Tritax Symmetry (Hinckley) Limited

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE

The Hinckley National Rail Freight Interchange Development Consent Order

Project reference TR050007

Environmental Statement
Volume 1: Main Statement

Chapter 9: Air Quality

Document reference: 6.1.9

Revision: 04

November 2022

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 Regulation 14

This document forms a part of the Environmental Statement for the Hinckley National Rail Freight Interchange project.

Tritax Symmetry (Hinckley) Limited (TSH) has applied to the Secretary of State for Transport for a Development Consent Order (DCO) for the Hinckley National Rail Freight Interchange (HNRFI).

To help inform the determination of the DCO application, TSH has undertaken an environmental impact assessment (EIA) of its proposals. EIA is a process that aims to improve the environmental design of a development proposal, and to provide the decision maker with sufficient information about the environmental effects of the project to make a decision.

The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to ameliorate any adverse effects.

Further details about the proposed Hinckley National Rail Freight Interchange are available on the project website:

http://www.hinckleynrfi.co.uk/

The DCO application and documents relating to the examination of the proposed development can be viewed on the Planning Inspectorate's National Infrastructure Planning website:

https://infrastructure.planninginspectorate.gov.uk/projects/east-midlands/hinckley-national-rail-freight-interchange/

Chapter 9 ◆ Air Quality

INTRODUCTION

9.1. This Chapter summarises the assessment work undertaken on the Hinckley National Rail Freight Interchange (HNRFI) scheme with regard to air quality.

9.2. This Chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the Order Limits and study areas identified and the potential direct and indirect impacts of the HNRFI. Where applicable, it also identifies mitigation measures required to prevent, reduce, or offset these impacts, and describes the remaining (residual) impacts with such mitigation measures in place.

9.3. This Chapter was completed by members of the BWB Air Quality Team who were responsible for undertaking the studies and assessments reported, contributing to the information described and for compiling this Chapter and the corresponding appendices. The assessment team are members of the Institute of Air Quality Management (IAQM) and Institution of Environmental Sciences (IES).

9.4. This report is necessarily technical in nature, so to assist the reader a glossary of air quality terminology can be found in Appendix 6.2.9.1.

METHODOLOGY AND DATA SOURCES

The 2020 Scoping Opinion

9.5. An EIA Scoping Report was submitted to the Planning Inspectorate (PINS) in November 2020 which provided an outline approach for the identification and assessment of likely significant effects for air quality.

9.6. In December 2020 PINS, on behalf of the Secretary of State (SoS) and key stakeholders, returned their Scoping Opinion to the Applicant and comments related to air quality are provided in Table 9.1.

Table 9.1: Planning Inspectorate's comments from EIA Scoping Opinion in relation to air quality (December 2020)

Secretary of State	Scoping Opinion Response	Response to Comments
Detailed (quantitative assessment of operational energy plant emissions)	The report states that energy production from plant(s) are likely to be installed to the warehousing element of the HNRFI. A detailed assessment of emissions from this infrastructure is proposed to be scoped out, as the HNRFI would not be sufficiently progressed to allow for a quantitative assessment of operational emissions. The Scoping Report provides no explanation of the potential nature of the energy facility (fuel types, potential capacity). Given the lack of information the Inspectorate is unable to scope this matter out.	A detailed assessment of emissions associated with the back-up energy centre proposed within the Main HNRFI Site is included within this ES. The assessment considers the impact of energy centre emissions on pollutant concentrations at both existing human and ecological receptors.
Receptors	The Scoping Report describes potentially sensitive receptors including Air Quality Management Areas (AQMAs). The ES should include the figures to indicate the location of these receptors.	Human receptor locations considered in the construction phase road traffic emissions assessment are detailed in Figure 6.3.9.3. Human receptors considered in the operational phase road traffic emissions assessment are detailed in Figures 6.3.9.6 – 6.3.9.11. Human receptor locations considered in the operational phase back-up CHP emissions assessment are detailed in Figure 6.3.9.15. All human receptor locations are also detailed in Appendix 6.2.9.4.
Study Area	The Scoping Report suggests that the study area will be established based on	The rail network geographic scope was established in

Secretary of State	Scoping Opinion Response	Response to Comments
	the Affected Road Network. The ES should also justify the extent of consideration of the affected areas of the rail network in the geographic scope of the assessment.	accordance with relevant guidance and details are provided within the Assessment Methodology section of this Chapter.
Sensitive Receptors	The Scoping Report identifies locations where members of the public would spend extended periods of time and experience longer periods of exposure. Burbage Woods and Burbage Common are missing from this list but are identified as popular leisure destinations by Stoney Stanton Parish Council.	Receptor locations, including Burbage Woods and Common, were considered within the assessment of construction phase dust and construction and operational phase road traffic and operational phase back-up Combined Heat and Power (CHP) emissions. Pollutant concentrations were also predicted across the Main HNRFI Site and surrounding area to consider the exposure of users of the Main HNRFI Site and surrounding area to elevated pollutant concentrations given proximity to the new A47 Link Road, and the M69 motorway. Details are provided within the Assessment Methodology section of this Chapter and shown in contour plots of pollutant concentrations in the vicinity of the Main HNRFI Site which are illustrated in Figures 6.3.9.25 – 6.3.9.27 for the 2026 Opening Year and Figures 6.3.9.28 – 6.3.9.30 for the 2036 Future Year scenarios.
Consultation	Discussions with Blaby District Council (BDC) and Hinckley and Bosworth District Council (HBBC) over the methodology should be documented in the ES.	Further consultation was undertaken with BDC and HBBC to discuss the methodology and sensitive receptors. Agreement from both BDC and HBBC was

Secretary of State	Scoping Opinion Response	Response to Comments
		received prior to undertaking the assessment. Further s42 consultation was received from BDC and HBBC following publication of the PEIR and the responses to these comments are detailed in the section below.
Temporal Scope of the Assessment	The Scoping Report states that assessments will be carried out for the baseline year and a future assessment year but does not explain what the future assessment year would be. The ES should ensure that the choice of future assessment year is based on a worst-case scenario.	The earliest possible Opening Year of the HNRFI is confirmed as 2026 for the purpose of the assessment in the ES. A future year of 2036 was chosen early in the development proposals as 10 years after the Opening Year rather than the end of the Blaby plan period (2038). The transport model does not encompass a 2038 assessment year, only up to 2036 and National Highways (NH) advised that 2036 is a suitable proxy.

2022 S42 Consultation Responses

9.7. Consultation was undertaken with Blaby District Council (BDC) and Hinckley and Bosworth Borough Council (HBBC) for a period of 12 weeks from the 12th of January to 8th of April 2022. Comments from both BDC and HBBC with regard to air quality centred on the traffic data utilised in the operational phase road traffic emissions assessment detailed in the PEIR.

9.8. At the time of consultation, traffic data provided by the Project Transport Consultants, BWB Consulting Limited, for use in the operational phase road traffic emissions assessment was not agreed with the Transport Working Group (TWG). It was requested by both BDC and HBBC that the operational phase road traffic emissions assessment be updated following agreement of the traffic dataset with the TWG. Agreement of the traffic data was obtained in April 2022 and updated traffic data for use in the operational phase road traffic emissions assessment was provided by the Project Transport Consultants in May 2022.

9.9. An updated operational phase road traffic emissions assessment was undertaken in August 2022 and the methodology utilised in the assessment. The assessment results are presented in this Chapter and utilise the agreed traffic dataset.

9.10. In addition to comments regarding the traffic data used in the operational phase road traffic emissions assessment, BDC and HBBC raised the absence of a quantitative construction phase road traffic emissions assessment, and assessment of the operational phase back-up Combined Heat and Power (CHP) unit proposed for implementation on the Main HNRFI Site.

9.11. Following receipt of information regarding peak construction phase road traffic movements from the Project Transport Consultants, a detailed construction phase road traffic emissions assessment was undertaken. The methodology utilised in this assessment, and the results of the assessment, are presented in this Chapter.

9.12. Following provision of details regarding the proposed back-up CHP unit on the Main HNRFI Site, a detailed operational phase back-up CHP emissions assessment was undertaken. The methodology utilised in this assessment, and the results of the assessment, are presented in this Chapter.

2021 Consultation with HBBC and BDC

9.13. Further to the Scoping Report consultation, consultation was also undertaken at the outset of the project with the Environmental Health departments at Blaby District Council (BDC) and Hinckley and Bosworth Borough Council (HBBC). The scope of works and methodology of the assessment was provided by email. Table 9.2: provides a summary of the consultation undertaken.

Table 9.2: Consultation responses relevant to this Chapter

Consultee	Date	Comments	Actions
Blaby District Council Environmental Health Department	17/06/2021	Consultation email detailing proposed assessment methodology and receptor locations issued to BDC for review.	None
	22/06/2021	Confirmation of acceptance of methodology received from BDC by email.	None

Consultee	Date	Comments	Actions
Hinckley and Bosworth Borough Council Environmental Health Department	17/06/2021	Consultation email detailing proposed assessment methodology and receptor locations issued to HBBC for review.	None
	18/06/2021	Confirmation of acceptance of methodology received from HBBC by email.	None

Section 47 Consultation Responses

9.14. On the theme of air quality, Section 47 (s47) consultation responses were received. The key themes featured in s47 responses relating to air quality were with regard to increases road traffic associated with construction activities and vehicles associated with the HNRFI once operational and dust generated by construction phase activities.

9.15. The assessment detailed in this Chapter includes a detailed assessment of both construction phase road traffic emissions, and emissions associated with traffic generated by the HNRFI once operational. Additionally, a construction phase dust assessment was undertaken to identify proportionate measures that should be implemented during the construction phase to minimise the influence of dust emissions on the local area.

Assessment methodology

Construction phase dust assessment

9.16. An assessment of the potential impacts from the construction of the Proposed Development was undertaken in accordance with IAQM guidance. The guidance sets out principles to determine the sensitivity of the area and dust emission magnitudes based on those receptors which will experience the maximum impact. The full assessment methodology is provided in Appendix 6.2.9.3 and a summary of the assessment steps are provided below:

- Step 1 - screen the requirement for a more detailed assessment. No assessment is required if there are no receptors within a certain distance of the works.
- Step 2 - assess the risk of dust impacts separately for each of the four activities considered (demolition, earthworks, construction and trackout).
    - Step 2A - determine the potential dust emission magnitude for each of the four activities.

- Step 2B - determine the sensitivity of the area.
- Step 2C - determine the risk of dust impacts by combining the findings of steps 2A and 2B.

- Step 3 - determine the site-specific mitigation for each of the four activities; and
- Step 4 - examine the residual and in combination effects and determine significance.

Study area and identification of existing sensitive receptors

9.17. Existing sensitive receptors were identified within the distance bands detailed in the IAQM guidance and considered regarding dust soiling, human health effects and ecological designated sites. Figure 6.3.9.1 details the construction phase dust distance buffers which are measured at 20m, 50m, 100m, 200m and 350m from the Main Order Limits and represent the extents of the construction phase dust assessment. Only the Main Order Limits were considered in the construction phase dust assessment as these are areas where construction activities which may generate dust will take place. Other areas within the wider Order Limits do not include construction activities (e.g., change of speed limit or addition of new road signage) and therefore were not considered in the assessment of construction phase dust.

9.18. The distance bands provided by the IAQM guidance *"are deliberately chosen to be conservative and take into account the exponential decline in both airborne concentrations and the rate of deposition of dust with distance from the source"*.

9.19. Sensitive receptors for construction dust were identified based on the criteria above.

Construction phase road traffic emissions

9.20. A detailed assessment of construction phase road traffic emissions was undertaken to consider the impact of peak construction phase road traffic on local air quality. The assessment was undertaken in accordance with IAQM and EPUK guidance and DEFRA air quality technical guidance.

9.21. The Atmospheric Dispersion Modelling System ('ADMS') ADMS-Roads, version 5.0.1.3, was utilised in the assessment to predict concentrations of oxides of nitrogen (NO_x) and varying sizes of particulate matter (PM_{10} and $PM_{2.5}$).

Study area and identification of existing receptor locations

9.22. Concentrations of pollutants were predicted at identified existing human receptor locations, and within the designated ecological sites, in the vicinity of the primary road network to be utilised by construction traffic during peak construction phase activities.

9.23. As no detail was available at the time of assessment regarding where materials and labour will be sourced from, the construction phase road traffic emissions assessment study area focussed on Junction 2 of the M69 motorway, and the adjoining roads. These roads were predicted to experience the greatest increase in road traffic during the peak of

construction operations, due to the required routing of delivery vehicles and available access point to the Main HNRFI Site at this stage of the construction.

9.24. The extent of the study area for the construction phase road traffic emissions assessment is shown in Figure 6.3.9.2.

9.25. The existing human sensitive receptor locations considered in the assessment were based on their relative proximity to road links within the construction phase road traffic emissions assessment study area. Where possible the closest receptors to those road links were considered, as these receptors are likely to experience the greatest change in pollutant concentrations as a result traffic associated with peak construction activities. The receptors were located on the facades of the properties closest to the road source.

9.26. The existing human receptor locations are detailed in Appendix 6.2.9.4 and Figure 6.3.9.3. Pollutant concentrations were predicted at a height of 1.5m above the modelled road level to represent the average breathing height at ground floor level.

9.27. Ecological designations, including Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNR) and Ancient Woodlands (AW), were considered within the construction phase road traffic emissions assessment, where they were located within 200m of the study area in accordance with the DMRB LA105 criteria. The locations of the ecological designations considered in the construction phase road traffic emissions assessment are illustrated in Figure 6.3.9.4.

9.28. The dispersion modelling software ADMS-Roads was utilised to predict concentrations of NOx resulting from additional traffic generated by the construction phase road traffic emissions. Transects were modelled at 10m intervals from the boundary of each designated ecological site, up to 200m into the ecological site in accordance with IAQM and DMRB guidance.

Operational phase road traffic emissions assessment

9.29. A detailed assessment of operational phase road traffic emissions on local air quality was undertaken in accordance with DMRB LA105, with reference to DEFRA air quality technical guidance, IAQM and EPUK guidance and National Policy Statement (NPS) for National Networks guidance.

9.30. ADMS-Roads, version 5.0.1.3, was utilised in the assessment to predict concentrations of NO_x and varying sizes of PM_{10} and $PM_{2.5}$ at identified existing human receptor locations and within the designated ecological sites identified within the study area.

Study area and identification of existing receptor locations

9.31. The study area was determined in accordance with the criteria provided by DMRB LA 105 Air Quality guidance. In accordance with DMRB LA105 guidance, the screening criteria for the *'affected road network'* is:

- a change in alignment of more than 5m or more; or

- a change in daily traffic flows of 1,000 Annual Average Daily Traffic (AADT) or more; or
- a change in heavy duty vehicle (HDV) flows of 200 AADT or more; or
- a change in speed band.

9.32. Traffic data provided by the project's Transport Consultant, as set out in Chapter 8: *Transport and Traffic (document reference 6.1.8)*, was screened in accordance with these criteria to identify affected road links and the extent of the study area. Additional traffic data for roads in the vicinity of receptors or monitoring locations was included, if required for assessment purposes.

9.33. Existing human receptor locations were identified within the study area and concentrations of NOx, PM_{10} and $PM_{2.5}$ were predicted at these receptors in the operational phase road traffic emissions assessment.

9.34. The extent of the study area for the operational phase road traffic emissions assessment is shown in Figure 6.3.9.5, and the receptor locations included within the operational phase road traffic emissions assessment are depicted in Figures 6.3.9.6 - 6.3.9.11. Details of the receptors considered in the operational phase road traffic emissions assessment are provided in Appendix 6.2.9.4.

9.35. The existing human sensitive receptor locations considered in the assessment were based on their relative proximity to road links within the operational phase road traffic emissions assessment study area. Where possible the closest receptors to those road links and junctions were considered, as these receptors are likely to experience the greatest change in pollutant concentrations as a result of the operation of the Proposed Development. The receptors were located on the facades of the properties closest to the road source.

9.36. As the Proposed Development will relocate existing Public Rights of Way (PRoWs) and bridleways through the Main HNRFI Site, consideration was also given to pollutant concentrations across the Main HNRFI Site. Concentrations of NOx, PM_{10} and $PM_{2.5}$ were predicted across the Main HNRFI Site to consider the exposure of users of the relocated PRoWs and bridleways to air pollution, during the construction phase when temporary routes will be provided, and once the Proposed Development is operational. As users of the PRoWs and bridleways will only be present in the Main HNRFI Site transiently under the normal pattern of use of these land uses, the short term air quality objectives were considered to be relevant across the Main HNRFI Site.

9.37. Pollutant concentrations were predicted at the height representative of exposure. Ground floor receptors were modelled at a height of 1.5 metres (m) above modelled road height. This excludes schools and nurseries, which were modelled at a height of 1.0m or 0.8m respectively to represent the lower-than-average breathing height for children.

