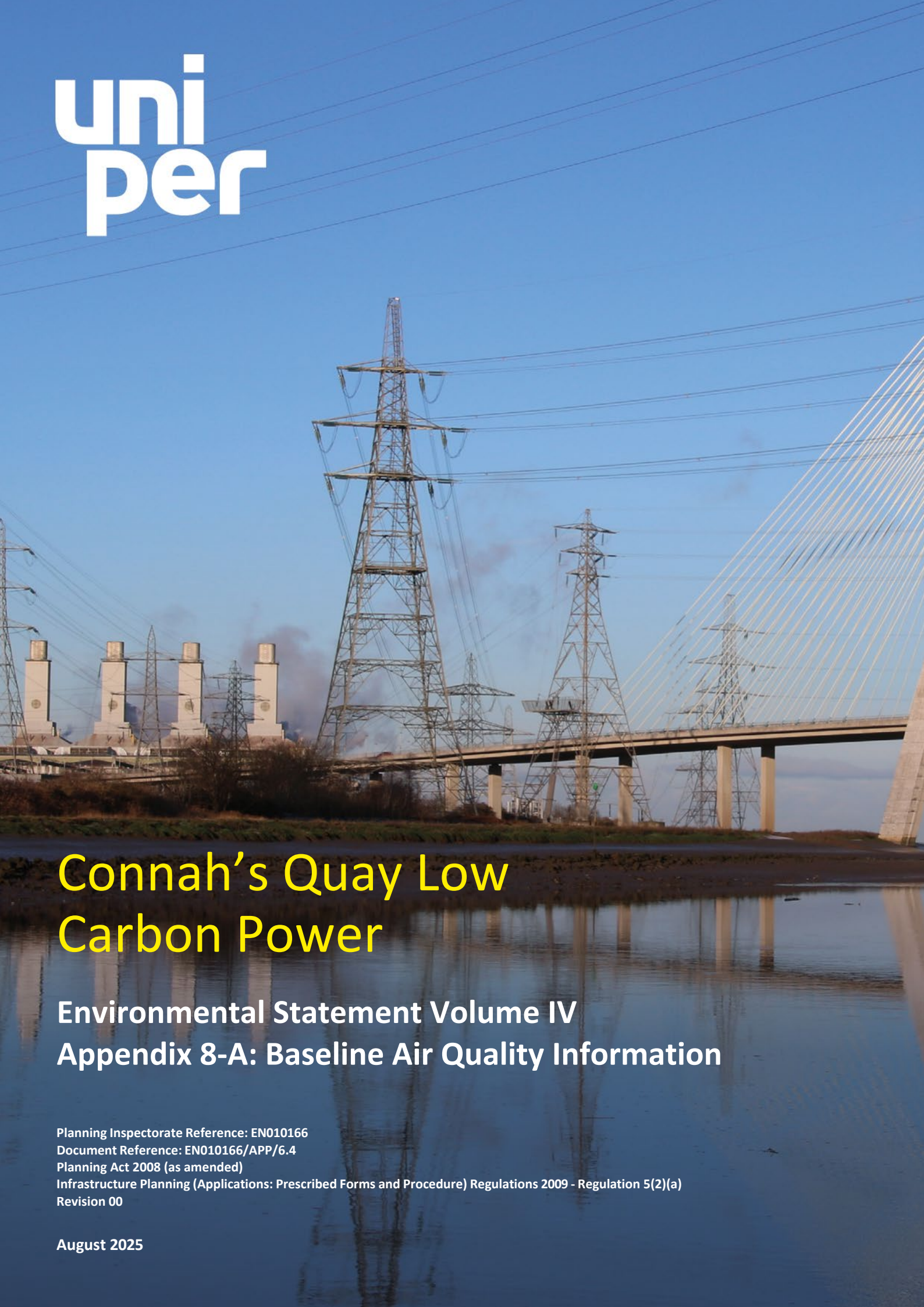

Connah's Quay Low Carbon Power

Environmental Statement Volume IV
Appendix 8-A: Baseline Air Quality Information

Planning Inspectorate Reference: EN010166
Document Reference: EN010166/APP/6.4
Planning Act 2008 (as amended)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)
Revision 00

