Kronospan Low Carbon CHP Facility

Appendix 6H

Ecological Interpretation of Air Quality Assessment

Prepared for: Kronospan

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DNS5-4-029

1.0 INTRODUCTION

1.1 Aims and Objectives

1.1.1 This document provides an ecological interpretation of the air quality assessment (AQA) (see **ES Chapter 6.0 (Air Quality and Odour)**) for the Proposed Development, with particular reference to predicted impacts above screening thresholds on statutory and locally designated nature conservation sites.

1.1.2 The assessment includes the following elements:

i) Clarification of sensitivity of nature conservation sites, including confirmation of appropriate environmental quality standards (EQS) for the designated or notified features; and

ii) Assessment of significance of potential effects of emissions from the Proposed Development on designated/notified features, based on dispersion and deposition modelling undertaken by Fichtner Consulting Engineers.

1.1.3 The assessment of effect significance then informs the Biodiversity Assessment Report (BAR) (**DNS4-007**). In particular, it helps to determine the level of mitigation and enhancement measures needed in order achieve a net benefit for biodiversity in accordance with the Biodiversity and Resilience of Ecosystems Duty in Section 6 of Environment Act (Wales) 2016.

1.1.4 The ecological interpretation should be read in conjunction with **ES Chapter 6.0 (Air Quality and Odour) and ES Appendix 6F (Dispersion Modelling Results – Ecology)** for details of the dispersion and deposition modelling undertaken by Fichtner Consulting Engineers, which forms the basis of this assessment. **ES Appendix 6G (Baseline Habitat Condition Survey)** informs the assessment of baseline habitat condition and sensitivity for key sites considered in this document.

2.0 SCOPE AND METHODOLOGY

2.1 Scope of Assessment

Geographic Scope

2.1.1 The geographic scope of the assessment was defined by the results of air quality dispersion and deposition modelling. In accordance with Natural Resources Wales (NRW) guidance, this applies a 2km screening distance to nationally and locally designated sites and ancient woodlands, and a 10km screening distance to European designated sites.

2.1.2 One statutory designated site beyond the 2km screening radius, Nant y Belan and Prynela Woods Site of Special Scientific Interest (SSSI) was also included as a sensitive receptor in the dispersion modelling, because of the potential for impacts above the screening threshold.

2.1.3 Sites included in the assessment are set out in the BAR (**DNS4-007**); locations and extents are shown in Figures 1 and Figure 2 of the BAR.

Scope of Ecological Interpretation

2.1.4 The ecological interpretation comprises two main elements:

i) Confirming site sensitivity with reference to Air Pollution Information Service (APIS) advice, supported where necessary by the site surveys reported in **ES Appendix 6G** to inform the AQA.

ii) Interpreting the significance of any predicted impacts above screening thresholds and identifying any mitigation requirements.

2.2 Assessment Methodology

Assessment of Site Sensitivity to Air Quality Impacts

2.2.1 The Air Pollution Information Service (APIS) GIS map tool[1] was used to identify site-relevant critical loads for nitrogen and acid deposition, and the appropriate critical level for atmospheric ammonia. Features used by APIS were cross-checked against NRW publications to ensure all qualifying and notified features had been considered. Field survey information (2023) (**ES Appendix 6G**) provided further information about appropriate habitats and critical load classes. Where appropriate, the most recent revision of nitrogen critical loads (Bobbink *et al*, 2022[2]) was referred to, as this provides the underpinning data for the values adopted by APIS.

2.2.2 Nitrogen critical load classes listed by APIS are based on European Nature Information System (EUNIS) habitats. These are based on translation from Annex I habitats for European conservation sites, and National Vegetation Classification (NVC) plant communities for Sites of Special Scientific Interest (SSSIs). Locally designated sites and ancient woodlands do not have critical loads assigned by APIS; in these cases, the appropriate EUNIS habitat and critical load class is derived from published site descriptions, or field survey; in cases of uncertainty, the most precautionary (i.e. lowest) critical load class is assigned.

2.2.3 Acid deposition critical loads used by APIS are based on broad habitat classes, and for most habitat types are derived from the weathering rate and mineralogy of the dominant soil types in the relevant 1km grid-square. For locally designated sites not included in the APIS GIS App, the Search by Location function provides appropriate acid deposition critical loads for each broad habitat.

2.2.4 Ammonia critical levels are based on whether sensitive lower plants (bryophytes and lichens) are important components of the designated or notified features for a site. Due to higher sensitivity to atmospheric ammonia levels, a lower critical level is applied in these circumstances.

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[1] *APIS GIS Map Tool. https://www.apis.ac.uk/app*

[2] *Bobbink R, Loran C, Tomassen H, eds. (2022). Review and revision of empirical critical loads of nitrogen for Europe. Dessau-Rosslau: German Environment Agency.*

2.2.5 The NRW *Protected Sites Baseline Assessment 2020*[3] was referred to in order to assess habitat condition of SSSI notified features. This includes data in spreadsheet format listing the notified features of all Welsh SSSIs, and (where available) their condition.

Assessment of Effect Magnitude and Significance

Air Quality

2.2.6 There are no currently accepted thresholds for assessing the **magnitude** of air quality effects on ecological receptors (i.e. the degree of change from baseline conditions, relative to the relevant environmental quality standard). Neither IAQM (2020) guidance or the Chartered Institute of Ecology and Environmental Management (CIEEM, 2021)[4] Air Quality Advice Note provide any guidance on effect magnitude or ecological significance thresholds.

2.2.7 In the absence of guidance for ecological receptors, Environmental Protection UK (EPUK, 2010)[5] advice can be applied with caution; although this was developed for assessment of nitrogen dioxide and particulate emissions on human health in a development control context, it provides a useful descriptor to express impact magnitude as a percentage of the relevant assessment level (see **Table 2.1** below). This has now been superseded by revised advice, which is now explicitly reserved for application in a human health assessment context, leaving this as the most recent characterisation of effect magnitude applicable to habitats.

Table 2.1: Characterisation of Impact Magnitude

Magnitude of Change	Annual Mean Value Increase/Decrease (as percentage of assessment level)
Large	>10%
Medium	5-10%
Small	1-5%
Imperceptible	<1%

[3] *NRW Protected Sites Baseline Assessment 2020. https://naturalresources.wales/evidence-and-data/research-and-reports/protected-sites-baseline-assessment-2020/?lang=en*

[4] *CIEEM (2021). Advice on Ecological Assessment of Air Quality Impacts. Chartered Institute of Ecology and Environmental Management. Winchester, UK*

[5] *Environmental Protection UK (2010). Development Control: Planning For Air Quality (2010 Update). EPUK, April 2010.*

2.2.8 With respect to assessing **significance** of ecological effects, it is important to note that the 1% screening threshold is not an effect threshold. The magnitude of impact which might result in a significant ecological effect is likely to depend on baseline conditions and sensitivity of the receiving environment. CIEEM (2018[6]) define a significant ecological effect as *"an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area"*.

2.2.9 Environment Agency (EA) guidance[7], at the time applicable to permit applications in England and Wales, addressed whether it is possible to conclude no adverse effect on site integrity (for European sites) or to conclude no likelihood of damage (SSSIs). It distinguished between circumstances when:

i) the background concentration is less than the appropriate environmental criterion, but a small process contribution leads to an exceedance; or

ii) the background concentration is currently exceeding the appropriate environmental criterion, and the new process contribution will cause an additional **small** increase; and

iii) the background concentration is less than the appropriate environmental criterion, but the process contribution is significant (*i.e. of higher magnitude*) and leads to an exceedance; or

iv) the background concentration is more than the appropriate environmental criterion, and the process contribution is **large.**

2.2.10 In the first two circumstances, the EA recommend that a decision is based on local circumstances, based on factors set out in guidance (such as spatial disposition of sensitive habitats relative to predicted effects); in the latter two circumstances, the EA state that it is not possible to conclude no adverse effect.

