & Data Ltd. does not accept any liability in negligence for any matters arising outside of the agreed scope of works, or for changes that may be required due to omissions in the information provided.

1. Introduction

AS Modelling & Data Ltd. has been instructed by Mr. Edward Bennett of AWSM Farming Ltd., on behalf of Mr. John Howard Mitchinson and Mrs. Barbara Mitchinson, to use computer modelling to assess the impact of ammonia emissions from the broiler chicken rearing houses at Beck House Poultry Farm, Southwaite, Carlisle, Cumbria. CA4 0PY.

Ammonia emission rates from the existing and proposed poultry rearing houses have been assessed and quantified based upon the Environment Agency standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

This report is arranged in the following manner:

- Section 2 provides relevant details of the farm and potentially sensitive receptors in the area.
- Section 3 provides some general information on ammonia; details of the method used to estimate ammonia emissions; relevant guidelines and legislation on exposure limits and where relevant, details of likely background levels of ammonia.
- Section 4 provides some information about ADMS, the dispersion model used for this study and details the modelling procedure.
- Section 5 contains the results of the modelling.
- Section 6 provides a discussion of the results and conclusions.

2. Background Details

Beck House Poultry Farm is in a rural area approximately 2.8 km to the north-west of the village Southwaite in Cumbria. The surrounding land is used mainly for arable cultivation and grazing/fodder production. The farm is at an altitude of around 122 m with land falling toward the River Petteril to the east and rising toward higher ground to the south-west.

There are currently nine poultry rearing houses at Beck House Poultry Farm: six at the northern site and three at the southern site. The houses are ventilated primarily using uncapped high-speed ridge/roof fans, each with a shorth chimney; however, there are gable end fans for use in warmer weather conditions and the houses at the northern site are also fitted with heat exchanger units. The northern site provides accommodation for up to 255,000 birds and the southern site up to 171,000 birds. The chickens are reared from day old chicks for a period of around 38 days and houses are empty for around 10 days at the end of each crop.

It is proposed that two new poultry houses be constructed on land to the south-east of the existing poultry houses at the southern site. The new poultry houses would be used to accommodate up to 80,000 broiler chickens. The houses would be ventilated primarily by uncapped high-speed ridge/roof mounted fans, each with a small chimney, with gable end fans for supplementary ventilation during periods of warmer weather; these houses would also be fitted with heat exchanger units. The chickens would be reared from day old chicks for a period of around 38 days and houses would be empty for around 10 days at the end of each crop.

AS Modelling & Data Ltd. have identified three areas designated as Ancient Woodlands (AWs) and one Local Wildlife Site (LWS) within 2 km of the farm (the normal screening distance for non-statutory sites). There are also seven SSSIs within 10 km (the screening distance for a SSSI/internationally designated site - Defra/Natural England, Impact Risk Zone Mapping), some of the SSSIs are also designated as Special Areas of Conservation (SACs). Some further details of the statutory wildlife sites are provided below:

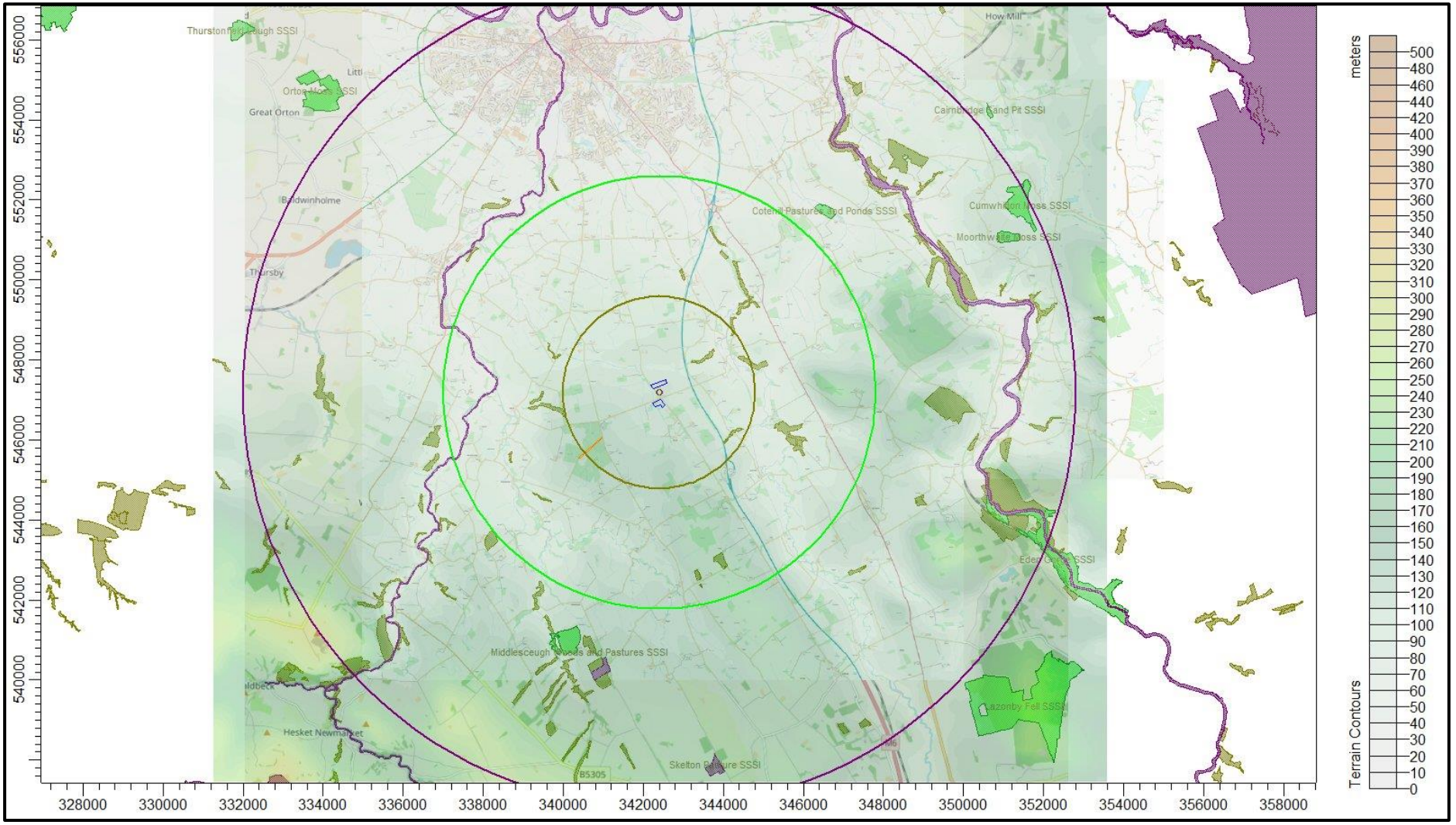
- **Cotehill Pastures and Ponds SSSI** - Approximately 5.7 km to the north-east - A series of ponds of various ages and stages of vegetational development which are bounded by rough grazing land. Around two of the four ponds there are also interesting areas of fen, scrub and woodland.
- **Moorthwaite Moss SSSI** - Approximately 9.0 km to the east-north-east - A very important example of a basin mire. In Britain it is one of the very few lowland basin mires retaining a rainwater-fed, acidic bog vegetation and it supports the best developed example of one form of this vegetation. The areas of open, acidic mire are dominated by the bog mosses *Sphagnum* species that form the peat deposits. *Sphagnum magellanicum* and *S. papillosum* are prominent at Moorthwaite and of note because they are very rare in other lowland basin mires.
- **Cumwhitton Moss SSSI** - Approximately 9.4 km to the east-north-east - Important for its raised and valley mire communities and for its diversity of habitats. The mire vegetation ranges from fairly base-rich fen to acidic raised bog. Areas of wet to dry heath also occur as well as species-rich marshy grassland on the periphery. In recent times the Moss has become fairly well wooded with birch and Scot's pine, however, some areas of more interesting pinewood suggest a long-established, 'relict' element.
- **Eden Gorge SSSI** - Approximately 8.4 km to the east-south-east - Semi-natural woodland covers over half the site, a remnant of the much larger ancient forest of Inglewood. The areas of oak, ash, wych elm and alder woodland found in the Eden Gorge are all important in their own right within the eastern part of Cumbria. Areas of grassland, heath, scrub and flushed wetland add to the diversity of habitats and, coupled with the proximity of the River Eden, greatly increase the richness and value of the site for animal life. An outstanding lichen flora exists on the

exposed yet humid riverside cliffs and an interesting moss and liverwort flora has also developed on the rocks and in the woods. Many 'Atlantic' species not usually found in Cumbria outside lakeland occur in the gorge, including the liverworts *Harpanthus scutatus*, *Bazzania trilobata*, *Microlejeunea uliana* and *Saccogyna viticulosa*.

- **Middlesceugh Woods and Pastures SSSI/Cumbrian Marsh Fritillary SAC** - Approximately 5.7 km to the south-south-west - The woods represent the largest remaining expanse of important ash/oak woodland left in the lowland zone of East Cumbria. Smaller stands of alder and wych elm woodland also occur and associated with the woods are valuable examples of species-rich marshy grasslands unaltered by modern agricultural techniques.
- **Skelton Pasture SSSI/Cumbrian Marsh Fritillary SAC** - Approximately 8.7 km to the south-south-west - The main importance of this site is the presence of a large colony of the nationally scarce marsh fritillary butterfly *Eurodryas aurinia*. Skelton supports a number of fen meadow vegetation types in a combination which is unique in East Cumbria.
- **River Eden and Tributaries SSSI/River Eden SAC** - Approximately 3.8 km to the west (closest point) - The Eden is an outstanding floristically rich, northern river on sandstone and hard limestone. The diversity of aquatic plants is amongst the highest of all rivers in Britain.