August 2025

Prepared for:
Uniper UK Limited

Prepared by:
AECOM Limited

Table of Contents

1. Baseline Air Quality Information 1
1.1 Introduction 1
1.2 Baseline Nitrogen Dioxide Survey 1
1.3 Published Air Quality Data 4
References 18

Tables

Table 1: Air Quality Monitoring Locations 2
Table 2: Diffusion Tube Visits 3
Table 3: Bias Adjusted and Annualised Diffusion Tube Survey Monitoring Results (NO_2) 4
Table 4: Defra Background Concentrations at Human Health Receptors 5
Table 5: Apis Background Concentrations at Sensitive Ecological Receptors (for air quality assessment of operational emissions) 7
Table 6: Apis Background Concentrations at Sensitive Ecological Receptors (for air quality assessment of traffic emissions) 11
Table 7: Measured Concentrations at Nearby Monitoring Locations 14

1. Baseline Air Quality Information

1.1 Introduction

1.1.1 This appendix supports **Chapter 8: Air Quality** (**EN010166/APP/6.2.8**) and describes the baseline air quality information used in the assessment.

1.2 Baseline Nitrogen Dioxide Survey

Baseline Air Quality Survey Study Area

1.2.1 Uniper UK Limited (hereafter referred to as the Applicant) have commissioned AECOM to conduct an air quality survey to establish baseline air quality in the Connah's Quay area in connection with the proposed construction, operation and maintenance of the Connah's Quay Combined Cycle Gas Turbine (CCGT) fitted with Carbon Capture Plant (CCP) (hereafter referred to as the Proposed Development). This section details the survey that was undertaken, as well as the results of the survey.

1.2.2 Nitrogen dioxide (NO_2) has been measured as oxides of nitrogen (NOx) as it would be a regulated emission species from the Proposed Development and it is the pollutant with the biggest spatial variation within the area, hence the need for several measurement locations. This spatial distribution is due to emissions from vehicles using local roads and other combustion sources (industrial and domestic). Although other pollutants, such as Sulphur Dioxide (SO_2), Carbon Monoxide (CO), benzene and 1,3-butadiene, are present in motor vehicle exhaust emissions, detailed consideration of baseline concentrations of these substances and their associated impacts on local air quality is not considered relevant here. This is because the release concentrations of these pollutants from construction, operation and decommissioning of the Proposed Development are anticipated to be low enough so as to not be likely to give rise to significant effects. In addition, no areas within the local administrative boundaries are considered to be at risk of exceeding the relevant objectives for these pollutants, and the risks to achievement of the relevant air quality objectives in the area are considered negligible. There are no Air Quality Management Areas (AQMAs) designated within the administrative boundary of Flintshire County Council (FCC) or the adjoining Welsh local authority areas of Denbighshire and Wrexham, as well as in the Wirral. The nearest AQMAs are located within Cheshire West and Chester Council, one in Chester approximately 12 km east from the Main Development Area and two in Ellesmere Port, approximately 13 km and 15 km north-east from the Main Development Area.

1.2.3 The survey study area included areas which may be affected by increased road traffic movements or emissions from sources on site associated with the Proposed Development within a 15 km radius from the Main Development Area, with a focus up to 2 km from that area.

1.2.4 The locations chosen were intended to be representative of the range of NO_2 concentrations which may be experienced in the vicinity of the Proposed Development, including:

- roadside locations affected by traffic emissions;
- residential areas near to major traffic routes; and
- background locations situated away from major sources of air pollution.

1.2.5 The monitoring locations are presented in **Figure 8-1: Construction Phase Assessment – Air Quality Study Area and Baseline Monitoring Locations** (**EN010166/APP/6.3**) and more details on the study area are included in **Chapter 8: Air Quality** (**EN010166/APP/6.2.8**).

