# Outer Dowsing Offshore Wind

## Environmental Statement

Chapter 19 Onshore Air Quality

Volume 3 Appendices

Appendix 19.4 Road Traffic Dispersion Modelling

| Company: | **Outer Dowsing Offshore Wind** | Asset: | | **Whole Asset** |
|---|---|---|---|---|
| Project: | **Whole Wind Farm** | Sub Project/Package: | | Whole Asset |
| Document Title or Description: | Appendix 19.4 Road Traffic Dispersion Modelling | | | |
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# Volume 3, Appendix 19.4: Road Traffic Dispersion Modelling

## Outer Dowsing Offshore Wind Environmental Statement

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# Acronyms and Abbreviations

| Acronym | Expanded name |
|---|---|
| µg/m$^3$ | Micrograms per cubic metre |
| AADT | Annual Average Daily Traffic |
| APIS | Air Pollution Information System |
| AQAL | Air Quality Assessment Level |
| AQTAG | Air Quality Technical Advisory Group |
| BBC | Boston Borough Council |
| BC | Base Case |
| CERC | Cambridge Environmental Research Consultants |
| DCO | Development Consent Order |
| Defra | Department for Environment, Food and Rural Affairs |
| DfT | Department for Transport |
| DM | Do Minimum |
| DS | Do Something |
| EA | Environment Agency |
| ECC | Export Cable Corridor |
| EFT | Emission Factor Toolkit |
| EIA | Environmental Impact Assessment |
| ELDC | East Lindsey District Council |
| EPUK | Environmental Protection UK |
| HDV | Heavy Duty Vehicle |
| IAQM | Institute of Air Quality Management |
| LAQM.TG22 | Local Air Quality Management Technical Guidance 2022 |
| LDV | Light Duty Vehicle |
| LNR | Local Nature Reserve |
| LWS | Local Wildlife Site |
| LWT | Lincolnshire Wildlife Trust |
| NGR | National Grid Reference |
| NKDC | North Kesteven District Council |
| NO$_2$ | Nitrogen Dioxide |
| NO$_x$ | Nitrogen Oxides |
| NSIP | Nationally Significant Infrastructure Project |
| O&M | Operation and Maintenance |
| ODOW | Outer Dowsing Offshore Wind |
| PM$_{10}$ | Airborne particulate matter with an aerodynamic diameter of 10µm or less |

| PM$_{2.5}$ | Airborne particulate matter with an aerodynamic diameter of 2.5µm (micrometres) or less |
|---|---|
| RMSE | Root Mean Square Error |
| SHDC | South Holland District Council |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| TG | Technical Guidance |
| UK | United Kingdom |

# Terminology

| Term | Description |
|---|---|
| Baseline | The status of the environment at the time of assessment without the development in place. |
| Cumulative effects | The combined effect of the Project acting additively with the effects of other developments, on the same single receptor/resource. |
| Development Consent Order (DCO) | An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP). |
| Effect | Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the sensitivity of the receptor, in accordance with defined significance criteria. |
| EIA Regulations | Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. |
| Environmental Statement | The suite of documents that detail the processes and results of the EIA. |
| Impact | An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial. |
| Intertidal | Area where the ocean meets the land between high and low tides. |
| Landfall | The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore. |
| Mitigation | Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects. |
| Order Limits | The area subject to the application for development consent. The limits shown on the works plans within which the Project may be carried out. |
| Outer Dowsing Offshore Wind (ODOW) | The Project. |
| The Planning Inspectorate | The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs). |
| The Project | Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure. |
| Receptor | A distinct part of the environment on which effects could occur and can be the subject of specific assessments.  Examples of receptors include species (or |

| Term | Description |
|---|---|
| | groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc. |
| Study area | Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist. |

# 19.0   Road Traffic Dispersion Modelling

## 19.1   Introduction

1.  To appropriately assess road traffic impacts associated with the construction phase of the onshore elements of Outer Dowsing Offshore Wind (ODOW) ('the Project') on sensitive receptors, detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5 dispersion model, focussing on concentrations of nitrogen dioxide ($NO_2$), and particulate matter ($PM_{10}$ and $PM_{2.5}$) for the following scenarios:

    *   2019 Base Case (BC) – Base flows for the year (2019);
    *   2027 Do Minimum (DM) – Future baseline flows for the earliest potential year construction will commence (2027), inclusive of any other relevant committed development flows; and
    *   2027 Do Something (DS) – 2027 DM flows, plus peak road traffic flows generated by ODOW onshore construction activities.

2.  To disaggregate in-combination impacts on designated ecological sites, an additional modelled scenario was included for 2027; comprising future baseline flows without the addition of committed developments (i.e. 2027 DM minus committed development flows).

3.  For the above future year scenarios (2027), concurrent emission factors and background (projected) pollutant concentrations have been used – representing the earliest date of potential construction.

4.  To understand potential air quality impacts that may arise throughout the construction phase 2027 has been adopted for the purposes of dispersion modelling (i.e. earliest date of potential construction). The use of 2027 is believed to be conservative given the forecasted reductions in vehicle emission factors and background pollutant concentrations following the introduction of legislative and policy initiatives, alongside low emission technologies and fuels.

## 19.2   Traffic Inputs

5.  Traffic data inputs used in support of the construction phase assessment has been informed by analysis undertaken and presented within Volume 1, Chapter 27: Traffic and Transport (document reference 6.1.27). Data has been supplemented from the

Department for Transport (DfT) traffic count website[1] where relevant and adjusted accordingly.

6.  Construction road traffic flows have been calculated using the maximum consecutive 12 month (representing annual) average flow (Heavy Duty Vehicles (HDVs) and employees Light Duty Vehicles (LDVs) separately) across the construction programme. This Annual Average Daily Traffic (AADT) flow ensures the highest average period of construction has been captured for each section of the road network. This approach represents industry best practice and is preferable to averaging out road traffic values across the full onshore construction period to derive AADT flows, which would dilute the predicted datasets. Further, the approach assumes that the maximum consecutive 12-month vehicle flows generated throughout the whole construction phase occur under worst case air quality conditions (2027 vehicle emission factors and background pollutant concentrations) projected for the full construction period. This is considered conservative.

7.  Traffic speeds were modelled at the relevant national speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue, in accordance with the Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (TG22) (LAQM.TG22). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

8.  The Emissions Factors Toolkit (EFT) version 11.0 developed by Defra[2] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model, supporting each of the above scenarios.

9.  To initially inform the spatial extent of the model, changes in traffic volumes on the local road network were compared to ecological and human screening thresholds (See Section 7.1 – Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19)). Where relevant, neighbouring links were also included within the dispersion model to facilitate a robust assessment, rather than rely on their individual contributions being represented within the appropriate background datasets. As such, the spatial extent of

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[1] DfT, Road Traffic Statistics website. https://roadtraffic.dft.gov.uk/ [accessed November 2023].
[2] Defra, EFT v11.0 (2021). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [accessed November 2023].

the dispersion model is greater than the affected road network, as it includes road links which experience insignificant vehicle volumes as a result of the Project.

10. The traffic flows used for the future modelled assessment years (2027 DM and 2027 DS) include vehicle movements associated with relevant committed developments and live projects/plans in the assessment area for the assessment of cumulative effects (see Chapter 27 (document reference 6.1.27)). As such, the dispersion modelling exercise and associated outcomes are inherently cumulative in nature.

11. Details of the traffic flows used in this assessment are provided in Table 19.1[3], whilst the modelled roads in relation to the Order Limits are presented in Volume 2, Chapter 19: Onshore Air Quality Figure 19.2 (document reference 6.2.19.2).

**Table 19.1: Traffic Data Used within the Assessment**

| Road Link | 2019 BC | | 2027 DM | | 2027 DM-C | | 2027 DS | |
|---|---|---|---|---|---|---|---|---|
| | AADT | % HDV | AADT | % HDV | AADT | % HDV | AADT | % HDV |
| A16 north of A1028 / A1104 | 8,928 | 7.3 | 9,760 | 7.1 | 9,515 | 7.3 | 10,070 | 9.8 |
| A158 west of A16 | 7,714 | 16.1 | 8,033 | 16.1 | 8,033 | 16.1 | 8,340 | 19.1 |
| A16 between A158 and A1028 | 5,515 | 9.2 | 5,878 | 9.2 | 5,878 | 9.2 | 6,189 | 13.5 |
| A17 (north of River Welland) | 18,859 | 25.3 | 19,638 | 25.3 | 19,638 | 25.3 | 19,765 | 25.6 |
| A17 (between A16 and A1121) | 17,506 | 23.7 | 18,229 | 23.7 | 18,229 | 23.7 | 18,404 | 24.4 |
| A17 (west of A1221) | 23,548 | 13.1 | 25,097 | 13.1 | 25,097 | 13.1 | 25,302 | 13.7 |
| A16 (south of Boston, north of Kirton) | 22,100 | 17.2 | 23,345 | 17.2 | 23,012 | 17.2 | 23,429 | 17.3 |
| A16 (south of Boston, south of Kirton) | 22,100 | 17.2 | 23,138 | 17.4 | 23,012 | 17.2 | 23,334 | 17.9 |
| A1121 between Boston and A17 | 8,562 | 7.2 | 9,257 | 7.1 | 9,125 | 7.2 | 9,317 | 7.6 |
| A16 Boston | 37,058 | 6.0 | 40,000 | 6.1 | 39,495 | 6.0 | 40,239 | 6.4 |
| A16 between A52 (Boston) and A155 | 6,762 | 18.7 | 7,042 | 18.7 | 7,042 | 18.7 | 7,271 | 20.7 |
| A16 between A155 and A158 | 9,364 | 8.1 | 9,980 | 8.1 | 9,980 | 8.1 | 10,206 | 9.8 |
| A158 between A1028 and A16 | 11,604 | 3.8 | 12,367 | 3.8 | 12,367 | 3.8 | 12,589 | 5.3 |
| A1028 between A158 and A16 | 6,019 | 4.8 | 6,415 | 4.8 | 6,415 | 4.8 | 6,619 | 7.7 |
| A158 Skegness Road (west of ECC) | 13,005 | 14.9 | 13,542 | 14.9 | 13,542 | 14.9 | 13,832 | 16.5 |
| A158 Skegness Road (east of ECC) | 13,005 | 14.9 | 13,542 | 14.9 | 13,542 | 14.9 | 13,617 | 15.4 |