9.38. Receptors relevant to the short-term air quality objectives were also identified within the study area for the operational phase road traffic emissions assessment. These receptors were located where members of the public could be present for a period of time comparable to the short-term air quality objectives, but unlikely to be present for

extended periods such as those representative of the annual air quality objectives. Such uses include hotels or restaurants.

9.39. Receptors were considered within the following Local Authority areas:

- Blaby District Council (BDC);
- Hinckley and Bosworth Borough Council (HBBC);
- Rugby Borough Council (RBC);
- Harborough District Council (HDC);
- Charnwood Borough Council (CBC);
- Erewash Borough Council (EBC);
- North Warwickshire Borough Council (NWBC);
- North West Leicestershire Council (NWLC);
- Coventry City Council (CCC);
- Tamworth Borough Council (TBC);
- Nuneaton and Bedworth Borough Council (NBBC); and
- West Northamptonshire Council (Daventry District Council (DDC)) (WNC).

9.40. In addition to human receptors, ecological designations, including SSSIs, Special Areas of Conservation (SAC), LNRs and AWs, were considered within the assessment where they were located within 200m of the 'affected road network' in accordance with the DMRB LA105 criteria. The locations of the ecological designations are depicted in Figures 6.3.9.12 - 6.3.9.14.

9.41. The dispersion modelling software ADMS-Roads was utilised to predict concentrations of NOx resulting from additional development-generated road traffic emissions within the ecological sites. Transects were modelled at 10m intervals from the boundary of each designated ecological site adjacent to 'affected roads', up to 200m into the ecological site, in accordance with IAQM and DMRB guidance.

Rail emissions

9.42. DEFRA guidance provides screening criteria for both stationary and moving diesel locomotives, which set out when a more detailed assessment of rail emissions may be required.

Study area and identification of existing receptor locations

9.43. The rail emissions were considered in accordance with DEFRA guidance. The guidance provides the following criteria to consider whether an assessment of rail emissions is required:

- where relevant sensitive exposure locations lie within 15m of stationary locomotives; or
- where relevant sensitive exposure locations lie within 30m of identified high diesel usage lines, as defined in DEFRA guidance.

Operational phase back-up CHP emissions

9.44. The HNRFI will be powered a centralised Energy Centre including a 33 kV electricity substation and associated switchgear, central battery storage in container-scale modules, and additional container-scale battery storage modules will be located at each unit substation according to occupier energy demands. Provision if made for the installation of up to 5megawatt (MW) of central Combined Heat and Power (CHP) units to augment the grid supply in the case of demand exceeding instantaneous firm and variable supplies. The CHP units will be operated as a back-up power supply and will be hydrogen ready and able to operate on 100% hydrogen as grid gas is decarbonised.

9.45. A detailed operational phase energy centre emissions assessment was undertaken using the dispersion model ADMS-5, version 5.2.2.0 to consider the impact of emissions associated with the proposed back-up CHP on local air quality. Concentrations of NOx were predicted at identified existing sensitive receptors and within the designated ecological sites identified within the study area.

Study area and identification of existing receptor locations

9.46. The study area considered in the assessment included sensitive human and ecological receptors within a 10km radius of the proposed back-up CHP. Figure 6.3.9.15 illustrates the location of the back-up CHP and the receptors considered in the associated operational phase emissions assessment.

Sensitivity of receptors

Construction phase dust emissions

9.47. Existing receptors are located within 350m of the Order Limits where construction activities will take place, as detailed in Figure 6.3.9.1. These receptors comprise a variety of sensitivities which are defined using the IAQM guidance and are presented in Table 9.3:

Table 9.3: Construction phase dust receptor sensitivity

Receptor Sensitivity	Rationale	Example Uses
High	Surrounding land where users can reasonably expect to enjoy a high level of amenity or the appearance, aesthetics or value of their property would be diminished by soiling. The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods of time.	Highly sensitive receptors within 350m of the Order Limits include residential dwellings and medium-term car parks.
Medium	Users would expect to enjoy a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home, or the appearance, aesthetics or value of their property could be diminished by soiling. The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods of time as part of their normal pattern of use.	Medium sensitive receptors within 350m of the Order Limits include Burbage Common and Woods, Aston Firs SSSI and PRoWs.
Low	The enjoyment of amenity would not be reasonably expected, or property would not be reasonably be expected to be diminished in appearance, aesthetics, or value by soiling. There is transient exposure where people or property would reasonably only be expected to be present only for limited periods of time as part of the normal pattern of use of the land.	Low sensitivity receptors within 350m of the Order Limits include roads.

9.48. The construction phase dust assessment was undertaken using the most sensitive receptor classification within the appropriate distance bands to the Order Limits. The closest human receptors are residential dwellings on Smithy Lane, Leicester Road and Station Road. These receptors are highly sensitive to both dust soiling and human health impacts in accordance with IAQM guidance. Car parking for the Burbage Common and Woods Country Park is highly sensitive to dust soiling.

9.49. Where early phases of the HNRFI are built and operational whilst later phases of construction are ongoing, the earlier occupied phases may represent sensitive receptors to construction phase dust and emissions. These were therefore considered in the construction phase dust assessment to represent a conservative assessment assuming the greatest number of sensitive receptors within the closest proximity to construction works.

9.50. The closest ecological receptors identified within 20m of the Order Limits, in accordance with the IAQM guidance, are the Burbage Common and Woods and Aston Firs SSSI. Following advice from the appointed ecological consultants, EDP, these are considered to be medium sensitivity receptors to dust soiling.

Construction phase and operational phase road traffic emissions

9.51. All human receptors identified and considered in the assessment were classified as residential, educational, or medical in nature and were therefore considered to be highly sensitive.

9.52. International, national, or local ecological designated sites are considered sensitive receptors in accordance with DMRB guidance.

Assessment scenarios and traffic data

9.53. Traffic data for use in the construction phase road traffic emissions assessment was provided by BWB Consulting Limited, the appointed transport consultants for the HNRFI.

9.54. Traffic data, for use in the construction phase and operational phase road traffic emissions assessment, was provided by BWB Consulting Limited and was obtained from the Pan Regional Transport Model 2 (PRTM2.2) which was provided by AECOM. 24-hour AADT and HDV flows, and average speeds were provided for the roads shown in Figure 6.3.9.2 and Figure 6.3.9.5.

9.55. The following scenarios were considered in the air dispersion modelling:

- Scenario 1: Base and Model Verification Year (2019);
- Scenario 2: Peak Construction Year (2026) Without Peak Construction Traffic;
- Scenario 3: Peak Construction Year (2026) With Peak Construction Traffic;
- Scenario 4: Opening Year (2026) Without HNRFI;
- Scenario 5: Opening Year (2026) With HNRFI;
- Scenario 6: Future Year (2036) Without HNRFI; and
- Scenario 7: Future Year (2036) With HNRFI.

9.56. The Proposed Development includes the creation of new slip roads at junction 2 of the M69, alongside a new link road through the Main HNRFI Site, from junction 2 of the M69 to the B4668 Leicester Road, referred to as the A47 Link Road. The operational phase assessment therefore considers the new road geometry for the With HNRFI scenarios. Other proposed off-site highway works are minor, do not result in changes in traffic movements and were therefore not explicitly included in the traffic data utilised in the air dispersion modelling.

9.57. The peak year of construction was advised to be 2026 based on the phasing plan for the HNRFI. This is the same year as the Opening Year utilised in the operational phase road traffic emissions assessment as this is the earliest year in which certain elements of the Main HNRFI Site may become operational. Whilst this is the earliest year that operations may commence on the Main HNRFI Site, it is considered to represent a conservative scenario assuming the entire HNRFI is operational in the earliest possible year where road traffic emissions and background concentrations are higher than later years. The operational phase Opening Year therefore represents a robust and conservative scenario.

9.58. During the Peak Construction Year, the new A47 Link Road and southern slip roads at junction 2 of the M69 motorway will not be in operation and therefore the construction phase road traffic emissions assessment utilises the existing road geometry in the study area.

9.59. Committed developments were included in the traffic data provided for the Opening Year and Future Year scenarios, to enable consideration of cumulative effects associated with simultaneous operation of the HNRFI and identified committed developments in the study area. Details of committed developments considered in the assessment are set out in Chapter 8: *Transport and Traffic (document reference 6.1.8)*.

9.60. Several roads within the study area are elevated, including railway bridges and motorways, and therefore these sections were elevated in the dispersion model to replicate road geometry. As precise road elevations were not available, elevated road sections were modelled at a height of 5m, which is the minimum height for unmarked road bridges in accordance with Driver & Vehicle Standards Agency (DVSA) guidance. The use of 5m as an elevated road height represents a conservative assessment as it locates the emission source at the closest possible height to the receptors modelled in the assessment.

Assessment inputs and calculations

9.61. The following inputs were utilised in the assessment:

- Emission Factors - emission factors were utilised from the DEFRA Emission Factor Toolkit, version 11.0, for the years of assessment (2019, 2026 and 2036). 2030 emissions factors were used for the 2036 scenarios, as this is the latest year for which emission factors were derived by DEFRA at the time of assessment. 2030 emission factors are anticipated to be higher than the emission factors expected post 2030 due to further fleet composition improvements, such as greater uptake of low emission vehicles. The use of 2030 emission factors in the 2036 Future Year assessment scenarios therefore represents a conservative assessment through the use of higher emission factors than real world emissions likely to be present in 2036 when the HNRFI will be fully operational.

- Conversion of oxides of nitrogen – concentrations of NOx were predicted using the ADMS-Roads dispersion model. These concentrations were converted to NO_2 using the DEFRA NOx to NO_2 calculator, version 8.1.

- Meteorological Data – hourly sequential meteorological data for the base and verification year of assessment (2019) were obtained from the East Midlands Airport recording station as agreed with BDC and HBBC during consultation. This is the closest, most representative recording station to the HNRFI. The wind rose for 2019 is provided in Appendix 6.2.9.6.

- Surface roughness – a surface roughness of 0.75m was utilised in the dispersion model. This is representative of the wider study area, which includes a variety of environments including urban areas such as Hinckley, Narborough and Atherstone, woodland, rural environments, and open fields.

- Monin-Obukhov length (MO) – a MO of 30m was utilised in the dispersion model. This is representative of the Main HNRFI Site location and surrounding area which is a mix of urban areas, woodland, and open fields.

- DEFRA background maps – background concentrations of NOx, NO_2, PM_{10} and $PM_{2.5}$ were obtained for use in the assessments. All were obtained from the pollutant concentration maps provided by DEFRA. The DEFRA pollutant concentration maps are provided as 1-kilometre (km) x 1km grids squares of the UK and were obtained for the years of assessment (2019, 2026 and 2036). 2030 data was used for the 2036 scenarios as this is the latest year for which background mapped concentrations were derived by DEFRA at the time of assessment. 2030 background concentrations are anticipated to be higher than those expected post 2036 as they do not account for improvements in background concentrations that may be associated with the uptake of low emission heating and energy technology and transportation options. The Future Year assessment is therefore considered to represent a conservative assessment due to the use of higher background concentrations than are likely to be present in 2036. The background concentrations used within the assessment are detailed in Appendix 6.2.9.7.

- Air Pollution Information System (APIS) - APIS provides critical loads for ecological habitats and was utilised to obtain nitrogen deposition values relevant for the ecological sites within the study area. Nitrogen deposition values for ecological habitats not included within APIS were obtained from the appointed ecological consultants for ecological sites within the study area. The critical loads utilised in the assessment were discussed and agreed with the Project Ecologists, EDP.

- Model verification - model verification was undertaken using 2019 local authority monitoring data for the study area. Full details of the verification procedure are provided in Appendix 6.2.9.8. 2020 and 2021 monitoring data was available at the time of assessment; however due to the influence of COVID-19 pandemic lockdown restrictions on traffic levels in 2020, monitoring undertaken in 2020 or 2021 would not be considered representative of *'typical'* conditions. Model verification was therefore undertaken utilising 2019 monitoring data as the last year of *'typical'* monitoring data, in accordance with the IAQM position statement.

- Calculation of short term PM_{10} concentrations - the following calculation, as detailed in

DEFRA guidance was utilised to calculate the number of exceedances of the 24-hour mean PM_{10} air quality objective.

*Number of 24-hour Mean Exceedances = -18.5 + 0.00145*Annual Mean^3 + (206/Annual Mean)*

- Nitrogen deposition conversion - NOx concentrations predicted within each of the ecological sites were converted to deposition values using the relevant deposition conversions as provided in DMRB guidance.

Operational phase back-up CHP emissions

9.62. All human receptors identified and considered in the assessment were classified as residential, educational, or medical in nature and were therefore considered to be highly sensitive.

9.63. International, national, or local ecological designated sites are considered sensitive receptors in accordance with DMRB guidance.

Assessment scenarios and model inputs

9.64. The HNRFI will include a new back-up 5MW CHP unit with an effective combined stack. Emissions data was provided for the proposed unit and model input information utilised in the assessment is detailed in Table 9.4. The CHP unit is proposed for back-up purposes only, should the PV array fail or a shortage in Grid supply is identified. The back-up CHP will not operate for more than 10% of the year. The assessment considered the contribution of emissions from the back-up CHP on sensitive receptors within 10km of the stack, assuming operation for up to 10% of a calendar year. In addition, a sensitivity test was undertaken to consider the greatest percentage of the year that the back-up CHP could operate without any potentially significant impacts on local air quality arising. This is detailed in paragraph 9.174.

9.65. Process Contributions (PCs) were calculated at each receptor location and a total Predicted Environmental Concentration (PEC) was calculated in combination with the predicted operational phase road traffic contributions for both the Opening Year and Future Year of the Proposed Development, at receptor locations within a 10km radius of the stack.

Table 9.4: Modelled back-up CHP flue emissions

Parameter	Combined Effective Stack
Stack location (X, Y)	445688.8, 294538.5
Stack diameter (m)	0.87

Parameter	Combined Effective Stack
Stack height (m) from ground	12
Temperature (°C)	120
Efflux velocity (m/s)	15
Volumetric flow rate (m^3/s)	6.25
NOx Emission Rate (g/s)	1.5625

9.66. The model inputs detailed in paragraph 9.61 were also utilised in the ADMS 5 dispersion model, in addition to the below:

- Buildings – The buildings within the Main HNRFI Site were included within the ADMS 5 model to account for building effects that may influence dispersion of emissions from the stack. Details of the building parameters included in the model are provided in Appendix 6.2.9.9.

- NOx to NO_2 conversion – 100% of modelled NOx emissions associated with the proposed back-up CHP unit were converted to NO_2 to provide a conservative assessment of the impact of the back-up CHP unit on local air quality.

Assessment criteria, characterisation of impact and significance criteria

Assessment criteria - construction phase dust assessment

9.67. The construction dust assessment was undertaken in accordance with IAQM guidance. The assessment criteria used to undertake the assessment steps is detailed in paragraph 9.9 and provided in Appendix 6.2.9.3.

Assessment criteria - construction and operational phase road traffic emissions assessment and back-up CHP emissions assessment

9.68. Predicted pollutant concentrations at existing human receptor locations were compared to the relevant air quality objectives. The current relevant air quality standards and objectives are detailed in Table 9.5.

Table 9.5: Air quality standards and objectives (England)

Pollutant	Averaging Period	Air Quality Objective ($\mu g.m^{-3}$)	Date to be Achieved by
NO_2	Annual Mean	40	31 December 2005
	1-hour mean not to be exceeded more than 18 times per year	200	31 December 2005
PM_{10}	Annual Mean	40	31 December 2004
	24-hour mean not to be exceeded more than 35 times per year	50	31 December 2004
$PM_{2.5}$	Annual mean target (15% cut in annual mean urban background exposure)	20	1st January 2020

Critical levels

9.69. The current relevant annual mean Critical Level for NOx for the protection of vegetation and ecosystems, as transposed into UK law by the Air Quality Standards and Regulations 2010, as amended, is detailed in Table 9.6.

Table 9.6: Annual mean critical level for the protection of vegetation and ecosystems

Pollutant	Averaging Period	Critical Level ($\mu g.m^{-3}$)
NO_x	Annual Mean	30

Critical loads

9.70. The level of nitrogen deposition calculated across the transect points within the designated ecological sites were compared to the lower critical load value to determine whether changes in nitrogen deposition were greater than 1% of the critical load. Utilising the lower critical load value provides a conservative assessment. The critical loads utilised within the assessment are detailed in Table 9.7. Ecological designations in italics identifies designations that were considered in the construction phase road traffic emissions assessment in addition to the operational phase road traffic emissions assessment.

