VANGUARDIA

A BURO HAPPOLD COMPANY

Technical Note

Project	Goldthorpe - Air Quality Comments
Subject	Consultation Response
Project no	00052805
Date	29 June 2024

1 Introduction

This Technical Note (TN) has been prepared by Vanguardia on behalf of Equite Newlands (Goldthorpe) Ltd to address comments received in respect to Air Quality works undertaken for planning Ref: 2023/1105.

This TN sets out responses (where deemed to be required) to the following comments received:

- Ricardo (2024) *Air Quality Assessment Review* (on behalf of Barnsley Metropolitan Borough Council (BMBC)); and
- Hickleton Parish Council comments (dated 26th March 2024).

This TN should be read in conjunction with the associated comments (which are set out in **Appendix A**).

2 Ricardo Comments

2.1 Vanguardia Comments on Table 2.1

Table 1-Vanguardia Reply to Comments

Ricardo Clarifications and Recommendations	Vanguardia Reply
The applicant should clarify the surface roughness value used at the dispersion and meteorological site (AQ1)	The surface roughness for the dispersion site was 0.5. The surface roughness for the metrological site was 0.2.
The applicant should provide justification for met site (AQ2)	Initially Elmey Moor was considered as the most suitable meteorological site. However, upon discussions with the Environmental Health Officer at the City of Doncaster Council (CDC) it was agreed the Doncaster / Sheffield was utilised. It is noted that this meteorological site is now closed down (which is discussed further on in this TN), and therefore, despite Doncaster / Sheffield being most appropriate for the original assessment, Emley Moor was considered most appropriate for the updated assessments as part of this TN.
Applicant should clarify the source of the background data used for the ecological receptors (AQ3)	N deposition and acid deposition have been taken from the APIS website, as presumed. Baseline NO_x concentrations have been taken from DEFRA background mapping. Baseline NH_3 concentrations have been taken from the APIS website and the value obtained was 2.4.
The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that the impacts would become "negligible". It is recommend that the ecological assessment of air quality impact's is reviewed by Barnsley's Ecologist to confirm an adequate assessment has been undertaken. (AQ4)	This is discussed further in Section 6 – Mitigation.
The applicant should take into consideration stringent $PM_{2.5}$ target of 10 µg/m^3 (AQ5)	The $PM_{2.5}$ targets are central government targets primarily focussing on tackling emissions, rather than requiring local

	authorities to assess concentrations against these new $PM_{2.5}$ targets. In March 2023, the Department for Levelling-Up, Housing and Communities (DLUHC) wrote to all Chief Planning Officers in England advising that guidance was progressing on how these new targets should be integrated into the planning system, but that until such guidance is published, local authorities should continue to assess local air quality impacts in accordance with existing guidance. It is, thus, not appropriate to consider these new targets until such guidance has been published, which at this time it is understood this guidance has not been released.
The applicant should clarify the source of power and heating of the development. (AQ6)	It is noted that in Appendix 15.4 'Sustainability and Energy Statement', the forms of heating technology which are deemed to be feasible are Air Source Heat Pumps (ASHPs), Electric Heaters and Solar Photovoltaic (PV). None of these heating technologies have any associated NO_x or PM emissions and therefore would not impact upon local air quality.
The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that cumulative impacts would be negligible (AQ7)	This is discussed further in Section 6 – Ecological Impacts / Mitigation.
The applicant should conduct a more robust study of the effects of mitigation measures and then provide an overall significance of the impact of the development based on the outcome of this study (AQ8)	This is discussed further in Section 5 – Ecological Impacts / Mitigation which sets out the position of both BMBC Ecologist and Natural England's consultation position of No Objection.

2.2 Vanguardia Comments in Respect to Ricardo Review of CDC's Response

This is discussed further in Section 5 – Mitigation

3 Hickleton Parish Council Comments

Table 2-Vanguardia Reply to Comments

Hickleton Parish Council Comments	Vanguardia Reply
NO_x traffic pollution data for Hickleton is shown in TABLE 2. There are 3 hotspots where levels of NO_X consistently exceed the 40 µg/m^3 target level. The worst position generally has been opposite Fir Tree Close which is quite close to the bus stop on the Eastern carriageway. Your pollution impact assessment only refers to high levels of NOx outside John O'Gaunt and we would welcome your comments on why you haven't referred to the higher levels recorded opposite Fir Tree Close in your Air Pollution Impact Assessment?	A detailed air quality dispersion modelling exercise has been undertaken as part of the initial air quality assessment, as illustrated in Figure B.1 of **Appendix 14.4** residential receptors (R11 and R12) were modelled around the monitoring location (DT47 – concentrations of which are set out in **Table 3** below).

4 Other Considerations

4.1 2023 Air Quality Monitoring Data – Hickleton

It is noted since with the Hickleton Parish Council comments that 2023 monitoring data has been provided. This data has also been provided by CDC, and is replicated below in **Table 3** for the last five years of data.

Table 3-Monitored NO_2 Hickleton Concentrations

Diffusion Tube ID	2019	2020	2021	2022	2023
DT44	**67.0**	**50.7**	**51.0**	**52.0**	**45.9**
DT45	22.0	16.8	15.9	15.3	14.3
DT46	35.0	24.9	26.0	25.8	22.4
DT47	**76.0**	**59.4**	**54.1**	**54.2**	**50.0**

DT48	**80.0**	**55.8**	**55.2**	**61.1**	**52.5**

A review of the monitoring data does indicate improvements since the original air quality monitoring data (where 2022 data was utilised) used within Hickleton, but it is noted three out of the five locations still exceed the NO_2 annual mean objective.

4.2 Updated Modelling – Hickleton

Due to the release of 2023 data, it was considered prudent for completeness and robustness that an updated model verification (as set out in **Appendix B**) and modelling exercise (the results of which are set out in **Appendix C**), be undertaken.

To note, this updated modelling exercise also considered the following updates:

- Updated Emission Factor Toolkit (EFT) 12 (fleet composition adapted in line with the previous approach set out in the original air quality assessment);
- 2023 meteorological data from Elmley Moor (as weather data stopped being monitored in 2022 at the Doncaster / Sheffield met site); and
- 2023 traffic data was calculated using growth factors derived from nearby DfT traffic counts, as set out in **Appendix D**.

To note, the modelling exercise for the receptors outside Hickleton (within the jurisdiction of BMBC) has not been updated as 2023 monitoring data has not been released at the time of writing.

4.2.1 Modelling Results

The updated modelled results generally agree with the previous modelling assessment with regards to the impacts on the specific receptors in Hickleton, however some differences are noted.

The updated verification, specifically at the now relocated DT47 (as set out in **Appendix B**), has seen an increase in the kerbside adjustment factor, from 2.531 to 2.859. As a result, the concentrations predicted at kerbside receptors have seen a slight increase, in all scenarios. Conversely, due to data only being available from the diffusion tube (DT46), the roadside verification factor has decreased from 1.774 to 1.499, and consequently the concentrations predicted at roadside receptors have seen a slight decrease, in all scenarios.

The changes in the verification factor have had a greater impact than the changes caused by updating the EFT or any perceived changes in the meteorological data used. To note, using updated emission rates as included in EFT12, did predict a general reduction in NO_2 emissions, compared to EFT11.

As a result of this, in general, the impacts have increased at kerbside receptors but decrease at roadside receptors in line with this updated modelling exercise.

4.3 Updated Air Quality Damage Calculation

As the EFT has changed, a revised Air Quality Damage Calculation has been undertaken, the outcome of which is set out below in **Table 4** (for the whole scheme) and **Table 5** (specifically for Hickleton). The rest of the parameters are the same as set out in the original air quality assessment.

Table 4-Air Quality Damage Costs – Whole Scheme

Pollutant	2026 Average Link Emissions (Tonnes/Annum)	2026 National Damage Costs – Road Transport (£/tonne)	5 Year Present Valuation (£)
NO_x	6.3	12,644.97	400,954.43
PM_{10}	1.7	56,923.87	475,343.86
		Total:	876,298.29

Table 5-Air Quality Damage Costs - Hickleton

Pollutant	2026 Average Link Emissions (Tonnes/Annum)	2026 National Damage Costs – Road Transport (£/tonne)	5 Year Present Valuation (£)
NO_x	1.6	12,644.97	100,203.98
PM_{10}	0.4	56,923.87	127,278.74
		Total:	227,482.73

These figures represent a slight increase in damage costs compared to when the original assessment was submitted. Air quality damage costs have been calculated in line with the CDC Air Quality Technical Planning Guidance (2022) guidelines, using EFT 12. Previously, clarification has been sought on the purpose of damage cost calculations, and the methods surrounding how this money should be spent. The CDC guidance states the following:

> *"The pollution damage costs attributed to the predicted emission changes will determine the level of mitigation compensation required to negate their impact."*

Possible compensation measures are listed in the document. With regards to these mitigation measures, the document states:

> *"This is not an exhaustive list and will be adapted for particular locations and needs as identified by relevant officers. The type, scale and the specifics of measures should be agreed with the planning authority."*

Therefore, once the quantum of monies that should be contributed to compensation measures is agreed, it is deemed that the developers, local planning authority and any known end-users should discuss how best to spend this money in order to obtain the maximum benefit to residents. This should take into account the unique situation at Hickleton and be focussed on specific requirements within Hickleton itself, including any possible constraints that are specific to this highly sensitive location.

It is noted that reasonable success in achieving model shift could be achieved. Paragraph 6.2 of the Transport Assessment (TA), states:

> *"A Framework Travel Plan has been prepared for implementation by the eventual occupiers at the development and is submitted (under separate cover) as part of the planning application. The Framework Travel Plan includes measures to encourage the use of sustainable modes of travel and to reduce the overall number of single-occupancy vehicle trips. Initial Travel Plan targets will aim for a reduction of 10% of single occupancy vehicle trips. To provide a robust assessment, the vehicle trip generation presented in this report does not account for the targeted reduction."*

Considering the above with regards to robust assumptions regarding trip generation, is therefore anticipated that a reasonable shift away from private car can be achieved for the proposed development hence help mitigating air quality impacts.

5 Ecological Impacts / Mitigation

5.1 BMBC Ecology and Natural England Position

The BMBC Ecologist made the following comments in respect to air quality impacts on ecological receptors:
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> *"The site lies within 100 m of the Dearne Valley Wetlands SSSI, designated for the presence of breeding and non-breeding birds. Impacts to habitats within the SSSI have been considered within the ES and a separate air quality report has been prepared to review potential impacts to Gypsy Marsh, compartment 12 of the SSSI. The results indicate that upon the completed development the proposal will result in a minor adverse, permanent impact to habitats along the periphery of the SSSI but would be unlikely to impact upon the structure or function of the habitats or the bird assemblage associated with the SSSI. The proposal site is located within the SSSI Impact Risk Zone and the development is of a size and nature where impacts could occur to the SSSI. As such, BMBC have consulted with Natural England on the proposals and expect a response shortly.*

Due to the proximity of the proposal site to the SSSI there is potential for adverse impacts from pollution e.g. dust, environmental release to the ground/watercourses. Natural England have been consulted on this and their response should be taken into account with the ES."

Since this consultation the following consultation response was provided by Natural England:

"NO OBJECTION - SUBJECT TO APPROPRIATE MITIGATION BEING SECURED

We consider that without appropriate mitigation the application would:

• damage or destroy the interest features for which Dearne Valley Wetlands Site of Special Scientific Interest (SSSI) has been notified.

In order to mitigate these adverse effects and make the development acceptable, the following mitigation measures are required / or the following mitigation options should be secured:

• A Construction Environmental Management Plan (CEMP), compliant with the Construction Environmental Management Plan Framework (CEMPF) submitted (November 2023).

• Pollution measures to mitigate for potential water quality impacts as described in chapter 10 of the Environment Statement (December 2023).

• Scrub creation & management for willow tit and the provision of deadwood habitat for willow tit as described in chapter 9 of the Environment Statement and the Breeding bird survey report (June 2023).

