



**Biodiversity Air Quality
Screening Assessment:
Transcontinental
Advanced Coatings UK,
Wrexham**

July 2024



Experts in air quality
management & assessment

Document Control

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Executive Summary

The air quality impacts associated with the proposed Regenerative Thermal Oxidiser (RTO) system at Transcontinental Advanced Coatings (AC) UK in Wrexham Industrial Estate have been assessed.

Transcontinental AC UK is regulated by Wrexham County Borough Council (WCBC) under the Environmental Permitting (England and Wales) Regulations 2016. Following a review of their operating permit by WCBC in light of the revised Best Available Techniques (BAT) Reference Document (BRef), Transcontinental AC UK agreed to replace the existing RTO that was installed in 1995, with a new RTO that will meet the BAT recommendations.

The assessment has considered the impacts of the operation of the proposed RTO on designated habitats, and considers the changes in pollutant concentrations and fluxes in the context of published screening criteria.

The assessment demonstrates that the change in pollutant concentrations and fluxes are below screening criteria, and thus the impacts in isolation can be discounted as 'not significant' without further assessment from an ecologist. It is also considered relatively unlikely that there will be a significant in-combination effect with other plans and projects at any assessed designated site.

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1 Introduction

- 1.1 This report describes a screening assessment for air quality effects on biodiversity associated with the proposed Regenerative Thermal Oxidiser (RTO) system at Transcontinental Advanced Coatings (AC) UK in Wrexham Industrial Estate (the 'facility'). It accompanies the report prepared by Air Quality Consultants Limited (AQC) which describes the operational air quality effects on public health (document reference J10/12125B/10/1/F1, dated 19th December 2023) (AQC, 2023).
- 1.2 The facility is located in Wrexham Industrial Estate, approximately 5 km east of Wrexham city centre. The facility is immediately surrounded by industrial and commercial warehouses. Transcontinental AC UK is regulated by Wrexham County Borough Council (WCBC) under the Environmental Permitting (England and Wales) Regulations 2016. Following a review of their operating permit by WCBC in light of the revised Best Available Techniques (BAT) Reference Document (BRef), Transcontinental AC UK agreed to replace the existing RTO that was installed in 1995, with a new RTO that will meet the BAT recommendations.
- 1.3 The locations of the existing and proposed RTOs that form the application boundary within the wider Transcontinental AC UK site are shown in Figure 1.



Figure 1: Application Boundary (Western Area is the Existing RTO, Eastern Area is the Proposed RTO) within the Transcontinental AC UK Site

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- 1.4 The operation of the RTO will lead to emissions of nitrogen oxides (NO_x) and ammonia (NH₃), and some sensitive vegetation may be affected by elevated concentrations of these pollutants. Furthermore, the deposition of NO_x, ammonia and hydrogen chloride (HCl) can alter the nutrient and acidity balance of some ecosystems, causing changes to their composition and health. This assessment has quantified the changes to NO_x and ammonia concentrations that would be caused by the proposed development, as well as the changes to nitrogen and acid deposition fluxes.
- 1.5 In this report, the term 'impact' refers to a change to concentrations or deposition fluxes, while the term 'effect' refers to the consequence of that change. Because this is a screening report, the approach has been to consider changes to air quality and deposition in the context of *potential* effects on ecosystem health. This has relied on published and commonly accepted screening criteria which make worst-case assumptions regarding the sensitivity of any given habitat to air pollution effects. This assessment does not extend to defining the specific sensitivity of the habitats in practice and is thus worst-case.
- 1.6 This report has been prepared taking into account all relevant local and national guidance and regulations to support the full planning application for the replacement RTO. The professional experience of the consultants involved in the assessment is summarised in Appendix A1.
- 1.7 This report assesses the air quality impacts of the proposed development using an approach and structure that addresses the requirements of a planning submission. The requirements of an environmental permitting application are specific, and differ from the requirements of a planning submission. This report should not, therefore, be submitted in support of an environmental permitting application.

2 Policy Context

- 2.1 Protection of nature conservation sites is provided by an array of different national, and international policies. This effectively provides different levels of protection to different types of sites, as outlined below.

European Sites

- 2.2 The Habitats Directive (European Council Directive 92/43/EEC, 1992) requires all European member states to introduce a range of measures for the protection of habitats and species. The Conservation of Habitats and Species Regulations (2017) ('the Habitats Regulations') transpose the Directive into UK law. Changes to the Habitats Regulations in 2021 (Defra, 2021) transferred functions from the European Commission to the appropriate UK authorities.

- 2.3 The following European sites are protected by the Habitats Regulations and any proposals that could affect them will require a Habitats Regulations Assessment ('HRA'):

- Special Areas of Conservation (SACs), which are designated because of their importance for specific habitats or species listed in the Directive;
- Special Protection Areas (SPAs), which are designated for the protection of birds under the "Birds Directive" (Directive 2009/147/EC, 2009), implemented in UK law through the Conservation of Habitats and Species Regulations (2010).;
- Ramsar Sites. Originally intended to protect waterfowl habitat, the Ramsar Convention has broadened its scope to cover all aspects of wetland conservation;
- proposed SACs and SPAs (often termed cSAC and cSPA); and
- areas secured as sites compensating for damage to a European Site

- 2.4 In practice, it is not uncommon for the same area of land to be covered by more than one designation.

- 2.5 The Habitats Regulations, require competent authorities (in this case WCBC) to only allow new projects (e.g. individual developments seeking planning permission) or plans (e.g. local plans) having first ascertained that they will not adversely affect the integrity of a European site either alone or 'in-combination' with other projects and plans.

- 2.6 HRA refers to the process of assessment required under the Regulations, which is commonly described as four distinct stages (e.g. the Planning Inspectorate (2017)):

- Stage 1 - screening;
- Stage 2 - Appropriate Assessment ('AA');
- Stage 3 - assessment of alternatives; and
- Stage 4 - assessment of Imperative Reasons of Overriding Public Interest ('IROPI').

- 2.7 Not all stages are required for most projects or plans. In particular, if the screening stage can show that the project will not have a Likely Significant Effect ('LSE') on the interest features either alone or in-combination with other plans and projects then an AA is not required. This report considers the screening stage only but also contains information which may be used in subsequent stages of the assessment where needed.
- 2.8 An effect is 'significant' if it undermines the conservation objectives. Before granting planning permission, decision makers must be satisfied that no reasonable scientific doubt remains as to the absence of adverse effects to site integrity.
- 2.9 Interpretation of the Habitats Regulations with respect to air quality impacts and effects has been shaped by judgements and opinions of European and UK courts, and a brief summary of some relevant case law is provided in Appendix A2. These Judgements and Opinions have highlighted the extent to which the Directive, and therefore Regulations, require a precautionary approach. However, the Courts have also recognised that there is no such thing as absolute certainty. This is particularly important with air quality modelling, which is always uncertain, with this uncertainty impossible to quantify precisely. Decision makers must identify reasonably foreseeable risks based on information that can readily be obtained. The courts have also established that, whilst a risk is sufficient to constrain development under the Habitats Regulations, there must be credible evidence that this risk is real, rather hypothetical (see Paragraph A2.3).
- 2.10 UK interpretation of the Habitats Regulations has also been shaped by guidance given by Natural England (NE) to local planning authorities and the Planning Inspectorate. A key area where this prior advice is important is the reliance which should be placed on forecast reductions in emissions from road traffic and other sectors over time. Measures which are expected to improve air quality in the future which are unrelated to a plan or project being determined are described as 'autonomous measures', and the forecast improvements resulting from these measures are termed 'autonomous reductions'. Paragraphs A2.9 to A2.14 in Appendix A2 explain that there are significant risks to local planning authorities if they do not adequately take account of the ability of autonomous reductions to offset and negate adverse changes caused by new plans and projects.

Sites of National and Local Importance

- 2.11 Sites of national importance are designated as Sites of Special Scientific Interest (SSSIs). Originally notified under the National Parks and Access to the Countryside Act (1949), SSSIs have been re-notified under the Wildlife and Countryside Act (1981). Improved provisions for the protection and management of SSSIs (in England and Wales) were introduced by the Countryside and Rights of Way Act (2000) (the "CROW" act). If a development is "*likely to damage*" a SSSI, the CROW act requires that a relevant conservation body (in this case Natural Resources Wales (NRW)) is consulted.

2.12 The CROW act also provides protection to local nature conservation sites, which can be particularly important in providing 'stepping stones' or 'buffers' to SSSIs and European sites. A broad range of site designations are included under the umbrella term of 'sites of local importance'. They are largely non-statutory designations, with sites identified by the local authority, the Wildlife Trusts, or other local groups. An ancient woodland inventory is provided by NRW to identify the locations of the main historic woodlands. It is important to note, however, that local site designations, including ancient woodlands, are frequently updated and that there is no single published database which includes all sites. It is thus necessary to apply professional judgement in determining the key locations where a proposed project might have air quality effects, noting that sites which are both highly sensitive and highly valuable would be expected to be designated as being of national or international importance.

