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TABLES

6 AIR QUALITY

6.1 Introduction

6.1.1 This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Development upon air quality during construction and operation.

6.2 Consultation, scope and Study Area

Consultation undertaken to date

6.2.1 **Table 6.1** provides a summary of the consultation activities undertaken in support of the preparation of this assessment.

Table 6.1 Summary of consultation undertaken

Consultee	Key matters raised	Actions in response to consultee comments
Natural Resources Wales (Meeting held on 23 January 2024)	Request to provide methodology of amine assessment in the Environmental Statement chapter	Details of amine assessment are included in **Paragraphs 6.3.21** to **6.3.24**

Scope of the assessment

6.2.2 The scope of this assessment has been established through an ongoing scoping process. Further information can be found in **Volume 2, Chapter 4: Approach to EIA**.

6.2.3 This section provides the scope of the air quality assessment and updates the evidence base for the scoping out of some air quality matters following further iterative assessment.

Receptors/matters scoped out of further assessment

6.2.4 **Table 6.2** presents the receptors/matters that are scoped out of further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 6.2 Receptor/matters scoped out of further assessment

Receptor/matter	Phase	Justification	Change since EIA Scoping?
Plant exhaust emissions	Construction	The operation of site equipment and machinery during construction will result in emissions to atmosphere of exhaust gases, but with suitable controls and site management, such emissions are unlikely to be significant.	No. The Scoping Opinion agreed that this matter should be scoped out of further assessment

Receptors/matters scoped into further assessment

6.2.5 **Table 6.3** presents the receptors/matters that are scoped into further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 6.3 Receptor/matters scoped into further assessment

Receptor/matter	Phase	Justification	Change since EIA Scoping?
Dust and particulate matter emissions	Construction	Sensitive receptors are located within 350m of the Site. An assessment is necessary to understand the type of mitigation required.	No. The Scoping Opinion agreed that this matter should be scoped into further assessment.
Traffic exhaust emissions	Construction and Operation	A qualitative assessment only. Considering the nature of the Proposed Development, it is not likely that significant road traffic will be generated during the operational phase when compared to that on the existing road network.	No. The Scoping Opinion agreed that this matter should be scoped into further assessment.
Stack emissions (including combustion emissions and dust and particulate matter emissions)	Operation	Given the nature of the Proposed Development, the main potential air quality impact once operational is likely to be stack emissions. It should be noted that the Site is	No. The Scoping Opinion agreed that this matter should be scoped into further assessment.

Receptor/matter	Phase	Justification	Change since EIA Scoping?
		currently operating, with existing emissions. Therefore, emissions from the Proposed Development will assessed with reference to the emissions from existing plant on-site.	

Extent of the Study Area

Construction Phase

6.2.6 Based on the Institute of Air Quality Management (IAQM) construction dust guidance (IAQM, 2024)[1], the Study Area for sensitive human receptors for demolition, earthworks and general construction activities is considered to be up to 350m from the Site boundary. For trackout activities, the Study Area is up to 50m from the edge of the roads likely to be affected by trackout.

6.2.7 The Study Area for sensitive ecological receptors for demolition, earthworks and general construction activities is considered to be up to 50m from the Site boundary.

6.2.8 The Study Area for traffic emissions is identified as the two routes from the A55 likely to be affected by the Proposed Development.

Operation Phase

6.2.9 Sensitive human receptors within 2km from the flue gas stack have been considered in the assessment of operational stack emissions.

6.2.10 As recommended by the Environment Agency's air quality risk assessment guidance for "larger emitters"[2], the air quality assessment for the stack emissions will consider Special Area of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites within 15km, and SSSIs within 10km of the Proposed Development as the thermal capacity of the Combined Heat and Power plant is more than 50 megawatts.

6.3 Approach and methodology

Applicable guidance

6.3.1 The following guidance documents have been used during the preparation of this chapter:

[1] https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

[2] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

- Institute of Air Quality Management (IAQM), Guidance on the Assessment of Dust from Demolition and Construction, 2024[3];
- Environmental Protection UK (EPUK) and IAQM, Land Use Planning and Development Control: Planning for Air Quality, 2017[4];
- Department for Environment, Food and Rural Affairs (Defra), Local Air Quality Management (LAQM) Technical Guidance (TG.22), 2022[5];
- Environment Agency, Air emissions risk assessment for your environmental permit, 2016[6]; and
- Environment Agency, AQTAG06: Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, 2014[7].

6.3.2 Where there is an absence of Natural Resources Wales specific guidance, the equivalent Environment Agency guidance is used.

Data sources to inform the EIA baseline characterisation

6.3.3 Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

6.3.4 A desk-based study was undertaken including a review of monitoring data available from Flintshire County Council and estimated background data from the UK-AIR (United Kingdom Air Information Resource)[8] website maintained by Defra.

6.3.5 It is noted that there are already emissions generated from the operation of the existing cement works. Those emissions are taken into account as the baseline for this chapter. The Proposed Development will only ever operate in conjunction with the cement works, and otherwise provides no functional purpose. Inclusion of the cement works as part of the baseline is therefore a logical position.

Surveys to inform the EIA baseline characterisation

6.3.6 No surveys or site visits have been undertaken to inform the assessment. This was not considered necessary as adequate data already exists for the vicinity through the sources referred to above.

Assessment methodology

Construction Phase

[3] https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf

[4] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

[5] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

[6] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[7] https://ukwin.org.uk/files/ea-disclosures/AQTAG06_Mar2014%20.pdf

[8] https://uk-air.defra.gov.uk/

Construction Phase: Dust and Particulate Matter Emissions

6.3.7 Construction works for the Proposed Development have the potential to lead to the release of fugitive dust and particulate matter. Three separate sources of dust impacts were considered:

- Disamenity due to dust soiling;
- The risk of health effects due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors.

6.3.8 An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors within the identified Study Area(s) has been undertaken following the IAQM's guidance note '*Assessment of dust from demolition and construction 2014*[9]', using the available information for the construction phase of the Proposed Development provided by the project team and professional judgement.

6.3.9 The assessment has considered the risk of potential dust and particulate matter effects from the following four sources: demolition; earthworks; general construction activities; and trackout. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to dust and particulate matter levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust effects. Once the level of risk was ascertained, then site specific mitigation measures proportionate to the level of risk were identified, and the likely significance of residual effects determined.

Construction Phase: Traffic Exhaust Emissions

6.3.10 A qualitative assessment has been undertaken with reference to the Environmental Protection (UK) and IAQM guidance entitled "Land-Use Planning & Development Control: Planning for Air Quality" (v1.2, 2017) (Moorcroft et al., 2017)[10], using professional judgement and by considering the following information, where available:

- The number and type of construction traffic likely to be generated;
- The number and proximity of sensitive receptors to the Site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction phase and the nature of the construction activities undertaken.

Operation Phase

Traffic Exhaust Emissions

6.3.11 A qualitative impact assessment has been undertaken to consider the likely key impacts and focus on recommending effective mitigation measures and sound environmental management techniques. This includes an assessment of emissions

[9] https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

[10] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

from increased road traffic due to the Proposed Development, based on consideration of traffic data provided by the Applicant, and comparison with 'screening criteria' in the EPUK and IAQM guidance entitled "Land-Use Planning & Development Control: Planning for Air Quality" (v1.2, 2017)[11].

Stack Emissions

6.3.12 It is anticipated that key stationary sources of emissions for the Proposed Development are process emissions and combustion emissions. Given the nature of the Proposed Development, potential impacts may arise due to a number of key pollutants. The air quality impacts have been assessed in terms of the following pollutants:

- Nitrogen oxides (NO_x), including nitrogen dioxide (NO_2);
- Ammonia (NH_3);
- Hydrochloric acid (HCl);
- Fine particulate matter (PM_{10} and $PM_{2.5}$);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO); and
- Amine and nitrosamine compounds associated with the use of a proprietary solvent as part of the carbon capture process.

6.3.13 For the purposes of this assessment, all modelled amine concentration outputs are treated as monoethanolamine (MEA) and all nitrosamine concentration outputs as N-nitrosodimethylamine (NDMA) for comparison with the associated non-statutory assessment levels set by the Environment Agency.

6.3.14 Air quality impacts may result in direct effects, such as adverse effects on human health due to increased concentrations of oxides of nitrogen, particulate matter and other pollutants, or disamenity due to soiling of surfaces by fugitive dust or, indirect such as ecological changes due to the deposition of nitrogen on soils or soiling of vegetation by dust. An assessment of the effects on ecological receptors has been undertaken in accordance with IAQM (2020) guidance '*A guide to the assessment of air quality impacts on designated nature conservation-sites*'[12].

6.3.15 The existing stack emissions were calculated based on modelling and the emission data is presented in **Table 6.4**.

6.3.16 A detailed dispersion modelling study of process emissions from the Proposed Development has been undertaken using the widely used dispersion model ADMS 6. Modelling was undertaken in line with the LAQM TG.22[13] published by Defra, and the guidance, "*Air emissions risk assessment for your environmental permit*" (Environment Agency and Defra, 2016)[14], published by the Environment Agency. The latter guidance is applicable in a planning context as it provides specific methods and

[11] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

[12] https://www.iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

[13] https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

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

assessment thresholds for which there is no equivalent planning or EIA specific guidance.

6.3.17 The assessment considered the potential impacts of stack emissions on both human receptors and ecologically sensitive. Details of the methodology and model inputs for the operational phase modelling are provided in **Volume 4, Technical Appendix 6.1.**

6.3.18 The assessment of worst-case long-term (annual mean) and short-term (daily and hourly mean) emissions resulting from the operation of the Proposed Development have been undertaken by comparison of the maximum predicted process contributions at identified sensitive receptors with the annual mean and hourly mean Air Quality Assessment Levels (AQALs), taking into consideration the baseline air quality, in accordance with Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2016) [15] (as there is no equivalent Natural Resources Wales guidance).

6.3.19 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_2, NH_3, SO_2 and HCl concentrations at the identified ecological sites, determined through dispersion modelling, to calculate nitrogen deposition rates (expressed as kilograms per hectare per year (Kg/ha/yr)). These deposition rates have then been compared to the Critical Loads for nitrogen published by UK Air Pollution Information System (APIS) (Centre for Ecology and Hydrology and APIS, 2016)[16], taking into consideration the baseline air quality. Further information is presented in **Volume 4, Technical Appendix 6.1**.

6.3.20 **Table 6.4** presents the physical and emission characteristics of the Proposed Development, which are based on datasheets provided by the Applicant. The Proposed Development layout is shown in **Volume 3, Figure 1.2** and in **Figure D1** in **Volume 4, Technical Appendix 6.1**.

6.3.21 Currently, the primary emission point for the cement works is the kiln stack. This will be retained but once the Proposed Development is operational it will only be used as emergency back up and operating for a short period of time during start up and shutdown; anticipated for 3% of total working hours, which is 263 hrs/yr. The modelling assessment for the Carbon Capture Plant is based on continuous operation for the remaining 8497 hrs/yr. This is likely to be an over-estimate of actual operating hours as there will be periods of shutdown and maintenance when the plant is not operating and therefore provides a robust, worst-case assessment.

6.3.22 The emission characteristics used in the assessment are identified below. Modelled emissions are based on the maximum emission limit value for the Proposed Development, which is consistent with a reasonable worst-case assessment. Actual emission rates were not available at the time of the assessment but are expected to be substantially below the assumed maximum in most cases.

[15] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

[16] http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm.