We advise that an appropriate planning condition or obligation is attached to any planning permission to secure these measures."

On the basis of this response, it is not deemed necessary to consider any further mitigation measures in terms of air quality.

6 Mitigation – Human Receptors

The previous air quality assessment and this TN have utilised the following mitigation hierarchy when consideration mitigation measures, based upon the Institute of Air Quality Management (2018) *Mitigation of Development Air Quality Impacts(v1.1)* – position statement:

- Preference should be given to **preventing or avoiding** exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives. This is usually best achieved through taking air quality considerations into account at the development scheme design stage.
- **Reduction and minimisation** of exposure/impacts should next be considered, once all options for prevention/avoidance have been implemented so far as is reasonably practicable (both technically and economically).
- **Off-setting** a new development's air quality impact by proportionately contributing to air quality improvements elsewhere (including those identified in air quality action plans and low emission strategies) should only be considered once the solutions for preventing/avoiding, and then for reducing/minimising, the development-specific impacts have been exhausted.

6.1 Previous Mitigation Proposals

The previous air quality assessment primarily recommended mitigation on impacted receptors within Hickleton. These measures would fall within point 2 (**Reduction and minimisation**) of the IAQM (2018) mitigation hierarchy. It is noted that concerns have been raised about the viability of such mitigation. In addition, a Framework Travel Plan is aiming for a reduction of 10% of single occupancy vehicle trips and 10% of Parking providing electric vehicle charging points, which would reduce air quality impacts.

However, it is noted that wider mitigation on Site would be required in line with the BMBC (2021) *Air Quality and Emissions Good Practice Planning Guidanc*e document, which would fall under point 1 (**preventing or avoiding**) of the IAQM (2018) mitigation hierarchy.

Where the total quantum of the air quality cost damage calculation has been not spent, wider offsetting contributions have been recommended (which would fall within point 3 (**offsetting**) of the IAQM (2018) mitigation hierarchy and discussed further below.

6.1.1 Wider Scheme Mitigation Measures

Financial contributions towards public transport (and active travel) measures are anticipated to be secured via Section 106 and Section 278 agreements. There are significant overlaps between these measures and measures which would be anticipated to be secured via the air quality damage costs funding, as set out in **Table 4** for measures for the wider scheme. The following measures have been considered feasible with relation to the proposed development and have synergies with local air quality benefits:

- Funding to support bus service improvements during evenings and Sundays, to accommodate shift patterns;
- Full length bus stop laybys on A635 (eastbound and westbound) and associated bus stop infrastructure (including shelter, real time info display);
- Bus stop infrastructure improvements at stops on Carr Field Lane (50245) and Billingley View (55109); and
- Wayfinding for level access route / alternative to Footpath 15

These measures would encourage travelling to the site via public transport (and active travel) and could be considered as ways to reduce the total air quality damage cost that would be required to be fronted by any end-users. While the exact amount required to fund these measures has yet to be confirmed, it is anticipated that this would 'knock off' a reasonable amount of the sum calculated by the damage cost calculation, however some funding might remain for other air quality specific measures in the local area

6.1.2 Hickleton Mitigation Measures

The specific mitigation the applicant recommended for Hickleton related to a financial offering, the sum of which was ascertained by the damage cost calculation exercise. The applicant has offered a proportion of this to go towards mechanical ventilation and filtration at the John O Gaunts residential property, with an additional amount contributing towards a further study on improving air quality in Hickleton or a highways improvement scheme to reduce idling at the Hickleton Road and A635 junction, as an example.

It is noted that, as referenced above, financial contributions towards road improvements are anticipated to be secured via Section 106 agreements, one of which is listed as:

- Contribution to CDC in respect of Hickleton bypass.

This funding could be subtracted from the damage costs calculated specifically for Hickleton.

6.1.3 Further Discussion

It is noted within the Ricardo comments that post mitigation modelling works are requested to demonstrate that post mitigation, the significant adverse effects would be reduced to 'negligible,' not only on the impacted receptors, but also across the Air Quality Management Area as a whole (this is also in line with the comments set out by CDC). It should be noted that 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.

With regards to the property opposite Fir Tree Close (as highlighted by Hickleton Parish Council), it is deemed more appropriate that the air quality objective should apply at the (openable) window set back from the main highway, and not to the sealed façade adjacent to the highway. 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.

On this basis it is not deemed a requirement that the impacts on the entirety of the AQMA is required, it is more the impact in terms of exposure on the associated receptors, and at the time of the submission this is why the applicant recommended a number of potential receptor specific mitigation options.

These mitigation options were indicative at the time of the submission, however the position has now progressed since the original submission, and it is noted that a new Doncaster (2023) Air Quality Action Plan has been released, which has been considered and is discussed further below in **Section 6.2**.

6.2 Doncaster Air Quality Action Plan (2023)

A review of the Air Quality Action Plan indicates further options which would not only reduce both the impact of the Proposed Development upon Hickleton, but potentially go above and beyond the requirements to mitigate its impacts.

The applicant is happy to utilise the air quality damage calculation costs (in conjunction of other schemes which come forward) towards the following measures set out in the AQAP:

Table 6-Doncaster Air Quality Action Plan Considerations

Proposed Measures in AQAP	Estimated Costs	Vanguardia Consideration
Investigate Roadvent	<£10k	It is noted that this option does not reduce the volume of vehicular traffic on the highway network. However, upon discussions with Pollution Solution (the distributor) have advised the following: Modelling was undertaken in a similar environment to Hickleton to understand the potential benefit of Roadvent. The technology was deemed to provide a sustained and significant reduction in air pollutant concentrations near to the modelled road. On the assumption this is correct it is anticipated the hotspot pollution area(s) of Hickleton would comply with the current NO_2 annual mean objective.
Hickleton/Marr Bypass	>£10m	It is anticipated this would reroute both existing vehicular trips away from the A635, and also the associated Development traffic.

7 Policy Compliance

7.1 National Level

7.1.1 National Planning Practice Guidance (2019)

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.*
>
> *[..]"*

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

[..]

- *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."*

7.2 Local Level

7.2.1 Barnsley Local Plan (2019)

Site ES10 Land South of Dearne Valley Parkway 72.9 ha states:

"[..]
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"

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 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."

7.2.2 Doncaster Local Plan (2015-2035)

Policy 54: Pollution states:

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.

[..]

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.

[..]"

The Doncaster Local Plan also makes reference to Major Road Network Enhancement Priorities, of which one of the longer term priorities is the Pan Northern Route (PNR). Within the scheme description, the PNR is envisaged to deliver two key projects to Doncaster of which one is the Hickleton and Marr Bypass. The description goes on to state:

"If funding is not forthcoming the A1-A19 and the Hickleton and Marr bypasses will be delivered as stand-alone schemes."

8 Commentary

This TN has been produced to address the comments raised by the BMBC subconsultant and also Hickleton Parish Council. Furthermore, considerations have been made of the changing baseline position in Hickleton with the release of 2023 monitoring data, and new the release of the new EFT in November 2023 (both of which became available post submission).

The updated modelling results have generally seen an increase in predicted kerbside concentrations (and associated impacts), while a reduction in predicted roadside concentrations, driven by changes to the verification process.

The applicant is willing to work with both BMBC and CDC (as required as part of the NPPG, and the site being an allocated site, in line with the Barnsley Local Plan) to aid in reducing the Proposed Development impacts (and possibly aiding in providing betterment) through a financial contribution. As set out in the original EIA, the primary areas of concern / impacts are within Hickleton. A review of the AQAP (2023) has provided potential options the applicant can financially contribute (in conjunction with other developments) towards these measures. However, collaboration between the applicant and the local authority would be required to achieve this betterment within Hickleton.

During the discussion process of how best to implement beneficial measures to Hickleton, a number of methods have been suggested by various parties which would potentially mitigate the issue. A non-exhaustive list is included below:

- Roadvent technology
- Mechanical ventilation on the impacted properties
- The Hickleton bypass
- Removal of HGVs within Hickleton

In addition to this, other methods which could be used which have not been discussed include:

- Variation of speed limits within Hickleton - a method which has been trialled in Chideock, Dorset, which is deemed a good example of a local authority working with various third parties including Highways England / National Highways (who also provided funding in Chideock), to improve air quality in an exceedance area.

Since none of the above methods have yet been implemented in Hickleton, despite air pollutant concentrations breaching the relevant standards, it is considered likely that the local authority is prioritising funding in other areas; this may well include packages to benefit wider residents of CDC. Nonetheless it is considered that funding from National Highways is a possible route which may yet not have been explored which may help provide mitigation measures.

As noted, the applicant is willing to work with the local authorities, including providing a significant amount of funding, to mitigate their impacts on local air quality while also ensuring the development can be approved during planning via planning conditions and / or Section 106 agreements.

However, should the planning application subsequently be deemed unviable due to the impacts on local air quality, this funding would not be provided by the applicant, and the air pollution issue in Hickleton would remain, with levels still breaching relevant national standards.

Appendix A – Consultation Comments

STORAGE AND DISTRIBUTION CENTRE, ROTHERHAM

Air Quality Assessment Review

Report for: Barnsley Metropolitan Borough Council

Planning reference: 23/02596/CON

Ricardo ref. ED18432116 Issue: 1 02/05/2024

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CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

Ricardo have been commissioned by Barnsley Metropolitan Borough Council (BMBC) to carry out a critical review of the air quality impact assessment for the development of a storage and distribution centre on the land to the south of Dearne Valley Parkway (Application Reference: 23/02596/CON) (hereafter referred to as the development). The development is located within the administrative area of BMBC; however, the construction and operation of the development would result in traffic generation within the neighbouring council - the City of Doncaster Council (CDC).

CDC has declared two air quality management areas (AQMA) within their administrative area at Hickleton and Marr due to exceedances of the annual mean nitrogen dioxide (NO_2) air quality objective attributable to traffic emissions.

Due to the potential for the development to generate traffic within the Hickleton AQMA, CDC have undertaken a review of the air quality assessment submitted to support the planning application. The outcome of CDC's review is that the development should not be granted planning permission on air quality grounds.

Therefore, the purpose of this review is to:

- Check that the air quality impact assessment has been undertaken in line with best practice standards, relevant air quality issues have been adequately addressed, and adequate mitigation has been proposed where necessary.
- Review CDCs response to the planning application to determine whether they have valid reasons which have led to the rejection to support the planning application.

The review will focus on traffic impacts as this is the main cause of concern for BMBC as stated in their email dated 19 April 2024.

2. AIR QUALITY ASSESSMENT REVIEW

In order to carry out the air quality methodology review, the following aspects of the air quality methodology were reviewed, drawing on professional judgement, the Institute for Air Quality Management (IAQM), "Land-Use Planning & Development Control: Planning for Air Quality," January 2017:

- Check that local planning policies which relate to air quality have been appropriately considered.
- Check the traffic data used in the calculation of emissions rates, the method used to calculate the emission rates (baseline and future year) and proper inclusion within the dispersion model.
- Check that the dispersion model used is fit for purpose and the surface parameters, meteorological data chose is representative of the area and that relevant sensitivity tests and model uncertainty are taken into consideration.
- Check the adequacy of the background data assumed.
- Check the suitability of the air quality monitoring data used for model verification.
- Check that the model verification has followed LAQM.TG(23).
- Check that construction phase and operational phase impacts have been adequately considered.
- Check that the worst-case human health and ecosystem receptors have been identified and the impacts assessed.
- Check that the methodology used to assess impacts from any proposed combustion plant is robust.
- Review the robustness of cumulative impacts and mitigation.
- Confirming that the overall significance of the air quality effects resulting from the proposed development have been addressed.

Each of these aspects was reviewed based on professional experience and in the light of relevant policy and guidance produced by the UK Government and the Institute of Air Quality Management. The key documents used include the following:

- Local Air Quality Management Technical Guidance 2023 (LAQM.TG(23))[1];
- Institute for Air Quality Management (IAQM) "Land use Planning and Development Control" (2017)[2];
- IAQM's "A guide to the assessment of air quality impacts on designated nature conservation sites"[3]; and
- IAQM's "Guidance on the assessment of dust from demolition and construction" (January 2024)[4].