2.13 The CROW act is less prescriptive than the Habitats Regulations in terms of assessment approach. In particular, the requirement to ensure the absence of LSE in combination with other plans and projects is specific to the Regulations (and thus to European sites). This does not, however, mean that other plans and projects may be ignored with respect to impacts on nationally- and locally-designated sites. Planning policy (see the next section) defines the main assessment requirements with respect to the impacts of new developments on sites of national and local importance.

Planning Policy

National Policies

2.14 Land-use planning policy in Wales is established within the policy document Planning Policy Wales (PPW12) (Welsh Government, 2024), which provides the strategic policy framework for the effective preparation of local planning authority development plans. PPW12 states that *"The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales"*.

2.15 Planning policy set out in PPW12 is divided into four themes; under the 'Distinctive and Natural Places' theme, PPW12 states:

"Desired Distinctive and Natural outcomes will be based on sustaining and creating places in which... sites designated for their landscape or biodiversity or geodiversity importance are fully considered and their special characteristics and features protected and enhanced ..."

2.16 Section 6.4, which addresses biodiversity and ecological networks sets out five considerations that must be taken into account by all development proposals, including:

- support the maintenance and enhancement of biodiversity and the resilience of ecosystems;
- ensure action in Wales contributes to meeting international responsibilities and obligations for biodiversity and habitats, including the most recent targets set out in the 2022 UN Global Biodiversity Framework;

- *ensure statutorily and non-statutorily designated sites and habitats are properly protected and managed and their role at the heart of resilient ecological networks is safeguarded;*
- *safeguard protected species and species of principal importance and existing biodiversity assets from direct, indirect or cumulative adverse impacts that affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water, air and soil, including peat; and*
- *secure the maintenance and enhancement of ecosystem resilience and resilient ecological networks by improving diversity, extent, condition, and connectivity.*

2.17 To achieve these five objectives, and to “*maintain and enhance biodiversity, build resilient ecological networks and deliver net benefits for biodiversity*”, Paragraph 6.4.11 of PPW12 sets out the stepwise approach that planning authorities must follow. This includes ensuring adverse environmental effects are firstly avoided, then minimised, mitigated, and as a last resort, compensated for.

2.18 Paragraph 6.4.19 of PPW12 states that:

“all designated sites must be able to continue to protect the biodiversity and features for which they were designated and contribute to the resilience of ecosystems at the appropriate scale. This ability should not be compromised by inappropriate development or other activity.”

2.19 PPW12 is supported by a series of Technical Advice Notes (TANs) and National Assembly for Wales Circulars. Local planning authorities have to take PPW, TANs and Circulars into account when preparing Development Plans. With respect to planning policy guidance, TAN 5 on nature conservation and planning (Welsh Government, 2007) sets out how the development control process can help meet the objectives of PPW12, the context behind different designations, and how developments can affect designated sites.

Local Policies

2.20 The Council adopted its new Local Development Plan (LDP), which covers the period 2013-2028, in December 2023 (Wrexham County Borough Council, 2023). There are three policies of relevance to the proposals.

2.21 Policy SP14, Natural Environment, states:

“Development will only be permitted where it seeks to protect, conserve and enhance the natural environment including:

- *Special Areas of Conservation, Special Protection Areas, and Ramsar Sites;*
- *Sites of Special Scientific Interest and National Nature Reserves;*
-

- *The quality of natural services including water, soundscape, air and soils; and*
- *Habitats and species of principal importance to Wales.”*

2.22 Policy NE1, which covers International and National Nature Conservation Designations states:

“Development likely to significantly affect any protected site of international importance, either alone or in combination with other plans or projects, will be subject to a Habitat Regulations Assessment (HRA). Development will only be permitted where it is possible to ascertain no adverse effect on the integrity of the habitat or site or where there are Imperative Reasons of Overriding Public Interest and compensatory measures are secured....”

2.23 Policy DM1, which relates to Development Management Considerations states:

“Development proposals, where relevant, must:

...

iii. Safeguard the environment from the adverse effects of pollution of....air...arising from development”.

2.24 The Council has also prepared a Local Planning Guidance Note (PGN) addressing Biodiversity and Development (Wrexham County Borough Council, 2011), which seeks to *“raise the quality and profile of nature conservation, protected species and biodiversity issues when submitting and considering planning applications.”* The PGN sets out the local policy landscape, identifies protected sites within WCBC, and details the content of an ecological assessment.

3 Critical Levels and Critical Loads

- 3.1 European Union (EU) Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets a limit value for annual mean concentrations of nitrogen oxides. The same value has been set as a domestic objective within the Air Quality (Wales) Regulations (2000) and the Air Quality (Amendment) (Wales) Regulations (2002). The limit value and objective only apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built up areas of more than 5,000 people.
- 3.2 Critical levels (CLEs) and critical loads (CLOs) are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive ecosystems are unlikely to occur. Some of the CLEs are set at the same concentrations as the objectives but do not have the same spatial constraints on where they apply. Exceedances of the CLEs and CLOs are considered in the context of preventing harm to sites which are protected under the various designation frameworks outlined in Section 2.
- 3.3 The CLEs relevant to this assessment are set out in Table 1; however, it should be noted that the Project Ecologist (Tyler Grange) has stated that the CLEs for nitrogen oxides and ammonia only apply to the Midland Meres and Mosses (Phase 2) Ramsar. For completeness, it has been assumed that the CLEs apply to all habitats considered in this report.

Table 1: Vegetation and Ecosystem CLEs ^a

Pollutant	Time Period	CLE
Nitrogen Oxides (expressed as NO ₂)	Annual Mean ^{a,b}	30 µg/m ³
	24-Hour Mean ^{a,c}	75 µg/m ³
Ammonia	Annual Mean	3 (1 ^d) µg/m ³

^a The CLEs are defined by the World Health Organisation (WHO, 2000).

^b Away from major sources (see Paragraph 3.1), this CLE is set as an objective (Defra, 2007) and a limit value (The European Parliament and the Council of the European Union, 2008).

^c This CLE is not an objective and thus does not have the same legal standing.

^d The more stringent CLE of 1 µg/m³ only applies where lichens or bryophytes are present or form a key part of the ecosystem integrity.

- 3.4 The CLOs are specific to different habitat types, and those which are most relevant to this assessment, as determined and provided by the Project Ecologist (Tyler Grange), are detailed in Table 2.

Table 2: Vegetation and Ecosystem CLo^a

Designation	Nutrient Nitrogen (kgN/ha/yr)	Acid Deposition 'N _{max} ' (keq/ha/yr) ^b
Midland Meres and Mosses (Phase 2) Ramsar	5	1.117
River Dee and Bala Lake SAC	2	1.075
Johnstown Newt Sites SAC	No CLo Available	No CLo Available
River Dee SSSI	2	No CLo Available

^a CLo_s have been provided by the Project Ecologist, Tyler Grange.

^b N_{max} is the value above which additional nitrogen deposition will lead to an exceedance.

4 Relevant Guidance

- 4.1 Different organisations have issued assessment guidance and screening criteria for different types of emissions source and different site designations. This has resulted in different levels of protection being provided with respect to effects of the same pollutants on the same sites. There is no single official guidance document which fully covers the impacts assessed in this report and so it is helpful to consider the protection provided with respect to different development types.

Natural Resources Wales

- 4.2 NRW is responsible for the management of natural resources of Wales, however, in the absence of its own specific guidance for assessing impacts from permitted development, refers to the guidance published by the Environment Agency (EA).
- 4.3 The Environment Agency has published criteria which allow impacts from developments requiring environmental permits to be rapidly screened out as insignificant (Environment Agency, 2024a; 2024b). These are applied to the impacts from developments in isolation (i.e. not in combination with other plans or projects). Exceeding these criteria does not mean that there is an LSE, it simply means that further consideration is required of the potential changes to air quality or deposition. No further assessment is required if the changes caused by the proposed development (termed the Process Contributions 'PC' by the Environment Agency) are all less than the relevant criteria in Table 3.

Table 3: Environment Agency Screening Criteria (% of CLe or CLo)

Site Type	Averaging Period ^a	Impacts of Ammonia Emissions from Intensive Pig and Poultry Farms	Impacts from Other Emissions
European Sites	LT	4% to 20% ^b	1%
	ST	- ^c	10%
SSSIs	LT	20% to 50% ^b	1%
	ST	- ^c	10%
NNRs, LNRs, LWS, and AW	LT or ST	100%	100%

^a LT = Long Term (annual mean or 1-week mean), ST = Short-term (15-minute, 1-hour and 24-hour).

^b The upper thresholds apply in where there are no other intensive farms which might affect the same receptors. Internally, the Environment Agency has begun requiring detailed modelling wherever the PC exceeds 4% of a CLe or CLo and the 20% criterion is not supported, but is still recommended in the Environment Agency's published guidance.

^c There is no short-term CLe for ammonia and no short-term CLo.