Table 6.4 Physical and emission characteristics of the Carbon Capture Plant included in the assessment

Description	Existing Stack	Proposed Stack
Plant	**Kiln Stack**	**PCCCC plant**
Operation Hours per annum	263	8,497
Stack height above ground level (m)	117.9	117.9
Stack diameter (m)	3.35	3
Stack exhaust temperature (°C)	135	85
Actual stack exit velocity (m/s)	15.4	14.94
Volumetric Flow Rate (m^3/s) – Actual	158.06	105.64
Volumetric Flow Rate (m^3/s) – Ref	90.53	84.31
NOx exhaust emissions rate (mg/Nm^3)	450	200
SO_2 exhaust emissions rate (mg/Nm^3)	200	50
CO exhaust emissions rate (mg/Nm^3)	1,200	400
PM_{10} exhaust emissions rate (mg/Nm^3)	10	10
HCl exhaust emissions rate (mg/Nm^3)	10	10
NH_3 exhaust emissions rate (mg/Nm^3)	70	30
Amine 1 exhaust emissions rate (mg/Nm^3)	-	5
Amine 2 exhaust emissions rate (mg/Nm^3)	-	5
Nitrosamine 1 exhaust emissions rate (mg/Nm^3)	-	0.0001
Nitrosamine 2 exhaust emissions rate (mg/Nm^3)	-	0.0001
NOx exhaust emissions rate (g/s)	29.82	16.86

Description	Existing Stack	Proposed Stack
SO_2 exhaust emissions rate (g/s)	13.25	4.22
CO exhaust emissions rate (g/s)	79.52	33.72
PM_{10} exhaust emissions rate (g/s)	0.66	0.84
HCl exhaust emissions rate (g/s)	0.66	0.84
NH_3 exhaust emissions rate (g/s)	4.64	2.53
Amine 1 exhaust emissions rate (g/s)	-	0.42
Amine 2 exhaust emissions rate (g/s)	-	0.42
Nitrosamine 1 exhaust emissions rate (g/s)	-	0.000008
Nitrosamine 2 exhaust emissions rate (g/s)	-	0.000008
Annual NOx mass emissions (tonnes/yr)	28.2*	515.8*
Annual SO_2 mass emissions (tonnes/yr)	12.5*	128.9*
Annual CO mass emissions (tonnes/yr)	75.3*	1031.6*
Annual PM_{10} mass emissions (tonnes/yr)	0.6*	25.8*
Annual HCl mass emissions (tonnes/yr)	0.6*	25.8*
Annual NH_3 mass emissions (tonnes/yr)	4.4*	25.8*
Annual Amine 1 mass emissions (tonnes/yr)	-	12.9*
Annual Amine 2 mass emissions (tonnes/yr)	-	12.9*
Annual Nitrosamine 1 mass emissions (tonnes/yr)	-	0.0002*
Annual Nitrosamine 2 mass emissions (tonnes/yr)	-	0.0002*
Stack location	X: 329067 Y: 362058	X: 328915 Y: 362079

Description	Existing Stack	Proposed Stack
Emission Concentration Release Conditions (REF): 273K, 101.3kPa, dry gas, 10% oxygen *Based on the operational hours of stacks		

Existing Particulate Matter (PM) Emission Sources

6.3.23 In the existing cement kiln, there are various sources of particulate matter emissions. Details of existing PM emission sources is presented in **Volume 4, Technical Appendix 6.1**.

Discrete receptors included in the assessment

6.3.24 The existing sensitive human receptors have been chosen to represent worst-case locations in respect to emissions associated with the Proposed Development. These locations are detailed in **Table 6.5** and illustrated in **Figure D2**, **Volume 4, Technical Appendix 6.1**.

Table 6.5 Human receptors included in the dispersion modelling assessment

Rec. ID	Receptor location	Grid reference	
		X	Y
R1	Padeswood Drive, Mold	329175	362639
R2	Chester Road, Mold	329286	362723
R3	Chester Road, Mold	328582	362534
R4	Chester Road, Mold	328363	362409
R5	Bannel Lane, Mold	329774	362672
R6	Chester Road, Mold	329918	362857
R7	Springfield, Penymynydd	329624	362422
R8	Hawarden Road, Penymynydd	330328	362451
R9	Aspen Way, Penymynydd	329844	361727
R10	Ffordd Derwyn, Penymynydd	329719	361423
R11	A5104, Penymynydd	329234	361109
R12	Leeswood, Mold	328521	361811

6.3.25 This assessment has considered local nature sites within 2km, SSSIs within 10km and SPA/SAC/Ramsar sites within 15 km. These locations are detailed in **Table 6.6** and shown on **Figure D3, Volume 4, Technical Appendix 6.1**.

Table 6.6 Discrete ecological receptors (as worst-case locations) included in the dispersion modelling assessment

Rec. ID	Receptor	Approx. distance to the Site (km)	Grid reference	
			X	Y
E1	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	1.7	329355	363689
E2	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	2.7	328520	364732
E3	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	2.9	327689	364630
E4	Maes Y Grug SSSI/Deeside and Buckley Newt Sites SAC	4.9	326204	366025
E5	Connah's Quay Ponds and Woodland SSSI/Deeside and Buckley Newt Sites SAC	5.1	328991	367166
E6	6-11fin Dyfrdwy (River Dee) SSSI/SAC/SPA	8.9	337227	365493
E7	6-11fin Dyfrdwy (River Dee) SSSI/SAC/SPA	7.2	333402	367839
E8	6-11fin Dyfrdwy (River Dee) SSSI/SAC/SPA	7.3	331620	368940
E9	Dee Estuary/Aber Afon Dyfrdwy SSSI/SAC	7.5	330273	369491
E10	Shotton Lagoons and Reedbeds SSSI	8.7	329592	370722
E11	Mynydd Y Fflint/Flint Mountain SSSI	9.8	323935	370432
E12	Coed Talon Marsh SSSI	4.0	327057	358648
E13	Chwarel Cambrian/Cambrian Quarry, Gwernymynydd SSSI	7.4	321679	362291
E14	Alyn Valley Woods and Alyn Gorge Caves SSSI/SAC	8.3	320814	362412
E15	Bryn Alyn SSSI	9.1	320763	358447

Rec. ID	Receptor	Approx. distance to the Site (km)	Grid reference	
			X	Y
E16	Glaswelltiroedd Eryrys (Eryrys Grasslands) SSSI	9.3	320678	357963
E17	Llay Bog SSSI	7.2	332083	355487
E18	Chwarel Singret SSSI	7.9	334458	356229
E19	Marford Quarry SSSI	8.8	335677	356267
E20	Halkyn Mountain/Mynydd Helygain SAC	9.7	321418	368112
E21	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	9.3	322825	355170
E22	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	10.3	325694	352356
E23	Price's Hill Wood Ancient Woodland/Flintshire Wildlife Site	1.6	330499	362853
E24	Bistre Wood Ancient Woodland/Flintshire Wildlife Site	1.1	328147	362698
E25	Black Pool Plantation Flintshire Wildlife Site	0.5	328690	361716
E26	Hartsheath Flintshire Wildlife Site	1.1	328483	361121
E27	Pontblyddyn Marsh and Coppa Wood Flintshire Wildlife Site	1.7	327579	361251
E28	Padeswood Pool Flintshire Wildlife Site	1.3	327786	362181
E29	Padeswood Pasture Flintshire Wildlife Site	1.1	327941	362129
E30	Marleyfield Meadow Flintshire Wildlife Site	1.6	327708	362879

Amine Assessment and Amine Degradation Assessment

6.3.26 The proposed absorber tower will use amine-based solvents to remove CO_2 within the flue gas. Amine slip' can occur during the carbon capture process, resulting in amine emissions to air. Furthermore, amines can potentially degrade into nitrosamines and nitramines (collectively referred to as N-amines) both during the

carbon capture process itself (referred to as the 'direct' N-amine emissions) and also in the environment following release (referred to as the 'indirect' N-amine emissions. Depending on the amine solvent, other degradation products, such as acetaldehyde, formaldehyde, ketones and acetic acid may be formed during the carbon capture process.

6.3.27 Dispersion modelling has been carried out to consider both amine emissions and amine degradation products emissions. Modelling was undertaken using the ADMS version 5.2 software and modelling techniques. For 'direct' N-amine emissions the maximum concentration provided by the solvent licensors is used, and no atmospheric chemistry is assumed to occur. For 'indirect' N-amine emissions, the ADMS amines chemistry module will be used. Details of amine input is presented in **Section 5.2.2** of **Volume 4, Technical Appendix 6.1**.

6.3.28 All amine concentration outputs, which are based on the proprietary amine solvent proposed for use in the CCS process, have been treated as monoethanolamine (MEA) for comparison with the respective Environmental Assessment Levels (EALs). The modelled maximum hourly mean and daily mean amine (as MEA) concentrations have been derived based on the sum of 'Amine 1' and 'Amine 2' maximum ground level concentrations at each receptor and grid point. This approach is potentially conservative because the 'Amine 1' maximum concentration might occur at a different time (day or hour) to the corresponding 'Amine 2' maximum concentration.

6.3.29 Furthermore, the sum of all nitrosamine and nitramine concentration outputs have been treated as N-nitrosodimethylamine (NDMA) for comparison with the relevant EAL. This is conservative given that NDMA is considered to be one of the most toxic nitrosamines that has been tested, with nitramines being considered notably less toxic based on preliminary toxicity studies (Gjernes, 2013[17]).

Significance criteria

6.3.30 The significance level attributed to each effect has been assessed based on the magnitude of change due to the Proposed Development and the sensitivity of the affected receptor, with further discussion below.

[17] https://www.sciencedirect.com/science/article/pii/S1876610213001720

Construction: dust and particulate matter emissions

6.3.31 The IAQM (2024) 'Guidance on the Assessment of Dust from Demolition and Construction[18]' criteria and methodology will be adopted to determine the sensitivity of the receptor and the magnitude of effect.

6.3.32 **Table 6.7** sets out the general principles, along with professional judgement that will be considered to determine the scale of sensitivity that will be applied to receptors identified and considered within the construction phase assessment.

Table 6.7 Scale of receptor sensitivity used in the construction phase assessment

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	Users can reasonably expect an enjoyment of a high level of amenity. The appearance, aesthetics or value of their property would be diminished by soiling. The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. Examples include a SAC designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably	Locations where the people exposed are workers and exposure is over a	Locations where there is a particularly important plant species, where its dust

[18] iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
	expect to enjoy the same level of amenity as in their home. The appearance, aesthetics or value of their property could be diminished by soiling. The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples include parks and places of work.	time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition. Example is SSSI with dust sensitive features.
Low	The enjoyment of amenity would not reasonably be expected. Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples include playing fields, farmland	Locations where human exposure is transient. Indicative examples include public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. Example is a Local Nature Reserve with dust sensitive features.

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
	(unless commercially-sensitive horticultural), footpaths, short term car parks and roads.		

6.3.33 **Table 6.8** indicates the scale of impact magnitude that will be used in undertaking the construction phase assessment. The descriptors included in this section are based upon the IAQM (2024) 'Guidance on the Assessment of Dust from Demolition and Construction[19]'

Table 6.8 Scale of receptor sensitivity used in the construction phase assessment

Activity	Magnitude	Description
Demolition	Large	Total building volume >50,000m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level.
	Medium	Total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10m – 20m above ground level.
	Small	Total building volume <20,000m^3, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.
Earthworks	Large	Total site area >10,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes.
	Medium	Total site area 2,500m^2 – 10,000m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 – 100,000 tonnes.
	Small	Total site area < 2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.

[19] iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Activity	Magnitude	Description
Construction	Large	Total building volume >100,000m^3, piling, on-site concrete batching.
	Medium	Total building volume 25,000 m^3 – 100,000m^3, potentially dusty construction material (e.g. concrete), piling, on-site concrete batching.
	Small	Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	Large	>50 Heavy Duty Vehicle (HDV) (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m.
	Medium	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m.
	Small	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

6.3.34 The sensitivity of receptor and magnitude of impact will then be combined using the significance matrix as detailed in **Table 6.9** to determine the significance of effects. The dusts emission magnitude determined will be used to recommend site-specific mitigation measures.

Table 6.9 Scale of magnitude for dust emission impacts used in the construction phase assessment

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Construction: traffic exhaust emissions

6.3.35 The significance of effects of exhaust emissions arising from construction phase vehicles will be evaluated qualitatively using professional judgement and the principles of the EPUK / IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'[20] significance criteria.

[20] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Operation: traffic exhaust emissions

6.3.36 The EPUK-IAQM 2017 guidance provides indicative criteria, for when an air quality assessment is required. If none of the criteria are exceeded, it is considered unlikely that there will be any significant effects.

Human health – long term impacts

6.3.37 To assess the impacts of a development on the surrounding area, the EPUK-IAQM 2017 guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. **Table 6.10** presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

Table 6.10 Impact descriptors for individual receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy Objectives.

Where the % change in concentrations is <0.5%, the change is described as 'negligible' regardless of the concentration.

Where concentrations increase the impact is described as adverse, and where it decrease as beneficial.

