GOLDTHORPE, BARNSLEY – IMPACT ON HICKLETON

AIR QUALITY ASSESSMENT

VC-00052805-EN-RP-0001
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VANGUARDIA

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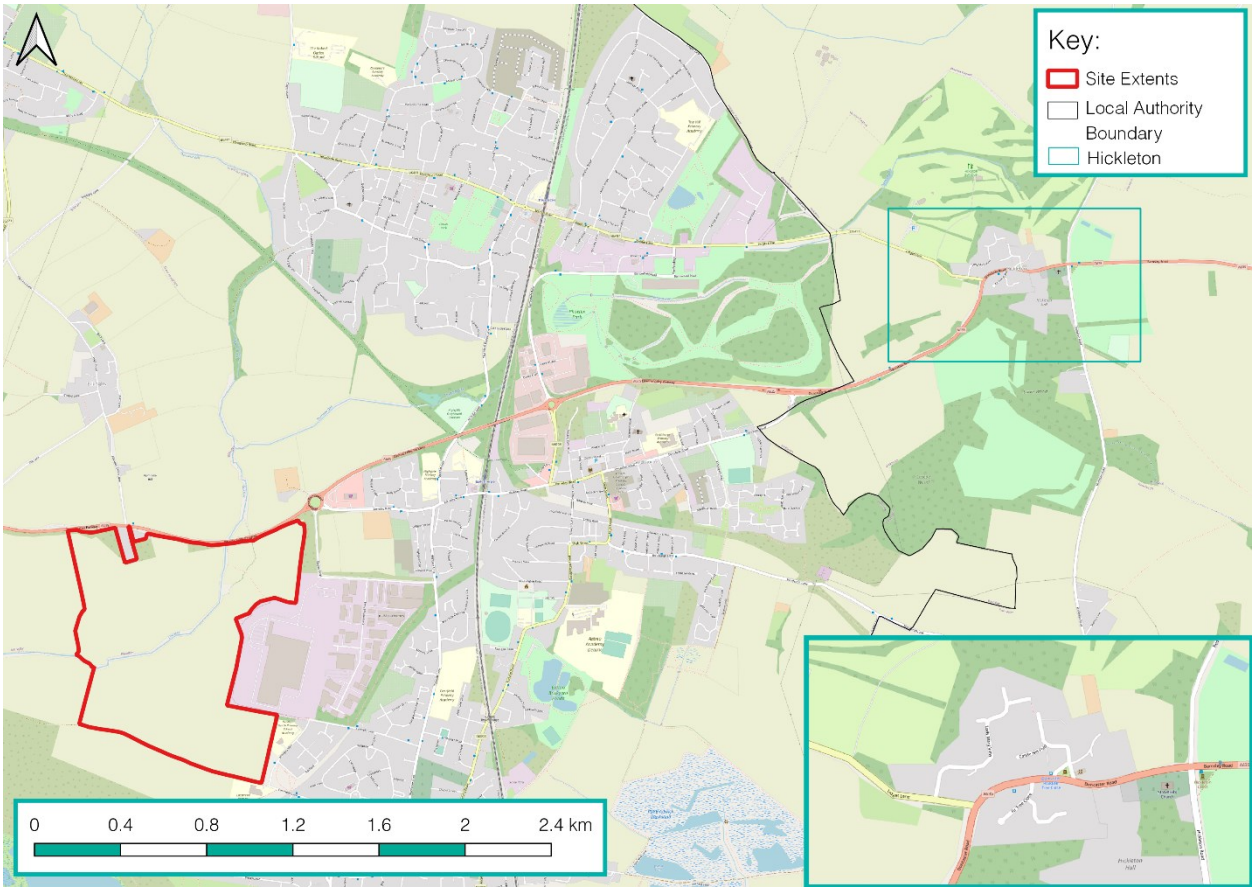
1. INTRODUCTION

1.1. Vanguardia has been commissioned by the Newlands Developments to prepare this Air Quality Assessment (AQA) in order to assess the impact of a proposed commercial development on the village of Hickleton.

1.2. The proposals of the application site is identified as *ES10 Land South of Dearne Valley Parkway* within the Barnsley Local Plan. As highlighted in Section 2 of this AQA, the site allocation requires a detailed AQA of the impacts associated with traffic utilising the A635 and other strategic road links to the A1(M) and M1.

1.3. The application site in relation to the village of Hickleton is shown in Figure 1. To note, the application site is located within the jurisdiction of Barnsley Metropolitan Borough Council (BMBC), whereas Hickleton is within the jurisdiction of City of Doncaster Council (CDC).

Figure 1 Site Location



1.4. The associated planning application is a hybrid planning application, meaning some elements are seeking approval for outline planning permission and some elements are seeking approval for full permission.

"Outline permission sought for the construction of Storage and Distribution (Use Class B8) and General Employment (Use Class B2) space with ancillary offices and gatehouses on four separate, self-contained and severable plots as shown on the submitted Parameters Plan. All matters reserved except for site access. Full permission sought for engineering infrastructure works to support the employment development comprising: the access roads; earthworks to create the development plot platforms/bunding; drainage and culvert works; a flood compensation area; and strategic landscaping areas."

1.5. This AQA is a standalone report which has been undertaken to assess if the proposed development is likely to give rise to any significant air quality impacts within the village of Hickleton to establish the magnitude and the significance of such impacts caused as a result of the proposed development in respect to the prevailing environmental conditions, and provide a mitigation strategy to aid in minimizing any level of impact. To note, this AQA solely focuses on air quality impacts within Hickleton, as during initial correspondence with CDC, Marr was not considered to be of concern. A further consideration of the air quality impacts on receptors along the A635 between the application site and Hickleton is set out in a wider Air Quality Environmental Statement (ES) Chapter.

1.6. For background, the village of Hickleton suffers from inherent poor air quality, with three diffusion tube monitors exceeding the NO_2 annual mean objective and one possibly exceeding the NO_2 1-hour mean objective.

1.7. The report is structured as follows:

- Section 2 sets out an overview of the national and local air quality policy context, in relation to the development proposals;
- Section 3 details the methodology for estimating the air quality impacts;
- Section 4 describes the baseline conditions in Hickleton;
- Section 5 considers the impacts on sensitive receptors within Hickleton as a result of construction traffic and cumulative traffic;
- Section 6 considers the impacts on sensitive receptors within Hickleton as a result of operational traffic and cumulative traffic;
- Section 7 discusses the potential mitigation measures for the construction and operational phase(s); and
- Section 8 summarises and concludes the assessment.

2. LEGISLATION / STRATEGY / POLICY CONTEXT

EUROPEAN LEGISLATION

2.1. Air pollutants at high concentrations can give rise to adverse effects upon the health of both humans and ecosystems. The European Union (EU) legislation on air quality forms the basis for the national UK legislation and policy.

2.2. The EU Framework Directive 2008/50/EC came into force in May 2008 and sets out legally binding limits for concentrations of the major air pollutants that can impact on public health. This Directive came into force in England in June 2010. Amendments to this Directive was made following amendments to the 2008/50/EC and 1004/107/EC on air quality made by Directive 2015/1480/EC. The updated Directive, The Air Quality Standards (Amendment) Regulations 2016, came into force on 31st December 2016[1].

2.3. Following the UK's departure from the EU and the Brexit transition period the previous EU Legislation has been retained in the United Kingdom. The following text is taken from the legislation.gov.uk website[2] setting out details of the retention:

"The UK is no longer a member of the European Union. EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation, under the control of the UK's Parliaments and Assemblies, and is published on legislation.gov.uk.

[...]

EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16)."

NATIONAL LEGISLATION

2.4. Part IV of the Environment Act 1995[3] requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy was adopted in 1997, with national health-based standards and objectives set out for the, then, eight key air pollutants including benzene, 1-3 butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulphur dioxide.

[1] Statutory Instrument, 2016. The Air Quality Standards Regulations,' No. 1184. Queen's Printer of Acts of Parliament.
[2] EU legislation and UK law. Accessible at: https://www.legislation.gov.uk/eu-legislation-and-uk-law
[3] Department for Environment, Food and Rural Affairs (1995) The Environment Act. HMSO, London.

2.5. Part IV of the Environment Act 2021[4] amends both the Environment Act 1995 and the Clean Air Act 1993. It builds on the foundations provided by Part IV of the Environment Act 1995 and strengthens the local air quality management framework. The act allows the Secretary of State to make provisions for, about or connect with the recall of relevant products that do not meet relevant environmental standards.

2.6. The government has resisted calls for the adoption of the recently updated World Health Organisation (WHO) air quality guidelines, specifically targeting particulate matter pollution. The act does introduce a duty on the government to bring forward at least two air quality targets by October 2022 for consultation that will be set in secondary legislation, which, after a delay[5], has now been introduced in secondary legislation. The first aim of the legislation is to reduce the annual average level of fine particulate matter ($PM_{2.5}$) in ambient air. The second aim is to set a long-term target (set a minimum of 15 years in the future), which the government says, *"will encourage long-term investment and provide certainty for businesses and other stakeholders."*

England Air Quality Standards

2.7. The Air Quality Strategy[6] sets out air quality objectives and policy options to further improve air quality in the UK from today into the long term. The Air Quality Strategy has since been updated[7] and includes a range of actions, for both local authorities and the UK government, to improve air quality across the UK. Examples of actions set out in the Air Quality Strategy include tighter emissions standards for vehicles and machinery, greater use of low-emission vehicles, and new rules on burning solid fuels, as well as local action to support the delivery of the recently implemented $PM_{2.5}$ targets.