Annualisation Methodology

1.2.6 The primary pollutant of concern related to road traffic emissions is NO_2. In order to establish baseline concentrations of NO_2, a 12-week passive diffusion tube survey was undertaken to measure the concentrations of NO_2 within the vicinity of the Main Development Area.

1.2.7 Diffusion tubes were deployed at 10 locations, attached on street columns (mostly lampposts), high enough to be out of the sight line of the general public. The sites were chosen as they cover the study area described in paragraph 1.2.4 and provide a good overview of the baseline air quality.

1.2.8 The locations of the monitoring sites (DT1-DT10) are detailed in **Table 1**, and presented on **Figure 8-1: Construction Phase Assessment - Air Quality Study Area and Baseline Monitoring Locations** (**EN010166/APP/6.3**).

1.2.9 The 12-week survey period was split into three periods, in order to obtain a mean concentration of NO_2 across the entire survey period. **Table 2** shows the exposure dates for the survey period.

Table 1: Air Quality Monitoring Locations

ID	X	Y	Height (m)
DT1	327119	371220	1.8
DT2	327779	370830	2
DT3	327986	370643	2.1
DT4	327403	371099	2.2
DT5	328292	370258	2.1
DT6	328728	370172	2.3
DT7	324963	371660	2.2
DT8	325688	371573	1.8
DT9*	328176	369287	2

ID	X	Y	Height (m)
DT9b*	328180	369121	2.1
DT10	328217	368732	2.25

*DT9 was moved to DT9b for Period 2 and 3 due to its proximity to the presence of construction activities making it an unsuitable location to gain baseline data.

Table 2: Diffusion Tube Visits

Period Number	Date Installed	Date Removed
1	09/02/2024	11/03/2024
2	11/03/2024	09/04/2024
3	09/04/2024	07/05/2024

1.2.10 The diffusion tubes were supplied and analysed by Gradko International Ltd (Gradko), using a 20% triethanolamine (TEA) in water method. Gradko participates in the AIR Proficiency Testing (PT) scheme for diffusion tubes, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL) which provides a Quality Assurance/Quality Control framework.

1.2.11 The data obtained during the survey has been bias adjusted and annualised to calculate an annual mean concentration for 2023 using the methodologies presented in LAQM.TG (22) (Ref 1).

1.2.12 Annualisation is a process which enables the average concentration measured during the survey period to be corrected for seasonal bias, allowing a direct comparison with the annual mean objective for NO_2 to be made.

1.2.13 The bias adjustment factor was obtained from the latest Defra National Bias Adjustment Factor Spreadsheet (Ref 2). A bias adjustment factor of 0.81 was applied to the 2023 annualised concentrations.

Baseline Survey Results and Discussion

1.2.14 Data capture rates for the survey were high, achieving an overall 100% in periods 1 - 3.

1.2.15 The annualised and bias adjusted results are presented in **Table 3** below.

1.2.16 There were no exceedances of the annual mean NO_2 objective of 40 $\mu g/m^3$. The highest recorded adjusted annual mean was 26.06 $\mu g/m^3$ at DT1.

1.2.17 Measured concentrations were well below the NO_2 annual mean objective of 40 $\mu g/m^3$, with some elevated concentrations in close proximity to major traffic routes. Overall, air quality within the study area can be considered to be of a standard that would not represent a constraint on future development.

1.2.18 The data presented in this report has been used both to give an indication of the local air quality prior in the absence of the Proposed Development, and to verify the performance of road traffic air quality modelling against measured concentrations.

Table 3: Bias Adjusted and Annualised Diffusion Tube Survey Monitoring Results (NO_2)

ID	Period 1 Raw Concentration (µg/m^3)	Period 2 Raw Concentration (µg/m^3)	Period 3 Raw Concentration (µg/m^3)	Raw Period Mean Concentration (µg/m^3)	Annualised Mean Concentration (µg/m^3)	Annualised and Bias Adjusted Concentration (µg/m^3)
DT1	31.8	33.9	28.7	31.5	32.9	26.6
DT2	26.7	22.3	19.1	22.7	23.7	19.2
DT3	19.4	13.0	13.0	15.1	15.8	12.8
DT4	17.1	13.6	9.3	13.3	13.9	11.3
DT5	18.0	11.6	7.9	12.5	13.1	10.6
DT6	23.0	17.8	14.2	18.3	19.2	15.5
DT7	9.5	6.1	5.1	6.9	7.2	5.8
DT8	9.8	6.5	6.7	7.6	8.0	6.5
DT9	10.5	6.4	5.0	7.3	7.6	6.2
DT10	21.5	14.6	16.6	17.6	18.3	14.9