6.3.38 The EPUK/IAQM guidance notes that the criteria in **Table 6.9** should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and

- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Human health - short term impacts

6.3.39 The EPUK-IAQM 2017 guidance advised that for short term concentrations, which are averaged over periods of an hour or less, the following descriptors of change could be used to describe the impact:

- Less than or equal to 10% of the AQAL – Negligible
- 11% - 20% of the AQAL – Slight
- 21% - 50% of the AQAL – Medium
- >51% of the AQAL - Large

6.3.40 Furthermore, the EPUK-IAQM 2017 guidance states that: *"In most cases, the assessment of impact severity for a Proposed Development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other prominent local sources."*

Sensitive ecological receptors

6.3.41 Potential impacts of the Proposed Development on sensitive ecological receptors will be determined using the criteria outlined in the Defra and Environment Agency (2016) guidance[21]. These are intended for use in interpreting the results of an air quality screening assessment to determine whether further detailed modelling is required, but they provide a useful guide to assessing the significance of an impact in the absence of any agreed criteria relating to the assessment of impacts from dispersion modelling.

SPAs, SACs, Ramsar sites and SSSIs

6.3.42 Based on the Defra and Environment Agency (2016) screening criteria[22], the environmental concentration of substance released into the air, which is known as the process contribution, from the Proposed Development can be considered to be insignificant if the following primary criteria are met:

- The short-term process contribution is less than 10% of the short-term environmental standard for protected conservation areas; and
- The long-term process contribution is less than 1% of the long-term environmental standard for protected conservation areas

[21] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[22] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

6.3.43 If the primary criteria aren't met, then the secondary stage criteria can be used, which are:

- The long-term predicted environmental concentration is less than 70% of the long-term standard.

6.3.44 If the second stage criteria are met, then the impact can be considered to be insignificant. However, if the criteria are not met, this does not necessarily mean an impact is significant and consideration has been given as to whether the predicted environmental concentration exceeds the relevant standards taking into account the conservative nature of this assessment.

Local nature sites

6.3.45 The process contribution from the Proposed Development can be considered to be insignificant if the following primary criteria are met:

- The short-term process contribution is less than 100% of the short-term environmental standard for protected conservation areas.
- The long-term process contribution is less than 100% of the long-term environmental standard for protected conservation areas.

6.4 Baseline conditions

6.4.1 Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data for the pollutants of concern have been reviewed in the following subsections.

6.4.2 It is noted that the emissions from the existing plant are already a component of the local authority air quality monitoring data and background LAQM data. Therefore those emissions are factored into the monitoring results which are being undertaken by the local authorities in the area, and form part of the baseline in this assessment. Also, the emission from the existing cement works forms part of the assessment scenario in the model and there will be some resultant double counting. This is consistent with a conservative assessment and does not prevent full interpretation of the assessment results.

6.4.3 There is on-site monitoring undertaken by the Applicant in Penyffordd which is provided below. However, the data averaging period and monitor availability does not allow for averaging over a full-calendar year. Hence, local authority air quality monitoring data provides the best available source of data for air quality for the local area, as summarised below.

On-site air quality monitoring data

6.4.4 There is on-site monitoring undertaken by the Applicant in Penyffordd. A summary of monitoring data is illustrated in in **Table 6.11**. It is noted that the data was obtained from March 2023 to January 2024, and does not accord to a full calendar year.

Table 6.11 Onsite air quality monitoring data at Penyffordd

Location	Annual average NO_2 ($\mu g/m^3$)	Annual average PM_{10} ($\mu g/m^3$)	Annual average $PM_{2.5}$ ($\mu g/m^3$)	24-hour mean PM_{10} ($\mu g/m^3$)	8-hour rolling mean CO ($\mu g/m^3$)	1-hour mean NO_2 ($\mu g/m^3$)
Penyffordd	8.2*	3.5*	3.1*	11.4	0.6	80.5
AQS Objectives	40	40	20	50	10	200

Note: The data presented is from March 2023 to January 2024.

*The annual data is not derived from a full-year and only for 10 months.

Local authority air quality monitoring data

6.4.5 There are currently no Air Quality Management Areas (AQMAs) declared within the Flintshire County Council area. Therefore, the Proposed Development is not located within or close to an AQMA.

6.4.6 According to the North Wales Authorities Collaborative Project 2023 Air Quality Progress Report[23], Flintshire County Council co-located three NO_2 diffusion tube monitors with an automatic monitor, which is owned by an external organisation during 2021.There was also a network of 59 NO_2 diffusion tubes monitoring locations across the district in 2022. There were three diffusion tubes within 3km of the Proposed Development site. The monitoring data from sites within 3km from the Proposed Development site are reproduced in **Table 6.12**.

Table 6.12 2018-2022 annual average NO_2 concentrations measured at diffusion tube sites

Site ID	Site name	Site type	Approx. distance from Site (km)	Annual average NO_2 ($\mu g/m^3$)				
				2018	2019	2020	2021	2022
ADDC-120	Ysgol St John Penymynydd CH4 0LG	Kerbside	1.4	20.8	17.1	11.5	11.4	13.4
ADDC-109	Westwood CP School Padeswood Rd CH7 2JT	Kerbside	2.1	12.2	10.4	8.6	8.6	8.3

[23] https://www.conwy.gov.uk/en/Resident/Environmental-problems/assets-Air-Quality/documents/NW-Annual-Progress-Report-2023.pdf

Site ID	Site name	Site type	Approx. distance from Site (km)	Annual average NO_2 (µg/m^3)				
				2018	2019	2020	2021	2022
ADDC-075	17, Mill Lane, Buckley CH7 3HA	Kerbside	2.4	23.3	21.2	17.8	17.1	15.2

6.4.6.1 LAQM background data

6.4.7 Estimated background air quality data available from the LAQM website operated by Defra has been included in the assessment. No exceedances of the NO_2, PM_{10} or $PM_{2.5}$ Air Quality Strategy (AQS) standards are predicted. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective AQSs.

6.4.8 A summary of Defra background concentrations is illustrated in **Table 6.13**.

Table 6.13 Estimated Background Annual Average NO_2, PM_{10} and $PM_{2.5}$ Concentrations at the Site (from 2018 base map)

Grid square		Annual average NO_2 (µg/m^3)	Annual average PM_{10} (µg/m^3)	Annual average $PM_{2.5}$ (µg/m^3)
X	Y			
358500	413500	7.5	10.0	6.3
AQS Objectives		40	40	20

Note: Presented concentrations for 1km^2 grid centred on 329500, 362500; approximate centre of development site is 329196, 362196.

6.4.8.1 Designated sites

6.4.9 In accordance with the Environment Agency air quality risk assessment guidance[24], total annual mean NOx concentrations should be calculated at discrete receptor locations within any SACs, SPAs and Ramsar sites within 15km of the Site boundary, at any SSSIs within 10km of the Site boundary and local nature sites (Ancient Woodlands, Local Wildlife Sites and national and local nature reserves) within 2km of the Site boundary, if the proposed CHP will have a capacity of more than 50 megawatts. Background nitrogen and acid deposition rates for the sites captured per the above guidance were sourced from APIS and a summary of the background concentrations is provided in **Table 6.14**. The background concentrations below have been based on the designated features of the SPAs, SACs and SSSIs or the broad habitat types of the local sites that are most sensitive to nitrogen and acid deposition. The data is updated every year using the latest measurement data from the various networks around the UK.

[24] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Table 6.14 Background nitrogen deposition rates and acid deposition rates for designated sites

Rec ID	Designated site	Designated features/broad habitat type	APIS equivalent habitat applied in the assessment	Existing background nitrogen deposition rate (kgN/ha/yr)	Existing background N acid deposition rate (keq/ha/yr)	Existing background S acid deposition rate (keq/ha/yr)
E1	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**34.25**	2.47	0.21
E2	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**33.42**	2.39	0.22
E3	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**32.58**	2.33	0.22
E4	Maes Y Grug SSSI/Deeside and Buckley Newt Sites SAC	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**32.46**	2.32	0.25

Rec ID	Designated site	Designated features/broad habitat type	APIS equivalent habitat applied in the assessment	Existing background nitrogen deposition rate (kgN/ha/yr)	Existing background N acid deposition rate (keq/ha/yr)	Existing background S acid deposition rate (keq/ha/yr)
E5	Connah's Quay Ponds and Woodland SSSI/Deeside and Buckley Newt Sites SAC	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**32.46**	2.32	0.25
E6	Afon Dyfrdwy (River Dee) SSSI/SAC/ SPA	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**40.08**	2.86	0.22
E7	Afon Dyfrdwy (River Dee) SSSI/SAC/ SPA	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**35.58**	2.54	0.24
E8	Afon Dyfrdwy (River Dee) SSSI/SAC/ SPA	Acidophilous Quercus forest	Unmanaged Broadleafed/ Coniferous Woodland	**34.92**	2.41	0.25
E9	Dee Estuary/Aber Afon Dyfrdwy SSSI/SAC	Coastal dune grasslands (grey dunes) - acid type European dry heaths	Coastal dune grasslands (grey dunes) - acid type Dwarf shrub heath	**19.48**	2.41	0.25
E10	Shotton Lagoons and Reedbeds SSSI	Coastal dune grasslands (grey dunes) - acid type European dry heaths	Coastal dune grasslands (grey dunes) - acid type Dwarf shrub heath	**19.04**	1.36	0.26

Rec ID	Designated site	Designated features/broad habitat type	APIS equivalent habitat applied in the assessment	Existing background nitrogen deposition rate (kgN/ha/yr)	Existing background N acid deposition rate (keq/ha/yr)	Existing background S acid deposition rate (keq/ha/yr)
E11	Mynydd Y Fflint/Flint Mountain SSSI	Other: Other Tall Herb And Fern	Other: Other Tall Herb And Fern	**18.31**	1.31	0.17
E12	Coed Talon Marsh SSSI	Salix cinerea-Galium palustre woodland	Moist and wet dune slacks	**32.20**	1.49	0.18
E13	Chwarel Cambrian/Cambrian Quarry, Gwernymynydd SSSI	Rhinolophus hipposideros	Broadleaved and mixed woodlands	**30.20**	2.16	0.21
E14	Alyn Valley Woods and Alyn Gorge Caves SSSI/SAC	Avenula pubescens grassland: Dactylis glomerata-Briza media subcommunity	Semi-dry Perennial calcareous grassland (basic meadow steppe)	**17.51**	2.11	0.2
E15	Bryn Alyn SSSI	Festuca ovina-Agrostis capillaris-Thymus praecox grassland: Trifolium repens-Luzula campestris subcommunity	Semi-dry Perennial calcareous grassland (basic meadow steppe).	**16.66**	2.12	0.2
E16	Glaswelltiroedd Eryrys (Eryrys Grasslands) SSSI	Low and medium altitude hay meadows	Low and medium altitude hay meadows	**16.44**	1.41	0.17
E17	Llay Bog SSSI	Broadleaved deciduous woodland	Broadleaved deciduous woodland	**36.73**	1.59	0.18

Rec ID	Designated site	Designated features/broad habitat type	APIS equivalent habitat applied in the assessment	Existing background nitrogen deposition rate (kgN/ha/yr)	Existing background N acid deposition rate (keq/ha/yr)	Existing background S acid deposition rate (keq/ha/yr)
E18	Chwarel Singret SSSI	Broadleaved and mixed woodlands	Broadleaved and mixed woodlands	**39.26**	2.7	0.22
E19	Marford Quarry SSSI	Broadleaved and mixed woodlands	Broadleaved and mixed woodlands	**40.24**	2.87	0.19
E20	Halkyn Mountain/Mynydd Helygain SAC	Arctic-alpine calcareous grassland	Arctic-alpine calcareous grassland	**18.97**	1.35	0.17
E21	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	Arctic-alpine calcareous grassland Blanket bogs	Arctic-alpine calcareous grassland Blanket bogs	**19.48**	1.39	0.17
E22	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	Arctic-alpine calcareous grassland Blanket bogs	Arctic-alpine calcareous grassland Blanket bogs	**19.42**	1.39	0.17
E23	Price's Hill Wood Ancient Woodland/Flintshire Wildlife Site	Broadleaved woodland and scrub	Broadleaved woodland and scrub	**35.87**	2.56	0.2
E24	Bistre Wood Ancient Woodland/Flintshire Wildlife Site	Broadleaved woodland and scrub	Broadleaved woodland and scrub	**33.73**	2.41	0.2

Rec ID	Designated site	Designated features/broad habitat type	APIS equivalent habitat applied in the assessment	Existing background nitrogen deposition rate (kgN/ha/yr)	Existing background N acid deposition rate (keq/ha/yr)	Existing background S acid deposition rate (keq/ha/yr)
E25	Black Pool Plantation Flintshire Wildlife Site	Fen	Fen	**21.09**	1.51	0.17
E26	Hartsheath Flintshire Wildlife Site	Lowland pasture and parkland	Lowland pasture and parkland	**33.63**	2.4	0.21
E27	Pontblyddyn Marsh and Coppa Wood Flintshire Wildlife Site	Pasture/meadow and scrub Broadleaved woodland and scrub	Pasture/meadow and scrub Broadleaved woodland and scrub	**32.55**	2.32	0.21
E28	Padeswood Pool Flintshire Wildlife Site	Wet woodland/Fen	Wet woodland/Fen	**20.53**	1.47	0.17
E29	Padeswood Pasture Flintshire Wildlife Site	Pasture/meadow and scrub	Pasture/meadow and scrub	**20.53**	1.47	0.17
E30	Marleyfield Meadow Flintshire Wildlife Site	Pasture/meadow and scrub Broadleaved woodland and scrub	Pasture/meadow and scrub	**20.53**	2.33	0.2

Bold text indicates an exceedance of the lower critical load range for this habitat.