- 4.4 The Environment Agency (2024a) also notes that there is no need for further consideration of changes to concentrations or deposition fluxes if:

- the annual mean concentration or flux is less than 70% of the CLe or CLo; and

- the short-term Process Contribution is less than 20% of the short-term CLe minus twice the long-term background concentration.

4.5 These criteria have been widely applied to the results from detailed dispersion modelling but are principally intended by the Environment Agency and NRW to guide a decision as to whether detailed modelling is required, with changes below the criteria not requiring such modelling.

IAQM

4.6 IAQM issued a guide to the assessment of air quality impacts on designated nature conservation sites in 2019, which was then amended in 2020 (Holman et al, 2020). This does not definitively recommend any one complete assessment approach. The following areas are relevant to this assessment:

- on the Environment Agency / NRW screening criteria:
 - the Environment Agency / NRW criteria (Paragraph 4.2) are suitable for screening the need for further assessment from all types of emissions sources where detailed air quality modelling has been carried out and not just those requiring environmental permits. The criteria should, though, *“be used in the context of an in-combination assessment”*.
 - the 1% criterion should not be used rigidly, or with more precision than the modelling can justify (for example emphasising the difference between 0.9% and 1.1%);
 - that exceeding the 1% criterion is simply an indication that further investigation is needed and does not necessarily indicate an LSE;
- on defining in combination projects:
 - projects and plans to be considered include those that may have been approved but are, as yet, incomplete, the subject of an outstanding appeal, or ongoing review;
- on receptor siting:
 - it is recommended that the predictions are not made closer than 2 m from the edge of the road; and
- on designation types:
 - the IAQM document covers all site designation types and thus suggests that the same overall assessment method should be applied regardless of the designation.

CIEEM

4.7 The Chartered Institute of Ecology and Environmental Management (CIEEM) has published advice on the Ecological Assessment of Air Quality Impacts (CIEEM, 2021), which is intended for use by both ecologists and air quality specialists. This provides six steps to exploring potential effects:

- 1) identifying the baseline ecological features and air quality;
- 2) assessing confounding factors, background pollution trends, the relative importance of each sector, and the sensitivity of the receptor;
- 3) determining if the CLes or CLoS are exceeded?
- 4) applying the CLes and CLoS with expert judgement;
- 5) considering the project duration and seasonal effects; and
- 6) considering the relative importance of ambient concentrations versus deposition fluxes.

JNCC

4.8 The Joint Nature Conservation Committee (JNCC) has published Decision-Making Thresholds (DMTs) and Site-Relevant Thresholds (SRTs) for air pollution (Chapman and Kite, 2021). While previously agreed with the UK conservation agencies, this approach is yet to be universally adopted in Wales and England, resulting in the potential for confusion and delays when it is applied. The JNCC guidance is not, therefore, referred to further in this report.

5 Assessment Approach

Study Area

- 5.1 Following the advice of the Project Ecologists, consideration has been given to potential effects on the following European sites and SSSIs:
- Johnstown Newt Sites SAC;
 - Midland Meres and Mosses (Phase 2) Ramsar;
 - River Dee and Bala Lake SAC; and
 - River Dee SSSI.
- 5.2 The locations of the habitats are shown in Figure 2. The Project Ecologists also identified Dee Cliffs, Farndon SSSI, however, this is designated for geological features, and therefore will not be sensitive to aerial impacts.

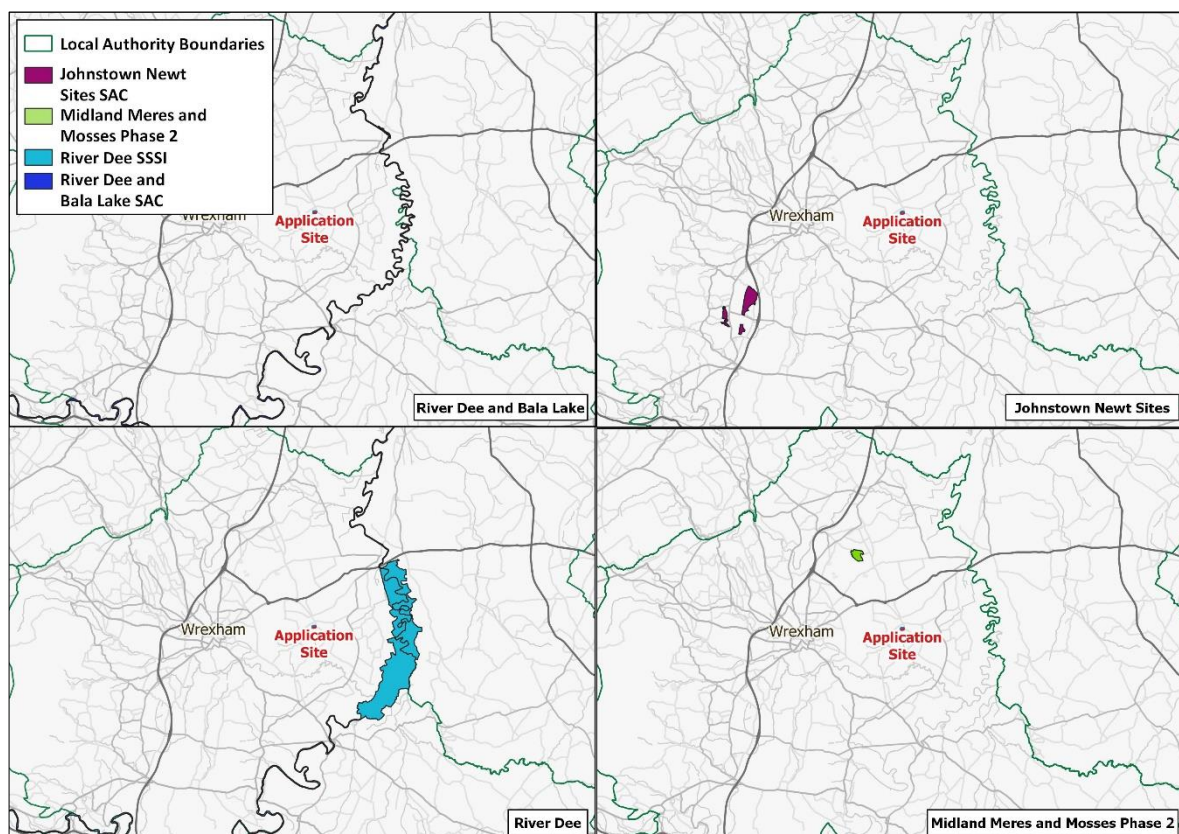


Figure 2: European Sites and SSSIs in the Study Area

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Habitat Features

- 5.3 The Johnstown Newt Sites SAC comprises two post-industrial sites, which are inhabited by one of the largest known populations in the UK of great crested newts (JNCC, 2024). The site covers approximately 69 hectares (ha), and supports inland water bodies, bogs, marshes and fens, heath and scrub land, improved grassland and deciduous woodland.
- 5.4 Midland Meres and Mosses (Phase 2) comprises 18 sites, the nearest of which covers approximately 20 ha. The sites are made up of nutrient-rich open water bodies with fringing habitats of reed swamp, fen, carr and damp pasture, and peatlands (Ramsar Sites Information Service, 2024).
- 5.5 The River Dee and Bala Lake SAC and River Dee SSSI, which runs parallel to part of the WCBC border, is approximately 175 km in length and extends across nearly 1,300 ha. The site is principally designated for inland water bodies which support a diverse range of migratory fish, but also comprises tidal rivers, estuaries, mud flats, sand flats and lagoons, as well as salt marshes, improved grassland and deciduous woodland (JNCC, 2024).

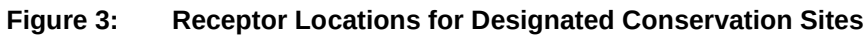
Receptors

- 5.6 Impacts have been predicted at discrete receptor locations, chosen to represent the boundary of each designated site closest to the facility. All receptors have been modelled at a height of 1.5 m to ensure consistency with the national background deposition modelling carried out on behalf of Defra and NRW and used within this assessment. These receptors are described in Table 4 and are shown in Figure 3.