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[6] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

[7] Environment Agency (2012). Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation. Operational Instruction 67_12, Issued 08/05/12

2.2.11 Natural England Commissioned Report NECR210 provides some quantification of potential significance with respect to nitrogen deposition impacts, using a modelled metric of the incremental increase in deposition rates likely to result in the loss of one species from a habitat. Although their guidance is limited to a small number of habitats, it has been adopted by Highways England for assessment of road transport air quality impacts.

3.0 SENSITIVITY OF ECOLOGICAL RECEPTORS

3.1 Sites Considered in Assessment

3.1.1 The following sites have been considered in the assessment. Further details of location, size and reasons for designation are given in Section 4.0 of the BAR (**DNS4-007**).

i) River Dee and Bala Lake Special Area of Conservation (SAC).
ii) Berwyn and South Clywd Mountains SAC.
iii) Berwyn Special Protection Area (SPA).
iv) Chirk Castle and Parkland Site of SSSI.
v) Nant y Belan and Prynela Woods SSSI.
vi) River Dee SSSI.
vii) Canal Wood Local Wildlife Site (LWS).
viii) Barracks Field LWS.
ix) Pentre Wood LWS.
x) Various ancient woodland sites.

3.1.2 Appropriate environmental quality standards (critical levels and critical loads) for each site are considered below. As noted in **Section 2.2**, these are based on APIS advice for statutory designated sites, modified if necessary following field survey (**ES Appendix 6G**) data search or consideration of other published data on site features. For locally designated sites which are not covered by APIS GIS App, the correct habitat assignment has been derived from field survey and/or published data on reasons for designation.

3.1.3 The assessment of sensitivity focusses on three parameters where there are potential risks of exceeding screening thresholds, due to background levels or deposition rates being close to or above the relevant critical level or critical load. These are annual mean ammonia levels, nitrogen deposition and acid deposition rates. Long and short-term oxides of nitrogen levels and sulphur dioxide levels are well below critical levels, and there is therefore no risk of exceedance. However, all parameters have been modelled in the AQA (**ES Appendix 6F**), which should be referred to for full details of background levels and environmental quality standards.

3.2 River Dee and Bala Lake SAC

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.2.1 Only one qualifying feature of the SAC is assigned a critical load for nitrogen deposition by APIS - floating water-plantain *Luronium natans*. This is associated with oligotrophic lakes habitat (EUNIS C1.1), which has a critical load range of 2 - 10kg N/ha/yr, with the lower value reserved for boreal and alpine lakes. Within the SAC, this is represented by Bala Lake, located over 35km west of the Proposed Development and outside of its potential zone of influence.

3.2.2 APIS do not assign any critical loads for nitrogen deposition to other qualifying features of the SAC. Rivers and stream habitats and their associated fauna are sensitive to eutrophication; however, atmospheric deposition from point sources is not normally regarded as significant, relative to the much greater contributions from land-based sources, including diffuse inputs from agriculture and wastewater treatment works.

Acid Deposition

3.2.3 APIS do not assign any critical loads for acid deposition to qualifying features of the SAC. Acid deposition can be significant in poorly-buffered upland catchments but is not regarded as a likely threat to proximal or downstream reaches of the River Dee or Ceiriog, which are classified by NRW as either 'not at risk' or 'probably not at risk'. The *Core Management Plan and Conservation Objectives* sets catchment-wide targets for an acid neutralising capacity (ANC) >40, and river pH >6.54[8].

Ammonia Levels

3.2.4 APIS give an ammonia critical level for the SAC of 3μg/m^3 annual mean, the standard value for protection of ecosystems. None of the qualifying features have a higher sensitivity to atmospheric ammonia, which would justify a lower critical level.

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[8] *Natural Resources Wales (2022). Core Management Plan including Conservation Objectives for River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC. https://naturalresources.wales/media/673374/river_dee___bala_lake_32_plan.pdf*

3.3 Berwyn and South Clwyd Mountains SAC

Sensitivity to Air Quality Impacts

Summary

3.3.1 This site contains a number of features with a relatively high sensitivity to air quality impacts, including heathland and bog habitats. The table below summarises APIS advice with respect to site-relevant critical loads and levels.

3.3.2 It should be noted that APIS provide critical loads for a number of other habitats within this SAC which are not listed either by NRW or JNCC as qualifying features. The table below is restricted to those features which are a main reason for site selection (European dry heaths and blanket bogs) together with four additional features which are listed as occurring within the site but are not a primary reason for site selection.

Table 3.1: Sensitivity of Berwyn and South Clwyd Mountains SAC (from APIS)

Qualifying Features	N Critical Load Class	EUNIS Habitat Code	N Deposition Critical Load (kg N/ha/yr)	Acid Dep. Critical Load (keq/ha/yr)	NH3 Critical Level ($\mu g/m^3$)
European dry heaths	Dry heaths	S42	5-15	0.882	1.0
Blanket bogs	Raised and blanket bogs	Q1	5-10	0.660	1.0
Semi-natural dry grasslands and scrublands on calcareous facies	Semi-dry perennial calcareous grassland	R1A	10-20	4.856	1.0
Transition mires and quaking bogs	Valley mires, poor fens and transition mires	Q2	5-15	0.660	1.0
Calcareous and calcschist screes of montane to Alpine levels	Arctic, alpine and subalpine scrub habitats	S2	5-10	0.551	1.0
Calcareous rocky slopes with chasmophytic vegetation	Arctic - alpine calcareous grassland	R44	5-10	0.551	1.0

Critical Loads and Levels for Screening and Assessment

3.3.3 The minimum critical loads for nitrogen and acid deposition given by APIS are appropriate for screening and environmental assessment purposes. The lower $1\mu g/m^3$ annual mean critical level for ammonia is appropriate for all habitats, which typically have a significant bryophyte and lichen component.

3.4 Berwyn SPA

3.4.1 The four qualifying features of Berwyn SPA are all raptor species breeding either on heathland or bog habitats (hen harrier, merlin), rocky faces (peregrine) or woodland (red kite), and predominantly foraging over open habitats. Their potential sensitivity to air quality impacts is secondary, requiring habitat change which would either affect the abundance or detectability of prey species, or suitability of nesting habitat.

3.4.2 APIS gives critical loads for supporting wet heath and broadleaved woodland habitat, and states that for hen harrier there is a potential negative impact due to impacts on the species' broad habitat.

3.4.3 The postulated effect mechanism is not specified by APIS but is likely to be due to replacement of heather used for nesting by graminoid species under conditions of excess nitrogen deposition. The 5 - 15 kg N/ha/yr critical load range for northern wet heath (EUNIS S411) can be applied as a precautionary threshold for hen harrier supporting habitat.

3.4.4 For other qualifying species, APIS state that there is no expected negative impact on species due to effects on supporting habitat.

3.4.5 No acid deposition critical load or ammonia critical level is given by APIS for any of the features, which are stated to be not sensitive to these pollutants.

3.5 Chirk Castle and Parkland SSSI

Summary

3.5.1 The SSSI contains four notified features - veteran trees, grassland macrofungal assemblage (waxcap grasslands), saproxylic (dead-wood) invertebrate assemblage, and lesser horseshoe bat.

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.5.2 APIS list the veteran trees feature as 'semi-natural woodland' and assign a critical load for nitrogen deposition based on the broadleaved deciduous woodland EUNIS level 2 habitat (T1). This is 10 - 15kg N/ha/yr, taking account of the occurrence of sensitive woodland communities within this broad habitat definition.

3.5.3 There are no critical loads for nitrogen deposition assigned by APIS for waxcap grassland, saproxylic invertebrates feature, or lesser horseshoe bat; APIS recommend seeking site-specific advice, stating sensitivity to nitrogen deposition has not been assessed.

