M54 to M6 Link Road

TR010054

Volume 8

8.2 DMRB Updates and the Impact on the DCO Application

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

July 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M54 to M6 Link Road

Development Consent Order 202[ ]

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1 Introduction

1.1 Background

1.1.1 Highways England is developing a link road between the M54 and M6 to provide a link between Junction 1 of the M54, M6 North and the A460 to Cannock. The M54 to M6 Link Road (herein referred to as 'the Scheme') aims to reduce congestion on local / regional routes, particularly the A449 and A460 and deliver improved transport links to encourage the development of the surrounding area.

1.1.2 The likely environmental impacts and effects resulting from the Scheme during construction and operation are reported in the Environmental Statement (ES) [TR010054/APP/6.1] submitted as part of the Development Consent Order (DCO) application for the Scheme.

1.2 Purpose of this report

1.2.1 This report documents alterations to the content of the ES and associated documents as submitted to the Planning Inspectorate on 30 January 2020.

Sensitivity test

1.2.2 The Design Manual for Roads and Bridges (DMRB) is the recognised standard guidance for design, assessment and operation of trunk roads in the United Kingdom. Updated methodologies for the environmental assessment of road schemes as outlined in the DMRB were published between July and November 2019.

1.2.3 Appendix 4.5 of the ES [APP-164/Volume 6.3] outlines the key changes in methodology between the superseded methodologies reported in the scoping opinion and those used to undertake the environmental impact assessment as reported in the ES. Despite the timing of the updated DMRB the majority of the assessments reported in the ES were undertaken using the latest methodology.

1.2.4 The new DMRB standards for air quality and noise and vibration assessment were published 28 November 2019. Due to the complexity of these assessments and the timing of the published changes, it was not possible to update the assessment to take into consideration the latest methodology prior to submission of the DCO application, without incurring a substantial delay to the Scheme.

1.2.5 In order to test whether the results of the air quality and noise and vibration assessment (as reported in the ES) would alter when assessed using the new DMRB standards (LA 105 and LA 111), sensitivity tests, and where appropriate further assessment, have been undertaken. This report is intended to summarise the results of this work and report where changes to these assessments would result in alterations to other aspects of the ES and DCO application.

Other updates

1.2.6 Comments regarding the assessment of Agricultural soils were received from Natural England on the 24 January 2020. The majority of these were able to be addressed within the submission to PINS on 30 January, however minor updates to

Appendix 9.2: Agricultural Land Survey [AS-033] have been undertaken to address outstanding comments.

1.2.7 Chapter 8: Biodiversity [AS-025] has been updated to correct a formatting issue with paragraph numbering to avoid confusion.

1.2.8 Annex E: Natural England Screening Consultation Response of the Habitat Regulations Assessment (HRA) [AS-035] was omitted from the version of the report submitted to the Inspectorate in January 2020. This annex has been included in version 2 of the HRA submitted to the Inspectorate on 29 May 2020.

1.2.9 Appendix 8.2: Biodiversity Metric Calculation [AS-032] Table 3.9: Phase 1 habitat areas. The area of broadleaved plantation which was not included as part of the metric calculation has been updated from 2.53 ha to 3.09 ha at the table. This reflects the actual calculation undertaken and the assessment reported in the Environmental Statement. 2.53 ha was an error.

1.2.10 At the request of the Inspectorate Figure 13.1 [APP-151/Volume 6.2] has now been split into four figures, Figure 13.1 [AS-027] and Figures 13.1A to C [AS-028 to 030] to better present the information.

1.2.11 Outline Environmental Management Plan [AS-042] has been updated to reflect an error in Version 1. Table 3.4, D-BIO11, column 6 (Assumption on which the action is based). Text updated from “ES assumes loss of 2.53 ha of ancient woodland.” To “ES assumes loss of 3.09 ha of ancient woodland”. This reflects the assessment as reported in Chapter 8: Biodiversity of the ES. An error in the cross referencing to draft DCO Requirements has also been corrected.

1.2.12 The documents reported above have been revised and updated versions submitted to the Inspectorate on 29 May 2020. All other changes are only reported here-in, with no associated update of documents. The Guide to Documents to be Certified [AS-005/ Volume 1.5] provides a list of all documents submitted to date, including revised version numbers for the above documents.

1.2.13 The applicant has also requested a change to the DCO application to remove a small area of the Order limits located along the M54 in Shropshire. This area was included to change a road sign along the existing M54 corridor. That sign no longer requires amendment so this area is proposed for removal, which required removal of this area of the Order limits from the following documents:

- Location Plan
- Land Plans
- Crown Land Plans
- Works Plans
- General Arrangement Plans
- Special Category Land Plans
- Streets, Rights of Way and Access Plans
- Traffic Regulation Measures Plan

- Classification of Roads Plans
- Outline Drainage Works
- Statement of Reasons
- Book of Reference
- Consultation Report
- Case for the Scheme
- Environmental Statement, Figure 2.8.

1.2.14 Revised versions of the above documents were submitted to the Inspectorate on 29 May 2020 for the Examining Authority to review when considering whether to accept the change. There were no environmental impacts associated with the change to the road sign so the change does not affect the environmental impact assessment or its conclusions beyond the removal of the area of the Order limits from Figure 2.8.

2 Methodology

2.1 Air Quality

2.1.1 A review of the changes in the prediction and assessment methodology in the updated DMRB guidance, LA 105, has been completed to determine the likely impact on the results of the air quality assessment reported in Chapter 5: Air Quality of the ES [APP-044/Volume 6.1]. This review identified that the main points of difference between the superseded DMRB methodology (HA207/07 and the associated interim advice notes) and LA 105 are as follows:

- The change in screening criteria to define the air quality study area.
- The changes to speed bands and emission rates.
- The changes to conversion rates of nitrogen dioxide (NO_2) to dry nutrient nitrogen deposition rate for ecologically designated sites.
- The additional ecological site designations to be considered as part of the air quality assessment.
- Changes to the assessment of compliance with EU Limit Values.

2.1.2 A series of sensitivity tests were devised to test whether these updates to the air quality assessment methodology would alter the impacts and effects as reported in Chapter 5: Air Quality of the ES and where applicable other ES chapters (in particular Chapter 8: Biodiversity) and DCO application documents. The methodologies for these sensitivity tests are outlined in this section.

Study area test

2.1.3 The screening criteria used to identify the roads that make up the operational air quality study area (Affected Road Network (ARN)) have changed between HA207/07 and LA 105. There is the potential that the study area for the Scheme could therefore be different and include areas that were not considered as part of the ES. To establish any differences in the study area that could occur as a result of the new screening criteria set out in LA 105, the Scheme traffic data has been re-screened, based upon the new LA 105 criteria. To enable the reassessment, the traffic data was reformulated to account for the change in speed band classifications as set out LA 105 (based upon the same pivoted speeds as the data used to inform the assessment as reported in the ES). The wider implication of the LA 105 speed bands to the assessment reported in the ES were considered separately in this note, refer to paragraph 3.1.5. Table 1 outlines the change to the methodology for determining the ARN.

Table 1: Criteria for defining the ARN using DMRB superseded HA207/07 and new guidance LA 105

Criteria for including roads within the air quality study area		
HA207/07	**LA 105**	**Difference in methodology**
Road alignment will change by 5 m or more	Road alignment will change by 5 m or more	No change

Criteria for including roads within the air quality study area		
HA207/07	**LA 105**	**Difference in methodology**
Annual average daily traffic (AADT) flows will change by 1,000 or more	AADT flows will change by 1,000 or more	No change
Heavy duty vehicle (HDV) flows will change by 200 AADT or more	HDV flows will change by 200 AADT or more	No change
Daily average speeds will change by 10 km/hr or more	A change in speed band	Alteration to methodology
Peak hour speed will change by 20 km/hr or more		

2.1.4 A risk review was carried out to establish the likelihood of significant effects on air quality being reported should any additional links be included in the air quality study area. This process followed the steps set out below:

- Identifying whether there are any sensitive receptors present within 200 m of the new road links, and how close they are to them.
- Identifying the traffic changes on the links and whether they are likely to result in a notable increase or decrease in emissions from the links.
- Using modelled receptors that are near to, or in a similar environment to, those on these two road links to estimate the likely pollutant concentrations and concentration changes at the identified additional sensitive receptors.

Speed bands and emission rates

2.1.5 For the purposes of conducting the operational air quality assessment, traffic behaviour on links is categorised into 'speed bands' – determined primarily by the average speed of traffic. The speed band informs the emission factors attributed to the traffic on the road via the Speed Band Emission Factors Tool (SBEFT) which takes inputs in terms of traffic flow, composition and speed band and returns the emission rate (in g/km/s) of the road which is then used as an input to the air quality modelling.

2.1.6 LA 105 includes updated speed band categories and an amended approach to categorising links into speed band categories to that published in IAN185/15, with the latter used to inform the ES. To accompany LA 105 and the updated speed band categories and approach, an updated SBEFT has also been released by Highways England.

2.1.7 This sensitivity test considered emissions within the ARN calculated using the new speed band categories, approach and SBEFT, compared to the emissions calculated to inform the operational air quality assessment reported in the ES. The test focuses on emissions of NO_x which are used to calculate concentrations of NO_2.

2.1.8 The sensitivity test considers these changes for the baseline situation and model verification and also the future situation without the Scheme (Do-Minimum) and with the Scheme (Do-Something).

Nitrogen deposition rates

2.1.9 The assessment of air quality impacts on designated habitats in the form of impacts from nitrogen deposition forms part of the air quality assessment. The updated DMRB guidance, LA 105, specifies new conversion rates of NO_2 concentrations to nitrogen deposition (Ndep) that differ to that specified by the superseded HA207/07. HA207/07 stated that "*Dry NO_2 deposition rates should be estimated using… 1 µg/m^3 of NO_2 = 0.1 kg N ha^{-1} yr^{-1}*", while LA 105 provides the following conversion rates:

- "grassland and similar habitats: 1 µg/m^3 of NO_2 = 0.14 kg N/ha/yr;
- forests and similar habitats: 1 µg/m^3 of NO_2 = 0.29 kg N/ha/yr."

2.1.10 In both cases this represents an increased conversion factor, particularly for forests for which the conversion rate has almost tripled. Using these rates, the same predicted NO_2 concentrations as previously modelled would therefore result in higher rates of nitrogen deposition, which increases the likelihood of significant effects at ecological sites, as these effects are determined based on nitrogen deposition with respect to habitat-specific critical loads.

2.1.11 To establish any differences in the results at the ecological sites, nitrogen deposition has been recalculated using the new rates at each of the sites that was modelled for the ES. These sites fall into two categories: statutory national nature conservation designated sites within the air quality study area that were required to be modelled by the superseded HA207/07 guidance; and ancient woodland and veteran trees that were modelled for inclusion in Chapter 8: Biodiversity of the ES [AS-025/ Volume 6.1] by request from Natural England.

2.1.12 The significance of the results of the reassessment was considered using the criteria specified in LA 105, which follows the following process:

1) Calculate the nitrogen deposition for the Do Minimum and the Do Something scenarios.
2) If the total (Scheme plus background deposition) nitrogen deposition in the Do Something scenario is less than the critical load at a site, it is not significant. Otherwise continue analysis.
3) If the change in nitrogen deposition is less than 1% of the (lower bound of the) critical load, it is not significant. Otherwise continue analysis.
4) Identify whether the change in nitrogen deposition could lead to the loss of one species (taking into account the air quality attribute for the site).
   a) For most sites the air quality attribute will be set to 'restore' and the lowest change in nitrogen deposition which would bring about a loss of one species regardless of background nitrogen deposition should be used.
   b) The lowest change in nitrogen deposition which would bring about the loss of one species is habitat dependent. Where information is not available for the habitat in question, the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, should be used. As reported in Chapter 8: Biodiversity of the ES

[AS-025/Volume 6.1], this habitat is either Upland Heath TU 2009 or Lowland Heath TU 2009, both of which are listed at 0.4 kg N ha^{-1} yr^{-1}.

c) Therefore, if the change in nitrogen deposition is less than 0.4 kg N ha^{-1} yr^{-1}, for all habitats apart from nutrient impoverished sand dunes, it is not significant. Otherwise continue analysis.

5) Conduct site investigation and identify whether there are species located in the area which could be lost due to the identified nitrogen deposition change. If there are not, it is not significant. Otherwise continue analysis.

6) Finally, if a project air quality action plan can mitigate the impact of the project such that the loss of one species is not triggered, it is not significant. Otherwise the impact is significant.

2.1.13 For the purposes of this assessment, where specific information on the air quality attribute of a special site of scientific interest (SSSI) is not available, the overall condition of the SSSI (based on information publicly available on Natural England's website https://designatedsites.naturalengland.org.uk) has been used to define whether the air quality attribute for that site is restore or maintain. Where a site is in unfavourable condition the air quality attribute has been assumed to be restore. Where a site is in favourable condition the air quality attribute has been assumed to be maintain.

2.1.14 Where the air quality attribute or condition for a site is not available (for example ancient woodlands or locally designated sites), an assumption has been made, following LA105, that the sites air quality attribute is restore.

2.1.15 For the purposes of this sensitivity test therefore the two important indicators for significance are whether the change in nitrogen deposition exceeds 1% of the critical load, and further, whether it is ≥0.4 kg N ha^{-1} yr^{-1}.

Nitrogen deposition – new sites

2.1.16 In addition to the modified conversion rates detailed in paragraph 2.1.9, the updated DMRB guidance LA 105 requires all the sites specified under HA207/07, in addition to local nature reserves (LNRs), local wildlife sites (LWS), nature improvement areas (NIAs), ancient woodlands and veteran trees within 200 m of the ARN to be modelled. Some of these additional sites (ancient woodland and veteran trees within 2 km of the Scheme) have already been modelled and the assessment reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1] at the request of Natural England and are therefore covered by the sensitivity test detailed in paragraphs 2.1.9 and 2.1.13.

2.1.17 A desk study was undertaken to identify sites meeting the LA105 ecological site criteria within the air quality study area. The first step of review was to undertake screening to identify potential for significant adverse effects, on the basis of the level of traffic change at those sites, compared to the level of traffic change known to have resulted in a change in nitrogen deposition at previously modelled sites assessed and reported in the ES [TR010054/APP/6.1].

2.1.18 Where the increase in AADT is higher than 2,000 vehicles, a speed band change occurs, and/or the site falls outside the general verification zone, these sites were

analysed further, considering emission changes, distance to road and nitrogen sensitivity (critical load). Sites modelled for the ES have been used as a comparative tool to assess the likely impact on new sites.

Compliance with limit values

2.1.19 The approach to the consideration of compliance of a scheme with the EU Ambient Air Quality Directive has changed with the publication of LA 105. The guidance requires not only the reporting of changes in air quality and relating them to Defra's Pollution Climate Mapping (PCM) model (which considers compliance at a point 4 m from the road) but also reporting compliance at "qualifying features" which may be closer to the road than 4 m, and therefore at greater risk of non-compliance.

2.1.20 Qualifying features include residences, schools and hospitals that have already been modelled at worst case exposure along the ARN, including where it intersects links of the PCM model. However, qualifying features also include areas of public access, for example roadside footpaths, which have not been modelled, and are likely to be the areas where the qualifying features are very close to the roadside.

2.1.21 A risk review was carried out to establish the likelihood of a high compliance risk being reported had the new compliance assessment been followed for the ES. This process followed the steps set out below:

- Identifying all PCM model links that are at least partially within 200 m of the ARN;
- Identifying any qualifying features on each road link and their distance to the roadside; and
- Using modelled receptors that are close by, modelled concentrations and the PCM model predictions, to estimate the risk of compliance impacts at each identified road link using the new process set out in LA 105.

2.2 Noise and Vibration

2.2.1 A review of the changes in the prediction and assessment methodology in the updated version of DMRB, LA 111, has been completed to determine the likely impact on the results of the noise and vibration assessment reported in Chapter 11: Noise and Vibration of the ES [APP-050/Volume 6.1] (Revision 1). This review identified that while the overall picture in terms of traffic noise changes would be unlikely to be considerably different, the detail of the impacts and residual effects reported in Chapter 11: Noise and Vibration of the ES would potentially alter when utilising the latest methodology. The main reason for reaching this conclusion is the change from the use of banded traffic speeds to pivoted traffic speeds. The previous version of DMRB assigned each link one of a limited number of speeds based on the band within which the pivoted speed fell. The new version of DMRB uses the pivoted speeds directly, which has the potential to slightly change the predicted traffic noise levels. In addition, further clarity on identifying significant operational traffic noise effects is provided in the revised DMRB.

2.2.2 The assessment has therefore been updated using the new standard, DMRB LA 111 Noise and Vibration. However, given the advanced stage of the Scheme a worst case approach to the reporting of the impacts of the Scheme, which is consistent

with all the previous stages of assessment, has been adopted. Therefore, the requirement of LA 111 to report the impact at each receptor based on the façade with the greatest magnitude of noise change, rather than at the worst affected façade as per the previous version of DMRB, has not been adopted. Chapter 11: Noise and Vibration of the ES has been revised and is provided with this Note. The methodology used to undertake the assessment is therefore reported in Chapter 11: Noise and Vibration, Version 2.

3 Alterations to the Environmental Statement

3.1 Air Quality

3.1.1 This technical note has considered how the changes to the DMRB guidance from HA207/0 to LA 105 would have impacted the conclusions of the air quality chapter of the M54 to M6 Link Road ES [APP-044/Volume 6.1] had they been incorporated. As outlined in Section 2 the main specific points of difference between the superseded HA207/07 and LA 105 are:

- The change in screening criteria to define the air quality study area.
- The changes to speed bands and emission rates.
- The changes to conversion rates of nitrogen dioxide (NO_2) to dry nutrient nitrogen deposition rate for ecologically designated sites.
- The additional ecological site designations to be considered as part of the air quality assessment.
- Changes to the assessment of compliance with EU Limit Values.

3.1.2 A summary of the key findings of the sensitivity tests undertaken on the air quality assessment presented in Chapter 5: Air Quality of the ES [APP-044/Volume 6.1] are outlined below. Further details of the air quality sensitivity test are provided in Appendix A of this report.

Construction

3.1.3 The changes to the guidance regarding the construction phase assessment were not considered to be likely to alter the overall findings of the air quality assessment as presented in Chapter 5: Air Quality of the ES [APP-044/Volume 6.1].

Operation

Study Area

3.1.4 Taking into consideration the screening criteria set out in LA 105, the sensitivity test of the operational study area demonstrated that the operational air quality study area would have been slightly larger, with two extra road links included in the ARN. This enlargement of the study area is not expected to result in any significant effects as emission concentrations at receptors modelled in the vicinity of these links suggest concentrations of NO_2 will be below the air quality objective, 40 µg/m^3.

Speed bands and emission rates

3.1.5 The sensitivity test considering the changes to speed banding and emission rates in the assessment of operational air quality impacts found that the emissions calculated at the links and modelled pollutant concentrations (which are a direct result of those emissions) would be different due to the use of new speed banding categories at motorways, and an update to the SBEFT. The level of effect on road links vary depending on the link type, speed and proximity to junctions. The potential effect on sensitive receptors will depend on these and the proximity of those receptors to the road links. However, it is not anticipated that the changes resulting from the new speed band categories and updated emission factors would affect the

overall evaluation of significance for the Scheme. The Scheme would not result in a significant effect on air quality.

Nitrogen deposition

3.1.6 Using the updated formula for the calculation of nitrogen deposition it was concluded that the reported nitrogen deposition rate at modelled ecological sites would be higher than was reported in Chapter 8: Biodiversity of the ES due to the increase in dry nitrogen deposition rates. Changes to the assessment reported in Chapter 8: Biodiversity of the ES are outlined in Section 3.5 of this report.

3.1.7 The desk study exercise identified an additional 84 ecologically designated sites which would have been required to be modelled as receptors as part of the operational air quality assessment. At the majority of these sites neutral effects are anticipated because changes in traffic flows in the surrounding areas are small or are reductions in flows. There is the potential for additional significant adverse effects on two areas of ancient woodland. Refer to Section 3.5 of this report for the impact these changes would have on Chapter 8: Biodiversity of the ES [AS-025/ Volume 6.1]. Appendix A of this report provides further details of the assessment including the critical load for each site, the distance from the ARN and the change in traffic flows resulting from the Scheme.

Compliance with limit values

3.1.8 The sensitivity test confirmed that changes to the way that EU limit value compliance is considered in LA 105 would not result in the reporting of non-compliance for the Scheme. The Scheme remains compliant with the EU Ambient Air Quality Directive.

Summary of the air quality sensitivity test

3.1.9 In conclusion it is anticipated that LA 105 would not have resulted in the reporting of significant effects for human health or compliance with air quality limit values. However, the revised methodology would have resulted in differences in the reporting of operational impacts on ecologically designated sites. Refer to Section 3.5 of this report for further details of how the results of the air quality sensitivity test would alter the biodiversity assessment reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1].

3.2 Noise and Vibration

3.2.1 The assessment has been updated in line with the new standard, DMRB LA 111 Noise and Vibration. Chapter 11: Noise and Vibration of the ES has been revised and a new version (Version 2) submitted to the Planning Inspectorate with this Note. A revised Appendix 11.3: Construction Phase Noise Predictions (Version 2), Appendix 11.4: Noise Modelling Details (Version 2) and Figures 11.1 to 11.5 have also been updated and submitted to the Planning Inspectorate with this Note. A new appendix, Appendix 11.5: Affected Routes Beyond 600 m has been submitted with this Note to the Planning Inspectorate. This appendix outlines the results of Basic Noise Level calculations and counts of residential and non-residential receptors within 50 m of 'affected routes' outside of the 600 m calculation area. The equivalent information was previously included within the main chapter (Version 1) but has been moved to a separate appendix to improve the readability of the chapter.

3.2.2 A summary of the key points of comparison between Version 1 and Version 2 of Chapter 11: Noise and Vibration of the ES is provided below. Further details on these changes, and also details of other minor changes which do not affect the results and conclusions of the assessment, are provided in Appendix B of this report.

- No new or materially different significant effects have been identified with regard to construction noise, construction vibration or construction traffic.
- Removal of the assessment of operational traffic vibration impacts, which is scoped out of the revised DMRB.
- Removal of the assessment of operational traffic noise annoyance impacts which is no longer included in the revised DMRB.
- The change from banded to pivoted speeds does not result in large changes to the predicted traffic noise levels with and without the Scheme in operation. There is, therefore, no change to the overall picture of significant adverse operational traffic noise effects at Hilton Lane and The Bungalow at Brookfield Farm, and significant beneficial effects along the existing A460 bypassed by the Scheme. However, the change from banded to pivoted speeds does result in some slight changes to traffic noise levels, which, in combination with the further clarity on identifying significant effects provided in the revised DMRB, results in some changes to the significance of effect at a small number of receptors.
  - The total number of significant adverse operational traffic noise effects along the Scheme is increased from two to six (The Bungalow at Hilton Farm and five properties on Hilton Lane) and the total number of significant beneficial effects on the existing A460 from 18 to 32.
  - The significant adverse effect at 197 residential buildings on the section of the existing A460 south of the M54 identified as an ‘affected route’, is removed.
  - The Dark Lane barrier is increased in height from 3.0 m to 4.0 m, and the Brookfield Farm barrier from 2.5 m to 3.0 m.
- The significant beneficial operational traffic noise effect at 11 residential properties along the ‘affected route’ Old Stafford Road is unchanged.
- At all other receptors in the study area the operational traffic noise effect of the Scheme remains not significant.
- No changes to the conclusions with regard to demonstrating compliance with policy, for both construction and operation, have been made.

3.3 Cultural Heritage

Air quality

3.3.1 The assessment of construction impacts on cultural heritage assets does not rely on the results of the air quality assessment. No alterations to Chapter 6: Cultural Heritage of the ES [APP-045/Volume 6.1] are required in relation to air quality.

Noise and vibration

3.3.2 The proposed noise mitigation and results of the noise and vibration assessment inform the assessment of impacts on listed buildings and the historic landscape during construction and operation of the Scheme, as reported in Chapter 6: Cultural Heritage of the ES [APP-045/Volume 6.1].

3.3.3 Paragraphs 6.9.13, 6.9.16, 6.9.23, 6.9.31, 6.9.41 of the ES consider noise levels as part of the construction impact on heritage assets. Paragraphs 6.9.45, 6.9.46, 6.9.49, 6.9.51 of the ES consider noise levels as part of the operation impact on heritage assets. The results reported in the updated Chapter 11: Noise and Vibration do not alter the assessment as reported in Chapter 6: Cultural Heritage of the ES [APP-045/Volume 6.1].

3.3.4 No changes to Chapter 6: Cultural Heritage of the ES [APP-045/Volume 6.1] are required in response to the updated Noise and Vibration chapter or air quality sensitivity test.

3.4 Landscape and Visual

Air quality

3.4.1 The assessment of construction impacts on landscape and visual receptors does not rely on the results of the air quality assessment.

Noise and vibration

3.4.2 The proposed noise mitigation and results of the noise assessment where appropriate inform the assessment of visual impacts during construction and operation of the Scheme, as reported in Chapter 7: Landscape and Visual of the ES [APP-046/Volume 6.1].

3.4.3 Construction noise is considered in Table 7.12 of the ES. No changes are required in response to the updated Noise and Vibration chapter.

3.4.4 Operational noise and the location and height of noise barriers are considered as part of the assessment of visual impacts reported in Table 7.14. The discussion on the impact on Viewpoint 11 and Viewpoint 14 requires minor amendments to the text to accommodate the change in noise barrier height at Brookfield Farm and Dark Lane. However, the magnitude of impact and therefore significance of effect as reported in Chapter 7: Landscape and Visual remain unchanged. Minor changes to the impact of the Scheme on Viewpoint 11 and 14 are outlined below.

3.4.5 Viewpoint 11: View from PRoW east of Brookfield Farm

"Year 1 of operation: Changes to the view would be apparent across the full extent of the foreground. The receptors' proximity to the Scheme means that the scale would be large, although the Scheme would be in a cutting, obscuring most cars and lorries from the view. Receptors would be able to see the western side of the cutting, as well as associated landscape mitigation which would not have matured by Year 1. The noise barrier at the western side of the cutting would also be visible in the left of the view, at 3m tall, as would the start of the ramp taking the diverted Shareshill Bridleway 1 over the accommodation bridge. The impact would be

permanent and long term. Overall, the magnitude of change for recreational receptors would be major.

Year 15 of operation: Landscape mitigation would be maturing, screening views of the Scheme and reducing visibility of vehicles travelling along it, as well minimising views of the western embankment of the cutting (and associated infrastructure such as the noise barrier and the accommodation bridge). The large scale of the Scheme and location in the foreground of the view means that receptors would remain aware of the change in landform, with increased noise levels affecting perceptions of tranquillity. The magnitude of change would reduce to moderate for recreational receptors."

3.4.6 Viewpoint 14: View from houses on Dark Lane and Park Road

"Year 1 of operation: The full extent of the view would be affected by the Scheme from the foreground into the distance. The scale of change within it would be large. The Scheme at this point is approximately at grade with a slight cutting, with a ~~3 m~~ 4 m high noise barrier obstructing the majority of the views towards the Scheme/ vehicles using the Scheme. In the left of the view, the borrow pit would have been restored, replaced by landscape mitigation planting and views of vehicles using the Scheme would be seen where the noise barrier ends. The change in traffic noise level is not anticipated to affect perceived tranquillity. Landscape mitigation would not have matured by Year 1, and the impact of the Scheme would be both permanent and long term. The magnitude of change within the view for residential and highway receptors would be major.

Year 15 of operation: Views towards the Scheme ~~would be filtered and partially screened by maturing landscape mitigation, which would also filter views of moving vehicles~~. would continue to be screened by the noise barrier across much of the view, with landscape mitigation filtering and partially screening these views in the remainder of the panorama. The change in traffic noise level is not anticipated to affect perceived tranquillity. The magnitude of change would reduce to moderate for residential and highway receptors."

3.4.7 The conclusions of the landscape and visual assessment reported in Chapter 7 of the ES remain as outlined in the Environmental Statement [APP-046/Volume 6.1].

3.5 Biodiversity

Air quality

3.5.1 The results of the air quality assessment where appropriate inform the assessment of impacts on biodiversity during construction and operation of the Scheme, as reported in Chapter 8: Biodiversity of the ES [APP-047/Volume 6.1]. The paragraph numbering referred to in Section 3.5 refers to the updated paragraph numbers in Version 2 of the Biodiversity chapter [AS-025/Volume 6.1].

Construction

3.5.2 Assessment of the potential impact on habitats resulting from the deposition of dust during construction of the Scheme is reported in paragraph 8.9.46 of the ES. No alterations to the construction assessment reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1] are required in relation to air quality.

Operation

3.5.3 The results of the air quality assessment are utilised for the operational assessment of impacts on international, national and locally designated sites and habitats (including Local Wildlife Sites (LWS), ancient woodland and veteran trees), as reported in Chapter 8: Biodiversity of the ES.

Designated sites of national importance

3.5.4 There are no changes to the conclusions of the operational assessment of impacts on SSSIs (designated sites of national importance), paragraph 8.9.127 of the ES, as a result of using the revised DMRB, LA 105 Air Quality. The reasoning for the designation of these sites and their relationship to the Scheme is provided in Table 8.8 of the Environmental Statement [AS-025/Volume 6.1]. A reduction in the concentration of NO_x at Belvide Reservoir SSSI is still anticipated, resulting in no perceptible change in nitrogen deposition and therefore an effect of neutral significance as reported in the ES [AS-025/Volume 6.1] is maintained. The interest features of Four Ashes Pit SSSI and Stowe Pool and Walk Mill Clay Pit SSSI are not sensitive to nitrogen deposition and the nitrogen dose at Chasewater and the Southern Staffordshire Coalfield Heaths SSSI will remain below 1% of the critical load. As reported in Chapter 8: Biodiversity the ES [AS-025/Volume 6.1], no significant effects on SSSIs are anticipated during operation of the Scheme.

Non-statutory designated sites and ancient woodland

3.5.5 The updated guidance would not result in a change to the conclusions of the assessment of operational impacts on ancient woodland within the Brookfield Farm Site of Biological Importance (SBI) and Local Wildlife Site (LWS), although the extent of the impact would increase. The reasoning for the designation of these sites and their relationship to the Scheme is provided in Table 8.8 of the Environmental Statement [AS-025/Volume 6.1]. Using the conversion rates in LA 105, the maximum nitrogen dose would increase from 0.6 kg N ha^{-1} yr^{-1} (at the edge of the site) (+≥0.4 kg N ha^{-1} yr^{-1} up to 30 m from the site edge) as reported in the ES, to 1.7 kg N ha^{-1} yr^{-1} (at the edge of the site) (+≥0.4 kg N ha^{-1} yr^{-1} across the remainder of the 0.53 ha of ancient woodland). Taking into account direct and indirect losses of ancient woodland during the construction period, (including the buffer zone of 15 m from construction works) 0.078 ha of ancient woodland was considered to be impacted by nitrogen deposition in the ES, with LA 105 this increases to 0.54 ha. The increases in nitrogen deposition could result in shifts in species richness, percentage cover and changes in growth rates of certain species rather than total habitat loss. A reduction in species richness does not necessarily mean that species are 'lost' from the woodland, but rather that they may occur with reduced frequency. Given that the increased nitrogen deposition will not result in loss of the woodland but is likely to negatively affect some of the key characteristics of the woodland, the impact would be moderate adverse. As such an effect of moderate adverse significance as reported in paragraph 8.9.141 of the ES [AS-025/Volume 6.1] is still considered appropriate.

3.5.6 For Oxden Leasow (Whitgreaves Wood) ancient woodland using the revised NO_2 conversion rates the maximum nitrogen dose would increase from 0.3 kg N ha^{-1} yr^{-}

[1], (at the edge of the site only) as reported in the ES, to 0.9 kg N ha^{-1} yr^{-1} (at the site edge) (+≥0.4 kg N ha^{-1} yr^{-1} up to 30 m from the site edge). The increased nitrogen deposition would impact up to 0.33 ha of the 1.36 ha woodland. This increase in nitrogen dose between 0.04 kg N ha^{-1} yr^{-1} and 0.9 kg N ha^{-1} to yr^{-1} would trigger a one species change and negatively affect some of the key characteristics of the woodland, the impact of which would be moderate adverse. The significance of effect would change from not significant (as reported in paragraph 8.9.143 of the ES) to an adverse effect of moderate significance.

3.5.7 A total of 0.87 ha of ancient woodland would be impacted by increased nitrogen deposition across Brookfield Farm and Oxden Leasow ancient woodlands, this is an increase from the 0.078 ha reported in the ES. To compensate for this impact, woodland planting at a ratio of 1:1 (0.87 ha of woodland) within the immediate vicinity of the Brookfields Farm LWS and SBI woodland would be provided. This is a departure from the 7:1 ratio referenced in the ES to compensate for the impact on ancient woodland due to nitrogen deposition (0.078 x 7= 0.546 ha). It is considered the assumption of total loss of ancient woodland through increased nitrogen deposition was overly precautionary and like for like replacement is more proportionate to the effect on these woodlands. Direct and indirect loss of ancient woodland during the construction phase would still be compensated for at a 7:1 ratio. Refer to Table 2 to illustrate how the total area of compensation planting was calculated. These findings and the compensation proposed have been sent to Natural England for discussion.

