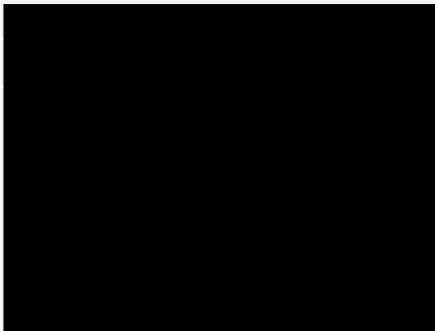


Air Quality Assessment for the proposed development at 35 Wilson Road, Huyton

**Report to Linden Hill-Capital
Assets-ALX Limited**

May 2022

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1 Introduction

Aether has been commissioned by Linden Hill-Capital Assets-ALX Limited to undertake an air quality assessment for the proposed development at 35 Wilson Road, Huyton. The development will consist of the construction of at least one industrial unit for use class E (commercial, business, and service use). It is not yet known how many car parking spaces will be provided with the development, but it is likely to be between 180 and 200 including trailer spaces.

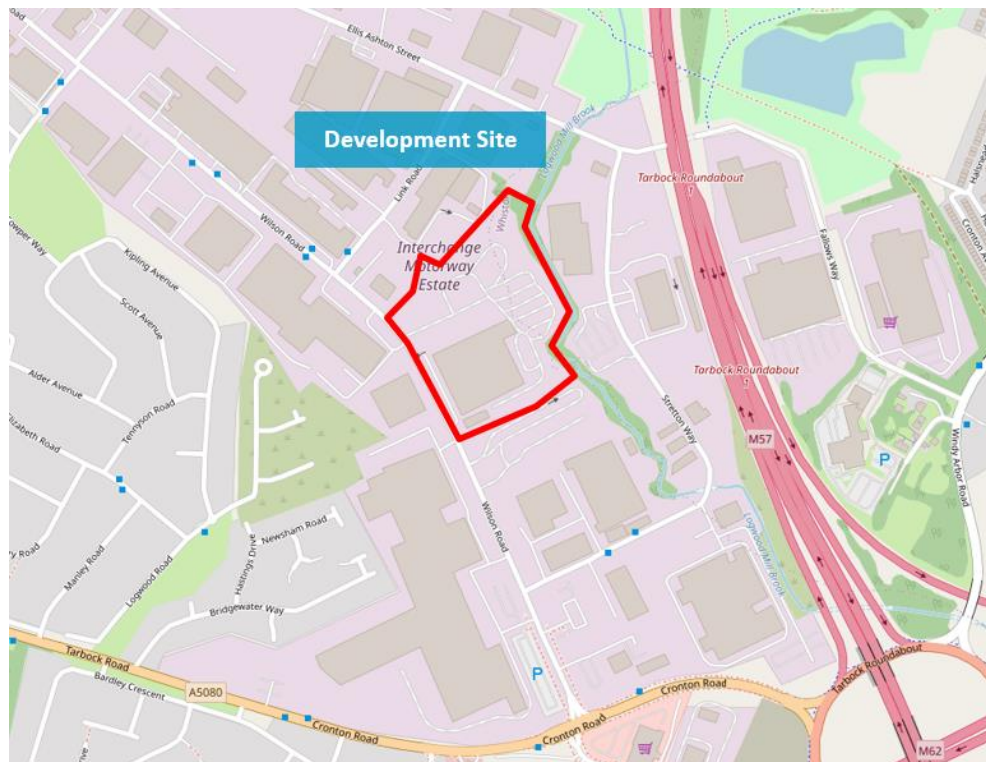
The development falls within Knowsley Metropolitan Borough Council. It is important to assess whether there will be an exceedance of the air quality objectives for particulate matter (PM₁₀) or nitrogen dioxide (NO₂) at local existing sensitive receptors, such as residential dwellings, as a result of increased traffic due to the proposed development. If an exceedance occurs, it is important to then advise whether any action is required to reduce the residents' exposure to air pollution. The assessment utilises ADMS-Roads, a comprehensive dispersion modelling tool for investigating air pollution problems due to small networks of roads and industrial sources.

The expected completion date of the proposed development is 2023. The assessment has therefore been completed for 2024, the expected first full year the proposed development will be utilised.

1.1 The Location of the Development

The proposed development is located on Wilson Road at the site of an existing industrial unit used for a shipping service. Wilson Road is a minor road, with the boundary of the proposed development just under 200 m from the M57 at point of closest proximity (**Figure 1**).

Figure 1: Location of the development site



1.2 Assessment Criteria

A summary of the air quality objectives relevant to the Huyton development, as set out in the UK Air Quality Strategy¹, is presented in **Table 1** below.

Table 1: UK Air Quality Objectives for NO₂ and PM₁₀

Pollutant	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	40 µg/m ³	Annual mean
	200 µg/m ³	Hourly mean not to be exceeded more than 18 times per year (99.8th percentile)
Particulate Matter (PM ₁₀)	40 µg/m ³	Annual mean
	50 µg/m ³	24 hour mean not to be exceeded more than 35 times a year (90.4th percentile)

The oxides of nitrogen (NO_x) comprise principally of nitric oxide (NO) and nitrogen dioxide (NO₂). NO₂ is a reddish brown gas (at sufficiently high concentrations) and occurs as a result of the oxidation of NO, which in turn originates from the combination of atmospheric nitrogen and oxygen during combustion processes. NO₂ can also form in the atmosphere due to a chemical reaction between NO and ozone (O₃). Health based standards for NO_x generally relate to NO₂, where acute and long-term exposure may adversely affect the respiratory system.

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update.pdf

Particulate matter is a term used to describe all suspended solid matter, sometimes referred to as Total Suspended Particulate matter (TSP). Sources of particles in the air include road transport, power stations, quarrying, mining and agriculture. Chemical processes in the atmosphere can also lead to the formation of particles. Particulate matter with an aerodynamic diameter of less than 10 μm is the subject of health concerns because of its ability to penetrate deep within the lungs and is known in its abbreviated form as PM_{10} .