1.3 Published Air Quality Data

Defra and APIS Background Maps

1.3.1 Defra's background maps (Ref 3) predict concentrations of pollutants relevant to human health such as NO_2, particulate matter smaller than 10 (PM_{10}) and 2.5 micrometers ($PM_{2.5}$) over the UK as a 1 km x 1 km grid. APIS's background maps (Ref 4) predict concentrations of pollutants relevant to ecological receptors over the same area, as a 1 km x 1 km or 5 km x 5 km grid depending on the pollutant.

1.3.2 Predictions relevant to each receptor for 2023 are presented in **Table 4** to **Table 6** below and on **Figure 8-1** and **8-2**.

Table 4: Defra Background Concentrations at Human Health Receptors

Receptor ID	OS Grid Coordinates		Background Concentrations	
	X	Y	NO_2 (µg/m^3)	CO (mg/m^3)
R1	327170	371241	6.5	0.301
R2	327152	371210	6.5	0.301
R3	326749	371070	7.8	0.253
R4	327557	370826	6.2	0.253
R5	327880	370743	6.2	0.252
R6	327972	370700	6.2	0.252
R7	328024	370545	7.3	0.252
R8	326371	371298	7.8	0.252
R9	326452	370953	5.4	0.253
R10	326048	371070	7.8	0.258
R11	325943	371334	5.7	0.256
R12	325928	371585	5.7	0.256
R13	325967	371792	5.7	0.256
R14	325966	371823	5.7	0.261
R15	328454	370344	7.3	0.261
R16	328381	370167	7.3	0.267
R17	328213	370061	7.3	0.249
R18	328026	370163	7.3	0.25

Receptor ID	OS Grid Coordinates		Background Concentrations	
	X	Y	NO_2 (µg/m^3)	CO (mg/m^3)
R19	327314	369848	5.6	0.276
R20	326567	369690	5.2	0.276
R21	328609	369883	7.0	0.25
R22	328824	370107	7.3	0.276
R23	328830	370114	7.3	0.261
R24	329067	369895	7.8	0.261
R25	328941	369539	7.0	0.267
R26	328634	369331	7.0	0.276
R27	325516	372175	6.1	0.276
R28	324919	372091	6.9	0.276
R29	324990	372645	6.9	0.295
R30	324385	371941	5.6	0.25
R31	324516	372532	6.9	0.249
R32	324546	373323	7.1	0.249
R33	324186	370145	5.1	0.25
R34	329678	369534	7.8	0.261
R35	329955	369652	7.8	0.261
R36	329953	369351	7.8	0.257
R37	329600	369081	7.8	0.261

Receptor ID	OS Grid Coordinates		Background Concentrations	
	X	Y	NO_2 (µg/m^3)	CO (mg/m^3)
R38	329128	368936	7.0	0.267
R39	328165	368716	6.8	0.287
R40	330375	368913	8.1	0.298
R41	330528	367801	8.7	0.295
R42	332295	369161	8.2	0.251
R43	331087	366723	7.5	0.301
R44	331149	373884	6.9	0.274

Table 5: Apis Background Concentrations at Sensitive Ecological Receptors (for air quality assessment of operational emissions)

Ecological Site	Designation	Receptors	Background Concentrations (µg/m^3)		Background Deposition	
			NH_3	NO_x	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
Heswall Dales	Site of Special Scientific Interest (SSSI)	OE01	2.1	9.1	15.0	1.23
Dee Estuary	Ramsar, Special Area	OE02	2.6	12.7	16.3	1.42