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[3] Following completion of the air quality modelling, minor changes to the Project construction traffic flows were identified, therefore impacting the 2027 DS scenario. It is noted that these changes do not impact the overall screening assessment for both human and ecological receptors, i.e. all relevant road links and receptors/designated ecological sites have been included in the detailed assessment where required. Given this, and the conservative nature of the derived traffic flows (Paragraph 6), it is not anticipated that the changes would impact the overall conclusions of the road traffic emissions assessment.

| Road Link | 2019 BC | | 2027 DM | | 2027 DM-C | | 2027 DS | |
|---|---|---|---|---|---|---|---|---|
| | AADT | % HDV | AADT | % HDV | AADT | % HDV | AADT | % HDV |
| A52 Wainfleet Road (east of Haltoft End) | 11,616 | 15.4 | 12,400 | 15.0 | 12,096 | 15.4 | 12,671 | 16.3 |
| A52 Wainfleet Road (west of Haltoft End) | 11,616 | 15.4 | 12,400 | 15.0 | 12,096 | 15.4 | 12,672 | 16.3 |
| A52 (Wrangle) | 6,355 | 21.0 | 6,922 | 20.1 | 6,618 | 21.0 | 7,038 | 20.4 |
| A52 (Holland Lane) | 4,835 | 19.4 | 5,339 | 18.3 | 5,035 | 19.4 | 5,434 | 18.8 |
| A52 (south of Low Road) | 8,027 | 14.6 | 8,663 | 14.1 | 8,359 | 14.6 | 8,771 | 14.6 |
| A52 (north of Low Road) | 8,027 | 14.6 | 8,663 | 14.1 | 8,359 | 14.6 | 8,743 | 14.5 |
| Lincoln Road Skegness | 8,750 | 10.0 | 9,111 | 10.0 | 9,111 | 10.0 | 9,188 | 10.7 |
| A52 Wainfleet Road Skegness | 4,375 | 10.0 | 4,556 | 10.0 | 4,556 | 10.0 | 4,594 | 10.7 |
| Ings Road | 278 | 17.4 | 289 | 17.4 | 289 | 17.4 | 377 | 33.0 |
| West End Road | 557 | 24.3 | 579 | 24.3 | 579 | 24.3 | 667 | 32.2 |
| B1192 Station Road | 5,342 | 2.7 | 5,693 | 2.7 | 5,693 | 2.7 | 5,693 | 2.7 |
| B1397 London Road | 8,823 | 3.2 | 9,403 | 3.2 | 9,403 | 3.2 | 9,403 | 3.2 |
| London Road / High Street (Boston) | 6,245 | 2.0 | 6,656 | 2.0 | 6,656 | 2.0 | 6,656 | 2.0 |
| South Square (Boston) | 5,395 | 2.5 | 5,750 | 2.5 | 5,750 | 2.5 | 5,750 | 2.5 |
| A1138 South End | 694 | 36.3 | 740 | 36.3 | 740 | 36.3 | 740 | 36.3 |
| A1137 Horncastle Road | 7,476 | 3.0 | 7,968 | 3.0 | 7,968 | 3.0 | 7,968 | 3.0 |
| A153 South Street | 10,611 | 6.4 | 11,309 | 6.4 | 11,309 | 6.4 | 11,309 | 6.4 |
| A153 Bull Ring / North Street | 3,721 | 4.5 | 3,966 | 4.5 | 3,966 | 4.5 | 3,966 | 4.5 |
| A52 between Marsh Lane and Skegness | 3,825 | 13.7 | 4,228 | 12.9 | 3,983 | 13.7 | 4,233 | 12.9 |
| A52 Liquorpond Street / Queen Street, Boston | 14,531 | 4.7 | 15,992 | 4.9 | 15,487 | 4.7 | 16,086 | 5.3 |
| A52 Sleaford Road, Boston | 18,144 | 3.8 | 19,842 | 4.0 | 19,337 | 3.8 | 19,937 | 4.3 |
| Station Road / Skeldyke Road / Nidd's Lane / Marsh Road | 321 | 16.1 | 334 | 16.1 | 334 | 16.1 | 411 | 29.4 |
| A17 (south of River Welland) | 18,859 | 25.3 | 19,638 | 25.3 | 19,638 | 25.3 | 19,770 | 25.7 |
| A16 (south of A17) | 16,270 | 30.1 | 17,068 | 30.3 | 16,942 | 30.1 | 17,336 | 30.8 |
| A16 Wide Bargate / Bargate Bridge / Spilsby Road | 21,912 | 5.9 | 23,858 | 6.0 | 23,353 | 5.9 | 24,097 | 6.4 |

## 19.3   Non-Road Inputs

12. In addition to traffic inputs (described in Section 19.2), non-road inputs are incorporated into the detailed dispersion modelling assessment with application of the background datasets. These include non-road emission contributions (see Section 19.6).

13. It is recognised that committed development and projects/plans may become operable in the interim since the background datasets were published, and subsequent emission contributions would therefore not be included in the datasets.

14. To account for this, regulated non-road emissions (e.g. from combustion processes) associated with cumulative developments, as identified in Table 19.20 of Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19), have also been considered to replicate future air quality conditions and impacts. These developments have been reviewed in-combination with the supporting assessment documentation to determine if emissions are predicted to interact with the sensitive receptors assessed within the road traffic dispersion modelling assessment – and therefore represent a potential cumulative effect.

15. From review of the cumulative developments and associated assessment documentation, the Boston Alternative Energy Facility (BAEF) is the only facility that could cause a potential cumulative impact from non-road emissions (e.g. from combustion processes). Outputs presented within the BAEF Air Quality ES Chapter and technical appendices have been used to facilitate the assessment. Emissions from BAEF have only been considered with respect to human receptors. Based on a review of application documentation, BAEF emissions will not interact with any of the designated ecological sites considered within the Project's road traffic modelling assessment. No further assessment is therefore necessary.

16. In relation to human receptors, a detailed assessment of road and non-road emissions generated during the construction and operational phases of the BAEF was undertaken to support the application. The impacts associated with pollutants $NO_2$, $PM_{10}$ and $PM_{2.5}$ have the potential to interact with the impacts of the Project.

17. From review of results of the BAEF detailed assessment, the operational phase predicted higher pollutant concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ when compared to the construction phase. Therefore, the BAEF operational phase results have been considered in combination with the Project's construction phase results to present a worst-case assessment scenario.

18. The pollutant concentration contours associated with the BAEF's operational phase (where available) have been reviewed and the maximum concentration at the point of overlap with the Project's study area extracted. This BAEF contribution has been added

as part of the background concentration and therefore forms part of the DM and DS scenario concentrations predicted in the Project's construction road traffic emissions assessment. The assessment is therefore inherently cumulative.

19. The annual mean contributions are summarised as follows:

- $NO_2$: the annual mean $NO_2$ contour of 0.5 – 1.0µg/m$^3$ is the maximum that interacts with the Project's study area. 1.0µg/m$^3$ has therefore been added as part of the $NO_2$ background concentration;

- $PM_{10}$: the annual mean $PM_{10}$ contour of 0.04 – 0.06µg/m$^3$ is the maximum that potentially interacts with the Project's study area. 0.06µg/m$^3$ has therefore been added as part of the $PM_{10}$ background concentration; and

- $PM_{2.5}$: an annual mean $PM_{2.5}$ contour was not available for the BAEF assessment, and instead the maximum Process Contribution predicted at the modelled human receptors (0.24µg/m$^3$) was applied in lieu. 0.24µg/m$^3$ has therefore been added as part of the $PM_{2.5}$ background concentration.

## 19.4   Meteorological Data

20. To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

21. The dispersion modelling has been undertaken using data from Wainfleet (Aut) meteorological station, located approximately 3.3km southeast from the Order Limits, and 2.4km from the modelled road network. Wainfleet (Aut) is the closest station to the study area and is considered representative of the majority of the study area; therefore, likely to reflect local meteorological conditions.