3.5.4 Application of the generic broadleaved woodlands nitrogen critical load class (10kg N/ha/yr minimum) by APIS to veteran trees can be considered over-precautionary, when the field survey clearly placed all woodlands on site within the Carpinus - Quercus mesic forest (15kg minimum CL) class. Veteran trees occupy the same areas and same soil types, and in some cases are located within the same woodlands, although most occupy parkland locations set in semi-improved pasture habitat.

3.5.5 Advice by statutory agencies and conservation bodies on waxcap grasslands emphasises their association with low nutrient status grasslands, so the lack of a critical load should not imply a lack of sensitivity. It would therefore be appropriately precautionary to apply the minimum critical load for low and medium altitude hay meadows (EUNIS R22) of 10kg N/ha/yr to this feature.

3.5.6 There is no clear effect pathway for impacts of nitrogen deposition on saproxylic invertebrates or lesser horseshoe bat, and it is reasonable to regard these features as not sensitive.

Acid Deposition

3.5.7 The only feature assessed for acid deposition by APIS is the semi-natural woodland analogue for the veteran trees feature, which has a critical load assigned of 1.864keq H^+/ha/yr. This appears precautionary, given the field survey did not suggest woodland soils were highly leached or acidic in nature.

Ammonia Critical Levels

3.5.8 APIS do not assign a critical level for ammonia to the semi-natural woodland/veteran trees feature. The most sensitive component of veteran trees to elevated levels of ammonia is the epiphyte flora, in particular lichens associated with acid-barked trees such as oaks, which are sensitive to ammonia and to nitrogen deposition. However, the SSSI Citation and 'Your Special Site and its Future' documents do not highlight the site's lichen flora as a feature of special interest; the key feature associated with veteran trees on this site is the saproxylic (dead-wood) invertebrate fauna.

3.5.9 The field survey in 2023 found very few lichens on tree boles, while the twig lichen flora was dominated by nitrogen-tolerant species. This could be explained by high background rates of nitrogen deposition of up to 32kg N/ha/yr (at woodland deposition velocities), coupled with elevated annual mean ammonia levels of around 1.9μg/m^3, both well above their respective critical loads and levels of 15kg N/ha/yr and 1.0μg/m^3 annual mean. Because of this clear evidence of dominance of nitrophilous lichens, the report suggested that the higher 3.0μg/m^3 may be more appropriate to apply to Chirk Castle.

3.5.10 It should be cautioned that the 2023 survey focussed on indicator species used to define pollution indices, and did not constitute a full lichen survey. The data search did reveal the presence of one nitrogen-sensitive tree bole epiphyte, *Lecanora sublivescens* in the southern and western parts of the SSSI, 1.1 - 1.9km from the Proposed Development. The lower 1.0μg/m^3 annual mean critical level has therefore been applied in this assessment.

3.5.11 APIS assign a critical level of 1.0μg/m^3 for the grassland fungi feature, but it is unclear what the ecological justification is for this. Whilst waxcap fungi are associated with low nutrient status grassland, there does not appear to be any literature suggesting that these soil-dwelling organisms are sensitive to ambient ammonia levels, and the 3.0μg/m^3 critical level applied to the grassland habitat may therefore be more appropriate.

3.6 Nant y Belan and Prynela Woods SSSI

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.6.1 The NRW Citation and *Your Special Site and its Future* publications note that the SSSI is designated for the presence of oak and ash woodland. The Citation states that the woodland is very variable, with the canopy variously dominated by sessile oak (*Quercus petraea*), ash (*Fraxinus excelsior*), wych elm (*Ulmus glabra*) and wild cherry (*Prunus avium*). It goes on to state that the herb layer is equally variable, with more acidic soils derived directly from sandstone supporting species such as bilberry (*Vaccinium myrtillus*) and great wood-rush *(Luzula sylvatica*), while deeper, more alkaline soils support wood false-brome (*Brachypodium sylvaticum*); extensive wet flush areas support stands of pendulous sedge (*Carex pendula*).

3.6.2 The variability of soil type is key to understanding the sensitivity of the woodland to nitrogen deposition. APIS disaggregate the woodland habitat into 5 different National Vegetation Classification (NVC) communities and one 'planted trees and shrubs' feature. In terms of nitrogen critical load class, these can be simplified as the most sensitive acidophilous *Quercus* forest habitat (EUNIS T1B), with a critical load range of 10 - 15kg N/ha/yr, and the less sensitive *Carpinus* and *Quercus* mesic deciduous forest habitat (EUNIS T1E), with a critical load range of 15 - 20kg N/ha/yr.

3.6.3 The field survey included a walkover of the whole of the SSSI and located the sensitive T1B community (NVC W16 or W17) on a sandstone ridge with leached, acidic soils, located east of the A483 Dee Viaduct within Nant y Belan Wood. The remainder of the woodland occupying more mesic soils can be classified as either oak (NVC W10) or ash (NVC W8) communities, both of which fall within EUNIS T1E. Prynela Wood to the east mainly comprised the W8 ash woodland community.

3.6.4 The frequent flushed areas in the woodland occupying lower-lying convex slopes are treated by APIS as examples of NVC W7 alder woodland, which is assigned to EUNIS T1 deciduous woodland broad habitat and critical load class, and given a default precautionary critical load of 10 - 15kg N/ha/yr. This is inconsistent with the treatment of this community in APIS advice for European sites, which does not consider W7 to be sensitive to nitrogen deposition, due to the naturally enriched soils resulting from the nitrogen fixing properties of alder trees. As this community occupies relatively small areas of the woodland, much of which has an ash rather than alder canopy, it is more appropriate to retain the 15 - 20 kg N/ha/yr critical load for EUNIS T1E mesic woodland.

Acid Deposition

3.6.5 APIS propose a critical load for acid deposition to unmanaged broadleaved/coniferous woodland broad habitat of 1.879keq/ha/yr. In practice sensitivity of woodland habitats will also vary across the site, with the more strongly leached, poorly buffered soils in the acidophilous *Quercus* woodland habitat having the highest sensitivity.

Ammonia Levels

3.6.6 APIS do not define a critical level for the woodland habitat, giving a 1 or 3μg/m^3 critical level. The SSSI Citation does not highlight bryophytes or lichens as important features of the site, and the field survey indicated that oak twig lichens were mostly dominated by nitrogen-tolerant species. However, the presence of more sensitive species (e.g. *Graphis* sp.) in more sheltered parts of the woodland alongside the River Dee suggested that the lower 1μg/m^3 critical level may be more appropriate for this site.

3.7 River Dee SSSI

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.7.1 In comparison to the SAC, River Dee SSSI includes a number of additional notified features which require consideration of potential sensitivity. The key additional habitat feature is saltmarsh, which APIS assign a Critical Load of 10 - 20kg N/ha/yr.

3.7.2 Although not identified as a supporting habitat by APIS, the rare vascular plant notified feature comprises three species which are associated with coastal habitats: sea barley, slender hare's-ear and hard grass. They are not assigned a critical load, although the 10 - 20kg N/ha/yr saltmarsh critical load class would be appropriate.

3.7.3 The SSSI Citation notes that sensitive saltmarsh habitats and their associated flora are only found in the lowest reaches of the river downstream of Chester, where it abuts the Dee Estuary SAC and SSSI. This reach is well outside the 10km screening distance for the Proposed Development and therefore does not require consideration in this assessment.

Acid Deposition

3.7.4 The SSSI notified features do not introduce any additional sensitivities to acid deposition compared to the SAC. The relevant reaches of the river and their associated features can therefore be regarded as not being at risk from acid deposition impacts.

Ammonia Levels

3.7.5 APIS give an ammonia critical level for the SSSI of 3μg/m^3 annual mean, the standard value for protection of ecosystems and the same as the SAC.

3.8 Canal Wood LWS

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.8.1 The field survey confirmed that most of the woodland fell into the EUNIS T1E Carpinus - *Quercus* mesic forest critical load class, with a range of 15 - 20kg N/ha/yr. This is the most sensitive feature on the site, and therefore the most appropriate critical load to use for screening and assessment purposes.