2.8. The pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence regarding how each pollutant affects human health. Pollutant objectives are the future dates by which each standard is to be achieved, taking into account economic considerations, practical and technical feasibility.

2.9. The air quality objectives are managed through the Local Air Quality Management, (LAQM) regime, which is defined within the Air Quality (England) Regulations 2000, (SI 928) and the Air Quality (England) (Amendment) Regulations 2002, (SI 3043). Table 1 lists the National Air Quality Objectives that are relevant to this AQA, as set out in the Air Quality Standards (Amendment) Regulations 2016.

[4] Department for Environment, Food and Rural Affairs (2021) The Environment Act. HMSO, London.
[5] UK Government, Update on Progress on Environmental Targets. Accessible at: https://www.gov.uk/government/news/update-on-progress-on-environmental-targets
[6] Department for Environment Food and Rural Affairs, 2007. *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*, Cm 7169, Department for Environment Food and Rural Affairs.
[7] Department for Environment Food and Rural Affairs, 2023. *Air quality strategy: framework for local authority delivery.*

Table 1 Air Quality Standards (England)

Pollutant	Average Period	Standard	Percentile Equivalent
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3	-
	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year [A]	99.79
Particles (PM_{10})	Annual Mean	40 µg/m^3	-
	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year	90.41
Particles ($PM_{2.5}$)	Annual Mean	25 µg/m^3– Stage 1 limit value pre 2020	-
		20 µg/m^3– Indicative Stage 2 limit value post 2020. 15% reduction in background to be achieved between 2010 & 2020 at Urban Background sites [B]	
	Annual Mean	12 µg/m^3– Target to be achieved by 2028 [C]	
	Annual Mean	10 µg/m^3– Target to be achieved by 2040 [C]	

Notes:

[A] Annual mean value of 60 µg/m^3 used to assess whether the NO_2 1-hour mean objective will be exceeded. A study carried out on behalf of DEFRA and the Devolved Administrations identified that exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below this concentration.

[B] Current UK limit value.

[C] As set out in the Environmental Improvement Plan (2023). These targets will help drive reductions in the worst $PM_{2.5}$ hotspots across the country, whilst ensuring nationwide action to improve air quality for everyone.

2.10. Further to the air quality objectives set out above, the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[8] came into force in England on 30th January 2023 and set out two fine particulate matter targets to be achieved by 2040. These are:

- The annual mean concentration target is that by the end of 31st December 2040 the annual mean level of $PM_{2.5}$ in ambient air must be equal to or less than 10 µg/m^3; and
- The population exposure reduction target is that there is at least a 35% reduction in population exposure by the end of 31st December 2040 ("the target date"), as compared with the average population exposure in the three-year period from 1st January 2016 to 31st December 2018.

2.11. To note, these central government targets primarily focus on tackling emissions, rather than requiring local authorities to assess concentrations against these new $PM_{2.5}$ targets.

World Health Air Quality Guidelines

2.12. The WHO guidelines were updated in September 2021[9], and are a set of evidence-based recommendations of limit values for specific air pollutants developed to help countries achieve

[8] Statutory Instrument, 2023. *The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. No.96.*
[9] World Health Organization, 2021. *WHO global air quality guidelines.*

air quality that protects public health. They are significantly lower than the current levels legislated within the Air Quality Standards (as set out in Table 2). The WHO guideline levels are set out below.

Table 2 Air Quality Guidelines

Pollutant	Average Period	Objective
Nitrogen Dioxide (NO_2)	25 µg/m^3	24-hour mean (99th percentile)
	10 µg/m^3	Annual mean
Particles (PM_{10})	45 µg/m^3	24-hour mean (99th percentile)
	15 µg/m^3	Annual mean
Particles ($PM_{2.5}$)	15 µg/m^3	24-hour mean (99th percentile)
	5 µg/m^3	Annual mean

2.13. The Committee on the Medical Effects of Air Pollutants (COMEAP)[10] has concluded the following:

> *"The WHO's revised AQGs for pollutants in outdoor air are suitable as long-term targets to inform policy development. We stress that the AQG values should not be regarded as thresholds below which there are no impacts on health - the current evidence has not identified thresholds for effect at the population level, meaning that even low concentrations of pollutants are likely to be associated with adverse effects on health. Therefore, continued reductions, even where concentrations are below the AQGs, are also likely to be beneficial to health."*

2.14. However, this assessment has considered the current legislation, and therefore the objectives set out in Table 1 have been used to inform this AQA, including the recently implemented $PM_{2.5}$ target.

PLANNING POLICY

NATIONAL POLICY AND STRATEGY

National Planning Policy Framework

2.15. The National Planning Policy Framework (NPPF) (2023)[11] sets out the planning policy for England, to help achieve sustainable development within the planning sector, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an environmental objective:

[10] Committee on the Medical Effects of Air Pollutants (COMEAP), 2022. *COMEAP statement: response to publication of the World Health Organization Air quality guidelines 2021*
[11] Department of Levelling Up, Housing & Communities, 2023. National Planning Policy Framework

"To protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy"

2.16. . Paragraph 105 states:

"The planning system should actively manage patterns of growth in support of these objectives. 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."

2.17. Paragraph 174 states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[..]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

[..]"

2.18. Paragraph 185 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

2.19. Paragraph 186 states:

"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 Management Areas and Clean Air Zones is consistent with the local air quality action plan."

2.20. Paragraph 188 states:

"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

2.21. The NPPF also sets out the national planning policy on biodiversity and conservation. This emphasises that the planning system should seek to minimise effects on and provide net gains in biodiversity, wherever possible, as part of the Government's commitment to halting decline and establishing coherent and resilient ecological networks.

Planning Practice Guidance

2.22. The NPPF is supported by Planning Practice Guidance (PPG)[12] (2021), which includes guiding principles on how planning can take account of the impacts of new development on air quality.

2.23. Paragraph 001 Reference ID: 32-001-20191101 states:

"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2).

The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:

- *fine particulate matter ($PM_{2.5}$)*
- *ammonia (NH_3)*
- *nitrogen oxides (NO_x)*
- *sulphur dioxide (SO_2)*
- *non-methane volatile organic compounds (NMVOCs)*

[12] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government. Planning Practice Guidance. Accessible at: http://planningguidance.planningportal.gov.uk/

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

2.24. Paragraph: 005 Reference ID: 32-005-20191101 states:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.

Where air quality is a relevant consideration the local planning authority may need to establish:

- *The 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality"*

2.25. The PPG also provides guidance on the mitigation options. Paragraph: 008 Reference ID: 32-008-20191101 states:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- *maintaining adequate separation distances between sources of air pollution and receptors;*

- *using green infrastructure, in particular trees, where this can create a barrier or maintain separation between sources of pollution and receptors;*
- *appropriate means of filtration and ventilation;*
- *including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.*

Environmental Improvement Plan

2.26. The Environmental Improvement Plan 2023 is the first revision of the 25 year Environment Plan[13], and sets out how the 25 Year Environmental Plan goals, Environment Act targets, and other commitments that have been made domestically and internationally will combine to drive specific improvements in the natural environment. This is to be reviewed every five years, with the next review due in 2028.

2.27. Goal 2 – Clean Air sets out what the government has achieved since 2018, which includes publishing the Clean Air Strategy[14] in 2019, reducing pollution from domestic burning and publishing the Transport Decarbonisation Plan[15], all of which aim to improve air quality.

2.28. The document sets out the following measures and interventions to be implemented in order to tackle poor air pollution:

- A legal target to reduce population exposure to $PM_{2.5}$ by 35% in 2040 compared to 2018 levels, with a new interim target to reduce by 22% by the end of January 2028.
    - Interim target - Compared to 2018, the reduction in population exposure to $PM_{2.5}$ in the most recent full calendar year must be 22% or greater.
- Legal concentration limits for a number of other key pollutants. The majority of these limits, including for sulphur dioxide and coarse particulate matter, are already met; however, nitrogen dioxide still exceeds its annual mean objective, therefore the government is working towards meeting compliance with the 40 $\mu g/m^3$ limit.
- A legal target to require a maximum annual mean concentration of 10 micrograms of $PM_{2.5}$ per cubic metre ($\mu g/m^3$) by 2040, with a new interim target of 12 $\mu g/m^3$ by the end of January 2028.

[13] Department for Environment, Food and Rural Affairs, 2018. *A Green Future: Our 25 Year Plan to Improve the Environment.*
[14] Department for Environment, Food and Rural Affairs, 2019. *Clean Air Strategy 2019.*
[15] Department for Transport, 2021. *Decarbonising Transport. A Better, Greener Britain.*

- The highest annual mean concentration in the most recent full calendar year must not exceed 12 µg/m^3 of $PM_{2.5}$.