22. LAQM.TG22 recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Wainfleet (Aut) meteorological station includes 8,760 lines of usable hourly data out of the total 8,760 for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise. A windrose of the 2019 data is presented in Plate 19.1.

23. Roughness length, z0, represents the aerodynamic effects of surface friction and is physically defined as the height at which the extrapolated surface layer wind profile trends to zero.

24. The modelled road network is situated in predominantly rural areas of Lincolnshire, however, also includes urban areas of Boston, Skegness, and Horncastle. Given the variance in land use types across the modelled domain, a variable surface roughness file has been used. The file covers an area of 64km x 72km at a 200m grid resolution across the modelled road network. The ADMS-Roads dispersion model interpolates the values between the gridded points.

25. A visualisation of the surface roughness file used in the modelling is presented in Plate 19.2.

26. A minimum Monin-Obukhov Length value of 10 has been used for both the dispersion and meteorological measurement sites.
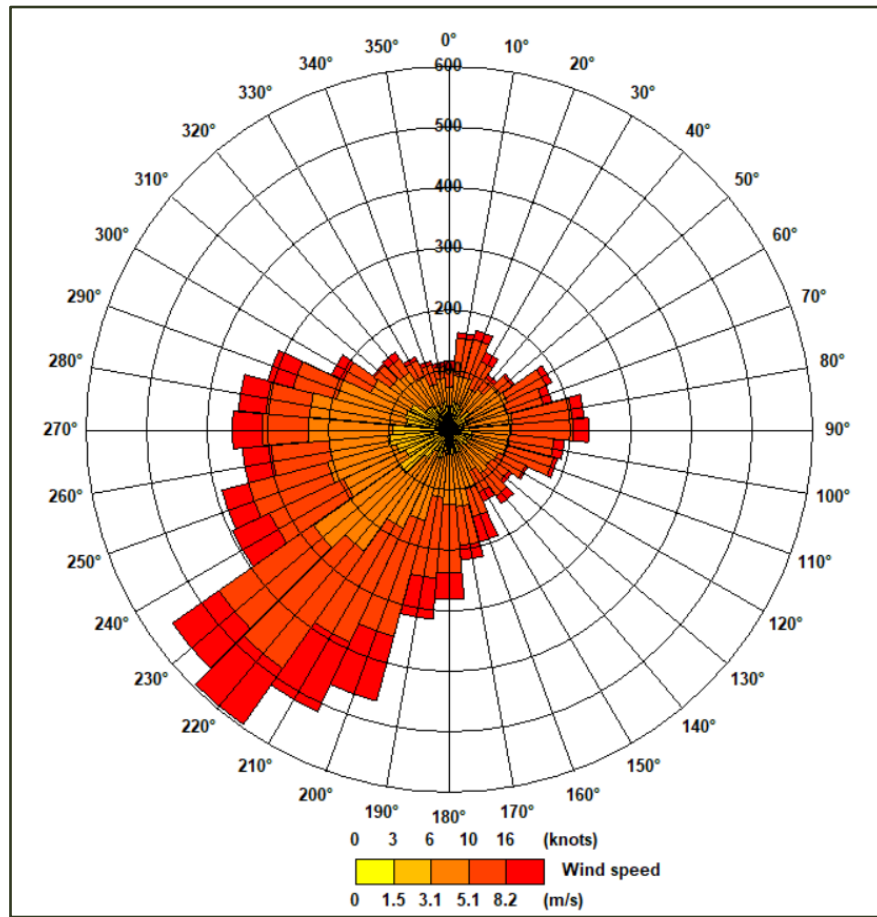
**Plate 19.1: Windrose from Wainfleet Aut (2019)**
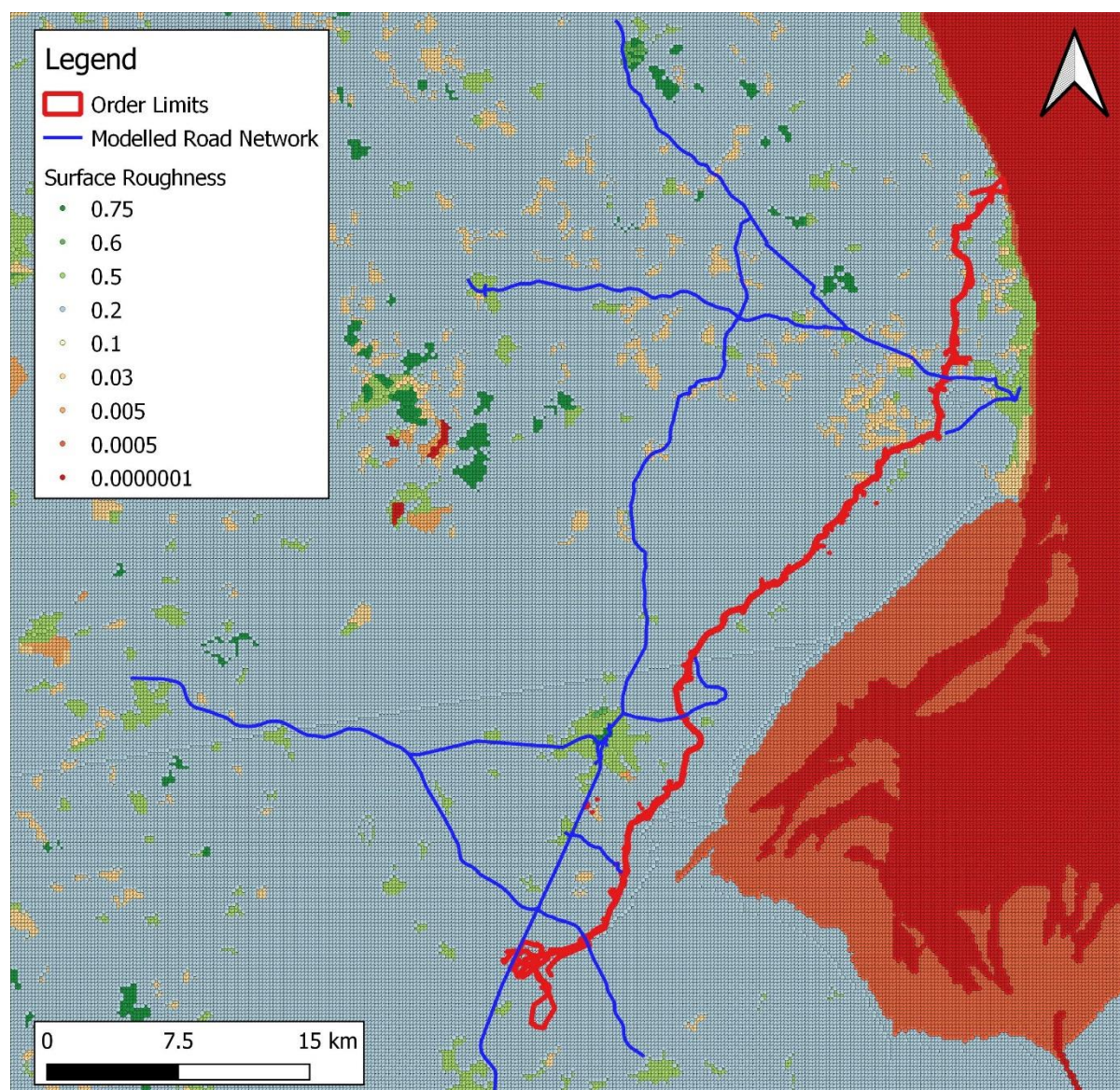
**Plate 19.2: Modelled Variable Surface Roughness File**

## 19.5 Sensitive Receptors

### 19.5.1 Human Receptors

27. Human receptors considered in the assessment of emissions from peak construction phase road traffic volumes generated by the Project are detailed in Table 19.2.

28. Receptors are representative of worst-case exposure locations at existing residential properties relative to the extent of the affected road network (See Section 19.7 – Volume 1, Chapter 19: Onshore Air Quality for details of the applied screening thresholds), selected in accordance with LAQM.TG22. All receptors were considered in relation to exposure at breathing height relative to the adjacent road, at ground level, (i.e. 1.5m).

29. The receptors have been grouped by Local Authority – East Lindsey District Council (ELDC), Boston Borough Council (BBC), North Kesteven District Council (NKDC) and South Holland District Council (SHDC). Their locations are illustrated in Volume 2, Chapter 19: Onshore Air Quality Figure 19.2 (document reference 6.2.19.2). Whilst the Order Limits does not interact with NKDC, construction vehicle movements generated along the A17 are above the applied human screening thresholds and therefore require further assessment.