A map of the surrounding area showing the location of the poultry houses (outlined in blue), the AWs (shaded in olive), the LWS (shaded in yellow), the SSSIs (shaded in green) and the SSSIs/SACs (shaded in purple) is provided in Figure 1.

Figure 1. The area surrounding Beck House Poultry Farm - concentric circles radii 2.4 km (olive), 5.4 km (green) and 10.4 km (purple)



3. Ammonia, Background Levels, Critical Levels & Loads & Emission Rates

3.1 Ammonia concentration and nitrogen and acid deposition

When assessing potential impact on ecological receptors, ammonia concentration is usually expressed in terms of micrograms of ammonia per metre cubed of air (µg-NH_3/m^3) as an annual mean. Ammonia in the air may exert direct effects on the vegetation, or indirectly affect the ecosystem through deposition which causes both hyper-eutrophication (excess nitrogen enrichment) and acidification of soils. Nitrogen deposition, specifically in this case the nitrogen load due to ammonia deposition/absorption, is usually expressed in kilograms of nitrogen per hectare per year (kg-N/ha/y). Acid deposition is expressed in terms of kilograms equivalent (of H^+ ions) per hectare per year (keq/ha/y).

3.2 Background ammonia levels and nitrogen and acid deposition

The source of the background figures is the Air Pollution Information System (APIS, August 2025). It should be noted that the 1 km APIS database background levels are extrapolated from 5 km modelled data. Ammonia levels may vary markedly over relatively short distances and the APIS website itself notes that, the background values should be used only to assist the user in obtaining a broad indication of the likely pollutant impact at a specific location and cannot be considered representative of any particular location within the 5 km grid square; extrapolation to a 1 km grid does not alter this.

The APIS figures for background ammonia concentration (2021) in the area around Beck House Farm is 2.69 µg-NH_3/m^3. The background nitrogen deposition rate to woodland is 36.73 kg-N/ha/y and to short vegetation is 19.40 kg-N/ha/y. The background acid deposition rate to woodland is 2.70 keq/ha/y and to short vegetation is 1.43 keq/ha/y.

The APIS background figures are subject to correction and revision and appear to change fairly frequently, the latest figures can be obtained at https://www.apis.ac.uk/search-location.

In most cases, the APIS background figures, which are modelled, extrapolated and statistically manipulated figures, nevertheless, are the only figures available and although it is noted that the background values should be used only to assist in obtaining a broad indication of the likely pollutant impact, it is also noted that across the majority of the UK the lower bounds of the Critical Level and Critical Load are already exceeded.

3.3 Critical Levels and Critical Loads

Critical Levels and Critical Loads are a benchmark for assessing the risk of air pollution impacts to ecosystems. It is important to distinguish between a Critical Level and a Critical Load. The Critical Level is the gaseous concentration of a pollutant in the air, whereas the Critical Load relates to the quantity of pollutant deposited from air to the ground.

Critical Levels are defined as, "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge" (UNECE).

Critical Loads are defined as, "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE).

For ammonia concentration in air, the Critical Level for higher plants is 3.0 µg-NH_3/m^3 as an annual mean. For sites where there are sensitive lichens and bryophytes present, or where lichens and bryophytes are an integral part of the ecosystem, the Critical Level is 1.0 µg-NH_3/m^3 as an annual mean.

Critical Loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution. They are based on empirical evidence, mainly observations from experiments and gradient studies. Critical Loads are given as ranges (e.g. 10-20 kg-N/ha/y); these ranges reflect variation in ecosystem response across Europe.

The Critical Levels and Critical Loads at the wildlife sites assumed in this study are provided in Table 1. N.B. Where the Critical Level of 1.0 µg-NH_3/m^3 is assumed, it is usually unnecessary to consider the Critical Load as the Critical Level provides the stricter test. Normally, the Critical Load for nitrogen deposition provides a stricter test than the Critical Load for acid deposition.

Please note that the assessment requirement is to use the lower bound of the range of Critical Loads for habitats that are present; however, the APIS database (https://www.apis.ac.uk/app) may contain Critical Levels and Critical Loads for species/habitats that are not present at the site, or not present at the parts of the site under consideration.

Table 1. Critical Levels and Critical Loads at the wildlife sites

Site	Critical Level (µg-NH_3/m^3)	Critical Load Nitrogen Deposition (kg-N/ha/y)	Critical Load Acid Deposition (keq/ha/y)
AWs and LWS	1.0 [1]	-	-
Cotehill Pastures and Ponds SSSI	3.0 [2]	10.0 [2 & 3]	-
Moorthwaite Moss SSSI	1.0 [1 & 2]	5.0 [2 & 3]	-
Cumwhitton Moss SSSI	1.0 [1 & 2]	5.0 [2 & 3]	-
Middlesceugh Woods and Pastures SSSI	1.0 [1 & 2]	10.0 [2 & 3]	-
Eden Gorge SSSI	1.0 [1 & 2]	10.0 [2 & 3]	-
Skelton Pasture SSSI/Cumbrian Marsh Fritillary SAC	3.0 [2]	10.0 [2 & 3]	-
River Eden and Tributaries SSSI/SAC	1.0 [1 & 2]	10.0 [2 & 3]	-

1. A precautionary figure used where no details of the ecology of the site are available, or the citation for the sites indicates that sensitive lichens and/or bryophytes are/may be present.
2. Based upon APIS (https://www.apis.ac.uk/search-habitat-impacts) and/or the citation for the site. Note that the APIS database may contain entries habitats/species that are not present at the site or part of the site under consideration.
3. The lower bound of the range of Critical Load for habitats/species present at the site (https://www.apis.ac.uk/search-habitat-impacts) and Review and revision of empirical critical loads of nitrogen for Europe, 2022. Note that the APIS database may contain entries habitats/species that are not present at the site or part of the site under consideration.

3.4 Guidance on the Significance of Ammonia Emissions

3.4.1 Environment Agency Criteria

The Environment Agency web-page titled "Intensive farming risk assessment for your environmental permit", contains a set of criteria, with thresholds defined by percentages of the Critical Level or Critical Load, for: internationally designated wildlife sites (Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites); Sites of Special Scientific Interest (SSSIs) and other non-statutory wildlife sites. The lower and upper thresholds are: 1% and 'no upper level'% for SACs, SPAs and Ramsar sites; 20% and 50% for SSSIs and 100% and 100% for non-statutory wildlife sites.

If the predicted process contributions to Critical Level or Critical Load are below the lower threshold percentage, the impact is usually deemed acceptable.

If the predicted process contributions (PCs) to Critical Level or Critical Load are in the range between the lower and upper thresholds; 1% to n/a% for SACs, SPAs and Ramsar sites; 20% to 50% for SSSIs and 100% to 100% for other non-statutory wildlife sites, whether or not the impact is deemed acceptable is at the discretion of the Environment Agency. In making their decision, the Environment Agency will consider whether other farming installations might act in-combination with the farm and the sensitivities of the wildlife sites. In the case of LWSs and AWs, the Environment Agency do not usually consider other farms that may act in-combination and therefore a PC of up to 100% of Critical Level or Critical Load is usually deemed acceptable for permitting purposes and therefore the upper and lower thresholds are the same (100%).

It should be noted that at the detailed modelling stage there are no criteria to decide whether PCs are significant. The significance and the impact and effect of the PCs should be assessed in the context of the current background levels, the environmental standard and the site-specific circumstances.

3.4.2 Natural England advisory criterion

Natural England are a statutory consultee at planning and usually advise that, if predicted process contributions exceed 1% (in some circumstances <1%) of Critical Level or Critical Load at a SSSI, SAC, SPA or Ramsar site, then the local authority should consider whether other farming installations[1] might act in-combination or cumulatively with the farm and the sensitivities of the wildlife sites.

1. The process contribution from most farming installations is already included in the background ammonia concentrations and nitrogen and acid deposition rates. Therefore, it is normally only necessary to consider new installations and installations with extant planning permission developments when understanding the additional impact of a proposal upon nearby ecologies. However, established farms in close proximity may need to be considered given the background concentrations and deposition rates are derived as an average for a 5 km by 5 km grid.

3.4.3 Joint Nature Conservancy Committee - Guidance on Decision-making Thresholds for Air Pollution

In December 2021, the Joint Nature Conservancy Committee (JNCC) published a report titled, "Guidance on Decision-making Thresholds for Air Pollution" This report provides decision-making criteria to inform the assessment of air quality impacts on designated conservation sites. The criteria are intended to be applied to individual sources to identify those for which a decision can be taken without the need for further assessment effort.

The Decision-making thresholds (DMT) for on-site emission sources provided in the JNCC report are reproduced below:

- For lichens and bryophytes - 0.08%, 0.20%, 0.34% and 0.75% of the Critical Level for high, medium, low and very low development density areas, respectively.
- For higher plants - 0.08%, 0.20%, 0.34% and 0.75% of the Critical Level for high, medium, low and very low development density areas, respectively.
- For nitrogen deposition to woodland (Critical Load 10 kg-N/ha/y) - 0.13%, 0.34%, 0.57% and 1.30% of the Critical Level for high, medium, low and very low development density areas, respectively.
- For nitrogen deposition to grassland (Critical Load 10 kg-N/ha/y) 0.09%, 0.24%, 0.40% and 0.88% of the Critical Level for high, medium, low and very low development density areas, respectively.

Note that 'development density' is defined as, the assumed number of additional new sources below the DMT within 5 km of the proposed development over 13 years: very low density being 1 development; low 5 developments; medium 10 developments and high 30 developments.