A growing body of research has also pointed towards the smaller particles as a metric more closely associated with adverse health impacts. In particular, particulate matter with an aerodynamic diameter of less than 2.5 micrometres, known as $\text{PM}_{2.5}$. Local Authorities in England have a flexible role² in working towards reducing emissions and concentrations of $\text{PM}_{2.5}$ as there is no specific objective for them. However, there is a UK (excluding Scotland) annual mean objective of 25 $\mu\text{g}/\text{m}^3$.

Further information on the health effects of air pollution can be found in the reports produced by the Committee on the Medical Effects of Air Pollutants³.

As defined by the regulations, the air quality objectives for the protection of human health are applicable:

- Outside of buildings or other natural or man-made structures above or below ground
- Where members of the public are regularly present.

Using these definitions, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building façades of residential properties, schools and hospitals and will not apply at the building façades of offices or other places of work, where members of the public do not have regular access. The 24 hour objective will apply at all locations where the annual mean objective would apply together with hotels. Therefore, in this assessment the annual mean and 24 hour mean objectives do not apply at the development site but will apply at nearby residential locations. The hourly objective will apply at all locations where members of the public could reasonably be expected to spend that amount of time. Therefore, in this assessment the hourly objective will apply at all levels of the development and at nearby residential locations.

1.3 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP).

Knowsley Metropolitan Borough Council has not declared any AQMAs. Therefore, no AQAP has been published at the time of writing.

² LAQM TG16 – paragraph 1.09

³ <https://www.gov.uk/government/collections/comeap-reports>

1.4 The ADMS-Roads Method

Local air quality has been assessed using ADMS-Roads, a comprehensive dispersion model that can be used to estimate concentrations of pollutants in the vicinity of roads and small industrial sources. The model has been used for many years in support of planning applications for new residential and commercial developments.

ADMS-Roads is able to provide an estimate of air quality both before and after development, taking into account important input data such as background pollutant concentrations, meteorological data, traffic flows and on-site energy generation (if applicable). The model output can be verified against local monitoring data to increase the accuracy of the estimated pollutant concentrations and this approach has been followed in this assessment.

The use of dispersion modelling enables estimates of concentrations to be made at varying heights. As a result, suggestions for appropriate mitigation measures can be made where necessary, taking into consideration the identification of worst-case locations.

The most recent version of ADMS-Roads (v5.01) was issued in March 2022 and requires the following information to assess the impact at sensitive receptor locations:

- **Setup:** General site details and modelling options to be used
- **Source:** Source dimensions and locations, release conditions, emissions
- **Meteorology:** hourly meteorological data
- **Background:** Background concentration data
- **Grids:** Type and size of grid for output
- **Output:** Output required and sources/groups to include in the calculations.

2 Methodology

2.1 Local Pollutant Concentrations

It is good practice to include up-to-date local background pollutant concentrations in the assessment model, and also to verify modelled outputs against local monitoring data where available. This section provides an overview of the local data available for use in the assessment.

2.1.1 Local monitoring data

Knowsley Metropolitan Borough Council has three automatic monitoring sites which measure nitrogen dioxide (NO₂) and particulate matter (PM₁₀). NO₂ concentrations are also measured passively at diffusion tube sites across the Borough. Five of these diffusion tube sites lie within 600 m of the development site. Details of these monitoring sites are given in **Table 2**.

Monitoring results have been taken from the Council's latest Annual Status Report (ASR)⁴.

⁴ <https://www.knowsley.gov.uk/knowsleycouncil/media/Documents/Knowsley-ASR-2020.pdf>

Table 2: Monitoring sites within 600 m of the 35 Wilson Road, Huyton development

Site Name	Site Type	Pollutant(s)	Grid Reference	Distance to Kerb (m)	Approx. Distance to development site (m)
Cronton Road, Huyton*	R	NO ₂ , PM ₁₀	345552, 389413	2.0	570
Tarbock Island	R	NO ₂	345996, 389471	2.2	550
Sevenoak Grove	R	NO ₂	345676, 389366	1.5	590
Outside 1 Whitefield Lane	K	NO ₂	345563, 389399	0.8	580
Outside 2 Whitefield Lane	R	NO ₂	345537, 389407	1.2	580
Wilson Road Junction	R	NO ₂	345878, 389437	2.3	540

Note: R = roadside, K = kerbside, * automatic monitor

The diffusion tubes were analysed by ESG Didcot, who participate in the Proficiency scheme⁵. Whilst diffusion tubes provide an indicative estimate of pollutant concentrations, they tend to under or over read. The data is therefore corrected using a bias adjustment factor. There are two types of bias adjustment factor – local and national. The local factor is derived from co-locating diffusion tubes (usually in triplicate) with automatic monitors, whereas the national factor is obtained from the average bias from all local authorities using the same laboratory. Knowsley Metropolitan Borough Council has applied a local bias adjustment factor (0.81) to their 2019 diffusion tube results.

Monitoring results are presented in **Table 3**. The data shows that the annual mean NO₂ objective was exceeded at two of the monitoring sites in 2017, 2018, and 2019. The annual mean NO₂ objective was not exceeded at the other monitoring sites between these years. The hourly mean NO₂ objective was not exceeded at the automatic monitoring site on Cronton Road. Diffusion tubes do not provide information on hourly exceedances, but research⁶ identified a relationship between the annual and 1 hour mean objective, such that exceedances of the latter were considered unlikely where the annual mean was below 60 µg/m³. Therefore, no exceedances of the hourly mean objectives are expected at the diffusion tube monitoring sites.

Only one monitoring site within the local proximity of the proposed development measures PM₁₀ concentrations. At this site, neither the annual mean or the daily mean PM₁₀ objectives were exceeded between 2017 and 2019.

⁵ This is a national QA/QC scheme.

⁶ As described in Box 5.2 of LAQM Technical Guidance (TG16).