**Table 19.2: Human Receptor Locations Considered**

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| *ELDC* | | | | |
| R1 | 533718 | 384693 | 1.5 | B |
| R2 | 533874 | 383262 | 1.5 | B |
| R3 | 533975 | 382620 | 1.5 | B |
| R4 | 534023 | 382266 | 1.5 | B |
| R5 | 535510 | 379578 | 1.5 | B |
| R6 | 535492 | 379545 | 1.5 | B |
| R7 | 535700 | 379299 | 1.5 | B |
| R8 | 536600 | 378228 | 1.5 | B |
| R9 | 536816 | 377932 | 1.5 | B |
| R10 | 538020 | 376995 | 1.5 | B |
| R11 | 538054 | 376983 | 1.5 | B |
| R12 | 538058 | 376942 | 1.5 | B |
| R13 | 538137 | 376864 | 1.5 | B |
| R14 | 538833 | 376412 | 1.5 | B |
| R15 | 540261 | 374818 | 1.5 | B |
| R16 | 540790 | 374428 | 1.5 | B |
| R17 | 540281 | 368197 | 1.5 | B |
| R18 | 540076 | 368312 | 1.5 | B |
| R19 | 539810 | 368467 | 1.5 | B |
| R20 | 539627 | 368499 | 1.5 | B |
| R21 | 538407 | 368980 | 1.5 | B |
| R22 | 538386 | 369016 | 1.5 | B |
| R23 | 538361 | 369012 | 1.5 | B |
| R24 | 538067 | 369258 | 1.5 | B |
| R25 | 535233 | 369304 | 1.5 | B |
| R26 | 535224 | 369340 | 1.5 | B |

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| R27 | 534817 | 369577 | 1.5 | B |
| R28 | 534635 | 369611 | 1.5 | B |
| R29 | 534537 | 369615 | 1.5 | B |
| R30 | 534347 | 369619 | 1.5 | B |
| R31 | 534160 | 369635 | 1.5 | B |
| R32 | 529209 | 370009 | 1.5 | B |
| R33 | 528683 | 369923 | 1.5 | B |
| R34 | 528463 | 369936 | 1.5 | B |
| R35 | 528395 | 369894 | 1.5 | B |
| R36 | 527824 | 369836 | 1.5 | B |
| R37 | 526996 | 369572 | 1.5 | B |
| R38 | 526896 | 369528 | 1.5 | B |
| R39 | 526767 | 369515 | 1.5 | B |
| R40 | 526782 | 369539 | 1.5 | B |
| R41 | 526443 | 369616 | 1.5 | B |
| R42 | 526533 | 369579 | 1.5 | B |
| R43 | 526228 | 369563 | 1.5 | B |
| R44 | 526245 | 369583 | 1.5 | B |
| R45 | 526081 | 369543 | 1.5 | B |
| R46 | 540967 | 369372 | 1.5 | B |
| R47 | 540678 | 370101 | 1.5 | B |
| R48 | 540666 | 370230 | 1.5 | B |
| R49 | 540698 | 370219 | 1.5 | B |
| R50 | 540511 | 370885 | 1.5 | B |
| R51 | 540388 | 371658 | 1.5 | B |
| R52 | 540683 | 373403 | 1.5 | B |
| R118 | 534528 | 347917 | 1.5 | B |
| R119 | 534967 | 348722 | 1.5 | B |
| R120 | 535222 | 349380 | 1.5 | B |
| R121 | 535232 | 349515 | 1.5 | B |
| R122 | 535284 | 350855 | 1.5 | B |
| R123 | 535160 | 351203 | 1.5 | B |
| R124 | 535144 | 351464 | 1.5 | B |
| R125 | 535118 | 351781 | 1.5 | B |
| R126 | 535161 | 351949 | 1.5 | B |
| R127 | 535161 | 352145 | 1.5 | B |
| R128 | 535140 | 352207 | 1.5 | B |

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| R129 | 535098 | 352836 | 1.5 | B |
| R130 | 535057 | 352993 | 1.5 | B |
| R131 | 534902 | 354752 | 1.5 | B |
| R132 | 534456 | 356013 | 1.5 | B |
| R133 | 534464 | 356122 | 1.5 | B |
| R134 | 534428 | 356267 | 1.5 | B |
| R135 | 534446 | 356332 | 1.5 | B |
| R136 | 534367 | 356632 | 1.5 | B |
| R137 | 534365 | 356737 | 1.5 | B |
| R138 | 534343 | 356925 | 1.5 | B |
| R139 | 534376 | 357339 | 1.5 | B |
| R140 | 537403 | 363616 | 1.5 | B |
| R141 | 537670 | 363635 | 1.5 | B |
| R142 | 537737 | 363701 | 1.5 | B |
| R143 | 537740 | 363928 | 1.5 | B |
| R144 | 539699 | 365939 | 1.5 | B |
| R145 | 539698 | 366493 | 1.5 | B |
| R146 | 540560 | 367973 | 1.5 | B |
| R147 | 542432 | 368073 | 1.5 | B |
| R148 | 543624 | 367641 | 1.5 | B |
| R149 | 544193 | 367474 | 1.5 | B |
| R150 | 545670 | 367410 | 1.5 | B |
| R151 | 545337 | 368754 | 1.5 | B |
| R152 | 542073 | 372180 | 1.5 | B |
| R153 | 541948 | 372567 | 1.5 | B |
| R154 | 546907 | 367280 | 1.5 | B |
| R155 | 537737 | 363701 | 1.5 | B |
| R165 | 547396 | 367029 | 1.5 | B |
| R166 | 547616 | 366880 | 1.5 | B |
| R167 | 525870 | 369462 | 1.5 | B |
| R168 | 525421 | 369635 | 1.5 | B |
| R169 | 525335 | 369690 | 1.5 | B |
| R170 | 536613 | 361338 | 1.5 | B |
| R171 | 536668 | 361715 | 1.5 | B |
| R177 | 525967 | 369492 | 1.5 | B |
| R178 | 536616 | 361574 | 1.5 | B |
| R179 | 536573 | 361110 | 1.5 | B |

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| R180 | 534678 | 358844 | 1.5 | B |
| *BBC* | | | | |
| R53 | 528713 | 334217 | 1.5 | B |
| R54 | 524899 | 336826 | 1.5 | B |
| R55 | 524704 | 336927 | 1.5 | B |
| R56 | 524688 | 337015 | 1.5 | B |
| R57 | 524630 | 337198 | 1.5 | B |
| R58 | 524541 | 337634 | 1.5 | B |
| R59 | 524500 | 337728 | 1.5 | B |
| R60 | 522468 | 341583 | 1.5 | B |
| R61 | 522301 | 342114 | 1.5 | B |
| R62 | 522235 | 342222 | 1.5 | B |
| R63 | 521815 | 342788 | 1.5 | B |
| R64 | 521837 | 342835 | 1.5 | B |
| R65 | 521744 | 342917 | 1.5 | B |
| R66 | 521642 | 343017 | 1.5 | B |
| R67 | 521642 | 343026 | 1.5 | B |
| R68 | 521172 | 343428 | 1.5 | B |
| R69 | 520822 | 343565 | 1.5 | B |
| R83 | 529233 | 334751 | 1.5 | B |
| R84 | 530061 | 336385 | 1.5 | B |
| R85 | 530603 | 337580 | 1.5 | B |
| R86 | 530564 | 337665 | 1.5 | B |
| R87 | 530765 | 338091 | 1.5 | B |
| R88 | 530837 | 338234 | 1.5 | B |
| R89 | 530894 | 338407 | 1.5 | B |
| R90 | 530995 | 338518 | 1.5 | B |
| R91 | 530943 | 338495 | 1.5 | B |
| R92 | 532471 | 343611 | 1.5 | A |
| R93 | 532513 | 343716 | 1.5 | A |
| R94 | 532595 | 343660 | 1.5 | A |
| R95 | 532558 | 343695 | 1.5 | A |
| R96 | 532473 | 343738 | 1.5 | A |
| R97 | 532512 | 343659 | 1.5 | A |
| R98 | 532333 | 343846 | 1.5 | A |
| R99 | 532161 | 343986 | 1.5 | A |
| R100 | 521806 | 343001 | 1.5 | B |

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| R101 | 532657 | 343690 | 1.5 | A |
| R102 | 532860 | 343753 | 1.5 | A |
| R103 | 532874 | 343798 | 1.5 | A |
| R104 | 532977 | 344054 | 1.5 | A |
| R105 | 533122 | 344505 | 1.5 | A |
| R106 | 533111 | 344540 | 1.5 | A |
| R107 | 533223 | 344627 | 1.5 | A |
| R108 | 533249 | 344646 | 1.5 | A |
| R109 | 533267 | 344629 | 1.5 | A |
| R110 | 533884 | 345381 | 1.5 | B |
| R111 | 533890 | 345430 | 1.5 | B |
| R112 | 533919 | 345503 | 1.5 | B |
| R113 | 533887 | 346415 | 1.5 | B |
| R114 | 533927 | 346466 | 1.5 | B |
| R115 | 534084 | 347146 | 1.5 | B |
| R116 | 534129 | 347296 | 1.5 | B |
| R117 | 534348 | 347590 | 1.5 | B |
| R156 | 534040 | 345350 | 1.5 | B |
| R157 | 536641 | 345055 | 1.5 | B |
| R158 | 536941 | 345093 | 1.5 | B |
| R159 | 537707 | 345420 | 1.5 | B |
| R161 | 531802 | 332326 | 1.5 | B |
| R162 | 531870 | 332174 | 1.5 | B |
| R172 | 533042 | 344104 | 1.5 | A |
| R173 | 533187 | 344316 | 1.5 | A |
| R174 | 533115 | 344455 | 1.5 | A |
| R175 | 539765 | 346541 | 1.5 | B |
| R176 | 531975 | 331902 | 1.5 | B |
| R181 | 532920 | 343900 | 1.5 | A |
| R182 | 533114 | 344398 | 1.5 | A |
| R183 | 533557 | 344982 | 1.5 | B |
| R184 | 535855 | 344998 | 1.5 | B |
| R185 | 538203 | 345671 | 1.5 | B |
| R186 | 533159 | 344302 | 1.5 | A |
| R187 | 533733 | 345145 | 1.5 | B |
| *NKDC* | | | | |
| R70 | 520408 | 343759 | 1.5 | B |