Table 2: Calculation of ancient woodland compensation area

Ancient woodland loss and compensation	Area in hectares (ha)	
	As Reported in ES	LA 105
Direct loss (Brookfield Farm - BF)	0.0015	0.0015
Direct loss (Oxden Leasow - OL)	0	0
Indirect loss (15m Buffer) BF	0.04	0.04
Indirect loss (15m Buffer) OL	0.32	0.32
Total direct and indirect loss (BF+OL)	0.3615	0.3615
Area impacted by nitrogen deposition BF	0.078	0.54
Area impacted by nitrogen deposition OL	0	0.33
Total area impacted by nitrogen deposition (BF + OL)	0.078	0.87
Area of compensation for loss of AW (7:1 ratio)	2.5305	2.5305
Area of compensation for impact of nitrogen deposition	0.546 (7:1 ratio)	0.87 (1:1 ratio)
Total area of ancient woodland compensation planting	**3.08**	**3.39**

3.5.8 The assessment of impacts would not change for any other ancient woodlands assessed and reported in Chapter 8: Biodiversity of the ES, paragraphs 8.9.144 to 8.9.145. The change to the NO_2 conversion rates would not alter the conclusion that the remaining sites of ancient woodland within 2 km of the Scheme (Essington Wood, Beech Head, Keeper's Wood, Spring Coppice, Burns Wood (west) and Burns

Wood (east)) would not experience an additional nitrogen dose above 1% of the critical load and/or above the lowest dose identified in LA 105 as likely to affect species richness except in sand dunes (0.4 kg N ha^{-1} yr^{-1}).

3.5.9 The Biodiversity chapter identifies two veteran trees (T137 and T221) that would experience nitrogen deposition rates above 0.4 kg N ha^{-1} yr^{-1}. However, paragraph 10.9.137 of the ES concludes that '*Given the location of these trees, surrounded by busy roads, they are already well in excess of the 10-20 kg N ha-1 year-1 critical load identified (48.5 kg N ha-1 year-1) and therefore the slight increase in deposition is not considered to have any more than a minor adverse impact, resulting in an effect of slight significance*'. Using LA 105 a greater number of veteran trees (seven rather than two) would be subject to nitrogen deposition doses due to the Scheme which exceeded 0.4 kg N ha^{-1} yr^{-1}, up to a maximum of 0.8 kg N ha^{-1} yr^{-1}. However, the same conclusion would be drawn as for trees T137 and T221; nitrogen deposition critical loads were never intended to apply to individual plants rather than to habitats, and the species richness metric from which the 0.4 kg N ha^{-1} yr^{-1} dose is derived is not applicable to solitary veteran trees where only one higher plant species is involved. Moreover, the botanical effects of nitrogen deposition on tree growth and health are subtle and tree survival is unlikely to be affected. The effect would therefore remain not significant for veteran trees as reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1].

Additional biodiversity sites

3.5.10 Under the superseded DMRB guidance for air quality assessment there was previously no requirement to assess the impact of nitrogen deposition on local nature reserves, locally designated sites, nature improvement areas, ancient woodland or veteran trees. However, the revised guidance LA 105 requires the assessment of these sites when located within 200 m of the ARN. Following a request from Natural England ancient woodland and veteran trees identified in the biodiversity study area (2 km from the Scheme boundary) were included in the assessment of air quality impacts on biodiversity sites reported in Chapter 8: Biodiversity. Any changes to the assessment as reported in the ES is outlined above. The following text assesses the likely impacts on those sites not considered in the published ES based on extrapolations from the detailed air quality model.

3.5.11 A desktop study identified an additional LNR, one NIA, six ancient woodlands, 62 locally designated sites and 12 veteran trees within 200 m of the ARN which were analysed using comparable data from other nearby sites that had been subject to detailed dispersion modelling. The reasoning for the designation of these sites, where known, is provided in Appendix A of this report.

3.5.12 Rough Wood Chase LNR is situated adjacent to the M6, between Junction 10 and Junction 10a. This site is located in an area expected to experience a reduction in AADT flows (with no speed band changes) and therefore there is no risk of a significant adverse effect in this location.

3.5.13 Birmingham and the Black Country NIA covers a large area, within which patches of land are identified and then enhanced for biodiversity e.g. woodland planting or grassland management. No specific areas for such enhancement have been

identified within 200 m of the ARN. Furthermore, where the air quality study area intersects with the NIA is a highly urban area with limited habitat creation potential. It is therefore very unlikely that any change in deposition from the affected roads would compromise the ability of the NIA to achieve its objectives.

3.5.14 Of the six additional ancient woodlands identified, one unnamed ancient woodland located near Burlington Pools LWS is in an area which would experience a reduction in AADT flows (with no speed band changes) and therefore there is no risk of a significant adverse effect in this location. The five remaining ancient woodlands have been analysed further. All five woodlands are affected by traffic changes along the M54, which has an increase in AADT of between 4,000-5,000 vehicles, with no speed band changes. This is a similar traffic change to that seen at the A460 at Stowe Pool and Walk Mill Clay Pit SSSI so this site has been used for direct comparison – likely to be a conservative one because of the exacerbating effect of the M6 very close by to Stowe Pool and Walk Mill Clay Pit SSSI, for which there is no equivalent at the ancient woodlands.

3.5.15 Big Wood ancient woodland and SBI and Biological Alert Site (BAS) would be subject to increased nitrogen deposition as the woodland is located closer to the ARN than Stowe Pool and Walk Mill Clay Pit SSSI used for comparison; the SSSI would experience a change at the site edge of +0.3 kg N ha-1 year-1. The Ndep change is above 1% of the critical load, but below the species change level, and only 0.53 ha of the 135.4 ha woodland (0.39%) would be impacted. With >99% of the woodland not subject to any increased nitrogen deposition, the key characteristics of the woodland would be not be affected; the impact is therefore minor adverse, acknowledging that the impact to ancient woodland is likely to be irreversible. Given the slight adverse effect, no compensation planting would be provided for the impact to Big Wood.

3.5.16 The other four ancient woodland sites identified within 200 m of the ARN are unlikely to experience a significant adverse effect during operation of the Scheme as none would experience an additional nitrogen dose above 1% of the critical load and/ or are below the lowest dose identified in LA 105 as likely to affect species richness.

3.5.17 Based on the criteria set out in LA 105, where the increase in AADT is higher than 2,000, a speed band change occurs, and/or the site falls outside the general verification zone, 62 locally designated sites (LWS, SBI, BAS, Sites of Importance for Nature Conservation (SINC) and Sites of Local Importance for Nature Conservation (SLINC)) were analysed further, considering emission changes, distance to road and nitrogen sensitivity (critical load). This resulted in 28 sites (the impacts on Big Wood SBI and BAS are reported under ancient woodland in paragraph 3.5.15 above) being taken forward for further assessment.

3.5.18 For six locally designated sites: Chillington Estate (semi-improved fields on) SBI, Bone Mill Disused Pools SBI, Hatherton Reservoir (Cheslyn Hay) SBI, Hatherton Pines BAS, Grassy Lane SLINC and Land West of Stafford Road (Site 1) the nitrogen dose is expected to exceed 0.4 kg N ha-1 yr-1 within a relatively narrow belt on the outer edges of the sites. This would result in a moderate adverse impact on a receptor of county importance leading to an effect of slight significance, which is not significant.

3.5.19 For Lower Pool SBI the nitrogen dose is expected to exceed 0.4 kg N ha^{-1} yr^{-1} up to 1.7 kg N ha^{-1} yr^{-1}. This would result in a moderate adverse impact on a receptor of county importance leading to an effect of slight significance, with is not significant. The other locally designated sites identified are unlikely to experience a significant adverse effect during operation of the Scheme as none would experience an additional nitrogen dose above 1% of the critical load and/ or are below the lowest dose identified in LA105 as likely to affect species richness.

3.5.20 Eight of the veteran trees identified south of the A5, in or near Weston Park are located in an area experiencing reducing AADT flows (with no speed band changes) and therefore there is no risk of a significant effect at the veteran trees in this location. The four remaining veteran trees located along the M54 were analysed further as they would experience an increase in AADT of between 4,000 and 5,000 vehicles, with no speed band changes. It is unlikely these veteran trees would experience a significant adverse effect during operation of the Scheme as none would experience an additional nitrogen dose above 1% of the critical load and/ or are below the lowest dose identified in LA105 as likely to affect species richness.

3.5.21 The Habitats Regulations Assessment: No Significant Effects Reports [AS-035/Volume 6.9] considers the impacts on statutory designated sites of international importance. Refer to Section 4.2 of this report for details of how the air quality sensitivity test affected this report.

Air quality and biodiversity: summary

3.5.22 In summary, the application of the new conversion rates for nitrogen deposition outlined in LA 105 has a magnifying effect on the changes in nitrogen deposition reported, whether positive or negative compared to the superseded DMRB guidance. This has resulted in the effect of neutral significance reported at Oxden Leasow (Whitgreaves Wood) being increased to moderate adverse significance. The conclusions of the operational assessment of impacts on designated ecological sites reported in Chapter 8: Biodiversity of the ES is otherwise unchanged.

3.5.23 The revised DMRB guidance LA 105 also requires the assessment of nitrogen deposition impacts on a number of additional designated sites, ancient woodland and veteran trees. Of the additional 81 sites assessed in the sensitivity test, none are considered likely to result in a potential significant adverse effect. For further details of the assessment is provided in Appendix A of this report.

3.5.24 Paragraph 8.9.184 of the ES would be altered as follows to reflect the results of the air quality sensitivity test:

"All residual effects are non-significant, i.e. lie within the neutral or slight categories, with the exception of the following:

- *The loss of ancient woodland would result in a permanent large adverse residual effect during the construction of the Scheme.*
- *Increases in emissions at Brookfield Farm SBI, LWS and ancient woodland, <u>Oxden Leasow (Whitgreaves Wood) ancient woodland</u> would result in moderate adverse residual effects on ancient woodland during the operation of the Scheme*."

Noise and vibration

3.5.25 The results of the noise modelling are utilised for the construction and operational assessment of impacts on protected species (where appropriate), as reported in Chapter 8: Biodiversity of the ES [APP-047/Volume 6.1]. The paragraph numbering below refers to the updated paragraph numbers in Version 2 of the Biodiversity chapter [AS-025/Volume 6.1].

Construction

3.5.26 The construction assessment considers the impact of noise in relation to the following protected species:

- Barn owl – paragraph 8.9.54
- Bat – paragraph 8.9.62, 8.9.70 and 8.9.71
- Breeding and wintering birds – paragraphs 8.9.88

3.5.27 Minor changes to the results reported in paragraph 8.9.62, assessing the impact of disturbance on bats during construction, are required in response to the updated Noise and Vibration chapter. These changes are as follows:

"8.9.62 […] At B18 (the assumed maternity long-eared roost), construction noise is anticipated to exceed the existing ambient by up to 6 dB, and at B11 (pipistrelle day roost) construction noise levels are anticipated to be up to ~~14~~ 13 dB above existing ambient levels. On balance, given the level and temporary duration of the elevated levels of construction noise (at or above the existing ambient for up to ~~10~~ 9 months at B18 and up to 22 months at B11), it is unlikely that they would result in significant effects such as to result in abandonment of the roosts present."

3.5.28 The overall impact on bats resulting from habitat loss, disturbance (from noise, vibration and light) and habitat fragmentation remains as reported in the ES; a negligible impact, resulting in an effect of neutral significance.

Operation

3.5.29 The operational assessment considers the impact of noise in relation to the following protected species:

- Barn owl – paragraph 8.9.153
- Bats – paragraph 8.9.161
- Breeding and wintering birds – paragraph 8.9.168
- Otter and water vole – paragraph 8.9.173

3.5.30 No changes are required to the operational assessment reported in Chapter 8: Biodiversity [AS-025/Volume 6.1] in response to the updated Noise and Vibration chapter.

Appendix 8.2

3.5.31 Following the results of the air quality sensitivity test reported in paragraphs 3.5.5 to 3.5.8, this figure should be updated from 3.08 ha to 3.39 ha. This increase in

compensation planting is provided to compensate for the increased area of ancient woodland impacted by nitrogen deposition, refer to paragraph 3.5.8 of this report.

3.5.32 In addition to the above the following amendments to the text would be required to reflect these changes in compensation areas. Paragraph 2.1.2, bullet points 5, 6 and 7 requires the following amendments:

- *TN97: Oxden Leasow (Whitgreaves wood) – no direct loss but incursion into 15 m buffer zone resulting in an assumed loss of 0.32 ha and a further 0.33 ha adversely impacted by changes in air quality; and*
- *TN43: Brookfields Farm Site of Biological Importance (SBI) – 0.0015 ha direct loss; 0.04ha assumed loss due to incursion into the 15 m buffer zone and a further ~~0.078~~ 0.54 ha adversely impacted by ~~assumed lost as a result of the~~ changes in air quality.*
- *The 15 m buffer zone referred to above is considered a best practice minimum development offset for ancient woodland (Ref 5). As such, it has been determined through consultation with Natural England that the provision of 2.53 ha ~~3.08 ha~~ of broad-leaved plantation will be sufficient to compensate for the above cumulative losses of ancient woodland. This is set out in the Statement of Common Ground with Natural England [TR010054/APP/7.3]. A further 0.86 ha of broad-leaved plantation is proposed to compensate for the adverse impacts on ancient woodland resulting from changes in air quality. Compensation for the impact on ancient woodland from nitrogen deposition will be discussed with Natural England and both parties position set out in the Statement of Common Ground. Given that ancient woodland is not included in the metric as it is considered 'irreplaceable', this ~~3.08~~ 3.39 ha of broad-leaved plantation has been subtracted from the creation figure in Table 3.9 below (marked by a '*').*

3.5.33 The following updates to Table 3.9 are required as below:

Phase 1 habitat category	Area (ha)			Percentage change
	Before works	After works (Retained)	After works (Created)	
Broad-leaved semi-natural woodland	4.97	3.79	-	-23.74
Broad-leaved plantation	61.07	44.43	~~25.04~~24.73*	+13.25~~75~~
Bare ground	0.01	0.01	-	0
Mixed plantation	3.13	0.51	-	-83.71
Recently felled woodland	0.45	0.32	-	-28.89
Improved grassland	35.03	6.67	-	-80.99
Poor semi-improved grassland	8.18	5.68	-	-30.56
Tall ruderal	0.36	0.04	-	-88.89
Standing water	2.31	1.00	2.88	+67.97
Buildings or hardstanding	37.08	24.90	23.62	+30.85
Arable	44.51	6.94	-	-84.81
Amenity grassland	0.94	0.47	5.27	+510.63
Semi-improved grassland	-	-	42.43	100
Marsh or marshy grassland	-	-	1.04	100
Total	198.04	94.76	~~100.28~~ 99.97	N/A
* ~~3.08~~ 3.39 ha creation of broadleaved plantation to compensate for direct and indirect effects on ancient woodland is not included in the metric as ancient woodland is considered 'irreplaceable'				

3.5.34 The following updates to Table 3.11 are required as below:

Condition	Phase 1 habitat category	Biodiversity units			
		Before works	After works (Retained)	After works (Created)	Difference
Good	Broad-leaved semi-natural woodland	80.91	66.73	-	-14.18
	Broad-leaved plantation	87.38	53.22	-	-34.16
	Standing Water	23.57	13.31	14.50	4.24
	Semi-improved Grassland	-	-	242.45	242.45
	Marsh/Marshy Grassland	-	-	4.48	4.48
Moderate	Broad-leaved semi-natural woodland	5.68	0.97	-	-4.72

Condition	Phase 1 habitat category	Biodiversity units			
		Before works	After works (Retained)	After works (Created)	Difference
	Broad-leaved plantation	645.31	475.56	~~71.54~~ 70.66	~~- 98.28~~ - 99.08
	Mixed Plantation	25.04	4.05	-	-20.99
	Recently Felled Woodland	1.79	1.27	-	-0.52
	Poor Semi-improved Grassland	8.67	2.72	-	-5.95
	Tall Ruderal	0.63	0.15	-	-0.48
	Standing Water	12.21	3.12	9.51	+ 0.42
Poor	Broad-leaved plantation	14.64	11.02	-	-3.62
	Bare Ground	0.02	0.02	-	0
	Improved Grassland	70.06	13.34	-	-56.72
	Poor Semi-improved Grassland	28.40	21.37	-	-7.03
	Tall Ruderal	0.40	0.005	-	-0.395
	Standing Water	0.01	0.00	-	-0.01
	Buildings/Hardstanding	0.00	0.00	-	0
	Arable	89.02	13.88	-	-75.14
	Amenity Grassland	1.88	0.95	8.79	7.86
Total		1095.62	681.685	351.27	~~-62.74~~ -63.55

3.5.35 It should be noted that these amendments do not result in alterations to the final metric figure as reported in the ES, the Scheme would result in -4.99% net loss in biodiversity units. This is considered to be an overall no net loss of biodiversity.

3.6 Geology and Soils

3.6.1 No alterations required to Chapter 9: Geology and Soils of the ES [APP-048/Volume 6.1]. The results of the environmental impact assessment remain as reported in the ES.

3.7 Material Assets and Waste

3.7.1 No alterations required to Chapter 10: Material Assets and Waste of the ES [APP-049/Volume 6.1]. The results of the environmental impact assessment remain as reported in the ES.

3.8 Population and Human Health

3.8.1 The assessment of impacts on human health considers amongst other aspects, the results reported in Chapter 5: Air Quality and Chapter 11: Noise and Vibration of the

ES. This assessment of impacts on air quality, noise and neighbourhood amenity as a determinant of human health is summarised in Chapter 12: Population and Human Health [APP-051/Volume 6.1] with further detail provided in Appendix 12.1 of the ES [APP-198/Volume 6.1].

Construction

3.8.2 Paragraphs 12.9.43 to 12.9.46 of the ES consider the impact of construction noise levels and air quality emissions as a determinant of human health during construction of the Scheme. The assessment reported in Version 2 of Chapter 11: Noise and Vibration and the results of the air quality sensitivity test (as reported in this technical note) do not alter the assessment of impacts on human health during construction, as reported in Chapter 12: Population and Human Health of the ES [APP-051/Volume 6.1].

3.8.3 Although the updated noise and vibration assessment would not alter the conclusions of Chapter 12: Population and Human Health, Appendix 12.1 (Table 1.4, row 1) considers construction impacts in more detail. The conclusions of the assessment would remain the same however the text requires an amendment as follows.

"The construction traffic noise assessment is based on estimated construction traffic for the busiest period of the construction works and the period of traffic management on the M54 when one lane of eastbound traffic is diverted via the eastbound off/on slip-roads at Junction 1. The construction traffic noise impact is compared to the 2024 Do-Minimum scenario. The results indicate that the vast majority of identified potentially noise sensitive receptors are anticipated to experience no more than a negligible increase in traffic noise due to construction traffic. Five properties at the western end of Hilton Lane, are anticipated to experience a minor increase (maximum increase +1.2 dB) during the busiest period of the works in this area to build the new Hilton Lane bridge. This assumes the worst-case option of all construction traffic using the western end of Hilton Lane to both access and exit the bridge works. This is considered a worst case assumption as some vehicles are likely to use the haul road along the Scheme alignment instead, which is more remote from residential receptors ~~no identified potentially noise sensitive receptor is anticipated to experience more than a negligible increase in traffic noise due to construction traffic~~. On this basis construction traffic is not anticipated to result in any significant adverse traffic noise effects"

Operation

3.8.4 The reference to vibration in paragraph 12.7.5 on permanent changes arising from the operation of the Scheme is removed as the assessment of operational traffic vibration impacts is scoped out of the new DMRB LA 111.

3.8.5 Paragraphs 12.9.71 to 12.9.75 of the ES consider the impact of changes in traffic noise levels and air quality emissions as a determinant of human health during operation of the Scheme. Minor alterations to the text in Chapter 12, paragraphs 12.9.73 and 12.9.74 replicated in Appendix 12.1 (Table 1.4, row 3) as illustrated below, reflect the assessment as reported in Version 2 of Chapter 11: Noise and Vibration:

"12.9.73 As detailed in Chapter 11: Noise and Vibration, the majority of properties would experience either no change or a negligible change in noise levels from traffic during operation in the short term (2024). The overall trend in the study area is for a slight increase in traffic flows, and therefore traffic noise. ~~Two~~ Six residential properties (in Hilton and Shareshill) are anticipated to experience a significant adverse effect as a result of increases in traffic noise levels on the worst affected façade, whilst ~~18~~ 32 properties, close to ~~along~~ the A460, Featherstone would experience a significant beneficial effect. The Scheme is mainly located in the ward of Featherstone and Shareshill and is the ward with the most receptors in proximity to the Scheme. Health statistics for this ward generally show an improvement on the national average. Decreases in traffic noise are anticipated on the eastern edge of Featherstone along the existing A460, and the northern and western edges along New Road and East Road, which undergo a reduction in traffic due to the Scheme. A small number of properties in Shareshill would experience minor increases and minor decreases due to the rerouting of traffic.

12.9.74 Receptors in the ward of Essington and Cheslyn Hay North and Saredon have a higher percentage of people with bad or very bad health and / or a limiting long term illness or disability than the national average, as set out in the Section 12.6. The majority of the areas covered by these wards are outside of the study area for the operational traffic noise assessment, however a number of affected routes have been identified within these wards. These routes would generally experience, no more than a minor increase or decrease in road traffic noise which is unlikely to change residents response to traffic noise. ~~however a number of significant adverse noise effects are anticipated on the A460 through the ward of Essington, south of the M54, though the increase in noise as a result of the Scheme is minor. Reductions in air quality are also anticipated along this route though emission concentrations would not exceed the health objectives~~."

3.8.6 The assessment reported in Version 2 of Chapter 11: Noise and Vibration and the results of the air quality sensitivity test (as reported in this technical note) do not alter the conclusions of the assessment of impacts on human health during operation, as reported in Chapter 12: Population and Human Health of the ES [APP-051/Volume 6.1].

3.9 Road Drainage and the Water Environment

3.9.1 No alterations required to Chapter 13: Road Drainage and the Water Environment of the ES [APP-052/Volume 6.1]. The results of the environmental impact assessment remain as reported in the ES.

3.10 Climate

3.10.1 No alterations required to Chapter 14: Climate of the ES [APP-053/Volume 6.1]. The results of the environmental impact assessment remain as reported in the ES.

3.11 Assessment of Cumulative Effects

Cumulative impacts

3.11.1 Alterations to Table 15.1 are required to reflect the change in the noise and vibration study areas used in DMRB LA 111. The construction noise study area specified in

the new DMRB is a maximum of 300 m from the Scheme boundary. This was previously undefined by DMRB and therefore the study area utilised in the cumulative impact assessment was up to 600 m from the Scheme boundary. This alteration reduces the Zone of Influence (ZoI) to 600 m, from the 1.2 km used previously. The operational traffic noise study area is as described in Chapter 11: Noise and Vibration. As the operational phase traffic data includes traffic associated with other developments, the noise impact assessment reported within Chapter 11: Noise and Vibration is inherently cumulative.

3.11.2 Appendix 15.1 [APP-153/Volume 6.3], Table 15.1.1 and Table 15.1.2 consider other developments and the potential for cumulative impacts (including air quality, noise and vibration) during construction and operation.

3.11.3 The timing of construction works (overlap in temporal scope) has not changed, however the ZoI has changed. The assessments in Table 15.1.1 and Table 15.1.2 will therefore change such that other development projects with ID numbers 1, 8, 9, 10, 25 and 51 would no longer fall within the construction noise ZoI, meaning there are not likely to be any significant cumulative construction noise effects in combination with the Scheme.

3.11.4 The assessment of air quality and noise impacts during operation includes traffic associated with other developments therefore these assessments are inherently cumulative.

Combined impacts

Construction

3.11.5 Table 15.4 does not identify any significant construction noise or vibration effects at 'Residential receptors on the A460 Cannock Road, Featherstone'. Chapter 11: Noise and Vibration of the ES identifies that there is the potential for combined significant effects from construction noise and vibration during the construction works at receptors located in close proximity to the works along the section of the A460 which would be modified by the Scheme. This was reported in Version 1 of Chapter 11: Noise and Vibration and it has not changed as a result of the updated Noise and Vibration chapter (Version 2), however this was omitted in error from Chapter 15. The following minor amendments are required to Table 15.4 of the ES.

Table 15.4: Summary of potential combined impacts upon a single receptor (construction) - updates

Receptor	Value	Potential combined impacts					Mitigation	Residual (cumulative) effect
		Air Quality	Dust	Noise	Vibration	Visual		
Residential receptors on the A460 Cannock Road, Featherstone	High*	Worsening of the NO_2 annual mean concentration experienced at some properties, but below national air quality objective levels (not significant)	Potentially adverse effects (not significant)	Significant adverse effects are anticipated ~~No significant adverse effects are anticipated.~~	Significant adverse effects are anticipated ~~No significant adverse effects are anticipated.~~	VP02: Major adverse (significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	There is likely to be temporary moderate adverse (significant) combined effects on these properties, as a result of construction noise, vibration and visual impacts. Only the visual impacts would remain significant following construction. ~~There are unlikely to be any significant combined effects (neutral) on these properties, however, a significant adverse effect as a result of visual impacts would remain.~~

3.11.6 The following text is required to reflect the change to Table 15.4 and would sit between paragraphs 15.5.7 and 15.5.8:

"Properties located along the section of A460 (Featherstone) which is modified by the Scheme are anticipated to experience moderate adverse (significant) combined effects as a result of noise, vibration and visual impacts. This is a temporary effect on receptors of high value."

3.11.7 No further alterations are required to the construction assessment.

Operation

3.11.8 Minor alterations are required to the combined operational assessment reported in Chapter 15: Assessment of Cumulative Effects [APP-054/Volume 6.1] of the ES to reflect the assessment as reported in Version 2 of Chapter 11: Noise and Vibration.

3.11.9 Due to the updated noise and vibration assessment guidance as set out in LA 111, the assessment of operational vibration impacts is no longer part of the scope of the noise and vibration assessment. As no significant operational vibration effects were identified this does not affect the outcome of the cumulative assessment.

3.11.10 The following minor amendments are required to Table 15.5 of the ES.

Table 15.5: Summary of potential combined impacts upon a single receptor (operation) - updates

Receptor	Value	Potential combined impacts					Mitigation ~~Air Quality~~	Residual (cumulative) effect
		Air Quality	Dust	Noise	Vibration	Visual		
Residential receptors on Hilton Lane (east of the Scheme)	High *	Small increase in Annual Mean NO_2 concentration and small improvements in PM_{10} (not significant)	N/A	Negligible or minor increase (not significant)	N/A ~~Potentially adverse (not-significant)~~	VP 15: Year 1: Moderate adverse (significant) Year 15: Minor adverse (not)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	There are unlikely to be any significant combined effects on these receptors that are noteworthy – Neutral. However, significant visual effects would remain in the short term but this is not a combined effect.
Residential receptors on Hilton Lane (west of the Scheme)	High *	Small increase in Annual Mean NO_2 for properties located closest to the Scheme, with small decreases for properties	N/A	Moderate/ minor increase in noise (significant) for ~~one~~ five properties ~~y~~ only.	N/A ~~Potentially adverse (not-significant)~~	VP07: Negligible (not significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	~~One~~ Five receptors close to the Scheme ~~is~~ are likely experience both minor changes in NO_2 concentrations and significant noise increases. Combined effects would be noteworthy, but unlikely to be significant. Slight adverse (not significant).

Receptor	Value	Potential combined impacts					Mitigation ~~Air Quality~~	Residual (cumulative) effect
		Air Quality	Dust	Noise	Vibration	Visual		
		located within close proximity to the A460 Cannock Road. In addition, small improvements in PM_{10} (not significant).						For other properties, there would not likely be any significant combined effects – Neutral.
Residential receptors on the A460 Cannock Road, Featherstone and Shareshill.	High*	Large decreases in Annual Mean NO_2 Concentration, for properties off the A460 in Featherstone. Small to medium decreases for properties in Shareshill (not significant).	N/A	Generally not significant, however, ~~18~~ 32 residential properties ~~(~~close to ~~on~~ the existing A460 bypassed by the Scheme ~~(Featherston e, Hilton and Villa Bungalow))~~ will experience significant beneficial effects.	N/A ~~Potentially adverse (not significant).~~	VP 02: Year 1: Major adverse (significant) Year 15: Moderate adverse (significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	Although significant beneficial effects have been identified, it cannot be assumed that a significant beneficial effect will outweigh or balance a significant adverse effect. Therefore, a worst case approach has been adopted and the ~~medium~~ moderate adverse (significant) effect remains but only in relation to one environmental aspect (i.e. visual effects). Therefore, this does not constitute a significant combined effect. There are unlikely to be any significant combined effects on these properties that are noteworthy – Neutral.
Residential receptors on the	High*	Small increase to small decrease in	N/A	Negligible or minor increase/ minor	N/A ~~Potentially adverse~~	VP 10: Year 1 and Year 15:	No additional mitigation has been identified above the	There are unlikely to be any significant combined effects on

Receptor	Value	Potential combined impacts					Mitigation ~~Air Quality~~	Residual (cumulative) effect
		Air Quality	Dust	Noise	Vibration	Visual		
A460 Cannock Road (east of Shareshill)		Annual Mean NO_2 Concentration (not significant)		decrease (not significant)	~~(not-significant)~~	Negligible (not significant)	measures as outlined within the OEMP [TR010054/APP/6.11].	these properties that are noteworthy – Neutral.
Residential receptors at Brookfield Farm	High*	Small increase Annual Mean NO_2 Concentration (not significant)	N/A	Moderate increase (Significant) for one property only.	N/A ~~Potentially adverse (not-significant)~~	VP11 is most representative: Year 1: Moderate Adverse** (significant) Year 15: Slight Adverse**	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	Initially there would be a significant combined effect (moderate adverse) on one property~~ies~~ at Brookfield Farm as a result of traffic derived noise and visual effects. This would reduce as proposed mitigation planting matures to provide screening. In the long term the level of visual effect is likely to reduce to a level that is not significant (slight adverse) and would not contribute to combined effect. However, the noise impact is likely to remain significant. a combined effect. However, the noise impact is likely to remain significant.
Residential receptors at Laney Green	High*	Small increase in Annual Mean NO_2 Concentration (not significant)	N/A	Negligible or minor decrease ~~increase~~/ negligible increase ~~decrease~~ (not significant)	N/A ~~Potentially adverse (not-significant)~~	VP 04: Year 1 and Year 15: Minor adverse (not significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	There are unlikely to be any significant combined effects on these properties that are noteworthy – Neutral.

Receptor	Value	Potential combined impacts					Mitigation ~~Air Quality~~	Residual (cumulative) effect
		Air Quality	Dust	Noise	Vibration	Visual		
Residential receptors along Great Saredon Road	High*	Negligible change in Annual Mean NO_2 Concentration (not significant)	N/A	Negligible increase/ decrease (not significant)	N/A ~~Potentially adverse (not-significant)~~	VP 08: Year 1: Moderate adverse (significant) Year 15: Minor adverse (not significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	There are unlikely to be any significant combined effects on these properties that are noteworthy – Neutral.
Residential receptors on Featherstone Lane	High*	Small decreases in Annual Mean NO_2 Concentration for properties on Featherstone Lane (modelled for two properties at the junction with New Road)	N/A	Negligible (not significant)	N/A ~~Potentially adverse (not-significant)~~	VP18: Year 1 and Year 15: Negligible (not significant)	No additional mitigation has been identified above the measures as outlined within the OEMP [TR010054/APP/6.11].	There are unlikely to be any significant combined effects on these properties, therefore the effects are likely be Neutral.

3.11.11 The following updates to paragraphs 15.5.11 and 15.5.12 to reflect the updates to the assessment in Table 15.5 above.

"15.5.11 On Hilton Lane (west of the Scheme) there is likely to be ~~one~~ five properties ~~y~~ that experience~~s~~ both minor changes in NO_2 concentrations and moderate/minor noise increases (significant). The combined effects would be noteworthy but are unlikely to be significant (slight adverse), however, significant effects in relation to traffic derived noise would remain (as reported in Chapter 11: Noise and Vibration). For other properties, there would not likely be any significant combined effects.

15.5.12 Significant beneficial noise effects have been predicted for ~~18~~32 residential properties located ~~off the~~ close to the existing A460 Cannock Road, Featherstone, and significant adverse visual effects have been predicted for properties located along the same section of this road. However, it cannot be assumed that a significant beneficial effect would outweigh or balance a significant adverse effect. Therefore, a worst case approach has been adopted and a ~~medium~~ moderate adverse (significant) visual effect (15 years after the completion of the Scheme) remains but only in relation to one environmental aspect (i.e. visual effects). Therefore, this does not constitute a significant combined effect."