Subject to some exceptions, where the process contribution from an on-site source is below the DMT, no further assessment is required. Where the process contribution exceeds the DMT there are two possible outcomes:

- Where site-relevant thresholds have been derived these can be applied to see if it is possible to avoid further assessment effort on the basis of site-specific circumstances.
- If site-relevant thresholds have not yet been derived, further assessment in combination with other plans and projects is required.

3.5 Quantification of Ammonia Emissions

Ammonia emission rates from poultry houses depend on many factors and are likely to be highly variable. However, the benchmarks for assessing impacts of ammonia and nitrogen deposition are framed in terms of an annual mean ammonia concentration and annual nitrogen deposition rates. To obtain relatively robust figures for these statistics, it is not necessary to model short term temporal variations and a steady continuous emission rate can be assumed. In fact, modelling short term temporal variations might introduce rather more uncertainty than modelling continuous emissions.

The emission factors used for the poultry housing have been obtained from: https://www.gov.uk/guidance/ammonia-emission-factors-for-pig-and-poultry-screening-modelling-and-reporting#ammonia-emission-factors-for-poultry.

Details of the poultry numbers and types and emission factors used and calculated ammonia emission rates are provided in Table 2.

Table 2. Details of poultry numbers and ammonia emission rates

Source	Animal numbers	Type or weight	Emission factor (kg-NH_3/place/y)	Emission rate (g-NH_3/s)
Existing Housing (north)	255,000	Broiler Chickens	0.024	0.193931
Existing Housing (south)	171,000	Broiler Chickens	0.024	0.130048
Proposed Housing (south)	80,000	Broiler Chickens	0.024	0.060841

4. The Atmospheric Dispersion Modelling System (ADMS) and model parameters

The Atmospheric Dispersion Modelling System (ADMS) ADMS 6 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters; the boundary layer depth, and the Monin-Obukhov length rather than in terms of the single parameter Pasquill-Gifford class.

Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

ADMS has a number of model options, that include: dry and wet deposition; NO_x chemistry; impacts of hills, variable roughness, buildings and coastlines; puffs; fluctuations; odours; radioactivity decay (and γ-ray dose); condensed plume visibility; time varying sources and inclusion of background concentrations.

ADMS has an in-built meteorological pre-processor that allows flexible input of meteorological data both standard and more specialist. Hourly sequential and statistical data can be processed and all input and output meteorological variables are written to a file after processing.

The user defines the pollutant, the averaging time (which may be an annual average or a shorter period), which percentiles and exceedance values to calculate, whether a rolling average is required or not and the output units. The output options are designed to be flexible to cater for the variety of air quality limits, which can vary from country to country and are subject to revision.

4.1 Meteorological data

Computer modelling of dispersion requires hourly sequential meteorological data and to provide robust statistics the record should be of a suitable length; preferably four years or longer.

The meteorological data used in this study is obtained from assimilation and short-term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS)[1].

The GFS is a discrete model. The physics/dynamics model has a resolution or had a resolution of approximately 7 km over the central UK; terrain is understood to be resolved at a resolution of approximately 2 km, with sub-7 km terrain effects parameterised. Site specific data may be extrapolated from nearby archive grid points or a most representative grid point chosen. The GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topological features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR[2]). The use of NWP data has advantages over traditional meteorological records because:

- Calm periods in traditional observational records may be overrepresented, this is because the instrumentation used may not record wind speeds below approximately 0.5 m/s and start up wind speeds may be greater than 1.0 m/s. In NWP data, the wind speed is continuous down to 0.0 m/s, allowing the calms module of ADMS to function correctly.

- Traditional records may include very local deviations from the broad-scale wind flow that would not necessarily be representative of the site being modelled; these deviations are difficult to identify and remove from a meteorological record. Conversely, local effects at the site being modelled are relatively easy to impose on the broad-scale flow and provided horizontal resolution is not too great, the meteorological records from NWP data may be expected to represent well the broad-scale flow.

- Information on the state of the atmosphere above ground level which would otherwise be estimated by the meteorological pre-processor may be included explicitly.

A wind rose showing the distribution of wind speeds and directions in the GFS derived data is shown in Figure 2a. Wind speeds are modified by the treatment of roughness lengths (see Section 4.7) and where terrain data is included in the modelling, the raw GFS wind speeds and directions will be modified. The terrain and roughness length modified wind rose for the site is shown in Figure 2b. Please note that FLOWSTAR[2] is used to obtain a local flow field, not to explicitly model dispersion in complex terrain as defined in the ADMS User Guide; therefore, the ADMS default value for minimum turbulence length has been amended [3].

1. The GFS data used is derived from the high-resolution operational GFS datasets, the data is not obtained from the lower resolution (0.5 degree) long-term archive.
2. Note that FLOWSTAR requirements are for meteorological data representative of the upwind flow over the modelling domain and that single site meteorological data (observational or from high resolution modelled data) that is representative of the application site is not generally suitable (personal correspondence: CERC 2019 and UK Met O 2015). If data are deemed representative of a particular application site, either wholly or partially, then these data cannot also be representative of the upstream flow over the modelling domain. Furthermore, it would be extremely poor practice to use such data as the boundary conditions for a flow-solver, such as FLOWSTAR.

3. When modelling complex terrain with ADMS, by default, the minimum turbulence length has 0.1 m added to the flat terrain value (calculated from the Monin-Obukhov length). Whilst this might be appropriate over hill/mountain tops in terrain with slopes > 1:10 (and quite possibly only in certain wind directions) in lesser terrain it introduces model behaviour that is not desirable where FLOWSTAR is simply being used to modify the upwind flow. Specifically, the parameter sigma z of the Gaussian plume model is overly constrained, which for elevated point sources emissions, may on occasion cause over prediction of ground level concentrations in stable weather conditions and light winds (Steven R. Hanna & Biswanath Chowdhury, 2013), conversely for low level emission sources, this will cause gross under prediction. Note that this becomes particularly important overnight and if calm and light wind conditions are not being ignored, as they often are when using traditional observational meteorological datasets. To reduce this behaviour, where terrain is modelled, AS Modelling & Data Ltd. have set a minimum turbulence length of 0.025 m in ADMS. This approximates the normal behaviour of ADMS with flat terrain.