- Legal emission reduction targets for five damaging pollutants by 2030 relative to 2005 levels:
  - Reduce emissions of nitrogen oxides by 73%.
  - Reduce emissions of sulphur dioxide by 88%.
  - Reduce emission of $PM_{2.5}$ by 46%.
  - Reduce emissions of ammonia by 16%.
  - Reduce emissions of non-methane volatile organic compounds by 39%.

2.29. These measures will be monitored through the Annual Progress Report and the Outcome Indicator Framework. As noted previously, these targets have been set by central government, as opposed to local authorities directly assessing $PM_{2.5}$ concentrations against these targets.

National Clean Air Strategy

2.30. The Clean Air Strategy[16] was published in January 2019 and sets out how the government will improve air quality nationally. The document aims to tackle the issue of air quality across all parts of government and society to protect public health and the environment, and identifies what needs to be done to achieve this. The document complements the Industrial Strategy (archived), the Clean Growth Strategy[17] and the 25 Year Environment Plan[18] and is a key part of delivering the government's 25 Year Environmental Plan.

2.31. The document has adopted international targets to reduce emissions of fine particulate matter, ammonia, nitrogen oxides, sulphur dioxide and non-methane volatile organic compounds by 2020 and 2030. The document proposes tougher goals to cut public exposure to particulate matter pollution, as recommended by the WHO.

2.32. The strategy not only targets the reduction of emissions, but also a reduction in exposure.

Reducing Emissions from Road Transport: Road to Zero Strategy

2.33. The *Reducing emissions from road transport: Road to Zero Strategy*[19] (2018) document produced by the Office for Low Emission Vehicles (OLEV), Office for Zero Emission Vehicles (OZEV) and the Department for Transport (DfT) sets out how the government aims to end the sale of new conventional petrol and diesel cars and vans by 2040, with almost every car and van having zero emissions by 2050. Furthermore, the aim of the government is to see at least 50%, and as many as 70%, of new car sales being ultra-low emission by 2030 (and up to 40% of new van sales).

[16] Department for Environment, Food and Rural Affairs, 2019. Clean Air Strategy 2019.
[17] Department for Business, Energy and Industrial Strategy, 2017. The Clean Growth Strategy.
[18] Department for Environment, Food and Rural Affairs, 2018. A Green Future: Our 25 Year Plan to Improve the Environment.
[19] Department for Transport, Office for Low Emission vehicles and Office for Zero Emission Vehicles, 2018. Reducing emissions from road transport: Road to Zero Strategy

2.34. A number of measures have been set out in the document which outline how the government will support this gradual transition, some of which are consumer incentives, research and development and innovation support based.

2.35. Since this document was released, the then Prime Minister has announced that, as part of the Ten Point Plan for a Green Industrial Revolution (2020)[20], the government will end the sale of new petrol and diesel cars and vans from 2030, 10 years earlier than set out in the document above. This has now been delayed and pushed back to 2035.

2.36. This ambitious plan will see road traffic-related NO_x emissions to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in air quality tools used to assess air quality impacts.

REGIONAL POLICY AND GUIDANCE

South Yorkshire Mayoral Combined Authority (SYMCA) – Sheffield City Region Transport Strategy.

2.37. The Sheffield City Regional Transport Strategy (2019)[21], produced by SYMCA, sets out a vision for the future, including key transport challenges and commitments to address them, along with the policies adopted to deliver upon those commitments. The following policy relates to air quality:

- Policy 4 – Improve air quality across our City Region to meet legal thresholds, supporting improved health and activity for all, especially in designated AQMAs and CAZs.

2.38. To achieve this policy, the transport strategy lists the following measures that will put into place:

- Support adoption of sustainable travel modes over private cars to reduce the number of vehicles that use our roads, particularly into our town and city centres, through both infrastructure and behavioural change measures to public and sustainable transport;
- Encourage the uptake of low and zero emission vehicles to improve our air quality, including investing in expanding the network of vehicle charging points across the City Region in a coordinated way, to ensure full coverage across the region;
- Support investment in communications technology to reduce the need the travel, enabling more people to access broadband speeds needed to work away from a

[20] Department for Transport and Office for Zero Emission Vehicles, 2020. The Ten Point Plan for a Green Industrial Revolution
[21] South Yorkshire Mayoral Combined Authority, 2019. The Sheffield City Regional Transport Strategy

main office base and encourage businesses to adopt more home working for employees;

- Support investment in information and communications technology to help get the most out of the highways network for all modes, including smart motorways and traffic signal timings where they can smooth vehicle flows and reduce pollutants from queueing vehicles;
- Work with partners in the taxi and private hire trade to reduce pollutants by encouraging them to switch off engines when stationary and increase the number of ULEV hire vehicles;
- Work with Highways England to tackle emissions from the SRN where there is an impact on our urban areas;
- Develop a plan to address the higher level of pollutants resulting from freight and deliveries, including encouraging low emission vehicles and reducing the number of delivery vehicles in our town and city centres and/or for the first/last mile connections;
- Work with partners to introduce and enforce low emission and CAZs, supporting them in delivering cuts in emissions though investing in encouraging sustainable modes and reducing the need to travel.

LOCAL POLICY AND GUIDANCE

Barnsley Local Plan

2.39. The Barnsley Local Plan[22] was adopted on the 3rd January 2019 and at the time of writing is the current policy framework to aid in deciding planning applications.

2.40. It is noted that the application site is an allocated employment site within the Local Plan, and is identified as *ES10 Land South of Dearne Valley Parkway*. The description of the allocation states:

> *"The development will be subject to the production of a phased Masterplan Framework and will be expected to:*
>
> *[..]*
>
> *Provide an air quality assessment to assess the impacts of traffic emissions within air quality management areas along the A635 and other strategic road links to the A1/M and M1. Any adverse impacts on air quality should be mitigated in accordance with policy AQ1.*

[22] Barnsley Metropolitan Borough Council, 2019. Local Plan

[..]"

2.41. Paragraph 8.16 of the Local Plan in respect to this allocation goes on to state:

> *"A detailed air quality assessment is necessary to quantify the impact of any development together with robust mitigation proposals to off-set impacts. Any decision will be subject to consultation with Doncaster Metropolitan Borough Council given potential effects within its boundary."*

2.42. Policy T5 *Reducing the Impact of Road Travel* states:

- *"Developing and implementing robust, evidence-based air quality action plans to improve air quality;*
- *Working with our sub regional partners, fleet and freight operators to improve the efficiency of vehicles and goods delivery, and reduce exhaust emissions; and*
- *Implementing measures to ensure the current road system is used efficiently."*

2.43. Policy Poll1 *Pollution Control and Protection* states:

> *"Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.*
>
> *We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.*
>
> *Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate."*

2.44. Policy AQ1 *Development in Air Quality Management Areas* states:

> *"Development which impacts on areas sensitive to air pollution in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development.*
>
> *We will only allow residential development which impacts on areas sensitive to air pollution, where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.*

We will only allow development which impacts on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development."

Barnsley Metropolitan Borough Council: Air Quality and Emissions, Good Practice Planning Guidance

2.45. The BMBC (2021) Air Quality and Emissions, Good Practice Planning Guidance[23] sets out considerations of air quality impacts associated with developments.

2.46. The guidance explains how to classify developments as either 'Minor,' 'Medium' or 'Major' and the mitigation strategies associated with each, including when to incorporate an air quality assessment and/or an exposure assessment, as well as providing information as to what mitigation will be required depending on the classification of a proposed development.

Doncaster Local Plan

2.47. As stated previously, although the application site is situated within BMBC, Hickleton is situated within CDC, and therefore the Local Plan[24] for CDC has been considered within this assessment. The Doncaster Local Plan, adopted in September 2021, sets out how Doncaster will grow and develop from 2015 to 2035. Policy 54 relates to air quality.

2.48. Policy 54: *Pollution*, states:

"Development proposals that are likely to cause pollution, or be exposed to pollution, will only be permitted where it can be demonstrated that pollution can be avoided, or where mitigation measures (such as those incorporated into the design and layout of development) will minimise significantly harmful impacts to acceptable levels that protect health, environmental quality and amenity. When determining planning applications, the agent of change principle will be applied, and particular consideration will be given to:

A) an assessment of the risks to public health and the impact of cumulative effects and where necessary that the provision for mitigation against the total effects has been provided.

[...]

[23] Barnsley Metropolitan Borough Council, 2021. Air Quality and Emissions Good Practice Planning Guidance.
[24] Doncaster Council, 2021. Doncaster Local Plan 2015 – 2035.

C) the impact on national air quality; especially but not limited to Air Quality Management Areas, areas potentially close to the EU limit value, other sensitive areas and the aims and objectives of the Air Quality Action Plan. An Air Quality Assessment will be required to enable clear decision making on any relevant planning application.

D) any adverse effects on the quantity, quality and ecology features of water bodies and groundwater resources, including contamination to Source Protection Zones.

[…]"

Doncaster Council: Air Quality Technical Planning Guidance

2.49. The CDC (2022) Air Quality Technical Planning Guidance[25] sets out considerations of air quality impacts associated with developments and requires a proportionate level of mitigation to be put in place to achieve sustainable development.

2.50. The guidance explains how to classify developments as either 'Minor,' 'Medium' or 'Major' and the mitigation strategies associated with each, including when to incorporate an air quality assessment and/or an exposure assessment, as well as providing information as to what mitigation will be required depending on the classification of a proposed development.