3.8.2 The northeastern end of the woodland supported an alder canopy with a eutrophic, nettle dominated field layer. The field survey considered this to be an example of NVC W6 *Alnus glutinosa - Urtica dioica* (alder - stinging nettle) woodland, which translates to EUNIS habitat T121 Riverine *Alnus - Fraxinus* forest; more specifically, it is equivalent to T12132 West European tall herb ash-alder forests. This plant community is not considered by APIS to be sensitive to nitrogen deposition, as discussed above in **Section 3.6**.

Acid Deposition

3.8.3 The APIS Query by Location function provides an acid deposition critical load for unmanaged broadleaved/coniferous woodland broad habitat in this grid square of 1.873keq/ha/yr.

Ammonia Levels

3.8.4 The LWS Citation does not note the presence of bryophyte or lichen species as a reason for site selection. Oak twig lichens from a suitable sample site on the western edge of the woodland were dominated by nitrophilous species, with low sensitivity to elevated ammonia levels. For these reasons, the 3μg/m^3 annual mean critical level is appropriate for this site.

3.9 Barracks Field LWS

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.9.1 The field survey identified the most sensitive habitat as EUNIS R2211 Atlantic *Arrhenatherum* grassland. This is a higher (Level 5) subdivision of R22 Low and medium altitude hay meadows habitat and nitrogen critical load class. The currently recommended critical load range is 10 - 20kg N/ha/yr.

Acid Deposition

3.9.2 The grassland habitats present at the LWS are typical of those associated with moderately base-rich, well-buffered soils. The calcareous grassland broad habitat critical load class is therefore appropriate. APIS Query by Location tool proposes a critical load of 5.071keq/ha/yr for the relevant grid-square.

Ammonia Levels

3.9.3 No sensitive bryophyte or lichen communities are associated with this site, so the 3μg/m^3 annual mean critical level for protection of ecosystems is appropriate here.

3.10 Pentre Wood LWS

Sensitivity to Air Quality Impacts

Nitrogen Deposition

3.10.1 This is an ancient woodland site on the south bank of the Ceiriog River, within Shropshire. As no information was available on woodland community type, a precautionary approach would be to assess it as EUNIS T1 broadleaved woodland broad habitat, with a critical load of 10 - 15kg N/ha/yr. Although T1E mesic woodland is most likely in this location, this accounts for the possible presence of any areas of strongly leached soils over sandstone, which may support the more sensitive T1B acidophilous oak woodland habitat.

Acid Deposition

3.10.2 The APIS Query by Location value for unmanaged broadleaved/coniferous woodland broad habitat of 1.873keq/ha/yr is appropriate for environmental screening and assessment purposes.

Ammonia Levels

3.10.3 As there is no information regarding the importance of bryophyte or lichen communities on the site, and it is a woodland habitat, a precautionary lower critical level of 1μg/m^3 annual mean should be applied for screening purposes.

3.11 Ancient Woodland Sites

Sensitivity to Air Quality Impacts

3.11.1 There are a number of ancient woodland sites within the 2km search radius. Apart from those included in the field survey which have other designations (e.g. Chirk Castle woodlands, Canal Wood), no further information is available on plant community or sensitivity.

3.11.2 A precautionary approach for screening purposes is to apply the lowest 10 - 15kg N/ha/yr critical load for nitrogen deposition to woodland habitats. For acid deposition an appropriate critical load in the APIS Search by Location function for ancient woodland sites in the vicinity of the emission source is 1.876keq/ha/yr. Application of the lowest critical level of 1μg/m^3 annual mean for screening purposes is appropriate, on the assumption that some woods could support nitrogen-sensitive lichens or bryophytes.

3.12 Summary of Critical Loads and Levels

3.12.1 **Table 3.2** below summarises critical loads for nitrogen and acid deposition and critical levels for ammonia applied to the features of all sites within screening radii. Background levels are also given, as listed either on the APIS GIS App for statutory designated sites, or the Search by Location function for locally designated sites and ancient woodlands. These are shown in bold for circumstances where background values currently exceed the relevant environmental quality standard.

3.12.2 **Table 3.2** uses the most sensitive feature of each site, as discussed above. Where appropriate, separate values are set out for different features; this includes circumstances where a less sensitive feature occupies a higher proportion of the site (e.g. at Nant y Belan and Prynela Wood SSSI), or where deposition velocities vary for different features (e.g. woodland and grassland at Chirk Castle SSSI).

Table 3.2: Summary of Critical Loads and Levels for Screening and Assessment

Site	Most Sensitive Feature	NH3 (μg/m^3)		N Deposition (kg N/ha/yr)		Acid Deposition (keq/ha/yr)	
		Critical Level	Bg	Critical Load	Bg	Critical Load	Bg
River Dee and Bala Lake SAC	No sensitive feature within screening radius	3.0	1.9	n/a	18.5	n/a	1.4
Berwyn and South Clwyd Mountains SAC	Blanket bogs & Arctic-alpine grassland	1.0	**1.2**	5 -10	**16.5**	0.551	**1.3**
Berwyn SPA	Hen harrier / wet heath	n/a	0.9	n/a	17	n/a	1.2
Chirk Castle SSSI	Veteran trees	1.0	**1.8**	15 - 20	31.3	1.864	**2.4**
Chirk Castle SSSI	Waxcap grassland	3.0	1.8	10 - 20	**18.1**	n/a	1.4
Nant y Belan and Prynela Wood SSSI	Acidophilous *Quercus* woodland	1.0	**2.5**	10 - 15	**33**	1.879	**2.1**
Nant y Belan and Prynela Wood SSSI	*Carpinus* - *Quercus* mesic forest	1.0	**2.5**	15 - 20	**33.1**	1.879	**2.2**
River Dee SSSI	No sensitive feature within screening radius	3.0	1.9	n/a	18.5	n/a	1.4
Canal Wood LWS	*Carpinus* - *Quercus* mesic forest	3.0	1.76	15 - 20	**31.21**	1.873	**2.35**
Barracks Field LWS	Atlantic *Arrhenatherum* grassland	3.0	1.97	10 - 20	**18.52**	5.071	1.42
Pentre Wood LWS	Broadleaved woodland	1.0	**1.6**	10 - 15	**30.58**	1.878	**2.3**
Ancient woodland sites	Broadleaved woodland	1.0	**1.97**	10 - 15	**32.13**	1.876	**2.43**

4.0 PREDICTED ECOLOGICAL EFFECTS - AIR QUALITY

4.1 Summary of Air Quality Impacts

Summary of Emissions above Screening Threshold

4.1.1 **Table 4.1** below is extracted from the results of the AQA (**ES Appendix 6F**), summarising results at statutory designated sites above the 1% screening threshold, in circumstances where the predicted environmental concentration (PEC = process contribution (PC) + background concentration) exceeds the relevant critical level or critical load. This includes the cumulative impacts of currently permitted emissions, the planned OSB plant, and the CHP; the final column gives the predicted increase over current baseline (i.e. the planned OSB facility together with the proposed CHP). This is explained further in the AQA, but essentially **all impact predictions incorporate the cumulative effect of both planned (permitted) and proposed emissions** (i.e. all emissions above current baseline).

4.1.2 All of the values below are maximum values from the point of greatest impact, usually on the designated site boundary proximal to the emission source and use worst-case meteorological data over the latest available 5-year period. In interpreting the ecological effect of these values, the precautionary assumptions built into the modelling should be recognised. In particular, the use of worst-case meteorological data in an ecological context is over-precautionary when applied to nitrogen and acid deposition in particular, since most ecological effects occur in a cumulative manner due to alteration of competitive advantage between species; in contrast, the use of 5-year maxima is more relevant in considering toxic, episodic effects on vegetation (e.g. of sulphur dioxide or low-level ozone pollution).

4.1.3 All values below are modelled with incorporation of embedded mitigation measures to reduce emissions of oxides of nitrogen and ammonia below prescribed standards. These are discussed in detail in the AQA. They are based on the maximum (worst-case) concentration and deposition rate in five years of meteorological data.