| ID | X | Y | Height (m) | Verification Zone |
|---|---|---|---|---|
| R71 | 520243 | 343863 | 1.5 | B |
| R72 | 519926 | 344028 | 1.5 | B |
| R73 | 519691 | 344122 | 1.5 | B |
| R74 | 519623 | 344152 | 1.5 | B |
| R75 | 519602 | 344184 | 1.5 | B |
| R76 | 518766 | 344449 | 1.5 | B |
| R77 | 516298 | 344073 | 1.5 | B |
| R78 | 516218 | 344104 | 1.5 | B |
| R79 | 512624 | 344661 | 1.5 | B |
| R80 | 511859 | 344675 | 1.5 | B |
| R81 | 509795 | 345629 | 1.5 | B |
| R82 | 506530 | 347334 | 1.5 | B |
| *SHDC* | | | | |
| R160 | 526590 | 328718 | 1.5 | B |
| R163 | 532715 | 330372 | 1.5 | B |
| R164 | 533574 | 328083 | 1.5 | B |

## 19.5.2    Ecological Receptors

30. As documented in Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19), Table 19.3 details the extent of ecological designations (with sensitive qualifying features) located within 200m of road links projected to experience developmental-generated vehicle movements requiring detailed assessment. These comprise one Site of Special Scientific Interest (SSSI), one Local Nature Reserve (LNR) and 29 Local Wildlife Sites (LWS) / Lincolnshire Wildlife Trust reserves (LWT).

31. Their locations are illustrated in Figure 19.3 in Volume 2, Chapter 19: Onshore Air Quality (document reference 6.2.19.3).

**Table 19.3: Designated Ecological Sites Considered Within the Modelling Assessment**

| ID | Name | Designation |
|---|---|---|
| ER1 | Candlesby Hill | SSSI |
| ER5 | South Thoresby Warren | LNR |
| ER6 | A16 Road Verge, Burwell North | LWS |
| ER7 | A16 Road Verge, Dalby Bar | LWS |
| ER8 | A16 Road Verge, White Pit | LWS |
| ER9 | A16 Road Verges, Green Man Plantation | LWS |
| ER10 | A16 Verges North of the River Glen | LWS |

| ID | Name | Designation |
|---|---|---|
| ER11 | Banovallum House | LWT |
| ER12 | Bluestone Heath Road Verges, East | LWS |
| ER13 | Calceby Beck, Furze Closes to A16 | LWS |
| ER14 | Callow Carr | LWS |
| ER15 | Candlesby Hill Quarry | LWT |
| ER16 | Chalk Pit Lane Verges, Candlesby | LWS |
| ER17 | Cowdyke Plantation | LWS |
| ER18 | Dawber Lane Road Verges | LWS |
| ER20 | Gunby Meadow | LWS |
| ER21 | Gunby Park | LWS |
| ER22 | Hagworthingham Meadow | LWS |
| ER25 | Hobhole Drain, Baker's Bridge South | LWS |
| ER26 | Horncastle Canal Grassland | LWS |
| ER28 | Ketsby Beck, Ketsby to Calceby | LWS |
| ER29 | Mill Lane Road Verges | LWS |
| ER31 | Pinchbeck Marsh | LWS |
| ER32 | Pinfold Lane, White Pit | LWS |
| ER33 | Risegate Eau | LWS |
| ER34 | River Glen Corridor | LWS |
| ER35 | River Lymn (Partney Bridge to Mill Bridge) | LWS |
| ER36 | Riverdale Meadow, Hagworthingham | LWS |
| ER41 | Thunker Hollow Road Verge | LWS |
| ER43 | Vernatt's Drain | LWS |
| ER46 | Welton le Marsh Quarry Verges | LWS |

32. All receptors have assumed a height of 0m and are represented in the model using gridded and polygon boundary receptors (within 200m of the affected road) to identify the maximum modelled impact.

33. Details of baseline conditions for the above designations is provided in Section 19.9.

## 19.6    Background Datasets

### 19.6.1    Ambient Concentrations

34. In the absence of locally representative background monitoring sites across the modelled domain, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year), based on the 1km grid squares which cover the dispersion model

domain, as presented in Table 19.4. Defra supplied background concentration estimates were utilised for the purposes of the ecological road traffic modelling assessment (where appropriate) to maintain consistency with the verification procedure and incorporate the future projection of concentration estimates.

35. To avoid double counting of potential background sources already contained within the ADMS-Roads dispersion model, relevant sources were removed from the appropriate background map grid square. This was limited to the removal of 'Primary A Road In' across the assessment study area.

36. As the relationship between $NO_2$ and nitrogen oxides ($NO_x$) is not linear, the $NO_2$ Adjustment for $NO_x$ Sector Removal Tool[4] has been used – in accordance with LAQM.TG22.

**Table 19.4: Defra Mapped Background Pollutant Concentrations**

| Grid Square (X, Y) | Year | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|
| | | $NO_x$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| 533500, 384500 | 2019 | 11.6 | 8.9 | 15.6 | 8.6 |
| | 2027 | 8.9 | 6.9 | 14.6 | 7.8 |
| 533500, 383500 | 2019 | 11.1 | 8.5 | 15.6 | 8.5 |
| | 2027 | 8.6 | 6.7 | 14.6 | 7.7 |
| 533500, 382500 | 2019 | 10.8 | 8.3 | 15.5 | 8.5 |
| | 2027 | 8.4 | 6.6 | 14.5 | 7.7 |
| 534500, 382500 | 2019 | 10.8 | 8.3 | 15.0 | 8.4 |
| | 2027 | 8.5 | 6.6 | 14.0 | 7.5 |
| 535500, 379500 | 2019 | 11.1 | 8.5 | 15.3 | 8.5 |
| | 2027 | 8.6 | 6.7 | 14.3 | 7.7 |
| 536500, 378500 | 2019 | 11.0 | 8.4 | 15.5 | 8.5 |
| | 2027 | 8.6 | 6.7 | 14.5 | 7.7 |
| 536500, 377500 | 2019 | 10.7 | 8.2 | 15.3 | 8.4 |
| | 2027 | 8.4 | 6.6 | 14.2 | 7.6 |
| 538500, 376500 | 2019 | 11.1 | 8.5 | 15.1 | 8.5 |
| | 2027 | 8.7 | 6.8 | 14.1 | 7.6 |
| 540500, 374500 | 2019 | 11.2 | 8.6 | 15.5 | 8.5 |
| | 2027 | 8.7 | 6.8 | 14.5 | 7.7 |

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[4] Defra $NO_2$ Adjustment for $NO_x$ Sector Removal Tool (v8.0).

| Grid Square (X, Y) | Year | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|
| | | $NO_x$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| 540500, 368500 | 2019 | 11.2 | 8.6 | 15.5 | 8.6 |
| | 2027 | 8.7 | 6.8 | 14.4 | 7.7 |
| 539500, 368500 | 2019 | 11.0 | 8.5 | 15.7 | 8.6 |
| | 2027 | 8.6 | 6.7 | 14.7 | 7.8 |
| 538500, 368500 | 2019 | 10.8 | 8.3 | 15.7 | 8.6 |
| | 2027 | 8.5 | 6.6 | 14.7 | 7.8 |
| 538500, 369500 | 2019 | 10.8 | 8.3 | 15.7 | 8.6 |
| | 2027 | 8.5 | 6.6 | 14.6 | 7.8 |
| 535500, 369500 | 2019 | 10.9 | 8.4 | 15.6 | 8.6 |
| | 2027 | 8.5 | 6.7 | 14.6 | 7.8 |
| 534500, 369500 | 2019 | 11.0 | 8.5 | 15.8 | 8.7 |
| | 2027 | 8.6 | 6.7 | 14.8 | 7.9 |
| 529500, 370500 | 2019 | 10.8 | 8.3 | 15.7 | 8.6 |
| | 2027 | 8.5 | 6.6 | 14.6 | 7.8 |
| 528500, 369500 | 2019 | 11.2 | 8.6 | 15.8 | 8.7 |
| | 2027 | 8.7 | 6.8 | 14.8 | 7.8 |
| 527500, 369500 | 2019 | 11.7 | 8.9 | 16.0 | 8.8 |
| | 2027 | 9.1 | 7.1 | 14.9 | 8.0 |
| 526500, 369500 | 2019 | 12.8 | 9.8 | 15.0 | 8.8 |
| | 2027 | 9.9 | 7.7 | 13.9 | 7.9 |
| 540500, 369500 | 2019 | 11.0 | 8.4 | 14.9 | 8.4 |
| | 2027 | 8.6 | 6.7 | 13.9 | 7.6 |
| 540500, 370500 | 2019 | 10.9 | 8.4 | 15.4 | 8.5 |
| | 2027 | 8.5 | 6.7 | 14.3 | 7.7 |
| 540500, 371500 | 2019 | 10.9 | 8.4 | 15.2 | 8.4 |
| | 2027 | 8.5 | 6.7 | 14.1 | 7.6 |
| 540500, 373500 | 2019 | 10.9 | 8.4 | 15.6 | 8.5 |
| | 2027 | 8.6 | 6.7 | 14.6 | 7.7 |
| 528500, 334500 | 2019 | 10.9 | 8.4 | 17.1 | 9.5 |
| | 2027 | 8.1 | 6.4 | 16.0 | 8.6 |
| 524500, 336500 | 2019 | 10.1 | 7.8 | 16.3 | 9.0 |
| | 2027 | 7.8 | 6.1 | 15.3 | 8.2 |
| 524500, 337500 | 2019 | 10.5 | 8.1 | 16.7 | 9.2 |
| | 2027 | 7.9 | 6.2 | 15.7 | 8.4 |
| 522500, 341500 | 2019 | 10.5 | 8.1 | 16.4 | 9.0 |
| | 2027 | 8.0 | 6.3 | 15.4 | 8.2 |