Doncaster Council: Real World Driving Emissions Study 2022.

2.51. The CDC (2022) Real World Driving Emissions Study[26] presents an analysis of the real-world emissions measurements made during measurement campaigns conducted within the village of Hicketon in Doncaster, which is known to be an area of poor air quality.

2.52. The study explores the fleet composition travelling eastbound and westbound through Hicketon, through categorisation of vehicle types, Euro types and source apportionment. The document stops short of providing conclusions regarding the air quality issues within Hickleton, and does not provide any summary of what can be done to improve air quality within the village.

AIR QUALITY ACTION PLAN

National Air Quality Plan

2.53. DEFRA has produced an Air Quality Plan[27] to tackle roadside nitrogen dioxide (NO_2) throughout the United Kingdom. Along with a package of infrastructure, initiatives and grants, the plan requires Local Authorities to produce local action plans by March 2018, with the aim of

[25] Doncaster Council, 2022. *Air Quality Technical Planning Guidance.*
[26] Ricardo Energy & Environment 2022. *Real World Driving Emissions Study.*
[27] Department for Environment, Food and Rural Affairs, 2018. *UK plan for tackling roadside nitrogen dioxide concentrations*

reducing the air quality concentrations below the objective as soon as practically possible, should they be predicting exceedances of the air quality objectives beyond 2020.

Local Air Quality Action Plan – Barnsley

2.54. The latest BMBC Air Quality Action Plan[28] (AQAP) was produced in 2017, and further updated in 2019. The document sets out twenty-six measures to aid in reducing emissions.

2.55. Further details on these measures are set out in the AQAP and their progress is monitored through the latest Air Quality Annual Status Report[29] (ASR).

Local Air Quality Action Plan – Doncaster

2.56. The latest CDC AQAP[30] was produced in 2018, and sets out 15 measures to aid in reducing emissions across Doncaster. To note, there are no specific measures listed that focus on the air quality issue in the village of Hickleton. The following measures have been set out in the AQAP:

- Fuelling Change Campaign;
- ECO stars Fleet Recognition Scheme;
- Air Quality and Planning Technical Guidance;
- Clean Air Feasibility Study;
- Sustainable Travel Access Fund Projects;
- Investigate emission standards via taxi licensing;
- Future (Fleet) Transport Policy;
- 20mph Speed Limits;
- Highways Planned Maintenance Scheme Priority;
- Cycling Strategy;
- Quality Bus Partnership;
- Investigate the feasibility of green barriers in Doncaster's AQMAs;
- Parking Strategy;
- Walking Strategy; and
- Procurement.

[28] Barnsley Metropolitan Borough Council (2017) Air Quality Action Plan
[29] Barnsley Metropolitan Borough Council, 2021. *2021 Air Quality Annual Status Report (ASR).*
[30] Doncaster Council, 2018. Doncaster Metropolitan Borough Council Air Quality Action Plan

2.57. Further details on these measures are set out in the AQAP and their progress is monitored through the latest ASR[31]. To note, further consideration of these measures has been considered in Section 7 (Mitigation Discussion).

2.58. Vanguardia were advised that a specific AQAP for Hickleton has been created, but this has yet to be released to the public domain. Historically, a standalone AQAP for Hickleton has not been produced, with only a detailed emission monitoring study[32] carried out in 2022.

[31] Doncaster Council, 2022 *2022 Air Quality Annual Status Report (ASR).*
[32] Ricardo Energy & Environment 2022. *Real World Driving Emissions Study.*

3. ASSESSMENT METHODOLOGY

CONSULTATION

3.1. *Paragraph: 007 Reference ID: 32-007-20191101 of the NPPG (2023) states the following:*

> *"The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned."*

3.2. Vanguardia held initial discussions with CDC (as required in line with paragraph 8.16 of the Barnsley Local Plan) on 08th November 2022 regarding the impact of the proposed development on the village of Hickleton and the associated residential receptors. Within the meeting, it was made apparent that an independent study[33] on the air quality issues within Hickleton had been produced, and was undergoing internal review, and has since been released and considered as part of this AQA. A further meeting was held on 16th June 2023 to discuss the initial results of the AQA, where the CDC EHO provided Vanguardia with comments, which have been considered within this AQA.

3.3. As previously highlighted no consideration of impacts within Marr were deemed to be required during this initial consultation exercise.

CONSTRUCTION & OPERATIONAL TRAFFIC IMPACTS

3.4. The key guidance document which has been used to determine the potential for impacts upon air quality is the Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) (2017)[34] *Land-Use Planning and Development Control: Planning for Air Quality* document.

3.5. This guidance document provides indicative screening criteria for when an Air Quality Impact Assessment is required. The following screening criteria has been considered for this AQA:

Local Highway Network

Stage 1

- If any of the following apply to the proposed development:
  - Contains 10 or more residential units or a site area of more than 0.5ha; or
  - Contains more than 1,000 m^2 of floor space for all other uses or a site area greater than 1ha.

[33] Ricardo Energy & Environment 2022. *Real World Driving Emissions Study.*
[34] Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM), 2017. *Land-use Planning & Development Control: Planning for Air Quality.*

- Coupled with any of the following:
  - The development has more than 10 parking spaces; or
  - The development will have a centralised energy facility or other centralised combustion process.

Stage 2

- A change of LDV, (light duty vehicle) flow of:
  - More than 100 AADT (Annual Average Daily Traffic) within or adjacent to an Air Quality Management Area (AQMA); or
  - More than 500 AADT elsewhere.
- A change of HDV, (heavy duty vehicle) flow of:
  - More than 25 AADT within or adjacent to an AQMA; or
  - More than 100 AADT elsewhere.

3.6. Should these criteria not be met, then the guidance document considers air quality impacts associated with a scheme to be 'insignificant' and no further assessment is required.

3.7. As the development will create more than 1,000 m^2 of floor space, with car parking likely to exceed 10 spaces, the Stage 1 criteria are exceeded. The development proposals have therefore been assessed against the Stage 2 criteria.

3.8. Traffic generated as a result of the proposed development will pass through the Hickleton AQMA, therefore the more stringent criteria should be applied. A review of the traffic data provided by the transport consultant indicated that the proposed development operational traffic will generate 474 LDV and 854 HDV two-way annual average daily traffic movements through the AQMA, which exceeds the Stage 2 criteria. Furthermore, the construction traffic resulting from the construction of the proposed development will generate 105 LDV and 86 HDV two-way annual average daily traffic movements through the AQMA, which exceeds the Stage 2 criteria on a temporary basis.

3.9. On this basis, a full impact assessment is required to assess the impact of the proposed development operational and construction traffic on residential receptors within this AQMA. The methodology of assessing the impacts is set out below.

SENSITIVE HUMAN RECEPTORS

3.10. The concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been considered as part of this assessment.

3.11. While selecting the receptor locations, careful consideration was made to receptors located near key factors that may influence the level of impact, such as changes in gradient, euro engine standards, street canyon effects and vehicle speeds.

3.12. The sensitive locations at which the standards and objectives apply are places where the population is expected to be exposed to the various pollutants over the particular averaging period. Thus, for those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to measure concentrations against the set standards are areas of residential housing, since it is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.

3.13. Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time, such as on public footways or residential amenity areas.

3.14. DEFRA (2022) Local Air Quality Management Technical Guidance (TG22) (LAQM TG(22))[35] states:

> *"Dispersion models cannot predict short-term concentrations as reliably as annual mean concentrations.*
>
> *[..]*
>
> *Previous research carried out on behalf of Defra and the Devolved Administrations identified that exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60 µg/m^3 This assumption is still considered valid; therefore local authorities should refer to it."*

3.15. The modelling receptor locations used within this AQA are set out in Appendix B. The classification of each receptor is set also set out.

ASSESSMENT SCENARIOS

3.16. The impacts of the proposed development has been considered in isolation and in conjunction with other approved schemes, to quantify the standalone impact of the proposed development as well as the cumulative impacts. The following traffic scenarios have been considered within this AQA:

- Scenario 1 – 2022 Baseline (for Model Verification)
- Scenario 2 – 2025 Baseline
- Scenario 3– 2025 Baseline + Proposed Development

[35] Department for Environment, Food & Rural Affairs, 2022. *Local Air Quality Management. Technical Guidance (LAQM TG(22)).*

- Scenario 4 – 2025 Baseline + Proposed Development + Cumulative Developments
- Scenario 5 – 2026 Baseline
- Scenario 6– 2026 Baseline + Proposed Development
- Scenario 7 – 2026 Baseline + Proposed Development + Cumulative Developments

3.17. To note, the 2025 scenarios consider associated construction traffic, and the 2026 scenarios consider operational traffic.

3.18. The traffic data, (and the assumptions built into this traffic data) utilised within this assessment for all assessment years has been provided by the transport consultant, Fore Consulting Limited. This traffic data is set out in Appendix C.

3.19. To note, the cumulative developments inherently built into the baseline positions for this AQA are set out in the table below.