3.12 Environmental Statement Summary

3.12.1 The updates to the ES as set out in this technical note would result in the following alterations to Chapter 16: Summary of the ES. Table 16.1, summary of likely significant effects, row 4, Chapter 8: Biodiversity would be altered as follows:

Operation

- "*No significant effects on internationally designated sites are anticipated.*
- *Moderate adverse effect on ancient woodland within Brookfield Farm SBI, LWS and Oxden Leasow (Whitgreaves Wood) ancient woodlands due to changes in air quality*."

3.12.2 Table 16.1, summary of likely significant effects, row 7, Chapter 11: Noise and Vibration would be altered as follows:

Construction

- *"Significant adverse construction vibration effects (for receptors along the section of A460 which is modified by the Scheme[1], near to Dark Lane turning head, along Hilton Lane (east and west of the Scheme) and at Brookfield Farm.*
- *Significant adverse construction noise effect at the closest receptors to the construction works in the vicinity of the tie in to the existing A460[1], Dark Lane, Hilton Lane (east and west of the Scheme) and Brookfield Farm."*

Operation

- *"Significant adverse, short-term effect on ~~one~~ five residential properties~~y~~ located to the west of the Scheme on Hilton Lane.*
- *Significant adverse, short-term effect on one property at Brookfield Farm.*
- ~~*Significant adverse, short-term effect on 197 residential properties on the A460, south of the M54.*~~
- *Significant beneficial, short-term effect on ~~18~~ 32 properties close to ~~on~~ the existing A460 bypassed by the Scheme.*
- *Significant beneficial, short-term effect on 11 residential properties located on Old Stafford Road."*

3.13 Appendix 4.5: Changes to Scope and Methodology

3.13.1 Appendix 4.5 of the ES [APP-164/Volume 6.3] has been revised and a new version (Version 2) submitted to the Planning Inspectorate with this Note. This revised document has been submitted alongside Version 2 of Chapter 11: Noise and Vibration of the ES to set out the change in scope of the noise and vibration assessment resulting from new guidance, DMRB LA 111.

[1] This change is not as a result of the change in methodology but the correction of an error in Version 1 of this document.

4 Alterations to other application documents

4.1 Non-Technical Summary

Air quality

4.1.1 No alterations are required to Chapter 6: Air Quality of the Non-Technical Summary [APP-211/Volume 6.4]. However, the air quality sensitivity testing of the revised air quality assessment guidance LA105 identified the need for the following alterations to Chapter 8: Biodiversity of the ES. Alterations to Chapter 9: Biodiversity and Table 17.1 of the Non-Technical Summary (NTS) [APP-211/Volume 6.4] are therefore required. The following alterations to the text capture the updates required under the summary of operational assessment reported in Chapter 9 and the summary of likely significant residual effects reported in Table 17.1 of the NTS:

Operation

- "*No significant effects on designated sites, including those of national and international importance are anticipated during operation of the Scheme.*
- *Permanent adverse effect on ancient woodland within Brookfield Farm Site of Biological Importance, Whitegreaves Wood (Oxden Leasow) due to increases in emissions that affect air quality*."

Noise and vibration

4.1.2 To reflect the revision of Chapter 11: Noise and Vibration of the ES, alterations to Table 17.1 and Chapter 12: Noise and Vibration of the NTS [APP-211/Volume 6.4] are required. The following alterations to the text capture the updates required under the summary of construction and operational assessment reported in Chapter 12 and the summary of likely significant residual effects reported in Table 17.1 of the NTS:

Construction

- *"Temporary significant adverse construction vibration effects are anticipated at the closest properties to the construction works along the section of A460 which is modified by the Scheme[2], in the vicinity Dark Lane, Hilton Lane (east and west of the Scheme) and Brookfield Farm.*
- *Temporary significant adverse construction noise effects are anticipated at the closest properties to the construction works in the vicinity of the tie in to the existing A460[2], Dark Lane, Hilton Lane (east and west of the Scheme) and Brookfield Farm."*

Operation

- *"Significant adverse noise effects on ~~one~~ five residential properties~~y~~ on Hilton Lane and one property at Brookfield Farm due to their proximity to the Scheme.*

[2] This change is not as a result of the change in methodology but the correction of an error in Version 1 of this document.

- ~~*Significant adverse noise effects on residents on the A460, south of the M54 due to increase in traffic on this route and the existing high traffic noise levels in this location.*~~
- *Significant beneficial noise effects on residents close to ~~on~~ the A460 bypassed by the Scheme due to the reduction in traffic on this route.*
- *Significant beneficial noise effects on residents on a section of Old Stafford Road due to reductions in traffic flows on this route."*

4.1.3 There are a number of other assessments within the ES which utilise the results of the air quality and noise and vibration assessments. As documented in this report the results of the air quality sensitivity test and updated noise and vibration assessment do not alter the conclusions of the other assessments, with the exception of the biodiversity assessment reported in ES [AS-025/Volume 6.1].

4.1.4 No further changes to the Non-Technical Summary [APP-211/Volume 6.4] are required.

4.2 Habitat Regulations Assessment

4.2.1 The results of the air quality assessment are utilised for the assessment of impacts on statutory designated sites of international importance, as reported in the HRA [AS-035/Volume 6.9].

4.2.2 The revised air quality guidance LA 105 would change the way that the air quality study area, the ARN, is calculated, refer to Chapter 2, Table 1 of this report for further details on how the methodology for calculating the ARN has altered. The new guidance would result in minor changes to the air quality study area when using guidance LA 105. A review of the new ARN has concluded that there are no European designated sites within 200 m of the updated ARN, therefore there are no anticipated impacts on European designated sites. No change is required to the Habitats Regulations Assessment: No Significant Effects Report [AS-035/Volume 6.9].

4.2.3 Since the submission of the DCO application revised Air Pollution Information Service (APIS) data for baseline deposition rates and critical loads were published on 18 March 2020. This would alter paragraph 3.1.11 of the HRA [AS-035/Volume 6.9] as follows:

"The current average loads (as shown on APIS) at the two SACs are as follows:

- *Cannock Chase SAC: ~~20.2~~ 21.2 kg/ha; and*
- *Cannock Extension Canal: ~~14.5~~ 17.1 kg/yr."*

4.2.4 This update to the baseline data would not change the findings of the HRA: No Significant Effects Report [AS-035/Volume 6.9] as both SAC remain scoped out of further assessment due to the distance of these sites from the Scheme and the ARN.

4.3 Outline Environmental Management Plan

4.3.1 Following the results of the air quality sensitivity test the Outline Environmental Management Plan (Version 2) would require the following alteration. The text in Table 3.4, D-BIO11, Column 6 should be altered, from 3.08 ha to 3.39 ha of

woodland planting to compensate for the loss of and damage to ancient woodland. This increase in compensation planting is provided to compensate for the increased area of ancient woodland impacted by nitrogen deposition, refer to paragraph 3.5.7 of this report.

4.3.2 The following alterations to the OEMP are required to reflect the updated noise and vibration assessment as reported in Chapter 11: Noise and Vibration of the ES (Version 2):

- Table 3.4, Ref D-N2, the height of the reflective noise barrier to the east of Dark Lane has been increased in height from 3.0 m to 4.0 m.
- Table 3.4 of the OEMP, Ref D-N4. The height of the reflective noise barrier to the east of Brookfield Farm has been increase in height from 2.5 m to 3.0 m.

4.4 Case for the Scheme and NPSNN Accordance Table

4.4.1 The following alterations to the Case for the Scheme are required to reflect the updated noise and vibration assessment undertaken in line with updated DMRB guidance LA 111, as reported in Chapter 11: Noise and Vibration of the ES (Version 2):

- Table 6.1 and paragraph 6.2.11 refer to the monetised costs and benefits associated with the Scheme, the entry for noise is reported as a cost of £-0.8 million. Under the revised DMRB methodology, including the amended study area would reduce to £-0.013 million. This would change the Present Value of Benefits from £443.9m to £444.7m and the Net Present Value to £296.3m in Table 6.1.
- Paragraph 8.10.18 would be amended as follows "*No properties would experience a 'major' increase in noise levels as a result of the Scheme after construction. ~~Two~~ Four properties would experience a 'moderate' increase in noise levels from traffic on the new link road, namely ~~one~~ three properties ~~y~~ on Hilton Lane and The Bungalow at Brookfield Farm. A further two properties on Hilton Lane which experience a minor increase in traffic noise are also identified as experiencing a significant adverse effect. ~~The Scheme will result in an increase in noise levels on the stretch of the A460 south of the M54 due to an increase in traffic along this stretch and the existing high noise levels. This will result in a minor increase in noise levels for 197 properties.~~ Conversely, 10 ~~18~~ residential properties close to ~~on~~ the existing A460 will experience moderate/ major reductions in traffic noise with a total of 32 properties experiencing a significant beneficial effect due to the transfer of traffic off the existing A460. 11 residential properties along Old Stafford Road in Cross Green would also experience a moderate decrease in traffic noise levels. All other increases and decreases in noise levels are at a level considered not significant*."
- Paragraph 8.10.19 would be amended as follows "*When examining compliance with the first NPSNN aim, traffic noise levels are anticipated to be reduced from above the SOAEL (without the Scheme) to below the SOAEL (with the Scheme) at ~~71~~ 70 residential buildings. These buildings are located predominantly on the existing A460 and New Road on the northern edge of Featherstone. The transfer of traffic from the existing A460 onto the Scheme,*

and local re-routing around Featherstone due to the large reduction in traffic on the A460 are the dominant source of the reductions below SOAEL~~, with a small number being due to the reduction in speed limit from 60 mph to 30 mph on the realigned Hilton Lane, and the combination of thin surfacing and a noise barrier adjacent to the A460 north of the M6 Junction 11~~. These improvements are a benefit of the Scheme."

- Paragraph 8.10.20 would be amended as follows *"A total of ~~33~~ 12 residential buildings are anticipated to experience an increase in traffic noise level which takes them from below the SOAEL (without the Scheme) to above the SOAEL (with the Scheme). Four are located on Hilton Lane, with increases in noise due to the closure of the connection from Hilton Lane onto Dark Lane and related increase in traffic along Hilton Lane and noise generated by the Scheme itself. Mitigation is incorporated into the design of the Scheme in this location through locating the Scheme in a cutting of approximately 6 m, and through the reduction in speed limit from 60 mph to 30 mph on this section of Hilton Lane. speed limit reduction prevents a small number of properties that would otherwise be brought above the SOAEL by the Scheme from doing so. The remaining ~~29~~ eight residential buildings are predominantly located on The Avenue in Featherstone, and the A460 south of the M54. On the Avenue in Featherstone, only a negligible increase in traffic noise is anticipated but this is sufficient to take some properties from just under to just over the SOAEL. ~~On the A460 south of the M54 a minor increase in traffic noise levels is anticipated as a result of traffic being attracted to the area due to the Scheme.~~ The noise barriers incorporated into the Scheme design prevent ~~ten~~ eight residential buildings experiencing an increase in traffic noise to above the SOAEL, these are predominantly located on Dark Lane in Hilton, and The Avenue in Featherstone.*"
- Paragraph 8.10.21 would be amended as follows "*~~339~~ 125 residential buildings are above the SOAEL both with and without the Scheme in operation, therefore the exceedance of the SOAEL is not due to the Scheme. Whilst experiencing a reduction in traffic noise due to the operation of the Scheme the very closest residential buildings to the existing A460 remain above the SOAEL. Other residential buildings which remain above the SOAEL are located on the Avenue in Featherstone, the eastern end of New Road in Featherstone, a small number of properties on Hilton Lane and on Church Road in Shareshill, Wolverhampton Road to the north east of M6 Junction 11, ~~A460 Cannock Road south of the M54,~~ and individual properties located close to roads such as the M54, M6, M6 Toll and the A462.*"
- Paragraph 8.10.26 and 8.10.27 refer to a 3 m high reflective noise barrier on the west side if the main line in the vicinity of Dark Lane/Park Road, with the new DMRB methodology, this is increased to 4 m.
- Paragraph 8.10.27 refers to a 2.5 m high reflective noise barrier on the west side of the mainline as it passes close to Brookfield Farm, this is increased to 3 m with the revised DMRB methodology.

- Paragraph 8.11.19 would be amended as follows "*Some of the listed buildings in the study area would experience a change in traffic noise level during the operation of the Scheme, though none are expected to experience a significant change (a change in noise level of less than 3 dB in the opening year (2024) is not normally considered to be significant). The highest increases in noise would be experienced at Hilton Hall (+1.9 ~~1.7~~ dB) and the Conservatory (+2.2 ~~2.1~~ dB) at the worst affected façade….*"
- Table 3: National Policy Statement for National Networks Chapter 5, NPSNN paragraph number 5.190 refers to the identification of affected routes, including those which are remote from the Scheme (>1 km). In accordance with the revised DMRB methodology this is updated to 600 m from the Scheme and the existing A460 bypassed by the Scheme.

Appendix A – Air Quality Sensitivity Testing Revised Guidance LA 105

AIR QUALITY SENSITIVITY TESTING – REVISED GUIDANCE LA 105

1 Introduction

1.1 Highways England is developing a link road between the M54 and M6 to provide a link between Junction 1 of the M54, M6 North and the A460 to Cannock. The M54 to M6 Link Road (herein referred to as 'the Scheme') aims to reduce congestion on local / regional routes, particularly the A449 and A460 and deliver improved transport links to encourage the development of the surrounding area.

1.2 The likely environmental impacts and effects resulting from the Scheme during construction and operation are reported in the Environmental Statement (ES) [TR010054/APP/6.1] submitted as part of the Development Consent Order (DCO) application for the Scheme.

1.3 The assessment presented in Chapter 5: Air Quality of the ES was informed by the Design Manual for Roads and Bridges (DMRB) Air Quality guidance published 2007, HA207/07, and the associated Interim Advice Notes (IANs), which were current at the time the assessment commenced. The new DMRB standard for air quality assessment, LA 105 Air Quality, was published 28 November 2019 superseding the previous guidance. Due to the complexity of the air quality assessment it was not possible to update the assessment to take into consideration the latest methodology prior to submission of the DCO application without incurring a substantial delay to the Scheme.

1.4 This technical note presents five sensitivity tests to assess how the changes to the DMRB guidance from HA207/07 to LA 105 would have impacted the conclusions of the air quality chapter of the ES [APP-044/Volume 6.1] with respect to the operation of the Scheme had they been incorporated. The key specific points of difference between the superseded HA207/07 and LA 105 that have the potential to affect the overall evaluation of significance of the air quality effects of the Scheme and are presented in this technical note are:

1) The change in screening criteria to define the air quality study area.
2) The changes to speed bands and emission rates.
3) The changes to conversion rates of nitrogen dioxide (NO_2) to dry nutrient nitrogen deposition rate for ecologically designated sites.
4) The additional ecological site designations to be considered as part of the air quality assessment.
5) Changes to the assessment of compliance with EU Limit Values.

1.5 The sensitivity tests undertaken and their findings are presented in this technical note.

2 Sensitivity Test 1: LA 105 Screening Criteria

2.1 The screening criteria used identify the roads that make up the air quality study area (Affected Road Network (ARN)) has changed between HA207/07 and LA 105. There is the potential that the study area for the Scheme could therefore be different and include areas that were not considered as part of the ES. Table 1 highlights the differences in criteria between the two methodologies.

Table 1: Criteria for defining the ARN using DMRB superseded HA207/07 and new guidance LA 105

Criteria for including roads within the air quality study area		
HA207/07	**LA 105**	**Difference in methodology**
Road alignment will change by 5 m or more	Road alignment will change by 5 m or more	No change
Annual average daily traffic (AADT) flows will change by 1,000 or more	AADT flows will change by 1,000 or more	No change
Heavy duty vehicle (HDV) flows will change by 200 AADT or more	HDV flows will change by 200 AADT or more	No change
Daily average speeds will change by 10 km/hr or more	A change in speed band	Alteration to methodology
Peak hour speed will change by 20 km/hr or more		

2.2 Whilst the screening criteria relating to road alignment, AADT flow and HDV flow remains unchanged, the criteria relating to vehicle speed has changed, from a change in actual daily average and peak speeds to a change in speed band.

2.3 To establish any differences in the study area that could occur as a result of the new screening criteria set out in LA 105, the Scheme traffic data has been re-screened, based upon the new LA 105 criteria. This has required input from the Scheme's traffic team, who have reissued the traffic data to account for the change in speed band classifications as set out LA 105 (based upon the same pivoted speeds as the data used to inform the assessment as reported in the ES). The wider implication of the LA 105 speed bands to the assessment reported in the ES are discussed in Section 3.

2.4 Rescreening the traffic data in line with the approach set out in LA 105 resulted in the findings that:

- All roads that were in the HA207/07 ARN are also present in the LA 105 ARN; and
- There are only two additional sections of road in the LA 105 ARN that were not present in the HA207/07 ARN.

2.5 The ARN including the two additional LA 105 road sections, Watling Street and Pear Tree Lane are shown in Figure 1.

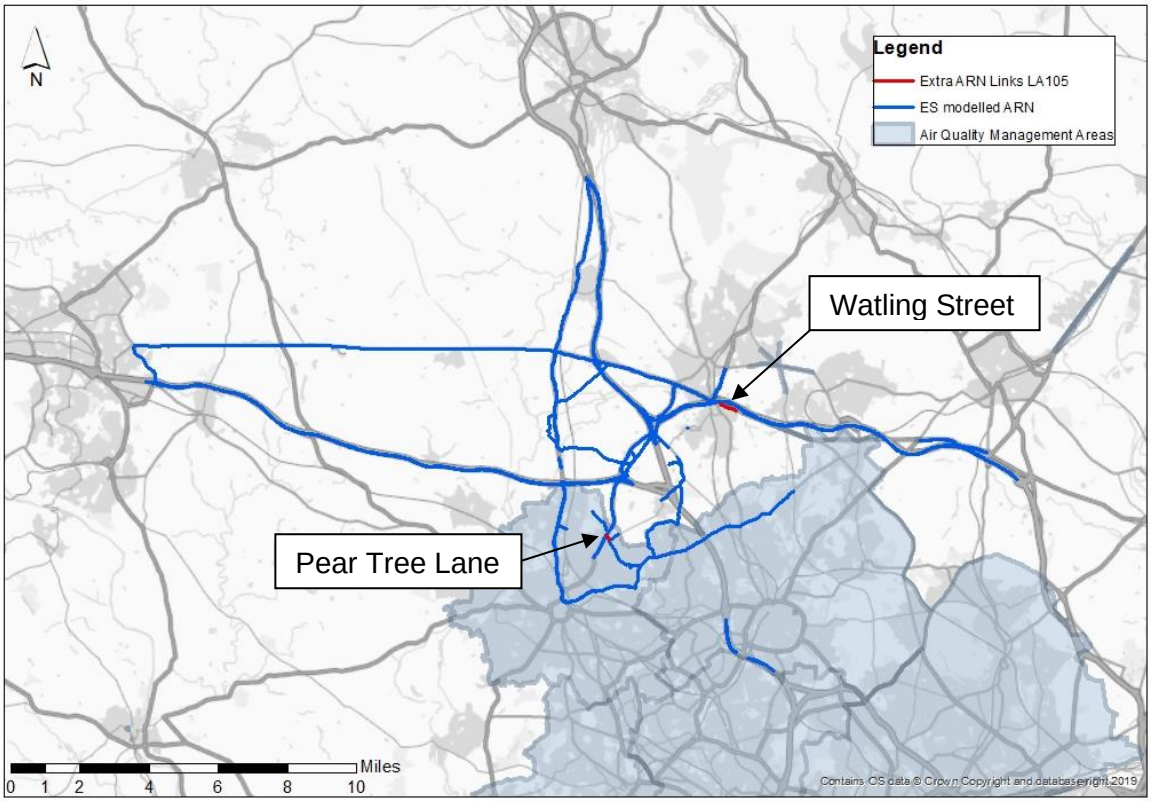

Figure 1: ARN Including Additional LA 105 Affected Roads

2.6 A risk review was carried out to establish the likelihood of significant effects on air quality being reported had these two links been included in the air quality study area reported in the ES. This process followed the steps set out below:

- Identifying whether there are any sensitive receptors present within 200 m of the new road links, and how close they are to them.
- Identifying the traffic changes on the links and whether they are likely to result in a notable increase or decrease in emissions from the links.
- Using modelled receptors that are near to, or in a similar environment to, those on these two-road links to estimate the likely pollutant concentrations and concentration changes at the identified additional sensitive receptors.

B4484 (Pear Tree Lane)

2.7 The first of the new links to be analysed is part of the B4484 (Pear Tree Lane), which is a single carriageway residential road in the north-east of Wolverhampton. This road link triggered the LA 105 screening criteria because of a speed band change from light congestion to heavy congestion in the inter-peak period, occasioned by a drop in pivoted speed from 23.3 kph to 14.2 kph. The link is illustrated in Figure 2. This link connects to existing ARN at both ends and was modelled in the ES as one of the 'other links modelled' due to its proximity to modelled receptors.

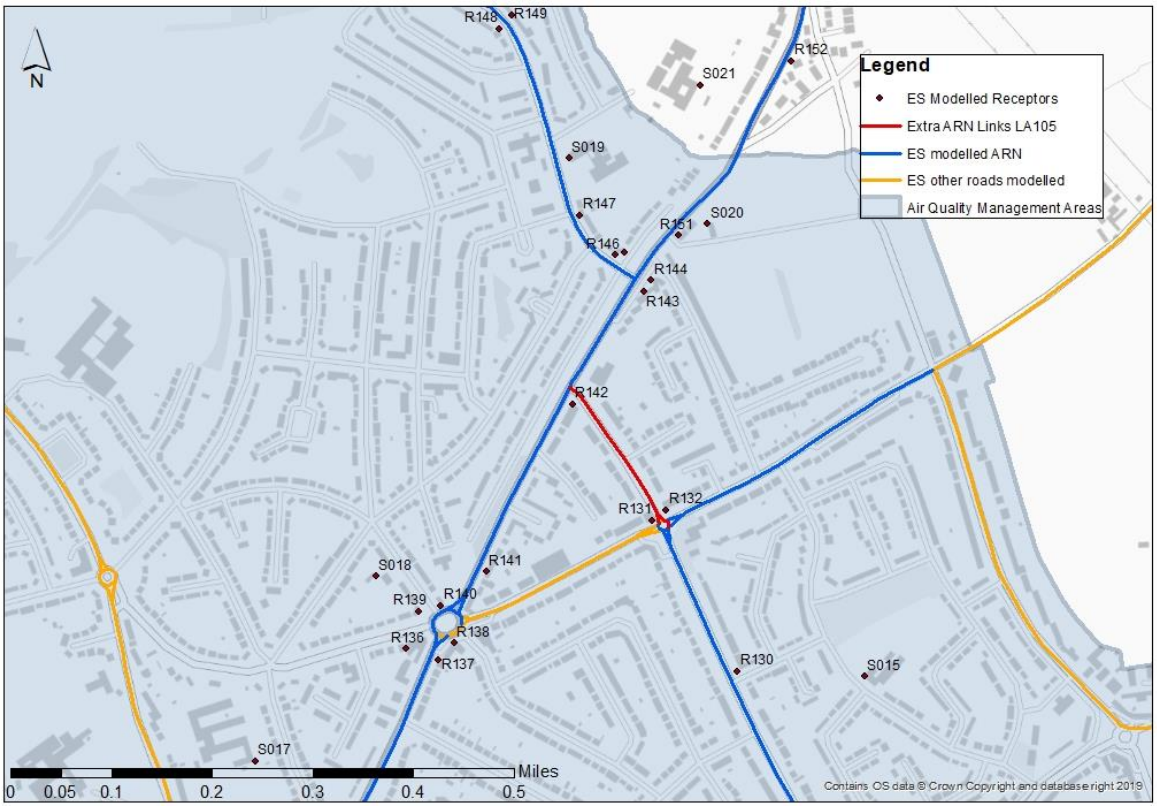

Figure 2: New ARN Link Pear Tree Lane

2.8 The sensitive receptor closest to the road is a residential property set 6.5 m back to the south-west of the link, close to the roundabout with the B4484 Long Knowle Lane and the B4156 Blackhalve Lane. This receptor was modelled in the ES as R131 to represent worst case exposure to the east of this roundabout. There are 35 other residential receptors running alongside the link, at distances of approximately 8.7 m to 19.4 m from the road, two of which were modelled in the ES as R132 and R142. There are approximately 500 additional sensitive receptors within a 200 m radius of this link as this is a densely populated residential area.

2.9 Concentrations at the modelled receptors close to this road link, which are in worst-case locations due to their proximity to the junctions, were increased in the DS scenario (with Scheme) (see). However, the concentrations were well under 40 µg/m^3 and therefore the changes were not considered significant. A change in emission associated with a speed band change for 6 hours of the (inter-peak hours) would not be sufficient to increase concentrations at these receptors above the objective value.

Table 2: NO_2 Concentrations at receptors close to new affected road (Pear Tree Lane)

Receptor	DM NO_2 Concentration ($\mu g/m^3$)	DS NO_2 Concentration ($\mu g/m^3$)	Change in NO_2 Concentration / ($\mu g/m^3$)	Potentially Significant?
R131	23.6	23.8	+0.2	No
R132	23.7	24.2	+0.4	No
R142	20.9	22.0	+1.1	No

Note: Change in concentration calculated on unrounded DM and DS concentrations

A5 (Watling Street)

2.10 The second of the new road links to be analysed is part of the A5 (Watling Street) to the east of Churchbridge, where the A5 is single carriageway. This road link triggered the LA 105 screening criteria because of a speed band change from free flow to light congestion in the AM period occasioned by a drop in pivoted speed from 47.0 kph to 41.8 kph. The link is illustrated in Figure 3. This link is within 200 m of the existing ARN and was modelled in the ES as one of the 'other links modelled' due to its proximity to modelled receptors.

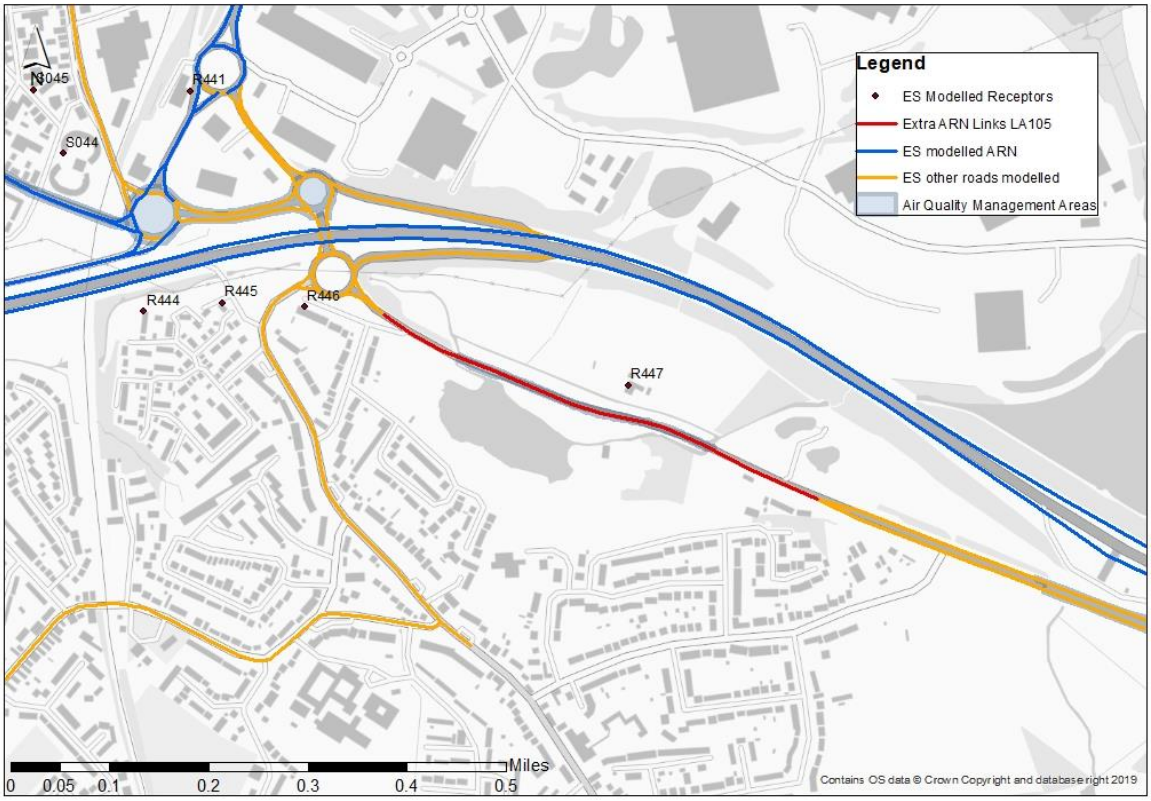

Figure 3: New ARN Link A5 Watling Street

2.11 The sensitive receptor closest to the road is a residential property approximately 23.8 m from the road to the south of the link's eastern end. There are three additional properties between approximately 23.8 m and 26.5 m back from the road in this location. To the south of the western end of the link the closest

receptor is approximately 28.1 m from the road, on Leacroft Close. To the north of the link, Streetway Farm is 32.9 m away from the road. This receptor was modelled in the ES as R447 (although on the opposite façade of the property, approximately 48.4 m from the A5), to represent exposure to the M6 Toll. There are approximately 170 additional sensitive receptors within a 200 m radius of this link on the fringes of Churchbridge and Great Wyrley.

2.12 Concentrations at the modelled receptor close to this link were increased in the DS scenario, reflecting the increases in emissions (see Table 3). However, the concentrations were well under 40 µg/m^3 and therefore the changes were not considered significant. This receptor (as modelled) is approximately 24.6 m further from the road than the closest receptor to the road, so there is potential for the concentrations, and changes, to be higher here. However, comparison with R450, which is 1.2 km east in another single carriageway section of the A5, and only approximately 3.3 m from the road, concentrations still are not predicted to exceed the annual average air quality objective of 40 µg/m^3 for NO_2. A change in emissions associated with a speed band change for 3 hours of the day (AM peak hours) would not be sufficient to increase concentrations at these receptors above the objective value. Therefore, it is considered very unlikely that there would be any significant effects had any other receptors on the newly added link been modelled.

Table 3: Concentrations at receptors close to new affected road (Watling Street)

Receptor	DM NO_2 Concentration (µg/m^3)	DS NO_2 Concentration (µg/m^3)	Change in NO_2 Concentration / (µg/m^3)	Potentially Significant?
R447	26.2	26.4	+0.2	No
R450	34.8	35.3	+0.4	No

Note: Change in concentration calculated on unrounded DM and DS concentrations

3 Sensitivity Test 2: LA 105 Emissions Calculator

3.1 For the purposes of conducting the operational air quality assessment, traffic behaviour on links is categorised into 'speed bands' – determined primarily by the average speed of traffic. The speed band informs the emission factors attributed to the traffic on the road via the Speed Band Emission Factors Tool (SBEFT) which takes inputs in terms of traffic flow, composition and speed band and returns the emission rate (in g/km/s) of the road which is then used as an input to the air quality modelling.

3.2 LA 105 includes updated speed band categories for motorways and an amended approach to categorising links into speed band categories to that published in IAN185/15 and used to inform the ES. The speed band categories for non-motorways remains unchanged. The IAN185/15 speed band categories and the LA 105 speed band categories are detailed in Table 4.

Table 4: Motorway Speed Band Categories in IAN185/15 and LA 105

IAN185/15		LA 105	
Category	**Speed range (kph)**	**Category**	**Speed range (kph)**
Heavy Congestion	<30	Heavy Congestion	5-48
Light Congestion	30-80	Light Congestion	48-80
High Speed	≥80	Free Flow	80-96
		High Speed	96-140

3.3 Furthermore, to accompany LA 105 and the updated speed band categories and approach, an updated SBEFT has also been released by Highways England, which incorporates changes to the emission rate per vehicle, resulting in different emission rates using the new tool even if provided the same inputs.

3.4 This sensitivity test considers emissions within the ARN calculated using the new speed band categories, approach and SBEFT, compared to the emissions calculated to inform the operational air quality assessment reported in the ES. The test focuses on emissions of NO_x which are used to calculate concentrations of NO_2.

3.5 This sensitivity test considers these changes for the baseline situation and model verification and the future situation without the Scheme (Do-Minimum) and with the Scheme (Do-Something).

Baseline

3.6 A comparison of baseline emissions based on the LA 105 approach to those calculated using the IAN185/15 approach, which was used to inform the ES, has been undertaken. The following points have been identified:

- The weighted daily average emissions associated with 66% of the baseline ARN links are higher following LA 105, and emissions associated with 34% of the baseline ARN links are lower.
- Of these, 64% of the links experience a change in weighted daily average emissions from the IAN185/15 approach of just +/-1%.
- Of the links that experience higher emission rates following LA 105;
  - 9% experience an increase in emissions of 5% or more; and

- 4% experience an increase in emissions of 20% or more.

- Of the links that experience lower emission rates due to LA 105;
  - 20% experience a decrease in emissions of 5% or more; and
  - 4% experience a decrease in emissions of 20% or more.