| Grid Square (X, Y) | Year | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|
| | | $NO_x$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| 522500, 342500 | 2019 | 10.2 | 7.9 | 16.2 | 8.9 |
| | 2027 | 7.8 | 6.2 | 15.2 | 8.1 |
| 521500, 342500 | 2019 | 10.2 | 7.9 | 16.1 | 8.9 |
| | 2027 | 7.8 | 6.1 | 15.1 | 8.0 |
| 521500, 343500 | 2019 | 11.1 | 8.5 | 16.5 | 9.1 |
| | 2027 | 8.3 | 6.5 | 15.5 | 8.2 |
| 520500, 343500 | 2019 | 11.2 | 8.6 | 16.6 | 9.1 |
| | 2027 | 8.3 | 6.5 | 15.6 | 8.3 |
| 519500, 344500 | 2019 | 11.1 | 8.5 | 16.6 | 9.1 |
| | 2027 | 8.2 | 6.5 | 15.6 | 8.3 |
| 518500, 344500 | 2019 | 11.1 | 8.5 | 16.6 | 9.1 |
| | 2027 | 8.2 | 6.5 | 15.6 | 8.3 |
| 516500, 344500 | 2019 | 11.1 | 8.6 | 16.6 | 9.1 |
| | 2027 | 8.3 | 6.5 | 15.6 | 8.3 |
| 512500, 344500 | 2019 | 11.0 | 8.5 | 16.6 | 9.1 |
| | 2027 | 8.2 | 6.4 | 15.6 | 8.3 |
| 511500, 344500 | 2019 | 10.5 | 8.1 | 16.4 | 9.0 |
| | 2027 | 7.9 | 6.2 | 15.4 | 8.1 |
| 509500, 345500 | 2019 | 11.9 | 9.1 | 16.7 | 9.1 |
| | 2027 | 8.9 | 7.0 | 15.7 | 8.3 |
| 506500, 347500 | 2019 | 12.2 | 9.3 | 17.2 | 9.4 |
| | 2027 | 9.0 | 7.0 | 16.2 | 8.6 |
| 529500, 334500 | 2019 | 11.2 | 8.7 | 16.9 | 9.4 |
| | 2027 | 8.3 | 6.5 | 15.8 | 8.5 |
| 530500, 336500 | 2019 | 11.0 | 8.4 | 16.5 | 9.2 |
| | 2027 | 8.3 | 6.5 | 15.4 | 8.3 |
| 530500, 337500 | 2019 | 11.4 | 8.8 | 16.7 | 9.3 |
| | 2027 | 8.6 | 6.8 | 15.6 | 8.4 |
| 530500, 338500 | 2019 | 12.0 | 9.2 | 15.3 | 9.1 |
| | 2027 | 9.2 | 7.1 | 14.2 | 8.2 |
| 532500, 343500 | 2019 | 17.7 | 13.1 | 15.5 | 9.8 |
| | 2027 | 13.4 | 10.2 | 14.2 | 8.8 |
| 532500, 344500 | 2019 | 16.2 | 12.1 | 14.8 | 9.4 |
| | 2027 | 12.6 | 9.6 | 13.7 | 8.5 |
| 533500, 344500 | 2019 | 16.6 | 12.3 | 14.9 | 9.5 |
| | 2027 | 12.6 | 9.6 | 13.8 | 8.6 |

| Grid Square (X, Y) | Year | Annual Mean Concentration (µg/m³) | | | |
|---|---|---|---|---|---|
| | | NO$_x$ | NO$_2$ | PM$_{10}$ | PM$_{2.5}$ |
| 533500, 345500 | 2019 | 15.0 | 11.2 | 15.0 | 9.1 |
| | 2027 | 11.8 | 9.0 | 13.8 | 8.1 |
| 533500, 346500 | 2019 | 11.6 | 8.9 | 16.4 | 9.2 |
| | 2027 | 9.1 | 7.1 | 15.3 | 8.3 |
| 534500, 347500 | 2019 | 11.0 | 8.4 | 16.2 | 9.0 |
| | 2027 | 8.6 | 6.7 | 15.1 | 8.2 |
| 534500, 348500 | 2019 | 10.8 | 8.3 | 16.1 | 9.0 |
| | 2027 | 8.5 | 6.6 | 15.1 | 8.1 |
| 535500, 349500 | 2019 | 10.7 | 8.3 | 16.2 | 9.0 |
| | 2027 | 8.4 | 6.6 | 15.1 | 8.1 |
| 535500, 350500 | 2019 | 11.2 | 8.6 | 15.0 | 8.7 |
| | 2027 | 8.7 | 6.8 | 13.9 | 7.9 |
| 535500, 351500 | 2019 | 10.8 | 8.3 | 16.3 | 8.9 |
| | 2027 | 8.5 | 6.6 | 15.3 | 8.1 |
| 535500, 352500 | 2019 | 10.6 | 8.2 | 16.0 | 8.8 |
| | 2027 | 8.3 | 6.5 | 15.0 | 8.0 |
| 534500, 354500 | 2019 | 10.3 | 7.9 | 15.9 | 8.8 |
| | 2027 | 8.1 | 6.4 | 14.8 | 7.9 |
| 534500, 356500 | 2019 | 10.8 | 8.3 | 15.8 | 8.8 |
| | 2027 | 8.5 | 6.6 | 14.7 | 8.0 |

### 19.6.2   Deposition Fluxes

37. Habitat specific background deposition rates have been obtained from the UK Air
Pollution Information System (APIS)[5] website, based on the 1km grid squares which
cover the modelled area. Further detail on these datasets can be found in Section 19.9.

## 19.7   Model Outputs

### 19.7.1   Ambient Concentrations

38. The background pollutant values have been used in conjunction with the concentrations
predicted by the ADMS-Roads model to calculate predicted total annual mean
concentrations of NO$_2$, PM$_{10}$ and PM$_{2.5}$ for each respective scenario.

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[5] https://www.apis.ac.uk/ [accessed November 2023].

39. For the prediction of annual mean $NO_2$ concentrations for all modelled scenarios at receptor locations, the road $NO_x$ contributions (adjusted as per Section 19.6.1) have been converted to total $NO_2$ following the methodology in LAQM.TG22 using Defra's $NO_x$ to $NO_2$ conversion tool (v8.1)[6]. The modelled $NO_2$ road contribution was then added to the appropriate $NO_2$ background concentration value to obtain an overall total annual mean $NO_2$ concentration.

40. For the prediction of short-term $NO_2$ impacts, LAQM.TG22 advises that it is valid to assume that exceedances of the 1-hour mean Air Quality Assessment Level (AQAL) for $NO_2$ are unlikely to occur where the annual mean $NO_2$ concentration is <60µg/m³. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations with an applicable exposure period.

41. For the prediction of short-term $PM_{10}$, LAQM.TG22 provides an empirical relationship between the annual mean and the number of exceedances of the 24-hour mean AQAL for $PM_{10}$ that can be calculated as follows:

*No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean³ + (206/annual mean)*

42. This relationship has thus been adopted to determine whether exceedances of the short-term $PM_{10}$ AQAL are likely in this assessment.

43. Verification of the ADMS-Roads assessment has been undertaken as per Section 19.10. All results presented in the assessment are those calculated following the process of model verification, as detailed in Section 19.10.

## 19.7.2    Deposition Fluxes

44. Road dry deposition fluxes were calculated from the adjusted road-$NO_2$ using empirical methods provided within the Environment Agency's (EA) Air Quality Technical Advisory Group's (AQTAG) guidance[7], which are subsequently recommended within the IAQM's ecological guidance.

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[6] Defra NOx to NO2 Calculator v8.1 (2020), available at https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/.

[7] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

45. In recognition of the $NO_x$ to $NO_2$ non-linear relationship (calculated using the $NO_x$ to $NO_2$ conversion tool), the road $NO_2$ contribution used for screening was derived through subtraction of the total $NO_2$ modelled concentration from the scenarios discussed in Section 19.1, as it is not considered appropriate to process individual contributions of $NO_2$ from different development aspects.