Table 3 Cumulative Developments

Local Plan Ref	Planning App. Ref.	Description
ES8	2020/1032	B2 and B8 development at Park Spring Road, Grimethorpe
ES11	2021/0012	7,400 sqm extension to existing warehouse at Fields End Business Park, Portwest, Colliery Lane, Thurnscoe
ES12	N/A	Thurnscoe Business Park - 1.6ha left to develop
ES20	2018/1353	B1, B2 and B8 development at Land at Everill Gate, Wombwell.
ES23	2021/1282	19,147 sqm employment development (Class E, B2 and B8) at Land at Houghton Main, Park Spring Road, Little Houghton
HS42	N/A	Lane South of Lowfield Road - 86 dwellings (Indicative yield)
HS43	2017/1051	479 residential dwellings at Land off Willow Road, Thurnscoe
HS44	N/A	Bolton House Farm - 194 dwellings (Indicative yield)
HS45	2020/1439	68 residential dwellings at Land off Barnburgh Lane, Goldthorpe
HS46	2021/1171	137 residential dwellings at Lockwood Road, Goldthorpe
HS47	2022/0420	109 residential dwellings at Land off Goldthorpe Road, Goldthorpe
HS48	N/A	Land North of Barnburgh Lane - 109 dwellings (Indicative Yield)
HS49	2019/1274	116 residential dwellings at Land at Kingsmark Way, Goldthorpe
HS50	N/A	Brunswick Street - 45 dwellings (Indicative yield)
HS51	N/A	Broadwater Estate - 279 (Indicative yield)
HS52	N/A	Land West of Thurnscoe Bridge Lane and South of Derry Grove - 308 dwellings (Indicative yield)
HS53	N/A	South of King Street - 25 dwellings (Indicative yield)
HS54	N/A	Land off Gooseacre Avenue - 80 dwellings (Indicative yield)
HS55	N/A	Former Highgate Social Centre - 29 dwellings (Indicative yield)
HS92	N/A	Everill Gate Farm - 26 dwellings (Indicative yield)

Local Plan Ref	Planning App. Ref.	Description
MU6	2019/0089	235 residential dwellings at Lundhill Road, Wombwell
N/A	2020/1246	43 residential dwellings at Land off Barnsley Road, Goldthorpe
N/A	2015/1198 (Ph2)	61 residential dwellings at Land off Barnburgh Lane, Goldthorpe
N/A	2017/1001	150 residential dwellings at Land east of Lundhill Road, Wombwell
N/A	2022/0056	1,979 sqm retail unit at Former Goldthorpe Primary School, High Street, Goldthorpe

MODELLING METHODOLOGY

Dispersion Model

3.20. The modelling of the release of vehicular emissions, (dispersion), into the air has been carried out using the latest version of the air dispersion model: ADMS-Roads (v5.0.1.3). The model calculates pollution concentrations and deposition over a specified area and/or at a specified location, based upon the following input information:

- Source parameters: e.g. highway width, average speed of vehicles, the number of vehicles per hour and the diurnal traffic profile;
- Meteorological parameters: e.g. wind speed, direction, precipitation, temperature, and atmospheric stability; and
- Topographical factors: e.g. ground levels, terrain, buildings, gradients and surface roughness.

3.21. The following information, as set out in LAQM.TG(22) has been utilised within this AQA:

"For junctions, common sense, driving experience and local knowledge are helpful to estimate speeds. For example, for a section of road leading up to traffic lights, the aim should be to estimate average speeds over a 50 m section of road:

- *Traffic pulling away from the lights, e.g. 40-50kph;*
- *Traffic approaching the lights when green, e.g. 20-50kph; and*
- *Traffic on the carriageway approaching the lights when red, e.g. 5-20kph, depending on the time of day and how congested the junction is.*

It is considered that the combined effect of these three conditions is likely in most instances to be a two-way average speed for all vehicles of 20 to 40kph. Speeds in similar ranges would also apply at roundabouts, although on sections of large roundabouts, speeds may well average between 40-50kph."

3.22. Due to the changing of speed through the village, from national speed limit (60 mph) to 30 mph, as well as the changing gradient, a speed survey was carried out by the transport consultant, which has taken into account the changing speeds through the village. The speeds through Hickleton are set out in Appendix A. The nature of the junction to the east of Hicketon (Hickleton Road and Red Hill Lane junction with the A635) means that there is potential for queuing (should a vehicle be turning right on the eastbound carriageway). This however has not been accounted for in the modelling as it is not clear whether queuing is a frequent occurrence.

3.23. The modelled road network, including the modelled gradient percentages, are illustrated in Figure 2. The modelled road speeds are based on the survey carried out by the transport consultant, and are set out and illustrated in Appendix A.

Figure 2 Modelled Road Gradients

Terrain

3.24. Due to the gradient change through the village of Hickleton, complex terrain has been modelled. The complex terrain was calculated from the OS Terrain 50 contour spot heights, at a 64 x 64 grid.

Street Canyons

3.25. Due to the nature of the village of Hickleton, and the position of diffusion tubes and fresh air openings on the façade of buildings within the village, the façades of buildings and walls have been modelled using the advanced street canyons option in ADMS-Roads. This is to improve the accuracy of the model, and to account for the poor dispersion at the façade of these structures, as the recorded diffusion tube concentrations are elevated at these locations. Due to this poor dispersion, concentrations at receptors can be higher than what would usually be experienced, due to the 'trapping' effect. LAQM TG(22) defines the following for street canyons:

> *"Although street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, there are numerous example whereby broader streets may also be considered as street canyons where buildings result in reduced dispersion and elevated concentrations (which may be demonstrated by monitoring data). Therefore, canyon effects can occur both in small towns or large cities."*

3.26. Vanguardia consulted Cambridge Environmental Research Consultants (CERC) (the developer of the ADMS-Roads air quality dispersion modelling software) on the use of street canyons. It was advised that the 'advanced street canyon' option can be used for streets with buildings/walls on only one side, not just typical narrow canyons. On the basis that two receptor locations are located on the façade of buildings, building façades have been modelled. These modelled building façades are illustrated in Figure 3 for:

- R11 and R12 (6, The Mews, Hickleton); and
- R29, R30 and R31 (John O Gaunts, Hickleton)

3.27. Parameters that have been included within the model are:

- The street canyon width, which is not the road width, but the distance measured as façade to façade of buildings on either side of the street; and
- The average height of buildings and structures.

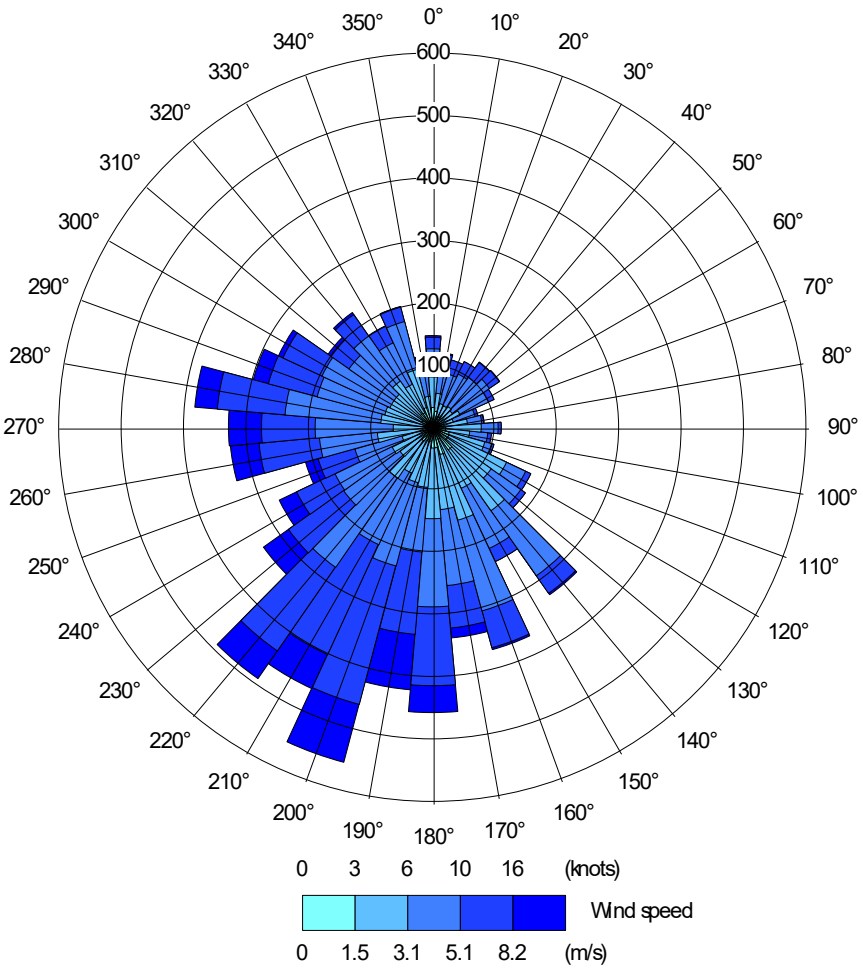
Figure 3 Modelled Street Canyons

Meteorological Data

3.28. The meteorological data required for the ADMS model must be sourced from a representative location to the study site and include a full year of sequential readings. A review of the nearest available meteorological stations indicates Doncaster Sheffield is the most suitable site with the most complete/representative information. 2022 meteorological data has been utilised for this assessment in line with the verification year.