Table 9.7: Nitrogen deposition critical loads utilised in the assessment

Ecological Site	Critical Load (kg N $ha^{-1}yr^{-1}$)
Alvecote Pools SSSI	20-30
Ashlawn Cutting LNR	10-20
Aston Firs SSSI	*15-20*
Bramcote Covert AW	10-20
Burbage LNR	*10-15*
Cave's Inn Pits SSSI	20-30
Daniels Wood AW	10-20

Ecological Site	**Critical Load (kg N $ha^{-1}yr^{-1}$)**
Free Holt Wood AW	*10-20*
Grendon Wood AW	10-20
Kettle Brook LNR	10-20
Lount Meadows SSSI	20-30
Many Lands Wood AW	10-20
Martinshaw Wood AW	5-15
Martinshaw Wood South AW	10-20
Narborough Bog SSSI	10-20
Oakley Wood SSSI	15-20
Piper Wood AW	10-20
River Mease SAC/SSSI	No critical load derived
Shawell Wood AW	10-20
Sparrowdale Wood AW	10-20
Tonge Gorse AW	10-20
Wyken Slough LNR	10-15

9.71. To provide a conservative assessment, the changes in nitrogen deposition were calculated

as a percentage of the lower critical load for each site.

Significance criteria - construction phase dust assessment

9.72. Any impacts associated with the construction of the HNRFI are likely to be local, medium term and temporary in nature. The significance of any impacts was identified in accordance with IAQM guidance.

9.73. Step four of the IAQM guidance examines the residual effects states '*for almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation'.*

9.74. The assessment is used to define appropriate mitigation measures to minimise any potential effect.

Significance criteria - construction and operational phase road traffic emissions assessment and back-up CHP emissions assessment

9.75. Any impacts associated with construction phase road traffic emissions are likely to be local, medium term and temporary in nature. Impacts will be negative as a result of the increase in road traffic as a result of peak construction traffic movements. However, these will not be present on the road network permanently and are therefore considered to be temporary impacts.

9.76. Construction activities outside of the peak construction year will generate lower road traffic movements in comparison to the peak year. Therefore, the impacts predicted in the peak construction year are considered to represent a conservative assessment, assuming the greatest number of construction traffic movements and the greatest vehicle emissions. The significance of any impacts was identified in accordance with reference to the criteria provided by IAQM and EPUK guidance.

9.77. Any impacts associated with operational phase road traffic emissions are likely to be local, long term and permanent in nature. Impacts will be positive or negative depending on whether an increase or decrease in development-generated vehicle movements is experienced on the local road network. The significance of any impacts was identified in accordance with reference to the criteria provided by IAQM and EPUK guidance and DMRB LA105.

9.78. Any impact associated with operational phase back-up CHP emissions are likely to be local, short term and temporary in nature due to the use of the CHP unit as a back-up energy source only. The CHP unit is expected to be required for use for less than 10% of a calendar year and therefore will not represent a permanent constant source of emissions associated with the operation of the HNRFI.

Human receptors – IAQM and EPUK guidance

9.79. The impact of road traffic associated with the construction and operational phases was determined regarding the percentage change in pollutant concentrations relative to the

relevant Air Quality Assessment Level (AQAL). Predicted pollutant concentrations are compared to the relevant air quality objectives (as detailed in Table 9.5) and the significance of the impact determined regarding IAQM and EPUK guidance.

9.80. Guidance is provided by the IAQM and EPUK to determine the significance of the impact of development-generated road traffic emissions on local air quality. The impact descriptors at human receptor locations are detailed in 9.80 and were adjusted to the magnitude descriptors used within Environmental Impact Assessments (EIAs). These impact descriptors consider the predicted magnitude of change in pollutant concentrations and the concentration in relation to the relevant air quality objectives (as detailed in Table 9.5).

Table 9.8: IAQM impact descriptors for individual receptors

Long Term Average Concentrations at Receptor in the Assessment Year	**% Change in Concentration Relative to Air Quality Assessment Level (AQAL)**			
	1%	**2-5%**	**6-10%**	**>10%**
<75% of AQAL (<30µg.m^{-3})	Negligible	Negligible	Minor	Moderate
76-94% of AQAL (30-38µg.m^{-3})	Negligible	Minor	Moderate	Moderate
95-102% of AQAL (38-41µg.m^{-3})	Minor	Moderate	Moderate	Major
103-109% of AQAL (41-44µg.m^{-3})	Moderate	Moderate	Major	Major
>110% (>44µg.m^{-3})	Moderate	Major	Major	Major

Note: Figures rounded to the nearest whole number, therefore any values less than 1% after rounding (effectively less than 0.5%) will be described as negligible.

9.81. For each effect, it was concluded whether the effect is *'beneficial'* or *'adverse'*.

9.82. The following terms were used to define the significance of the effects identified and these can be *'beneficial'* or *'adverse'*:

- Major effect: where the HNRFI is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered *'Significant'*.
- Moderate effect: where the HNRFI is likely to cause either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance, or recoverability. This effect is considered more likely to be *'Significant'* but will be subject to professional judgement.
- Minor effect: where the HNRFI is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity; or where the Proposed Development is likely to cause a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or/and can recover from the change. This effect is *'Not Significant'* but will be subject to professional judgement.
- Negligible: where the HNRFI is unlikely to cause a noticeable change at a receptor, despite its level of sensitivity or there is a considerable change at a receptor which is not considered sensitive to a change. This effect is *'Not Significant'*.

9.83. In accordance with IAQM and EPUK guidance, *'Minor'* and *'Negligible'* level effects were considered *'Not Significant'*, whilst *'Moderate'* or *'Major'* level effects were potentially *'Significant'*. A statement is made as to whether the level of effect is *'Significant'* or *'Not Significant'*.

Human receptors – DMRB guidance – Operational phase road traffic assessment only

9.84. DMRB LA105 guidance sets out magnitudes of change in annual concentrations of NO_2, PM_{10} and $PM_{2.5}$ to categorise a significant effect for receptors where the concentration of a pollutant is within 10% of the relevant objective with the Proposed Development. The magnitude of change criteria is presented in Table 9.9.

Table 9.9: Magnitude of change criteria

Magnitude of Change in Concentration ($\mu g.m^{-3}$)	**Value of Change in Annual Average NO_2 and PM_{10}**
Large (>4)	Greater than 10% of the air quality objective.

Magnitude of Change in Concentration (µg.m^{-3})	**Value of Change in Annual Average NO_2 and PM_{10}**
Medium (>2-4)	Greater than 2µg.m^{-3} but less than 10% of the objective (4µg.m^{-3}).
Small (>0.4 to 2)	Greater than 1% of the objective (0.4µg.m^{-3}) but less than 5% of the objective (2µg.m^{-3}).
Imperceptible (≤ 0.4)	Less than equal to 1% of the objective (0.4µg.m^{-3}).

9.85. Where DMRB LA105 is applied, changes in pollutant concentrations greater than imperceptible (0.4µg.m^{-3}) at each receptor based on the Without HNRFI versus With HNRFI model results, are compared with guideline bands that inform the potential significance of the impact of the HNRFI. The guideline band ranges are presented in Table 9.10 and provide the upper level of likely non-significance and the lower level of likely significance. Between these two levels are the ranges where likely significance is more uncertain, and greater onus is afforded to professional judgement.

Table 9.10: Guideline to number of properties constituting a significant effect

Magnitude of Change (µg.m^{-3})	**Number of Receptors Demonstrating:**	
	Worsening of air quality that already exceeds objective, risk of exceeding objective or creation of new exceedance	**Improvement of air quality that already exceeds objective, risks of exceeding objective or the removal of existing exceedances**
Large (>4)	1 to 10	1 to 10
Medium (>2 to 4)	10 to 30	10 to 30
Small (0.4 to 2)	30 to 60	30 to 60

9.86. Significant air quality effects are only identified for those receptors where air quality thresholds are exceeded or at risk of being exceeded in the without and/or With HNRFI scenarios. Whilst the approach contained within DMRB LA105 focuses on receptors already exceeding an annual mean air quality objective, or within 10% of exceeding an objective, guidance for determining the impact of the operational phase of the HNRFI on each individual local air quality sensitive receptors is provided by the IAQM guidance as detailed in Table 9.8.

Ecological designations

9.87. The NOx concentrations predicted at the transect points within the ecological sites, were compared to the relevant critical level, as detailed in Table 9.6, to determine any exceedances.

9.88. The level of nitrogen deposition calculated across the transect points within the ecological sites were compared to the lower relevant critical load value detailed in Table 9.7 to determine whether changes in nitrogen deposition were greater than 1% of the critical load. The results were referred to the appointed ecological consultants, to determine any potential impacts. Further details are provided in Chapter 12: *Ecology and Biodiversity (document reference 6.1.12)*.

Limitations and assumptions

9.89. There are uncertainties associated with both measured and predicted pollutant concentrations. The models (ADMS-Roads and ADMS-5) used in this assessment rely on input data (including predicted traffic flows), which are also subject to uncertainty. The models simplify complex physical systems into a range of algorithms. In addition, local microclimatic conditions may affect the concentrations of pollutants that the ADMS-Roads and ADMS-5 models will not consider.

9.90. The road traffic emissions assessments are based on traffic data provided by AECOM for the PRTM2.2 Model. As such any assumptions made within the PTRM2.2 model are included within the air quality assessment.

9.91. The traffic data utilised in the 2026 Opening Year assessment assumed the full operation of the HNRFI; however, in reality only a small proportion of the HNRFI may operate in the Opening Year. It is therefore considered that the Opening Year assessment scenario represents a robust and conservative assessment of road traffic emissions.

9.92. In future year scenario, uncertainty relates to the projection of vehicle emissions and, in particular, the rate at which emissions per vehicle will improve over time. This assessment utilised the most recent version of DEFRA's EFT to provide the most up to date estimate of current and future emission projections.

9.93. Current projections for vehicle emission factors are only available until 2030, which precedes the 2036 future year scenarios. Therefore, vehicle emission factors adopted for this year were based on 2030 emission factors, which is conservative.

9.94. To reduce uncertainty associated with predicted concentrations, model verification was carried out following DEFRA guidance. As the models were verified using local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

9.95. The proposed back-up CHP will operate as a back-up energy source and will only be operated when issues arise with the PV array, or sufficient electricity is not available from the grid. Whilst the use of the back-up CHP cannot be forecast, due to the nature of its use as a contingency energy supply, it will not be operated for more than 10% of the year in any calendar year under normal conditions. The operational phase back-up CHP emissions assessment was undertaken to consider the impact of the operation of the back-up CHP operating for 10% of the year, and also at 30% of the year to consider an abnormal use scenario. The abnormal use scenarios therefore enabled a conservative assessment of back-up CHP emissions on local air quality as the back-up CHP will operate less frequently under the normal pattern of its use at 10% per annum.

RELEVANT LAW, POLICY, AND GUIDANCE

National Legislation and Planning Policy

9.96. The following national legislation and planning policy is relevant to air quality and was considered in the undertaking of the assessment. A summary of the relevant national legislation and planning policy is provided in Appendix 6.2.9.2:

- European Parliament, EU 2008 Ambient Air Quality Directive (2008)[1];
- HMSO, Air Quality (England) Regulations (2000)[2];
- HMSO, Environment Act (1995)[3];
- HMSO, Environment Act (2021)[4];
- Department for the Environment, Food and Rural Affairs (DEFRA), Air Quality Strategy (AQS) (2007)[5];

[1] *European Parliament (2008) Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe.*

[2] *HMSO (2000) Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations 2000 (as amended), London: HMSO.*

[3] *HMSO (1995) The Environment Act 1995, London: TSO.*

[4] *HMSO (2021) The Environment Act 2021, London: TSO.*

[5] *Department of the Environment, Food and Rural Affairs (DEFRA) (2007) The Air Quality Strategy for*

- DEFRA, The Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020)[6];
- Ministry of Housing, Communities and Local Government (MHCLG), National Planning Policy Framework (NPPF) (2021)[7];
- National Policy Statement (NPS) for National Networks (2014)[8];
- National Planning Policy Framework[9];
- Planning Practice Guidance[10].

Local Planning Policy

Local Plan Policy

9.97. The following local planning policy was considered in the undertaking of the assessment and a summary is provided in Appendix 6.2.9.2:

- Blaby District Local Plan Adopted Core Strategy[11];
- Hinckley and Bosworth Local Development Framework (LDF) Core Strategy[12];
- Rugby Local Plan[13]; and
- Harborough Local Plan[14].

Air Quality Guidance

England, Scotland, Wales and Northern Ireland, London: HMSO.

[6] *Department of the Environment, Food and Rural Affairs (Defra) (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations, London: HMSO*

[7] *Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, HMSO London.*

[8] *Department for Transport (DfT) (2014) National Planning Policy Statement for National Networks, HMSO London.*

[9] *Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework, HMSO London.*

[10] *Department for Communities and Local Government (2019) Planning Practice Guidance Air Quality.*

[11] *Blaby District Council (2013) Adopted Core Strategy.*

[12] *Hinckley and Bosworth Borough Council (2016) Local Development Core Strategy.*

[13] *Rugby Borough Council (2019) Rugby Borough Council Local Plan 2011-2031.*

[14] *Harborough District Council (2019) Harborough Local Plan 2011-2031.*

9.98. The following guidance was used in the AQA:

- DEFRA, Local Air Quality Management Technical Guidance (LAQM TG(22)) (2022)[15];
- Highways England (HE), Design Manual for Roads and Bridges (DMRB) LA105 Air Quality guidance (2019)[16];
- Institute of Air Quality Management, Guidance on the assessment of dust from demolition and construction (2014)[17];
- Institute of Air Quality Management and Environmental Protection UK, Land-Use Planning and Development Control: Planning for Air Quality (2017)[18]; and
- Institute of Air Quality Management, A Guide to the Assessment of Air quality Impacts on Designated Nature Conservation Sites (2020)[19].

BASELINE CONDITIONS

9.99. This section summarises the characteristics of the existing air quality conditions within the study area. The Main Order Limits are located within four different local authority areas and details of baseline air quality conditions in these areas are provided. Diffusion tube monitoring data for each local authority for within the study area can be found in Appendix 6.2.9.10.

9.100. Principal air pollution sources in the vicinity of the Order Limits are likely to comprise road traffic emissions with the M69 motorway, M6 motorway, M1 motorway and the A5 all within the study area.

Air quality review and assessment

9.101. The Order Limits are located within the administrative areas of BDC, HBBC, HDC and RBC and this section provides a summary of baseline air quality conditions within these areas. The Order Limits are not located within, or in the vicinity of, any existing Air Quality Management Areas (AQMAs).

[15] *DEFRA (2021) Local Air Quality Management Technical Guidance (LAQM TG(22)).*

[16] *Highways England, (2019), Design Manual for Roads and Bridges LA 105 Air Quality.*

[17] *Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction.*

[18] *Institute of Air Quality Management and Environmental Protection UK (2017) Land-Use Planning and Development Control: Planning for Air Quality.*

[19] *Institute of Air Quality Management, (2019), A guide to the assessment of air quality impacts on designated nature conservation sites.*

Blaby District Council

9.102. BDC declared five AQMAs for the potential exceedance of the annual mean NO_2 objective. AQMA 2 is located along the M1 corridor between Enderby and Narborough and AQMA 3 covers the M1 corridor between Thorpe Astley and Kirby Muxloe and extends along the A47 Hinckley Road. Existing sensitive receptors were selected within these AQMAs as part of the operational phase road traffic emissions assessment.

9.103. Monitored annual mean NO_2 concentrations indicate a downward trend in concentrations within the AQMAs and across the borough. 2019 monitoring results recorded no exceedances of the annual mean NO_2 objective of 40µg.m^{-3}.

9.104. No exceedances of the annual mean PM_{10} objective of 40µg.m^{-3} or the annual mean $PM_{2.5}$ objectives of 20µg.m^{-3} were recorded over the most recent five years of monitoring data available for review.

Hinckley and Bosworth Borough Council

9.105. No AQMAs were declared by HBBC at the time of assessment. Diffusion tube data indicated there were no exceedances of the annual mean NO_2 objective of 40µg.m^{-3} in 2019. Between 2015 and 2018 there was one exceedance recorded at monitoring location 14 which is not located within the study area. Overall, annual mean NO_2 concentrations indicate a downward trend over the past five years. No PM_{10} or $PM_{2.5}$ monitoring is undertaken by HBBC within the borough.

Harborough District Council

9.106. HDC declared two AQMAs for the potential exceedance of the annual mean NO_2 objective, however neither of these are located in the vicinity of the study area. 2019 air quality monitoring indicated exceedances of the annual mean NO_2 objectives at a number of monitoring locations, although these locations are not situated in the vicinity of the study area. Annual mean NO_2 concentrations within the borough fluctuated between 2015 and 2019 with no clear trend evident.