Ecological Site	Designation	Receptors	Background Concentrations (µg/m^3)		Background Deposition	
			NH_3	NO_x	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
	of Conservation (SAC), Special Protection Area (SPA) and SSSI					
The Dungeon	SSSI	OE03	Not sensitive – Geological feature			
Thurston Common	SSSI	OE04	2.0	7.3	14.1	1.14
Dibbinsdale	SSSI	OE05	2.5	12.2	29.2	2.33
Mersey Estuary	Ramsar, SPA, SSSI	OE06	2.6	21.0	17.3	1.08
New Ferry	SSSI	OE07	2.3	20.1	16.0	NA
Hallwood Farm Marl Pit	SSSI	OE08	2.7	10.0	17.2	NA
Inner Marsh Farm	SSSI	OE09	2.5	10.0	16.2	NA

Ecological Site	Designation	Receptors	Background Concentrations ($\mu g/m^3$)		Background Deposition	
			NH_3	NO_x	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
River Dee and Bala Lake	SAC, SSSI	OE10	2.4	8.8	16.2	NA
Connah's Quay Ponds and Woodland	SSSI	OE11	2.5	9.8	17.2	NA
Maes y Grug	SSSI	OE12	2.4	7.4	17.5	NA
Deeside and Buckley Newt sites	SAC, SSSI	OE13	2.7	11.5	18.2	NA
Coed Talon Marsh	SSSI	OE14	2.1	5.9	29.8	2.35
Bryn Alyn	SSSI	OE15	1.6	4.6	17.0	1.37
Cambrian Quarry	SSSI	OE16	1.9	5.7	28.7	2.25
Alyn Valley Woods and Alyn Gorge Caves	SAC, SSSI	OE17	1.9	4.9	28.5	NA

Ecological Site	Designation	Receptors	Background Concentrations (µg/m^3)		Background Deposition	
			NH_3	NO_x	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
Halkyn Mountain	SAC. SSSI	OE18 f	2.2	7.3	15.8	1.35
Pen-y-Cefn Pasture	SSSI	OE19f	1.8	4.7	16.7	1.35
Cefn Meadow	SSSI	OE20	1.8	4.7	16.7	1.35
Coed Trefraith	SSSI	OE21	2.0	4.5	28.5	2.23
Ddol Uchaf	SSSI	OE22	Not sensitive – Geological feature			
Caerwys Tufa	SSSI	OE23	Not sensitive – Geological feature			
Tyddyn-y-barcut	SSSI	OE24	1.9	5.2	16.6	NA
Parc Bodlondeb and Gwenallt-parc	SSSI	OE25	1.9	4.8	16.6	1.34
Parc Linden, Lixwm	SSSI	OE26	2.0	5.1	16.6	1.34

Ecological Site	Designation	Receptors	Background Concentrations (µg/m^3)		Background Deposition	
			NH_3	NO_x	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
Flint Mountain	SSSI	OE27	2.1	7.8	28.1	2.29
Herward Smithy	SSSI	OE28	2.1	7.2	16.3	1.3
Shotton Lagoons and Reedbeds	SSSI	OE29	2.5	10.8	16.4	1.02
Local Ancient Woodlands	Ancient Woodland	OE30	2.7	10.0	31.1	2.47

Table 6: Apis Background Concentrations at Sensitive Ecological Receptors (for air quality assessment of traffic emissions)

Receptor ID	Closest Coordinate to the Road		Site	Background NOx Concentrations (µg/m^3)	Background NO_x Deposition (kgN/ha/yr)
	X	Y			
TE1	326251.9	371462.8	Ancient Woodland	10.3	28.2
TE2	325213.5	370708.6	Ancient Woodland	7.2	28.7
TE3	327512.8	369146.2	Ancient Woodland	7.9	29.5
TE4	327120.5	369346.4	Ancient Woodland	7.9	29.5