Table 3: Monitoring results for sites close to the proposed development site, 2017-2019

Objective	Site Name	2017	2018	2019
Annual mean NO ₂ (µg/m ³)	Cronton Road, Huyton*	36	37	38
	Tarbock Island	36	37	37
	Sevenoak Grove	25	27	27
	Outside 1 Whitefield Lane	48	49	48
	Outside 2 Whitefield Lane	40	41	41
	Wilson Road Junction	29	30	32
Hourly mean NO ₂ (no. exceedances)	Cronton Road, Huyton*	0	0	0
Annual mean PM ₁₀ (µg/m ³)	Cronton Road, Huyton*	23	22	23
Daily mean PM ₁₀ (no. exceedances)	Cronton Road, Huyton*	5	1	2

Values exceeding the 40 µg/m³ annual mean objective are shown in bold, * automatic monitor

2.1.2 Background mapped data

Background pollutant concentration maps are available from the Defra LAQM website⁷ and data has been extracted for Huyton for this assessment. These 2018 baseline, 1 kilometre grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The projections in the 2018 LAQM background maps are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these maps do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

The estimated mapped background NO_x, NO₂ and PM₁₀ concentrations around the development site are 27.5 µg/m³, 19.4 µg/m³ and 13.5 µg/m³ respectively in 2019. For 2024 (the estimated first full year of occupation), the concentrations obtained for the same pollutants are 21.4 µg/m³, 15.5 µg/m³ and 12.8 µg/m³ respectively. These background concentrations were also applied to the verification sites used in the modelling.

Due to the lack of a nearby urban background monitoring site, the mapped background concentrations have been used for this assessment. In order to carry out a robust assessment, two modelling approaches have been used. The first modelling approach uses the 2019 mapped background concentration data for the future year scenarios in order to provide a worst-case scenario. The second 'with improvement' modelling approach uses future year background concentration values to represent scenarios in which air quality improves as predicted.

⁷ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

2.2 Model input data

Hourly meteorological data from Liverpool for 2019 has been used in the model. The wind-rose diagram (**Figure 2**) presents this below.

Figure 2: Wind-rose diagram for Liverpool meteorological data, 2019

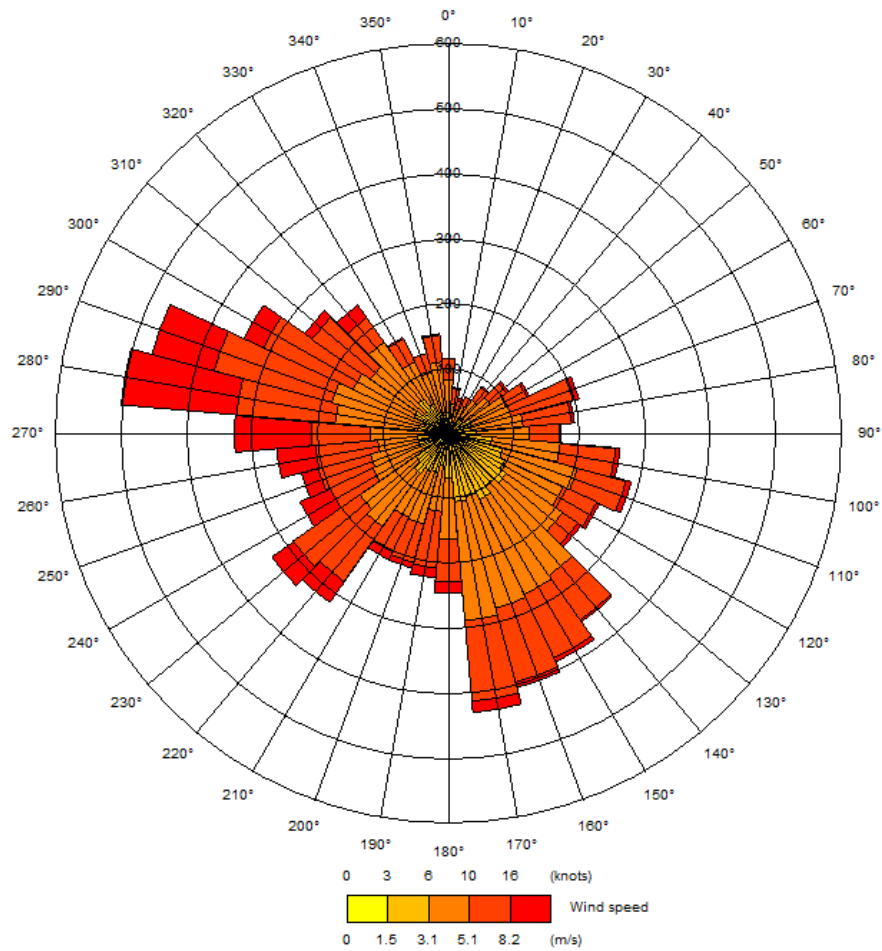
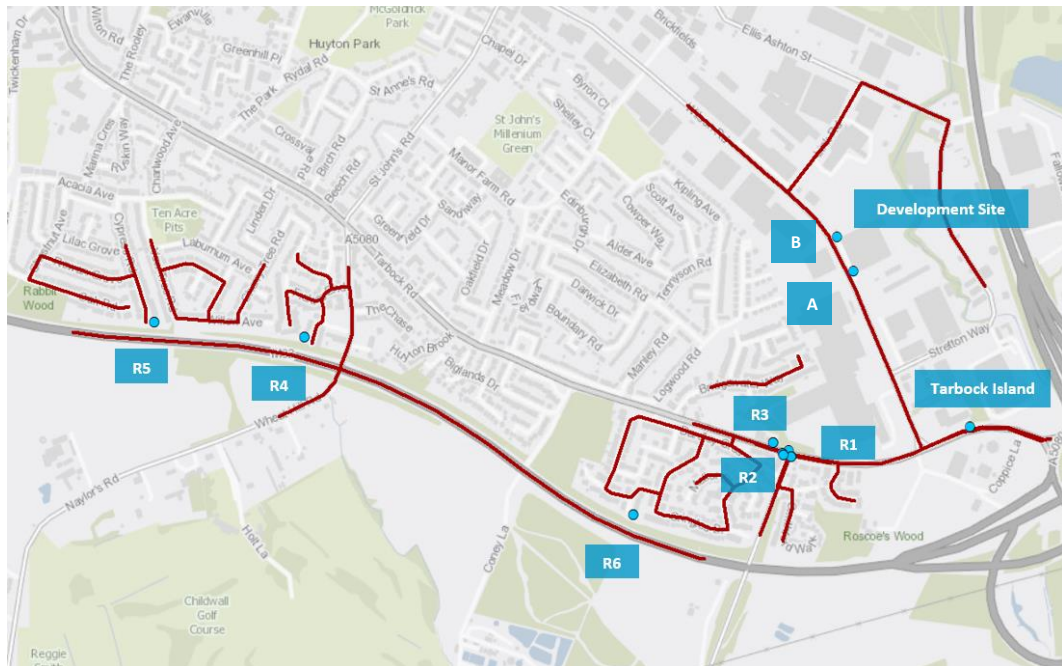