3.29. It is recognised that a minimum data capture of 90% is recommended for representing hourly dispersion conditions within the dispersion model. Missing lines of meteorological data can be interpolated or filled by data for these specific hours from a neighbouring site. The data capture for Doncaster Sheffield in 2022 was within an acceptable margin error for use. The wind rose for this site is illustrated in Figure 4.

Figure 4 Doncaster Sheffield Meteorological Site Windrose (2022)

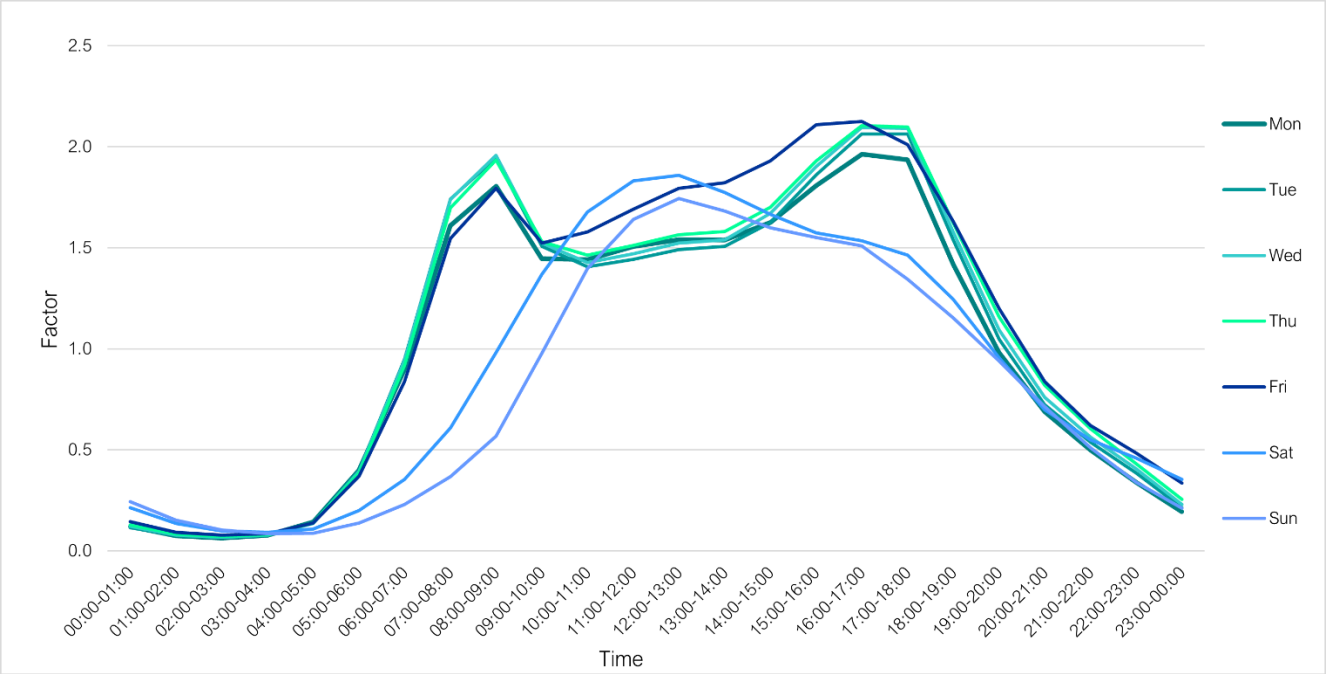


Diurnal Profile

3.30. A standard diurnal profile from the Department of Transport website[36] has been utilised as part of the modelling process for an average 7 day week in 2022. The diurnal profile is illustrated in Figure 5.

[36] Department of Transport. Table TRA0307. https://www.gov.uk/government/collections/road-traffic-statistics

Figure 5 Standard Diurnal Traffic Profile



Emission Factors

3.31. There are numerous sources of NO_2, PM_{10} and $PM_{2.5}$ which include for example, industry and domestic origins. However, the main source is usually road transport. For the purpose of this AQA and due to the absence of other sources in the area, only road traffic emissions have been modelled.

3.32. The potential impacts have been modelled using the ADMS-Roads atmospheric dispersion model software. Emission factors have been calculated using the Emission Factor Toolkit v11.0, with the fleet composition adjusted based on the outcomes of the Ricardo AEA (2022) Report, which has been discussed further in Appendix C.

3.33. It has been widely known for some time that NO_x/NO_2 levels historically have not been reducing as quickly as anticipated, and this was identified by DEFRA in 2011. This was recently reiterated in an IAQM Interim Position Statement (v1.1)[37] released in July 2018 recognising that emissions from diesel vehicles have not declined as expected by DEFRA. This document has since been formally withdrawn, stating:

> *"There is a growing body of evidence to suggest that the latest COPERT vehicle emission factors, which feed into the EFT (v9 and onwards), reflect the real-world NO_x emissions more accurately.*

[37] Institute of Air Quality Management, 2018. *Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments.*

It is judged that an exclusively vehicle emissions-based sensitivity test is no longer necessary.

On this basis, the EFT may be used for future year modelling with greater confidence when considering the per vehicle emission, provided that the assessment is verified against measurements made in the year 2016 or later."

3.34. Therefore, the EFT v11.0 is acceptable for an assessment year of 2022, 2025 and 2026 and no sensitivity test has therefore been undertaken.

3.35. Vehicles emit NO_x with different proportions of NO_2. Following release into the atmosphere, chemical reactions take place between nitric oxide (NO), NO_2 and Ozone (O_3). In this AQA, the modelling of NO_x emissions has taken place and the resulting NO_2 concentration has been calculated post modelling using the DEFRA NO_x to NO_2 Calculator (v8.1)[38].

Model Verification

3.36. Whilst ADMS-Roads is widely accepted for its use in assessments of this nature, it is still important that a model verification process is undertaken to confirm that the model's performance for the assessment is within an acceptable margin of error. Therefore, a comparison of modelled results with monitored results has been undertaken in line with LAQM.TG(22)[39].

3.37. Two verifications models were conducted, one using roadside NO_2 diffusion tubes, and one using kerbside NO_2 diffusion tubes. LAQM TG(22) states the following regarding the use of kerbside sites for verification purposes:

"Kerbside sites are generally not recommended for the adjustment of road traffic modelling results as the inclusion of these sites may lead to an over-adjustment of modelling at roadside sites. The exception is where kerbside sites are relevant for exposure, for example properties fronting directly onto the road. In that case, kerbside sites may be used in the model verification process."

3.38. To note, LAQM TG(22) defines roadside and kerbside locations as:

- Roadside - A site sampling typically within one to five metres of the kerb of a busy road (although distance can be up to 15 m from the kerb in some cases); and
- Kerbside - A site sampling within one metre of the kerb of a busy road.

[38] Department for Environment, Food & Rural Affairs. NO_x to NO_2 Calculator. Accessible at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html
[39] Department for Environment, Food and Rural Affairs (2022) Local Air Quality Management Technical Guidance LAQM, TG (22).DEFRA. London

3.39. On the basis that the buildings of two residential receptors, representative of long-term exposure, are located within one metre of the nearest kerb, two adjustment factors have been derived; one for adjusting those receptors representative of roadside locations, and one for adjusting those receptors representative of kerbside locations.

3.40. The adjustment factors for the roadside and kerbside sites are set out in Appendix G. The kerbside verification model was found to be under-predicting NO_2 compared to the monitored concentrations, which is not unusual. However, the roadside verification model showed one tube over-predicting concentrations. Therefore, adjustment factors for both has been derived. The verification has utilised 2022 data, which is considered to be the most representative year post the COVID-19 pandemic.

3.41. To note, it is noted that an automatic monitor is located within Hickleton, which monitors concentrations of NO_2, PM_{10} and $PM_{2.5}$. However, data for 2022 was not provided, therefore could not be used in the verification process. Therefore Road-NO_x adjustment factor has been used on the modelled Road-PM_{10} and Road-$PM_{2.5}$ concentrations.

SIGNIFICANCE IMPACT CRITERIA

Construction & Operational Traffic

3.42. Currently there is no formal guidance on the absolute magnitude and significance criteria for the assessment of air quality impacts. However, the EPUK & IAQM (2017) document have published recommendations for describing the impact at individual receptor locations as set out in Table 4 and utilised to determine the description of any impact.

Table 4 Air Quality Impact Descriptors for Individual Receptors

Long term average Concentration at receptor in assessment year.	% Change in concentration relative to Air Quality Action Level (AQAL*)				
	<0.5	1	2-5	6-10	>10
75% of less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

Notes:
Vales are rounded to the nearest whole number.
When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL).'

3.43. The EPUK & IAQM (2017) advice provides guidance on the severity of an impact as a descriptor. However, although the impacts might be considered 'Slight,' 'Moderate' or 'Substantial' at one or more receptor location, the overall effects of a proposed development

may not always be judged as being 'significant.' Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole including the extent to which receptors represent sensitive locations and whether this wider impact is significant or not.

3.44. The EPUK & IAQM (2017) guidance goes on to state:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

3.45. To note, when considering this, careful considerations has been made of the World Health Organisation (WHO) guidelines. The current air quality objectives were set based on NO_2 in particular being a "threshold" pollutant – i.e. that there is a "safe" level of NO_2 in the ambient air that will not damage the health of an average person. In recent years this has been called into question, and the WHO Guidelines, while not statutory, are considerably lower (10 µg/m^3 compared to 40 µg/m^3 for NO_2). While using the current objectives is not technically incorrect, there is an argument to be made that any worsening of air quality, particularly within an AQMA, should not be allowed to occur as the potential to damage health is clear.