Table 4: Description of Receptor Locations for Designated Conservation Sites

Receptor	Designated Site	X Coordinate	Y Coordinate
1	Johnstown Newt Sites SAC	330803.6	345261.6
2	Johnstown Newt Sites SAC	330986.4	347284.2
3	Johnstown Newt Sites SAC	331371.3	346947.4
4	Midland Meres and Mosses (Phase 2) Ramsar	336011.2	353752.7
5	Midland Meres and Mosses (Phase 2) Ramsar	336227.1	353780.8
6	Midland Meres and Mosses (Phase 2) Ramsar	336257.2	354077.4
7	River Dee and Bala Lake SAC	339781.7	355188.5
8	River Dee and Bala Lake SAC	340397.8	354840.3
9	River Dee and Bala Lake SAC	341003.8	353413.3
10	River Dee and Bala Lake SAC	341277.4	352752.2
11	River Dee and Bala Lake SAC	341757.0	352221.4
12	River Dee and Bala Lake SAC	341947.3	351256.8
13	River Dee and Bala Lake SAC	342017.5	350915.8
14	River Dee and Bala Lake SAC	341990.5	349940.2

Receptor	Designated Site	X Coordinate	Y Coordinate
15	River Dee and Bala Lake SAC	341952.5	349604.6
16	River Dee and Bala Lake SAC	341602.0	348912.3
17	River Dee and Bala Lake SAC	341325.7	347908.6
18	River Dee and Bala Lake SAC	340820.8	347301.9
19	River Dee and Bala Lake SAC	338914.7	346581.9
20	River Dee SSSI	341053.4	353293.9
21	River Dee SSSI	341216.7	352647.4
22	River Dee SSSI	341330.3	352237.9
23	River Dee SSSI	341473.1	351657.4
24	River Dee SSSI	341503.7	351347.5
25	River Dee SSSI	341611.5	350844.2
26	River Dee SSSI	341589.3	350422.7
27	River Dee SSSI	341379.0	350053.7
28	River Dee SSSI	341280.8	349094.7
29	River Dee SSSI	341061.5	348758.7
30	River Dee SSSI	340082.1	347171.3



Background Concentrations and Fluxes

- July 2024

Table 5: Estimated Annual Mean Background Concentrations and Deposition Fluxes ^a

Site	NO _x (µg/m ³) ^b		NH ₃ (µg/m ³)		Nutrient Nitrogen Deposition (kgN/ha/yr)		Acid Nitrogen Deposition (keq/ha/yr)	
	Value	CLe	Value	CLe	Value	CLo	Value	CLo
Johnstown Newt Sites SAC	7.5 – 10.7	30	2.0 – 2.5	3	No CLo available		No CLo available	
Midland Meres and Mosses (Phase 2) Ramsar	8.0 – 8.8	30	2.8 – 3.0	1	22.9 – 40.3	5	1.7 – 3.0	1.1
River Dee and Bala Lake SAC	2.9 – 20.2	30	0.8 – 4.1	3	14.7 – 45.7	2	1.1 – 3.4	1.1
River Dee SSSI	2.9 – 20.2	30	0.8 – 4.1	3	14.7 – 45.7	2	No CLo available	

^a Values for habitats where the Project Ecologist has stated the CLe does not apply are italicised.

^b Following published guidance, short-term (24-hour mean) NO_x backgrounds are twice the annual mean NO_x backgrounds.

5.10 Regardless of where the CLe applies, the background concentrations of NO_x are predicted to be well below the CLe at all habitats.

5.11 Predicted background concentrations of NH₃ are above the specified CLe of 1 µg/m³ for Midland Meres and Mosses; similarly, at some locations at River Dee and Bala Lake, and River Dee, the CLe is exceeded. Although the Project Ecologist has advised that the CLe does not apply, background concentrations of NH₃ are below the CLe at Johnstown Newt Sites.

5.12 At habitats that are sensitive to nutrient and acid nitrogen deposition, the predicted background rates exceeded the CLo.

In Combination Projects

5.13 Specific plans and projects which may lead to changes in combination with the proposed RTO have not been identified explicitly.

5.14 Instead, the approach taken in this assessment is to consider the headroom between the contribution from the proposed RTO and the screening criteria (1% or 10%), and the potential for this headroom to be generated by other live plans or projects. Where the contribution from the proposed RTO exceeds the screening criteria, the headroom before the CLe or CLo is exceeded has been determined and the likeliness of an exceedance with other live plans or projects considered.

Assessment Scenarios

5.15 NO_x and ammonia concentrations, and nitrogen and acid deposition fluxes, have been predicted for the following scenarios:

A) With the existing RTO; and

B) With the proposed RTO.

- 5.16 For annual mean concentrations and deposition fluxes, the two scenarios have been compared and represent the change caused by the proposed RTO in isolation which is termed the Process Contribution ('PC'). For 24-hour mean NO_x concentrations, the absolute (gross) concentration has been determined and presented throughout, since it is not appropriate to calculate the difference between daily maxima (which often occur on different days) ; this is considered worst-case.

Modelling Methodology

- 5.17 The impacts of emissions from the existing and proposed RTOs have been modelled using the ADMS-6 dispersion model. ADMS-6 is a next generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer.
- 5.18 The model input parameters and their derivation have been reproduced from the AQC report for the operational air quality effects on public health (AQC, 2023). Where possible a realistic worst-case approach has been adopted. Deposition fluxes have been calculated from the predicted concentrations. Details on the method for calculating the deposition rates are provided in Appendix A4.
- 5.19 The dispersion model used in the assessment is required to simplify real-world conditions into a series of algorithms. As such, in order to allow for uncertainties in local and future-year conditions, the dispersion model has been run five times, with each run using a different full year of hour-by-hour meteorological data from the nearest appropriate meteorological site.
- 5.20 Further, consistent with the public health assessment, to ensure a conservative approach, the assessment has assumed that the facility operates continuously at the NO_x levels permitted when nitrogen containing compounds (specifically dimethylformamide, DMF) are in the airstream. The permitted NO_x levels when there are no nitrogen containing compounds present are significantly lower. In reality, there will be periods of time when there are no nitrogen containing compounds in the airstream, and thus average operational emissions will be significantly less than applied in this assessment.

Uncertainty

- 5.21 The modelling is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each RTO, all of which in reality are variable and uncertain. The emission parameters have also been calculated based on testing of the existing RTO at the facility; the proposed RTO may operate under slightly different conditions, although, as processes occurring on-site are well established, it is not expected that the operational parameters will be too dissimilar.
- 5.22 There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified, and it is not practical to verify

the point-source model outputs. Where these parameters have been estimated the approach has been to use reasonable worst-case assumptions.

- 5.23 On balance, when taking into account the approach taken to meteorological conditions and the assessment of emissions at the permitted values, the assessment can be expected to over-predict the total concentrations associated with the RTO at the facility. The approach has been designed to provide a robust and conservative assessment.

6 Impact Assessment

In Isolation

- 6.1 Table 6 summarises the changes to concentrations and deposition fluxes from the proposed RTO in isolation at the worst-case assessed locations and expresses these changes in relation to the CLeS (Table 1) and CLoS (Table 2) from the RTO in isolation.

Table 6: Summary of Worst-case Changes to Air Quality Conditions ^a

Pollutant/Averaging Period	Absolute PC	PC as % of CLe/CLo
Johnstown Newt Site SAC		
Annual Mean NH ₃ (µg/m ³)	<0.001	<0.01
Annual Mean NO _x (µg/m ³)	0.009	0.03
24-hour Mean NO _x (µg/m ³) ^b	1.960	2.61
Nitrogen Deposition (kgN/ha/yr)	0.002	- ^c
Acid Deposition (keq/ha/yr)	0.001	- ^c
Midland Meres and Mosses (Phase 2) Ramsar		
Annual Mean NH ₃ (µg/m ³)	<0.001	0.04
Annual Mean NO _x (µg/m ³)	0.094	0.31
24-hour Mean NO _x (µg/m ³) ^b	5.776	7.70
Nitrogen Deposition (kgN/ha/yr)	0.022	0.44
Acid Deposition (keq/ha/yr)	0.007	0.58
River Dee and Bala Lake SAC		
Annual Mean NH ₃ (µg/m ³)	<0.001	0.03
Annual Mean NO _x (µg/m ³)	0.081	0.27
24-hour Mean NO _x (µg/m ³) ^b	6.209	8.28
Nitrogen Deposition (kgN/ha/yr)	0.019	0.93
Acid Deposition (keq/ha/yr)	0.006	0.52
River Dee SSSI		
Annual Mean NH ₃ (µg/m ³)	<0.001	0.03
Annual Mean NO _x (µg/m ³)	0.080	0.27
24-hour Mean NO _x (µg/m ³) ^b	5.909	7.88
Nitrogen Deposition (kgN/ha/yr)	0.018	0.93
Acid Deposition (keq/ha/yr)	0.006	- ^c

^a Entries have been greyed out where the Project Ecologist has advised that the CLe does not apply.

^b For 24-hour NO_x, the PCs presented are the gross change (rather than the net change, as presented for annual mean concentrations), since it is not possible to subtract daily maxima.

^c No critical load applies.

- 6.2 The maximum annual mean NO_x and NH₃ PCs (when rounded) are well below 1% of the CLe at any habitat, regardless of the sensitivity. Similarly, at designations sensitive to nutrient nitrogen, the contribution to annual mean deposition fluxes is below 1% of the relevant CLo.
- 6.3 Thus, according to the guidance summarised in Section 4, the effects of the proposed RTO will be not significant and not give rise to an LSE.