Figure 3: Road sources and receptors



Contains Ordnance Survey data © Crown copyright and database right [2022]

Figure 4: Road sources and receptors (Cronton Road and Whitefield Lane junction)



Contains Ordnance Survey data © Crown copyright and database right [2022]

ArcMap software has been used to model the road source locations (red lines) that are within 200 metres of the receptor locations (blue squares). This data can then be automatically uploaded to ADMS-Roads. This generates an accurate representation of the surrounding area to be assessed in the model in terms of the length of roads and distances between sources and receptors. This is shown in **Figure 3** and **Figure 4** above. It is assumed that the contribution of other sources to NO₂ and PM₁₀ is included in the background concentrations.

Two receptor locations within the proposed development have been selected for the assessment:

- A: the southwest corner of the development, located adjacent to Wilson Road
- B: the northwest corner of the development, located adjacent to Wilson Road.

In addition, six residential receptors have been included to assess the impact of the development on existing nearby residents:

- R1, representing the concentrations at 1 Whitefield Lane
- R2, representing the concentrations at 2 Whitefield Lane
- R3, representing the concentrations at 92 Cronton Road
- R4, representing the concentrations at 4 Silverdale Close
- R5, representing the concentrations at 61 Cypress Road
- R6, representing the concentrations at 15 Richmond Way.

The sites selected at the proposed development (receptors A and B) have been chosen to reflect the extremities of the site and their proximity to road traffic sources. In addition, six existing sensitive receptors have been chosen due to their proximity to local roads anticipated to have elevated traffic volumes as a result of the proposed development. In accordance with the IAQM guidance⁸, existing receptors only need to be modelled where the change of LDV flow is more than 500 AADT or the change of HDV flow is more than 100 AADT. Likely traffic flows as a result of the development have been provided by the transport consultants, Markides Associates Ltd. An assessment is made for the receptors at varying heights to assess likely concentrations across floor levels. It has been assumed that background concentrations remain constant at all heights of the development based on the 2017 City Air Quality at Height report⁹. Exposure has been assumed to be represented at the mid-point of each floor.

2.3 Traffic data

Average annual daily traffic (AADT) count data for 2019 (the selected baseline year) has been obtained for Cronton Road, Cowper Way, Victoria Road, M62 from Department for Transport (DfT) Traffic Counts¹⁰, which provides data for major roads. In the absence of any other data being available for the minor roads, estimates are based upon AADT values for local roads which are comparable in traffic volume and mixture. Therefore there will be uncertainty in the model input. A time variant factor was applied to all data based on the distribution on all roads by time of day and day of the week in Great

⁸ <https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

⁹ <http://www.wsp-pb.com/PageFiles/80156/WSPPB%20City%20Air%20Quality%20at%20Height.pdf>

¹⁰ <http://www.dft.gov.uk/traffic-counts>

Britain¹¹. All roads within 200 metres of the modelled receptors have been included in the assessment. The values are shown in Appendix B.

For the purpose of this assessment, TEMPro has been used model to project traffic growth. It has been assumed that traffic on local roads will increase by 2.9 % between 2019 and 2024. This growth factor applies for the geographical region of Knowsley.

The transport consultants, Markides Associates Ltd, have concluded that the development will result in a maximum of 2,860 additional daily vehicular trips. The anticipated traffic distribution across local roads has also been provided for 2024. Results (**Section 3** of this report) therefore include concentrations modelled in 2024 both without and with the proposed development.

An average speed of 41.5 kph has been assumed on Cronton Road, which is the average traffic speed for the A5080 in 2019¹². An average speed of 104.0 kph has been assumed on the M62, which is the average traffic speed for this road in 2019¹³. In the absence of any other data being available for other modelled roads, average speeds have been assumed to be equal to the average speed in Knowsley in DfT's table CGN0501b in the same data set, equal to 29.1 kph. This provides a worst-case scenario, as it is the slowest time period reported, resulting in highest exhaust emissions.

2.3.1 Queuing Traffic

Special consideration has been given to notable junctions modelled in this assessment. CERC note 60¹⁴ has been used for estimating emissions from queuing traffic. This defines a representative AADT for queuing traffic to be 30,000 at 5 kph, assuming an average vehicle length of 4 m. These figures, along with the traffic composition of the corresponding roads were then input into the Emission Factor Toolkit (EFT)¹⁵ to calculate emission rates. The emission rates were then used within the dispersion model as separate road sources of pre-defined length, representing each queue with time-varying emission profiles applied to represent busy periods. Queues have been modelled along Cronton Road and Whitefield Lane.

2.4 Conversion of NO_x to NO₂

Evidence shows that the proportion of primary NO₂ in vehicle exhaust has increased¹⁶. This means that the relationship between NO_x and NO₂ at the roadside has changed from that currently used in the ADMS model. A NO_x to NO₂ calculator (Published in August 2020)¹⁷ has therefore been developed and has been used in conjunction with the ADMS model to obtain a more accurate picture of NO₂ concentrations.

¹¹ <https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra>

¹² Department for Transport statistics, Table CGN0501c

¹³ Department for Transport statistics, Table CGN0404d

¹⁴ Cambridge Environmental Research Consultants Ltd, Modelling Queuing Traffic – note 60, 20th August 2004

¹⁵ Latest version v11, <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>

¹⁶ <http://uk-air.defra.gov.uk/assets/documents/reports/ageg/primary-no-trends.pdf>

¹⁷ <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc>

2.5 Model Verification

Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of estimated versus measured concentrations. Where there is a disparity, the first step is to check the input data and the model parameters in order to minimise the errors. If required, the second step will be to determine an appropriate adjustment factor that can be applied.