In order to carry out the air quality review, the issues identified with regard to the air quality assessment were tabulated and prioritised. A recommendation has also been provided in respect to each issue identified.

The findings of this review are set out in Section 2 and summarised in **Table 2-1**. Overall conclusions are presented in Section 4. Comments are rated as follows:

- High significance: potentially important for understanding the conclusions of the air quality assessment.
- Medium significance: important to be addressed; unlikely to alter understanding of the air quality assessment.
- Low significance: May be required for completeness.
- Advisory: Comment to assist the decision-making authority.

[1] LAQM.TG(23): https://laqm.defra.gov.uk/guidance/

[2] Land-Use Planning and Development Control: https://iaqm.co.uk/guidance/

[3] A guide to the assessment of air quality impacts on designated nature conservation sites: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

[4] Guidance on the assessment of dust from demolition and construction: https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf

- Editorial: Correction to the text, for example, a typographical error

2.1 DOCUMENTS REVIEWED

Ricardo have undertaken a review of the following documents:

- Chapter 14 Air Quality ES Chapter
- Appendix 14.1 – Policy and Legislative Context;
- Appendix 14.2 – Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction.
- Appendix 14.3 – Environmental Protection UK (EPUK) & IAQM Planning for Air Quality Guidance.
- Appendix 14.4 – Design Manual for Roads and Bridges (DMRB) LA.105 guidance and Natural England (2018) Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations guidance;
- Appendix 14.5 – Construction Dust Risk Assessment;
- Appendix 14.6 – Traffic Flows;
- Appendix 14.7 – Baseline Air Quality Concentrations;
- Appendix 14.8 – Construction and Operational Traffic Impacts on Sensitive Receptors;
- Appendix 14.9 – Construction and Operational Traffic Impacts (Including Cumulative Development Traffic) on Sensitive Receptors;
- Appendix 14.10 – Model Verification;
- Appendix 14.11 – General Construction Dust Mitigation Measures;
- Appendix 14.12 – Air Quality Damage Calculator;
- Appendix 14.13 – Ecological Impacts; and
- Appendix 14.14 – Vanguardia Air Quality Assessment – Goldthorpe, Barnsley – Impact on Hickleton - VC-00052805-EN-RP-0001

Table 2-1 of this report summarises the key findings of Ricardo's critical review. They have been assigned a priority, based on the potential significance of each finding and it's potential to change the applicant's conclusions, as follows:

Table 2-1 - Review of air quality assessment

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
Check that local planning policies which relate to air quality have been appropriately considered	Appendix 14.1 provides details of the relevant national and local planning policies for BMBC and CDC which relate to air quality. Specific mention of the Environmental Act and the proposed $PM_{2.5}$ target of 10 µg/m^3 was also duly recognised. Appendix 14.14 also considers Barnsley's Air Quality and Emissions, Good Practice Planning Guidance, Doncaster's Air Quality Technical Planning Guidance and the AQAPs for BMBC and CDC.	None	None
Check the traffic data used in the calculation of emissions rates, the method used to calculate the emission rates (baseline and future year) and proper inclusion within the dispersion model	Appendix 14.6 provides the traffic data used within the assessment for receptors in BMBC. This considers a base year of 2022 which is the first year after the lockdown. Future construction (2025) and operational (2026) years have also been considered including several cumulative developments (Table 3, appendix 14.14). Traffic emissions for the assessment within BMBC (paragraph 14.34, Chapter 14 ES) have been estimated using the emission factors from the latest EFT at the time of the assessment (EFT v11). While the emissions factors for the assessment in Hickleton (CDC) were based on the advanced options of the EFT. This is the most current tool developed by Defra to calculate emissions from road traffic and is acceptable.	None	None
Check that the dispersion model used is fit for purpose and the surface parameters, meteorological data chose is representative of the area and that relevant sensitivity tests and model uncertainty are taken into consideration	Road sources have been modelled using the ADMS Roads dispersion model (version 5.1.0.3) released in March 2023. The model includes the latest EFT road traffic emissions datasets V11.0 and is fit for purpose (paragraph 14.28, Chapter 14). The applicant states that several parameters have been included in the model but does not provide the specific data used. The applicant should clarify the surface roughness value used at the dispersion and meteorological site. Meteorological data from Doncaster Sheffield Meteorological Site for the year 2022 has been used in the model. The distance of the meteorological site to the development was not provided and the reason why it is considered	The applicant should clarify the surface roughness value used at the dispersion and meteorological site (AQ1) The applicant should provide justification for met site (AQ2)	Medium Low

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
	representative of the meteorological conditions at the development site has not been mentioned. The applicant should provide justification for met site.		
Checking the adequacy of the background data assumed	Background concentrations for human receptors have been abstracted from the DEFRA background maps for NO_2, PM_{10} and $PM_{2.5}$ and calibrated with NO2 background monitoring data (paragraph 14.63). As the Defra maps showed lower concentrations, this is a conservative way of ensuring that the background concentrations reflect the existing concentrations. This is an acceptable approach. It is not clear how the baseline NOx, NH_3, N deposition and acid deposition used for the ecological receptors have been established. Although there is mention of the critical loads for N deposition and Acid deposition being taken from APIS.	Applicant should clarify the source of the background data used for the ecological receptors (AQ3)	Medium
Check the suitability of the air quality monitoring data used for model verification and Check that the model verification has followed LAQM.TG(23).	A model verification exercise has been undertaken for the assessment in BMBC and for the assessment in Hickleton using the 2022 NO_2 monitoring data in order to check that the modelled concentrations compare well with roadside monitoring data. A verification factor was derived for NOx concentrations, and these have been applied to PM_{10} and $PM_{2.5}$ in accordance with LAQM guidance. The verification study appears robust although it has included the use of kerbside sites which is not ideal, but the RMSE value after correction is within 4 $\mu g/m^3$ and as such the study is acceptable.	None	None
Check that construction phase and operational phase impacts have been adequately considered	A suitable dust risk assessment has been undertaken in Appendix 14.5 using the latest IAQM guidance summarised in Appendix 14.2 to assess the risk of dust during construction of the development.	The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that the impacts would become “negligible”. It is recommend that the ecological assessment of	High

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
	The risk of dust was adequately assessed to be high risk and appropriate mitigation measures have been recommended in Appendix 14.11 which are suitable for this level of risk in accordance with the IAQM guidance. The impacts of the development due to traffic emissions generated during the construction and operation phase have been assessed in Appendix 14.8, 14.9 and 14.14 and summarised in Table 14-10 of Chapter 14. **Construction Traffic Impacts** Construction traffic impacts at human receptors in BMBC have been predicted negligible adverse. The significance of the impact after mitigation is defined as the same. This is agreed as no mitigation is proposed for these receptors. However, construction traffic impacts at human receptors in Hickleton are predicted to be negligible to moderate adverse and with the implementation of mitigation measures, the applicant concludes that the impact would reduce to negligible. The mitigation measures have not been quantified and this conclusion is based on a qualitative assessment of the effectiveness of the measure. The applicant should undertake further modelling studies which should investigate the revised air quality concentrations and the significance of the impact to confirm that the impacts would become "negligible". For the ecological receptors, the 1% screening criteria is exceeded at a number of transect points at the Deane Valley Park SSSI – Gypsy Marsh and the significance of the impact would be addressed by the ecologist. This is acceptable. It is recommend that Barnsley's ecologists review the air quality ecological assessment of air pollution and advise on adequacy. **Operational Traffic Impacts** Operational traffic impacts at human receptors in BMBC have been predicted to be Moderate – Minor to Negligible adverse for NO_2, and $PM_{2.5}$ and negligible adverse for PM_{10}. The significance of the impact after mitigation is defined as the same. This is agreed as no mitigation is proposed for these receptors.	air quality impact's is reviewed by Barnsley's Ecologist to confirm an adequate assessment has been undertaken. (AQ4) The applicant should take into consideration stringent $PM_{2.5}$ target of 10 µg/m^3 (AQ5)	Medium

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
	However, operational traffic impacts at human receptors in Hickleton are predicted to be *"Moderate – Minor to Negligible adverse effects for NO_2 at the majority of receptors, with Negligible adverse effects predicted at all receptors for PM_{10} and $PM_{2.5}$. A Major – Moderate effect is predicted at 6, The Mews receptor and a Major adverse effect is predicted at the John O Gaunts receptor for NO_2."* With the implementation of mitigation measures, the applicant concludes that the impact would reduce to negligible. The mitigation measures have not been quantified and this conclusion is based on a qualitative assessment of the effectiveness of the measure. The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that the impacts would become "negligible". For the ecological receptors, the 1% screening criteria is exceeded at a number of transect points at the Deane Valley Park SSSI – Gypsy Marsh and the significance of the impact would be addressed by the ecologist. This is acceptable. Although specific mention of the Environmental Act and the proposed $PM_{2.5}$ target of 10 µg/m^3 was duly recognised in the policy section, the assessment has not taken this into consideration. The applicant should take into consideration stringent $PM_{2.5}$ target of 10 µg/m^3.		
Check that the worst-case human health and ecosystem receptors have been identified and the impacts assessed.	Both human receptors and ecological receptors have been considered where the air quality impacts are most likely to be significant (i.e., within the AQMA, and receptors have been chosen near junctions and roads with the highest changes in traffic) based on a review of Figure 14.3, Figure 14.4 and Appendix 14.6. The overall methodology is in line with recommendations made in the LAQM TG23 document.	None	None

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
Check that the methodology used to assess impacts from any proposed combustion plant is robust.	No combustion source has been identified as part of the operation of the development. If this is a combustion source it is important that the emissions from this source does not exceed 5mg/s threshold stated in the IAQM guidance as additional modelling may be required to determine the combined effects of traffic and the combustion sources.	The applicant should clarify the source of power and heating of the development. (AQ6)	High
Review the robustness of cumulative impacts and mitigation.	The applicant has taken into consideration the operational traffic emissions associated with several committed developments in the Appendix 14.14 for Hickleton assessment. However cumulative traffic impacts for receptors in BMBC have been predicted in Appendix 14.9 and summarised in Chapter 14 Table 14.10 as "*Moderate – Minor to Negligible adverse for NO_2, and $PM_{2.5}$. Negligible adverse for PM_{10}*". In addition, cumulative traffic impacts for NO_2 in the Hickleton area have been assessed in Appendix 14.14 to be negligible to slight adverse, with substantial adverse impacts predicted at R29, R3, and John Gaunts dwelling. Moderate adverse impacts are also predicted at R11 (6, the Mews, Hickleton) and at R31 (John O Gaunts dwelling) (paragraph 6.24). PM_{10} and $PM_{2.5}$ impacts are predicted to be negligible. Cumulative impacts have been appropriately considered. However, the impacts are quite significant at receptors in BMBC and Hickleton. Mitigation measures have been proposed to improve the air quality in section 7 of Appendix 14.4 which include the use of mechanical ventilation and a highway improvement scheme which will aid in reducing idling at A635 junction. However, none of these measures have been modelled to show the eventual possible reduction in air quality that they can achieve individually or together. The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that cumulative impacts would be negligible.	The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that cumulative impacts would be negligible (AQ7)	High
Confirming that the overall significance of the air quality effects	The comparison of air pollutant estimates against air pollutant standards and guidelines is considered comprehensive and appropriate and this has been based on significance criteria from IAQM planning guidance (for human	The applicant should conduct a more robust study of the effects of	High

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
resulting from the proposed development have been addressed.	receptors) and IAQM guidance for ecological sites. The impacts at receptors have been assessed to range from negligible to substantial adverse using the IAQM significance criteria. The impact of ecological sites exceed the 1% threshold at several ecological receptors and the applicant stated the significance of this impact would be addressed in the ecological chapter (Chapter 9). Ricardo has not reviewed this chapter and it is typically expected for an ecologist to make this judgement. The overall significance of the impact of the scheme has not been qualified in the assessment but the summary of effects in Table 14.10, Chapter 14 suggests that the impacts of the development would be negligible after implementation of mitigation measures. There are several receptors where adverse impacts are experienced and the effectiveness of the mitigation measures have not been sufficiently investigated. Policy AQ1 of BMBC's Local Plan also states that "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.'. Policy 54 of CDC's Local plan states that "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." The above air quality policies for both BMBC and CDC expatiates on the fact that where significant impacts have been identified demonstrable suitable mitigation measure should be adopted which are incorporated in the inherent design of the development to minimise air pollution. The main measure of applying mechanical ventilation to the affected receptors is arguably not an inherent part of scheme design. Furthermore, both the mechanical ventilation	mitigation measures and then provide an overall significance of the impact of the development based on the outcome of this study (AQ8)	

Aspect of review	Outcome of Review	Clarification and Recommendations	Significance or Priority
	measure and highway improvement measure have not been suitably demonstrated to minimise significant air quality impacts. The applicant should conduct a more robust study of the effects of the mitigation measures and then provide an overall significance of the impact of the development based on the outcome of this study.		