3.7 This is illustrated in Figure 4, which shows the spatial distribution of changes in weighted daily average baseline emission rates within the ARN based on LA 105, relative to the emissions calculated to inform the IAN185/15 based assessment reported in the ES.

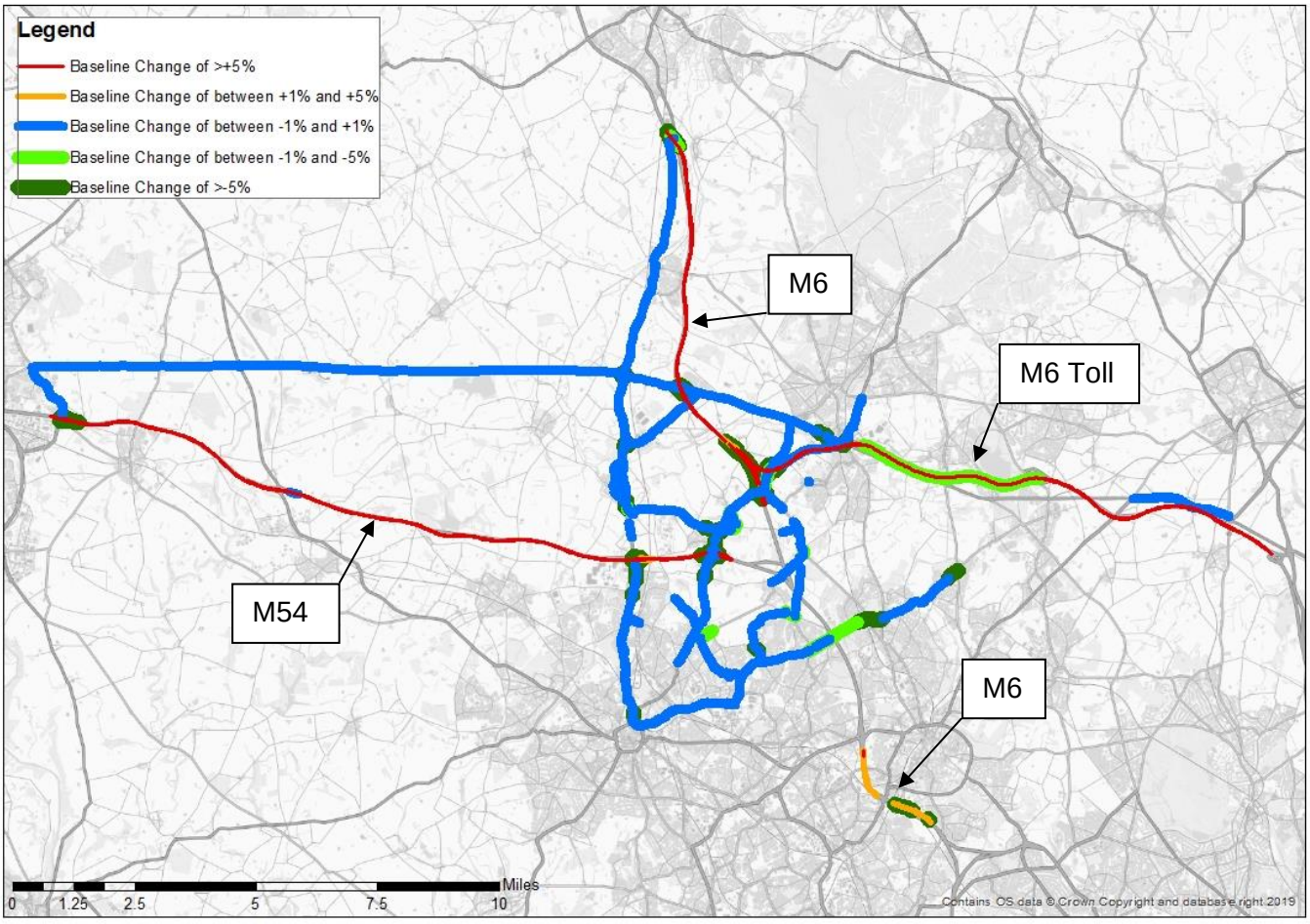

Figure 4: Change in Baseline Weighted Daily Average Emission Rates across the ARN (relative to those used to inform the ES)

3.8 From Figure 4 the following observations can be made:

- At least one direction of most motorway links in the ARN experience an increase in weighted daily average baseline NO_x emissions of greater than 5%, relative to IAN 185/15 emissions. The following reasons contribute to this change:
  - The division of the IAN 185/15 'Motorway High Speed' speed band into two speed bands (Motorway Free Flow and Motorway High Speed) in LA 105. For example, link 39829_95014 on the M6 motorway at Junction

11a and links 39821_39722, 39729_39821 and 39820_39730 on the M54 between junction 1 and junction 2, were previously Motorway High Speed in all time periods following the IAN 185/15 approach, but is a combination of Motorway Free Flow and Motorway High Speed following LA 105 speed bands.

- The change in motorway speed band brackets for the Motorway Heavy Congestion and Motorway Light Congestion speed band categories. For example, link 2053_1202 (M6 southbound slip on at Junction 12) falls into the Motorway Heavy Congestion category for AM, Inter Peak (IP) and PM periods and Motorway Light Congestion in the Off Peak (OP) period with LA 105. With IAN 185/15 this motorway section fell into the Motorway Light Congestion category for AM, IP and PM periods and Motorway High Speed in the OP period.
- The change in output from the SBEFT. For example, link 56557_97148 on the M54 eastbound, east of Junction 3 falls into the High Speed category for both LA 105 and IAN 185/15, but receives higher NO_X emissions rates using the version of the SBEFT released to support the LA105 speed band classifications.

- The vast majority of non-motorway links in the ARN experience a minor change in NO_X emissions as a result of LA 105 (<+1 to <-1%), relative to IAN185/15 emissions.
- Decreases in LA 105 emissions relative to IAN185/15 emissions of greater than 5% are more sporadic, typically occurring on non-motorway roads, with the exception of isolated stretches of opposite carriageways on the M6, M6 Toll and M54. Where larger decreases do occur, they are generally located on road links on the approach to junctions. The following reasons contribute to this change:
  - The change in output from the SBEFT for non-motorway speed bands. For example, links 2028_16024, 2029_16024, 2030_16024 and 2031_16024, all arms of the A460 Cannock Road, New Road and Dark Lane junction, fall into the Heavy Congestion speed category in AM, IP and PM periods and the Light Congestion speed band category in the OP period for both LA 105 and IAN 185/15, but receive lower NO_X emissions rates using the version of the SBEFT released to support the LA 105.
  - The change in motorway speed band classification. For example, link 39770_39771, the westbound M6 Toll carriageway west of Junction T7, where the link was categorised as Motorway High Speed under the IAN 185/15 approach but would be categorised as Motorway Free flow under the LA 105 approach.
  - The change in output from the SBEFT for motorway speed bands. For example, link 50307_50314, M54 Junction 4 eastbound slip on, and link 61824_61801 on the M6 southbound, south of Junction 9, both fall into the Motorway Heavy Congestion speed category in all time periods for both LA 105 and IAN 185/15, but receive lower NO_X emissions rates

using the version of the SBEFT released to support the LA 105 speed band classifications.

3.9 The implications of the revised speed bands and emissions within LA 105 means that there would be a change in the NO_x contribution to annual mean NO_2 concentrations predicted at the monitoring sites used for model verification, therefore affecting the model verification process. In particular, this would affect most monitoring sites located adjacent to the motorway network, increasing the modelled NO_X contribution in most instances, and, to a lesser extent, the majority of monitoring sites located adjacent to the non-motorway network. Where baseline emissions increase around measurement sites, a lower adjustment factor would be likely, although where these emission changes are less than 1% in each direction the effect would be negligible. The potential effect on verification is discussed in detail below.

3.10 Figure 5 shows the spatial distribution of changes in baseline weighted daily average emission rates at locations close to the Scheme based on LA 105, relative to the emissions calculated to inform the IAN185/15-based assessment reported in the ES. Data for key links in close proximity to the Scheme are then summarised in Table 5.

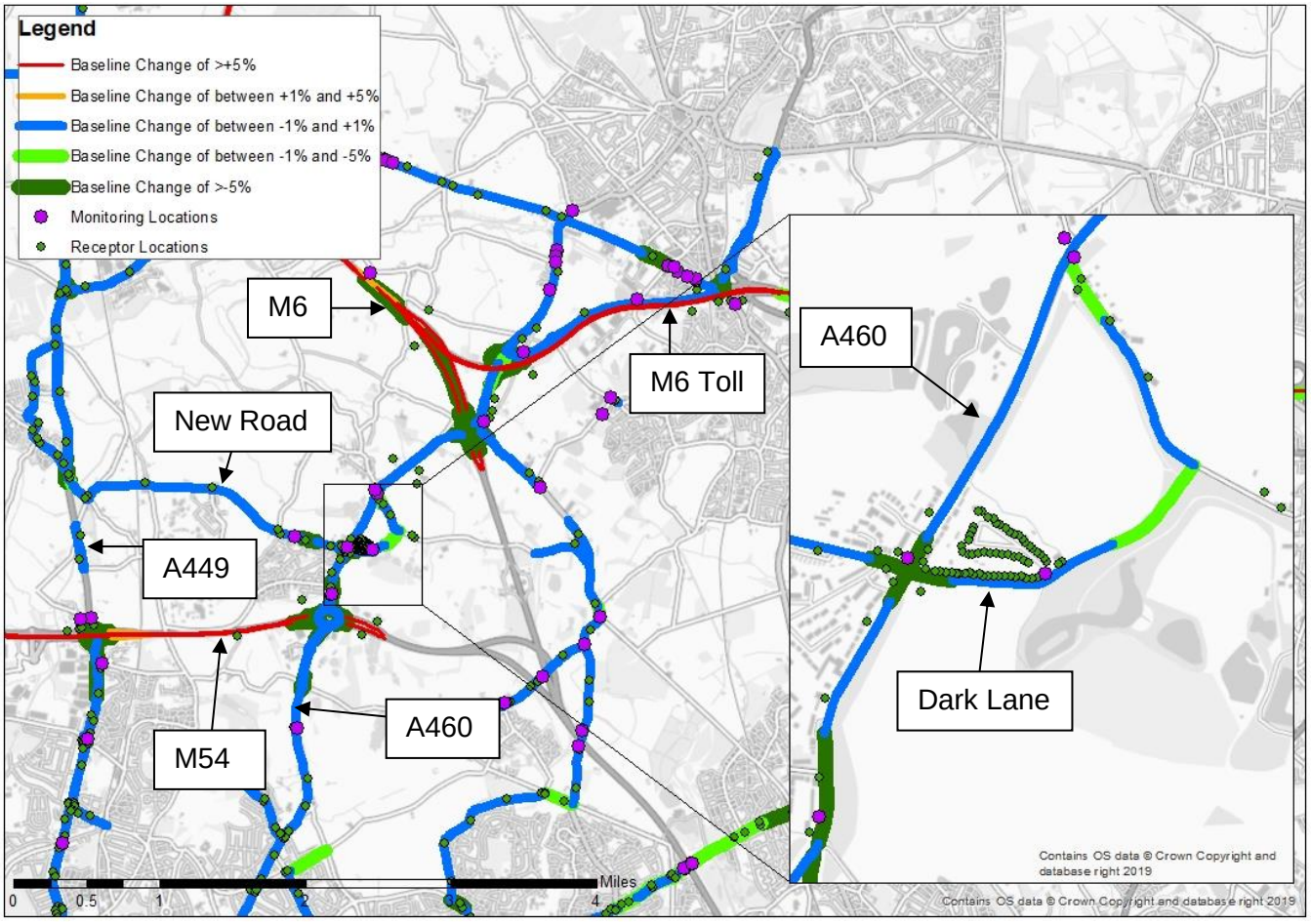

Figure 5: Change in Weighted Daily Average Baseline Emission Rates within the ARN close to the Scheme (relative to those used to inform the ES)

Table 5: Emission Rate Statistics in the Baseline Scenario (Dark Lane/Cannock Road Junction)

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
IAN185/15 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane)	0.355	0.326	0.266	0.076	0.197
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.973	0.928	0.598	0.107	0.482
2028_16024 (Dark Lane)	0.083	0.035	0.065	0.005	0.030
2030_16024 (New Road)	0.153	0.114	0.130	0.014	0.071
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.995	0.925	0.594	0.110	0.485
2029_2032 (A460 Cannock Road, 100m south of Dark Lane)	0.434	0.396	0.312	0.078	0.231
LA 105 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane)	0.358	0.329	0.268	0.077	0.199
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.826	0.785	0.531	0.107	0.419
2028_16024 (Dark Lane)	0.078	0.032	0.062	0.005	0.028
2030_16024 (New Road)	0.142	0.106	0.124	0.014	0.067
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.846	0.783	0.529	0.111	0.423
2029_2032 (A460 Cannock Road, 100m south of Dark Lane)	0.438	0.400	0.314	0.078	0.233
Difference					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane)	+0.003 (+1%)	+0.003 (+1%)	+0.002 (+1%)	+0.001 (+1%)	+0.002 (+1%)
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	-0.147 (-15%)	-0.144 (-15%)	-0.067 (-11%)	+0.001 (+1%)	-0.062 (-13%)
2028_16024 (Dark Lane)	-0.006 (-7%)	-0.002 (-6%)	-0.002 (-4%)	<0.001 (+1%)	-0.002 (-5%)
2030_16024 (New Road)	-0.011 (-7%)	-0.009 (-8%)	-0.006 (-5%)	<0.001 (+1%)	-0.004 (-6%)
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	-0.149 (-15%)	-0.142 (-15%)	-0.065 (-11%)	0.001 (+1%)	-0.062 (-13%)
2029_2032 (A460 Cannock Road, 100m south of Dark Lane)	+0.004 (+1%)	+0.004 (+1%)	+0.002 (+1%)	+0.001 (+1%)	+0.002 (+1%)

3.11 Table 5 shows the change in baseline weighted daily average emissions on the approach to the Dark Lane/A460 Cannock Road/New Road junction. At this location, diffusion tube M54M6TL_002_0813 is within 10 m of link 2031_16024. Based on the IAN185 emissions calculated to inform the ES, this diffusion tube currently over-predicts NOx contributions here, so a decrease with LA 105 emissions would bring the model closer to monitored concentrations, at this specific location.

3.12 The nearest receptors to the junction are around 10 m back from the five-road links listed. For those receptors that are located close to the four links that experience an overall decrease in weighted daily average emissions (R374, R375, R376, R377, R378 and R379), a decrease in NOx contribution to total NO_2 concentrations is likely following the LA 105 approach, subject to wider model verification. Receptor R374 is currently reported to experience an exceedance of the air quality objective value for NO_2 in the baseline scenario.

3.13 Receptors (such as R373 and R380) that are close to the links that experience an increase in NOx emissions due to LA 105 (2024_2031 and 2029_2032), are likely to experience a limited increase in road NOx contribution to total NO_2 concentrations with this approach, subject to wider model verification. Receptor R373 and R380 are currently reported to experience concentrations that are well below the air quality objective value for NO_2 in the baseline scenario.

Effect on Verification

3.14 The air quality assessment for this Scheme included the use of five adjustment factors for specific zones within the modelled study area.

3.15 Four of these zones were centred on air quality management areas (AQMAs) where the model underpredicted pollutant concentrations. These AQMAs and adjustment factors are:

- Muckley Corner AQMA (1.47);
- Wedge Mills AQMA (1.58);
- Oak Farm AQMA (1.54); and
- Cannock Chase AQMA No. 2 (1.34).

3.16 A final fifth zone and adjustment factor was used for areas outside the AQMAs. The model tended to generally overpredict pollution concentrations in these areas. A conservative approach was adopted in these areas by applying an adjustment factor of 1.00. Thereby accepting the over-prediction of the road NO_X contribution at these locations and, therefore, conservatively reporting total concentrations in all scenarios that are higher than would have been had the calculated factor been applied. Any changes to emission rates and pollutant concentrations in areas covered by this zone are unlikely to be of a magnitude to change this conclusion and therefore the general adjustment factor applied to the majority of receptors within the study area will not change.

3.17 The potential effect of changing baseline concentrations in the four AQMAs is considered in turn below.

Muckley Corner AQMA

3.18 Two links were identified as part of the ARN on the A5 dual-carriageway within the Muckley Corner AQMA, links 58621_51462 and 58628_58622. Analysis of the emissions calculated for these links using the LA 105 approach compared to the IAN 185/15 approach has identified that LA 105 would increase emissions by less than 1%.

3.19 Local Authority monitoring undertaken in the Muckley Corner AQMA in the baseline year identified exceedances of the air quality objective for NO_2 adjacent to and on the approach to the Muckley Corner roundabout. One receptor located in the Muckley Corner AQMA is predicted to exceed the NO_2 air quality objective in the baseline scenario (R477). However, concentrations at this and nearby locations are predicted to be well below the air quality objective in the Do-Minimum and Do-Something scenarios.

3.20 A change in emissions of this magnitude is considered unlikely to affect the model verification factor calculated for this AQMA to the extent that it would alter the conclusions of the assessment at this location.

Wedge Mills AQMA

3.21 Two links were identified as part of the ARN on the A4601 within the Wedge Mills AQMA, links 2018_38963 and 16810_38963. Analysis of the emissions calculated for these links using the LA 105 approach compared to the IAN 185/15 approach has also identified that LA 105 would increase emissions by less than 1%.

3.22 In the baseline year, the Local Authority monitoring within the AQMA did not measure an exceedance of the air quality objective. None of the receptors within the Wedge Mills AQMA are predicted to exceed the NO_2 air quality objective in the baseline scenario (R408 having the highest baseline concentration of 37.4 µg/m^3), and concentrations at this and nearby locations are predicted to be well below the air quality objective in the Do-Minimum and Do-Something scenarios.

3.23 A change in emissions of this magnitude is unlikely to affect the model verification factor calculated for this AQMA to the extent that it would alter the conclusions of the assessment at this location.

Oak Farm AQMA

3.24 A single link was identified as part of the ARN on the A5 within the Oak Farm AQMA, link 16030_90196. Analysis of the emissions calculated for this links using the LA 105 approach compared to the IAN 185/15 approach has also identified that LA 105 would increase emissions by less than 1%.

3.25 Local Authority monitoring undertaken in the Oak Farm AQMA in the baseline year identified no exceedance of the air quality objective for NO_2. None of the receptors within the AQMA are predicted to exceed the NO_2 air quality objective in the baseline scenario (R396 having the highest baseline concentration of 37.4 µg/m^3), and concentrations at this and nearby locations are predicted to be well below the air quality objective in the Do-Minimum and Do-Something scenarios.

3.26 A change in emissions of this magnitude is unlikely to affect the model verification factor calculated for this AQMA to the extent that it would alter the conclusions of the assessment at this location.

Cannock Chase AQMA

3.27 Numerous links were identified as part of the ARN within the Cannock Chase AQMA, including stretches of the A5 at Watling Street (links 16030_16810, 16088_16810, 16088_49712 and 49712_97082). Analysis of the emissions calculated for these links has identified that LA 105 would decrease emissions by more than 5% on link 16088_49712. It would decrease emissions by less than 1% on links 16088_16810 and 49712_97082 and increase emissions by less than 1% on link 16030_16810. The more than 5% decrease is due to the way the LA105 SBEFT now deals with emissions associated with the Heavy Congestion speed band.

3.28 In the baseline year, the Local Authority and Highways England monitoring within the AQMA did not measure an exceedance of the NO_2 air quality objective, although two receptors were predicted to exceed that objective where they were either located closer to the road than the diffusion tubes, or on a stretch of road that experienced a higher emission rate (R438 and R440). By 2024, Do-Minimum and Do-Something concentrations at these locations are predicted in the ES to be below the air quality objective, with both receptors experiencing an imperceptible change.

3.29 A change in baseline emissions of this magnitude could potentially increase the verification factor calculated at monitoring locations close to the link that experiences the larger decrease in baseline emissions. However, even with a greater factor at this location, any change to predicted Do-Minimum and Do-Something concentrations are unlikely to alter the conclusions of the assessment, given the negligible impacts reported at this location.

Do-Minimum

3.30 A comparison of weighted daily average Do-Minimum emissions based on the LA 105 approach to those calculated using the IAN185/15 approach, which was used to inform the ES, has been undertaken. The following points have been identified:

- Weighted daily average emissions associated with 69% of the Do-Minimum links are higher following LA 105, and emissions associated with 31% of the Do-Minimum links are lower.
- Of these, 3% of the links experience a change in emissions from the IAN185/15 approach of +/-1%.
- Of the Do-Minimum links that experience higher emission rates following LA 105;
  - 9% experience an increase in emissions of 5% or more; and
  - 8% experience an increase in emissions of 20% or more.
- Of the links that experience lower emission rates due to LA 105;
  - 24% experience a decrease in emissions of 5% or more; and

- 10% experience a decrease in emissions of 20% or more.

3.31 This is illustrated in **Figure 6**, which shows the spatial distribution of changes in weighted daily average emission rates within the ARN based on LA 105, relative to the emissions calculated to inform the IAN185/15-based assessment reported in the ES.

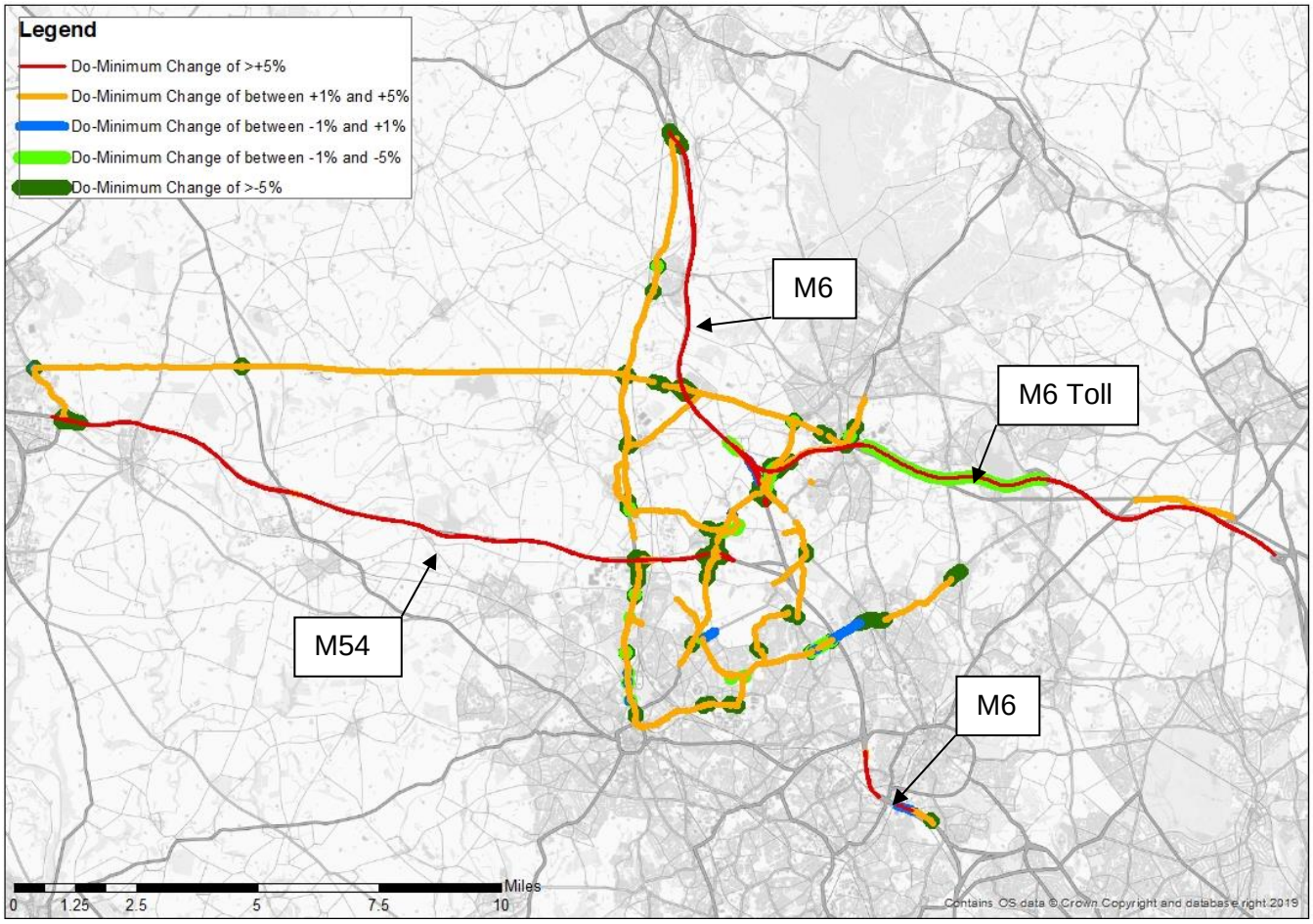

Figure 6: Change in Weighted Daily Average Do-Minimum Emission Rates across the ARN (relative to those used to inform the ES)

3.32 As was the case with the comparison of baseline emissions, **Figure 6** demonstrates that: the majority of motorway links in the Do-Minimum ARN experience an increase in weighted daily average NO_x emissions of greater than +5%, relative to IAN185/15 emissions. The reasons for which are as summarised in paragraph 3.4.

3.33 However, unlike the baseline scenario, in the Do-Minimum scenario the majority of non-motorway links in the ARN now experience an increase in NO_x emissions of +1% to +5%, as a result of LA 105, relative to IAN185/15 emissions. This includes large stretches of ARN on the A460 (including link 2029_2032), A449 (including links 2028_49753 and 49753_2048) and the A5 (including link 16030_90196), and analysis suggests this is due to the output from the LA 105 version of the SBEFT generating slightly higher emission rates in the Do-Minimum year for Free Flow and Light Congestion speed bands.

3.34 Decreases in LA 105 emissions relative to IAN185/15 emissions of greater than 1% are more sporadic, but do occur, typically affecting non-motorway roads, with the exception of isolated stretches of opposite carriageways on the M6, M6 Toll and M54, and in particular links on the approach to major junctions. These larger decreases seem to be for the same reason as reported in paragraph 3.4, in that the LA 105 SBEFT generates lower emissions for links that are categorised as Heavy Congestion in the Do-Minimum scenario, when compared to the version of the SBEFT compatible with IAN 185/15 and used to inform the ES.

3.35 The implication of LA 105 and its effect on weighted daily average Do-Minimum emissions rates means that there will be some change in the NO_x contribution to annual mean NO_2 concentrations predicted at the air quality sensitive receptors for this scenario. In general, predicted NO_x contributions will be most likely to increase at receptors located close to the motorway links within the ARN, and, to a lesser extent, at receptors located close to the majority of non-motorway links.

3.36 Some receptors would have a decrease in NO_x contributions as a result of the LA 105 approach, particularly at receptor locations close to congested sections of road, such as on the approach to major junctions, although this would likely affect a smaller number of receptors overall. The precise effect of these changes to the annual mean NO_2 concentrations reported in the ES would be affected by both the changes in emissions in this scenario and in the baseline due to the verification. Effects on specific areas sensitive to the Scheme are considered in turn below.

3.37 Figure 7 shows the spatial distribution of changes in weighted daily average Do-minimum emission rates at locations close to the Scheme based on LA 105, relative to the weighted daily average emissions calculated to inform the IAN185/15-based assessment reported in the ES. Data for key links in close proximity to the Scheme are then summarised in Table 6.

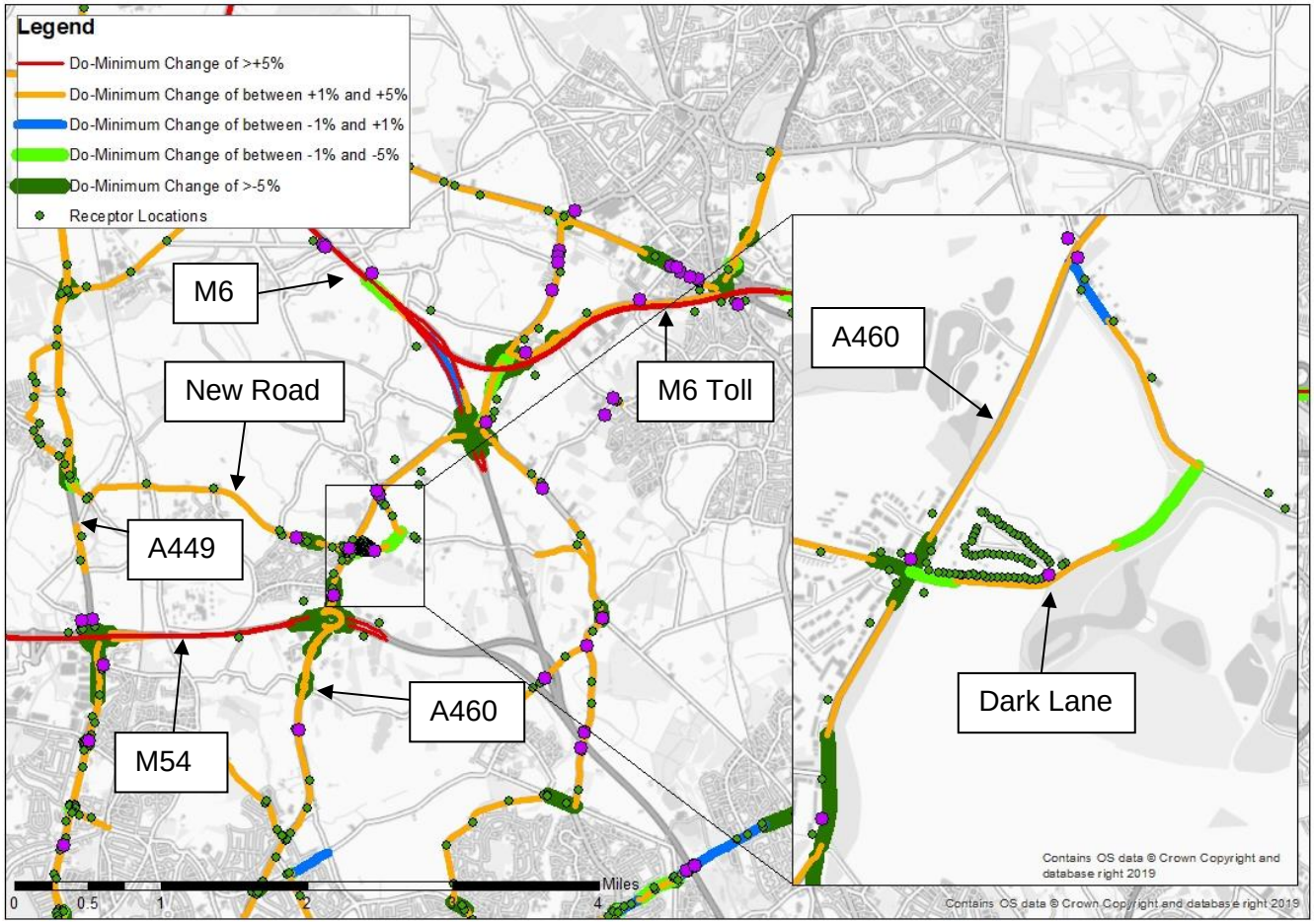

Figure 7: Change in weighted daily average Do-Minimum Emission Rates within the ARN close to the Scheme (relative to those used to inform the ES)

Table 6: Emission Rate Statistics in the Do-Minimum Scenario (Dark Lane/Cannock Road Junction)

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
IAN185/15 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	0.177	0.164	0.156	0.041	0.104
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.483	0.462	0.319	0.055	0.243
2028_16024 (Dark Lane)	0.045	0.020	0.037	0.003	0.017
2030_16024 (New Road)	0.077	0.058	0.072	0.007	0.037
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.495	0.463	0.318	0.056	0.245

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
2029_2032 (A460 south of link2029_16024 and north of link 2032_16023)	0.184	0.167	0.159	0.042	0.106
2032_16023 (A460 north of The Avenue)	0.495	0.463	0.318	0.056	0.245
LA 105 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	0.181	0.168	0.160	0.043	0.106
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.368	0.348	0.270	0.056	0.195
2028_16024 (Dark Lane)	0.042	0.019	0.036	0.003	0.016
2030_16024 (New Road)	0.070	0.052	0.068	0.007	0.034
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.378	0.351	0.272	0.057	0.197
2029_2032 (A460 south of link2029_16024 and north of link 2032_16023)	0.187	0.171	0.163	0.043	0.108
2032_16023 (A460 north of The Avenue)	0.378	0.351	0.272	0.057	0.197
Difference					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	+0.004 (+2%)	+0.003 (+2%)	+0.004 (+3%)	+0.001 (+3%)	+0.002 (+2%)
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	-0.115 (-24%)	-0.114 (-25%)	-0.049 (-15%)	+0.001 (+2%)	-0.048 (-80%)
2028_16024 (Dark Lane)	-0.003 (-7%)	-0.001 (-6%)	-0.001 (-2%)	<0.001 (+3%)	-0.001 (-5%)
2030_16024 (New Road)	-0.007 (-9%)	<0.001 (-11%)	-0.003 (-5%)	<0.001 +2(%)	-0.003 (-7%)
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	-0.117 (-24%)	-0.112 (-24%)	-0.046 (-15%)	+0.001 (+2%)	-0.048 (-20%)
2029_2032 (A460 south of link2029_16024 and north of link 2032_16023)	+0.004 (+2%)	+0.003 (+2%)	+0.004 (+3%)	+0.001 (+3%)	+0.002 (+2%)
2032_16023 (A460 north of The Avenue)	-0.117 (-24%)	-0.112 (-24%)	-0.046 (-15%)	+0.001 (-2%)	-0.048 (-20%)

3.38 Table 6 shows the change in Do-Minimum emissions on the approach to the Dark Lane/ A460 Cannock Road/ New Road junction. In this scenario, the LA 105 approach leads to a decrease in daily weighted average emissions of up to 24% on the immediate approach to the junction from the A460 Cannock Road (2031_16024 and 2029_16024) and New Road (2030_16024). This is due to

the LA 105 SBEFT output for roads classified with the Heavy Congestion speed band, which generates lower emission rates compared to the SBEFT used to inform the ES under the IAN 185/15 approach. A smaller level of decrease is calculated on the approach to the junction from Dark Lane (2028_16024), relative to IAN185/15 emissions, which is less affected than the other arms of the junction by the SBEFT output because of the lower proportion of HGVs on that link.