46. Road dry deposition fluxes were calculated using the following equation:

47. Dry deposition flux ($\mu g/m^2/s$) = ground level concentration ($\mu g/m^3$) x deposition velocity (m/s)

48. The applied deposition velocities for the relevant chemical species are provided in Table 19.5. These velocities vary, dependant on land use.

**Table 19.5: Applied Deposition Velocities**

| Chemical Species | Recommended Deposition Velocity (m/s) | |
|---|---|---|
| $NO_2$ | Grassland | 0.0015 |
| | Woodland | 0.0030 |

### 19.7.2.1 Critical Loads – Nutrient Nitrogen

49. For the assessment of nutrient nitrogen, the predicted road deposition rates were converted from $\mu g/m^2/s$ to units of kgN/ha/year using a standard conversion factor of 95.9.

### 19.7.2.2 Critical Loads – Acidification

50. For the assessment of acidification, the predicted road deposition rates were converted to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux ($\mu g/m^2/s$) by the standard conversion factor of 6.84.

51. The calculation of the process contribution of nitrogen to the critical load function has been carried out according to the Critical Load Function Tool guidance on APIS[8], to determine which compound is the primary contributor to acidity in the local setting, where:

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[8] APIS, Critical Load Function Tool – Guidance, http://www.apis.ac.uk/clf-guidance [accessed November 2023].

- CLmaxS — the maximum critical load of sulphur, above which the deposition of sulphur alone would be considered to lead to an exceedance;

- ClminN — a measure of the ability of a system to "consume" deposited nitrogen (e.g. via immobilisation and uptake of the deposited nitrogen); and

- ClmaxN — the maximum critical load of acidifying nitrogen, above which the deposition of nitrogen alone would be considered to lead to an exceedance.

52. Given that sulphur vehicular emissions have not been calculated within this assessment (as standard practice for UK assessments – given the use of low sulphur fuels), the above acid critical load function has only considered inputs of nitrogen solely relative to '$CL_{max}N$'.

## 19.8    Uncertainty

53. Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with representative publicly available local monitoring data – as collected by BBC, ELDC, and SHDC.

54. Following verification, all model output statistical parameters (used to evaluate model performance and uncertainty) are within LAQM.TG22 prescribed tolerances (Section 19.10.1).

55. In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the EFT version 11.0 utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra.

56. 2027 has been adopted for the purposes of assessing the maximum consecutive 12-month average vehicle flows generated throughout the whole construction phase. Adoption of 2027 air quality conditions (2027 vehicle emission factors and background pollutant concentrations) for the full construction period (i.e. up to 51-months) is industry best practice and conservative in recognition of the forecasted reductions in vehicle emission factors and background pollutant concentrations, which may occur within the 51-month construction phase, following the introduction of legislative and policy initiatives, alongside low emission technologies/vehicles. Use of these variables in combination will likely exaggerate resultant concentrations and effects relative to what may occur in reality.

## 19.9 Ecological Baseline Conditions

57. Critical Loads and background conditions vary at each ecological designation (based upon geography, sensitivity and interest features). APIS has been used to provide details of baseline conditions at the assessed ecological designations requiring detailed assessment. APIS is a support tool for the assessment of potential effects of air pollutants on habitats and species, developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology.

58. APIS provides details of habitats and corresponding Critical Loads/baseline rates for international and national ecological designations. For the assessment of locally important designations, Critical Loads/deposition rates were obtained via the 'search by location' function via APIS – requiring the location (NGR coordinate) and primary habitat type to be defined. Details of the applied assessed primary habitat type present at each designation were provided by the project Ecologist based upon information provided by the Lincolnshire Wildlife Trust Biological Records Centre and professional judgement.

### 19.9.1 Critical Levels

59. Table 19.6 details the applied baseline annual mean $NO_x$ Critical Level conditions at each assessed ecological designation. The maximum background concentration for covering each designation has been reported.

60. As discussed in Section 19.6.1, Defra supplied 1km background concentration estimates were utilised in the ecological road traffic modelling assessment. These datasets have been adjusted as per Section 19.6.1.

**Table 19.6: Baseline Annual Mean $NO_x$ Critical Level Conditions at Ecological Receptors**

| Site* | $NO_x$ Annual Mean Concentration (µg/m³) | |
|---|---|---|
| | Critical Level | 2027 Adjusted Defra Max Background |
| ER1 | 30 | 10.2 |
| ER5 | 30 | 8.4 |
| ER6 | 30 | 8.3 |
| ER7 | 30 | 8.4 |
| ER8 | 30 | 8.4 |
| ER9 | 30 | 8.4 |
| ER10 | 30 | 7.5 |
| ER11 | 30 | 9.2 |

| Site* | NO$_x$ Annual Mean Concentration (µg/m$^3$) | |
| --- | --- | --- |
| | Critical Level | 2027 Adjusted Defra Max Background |
| ER12 | 30 | 8.4 |
| ER13 | 30 | 8.4 |
| ER14 | 30 | 8.4 |
| ER15 | 30 | 10.2 |
| ER16 | 30 | 8.5 |
| ER17 | 30 | 8.4 |
| ER18 | 30 | 8.4 |
| ER20 | 30 | 8.4 |
| ER21 | 30 | 8.4 |
| ER22 | 30 | 8.4 |
| ER25 | 30 | 8.9 |
| ER26 | 30 | 9.2 |
| ER28 | 30 | 8.4 |
| ER29 | 30 | 8.5 |
| ER31 | 30 | 9.0 |
| ER32 | 30 | 8.5 |
| ER33 | 30 | 7.5 |
| ER34 | 30 | 7.4 |
| ER35 | 30 | 8.6 |
| ER36 | 30 | 8.4 |
| ER41 | 30 | 8.4 |
| ER43 | 30 | 9.0 |
| ER46 | 30 | 8.5 |
| Table note: * Name and designation of each site is provided in Table 19.3. | | |

## 19.9.2   Critical Loads

61. Where Critical Loads and baseline deposition values vary spatially (i.e. reported as 1km grid squares), worst case values reported across the whole assessed designation have been used (e.g. min Critical Loads). This approach assumes that the location of maximum impact coincides with the location of greatest sensitivity in terms of baseline and is recommended by APIS guidance[8] to facilitate a conservative assessment.

### 19.9.2.1 Nutrient Nitrogen

62. Table 19.7 details the applied baseline nutrient nitrogen Critical Load conditions at each assessed ecological designation.

63. Nutrient nitrogen Critical Loads are habitat/species specific (derived from a range of experimental studies) available via APIS. Given that critical loads are often reported in ranges in relation to eutrophication, representing the upper and lower bounds where impacts are perceptible, those values which facilitate a worst-case assessment have been used (i.e. minimum critical load for nutrient nitrogen deposition).

**Table 19.7: Baseline Nutrient Nitrogen Critical Load Conditions at Ecological Receptors**

| Site | Nitrogen Class/Habitat | Critical Load | Baseline |
|------|------------------------|---------------|----------|
|      |                        | Min – Max (kgN/ha/yr) | |
| ER1 | Semi-dry Perennial calcareous grassland (basic meadow steppe) | 10 - 20 | 16.6 - 16.8 |
|      | Carpinus and Quercus mesic deciduous forest | 15 - 20 | 28.5 - 28.8 |
| ER5 | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 26.5 |
| ER6 | Calcareous Grassland | 10 - 20 | 16.0 |
| ER7 | Calcareous Grassland | 10 - 20 | 17.0 - 17.1 |
| ER8 | Calcareous Grassland | 10 - 20 | 15.7 - 15.9 |
| ER9 | Calcareous Grassland | 10 - 20 | 15.8 - 16 |
| ER10 | Neutral Grassland | 10 - 20 | 16.2 - 16.3 |
| ER11 | Neutral Grassland | 10 - 20 | 16.7 |
| ER12 | Calcareous Grassland | 10 - 20 | 16.1 |
| ER13 | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 26.5 - 26.9 |
| ER14 | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 28.9 |
| ER15 | Calcareous Grassland | 10 - 20 | 16.6 - 16.8 |
|      | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 28.5 - 28.8 |
| ER16 | Calcareous Grassland | 10 - 20 | 16.8 |
| ER17 | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 26.2 |
| ER18 | Neutral Grassland | 10 - 20 | 16.8 |
| ER20 | Neutral Grassland | 10 - 20 | 16.5 |
| ER21 | Neutral Grassland | 10 - 20 | 16.7 |
| ER22 | Acid Grassland | 6 - 10 | 17.5 |
| ER25 | Calcareous / Neutral Grassland | 10 - 20 | 16.1 - 16.2 |
| ER26 | Neutral Grassland | 10 - 20 | 16.7 |
| ER28 | Broadleaved, Mixed and Yew Woodland | 10 - 15 | 26.5 |
| ER29 | Calcareous Grassland | 10 - 20 | 16.8 |
| ER31 | Calcareous Grassland | 10 - 20 | 16.3 |
| ER32 | Calcareous Grassland | 10 - 20 | 15.6 - 15.7 |
| ER33 | Neutral Grassland | 10 - 20 | 16.1 - 16.2 |

| Site | Nitrogen Class/Habitat | Critical Load | Baseline |
|------|------------------------|---------------|----------|
| | | Min – Max (kgN/ha/yr) | |
| ER34 | Neutral Grassland | 10 - 20 | 16.2 |
| ER35 | Calcareous Grassland | 10 - 20 | 17.4 - 17.5 |
| ER36 | Acid Grassland | 6 - 10 | 17.5 |
| ER41 | Calcareous Grassland | 10 - 20 | 17.2 - 17.4 |
| ER43 | Neutral Grassland | 10 - 20 | 16.3 |
| ER46 | Calcareous Grassland | 10 - 20 | 16.6 - 16.9 |

Table note:
* Name and designation of each site is provided in Table 19.3.