In the case of NO₂, the model should be verified for NO_x as the initial step and should be carried out separately for the background contribution and the source (i.e. road traffic). Once the NO_x has been verified and adjusted as necessary, a final check should be made against the measured NO₂ concentration.

For this project, modelled annual mean road-NO_x estimates have been verified against the concentrations measured at the one automatic monitor, Cronton Road, and two diffusion tube sites, Outside 2 Whitefield Lane and Tarbock Island (see **Appendix A**). These sites were selected because they represent the monitoring sites closest to the proposed development for which traffic data was available. However, it is worth noting that none of these sites lie in close proximity to the development site and therefore there will be uncertainty in the modelled results.

In addition, modelled annual mean PM₁₀ estimates have been verified against the concentrations measured at the one automatic site (see **Appendix A**).

3 Results

3.1 Results of the Dispersion Modelling

Table 4 below provides the estimated pollutant concentrations in the development year (2024) without and with¹⁸ the development.

Two types of modelling approach have been used. Firstly, background pollutant concentrations and vehicle fleet emission factors have been maintained at 2019 levels in the development year scenarios to provide a worst-case estimate; assuming no improvements in vehicles emissions in the future. In addition to this worst-case scenario, a scenario in which air quality improves as predicted in future years is also modelled. For this scenario, the latest version of Defra's road transport emission factor toolkit (v11) has been used. As a result of recent precedent, it is now appropriate to use the improvement scenario and to utilise it as a realistic estimate of pollutant concentrations in future years (see **Appendix C**).

Traffic growth predictions were estimated using TEMPro with the traffic volume increases provided by the Transport Consultants (see **Section 2.3**).

¹⁸ 'With' development includes the impact of the additional traffic that will be generated with the development.

Table 4: Estimated pollutant concentrations in 2024 without and with the development ($\mu\text{g}/\text{m}^3$). The results of the **no improvement** approach are presented with the results of the **with improvements** scenario in brackets.

Floor level	Receptor	Annual mean NO ₂ concentration ($\mu\text{g}/\text{m}^3$)		Annual mean PM ₁₀ concentration ($\mu\text{g}/\text{m}^3$)		NO ₂ Change	PM ₁₀ change
		Without development	With development	Without development	With development		
0 (ground floor)	A	20.6 (16.2)	21.8 (16.8)	14.1 (14.0)	14.5 (14.5)	1.1 (0.6)	0.5 (0.5)
	B	20.5 (16.2)	20.9 (16.4)	14.0 (14.0)	14.2 (14.1)	0.4 (0.2)	0.2 (0.2)
	R1	45.5 (32.8)	45.6 (33.0)	25.3 (24.5)	25.4 (24.8)	0.1 (0.2)	<0.1 (0.3)
	R2	40.8 (29.6)	40.9 (29.8)	22.8 (22.2)	22.8 (22.4)	<0.1 (0.2)	<0.1 (0.3)
	R3	31.5 (23.3)	31.5 (23.4)	18.7 (18.4)	18.8 (18.6)	<0.1 (0.1)	<0.1 (0.2)
	R4	27.0 (19.8)	27.1 (20.0)	16.2 (15.8)	16.2 (16.0)	0.1 (0.2)	<0.1 (0.2)
	R5	26.9 (19.3)	27.0 (19.5)	16.6 (16.1)	16.6 (16.4)	0.1 (0.2)	<0.1 (0.3)
1 (first floor)	R6	28.5 (20.8)	28.6 (21.0)	16.3 (15.9)	16.4 (16.1)	0.1 (0.2)	<0.1 (0.2)
	R1	28.1 (21.1)	28.1 (21.2)	17.1 (16.9)	17.2 (17.1)	<0.1 (0.1)	<0.1 (0.2)
	R2	28.4 (21.3)	28.4 (21.4)	17.3 (17.0)	17.3 (17.2)	<0.1 (0.1)	<0.1 (0.2)
	R3	26.7 (20.2)	26.8 (20.3)	16.6 (16.4)	16.6 (16.6)	<0.1 (0.1)	<0.1 (0.2)
	R4	25.7 (19.1)	25.8 (19.2)	15.8 (15.4)	15.8 (15.6)	<0.1 (0.2)	<0.1 (0.2)
	R5	25.0 (18.2)	25.1 (18.4)	16.0 (15.6)	16.0 (15.8)	<0.1 (0.2)	<0.1 (0.2)
	R6	27.1 (20.0)	27.1 (20.1)	15.9 (15.5)	15.9 (15.7)	<0.1 (0.2)	<0.1 (0.2)

Note: Exceedances of the objectives are highlighted. The changes in NO₂ and PM₁₀ presented may not exactly equal the difference in the constituent parts shown due to rounding.

Nitrogen dioxide

In the without development scenario, the model estimates annual mean NO₂ concentrations to be above (by 13.8 %) the annual mean objective at R1 if there are no improvements in background pollutant concentrations or in the vehicle fleet between 2019 and 2024. R1 is located at 1 Whitefield Lane. This is a residential dwelling at the junction between Cronton Road and Whitefield Lane where idling traffic is common. A diffusion tube measures concentrations of NO₂ at the roadside of this property (see **Table 3**) giving confidence in the results (see below). R2 also estimates a slight exceedance; however other locations are estimated to meet the objective. It is worth noting though that the annual mean objective will not apply at the development site and will only apply at the residential locations.

If improvements in the vehicle fleet are taken into consideration, the annual mean NO₂ concentrations are estimated to be met at all receptor locations modelled.

The estimated annual mean NO₂ concentrations at the receptors are reasonable when compared to the data collected at the monitoring sites. The diffusion tube measured NO₂ concentrations of 48.3 µg/m³ in 2019 close to 1 Whitefield Lane. This diffusion tube is located 0.8 m from the kerb whereas the façade of the residential dwelling is approximately 3.5 m from the kerb. Therefore, it is reasonable that the model would estimate lower concentrations at the façade of the residential dwelling (at R1).

The Guidance states that authorities may assume exceedances of the hourly mean objective are only likely to occur where annual mean concentrations are 60 µg/m³ or above. Therefore, it is considered highly unlikely that this objective will be exceeded at any of the receptors.