3. CDC'S RESPONSE REVIEW

Ricardo has reviewed CDC's planning consultation response to the development with respect to air quality approved by Alicia Murray – Principal Planning Officer on 06.02.2024. The response is provided below followed by Ricardo's comment or review:

Ambient Air Quality Regulations

CDC Response

The traffic using this proposed site is expected travel along the A635 as outlined within the submitted Transport Assessment (TA), which would be through two of the city's air quality management areas AQMA 7 (Hickleton) and AQMA7A (Marr). Both AQMAs have been declared due to the exceedances of nitrogen dioxide, AQMA 7 is considered to have the most complex issues.

The modelling shows that during the construction phase nitrogen dioxide will increase by less than 1microgram per cubic metre (1µg/m+), however the operational phase results in a more significant increase of 5.09 µg/m^3 at the façade of one dwelling, identified as John O' Gaunts, with several other areas increasing by over 2 µg/m^3.

These increases are of concern and will add to the difficulty in reducing the NO_2 concentrations in Hickleton. The CDC Air Quality Officer does not consider the mitigation schemes outlined within Sections 8.8 and 8.9 of the AQA are viable measures and are therefore unacceptable.

Ricardo Review

Ricardo could not identify where Sections 8.8 and 8.9, referred to by CDC in any of the ES documents. However, the mitigation measures were provided in Appendix 14.14. Section 7. This included several measures and in summary two final measures to be incorporated to the scheme, which are the use of mechanical ventilation and highway improvement scheme which will aid in reducing idling at A635 junction. As mentioned in Section 2 of this review the effectiveness of these measures has not been suitably quantified. Therefore, we agree with CDC's response that the measures could potentially be unviable in minimising air pollution to a negligible impact.

Mechanical Ventilation and filtration.

CDC Response

The first consideration, and perhaps the overriding one, is that John O' Gaunts is a listed building. Therefore, it is unlikely that permission for installation would be forthcoming given the impact the system would have on the listed building.

It should also be noted that the AQA identifies 3 other dwellings in Hickleton where the nitrogen dioxide concentration increases between 2.2 and 2.49 µg/m^3.

Nevertheless, mechanical ventilation and filtration is a method for reducing the impact of ambient pollution within a premises, however it is usually only considered as part of a new build within an AQMA. This proposal will be a retrofit into an existing premises.

Such a refit would require the agreement of the owner, plus there is the matter of the funding of ongoing operational costs (electricity, consumables etc).

Finally, the Air Quality Regulations are applicable to concentrations at the façade of dwellings therefore this method will not address the detrimental effect of the proposal on the AQMA.

Ricardo Review

There are several receptors identified in the Hickleton area where adverse impacts have been predicted as stated by CDC above. The applicant has only stated the application of mechanical ventilation to John O Gaunts and no measures have been stated for the other receptors. Furthermore, mitigation measures should ideally be applied within the design of the scheme as stipulated in Local Policy. As alluded by CDC, the application of the mechanical ventilation to John O Gaunts would not improve the air quality within the AQMA and there are also other planning considerations and agreements which would need to be reached before this measure is adopted, as such it is agreed that this measure is potentially unviable.

Highway Improvement Scheme

CDC Response

Firstly, whilst welcome, a financial contribution does not constitute a mitigation method. The highway improvement scheme proposal alludes to section 3.22 of the AQA. This refers to the potential for the queuing of traffic caused by vehicles from the West wishing to turn right at the Hickleton Road/Red Hill Lane/A635 junction. However section 3.22 also states that “it is not clear whether queuing is a frequent occurrence”.

Whilst it would seem self-evident that a freer flowing junction would reduce local concentrations it is difficult to quantify or accept if no queuing data is available.

Therefore, as a mitigation method, it is not currently acceptable.

Ricardo Review

The proposed highway improvement measure could potentially be viable; however, traffic analysis of the highway improvement should be undertaken, and then further modelling studies should be done to investigate the revised air quality concentrations and the significance of the impact at these worse case receptors to confirm that the impacts would become “not significant”.

4. CONCLUSIONS

Ricardo have carried out a critical appraisal of the air quality assessment for the development of a storage and distribution centre on the land to the south of Dearne Valley Parkway. The review has revealed that further information and/or clarification is sought on the following matters:

Low Priority

- The applicant should clarify the surface roughness value used at the dispersion and meteorological site (AQ1)
- The applicant should provide justification for met site (AQ2)
- The applicant should clarify the source of power and heating of the development. (AQ6)

Medium Priority

- The applicant should take into consideration stringent $PM_{2.5}$ target of 10 µg/m^3 (AQ5)
- Applicant should clarify the source of the background data used for the ecological receptors (AQ3)

High Priority

- The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that the impacts would become “negligible”. It is recommend that the ecological assessment of air quality impact’s is reviewed by Barnsley’s Ecologist to confirm an adequate assessment has been undertaken. (AQ4).
- The applicant should undertake further modelling studies of the proposed mitigation measures to confirm that cumulative impacts would be negligible (AQ7)
- The applicant should conduct a more robust study of the effects of mitigation measures and then provide an overall significance of the impact of the development based on the outcome of this study (AQ8)

Ricardo has also reviewed CDCs response to the planning application which are valid, as such further work needs to be undertaken by the applicant (AQ4, AQ7 and AQ8) to demonstrate that the measures would minimise air quality impacts to a negligible significance.

COMMENTS/CONCERNS REGARDING GOLDTHORPE ES10 PROPOSED DEVELOPMENT IN RESPONSE TO PRESENTATION GIVEN TO HICKLETON PARISH COUNCIL MAR 26TH 2024

Thank you for the presentation on March 20th to members of Hickleton Parish Council and the bypass sub-committee regarding the ES10 development at Goldthorpe. We have reviewed the information and data presented and make the following comments and observations which are intended to be constructive:

- The baseline traffic volume data for Hickleton, 1600 vehicles/hr, in our opinion is low and the baseline traffic volume data referred to in your presentation of March 2022 is based on an incomplete data set as the permanent traffic counter on A635 in Marr was only partially operative for March, April and May of 2022.
- Highways England modelled traffic flow around Junction 37 of the A1 in 2020 and you don't appear to have made any reference to this report and its conclusions that all 4 legs of the roundabout are at capacity without the increase in traffic from the ES10 development.
- You don't appear to have made any reference to the highest NOx concentrations recorded in Hickleton for over 10 years which is opposite Fir Tree Close, with John O'Gaunt second highest.

Discussing these points in more detail:

1. We believe the 2022 baseline traffic data used in the ES10 development is based on an incomplete data set for traffic volumes along the A635. The traffic counter at Marr was inoperative for part of March 2022 as can be seen from the figures in Table 1. The traffic volume data is averaged across each month, the peak hourly weekday traffic volume is averaged across each month and in brackets shows the highest figure for that month. The Marr traffic data is a good proxy for traffic flow through Hickleton on the A635. As can be seen from Peak Hourly Volume figures the traffic flow at peak times is consistently greater than 1,600 (your baseline figure) and as high as 1,904 in November 2022. Taking an average of peak hourly traffic flow from the data in Table 1 suggests a more realistic hourly traffic flow figure is 1,764 vehicles/hour. Your modelling and assessment should take in to account the likely impact on traffic congestion at peak rush hour in the morning and late afternoon (max peak >2,000 vehicles/hr) when traffic turning on and off the A635 at the Hickleton cross roads and at 2 junctions in Marr is likely to be most severe. We would like you to comment on these points as the potential impact on noise, pollution and safety in Hickleton and Marr will be greater than your assessment when ES10 is completed.

2. Highways England have modelled traffic flows at Junction 37 of A1,(**REF**: *T E C H N I C A L M E M O R A N D U M SDEB51 Dated 19/12/2019 HIGHWAYS ENGLAND SPATIAL PLANNING ARRANGEMENT – NORTH EAST AND YORKSHIRE & HUMBER 1 Doncaster Local Plan – Local Plan Modelling – Interim Progress PROJECT NUMBER: DEVHU002 DOCUMENT REF: TM004*) , to assess the cumulative impact of the Doncaster Local Plan on the SRN. The study found that " *that, by 2035, several approach lanes to the A1(M) Junction 37 roundabout will be operating over capacity, with or without the developments of the Local Plan coming forward. However, it can be seen that the Local Plan will result in additional queuing on the majority of approaches to A1(M) Junction 37. Of particular importance to Highways England is the forecast increase in queuing to the offside lane of the southbound off-slip during the PM*

peak hour, which will be extensive enough to extend back onto the A1(M) mainline carriageway. It is therefore concluded that improvement works are required at the junction to adequately mitigate the predicted traffic impact of the Local Plan." It should be noted that the study concluded that, based on current traffic conditions, all 4 approaches to Jn 37 will be at or above capacity irrespective of any planned developments.

3. NOx traffic pollution data for Hickleton is shown in TABLE 2. There are 3 hotspots where levels of NOX consistently exceed the 40 µg/m^3 target level. The worst position generally has been opposite Fir Tree Close which is quite close to the bus stop on the Eastern carriageway. Your pollution impact assessment only refers to high levels of NOx outside John O'Gaunt and we would welcome your comments on why you haven't referred to the higher levels recorded opposite Fir Tree Close in your Air Pollution Impact Assessment?

Richard Clark

Chairman

Hickleton Bypass Action Group

TABLE 1. DETAILS OF TRAFFIC COUNT ON A635 AT MARR AS PROVIDED BY DMBC

2022	Total Volume	Highest Daily Volume	Peak Hourly Av. Volume (Max)	% HGV's	HGV Volume
January	552,397	19,898	1,680 (1,885)	15.1	86,446
February	539,196	20,958	1,782 (1,968)	14.8	79,801
March (3 weeks worth of data)	175,897	22,939		15.2	26,796
April	No data				
May	No data				
June	597,291	21,437	1,727 (1,928)	14.5	86,607
July	622,086	22,007	1,824 (1,981)	13.3	73,645
August	630,002	21,709	1,734 (2,007)	13.6	75,108
September	604,393	24,145	1,832 (2,050)	14.5	88,104
October	624,999	23,390	1,845 (2,007)	14.8	92,292
November	610,901	23,364	1,904 (2,030)	15.3	93,576
December	551,189	22,355	1,558 (1,924)	14.5	79,965

2023	Total Volume	Highest Daily Volume	Peak Hourly Av Volume(Max)	% HGV's	HGV Volume
January	573,182	21,673	1,765 (1,932)	15.1	86,446
February	Traffic counter data down for part of month				
March	Traffic counter data down for part of month				
April	573,484	22,594	1,732 (1,982)	15.2	87,170
May	600,892	23,110	1,709 (1,934)	14.5	85,782
June	611,060	23,542	1,867 (2008)	14.5	88,374

From July 2023 onwards the A635 closed near Goldthorpe due to damage to an underpass, in Dec 2023 a one way system was brought in tp operation on A635 and this is still operational as of April 2024 and this has acted as a major reduction in traffic volumes through Hickleton and Marr.