Table 4.1: Summary of Emissions above Screening Threshold as % of Critical Load

Site	Parameter	Critical Load or Level	Existing Permitted	Planned	Cumulative with CHP	CHP & OSB
Chirk Castle SSSI	Ammonia levels	1μg/m^3	1.0%	1.2%	2.3%	1.1%
Chirk Castle SSSI	N deposition (Veteran trees)	15kg N/ha/yr	5.49%	6.59%	7.23%	1.75%
Chirk Castle SSSI	Acid deposition (Veteran trees)	1.864keq/ha/yr	5.95%	6.58%	7.77%	1.82%
Chirk Castle SSSI	Nitrogen deposition (waxcap grassland)	10kg N/ha/yr	4.25%	5.08%	5.72%	1.47%
Nant y Belan and Prynela Woods SSSI	N deposition (acid oak woodland)	10kg N/ha/yr	3.55%	4.24%	4.77%	1.22%
Canal Wood LWS	N deposition (Woodland)	15kg N/ha/yr	7.41%	8.56%	9.65%	2.24%
Canal Wood LWS	Acid deposition (Woodland)	1.864keq/ha/yr	7.90%	8.56%	10.27%	2.37%
Barracks Field LWS	N deposition (grassland)	10kg N/ha/yr	2.95%	3.58%	4.21%	1.25%
Ancient woodland sites	Ammonia levels	1μg/m^3	0.9%	0.9%	3.0%	2.1%
Ancient woodland sites	N deposition (woodland)	10kg N/ha/yr	10.90%	13.15%	14.85%	3.95%
Ancient woodland sites	Acid deposition (woodland)	1.876keq/ha/yr	7.78%	8.64%	10.40%	2.62%

4.1.4 For sites not listed in the table above, all impacts are either below the 1% screening threshold, or there are no sensitive features to consider.

4.1.5 For sites where at least one parameter exceeds the screening threshold, further consideration is given below of additional considerations, including:

i) Difference in results between maximum and average 5-year meteorological data.

ii) Spatial extent of exceedance, determined with reference to contour plots (See Section 6.0 below for relevant plots).

iii) Spatial disposition of sensitive features within site (e.g. nitrogen-sensitive epiphytic lichens; acidophilous oakwood habitat).

iv) Magnitude of effect, in relation to other emission sources (including total cumulative contribution of Kronospan Facility).

v) Other factors which may mitigate or exacerbate ecological effect of predicted impacts.

4.1.6 Results using average 5-year meteorological data are set out below, derived from the results spreadsheet from Fichtner. As noted above, whilst AQA modelling is required to use worst-case data within the most recent 5-year period for screening purposes, the ecological effect of nutrient and acid deposition is cumulative over longer timescales. The use of 5-year average data is therefore more appropriate in reflecting the likely mechanism of effect and is sufficiently precautionary for ecological assessment purposes.

Table 4.2: Summary of Average Emissions above Screening Threshold as % of Critical Load

Site	Parameter	Critical Load or Level	Existing Permitted	Planned	Cumulative with CHP	CHP & OSB
Chirk Castle SSSI	Ammonia levels	1μg/m^3	0.8%	0.8%	1.6%	0.9%
Chirk Castle SSSI	N deposition (Veteran trees)	15kg N/ha/yr	4.17%	4.93%	5.39%	1.22%
Chirk Castle SSSI	Acid deposition (Veteran trees)	1.864keq/ha/yr	4.41%	4.84%	5.69%	1.28%
Chirk Castle SSSI	Nitrogen deposition (waxcap grassland)	10kg N/ha/yr	3.23%	3.80%	4.26%	1.03%
Nant y Belan and Prynela Woods SSSI	N deposition (acid oak woodland)	10kg N/ha/yr	3.31%	3.95%	4.43%	1.12%
Canal Wood LWS	N deposition (Woodland)	15kg N/ha/yr	6.47%	7.45%	8.34%	1.87%
Canal Wood LWS	Acid deposition (Woodland)	1.864keq/ha/yr	6.73%	7.29%	8.69%	1.96%
Barracks Field LWS	N deposition (grassland)	10kg N/ha/yr	2.60%	3.11%	3.65%	1.04%
Ancient woodland sites	Ammonia levels	1μg/m^3	0.8%	0.8%	2.5%	1.7%
Ancient woodland sites	N deposition (woodland)	10kg N/ha/yr	9.78%	11.58%	12.94%	3.15%
Ancient woodland sites	Acid deposition (woodland)	1.876keq/ha/yr	6.82%	7.50%	8.91%	2.09%

4.2 Predicted Effects

Berwyn and South Clwyd Mountains SAC

4.2.1 As discussed above (**Section 3.3**), the qualifying features of the SAC such as blanket bog are regarded as very sensitive to excess nitrogen and acid deposition. However, the additional emissions proposed by the CHP in combination with the OSB are less than 1% of the lowest critical load for both nitrogen and acid deposition (maximum 0.4%). They can therefore be regarded as an inconsequential or *de minimis* impact, which will not give rise to a likely significant effect.

Berwyn SPA

4.2.2 The minimum critical load (5kg N/ha/yr) for wet heath supporting habitat is the same as those applied to Berwyn and South Clywd Mountains SAC. Due to greater distance from the site, modelled nitrogen deposition impacts are even lower (0.2% of critical load). This can therefore be regarded as an inconsequential or *de minimis* impact, which will not give rise to a likely significant effect.

Chirk Castle SSSI

Veteran Trees Notified Feature

4.2.3 **Table 4.1** above shows increases of between 1.1 - 1.8% of critical levels and loads for ammonia, nitrogen and acid deposition for the veteran trees feature (using mesic woodland habitat as an analogue). These are small magnitude increments, and unlikely to be regarded as significant in terms of contributing to changes in species composition or delaying the return of notified features to favourable condition. However, they do exceed the 1% screening threshold and therefore require more detailed consideration.

4.2.4 Average values over 5 years meteorological data are between 72% - 73% of maximum values. **Table 4.2** shows the effect of this is to reduce the additional ammonia contribution to 0.9%, while maximum nitrogen and acid deposition are just above 1%.

4.2.5 When the spatial extent of impacts is considered (using worst-case meteorological data), the >1% ammonia contour can be seen to be localised in a small area in the eastern part of the SSSI (see **Figure 1**). The field survey in 2023 included veteran trees from this area. It found very few lichens on tree boles, while the twig lichen flora was dominated by nitrogen-tolerant species. **Figure 1** also shows the known locations of the nitrogen-sensitive tree-bole lichen *Lecanora sublivescens*, which are located outside of this zone, to the west and south-west. No significant impacts are therefore predicted to the epiphyte flora as a consequence of ammonia emissions.

4.2.6 The dominance of nitrogen-tolerant oak epiphyte lichens could be explained by high background rates of nitrogen deposition of up to 32kg N/ha/yr (at woodland deposition velocities), coupled with elevated annual mean ammonia levels of around 1.9$\mu g/m^3$, both well above their respective critical loads and levels of 15kg N/ha/yr and 1.0$\mu g/m^3$ annual mean.

4.2.7 The woodland habitats within the SSSI all showed some evidence of nutrient enrichment in the 2023 survey, as evidenced by Ellenberg environmental indicator values for nutrient status (EIV N values) of field layer/understorey vegetation. This again was not unexpected, given high modelled background rates of nitrogen deposition. Given this background rate and its apparent existing effect on woodland vegetation, the habitat may be less sensitive to additional small increments.

4.2.8 APIS Source Attribution charts for the SSSI indicate that the highest contribution to total nitrogen deposition is from agricultural sources (41.4% livestock + 5.31% fertiliser application), with the majority of local sources being agricultural (57.7% livestock + 6.9% fertiliser application). Although long-range and overall trends in agricultural emissions are falling, local trends plotted by APIS show an upward trend in the 2012-2018 modelled period. To put this in context, baseline contributions from the Kronospan site have been modelled by Fichtner as up to 0.82kg N/ha/yr (maximum/worst-case meteorological data), representing 5.5% of critical load or around 2.5% of total predicted deposition.