The model has also been run for a with development scenario taking into account predicted increases to traffic levels due to the development. The results indicate that at the development site annual mean NO₂ concentrations would increase by 1.1 µg/m³ at worst-case locations in the “without improvements” scenario. In the “with improvements” scenario, NO₂ concentrations are estimated to increase by 0.6 µg/m³. Outside of the development site, annual mean NO₂ concentrations are expected to increase by a maximum of 0.1 µg/m³ and 0.2 µg/m³ respectively.

Particulate matter

In the without development scenario, the model estimates no exceedance against the annual mean PM₁₀ objective in either the “without improvement” or the “with improvement” scenario. Potential exceedances of the daily mean PM₁₀ objective can be estimated based on the annual mean¹⁹, such that:

$$\begin{aligned} \text{No. 24 – hour mean exceedances} \\ = -18.5 + 0.00145 \times \text{Annual Mean}^3 + \left(\frac{206}{\text{Annual Mean}} \right) \end{aligned}$$

On this basis, it is estimated that in 2024 there will be thirteen exceedances of the daily mean PM₁₀ limit value for the “without improvements” scenario, regardless of whether the development takes place or not. In the “with improvements” scenario, eleven

¹⁹ Paragraph 7.92 of LAQM TG(16)

exceedances and twelve exceedances of the daily mean PM₁₀ limit value are estimated for the without development and with development scenarios, respectively. Therefore, the daily mean PM₁₀ objective would be met in all cases as 35 exceedances of limit value are allowed per year.

For estimating PM_{2.5} concentrations, where no appropriate sites measuring both PM₁₀ and PM_{2.5} are available, then a nationally derived correction ratio of 0.7 can be used²⁰. If this factor is used, then all locations in the modelling meet the EU Directive annual mean PM_{2.5} limit value of 25 µg/m³.

3.2 Significance

Professional judgement is an important part of the assessment of significance. However, there are various documents available that attempt to qualitatively or quantitatively provide ways of assessing the significance of a development on air quality. The most commonly applied is Environmental Protection UK's Air Quality Guidance Document²¹ which outlines how impacts may be assessed quantitatively. The assessment is made up of two steps – firstly to assess the magnitude of change in concentration (e.g. between with and without development) relative to the objective level, and secondly the percentage above/below the objective based upon the total modelled concentration at a given location or receptor. By combining these two values, you can obtain the impact descriptor. This method is presented in **Table 5** below.

Table 5: Significance of change description

Long term average concentration at receptor 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 % of 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

In addition to the criteria provided above, the Guidance document states that the table is intended to be used by rounding the change in percentage pollutant concentrations to whole numbers. Changes of 0 % i.e. less than 0.5 % are described as negligible.

In applying these criteria, it can be concluded that the impact of the development on local annual mean NO₂ concentrations is likely to be 'negligible', as the change in concentration due to the development is < 0.5 % of the Air Quality Assessment Level (AQAL) at all existing sensitive receptor locations.

However, this is a fairly simplistic conclusion and other factors may also need to be considered in order to make transparent conclusions. Specific factors to consider may include:

1. Number of properties affected by the slight, moderate or major impacts and a judgement of the overall balance

²⁰ LAQM: TG16, paragraph 7.109

²¹ <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

2. Where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant
3. The magnitude of the changes and descriptions of the impacts at the receptors
4. Whether or not an exceedance of an objective or limit value is predicted to arise in the study area where none existed before or an exceedance area is substantially increased
5. Whether or not the study area exceeds an objective or limit value and this exceedance is removed or the exceedance area is reduced
6. Uncertainty, including the extent to which worst case assumptions have been made
7. The extent to which an objective or limit value is exceeded, for example an annual mean of 41 $\mu\text{g}/\text{m}^3$ should attract less significance than an annual mean of 51 $\mu\text{g}/\text{m}^3$.

In this case, none of the above criteria are of significance, suggesting that there will be no concerns in terms of new exposure to harmful pollutant concentrations across the study area.

3.3 Mitigation Measures

Recent precedent confirms that it is now reasonable to assume an improvement in pollutant concentrations going forward (see **Appendix C**). Therefore, based on the ADMS results for the with improvement scenario, there is no specific requirement for mitigation, as concentrations are estimated to meet all of the objective levels in the with improvement scenario and a negligible impact is estimated.

However, it is widely acknowledged that there is no safe level of exposure to air pollution²², and as such, the developer is encouraged to consider further mitigation measures to reduce emissions arising from the site. The National Planning Policy Framework²³, updated July 2021, requires new developments to support sustainable travel and air quality improvements. A key theme of the NPPF is that *“Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making”* (paragraph 105).

The NPPF also states that *“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality*

²² <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>

²³ <https://www.gov.uk/government/publications/national-planning-policy-framework--2> Published in July 2018

Management Areas and Clean Air Zones is consistent with the local air quality action plan” (paragraph 186).

In addition, the following relevant requirements for improving air quality are outlined (paragraph 112-113):

- Give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use
- Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations
- All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed.

Building on the NPPF, the Institute of Air Quality Management (IAQM) has provided guidance on the principles of good practice²⁴ which should be applied to all major development²⁵. Examples of good practice include:

- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floor space. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made.
- Where the development generates significant additional traffic, a detailed travel plan should be implemented.

3.4 Mitigating the Impacts of the Construction Phase

Emissions and dust from the construction phase of a development can have a significant impact on local air quality. The Institute of Air Quality Management (IAQM) has produced a document titled ‘Guidance on the assessment of dust from demolition and construction’²⁶ published in May 2015. This guidance contains a methodology for determining the significance of construction developments on local air quality using a simple four step process:

- STEP 1: Screen the requirement for a more detailed assessment
- STEP 2: Assess the risk of dust impacts
- STEP 3: Determine any required site-specific mitigation
- STEP 4: Define post mitigation effects and their significance.

The risk of dust emissions from a demolition/construction site causing loss of amenity and/or ecological impacts is related to a number of factors, including: the activities being undertaken; the duration of these activities; the size of the site; the mitigation

²⁴ <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

²⁵ Major developments can be defined as developments where:

(1) The number of dwellings is 10 or above, (2) The residential development is carried out on a site of more than 0.5ha where the number of dwellings is unknown, (3) The provision of more than 1000 m² commercial floor space, (4) Development carried out on land of 1ha or more, (5) Developments which introduce new exposure into an area of existing poor air quality (e.g. an AQMA) should also be considered in this context.