Assessment against future baseline

6.4.10 If the Proposed Development does not go ahead, the existing cement works would continue to operate without the benefit of carbon capture and the emissions that are currently generated by the cement manufacture process will continue. The background levels of key pollutants would be expected to continue to decline in line with national trends.

6.5 Relevant legislation and planning policy

6.5.1 This section sets out the planning policy frameworks that are relevant to the air quality assessment. An assessment of the Proposed Development against the relevant national and local planning policies are provided in the Planning, Design and Access Statement.

Relevant legislation

6.5.2 The applicable legislative frameworks are summarised as:

- The Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland, 2007[25];
- The Clean Air Strategy 2019[26];
- Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008 on Ambient Air Quality and Cleaner Air for Europe[27];
- Air Quality (Wales) Regulations, 2000[28];
- Air Quality Standards (Wales) Regulations, 2010[29];
- Air Quality Standards (Amendment) Regulations, 2016[30];
- The Environment Act, 1995[31]; and
- The Environment Act, 2021[32].

Air Quality Objectives and Standards

6.5.3 The Air Quality Standards (AQSs) in the United Kingdom are derived from European Commission (EC) directives and are adopted into Welsh law via the Air Quality (Wales) Regulations, 2010[33]. The Air Quality Limit Values Regulations 2003[34] and subsequent amendments implement the Air Quality Framework Directive into Welsh

[25] https://assets.publishing.service.gov.uk/media/5a758459ed915d731495a940/pb12654-air-quality-strategy-vol1-070712.pdf

[26] https://www.gov.uk/government/publications/clean-air-strategy-2019

[27] https://eur-lex.europa.eu/eli/dir/2008/50/oj

[28] https://www.legislation.gov.uk/wsi/2000/1940/contents/made

[29] https://www.legislation.gov.uk/wsi/2010/1433/contents/made

[30] https://www.legislation.gov.uk/uksi/2016/1184/contents/made

[31] https://www.legislation.gov.uk/id/ukpga/1995/25

[32] https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

[33] https://www.legislation.gov.uk/wsi/2010/1433/contents/made

[34] https://www.legislation.gov.uk/uksi/2003/2121/made

Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards (Wales) Regulations 2010[35].

6.5.4 The relevant standards to protect human health and ecology are summarised in **Table 6.15**.

Table 6.15 Air Quality Standards Relevant to the Proposed Development

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit ($\mu g/m^3$)
Nitrogen dioxide (NO_2)	1 calendar year*	N/A	40
	1 hour*	18	200
Nitrogen oxides (NO)	1 calendar year**	N/A	30
Fine particles (PM_{10})	1 calendar year*	N/A	40
	24 hours*	35	50
Fine particles ($PM_{2.5}$)	1 year*	N/A	20
Sulphur dioxide (SO_2)	1 year**	N/A	20
	24 hours*	3	125
	1 hour*	24	350
	15 minutes*	35	266
Carbon Monoxide (CO)	8 hour (rolling mean)	N/A	10,000
Monoethanolamine (MEA)	24 hours	NA	100
	1 hour	NA	400
N-Nitrosodimethylamine (NDMA)	Annual	NA	0.0002

* For the protection of human health

**For the protection of vegetation and ecosystems

Critical levels and critical loads

6.5.5 Critical levels and loads have been designated for certain habitat types within the UK based on the sensitivity and qualifying features of the receiving habitat. A review of the APIS website[36] was undertaken to identify the most sensitive habitat within each designated site and the associated critical level/load. The 'site relevant critical loads' were used to identify the relevant critical level/loads for the SPAs, SACs and SSSIs and the 'search by location' was used for the local sites. The relevant critical level for

[35] https://www.legislation.gov.uk/wsi/2010/1433/contents/made

[36] https://www.apis.ac.uk/

ammonia concentration and critical loads for nitrogen deposition and acid deposition, taken from APIS, at the identified designated sites are presented in **Table 6.16**

Table 6.16 Critical levels for ammonia concentration and critical loads for nitrogen and acid deposition

Rec. ID	Designated features/ broad habitat type	Ammonia critical level (µg/m^3)	Nutrient nitrogen critical load* (kgN/ha/yr	Acid critical load		
				CLMaxS (keqN/ha/yr)	CLMinN (keqN/ha/yr)	CLMaxN (keqS/ha/yr)
E1	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	1	10-15	2.642	0.357	2.999
E2	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	1	10-15	2.642	0.357	2.999
E3	Buckley Claypits and Commons SSSI/Deeside and Buckley Newt Sites SAC	1	10-15	2.642	0.357	2.999
E4	Maes Y Grug SSSI/Deeside and Buckley Newt Sites SAC	1	10-15	1.477	0.357	1.834
E5	Connah's Quay Ponds and Woodland SSSI/Deeside and Buckley Newt Sites SAC	1	10-15	2.642	0.357	2.999

Rec. ID	Designated features/ broad habitat type	Ammonia critical level (µg/m^3)	Nutrient nitrogen critical load* (kgN/ha/yr	Acid critical load		
				CLMaxS (keqN/ha/yr)	CLMinN (keqN/ha/yr)	CLMaxN (keqS/ha/yr)
E6	Afon Dyfrdwy (River Dee) SSSI/SAC/SPA	1	10-15	3.583	0.357	3.94
E7	Afon Dyfrdwy (River Dee) SSSI/SAC/SPA	1	10-15	3.583	0.357	3.94
E8	Afon Dyfrdwy (River Dee) SSSI/SAC/SPA	1	10-15	3.583	0.357	3.94
E9	Dee Estuary/Aber Afon Dyfrdwy SSSI/SAC	1	5-10	4.12	0.892	4.972
E10	Shotton Lagoons and Reedbeds SSSI	3	5-10	4.12	0.892	4.972
E11	Mynydd Y Fflint/Flint Mountain SSSI	1	10-15	0.349	0.142	0.634
E12	Coed Talon Marsh SSSI	1	5-15	0.349	0.142	0.634
E13	Chwarel Cambrian/Cambrian Quarry, Gwernymynydd SSSI	3	10-15	5.955	0.142	6.097
E14	Alyn Valley Woods and Alyn Gorge Caves SSSI/SAC	1	10-20	4	0.856	4.856
E15	Bryn Alyn SSSI	1	10-20	4	0.856	4.856

Rec. ID	Designated features/ broad habitat type	Ammonia critical level (µg/m^3)	Nutrient nitrogen critical load* (kgN/ha/yr	Acid critical load		
				CLMaxS (keqN/ha/yr)	CLMinN (keqN/ha/yr)	CLMaxN (keqS/ha/yr)
E16	Glaswelltiroed d Eryrys (Eryrys Grasslands) SSSI	1	10-20	4	0.856	4.856
E17	Llay Bog SSSI	3	10-15	1.696	0.357	1.918
E18	Chwarel Singret SSSI	3	10-15	1.696	0.357	1.918
E19	Marford Quarry SSSI	3	10-15	1.023	0.142	1.165
E20	Halkyn Mountain/Myn ydd Helygain SAC	1	5-10	4	1.071	5.071
E21	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	1	5-10	1.046	0.321	1.367
E22	Berwyn a Mynyddoedd De Clwyd/Berwyn and South Clwyd Mountains SAC	1	5-10	1.046	0.321	1.367
E23	Price's Hill Wood Ancient Woodland/Flint shire Wildlife Site	1	10-15	2.643	0.357	3
E24	Bistre Wood Ancient Woodland/Flint shire Wildlife Site	1	10-15	2.632	0.357	2.989

Rec. ID	Designated features/ broad habitat type	Ammonia critical level (µg/m³)	Nutrient nitrogen critical load* (kgN/ha/yr	Acid critical load		
				CLMaxS (keqN/ha/yr)	CLMinN (keqN/ha/yr)	CLMaxN (keqS/ha/yr)
E25	Black Pool Plantation Flintshire Wildlife Site	1	5-15	Not sensitive to acidity		
E26	Hartsheath Flintshire Wildlife Site	1	20-30	2.632	0.357	2.989
E27	Pontblyddyn Marsh and Coppa Wood Flintshire Wildlife Site	1	10-15	1.643	0.142	1.785
E28	Padeswood Pool Flintshire Wildlife Site	1	10-15	2.637	0.357	2.994
E29	Padeswood Pasture Flintshire Wildlife Site	1	20-30	2.637	0.357	2.994
E30	Marleyfield Meadow Flintshire Wildlife Site	1	10-15	2.637	0.357	2.994

*Lower critical load used in assessment for conservative assessment.

Relevant planning policy

6.5.6 The applicable planning policies are summarised as follows :

- Sections 6.7.16 and 6.7.18 of Planning Policy Wales[37] (PPW),
- Land-Use Planning & Development Control: Planning for Air Quality[38]; and
- Policy PC2 of Flintshire Local Development Plan 2015-2030[39] (January 2023).

[37] https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

[38] Institute of Air Quality Management (2017). Land-Use Planning & Development Control: Planning For Air Quality

[39] https://www.flintshire.gov.uk/en/PDFFiles/Planning/Examination-Library-Documents/LDP-Version-8.pdf

6.6 Assessment of potential effects, additional mitigation and residual effects

Construction phase

Fugitive Dust

6.6.1 Fugitive dust emissions arising from construction activities are likely to be variable in nature and would depend upon the type and extent of the activity, soil type and moisture, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust. Construction activities that are often the most significant potential sources of fugitive dust emissions are:

- Demolition of existing buildings (Padeswood Hall and Padeswood Hall Farm) and the size reduction and handling of materials;
- Earth moving, due to the handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);
- Movement of heavy site vehicles on dry or untreated haul routes; and
- Movement of vehicles over surfaces where muddy materials have been transferred off-site (e.g. on to public highways).

6.6.2 The main sources of fugitive dust emissions from the construction of the Proposed Development will therefore be from earthworks, construction and trackout.

6.6.3 Fugitive dust arising from construction activities is mainly of a particle size greater than the PM_{10} fraction however construction activities do not completely avoid the generation of PM_{10} emissions and so may contribute to local PM_{10} concentrations.

6.6.4 Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated. The site-specific mitigation measures are contained in **Appendix B** of **Volume 4, Technical Appendix 6.1**.

Potential dust emission magnitude

6.6.5 With reference to the IAQM guidance[40] criteria, the dust emission magnitudes for earthworks, construction and trackout activities are summarised in **Table 6.17**. Where information is not yet known, a conservative approach has been adopted and professional judgement has been used based on the scale of the Proposed Development and experience of working on similar schemes.