Figure 2a. The wind rose. Raw GFS derived data for 54.816 N, 2.897 W, 2021-2024

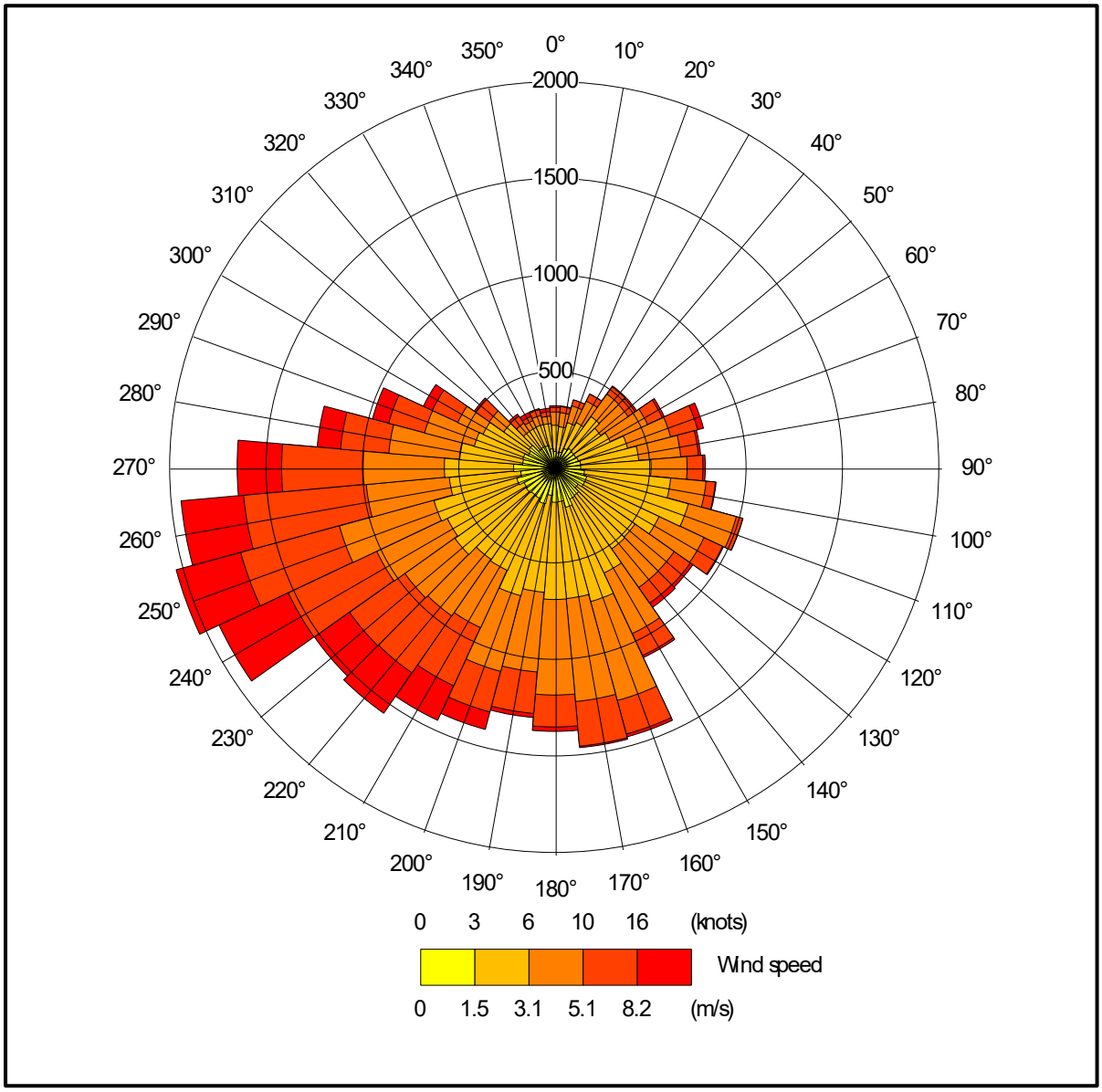
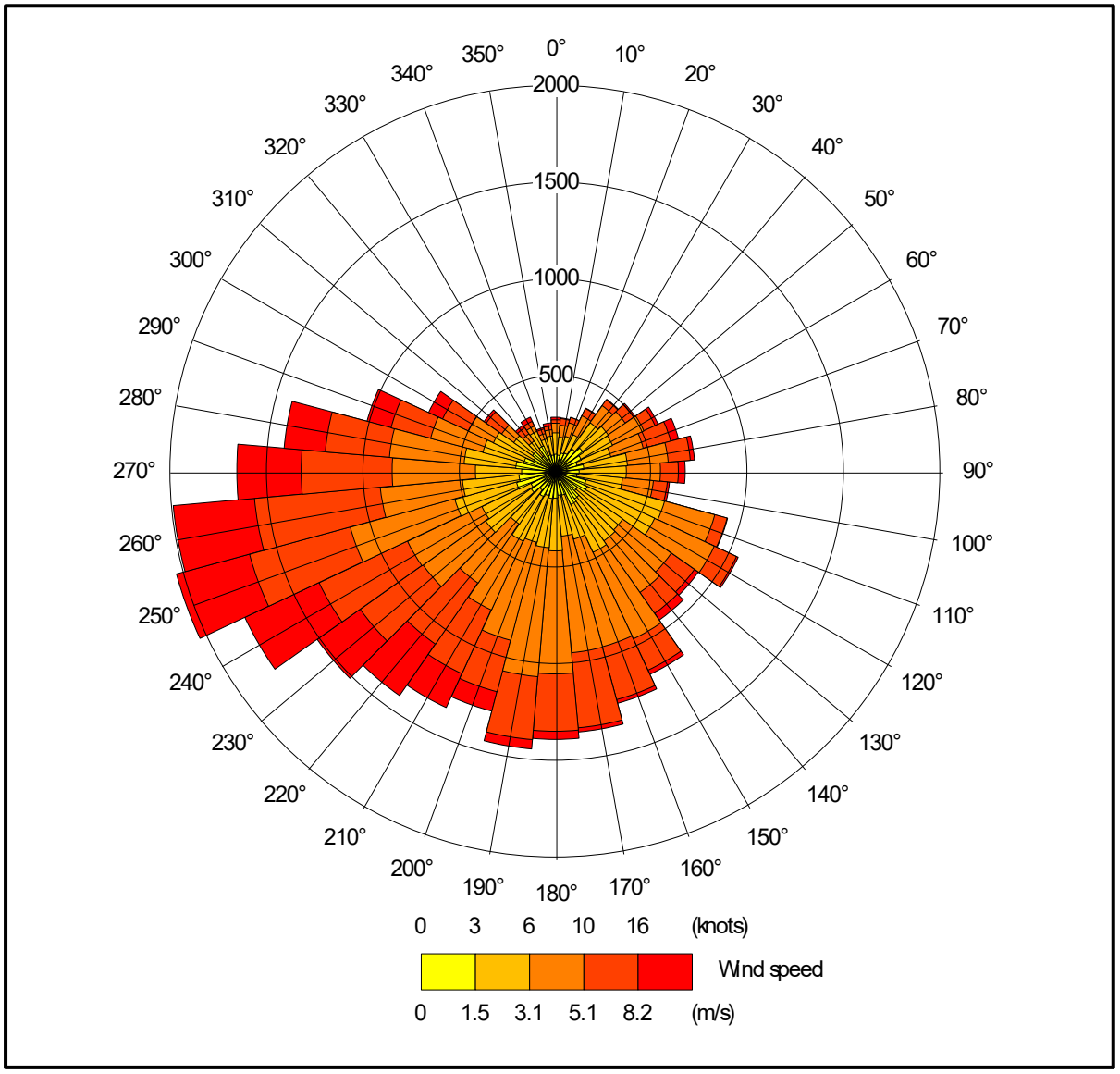


Figure 2b. The wind rose. FLOWSTAR modified GFS derived data for NGR 342400, 547200, 2021-2024



4.2 Emission sources

Emissions from the chimneys of the uncapped high-speed ridge/roof fans that are/would be used for the primary ventilation of the poultry houses are represented by three point sources per house within ADMS.

Emissions from the chimneys of the heat exchanger unit that are/would be used for the primary ventilation of the existing northern site poultry houses and the proposed southern site poultry houses are represented by single point sources per house within ADMS.

Emissions from the gable end fans that are/would be used to supplement the primary ventilation have been represented by volume sources within ADMS.

Where heat exchangers are used:

- If ambient temperature is 10 Celsius or lower, 75% of the emissions are assumed to be from the heat exchanger stack and 25% from the ridge/roof fans.
- If ambient temperature is between 10 and 15 Celsius or, 25% of the emissions are assumed to be from the heat exchanger stack and 75% from the ridge/roof fans.
- Above ambient temperatures exceeding 15 Celsius, it is assumed that heat exchangers are unused.

The emissions from the gable end fans are assumed to be zero unless the ventilation requirement within the poultry houses exceeds the capacity of the ridge fans. In this case, as a precautionary approach, this is assumed to occur when the temperature equals or exceeds 20 Celsius for the northern site and 22 Celsius for the southern site and the emissions are then split 50:50 between the point sources and the volume sources.

Details of the point source parameters are shown in Table 3a and details of the volume source parameters are shown in Table 3b. The positions of the emission sources used are shown in Figure 3 (where the point sources are marked by green circles and the volume sources are marked by red shaded rectangles).

Table 3a. Point source parameters

Source ID	Height (m)	Diameter (m)	Efflux velocity (m/s)	Emission temperature (˚C)	Baseline emission rate per source [2] (g/s)
H1 & H2; 1, 2 & 3	5.5	0.8	11.0	Variable [1]	0.008258
H3 & H4; 1, 2 & 3	5.5	0.8	11.0	Variable [1]	0.009032
H5 & H6; 1, 2 & 3	6.5	0.8	11.0	Variable [1]	0.015032
H7, H8 & H9; 1, 2 & 3	6.0	0.8	11.0	Variable [1]	0.014450
H10 & H11; 1, 2 & 3	6.5	0.8	11.0	Variable [1]	0.010140
HEX1 & HEX2	3.5	1.0	6.0	Variable [1]	0.024774
HEX3 & HEX4	3.5	1.0	6.0	Variable [1]	0.027095
HEX5 & HEX6	3.5	1.0	6.0	Variable [1]	0.045096
HEX10 & HEX11	3.5	1.0	6.0	Variable [1]	0.030421

Table 3b. Volume source parameters

Source ID	Width (m)	Length (m)	Depth (m)	Base height (m)	Emission temperature (°C)	Baseline Emission rate per source [2] (g/s)
PR12_GAB	10.0	48.0	0.0	3.0	Ambient	0.049549
PR34_GAB	10.0	48.0	0.0	3.0	Ambient	0.054191
PR56_GAB	10.0	53.0	0.0	3.0	Ambient	0.090191
PR789_GAB	10.0	82.0	3.0	3.0	Ambient	0.130048
PR1011_GAB	10.0	59.0	3.0	3.0	Ambient	0.060841

1. Dependent on ambient temperature.
2. See section 4.2.

4.3 Modelled buildings

The structure of the poultry houses may affect the plumes from the point sources. Therefore, the buildings are modelled within ADMS. The positions of the modelled buildings may be seen in Figure 3 (marked by blue rectangles).

4.4 Discrete receptors

Twenty-eight discrete receptors have been defined at the nearby wildlife sites. These receptors are defined at ground level within ADMS. The positions of the discrete receptors may be seen in Figure 4 (marked by enumerated pink rectangles).

4.5 Cartesian grid

To produce the contour plots presented in Section 5 of this report and to define the spatially varying deposition velocity field, two regular Cartesian grids have been defined within ADMS. The individual grid receptors are defined at ground level within ADMS. The positions of the Cartesian grids may be seen in Figure 4 (marked by grey lines).

4.6 Terrain data

Terrain has been considered in the modelling. The terrain data are based upon the Ordnance Survey 50 m Digital Elevation Model. A 22.0 km by 22.0 km domain has been resampled at 100 m horizontal resolution for use within ADMS for the modelling. The resolution of FLOWSTAR is 64 x 64 grid points; therefore, the effective resolution of the wind field for the terrain runs is approximately 340 m.

4.7 Roughness Length

In this case, a spatially varying roughness length file has been defined, this is based upon the Defra Living Landscapes database. The GFS meteorological data is assumed to have a roughness length of 0.223 m (arithmetic average of the spatially varying roughness over the modelling domain). The sample of the central area of the spatially varying roughness length field is shown in Figure 5.