9.107. HDC does not undertake any monitoring of PM_{10} or $PM_{2.5}$ within its borough.

Rugby Borough Council

9.108. RBC declared an AQMA for the potential exceedance of the annual mean NO_2 objective. Exceedances of the annual mean NO_2 objective were recorded at locations S54a and 54b. S54b is located within the Rugby AQMA and S54a is located outside of the AQMA in Shilton. These monitoring locations are not within the study area. Overall, annual mean NO_2 concentrations recorded between 2015 and 2019 indicate a downward trend.

9.109. RBC does not undertake any monitoring of PM_{10} or $PM_{2.5}$ within its borough.

Background concentrations

9.110. No background monitoring is undertaken within, or in the vicinity of, the study area.

Therefore, background concentrations were obtained from the latest DEFRA background concentrations maps, which are provided for the UK as a 1km by 1km grid network. The latest maps are based on 2018 monitoring and meteorological data. Predicted background concentrations of NO_2, NOx, PM_{10} and $PM_{2.5}$ were obtained for the grid squares covering the study area for the human and ecological receptors for the years of assessment 2019, 2026 and 2030 (for the 2036 scenario).

9.111. The range of background concentrations for each pollutant and each assessment year are detailed in Table 9.11. Full details of background concentrations used for each grid square are detailed in Appendix 6.2.9.7.

9.112. Exceedances of the annual mean air quality objectives are shown in bold.

Table 9.11: DEFRA background concentration ranges

Pollutant	Background Concentrations (µg.m^{-3})			
	2019	**2026**	**2030**	**Air Quality Objective**
NO_2	10.8-24.0	8.4-17.7	7.8-15.9	40
PM_{10}	14.0-17.1	13.0-16.1	13.0-16.1	40
$PM_{2.5}$	8.9-10.9	8.1-10.0	8.0-9.9	20
NOx*	14.2-**35.7**	10.9-25.1	10.1-22.2	30

**NOx – relevant to the protection of vegetation and ecosystems.*

9.113. The background concentrations are below the annual mean air quality objectives for NO_2, PM_{10} and $PM_{2.5}$ in all scenarios. The annual mean NOx objective set for the protection of vegetation and ecosystems was predicted to be exceeded in the Base Year 2019.

Baseline local air quality operational phase road traffic emissions assessment

9.114. Pollutant concentrations were predicted at the identified existing sensitive human receptor locations using the dispersion model ADMS-Roads. The range of predicted concentrations for Scenario 1, Scenario 4 and Scenario 6 are detailed in Tables 9.12 – 9.14.

Full details of pollutant concentrations at sensitive human receptor locations are provided in Appendix 6.2.9.11. Exceedances of the annual mean air quality objectives are shown in bold.

Table 9.12: NO_2 baseline pollutant concentrations in Scenario 1: 2019 Base year, Scenario 4: 2026. Opening Year Without HNRFI and Scenario 6: 2036 Future Year Without HNRFI

Local Authority	Scenario 1 2019 Base Year ($\mu g.m^{-3}$)	Scenario 4 2026 Opening Year Without HNRFI ($\mu g.m^{-3}$)	Scenario 6 2036 Future Year Without HNRFI ($\mu g.m^{-3}$)
BDC	11.1-36.5	8.5-23.4	7.7-19.3
HBBC	10.7-29.5	8.6-18.1	7.8-15.1
CBC	20.1-29.8	13.6-18.2	11.6-14.6
EBC	23.3-27.3	15.9-17.8	13.7-15.0
HDC	11.8-28.9	8.7-17.2	7.8-13.7
NWBC	13.6-18.7	10.2-12.9	9.3-11.1
NWLDC	15.3-36.1	10.5-22.4	9.1-18.2
CCC	24.1-36.0	16.2-26.1	13.9-21.0
RBC	16.2-**40.7**	10.5-25.0	9.0-19.6
TBC	17.7-34.9	12.7-22.1	11.3-17.9
NBBC	21.8-34.8	14.6-23.3	12.2-19.8
WNC	21.0-26.8	13.0-15.9	10.7-12.7

Table 9.13: PM_{10} baseline pollutant concentrations in Scenario 1: 2019 Base year, Scenario 4: 2026.

Opening Year Without HNRFI and Scenario 6: 2036 Future Year Without HNRFI

Local Authority	Scenario 1 2019 Base Year (µg.m^{-3})	Scenario 4 2026 Opening Year Without HNRFI (µg.m^{-3})	Scenario 6 2036 Future Year Without HNRFI (µg.m^{-3})
BDC	13.6-18.3	12.6-17.1	12.5-17.1
HBBC	13.7-18.8	12.7-17.0	12.7-17.1
CBC	16.8-18.2	15.7-17.1	15.7-17.1
EBC	15.7-16.2	14.7-15.1	14.6-15.1
HDC	13.9-18.4	12.9-17.1	12.9-17.7
NWBC	13.0-15.8	12.0-14.8	12.0-14.7
NWLDC	14.6-19.0	13.6-17.8	13.6-17.8
CCC	16.9-19.3	15.8-18.3	15.8-18.5
RBC	14.9-20.0	13.9-18.6	13.9-18.9
TBC	15.2-18.2	14.2-17.1	14.2-17.1
NBBC	15.9-18.4	14.8-17.3	14.8-17.4
WNC	165.-16.8	15.4-15.6	15.3-15.6

Table 9.14: $PM_{2.5}$ Baseline pollutant concentrations in Scenario 1: 2019 Base year, Scenario 4: 2026.

Opening Year Without HNRFI and Scenario 6: 2036 Future Year Without HNRFI

Local Authority	Scenario 1 2019 Base Year (µg.m^{-3})	Scenario 4 2026 Opening Year Without HNRFI (µg.m^{-3})	Scenario 6 2036 Future Year Without HNRFI (µg.m^{-3})
BDC	8.8-11.5	8.0-10.5	7.9-10.8
HBBC	8.6-11.5	7.9-10.3	7.9-10.4
CBC	10.4-10.9	9.5-10.0	9.5-9.9
EBC	10.0-10.4	9.2-9.5	9.2-9.5
HDC	8.8-11.1	8.0-10.1	8.0-10.3
NWBC	8.5-10.1	7.7-9.3	7.7-9.3
NWLDC	9.2-11.1	8.4-10.1	8.3-10.1
CCC	11.0-12.1	10.1-11.7	10.1-11.8
RBC	9.4-11.8	8.6-10.6	8.5-10.7
TBC	9.9-11.7	9.1-10.7	9.1-10.7
NBBC	10.1-11.9	9.2-10.9	9.2-11.0
WNC	10.3-10.6	9.3-9.5	9.3-9.5

9.115. No exceedances of the annual mean NO_2, PM_{10} or $PM_{2.5}$ objectives are predicted in the Base Year, Opening Year or Future Year baseline scenarios at any of the human receptor locations considered in the assessment. The exception to this is two receptor locations within the RBC administrative area, which exceed the annual mean NO_2 objective in

Scenario 1. These receptors are located adjacent to the M69, which carries a significant level of road traffic. The receptors are also located within the RBC AQMA and therefore exceedances of the annual mean NO_2 air quality objective are anticipated.

9.116. Predicted concentrations at short term human receptors were compared to the short-term air quality objectives for NO_2 and PM_{10}. The predicted annual mean NO_2 concentrations detailed in Table 9.21 are less than 60µg.m^{-3} and therefore in accordance with DEFRA guidance it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in paragraph 9.57 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

POTENTIAL SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSALS

Construction phase dust assessment

9.117. The construction phase will involve a number of activities which have the potential to impact on local air quality. These include emissions of dust generated through demolition, excavation, construction and trackout activities, exhaust pollutant emissions from construction traffic on the local highway network, and exhaust emissions from non-road mobile machinery (NRMM) within the construction site itself.

9.118. The location of sensitive receptors in relation to construction activities will affect the potential for such construction activities to cause dust soiling, nuisance, and local air quality impacts. Meteorological conditions and the use of control measures will also contribute to the effects experienced.

9.119. Steps 1 to 4 of the IAQM guidance were followed in undertaking the construction phase dust assessment. Full details of the assessment undertaken are provided in Appendix 6.2.9.3 with a summary of the findings of Steps 2a, 2b and 2c of the assessment provided below.

9.120. To enable a conservative assessment, the construction phase dust assessment was undertaken utilising the boundaries of the Order Limits where construction activities were proposed. Where off-site improvement works do not involve construction activities, e.g. replacement of signage, these works were not considered in the construction phase dust assessment. The areas considered in the assessment are detailed in Figure 6.3.9.1

Step 2: Assess the risk of dust impacts

Step 2A: Define the potential dust emission magnitude

9.121. The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance and detailed in Appendix 6.2.9.3. The dust emission magnitudes for the construction phase are summarised in Table 9.15.

Table 9.15: Dust emissions magnitudes definition

Activity	Project Defined Dust Emission Magnitude	Justification
Demolition	Large	Total volume of buildings to be demolished may exceed 50,000m^3 with potentially dusty materials being demolished.
Earthworks	Large	Total site area is significantly greater than 10,000m^2 with extensive earthworks proposed to alter levels within the Main HNFRI Site.
Construction	Large	Total building volume significantly greater than 100,000m^3.
Trackout	Large	>50 HDV movements in any one day over the duration of the development

Step 2B: Define the sensitivity of the area

9.122. The sensitivity of the study area considers specific receptors in the vicinity of the Order Limits where construction activities will occur, the proximity and number of those receptors, the local background concentration of PM_{10} and Site-specific factors. The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling, human health, and ecological impacts and these are presented in Table 9.16:

Table 9.16: Determination of the sensitivity of the study area

Activity	Project Defined Dust Emission Magnitude	Justification			
		Demolition	Earthworks	Construction	Trackout
Dust Soiling	There are more than 100 highly sensitive receptors within 20m of the Order Limits. The sensitive receptors identified are existing residential dwellings, car parks and footpaths within 20m of the boundaries of the Order Limits, where dust soiling may affect the amenity of the users there for extended periods. Residential dwellings and long-term car parks are considered highly sensitive in accordance with guidance. Footpaths are considered to be low sensitivity receptors. The highest sensitivity was considered in the assessment.	High	High	High	High
Human Health	There are more than 100 highly sensitive receptors within 20m of the Order Limits. The highly sensitive receptors are residential dwellings. The background PM_{10} concentrations across the study area, as detailed within Table 9.9, are less than 24µg.m^{-3}. Whilst the IAQM guidance determined the risk of human health effects as 'Medium', due to the proximity of sensitive receptors to the HNRFI, the sensitivity was uplifted to 'High'.	High	High	High	High

Activity	Project Defined Dust Emission Magnitude	Justification			
		Demolition	Earthworks	Construction	Trackout
Ecological Receptors	The Burbage Common and Woods and Aston Firs SSSI are located within 20m of the Order Limits. The appointed ecological consultants advised these habitats are of medium sensitivity to dust. Due to the close proximity of these habitats to the HNRFI, and to provide a conservative assessment, the sensitivity of the habitats to dust was uplifted to high.	High	High	High	High

Step 2C: Define the risk of impacts

9.123. The dust emission magnitude in Step 2A is then combined with the sensitivity of the area determined in Step 2B to define the risk of dust impacts with no mitigation applied. The results of this assessment are detailed in Table 9.17:.

Table 9.17: Summary of dust risk table to define site specific risk

Activity	**Step 2A: Dust Emission Magnitude**	**Step 2B: Sensitivity of the Area**	**Step 2C: Risk of Dust Impacts**
Dust Soiling Effects on People and Property			
Demolition	Large	High	High Risk
Earthworks	Large	High	High Risk
Construction	Large	High	High Risk
Trackout	Large	High	High Risk
Human Health Impacts			
Demolition	Large	High	High Risk
Earthworks	Large	High	High Risk
Construction	Large	High	High Risk
Trackout	Large	High	High Risk
Ecological Receptors			
Demolition	Large	High	High Risk

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Earthworks	Large	High	High Risk
Construction	Large	High	High Risk
Trackout	Large	High	High Risk

9.124. Mitigation measures proportionate to the level of risk identified for dust soiling, human health effects and ecological impacts are detailed in Table 9.38.

Construction phase road traffic emissions assessment

Human receptors

9.125. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified existing sensitive human receptor locations across the study area for Scenario 2 and Scenario 3 to consider the impact of construction vehicles on local air quality during the peak construction period of the HNRFI.

9.126. The predicted concentrations at the construction phase road traffic emissions assessment human receptors, as illustrated in Figure 6.3.9.3 and Appendix 6.2.9.4, are detailed in Table 9.18 – 9.20 for NO_2, PM_{10} and $PM_{2.5}$ respectively.

Table 9.18: Predicted annual mean NO_2 concentrations and construction traffic impact at existing human receptor locations in Scenario 2: 2026 Without Construction traffic, and Scenario 3: 2026 With Peak Construction traffic

Receptor	Scenario 2: 2026 Without Construction Traffic (NO_2 µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (NO_2 µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR1	10.8	10.8	0.0	0	Negligible

Receptor	Scenario 2: 2026 Without Construction Traffic (NO_2 µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (NO_2 µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR2	10.8	10.8	0.0	0	Negligible
CR3	9.4	9.4	0.0	0	Negligible
CR4	9.4	9.4	0.0	0	Negligible
CR5	9.4	9.4	0.0	0	Negligible
CR6	10.0	10.1	0.0	0	Negligible
CR7	9.6	9.7	0.0	0	Negligible
CR8	8.8	8.8	0.0	0	Negligible
CR9	10.9	10.9	0.0	0	Negligible
CR10	9.0	9.0	0.0	0	Negligible
CR11	8.7	8.8	0.0	0	Negligible
CR12	11.8	11.8	0.0	0	Negligible
CR13	9.8	9.8	0.0	0	Negligible
CR14	9.4	9.4	0.0	0	Negligible
CR15	11.7	11.7	0.0	0	Negligible

Receptor	Scenario 2: 2026 Without Construction Traffic (NO_2 µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (NO_2 µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR16	11.3	11.3	0.0	0	Negligible
CR17	11.3	11.3	0.0	0	Negligible

**Discrepancies in changes due to rounding effects.*

Table 9.19: Predicted annual mean PM_{10} concentrations and construction traffic impact at existing human receptor locations in Scenario 2: 2026 Without Construction traffic, and Scenario 3: 2026 With Peak Construction traffic

Receptor	Scenario 2: 2026 Without Construction Traffic (PM_{10} µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (PM_{10} µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR1	14.8	14.8	0.0	0	Negligible
CR2	14.8	14.8	0.0	0	Negligible
CR3	13.1	13.1	0.0	0	Negligible
CR4	13.1	13.1	0.0	0	Negligible
CR5	13.1	13.1	0.0	0	Negligible
CR6	13.4	13.4	0.0	0	Negligible

Receptor	Scenario 2: 2026 Without Construction Traffic (PM_{10} µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (PM_{10} µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR7	13.2	13.2	0.0	0	Negligible
CR8	13.4	13.4	0.0	0	Negligible
CR9	14.9	14.9	0.0	0	Negligible
CR10	13.5	13.6	0.0	0	Negligible
CR11	12.6	12.6	0.0	0	Negligible
CR12	15.3	15.3	0.0	0	Negligible
CR13	13.7	13.7	0.0	0	Negligible
CR14	12.8	12.8	0.0	0	Negligible
CR15	14.6	14.6	0.0	0	Negligible
CR16	14.4	14.4	0.0	0	Negligible
CR17	14.4	14.4	0.0	0	Negligible

**Discrepancies in changes due to rounding effects.*

Table 9.20: Predicted annual mean $PM_{2.5}$ concentrations and construction traffic impact at existing human receptor locations in Scenario 2: 2026 Without Construction traffic, and Scenario 3: 2026 With Peak Construction traffic

Receptor	Scenario 2: 2026 Without Construction Traffic ($PM_{2.5}$ $\mu g.m^{-3}$)	Scenario 3: 2026 With Peak Construction Traffic ($PM_{2.5}$ $\mu g.m^{-3}$)	Change* ($\mu g.m^{-3}$)	% Change relative to AQAL	Effect
CR1	8.9	8.9	0.0	0	Negligible
CR2	8.9	8.9	0.0	0	Negligible
CR3	8.2	8.2	0.0	0	Negligible
CR4	8.2	8.2	0.0	0	Negligible
CR5	8.2	8.2	0.0	0	Negligible
CR6	8.3	8.3	0.0	0	Negligible
CR7	8.2	8.2	0.0	0	Negligible
CR8	8.1	8.1	0.0	0	Negligible
CR9	8.9	8.9	0.0	0	Negligible
CR10	8.3	8.3	0.0	0	Negligible
CR11	8.1	8.1	0.0	0	Negligible
CR12	9.1	9.1	0.0	0	Negligible
CR13	8.3	8.3	0.0	0	Negligible
CR14	8.0	8.0	0.0	0	Negligible

Receptor	Scenario 2: 2026 Without Construction Traffic ($PM_{2.5}$ µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic ($PM_{2.5}$ µg.m^{-3})	Change* (µg.m^{-3})	% Change relative to AQAL	Effect
CR15	8.9	8.9	0.0	0	Negligible
CR16	8.8	8.8	0.0	0	Negligible
CR17	8.8	8.8	0.0	0	Negligible

**Discrepancies in changes due to rounding effects.*

9.127. The predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ in Scenarios 2 and Scenario 3 are below the current relevant annual mean air quality objectives at all receptors considered in the construction phase road traffic emissions assessment. The peak construction traffic associated with the construction of the HNRFI is not predicted to lead to any exceedances of the current relevant air quality objectives.