	TABLE 2. Hickleton A635 Road Traffic Pollution Nitrogen dioxide in µg/m^3											
	2012 (annual average)	**2013 (annual average)**	**2014 (annual average)**	**2015 (annual average)**	**2016 (annual average)**	**2017 (annual average)**	**2018 (annual average)**	**2019 (annual average)**	**2020 (annual average)**	**2021 (annual average)**	**2022 (annual average)**	**2023 (annual average)**
Opposite John O'Gaunt	**67**	**74**	**79**	**66**	**78**	**79**	**70**	**67**	**51**	**51**	**52**	**46**
Opposite Fir Tree Close	**86**	**95**	**95**	**87**	**106**	**100**	**91**	**76**	**59**	**54**	**54**	**50**
John O'Gaunts	**78**	**95**	**94**	**80**	**93**	**90**	**87**	**80**	**56**	**55**	**61**	**53**

Data collected by DMBC and published annually in the Annual Status Report (ASR) document available on DMBC website.

Appendix B – Model Verification

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in TG22. According to TG22, no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations, but ideally within 10%.

The modelled road network (including the modelled road speeds for both LDVs and HDVs) are demonstrated in **Figure B.1** and **Figure B.2**. The location of the verification monitoring locations used for the verification process are demonstrated in **Figure B.3.** Regarding the verification monitoring locations, it was noted that DT47 was moved in 2020, and therefore this updated verification process has been undertaken with the new monitoring location. To note, the monitoring location was moved from within to outside of the modelled street canyon.

Figure B.1: Modelled Road Speeds (LDVs)

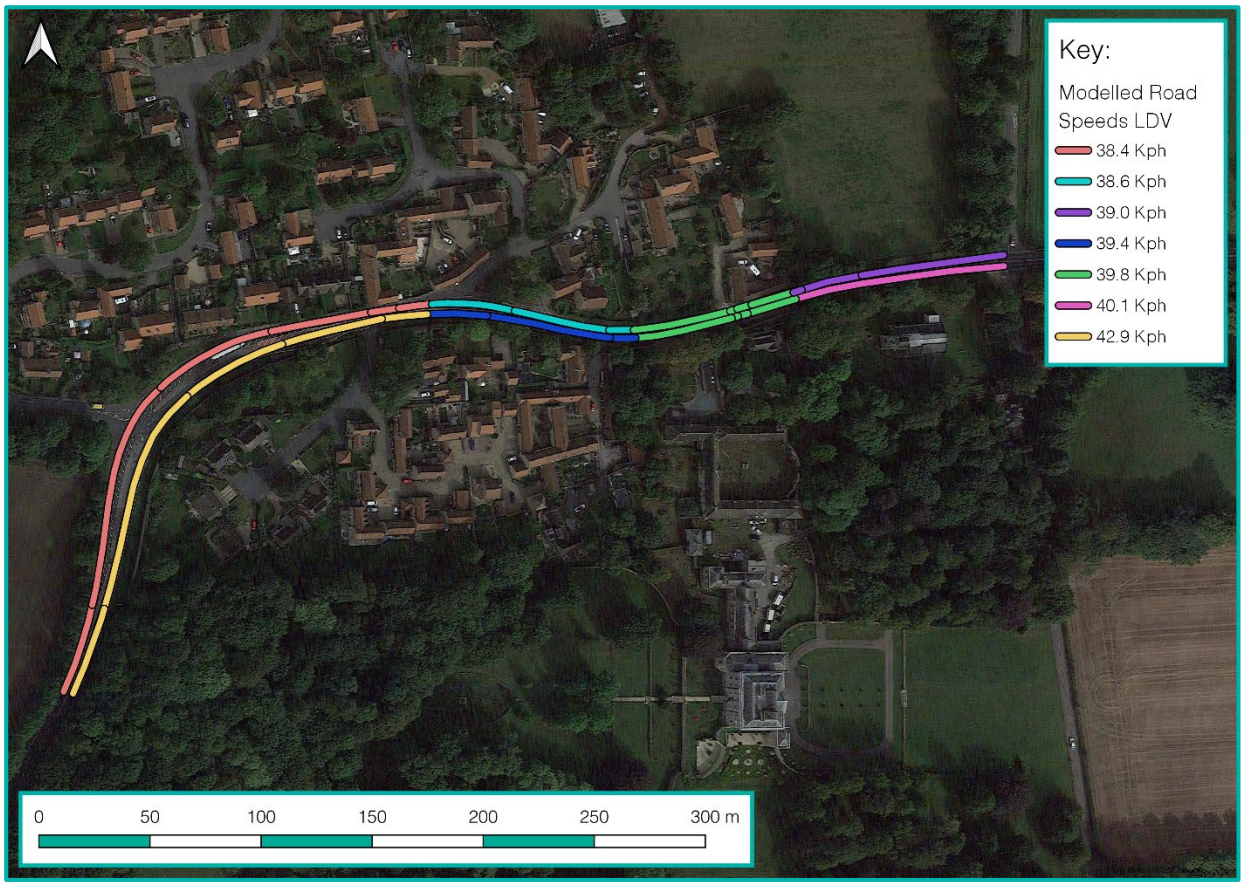

Figure B.2: Modelled Road Speeds (HDVs)

Figure B.3: Modelled Verification Diffusion Tubes

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM TG (22).

According to LAQM TG (22), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations, but ideally within 10%.

Model verification is normally undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed, however kerbside sites can be included within the assessment if they are representative of exposure. LAQM TG(22) recommends that a combination of automatic and diffusion tube monitoring data is used, although this may be limited by data availability. For this assessment, four diffusion tubes were used to verify against, three at kerbside locations and one at a roadside location. To note, DT45 was discounted from the verification as it was more representative of a suburban location, rather than a roadside location as listed in the ASR. DT46 was scoped in as it was more representative of a roadside location, rather than a suburban location as listed in the ASR.

Kerbside Verification

Table B.1 compares the monitored and modelled NO_2 concentrations at the monitoring locations.

Table B.1: Comparison of Monitored and Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
DT47	Diffusion Tube	50.0	21.1	-57.7
DT48	Diffusion Tube	52.5	29.9	-43.0
DT44	Diffusion Tube	45.9	25.9	-43.7

The data in **Table B.2** shows that the model is under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of local dispersion conditions. Since all modelled results lie outside of the ideal 10% margin of error, an adjustment has been derived.

As it is primary NO_x rather than secondary NO_2 emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations using the least squares statistical method has been undertaken to derive an adjustment factor, as set out in **Table B.2.**

Table B.2: Deriving the Adjustment Factor

Site ID	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio
DT47	82.22	17.42	2.859
DT48	88.68	35.33	
DT44	71.91	26.84	

Table B.3 compares monitored and modelled NO_2 concentrations at the monitoring location after the adjustment factor has been applied.

Table B.3: Comparison of Monitored and Adjusted Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
DT47	Diffusion Tube	50.0	36.5	-26.9
DT48	Diffusion Tube	52.5	57.1	8.8
DT44	Diffusion Tube	45.9	47.8	4.2

The data in **Table B.3** shows that NO_2 concentrations in the model improved after the adjustment factor was applied. However, one of the monitoring locations (DT47) was still not within the ideal 25% difference, indicating the modelled results should undergo statistical analysis in order to verify the results are within an acceptable margin of error.

Root Mean Square Error

A Root Mean Square Error (RMSE) has been calculated in **Table B.4** to determine the error within the calculations before Road-NO_x adjustment, based upon the following calculation:

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(obs_i - Pred_i)^2}$$

Table B.4: Root Mean Squared Error

Site ID	Predictions	Observations	Difference
DT47	36.5	50.0	-13.5
DT48	57.1	52.5	4.6
DT44	47.8	45.9	1.9
		RMSE:	8.3

The calculated RMSE is 8.3 µg/m^3, which means that modelled results could be under or over predicting pollution concentrations between +/- 8.3 µg/m^3. The RMSE means that modelled results are acceptable, as they are within a 25% margin of error (as advised in TG22), and therefore the modelling is deemed to be working within an acceptable level of tolerance no further adjustment is required.

Fractional Bias

The fractional bias, as set out in **Table B.5**, has been calculated to identify if the model shows a systematic tendency to over or under-predict. The following formula has been used to calculate the fractional bias:

$$FB = \frac{(Avg.Obs - Avg.Pred)}{0.5\ (Avg.Obs + Avg.Pred)}$$

Table B.5: Fractional Bias

Average Observed Values (µg/m^3)	Average Predicted Values (µg/m^3)	Fractional Bias
49.5	47.2	0.048

The calculated fractional bias is 0.048 which indicates that the model is slightly overpredicting. However, the fractional bias is close to the ideal value of 0, which suggests that the model is performing acceptably.

Roadside Verification

Table B.6 compares the monitored and modelled NO_2 concentrations at the monitoring locations. To note, for the previous assessment using 2022 monitoring data for the verification process automatic site CM7 was included. However, at the time of writing 2023 monitoring data for this location is not available and has therefore cannot be included within this verification process.

Table B.6: Comparison of Monitored and Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
DT46	Diffusion Tube	22.4	19.0	-15.1

The data in **Table B.6** shows that the model is under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of local dispersion conditions. Since the modelled result lies outside of the ideal 10% margin of error, an adjustment has been derived.

As it is primary NO_x rather than secondary NO_2 emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations using the least squares statistical method has been undertaken to derive an adjustment factor, as set out in **Table B.7.**

Table B.7: Deriving the Adjustment Factor

Site ID	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio
DT46	19.91	13.28	1.499

Table B.8 compares monitored and modelled NO_2 concentrations at the monitoring location after the adjustment factor has been applied.

Table B.8: Comparison of Monitored and Adjusted Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
DT46	Diffusion Tube	22.4	22.4	0

The data in **Table B.8** shows that NO_2 concentrations in the model match the monitored concentrations after the adjustment factor was applied, indicating that the model is performing acceptably.

PM_{10} and $PM_{2.5}$ Verification

For the previous assessment (using 2022 monitoring data) PM_{10} and $PM_{2.5}$ concentrations were verified against monitoring location CM7. However, as previously stated at the time of writing 2023 monitoring data for this location is not available. Therefore, the predicted road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the appropriate road EFT NOx factor before adding the appropriate background concentration.