In Combination

- 6.4 The maximum annual mean NO_x PC at any designated habitat is 0.094 µg/m³, equivalent to 0.31% of the CLe; this occurs at Receptor 6 at the Midland Meres and Mosses (Phase 2) Ramsar. There is, therefore, a headroom of 0.69% (equivalent to 0.2 µg/m³) that could be generated by other live plans or projects in the area before the 1% screening criterion is exceeded. Further, for an exceedance of the CLe to occur, other developments would need to contribute over 21 µg/m³ (CLe of 30 µg/m³ minus total concentration of 8.9 µg/m³¹); it is judged unlikely that other developments will generate this magnitude of contribution (i.e. other projects would need to add more than 200 times the impact of the proposed development for the CLe to be exceeded).
- 6.5 The maximum 24-hour mean NO_x PC at any designated habitat is 6.2 µg/m³, equivalent to 8.3% of the CLe; this occurs at Receptor 18 at the River Dee and Bala Lake SAC. Taking into account baseline concentrations (see Table 5), maximum total concentrations are predicted to be 46.6 µg/m³ (62% of the CLe)². For an exceedance of the CLe to occur, other developments would need to contribute nearly 30 µg/m³ (CLe of 75 µg/m³ minus total concentration of 46.6 µg/m³) during the same 24-hour period as the maximum PC from the proposed development. The affected receptors would therefore need to be concurrently downwind of both the proposed development and any other live projects. It is judged unlikely that this could occur in practice.
- 6.6 The maximum annual mean NH₃ PC at any designated habitat is less than 0.001 µg/m³, equivalent to 0.04% of the CLe. There is, therefore, a significant headroom of 0.96% (equivalent to 0.01 µg/m³) that could be generated by other live plans or projects in the area before the 1% screening criterion is exceeded. This is considered sufficiently large that it is judged unlikely that future live projects will generate this magnitude of contribution.
- 6.7 The maximum annual mean nutrient nitrogen deposition flux PC at any sensitive designated habitat is 0.02 kgN/ha/yr, equivalent to 0.9% of the CLo; this occurs at Receptor 18 at the River Dee and Bala Lake SAC. If other relevant live projects were to contribute more than 0.1% of the CLo at this same receptor, then the change in combination would be greater than 1%.

¹ Total annual mean concentration is calculated as the maximum background annual mean concentration at any location in the SAC plus the PC, i.e. 8.8 + 0.09.

² Total 24-hour mean concentration is calculated as twice the background annual mean concentration at any location in the SAC plus the PC, i.e. (2 x 20.2) + 6.2.

- 6.8 The only habitats sensitive to acid deposition are Midland Meres and Mosses (Phase 2) Ramsar and River Dee and Bala Lake SAC; the maximum annual mean acid deposition flux PC at either habitat is 0.007 keq/ha/yr, equivalent to 0.6% of the CLo, which occurs at Receptor 6 in the Midland Meres and Mosses (Phase 2) Ramsar. There is, therefore, a headroom of 0.4% (equivalent to 0.004 keq/ha/yr) that could be generated by other live plans or projects in the area before the 1% screening criterion is exceeded.
- 6.9 The annual mean contributions from other live plans or projects, before the screening criteria are exceeded, range between 0.4% and 0.9% of the CLe and CLo. Exceeding the 1% screening criterion does not suggest that harm would occur, and the 1% criterion was originally developed to take account of the likelihood of multiple developments acting cumulatively. For the 1% screening criteria to be exceeded from the impacts of multiple new developments acting in combination, relevant live projects would all need impact on the same receptor locations. There is no formal guidance on which live developments should be considered within an in combination assessment in Wales, but guidance published by Natural England (Natural England, 2018) is that this should rely on professional judgement and should only consider developments which are of a similar scale. Overall, it is judged to be relatively unlikely that the proposed development, acting in combination with any other relevant live plans and projects, would give rise to a significant effect.

7 Conclusions

- 7.1 A screening assessment has been provided for air quality effects on biodiversity associated with the proposed RTO system at Transcontinental AC UK. The emissions which have been considered are the proposed RTO system operating at the emission limit values set in the existing permit.
- 7.2 The proposed RTO will increase concentrations of NO_x and ammonia, and nitrogen deposition fluxes within Johnstown Newt Sites SAC, River Dee and Bala Lake SAC, Midland Meres and Mosses (Phase 2) Ramsar, and River Dee SSSI. However, the annual mean changes for all pollutants and deposition fluxes from the proposed RTO in isolation will be below 1% (when rounded) of the CLe or CLo.
- 7.3 Taking account of the small impacts from the proposed RTO, it is judged to be relatively unlikely that the proposed development, either alone or acting in combination with any other relevant live plans and projects, would give rise to a significant effect.

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9 Glossary

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ADMS-5	Atmospheric Dispersion Modelling System model for point sources
APIS	Air Pollution Information System
AQC	Air Quality Consultants
Autonomous Measures	Measures which are unrelated to a plan or project which is being determined
Autonomous Reductions	Forecast improvements resulting from autonomous measures.
CJEU	Court of Justice of the European Union
CLe	Critical Level - <i>“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”</i> (APIS, 2024)
CLo	Critical Load – <i>“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”</i> (APIS, 2024)
CROW	Countryside and Rights of Way Act
Defra	Department for Environment, Food and Rural Affairs
DMF	Dimethylformamide
EU	European Union
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HMSO	His Majesty's Stationery Office
IAQM	Institute of Air Quality Management
LNR	Local Nature Reserve
LSE	Likely Significant Effect. An effect is 'likely' if it cannot be excluded on the basis of objective information. An effect is 'significant' if it undermines the conservation objectives.
µg/m³	Microgrammes per cubic metre
NE	Natural England

NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NRW	Natural Resources Wales
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PC	Process Contribution
PPW	Planning Policy Wales
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TAN	Technical Advice Note
WHO	World Health Organisation

10 Appendices

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A1 Professional Experience

Dr Ben Marner, BSc (Hons) PhD CSci MEnvSc MIAQM

Dr Marner is the Director of Air Quality Modelling and Assessment at AQC and has over 20 years' relevant experience. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has acted as expert witness at public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has developed a range of widely-used air quality models and contributed to the development of best practice. Dr Marner has provided support and advice to foreign governments, Highways England, Transport Scotland, Transport for London, Greater London Authority, the Joint Nature Conservation Committee, the Environment Agency, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. He currently advises the UK Government on air quality as part of its Air Quality Expert Group (AQEG), where his specific area of expertise relates to air quality assessment in the development control process.

Dr Frances Marshall, MSci PhD MEnvSc MIAQM

Dr Marshall is a Principal Consultant with AQC with ten years' relevant experience. Prior to joining AQC, she spent four years carrying out postgraduate research into atmospheric aerosols at the University of Bristol. Dr Marshall has experience preparing air quality assessments for a range of projects, including residential and commercial developments, road traffic schemes, energy centres, energy from waste schemes and numerous power generation schemes. She has experience in producing air quality assessments for EIA schemes, and has also assessed the impacts of Local Plans on designated ecological areas, prepared Annual Status Reports for Local Authorities, and undertaken diffusion tube monitoring studies. She is a Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

Dr Imogen Heard, BSc (Hons) MSc PhD

Dr Heard is an Associate of AQC with over 12 years' experience in the field of air quality. She has been involved in numerous development projects including road schemes, energy from waste facilities, urban extensions and energy centres. These have included the use of ADMS-5 and ADMS-Roads dispersion models to study the impacts of a variety of pollutants, including nitrogen dioxide, PM₁₀ and PM_{2.5}, and the preparation of air quality assessment reports and air quality chapters for Environmental Statements. She also has experience in undertaking construction dust risk assessments, Air Quality Neutral assessments and human health risk assessments, as well as in preparing local authority reports. Prior to joining AQC she worked as a scientist in the Atmospheric

Dispersion and Air Quality area at the UK Met Office for four years, modelling the dispersion of a range of pollutants over varying spatial and temporal scales.

A2 Relevant Case Law

A2.1 Interpretation of the Habitats Regulations with respect to air quality impacts and effects has been shaped by judgements and opinions of European and UK courts. Published findings of the Planning Inspectorate for England and Wales, and the advice given to this Inspectorate by Natural England, has also proven seminal in defining how air quality impacts on European sites should be assessed. A brief summary of some key cases, in chronological order, is given below.

2004 - Waddenzee³

A2.2 This case in the Court of Justice of the European Union (CJEU) explained the extent to which the precautionary principal must be followed in HRA. In particular, the judgement (para 61) notes: *“the competent national authorities are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects”*.

2009 - Boggis⁴

A2.3 This judgement explained that a breach of Article 6.3 does not occur solely because of a hypothetical risk of harm to a designated site. There must be credible evidence that the risk is real for this to require consideration (para 37).

2011 Sweetman⁵

A2.4 This judgement from the CJEU also emphasised the need for the precautionary principal. In particular, it highlighted that the word “Likely” in LSE is unique to the English language interpretation of the Habitats Directive and should not be seen as synonymous with ‘probable’. The judgement explained that an AA *“cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned”*.