Figure 3. The positions of modelled buildings and sources

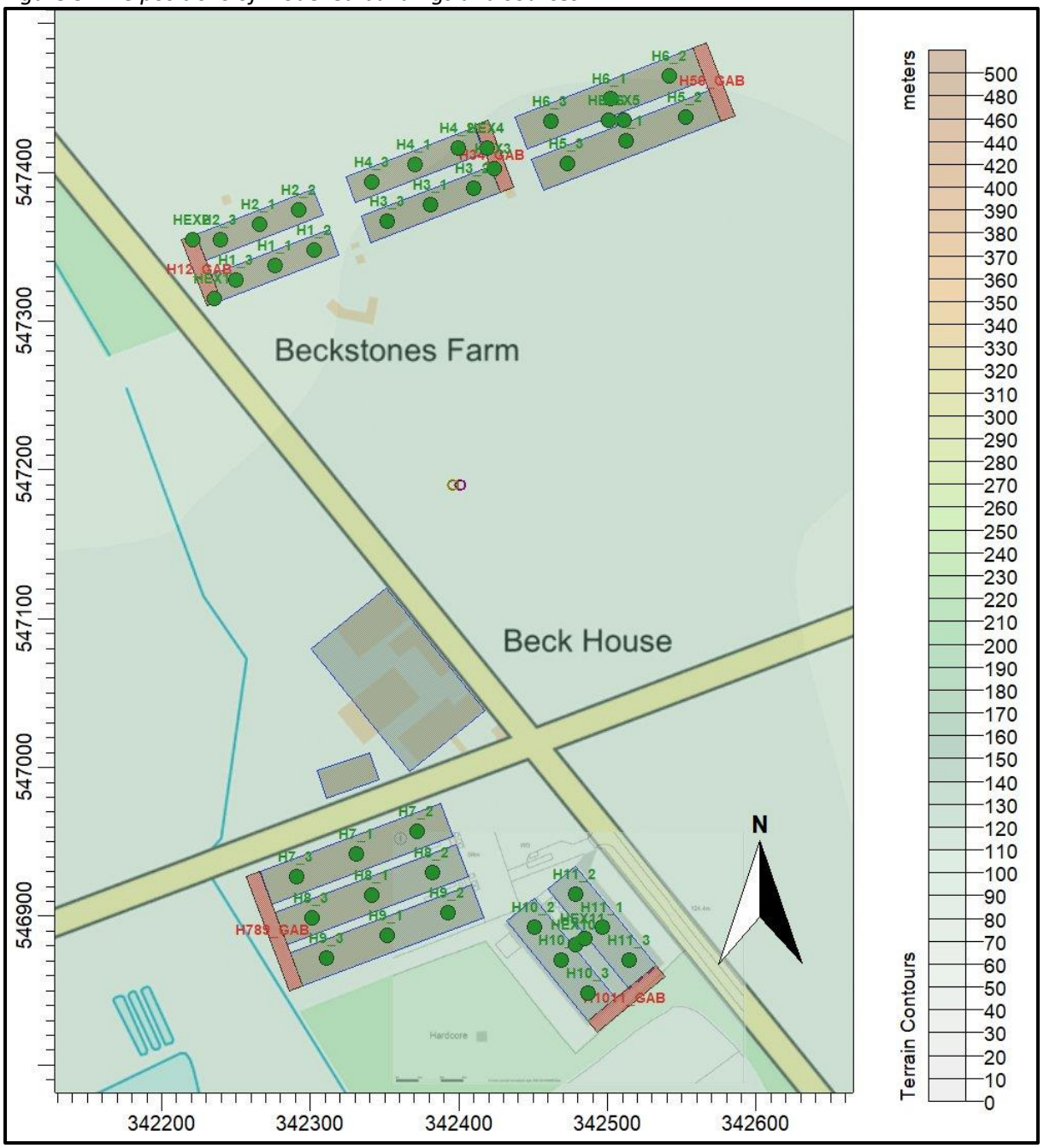


Figure 4. The discrete receptors and regular Cartesian grids

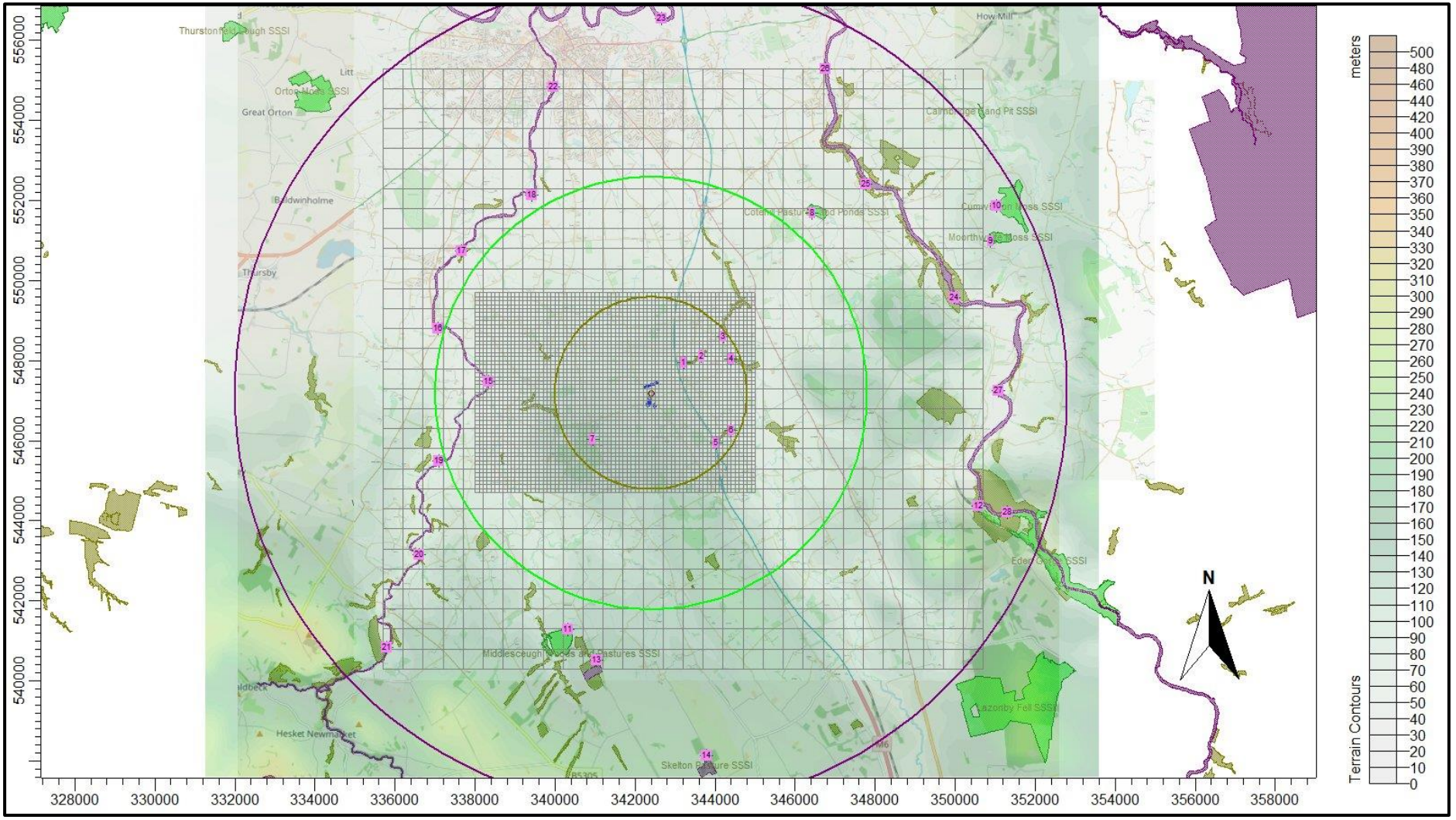
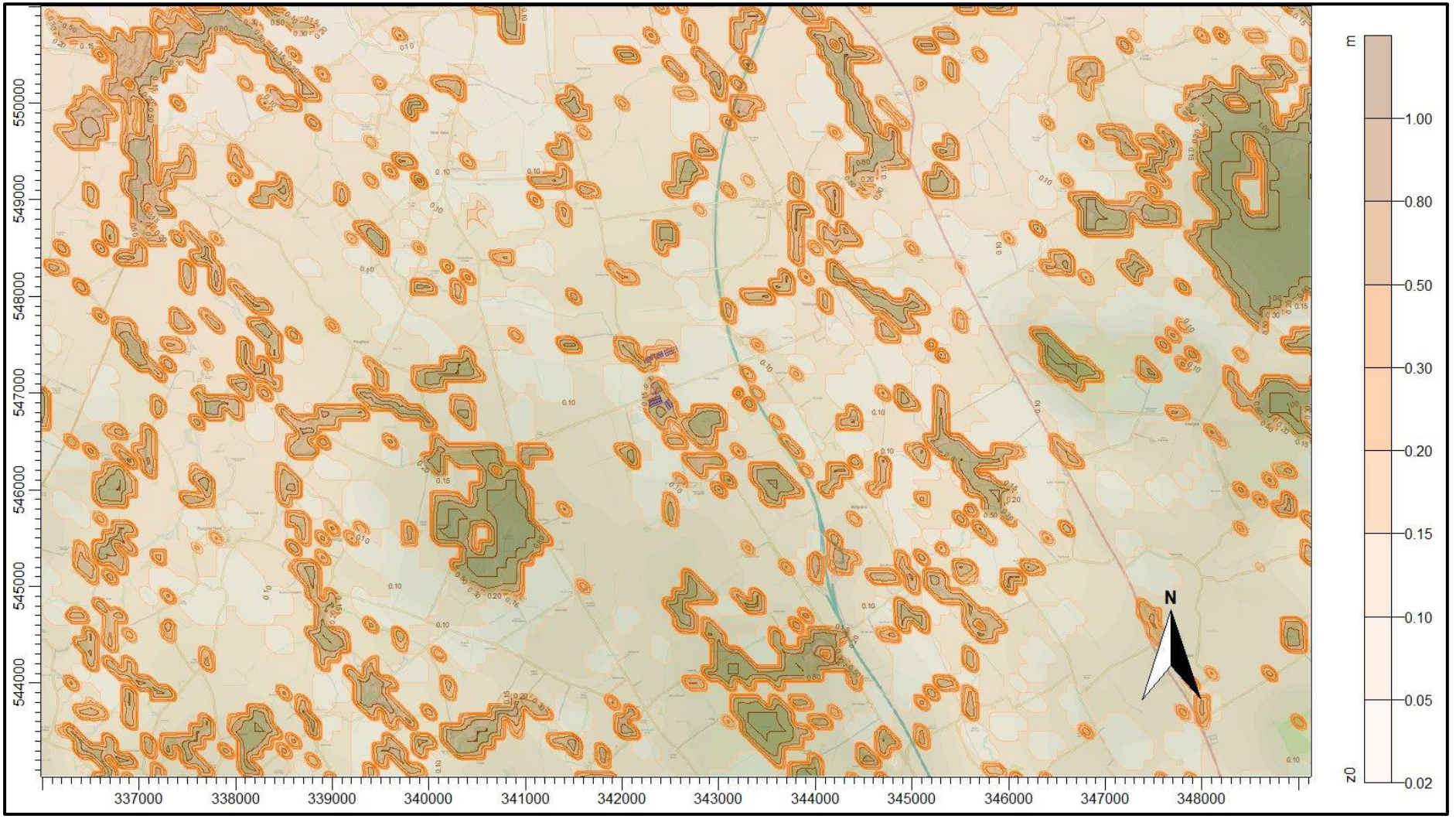