Appendix C – Model Results

Table C.1 – 2025 Baseline + Proposed Development Predicted NO_2 Impacts at Specified Receptors –

Calculated NO_2 Annual Mean (µg/m^3)				
Receptor ID	**2025 Baseline**	**2025 Baseline + Proposed Construction Traffic**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	13.9	13.9	0%	Negligible
R02	14.0	14.0	0%	Negligible
R03	14.5	14.6	0%	Negligible
R04	16.0	16.1	0%	Negligible
R05	17.0	17.1	0%	Negligible
R06	18.4	18.6	0%	Negligible
R07	16.5	16.6	0%	Negligible
R08	17.1	17.2	0%	Negligible
R09	17.7	17.8	0%	Negligible
R10	18.2	18.3	0%	Negligible
R11	24.0	24.2	1%	Negligible
R12	21.6	21.8	0%	Negligible
R13	15.5	15.6	0%	Negligible
R14	15.3	15.4	0%	Negligible
R15	14.9	15.0	0%	Negligible
R16	15.0	15.1	0%	Negligible
R17	16.6	16.7	0%	Negligible
R18	16.9	17.0	0%	Negligible
R19	16.0	16.1	0%	Negligible
R20	19.3	19.5	0%	Negligible
R21	19.6	19.8	0%	Negligible
R22	21.6	21.8	0%	Negligible
R23	20.7	20.9	0%	Negligible
R24	21.3	21.4	0%	Negligible
R25	17.2	17.3	0%	Negligible
R26	21.9	22.1	0%	Negligible
R27	18.7	18.8	0%	Negligible
R28	20.7	20.9	0%	Negligible
R29	58.5	59.2	2-5%	Substantial
R30	54.0	54.6	2-5%	Substantial
R31	22.1	22.3	0%	Negligible
R32	17.8	17.9	0%	Negligible
R33	18.2	18.3	0%	Negligible
R34	18.1	18.2	0%	Negligible

R35	16.4	16.5	0%	Negligible
Short-Term Exposure Receptors				
B01	29.9	30.2		
B02	32.8	33.2		
G01	14.6	14.7		
G02	14.9	15.0		
G03	15.7	15.8		
G04	17.7	17.8		
G05	19.1	19.3		
G06	20.9	21.1		
G07	32.9	33.3		
G08	33.9	34.3		
G09	18.8	19.0		
G10	17.2	17.3		
G11	19.5	19.6		
G12	16.4	16.5		
G13	36.1	36.5		
G14	36.0	36.5		
G15	34.9	35.3		
G16	33.9	34.3		
G17	30.0	30.4		
G18	29.5	29.8		
G19	29.6	29.9		
G20	30.6	30.9		
G21	30.2	30.5		
G22	34.6	35.0		
G23	35.9	36.3		
G24	36.6	37.1		
G25	36.2	36.6		
G26	36.7	37.1		
G27	35.5	35.9		
G28	34.2	34.6		
G29	31.3	31.6		
G30	28.7	29.0		
G31	35.6	36.0		
G32	19.6	19.8		
G33	20.4	20.5		
G34	21.1	21.3		
G35	20.9	21.1		

Table C.2 – 2025 Baseline + Proposed Development Predicted PM_{10} Impacts at Specified Receptors –

Calculated PM_{10} Annual Mean ($\mu g/m^3$)				
Receptor ID	**2025 Baseline**	**2025 Baseline + Proposed Construction Traffic**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	16.9	16.9	0%	Negligible
R02	16.9	16.9	0%	Negligible
R03	17.0	17.0	0%	Negligible
R04	17.2	17.2	0%	Negligible
R05	17.4	17.4	0%	Negligible
R06	17.6	17.6	0%	Negligible
R07	18.3	18.3	0%	Negligible
R08	18.4	18.4	0%	Negligible
R09	18.5	18.5	0%	Negligible
R10	18.6	18.6	0%	Negligible
R11	19.6	19.6	0%	Negligible
R12	19.2	19.2	0%	Negligible
R13	17.2	17.2	0%	Negligible
R14	17.2	17.2	0%	Negligible
R15	17.1	17.1	0%	Negligible
R16	18.1	18.1	0%	Negligible
R17	18.3	18.4	0%	Negligible
R18	18.4	18.4	0%	Negligible
R19	18.2	18.3	0%	Negligible
R20	18.8	18.8	0%	Negligible
R21	18.8	18.8	0%	Negligible
R22	19.2	19.2	0%	Negligible
R23	19.0	19.0	0%	Negligible
R24	19.2	19.2	0%	Negligible
R25	18.5	18.5	0%	Negligible
R26	19.3	19.4	0%	Negligible
R27	18.7	18.7	0%	Negligible
R28	19.1	19.1	0%	Negligible
R29	27.9	28.1	0%	Negligible
R30	26.7	26.9	0%	Negligible
R31	19.4	19.4	0%	Negligible
R32	18.5	18.5	0%	Negligible
R33	18.6	18.6	0%	Negligible
R34	18.6	18.6	0%	Negligible
R35	18.3	18.3	0%	Negligible

Short-Term Exposure Receptors		
B01	20.9	21.0
B02	21.2	21.2
G01	17.0	17.0
G02	17.1	17.1
G03	17.2	17.2
G04	17.5	17.5
G05	17.7	17.7
G06	18.0	18.0
G07	21.1	21.1
G08	21.3	21.3
G09	17.8	17.9
G10	17.5	17.5
G11	17.9	18.0
G12	17.4	17.4
G13	21.7	21.8
G14	21.8	21.8
G15	21.6	21.7
G16	21.4	21.4
G17	20.9	21.0
G18	20.8	20.9
G19	20.8	20.9
G20	21.1	21.1
G21	21.0	21.0
G22	21.9	22.0
G23	22.2	22.3
G24	22.0	22.0
G25	21.9	22.0
G26	22.0	22.0
G27	21.8	21.8
G28	21.5	21.6
G29	21.1	21.2
G30	20.6	20.7
G31	22.4	22.5
G32	18.9	18.9
G33	19.0	19.1
G34	19.1	19.1
G35	19.0	19.0

Table C.3 – 2025 Baseline + Proposed Development Predicted $PM_{2.5}$ Impacts at Specified Receptors –

Calculated $PM_{2.5}$ Annual Mean (µg/m^3)

Receptor ID	2025 Baseline	2025 Baseline + Proposed Construction Traffic	% Change of Limit	Impact Descriptor
Residential Receptors				
R01	9.9	9.9	0%	Negligible
R02	9.9	9.9	0%	Negligible
R03	10.0	10.0	0%	Negligible
R04	10.1	10.1	0%	Negligible
R05	10.2	10.2	0%	Negligible
R06	10.3	10.3	0%	Negligible
R07	10.4	10.4	0%	Negligible
R08	10.5	10.5	0%	Negligible
R09	10.5	10.5	0%	Negligible
R10	10.6	10.6	0%	Negligible
R11	11.1	11.1	0%	Negligible
R12	10.9	10.9	0%	Negligible
R13	10.1	10.1	0%	Negligible
R14	10.1	10.1	0%	Negligible
R15	10.1	10.1	0%	Negligible
R16	10.3	10.3	0%	Negligible
R17	10.5	10.5	0%	Negligible
R18	10.5	10.5	0%	Negligible
R19	10.4	10.4	0%	Negligible
R20	10.7	10.7	0%	Negligible
R21	10.7	10.7	0%	Negligible
R22	10.9	10.9	0%	Negligible
R23	10.8	10.8	0%	Negligible
R24	10.9	11.0	0%	Negligible
R25	10.5	10.5	0%	Negligible
R26	11.0	11.0	0%	Negligible
R27	10.7	10.7	0%	Negligible
R28	10.9	10.9	0%	Negligible
R29	15.7	15.8	0%	Negligible
R30	15.0	15.1	0%	Negligible
R31	11.0	11.0	0%	Negligible
R32	10.6	10.6	0%	Negligible
R33	10.6	10.6	0%	Negligible
R34	10.6	10.6	0%	Negligible
R35	10.4	10.4	0%	Negligible
Short-Term Exposure Receptors				
B01	11.9	11.9		
B02	12.0	12.0		

G01	10.0	10.0
G02	10.0	10.0
G03	10.1	10.1
G04	10.3	10.3
G05	10.4	10.4
G06	10.5	10.6
G07	12.0	12.0
G08	12.1	12.1
G09	10.5	10.5
G10	10.3	10.3
G11	10.5	10.5
G12	10.2	10.2
G13	12.3	12.4
G14	12.4	12.4
G15	12.3	12.3
G16	12.1	12.2
G17	11.9	11.9
G18	11.8	11.8
G19	11.8	11.9
G20	11.9	12.0
G21	11.9	11.9
G22	12.4	12.5
G23	12.6	12.6
G24	12.5	12.5
G25	12.4	12.5
G26	12.5	12.5
G27	12.3	12.4
G28	12.2	12.2
G29	12.0	12.0
G30	11.7	11.8
G31	12.7	12.7
G32	10.8	10.8
G33	10.8	10.9
G34	10.8	10.9
G35	10.8	10.8

Table C.4 – 2025 Baseline + Cumulative Predicted NO_2 Impacts at Specified Receptors –

Calculated NO_2 Annual Mean (µg/m^3)				
Receptor ID	**2025 Baseline**	**2025 Baseline + Proposed Construction**	**% Change of Objective**	**Impact Descriptor**

		Traffic (Cumulative)		
Residential Receptors				
R01	13.9	14.0	0%	Negligible
R02	14.0	14.2	0%	Negligible
R03	14.5	14.8	1%	Negligible
R04	16.0	16.3	1%	Negligible
R05	17.0	17.4	1%	Negligible
R06	18.4	18.9	1%	Negligible
R07	16.5	16.8	1%	Negligible
R08	17.1	17.4	1%	Negligible
R09	17.7	18.1	1%	Negligible
R10	18.2	18.7	1%	Negligible
R11	24.0	24.7	2-5%	Negligible
R12	21.6	22.3	2-5%	Negligible
R13	15.5	15.8	1%	Negligible
R14	15.3	15.6	1%	Negligible
R15	14.9	15.2	1%	Negligible
R16	15.0	15.3	1%	Negligible
R17	16.6	16.9	1%	Negligible
R18	16.9	17.2	1%	Negligible
R19	16.0	16.4	1%	Negligible
R20	19.3	19.8	1%	Negligible
R21	19.6	20.1	1%	Negligible
R22	21.6	22.2	2-5%	Negligible
R23	20.7	21.3	1%	Negligible
R24	21.3	21.9	2-5%	Negligible
R25	17.2	17.6	1%	Negligible
R26	21.9	22.6	2-5%	Negligible
R27	18.7	19.1	1%	Negligible
R28	20.7	21.3	2-5%	Negligible
R29	58.5	61.1	6-10%	Substantial
R30	54.0	56.4	6-10%	Substantial
R31	22.1	22.8	2-5%	Negligible
R32	17.8	18.2	1%	Negligible
R33	18.2	18.6	1%	Negligible
R34	18.1	18.5	1%	Negligible
R35	16.4	16.7	1%	Negligible
Short-Term Exposure Receptors				
B01	29.9	31.0		
B02	32.8	34.1		
G01	14.6	14.9		

G02	14.9	15.2
G03	15.7	16.0
G04	17.7	18.1
G05	19.1	19.6
G06	20.9	21.4
G07	32.9	34.1
G08	33.9	35.2
G09	18.8	19.3
G10	17.2	17.6
G11	19.5	20.0
G12	16.4	16.8
G13	36.1	37.5
G14	36.0	37.4
G15	34.9	36.2
G16	33.9	35.2
G17	30.0	31.2
G18	29.5	30.6
G19	29.6	30.7
G20	30.6	31.8
G21	30.2	31.4
G22	34.6	36.0
G23	35.9	37.3
G24	36.6	38.0
G25	36.2	37.6
G26	36.7	38.1
G27	35.5	36.8
G28	34.2	35.5
G29	31.3	32.4
G30	28.7	29.8
G31	35.6	37.1
G32	19.6	20.2
G33	20.4	20.9
G34	21.1	21.7
G35	20.9	21.5

Table C.5 – 2025 Baseline + Cumulative Predicted PM_{10} Impacts at Specified Receptors –

Calculated PM_{10} Annual Mean ($\mu g/m^3$)				
Receptor ID	**2025 Baseline**	**2025 Baseline + Proposed Construction Traffic (Cumulative)**	**% Change of Objective**	**Impact Descriptor**

Residential Receptors				
R01	16.9	16.9	0%	Negligible
R02	16.9	16.9	0%	Negligible
R03	17.0	17.0	0%	Negligible
R04	17.2	17.3	0%	Negligible
R05	17.4	17.4	0%	Negligible
R06	17.6	17.7	0%	Negligible
R07	18.3	18.3	0%	Negligible
R08	18.4	18.4	0%	Negligible
R09	18.5	18.6	0%	Negligible
R10	18.6	18.7	0%	Negligible
R11	19.6	19.7	0%	Negligible
R12	19.2	19.3	0%	Negligible
R13	17.2	17.3	0%	Negligible
R14	17.2	17.2	0%	Negligible
R15	17.1	17.2	0%	Negligible
R16	18.1	18.1	0%	Negligible
R17	18.3	18.4	0%	Negligible
R18	18.4	18.5	0%	Negligible
R19	18.2	18.3	0%	Negligible
R20	18.8	18.9	0%	Negligible
R21	18.8	18.9	0%	Negligible
R22	19.2	19.3	0%	Negligible
R23	19.0	19.1	0%	Negligible
R24	19.2	19.3	0%	Negligible
R25	18.5	18.5	0%	Negligible
R26	19.3	19.5	0%	Negligible
R27	18.7	18.8	0%	Negligible
R28	19.1	19.2	0%	Negligible
R29	27.9	28.7	2-5%	Negligible
R30	26.7	27.4	2-5%	Negligible
R31	19.4	19.5	0%	Negligible
R32	18.5	18.6	0%	Negligible
R33	18.6	18.7	0%	Negligible
R34	18.6	18.7	0%	Negligible
R35	18.3	18.3	0%	Negligible
Short-Term Exposure Receptors				
B01	20.9	21.2		
B02	21.2	21.4		
G01	17.0	17.1		
G02	17.1	17.1		