3.39 The nearest receptors to the junction (R374, R375, R376, R377, R378 and R379) and adjacent to the links that will experience the greatest decrease with LA 105, relative to IAN185/15, will experience a lower NO_x contribution to annual mean concentrations of NO_2, which could potentially be lower than that reported for the Do-Minimum scenario in the ES, subject to model verification. Of the six receptors close to the junction, R374 and R377 are reported in the ES to experience the highest Do-Minimum NO_2 concentration at this location, of around 34 µg/m^3, and will therefore remain below the 40 µg/m^3 annual average NO_2 objective.

3.40 Further back from the junction, on all four approaching links (including 2024_2031 and 2029_2032), daily weighted emissions increase by between 1% and 5%, relative to IAN185/15 emissions. Analysis suggests that this is due to the LA 105 SBEFT generating slightly more elevated emission rates for non-motorway links classified as the Light Congestion speed band. The nearest receptors to those links (R373, R380 and R386) will experience higher NO_x contributions to annual mean NO_2 concentrations, potentially increasing concentrations higher than that reported in the ES, subject to the baseline effect on model verification. Of those three receptors, R373 is reported in the ES to experience the highest Do-Minimum NO_2 concentration, of around 24 µg/m^3, therefore any increase in concentrations at this location is unlikely to lead concentrations above 40 µg/m^3 objective.

Do-Something

3.41 A comparison of weighted daily average Do-Something emissions based on the LA 105 approach against those calculated using the IAN185/15 approach, which was used to inform the ES, has also been undertaken. The following points have been identified:

- Weighted daily average emissions associated with 69% of the Do-Something links are higher following LA 105, and emissions associated with 31% of the Do-Something links are lower.
- Of these, 3% of the links experience a change in emissions from the IAN185/15 approach of +/-1%.
- Of the links that experience higher emission rates following LA 105;
  - 9% experience an increase in emissions of 5% or more; and
  - 8% experience an increase in emissions of 20% or more.
- Of the links that experience lower emission rates due to LA 105;
  - 23% experience a decrease in emissions of 5% or more; and
  - 9% experience a decrease in emissions of 20% or more.

3.42 This is illustrated in Figure 8, which shows the spatial distribution of changes in weighted daily average emission rates within the ARN based on LA 105, relative to the emissions calculated to inform the IAN185/15-based assessment reported in the ES.

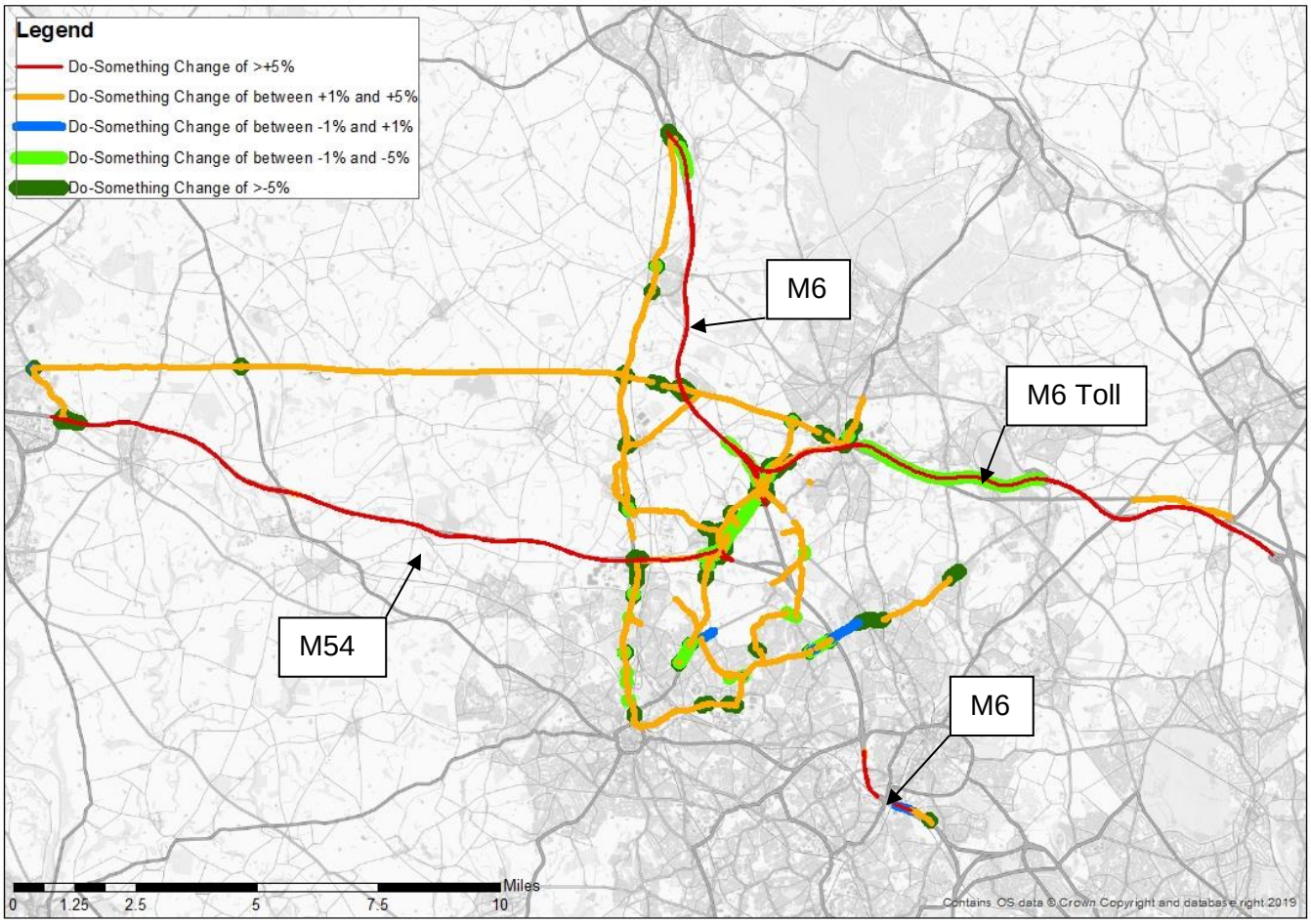

Figure 8: Change in weighted daily average Do-Something Emission Rates within the ARN close to the Scheme (relative to those used to inform the ES)

3.43 As with the comparison of baseline and Do-Minimum emissions, Figure 8 demonstrates that the majority of Do-Something motorway links in the ARN experience an increase in weighted daily average NO_x emissions of greater than +5%, relative to IAN185/15 emissions.

3.44 In the Do-something scenario the majority of non-motorway links in the ARN experience an increase in NO_x emissions of +1% to +5% similar to the Do-Minimum scenario, as a result of LA 105, relative to IAN185/15 emissions.

3.45 Decreases in LA 105 emissions relative to IAN185/15 emissions of greater than -1% are more sporadic, but do occur, typically affecting congested non-motorway roads on the approach to junctions, but also occurring on some isolated stretches of opposite carriageways on the M6, M6 Toll and M54.

3.46 The reasons for these changes have been discussed in the earlier section on the baseline and Do-Something scenarios, as described in paragraph 3.4 and 3.32.

3.47 The implication of LA 105 and its effect on Do-Something weighted daily average emissions rates means that there will be a change in the NO_x contribution to annual mean NO_2 concentrations predicted at the air quality sensitive receptors for this scenario.

3.48 Again, in general predicted NO_x contributions will be likely to increase at receptors located close to the motorway links within the ARN, and, to a lesser extent, at receptors located close to the majority of non-motorway links.

3.49 Some receptors would be predicted to have a decrease in NO_x contributions as a result of the LA 105 approach, particularly at locations adjacent to congested stretches of roads, although this would likely affect a smaller number of receptors overall.

3.50 The precise effect of these changes to the annual mean NO_2 concentrations reported in the ES would be affected by both the changes in emissions in this scenario and in the baseline due to the verification. Effects on specific areas is considered in turn below.

3.51 Figure 9 shows the spatial distribution of changes in Do-Something weighted daily average emission rates at locations close to the Scheme based on LA 105, relative to the emissions calculated to inform the IAN185/15-based assessment reported in the ES. Data for key links in close proximity to the Scheme are then summarised in Table 7.

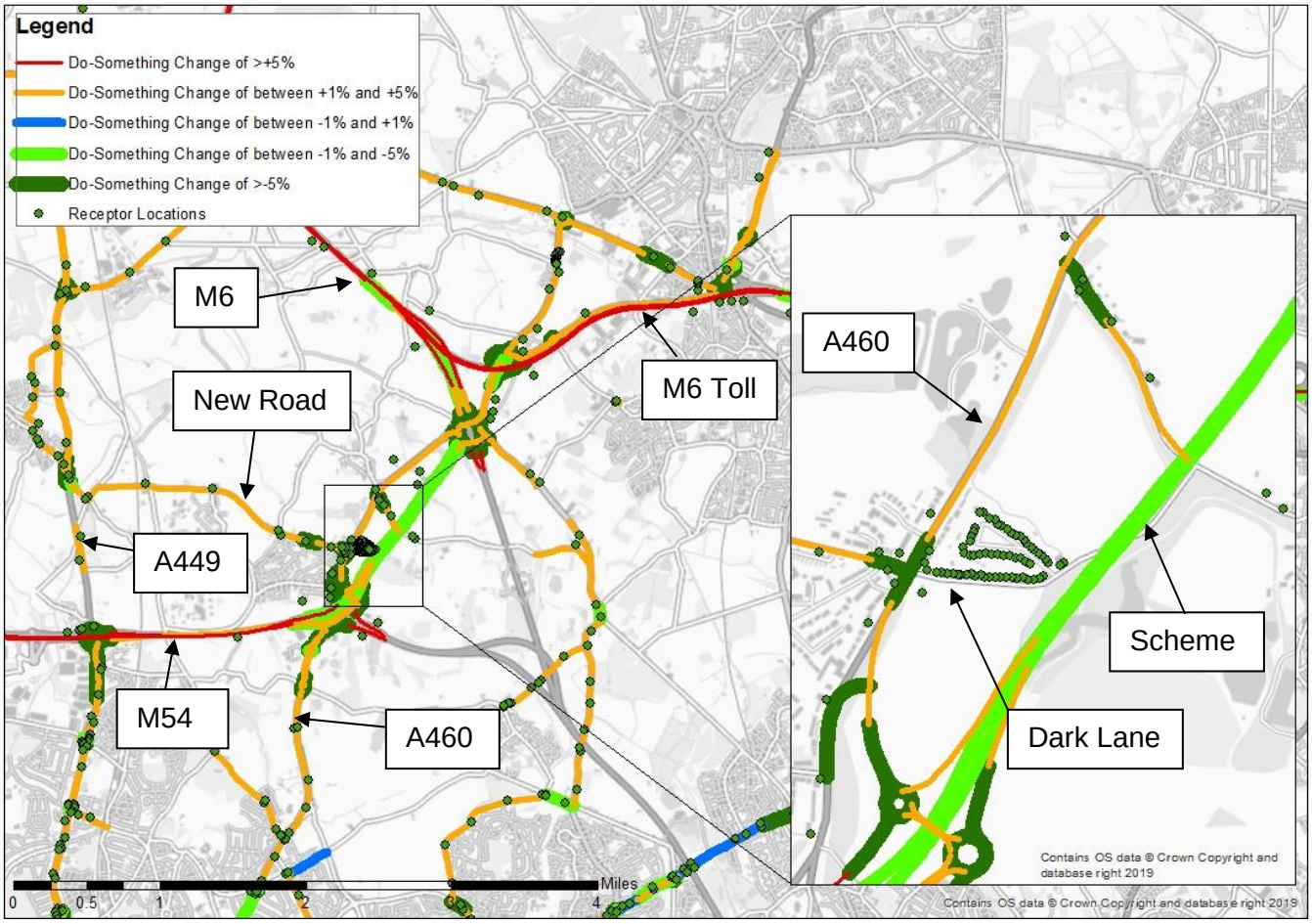

Figure 9: Change in Do-Something Emission Rates within the ARN close to the Scheme (relative to those used to inform the ES)

Table 7: Emission Rate Statistics in the Do-Something Scenario (Dark Lane/Cannock Road Junction)

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
IAN185/15 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	0.029	0.016	0.028	0.005	0.014
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.052	0.033	0.042	0.007	0.023
2030_16024 (New Road)	0.061	0.043	0.051	0.005	0.027
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.070	0.047	0.051	0.009	0.031
2029_2032 (A460 south of link2029_16024 and north of link 2032_16023)	0.034	0.021	0.030	0.007	0.017

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
2032_16023 (A460 north of The Avenue)	0.044	0.028	0.037	0.009	0.021
97201_2202 (The northbound Scheme carriageway past Dark Lane)	0.147	0.119	0.143	0.034	0.083
2203_97217 (The southbound Scheme carriageway past Dark Lane)	0.143	0.125	0.150	0.037	0.086
LA 105 Approach					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	0.030	0.017	0.029	0.006	0.014
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	0.049	0.029	0.041	0.007	0.022
2030_16024 (New Road)	0.055	0.039	0.048	0.005	0.025
2029_16024 (A460 Cannock Road, directly south of Dark Lane)	0.062	0.041	0.049	0.009	0.029
2029_2032 (A460 south of link2029_16024 and north of link 2032_16023)	0.034	0.022	0.031	0.007	0.017
2032_16023 (A460 north of The Avenue)	0.045	0.029	0.038	0.009	0.022
97201_2202 (The northbound Scheme carriageway past Dark Lane)	0.140	0.114	0.136	0.032	0.079
2203_97217 (The southbound Scheme carriageway past Dark Lane)	0.136	0.119	0.143	0.035	0.082
Difference					
2024_2031 (A460 Cannock Road, 100m north of Dark Lane	+0.001 (+3%)	<0.001 (+3%)	+0.001 (+3%)	<0.001 (+3%)	<0.001 (+3%)
2031_16024 (A460 Cannock Road, directly north of Dark Lane)	-0.004 (-7%)	-0.004 (-11%)	-0.001 (-2%)	<0.001 (+3%)	-0.001 (-6%)
2030_16024 (New Road)	-0.006 (-10%)	-0.005 (-11%)	-0.002 (-5%)	<0.001 (+2%)	-0.002 (-8%)
2029_16024 (A460 Cannock Road, directly South of Dark Lane)	-0.008 (-11%)	-0.005 (-11%)	-0.002 (-4%)	<0.001 (+3%)	-0.002 (-8%)
2029_2032 (A460 south of link 2029_16024 and north of link 2032_16023)	+0.001 (+3%)	+0.001 (+3%)	+0.001 (+3%)	<0.001 (+3%)	<0.001 (+3%)
2032_16023 (A460 north of The Avenue)	+0.001 (+3%)	+0.001 (+3%)	+0.001 (+3%)	<0.001 (+3%)	+0.001 (+3%)
97201_2202 (The northbound Scheme carriageway past Dark Lane)	-0.007 (-5%)	-0.006 (-5%)	-0.007 (-5%)	-0.002 (-5%)	-0.004 -(5%)

Road Link	Emissions (g/km/s)				
	AM	IP	PM	OP	Weighted Av.
2203_97217 (The southbound Scheme carriageway past Dark Lane)	-0.007 (-5%)	-0.006 (-5%)	-0.008 (-5%)	-0.002 (-5%)	-0.004 (-5%)

3.52 Table 7 shows the change in Do-Something emissions on the approach to the Dark Lane/ A460 Cannock Road/ New Road junction. In this scenario, the LA 105 method leads to a decrease in weighted daily average emissions of 6% to 8% on the approach to the junction from the A460 Cannock Road and New Road (2031_16024, 2029_16024, 2030_16024), but an increase of around 3% on the sections of the A460 Cannock Road further back from the junction, in comparison to the emission values provided by the IAN 185.15 approach. These differences are due to the emissions output provided by the LA 105 version of the SBEFT, which generates lower emission rates for non-motorway links that are categorised as Heavy Congestion, but marginally higher emission rates for links categorised as Free Flow.

3.53 The nearest receptors to the A460 Cannock Road at this junction (R373, R374, R375, R376, R377 and R380) will likely experience a decrease in emissions with LA 105, relative to IAN185/15, and will experience a lower NO_x contribution to annual mean concentrations of NO_2 in the Do-Something scenario, subject to any change to model verification. Of the receptors close to the A460 Cannock Road, R374 and R377 are reported in the ES to experience the highest Do-Something NO_2 concentration at this location, of around 21 µg/m^3, and will therefore remain below the 40 µg/m^3 annual average NO_2 objective.

3.54 Weighted daily emissions associated with the Scheme itself where it passes closest to the nearest sensitive receptors on Dark Lane (97201_2202 and 2203_97217) will decrease by around 5% with LA 105, relative to IAN185/15. This is due to addition of the motorway speed band category 'Free Flow' that has been introduced with LA 105, which has lower NO_x emissions than the motorway High Speed speed band category that is applied under the IAN 185/15 guidance.

3.55 Receptor R312 is located closest to the Scheme and was reported in the ES to experience a Do-Something concentration of around 20 µg/m^3, 2.8 µg/m^3 of which was related to the Scheme. A decrease in emissions from the Scheme following the LA 105 approach would not change the annual mean NO_2 concentrations to the extent that it would alter the conclusions of the assessment at this location and annual mean concentrations will remain below the 40 µg/m^3 annual average NO_2 objective.

Predicted Change

3.56 Finally, a comparison has been made of the change in weighted daily average emissions (Do-Something minus Do-Minimum) that occurs between the new LA 105 approach and the IAN185/15 approach used to inform the ES. This is illustrated in Figure 10.

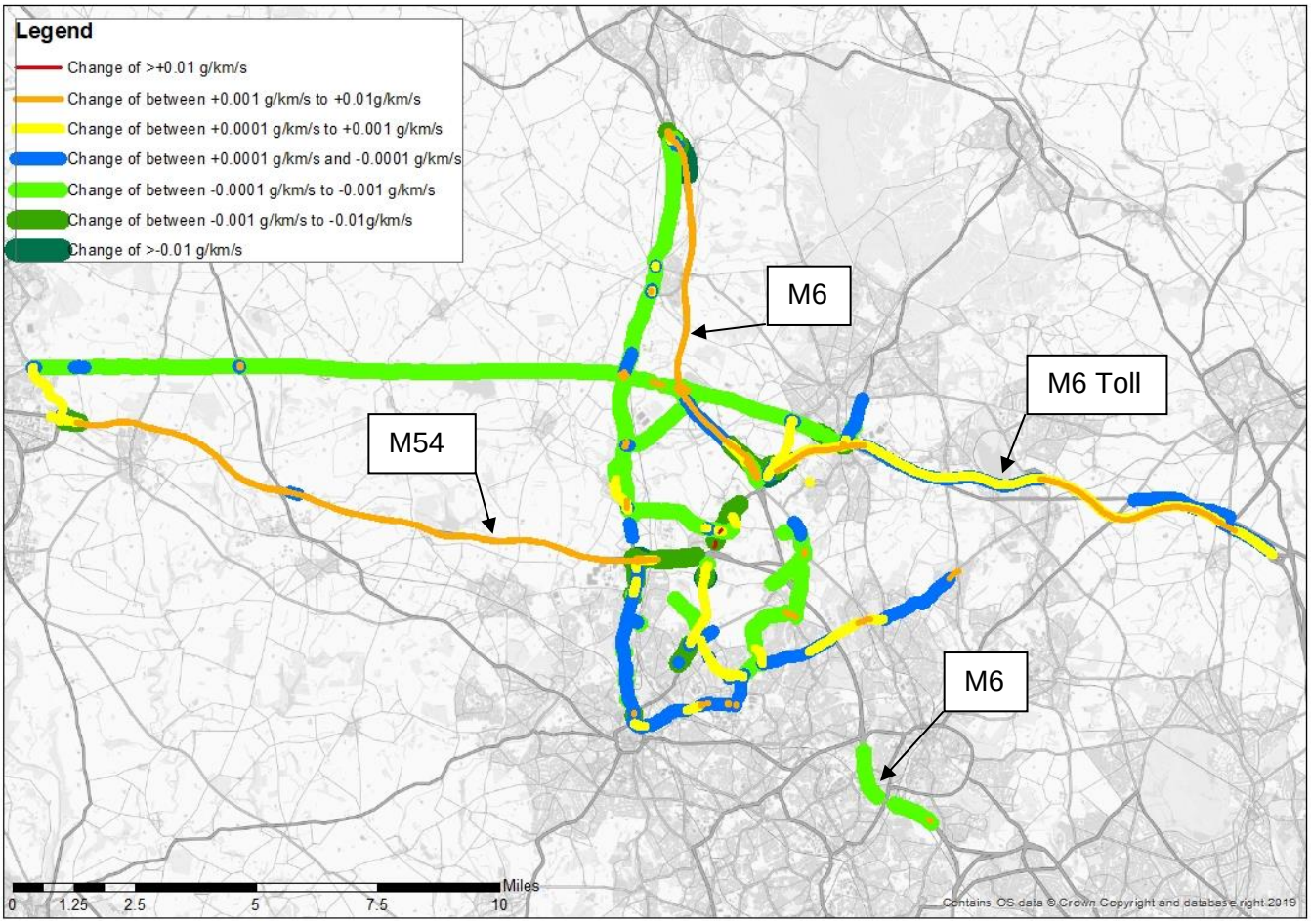

Figure 10: Difference in the Change of Emission Rates (Do-something minus Do-minimum) within the ARN (relative to those used to inform the ES)

3.57 Figure 10 shows that the larger differences in the level of change in weighted daily average emission rates (>+0.01 g/km/s and >-0.01 g/km/s) occur at very few isolated locations. Lesser differences in the level of change are more common, with the majority of the M6 (north of the Scheme), M54 and a proportion of the M6 Toll ARN experiencing an increase in change (or reduction in the level of decrease) of +0.001 g/km/s to +0.01 g/km/s as result of LA 105.

3.58 The remainder of the M6 Toll experiences a lesser increase (or a lesser reduction in the level of decrease) in the change in weighted daily average emissions of +0.0001 g/km/s to +0.001 g/km/s.

3.59 Shorter sections of the M6 and M54, and the majority of the non-motorway ARN experience little change (+0.0001 g/km/s to -0.0001 g/km/s) or a decrease (or reduction in increase) (-0.0001 g/km/s to >-0.01 g/km/s) in the change in weighted daily average emissions as a result of LA 105.

3.60 The largest decreases (or reduction in increases) (>-0.1 g/km/s) in weighted daily average emissions occurs on the M6 south of Junction 13, the westbound M54 carriageway to the east of Junction 2, the A449 south of M54 Junction 2, and the A460 north of Wolverhampton City Centre.

3.61 Where the difference in the change of weighted daily average emissions occurs results in an increase (or reduction in decrease) of emissions with LA 105, it is likely that the magnitude of change to total pollutant concentrations will also increase, subject to the effect of the LA 105 approach to model verification. Likewise, where the difference in the change of weighted daily emissions occurs with a decrease (or reduction in increase) with LA 105, it is likely that the magnitude of change to total pollutant concentrations will decrease.

3.62 Figure 11 reviews this relationship on links closer to the proposed Scheme. It does not include the Scheme itself, because no change can be calculated as Scheme links do not exist in the Do-minimum scenario.

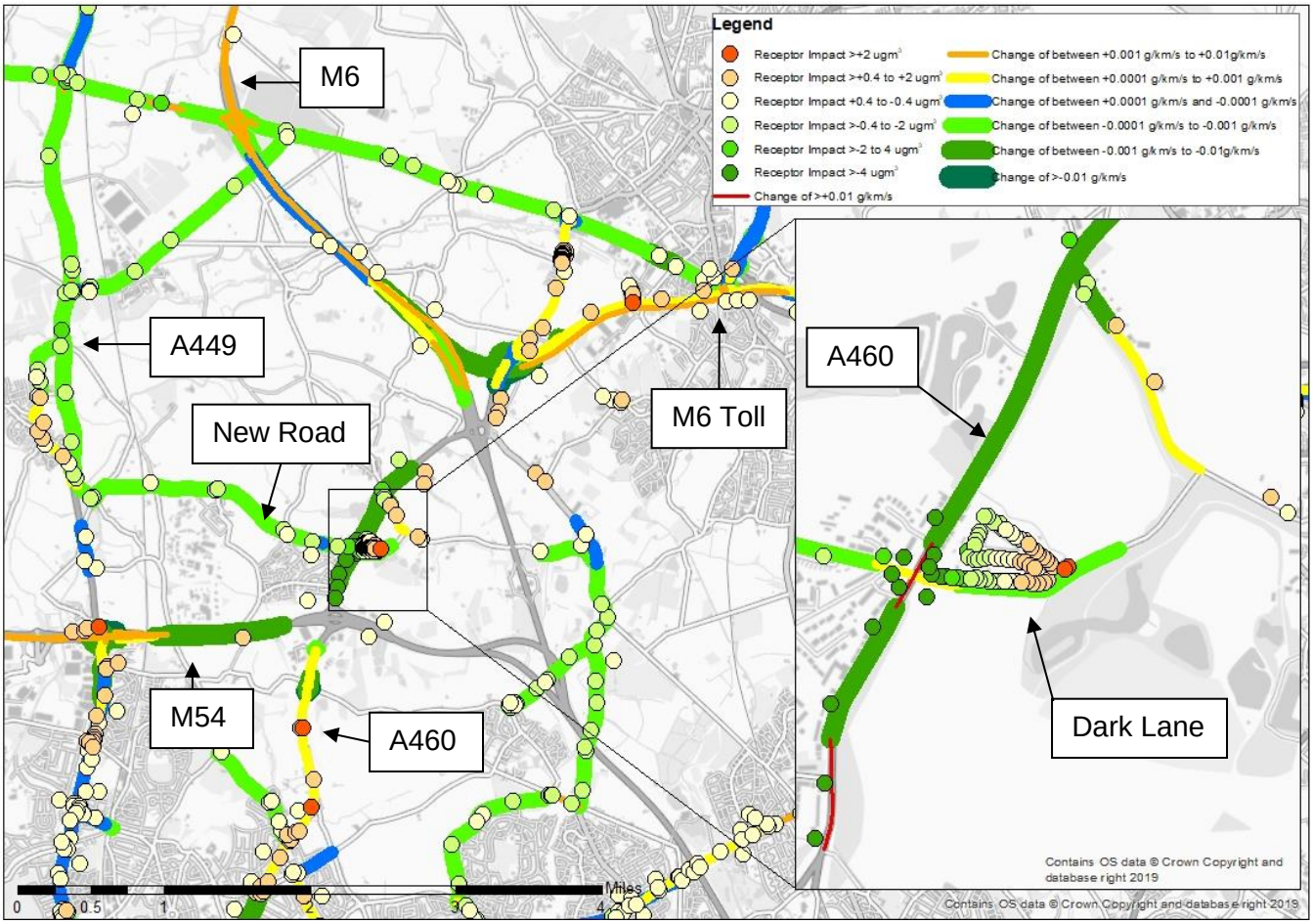

Figure 11: Difference in the Change of Emission Rates (Do-Something minus Do-Minimum) within the ARN close to the Scheme (relative to those used to inform the ES)

3.63 Figure 11 shows that the A460 Cannock Road, on the approach to and from the junction with Dark Lane and New Road, will experience a reduction in the level of decrease in weighted daily average emissions calculated, compared to that calculated with IAN185/15. This is due to the influence of the SBEFT associated with the LA 105 approach, which generates lower emission rates for roads categorised as Heavy Congestion than the SBEFT related to IAN 185/15 (used to inform the ES). Because flows and HGV proportions are greater in the Do-Minimum scenario, the level of reduction in emissions because of the LA 105 methodology is greater in that scenario than the Do-Something scenario,

therefore narrowing the gap between the two scenarios and the level of decrease. The predicted improvement in annual mean concentrations of NO_2 reported at this location in the ES (including receptors R374, R375 and R377, up to -13.5 µg/m^3) is therefore likely to be smaller, following the LA 105 approach, although not to the extent that it would likely alter the conclusions of the assessment.

3.64 Further north on the A460 Cannock Road, on the approach to and from the junction with Hilton Lane, the LA 105 methodology leads to a further decrease in emissions on top of the decrease used to inform the ES. The predicted improvement in annual mean concentrations of NO_2 reported at this location in the ES (including receptors R307, R308 and R309, up to -3.8 µg/m^3) would likely become an even bigger decrease, following the LA 105 approach.

3.65 Elsewhere within the study area, where receptors are predicted to exceed the national air quality objective value for NO_2 in the Do-Something scenario, as reported in the ES, the small improvement in weighted daily average emissions at receptors locations adjacent to the ARN at Lichfield Road, near Bloxwich (R205 and R206), is set to decrease by between +0.0001 g/km/s and +0.001 g/km/s (a change of around 4% of decrease applied in the ES). Beneficial impacts at this location in the ES were imperceptible and they would therefore remain so using the updated methodology, LA 105.

3.66 Receptors are also predicted to exceed the annual average air quality objective value for NO_2 at a location adjacent to the ARN on the M6, adjacent to Darlaston Road (R228, R229, R230 and R231). At this location, LA 105 would cause a decrease in emissions between Do-Something and Do-Minimum scenarios, which would lessen the imperceptible impact currently reported at those receptors.

3.67 Where the ES reports the highest adverse impact on annual mean NO_2 concentrations, excluding receptors on Dark Lane that are impacted upon by the Scheme itself, (receptors R045, R135, R152 and R155 were predicted to experience small increases of 1.7-1.8 µg/m^3), the LA 105 approach causes a decrease in the change in weighted daily average emissions between Do-Something and Do-Minimum scenarios on the nearest roads (R045 and R135), or a small increase in emissions of +0.0001 g/km/s and +0.001 g/km/s (a change of around 2% of the decrease applied in the ES) (R152 and R155), in relation to the results reported using IAN185/15. This is likely to translate into a decrease in the level of annual mean NO_2 impact reported at these locations however these are likely to still be small worsenings in NO_2 emissions.

3.68 In summary, the LA 105 approach to speed bands and the associated SBEFT will have an effect on emissions and pollutant concentrations that are a direct result of those emissions across the study area. The level of effect on links varies depending on the link type, speed and proximity to junctions. The potential effect on sensitive receptors will depend on these and the proximity of those receptors to the road links.

3.69 Whilst differences in annual mean concentrations of NO_2 and the impact of the Scheme would be anticipated at the majority of receptors within the study area, it is not anticipated that these changes would affect the overall evaluation of

significance for the Scheme and the impact of the Scheme on air quality would continue to be considered not significant.

4 Sensitivity Test 3: LA 105 Nitrogen Deposition Rates

4.1 This review has been carried out in conjunction with the Biodiversity team.

4.2 LA 105 specifies conversion rates of NO_2 concentrations to nitrogen deposition (Ndep) that differ to that specified by HA207/07. HA207/07 stated that "*Dry NO_2 deposition rates should be estimated using… 1 µg/m^3 of NO_2 = 0.1 kg N ha^{-1} yr^{-1}*", while LA 105 provides the following conversion rates:

1) grassland and similar habitats: 1 µg/m^3 of NO_2 = 0.14 kg N/ha/yr;
2) forests and similar habitats: 1 µg/m^3 of NO_2 = 0.29 kg N/ha/yr.

4.3 In both cases this represents an increased conversion factor, particularly for forests for which the conversion rate has almost tripled. Using these rates, the same predicted NO_2 concentrations as previously modelled would therefore result in higher rates of nitrogen deposition, which increases the likelihood of significant effects at ecological sites, as these effects are determined based on nitrogen deposition with respect to habitat-specific critical loads.

4.4 To establish any differences in the results at the ecological sites, nitrogen deposition has been recalculated using the new rates at each of the sites that was modelled for the ES. These sites fall into two categories: statutory national nature conservation designated sites within the air quality study area that were required to be modelled by the superseded HA207/07 guidance; and ancient woodland and veteran trees that were modelled for inclusion in the Biodiversity chapter.