Figure 5. The spatially varying surface roughness field (central area)



4.8 Deposition

The method used to model deposition of ammonia and consequent plume depletion is based primarily upon Frederik Schrader and Christian Brümmer. Land Use Specific Ammonia Deposition Velocities: a Review of Recent Studies (2004-2013). AS Modelling & Data Ltd. has restricted deposition over arable farmland and heavily grazed and fertilised pasture; this is to compensate for possible saturation effects due to fertilizer application and to allow for periods when fields are clear of crops (Sutton), the deposition is also restricted over areas with little or no vegetation and the deposition velocity is set to 0.002 m/s where grid points are over the poultry housing and 0.010 m/s to 0.015 m/s over heavily grazed grassland. Where deposition over water surfaces is calculated, a deposition velocity of 0.005 m/s is used.

In summary, the method is as follows:

- A preliminary run of the model without deposition is used to provide an ammonia concentration field.
- The preliminary ammonia concentration field, along with land usage, has been used to define a deposition velocity field. The deposition velocities used are provided in Table 4.

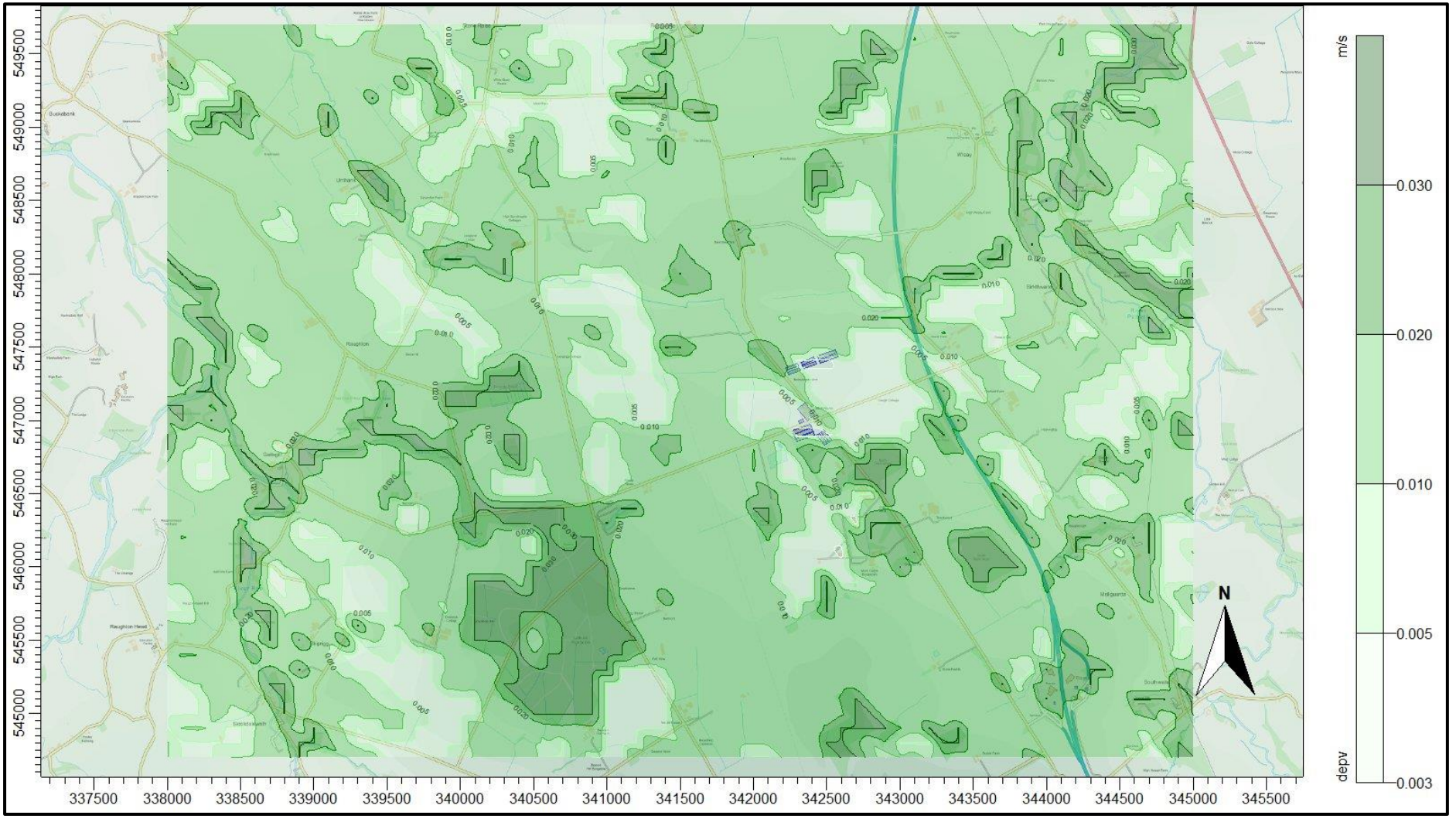
Table 4. Deposition velocities

NH_3 concentration (PC + background) ($\mu g/m^3$)	< 10	10 - 20	20 - 30	30 - 80	> 80
Deposition velocity - woodland (m/s)	0.03	0.015	0.01	0.005	0.003
Deposition velocity - short vegetation (m/s)	0.02 (0.010 to 0.015 over heavily grazed grassland)	0.015	0.01	0.005	0.003
Deposition velocity - arable farmland/rye grass (m/s)	0.005	0.005	0.005	0.005	0.003

- The model is then rerun with the spatially varying deposition module.

A contour plot of the spatially varying deposition fields is provided in Figure 6.

Figure 6. The spatially varying deposition field



5. Details of the Model Runs and Results

5.1 Preliminary modelling and model sensitivity tests

ADMS was effectively run a total of eight times, once for each year of the meteorological record in the following modes:

- In basic mode without calms, or terrain – GFS data.
- With calms and without terrain – GFS data.

For each mode, statistics for the maximum annual mean ammonia concentration at each receptor were compiled. Details of the predicted annual mean ammonia concentrations at each receptor are provided in Table 5. The primary purpose of the preliminary modelling is to assess the effect of calms on the results.

Table 5. Predicted maximum annual mean ammonia concentration at the discrete receptors – Existing and Proposed

Receptor number	X(m)	Y(m)	Name/Designation	Maximum annual mean ammonia concentration - (µg/m^3)	
				GFS No Calms No Terrain	GFS Calms No Terrain
1	343217	547948	AW	0.304	0.294
2	343658	548118	AW	0.195	0.189
3	344206	548603	AW	0.119	0.116
4	344401	548048	AW	0.129	0.125
5	344023	545957	AW	0.051	0.050
6	344401	546272	AW	0.064	0.062
7	340946	546030	LWS	0.076	0.073
8	346420	551695	Cotehill Pastures and Ponds SSSI	0.040	0.038
9	350877	550992	Moorthwaite Moss SSSI	0.025	0.024
10	351025	551857	Cumwhitton Moss SSSI	0.023	0.023
11	340328	541284	Middlesceugh Woods and Pastures SSSI	0.014	0.014
12	350584	544377	Eden Gorge SSSI	0.018	0.017
13	341028	540531	Middlesceugh Woods and Pastures SSSI/Cumbrian Marsh Fritillary SAC	0.011	0.011
14	343779	538145	Skelton Pasture SSSI/ Cumbrian Marsh Fritillary SAC	0.008	0.008
15	338345	547485	River Eden and Tributaries SSSI/River Eden SAC	0.051	0.050
16	337072	548816	River Eden and Tributaries SSSI/River Eden SAC	0.046	0.045
17	337670	550745	River Eden and Tributaries SSSI/River Eden SAC	0.036	0.034
18	339425	552133	River Eden and Tributaries SSSI/River Eden SAC	0.038	0.036
19	337092	545499	River Eden and Tributaries SSSI/River Eden SAC	0.027	0.026
20	336605	543146	River Eden and Tributaries SSSI/River Eden SAC	0.020	0.019
21	335795	540831	River Eden and Tributaries SSSI/River Eden SAC	0.016	0.015
22	339961	554833	River Eden and Tributaries SSSI/River Eden SAC	0.031	0.030
23	342651	556540	River Eden and Tributaries SSSI/River Eden SAC	0.025	0.024
24	349970	549568	River Eden and Tributaries SSSI/River Eden SAC	0.028	0.027
25	347772	552403	River Eden and Tributaries SSSI/River Eden SAC	0.031	0.030
26	346759	555296	River Eden and Tributaries SSSI/River Eden SAC	0.025	0.024

5.2 Detailed modelling

In this case, detailed modelling has been carried out over a high resolution 5 km x 5 km domain surrounding Beck House Farm. The primary purpose is to determine the magnitude of deposition of ammonia and consequent plume depletion close to the sources where it is of the greatest importance, but also to provide results should any LWSs be identified. Outside of the 5 km x 5 km domain a fixed deposition velocity of 0.005 m/s is assumed (with appropriate deposition velocities applied post-modelling at the discrete receptors).