2013 – Lough Corrib⁶

A2.5 This case in the CJEU explained that the entirety of each European site is protected by the Habitats Directive: if a *“plan or project will lead to the lasting and irreparable loss of the whole or part of a priority natural habitat type whose conservation was the objective that justified the designation of the*

³ Case C-127/02. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62002CJ0127:EN:PDF>

⁴ [2009] EWCA Civ 1061. [Boggis & Anor v Natural England & Anor \[2009\] EWCA Civ 1061 \(20 October 2009\) \(bailii.org\)](#)

⁵ Case C-258/11 (Sweetman) Judgement para 44, 46 and 47

⁶ Case C-258/11. [CURIA - Documents \(europa.eu\)](#)

site concerned ..., the view should be taken that such a plan or project will adversely affect the integrity of that site.” (para 46).

2017 - Wealden ¹⁷

- A2.6 This case in the UK High Court concerned the approach to in-combination assessments pursuant to the Habitats Regulations. The principal issue was whether it was appropriate to apply a screening criterion published by Highways England (in which changes of less than 1,000 vehicles per day could be discounted as not significant) to consider the impacts of individual plans. The overall conclusion in this respect was that the criterion should have been applied to the aggregated change caused by two plans and not to each plan in isolation. This has changed the approach taken at the screening stage of HRA, which now routinely considers the effects of plans and projects in combination as well as on their own.

2018 People over Wind⁸

- A2.7 The judgement of the CJEU was that it was more appropriate to consider the effects of mitigation at the AA stage rather than at the screening stage: *“it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site”*. This is particularly challenging to reconcile with the concepts of ‘better by design’ and ‘air quality positive’ which expect consideration of air quality improvement to run throughout the design of a project. Since the People over Wind judgement, most assessments consider that on-site measures to reduce emissions which are not required solely to avoid an LSE can form part of the assessment considered at the screening stage.

2018 Dutch Nitrogen Cases⁹

- A2.8 These two cases highlighted several interesting points. The most relevant in terms of air quality assessment in the UK are:

⁷ Judgment in Wealden District Council v Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority) [2017]

⁸ C-323/17 Judgement of the Court 12 April 2018, Request for a preliminary ruling under Article 247 TFEU from the High Court (Ireland), made by decision on 10 May 2017, received at the Court on 30 May 2017, in the proceedings of People Over Wind and Peter Sweetman v Coillte Teoranta, curia.europa.eu/juris/document/document.jsf?text=&docid=200970&pageIndex=0&doclang=en&mode=req&dir=&occ=first&part=1&cid=619449.

⁹ Coöperatie Mobilisation for the Environment UA and Vereniging Leefmilieu v College van gedeputeerde staten van Limburg and College van gedeputeerde staten van Gelderland. Requests for a preliminary ruling from the Raad van State Joined Cases C-293/17 and C-294/17

- 1) that an AA may not take into account the existence of 'autonomous' measures¹⁰ (i.e. measures not part of that programme), if the expected benefits of those measures are not certain;
- 2) that screening thresholds may only be used to discount an LSE from a project if there is no reasonable scientific doubt that that project will not affect the integrity of a designated site in combination with other plans and projects; and
- 3) that recurring activities such as grazing and fertilizer use may be classified as a 'project' in the context of the Habitats Directive.

2019 - Examination of the Submission Wealden Local Plan

- A2.9 This does not relate to a court case, but the judgements expressed by NE and the planning inspectorate have had significant implications for the way in which air quality impacts on nature conservation sites are assessed in the UK. In particular, they form the basis of the approach which was taken to derive the Decision Making Thresholds and Site Relevant Thresholds. Furthermore, the political implications for Wealden District Council (WDC) of not following NE's advice on this matter have provided a clear signal to other local planning authorities regarding the treatment of autonomous measures in planning decisions.
- A2.10 In the evidence supporting its 2018 Submission Local Plan, Wealden District Council showed the impact of its Submission Plan on air quality conditions within the Ashdown Forest SAC. It quantified the PC and ICC, and also showed the net effect of forecast changes to national and international emissions (i.e. autonomous measures). These emissions were forecast using three alternative approaches, each of which assumed a different level of efficacy of the autonomous measures.
- A2.11 NE advised WDC that it should base its plan-making solely on the scenario that used AQC's CURED model¹¹, but instead the Council took account of all three emissions scenarios, including one in which autonomous measures were assumed to have no effect¹².
- A2.12 Under NE's preferred scenario¹¹, improvements caused by autonomous measures were predicted to be greater than the adverse effects of the Submission Local Plan, both alone and in-combination with other predicted traffic growth (i.e. the effect of autonomous measures was greater than both the PC and ICC). Detailed habitats surveys had identified the distribution of the protected feature, and at the worst relevant location, the PC was predicted to remove 53% of the autonomous

¹⁰ i.e. measures which are not being delivered as part of the plan, project, or programme being assessed.

¹¹ This was termed 'Scenario B'. AQC's CURED model has since been withdrawn but the modelling presented in this report is consistent with the level of precaution which was inherent in this model scenario.

¹² This was termed 'Scenario A'.

improvements, while the ICC was predicted to remove 74% of the autonomous improvements¹³. These predictions were used by NE to inform its supplementary conservation objectives for Ashdown Forest (Natural England, 2019). Making specific reference to the modelling published by WDC, NE stated:

“Assessment of improvements in vehicular technology and in particular Euro6/VI standards that all vehicles are currently being manufactured to, will outweigh impacts from new development. The improvements will be marginally retarded by additional development but future nitrogen deposition and concentration will continue to decline with the existing trend.” (Natural England, 2019).

- A2.13 This statement relates to the entire SAC and thus takes account of the large area where the ICC was predicted to remove less than 74% of the autonomous improvements, as well as these worst-case impacts. NE also explained the importance of this net downward trend in its representations to the planning inspector^{14,15}. The predicted improving trend related only to NO_x and nitrogen deposition. The modelling published by WDC, to which NE referred, did not predict any reductions to ammonia concentrations, only adverse impacts. NE's advice took a holistic view of ambient concentrations in general in its advice relating to air quality.
- A2.14 It is important to note that NE's position regarding the importance of autonomous emissions reductions at Ashdown Forest did not refer to specific habitat features, their sensitivity, or any other ecological context. The statement which is quoted in Paragraph A2.12, relates solely to air quality forecasts. A key disagreement between WDC and NE was whether the autonomous measures included in the air quality forecasts were sufficiently certain for decision making in the context of the Habitats Regulations¹⁶. The Submission Plan ultimately had to be withdrawn, partly because of WDC's failure to take account of NE's advice on the significance of the PC and ICC when viewed in the context of the benefits provided by autonomous measures¹⁷.

¹³ As documented in the executive summary of the air quality modelling report cited by Natural England (2019) which shows the maximum deposition to heath predicted using the most detailed modelling would fall from 22.7 kgN/ha/yr in 2015 to: 19.3 kgN/ha/yr in 2028 without any 'in-combination' traffic; 20.8 kgN/ha/yr in 2028 without the Submission Plan, and 21.8 kgN/ha/yr with the Plan..

¹⁴ e.g. Paragraphs 19 to 25, and Paragraphs 37 to 46 of Annex 1 to Natural England Comments on Proposed Submission Document 05/08/18 – Natural England ref 255168 (available on request).

¹⁵ It is important to note that the examination in public followed shortly after the judgement from the Dutch Nitrogen Cases, which were discussed at length and thus fully accounted for in advice from both Natural England and the planning inspector.

¹⁶ In particular, WDC noted that measurements showed that traffic-related nitrogen deposition had, on average, been increasing for many years despite the same forecasts showing concurrent reductions.

¹⁷ Wealden District Council concluded that the PC and ICC were both potentially significant without mitigation, while for the reasons given in Paragraph A2.12, Natural England determined that mitigation was not required.

A3 Data from (Caporn et al., 2016) Cited by National Highways

Table A3.1: Values from Table 21 of Caporn et al (2016) Relied on in National Highways' Assessment Method

Habitat	CLO	Nitrogen Deposition KgN/ha/yr					
		Background deposition					
		5	10	15	20	25	30
		Increase required to reduce measured species richness by 1					
Upland heath ^a	10-20	0.4	0.8	1.3	1.7	2.0	2.4
Upland heath ^a	10-20	1.7	2.0	2.5	3.3	5.0	20.0
Lowland heath	10-20	0.4	0.8	1.3	1.7	2.0	2.4
Bog	5-10	-	-	-	3.3	-	-
Sand dunes ^a	8-15	0.1	0.5	1.1	2.0	-	-
Sand dunes ^a	8-15	0.3	0.6	0.9	1.3	-	-
Sand dunes ^a	8-15	0.3	0.6	0.9	1.3	-	-
Acid grasslands	10-15	1.7	1.7	2.0	2.0	2.5	2.5

^a Based on two separate studies using different quadrat sizes.