[40] Institute of Air Quality Management (2024). Guidance of the Assessment of dust from demolition and construction

Table 6.17 Scale of magnitude for dust emissions impacts used in the construction phase assessment

Activity	Dust emission magnitude	
Demolition	• Total volume of building to be demolished is <500m^3 • There is no on-site crushing and screening • The height of demolition activities above ground is <6m • Typical dust associated with masonry building demolition • Times for demolition will depend on when planning permission is issued	**Small**
Earthworks	• Total area of the Site is between 18,000m^2 – 110,000m^2 • Soil type is clay • Assumed there would be 5-10 pieces of earthmoving moving equipment at any one time • The height of bunds is between 3-6m • Assumed works could take place year round	**Large**
Construction	• Total building volume would be between 12,000m^3 – 75,000m^3. • Assumed on-site concrete batching or sandblasting would take place. • It is assumed there would be some potentially dusty materials on-site.	**Medium**
Trackout	• The average number of heavy vehicles in/out of the Site would be more than 50 per day. • The majority of the Site surface would be predominantly made ground.	**Large**

Sensitivity of the area for dust emissions

6.6.6 Earthworks and construction activities may have dust effects on sensitive receptors up to 350m from the Site boundary whereas trackout activities may have dust effects on sensitive receptors up to 50m from the edge of the road up to 200m in either direction of the Site access (based on medium dust emission magnitude), as per the guidance.

6.6.7 **Table 6.18** summarises the sensitivity of the area to dust emissions.

Table 6.18: Sensitivity of the area

Potential impact		Sensitivity of the surrounding area	
		Demolition, Earthworks and Construction	**Trackout**
Dust soiling	Receptor sensitivity	High	High
	Number of receptors	1-10	10-100
	Distance from the source	<20m	<20m
	Sensitivity of the area	**Medium**	**High**
Human health	Receptor sensitivity	High	High
	Annual mean PM_{10} concentration	<24µg/m^3	<24µg/m^3
	Number of receptors	<100	<100
	Distance from the source	<20m	<20m
	Sensitivity of the area	**Low**	**Low**
Ecological	Receptor sensitivity	N/A	N/A
	Distance from the source	N/A	N/A
	Sensitivity of the area	**N/A**	**N/A**

Risk of impacts

6.6.8 The dust emission magnitudes from **Table 6.17** have been combined with the sensitivity of the area from **Table 6.18**, to determine the risk of impacts of construction activities before mitigation, as summarised in **Table 6.19**. Prior to mitigation, the construction phase is expected to have direct, adverse, temporary, short-term effect on the surrounding area during the earthworks, construction and trackout activities. Full details of the assessment of dust risks prior to mitigation is presented in **Section 5.1** of **Volume 4, Technical Appendix 6.1.**

Table 6.19 Summary of the dust risk from construction activities

Potential impact	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low Risk	Medium Risk	Medium Risk	High Risk
Human health	Negligible	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

6.6.9 The construction phase assessment determines the significance of any residual effects once the pre-mitigation effects have been determined and the appropriate mitigation measures identified. Mitigation measures for construction activities are normally secured by planning conditions, a Dust Management Plan (DMP) or a Construction Environmental Management Plan (CEMP). Therefore, any adverse effects would be reduced through a DMP or CEMP, and thus the pre-mitigation impacts are not considered relevant. This chapter only reports the residual effects (after mitigation) for construction phase**.** The residual effects are likely to be not significant with the implementation of proposed mitigation measures.

Exhaust Emissions from Plant and Vehicles

6.6.10 Based on the traffic data presented in **Volume 2, Chapter 11: Traffic and Transport,** it is anticipated that the change of AADT of HGV and LGV is 173 and 325 in the peak HGV period of construction phase respectively. Whilst the threshold for further assessment referred in the IAQM guidance[41] is for 100 AADT HGV, it is only the 4-month period of peak construction within the overall 37-month construction period where vehicle movements will occur at this maximum levels. The change of AADT of HGV and LGV for 37-month average in total construction programme is 47 and 325 respectively, which is considered unlikely to cause a significant impact on local air quality, in accordance with the IAQM guidance[42].

Construction Phase Summary

6.6.11 **Table 6.20** presents a summary of the likely residual effects of the Proposed Development during the construction stage, accounting for embedded and additional mitigation.

[41]Institute of Air Quality Management (2017). Land-Use Planning & Development Control: Planning For Air Quality

[42] Institute of Air Quality Management (2024). Guidance of the Assessment of dust from demolition and construction

Table 6.20 Assessment of potential effects, additional mitigation and residual effects during construction

Receptor	Potential Effects/Additional (Secondary and Tertiary) Mitigation and Residual Effects	
Human receptors impacted by dust and particulate matter emissions resulting from the Site activities (demolition, earthworks, construction and trackout)	Potential effects	Generation and re-suspension of dust and particulate matter.
	Additional (secondary and tertiary) mitigation	Dust control measures incorporated into a detailed DMP or CEMP (secured by planning condition).
	Residual effects	The effect of dust and particulate matter emissions and exhaust emissions from construction equipment and machinery during the construction phase is likely to be not significant, provided that dust controls, site management and dust mitigation measures are applied.

Operational phase

Impact on human receptors

Annual mean NO_2 impacts

6.6.12 The AQS objective for annual mean NO_2 concentrations is 40 µg/m^3. The results of the assessment indicate that with the Proposed Development annual mean NO_2 concentrations for all receptor locations would be below the AQS objective.

6.6.13 **Table 6.21** also shows the comparison of annual mean NO_2 concentrations between the 'baseline' and 'Proposed Development' scenarios. The results as percentages of the AQAL (i.e. the UK AQS objectives) are also presented, as these are used in the determination of significance of effects (based on the EPUK-IAQM guidance[43]). The changes in annual mean NO_2 concentrations at relevant receptors as a result of the additional emissions from the Proposed Development range between 0.2% and 1.0% of the AQAL. The impact of the Proposed Development on nearby sensitive are predicted to be 'negligible' at all relevant receptor locations, in accordance with the EPUK-IAQM guidance, the effects are considered to be **'not significant'**. A contour plot of the annual mean NO_2 concentrations is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

[43] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.21 Predicted maximum annual mean NO_2 concentrations at discrete receptors

Rec. ID	Annual mean NO_2 concentration ($\mu g/m^3$)					
	NO_2 concentration ($\mu g/m^3$)			As PEC % of AQS objective	Change between baseline and PEC as % of AQS objective	Impact
	Baseline	PC	PEC			
R1	7.46	0.09	7.55	18.9%	0.2%	Negligible
R2	7.46	0.12	7.58	18.9%	0.3%	Negligible
R3	6.35	0.22	6.57	16.4%	0.5%	Negligible
R4	6.35	0.14	6.49	16.2%	0.4%	Negligible
R5	7.46	0.26	7.72	19.3%	0.7%	Negligible
R6	7.46	0.26	7.71	19.3%	0.6%	Negligible
R7	7.46	0.22	7.68	19.2%	0.6%	Negligible
R8	7.62	0.21	7.84	19.6%	0.5%	Negligible
R9	6.61	0.26	6.87	17.2%	0.6%	Negligible
R10	6.61	0.38	6.99	17.5%	1.0%	Negligible
R11	6.61	0.21	6.82	17.0%	0.5%	Negligible
R12	6.36	0.07	6.43	16.1%	0.2%	Negligible
AQS / EAL objective	**40 $\mu g/m^3$**					

Hourly mean NO_2 concentrations

6.6.14 The highest predicted 99.79th percentile of hourly average NO_2 concentrations at any of the assessed receptor locations under the Proposed Development scenario is 9.56 $\mu g/m^3$ at R7. The assessment predicts that, with the Proposed Development in place, predicted hourly mean NO_2 concentrations would be well below the hourly mean NO_2 AQS objective at all modelled receptors (**Table 6.22**). In accordance with EPUK-IAQM guidance[44], the impact of the Proposed Development on hourly mean NO_2 concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant'**. A contour plot of the hourly mean NO_2 concentration is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

[44] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.22 Predicted maximum hourly mean NO_2 concentrations at discrete receptors

Rec. ID	Hourly mean NO_2 concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	7.43	3.7%	Negligible
R2	7.51	3.8%	Negligible
R3	8.70	4.4%	Negligible
R4	7.98	4.0%	Negligible
R5	8.31	4.2%	Negligible
R6	7.14	3.6%	Negligible
R7	9.56	4.8%	Negligible
R8	6.67	3.3%	Negligible
R9	7.98	4.0%	Negligible
R10	8.70	4.3%	Negligible
R11	7.14	3.6%	Negligible
R12	8.38	4.2%	Negligible
AQS / EAL Objective	**200 µg/m^3**		

Annual mean PM_{10} impacts

6.6.15 The AQS objective for annual mean PM_{10} concentrations is 40µg/m^3. The results of the assessment indicate that with the Proposed Development, and existing PM sources, predicted annual mean PM_{10} concentrations for all receptor locations will be below the AQS limits.

6.6.16 **Table 6.23** also shows the comparison of annual mean PM_{10} concentrations between the 'baseline' and Proposed Development scenarios. The results as percentages of the AQAL (i.e. the UK AQS objectives) are also presented, as these are used in the determination of significance of effects (based on the EPUK-IAQM guidance[45]). The changes in annual mean PM_{10} concentrations at relevant receptors as a result of the additional emissions from the Proposed Development range between 0.3% and 2.2% of the AQAL. The impact of the Proposed Development on nearby sensitive are predicted to be 'negligible' at all relevant receptor locations, in accordance with the EPUK-IAQM guidance, the effects are considered to be **'not significant'**. A contour plot of the annual mean PM_{10} concentrations is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1.**

[45] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.23 Predicted maximum annual mean PM_{10} concentrations at discrete receptors

Rec. ID	Annual mean PM_{10} concentration ($\mu g/m^3$)					
	PM_{10} concentration ($\mu g/m^3$)			As PEC % of AQS objective	Change between baseline and PEC as % of AQS objective	Impact
	Baseline	PC (including Proposed Development only)	PEC (including Proposed Development and existing PM source)			
R1	10.13	0.01	11.23	22.5%	2.2%	Negligible
R2	10.13	0.01	10.64	21.3%	1.0%	Negligible
R3	9.88	0.02	10.30	20.6%	0.8%	Negligible
R4	9.88	0.01	10.05	20.1%	0.4%	Negligible
R5	10.13	0.02	10.60	21.2%	0.9%	Negligible
R6	10.13	0.02	10.46	20.9%	0.7%	Negligible
R7	10.13	0.02	10.96	21.9%	1.7%	Negligible
R8	10.28	0.01	10.60	21.2%	0.6%	Negligible
R9	9.81	0.02	10.35	20.7%	1.1%	Negligible
R10	9.81	0.03	10.37	20.7%	1.1%	Negligible
R11	9.81	0.01	9.93	19.9%	0.2%	Negligible
R12	9.98	0.01	10.12	20.2%	0.3%	Negligible
AQS / EAL objective	**40 $\mu g/m^3$**					

Daily mean PM_{10} concentrations

6.6.17 The highest predicted 90.41th percentile of daily average PM_{10} concentrations at any of the assessed receptor locations under the Proposed Development scenario is 2.97 $\mu g/m^3$ at R7. The assessment predicts that, with Proposed Development, inclusive of existing PM sources, predicted daily average PM_{10} concentrations would be well below the daily average PM_{10} AQS objective at all modelled receptors (**Table 6.24**). In accordance with EPUK-IAQM guidance [46], the impact of the Proposed Development on daily average PM_{10} concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant'**. A contour plot of

[46] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

the daily average PM_{10} concentration is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

Table 6.24 Predicted maximum daily mean PM_{10} concentrations at discrete receptors

Rec. ID	Daily mean PM_{10} concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	2.75	5.5%	Negligible
R2	1.35	2.7%	Negligible
R3	1.29	2.6%	Negligible
R4	0.56	1.1%	Negligible
R5	1.50	3.0%	Negligible
R6	0.97	1.9%	Negligible
R7	2.97	5.9%	Negligible
R8	0.94	1.9%	Negligible
R9	1.61	3.2%	Negligible
R10	1.81	3.6%	Negligible
R11	0.40	0.8%	Negligible
R12	0.44	0.9%	Negligible
AQS / EAL Objective	**500 µg/m^3**		

8-hour rolling mean CO concentrations

6.6.18 The highest predicted 100th percentile of 8-hour rolling average CO concentrations at any of the assessed receptor locations under the Proposed Development scenario is 66.41 µg/m^3 at R4. The assessment predicts that, with the Proposed Development in place, predicted 8-hour rolling mean CO concentrations would be well below the 8-hour rolling mean CO AQS objective at all modelled receptors (**Table 6.25**). In accordance with EPUK-IAQM guidance[47], the impacts of the Proposed Development on 8-hour mean CO concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant**'.