The detailed deposition run was made with terrain. Calms cannot be used with terrain or spatially varying deposition; therefore, calms have not been included in the detailed modelling; however, the results of the preliminary modelling indicate that the effects of calms are insignificant in this case.

The predicted maximum annual mean ground level ammonia concentrations and nitrogen deposition rates at the discrete receptors are shown in Tables 6a (Existing Only), 6b (Proposed Only), and 6c (Existing and Proposed).

In the Table, predicted ammonia concentrations or nitrogen deposition rates as a percentage of the Critical Level or Critical Load that are in excess of the Environment Agency's upper threshold for the site (n/a% for an internationally designated site, 50% for a SSSI and 100% for a non-statutory site) are coloured red. Process contributions that are in the range between the Environment Agency's upper threshold and lower threshold of the Critical Level or Critical Load for the site (1% and n/a% for an internationally designated site, 20% and 50% for a SSSI and 100% and 100% for a non-statutory site) are coloured blue. Process Contributions that exceed 1% of the relevant Critical Level or Critical Load at any of the statutory wildlife site are highlighted with bold text.

It has been noted previously that Critical Levels and Loads are almost certainly already exceeded and that available background levels are suitable only to provide a broad indication of likely pollutant impact at a specific location; therefore, PECs are not presented in the Tables.

Contour plots of the predicted ground level maximum annual mean ammonia concentration and maximum annual nitrogen deposition rates are shown in Figures 7a and 7b (Existing and Proposed).

Table 6a. Predicted maximum annual mean ammonia concentrations and nitrogen deposition rates - Existing Only

Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual mean ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	343217	547948	AW	0.03	1.0	10.0	0.184	18.36	1.43	14.30
2	343658	548118	AW	0.03	1.0	10.0	0.111	11.12	0.87	8.66
3	344206	548603	AW	0.03	1.0	10.0	0.058	5.79	0.45	4.51
4	344401	548048	AW	0.03	1.0	10.0	0.071	7.12	0.55	5.55
5	344023	545957	AW	0.03	1.0	10.0	0.027	2.68	0.21	2.09
6	344401	546272	AW	0.03	1.0	10.0	0.036	3.63	0.28	2.83
7	340946	546030	LWS	0.03	1.0	10.0	0.039	3.93	0.31	3.06
8	346420	551695	Cotehill Pastures and Ponds SSSI	0.02	3.0	10.0	0.014	0.47	0.07	0.73
9	350877	550992	Moorthwaite Moss SSSI	0.02	1.0	5.0	0.007	0.71	0.04	0.74
10	351025	551857	Cumwhitton Moss SSSI	0.03	1.0	5.0	0.006	0.65	0.05	**1.01**
11	340328	541284	Middlesceugh Woods and Pastures SSSI	0.03	1.0	6.0	0.005	0.50	0.04	0.65
12	350584	544377	Eden Gorge SSSI	0.03	1.0	10.0	0.006	0.62	0.05	0.49
13	341028	540531	Middlesceugh Woods and Pastures SSSI/Cumbrian Marsh Fritillary SAC	0.03	1.0	10.0	0.004	0.38	0.03	0.30
14	343779	538145	Skelton Pasture SSSI/ Cumbrian Marsh Fritillary SAC	0.02	3.0	10.0	0.002	0.07	0.01	0.10
15	338345	547485	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.019	**1.90**	0.10	0.98
16	337072	548816	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.020	**2.05**	0.11	**1.06**
17	337670	550745	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.017	**1.73**	0.09	0.90
18	339425	552133	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.018	**1.84**	0.10	0.95
19	337092	545499	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.011	**1.15**	0.06	0.60
20	336605	543146	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.007	0.73	0.04	0.38
21	335795	540831	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.005	0.50	0.03	0.26
22	339961	554833	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.011	**1.15**	0.06	0.60
23	342651	556540	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.011	**1.09**	0.06	0.56
24	349970	549568	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.009	0.92	0.05	0.48
25	347772	552403	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.010	**1.01**	0.05	0.53
26	346759	555296	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.010	0.97	0.05	0.50

Table 6b. Predicted maximum annual mean ammonia concentrations and nitrogen deposition rates - Proposed Only

Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	343217	547948	AW	0.03	1.0	10.0	0.025	2.51	0.20	1.96
2	343658	548118	AW	0.03	1.0	10.0	0.017	1.73	0.14	1.35
3	344206	548603	AW	0.03	1.0	10.0	0.010	1.01	0.08	0.79
4	344401	548048	AW	0.03	1.0	10.0	0.013	1.34	0.10	1.05
5	344023	545957	AW	0.03	1.0	10.0	0.007	0.72	0.06	0.56
6	344401	546272	AW	0.03	1.0	10.0	0.010	0.99	0.08	0.77
7	340946	546030	LWS	0.03	1.0	10.0	0.008	0.76	0.06	0.59
8	346420	551695	Cotehill Pastures and Ponds SSSI	0.02	3.0	10.0	0.003	0.09	0.01	0.14
9	350877	550992	Moorthwaite Moss SSSI	0.02	1.0	5.0	0.001	0.13	0.01	0.14
10	351025	551857	Cumwhitton Moss SSSI	0.03	1.0	5.0	0.001	0.12	0.01	0.19
11	340328	541284	Middlesceugh Woods and Pastures SSSI	0.03	1.0	6.0	0.001	0.10	0.01	0.13
12	350584	544377	Eden Gorge SSSI	0.03	1.0	10.0	0.001	0.13	0.01	0.10
13	341028	540531	Middlesceugh Woods and Pastures SSSI/Cumbrian Marsh Fritillary SAC	0.03	1.0	10.0	0.001	0.08	0.01	0.06
14	343779	538145	Skelton Pasture SSSI/ Cumbrian Marsh Fritillary SAC	0.02	3.0	10.0	0.000	0.01	0.00	0.02
15	338345	547485	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.004	0.39	0.02	0.20
16	337072	548816	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.004	0.42	0.02	0.22
17	337670	550745	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.003	0.31	0.02	0.16
18	339425	552133	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.003	0.33	0.02	0.17
19	337092	545499	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.22	0.01	0.11
20	336605	543146	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.001	0.14	0.01	0.07
21	335795	540831	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.001	0.10	0.01	0.05
22	339961	554833	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.21	0.01	0.11
23	342651	556540	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.20	0.01	0.10
24	349970	549568	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.18	0.01	0.09
25	347772	552403	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.19	0.01	0.10
26	346759	555296	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.002	0.18	0.01	0.09

Table 6c. Predicted maximum annual mean ammonia concentrations and nitrogen deposition rates - Existing and Proposed

Receptor number	X(m)	Y(m)	Name	Site Parameters			Maximum annual ammonia concentration		Maximum annual nitrogen deposition rate	
				Deposition Velocity	Critical Level (µg/m^3)	Critical Load (kg/ha)	Process Contribution (µg/m^3)	%age of Critical Level	Process Contribution (kg/ha)	%age of Critical Load
1	343217	547948	AW	0.03	1.0	10.0	0.209	20.87	1.63	16.26
2	343658	548118	AW	0.03	1.0	10.0	0.129	12.85	1.00	10.01
3	344206	548603	AW	0.03	1.0	10.0	0.068	6.80	0.53	5.30
4	344401	548048	AW	0.03	1.0	10.0	0.085	8.46	0.66	6.59
5	344023	545957	AW	0.03	1.0	10.0	0.034	3.40	0.27	2.65
6	344401	546272	AW	0.03	1.0	10.0	0.046	4.62	0.36	3.60
7	340946	546030	LWS	0.03	1.0	10.0	0.047	4.69	0.37	3.65
8	346420	551695	Cotehill Pastures and Ponds SSSI	0.02	3.0	10.0	0.017	0.56	0.09	0.87
9	350877	550992	Moorthwaite Moss SSSI	0.02	1.0	5.0	0.008	0.85	0.04	0.88
10	351025	551857	Cumwhitton Moss SSSI	0.03	1.0	5.0	0.008	0.77	0.06	**1.20**
11	340328	541284	Middlesceugh Woods and Pastures SSSI	0.03	1.0	6.0	0.006	0.60	0.05	0.78
12	350584	544377	Eden Gorge SSSI	0.03	1.0	10.0	0.008	0.76	0.06	0.59
13	341028	540531	Middlesceugh Woods and Pastures SSSI/Cumbrian Marsh Fritillary SAC	0.03	1.0	10.0	0.005	0.46	0.04	0.36
14	343779	538145	Skelton Pasture SSSI/ Cumbrian Marsh Fritillary SAC	0.02	3.0	10.0	0.002	0.08	0.01	0.12
15	338345	547485	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.023	**2.29**	0.12	**1.19**
16	337072	548816	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.025	**2.47**	0.13	**1.28**
17	337670	550745	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.020	**2.04**	0.11	**1.06**
18	339425	552133	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.022	**2.17**	0.11	**1.12**
19	337092	545499	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.014	**1.36**	0.07	0.71
20	336605	543146	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.009	0.87	0.04	0.45
21	335795	540831	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.006	0.59	0.03	0.31
22	339961	554833	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.014	**1.35**	0.07	0.70
23	342651	556540	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.013	**1.29**	0.07	0.67
24	349970	549568	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.011	**1.10**	0.06	0.57
25	347772	552403	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.012	**1.20**	0.06	0.63
26	346759	555296	River Eden and Tributaries SSSI/River Eden SAC	0.02	1.0	10.0	0.011	**1.14**	0.06	0.59