Receptor ID	Closest Coordinate to the Road		Site	Background NOx Concentrations (µg/m^3)	Background NO_x Deposition (kgN/ha/yr)
	X	Y			
TE5	327330.0	370020.6	Ancient Woodland	8.6	28.9
TE6	327368.2	370073.8	Ancient Woodland	8.6	28.9
TE7a	328085.7	368703.8	Connah's Quay Ponds and Woodland SSSI	9.8	30.6
TE7b	328423.4	368613.1	Connah's Quay Ponds and Woodland SSSI	9.8	30.6
TE7c	328894.3	368708.5	Connah's Quay Ponds and Woodland SSSI	9.8	30.6
TE8a	326300.4	371751.3	Dee Estuary SAC	10.3	16.0
TE8b	328631.1	370781.3	Dee Estuary SAC	10.6	28.8
TE8c	329122.7	370046.0	Dee Estuary SAC	14.2	16.8

Local Authority data

1.3.3 Flintshire County Council (FCC) conducts local air quality measurements for NO_2 using diffusion tubes at 59 sites (in 2023), according to the local air quality progress report (Ref 5). At all locations where air quality measurement is conducted, all concentrations are well below the NO_2 annual mean objective of 40 µg/m^3.

1.3.4 Measurement concentrations at FCC's monitoring locations within the study area are displayed below in **Table 7** and shown in the local air quality progress report (Ref 5).

Table 7: Measured Concentrations at Nearby Monitoring Locations

Receptor ID	OS Grid Coordinates		Type	NO_2 Concentrations (µg/m^3)				
	X	Y		2019	2020	2021	2022	2023
ADDC-008	330792	367434	Kerbside	24.3	14.4	14.9	26.6	25.3
ADDC-009	329830	366682	Roadside	17.5	13.4	13.6	13.9	14
ADDC-085	330718	367350	Kerbside	25.2	19.1	20.4	20.7	18.3
ADDC-111	330614	366195	Kerbside	16	10.7	11.9	12.5	11.9
ADDC-105	330986	356538	Roadside	10.8	12.2	11.9		11.9
ADDC-013	327307	369856	Rural	10.5	6.7	8.6	9.5	8.5
ADDC-014	327187	371243	Kerbside	14.8	11	10.5	11.3	11.5
ADDC-015	328032	370647	Urban Background	12.3	9.7	10.1	10	10.2
ADDC-106	320126	372346	Roadside	12.5	9.6	9.7	9.4	10
ADDC-107	323500	363397	Roadside	-	7.8	8.2	7.7	8.1
ADDC-084	326643	365550	Kerbside	28.2	23.6	23.2	21.8	23.1
ADDC-064	331648	365730	Kerbside	-	-	23.2	23.9	24.1
ADDC-098	331648	365730	Kerbside	28.2	23.6	23.2	23.6	24.7
ADDC-117	332500	367357	Kerbside	32.5	10	11.1	10.3	11
ADDC-099	330727	367354	Kerbside	13.9	17.7	19	18.5	21.6
ADDC-023	331663	368028	Urban Background	27.8	18.6	20.1	19.3	19.8

Receptor ID	OS Grid Coordinates		Type	NO_2 Concentrations (µg/m^3)				
	X	Y		2019	2020	2021	2022	2023
ADDC-024	330599	368922	Kerbside	24.3	17.6	20.5	20.1	18
ADDC-118	336904	364852	Kerbside	23.6	10.7	11.2	13.1	11.3
ADDC-080	323864	370368	Kerbside	13.6	13.4	14.5	14	14.3
ADDC-066	318669	378290	Kerbside	19.3	17.7	17.3	16.6	17.9
ADDC-116	332535	368907	Kerbside	22.1	14.6	14.7	15.5	15.2
ADDC-068	318766	375758	Kerbside	19.1	14.3	12.3	12.5	17.9
ADDC-069	318735	376611	Kerbside	17.2	17.7	18.5	17.2	16
ADDC-070	331806	368271	Kerbside	24.3	14.4	14.9	26	16.6
ADDC-081	324281	364926	Kerbside	31.8	11	11.1	19.2	19.2
ADDC-119	330705	358429	Kerbside	16.6	12.9	14	10.6	8.9
ADDC-114	318851	375592	Kerbside	14.4	14.1	14.7	14.3	14
ADDC-052	333731	369079	Kerbside	17.1	11.5	11.4	13.4	9.8
ADDC-115	314615	378238	Kerbside	18.3	20.1	18.5	11.6	5.9
ADDC-112	324838	372198	Kerbside	16.6	14.3	15.9	18.3	9.2
ADDC-113	324357	372008	Kerbside	24.3	-	15.8	16.6	7.6
ADDC-091	325961	371822	Kerbside	20.3	15.8	19	14	19.3
ADDC-108	323975	363794	Kerbside	16.4	16.7	16.5	17.1	7.1
ADDC-110	329284	366504	Kerbside	24.4	14	13.4	16.7	13.6
ADDC-100	326643	365550	Kerbside	21.2	17.4	17.6	15	22.4