4.5 The significance of the results of the reassessment was considered using the criteria specified in LA 105, which follows the following process:

1. Calculate the nitrogen deposition for the Do Minimum and the Do Something scenarios.
2. If the total (Scheme plus background deposition) nitrogen deposition in the Do Something scenario is less than the critical load at a site, it is not significant. Otherwise continue analysis.
3. If the change in nitrogen deposition is less than 1% of the (lower bound of the) critical load, it is not significant. Otherwise continue analysis.
4. Identify whether the change in nitrogen deposition could lead to the loss of one species (taking into account the air quality attribute for the site).
    a. For most sites the air quality attribute will be set to 'restore' and the lowest change in nitrogen deposition which would bring about a loss of one species regardless of background nitrogen deposition should be used.
    b. The lowest change in nitrogen deposition which would bring about the loss of one species is habitat dependent. Where information is not available for the habitat in question, the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, should be used. As reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1], this habitat is

either Upland Heath TU 2009 or Lowland Heath TU 2009, both of which are listed at 0.4 kg N ha^{-1} yr^{-1}.

c. Therefore if the change in nitrogen deposition is less than 0.4 kg N ha^{-1} yr^{-1}, for all habitats apart from nutrient impoverished sand dunes, it is not significant. Otherwise continue analysis.

5. Conduct site investigation and identify whether there are species located in the area which could be lost due to the identified nitrogen deposition change. If there are not, it is not significant. Otherwise continue analysis. To this end, aerial photography was examined to determine whether habitats may be present within the boundary of the designated site, but not within the relevant zone where deposition exceeds 0.4 kg N ha^{-1} yr^{-1}.
6. Finally, if a project air quality action plan can mitigate the impact of the project such that the loss of one species is not triggered, it is not significant. Otherwise the impact is significant.

4.6 For the purposes of this assessment, where specific information on the air quality attribute of a special site of scientific interest (SSSI) is not available, the overall condition of the SSSI (based on information publicly available on Natural England's website https://designatedsites.naturalengland.org.uk) has been used to define whether the air quality attribute for that site is restore or maintain. Where a site is in unfavourable condition the air quality attribute has been assumed to be restore. Where a site is in favourable condition the air quality attribute has been assumed to be maintain.

4.7 Where the air quality attribute or condition for a site is not available (for example ancient woodlands or locally designated sites), an assumption has been made, following LA105, that the sites air quality attribute is restore.

4.8 For the purposes of this sensitivity test therefore the two important indicators for significance are whether the change in nitrogen deposition exceeds 1% of the critical load, and further, whether it is ≥0.4 kg N ha^{-1} yr^{-1}.

Statutory national nature conservation designations

4.9 Four nationally designated sites for nature conservation were identified as being located within 200 m of the ARN. The larger study area detailed in Section 2 did not result in bringing any additional nationally designated sites within the study area. No internationally designated sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Ramsar sites) were identified. The four statutory designated sites identified were modelled and the assessment reported in the ES. No significant air quality effects were reported. A summary of findings following the HA20707 guidance and LA 105 guidance is presented in Table 8. The reason for the designation of these sites is reported in Appendix 8.4 of the ES [APP178/Volume 6.3].

Table 8: Summary of Nitrogen Deposition Results at Nationally Designated Sites using HA207/07 guidance and LA 105 guidance

Ecological Site and Importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
Belvide Reservoir (SSSI) - National importance	DS Ndep is above the critical load (10 kg N ha^{-1} yr^{-1}). The maximum change in Ndep is -0.1 kg N ha^{-1} yr^{-1} (up to 10 m from the road).	DS Ndep is above the critical load. The maximum change in Ndep is -0.2 kg N ha^{-1} yr^{-1} (at the site edge).	No change	Nitrogen deposition decreases. The change in Ndep is now >1% of critical load at site edge. This reduction in Ndep will not result in a significant effect.
Four Ashes Pit SSSI - National importance	This site is designated for its geological interest and therefore is not sensitive to nitrogen.		No change	No change in significance.
Stowe Pool and Walk Mill Clay Pit SSSI - National importance	DS Ndep is above the critical load (10 kg N ha^{-1} yr^{-1}). The maximum change in Ndep is +0.2 kg N ha^{-1} yr^{-1} (up to 10 m from the road).	DS Ndep is above the critical load. The maximum change in Ndep is +0.3 kg N ha^{-1} yr^{-1} (up to 10 m from the road) (+0.2 kg N ha^{-1} yr^{-1} up to 40 m from the road).	No change	The change in Ndep is now >1% of the critical load across a larger area of the site, which is comprised predominantly of open water which is already exposed to traffic emissions. Given the size of the water body, mixing and dilution of the deposited nitrogen would be expected, minimising any effects. Therefore, it is not considered likely that the white-clawed crayfish population, for which the site is designated would be impacted by this change in Ndep and no significant effect would occur.
Chasewater and the Southern Staffordshire	DS Ndep is above the critical load (10 kg N ha^{-1} yr^{-1}).	DS Ndep is above the critical load. The maximum change in Ndep	No change	The change in Ndep remains below 1% of the critical load therefore this change will not

Ecological Site and Importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
Coalfield Heaths SSSI - National importance	The maximum change in Ndep is +0.1 kg N ha^{-1} yr^{-1} (at the site edge of units 8 and 14).	is +0.1 kg N ha^{-1} yr^{-1} (up to 10 m from the road of units 8 and 14).		result in a significant effect.

4.10 In summary, the application of the new conversion rates has a magnifying effect on the changes in nitrogen deposition experienced at these sites, whether positive or negative, although not to the extent where significant effects are anticipated.

Ancient Woodland and Veteran Trees within 2 km of the Scheme

4.11 Seven ancient woodlands and seven veteran trees were modelled for inclusion in Chapter 8: Biodiversity of the ES, but which did not form part of the air quality assessment itself, as reported in Chapter 5: Air Quality. A moderate adverse impact resulting in an effect of moderate significance was found at the ancient woodland within the Brookfield Farm Site of Biological Importance (SBI) due to nitrogen deposition. A summary of findings following the HA20707 guidance and LA 105 guidance is presented in Table 9.

Table 9: Summary of Nitrogen Deposition Results for Ancient Woodland and Veteran Trees using HA207/07 guidance and LA 105 guidance

Ecological Site and importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
Ancient Woodland within Brookfield Farm SBI – National importance	DS Ndep is above the critical load. The maximum change in Ndep is +0.6 kg N ha^{-1} yr^{-1} (at the site edge) (+0.5 kg N ha^{-1} yr^{-1} up to 10 m from the road; +0.4 kg N ha^{-1} yr^{-1} up to 30 m from the site edge).	DS Ndep is above the critical load. The maximum change in Ndep is +1.7 kg N ha^{-1} yr^{-1} (at the site edge) (+≥0.4 kg N ha^{-1} yr^{-1} up to 150 m from the site edge).	Moderate adverse	The change in nitrogen deposition is now large enough to lead to the loss of one species across a larger area of the site. A significant moderate adverse effect was reported in Chapter 8 of the ES [AS-025/Volume 6.1] and there would be no change to this conclusion.
Oxden Leasow (Whitgreaves Wood) –	DS Ndep is above the critical load.	DS Ndep is above the critical load.	Moderate adverse	The change in nitrogen deposition is now large enough to lead to the loss of one species within the first 30 m of

Ecological Site and importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
National importance	The maximum change in Ndep is +0.3 kg N ha^{-1} yr^{-1} (at the site edge).	The maximum change in Ndep is +0.9 kg N ha^{-1} yr^{-1} (at the site edge) (+≥0.4 kg N ha^{-1} yr^{-1} up to 30 m from the site edge).		the site. This would result in the neutral effect reported in Chapter 8 of the ES [TR010054/APP/6.1] being increased to an effect of moderate adverse significance, following LA 105 and assuming that species are located in the area which could be lost due to the identified nitrogen deposition change. This would result in a new significant adverse effect.
Beech Head – National importance	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	No change	No change in significance.
Keepers Wood – National importance	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	No change	No change in significance.
Spring Coppice – National importance	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	>200 m from ARN DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	No change	No change in significance.

Ecological Site and importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
Burns Wood, Wakeman's Wood and Warstone Belt – National importance	DS Ndep is above the critical load. The maximum change in Ndep is <0.1 kg N ha^{-1} yr^{-1}	DS Ndep is above the critical load. The maximum change in Ndep is -0.1 kg N ha^{-1} yr^{-1} (at the site edge)	No change	No change in significance.
Essington Wood – National importance	DS Ndep is above the critical load. The maximum change in Ndep is -0.1 kg N ha^{-1} yr^{-1} (up to 20 m from the site edge).	DS Ndep is above the critical load. The maximum change in Ndep is -0.3 kg N ha^{-1} yr^{-1} (at the the site edge) (-0.2 kg N ha^{-1} yr^{-1} (up to 20 m from the site edge).	No change	The change in nitrogen deposition is now >1% of critical load up to 20 m from the site edge however this reduction in nitrogen deposition would not result in a significant effect. The effect will therefore remain neutral, not significant, as reported in Chapter 8 of the ES [AS-025/Volume 6.1].
Veteran Tree 1 (Sweet Chestnut, T211) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.1 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.3 kg N ha^{-1} yr^{-1}.	Minor adverse	The change in nitrogen deposition is now large enough to lead to the loss of one species. However, as in these cases 'the site' is one tree, species richness is not a relevant metric. The botanical effects of nitrogen deposition on tree growth and health are subtle and tree survival is unlikely to be affected. The effect will therefore remain as reported in Chapter 8: Biodiversity of the ES [AS-025/Volume 6.1], slight adverse effect (not significant).
Veteran Tree 2 (Common Oak, T214) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.1 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.4 kg N ha^{-1} yr^{-1}.	Minor adverse	
Veteran Tree 3 (Sweet Chestnut, T221) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.2 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.5 kg N ha^{-1} yr^{-1}.	Minor adverse	
Veteran Tree 4 (Common Lime, T227) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.3 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.7 kg N ha^{-1} yr^{-1}.	Minor adverse	

Ecological Site and importance (value)	HA207/07 Findings	LA 105 Findings	Level of impact	Discussion
Veteran Tree 5 (Small-leaved Lime, T182) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.1 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.3 kg N ha^{-1} yr^{-1}.	Minor adverse	
Veteran Tree 6 (Small-leaved Lime, T178) – National importance	DS Ndep is above the critical load. The change in Ndep is +0.2 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.4 kg N ha^{-1} yr^{-1}.	Minor adverse	
Veteran Tree 7 (Small-leaved Lime, T137#)– National importance	DS Ndep is above the critical load. The change in Ndep is +0.3 kg N ha^{-1} yr^{-1}.	DS Ndep is above the critical load. The change in Ndep is +0.8 kg N ha^{-1} yr^{-1}.	Minor adverse	

4.12 In summary, the application of the new conversion rates has a magnifying effect on the changes in nitrogen deposition, whether positive or negative, at these sites. This has the affect of turning effects of neutral significance into effects of moderate adverse significance at Oxden Leasow (Whitgreaves Wood). A summary of the changes to Chapter 8: Biodiversity resulting from the air quality sensitivity test is provided in technical note: DMRB Updates and the Impact on the DCO Application [TR010054/APP/8.2].

5 Sensitivity Test 4: LA 105 Ecological Sites

5.1 In addition to the modified conversion rates detailed in Section 4, the updated DMRB guidance LA 105 also requires additional types of ecologically designated sites to be modelled to consider the impact of nitrogen deposition on a greater number of sites.

5.2 HA207/07 required Ramsar Sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs) to be modelled where they are within 200 m of the ARN. A total of four sites (all SSSI) fell within the M54 to M6 Link Road Study Area for Air Quality and are detailed in Section 4.

5.3 LA 105 requires all the sites specified in HA207/07, as well as all local nature reserves (LNRs), LWSs, nature improvement areas (NIAs), ancient woodlands and veteran trees within 200 m of the ARN to be modelled.

5.4 Some of these additional sites (ancient woodland and veteran trees within 2 km of the Scheme) have already been modelled and the assessment reported in Chapter 8: Biodiversity of the ES [AS-026/Volume 6.1] at the request of Natural England. The change to impacts and effects on these sites resulting from the change in assessment methodology is reported in Section 4. All other ecological sites included in the designations listed above that have not been previously modelled are discussed in the following sections.

Sensitivity Test Methodology

5.5 A large number of sites meeting the new LA105 ecological site criteria have been identified within 200 m of the ARN (the study area). To enable the risk review to focus on those sites where there is potential for significant adverse effects to be identified, the changes in traffic adjacent to each of the sites has been compared to the level of traffic changes known to have resulted in changes in nitrogen deposition at previously modelled sites. These impacts are reported as the likely potential for significant effects to occur. Where it is likely significant effects could occur (above low/ very low potential) further consideration has been given to the likely magnitude of impact and significance of effect.

5.6 To enable this comparison, the traffic changes and emission changes that led to the nitrogen deposition changes at previously modelled sites are set out in Table 10. The impacts at these sites were described in Section 4.

Table 10: Summary of Traffic Changes and Consequent Nitrogen Deposition Effects at Statutory Sites and Ancient Woodland to be used as a Comparison

Ecological site	AADT change (veh/day)	Average NO_X Emissions Change (HA207/07) (µg/km/s)	Result (LA 105) – see T
Belvide Reservoir SSSI	-2,757 (A5, 1.1 m away) No speed band changes	-8.29	At the site edge, nitrogen deposition decreases by -0.19 kg N/ha/yr Not significant
Stowe Pool and Walk Mill Clay Pit SSSI	+4,635 (A460, 6.4 m away) +2,346 (M6 Toll, ~9 m behind A460) No speed band changes	+13.69 +7.56	At the site edge, nitrogen deposition increases by +0.30 kg N/ha/yr Not significant
Chasewater and the Southern Staffordshire Coalfield Heaths SSSI	+2,180 (M6 Toll, 1.1m away) No speed band changes	+6.65	At the site edge, Ndep increases by +0.07 kg N/ha/yr Not significant
Oxden Leasow (Whitgreaves Wood)	+16,821 (M54, 22 m away) No speed band changes	+57.11	At the site edge, Ndep increases by +0.43 kg N/ha/yr Significant
Ancient Woodland within Brookfield Farm SBI	New road with +49,321 AADT	New road with 169.5 µg/km/s	At the site edge, Ndep increases by +1.7 kg N/ha/yr Significant

5.7 Based on the above review, with particular reference to Chasewater and the Southern Staffordshire Coalfield Heaths SSSI, which would experience a very small change in nitrogen deposition occasioned by a traffic change of approximately 2000 vehicles, sites where traffic changes of less than 2000 will not be further analysed as a significant change in nitrogen deposition is unlikely, refer to Appendix 1 for the full list of additional biodiversity sites and their change in AADT. Where the increase in AADT is higher than 2,000 vehicles, a speed band change occurs, and/or the site falls outside the general verification zone[1], these cases will be analysed further, considering emission changes, distance to road and nitrogen sensitivity (critical load).

[1] Located within one of the four AQMAs outlined in paragraph 3.14.

Local Nature Reserves

5.8 There is only one local nature reserve within the study area, Rough Wood Chase, adjacent to the M6, south of Junction 10a, shown in Figure 12. Specific reasons for the designation of this site have not been provided, though it does include the largest oak woodland in Walsall and supports protected species such as great crested newts. This site is located in an area expected to experience reduced AADT flows (with no speed band changes) and therefore there is no risk of a significant adverse effect in this location.

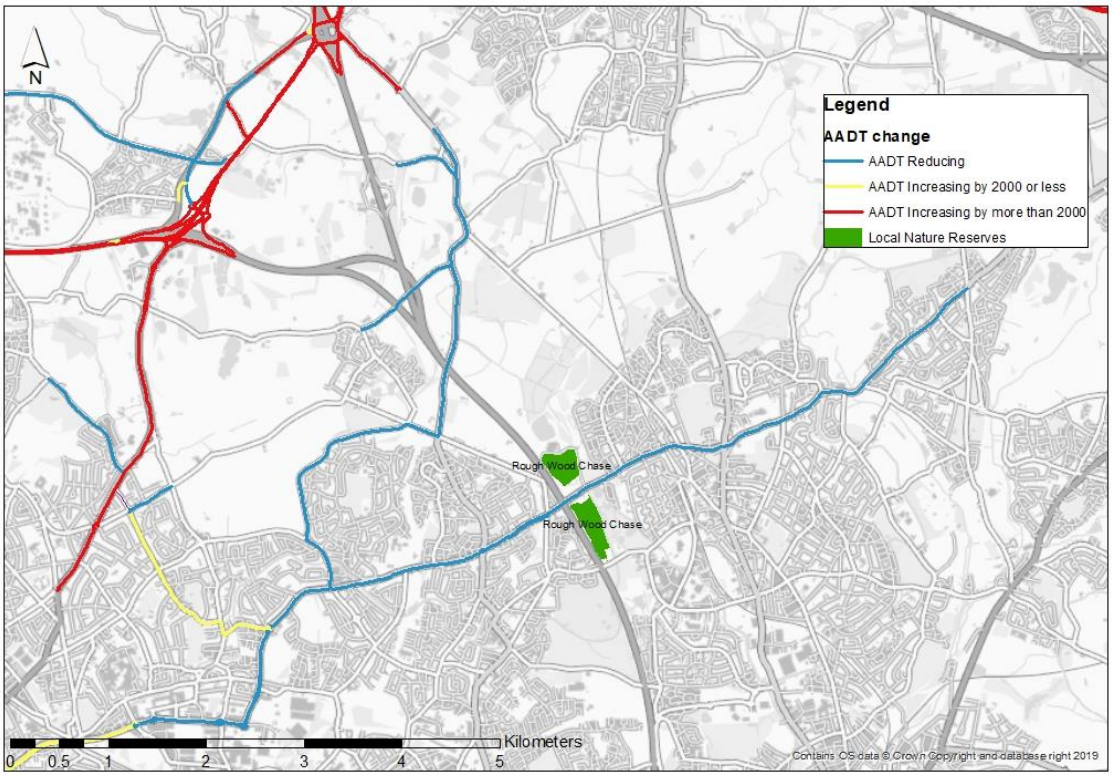

Figure 12: Local Nature Reserves within the Study Area

Nature Improvement Areas

5.9 There is only one NIA within the study area, Birmingham and the Black Country, shown in Figure 13.

5.10 The NIA covers a very wide area, within which patches of land are identified and then enhanced for biodiversity e.g. woodland planting or grassland management. No specific areas for such enhancement have been identified within 200 m of the ARN. Furthermore, where the air quality study area intersects with the NIA is a highly urban area with limited habitat creation potential. It is therefore very unlikely that any change in deposition from the affected roads would compromise the ability of the NIA to achieve its objectives.

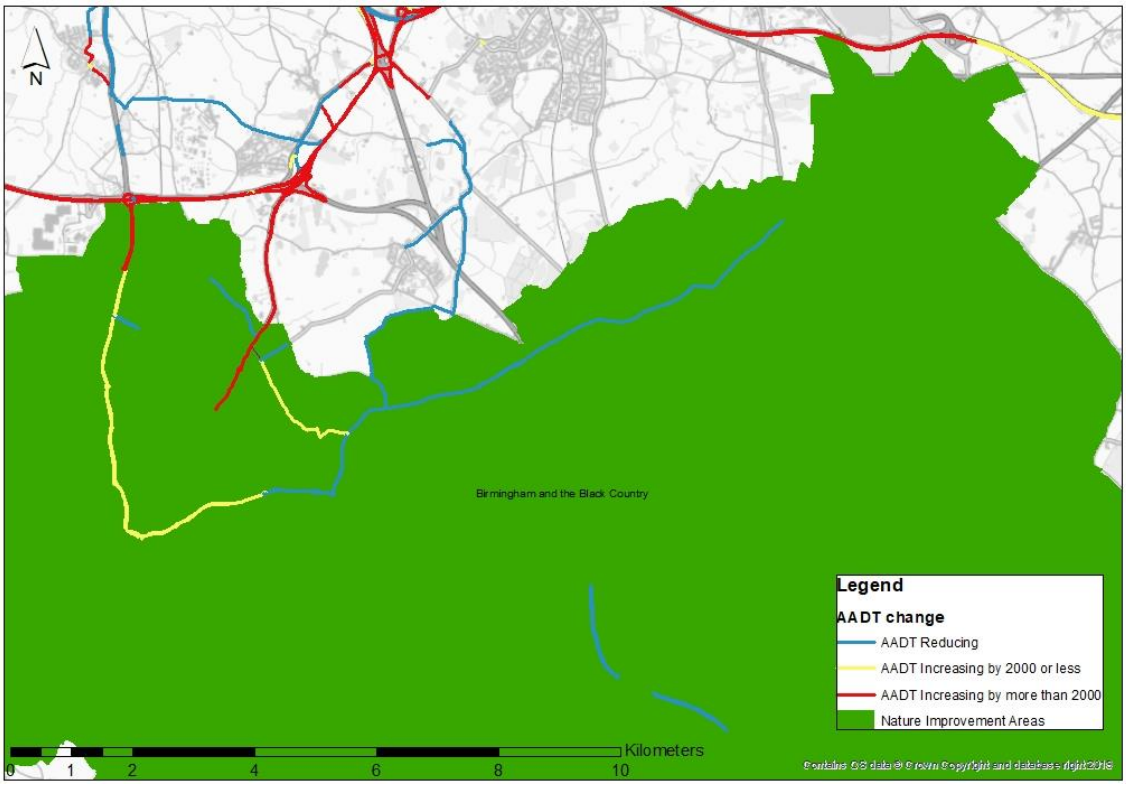

Figure 13: Nature Improvement Areas within the Study Area

Ancient Woodlands

5.11 There are six ancient woodlands within the study area recorded on the Ancient Woodland Inventory that have not been previously modelled. These are shown in Figure 14. Ancient woodlands were not previously required to be modelled under HA207/07, however those ancient woodlands identified within the Biodiversity study area, 2 km of the Scheme boundary, were assessed in the ES.

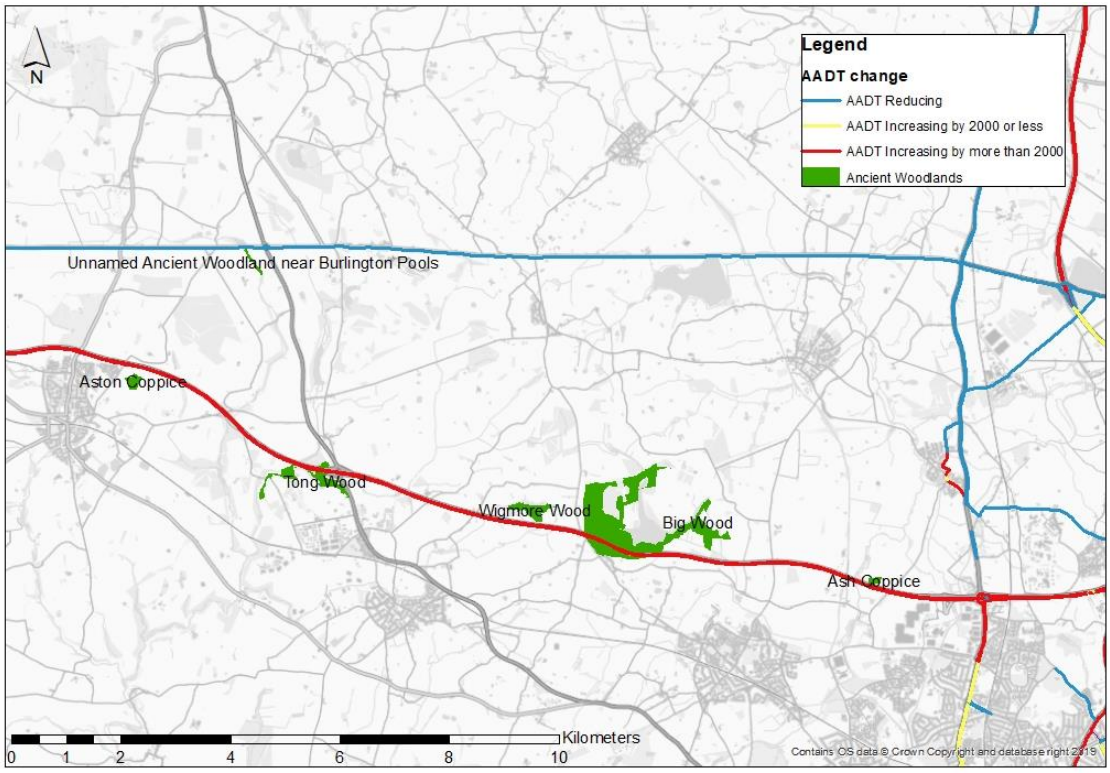

Figure 14: Ancient Woodlands (not previously modelled) within the Study Area

5.12 The Unnamed Ancient Woodland near Burlington Pools site is located in an area which would experience a reduction in AADT flows (with no speed band changes) and therefore there is no risk of a significant adverse effect in this location.

5.13 The five remaining ancient woodlands have been analysed further in Table 11. All five woodlands are affected by traffic changes along the M54, which has an increase in AADT of between 4,000-5,000 vehicles, with no speed band changes. This is a similar traffic change to that seen at the A460 at Walk Mill Clay Pit, part of the Stowe Pool and Walk Mill Clay Pit SSSI (Table 10) so this site can be used for direct comparison – likely to be a conservative one because of the exacerbating effect of the M6 very close by to Stowe Pool and Walk Mill Clay Pit SSSI, for which there is no equivalent at the ancient woodlands.

Table 11: Ancient Woodlands Analysis

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Level of impact	Comparison with Walk Mill Clay Pit (part of Stowe Pool and Walk Mill Clay Pit SSSI)
Aston Coppice – National importance	10	127.2	M54: AADT +4,017, HDVs +264	No change	At 125 m, nitrogen deposition would be +0.05 kg N ha^{-1}. This is below 1% of the critical load, and far below the species change level therefore

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Level of impact	Comparison with Walk Mill Clay Pit (part of Stowe Pool and Walk Mill Clay Pit SSSI)
			No speed band changes. +13.61 µg/km/s		there is very low potential for significant effects.
Tong Wood – National importance	10	9.4		Negligible	At 6.4 m, nitrogen deposition would be +0.30 kg N ha^{-1}. This is above 1% of the critical load, but below the species change level therefore there is low potential for significant effects.
Wigmore Wood – National importance	10	45.8	M54: AADT +4,560, HDVs +393 No speed band changes +15.33 µg/km/s	Negligible	At 40 m, nitrogen deposition would be +0.12 kg N ha^{-1}. This is above 1% of the critical load, but below the species change level therefore there is low potential for significant effects.
Big Wood SBI/ BAS – National importance	10	4.4		Minor adverse	At 6.4 m, nitrogen deposition would be +0.30 kg N ha^{-1}. This is slightly further back than the closest approach of Big Wood to the Road. Ndep change is above 1% of the critical load, but below the species change level. Changes in Ndep would be larger closer to the road although any impact would likely be limited to the 2 m next to the site edge, resulting in <1% of the woodland being impacted. As such, increased nitrogen deposition across such a small area would not negatively affect the key

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Level of impact	Comparison with Walk Mill Clay Pit (part of Stowe Pool and Walk Mill Clay Pit SSSI)
					characteristics of the woodland as >99% would remain unaffected; the impact would be minor adverse. This may result in an effect of slight adverse significance (precautionary assessment see 5.14).
Ash Coppice – National importance	10	17.9		Negligible	At 15 m, nitrogen deposition would be +0.12 kg N ha^{-1}. This is above 1% of the critical load, but below the species change level therefore there is low potential for significant effects.

5.14 In summary, there is potential for a minor adverse impact on Big Wood SBI/ BAS and ancient woodland, as it approaches closer to the ARN road than the site used for comparison; the site used for comparison experiencing a change at the site edge of +0.3 kg N ha^{-1} (0.1 kg N ha^{-1} below the species change level). This may result in an effect of slight adverse significance which is not significant. This is a precautionary assessment as the site has not been subject to detailed modelling or site survey, the affected area may be less than 2 m. All other sites have a low potential for significant effects due to being further away from the ARN road.

Local Wildlife Sites

5.15 Information regarding local wildlife sites, (herein referred to collectively as 'locally designated sites') has been obtained from three sources:

- Staffordshire Wildlife Trust;
- The Wildlife Trust for Birmingham and the Black Country; and
- Shropshire Wildlife Trust.

5.16 These authorities refer to locally designated sites by differing names, which are described in Table 12.

Table 12: Titles for locally designated sites

Site Name	Acronym	Description	Terminology used by
Local Wildlife Site	LWS	-	Shropshire Wildlife Trust
Site of Importance for Nature Conservation	SINC	Regionally important LWS in the context of Birmingham and the Black Country	The Wildlife Trust for Birmingham and the Black Country
Site of Local Importance for Nature Conservation	SLINC	Locally important LWS in the context of a metropolitan borough	The Wildlife Trust for Birmingham and the Black Country
Site of Biological Interest	SBI	Contribute the most significant element in Staffordshire's nature conservation resource	Staffordshire Wildlife Trust
Biological Alert Site	BAS	Collectively form a significant part of Staffordshire's nature conservation resource	Staffordshire Wildlife Trust

5.17 Specific reasons for all of these sites being designated has not been provided during the desk study. They can be designated for a wide range of reasons including supporting specific habitat types or species, or habitat mosaics or species assemblages. Where this information has been provided it is detailed in Table 13 below.

5.18 A total of 63 locally designated sites have been identified in the air quality study area (within 200 m of the ARN). One of these sites, Brookfield Farm SBI and ancient woodland was assessed in Chapter 8: Biodiversity of the ES and is therefore considered under Section 4 of this report. For presentational purposes the remaining locally designated sites have been separated by area around the ARN and they are shown in Figure 15 to Figure 19.