9.128. Predicted changes in concentrations at all receptors in both Scenario 2 and Scenario 3 are less than 0.5% of the relevant air quality objective and the total pollutant concentrations are less than 75% of the relevant air quality objective. The effect of peak construction traffic associated with the construction of the HNRFI is therefore considered to be 'negligible' in accordance with IAQM and EPUK guidance which is 'not significant'.

9.129. With regard to short term air quality objectives, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with DEFRA guidance it may be considered that exceedances of the 1-hour mean objective are unlikely.

9.130. Regarding short term air quality objectives for PM_{10} at the existing receptor locations, the calculation detailed in paragraph 9.57 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Ecological receptors – Critical level

9.131. Concentrations of NOx were predicted along transects through each of the designated sites located in the study area considered in the construction phase road traffic emission assessment. Predicted concentrations were compared to the Critical level of 30µg.m^{-3} for the protection of vegetation and ecosystems. The range of concentrations predicted are

detailed in Table 9.21 for Scenario 2 and Scenario 3. Further details of the results are available in Appendix 6.2.9.12.

Table 9.21: Predicted NOx concentration ranges at the designated ecological sites within the study area in Scenario 2: 2026 Without Construction traffic and Scenario 3: 2026 With Peak Construction traffic

Habitat	Scenario 2: 2026 Without Construction Traffic (NOx µg.m^{-3})	Scenario 3: 2026 With Peak Construction Traffic (NOx µg.m^{-3})	Change (µg.m^{-3})
Burbage LNR	11.0-11.5	11.1-11.6	0.0-+0.2
Freeholt Wood AW	14.0-14.0	14.1-14.1	0.0-+0.1
Aston Firs SSSI	12.1-14.2	12.1-14.2	0.0-+0.1

9.132. Concentrations of NOx at the ecological transects considered in the construction phase road traffic emissions assessment were predicted to be below the critical level of 30µg.m^{-3} in all scenarios considered.

Ecological receptors - Critical load

9.137. Transects were modelled at 10m intervals, up to 200m into each of the designated sites, to consider the impact of nitrogen deposition (N) on each of the ecological sites considered in the construction phase road traffic emissions assessment. The percentage change in deposition was compared to the lower critical load for each habitat. The range of concentrations predicted at each site are detailed in Tables 9.22. The full results are presented in Appendix 6.2.9.12.

Table 9.22: Predicted nitrogen deposition ranges at the designated ecological sites within the study area in Scenario 2: 2026 Without Construction traffic and Scenario 3: 2026 With Peak Construction traffic

Habitat	Lowest Critical Load ($kg\ N\ ha^{-1}yr^{-1}$)	2026 Without Construction Traffic N Deposition ($kg\ N\ ha^{-1}yr^{-1}$)	2026 With Peak Construction Traffic N Deposition ($kg\ N\ ha^{-1}yr^{-1}$)	Change in Nitrogen Deposition ($kg\ N\ ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load ($kg\ N\ ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.8-25.9	25.8-25.9	0.0	+0.1-+0.3
Freeholt Wood AW	10	49.4-49.4	49.4-49.4	0.0	0.0-+0.1
Aston Firs SSSI	15	48.4-48.7	48.4-48.78	0.0	0.0-+0.1

9.133. All modelled transect points were predicted to experience a change in nitrogen deposition of less than 1% of the lower critical load as detailed in Table 9.22. In accordance with DMRB guidance, the impact of the peak construction phase road traffic on local ecological designations is therefore *'not significant'*.

Operational phase road traffic emissions assessment

Human receptors

9.134. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified existing receptor locations across the study area, for Scenario 4 to Scenario 7, to consider the impact of development-generated vehicle emissions on local air quality.

2026 Opening year and 2036 Future year

9.135. The ranges of predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are detailed in Tables 9.23 - 9.25 for Scenario 4 to Scenario 7. The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are illustrated in Figures 6.3.9.16 – 6.3.9.18 for 2026 and Figures 6.3.9.19 – 6.3.9.21 for 2036. The operational effects reported are local, long-term, and permanent. Full details of pollutant concentrations at sensitive receptor locations are detailed in Appendix 6.2.9.11.

Table 9.23: Predicted annual mean NO_2 concentration ranges and HNRFI impact at existing human receptor locations in Scenario 4: 2026 Opening Year Without HNRFI, Scenario 5:2026 Opening Year With HNRFI, Scenario 6: 2036 Future Year Without HNRFI and Scenario 7:2036 Future Year With HNRFI

Local Authority	Scenario 4: 2026 Without HNRFI (NO_2 µg.m^{-3})	Scenario 5: 2026 With HNRFI (NO_2 µg.m^{-3})	Change (µg.m^{-3})	Effect	Scenario 6: 2036 Without HNRFI (NO_2 µg.m^{-3})	Scenario 7: 2036 With HNRFI (NO_2 µg.m^{-3})	Change (µg.m^{-3})	Effect
BDC	8.5-23.4	8.5-25.2	-0.4-+1.8	Negligible	7.7-19.3	7.7-19.3	-0.2-+0.9	Negligible
HBBC	8.6-18.1	8.6-20.2	-1.1-+2.4	Negligible – Minor Adverse	7.8-15.1	7.8-15.9	-0.7-+1.6	Negligible
CBC	13.6-18.2	13.8-18.5	+0.3	Negligible	11.6-14.6	11.7-14.7	0.0-+0.1	Negligible
EBC	15.9-17.8	15.9-17.8	0.0	Negligible	13.7-15.0	13.7-15.0	0.0	Negligible
HDC	8.7-17.2	8.7-17.3	-0.1-+1.1	Negligible	7.8-13.7	7.9-13.8	0.0-+2.0	Negligible
NWBC	10.2-12.9	10.2-12.9	0.0	Negligible	9.3-11.1	9.3-11.1	0.0	Negligible
NWLDC	10.5-22.4	10.5-22.4	0.0	Negligible	9.1-18.2	9.1-18.2	0.0	Negligible

Local Authority	**Scenario 4: 2026 Without HNRFI (NO_2 $\mu g.m^{-3}$)**	**Scenario 5: 2026 With HNRFI (NO_2 $\mu g.m^{-3}$)**	**Change ($\mu g.m^{-3}$)**	**Effect**	**Scenario 6: 2036 Without HNRFI (NO_2 $\mu g.m^{-3}$)**	**Scenario 7: 2036 With HNRFI (NO_2 $\mu g.m^{-3}$)**	**Change ($\mu g.m^{-3}$)**	**Effect**
CCC	16.2-26.1	16.3-26.3	+0.1-+0.3	Negligible	13.9-21.0	14.0-21.2	0.0-+0.2	Negligible
RBC	10.5-25.0	10.6-25.9	0.0-+2.4	Negligible – Minor Adverse	9.0-19.6	9.0-20.2	0.0-+1.8	Negligible
TBC	12.7-22.1	12.7-22.1	0.0	Negligible	11.3-17.9	11.2-17.9	-0.1-0.0	Negligible
NBBC	14.6-23.3	14.8-23.3	0.0-+1.0	Negligible	12.2-19.8	12.9-19.8	0.0-+0.7	Negligible
WNC	13.0-15.9	13.0-15.9	0.0	Negligible	10.7-12.7	10.7-12.7	0.0	Negligible
Air Quality Objective 40$\mu g.m^{-3}$								

**Discrepancies in changes due to rounding effects.*

Table 9.24: Predicted annual mean PM_{10} concentration ranges and HNRFI impact at existing human receptor locations in Scenario 4: 2026 Opening Year Without HNRFI, and Scenario 5: 2026 Opening Year With HNRFI, Scenario 6: 2036 Future Year Without HNRFI and Scenario 7: 2036 Future Year With HNRFI

Local Authority	Scenario 4: 2026 Without HNRFI (PM_{10} $\mu g.m^{-3}$)	Scenario 5: 2026 With HNRFI (PM_{10} $\mu g.m^{-3}$)	Change ($\mu g.m^{-3}$)	Effect	Scenario 6: 2036 Without HNRFI (PM_{10} $\mu g.m^{-3}$)	Scenario 7: 2036 With HNRFI (PM_{10} $\mu g.m^{-3}$)	Change ($\mu g.m^{-3}$)	Effect
BDC	12.6-17.1	12.6-17.5	-0.2-+0.3	Negligible	12.5-17.1	12.6-17.1	-0.1-+0.2	Negligible
HBBC	12.7-17.0	12.7-17.6	-0.4-+0.9	Negligible	12.7-17.1	12.7-17.7	-0.4-+0.9	Negligible
CBC	15.7-17.1	15.8-17.2	+0.1	Negligible	15.7-17.1	15.7-17.1	0.0	Negligible
EBC	14.7-15.1	14.7-15.1	0.0	Negligible	14.6-15.1	14.6-15.1	0.0	Negligible
HDC	12.9-17.1	12.9-17.7	0.0-+0.5	Negligible	12.9-17.7	12.9-17.9	0.0-+0.5	Negligible
NWBC	12.0-14.8	12.0-14.8	0.0	Negligible	12.0-14.7	12.0-14.8	0.0	Negligible
NWLDC	13.6-17.8	13.6-17.8	0.0	Negligible	13.6-17.8	13.6-17.8	0.0	Negligible
CCC	15.8-18.3	15.8-18.3	0.0-+0.1	Negligible	15.8-18.5	15.8-18.6	0.0-+0.1	Negligible
RBC	13.9-18.6	14.0-18.8	0.0-+0.6	Negligible	13.9-18.9	14.1-19.0	0.0-+0.7	Negligible

Local Authority	**Scenario 4: 2026 Without HNRFI (PM_{10} µg.m^{-3})**	**Scenario 5: 2026 With HNRFI (PM_{10} µg.m^{-3})**	**Change (µg.m^{-3})**	**Effect**	**Scenario 6: 2036 Without HNRFI (PM_{10} µg.m^{-3})**	**Scenario 7: 2036 With HNRFI (PM_{10} µg.m^{-3})**	**Change (µg.m^{-3})**	**Effect**
TBC	14.2-17.1	14.3-17.1	0.0	Negligible	14.2-17.1	14.2-17.1	0.0	Negligible
NBBC	14.8-17.3	14.8-17.3	0.0-+0.1	Negligible	14.8-17.4	14.8-17.4	0.0-+0.2	Negligible
WNC	15.4-15.6	15.4-15.6	0.0	Negligible	15.3-15.6	15.4-15.6	0.0	Negligible
Air Quality Objective 40µg.m^{-3}								

**Discrepancies in changes due to rounding effects.*

Table 9.25: Predicted annual mean $PM_{2.5}$ concentration ranges and HNRFI impact at existing human receptor locations in Scenario 4: 2026 Opening Year Without HNRFI, and Scenario 5: 2026 Opening Year With HNRFI, Scenario 6: 2036 Future Year Without HNRFI and Scenario 7: 2036 Future Year With HNRFI

Local Authority	Scenario 4: 2026 Without HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$	Scenario 5: 2026 With HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$	Change ($\mu g.m^{-3}$)	Effect	Scenario 6: 2036 Without HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$	Scenario 7: 2036 With HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$	Change ($\mu g.m^{-3}$)	Effect
BDC	8.0-10.5	7.9-10.8	-0.1-+0.3	Negligible	7.9-10.8	7.9-10.5	-0.1-+0.1	Negligible
HBBC	7.9-10.3	7.9-10.4	-0.2-+0.5	Negligible	7.9-10.4	7.9-10.4	-0.2-+0.5	Negligible
CBC	9.5-10.0	9.6-10.0	0.0	Negligible	9.5-9.9	9.5-10.0	0.0	Negligible
EBC	9.2-9.5	9.2-9.5	0.0	Negligible	9.2-9.5	9.2-9.5	0.0	Negligible
HDC	8.0-10.1	8.0-10.3	0.0-+0.3	Negligible	8.0-10.3	8.0-10.4	0.0-+0.2	Negligible
NWBC	7.7-9.3	7.7-9.3	0.0	Negligible	7.7-9.3	7.7-9.3	0.0	Negligible
NWLDC	8.4-10.1	8.4-10.1	0.0	Negligible	8.3-10.1	8.3-10.1	0.0	Negligible
CCC	10.1-11.7	10.2-11.7	0.0-+0.1	Negligible	10.1-11.8	10.2-11.8	0.0-+0.1	Negligible

Local Authority	**Scenario 4: 2026 Without HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$**	**Scenario 5: 2026 With HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$**	**Change ($\mu g.m^{-3}$)**	**Effect**	**Scenario 6: 2036 Without HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$**	**Scenario 7: 2036 With HNRFI ($PM_{2.5}$ $\mu g.m^{-3}$**	**Change ($\mu g.m^{-3}$)**	**Effect**
RBC	8.6-10.6	8.6-10.8	0.0-+0.4	Negligible	8.5-10.7	8.7-10.8	0.0-+0.4	Negligible
TBC	9.1-10.7	9.1-10.8	0.0	Negligible	9.1-10.7	9.1-10.7	0.0	Negligible
NBBC	9.2-10.9	9.2-11.0	0.0-+0.1	Negligible	9.2-11.0	9.2-11.0	0.0-+0.1	Negligible
WNC	9.3-9.5	9.4-9.5	0.0	Negligible	9.3-9.5	9.3-9.5	0.0	Negligible
Air Quality Objective 20$\mu g.m^{-3}$								

**Discrepancies in changes due to rounding effects.*

9.136. The predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ in Scenario 4 to Scenario 7 are below the current relevant annual mean air quality objectives at all receptors considered in the assessment. The HNRFI is not predicted to lead to any exceedances of the current relevant air quality objectives.

9.137. Predicted changes in concentrations at the majority of receptors in both the '2026 Opening Year' and '2036 Future Year' With and Without HNRFI scenarios are less than 5% of the relevant air quality objective and the total pollutant concentrations are less than 75% of the relevant air quality objective.

9.138. The exception to this is at two receptors in Scenario 5 2026 Opening Year scenario: R110 in the HBBC administrative area and R205 in the RBC administrative area. Both receptors are predicted to experience an increase in annual mean NO_2 concentrations of 6% of the annual mean NO_2 objective, with total predicted NO_2 concentrations considerably below 75% of the annual mean NO_2 objective. Receptor R110 is located on the B4668 Leicester Road, north of the new A47 Link Road, adjacent to the roundabout junction with the A47. Receptor R205 is located adjacent to the A5 at the roundabout with the A426. Both receptor locations are adjacent to main roads which experience some of the largest increases in traffic as a result of the operation of the HNRFI. Both are also located close to junctions where the influence of multiple roads converging and queuing is also considered to give rise to increased pollutant concentrations.

9.139. The impact of the HNRFI on annual mean NO_2 concentrations at receptors R110 and R205 is '*slight adverse'* in accordance with IAQM and EPUK guidance. The impact of the HNRFI on annual mean PM_{10} and $PM_{2.5}$ concentrations at receptors R110 and R205 is '*negligible*' in accordance with IAQM and EPUK guidance.

9.140. The impact of the HNRFI on annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations at all other human receptors considered in the assessment is '*negligible*' in accordance with IAQM and EPUK guidance.

9.141. With regard to short term air quality objectives, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with DEFRA guidance it may be assumed that exceedances of the 1-hour mean objective are unlikely.

9.142. Regarding the short term air quality objective for PM_{10} at the existing receptor locations, the calculation detailed in paragraph 9.57 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

9.143. Consideration was given to the predicted magnitude of change at receptor locations in accordance with DMRB LA105. As no receptor locations are predicted to be within 10% of the current relevant air quality objective for an assessed pollutant, in the 2026 Opening Year or 2036 Future Year scenarios, the significance criteria within DMRB LA105 does not apply. Further details can be found in Appendix 6.2.9.13.

9.144. Tables 9.26 and 9.27 and Figures 6.3.9.22 – 6.3.9.24 provide a summary across the study area of the total number of considered receptors, which are predicted to have an improvement, deterioration, or no change as a result of the HNRFI, in the 2026 Opening

Year and 2036 Future Year Without and With HNRFI scenarios respectively.