3.46. Air Quality is now the leading environmental risk factor globally, and the issue is rising in prominence all the time. As such worsening the air quality within an existing AQMA, even by a small amount should be carefully considered.

3.47. The guidance believes that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme / proposed development described as either significant or not significant. In drawing this conclusion, the following factors should be taken into account:

- The number of properties/receptors affected by different levels of impacts;
- The magnitude of any changes and descriptors;
- Whether a new exceedance of an objective or limit value is predicted to arise or an existing exceedance is removed, or an existing exceedance is substantially increased or reduced;
- The level of uncertainty, including the extent to which worst case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.48. The judgement of the significance should be made by a competent professional who is suitably qualified.

MODELLING UNCERTAINTY

3.49. There are many uncertainties when considering both measured and predicted pollution concentrations. The model is dependent upon the traffic data provided for the project, and should this be subject to change, so may the resulting modelled pollution concentrations.

3.50. The background air quality concentrations have been taken from the DEFRA background mapping. The DEFRA website includes estimated background air pollution data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for each 1km by 1km OS grid square. Background pollutant concentrations are modelled from the base year of 2018 and based on ambient monitoring and meteorological data from 2018. The mapping includes projections for future years, up to currently 2030. Furthermore, the concentrations are modelled at a standard 'living height,' which has been averaged across the grid square.

3.51. There is discrepancy between the concentrations mapped by DEFRA and those recorded at local background sites. This is supported by LAQM TG(22), which states:

> *"If national background maps are used, these should first be compared against any local monitoring to check they are representative of the area. In most cases there is good agreement with local monitoring, but some locations may not agree. Local authorities are not expected to verify and adjust the national background maps. Where these estimates do not agree with local monitoring, either local monitoring may be used, or local authorities may consider adjusting the background maps. The LAQM Support Helpdesk should be contacted for advice on adjusting national maps."*

3.52. Therefore, a calibration factor has been derived from the ratio between monitored urban background concentrations in 2022 (local authority monitoring for Doncaster) and DEFRA background mapped concentrations for NO_2. It has not been possible to derive an adjustment factor for PM_{10} and $PM_{2.5}$ due to the lack of background monitoring data, Therefore, the NO_2 calibration factor has been used to adjust the DEFRA background concentrations for these pollutants.

3.53. Due to the ongoing uncertainty regarding 2020 and 2021 air quality monitoring data as a result of the COVID-19 global pandemic, to ensure a conservative assessment of future exposure and impacts is made, a 2022 verification process has been used, as this was the first year without any lockdown events, and also considers the behavioural change as a result of the pandemic.

3.54. The emissions factors within the latest DEFRA Emission Factor Toolkit (EFT) are based on assumptions which were current before the occurrence of the COVID-19 pandemic. As such, this data will not reflect any changes that have occurred or may occur in the future as a result

of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

3.55. This is highlighted by a recent statement published by DEFRA, which states:

> *"Users of the updated LAQM tools should be aware that the projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these tools do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns."*

3.56. To reduce the uncertainty regarding emission factors, the assessment has utilised the specific Euro fleet composition monitored within Hicketon by Ricardo AEA, as set out in Appendix C. The user defined euro compositions in the EfT has been utilised, rather than using the national average emission factors. This gives a more accurate representation of the very localised fleet composition within Hickleton, and therefore makes the assessment both more representative of the fleet composition passing through Hickleton, thus improving the accuracy of the model.

3.57. As stated previously, due to a lack of PM_{10} and $PM_{2.5}$ monitoring carried out in at kerbside location in Hickleton in 2022, adjustment factor could not be derived for these pollutants. Therefore, the Road-NO_x verification factor for kerbside receptors has been applied to Road PM_{10} and $PM_{2.5}$ concentrations.

4. BASELINE CONDITIONS

AIR QUALITY REVIEW AND ASSESSMENT

4.1. Under the Air Quality Strategy there is a duty on all Local Authorities to consider the air quality within their boundaries and to report annually to DEFRA. Local Air Quality Management (LAQM) in the vicinity of the site had been assessed by CDC through the national Review and Assessment process, in fulfilment of Part IV of the Environmental Act 1995.

4.2. CDC have seven AQMAs in different areas of the jurisdiction, all declared for exceedances of the NO_2 annual mean objective and one additionally for exceedances of the NO_2 1-hour objective. To note, this AQA concentrates on AQMA no.7 (stated as the Hickleton AQMA for the purposes of this report), located within the village of Hickleton, and declared for exceedances of both the NO_2 annual mean and 1-hour mean objective.

LOCAL AIR QUALITY MONITORING

4.3. CDC have one automatic monitor measuring NO_2, PM_{10} and $PM_{2.5}$ and five diffusion tubes measuring NO_2 concentrations within the Hickleton AQMA. To note, this automatic monitor (CM7) was installed in 2021, but data was not provided for 2021 or 2022 by CDC.

4.4. The monitoring locations within Hickleton are illustrated in Figure 6 and set out in Table 5 to Table 9.

Table 5 Summary of Annual Mean NO_2 Monitoring (2017 – 2022)

Site ID	Site Type	2017	2018	2019	2020	2021	2022
Automatic Monitors – Annual Mean (µg/m³)							
CM7	Roadside	-	-	-	-	-	19.05
Diffusion Tubes – Annual Mean (µg/m³)							
DT44	Kerbside	**79.0**	**70.0**	**67.0**	**50.7**	**51.0**	**52.0**
DT45	Roadside	25.0	25.0	22.0	16.8	15.9	15.3
DT46	Suburban	37.0	40.0	35.0	24.9	26.0	25.8
DT47	Kerbside	**100.0**	**91.0**	**76.0**	**59.4**	**54.1**	**54.2**
DT48	Kerbside	**90.0**	**87.0**	**80.0**	**55.8**	**55.2**	**61.1**
Objective		**40**					

Notes:
Bold indicates exceedances of the NO_2 annual mean objective. **Bold and underlined** indicates exceedances of 60 µg/m³ (which is an indication the hourly mean objective could be being breached).

Table 6 Summary of NO_2 1-hour Monitoring (2017 – 2022)

Site ID	Site Type	2017	2018	2019	2020	2021	2022
Automatic Monitors – Number of 1-hour means exceeding 200 µg/m³							
CM7	Roadside	-	-	-	-	-	0 (83)
Objective		**18**					

Notes:
Bold indicates exceedances of the NO_2 1-hour mean objective (200 µg/m³ not to be exceeded more than 18 times per year).
If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets

Table 7 Summary of Annual Mean PM_{10} Monitoring (2017 – 2022)

Site ID	Site Type	2017	2018	2019	2020	2021	2022
Automatic Monitors – Annual Mean (µg/m³)							
CM7	Roadside	-	-	-	-	-	12.59
Objective		**40**					

Notes:
Bold indicates exceedances of the PM_{10} annual mean objective.

Table 8 Summary of PM_{10} 24-hour Monitoring (2017 – 2022)

Site ID	Site Type	2017	2018	2019	2020	2021	2022
Automatic Monitors – Number of 24-hour means exceeding 50 µg/m³							
CM7	Roadside	-	-	-	-	-	0 (83)
Objective		**35**					

Notes:
Bold indicates exceedances of the PM_{10} 24-hour mean objective (50 µg/m³ not to be exceeded more than 35 times per year).

Table 9 Summary of Annual Mean $PM_{2.5}$ Monitoring (2017 – 2022)

Site ID	Site Type	2017	2018	2019	2020	2021	2022
Automatic Monitors – Annual Mean (µg/m³)							
CM7	Roadside	-	-	-	-	-	8.6
Objective		**20**					

Notes:
Bold indicates exceedances of the $PM_{2.5}$ annual mean objective.

Figure 6 Local Monitoring Locations

4.5. The diffusion tube monitoring carried out by CDC within Hickleton shows a mixture of compliance and non-compliance of the NO_2 annual mean objective between 2017 to 2022.

4.6. Where non-compliance is concerned, they have been recorded at kerbside locations, immediately next to the heavily trafficked A635. However, these locations are relevant of exposure due to the nature of the village, with residential dwellings being within 1 m of the road in some cases.

4.7. It should be noted that 2020 and 2021 concentrations have been impacted as a result of the COVID-19 pandemic, and therefore cannot be used to inform concentrations in the local area. Whilst it is expected that as a result of the COVID-19 pandemic that behaviours have occurred (such as hybrid working patterns), data on the impact of this on air quality long-term is currently limited to monitoring data collected in 2022, therefore long-term conclusions cannot be drawn, but early evidence is showing a general reduction.

BACKGROUND CONCENTRATIONS

4.8. The DEFRA website includes estimated background air pollution data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for each 1km by 1km OS grid square[40]. Background pollutant concentrations are modelled from the base year of 2018 and based on ambient monitoring, meteorological data from 2018 and then projected for future years.