4.2.9 The predicted maximum increase of 1.75% of critical load in woodland habitats represents a process contribution of 0.26kg N/ha/yr, using the worst-case meteorological data. Average meteorological data over 5 years is 75% of this, or 0.18kg N/ha/yr (1.2% of critical load).

4.2.10 No values have been proposed for the magnitude of impact which would constitute a significant effect on woodland habitats, but both values are below the NECR210 minimum of 0.3 - 0.4kg for a reduction in 1 species applied to other sensitive habitats such as upland heath and sand dune. NECR210 cautions against using these values in broadleaved woodland, which does not appear to have a defined dose-response relationship with increasing nitrogen deposition.

4.2.11 NECR210[9] describes an apparent curvilinear response of habitats to nitrogen deposition; species loss is more rapid at lower background rates of N deposition above the critical load, then flattens out at higher rates, as the most sensitive species have already been lost. NECR210 postulates that the apparent lack of this dose-response relationship in woodland habitats may be due to the influence of shading canopy trees. This can be explained most simply as follows: the reduced light intensity on the forest floor acts as an ecological stress factor, preventing light-demanding species from exploiting increased nutrient availability. A closed canopy with well-developed shrub layer may therefore show fewer changes in species, retaining nutrient-sensitive but stress-tolerant flora. Woodland structure and management may therefore be important modifiers of responses to excess nitrogen deposition, while the 0.3kg N/ha/yr minimum significant value is likely to be over-precautionary when applied to woodland habitats.

4.2.12 In the context of the high background deposition rates, a maximum increase of under 0.3kg would be unlikely to have any measurable ecological effect on the woodland habitats, and it is unlikely to constitute an operation likely to damage the special interest of the SSSI (as represented by the veteran tree feature and its woodland habitat proxy). However, it could be regarded as a development impact requiring mitigation, in accordance with policy and legislative requirements. Such measures should aim to increase the resilience and connectivity of habitats within the SSSI; proposals are discussed further in the BAR (**DNS4-007**).

Waxcap Grassland Notified Feature

4.2.13 As noted in **Section 3.5** above, this feature does not have a critical load for nitrogen deposition, but a precautionary approach has been taken for the purposes of the assessment, due to the reported association of this feature with relatively low nutrient status grasslands, not subject to high fertiliser inputs.

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[9] *Caporn, S. et al (2016). Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance. Natural England Commissioned Reports no. 210.*

4.2.14 Taking the minimum critical load for lowland hay meadows of 10kg N/ha/yr as the closest analogue to the waxcap grasslands feature, the maximum predicted process contribution is 0.15kg N/ha/yr, 1.47% of critical load. However, when the 5-year average meteorological data are considered, this reduces to 0.10kg N/ha/yr (1.03%), a level which only just exceeds the screening threshold.

4.2.15 IAQM guidance (paragraph 5.5.2.6) cautions against placing too much emphasis on whether a predicted impact is 0.9 or 1.1%, essentially because the precision of the model exceeds the accuracy of the prediction. Given that the 1% value is not in itself a significance threshold (see paragraph 5.5.2.7), predictions close to this value can legitimately be regarded as inconsequential.

4.2.16 There are no exceedances of ammonia or acid deposition critical loads for this feature. In conclusion, there is no requirement for mitigation measures aimed at the waxcap grassland feature as a consequence of the Proposed Development.

Nant y Belan and Prynela Woods SSSI

4.2.17 Predicted impacts at this SSSI are lower than Chirk Castle, with small magnitude exceedances of screening thresholds of 0.12kg N/ha/yr (1.2%) for nitrogen deposition, reducing to 93% of maximum (1.1%) when 5-year average meteorological data are considered. The increase in ammonia levels does not exceed the screening threshold in any part of the woodland (see **Figure 1**), so no impacts are predicted on the nutrient-sensitive epiphytes in the River Dee valley area which were recorded in the field survey.

4.2.18 As discussed in **Section 3.0**, the most sensitive features in terms of nitrogen deposition is the area of acid oakwood habitat which is established on strongly-leached soils along an isolated ridge within Nant y Belan Wood, with a critical load of 10kg N/ha/yr. The location of this acid oakwood relative to the 0.1kg nitrogen deposition contour is therefore important.

4.2.19 **Figure 2** shows the areas where the process contribution exceeds 0.1kg are confined in all years to the southeastern part of the SSSI, within Prynela Wood. These areas were visited (see **ES Appendix 6G**), and confirmed to support mesic woodland habitats with a minimum critical load of 15kg N/ha/yr. As **Figure 2** illustrates, the relevant 1% contour (0.15kg N/ha/yr) does not reach any part of the woodland in any year.

4.2.20 No impacts above screening thresholds are therefore predicted on any of the notified features of the SSSI. There is accordingly no requirement for mitigation measures at Nant y Belan and Prynela Woods SSSI.

Canal Wood LWS

4.2.21 Canal Wood LWS is predicted to experience maximum low magnitude increases in nitrogen deposition of 2.2%, and acid deposition of 2.4%, in circumstances where background nitrogen and acid deposition rates significantly exceed the critical load. Using 5-year average meteorological data, values are 1.9% and 2.0% respectively.

4.2.22 Due to its proximity to the woodland, the existing facility contributes to background rates of up to 7.4 - 7.9% of maximum critical loads for nitrogen and acid deposition respectively (6.5 & 6.7% average). The maximum values are equivalent to 3.6% of total emission sources (1.11kg of 31.21kg N/ha/yr modelled 2020-22 background) for nitrogen deposition, and 6.3% of total emission sources (0.15keq of 2.35keq/ha/yr background) for acid deposition.

Predicted Effects of Ammonia Levels

4.2.23 **ES Appendix 6G** proposed a 3μg/m^3 critical level for ammonia at this site, based on the absence of nitrogen-sensitive lichens and limited epiphyte flora in the woodland. With a modelled background level of 1.8μg/m^3, the predicted environmental concentration remains below the critical level, and the maximum process contribution is only 0.8%, so no impact of ammonia emissions is predicted on this site.

Predicted Effects of Nitrogen Deposition Rates

4.2.24 There is some evidence from **ES Appendix 6G** that current baseline nitrogen deposition rates are having some impact on the mesic woodland habitat, with abundant bramble in parts of the field layer vegetation, and limited epiphyte cover. However other parts of the woodland field layer showed fewer apparent effects, perhaps reflecting the greater resilience of mesic woodland habitats, particularly where a closed canopy helps to limit the effect of increased nutrient supply.

4.2.25 **Figure 2** shows the areas of the woodland predicted to be impacted by the process contribution. This indicates that potential effects are limited to the northern section of the woodland. The eastern side of the canal in this area comprises an alder - stinging nettle woodland community, which is a naturally eutrophic habitat not regarded as sensitive to atmospheric nitrogen deposition. The north end of the woodland on the west side of the canal does support mesic woodland habitat, and this area could be regarded as sensitive to nitrogen deposition. The north-west section of the woodland was sampled (see **ES Appendix 6G**), with a weighted EIV N value of 5.5; this is not indicative of excessive eutrophication and included species such as wood anemone *Anemone nemorosa* and common dog-violet *Viola riviniana* which are associated with habitats with relatively low nutrient supply (EIV N 4). Brambles, although common in this area, did not dominate the understorey vegetation as much as in some other parts of the woodland, perhaps because of the relatively dense, closed canopy in this area.

4.2.26 In the context of the high background deposition rates and relatively high habitat resilience, a maximum increase of 2.2% of critical load/0.34kg N/ha/yr would be unlikely to have a significant ecological effect. The potential area affected is small relative to the size of the LWS and is in an area with a closed canopy and few indicators of eutrophication as a consequence of baseline critical load exceedance.