Table 9.26: Summary of total number of considered receptors with an improvement, no change or deterioration in pollutant concentrations in 2026 Opening Year With the HNRFI

Local Authority Area	Total Number of Considered Receptors								
	Improvement in Concentrations (+ve) (2026)			No Change in Concentrations (2026)			Deterioration in Concentrations (-ve) (2026)		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
BDC	24	23	23	2	1	1	29	31	31
HBBC	63	62	62	4	0	0	40	45	45
CBC	0	0	0	0	0	0	2	2	2
EBC	0	0	0	0	0	0	3	3	3
HDC	2	2	2	0	0	0	13	13	13
NWBC	0	0	0	6	6	6	0	0	0
NWLDC	0	0	0	1	0	0	11	12	12
CCC	0	0	0	0	0	0	5	5	5
RBC	0	1	1	0	0	0	12	11	11
TBC	0	0	0	6	6	6	0	0	0
NBBC	0	0	0	0	0	0	6	6	6

Local Authority Area	Total Number of Considered Receptors								
	Improvement in Concentrations (+ve) (2026)			No Change in Concentrations (2026)			Deterioration in Concentrations (-ve) (2026)		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
WNC	0	0	0	0	0	0	3	3	3
TOTALS	89	88	88	19	13	13	121	131	131

Table 9.27: Summary of total number of considered receptors with an improvement, no change or deterioration in pollutant concentrations in 2036 Future Year With the HNRFI

Local Authority Area	Total Number of Considered Receptors								
	Improvement in Concentrations (+ve) (2036)			No Change in Concentrations (2036)			Deterioration in Concentrations (-ve) (2036)		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
BDC	21	20	20	1	0	0	33	35	35
HBBC	61	64	64	3	0	0	43	43	43
CBC	0	0	0	0	0	0	2	2	2
EBC	0	0	0	0	0	0	3	3	3
HDC	2	2	2	0	0	0	13	13	13
NWBC	0	0	0	6	6	6	0	0	0

Local Authority Area	Total Number of Considered Receptors								
	Improvement in Concentrations (+ve) (2036)			No Change in Concentrations (2036)			Deterioration in Concentrations (-ve) (2036)		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
NWLDC	0	0	0	0	0	0	12	12	12
CCC	0	0	0	0	0	0	5	5	5
RBC	0	1	1	0	0	0	12	11	11
TBC	2	0	0	4	6	6	0	0	0
NBBC	0	0	0	0	0	0	6	6	6
WNC	0	0	0	0	0	0	3	3	3
TOTALS	86	87	87	14	12	12	132	130	133

9.145. In the 2026 Opening Year With HNRFI scenario, there are predicted to be 89 improvements in NO_2 concentrations and 88 improvements in PM_{10} and $PM_{2.5}$ concentrations at existing receptor locations across the study area as a result of the operation of the HNRFI. Conversely, there are predicted to be 121 deteriorations of NO_2 concentrations and 131 deteriorations in PM_{10} and $PM_{2.5}$ concentrations.

9.146. In the 2036 Future Year With HNRFI scenario, there are predicted to be 86 improvements in NO_2 concentrations and 87 improvements in PM_{10} and $PM_{2.5}$ concentrations at considered existing receptor locations within the study area as a result of the operation of the HNRFI. Conversely, there are predicted to be 132 deteriorations of NO_2 concentrations and 130 and 133 deteriorations of PM_{10} and $PM_{2.5}$ concentrations respectively.

9.147. The improvements in pollutant concentrations at a number of identified existing receptors, in the 2026 Opening Year and 2036 Future Year scenarios, are due to a redistribution of traffic across the network.

9.148. The overall effect of the HNRFI on air quality is considered to be *'negligible'* and *'not significant'*:

- Consideration was given to national and local planning policy and the HNRFI is considered to be in accordance with these polices with regard to air quality.
- Concentrations of NO_2, PM_{10} and $PM_{2.5}$ in the study area are predicted to be below the current relevant air quality objectives in the future years of assessment at all receptors and the impact of the HNRFI on existing sensitive receptors is negligible in accordance with the IAQM and EPUK guidance. The HNRFI does not lead to any new exceedances of the current relevant air quality objectives.
- The air quality assessment undertaken utilised robust model inputs including appropriate meteorological data, consideration of queuing traffic and cumulative traffic flows associated with committed developments within the study area.
- The impact of development-generated road traffic on local air quality is defined as '*negligible*' at all receptors in the assessment in accordance with IAQM and EPUK guidance, with the exception of two receptor locations in the Opening Year. The impact at these receptors is considered to be '*minor adverse'.* However, taking into consideration the extent of the study area and the receptors considered in the assessment, the overall impact of the Proposed Development is considered to be '*negligible*'.
- The Opening Year assessment scenario utilised traffic data assuming the entire HNRFI was operational whereas only a small proportion of the HNRFI may realistically be operational in the Opening Year. The Opening Year assessment is therefore considered to represent a robust and conservative assessment of operational phase road traffic emissions.

9.149. The sensitivity of all the assessed receptors is considered to be high. The magnitude of change and absolute concentrations were considered simultaneously regarding Table 9.10: and IAQM and EPUK guidance. Taking into consideration the results of the assessment, there is likely to be a local, permanent, negligible effect at all receptors.

Ecological receptors – Critical level

9.150. Concentrations of NOx were predicted along transects through each of the designated sites. Predicted concentrations were compared to the critical level of 30µg.m^{-3} for the protection of vegetation and ecosystems. The range of concentrations predicted are detailed in Table 9.28 for Scenarios 4 to 7. Further details of the results are available in Appendix 6.2.9.14. Exceedances of the critical level are indicated in bold.

Table 9.28: Predicted NOx concentration ranges at the designated ecological sites within the study area in Scenario 4: 2026 Opening Year Without HNRFI, Scenario 5: 2026 Opening Year With HNRFI, Scenario 6: 2036 Future Year Without HNRFI and Scenario 7: 2036 Future Year With HNRFI

Receptor	Scenario 4: 2026 Opening Year Without HNRFI (NOx µg.m^{-3})	Scenario 5: 2026 Opening Year With HNRFI (NOx µg.m^{-3})	Change* (µg.m^{-3})	Scenario 6: 2036 Future Year Without HNRFI (NOx µg.m^{-3})	Scenario 7: 2036 Future Year With HNRFI (NOx µg.m^{-3})	Change* (µg.m^{-3})
Burbage LNR	11.4-11.9	11.6-12.8	+0.2-+1.0	10.5-10.8	10.6-11.5	+0.1-+0.7
Freeholt Wood AW	14.3	14.9-14.9	+0.5-+1.3	12.5	12.9-13.4	+0.4-+0.9
Aston Firs SSSI	12.3-14.9	12.5-14.6	-0.3-+0.2	11.1-12.8	11.2-12.6	-0.1-+0.1
Narborough Bogs SSSI	18.2-19.0	18.2-19.0	0.0	15.6-16.1	15.6-16.1	0.0
Wyken Slough LNR	24.4-25.2	24.5-25.3	+0.1	20.5-21.1	20.6-21.2	+0.1
Cave's Inn Pitts SSSI	15.7-16.5	15.9-16.6	+0.1	13.3-13.8	13.4-13.9	+0.1
Shawell Wood AW	18.2-**41.9**	18.3-**42.4**	+0.1-+0.3	14.8-**32.1**	14.9-**32.2**	+0.1
Martinshaw Wood AW	18.0-**75.3**	18.0-**75.7**	+0.1-+0.5	14.9-**52.6**	15.0-**53.8**	+0.1-+1.2

Receptor	**Scenario 4: 2026 Opening Year Without HNRFI (NOx µg.m^{-3})**	**Scenario 5: 2026 Opening Year With HNRFI (NOx µg.m^{-3})**	**Change* (µg.m^{-3})**	**Scenario 6: 2036 Future Year Without HNRFI (NOx µg.m^{-3})**	**Scenario 7: 2036 Future Year With HNRFI (NOx µg.m^{-3})**	**Change* (µg.m^{-3})**
Oakley Wood SSSI	20.6-28.2	20.7-28.4	+0.1-+0.2	16.7-21.7	16.8-22.0	+0.1-+0.3
Piper Wood AW	15.7-**30.5**	15.8-**31.4**	+0.1-+0.9	13.3-23.4	13.3-24.0	0.0-+0.6
Tonge Gorse AW	14.1-28.7	14.1-28.9	0.0-+0.2	12.2-22.2	12.2-22.4	0.0-+0.2
Lount Meadows SSSI	13.4-22.8	13.4-22.9	0.0-+0.1	11.5-18.0	11.6-18.1	0.0-+0.1
River Mease SAC	12.3-27.2	12.3-27.3	0.0-+0.1	10.6-20.6	10.6-20.7	0.0-+0.1
Bramcote Covert AW	14.5-15.8	14.6-15.8	0.0	12.3-13.2	12.4-13.2	0.0
Alvecote Pools SSSI	15.1-17.1	15.1-17.2	0.0	12.9-14.3	13.0-14.4	0.0
Grendon Wood AW	11.4-12.2	11.4-12.2	0.0	10.2-10.8	10.3-10.8	0.0
Sparrowdale Wood AW	12.0-12.1	12.0-12.2	0.0	10.8-10.9	10.8-10.9	0.0

Receptor	Scenario 4: 2026 Opening Year Without HNRFI (NOx µg.m^{-3})	Scenario 5: 2026 Opening Year With HNRFI (NOx µg.m^{-3})	Change* (µg.m^{-3})	Scenario 6: 2036 Future Year Without HNRFI (NOx µg.m^{-3})	Scenario 7: 2036 Future Year With HNRFI (NOx µg.m^{-3})	Change* (µg.m^{-3})
Daniels Wood AW	20.8-28.2	20.8-28.3	0.0-+0.1	17.2-22.6	17.2-22.6	0.0-+0.1
Many Lands Woods AW	16.7-17.7	16.8-17.8	0.0-+0.1	14.2-14.9	14.2-15.0	0.0
Ashlawn Cutting LNR	19.2-**33.4**	19.4-**33.5**	+0.2	15.6-25.2	15.7-25.3	+0.1
Kettle Brook LNR	17.3-**64.0**	17.3-**63.8**	-0.2-0.0	15.1-**46.6**	15.1-**46.3**	-1.2-0.0

**Discrepancies in changes due to rounding effects.*

9.151. Concentrations of NOx at the ecological transects were predicted to be below the critical level of 30µg.m^{-3} in all scenarios considered, with the following exceptions:

- Shawell Wood AW - exceedances of the NOx critical level were predicted adjacent to the M1 motorway at the transect points closest to the road (26-46m) in the 2026 Opening Year and Without and With HNRFI scenarios. No exceedances of the critical level were predicted at this designation in the Future Year scenarios and no new exceedances of the NOx critical level were predicted as a result of the operation of the HNRFI.

- Martinshaw Wood AW - exceedances of the NOx critical level were predicted adjacent to the M1 motorway at the transect points north of the motorway closest to the road (5-115m) in the 2026 Opening Year Without and With HNRFI scenarios. A new exceedance of the critical level was predicted at the 125m transect point in the 2026 Opening Year With HNRFI scenario. Exceedances of the NOx critical level were also predicted at the transect points 5m – 55m in the 2036 Future Year scenarios. In the

transect south of the M1 motorway, an exceedance of the NOx critical level was predicted at the closest transect point to the motorway (23m) in both 2026 Opening Year scenarios.

- Piper Wood AW - exceedances of the NOx critical level were predicted adjacent to the M1 at the transect point closest to the road (29m) in the 2026 Opening Year Without and With HNRFI scenarios. A new exceedance of the NOx critical level was predicted at the 39m transect point in the 2026 Opening Year With HNRFI scenario. There are no exceedances of the NOx critical level in the Future Year scenarios.

- Ashlawn Cutting LNR – exceedances of the NOx critical level were predicted at transect points 44m and 55m, closest to the motorway, in both the 2026 Opening Year Without and With HNRFI scenarios. No exceedances of the NOx critical level were predicted in the 2036 Future Year scenarios and no new exceedances of the NOx critical level were predicted as a result of the operation of the HNRFI.

- Kettlebrook LNR - exceedances of the NOx critical level were predicted at the Kettlebrook LNR in both the 2026 Opening Year scenarios 10m into transect, 1, up to 30m in transect 2, at 0m in transect 3 and transect 5, up to 60m in transect 6 and up to 30m in transect 7. In the 2036 Future Year scenarios, exceedances of the NOx critical level were predicted at 0m in transect 1 and 2, up to 20m in transect 6 and up to 10m in transect 7. No new exceedances of the NOx critical level were predicted at the Kettlebrook LNR as a result of the operation of the HNRFI. The operation of the HNRFI, and resultant rerouting of traffic in the study area, leads to a reduction in NOx concentrations and reductions in nitrogen deposition within the LNR and it is therefore considered that the HNRFI is beneficial to the Kettlebrook LNR.

9.152. The results were provided to the appointed ecological consultants for analysis and are discussed in Chapter 12: *Ecology and Biodiversity (document reference 6.1.12)*.

Critical load

9.153. Transects were modelled at 10m intervals, up to 200m into each of the designated sites, to consider the impact of nitrogen deposition (N) on each of the ecological sites. The percentage change in deposition was compared to the lower critical load for each habitat. The range of concentrations predicted at each site are detailed in Tables 9.29 and 9.30 for 2026 Opening Year Without and With HNRFI Scenarios and 2036 Future Year Without and With HNRFI Scenarios. The full results are presented in Appendix 6.2.9.14.

Table 9.29: Predicted nitrogen deposition ranges at the designated ecological sites in 2026 Opening year scenarios

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.9-26.0	25.9-26.1	0.0-+0.1	0.0-+0.9%
Freeholt Wood AW	10	49.5	49.5-49.6	0.0-+0.1	-0.1-0.0%
Aston Firs SSSI	15	48.4-48.8	48.4-48.6	-0.2-0.0	-1.3- -0.1%
Narborough Bogs SSSI	10	52.3-52.4	52.2-52.3	-0.1	-1.4- -1.0%
Wyken Slough LNR	10	25.3-25.4	25.3-25.4	0.0	+0.1%
Cave's Inn Pits SSSI	20	25.9-26.0	25.9-26.0	0.0	+0.1%
Shawell Wood AW	10	47.3-50.9	47.3-51.0	0.0	0.1-+0.4%
Martinshaw Wood AW	5	43.6-51.5	43.6-51.5	0.0-+0.1	+0.1-+1.0%
Oakley Wood SSSI	15	42.9-44.1	42.9-44.1	0.0	+0.1-+0.2%

Receptor	**Critical Load (kg N $ha^{-1}yr^{-1}$)**	**2026 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)**	**2026 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)**	**Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)**	**Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)**
Piper Wood AW	10	42.0-44.5	42.1-44.6	0.0-+0.1	+0.2-+**1.4%**
Tonge Gorse AW	10	41.8-44.0	41.8-44.1	0.0	0.0-+0.2%
Lount Meadows SSSI	20	29.2-30.7	29.3-30.7	0.0	0.0-+0.1%
River Mease SAC**	No critical load	12.0-13.1	12.0-13.1	0.0	No critical load
Bramcote Covert AW	10	40.3-40.5	40.3-40.6	0.0	0.0-+0.1%
Alvecote Pools SSSI	20	11.3-11.4	11.3-11.4	0.0	0.0%
Grendon Wood AW	10	38.4-38.5	38.4-38.5	0.0	0.0-+0.1%
Sparrowdale Wood AW	10	37.1	37.1	0.0	0.0%
Daniels Wood AW	10	42.9-44.1	42.9-44.1	0.0	+0.1%
Many Lands Woods AW	10	42.5-42.7	42.6-42.7	0.0	+0.1%

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Ashlawn Cutting LNR	10	43.2-45.3	43.2-45.3	0.0	+0.2-+0.3%
Kettle Brook LNR	10	38.0-41.2	38.0-41.2	0.0	-0.1-0.0%

**Discrepancies in changes due to rounding effects.*

***Project Ecologist confirmed that River Mease SAC is not sensitive to nitrogen deposition.*

Table 9.30: Predicted nitrogen deposition ranges at the designated ecological sites in 2036 Future year scenarios

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2036 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2036 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.7-25.8	25.7-25.9	0.0-+0.1	+0.2-+**1.1%**
Freeholt Wood AW	10	49.1	49.1-49.2	+0.1	+0.6 - **+1.4%**
Aston Firs SSSI	15	48.2-48.4	48.2-48.4	0.0	-0.2-+0.1%

Receptor	**Critical Load (kg N $ha^{-1}yr^{-1}$)**	**2036 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)**	**2036 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)**	**Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)**	**Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)**
Narborough Bogs SSSI	10	51.8-51.9	51.8-51.9	0.0	0.0-+0.1%
Wyken Slough LNR	10	25.0	25.0	0.0	+0.1%
Cave's Inn Pits SSSI	20	25.4-25.5	25.4-25.5	0.0	0.0-+0.1%
Shawell Wood	10	46.7-49.4	46.7-49.4	0.0	+0.1-+0.2%
Martinshaw Wood AW	5	43.0-48.4	43.0-48.6	0.0-+0.2	+0.1-+**3.1%**
Oakley Wood SSSI	15	42.4-43.0	42.4-43.0	0.0	+0.1-+0.3%
Piper Wood AW	10	41.6-43.4	41.6-43.4	0.0-+0.1	0.0-+0.9%
Tonge Gorse AW	10	41.4-43.0	41.4-43.0	0.0	0.0-+0.3%
Lount Meadows SSSI	20	28.9-29.9	28.9-29.9	0.0	0.0%
River Mease SAC**	No critical load	11.8-12.6	11.8-12.6	0.0	No critical load

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2036 Opening Year Without HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2036 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Bramcote Covert AW	10	39.9-40.1	39.9-40.1	0.0	0.0%
Alvecote Pools SSSI	20	11.0-11.2	11.0-11.2	0.0	0.0%
Grendon Wood AW	10	38.1-38.2	38.1-38.2	0.0	0.0%
Sparrowdale Wood AW	10	37.0	37.0	0.0	0.0%
Daniels Wood AW	10	42.2-43.1	42.3-43.1	0.0	0.0-+0.1%
Many Lands Woods LNR	10	42.1-42.2	42.1-42.4	0.0	0.0-+0.1
Ashlawn Cutting LNR	10	42.5-44.0	42.5-44.0	0.0	+0.1-+0.2%
Kettle Brook LNR	10	37.8-40.1	37.8-40.0	-0.1-0.0	-0.9-0.0%

**Discrepancies in changes due to rounding effects.*

***Project Ecologist confirmed that River Mease SAC is not sensitive to nitrogen deposition.*

9.154. All modelled transect points experiencing a change in nitrogen deposition of less than 1% of the lower critical load, as detailed in Tables 9.29 and 9.30, are predicted to experience

a *'not significant'* impact in accordance with DMRB guidance.