²⁶ <http://iaqm.co.uk/guidance/>

measures implemented and meteorological conditions. In addition, the proximity of receptors to the site and the sensitivity of these receptors to dust, impacts the level of risk from dust emissions. Receptors include both 'human receptors' and 'ecological receptors'. The former refers to a location where a person or property may experience adverse effects for airborne dust or dust soiling, or exposure to PM₁₀, over a time period relevant to the air quality objectives (see **Table 1**). Ecological receptors are defined as any sensitive habitat affected by dust soiling, through both direct and indirect effects. Following assessment of the impacts of dust as a result of the development, a qualitative risk impact level can be assigned, ranging from 'negligible' to 'high risk'. Based on the designated risk impact level, the mitigation measures which are appropriate for all sites and are applicable specifically to demolition, earthworks, construction and trackout can be determined. Examples of the general measures include:

- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site
- Ensure all vehicles switch off engines when stationary – no idling vehicles
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable
- Ensure all loads entering and leaving the site are covered
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation

The use of the outlined IAQM methodology for assessing the impacts of dust from demolition/construction is considered to be current best practice. Therefore, it is recommended that the developer refers to the relevant IAQM documentation, to help reduce the impact of dust and vehicle exhaust emissions, and liaises with the Local Authority to come up with an acceptable dust management strategy.

4 Summary and Conclusions

An air quality assessment has been undertaken for a proposed commercial development at 35 Wilson Road, Huyton. The site is located in the Knowsley Metropolitan Borough Council area, which has not declared any Air Quality Management Areas.

Two modelling approaches were carried out with regards to expected improvements to air quality:

- A conservative approach where no improvement in the pollutant background concentrations or road transport emission factors has been assumed between the base year (2019) and the first year of occupation (2024); and
- A 'with improvements' scenario, where improvements in the pollutant background concentrations and in the vehicle fleet have been considered.

The ADMS-Roads dispersion model has been used to estimate the impact of emissions from road traffic on sensitive receptors under both scenarios. Estimated concentrations have been compared with the air quality objectives. For the "without development" and "without improvement" scenario, the results indicate that annual mean NO₂ concentrations are above the objective at two nearby residential locations modelled. However, at other locations the objective is estimated to be met. In the "without development" and "with improvement" scenario, which takes into account estimated future improvements to background concentrations and vehicle fleet emission factors, annual mean NO₂ concentrations are estimated to be well below the objective level at all locations modelled.

Concentrations of PM₁₀ are estimated to be below the annual mean objective in the 'without' development scenario, regardless of whether or not there are improvements in pollutant background concentrations or the vehicle fleet.

Based on the evidence it is estimated that there will be no exceedances of either short term objective for NO₂ or PM₁₀. The 'with' development scenario estimates that the development will cause annual mean NO₂ and PM₁₀ concentrations to increase by a negligible amount.

Recent precedent confirms that it is now reasonable to assume an improvement in pollutant concentrations going forward. Therefore, no mitigation is required as the air quality objectives are estimated to be met at the development site and a negligible impact is estimated. Instead, other measures such as providing secure and covered cycle storage, providing a travel plan, and installing electric charging point(s), should be considered to reduce the emissions arising from the development.

In addition, the developer is encouraged to refer to the IAQM's 'Guidance on the assessment of dust from demolition and construction' in order to minimise the impact of the demolition and construction phases on local air quality.

Appendix A – Model Verification

In order to verify modelled pollutant concentrations generated in the assessment, the model has been run to estimate the annual mean road-NO_x concentration during 2019 at the one automatic monitor, Cronton Road, and two diffusion tube sites, Tarbock Island and Outside 2 Whitefield Lane, described in **Table 2**.

The model output of road-NO_x has been compared with the ‘measured’ road-NO_x. Measured NO_x for the monitoring sites was calculated using the NO_x to NO₂ calculator²⁷.

A primary adjustment factor was determined to convert between the ‘measured’ road contribution and the model derived road contribution (**Figure A.1**). This factor was then applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. Total NO₂ concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the 2019 background NO₂ concentration.

The results imply that overall the model was in good agreement with the measured results. In addition, the one automatic site monitoring site has been used to verify the annual mean road-PM₁₀ concentrations. The results are presented in Table A.1.

Figure A.1: Comparison of Measured road-NO_x to unadjusted modelled road-NO_x concentrations

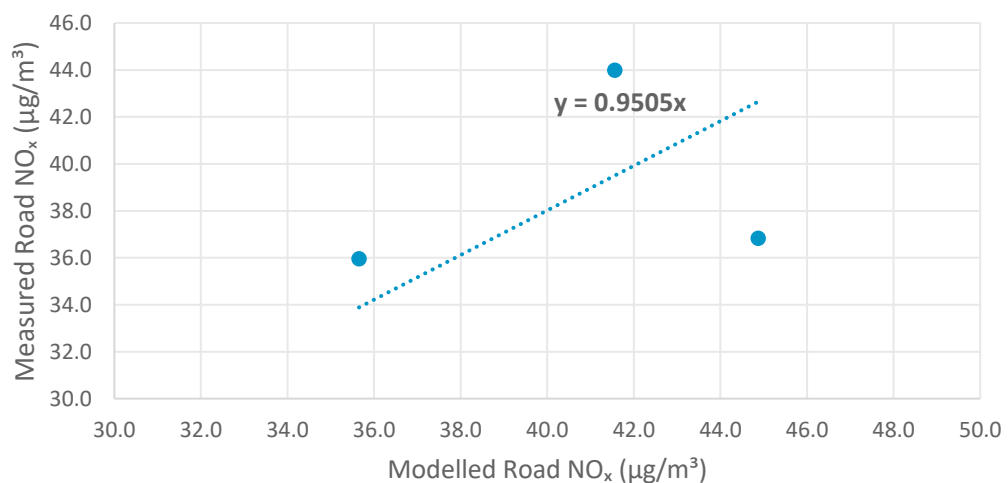


Table A.1: Comparison of Measured road-PM₁₀ to unadjusted modelled road-PM₁₀ concentrations

Receptor	Measured road-PM ₁₀	Unadjusted modelled road-PM ₁₀	Adjustment factor
Cronton Road	9.399567	3.24162	2.899651

RMSE

The root mean square error (RMSE) is used to define the average error or uncertainty of the model. The following RMSE values have been calculated:

²⁷ <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>

NO₂: 2.2

PM₁₀: 6.2

If the RMSE values are higher than $\pm 25\%$ of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. Ideally an RMSE within 10 % of the objective would be derived. In this case the model is being assessed against the annual mean objective, which is 40 $\mu\text{g}/\text{m}^3$ for NO₂. An RMSE value of less than 10 % of the objective (less than 4 $\mu\text{g}/\text{m}^3$) is obtained and therefore the model behaviour is acceptable.