Figure 7a. Maximum annual ammonia concentration – Existing and Proposed

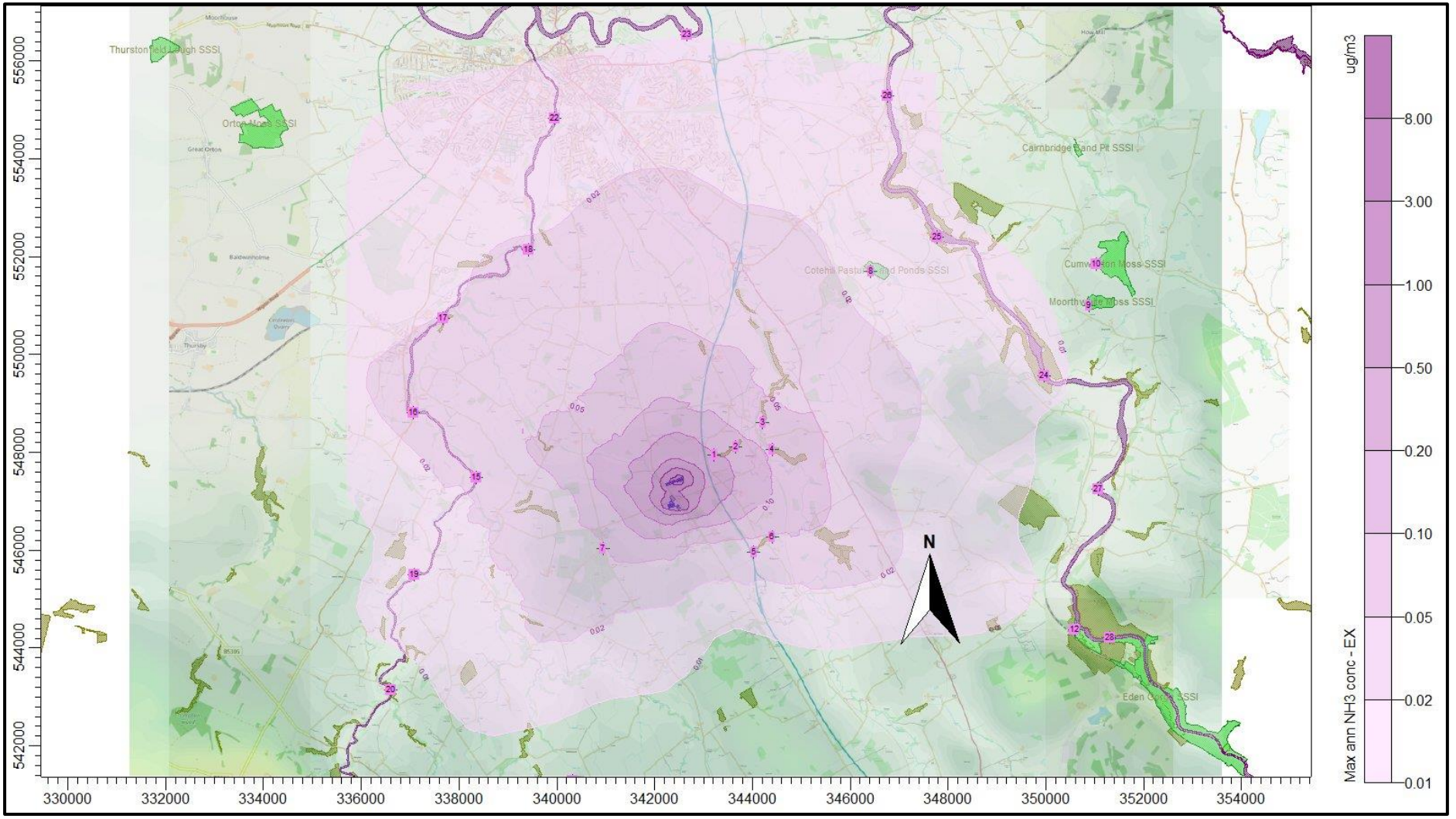
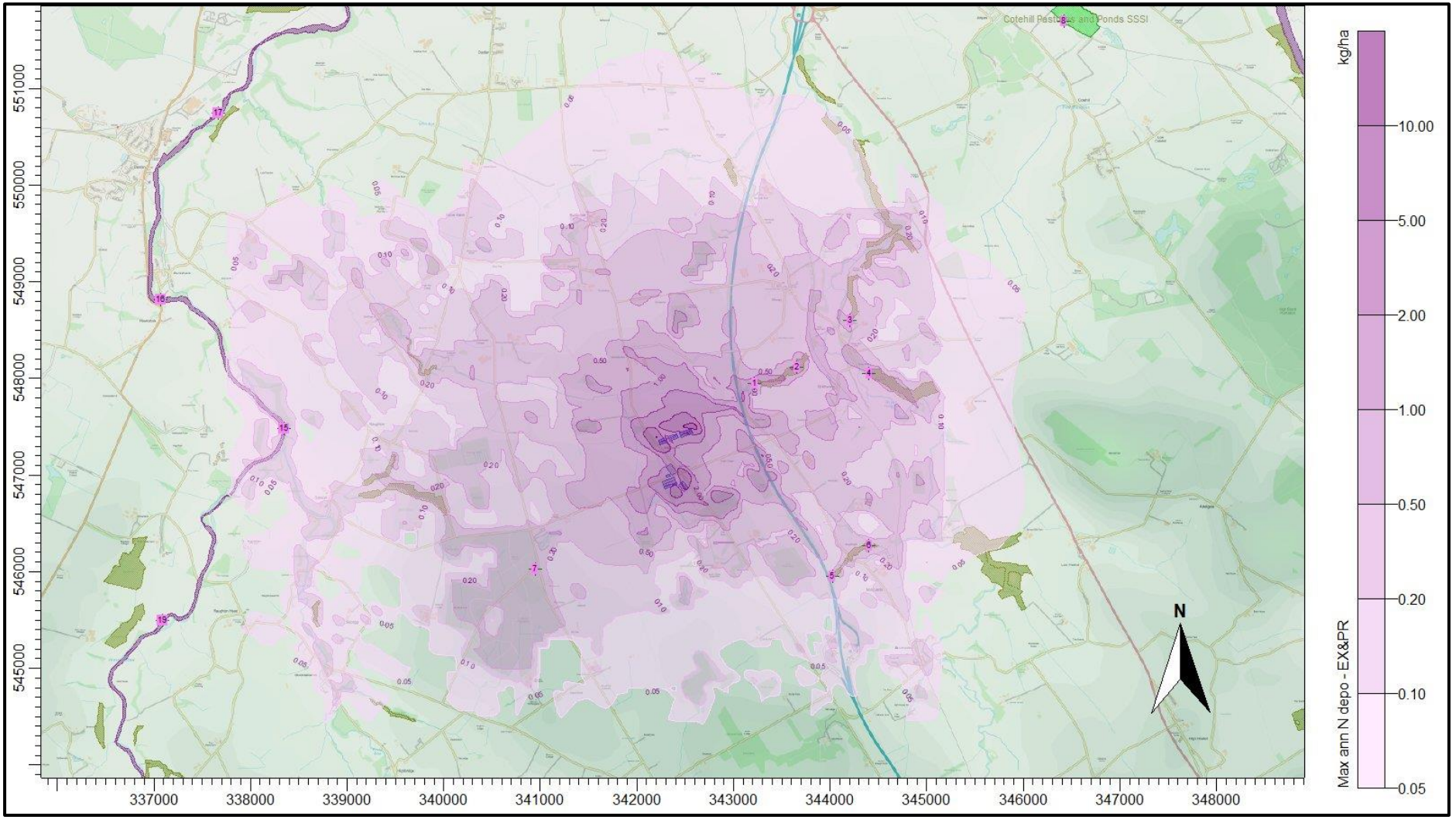


Figure 7b. Maximum annual nitrogen deposition rates – Existing and Proposed



6. Summary and Conclusions

Ammonia emission rates from the existing and proposed poultry rearing houses at Beck House Poultry Farm have been assessed and quantified based upon the Environment Agency standard ammonia emission factors. The ammonia emission rates have then been used as inputs to an atmospheric dispersion and deposition model which calculates ammonia exposure levels and nitrogen and acid deposition rates in the surrounding area.

The modelling predicts that:

- At all AWs and the LWS identified, the process contributions to annual mean ammonia concentration and nitrogen deposition are and would be below the Environment Agency threshold of 100% of the Critical Level and Critical Load.
- There are currently and would be exceedances of the Environment Agency lower threshold of 1% of the relevant Critical Level and Critical Load at: River Eden SAC. The increases due to the proposed development are less than 1% of the Critical Level and Critical Load.
- There are currently and would continue to be, no exceedances of 1% of the relevant Critical Level or Load at Cumbrian Marsh Fritillary SAC.
- At all SSSIs considered, the process contribution to annual mean ammonia concentration and nitrogen deposition would be below the Environment Agency threshold of 20% of the Critical Level and Critical Load.
- There would be exceedances of the 1% screening criterion of the relevant Critical Level and/or Critical Load at: Cumwhitton Moss SSSI and River Eden and Tributaries SSSI.

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