5.19 In the western part of the ARN there are four locally designated sites as shown in Figure 15. Based on the criteria set out at in paragraph 5.7, three of these sites will be considered in more detail:

- Big Wood – SBI/BAS
- Chillington Estate (semi-improved fields) SBI
- Priorslee Lake LWS

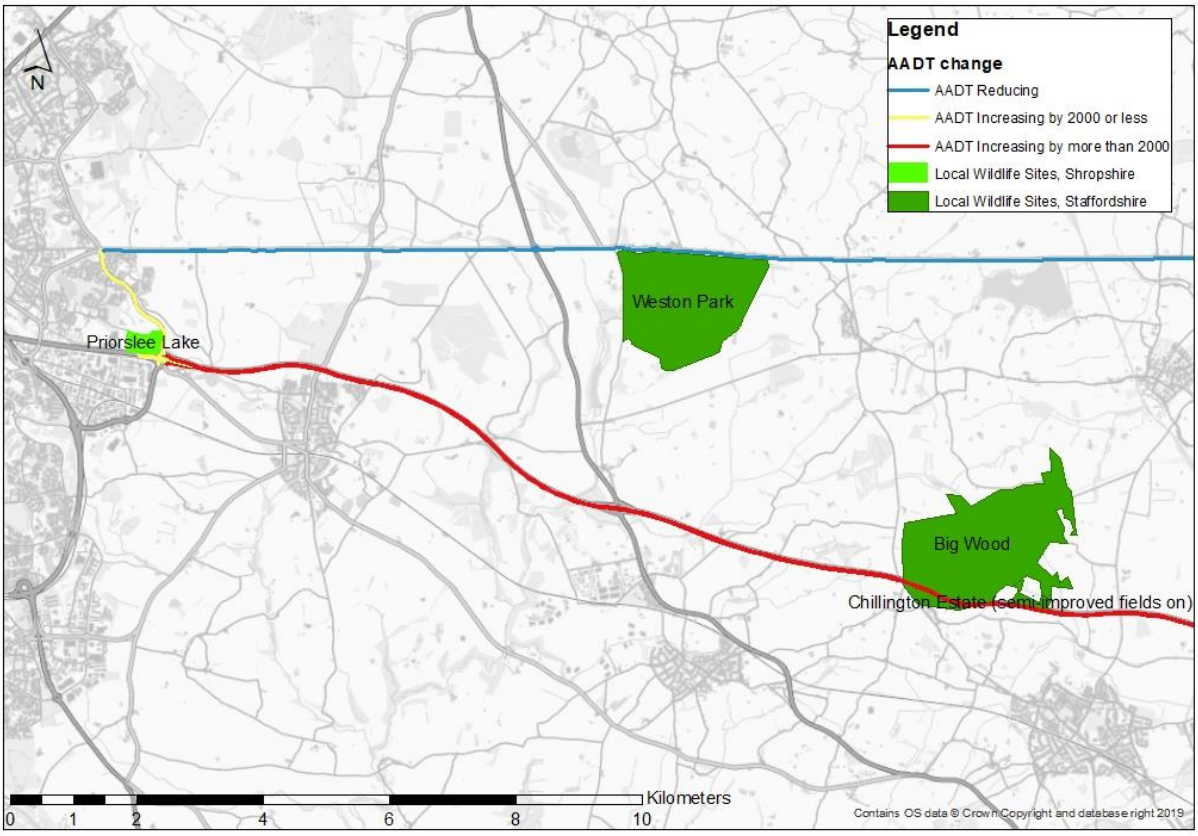

Figure 15: Locally designated sites in the western ARN

5.20 In the northern part of the ARN there are eight locally designated site as shown in Figure 16. Based on the criteria set out at in paragraph 5.7,5.17 seven of these sites will be considered in more detail:

- Cockpit Plantation BAS
- Teddesley Park SBI
- Bone Mill Disused Pools SBI
- Otherton Marsh, Penkridge SBI
- Staffordshire and Worcestershire Canal, Penkridge LWS
- Gailey Reservoir LWS
- Watling Street Plantation BAS

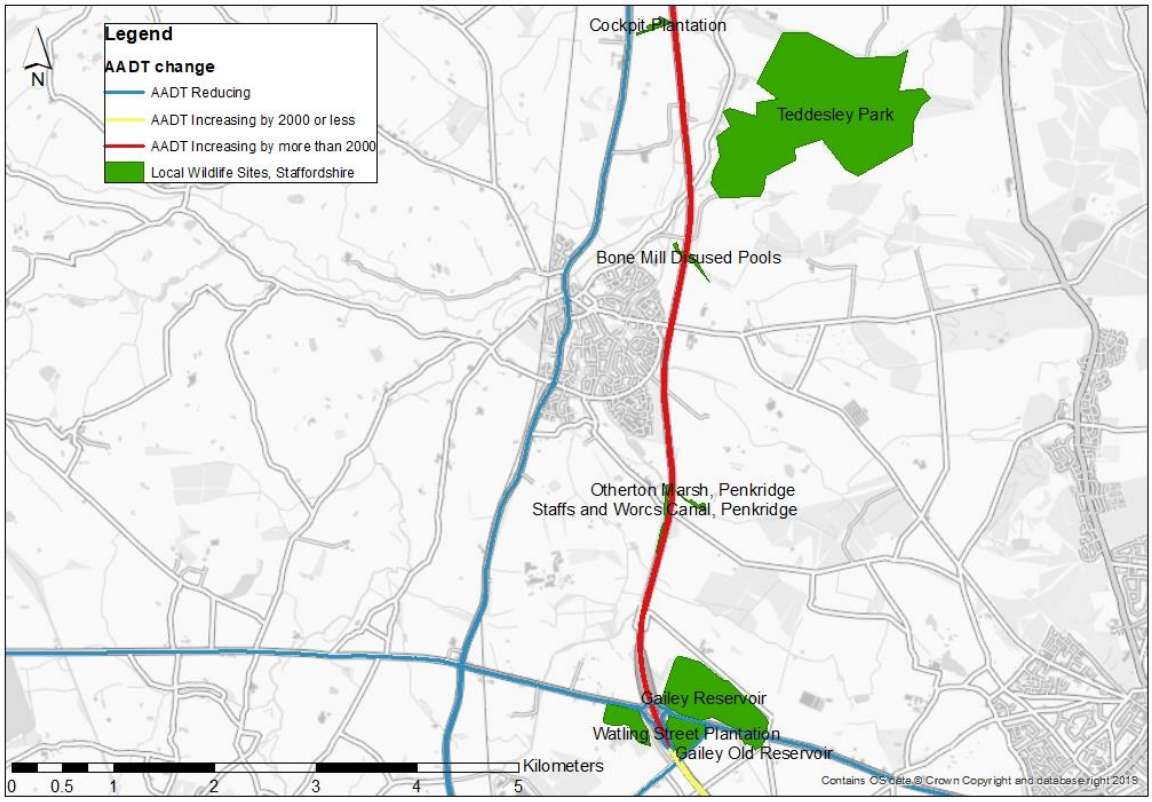

Figure 16: Locally designated sites in the northern ARN

5.21 In the central part of the ARN there are 24 locally designated sites, as shown in Figure 17. Based on the criteria set out at in paragraph 5.7, ten of these sites will be considered in more detail:

- Bridgetown Subsidence Pools SBI
- Hatherton Reservoir, Cheslyn Hay SBI
- Hatherton Pines BAS
- Saredon Hall Farm (south east of) BAS
- Brookfield Farm (north-east of) Shareshill (assessment discussed in Section 4 of this report) SBI
- Lower Pool LWS/SBI
- Westcroft (woods north of) BAS
- Land West of Stafford Road SLINC
- Staffordshire and Worcestershire Canal SINC
- Ashmore Lodge, Essington (disused railway line) BAS

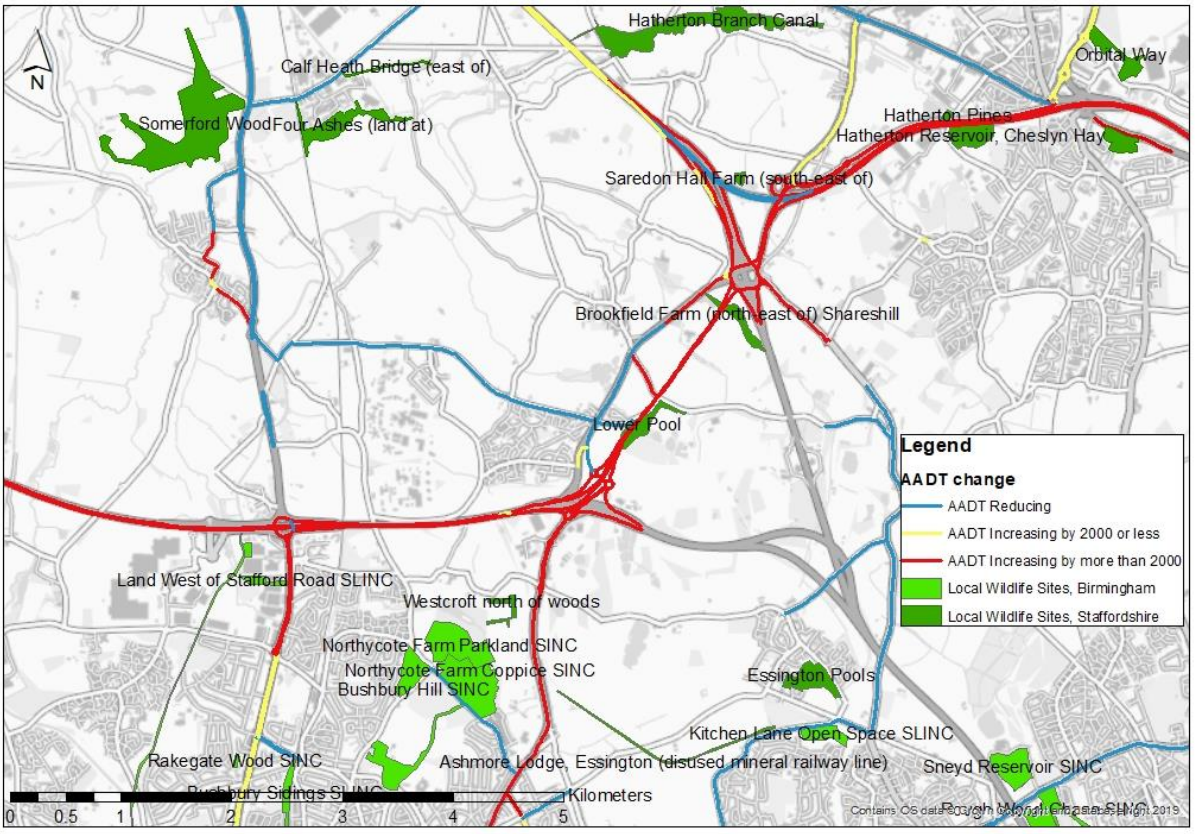

Figure 17: Locally designated sites in the central ARN

5.22 In the southern part of the ARN there are 19 locally designated sites, as shown in Figure 18. Based on the criteria set out at in paragraph 5.7, one of these sites will be considered in more detail:

- Grassy Lane SLINC

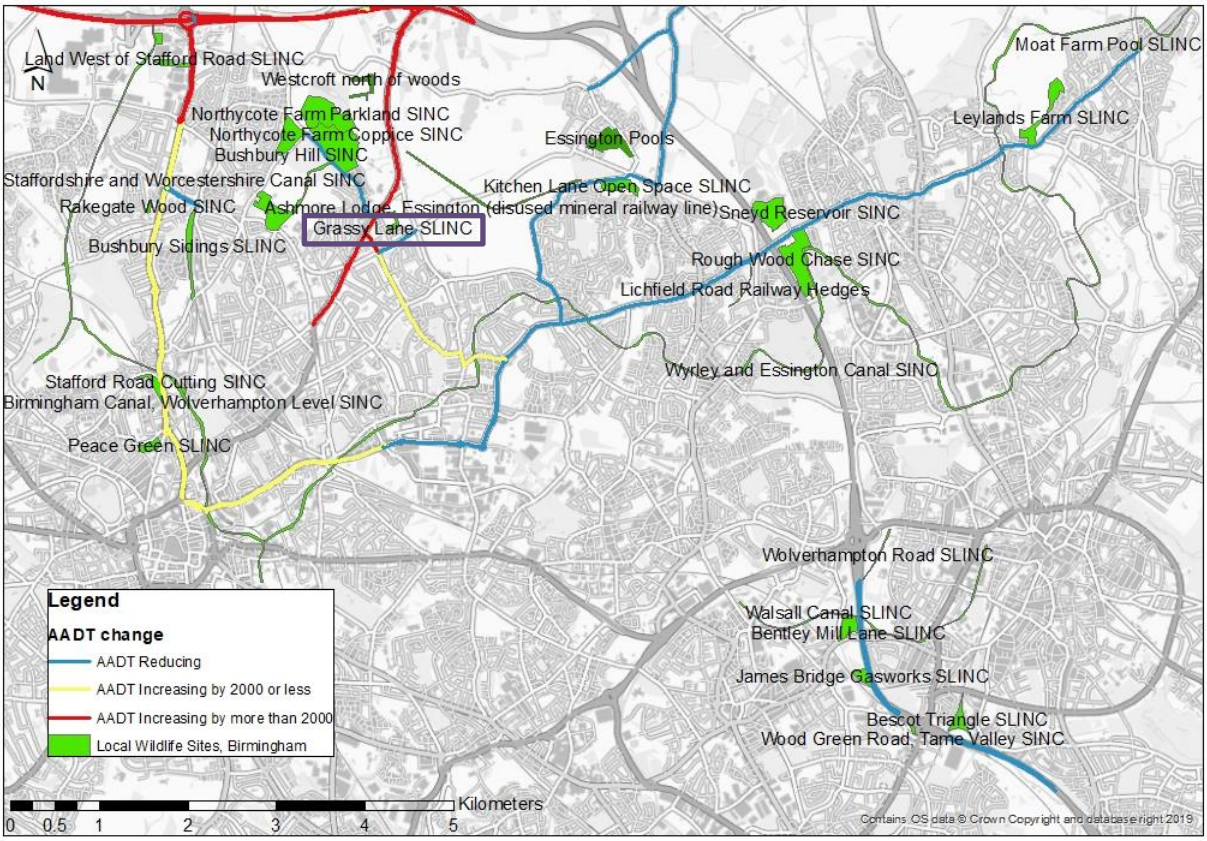

Figure 18: Locally designated sites in the southern ARN

5.23 In the eastern part of the ARN there are eight locally designated sites as shown in Figure 19. Based on the criteria set out at in paragraph 5.7, seven of these sites will be considered in more detail:

- Albutts Road SLINC
- Anglesey Branch SLINC
- Poole Crescent (land at) SBI
- Washbrook Lane BAS
- School Lane (pool east of) SBI
- Commonside Disused Railway SBI
- Brownhills Road BAS

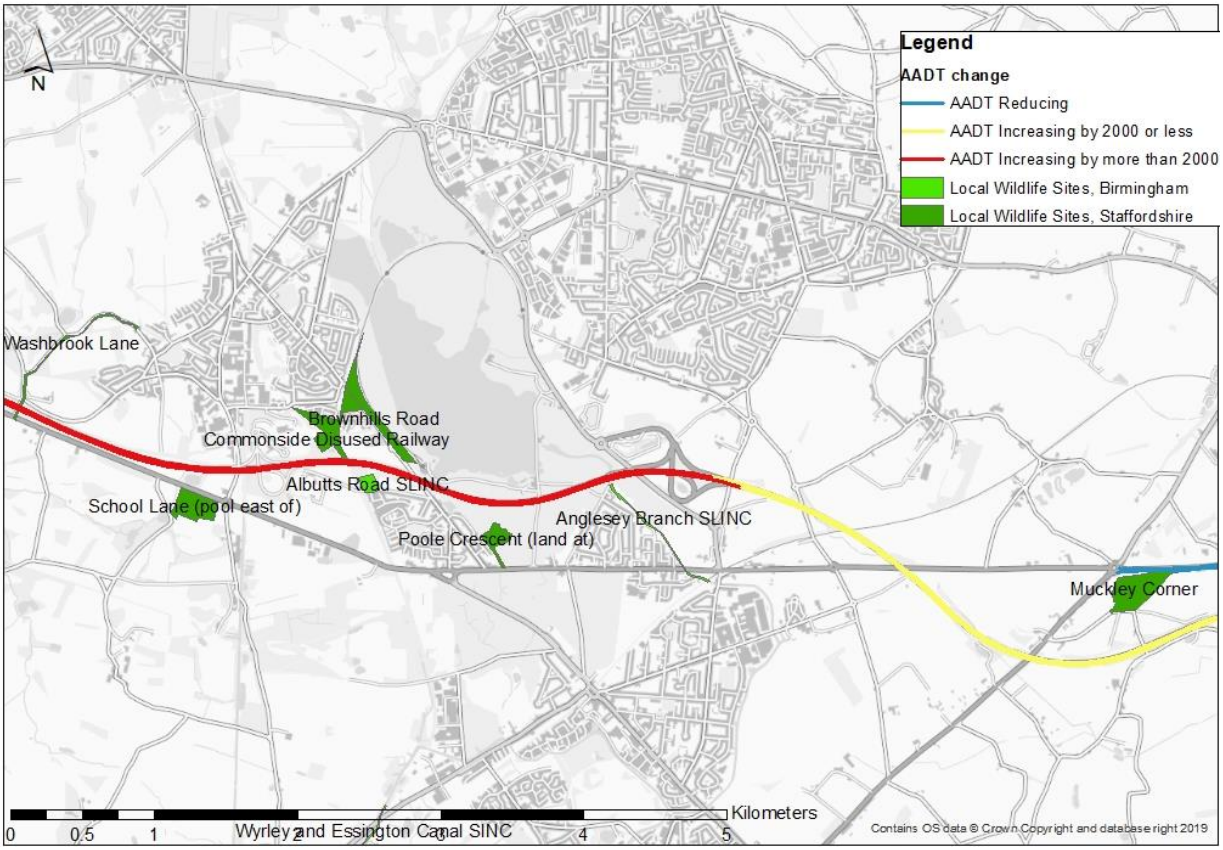

Figure 19: Locally designated sites in the eastern ARN

5.24 All 28 locally designated sites requiring further analysis are discussed in Table 13 and 14. The distances given in Table 14 are to the nearest road with an AADT increase of 2,000 vehicles or more, and in some cases are approximate based on the information provided.

Table 13: Non-statutory nature conservation designations within 200 m of the ARN requiring further analysis

Designation	Reason(s) for designation	Importance (reasoning)
Big Wood SBI/ BAS	Information Not Supplied during Desk Study	National (Ancient Woodland)
Chillington Estate (semi-improved fields on)	Information Not Supplied during Desk Study	County (LWS)
Priorslee Lake LWS	Information Not Supplied during Desk Study	County (LWS)
Cockpit Plantation BAS	Information Not Supplied during Desk Study	Local (BAS)
Teddesley Park SBI	Information Not Supplied during Desk Study	County (LWS)
Bone Mill Disused Pools SBI	Information Not Supplied during Desk Study	County (LWS)
Otherton Marsh, Penkridge SBI	Information Not Supplied during Desk Study	County (LWS)
Staffordshire and Worcestershire Canal, Penkridge LWS	Information Not Supplied during Desk Study	County (LWS)
Gailey Reservoir LWS	Information Not Supplied during Desk Study	County (LWS)
Watling Street Plantation BAS	Information Not Supplied during Desk Study	Local (BAS)
Watling Street Plantation	Information Not Supplied during Desk Study	Local (BAS)
Bridgetown Subsidence Pools LWS	Information Not Supplied during Desk Study	County (LWS)
Hatherton Reservoir, Cheslyn Hay SBI and LWS	Reservoir with high quality water and diverse emergent and submerged vegetation.	County (LWS)
Hatherton Pines retained BAS	An area of plantation coniferous woodland, situated between the two Hatherton Pools. The area of most importance is the grassland between the plantations which has a rich flora due to poor soil conditions, including kidney vetch (*Anthyllis vulneraria*) and bilberry (*Vaccinium myrtillus*).	Local (BAS)
Saredon Hall Farm retained Biodiversity Alert Site BAS[2] (south-east of)	An area of oak woodland with a small pond. Much of the wood is impenetrable with bramble *Rubus* sp. and nettle *Urtica dioica*. Additionally, there is a small pond to the south of the wood, fringed by glaucous sedge *Carex flacca*, reedmace *Typha* sp. and broad-leaved pondweed *Potamogeton natans* in the water.	Local (BAS)
Brookfield Farm, Shareshill, SBI and LWS	An area of wet woodland comprising alder and willow carr that is drying out in some areas of the site. Sycamore is common in the drier parts of the wood. Part of which is classified as ancient woodland (see below).	County (LWS)
Lower Pool SBI and LWS	A large ornamental pool with both emergent and floating vegetation.	County (LWS)

Designation	Reason(s) for designation	Importance (reasoning)
Westcroft Farm (land north of), Bushbury, SBI and LWS	A linear strip of alder/crack willow woodland along the stream with sycamore abundant in the canopy away from the stream. Hazel (*Corylus avellana*) frequents the understorey throughout the woodland, with scattered elder and holly (*Ilex aquifolium*).	County (LWS)
Ashmore Lodge, Essington (disused mineral railway line), Retained BAS	An old dismantled mineral line now covered by neutral grassland with some wooded areas.	Local (BAS)
Land West of Stafford Road (Site 1) – County importance	Information Not Supplied during Desk Study	County (LWS)
Land West of Stafford Road (Site 2) – County importance	Information Not Supplied during Desk Study	County (LWS)
Staffordshire and Worcestershire Canal SINC – County importance	Information Not Supplied during Desk Study	County (LWS)
Albutts Road SLINC – County importance	Information Not Supplied during Desk Study	County (LWS)
Anglesey Branch SLINC – County importance	Information Not Supplied during Desk Study	County (LWS)
Poole Crescent (Land at) SBI – County importance	Information Not Supplied during Desk Study	County (LWS)
Washbrook Lane BAS – Local importance	Information Not Supplied during Desk Study	Local (BAS)
School Lane (pool east of) SBI – County importance	Information Not Supplied during Desk Study	County (LWS)
Commonside Disused Railway SBI – County importance	Information Not Supplied during Desk Study	County (LWS)
Brownhills Road BAS – Local importance	Information Not Supplied during Desk Study	Local (BAS)

Table 14: Locally designated sites analysis

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
Big Wood SBI/ BAS – National importance	10-20	5 - 10	M54: AADT +4,560, HDVs +393 No speedband changes +15.33 µg/km/s	Stowe Pool and Walk Mill Clay Pit SSSI +0.30 kg N ha^{-1} yr^{-1} at 6.4 m	Minor adverse	Refer to Table 10: Ancient Woodland Analysis.
Chillington Estate (semi-improved fields on) SBI – County importance	20	5 - 10		Stowe Pool and Walk Mill Clay Pit SSSI +0.30 kg N ha^{-1} yr^{-1} at 6.4 m	Moderate adverse	Directly adjacent to Big Wood SBI/ BAS. Closer to road than comparison site. Any impact would likely be limited to the 2 m closest to the site edge or less. This may result in an effect of slight adverse significance.
Priorslee Lake LWS – County importance	Not sensitive to nitrogen (phosphate limited)	86.5	M54 slip: AADT +2,604, HDVs +81 No speedband changes +10.96 µg/km/s	N/A	No change	Not sensitive to nitrogen. No risk of significant effects.
Cockpit Plantation BAS – Local importance	10	10 - 15	M6: AADT +3,587,	Stowe Pool and Walk Mill Clay Pit SSSI	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which would trigger species change. Low potential for significant effects.

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
			HDVs +146 No speedband changes +12.27 µg/km/s	+0.30 kg N ha^{-1} yr^{-1} at 6.4 m		
Teddesley Park SBI – County importance	10	180 - 190		Stowe Pool and Walk Mill Clay Pit SSSI +0.04 kg N ha^{-1} yr^{-1} at 175 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects.
Bone Mill Disused Pools SBI – County importance	10-20	0		Stowe Pool and Walk Mill Clay Pit SSSI +0.30 kg N ha^{-1} yr^{-1} at 6.4 m	Moderate adverse	Closer to road than comparison site. Any impact would likely be limited to habitats within the 6 m closest to the site edge or less. This may result in an effect of slight adverse significance.
Otherton Marsh, Penkridge SBI – County importance	10	15 - 20		Stowe Pool and Walk Mill Clay Pit SSSI +0.21 kg N ha^{-1} yr^{-1} at 15 m	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which would trigger species change. Low potential for significant effects.
Staffordshire and Worcestershire Canal, Penkridge LWS – County importance	Not sensitive to nitrogen (phosphate limited)	20 - 30		N/A	No change	Not sensitive to nitrogen. No risk of significant effects.

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
Gailey Reservoir LWS – County importance	Not sensitive to nitrogen (phosphate limited)	60 - 70	M6: AADT +4,580, HDVs +106 No speedband changes +15.78 µg/km/s	N/A	No change	Not sensitive to nitrogen. No risk of significant effects.
Watling Street Plantation BAS – Local importance	10	10 - 15		Stowe Pool and Walk Mill Clay Pit SSSI +0.26 kg N ha^{-1} yr^{-1} at 10 m	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which would trigger species change. Low potential for significant effects.
Bridgetown Subsidence Pools LWS – County importance	20	0 - 5	A5: AADT +510 HDVs +4 Speed band change from free flow to light congestion in AM +6.62 µg/km/s	Chasewater and the Southern Staffordshire Coalfield Heaths SSSI +0.05 kg N ha^{-1} yr^{-1} at 10 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load as a result there is very low potential for significant effects

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
Hatherton Reservoir, Cheslyn Hay SBI – County importance	10-20	0	M6 Toll: AADT +2,346 HDVs +451 No speed band changes +7.56 µg/km/s A460 (~ 10 m behind): AADT +4,635 HDVs +92 No speed band changes +13.69 µg/km/s	Stowe Pool and Walk Mill Clay Pit SSSI +0.30 kg N ha^{-1} yr^{-1} at 6.4 m	Moderate adverse	This site is opposite Stowe Pool and Walk Mill Clay Pit SSSI and closer to the road. There is a potential for impacts at the site edge of Hatherton Reservoir, as changes in nitrogen deposition would be larger closer to the road. Although the site is closer to the road it experiences the lower changes of the two in this location, and is upwind of the prevailing wind. Any impact would likely be limited to the 6 m closest to the site edge or less. This may result in an effect of slight adverse significance.
Hatherton Pines BAS – Local importance	10-20	0	A460: AADT +4,635 HDVs +92	Stowe Pool and Walk Mill Clay Pit SSSI	Moderate adverse	This site is adjacent to Stowe Pool and Walk Mill Clay Pit SSSI although it is closer to the road than comparison site. There is potential for impacts at the site edge of Hatherton Pines,

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
			No speed band changes +13.69 µg/km/s M6 Toll (~ 10 m behind): AADT +2,346 HDVs +451 No speed band changes +7.56 µg/km/s	+0.30 kg N ha^{-1} yr^{-1} at 6.4 m		as changes in Ndep will be larger closer to the road although any impact would likely be limited to the 6 m closest to the site edge. This may result in an effect of slight adverse significance[1].
Saredon Hall Farm (south east of) BAS – Local importance	10	110-120	M6 S-bound†: +5,167 HDV -24 No speedband changes	Walk Mill Clay Pit * +0.06 kg N ha^{-1} yr^{-1} at 100 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
			+14.57 µg/km/s			
Brookfield Farm (north-east of), Shareshill SBI – National importance	10	0	New road with +49,321 AADT +169.5 µg/km/s	Brookfield Farm Ancient Woodland +1.7 kg N ha^{-1} yr^{-1} at site edge	Moderate adverse	Ancient Woodland within this site has been previously assessed – see Section 4. Refer to Table 10: Ancient Woodland Analysis..
Lower Pool SBI – County importance	10	0	New road with +49,321 AADT +169.5 µg/km/s	Brookfield Farm Ancient Woodland +1.7 kg N ha^{-1} yr^{-1} at site edge Veteran Tree 2 +0.4 kg N ha^{-1} yr^{-1} 160 m from the ARN (mainline of the Scheme)	Moderate adverse	By comparison, it is likely the level of nitrogen deposition is above the level that would trigger species change. This may result in an effect of slight significance.
Westcroft (woods north of) BAS – Local importance	10	150 - 160	A460: +5,056 HDV +298 No speedband changes	Oxden Leasow Wood + 0.15 kg N ha^{-1} yr^{-1} at 110 m	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which would trigger species change. Low potential for significant effects.
Ashmore Lodge,	10	110 - 120		Oxden Leasow Wood	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
Essington (disused railway line) BAS – Local importance			+23.11 µg/km/s	+ 0.15 kg N ha^{-1} yr^{-1} at 110 m		would trigger species change. Low potential for significant effects.
Grassy Lane SLINC – County importance	10	20 - 25		Oxden Leasow Wood + 0.43 kg N ha^{-1} yr^{-1} at 22 m with emissions increase of +57.11 µg/km/s	Moderate adverse	By comparison, likely above species change level, however emission rate change here is lower than at comparison site. There is potential for impacts at the site edge, as changes in nitrogen deposition would be larger closer to the road although any impact would likely be limited to the 6 m closest to the site edge. This may result in an effect of slight adverse significance.
Land West of Stafford Road (Site 1) – County importance	10-20	10 - 15	A449: +2,653 HDV +311 Speed band change +28.84 µg/km/s	Oxden Leasow Wood + 0.43 kg N ha^{-1} yr^{-1} at 22 m with emissions increase of +57.11 µg/km/s	Moderate adverse	Closer to road than comparison site, which is already above species change level, however emission rate change here is lower than at comparison site. There is potential for impacts at the site edge, as changes in nitrogen deposition would be larger closer to the road although any impact would likely be limited to the 6 m closest to the site edge. This may result in an effect of slight adverse significance.
Land West of Stafford Road (Site 2) –	10-20	110 - 120	M54: +4,652	Walk Mill Clay Pit * +0.06 kg N ha^{-1} yr^{-1} at 100 m	No change	By comparison, it is likely the level of nitrogen deposition change is below <1% of critical load. Very low potential for significant effects

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
County importance			HDV +395 No speed band changes +15.64 µg/km/s			
Staffordshire and Worcestershire Canal SINC – County importance	10	20 - 25		Walk Mill Clay Pit * +0.18 kg N ha^{-1} yr^{-1} at 20 m	Negligible	By comparison, it is likely the level of nitrogen deposition change is below the level which would trigger species change. Low potential for significant effects.
Albutts Road SLINC – County importance	10-20	40 - 50	M6 Toll: +2,058 HDV +448 No speedband changes +6.65 µg/km/s	Chasewater +0.02 kg N ha^{-1} yr^{-1} at 40 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects
Anglesey Branch SLINC – County importance	10-20	30 - 40		Chasewater +0.03 kg N ha^{-1} yr^{-1} at 30 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects
Poole Crescent (Land at) SBI – County importance	10-20	110 – 120		Chasewater +0.01 kg N ha^{-1} yr^{-1} at 100 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects
Washbrook Lane BAS – Local importance	10	0		Chasewater +0.07 kg N ha^{-1} yr^{-1} at 1.1 m	Negligible	Closer to road than comparison site but only by 1 m, and at comparison site nitrogen deposition change is very small (below 1% of critical load) therefore low potential for significant effects.

Ecological site and Importance (value)	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
School Lane (pool east of) SBI – County importance	Not sensitive to nitrogen (phosphate limited)	120 - 130		N/A	No change	Not sensitive no nitrogen. No risk of significant effects.
Commonside Disused Railway SBI – County importance	20	10 – 15		Chasewater +0.05 kg N ha^{-1} yr^{-1} at 10 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects
Brownhills Road BAS – Local importance	10-20	70 - 80		Chasewater +0.03 kg N ha^{-1} yr^{-1} at 70 m	No change	By comparison, it is likely the level of nitrogen deposition change is below 1% of critical load. Very low potential for significant effects
* Total AADT change of A460 and M6 combined (they are ~10 m apart) at Walk Mill Clay Pit is +6,981 (with total emission change of +21.25 µg/km/s, which, when considered at large distances is an acceptable proxy for one road experiencing that change. †M6 northbound is ~85 m away from the southbound lane in this location, and further than 200 m from the site, so only southbound lane need be considered.						

Veteran Trees

5.25 There are 12 veteran trees within the study area that have not been previously modelled. These are shown in Figure 20 and Figure 21.

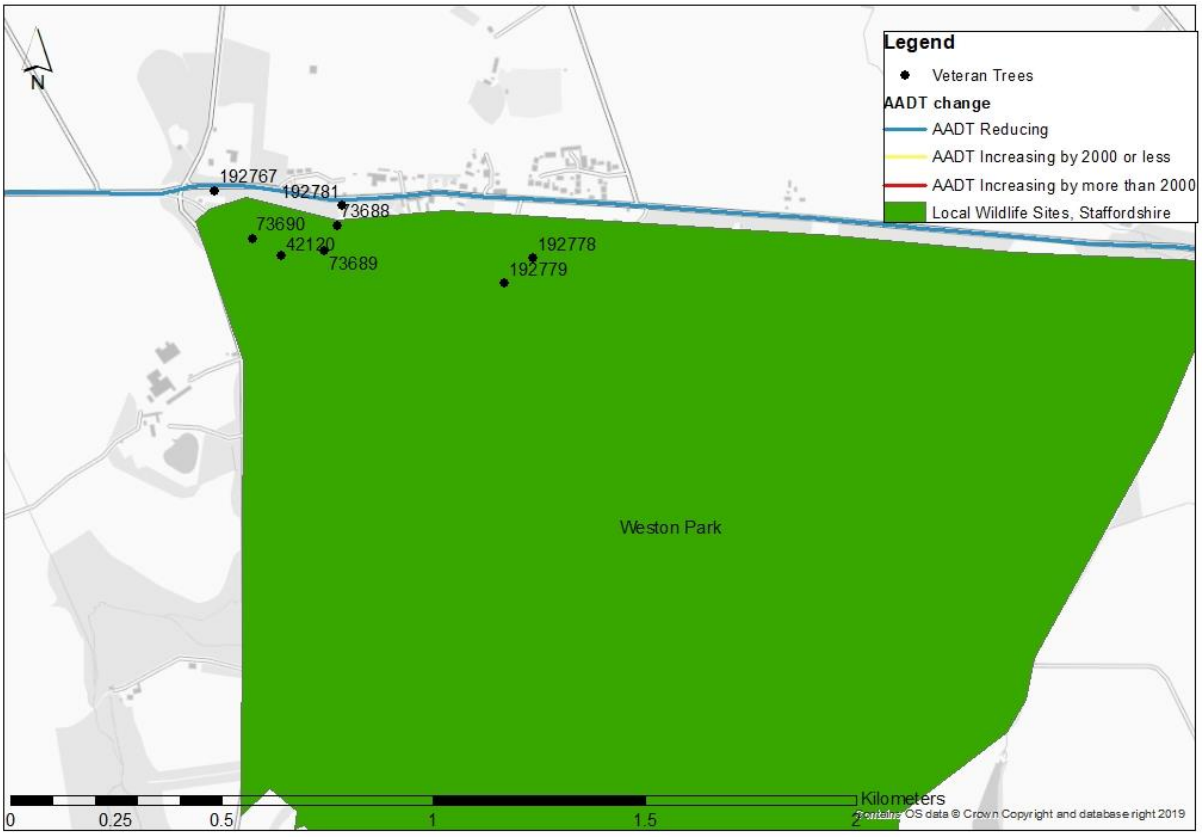

Figure 20: Veteran Trees (not previously modelled) within the Study Area (Weston Park area)

5.26 The eight veteran trees south of the A5, in or near Weston Park are located in an area experiencing reducing AADT flows (with no speed band changes) and therefore there is no risk of a significant effect at the trees in this location.