A4 Modelling Methodology

- A4.1 The details of the modelling methodology have been reproduced from the AQC report which describes the operational air quality effects on public health (document reference J10/12125B/10/1/F1, dated 19th December 2023) (AQC, 2023).

Model Inputs

- A4.2 The emissions from the existing and proposed RTO systems have been predicted using the ADMS-6 dispersion model. ADMS-6 is a next generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer.
- A4.3 The model has been run to predict the contribution of the RTO system emissions to annual mean concentrations of nitrogen oxides, HCl and NH₃ and the 100th percentile of 24-hour mean nitrogen oxides concentrations.
- A4.4 Model input selections are summarised in Table A4.1, and, where considered necessary, discussed further below. Input emission parameters are presented later in Table A4.2.

Table A4.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	Yes – 16 km x 16 km Cartesian grid at 50 m resolution
Variable Surface Roughness File Used?	Yes – 16 km x 16 km Cartesian grid at 50 m resolution
Urban Canopy Flow Used?	No
Building Downwash Effects Modelled?	Yes
Meteorological Monitoring Site	Hawarden
Meteorological Data Years	2018 - 2022
Dispersion Site Surface Roughness Length (m)	N/A (variable surface roughness file used)
Dispersion Site Minimum MO Length (m)	30
Met Site Surface Roughness Length (m)	0.2
Met Site Surface Minimum MO Length (m)	1

- A4.5 The modelled emission parameters are shown in Table A4.2; orange highlighted cells contain the values entered into the model, for ease of reference.

Table A4.2: Emissions and Release Conditions for the Existing and Proposed RTOs

Parameter	Value	
	Existing RTO	Proposed RTO
Source Type	Point	
X-Coordinate, Y-Coordinate	338008.9, 350604.6	338098.0, 350629.7
Height (m)	12.0	13.0
Exhaust Flow (Am ³ /hr) for Actual Flow	175,041	211,670
Exhaust Flow (Am ³ /s) for Actual Flow	48.6	58.8
Flue Internal Diameter (m)	2.28	2.20
Exhaust Velocity (Am/s) for Actual Flow	11.9	15.5
Exhaust Temperature (°C)	112	
Exhaust Flow (Nm ³ /s) for Normalised Flow ^a	34.3	41.7
Permitted NO _x Emission Concentration while Nitrogen-Containing Compounds are Used (mg/Nm ³) ^a	300	
NO _x Emission Rate (g/s)	10.3	12.5
Permitted HCl Emission Concentration (mg/Nm ³) ^a	10	
HCl Emission Rate (g/s)	0.34	0.42
Permitted NH ₃ Emission Concentration (mg/Nm ³) ^a	1	
NH ₃ Emission Rate (g/s)	0.03	0.04

^a 'Normal' here refers to 0°C and 101 kPa.

A4.6 Entrainment of the plume into the wake of the buildings (the so-called building downwash effect) has been taken into account in the model. The building dimensions and flue location have been obtained from drawings provided by Transcontinental AC UK.

A4.7 The locations of the flues are shown in Figure A4.1 along with the modelled buildings and their heights.



Figure A4.1: Flue Locations & Modelled Buildings

Imagery ©2024 Airbus, Bluesky, Infoterra Ltd & COWI A/S, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies.

- A4.8 Hourly sequential meteorological data in sectors of 10 degrees from Hawarden for 2018 - 2022 have been used in the model.
- A4.9 The Hawarden meteorological monitoring station is located approximately 15 km to the northwest of the facility. Both the application site and the Hawarden meteorological monitoring station are located in north Wales where they will be influenced by the effects of inland meteorology in hilly topography. Measurements from this site are considered to provide the most robust basis to predict meteorology within the model domain.
- A4.10 Wind roses for the site for the years 2018 - 2022 is provided in Figure A4.2. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

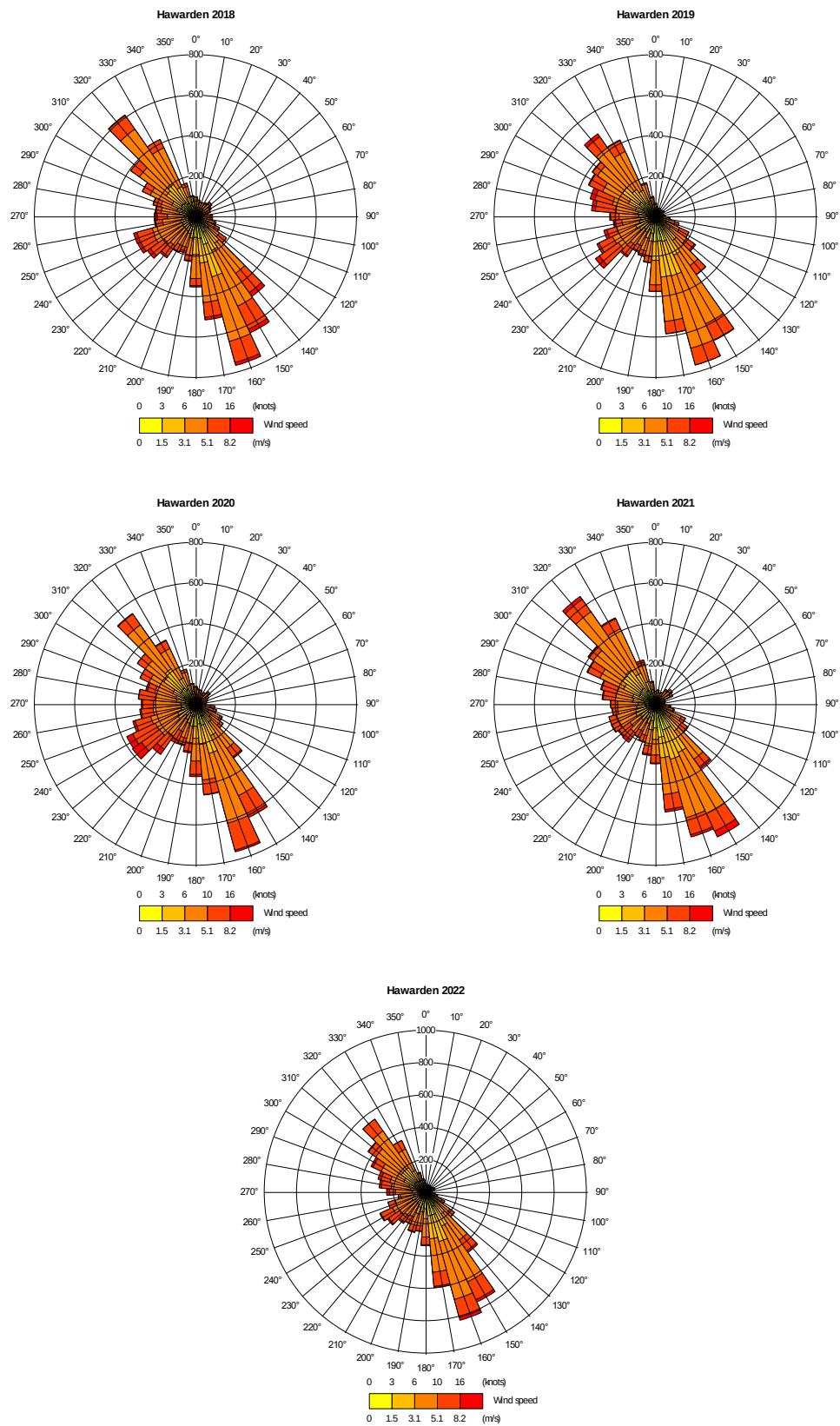


Figure A4.2: Wind Roses for 2018 - 2022

A4.11 The study area encompasses a range of land types. A variable surface roughness file has been used to represent the spatial variation of the surface roughness over each land type as shown in Figure A4.3. The following parameters have been used regarding surface roughness and land type:

- forest – 1 m;
- built-up area – 0.5 m;
- grassland – 0.2 m; and
- water – 0.0001 m.