4.2.27 In terms of the policy protection afforded to locally designated sites, the predicted increase in nitrogen deposition rates is not likely to damage the nature conservation interest of the LWS or cause unacceptable levels of harm to the woodland habitat. However, it could be regarded as a suitable site for mitigation to comply with Section 6 net gain requirements. It may therefore be appropriate to undertake mitigation or enhancement measures aimed at maintaining or increasing the resilience of the woodland habitat.

Predicted Effects of Acid Deposition Rates

4.2.28 The mesic woodland habitat appears to be relatively well buffered, and no impacts attributable to acidification were apparent (see **ES Appendix 6G**). The maximum predicted process contribution of 0.03keq H^+/ha/yr in the context of background exceedance is unlikely to result in a measurable effect on vegetation or tree health and can be regarded as a lesser concern than the possible effects of eutrophication.

Barracks Field LWS

4.2.29 A maximum process contribution of 1.25% of the 10kg N/ha/yr critical load for lowland hay meadows is predicted, reducing to 1.04% when the 5-year average meteorological data are considered. This can be regarded as inconsequential.

4.2.30 No exceedances of screening thresholds are predicted for ammonia levels or acid deposition.

Ancient Woodland Sites

4.2.31 Ancient woodland sites are predicted to experience low magnitude increases in ammonia levels, nitrogen and acid deposition of between 2.1 - 3.9%, in circumstances where ammonia levels and background nitrogen and acid deposition rates significantly exceed the critical load. These values equate to maximum process contributions of 0.02$\mu g/m^3$ for ammonia, 0.40kg N/ha/yr and 0.05keq H^+/ha/yr.

4.2.32 Note that in the absence of more detailed information on all sites, a precautionary approach has been taken to sensitivity, so these figures are based on a 1$\mu g/m^3$ critical level for ammonia, and 10kg N/ha/yr critical load for nitrogen deposition. Based on woodlands visited (see **ES Appendix 6G**) and existing background ammonia levels, it is likely that most ancient woodland sites support mesic woodland communities which do not contain nitrogen-sensitive lichen or bryophytes.

4.2.33 The values given above are maxima, with most sites experiencing significantly lower inputs. **Figure 2** shows most of the ancient woodland sites are located outside the 0.15kg N/ha/yr nitrogen deposition contour, and for mesic woodland with a 15kg N/ha/yr critical load the process contribution could be regarded as inconsequential.

4.2.34 Ancient woodlands where the process contribution exceeds 0.15kg N/ha/yr include those already considered at Chirk Castle SSSI, and some mostly small woodlands to the north of Chirk.

4.2.35 Predicted effects are therefore not likely to exceed those predicted for Canal Wood LWS and would not be regarded as likely to result in an unacceptable level of harm to the ancient woodland habitat. Mitigation measures aimed at Canal Wood LWS and at woodlands within Chirk Castle SSSI will serve to address impacts on the ancient woodland resource in the local area.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Predicted Effects

European Designated Sites

5.1.1 No likely significant effect is predicted on any European designated sites as a consequence of emissions from the Proposed Development, alone or in combination with the currently permitted OSB facility. European sites considered comprise River Dee and Bala Lake SAC, Berwyn and South Clwyd Mountains SAC, and Berwyn SPA.

5.1.2 No significant effects are predicted at River Dee SSSI, or Nant y Belan and Prynela Woods SSSI. At the latter site, the 1% screening threshold for nitrogen deposition is exceeded for the most sensitive feature present on the site, but it is located outside the predicted area of potential impact.

SSSIs

5.1.3 At Chirk Castle SSSI small magnitude exceedance of screening thresholds are predicted for ammonia levels, nitrogen and acid deposition for the veteran trees feature, using the critical loads and levels appropriate for broadleaved (mesic) woodland habitat. This is not predicted to result in a measurable ecological effect on woodland habitats, or to constitute an operation likely to damage the special interest of the SSSI. However, it would be an appropriate focus of mitigation measures, in accordance with policy and legislative requirements.

5.1.4 Values for nitrogen deposition at Chirk Castle SSSI reach the 1% screening threshold for the waxcap grassland notified feature, if the precautionary critical load for lowland hay meadows is applied to this feature. With reference to IAQM advice on interpretation of results very close to the screening threshold, it can be safely concluded that this does not constitute an operation likely to damage the special interest of the SSSI.

Local Wildlife Sites and Ancient Woodlands

5.1.5 No impacts are predicted on Pentre Wood LWS or Barracks Field LWS, whilst impacts on most ancient woodlands within the search area are predicated on the presence of the most sensitive acid oakwood habitat with a 10kg N/ha/yr critical load for nitrogen deposition.

5.1.6 At Canal Wood LWS, a low magnitude impact of nitrogen and acid deposition in excess of the 1% screening threshold is predicted at the northern end of the woodland only. Part of this area supports an alder - stinging nettle community which is naturally eutrophic and not regarded as sensitive to atmospheric nitrogen deposition. The remainder is a mesic woodland community not currently showing significant signs of eutrophication, despite background levels exceeding critical loads, and may be moderated by the intact woodland canopy.

5.1.7 Predicted impacts on Canal Wood LWS are not considered likely to result in an unacceptable level of harm; however, it would be a suitable site for mitigation and enhancement measures aimed at achieving a higher level of resilience, in accordance with policy and legislative requirements.

5.1.8 A number of ancient woodland sites are predicted to experience low magnitude exceedances of the 1% screening threshold for ammonia, nitrogen deposition and acid deposition. These are not considered sufficient to result in an unacceptable level of harm. Mitigation measures aimed at ancient woodlands in Chirk Castle SSSI, and Canal Wood LWS would be an adequate and proportionate response to the predicted impacts on the local ancient woodland resource.

5.2 Recommended Mitigation Measures

5.2.1 It should be emphasised that the AQA incorporates the results of emission control measures which will achieve reductions in ammonia and oxides of nitrogen emissions significantly below legislative requirements. This significantly reduces the potential impacts below those which could be regarded as ecologically significant - i.e. those which would result in a loss of favourable condition of a designated site feature, or which would delay the return to favourable condition of a feature in the context of reductions in emission rates elsewhere.

5.2.2 Residual impacts are low in magnitude and are not predicted to be likely to damage the special interest of SSSIs or result in an unacceptable level of harm to locally designated sites or ancient woodlands. Nevertheless, where impacts above screening thresholds are predicted on proximal sites, in accordance with legislative and policy requirements it would be appropriate to undertake mitigation and enhancement measures aimed at increasing the resilience and connectivity of features.