Appendix B – Traffic Data

Table B.1: Traffic data for 2019 (and prediction for 2024 without development)

Road links	Annual Average Daily Traffic (AADT)	% Heavy Duty Vehicles (HDV)	Speed (kph)
Cronton Road	16,074 (16,543)	1.4	42
Cowper Way	999 (1,028)	1.0	29
Victoria Road	2,634 (2,711)	3.0	29
M62	75,393 (77,594)	4.2	104

Note : With development results in an average daily traffic increase of 2,860 vehicles. The majority of this traffic is predicted to travel south of the development to junction 6 where the M62 meets the M57. Traffic volumes on local roads for the “with development” scenario are based upon the traffic distribution provided by the transport consultants (see **Section 2.3**).

Appendix C – Recent precedent for modelling future improvements

Two examples of recent precedent that confirm that it is now reasonable to assume an improvement in pollutant concentrations going forward are provided below.

Wealden District Council Local Plan (December 2019)²⁸

The Council had been working on a methodology to consider how to identify and model the air quality impacts of the development to be proposed in a new local plan on the Ashdown Forest and other Special Areas of Conservation. Within the Habitats Regulations Assessment (HRA), the Council’s air quality consultants set out three modelled scenarios of future baseline conditions. Emissions Model ‘A’ represented the existing baseline situation with respect to both emissions per vehicle and emissions released outside of the study area such that when applied to the future there will be no improvements to air quality over time. Emissions Model ‘B’ applied partial reductions in emissions relating to vehicle (and other sector) data predicted by Defra; and Emissions Model C applied full reductions of vehicle (and other sector) emissions as predicted by Defra.

Emissions Model B was the Council’s air quality consultants’ own bespoke conservative emissions reduction model (CURED V3A). The Inspector noted that “*this scenario is consistent with the precautionary principle established in relation to the HRA and that the Consultants consider it the most likely scenario, and that Natural England also accepts it to be the most appropriate emissions model set out within the HRA*”. The Inspector continued that “**it would be unreasonable and lacking in scientific credibility to conclude that Emissions Model A (i.e. a no improvement scenario) should be used as the basis on which to model future emissions.** Additional text is provided in the Inspector’s Examination notes to say that “*Emissions Model A assumes that vehicle fleet emissions make no improvement over the plan period, the composition will remain*

²⁸ [191220-inspectors-conclusion-after-stage-one-of-the-examination-of-the-submission-wealden-local-plan.pdf](https://www.herstmonceuxparish.org.uk/191220-inspectors-conclusion-after-stage-one-of-the-examination-of-the-submission-wealden-local-plan.pdf) ([herstmonceuxparish.org.uk](https://www.herstmonceuxparish.org.uk))

unchanged from that at 2015 and that background emissions remain static. It allows for no emission improvements in conventional vehicles between 2015 and 2028 and assumes no electric vehicles will join the fleet. This is contrary to what is already known. Improvements arising from previous emission regulations will continue to work through the fleet and further improvements will occur through national and international actions including the Clean Air Strategy and National Emissions Ceilings Directives to reduce background and vehicle emissions, together with the Road to Zero, which would require that by 2040 that no new fully petrol or diesel cars are to be sold within the UK”.

It is worth noting that in February 2020, Air Quality Consultants Ltd published a report that shows that they do not believe that there is any longer a need for applying the adjustments made in the CURED v3a model as they believe that the Defra emission factor toolkit is now appropriate²⁹.

Anglia Square (November 2020)³⁰

The proposed Anglia Square development consisted of the demolition of existing buildings including shops, offices and a public multistorey car park, with construction of up to 1,250 dwellings, hotel, ground floor retail and commercial floor space, cinema, multi-storey car parks for shoppers and residents, place of worship and associated highway and public realm areas. A public inquiry was held in January and February 2020 into the application for planning permission. The Inspector recommended that the application be approved, and planning permission granted. However, the Secretary of State disagreed with some of the Inspector’s conclusions relating in particular to impact on heritage assets and refused planning permission. The Secretary of State did however agree with the Inspector that in view of the AQA findings and conclusions, air quality was not a matter that weighed against the grant of planning permission³¹.

Paragraph 557 of the Anglia Square Inspector’s Report states: *At the inquiry there was discussion as to whether, in principle, it is right to take account of anticipated improvements in air quality as a result of government policy. Although the Council did not take account of such improvements at the time it considered the application, it now considers that it is right to do so. I agree. The EFT User Guide 2019 [version 9]³², which is published by Defra states that: “It is a tool that allows users to calculate road vehicle pollutant emission rates for oxides of nitrogen and particulate matter for a specified year, road type, vehicle speed and vehicle fleet composition”. To my mind that that makes it clear that Defra is expecting anticipated changes in vehicle emissions to be factored in to assessments such as this. The Wealden Local Plan examination, where the Inspector commented that it would be unreasonable to assume no improvements over time, is an example of this approach in action.*

²⁹ <https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=7fba769d-f1df-49c4-a2e7-f3dd6f316ec1>

³⁰ <https://www.gov.uk/government/publications/called-in-decision-anglia-square-norwich-ref-3225505-12-november-2020>

³¹ Paragraph 61 of the Secretary of State’s letter on the Anglia Square decision. Application 18/00330/F

³² Note – version 9 of the Defra EFT was the latest issue at the time of the Anglia Square Planning Inquiry. However, this has now been superseded and version 11 is the latest, which has been used in this assessment.



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