[47] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.25 Predicted maximum 8-hour rolling mean CO concentrations at discrete receptors

Rec. ID	8-hour rolling mean CO concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	53.40	0.5%	Negligible
R2	56.38	0.6%	Negligible
R3	61.47	0.6%	Negligible
R4	47.20	0.5%	Negligible
R5	54.70	0.5%	Negligible
R6	46.08	0.5%	Negligible
R7	66.41	0.7%	Negligible
R8	47.86	0.5%	Negligible
R9	53.41	0.5%	Negligible
R10	58.39	0.6%	Negligible
R11	32.25	0.3%	Negligible
R12	60.60	0.6%	Negligible
AQS / EAL Objective	**10,000 µg/m^3**		

Daily mean SO_2 concentrations

6.6.19 The highest predicted 99.19th percentile of daily average SO_2 concentrations at any of the assessed receptor locations under the Proposed Development scenario is 5.36 µg/m^3 at R7. The assessment predicts that, with the Proposed Development in place, daily average SO_2 concentrations would be well below the daily average SO_2 AQS objective at all modelled receptors (**Table 6.26**). In accordance with EPUK-IAQM guidance[48], the impacts of the Proposed Development on daily average SO_2 concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant**'.

[48] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.26 Predicted maximum daily average SO_2 concentrations at discrete receptors

Rec. ID	99.19th Daily Mean SO_2 concentration (µg/m³)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	2.40	1.9%	Negligible
R2	2.34	1.9%	Negligible
R3	3.90	3.1%	Negligible
R4	3.47	2.8%	Negligible
R5	4.69	3.8%	Negligible
R6	4.17	3.3%	Negligible
R7	5.36	4.3%	Negligible
R8	3.27	2.6%	Negligible
R9	3.94	3.2%	Negligible
R10	4.89	3.9%	Negligible
R11	1.53	1.2%	Negligible
R12	2.96	2.4%	Negligible
AQS / EAL Objective	**125 µg/m³**		

Hourly mean SO_2 concentrations

6.6.20 The highest predicted 99.73th percentile of hourly average SO_2 concentrations at any of the assessed receptor locations under the Proposed Development scenario is 12.01 µg/m³ at R7. The assessment predicts that, with the Proposed Development in place, hourly average SO_2 concentrations would be well below the hourly average SO_2 AQS objective at all modelled receptors (**Table 6.27**). In accordance with EPUK-IAQM guidance[49], the impacts of the Proposed Development on hourly average SO_2 concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant**'.

[49] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.27 Predicted maximum hourly average SO_2 concentrations at discrete receptors

Rec. ID	99.73th Hourly Mean SO_2 concentration (µg/m³)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	8.94	2.6%	Negligible
R2	9.34	2.7%	Negligible
R3	10.87	3.1%	Negligible
R4	9.72	2.8%	Negligible
R5	10.44	3.0%	Negligible
R6	8.91	2.5%	Negligible
R7	12.01	3.4%	Negligible
R8	8.43	2.4%	Negligible
R9	9.96	2.8%	Negligible
R10	10.90	3.1%	Negligible
R11	8.72	2.5%	Negligible
R12	10.34	3.0%	Negligible
AQS / EAL Objective	**350 µg/m³**		

15-min mean SO_2 concentrations

6.6.21 The highest predicted 99.99th percentile of hourly average SO_2 concentrations at any of the assessed receptor locations under the Proposed Development scenario is 12.01 µg/m³ at R7. The assessment predicts that, with the Proposed Development in place, hourly average SO_2 concentrations would be well below the hourly average SO_2 AQS objective at all modelled receptors (**Table 6.28**). In accordance with EPUK-IAQM guidance[50], the impacts of the Proposed Development on hourly average SO_2 concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant**'.

[50] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.28 Predicted maximum 15-minute average SO_2 concentrations at discrete receptors

Rec. ID	99.99th 15-minute Mean SO_2 concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	8.94	2.6%	Negligible
R2	9.34	2.7%	Negligible
R3	10.87	3.1%	Negligible
R4	9.72	2.8%	Negligible
R5	10.44	3.0%	Negligible
R6	8.91	2.5%	Negligible
R7	12.01	3.4%	Negligible
R8	8.43	2.4%	Negligible
R9	9.96	2.8%	Negligible
R10	10.90	3.1%	Negligible
R11	8.72	2.5%	Negligible
R12	10.34	3.0%	Negligible
AQS / EAL Objective	**350 µg/m^3**		

Daily mean amine concentrations

6.6.22 The highest predicted 100th percentile of daily average amine concentrations at any of the assessed receptor locations under the Proposed Development scenario is 0.24 µg/m^3 at R3. The assessment predicts that, with the Proposed Development in place, daily average amine concentrations would be well below the daily average amine AQS objective at all modelled receptors (**Table 6.29**). In accordance with EPUK-IAQM guidance[51], the impacts of the Proposed Development on daily average amine concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant**'.

[51] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.29 Predicted maximum daily average amine concentrations at discrete receptors

Rec. ID	Daily average amine concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	0.11	0.1%	Negligible
R2	0.13	0.1%	Negligible
R3	0.24	0.2%	Negligible
R4	0.23	0.2%	Negligible
R5	0.21	0.2%	Negligible
R6	0.22	0.2%	Negligible
R7	0.20	0.2%	Negligible
R8	0.21	0.2%	Negligible
R9	0.21	0.2%	Negligible
R10	0.23	0.2%	Negligible
R11	0.20	0.2%	Negligible
R12	0.15	0.2%	Negligible
AQS / EAL Objective	**100 µg/m^3**		
* Maximum modelled amine concentrations based on sum of 'Amine 1' + 'Amine 2' maxima, which is potentially conservative because the 'Amine 1' maximum concentration could occur at a different time (hour/day) to the 'Amine 2' maximum concentration at any given receptor or grid point			

Hourly mean amine concentrations

6.6.23 The highest predicted 100th percentile of hourly average amine concentrations at any of the assessed receptor locations under the Proposed Development scenario is 0.24 µg/m^3 at R3. The assessment predicts that, with the Proposed Development in place, hourly average amine concentrations would be well below the hourly average amine AQS objective at all modelled receptors (**Table 6.30**). In accordance with EPUK-IAQM guidance [52], the impacts of the Proposed Development on hourly average amine concentrations at sensitive human receptors are negligible, and the effects are considered to be '**not significant'**.

[52] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.30 Predicted maximum hourly average amine concentrations at discrete receptors

Rec. ID	Hourly Mean Amine concentration (µg/m^3)		
	PC (Proposed future)	As % of AQS objective	Impact
R1	0.11	0.3%	Negligible
R2	0.13	0.3%	Negligible
R3	0.24	0.3%	Negligible
R4	0.23	0.3%	Negligible
R5	0.21	0.3%	Negligible
R6	0.22	0.3%	Negligible
R7	0.20	0.3%	Negligible
R8	0.21	0.3%	Negligible
R9	0.21	0.2%	Negligible
R10	0.23	0.2%	Negligible
R11	0.20	0.2%	Negligible
R12	0.15	0.4%	Negligible
AQS / EAL Objective	**400 µg/m^3**		

Annual mean Nitrosamine (as NDMA) impacts

6.6.24 The results of the assessment indicate that with the Proposed Development, predicted annual mean Nitrosamine concentrations for all receptor locations will be below the AQS.

6.6.25 **Table 6.31** also shows the comparison of annual mean Nitrosamine (as NDMA) concentrations between the 'baseline' and 'Proposed Development' scenarios. The results as percentages of the AQAL (i.e. the UK AQS objectives) are also presented, as these are used in the determination of significance of effects (based on the EPUK-IAQM guidance[53]). The impact of the Proposed Development is predicted to be 'negligible' at all relevant receptor locations except R10 which is assessed as 'slight adverse'. In accordance with the EPUK-IAQM guidance, the effects are considered to be **'not significant'**. A contour plot of the annual mean Nitrosamine (as NDMA) concentrations is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

[53] https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Table 6.31 Predicted maximum annual mean Nitrosamine (as NDMA) concentrations at discrete receptors

Rec. ID	Annual mean Nitrosamine (as NDMA) concentration (ng/m^3)				
	Direct*	Indirect**	Total***	As % of AQS Objective	Impact
R1	0.0002	0.0021	0.0022	1.1%	Negligible
R2	0.0002	0.0029	0.0031	1.5%	Negligible
R3	0.0004	0.0063	0.0067	3.4%	Negligible
R4	0.0002	0.0068	0.0070	3.5%	Negligible
R5	0.0004	0.0053	0.0058	2.9%	Negligible
R6	0.0004	0.0057	0.0061	3.0%	Negligible
R7	0.0004	0.0037	0.0040	2.0%	Negligible
R8	0.0004	0.0048	0.0052	2.6%	Negligible
R9	0.0004	0.0058	0.0062	3.1%	Negligible
R10	0.0006	0.0119	0.0125	6.3%	Slight adverse
R11	0.0003	0.0079	0.0082	4.1%	Negligible
R12	0.0001	0.0036	0.0037	1.8%	Negligible
AQS / EAL objective	**0.2 ng/m^3**				

*Based on direct mass emissions of 'Nitrosamine 1' and 'Nitrosamine 2' from Main Stack only.

**Accounts for application of ADMS Amine Chemistry Module and relates to indirect formation of nitrosamines and nitramines through atmospheric reactions.

***Equal to sum of modelled direct and indirect nitrosamine + nitramine concentrations.

Impacts on ecological receptors

Annual mean NO_x impacts

6.6.26 **Table 6.32** presents the maximum annual mean NOx process contributions (PCs) and predicted environmental concentrations (PECs) at each of the modelled discrete

ecological receptor points, representing the designated nature conservation-sites, from the five meteorological years modelled, compared to the annual mean NO_x EAL.

6.6.27 The predicted maximum PCs are well below the Environment Agency and Defra 2016 screening criteria[54] of 1% at the discrete receptor points E1 – E22, which represent the SPAs, SACs and SSSIs except E3, and well below 100% for other discrete receptor points at the Ancient Woodland and Local Wildlife Sites (LWS). Meanwhile, the PEC at E3 is below 70% of AQS. Therefore, the impact of the Proposed Development on annual mean NOx concentrations is considered to be negligible and therefore the effects are considered to be **not significant**. Contour plots of the maximum annual mean NOx concentrations is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

Table 6.32 Maximum annual average NOx concentrations at designated nature conservation-sites

Rec. ID	Type of Receptor	NO_x baseline ($\mu g/m^3$)	AQS /EAL ($\mu g/m^3$)	NO_x PC ($\mu g/m^3$)	PC as a % of AQS/ EAL	NO_x PEC ($\mu g/m^3$)	PEC as a % of AQS/ EAL
E1	SSSI/ SAC	10.89	30	0.15	0.5%	11.04	36.8%
E2	SSSI/ SAC	10.02	30	0.25	0.8%	10.27	34.2%
E3	SSSI/ SAC	11.06	30	0.49	1.6%	11.55	38.5%
E4	SSSI/ SAC	8.11	30	0.28	0.9%	8.39	28.0%
E5	SSSI/ SAC	9.87	30	0.09	0.3%	9.96	33.2%
E6	SSSI/ SAC/ SPA	11.22	30	0.06	0.2%	11.28	37.6%
E7	SSSI/ SAC/ SPA	16.26	30	0.05	0.2%	16.32	54.4%
E8	SSSI/ SAC/ SPA	13.61	30	0.04	0.1%	13.65	45.5%
E9	SSSI/	11.21	30	0.04	0.1%	11.26	37.5%

[54] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

Rec. ID	Type of Receptor	NO_X baseline ($\mu g/m^3$)	AQS /EAL ($\mu g/m^3$)	NO_X PC ($\mu g/m^3$)	PC as a % of AQS/ EAL	NO_X PEC ($\mu g/m^3$)	PEC as a % of AQS/ EAL
	SAC						
E10	SSSI	14.65	30	0.05	0.2%	14.70	49.0%
E11	SSSI	8.27	30	0.18	0.6%	8.45	28.2%
E12	SSSI	6.15	30	0.05	0.2%	6.20	20.7%
E13	SSSI	6.12	30	0.02	0.1%	6.14	20.5%
E14	SSSI/ SAC	5.73	30	0.02	0.1%	5.75	19.2%
E15	SSSI	4.93	30	0.02	0.1%	4.95	16.5%
E16	SSSI	4.95	30	0.03	0.1%	4.98	16.6%
E17	SSSI	8.06	30	0.09	0.3%	8.15	27.2%
E18	SSSI	8.23	30	0.11	0.4%	8.34	27.8%
E19	SSSI	10.78	30	0.07	0.2%	10.86	36.2%
E20	SAC	6.57	30	0.06	0.2%	6.62	22.1%
E21	SAC	4.94	30	0.02	0.1%	4.97	16.6%
E22	SAC	5.30	30	0.02	0.1%	5.32	17.7%
E23	LWS	10.02	30	0.32	1.1%	10.34	34.5%
E24	LWS	8.69	30	0.31	1.0%	9.00	30.0%
E25	LWS	7.62	30	0.07	0.2%	7.69	25.6%
E26	LWS	7.62	30	0.13	0.4%	7.75	25.8%
E27	LWS	7.45	30	0.14	0.5%	7.59	25.3%
E28	LWS	7.79	30	0.15	0.5%	7.94	26.5%
E29	LWS	7.79	30	0.14	0.5%	7.93	26.4%
E30	LWS	7.79	30	0.24	0.8%	8.03	26.8%

Daily mean NOx impacts

6.6.28 **Table 6.33** presents the maximum daily mean NO_x PCs and PECs at each of the modelled discrete receptor points, representing the designated nature conservation-sites, from the five meteorological years modelled, compared to the daily NO_x EAL.