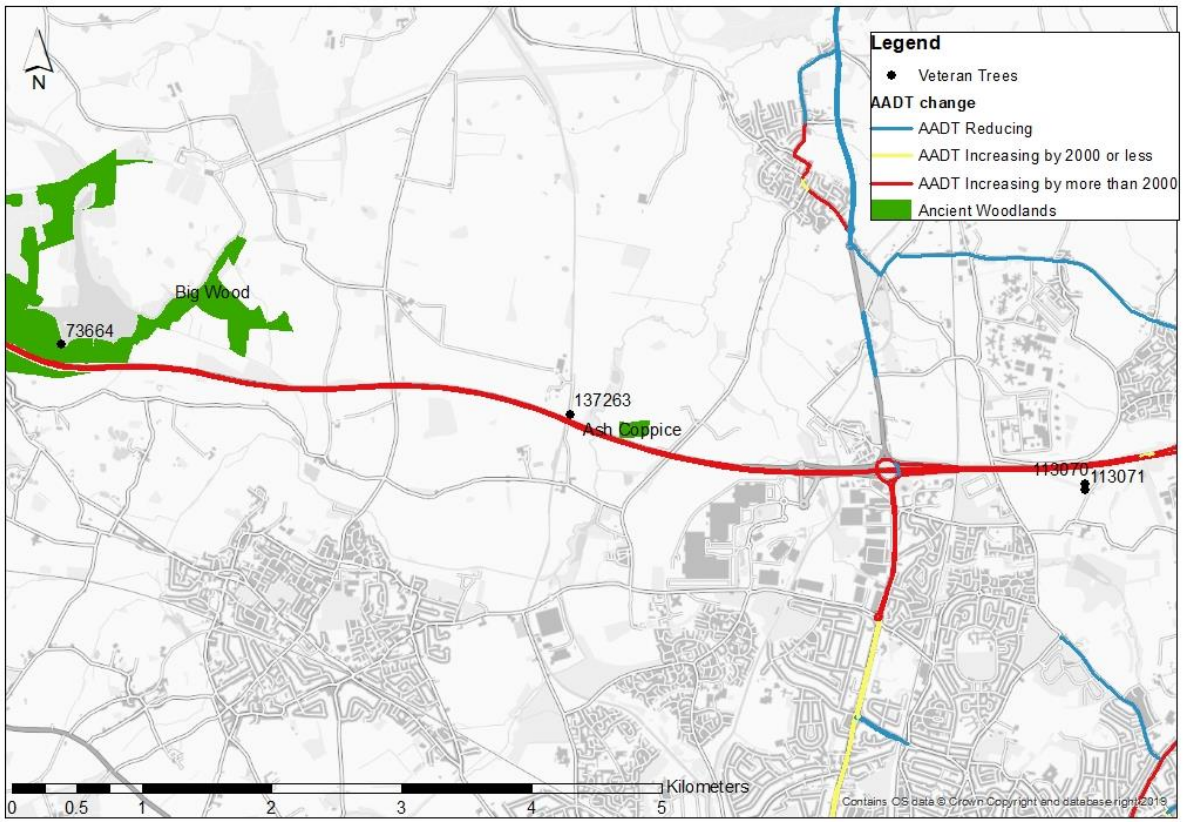

Figure 21: Veteran Trees (not previously modelled) within the Study Area (M54 area)

5.27 The four remaining veteran trees have been analysed further in Table 15.

Table 15: Veteran Trees Analysis

Site	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
73664 - National importance	10	141.1	M54: AADT +4,560, HDVs +393 No speed band changes +15.33 µg/km/s	Stowe Pool and Walk Mill Clay Pit SSSI* +0.05 kg N ha^{-1} yr^{-1} at 125 m	No change	By comparison, likely <1% of critical load. Very low potential for significant effects. However, as the site in this case is only one tree, species richness is not a relevant metric. The botanical

Site	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
						effects of nitrogen deposition on tree growth and health are subtle and tree survival is unlikely to be affected. The effect would therefore be neutral.
137263 - National importance	10	43.0		Stowe Pool and Walk Mill Clay Pit SSSI* +0.12 kg N ha^{-1} yr^{-1} at 40 m	Negligible	By comparison, the likely level of nitrogen deposition is below the level which would trigger species change. Low potential for significant effects. However, as the site in this case is only one tree, species richness is not a relevant metric. The botanical effects of nitrogen deposition on tree growth and health are subtle and tree survival is unlikely to be affected. The effect would therefore be neutral.
113070 - National importance	10	123.3	M54: AADT +16,821 HDVs +1,017 No speed band changes +57.11 µg/km/s	Brookfield Farm SBI and ancient woodland +0.57 kg N ha^{-1} yr^{-1} at 122 m	Negligible	
113071 - National importance	10	173.0		Brookfield Farm SBI and ancient woodland +0.45 kg N ha^{-1} yr^{-1} at 156 m	Negligible	

Site	Critical Load (kg N ha^{-1} yr^{-1})	Distance from Road (m)	Traffic changes	Is there a modelled site which functions as a worst case comparison?	Level of impact	Discussion
* Total AADT change of A460 and M6 combined (they are ~10 m apart) at Walk Mill Clay Pit (part of Stowe Pool and Walk Mill Clay Pit SSSI) is +6981 (with total emission change of +21.25 µg/km/s, which, when considered at large distances is an acceptable proxy for one road experiencing that change.						

5.28 In summary, there is low potential for significant effects at veteran trees.

Ecological Sites Summary

5.29 Of the additional 81 sites assessed in the sensitivity test only one is considered likely to result in a potential effect of moderate adverse significance, Big Wood SBI/BAS and ancient woodland. This is a precautionary assessment as the site has not been subject to detailed modelling or site survey, the affected area may actually be less than 2 m and would therefore result in an effect of slight significance.

6 Sensitivity Test 5: LA 105 PCM Compliance

6.1 With the publication of LA 105 the approach to the consideration of compliance for schemes has changed. This includes not only reporting changes in air quality and relating them to Defra's Pollution Climate Mapping (PCM) model (which considers compliance at a point 4 m from the road) but also reporting compliance at "qualifying features" which may be closer to the road than 4 m, and therefore at greater risk of non-compliance.

6.2 Qualifying features include residences, schools and hospitals that have already been modelled at worst case exposure along the ARN, including where it intersects links of the PCM model. However, qualifying features also include areas of public access, for example roadside footpaths, which have not been modelled, and are likely to be the areas where the qualifying features are very close to the roadside.

6.3 A risk review was carried out to establish the likelihood of a high compliance risk being reported had the new compliance assessment been followed for the ES. This process followed the steps set out below:

- Identifying all PCM model links that are at least partially within 200 m of the ARN;
- Identifying any qualifying features on each road link and their distance to the roadside; and
- Using modelled receptors that are close by, modelled concentrations and the PCM model predictions, to estimate the risk of compliance impacts at each identified road link using the new LA 105 process.

6.4 A total of 155 links categorised into 28 Census IDs were identified as being within 200 m of an ARN link. This encompasses some links which completely or partially overlap with the ARN, some links which meet ARN links at junctions, and some links that are only close to, but not joined to, ARN links. The location of these links is illustrated in Figure 22.

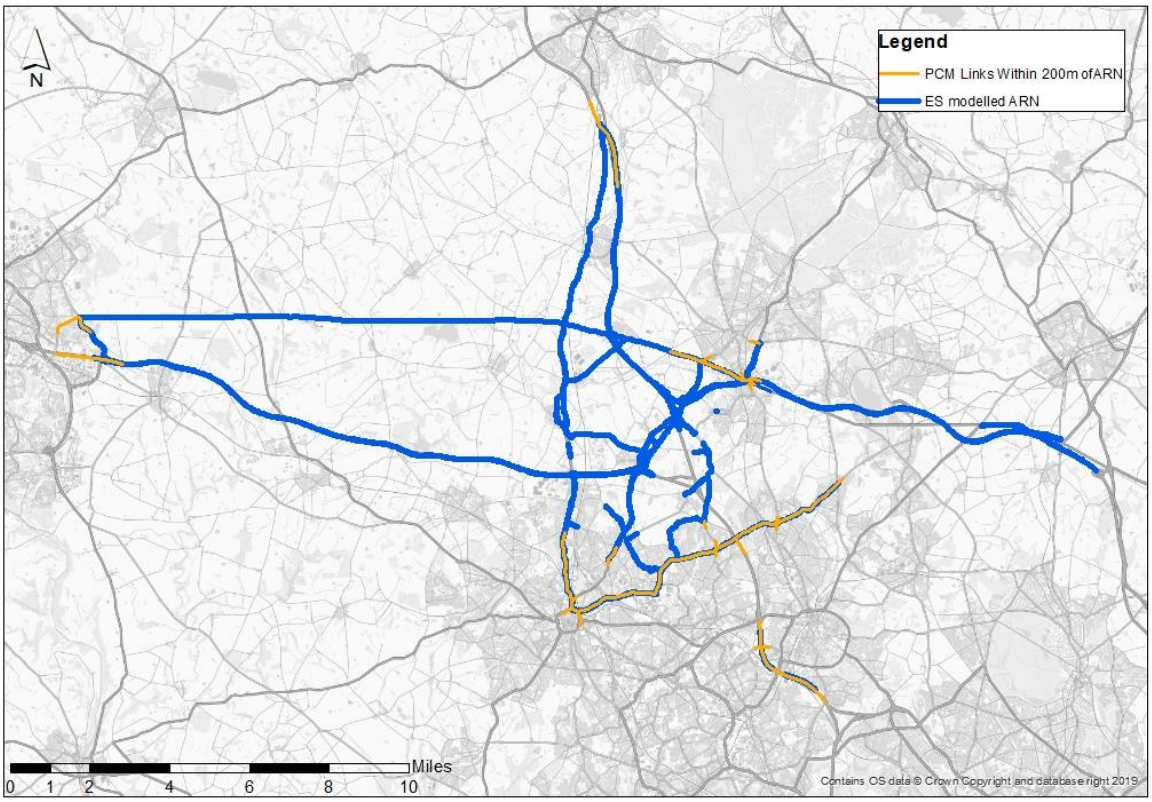

Figure 22: PCM links within 200 m of the ARN

6.5 These links were investigated for the presence of qualifying features within 15 m of the PCM link (and within 200 m of the ARN link, if different). The resources used for this were Ordnance Survey Mastermapping, Google Streetview, and Defra's Magic Map application.

6.6 The results of this survey are provided in Table 16 for each Census ID, along with Defra's predicted concentrations for the links in the opening year of 2024. In brief, footpaths are present along all of the A-roads considered. Qualifying features are also present along some of the motorways considered.

Table 16: PCM Links intersecting with the ARN

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
16027	M6	27.7	Track leading from Old Vicarage Lane runs alongside M6 at closest approach of 10.5 m. Road to sewer works runs alongside M6 at closest approach of 15.0 m.	Further than 4 m away so concentrations unlikely to be higher than PCM predictions which are well below the limit value. Predicted DS concentrations are higher than DM in this area but likely to still below 40 µg/m^3.	Low risk
81223	A4640	16.8	Footpath running alongside road on both sides for most of its length ~1.5 m from road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R026 (12.0 m - 13.6 µg/m^3). DS concentrations are higher than DM in this area, however predicted concentrations well below the limit value.	Low risk
56132	A5	14.7	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst case at 25 m from the roundabout.	Off-ARN. Closer than 4 m away so concentrations may be higher than PCM predictions. DS concentrations are higher than DM in this area. However, as Defra PCM predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk
99279	A5190	22.4	PCM link intersects ARN at roundabout. Footpath 1.5 m from the road edge running alongside road on both sides; considered worst case	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are higher than DM in this area. However, as Defra PCM predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
			at 25 m from the roundabout.		
57224	A4601	19.3	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst case at 25 m from the roundabout.	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are lower than DM in this area.	No risk
80452	M54	21.3	Track to Telford Sailing Club 10.7 m at closest approach.	Further than 4 m away so unlikely to be higher than PCM predictions. DS concentrations are higher than DM in this area. Nearest modelled receptor is C002 (23.9 m – 25.8 µg/m^3). However, as both Defra PCM and Scheme-model predicted concentrations here are low, exceedances of the limit value are not anticipated.	Low risk
6140	A5	19.8	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R440 (6.3 m – 26.0 µg/m^3). DS concentrations are lower than DM in this area.	No risk
99285	A34	18.6	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are higher than DM in this area. However, as Defra PCM predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
			case at 25 m from the roundabout.		
80811	A5	24.9	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R438 (4.8 m – 26.7 µg/m^3). DS concentrations are higher than DM in this area. As both Defra PCM and Scheme-model predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk
80818	M6(T)	15.3	No	Off-ARN but no qualifying features present and concentrations in PCM model well below limit value.	No risk
60029	A4124	20.3	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is H004 (2.6 m – 21.2 µg/m^3). DS concentrations are lower than DM in this area.	No risk
57650	A4124	21.4	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R212 (1.6 m – 28.8 µg/m^3). DS concentrations are lower than DM in this area.	No risk
74013	A34	18.7	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst case at 25 m from the roundabout.	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are lower than DM in this area.	No risk

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
37751	A4124	22.6	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R211 (3.3 m – 27.3 µg/m^3). DS concentrations are lower than DM in this area.	No risk
74015	A462	21.7	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst case at 25 m from the roundabout.	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are lower than DM in this area.	No risk
74016	A4124	21.3	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R193 (1.8 m – 26.4 µg/m^3). DS concentrations are lower than DM in this area.	No risk
57118	A449	28.7	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R089 (4.2 m – 28.0 µg/m^3). DS concentrations are higher than DM in this area. As both Defra PCM and Scheme-model predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk
37245	A460	25.1	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R135 (3.4 m – 23.0 µg/m^3). DS concentrations are higher than DM in this area. As both Defra PCM and Scheme-model predicted	Low risk

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
				concentrations here are so low, exceedances of the limit value are not anticipated.	
38071	M6	26.0	No	Off-ARN but no qualifying features present and concentrations in PCM model well below limit value.	No risk
17613	A4124	20.9	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R108 (11.1 m – 20.0 µg/m^3). DS concentrations are lower than DM in this area.	No risk
70205	A4124	23.5	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is C010 (5.2 m – 24.3 µg/m^3). DS concentrations are lower than DM in this area.	No risk
47707	A4124	25.5	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R100 (5.1 m – 24.2 µg/m^3). DS concentrations are lower than DM in this area.	No risk
47192	A449	27.2	Footpath running alongside road on both sides for most of its length adjacent to road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is R090 (4.9 m – 26.8 µg/m^3). DS concentrations are higher than DM in this area. As both Defra PCM and Scheme-model predicted concentrations here are so low, exceedances of the limit value are not anticipated.	Low risk
48346	A4150	27.3	Footpath running alongside road on both sides for most	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is	Low risk

Census ID for PCM link	Road name	2024 PCM predicted concentration (µg/m^3)	Qualifying features present?	Discussion	Risk of compliance impacts
			of its length adjacent to road edge.	R092 (23.8 m – 22.7 µg/m^3). DS concentrations are higher than DM in this area. As both Defra PCM and Scheme-model predicted concentrations here are so low, exceedances of the limit value are not anticipated.	
28464	A4150	31.8	PCM link intersects ARN at roundabout. Footpath adjacent to the road edge running alongside road on both sides; considered worst case at 25 m from the roundabout.	Off-ARN. Closer than 4 m away so may be higher than PCM predictions. DS concentrations are lower than DM in this area.	No risk
46022	M6	27.3	Pleck Park up to 1.7 m from road edge.	This site has been modelled as C042 (1.7 m – 60.9 µg/m^3). DS concentrations are lower than DM in this area.	No risk
37726	A4038	25.1	No	Off-ARN but no qualifying features present and concentrations in PCM model well below limit value.	No risk
16026	M6	26.6	Bescot Stadium Car Park - 3.0 m from road edge.	Closer than 4 m away so may be higher than PCM predictions. Nearest modelled receptor is C039 (45.3 m – 36.0 µg/m^3). DS concentrations are lower than DM in this area.	No risk

6.7 In all cases, the PCM predicted concentrations in the opening year of 2024 are well below 40 µg/m^3. Therefore, where there are no qualifying features present next to the link there is deemed to be no risk of compliance impacts as the PCM model of '4 m from the road edge' would be used.

6.8 Where there are qualifying features present that are closer to the road edge than those that have been modelled, modelled concentrations close to the qualifying feature were considered. Where concentrations in the area are predicted to be lower in the DS scenario than the DM scenario (that is, the Scheme is improving air quality in the area) due to reducing emissions from the link, there is considered to be no risk of compliance impacts. This is because, had the qualifying features been modelled, beneficial impacts would have been predicted at these locations.

6.9 Where qualifying features are present and modelled concentrations close to the qualifying feature were predicted to be higher in the DS scenario than the DM scenario, there is a risk of compliance impacts. This is because, closer to the road concentrations and changes in concentrations are higher than they are further out from the road. However, where this is the case in this Scheme the risk is considered to be low. This is because the PCM modelled concentrations and the nearby modelled concentrations are well below 40 µg/m^3, such that an increase in concentrations above the limit value is unlikely in these locations.

7 Summary

7.1 This technical note has considered how the changes to the DMRB guidance from HA207/0 to LA 105 would have impacted the conclusions of the air quality chapter of the ES [APP-044/Volume 6.1] had they been incorporated. The main specific points of difference between HA207/07 and LA 105 considered in this note were:

- The change in screening criteria to define the air quality study area.
- The changes to speed bands and emission rates.
- The changes to conversion rates of nitrogen dioxide (NO_2) to dry nutrient nitrogen deposition rate for ecologically designated sites.
- The additional ecological site designations to be considered as part of the air quality assessment.
- Changes to the assessment of compliance with EU Limit Values.

7.2 It was found that the air quality study area would have been slightly larger (two extra road links) due to changes in the screening criteria. This enlargement of the study area is not expected to result in any significant effects as receptors modelled in the vicinity of these link suggest concentrations will be below 40 µg/m^3.

7.3 It was found that the emissions calculated at the links and modelled pollutant concentrations (which are a direct result of those emissions) would be different due to the use of new speed banding categories at motorways, and an update to the SBEFT. The level of effect on links varies depending on the link type, speed and proximity to junctions. The potential effect on sensitive receptors will depend on these and the proximity of those receptors to the road links. However, it is not anticipated that these changes would affect the overall evaluation of significance for the Scheme and the Scheme would continue to be considered not significant for air quality.

7.4 It was found that reported nitrogen deposition at modelled ecological sites would be higher than was reported in the ES due to the increase in dry nitrogen deposition rates. This has the effect of turning effects of neutral significance into effects of moderate adverse significance at Oxden Leasow (Whitgreaves Wood), reported in Chapter 8: Biodiversity of the ES.

7.5 It was found that the increased list of ecological sites to consider would have brought in a requirement to model an additional 84 sites. At the majority of these sites neutral effects are anticipated.

7.6 It was found that the changes to the way that EU limit value compliance is considered in LA 105 would not result in the reporting of compliance for the Scheme, the Scheme remains compliant.

7.7 In conclusion it is anticipated that LA 105 would not have resulted in the reporting of significant effects for human health or for compliance. However, it would have resulted in differing reporting of the significance of effects due to air quality at ecological sites. This difference would increase the severity of a previously reported effect at Oxden Leasow (Whitgreaves Wood) ancient woodland (from neutral to moderate). This significant adverse effect is not

reported in Chapter 8: Biodiversity of the ES. For further consideration of the impact of these sensitivity tests on the published ES and other DCO documents refer to technical note DMRB Updates and the Impact on the DCO Application [TR010054/APP/8.2].

Appendix 1

Table 17: Full list of sites identified within the Air Quality Study Area

AADT reducing – no further analysis	AADT increasing by <2000 – no further analysis required	AADT increasing by >2000 – further analysis required
Rough Wood Chase LNR (also designated as Rough Wood Chase SINC and Sneyd Reservoir SINC)	Hatherton Branch Canal BAS	Birmingham and the Black Country NIA
Unnamed Ancient Woodland near Burlington Pools	Orbital Way LWS	Big Wood Ancient Woodland (also designated as SBI/BAS)
Weston Park LWS	Rakegate Wood SINC	Aston Coppice Ancient Woodland
Gailey Old Reservoir LWS	Wyrley and Essington Canal SINC/SLINC	Tong Wood Ancient Woodland
Calf Heath Bridge (east of) BAS	Birmingham Canal, Wolverhampton Level SINC	Wigmore Wood Ancient Woodland
Four Ashes (land at) LWS	Peace Green SLINC	Ash Coppice Ancient Woodland
Somerford Wood SBI*	Stafford Road Cutting SINC/SLINC	Chillington Estate (semi-improved fields on) SBI
Essington Pools BAS	Land at Wolverhampton Science Park SLINC	Priorslee Lake LWS
Kitchen Lane Open Space SLINC		Cockpit Plantation BAS
Bushbury Hill SINC		Teddesley Park SBI/ LWS
Northycote Farm Parkland SINC		Bone Mill Disused Pools SBI/ LWS
Northycote Farm Coppice SINC		Otherton Marsh, Penkridge SBI/ LWS
Northycote Farm SINC		Staffordshire and Worcestershire Canal, Penkridge LWS
Northycote Playing Fields SINC		Gailey Reservoir LWS
Moat Farm Pool SLINC		Watling Street Plantation BAS
Leylands Farm SLINC		Bridgetown Subsidence Pools LWS†
Bushbury Sidings SLINC		Hatherton Reservoir, Cheslyn Hay SBI/ LWS
Lichfield Road Railway Hedges SLINC		Hatherton Pines BAS
Wolverhampton Road SLINC		Saredon Hall Farm (south east of) BAS
Walsall Canal SLINC		Brookfield Farm (north-east of), Shareshill SBI/ LWS
Bentley Mill Lane SLINC		Lower Pool SBI/ LWS
James Bridge Gasworks SLINC		Westcroft (woods north of) BAS

AADT reducing – no further analysis	AADT increasing by <2000 – no further analysis required	AADT increasing by >2000 – further analysis required
Bescot Triangle SLINC		Land West of Stafford Road SLINC
Wood Green Road, Tame Valley SINC		Staffordshire and Worcestershire Canal SINC
Muckley Corner LWS*		Ashmore Lodge, Essington (disused railway line) BAS
Veteran Tree 192767		Grassy Lane SLINC
Veteran Tree 192781		Albutts Road SLINC
Veteran Tree 73688		Anglesey Branch SLINC
Veteran Tree 73690		Poole Crescent (land at) SBI
Veteran Tree 42120		Washbrook Lane BAS
Veteran Tree 73689		School Lane (pool east of) SBI
Veteran Tree 192779		Commonside Disused Railway SBI
Veteran Tree 192778		Brownhills Road BAS
		Veteran Tree 73664
		Veteran Tree 137263
		Veteran Tree 113070
		Veteran Tree 113071

* speed band changes but moving in a direction to reduce associated emissions between scenarios
† on LA105 ARN only, not HA207/07 ARN. The A5 in this location has less than 2,000 AADT change but has a speed band change so has been carried forward for further analysis.

Appendix B – Further details of alterations to Chapter 11: Noise and Vibration

Further explanation of the changes made to Chapter 11: Noise and Vibration to update the assessment in line with the revised DMRB, LA 111, as identified in Section 3.2 of this report is provided below. In addition, details are also provided of minor changes made to the chapter which do not materially affect the conclusions of the assessment. The changes are provided in the same order as the layout of the ES chapter [APP-050/Volume 6.1]:

- Removal of the assessment of operational traffic vibration impacts, which is scoped out of the revised DMRB. DMRB states that 'Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of the project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects'.
- Minor changes to the construction assessment methodology set out in Section 11.3 of the ES to directly reference the methodology prescribed in the updated DMRB, LA 111. The previous version of DMRB provided limited guidance on the construction assessment methodology, however the approach adopted in the original chapter closely aligns with that prescribed in the updated DMRB. The updated DMRB adopts a new magnitude of impact scale, though the thresholds for the onset of potentially significant effects are unchanged. It also includes a new requirement to explicitly consider impacts from night -time diversion routes. No change has been made to the construction source information, the construction prediction methodology, the use of the 'ABC' method for assessing the magnitude of impact of construction noise, the construction noise and vibration LOAELs and SOAELs, the thresholds for the onset of potentially significant effects, or the duration of construction impact criteria.
- Changes to the operational traffic noise prediction and assessment methodology set out in Section 11.3 of the ES to align with the updated DMRB requirements. No change to the Calculation of Road Traffic Noise (CRTN) prediction methodology or the 3D computer noise model has occurred, however as discussed in Section 3.2 above the traffic speed data used in the traffic noise predictions has been updated to use pivoted rather than banded speeds. The magnitude of impact criteria and operational traffic noise LOAEL and SOAEL remain unchanged. Clarifications have been made to the range of additional factors which are considered in identifying significant effects, to align directly with the detail in the revised DMRB. For example, the original ES chapter reported one of the factors as:
  - "where the magnitude of change in the short-term lies relative to the boundaries between the bands outlined in Table 11.7, e.g. in some circumstances a change towards the top end of the minor category, may be considered significant, conversely a change towards the bottom end of the moderate category may not be considered significant".

  This is clarified in the revised DMRB such that the comparable text is amended to:

  - "where the magnitude of change in the short-term lies relative to the boundaries between the bands outlined in Table 11.8: In some circumstances a change within 1 dB of the top of the minor range may be appropriate to be considered a likely significant effect. Conversely a change within 1 dB of the bottom of the moderate range, may in some circumstances be more appropriate to be considered as not likely to be a significant effect."

- Update to the Scoping Response part of Section 11.3 of the ES as some scoping responses relate to aspects of the methodology which have been removed from the revised DMRB.
- Revisions to the construction Study Area as set out in Section 11.5 of the ES. Adoption of the revised DMRB does not affect the study areas previously adopted for construction noise or construction vibration. The only effect on construction is the addition of a 25 m study area for existing roads used for night-time diversions.
- Revisions to the operational traffic noise Study Area as set out in Section 11.5 of the ES. The revised DMRB adopts the same two operational traffic noise assessment methodologies as the previous DMRB:
  - noise modelling (calculations of noise level changes at specific receptors using 3D noise modelling software); and
  - changes in Basic Noise Level (BNL) (calculations based on the source level of the road rather than the level at each individual receptor).
- The revised DMRB sets the area of operational traffic noise modelling (the calculation area) at 600 m from the Scheme and existing routes bypassed by the Scheme (i.e. A460 Cannock Road). The requirement in the previous DMRB to also include areas within 600 m of 'affected routes', up to a maximum of 1 km from the Scheme and routes bypassed by the Scheme, has been removed. In both the revised and previous DMRB affected routes outside the calculation area are assessed using the change in the BNL and a 50 m study area, unless this indicates a specific need for detailed modelling. No affected routes were found to require more detailed modelled using pivoted traffic speeds.
- Update to the Baseline Noise Survey in Section 11.6 of the ES with regards to the predicted baseline traffic noise levels at the monitoring locations. The use of pivoted rather than banded traffic speeds results in a slight improvement in the already close match between the precited and monitored noise levels.
- Update of the long-term change in Do-minimum traffic noise level results in Section 11.6 of the ES, due to the change from banded to pivoted traffic speeds. There is no change to the overall picture of negligible increases due to the growth of traffic from the opening year to the future assessment year, with a small number of minor and moderate increases in Shareshill due to the operation of the West Midlands Interchange, which is included in the future year Do-Minimum traffic data. The number of receptors in the overall study area i.e. including the 600 m calculation area and the 50 m area around 'affected routes' assessed using the change in BNL are now all reported in the summary table. In the previous chapter only those within the 600 m calculation area were included in the summary table, with a separate

table for the affected routes. The table for 'affected routes', which includes details of the Do-Minimum changes in BNL and the number of receptors, are now provided in the new Appendix 11.5.

- Details of the insertion loss provided by the barriers are now provided in Section 11.8 of the ES as required by the new DMRB. The Dark Lane barrier is increased in height from 3.0 m to 4.0 m, and the Brookfield Farm barrier from 2.5 m to 3.0 m.
- Minor updates to the summary of the construction noise assessment reported in Table 11.9 of the ES and the subsequent discussion, primarily in relation to the LOAEL/SOAEL which are determined from the revised baseline traffic noise levels. The corresponding graphs of monthly estimated construction noise levels relative to the LOAEL and SOAEL in Appendix 11.3 are also updated. The discussion is updated to incorporate the magnitude of impact scale included in the revised DMRB methodology. As the criteria for defining the threshold of the onset of potentially significant effects is unchanged, no new or materially different construction noise significant effects are identified. The description of construction vibration significant effects is also updated to incorporate the new magnitude of impact scale. As for noise, no new or materially different construction vibration significant effects are identified. The discussion of construction traffic impacts is updated to include consideration of the new 25 m study area for night time diversions specified in the new DMRB, no noise sensitive receptors are located within 25 m of roads identified as being used for night time diversions. The conclusion regarding no significant adverse effects due to construction traffic remains unchanged.
- The operational traffic noise impact assessment reported in Section 11.9 of the ES is updated to correspond to the methodology in the revised DMRB. The short term and long term change results are updated due to the change from banded to pivoted traffic speeds. The number of receptors in the overall study area i.e. including the 600 m calculation area and the 50 m area around 'affected routes' are now all reported in the summary tables. In the previous chapter only those within the 600 m calculation area were included in the summary tables, with a separate table for the affected routes. The table for 'affected routes', which includes details of the Do-Something changes in BNL and the number of receptors, are now provided in the new Appendix 11.5.

  The change from banded to pivoted speeds does not result in large changes to the predicted traffic noise levels with and without the Scheme in operation. There is, therefore, no change to the overall picture of significant adverse operational traffic noise effects at Hilton Lane and The Bungalow at Brookfield Farm, and significant beneficial effects along the existing A460 bypassed by the Scheme.

  However, the change from banded to pivoted speeds does result in some slight changes to traffic noise levels, which, in combination with the further clarity on identifying significant effects provided in the revised DMRB, results in some changes in the decisions on significance at a small number of receptors, and slight changes to two proposed noise barriers.

  The total number of significant adverse operational traffic noise effects due to the scheme is increased from two to six (The Bungalow at Hilton Farm and five

properties on Hilton Lane) and the total number of significant beneficial effects on the existing A460 from 18 to 33.

Two properties on Hilton Lane move from minor to moderate increases due to the change to pivoted speeds. The benefit of the reduction in the speed limit on Hilton Lane implemented as part of the Scheme, which partially offset the increase in traffic flows on this road due to the closure of Dark Lane, is reduced using pivoted rather than banded speeds. In addition, minor increases in traffic noise levels at the worst affected facade of a further two properties on Hilton Lane have now been identified as resulting in a significant adverse effect, due to the slight changes in the results using pivoted speeds, combined with the additional clarity on identifying significant effects when the change in traffic noise is minor provided in the revised DMRB. Correspondingly, a small number of minor decreases at the worst affected façade of properties on the A460 have been identified as a significant beneficial effect.

The significant adverse effect at 197 residential buildings on the A460 south of the M54 is removed. Although the change in traffic noise levels at these receptors was only minor in the previous assessment (just over 1.0 dB), the absolute levels were 'high' (above SOAEL), and therefore a significant adverse effect was identified. Using the pivoted rather than banded speeds the change in traffic noise levels due to the Scheme is now less than 1.0 dB (negligible), and therefore, a significant effect is no longer identified. The increase in flows on this road due to the Scheme is unchanged but is partially offset by a slight reduction in speed, which was not captured in the speed banded speed data.

The pivoted traffic speeds on the Scheme mainline past Dark Lane and Brookfield Farm are slightly higher than the banded speed, which results in a slight increase in operational traffic noise levels. With a 3 m barrier in place at Dark Lane the previous assessment indicated that the impact at the worst affected facades of properties on Dark Lane/Park Road was minor. To maintain the worst case impact at these properties as minor the barrier height has been increased to 4 m. With a 2.5 m barrier in place at The Bungalow at Brookfield Farm, the previous assessment indicated that the impact at the worst affected façade was moderate. To maintain a comparable moderate impact the barrier height has been increased to 3 m.

The significant operational traffic noise beneficial effect at 11 residential properties along the affected route Old Stafford Road remains.

At all other receptors in the study area the operational traffic noise effect of the Scheme remains not significant.

- No material changes have been made to the compliance with policy discussion with regard to construction in Section 11.9 of the ES. With regard to operation differences in the number of properties meeting various criteria are reported as below:
    - A total of 70 rather than 71 residential buildings are anticipated to be reduced from above to below the SOAEL due to the Scheme.

  - A total of 12 rather than 3 residential buildings are anticipated to increase from below to above the SOAEL, with the revised DMRB methodology.
  - The noise barriers incorporated into the Scheme design prevent eight, rather than ten residential buildings experiencing an increase in traffic noise to above the SOAEL.
  - A total of 125 rather than 339 residential buildings are above the SOAEL both with and without the Scheme, primarily because of the removal of the majority of properties on the A460 south of the M54 from the detailed traffic noise modelling calculation area. The change in traffic noise levels on this road is reduced such that it is no longer an 'affected route' as the increase in flows due to the scheme is partially offset by a slight reduction in speed, which was not captured in the speed banded speed data. The overall picture of a reduction in the number of properties above the SOAEL due to the Scheme remains unchanged.
- The overall conclusion with regard to demonstrating compliance with policy, for both construction and operation, remains unchanged.