9.155. Within Freeholt Wood AW and Piper Wood AW, there are predicted to be changes in nitrogen deposition of greater than 1% of the relevant critical load in the 2026 Opening Year Scenario. With the Martinshaw Wood AW, there is predicted to be change in nitrogen deposition concentrations greater than 1% of the lower relevant critical load along some of the transect points in the 2036 Future Year Scenario. The results were therefore referred to the appointed ecological consultants, to determine any potential impact. Further details are available in Chapter 12: *Ecology and Biodiversity (document reference 6.1.2.12)*.

Operational phase road traffic emissions site suitability assessment

9.156. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted across the Main HNRFI Site to consider the exposure of users of the rerouted PRoWs and bridleways to air pollution. A Site suitability assessment was undertaken due to the absence of existing sensitive receptors within the majority of the Main HNRFI Site. Existing sensitive receptors within the Main HNRFI will be removed as part of the Proposed Development and therefore there is no comparative baseline scenario for the Main HNRFI Site as no receptor points will remain between baseline and opening conditions. A Cartesian grid was modelled over the Main HNRFI Site over grid co-ordinates minimum X 444501, Y 293543 to maximum X 447398, Y 295977. The grid was modelled at 0m elevation to account for the varying users of the PRoWs and bridleways and presence of wellbeing zones within the Main HNFRI Site where users may be seated.

9.157. The greatest predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations within the Main HNRFI Site are detailed in Table 9.31. The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations across the Main HNRFI Site for the Opening and Future Years are illustrated in Figures 6.3.9.25 – 6.3.9.30 respectively. The assessment identified that pollutant concentrations across the Main HNRFI Site were well below the current relevant air quality objectives and therefore it was considered that future users of the Main HNRFI Site would not be exposed to pollutant concentrations close to, or in exceedance, of current relevant air quality objectives.

Table 9.31: Maximum annual mean concentrations across the Main HNRFI Site in the 2026 Opening Year and 2036 Future Year With HNRFI

Scenario	Annual Mean Concentration (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$
2026 Opening Year	25.5	18.1	10.8
2036 Future Year	19.5	18.0	10.7

Rail emissions

9.158. The operational development would lead to an increase in the number of trains using the Felixstowe to Nuneaton freight line to access the HNRFI. The rail paths to be utilised by the Proposed Development are planned into this freight line by Network Rail based on investment into the line. These paths will be taken up by an alternative operator should the Proposed Development not progress and therefore the increase in trains on this line will occur with, or without, the Proposed Development.

9.159. DEFRA guidance sets out a list of railway lines which are currently considered to experience heavy traffic of diesel locomotives. The Felixstowe to Nuneaton line is not identified in DEFRA guidance as a heavy diesel usage line.

9.160. It is recognised that COVID 19 is likely to have affected rail movements on the railway line. In the absence of information on known movements post March 2020, Realtimetrains was used to provide the baseline for the existing movements at the current time on a weekday, as provided by the appointed rail consultant, Baker Rose.

9.161. Typical existing rail movements were considered for the baseline, and these are detailed below in Table 9.32.

Table 9.32: Existing train movements

Train Type	No. daytime movements based on known movements (two-way)	No. of night-time movements based on known movements (two-way)
Turbostar Class 170	64	5
Class 66 freight engines	41	21

9.162. It is understood that there will be a maximum of 16 intermodal rail movements per day as a result of the HNRFI, which will result in an additional 32-two-way movements.

9.163. DEFRA guidance provides a screening criterion for both stationary and moving diesel locomotives, above which more detailed assessment may be required. Table 9.33 compares the DEFRA screening criteria to the HNRFI.

Table 9.33: Rail screening of the HNRFI

DEFRA Criteria	DEFRA Screening Criteria	Proposed Development	Criteria Exceeded
Stationary locomotives	Locations where diesel locomotives are regularly (at least three times a day stationary for 15 minutes or more); and	16 trains per day.	No
	Presence of relevant exposure within 15m of the locomotives.	No existing sensitive receptors are located within 15m of locations where stationary locomotives will be present within the Main HNRFI Site.	
Moving locomotives	Background annual mean NO_2 concentration about 25µg.m^{-3}	Background concentrations are well below this threshold as indicated in Table 9.11:.	No
	Relevant exposure within 30m of the relevant railway tracks.	Railway line is not a *'Rail Line with Heavy Traffic'* as defined by DEFRA.	No

9.164. It was determined that the HNRFI would not exceed any of the screening criteria detailed in Table 9.33 for rail locomotives. Furthermore, it is anticipated that the HNRFI would only generate an additional 16 train movements (32 two-way movements) per day, which is less than 1 per hour taking into account the 24 hour operation of the HNRFI. Based on the nature of signalling operations in the area, the maximum number of trains that may occur in any one hour is three.

9.165. Therefore, the impacts on local air quality from rail emissions as a result of the HNRFI once operational are deemed to be negligible and *'not significant'*.

Operational phase back-up CHP emissions

9.166. The predicted NOx concentrations associated with the operation of the back-up CHP were predicted at identified existing sensitive human and ecological receptors within a 10km radius of the stack location.

Human receptors

9.167. In accordance with EA guidance, 100% conversion of NOx to NO_2 was assumed for all human receptors where the annual mean NO_2 objective applies. The PC at each receptor was combined with the Opening Year and Future Year With HNRFI annual mean NO_2 concentrations at each receptor considered and the significance criteria provided by IAQM and EPUK guidance (detailed in Table 9.8) utilised to determine the impact of the back-up CHP emissions on local air quality.

9.168. Table 9.34 details the range of NO_2 concentrations at each human receptor considered in the assessment for both With and Without the proposed back-up CHP in the 2026 Opening Year and 2036 Future Year scenarios, along with the range of change and significance at each receptor location. The full results are detailed in Appendix 6.2.9.15 and results of the full cumulative assessment of operational phase road and back-up CHP emissions is presented in Appendix 6.2.9.17.

Table 9.34: Predicted annual mean NO_2 concentration ranges and back-up CHP emissions impact at existing human receptor locations in the 2026 Opening and 2036 Future Year of the HNRFI

	Annual mean NO_2 concentration ($\mu g.m^{-3}$)							
	2026 Opening Year With HNRFI	**2026 Opening Year With HNRFI and back-up CHP**	**Change ***	**Impact**	**2036 Future Year With HNRFI**	**2036 With HNRFI and back-up CHP**	**Change ***	**Impact**
All human receptors	8.5-18.0	8.5-18.0	0.0-+0.3	Negligible	7.7-15.0	7.8-15.0	0.0-+0.3	Negligible

**Discrepancies in changes due to rounding effects*

9.169. The predicted concentrations of NO_2 with the proposed back-up CHP in operation are below the current relevant annual mean NO_2 objective at all receptors considered in the assessment. The emissions associated with the back-up CHP are not predicted to lead to any exceedances of the annual mean NO_2 air quality objective.

9.170. Predicted changes in concentrations at all receptors as a result of the back-up CHP emissions, in both the 2026 Opening Year and 2036 Future Year Scenarios, are less than 5% of the annual mean NO_2 objective and the total pollutant concentrations are less than

75% of the annual mean NO_2 air quality objective.

9.171. The impact of the proposed back-up CHP on annual mean NO_2 concentrations is 'negligible' in accordance with IAQM and EPUK guidance, which is '*not significant*'.

9.172. With regard to short term air quality objectives, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with DEFRA guidance it may be assumed that exceedances of the 1-hour mean objective are unlikely.

Ecological receptors – critical level

9.173. Concentrations of NOx were predicted along transects through each of the designated ecological sites within 10km of the proposed back-up CHP. Predicted concentrations were compared to the critical level of 30µg.m^{-3} for the protection of vegetation and ecosystems. The range of concentrations predicted are detailed in Table 9.35 and full results are detailed in Appendix 6.2.9.16.

Table 9.35: Predicted NOx concentration ranges at the designated ecological sites within 10km of the proposed energy centre in both the Opening Year and Future Year With and Without the back-up CHP in operation

Receptor	2026 Opening Year With HNRFI (NOx µg.m^{-3})	2026 Opening Year With HNRFI and back-up CHP (NOx µg.m^{-3})	Change* (µg.m^{-3})	2036 Future Year With HNRFI (NOx µg.m^{-3})	2036 Future Year With HNRFI and back-up CHP (NOx µg.m^{-3})	Change* (µg.m^{-3})
Burbage LNR	11.6-12.8	11.6-12.8	0.0-+0.1	10.6-11.5	10.6-11.5	0.0-+0.1
Freeholt Wood AW	14.9-14.9	14.9-15.6	0.0-+0.1	12.9-13.4	12.9-13.4	0.0-+0.1
Aston Firs SSSI	12.5-14.6	12.5-14.6	0.0	11.2-12.6	11.2-12.6	0.0
Narborough Bogs SSSI	18.2-19.0	18.2-19.0	0.0	15.6-16.1	15.6-16.1	0.0

**Discrepancies in changes due to rounding effects*

9.174. Concentrations of NOx at the ecological designations considered in the back-up CHP assessment were predicted to be below the critical level of 30µg.m^{-3} in all scenarios. The impact of the proposed back-up CHP on NOx critical levels at the identified ecological designations was therefore considered to be '*not significant*' in accordance with DMRB guidance.

Ecological receptors – critical loads

9.175. Transects were modelled at 10m intervals, up to 200m into each of the identified ecological designations within a 10km radius of the proposed back-up CHP to consider the impact of nitrogen deposition (N) on each of the ecological designations. The percentage change in deposition was compared to the lower critical load for each habitat. The range of concentrations predicted at each site are detailed in Tables 9.36 and 9.37 for 2026 Opening Year and 2036 Future Year Scenarios. The full results are presented in Appendix 6.2.9.16.

Table 9.36: Predicted nitrogen deposition ranges at the designated ecological sites in 2026 Opening year scenarios With and Without the proposed back-up CHP

Receptor	Critical Load (kg N ha^{-1}yr^{-1})	2026 Opening Year With HNRFI N Deposition (kg N ha^{-1}yr^{-1})	2026 Opening Year With HNRFI and back-up CHP N Deposition (kg N ha^{-1}yr^{-1})	Change* in Nitrogen Deposition (kg N ha^{-1}yr^{-1})	Percentage Change of Lower Critical Load (kg N ha^{-1}yr^{-1})
Burbage Wood LNR	10	25.9-26.1	25.9-26.1	0.0	+0.1-+0.3%
Freeholt Wood AW	10	49.5-49.6	49.5-49.6	0.0	+0.1-+0.2%
Aston Firs SSSI	15	48.4-48.6	48.4-48.6	0.0	0.0-+0.1%
Narborough Bogs SSSI	10	52.2-52.3	52.5-52.3	0.0	0.0%

**Discrepancies in changes due to rounding effects*

Table 9.37: Predicted nitrogen deposition ranges at the designated ecological sites in 2036 Future year scenarios With and Without the proposed back-up CHP

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI and back-up CHP N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.7-25.9	25.6-25.9	0.0	+0.1-+0.3%
Freeholt Wood AW	10	49.1-49.2	49.2	0.0	+0.1-+0.3%
Aston Firs SSSI	15	48.2-48.4	48.2-48.4	0.0	0.0-+0.1%
Narborough Bogs SSSI	10	51.8-51.9	51.8-51.9	0.0	0.0%

**Discrepancies in changes due to rounding effects*

9.176. All modelled transect points were predicted to experience a change in nitrogen deposition of less than 1% of the lower critical load and are therefore predicted to experience a '*not significant*' impact in accordance with DMRB guidance.

Ecological receptors – critical load – sensitivity test

9.177. To consider the potential influence of abnormal operation of the back-up CHP, a sensitivity test was also undertaken to identify for what percentage of the year the back-up CHP could operate prior to triggering any potentially significant impacts at identified ecological receptors within 10km of the stack. The sensitivity test identified that the back-up CHP could operate for up to 30% of a calendar year prior to any predicted increases in nitrogen deposition exceeding 1% of the relevant critical load. The results of the sensitivity test are detailed in Table 9.38 and Table 9.39 for the 2026 Opening Year and 2036 Future Year respectively.

Table 9.38: Predicted nitrogen deposition ranges at the designated ecological sites in 2026 Opening year scenarios With and Without the proposed back-up CHP – 30% operation sensitivity test

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2026 Opening Year With HNRFI and back-up CHP N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.9-26.1	25.9-26.1	0.0-+0.1	+0.2-+1.0%
Freeholt Wood AW	10	49.5-49.6	49.5-49.6	0.0-+0.1	+0.2-+0.7%
Aston Firs SSSI	15	48.4-48.6	48.4-48.6	0.0	+0.1-+0.2%
Narborough Bogs SSSI	10	52.2-52.3	52.2-52.3	0.0	0.0%

**Discrepancies in changes due to rounding effects*

Table 9.39: Predicted nitrogen deposition ranges at the designated ecological sites in 2036 Future year scenarios With and Without the proposed back-up CHP – 30% operation sensitivity test

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI and back-up CHP N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Burbage Wood LNR	10	25.7-25.9	25.7-25.9	0.0-+0.1	+0.2-+1.0%
Freeholt Wood AW	10	49.1-49.2	49.2-49.3	0.0-+0.1	+0.2-+0.6

Receptor	Critical Load (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI N Deposition (kg N $ha^{-1}yr^{-1}$)	2036 Future Year With HNRFI and back-up CHP N Deposition (kg N $ha^{-1}yr^{-1}$)	Change* in Nitrogen Deposition (kg N $ha^{-1}yr^{-1}$)	Percentage Change of Lower Critical Load (kg N $ha^{-1}yr^{-1}$)
Aston Firs SSSI	15	48.2-48.4	48.2-48.4	0.0	+0.1-+0.2%
Narborough Bogs SSSI	10	51.8-51.9	51.8-51.9	0.0	0.0%

**Discrepancies in changes due to rounding effects*

9.178. All modelled transect points were predicted to experience a change in nitrogen deposition of less than 1% of the lower critical load with the back-up CHP operating up to 30% of the year. It was therefore considered that the impact of the back-up CHP on critical loads was '*not significant'* impact in accordance with DMRB guidance.

PROPOSED MITIGATION

Construction phase dust assessment

Step 3: Site-specific mitigation

9.179. The risk of dust impacts, defined in Step 2C of the assessment, are used to determine the mitigation measures required to minimise the emission of dust during construction phase activities. The IAQM guidance provides details of the highly recommended and desirable mitigation measures which are commensurate with the risk of dust impacts defined in Step 2C for demolition, earthworks, construction and trackout activities. Where the mitigation measures are general in nature, the highest risk category was applied in accordance with the guidance. The highest risk category identified was *'High Risk'*. The mitigation measures detailed in Table 9.40 and Table 9.41 will be included within the Construction Environmental Management Plan (CEMP) (document reference 17.1).