G03	17.2	17.2
G04	17.5	17.6
G05	17.7	17.8
G06	18.0	18.1
G07	21.1	21.3
G08	21.3	21.6
G09	17.8	17.9
G10	17.5	17.6
G11	17.9	18.0
G12	17.4	17.4
G13	21.7	22.1
G14	21.8	22.1
G15	21.6	21.9
G16	21.4	21.7
G17	20.9	21.2
G18	20.8	21.1
G19	20.8	21.1
G20	21.1	21.3
G21	21.0	21.2
G22	21.9	22.2
G23	22.2	22.6
G24	22.0	22.3
G25	21.9	22.2
G26	22.0	22.3
G27	21.8	22.1
G28	21.5	21.8
G29	21.1	21.4
G30	20.6	20.9
G31	22.4	22.8
G32	18.9	19.0
G33	19.0	19.2
G34	19.1	19.2
G35	19.0	19.1

Table C.6 –2025 Baseline + Cumulative Predicted $PM_{2.5}$ Impacts at Specified Receptors –

Calculated $PM_{2.5}$ Annual Mean (µg/m^3)				
Receptor ID	**2025 Baseline**	**2025 Baseline + Proposed Construction Traffic (Cumulative)**	**% Change of Limit**	**Impact Descriptor**
Residential Receptors				

R01	9.9	10.0	0%	Negligible
R02	9.9	10.0	0%	Negligible
R03	10.0	10.0	0%	Negligible
R04	10.1	10.2	0%	Negligible
R05	10.2	10.2	0%	Negligible
R06	10.3	10.4	0%	Negligible
R07	10.4	10.5	0%	Negligible
R08	10.5	10.5	0%	Negligible
R09	10.5	10.6	0%	Negligible
R10	10.6	10.6	0%	Negligible
R11	11.1	11.2	0%	Negligible
R12	10.9	11.0	0%	Negligible
R13	10.1	10.1	0%	Negligible
R14	10.1	10.1	0%	Negligible
R15	10.1	10.1	0%	Negligible
R16	10.3	10.3	0%	Negligible
R17	10.5	10.5	0%	Negligible
R18	10.5	10.5	0%	Negligible
R19	10.4	10.4	0%	Negligible
R20	10.7	10.7	0%	Negligible
R21	10.7	10.8	0%	Negligible
R22	10.9	11.0	0%	Negligible
R23	10.8	10.9	0%	Negligible
R24	10.9	11.0	0%	Negligible
R25	10.5	10.6	0%	Negligible
R26	11.0	11.1	0%	Negligible
R27	10.7	10.7	0%	Negligible
R28	10.9	10.9	0%	Negligible
R29	15.7	16.1	2-5%	Slight
R30	15.0	15.4	2-5%	Slight
R31	11.0	11.1	0%	Negligible
R32	10.6	10.6	0%	Negligible
R33	10.6	10.7	0%	Negligible
R34	10.6	10.7	0%	Negligible
R35	10.4	10.4	0%	Negligible
Short-Term Exposure Receptors				
B01	11.9	12.0		
B02	12.0	12.2		
G01	10.0	10.0		
G02	10.0	10.1		
G03	10.1	10.1		

G04	10.3	10.3
G05	10.4	10.4
G06	10.5	10.6
G07	12.0	12.1
G08	12.1	12.2
G09	10.5	10.5
G10	10.3	10.3
G11	10.5	10.6
G12	10.2	10.2
G13	12.3	12.5
G14	12.4	12.5
G15	12.3	12.4
G16	12.1	12.3
G17	11.9	12.0
G18	11.8	11.9
G19	11.8	12.0
G20	11.9	12.1
G21	11.9	12.0
G22	12.4	12.6
G23	12.6	12.8
G24	12.5	12.6
G25	12.4	12.6
G26	12.5	12.6
G27	12.3	12.5
G28	12.2	12.4
G29	12.0	12.1
G30	11.7	11.9
G31	12.7	12.9
G32	10.8	10.8
G33	10.8	10.9
G34	10.8	10.9
G35	10.8	10.9

Table C.7 – 2026 Baseline + Proposed Development Predicted NO_2 Impacts at Specified Receptors –

Calculated NO_2 Annual Mean (µg/m^3)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	13.6	14.1	1%	Negligible
R02	13.7	14.2	1%	Negligible

R03	14.3	14.9	2-5%	Negligible
R04	15.7	16.6	2-5%	Negligible
R05	16.7	17.8	2-5%	Negligible
R06	18.1	19.4	2-5%	Negligible
R07	16.2	17.1	2-5%	Negligible
R08	16.8	17.8	2-5%	Negligible
R09	17.4	18.5	2-5%	Negligible
R10	17.9	19.1	2-5%	Negligible
R11	23.6	25.7	2-5%	Negligible
R12	21.3	23.0	2-5%	Negligible
R13	15.2	15.9	2-5%	Negligible
R14	15.0	15.7	2-5%	Negligible
R15	14.7	15.3	2-5%	Negligible
R16	14.7	15.4	2-5%	Negligible
R17	16.3	17.2	2-5%	Negligible
R18	16.5	17.5	2-5%	Negligible
R19	15.7	16.6	2-5%	Negligible
R20	19.0	20.4	2-5%	Negligible
R21	19.3	20.7	2-5%	Negligible
R22	21.2	22.9	2-5%	Negligible
R23	20.4	22.0	2-5%	Negligible
R24	20.9	22.5	2-5%	Negligible
R25	16.9	17.9	2-5%	Negligible
R26	21.6	23.3	2-5%	Negligible
R27	18.3	19.6	2-5%	Negligible
R28	20.4	21.9	2-5%	Negligible
R29	57.6	63.4	>10%	Substantial
R30	53.2	58.5	>10%	Substantial
R31	21.7	23.4	2-5%	Negligible
R32	17.5	18.6	2-5%	Negligible
R33	17.9	19.0	2-5%	Negligible
R34	17.7	18.9	2-5%	Negligible
R35	16.1	17.0	2-5%	Negligible
Short-Term Exposure Receptors				
B01	29.4	32.1		
B02	32.3	35.8		
G01	14.4	15.0		
G02	14.7	15.3		
G03	15.4	16.2		
G04	17.4	18.6		
G05	18.8	20.2		

G06	20.5	22.3
G07	32.4	36.0
G08	33.4	37.1
G09	18.5	19.7
G10	16.9	17.9
G11	19.1	20.4
G12	16.1	17.0
G13	35.6	39.5
G14	35.5	39.4
G15	34.4	38.0
G16	33.4	37.0
G17	29.6	32.4
G18	29.0	31.7
G19	29.1	31.9
G20	30.1	33.0
G21	29.7	32.6
G22	34.1	37.4
G23	35.3	38.8
G24	36.1	39.9
G25	35.7	39.5
G26	36.1	40.0
G27	34.9	38.7
G28	33.6	37.2
G29	30.8	33.7
G30	28.3	30.9
G31	35.0	38.3
G32	19.3	20.6
G33	20.0	21.5
G34	20.8	22.5
G35	20.6	22.2

Table C.8 – 2026 Baseline + Proposed Development Predicted PM_{10} Impacts at Specified Receptors –

Calculated PM_{10} Annual Mean ($\mu g/m^3$)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	16.9	16.9	0%	Negligible
R02	16.9	16.9	0%	Negligible
R03	17.0	17.1	0%	Negligible

R04	17.2	17.3	0%	Negligible
R05	17.4	17.5	0%	Negligible
R06	17.6	17.7	0%	Negligible
R07	18.2	18.4	0%	Negligible
R08	18.3	18.5	0%	Negligible
R09	18.5	18.6	0%	Negligible
R10	18.6	18.7	0%	Negligible
R11	19.5	19.8	1%	Negligible
R12	19.1	19.4	1%	Negligible
R13	17.2	17.3	0%	Negligible
R14	17.2	17.3	0%	Negligible
R15	17.1	17.2	0%	Negligible
R16	18.1	18.2	0%	Negligible
R17	18.3	18.5	0%	Negligible
R18	18.4	18.5	0%	Negligible
R19	18.2	18.3	0%	Negligible
R20	18.7	18.9	0%	Negligible
R21	18.8	19.0	0%	Negligible
R22	19.1	19.4	1%	Negligible
R23	19.0	19.2	1%	Negligible
R24	19.2	19.4	1%	Negligible
R25	18.4	18.6	0%	Negligible
R26	19.3	19.6	1%	Negligible
R27	18.7	18.9	0%	Negligible
R28	19.1	19.3	1%	Negligible
R29	27.9	29.2	2-5%	Negligible
R30	26.7	27.9	2-5%	Negligible
R31	19.3	19.6	1%	Negligible
R32	18.5	18.7	0%	Negligible
R33	18.6	18.8	0%	Negligible
R34	18.6	18.8	0%	Negligible
R35	18.2	18.4	0%	Negligible
Short-Term Exposure Receptors				
B01	20.9	21.4		
B02	21.2	21.7		
G01	17.0	17.1		
G02	17.0	17.1		
G03	17.2	17.3		
G04	17.5	17.6		
G05	17.7	17.9		
G06	18.0	18.2		

G07	21.0	21.5
G08	21.3	21.8
G09	17.8	18.0
G10	17.5	17.7
G11	17.9	18.1
G12	17.4	17.5
G13	21.7	22.3
G14	21.8	22.3
G15	21.6	22.1
G16	21.4	21.9
G17	20.9	21.3
G18	20.8	21.2
G19	20.8	21.3
G20	21.0	21.5
G21	21.0	21.4
G22	21.9	22.5
G23	22.2	22.8
G24	21.9	22.6
G25	21.9	22.5
G26	22.0	22.6
G27	21.8	22.3
G28	21.5	22.1
G29	21.1	21.6
G30	20.6	21.1
G31	22.4	23.0
G32	18.9	19.1
G33	19.0	19.2
G34	19.0	19.3
G35	19.0	19.2

Table C.9 – 2026 Baseline + Proposed Development Predicted $PM_{2.5}$ Impacts at Specified Receptors –

Calculated $PM_{2.5}$ Annual Mean (µg/m³)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic**	**% Change of Limit**	**Impact Descriptor**
Residential Receptors				
R01	9.9	10.0	0%	Negligible
R02	9.9	10.0	0%	Negligible
R03	10.0	10.0	0%	Negligible
R04	10.1	10.2	0%	Negligible
R05	10.2	10.3	0%	Negligible

R06	10.3	10.4	0%	Negligible
R07	10.4	10.5	0%	Negligible
R08	10.5	10.5	0%	Negligible
R09	10.5	10.6	0%	Negligible
R10	10.6	10.7	0%	Negligible
R11	11.1	11.3	1%	Negligible
R12	10.9	11.0	1%	Negligible
R13	10.1	10.2	0%	Negligible
R14	10.1	10.1	0%	Negligible
R15	10.0	10.1	0%	Negligible
R16	10.3	10.4	0%	Negligible
R17	10.4	10.5	0%	Negligible
R18	10.5	10.5	0%	Negligible
R19	10.4	10.5	0%	Negligible
R20	10.7	10.8	1%	Negligible
R21	10.7	10.8	1%	Negligible
R22	10.9	11.0	1%	Negligible
R23	10.8	10.9	1%	Negligible
R24	10.9	11.1	1%	Negligible
R25	10.5	10.6	0%	Negligible
R26	11.0	11.1	1%	Negligible
R27	10.6	10.7	1%	Negligible
R28	10.8	11.0	1%	Negligible
R29	15.7	16.5	2-5%	Slight
R30	15.0	15.7	2-5%	Slight
R31	11.0	11.1	1%	Negligible
R32	10.5	10.6	0%	Negligible
R33	10.6	10.7	0%	Negligible
R34	10.6	10.7	0%	Negligible
R35	10.4	10.5	0%	Negligible
Short-Term Exposure Receptors				
B01	11.9	12.1		
B02	12.0	12.3		
G01	10.0	10.0		
G02	10.0	10.1		
G03	10.1	10.1		
G04	10.3	10.3		
G05	10.4	10.5		
G06	10.5	10.7		
G07	11.9	12.2		
G08	12.1	12.4		