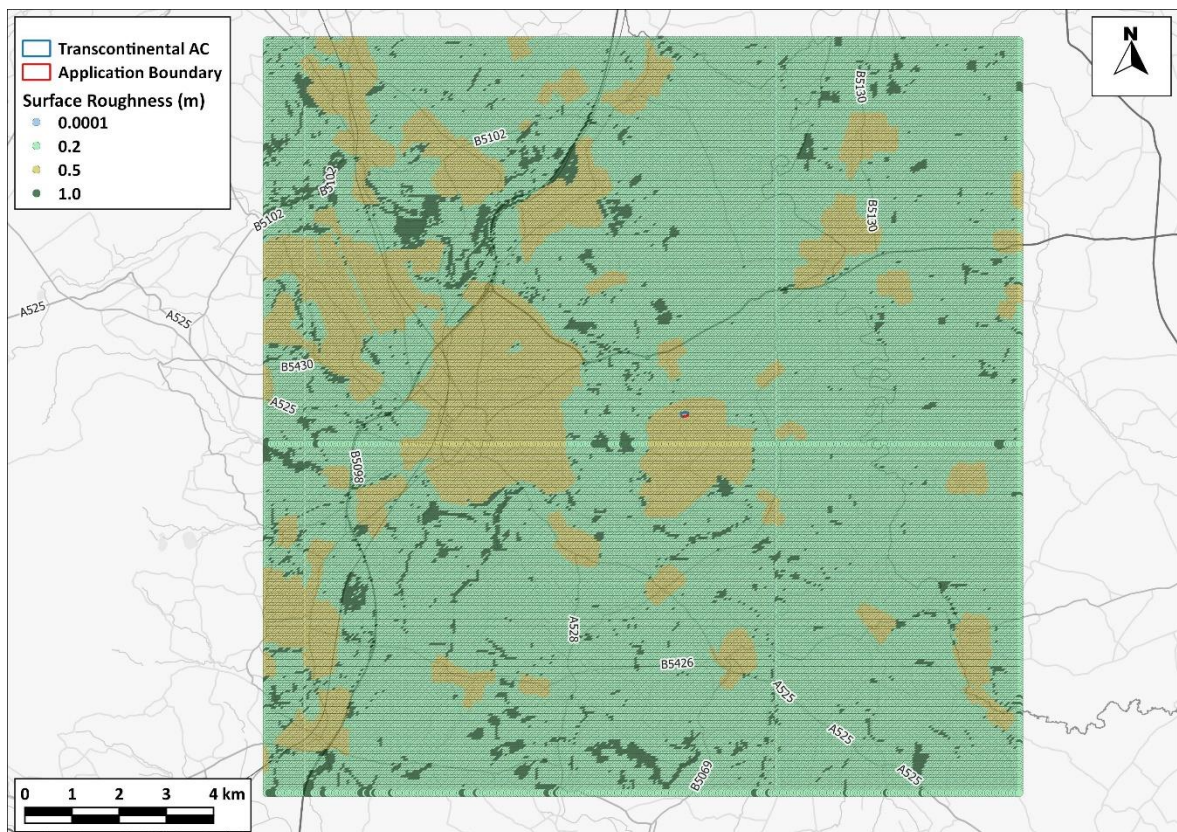


Figure A4.3: Surface Roughness across Modelled Area

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A4.12 Figure A4.4 shows the terrain across the modelled study area using Ordnance Survey (OS) Terrain 50 data. The area immediately surrounding the site is broadly flat, such that the base of the RTO flue is approximately at the same elevation as the base of the on-site buildings and nearest human health receptors. Terrain data have, however, been included in the model.

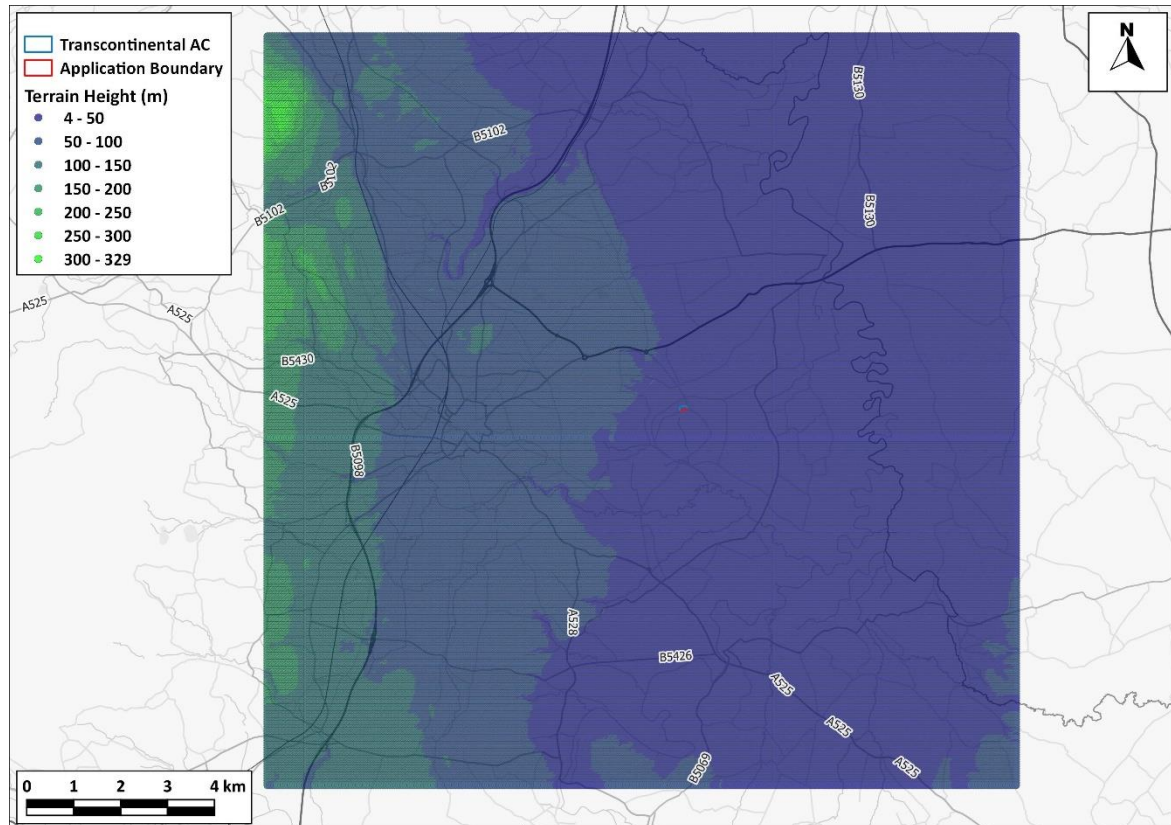


Figure A4.4: Terrain across Modelled Area

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Model Verification

A4.13 It is not practical, nor usual, to verify the ADMS-6 model.

Post-processing

A4.14 Emissions from the RTO will be predominantly in the form of nitrogen oxides, HCl and NH₃. ADMS-6 has been run to predict the contribution of the RTO emissions to annual mean concentrations of nitrogen oxides, HCl and NH₃, and maximum 24-hour mean nitrogen oxides concentrations.

A4.15 For the initial screening of the process contributions, the approach recommended by the Environment Agency (2005) has been used to predict nitrogen dioxide concentrations, assuming that annual mean NO₂ concentration = annual mean NO_x concentration multiplied by 0.7.

Deposition Rates

A4.16 Deposition has not been included within the dispersion model. Instead, deposition has been calculated from the predicted ambient concentrations using the deposition velocities set out in

Table A4.3. Deposition velocities refer to a height above ground, typically 1 or 2 m, although in practice the precise height makes little difference and here, they have been applied to concentrations predicted at a height of 1.5 m above ground. The velocities are applied simply by multiplying a concentration ($\mu\text{g}/\text{m}^3$) by the velocity (m/s) to predict a deposition flux ($\mu\text{g}/\text{m}^2/\text{s}$) and then scaling by time and area to represent kg/ha/yr of the nitrogen component of the molecule.

Table A4.3: Deposition Velocities Used in This Assessment

Pollutant	Deposition Velocity (m/s)	Reference
Nitrogen Dioxide	0.003 m/s (Forest)	AQTAG06 (2011)
Hydrogen Chloride	0.06 m/s (Forest)	
Ammonia	0.03 m/s (Forest)	

- A4.17 Wet deposition of NO_x and NH₃ emissions from the RTOs at the facility has been discounted. Wet deposition of NO_x and NH₃ this close to the emission source will be restricted to wash-out, or below cloud scavenging. For this to occur, rain droplets must come into contact with the gas molecules before they hit the ground. Falling raindrops displace the air around them, effectively pushing gasses away. The low solubility of NO₂ and NH₃ means that any scavenging of this gas will be a negligible factor.
- A4.18 Wet deposition for HCl should, however, be considered where a process emits this pollutant. As a worst-case, and thus precautionary, assessment, it is generally considered acceptable to assume that total deposition (wet and dry) comprises three times dry deposition. This is the methodology applied in this study when considering deposition from HCl.
- A4.19 Deposition may have an acidifying effect through the release of acid protons during chemical transformation in the soil or biota. Thus, even alkaline gases such as ammonia can have an acidifying effect. The acidity CLOs are expressed as equivalents ('eq'), referring to the molar equivalent of potential acidity. This is calculated from the mass (in g) of the deposited element, taking account of both its atomic mass and its valency. For example, the acidifying potential (in eq) of both ammonium (NH₄⁺) and nitrate (NO₃⁻) is 1/14 times the deposited mass in grammes (with 14 being the atomic mass of nitrogen), while for chloride (Cl⁻) it is 1/35.5 (with 35.5 being the atomic mass of chlorine). The species included in the calculation of acid deposition, and their calculated acidifying potentials, are set out in Table A4.4.

Table A4.4: Species Included in Acid Deposition Calculations

Pollutant	Calculation (kg deposition to keq)
N (from deposited NO ₂ , Ammonia)	0.071
Cl (from deposited HCl)	0.028