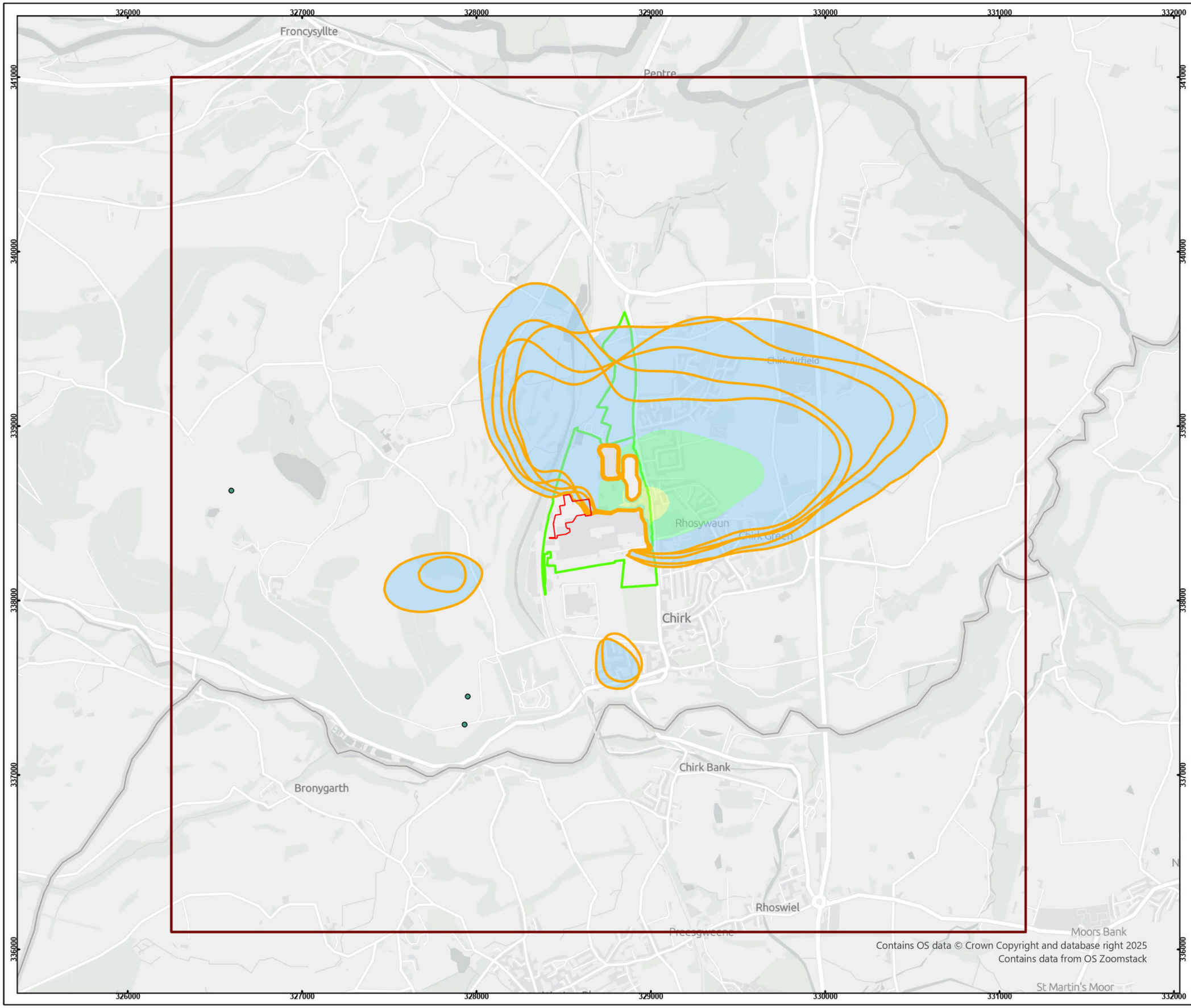
5.2.3 Suitable measures could include:

i) Buffer planting around woodland sites to help protect against local diffuse emissions generated at low level (e.g. vehicle emissions, fertiliser spreading);

ii) Management of woodlands which maintain and promote a continuous, multi-level and multi-age canopy; or

iii) Management changes to adjoining agricultural land to minimise emissions from livestock or fertiliser use.

5.2.4 Proposals are set out in further detail in the BAR (**DNS4-007**) which also sets out the underpinning legislation and policy guidance and gives more detail on the qualifying and notified features of each site.



Legend

- CHP Site Boundary
- Identified_Lichens
- Output grid extent

NH3 Conc - ug/m3

- <0.01
- <0.02
- <0.03
- <0.04
- >0.04
- Proposed Installation Boundary
- SSSIs
- Ancient Woodlands

Notes:

Change in Impact - Ammonia concentration ug/m3

Title:

Figure 1 - Ammonia Impacts - Change in Impact

Drawn by: RSF | Date: 18/12/2025

0 0.2 0.4 0.8 km

N

Scale: 1:20,000

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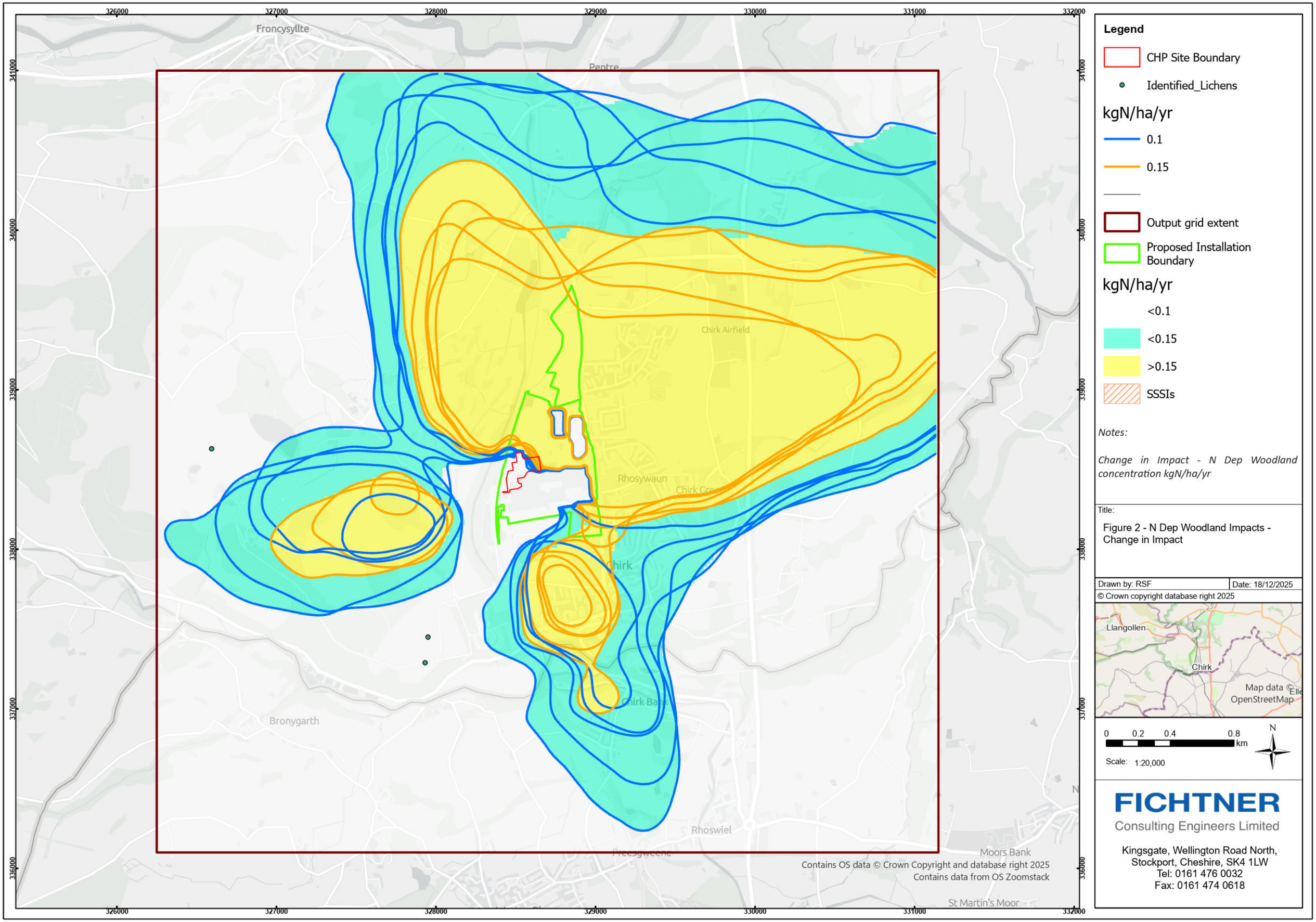

Legend

- CHP Site Boundary
- Identified_Lichens

kgN/ha/yr

- 0.1
- 0.15
- Output grid extent
- Proposed Installation Boundary

kgN/ha/yr

- <0.1
- <0.15
- >0.15
- SSSIs

Notes:

Change in Impact - N Dep Woodland concentration kgN/ha/yr

Title:

Figure 2 - N Dep Woodland Impacts - Change in Impact

Drawn by: RSF | Date: 18/12/2025

0 0.2 0.4 0.8 km

N

Scale: 1:20,000

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