G09	10.4	10.5
G10	10.3	10.4
G11	10.5	10.6
G12	10.2	10.3
G13	12.3	12.7
G14	12.3	12.7
G15	12.2	12.6
G16	12.1	12.4
G17	11.9	12.1
G18	11.8	12.0
G19	11.8	12.1
G20	11.9	12.2
G21	11.9	12.2
G22	12.4	12.7
G23	12.6	12.9
G24	12.4	12.8
G25	12.4	12.7
G26	12.4	12.8
G27	12.3	12.7
G28	12.2	12.5
G29	12.0	12.3
G30	11.7	12.0
G31	12.7	13.0
G32	10.7	10.9
G33	10.8	10.9
G34	10.8	11.0
G35	10.8	10.9

Table C.10 – 2026 Baseline + Cumulative Predicted NO_2 Impacts at Specified Receptors –

Calculated NO_2 Annual Mean (µg/m^3)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic (Cumulative)**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	13.9	14.3	1%	Negligible
R02	14.0	14.5	1%	Negligible
R03	14.5	15.2	2-5%	Negligible
R04	16.0	17.0	2-5%	Negligible
R05	17.0	18.3	2-5%	Negligible
R06	18.4	20.0	2-5%	Negligible

R07	16.5	17.6	2-5%	Negligible
R08	17.1	18.3	2-5%	Negligible
R09	17.7	19.0	2-5%	Negligible
R10	18.2	19.7	2-5%	Negligible
R11	24.0	26.7	6-10%	Slight
R12	21.6	23.8	6-10%	Slight
R13	15.5	16.3	2-5%	Negligible
R14	15.3	16.1	2-5%	Negligible
R15	14.9	15.7	2-5%	Negligible
R16	15.0	15.7	2-5%	Negligible
R17	16.6	17.7	2-5%	Negligible
R18	16.9	18.0	2-5%	Negligible
R19	16.0	17.0	2-5%	Negligible
R20	19.3	21.0	2-5%	Negligible
R21	19.6	21.4	2-5%	Negligible
R22	21.6	23.8	6-10%	Slight
R23	20.7	22.7	2-5%	Negligible
R24	21.3	23.4	2-5%	Negligible
R25	17.2	18.4	2-5%	Negligible
R26	21.9	24.2	6-10%	Slight
R27	18.7	20.2	2-5%	Negligible
R28	20.7	22.7	2-5%	Negligible
R29	58.5	66.9	>10%	Substantial
R30	54.0	61.7	>10%	Substantial
R31	22.1	24.4	6-10%	Slight
R32	17.8	19.1	2-5%	Negligible
R33	18.2	19.6	2-5%	Negligible
R34	18.1	19.5	2-5%	Negligible
R35	16.4	17.4	2-5%	Negligible
Short-Term Exposure Receptors				
B01	29.9	33.7		
B02	32.8	37.3		
G01	14.6	15.3		
G02	14.9	15.7		
G03	15.7	16.6		
G04	17.7	19.1		
G05	19.1	20.8		
G06	20.9	23.0		
G07	32.9	37.5		
G08	33.9	38.6		
G09	18.8	20.4		

G10	17.2	18.4
G11	19.5	21.2
G12	16.4	17.5
G13	36.1	41.2
G14	36.0	41.1
G15	34.9	39.7
G16	33.9	38.6
G17	30.0	33.9
G18	29.5	33.2
G19	29.6	33.4
G20	30.6	34.5
G21	30.2	34.1
G22	34.6	39.3
G23	35.9	40.8
G24	36.6	41.7
G25	36.2	41.3
G26	36.7	41.8
G27	35.5	40.4
G28	34.2	38.9
G29	31.3	35.3
G30	28.7	32.4
G31	35.6	40.3
G32	19.6	21.4
G33	20.4	22.3
G34	21.1	23.2
G35	20.9	23.0

Table C.11 – 2026 Baseline + Cumulative Predicted PM_{10} Impacts at Specified Receptors –

Calculated PM_{10} Annual Mean ($\mu g/m^3$)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic (Cumulative)**	**% Change of Objective**	**Impact Descriptor**
Residential Receptors				
R01	16.9	17.0	0%	Negligible
R02	16.9	17.0	0%	Negligible
R03	17.0	17.1	0%	Negligible
R04	17.2	17.4	1%	Negligible
R05	17.4	17.6	1%	Negligible
R06	17.6	17.9	1%	Negligible
R07	18.2	18.5	1%	Negligible

R08	18.3	18.6	1%	Negligible
R09	18.5	18.7	1%	Negligible
R10	18.6	18.8	1%	Negligible
R11	19.5	20.1	1%	Negligible
R12	19.1	19.6	1%	Negligible
R13	17.2	17.4	0%	Negligible
R14	17.2	17.3	0%	Negligible
R15	17.1	17.3	0%	Negligible
R16	18.1	18.2	0%	Negligible
R17	18.3	18.6	1%	Negligible
R18	18.4	18.6	1%	Negligible
R19	18.2	18.4	1%	Negligible
R20	18.7	19.1	1%	Negligible
R21	18.8	19.2	1%	Negligible
R22	19.1	19.6	1%	Negligible
R23	19.0	19.4	1%	Negligible
R24	19.2	19.6	1%	Negligible
R25	18.4	18.7	1%	Negligible
R26	19.3	19.8	1%	Negligible
R27	18.7	19.0	1%	Negligible
R28	19.1	19.5	1%	Negligible
R29	27.9	30.5	6-10%	Moderate
R30	26.7	29.0	6-10%	Slight
R31	19.3	19.8	1%	Negligible
R32	18.5	18.8	1%	Negligible
R33	18.6	18.9	1%	Negligible
R34	18.6	18.9	1%	Negligible
R35	18.2	18.5	1%	Negligible
Short-Term Exposure Receptors				
B01	20.9	21.8		
B02	21.2	22.1		
G01	17.0	17.2		
G02	17.0	17.2		
G03	17.2	17.4		
G04	17.5	17.7		
G05	17.7	18.0		
G06	18.0	18.4		
G07	21.0	22.0		
G08	21.3	22.2		
G09	17.8	18.2		
G10	17.5	17.8		

G11	17.9	18.3
G12	17.4	17.6
G13	21.7	22.8
G14	21.8	22.8
G15	21.6	22.6
G16	21.4	22.3
G17	20.9	21.8
G18	20.8	21.6
G19	20.8	21.7
G20	21.0	21.9
G21	21.0	21.8
G22	21.9	23.0
G23	22.2	23.4
G24	21.9	23.1
G25	21.9	23.0
G26	22.0	23.1
G27	21.8	22.8
G28	21.5	22.5
G29	21.1	22.0
G30	20.6	21.4
G31	22.4	23.6
G32	18.9	19.2
G33	19.0	19.4
G34	19.0	19.4
G35	19.0	19.4

Table C.6 –2026 Baseline + Cumulative Predicted $PM_{2.5}$ Impacts at Specified Receptors –

Calculated $PM_{2.5}$ Annual Mean ($\mu g/m^3$)				
Receptor ID	**2026 Baseline**	**2026 Baseline + Proposed Development Traffic (Cumulative)**	**% Change of Limit**	**Impact Descriptor**
Residential Receptors				
R01	9.9	10.0	0%	Negligible
R02	9.9	10.0	0%	Negligible
R03	10.0	10.1	0%	Negligible
R04	10.1	10.2	1%	Negligible
R05	10.2	10.3	1%	Negligible
R06	10.3	10.5	1%	Negligible
R07	10.4	10.5	1%	Negligible
R08	10.5	10.6	1%	Negligible

R09	10.5	10.7	1%	Negligible
R10	10.6	10.7	1%	Negligible
R11	11.1	11.4	1%	Negligible
R12	10.9	11.1	1%	Negligible
R13	10.1	10.2	1%	Negligible
R14	10.1	10.2	1%	Negligible
R15	10.0	10.1	0%	Negligible
R16	10.3	10.4	0%	Negligible
R17	10.4	10.6	1%	Negligible
R18	10.5	10.6	1%	Negligible
R19	10.4	10.5	1%	Negligible
R20	10.7	10.9	1%	Negligible
R21	10.7	10.9	1%	Negligible
R22	10.9	11.1	1%	Negligible
R23	10.8	11.0	1%	Negligible
R24	10.9	11.2	1%	Negligible
R25	10.5	10.6	1%	Negligible
R26	11.0	11.3	1%	Negligible
R27	10.6	10.8	1%	Negligible
R28	10.8	11.1	1%	Negligible
R29	15.7	17.1	6-10%	Moderate
R30	15.0	16.3	6-10%	Moderate
R31	11.0	11.3	1%	Negligible
R32	10.5	10.7	1%	Negligible
R33	10.6	10.8	1%	Negligible
R34	10.6	10.8	1%	Negligible
R35	10.4	10.5	1%	Negligible
Short-Term Exposure Receptors				
B01	11.9	12.4		
B02	12.0	12.5		
G01	10.0	10.1		
G02	10.0	10.1		
G03	10.1	10.2		
G04	10.3	10.4		
G05	10.4	10.6		
G06	10.5	10.7		
G07	11.9	12.5		
G08	12.1	12.6		
G09	10.4	10.6		
G10	10.3	10.4		
G11	10.5	10.7		

G12	10.2	10.3
G13	12.3	12.9
G14	12.3	12.9
G15	12.2	12.8
G16	12.1	12.7
G17	11.9	12.3
G18	11.8	12.3
G19	11.8	12.3
G20	11.9	12.4
G21	11.9	12.4
G22	12.4	13.0
G23	12.6	13.2
G24	12.4	13.1
G25	12.4	13.0
G26	12.4	13.1
G27	12.3	12.9
G28	12.2	12.8
G29	12.0	12.5
G30	11.7	12.2
G31	12.7	13.3
G32	10.7	10.9
G33	10.8	11.1
G34	10.8	11.1
G35	10.8	11.0

Appendix D – Traffic Data

The original modelling assessment utilised traffic data counted within the village of Hickleton. In the absence of 2023 data, DfT count points either side of Hickleton on the A635 were utilised to calculate a growth factor that could be applied to the 2022 data in order to generate a realistic dataset for 2023 traffic data. The two point counts used were count point 73009 (West of Hickleton) and 37454 (East of Hickleton) and the method for calculating the growth factors is set out in **Table D.1** and **Table D.2**. The traffic data used is then set out in **Table D.3**.

Table D.1 – Calculated Growth Factors Methodology (2022 to 2023)

Direction	Location	Vehicle Type	2022 Data	2023 Data	Factor to Apply
Eastbound	73009	Total	7925	8052	1.0160
		HGVs	963	931	0.9668
	37454	Total	7201	7319	1.0164
		HGVs	872	843	0.9667
Westbound	73009	Total	7798	7915	1.0150
		HGVs	1016	979	0.9636
	37454	Total	7991	8129	1.0173
		HGVs	878	853	0.9715

Table D.2 – Calculated Growth Factors (2022 to 2023)

Vehicle Type	Eastbound	Westbound
Total	1.0162	1.0161
HGVs	0.9668	0.9676

Table D.3 – 2023 Traffic Data

Vehicle Type	Eastbound	Westbound
Total Vehicles	9955	10137
HGVs	1231	1399
LDVs	8724	8738