Receptor ID	OS Grid Coordinates		Type	NO_2 Concentrations (µg/m^3)				
	X	Y		2019	2020	2021	2022	2023
ADDC-060	338283	365032	Kerbside	17.6	18.7	16.3	17.3	13.2
ADDC-061	334739	363340	Kerbside	20.8	8.4	9.6	17.3	12.7
ADDC-121	330898	357996	Kerbside	24.8	11.8	13.5	8.5	12.8
ADDC-101	330792	367434	Kerbside	11.7	10.8	10.5	14	24.8
ADDC-109	327843	363856	Kerbside	16.7	7.2	7	10.3	9.1
ADDC-075	327849	364146	Kerbside	13.4	9.2	9.4	5.9	17.7
ADDC-102	335594	369179	Kerbside	8.8	8.8	9.3	10	8.2
ADDC-103	337632	366682	Kerbside	11.9	18.2	18.6	10.8	7.8
ADDC-104	332558	368750	Kerbside	11.2	7.8	8.2	18.2	16.1
ADDC-089	324375	365007	Kerbside	21.8	13.8	13.5	7.5	30.4
ADDC-122	324530	363839	Roadside	10	21.4	23.3	12.4	20
ADDC-123	324562	363840	Roadside	17.8	15.3	14.9	21.2	18.3

Automatic Urban and Rural Network (AURN)

1.3.5 The AURN is the UK's largest automatic monitoring network and is run by the Department for Environment, Food & Rural Affairs (Defra). It includes automatic air quality monitoring stations measuring NOx and ozone (O_3), amongst others, at rural, urban or industrial sites around the UK. Hourly information from the Wirral Tranmere background site, located approximately 16 km north-east of the Main Development Area, has been used in this assessment as the closest representative background site to the Main Development Area, which includes co-located monitoring of both NOx and O_3.

1.3.6 Hourly values for NO, NO_2 and O_3 for the 5 meteorological years used in the model are required when using the Atmospheric Dispersion Modelling System (ADMS) chemistry module. However, any gap of more than 24 hours in the AURN dataset needs to be filled prior to the model runs. Although most of the data was available, some gaps had to be filled. For this, the hourly average for each hour of the day was calculated for each year (i.e. the average concentration at 1:00, the average concentrations at 2:00, etc) to account for daily concentration variability, and each missing hour was replaced with the relevant average.

References

Ref 1. Department for Environment, Food and Rural Affairs, "Local Air Quality Management Technical Guidance LAQM.TG(22)," 2022. Available at: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf (Accessed 03/06/2025).

Ref 2. Department for Environment, Food and Rural Affairs, "National Bias Adjustment Factors", 2023. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/national-bias/ (Accessed 03/06/2025).

Ref 3. Department for Environment, Food and Rural Affairs, 2024; Background Mapping data for local authorities – 2021. Available at: Background Mapping data for local authorities - 2021 - Defra, UK (Accessed 03/06/2025).

Ref 4. Centre for Ecology and Hydrology and APIS (2017). Air Pollution Information System.

Ref 5. Flintshire County Council and others (2024); North Wales Authorities Collaborative Project 2023 Air Quality Progress Report. Available at: NW Authorities Collaborative Project 2024 Air Quality Progress Report (Accessed 03/06/2025).