6.6.29 The predicted maximum daily mean NO_x PCs would be well below the Environment Agency and Defra 2016 screening criteria[55] of 10% at all of the discrete receptor

[55] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

points representing the SPAs, SACs and SSSIs and below the screening criteria of 100% at all of the discrete receptor points representing the Ancient Woodland and Local Wildlife Sites. In addition, the predicted PEC would be well below the daily mean NOx EAL of 75 µg/m^3 at all discrete receptor points. Therefore, the impact of the Proposed Development on daily mean NOx concentrations is negligible and the effect is considered to be **not significant**. A contour plot of the daily mean NOx concentration is presented in **Appendix F** of **Volume 4, Technical Appendix 6.1**.

Table 6.33 Maximum daily average NOx concentrations at designated nature conservation sites

Rec. ID	Type of Receptor	NO_X baseline (µg/m^3)	AQS/EAL (µg/m^3)	NO_X PC (µg/m^3)	PC as a % of AQS/EAL	NO_X PEC (µg/m^3)	PEC as a % of AQS/EAL
E1	SSSI/ SAC	10.89	75	6.15	8.2%	27.93	37.2%
E2	SSSI/ SAC	10.02	75	4.41	5.9%	24.45	32.6%
E3	SSSI/ SAC	11.06	75	5.37	7.2%	27.50	36.7%
E4	SSSI/ SAC	8.11	75	3.17	4.2%	19.40	25.9%
E5	SSSI/ SAC	9.87	75	1.71	2.3%	21.44	28.6%
E6	SSSI/ SAC/ SPA	11.22	75	1.30	1.7%	23.73	31.6%
E7	SSSI/ SAC/ SPA	16.26	75	1.37	1.8%	33.89	45.2%
E8	SSSI/ SAC/ SPA	13.61	75	1.06	1.4%	28.28	37.7%
E9	SSSI/ SAC	11.21	75	1.52	2.0%	23.95	31.9%
E10	SSSI	14.65	75	1.37	1.8%	30.67	40.9%
E11	SSSI	8.27	75	1.75	2.3%	18.29	24.4%
E12	SSSI	6.15	75	2.55	3.4%	14.85	19.8%
E13	SSSI	6.12	75	1.30	1.7%	13.54	18.0%
E14	SSSI/	5.73	75	1.18	1.6%	12.64	16.9%

Rec. ID	Type of Receptor	NO_X baseline ($\mu g/m^3$)	AQS/EAL ($\mu g/m^3$)	NO_X PC ($\mu g/m^3$)	PC as a % of AQS/EAL	NO_X PEC ($\mu g/m^3$)	PEC as a % of AQS/EAL
	SAC						
E15	SSSI	4.93	75	0.78	1.0%	10.63	14.2%
E16	SSSI	4.95	75	0.94	1.3%	10.85	14.5%
E17	SSSI	8.06	75	2.39	3.2%	18.52	24.7%
E18	SSSI	8.23	75	1.95	2.6%	18.41	24.6%
E19	SSSI	10.78	75	1.34	1.8%	22.91	30.5%
E20	SAC	6.57	75	1.30	1.7%	14.43	19.2%
E21	SAC	4.94	75	0.87	1.2%	10.76	14.3%
E22	SAC	5.30	75	0.70	0.9%	11.31	15.1%
E23	LWS	10.02	75	8.92	11.9%	28.96	38.6%
E24	LWS	8.69	75	12.83	17.1%	30.21	40.3%
E25	LWS	7.62	75	6.28	8.4%	21.52	28.7%
E26	LWS	7.62	75	7.08	9.4%	22.32	29.8%
E27	LWS	7.45	75	7.60	10.1%	22.50	30.0%
E28	LWS	7.79	75	11.10	14.8%	26.68	35.6%
E29	LWS	7.79	75	12.84	17.1%	28.42	37.9%
E30	LWS	7.79	75	7.74	10.3%	23.32	31.1%

Annual mean SO_2 impacts

6.6.30 **Table 6.34** presents the maximum annual mean SO_2 PCs at each of the modelled discrete ecological receptor points, representing the designated nature conservation-sites, from the five meteorological years modelled, compared to the annual mean SO_2 EAL.

6.6.31 The predicted maximum PCs are well below the Environment Agency and Defra 2016 screening criteria[56] of 1% at the discrete receptor points E1 – E22, which represent the SPAs, SACs and SSSIs, and well below 100% for other discrete receptor points at the Ancient Woodland and Local Wildlife Sites. Therefore, the impact of the Proposed Development on annual mean SO_2 concentrations is negligible and the effect is **not significant**. Contour plots of the maximum annual mean SO_2 concentrations is presented in **Appendix F** of **Technical Volume 4, Appendix 6.1**.

[56] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

Table 6.34 Maximum annual average SO_2 concentrations at designated nature conservation-sites

Rec. ID	Type of Receptor	AQS /EAL (µg/m^3)	SO_2 PC (µg/m^3)	PC as a % of AQS/ EAL
E1	SSSI/ SAC	10	0.04	0.2%
E2	SSSI/ SAC	10	0.07	0.3%
E3	SSSI/ SAC	10	0.12	0.6%
E4	SSSI/ SAC	10	0.07	0.4%
E5	SSSI/ SAC	10	0.02	0.1%
E6	SSSI/ SAC/ SPA	10	0.02	0.1%
E7	SSSI/ SAC/ SPA	10	0.01	0.1%
E8	SSSI/ SAC/ SPA	10	0.01	0.1%
E9	SSSI/ SAC	10	0.01	0.1%
E10	SSSI	10	0.01	0.1%
E11	SSSI	10	0.04	0.2%
E12	SSSI	10	0.01	0.1%
E13	SSSI	10	0.01	<0.1%
E14	SSSI/ SAC	10	0.01	<0.1%
E15	SSSI	10	0.01	<0.1%
E16	SSSI	10	0.01	<0.1%
E17	SSSI	10	0.02	0.1%
E18	SSSI	10	0.03	0.1%
E19	SSSI	10	0.02	0.1%

Rec. ID	Type of Receptor	AQS /EAL (µg/m^3)	SO_2 PC (µg/m^3)	PC as a % of AQS/ EAL
E20	SAC	10	0.02	0.1%
E21	SAC	10	0.01	<0.1%
E22	SAC	10	<0.01	<0.1%
E23	LWS	10	0.08	0.4%
E24	LWS	10	0.09	0.4%
E25	LWS	10	0.02	0.1%
E26	LWS	10	0.04	0.2%
E27	LWS	10	0.03	0.2%
E28	LWS	10	0.04	0.2%
E29	LWS	10	0.04	0.2%
E30	LWS	10	0.07	0.4%

Annual mean ammonia impacts

6.6.32 The predicted maximum annual mean ammonia PC at the discrete receptor points representing the designated nature conservation sites, from the five meteorological years modelled, are shown in **Table 6.35**. The results of the model run show that predicted PCs to atmospheric ammonia concentrations for the 'Proposed Development ' scenario are below the criteria of 1% of the relevant critical level from the Environment Agency and Defra 2016 guidance [57] at the discrete receptors representing SACs, SPAs and SSSIs except E1-E5, E11 and E20. It is noted that the total ammonia concentration exceeded the critical levels at all receptor locations, due to the high background ammonia concentration already exceeding the critical levels.

6.6.33 No exceedance of the Environment Agency threshold of 100% of the relevant critical levels is predicted at the Ancient Woodlands and Local Wildlife Sites.

6.6.34 Therefore, the impact of the Proposed Development on annual ammonia concentrations is considered to be negligible and the effect is considered as not significant, except E1-E5, E11 and E20. The impact of E1-E5, E11 and E20 exceeds the threshold of 'insignificance' as referred in the Defra and Environment Agency guidance and is therefore assessed further in the Habitats Regulation Assessment Screening report (**Volume 4, Technical Appendix 5.3**). A contour plot of the annual mean ammonia concentrations is presented in **Appendix F** of **Volume 4**, **Technical Appendix 6.1.**

[57] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

Table 6.35 Maximum annual mean ammonia concentration at designated nature conservation-sites

Rec. ID	Type of Receptor	Critical level (Cle) (µg/m³)	Ammonia PC (µg/m³)	% of Cle
E1	SSSI/ SAC	1	0.02	2.3%
E2	SSSI/ SAC	1	0.04	4.0%
E3	SSSI/ SAC	1	0.07	7.4%
E4	SSSI/SAC	1	0.04	4.2%
E5	SSSI/ SAC	1	0.01	1.4%
E6	SSSI/SAC/SPA	1	0.01	0.9%
E7	SSSI/SAC/SPA	1	0.01	0.8%
E8	SSSI/SAC/SPA	1	0.01	0.6%
E9	SSSI/ SAC	1	0.01	0.7%
E10	SSSI	3	0.01	0.2%
E11	SSSI	1	0.03	2.7%
E12	Coed Talon Marsh SSSI	1	0.01	0.9%
E13	SSSI	3	<0.01	0.1%
E14	SSSI/SAC	1	<0.01	0.3%
E15	SSSI	1	<0.01	0.4%
E16	SSSI	1	<0.01	0.4%
E17	SSSI	3	0.01	0.4%
E18	SSSI	3	0.02	0.5%
E19	SSSI	3	0.01	0.4%
E20	SAC	1	0.01	1.0%
E21	SAC	1	<0.01	0.4%
E22	SAC	1	<0.01	0.3%
E23	LW S	1	0.05	4.9%
E24	LWS	1	0.05	5.1%
E25	LWS	1	0.01	1.5%
E26	LWS	1	0.02	2.2%
E27	LWS	1	0.02	2.1%
E28	LWS	1	0.02	2.3%
E29	LWS	1	0.02	2.2%

Rec. ID	Type of Receptor	Critical level (Cle) (µg/m³)	Ammonia PC (µg/m³)	% of Cle
E30	LWS	1	0.04	4.3%

Annual mean nitrogen deposition impacts

6.6.35 The predicted maximum PC to nitrogen deposition rates at the discrete receptor points representing the designated nature conservation-sites, from the five meteorological years modelled, are shown in **Table 6.36**.

6.6.36 The results of the model run show that predicted PCs to nitrogen deposition for the 'Proposed Development ' scenario are below the criteria of 1% of the relevant critical level from the Environment Agency and Defra 2016 guidance[58] at the discrete receptors representing SACs, SPAs and SSSIs except E01-E05, E11 and E18-E20.

6.6.37 No exceedance of the Environment Agency threshold of 100% of the relevant critical levels is predicted at the Ancient Woodlands and Local Wildlife Sites.

6.6.38 It is noted that the total nitrogen deposition exceeded the lower critical loads at all receptor locations, due to the high background nitrogen deposition already exceeding the lower critical loads. However, it should be noted that the predicted nitrogen deposition PC, as a percentage of the lower critical load are all well below the 1% Environment Agency and Defra screening criteria, indicating that the PC would have minimal impact on nitrogen deposition at any of the ecosystems assessed.