Table 9.40: Construction phase mitigation measures for a *'High Risk'* site

Category	**Mitigation Measures**	
	Highly Recommended	**Desirable**
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	None
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager.	
	Display the head or regional office contact information.	
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.	
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.	
	Make the complaints log available to the local authority when asked.	None
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.	None

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, including photographs, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars, and windowsills within 100m of the site boundary, with cleaning to be provided as necessary.	None
	Carry out regular site inspections to monitor compliance with the DMP, record inspections results, and make an inspection log available to the local authority when asked.	
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	
Preparing and maintaining the site	Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	None
	Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site, or sheet, cover, damp or enclose stockpiles/activities.	
	Fully enclose specific operations where there is a high potential for dust production and the site is active for an extended period.	

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
	Avoid site runoff of water or mud.	
	Keep site fencing, barriers and scaffolding clean using wet methods where appropriate.	
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	
	Cover, seed, or fence stockpiles to prevent wind whipping.	
Operating vehicle machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles.	None
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (for long haul routes these speeds may be increased with suitable control measures provided, subject to the approval of the nominated undertaker with the agreement of the local authority, where appropriate).	
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	
Operations	Only use cutting, grinding, or sawing equipment fitted or in conjunction with suitable dust suppression techniques such	None

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
	as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.	
	Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	
	Used enclose chutes and conveyors and covered skips.	
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	
	Ensure equipment is readily available on site to clean and dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods where appropriate.	
Waste Management	Avoid bonfires and burning of waste materials.	None

Table 9.41: Mitigation measures specific for demolition, earthworks, construction and trackout

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
Demolition (High Risk Site)	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	None
	Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be	

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
	directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.	
	Bag remove any biological debris or damp down such material before demolition.	
Earthworks (High Risk Site)	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	None
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	
	Only remove the cover in small areas during work and not all at once.	
Construction (High Risk Site)	Avoid scabbling (roughening of concrete surfaces) if possible.	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	
	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any materials tracked out of	None

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
Trackout (High Risk Site)	the site. This may require the sweeper being continuously in use.	
	Avoid dry sweeping of large areas.	
	Ensure vehicles entering and leaving the sites are covered to prevent escape of materials during transport.	
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	
	Record all inspections of haul routes and any subsequent action in a site logbook.	
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	
	Access gates to be located at least 10m from receptors where possible.	

Construction phase road traffic emissions

9.180. The construction phase road traffic emissions assessment identified that construction traffic, at the peak of construction activities, will have a negligible impact on local air

quality at existing sensitive human and ecological receptors in the study area. It is therefore considered that the impact of construction phase road traffic on local air quality is *not significant*.

9.181. A Construction Traffic Management Plan (CTMP) (document reference 17.7) has been prepared for the Proposed Development to inform routing of deliveries and construction workers and to consolidate deliveries to minimise trips associated with the construction phase.

Operational phase road traffic emissions

9.182. A Sustainable Transport Strategy (STS) (document reference 6.2.8.1.14) and Travel Plan (TP) (document reference 6.2.8.2 will be submitted with the application and a comprehensive package of on and off-site transport improvements are proposed as part of the HNRFI. The STS and TP will promote the use of sustainable transport methods such as public transport, walking and cycling to the Main HNRFI Site to reduce emissions associated with the HNRFI.

9.183. The following measures will apply to the HNRFI to further reduce road traffic emissions. These measures were not explicitly included within the air quality assessment and are therefore additional measures proposed.

- A TP Co-ordinator will be appointed to implement and monitor measures across the Proposed Development.
- Car parking provision will be supplied with charging facilities for Electric Vehicles with ductwork provision for future car charging points on all remaining car parking spaces. This will encourage the use of EV for staff commuting to work.
- The yard areas will be future proofed for the future installation of Heavy Goods Vehicle (HGV) charging points.
- Provision of covered cycle parking facilities.
- New and improved walking and cycling routes are proposed across the Main HNRFI.
- Shared pedestrian and cycleway on the new A47 link road through the HNRFI Site.
- The HNRFI also seeks to improve bus accessibility to the HNRFI Site by enhancing local bus services.

9.184. The measures above aim to reduce emissions associated with the HNRFI and encourages the use of sustainable methods of transport. Any reduction in emissions will be beneficial to both human and ecological receptors.

9.185. The Main HNRFI Site was considered with regard to future pollutant concentrations in the areas identified for the rerouting PRoWs. The assessment identified that concentrations of NO_2, PM_{10} and $PM_{2.5}$ were well below the current relevant air quality objectives within

the Main HNRFI Site and therefore the proposed relocated routes for the PRoW are considered suitable with regard to air quality. No mitigation measures are therefore required to minimise exposure of users of the PRoW through the Main HNRFI Site to pollution.

Operational phase back-up CHP emissions

9.186. The proposed back-up CHP will have a negligible impact on identified human receptors considered in the assessment and will not lead to any exceedances of the NOx critical level at identified ecological designations. No increases in nitrogen deposition above 1% of the relevant critical load at any designation were predicted with the back-up CHP operating for 10% of the calendar year, or operating for 30% of the calendar year in the sensitivity test. Therefore no mitigation measures are required to reduce the impact of back-up CHP emissions on human and ecological receptor locations.

9.187. Whilst back-up CHP is included within the HNRFI, the main source of energy will be provided by a PV array which has no local emissions to air associated with its operation. This energy strategy is therefore considered to be beneficial to local air quality through reduced reliance on emissions-generating energy sources for the operation of the HNRFI.

RESIDUAL ENVIRONMENTAL EFFECTS

Construction phase dust assessment

Step 4: Determine significant effects

9.188. In accordance with IAQM guidance, with the implementation of the mitigation measures detailed in Tables 9.38 and Table 9.39, the residual impacts from the construction phase are considered local, medium term, temporary and *'not significant'*.

Construction phase road traffic emissions assessment

Human receptors

9.189. A negligible impact is predicted at all human receptors as a result of the peak construction phase road traffic emissions. The residual impacts are predicted to be local, temporary and 'not significant'.

Ecological receptors

9.190. No exceedances of the critical level were predicted at identified ecological designations and no increase in nitrogen deposition above 1% of the relevant critical loads was predicted during the peak of construction phase road traffic movements. The residual impacts are predicted to be local, temporary and 'not significant'.

Operational phase road traffic emissions assessment

Human receptors

9.191. A negligible impact is predicted at the majority of receptors as a result of the development-generated road traffic emissions, with the exception of two receptors in the Opening Year where 'slight adverse' impacts were predicted. Pollutant concentrations at all receptors in both the Opening and Future Year Scenarios 4-7 were predicted to be below the relevant current air quality objectives. The residual impacts are predicted to be local, permanent and *'not significant'.*

Ecological receptors

9.192. Within the ecological designations exceedances of the NOx critical level and changes of greater than 1% of the relevant critical load for nitrogen deposition were predicted in the 2026 Opening Year scenarios and 2036 Future Year scenarios at a number of ecological designations. Where exceedances of the critical level were identified, the majority were predicted in both the Without and With HNRFI scenarios, with the exception of Martinshaw Wood AW and Pipers Wood AW where a new exceedance was predicted in the 2026 Opening Year. The results of the assessment were referred to the appointed ecological consultants for analysis. The results are discussed in Chapter 12: *Ecology and Biodiversity (document reference 6.1.2.12).*

CUMULATIVE AND IN-COMBINATION EFFECTS

Construction phase dust assessment

9.193. The construction phase dust assessment was undertaken in accordance with IAQM guidance and considers potential dust impacts arising during construction for both human and ecological receptors within 350m of the Order Limits. Construction phase activities associated with other sites have the potential to occur simultaneously with construction phase activities associated with the HNRFI and give rise to in-combination effects where they are located within 700m of the HNRFI. This is due to both the HNRFI and other sites having an area of influence of 350m, which may overlap up to 700m from the HNRFI.

9.194. However, no committed developments were identified at the time of the assessment that would be located within 700m of the Order Limits at the time of assessment. It is therefore considered that the cumulative impacts associated with the construction phase are *'not significant'* and no further mitigation measures are required.

Construction phase road traffic emissions assessment

9.195. Construction road traffic movements associated with the HNRFI will be temporary in nature and will fluctuate over the course of the construction phase. The construction phase road traffic emissions assessment of peak construction traffic movements identified no significant impacts at existing human and ecological designations. The peak construction road traffic movements are not anticipated to occur at a time where construction traffic associated with other committed developments will occur within the construction road traffic assessment network and therefore cumulative effects are not considered likely to arise.

Operational phase road traffic emissions assessment

9.196. The traffic data provided for use in the air quality assessment includes cumulative traffic flows for the study area, as detailed within Chapter 8: *Transport and Traffic (document reference 6.1.8)*. Therefore, no additional cumulative road traffic emissions impact assessment was undertaken, as cumulative impacts were considered within the operational phase road traffic assessment. This provides a conservative assessment for both human and ecological receptors.

Operational phase back-up CHP emissions assessment

9.197. No significant industrial emission sources were identified in the vicinity of the Main HNRFI Site that may give rise to cumulative effects associated with the operation of the proposed back-up CHP at the Main HNRFI Site. The back-up CHP will be utilised to support the main energy supply for the HNRFI and operated as a back-up only. This will therefore not represent a permanent, long term source of emissions. No in-combination effects are therefore considered to arise as a result of back-up CHP emissions.

Cumulative operational phase emissions

9.198. To consider the combined impact of operational phase road traffic emissions and back-up CHP emissions on local air quality at existing sensitive receptors, a full cumulative assessment was undertaken. This considered the total change in pollutant concentrations as a result of With HNRFI With road traffic and back-up CHP emissions relative to the Without HNRFI scenarios. The cumulative assessment of the HNRFI predicted pollutant concentrations below the current relevant air quality objectives at all human receptors considered in the assessment and the impact was considered to be negligible overall at human receptor locations which is 'not significant'.

9.199. Concentrations of NOx predicted at identified ecological designations within 10km of the back-up CHP were below the critical level and therefore the cumulative impact of the HNRFI on critical levels at ecological designations was considered 'not significant'. Increases of greater than 1% of the lower critical load for nitrogen deposition were predicted at a number of transect points within ecological designation considered in the cumulative assessment. These results were passed to the Project Ecologist for further analysis. The results of this cumulative assessment are detailed in Appendix 6.2.9.17.

CLIMATE CHANGE

9.200. Climate change is caused by the emissions of greenhouse gases changing the general weather conditions prevailing over a long period of time. The impacts of climate change can therefore be considered in terms of volume of greenhouse gas emitted by the HNRFI.

9.201. The HNRFI will provide a major shift from road transport to rail. A report by the Strategic Rail Business Case Advisors, Baker Rose Ltd reviewed the HGV mileage saved per annum. Chapter 18 of this ES report sets-out the effects of the HNRFI on Climate Change.

SUMMARY AND CONCLUSIONS

Construction phase

Construction phase dust

9.202. A qualitative construction phase dust assessment was undertaken, and measures were recommended for inclusion in a CEMP to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions is considered to be *'not significant'* in accordance with IAQM guidance.

Construction phase road traffic

9.203. A quantitative construction phase road traffic emission assessment was undertaken to consider the impact of peak construction traffic vehicle movements on local air quality at identified existing human and ecological receptors. The impact of construction phase road traffic emissions at identified human receptors was determined to be 'not significant' in accordance with IAQM and EPUK guidance. No exceedances of the NOx critical level or changes in nitrogen deposition of greater than 1% of the relevant critical loads were predicted. Furthermore the construction phase road traffic emissions will be temporary. The impact of construction phase road traffic emissions on human and ecological receptors was therefore considered to be '*not significant'*.

Operational phase

Operational phase road traffic emissions assessment - human receptors

9.204. A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing human receptor locations within the study area. This included cumulative traffic flows for the study area as detailed within Chapter 8: *Traffic and Transport (document reference 6.1.8)*. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified sensitive receptor locations within the study area. The modelling assessment was undertaken in accordance with DEFRA guidance. Changes in pollutant concentrations were determined and the impact of the development on local air quality at identified human receptors was predicted to be '*negligible*' overall and therefore *'not significant'* in accordance with IAQM and EPUK guidance.

Operational phase road traffic emissions assessment - ecological receptors

Critical level

9.205. A critical level assessment was undertaken to consider the impact of the HNRFI on ecological designations within the study area. In accordance with DMRB guidance, transect points were modelled within each of the designations. Concentrations of NOx

were predicted and compared to the NOx critical level for ecosystems. Exceedances of the critical level were predicted at Shawell Wood, Martinshaw Wood and Piper Wood AWs and the Kettle Brook LNR. These results have been referred to the appointed ecological consultants for their assessment of the significance of this exceedance.

Critical loads

9.206. A critical load assessment for nitrogen deposition was also undertaken to consider the impact of the HNRFI on the designated sites within the study area. Transects were modelled within each designation, in accordance with DMRB guidance. The percentage increase in nitrogen critical loads, as a result of the development, was calculated for 2026 Opening Year and for 2036 Future Year Without and With HNRFI scenarios. The results of the assessment have been referred to the appointed ecological consultants to determine any potential impact.

Site suitability

9.207. An assessment was undertaken to consider pollutant concentrations across the Main HNRFI Site to consider the exposure of users of the rerouted PRoWs and bridleways to elevated pollutant concentrations. The assessment identified that pollutant concentrations were below the current relevant air quality objectives and therefore no measures are required to minimise exposure of users of the PRoWs or bridleways to air pollution within the Main HNRFI Site.

Rail emissions

9.208. An assessment of the potential effects of rail emissions was undertaken in accordance with DEFRA guidance. It was determined that the HNRFI would not exceed any of the screening criteria detailed for rail locomotives and therefore the impacts on local air quality from rail emissions as a result of the operational development are considered to be '*negligible*' and *'not significant'*.

Operational phase back-up CHP emissions

9.209. An assessment of emissions associated with the proposed back-up CHP was undertaken to consider the impact of emissions on air quality at identified human and ecological receptors. The assessment identified that the back-up CHP would have a '*not significant'* effect on pollutant concentrations at existing human receptors in accordance with IAQM and EPUK guidance.

9.210. No exceedances of the NOx critical level were predicted as a result of emissions associated with the proposed back-up CHP. No increases in nitrogen deposition greater than 1% of the relevant critical load were predicted within any ecological designations considered. It was therefore determined that the back-up CHP associated with the HNRFI would have a 'not significant' effect on ecological designations in accordance with DMRB guidance.

Table 9.42: Summary of environmental effects (air quality)

Potential Effect	Receptor*	Nature of Effect**	Sensitivity of Effect***	Magnitude of Effect****	Significance of Effect^	Mitigation	Residual Effect
Construction							
Dust Soiling from Construction Phase	Local	Short term and Temporary	High	Major	Not defined in accordance with IAQM guidance	Dust Mitigation Measures within CEMP	Not Significant
Dust impact from Construction Phase on Human Health	Local	Short term and Temporary	Medium	Major	Not defined in accordance with IAQM guidance	Dust Mitigation Measures within CEMP	Not Significant
Dust Impacts on Ecological Receptors	Local	Short term and Temporary	High	Major	Not defined in accordance with IAQM guidance	Dust Mitigation Measures within CEMP	Not Significant

Potential Effect	Receptor*	Nature of Effect**	Sensitivity of Effect***	Magnitude of Effect****	Significance of Effect^	Mitigation	Residual Effect
Emissions from Construction Traffic on Human Health	Local	Short term and Temporary	High	Not Defined	Negligible	CTMP to route deliveries away from densely populated areas where practicable and consolidate deliveries to minimise vehicle trips.	Not Significant
Emissions from Construction Traffic on Ecological Receptors	Local	Short term and Temporary	Please see Chapter 6.1.12: *Ecology and Biodiversity* for the assessment of ecological receptors.				
Operation							
Emissions from HNRFI Traffic on Human Health	Local	Long term and Permanent	High	Not Defined	Negligible	Comprehensive package of on and off-site transport improvements; Sustainable Transport Strategy, Travel Plan and EV charging	Not significant

Potential Effect	Receptor*	Nature of Effect**	Sensitivity of Effect***	Magnitude of Effect****	Significance of Effect^	Mitigation	Residual Effect
Emissions from HNRFI Traffic on Ecological Receptors	Local	Long Term and Permanent	Please see Chapter 6.1.12: *Ecology and Biodiversity* for the assessment of ecological receptors				
Emission from proposed back-up CHP on Human Health	Local	Short Term and Temporary	High	Not Defined	Negligible	None	Not Significant
Emission from proposed energy centre on Ecological Receptors	Local	Short term and temporary	Please see Chapter 6.1.12: *Ecology and Biodiversity* for the assessment of ecological receptors				

** International; United Kingdom; England; Regional; County; Borough; Local.*

*** Permanent or Temporary/Direct or Indirect.*

**** High, Moderate or Low.*

***** Major, Moderate, Minor or Negligible.*

^ Major, Moderate, Minor or Negligible/Adverse or Beneficial.