4.9. The background calibration factor for NO_2 is set out in Table 6. The calibrated projected background pollution concentrations for the future baseline years (2025 and 2026), covering the closest OS grid square to the specified receptors (as set out in Appendix B), are provided in Table 7 and have been utilised within this assessment.

Table 10 NO_2 Background Calibration Factor

NO_2	Monitoring Sites		
	DT33	**DT35**	**DT38**
Measured	9.3	10.4	13.5
Mapped	7.1	7.3	9.1
Calibration Factor	1.3	1.4	1.5
Average Calibration Factor	1.4		

Table 11 Estimated Annual Mean Background Pollutant Concentrations (µg/m^3)

Pollutant	2022	2025	2026
NO_2	12.1 – 12.2	11.0	10.8
PM_{10}	16.9 – 17.9	16.4 – 17.4	16.4 – 17.4
$PM_{2.5}$	10.1 – 10.3	9.7 – 9.9	9.7 – 9.9

[40] Department for Environmental Food and Rural Affairs. Accessible at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

5. CONSTRUCTION PHASE IMPACT ASSESSMENT

TRAFFIC IMPACTS – EXISTING RECEPTORS

5.1. As set out in Section 3, the screening process highlighted that a full impact assessment was required for the proposed development, based on the number of daily development trips exceeding the Stage 2 criteria in the EPUK & IAQM (2017) guidance.

2025 Impact Assessment Without Cumulative Traffic– Construction Phase Traffic

5.2. The '2025 Baseline' NO_2, PM_{10} and $PM_{2.5}$ concentrations at the previously specified human receptor locations, as set out in Appendix B, have been compared to the '2025 Baseline+ Proposed Development' concentrations and the results are set out in the tables in Appendix E. The tables also set out the impact descriptor, considered against the annual mean air quality standards set out in Table 1, at each receptor location in line with the assessment matrix set out in Table 4.

NO_2

5.3. The modelled NO_2 concentrations in Table E.1 show that NO_2 concentrations at one of the specified residential receptor locations are above the annual mean objective (40 µg/m^3). The highest concentration recorded is 55.8 µg/m^3 at R29 (John O Gaunts, Hickleton), located on the façade of the building fronting onto the A635. This receptor is predicted to experience an annual concentration increase of 0.6 µg/m^3.

5.4. Using the matrix in Table 4, it can be seen that the impacts on the majority of existing residential receptors in Hickleton are anticipated to be **negligible (adverse)**, with **substantial (adverse)** impacts at R29 and R30, the John O Gaunts dwelling.

5.5. The annual average mean concentration at two receptor locations (R29 and R30) do not however exceed 60 µg/m^3, indicating that the receptors would not experience an exceedance of the 1-hour mean objective, in line with paragraph 7.97 of LAQM.TG(22). The remaining receptors, including those representative of short-term exposure, are not predicted to exceed the 60 µg/m^3 indicator.

PM_{10}

5.6. The modelled PM_{10} concentrations in Table E.2 do not predict any exceedances of the annual mean objective (40 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.1 µg/m^3.

5.7. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

5.8. For PM_{10}, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m^3) is likely to be exceeded.

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

5.9. There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

> *"The relationship does have limitations in so far that it should not be applied when the annual mean PM_{10} concentration is lower than 14.8 µg/m^3."*

5.10. On the basis that all of receptors are above 14.8 µg/m^3, the formula above can be used to inform the number of 24-hour mean objective exceedances.

5.11. The highest annual mean PM_{10} concentration is 24.1 µg/m^3, predicted at R29 in 2025. Based on the formula above, this predicts 10.7 exceedance days, which is below the 35-days annual limit. It is, therefore, not thought that any receptor would not be impacted from short-term concentrations of PM_{10}.

$PM_{2.5}$

5.12. The modelled $PM_{2.5}$ concentrations in Table E.3 do not predict any exceedances of the Stage 2 Post 2020 annual mean limit (20 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.1 µg/m^3.

5.13. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

Significance of Impacts

5.14. The impacts on the majority of residential receptors modelled are anticipated to be **negligible (adverse)** for NO_2, with the exception of two modelled receptors, which are associated with the John O Gaunts dwelling. These receptors are predicted to experience a temporary **substantial (adverse)** impact as a result of construction traffic associated with the proposed development, with concentrations exceeding the annual mean objective. Although the concentration exceeded the NO_2 annual mean objective, the NO_2 1-hour mean objective is not expected to be exceeded at John O Gaunts, Hickleton.

5.15. The PM_{10} impacts on all residential receptors are predicted to be **negligible (adverse)**, with the PM_{10} 24-hour mean objective not expected to be exceeded at any receptor.

5.16. The $PM_{2.5}$ impacts on all modelled residential receptors are predicted to be **negligible (adverse)**.

5.17. Although the EPUK & IAQM (2017) states that a substantial (adverse) impact at one or more receptor location may not always be judged as being 'significant', the guidance goes on to state:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

5.18. On this basis, and in accordance with the EPUK & IAQM (2017) guidance, as substantial impacts have been identified that exceed the NO_2 annual mean objective, the overall impacts are considered '**significant**' at the John O Gaunts dwelling.

5.19. It should be noted that within the baseline scenario, the concentrations at this dwelling is exceeding the NO_2 annual mean objective. It is not clear if any mitigation has been considered for this dwelling due to the existing air quality issues.

2025 Impact Assessment with Cumulative Traffic– Construction Phase Traffic

5.20. The '2025 Baseline' NO_2, PM_{10} and $PM_{2.5}$ concentrations at the previously specified human receptor locations, as set out in Appendix B, have been compared to the '2025 Baseline + Proposed Development (with cumulative traffic) concentrations and the results are set out in the tables in Appendix F. The tables also set out the impact descriptor, considered against the annual mean air quality standards set out in Table 1, at each receptor location in line with the assessment matrix set out in Table 4.

NO_2

5.21. The modelled NO_2 concentrations in Table F.1 show that NO_2 concentrations at one of the specified residential receptor locations are above the annual mean objective (40 µg/m^3). The highest concentration recorded is 58.4 µg/m^3 at R29 (John O Gaunts, Hickleton), located on the façade of the building fronting onto the A635. This receptor is predicted to experience an annual concentration increase of 2.6 µg/m^3.

5.22. Using the matrix in Table 4, it can be seen that the impacts on the majority of existing residential receptors in Hickleton are anticipated to be **negligible (adverse) to slight (adverse)**, with **substantial (adverse)** impacts at R29 and R30, the John O Gaunts dwelling.

5.23. The annual average mean concentration at two receptor locations (R29 and R30) do not however exceed 60 µg/m^3, indicating that the receptors would not experience an exceedance of the 1-hour mean objective, in line with paragraph 7.97 of LAQM.TG(22). The remaining

receptors, including those representative of short-term exposure, are not predicted to exceed the 60 µg/m^3 indicator.

PM_{10}

5.24. The modelled PM_{10} concentrations in Table F.2 do not predict any exceedances of the annual mean objective (40 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.5 µg/m^3.

5.25. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

5.26. For PM_{10}, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m^3) is likely to be exceeded.

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

5.27. There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

> *"The relationship does have limitations in so far that it should not be applied when the annual mean PM_{10} concentration is lower than 14.8 µg/m^3."*

5.28. On the basis that all of receptors are above 14.8 µg/m^3, the formula above can be used to inform the number of 24-hour mean objective exceedances.

5.29. The highest annual mean PM_{10} concentration is 24.1 µg/m^3, predicted at R29 in 2025. Based on the formula above, this predicts 11.5 exceedance days, which is below the 35-days annual limit. It is therefore thought that this receptor (John O Gaunts, Hickleton) would not be impacted from short-term concentrations of PM_{10}.

$PM_{2.5}$

5.30. The modelled $PM_{2.5}$ concentrations in Table E.3 do not predict any exceedances of the Stage 2 Post 2020 annual mean limit (20 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.3 µg/m^3.

5.31. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

Significance of Impacts

5.32. The impacts on the majority of residential receptors modelled are anticipated to be **negligible (adverse)** to **slight (adverse)** for NO_2, with the exception of two receptors, which are associated with the John O Gaunts dwelling. These receptors are predicted to experience **substantial (adverse)** impact as a result of construction traffic associated with the proposed development and cumulative traffic, with concentrations exceeding the annual mean objective. The NO_2 1-hour mean objective is not predicted to be exceeded at John O Gaunts, Hickleton.

5.33. The PM_{10} impacts on all residential receptors are predicted to be **negligible (adverse)**, with the PM_{10} 24-hour mean objective not expected to be exceeded at any receptor.

5.34. The $PM_{2.5}$ impacts on all modelled residential receptors are predicted to be **negligible (adverse)**.

5.35. Although the EPUK & IAQM (2017) states that a substantial adverse impact at one or more receptor location, may not always be judged as being 'significant', the guidance goes on to state:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

5.36. On this basis, and in accordance with the EPUK & IAQM (2017) guidance, as substantial impacts have been identified that exceed the NO_2 annual mean objective, the overall impacts are considered '**significant**' at the John O Gaunts dwelling. The significance for post-mitigation has been determined in Section 7.

5.37. It should be noted that within the baseline scenario, the concentrations at this dwelling are exceeding the NO_2 annual mean objective. It is not clear if any mitigation has been considered for this dwelling due to the existing air quality issues.