6.6.39 Therefore, the impact of the Proposed Development on annual mean nitrogen deposition is considered to be negligible and the effect is considered as **not significant**, except E1-E5, E11 and E18-E20 The impact of E1-E5, E11 and E18-E20 exceeds the threshold of 'insignificance' as referred in the Defra and Environment Agency guidance and is therefore assessed further in the Habitats Regulation Assessment Screening report (**Volume 4**, **Technical Appendix 5.3)**.

[58] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

Table 6.36 Nitrogen deposition contribution at designated nature conservation-sites

Rec. ID	Type of Receptor	Lower critical load (Clo) (kg N/ha/yr)	N PC (kg N/ha/yr)	% of Clo
E1	SSSI/ SAC	10	0.205	2.1%
E2	SSSI/ SAC	10	0.364	3.6%
E3	SSSI/ SAC	10	0.677	6.8%
E4	SSSI/ SAC	10	0.383	3.8%
E5	SSSI/ SAC	10	0.125	1.2%
E6	SSSI/ SAC/ SPA	10	0.084	0.8%
E7	SSSI/ SAC/ SPA	10	0.074	0.7%
E8	SSSI/ SAC/ SPA	10	0.059	0.6%
E9	SSSI/ SAC	5	0.040	0.8%
E10	SSSI	10	0.042	0.4%
E11	SSSI	10	0.157	1.6%
E12	SSSI	10	0.050	0.5%
E13	SSSI	10	0.033	0.3%
E14	SSSI/ SAC	10	0.028	0.3%
E15	SSSI	10	0.034	0.3%
E16	SSSI	10	0.023	0.2%
E17	SSSI	10	0.077	0.8%
E18	SSSI	10	0.148	1.5%
E19	SSSI	10	0.103	1.0%
E20	SAC	5	0.058	1.2%
E21	SAC	5	0.021	0.4%

Rec. ID	Type of Receptor	Lower critical load (Clo) (kg N/ha/yr)	N PC (kg N/ha/yr)	% of Clo
E22	SAC	5	0.017	0.3%
E23	LWS	10	0.444	4.4%
E24	LWS	10	0.461	4.6%
E25	LWS	5	0.128	2.6%
E26	LWS	20	0.194	1.0%
E27	LW S	10	0.190	1.9%
E28	LWS	10	0.207	2.1%
E29	LWS	20	0.199	1.0%
E30	LWS	10	0.381	3.8%

Annual mean acid deposition impacts

6.6.40 The predicted maximum PC to acid deposition rates at the discrete receptor points representing the designated nature conservation-sites, from the five meteorological years modelled are shown in **Table 6.37**.

6.6.41 The results of the model run show that predicted PCs to acid deposition for the 'Proposed Development ' scenario are below the criteria of 1% of the relevant critical level from the Environment Agency and Defra 2016 guidance[59] at the discrete receptors representing SACs, SPAs and SSSIs except E02-E04 and E17-E19.

6.6.42 No exceedance of the Environment Agency threshold of 100% of the relevant critical levels is predicted at the Ancient Woodlands and Local Wildlife Sites.

6.6.43 Therefore, the impact of the Proposed Development on annual acid deposition rates is considered to be negligible and the effect is considered as not significant, except for E2-E4 and E17-E19, where the modelled results exceed the threshold of 'insignificance' as referred in the Defra and Environment Agency guidance and is

[59] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit#:~:text=Identify%20the%20receptors%20(people%2C%20animals,and%20can%20be%20screened%20ou

therefore assessed further in the Habitats Regulations Assessment Screening report **(Volume 4**, **Technical Appendix 5.3)**.

Table 6.37 Acid deposition contribution at designated nature conservation-sites

Rec. ID	Type of Receptor	Maximum critical load (clo) (nitrogen) (keq/ha/yr)	PC (keq/ha/yr)	% of Clo
E1	SSSI/ SAC	2.999	0.027	0.9%
E2	SSSI/ SAC	2.999	0.048	1.6%
E3	SSSI/ SAC	2.999	0.090	3.0%
E4	SSSI/ SAC	1.834	0.051	2.8%
E5	SSSI/ SAC	2.999	0.017	0.6%
E6	SSSI/ SAC/ SPA	3.940	0.011	0.3%
E7	SSSI/ SAC/ SPA	3.940	0.010	0.3%
E8	SSSI/ SAC/ SPA	3.940	0.008	0.2%
E9	SSSI/ SAC	4.972	0.005	0.1%
E10	SSSI	4.972	0.005	0.1%
E11	SSSI	5.071	0.018	0.4%
E12	SSSI	4.856	0.006	0.1%

Rec. ID	Type of Receptor	Maximum critical load (clo) (nitrogen) (keq/ha/yr)	PC (keq/ha/yr)	% of Clo
E13	SSSI	6.097	0.004	0.1%
E14	SSSI/ SAC	6.093	0.004	0.1%
E15	SSSI	6.240	0.005	0.1%
E16	SSSI	4.856	0.003	0.1%
E17	SSSI	0.595	0.009	1.5%
E18	SSSI	1.280	0.020	1.5%
E19	SSSI	1.165	0.014	1.2%
E20	SAC	5.071	0.007	0.1%
E21	SAC	1.367	0.002	0.2%
E22	SAC	1.367	0.002	0.1%
E23	LWS	3.000	0.059	2.0%
E24	LWS	2.989	0.061	2.0%
E25	LWS		Not sensitive to acidity	
E26	LWS	2.989	0.026	0.9%
E27	LWS	1.785	0.025	1.4%
E28	LWS	2.994	0.028	0.9%

Rec. ID	Type of Receptor	Maximum critical load (clo) (nitrogen) (keq/ha/yr)	PC (keq/ha/yr)	% of Clo
E29	LWS	2.994	0.027	0.9%
E30	LWS	2.994	0.050	1.7%

Exhaust Emissions from Plant and Vehicles

6.6.44 Based on the traffic data presented in **Volume 2, Chapter 11: Traffic and Transport**, for the operation phase, this will not exceed 500 AADT for LGVs or 100 AADT for HGVs. This is therefore below the EPUK-IAQM screening criteria for a development outside an AQMA. Therefore, none of the screening criteria in the IAQM is triggered, and further assessment is not required. Based on the above, it is considered unlikely that the operational traffic for the Proposed Development will have a significant impact on local air quality, and further assessment of the operational phase traffic is not considered to be required.

Cumulative Effects

6.6.45 An assessment of the cumulative effects of air quality is presented in **Volume 2, Chapter 15: Cumulative Effects**.

Operational Phase Summary

6.6.46 **Table 6.38** presents a summary of the likely effects of the Proposed Development, additional mitigation and residual effects during operation stage.

Table 6.38 Assessment of potential effects, additional mitigation, residual effects and monitoring during operation

Receptor	Potential Effects/Additional (Secondary and Tertiary) Mitigation/Residual Effects and Monitoring	
Human Receptor (human health)	Potential effects	Increase in pollutant concentrations as a result of stack emissions from the Proposed Development.
	Additional (secondary and tertiary) mitigation	N/A
	Residual effects and monitoring	The sensitivity of human receptor is high, and the magnitude of change, following additional mitigation, is negligible. Therefore, there is likely to be a direct, long-term and negligible residual effect on human receptor, which is considered to be **not significant**.
Ecological receptors (E01-E05, E11 and E18-E20)	Potential effects	Increase in pollutant concentrations as a result of stack exhaust emissions.
	Additional (secondary and tertiary) mitigation	It is suggested that ammonia emissions and NO_x are monitored continuously in accordance with relevant standards. This will allow for further mitigation and abatement to be applied should the emitted levels exceed that predicted by this assessment.
	Residual effects and monitoring	The sensitivity of ecological receptor is high, and the magnitude of change, following additional mitigation, is negligible. Therefore, there is likely to be a direct, long-term and negligible residual effect on ecological receptor, which is considered to be **not significant.** Further assessment of the effects of the development on the designated sites specifically is provided in the Habitats Regulation Assessment Screening report (**Volume 4**, **Technical Appendix 5.3)**.

Receptor	Potential Effects/Additional (Secondary and Tertiary) Mitigation/Residual Effects and Monitoring	
Ecological receptors (E06-E10, E12-E17 and E21-E30)	Potential effects	Increase in pollutant concentrations as a result of stack emissions.
	Additional (secondary and tertiary) mitigation	N/A
	Residual effects and monitoring	The sensitivity of ecological receptor is low to high, and the magnitude of change, following additional mitigation, is negligible. Therefore, there is likely to be a direct, long-term and negligible residual effect on ecological receptor, which is considered to be **not significant**

Decommissioning phase

6.6.47 As discussed in the introductory sections of the draft Environmental Statement, decommissioning is not envisaged and the Carbon Capture Plant is expected to operate for as long as the existing operational cement works. However as required by the scoping direction, brief consideration of decommissioning effects is provided in the event that decommissioning on an earlier timescale were to be required.

6.6.48 The majority of the effects associated with decommissioning would be similar to, but reduced, in comparison with construction period effects. There would be fewer materials, plant, labour and vehicles required during decommissioning when compared to construction. Decommissioning would take place over a shorter duration, and activities would be focused on areas of the site which at that point would already be developed. Consequently, the magnitude and significance of effects associated with decommissioning would not exceed those assessed elsewhere in this chapter in respect of construction. It is therefore not considered necessary to provide further assessment of decommissioning related effects.

6.6.49 Decommissioning, if required, would be conducted in accordance with the regulatory and policy environment in place at the time with all required permits and consents being obtained prior to commencement.

6.7 Difficulties and uncertainties

6.7.1 Estimated background data from the Defra LAQM website and the APIS website were used in the assessment. It is assumed that these background concentrations are likely to be applicable for the lifetime of the Proposed Development

6.7.2 There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at the Hawarden weather station for 2018 to 2022 were representative of wind conditions at and around the Site and will continue to be so for the duration of the Proposed Development. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution in order to simplify the real-world dilution and dispersion conditions.

6.7.3 There is an element of uncertainty in all measured and modelled data. All values presented in this report are considered reasonable estimates. Where estimations in emissions are made, these are overestimated and hence the impacts on local air quality reported are considered to be conservative in nature. Emissions have been assessed at the proposed emission limit values operating for 8760 hours per year actual emissions will be lower, in some cases significantly so, than the proposed ELV and over less operational hours. Also, the emissions of existing cement works are included in both the baseline and project contribution and this leads to a conservative assessment.

6.7.4 Where information is not yet known, a conservative approach has been adopted and professional judgement has been used based on the scale of the Proposed Development and experience of working on similar schemes.

6.8 Assessment summary

6.8.1 **Table 6.39** provides a summary of the findings of the assessment.

Table 6.39 Summary of Air Quality effects

Receptor	Potential Effects	Additional (Secondary and Tertiary) Mitigation	Residual Effects	Monitoring
Construction Phase				
Human receptors impacted by dust and particulate matter emissions resulting from the Site activities (demolition, earthworks, construction and trackout)	Generation and re-suspension of dust and particulate matter	Dust control measures incorporated into a detailed CEMP (secured by planning condition).	The effect of dust and particulate matter emissions and exhaust emissions from construction equipment and machinery during the construction phase is likely to be not significant, provided that dust controls, site management and dust mitigation measures are applied. **Negligible** **T / D / ST**	N/A.
Operational Phase				
Human receptors	Increase in pollutant concentrations as a result of stack emissions.	N/A.	**Negligible** **P / D & I / ST**	N/A.
Ecological receptors (E1-E5, E11 and E18-E20)	Increase in pollutant concentrations as a result of stack emissions	It is suggested that the measures are included in the CEMP, including ammonia emissions are monitored continuously	The sensitivity of ecological receptor is high, and the magnitude of change, following additional mitigation, is negligible. Therefore, there is likely to be a direct, long-term and negligible residual effect on	Continuously monitoring for NO_x and ammonia emission

Receptor	Potential Effects	Additional (Secondary and Tertiary) Mitigation	Residual Effects	Monitoring
		in accordance with relevant standards.	ecological receptor, which is considered to be **not significant**	
Ecological receptors (E6-E10, E12-E17 and E21-E30)	Increase in pollutant concentrations as a result of stack emissions	N/A.	Negligible P / D & I / ST	N/A..

Key to table:

P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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