### 19.9.2.2 Acidification

64. Table 19.8 details the applied baseline acidification Critical Load conditions at each assessed ecological designation.

65. Acidification Critical Loads are dependent on soil chemistry, as well as habitat type. In the UK, empirical Critical Loads have been assigned at a 1km grid square resolution based upon the mineralogy and chemistry of the dominant soil series present in the grid square, as provided on APIS. Where there is spatial variation in these Critical Loads across an ecological designation, the minimum values have been reported.

**Table 19.8: Baseline Acidification Critical Load Conditions at Ecological Receptors**

| Site | Acidity Class/Habitat | Critical Load | | | Max Background | |
|------|----------------------|---------------|--------|--------|----------------|-----|
| | | CLmaxS | CLminN | CLmaxN | N | S |
| | | (keq/ha/yr) | | | | |
| ER1 | Calcareous grassland (using base cation) | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| | Unmanaged Broadleafed/Coniferous Woodland | 1.4 | 0.1 | 1.7 | 1.9 | 2.1 |
| ER5 | Broadleaved, Mixed and Yew Woodland | 1.5 | 0.1 | 1.7 | 1.7 | 1.9 |
| ER6 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 0.9 | 1.2 |
| ER7 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER8 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 0.9 | 1.1 |
| ER9 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 0.9 | 1.2 |
| ER10 | Neutral Grassland | 4.0 | 1.1 | 5.1 | 1.1 | 1.2 |
| ER11 | Neutral Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER12 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 0.9 | 1.2 |

| Site | Acidity Class/Habitat | Critical Load | | | Max Background | |
|---|---|---|---|---|---|---|
| | | CLmaxS | CLminN | CLmaxN | N | S |
| | | (keq/ha/yr) | | | | |
| ER13 | Broadleaved, Mixed and Yew Woodland | 1.4 | 0.1 | 1.7 | 1.7 | 1.9 |
| ER14 | Broadleaved, Mixed and Yew Woodland | 10.7 | 0.1 | 10.9 | 1.8 | 2.1 |
| ER15 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| | Broadleaved, Mixed and Yew Woodland | 1.4 | 0.1 | 1.7 | 1.9 | 2.1 |
| ER16 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER17 | Broadleaved, Mixed and Yew Woodland | 10.8 | 0.1 | 10.9 | 1.6 | 1.9 |
| ER18 | Neutral Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER20 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.0 | 1.2 |
| ER21 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.0 | 1.2 |
| ER22 | Acid Grassland | 0.4 | 0.2 | 0.7 | 1.0 | 1.3 |
| ER25 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.2 |
| ER26 | Neutral Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER28 | Broadleaved, Mixed and Yew Woodland | 1.4 | 0.4 | 1.8 | 1.6 | 1.9 |
| ER29 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER31 | Calcareous Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.2 |
| ER32 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 0.9 | 1.1 |
| ER33 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.2 |
| ER34 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.2 |
| ER35 | Calcareous Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.3 |
| ER36 | Acid Grassland | 0.4 | 0.2 | 0.7 | 1.0 | 1.3 |
| ER41 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |
| ER43 | Neutral Grassland | 4.0 | 1.1 | 5.0 | 1.1 | 1.2 |
| ER46 | Calcareous Grassland | 4.0 | 0.9 | 4.9 | 1.0 | 1.2 |

Table note:
* Name and designation of each site is provided in Table 19.3.

## 19.10   Model Verification

66. The ADMS-Roads dispersion model has been widely validated for this type of
assessment and is specifically listed in LAQM.TG22 as an accepted dispersion model.

67. Model validation undertaken by the software developer (CERC) will not have included
validation in the vicinity of the modelled domain. It is therefore necessary to perform a

comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

68. Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

69. Consistent with advice provided by Defra to local authorities across England at the time of assessment, 2019 has been used for the purposes of model verification as this relates to the most recent year of monitoring data available which has not been impacted by the COVID-19 pandemic. Use of monitoring data recorded in 2020/2021 for the purposes of model verification introduces an element of uncertainty into the final adjusted modelled predictions, as monitoring conditions experienced for the majority of 2020/2021 are not deemed to be representative of long-term baseline conditions and could lead to a systematic underprediction at modelled receptor locations.

### 19.10.1   $NO_x$ / $NO_2$ Verification

70. $NO_x/NO_2$ verification relates to the comparison and adjustment of modelled road-$NO_x$ (as output from the ADMS-Roads dispersion model), relative to monitored road-$NO_x$.

71. For $NO_x/NO_2$ model verification, 2019 BBC, ELDC, and SHDC monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists (Table 19.9). The locations of the verification monitors are illustrated in Figure 19.2 in Volume 2, Chapter 19: Onshore Air Quality (document reference 6.2.19.2).

**Table 19.9: Local Monitoring Data Used for Model Verification**

| Local Authority | Site ID | X | Y | 2019 Monitored $NO_2$ Concentration ($\mu g/m^3$) | 2019 Data Capture (%) |
|---|---|---|---|---|---|
| BBC | 1 | 532575 | 343696 | 49.2 | 92.0 |
| BBC | 3 | 532470 | 343736 | 46.5 | 100.0 |
| BBC | 4 | 532331 | 343848 | 39.8 | 100.0 |
| BBC | 5 | 532859 | 343760 | 34.8 | 92.0 |
| BBC | 16 | 532855 | 343719 | 30.1 | 100.0 |
| BBC | 17 | 532877 | 343690 | 30.5 | 83.0 |

| Local Authority | Site ID | X | Y | 2019 Monitored NO$_2$ Concentration (µg/m$^3$) | 2019 Data Capture (%) |
|---|---|---|---|---|---|
| BBC | 8 | 533112 | 344476 | 31.3 | 100.0 |
| BBC | 9 | 533251 | 344642 | 37.0 | 100.0 |
| BBC | 20 | 532744 | 343719 | 41.6 | 100.0 |
| BBC | 12 | 532168 | 343987 | 28.9 | 100.0 |
| BBC | 21 | 532024 | 344060 | 29.0 | 100.0 |
| BBC | 14 | 533226 | 344624 | 35.8 | 100.0 |
| BBC | 22 | 532544 | 343702 | 35.9 | 67.0 |
| ELDC | SK4 | 556380 | 363363 | 22.7 | 58.0 |
| ELDC | SK1/SK2/SK3 | 556355 | 363295 | 28.7 | 100.0 |
| ELDC | H1 | 526075 | 369545 | 34.3 | 100.0 |
| ELDC | H2 | 526028 | 369528 | 25.9 | 92.0 |
| ELDC | H4 | 526007 | 369585 | 25.0 | 100.0 |
| BBC | 18 | 532600 | 342737 | 33.8 | 100.0 |
| BBC | 19 | 532630 | 342760 | 27.5 | 100.0 |
| SHDC | SH5 | 526585 | 328726 | 12.8 | 100.0 |

72. As NO$_2$ concentrations are solely reported using diffusion tubes, NO$_x$ was back calculated using Defra's NO$_x$ to NO$_2$ Calculator (v8.1). The NO$_x$ to NO$_2$ Calculator was also used to calculate road-NO$_2$ from modelled road-NO$_x$ (as output from the ADMS-Roads dispersion model).

73. Verification was completed using the 2019 Defra background mapped concentrations (2018 reference year) for the relevant 1km grid squares (i.e. those within which the model verification sites are located), with those already modelled sources removed, to avoid duplication. This was limited to removal of 'Primary A Road In' across the assessment study area.

### 19.10.1.1 Initial Verification – All Monitors

74. Initial comparison of the modelled vs. monitored road NO$_x$ contribution at all relevant verification locations outlined in Table 19.9 is provided in Table 19.10. An initial adjustment factor of 3.489 has been derived, based on a linear regression forced through zero, as shown in Plate 19.3.

**Table 19.10: NO$_x$/NO$_2$ Model Verification – Initial (3.489)**

| Site ID | Monitored Road NO$_x$ (µg/m$^3$) | Modelled Road NO$_x$ (µg/m$^3$) | Ratio (Monitored vs. Modelled Road NO$_x$) | Adjustment Factor | Adjusted Modelled Total NO$_2$ (µg/m$^3$) | Monitored Total NO$_2$ (µg/m$^3$) | % Difference (Adjusted Modelled NO$_2$ vs Monitored NO$_2$) |
|---|---|---|---|---|---|---|---|
| 1 | 80.5 | 17.3 | 4.7 | 3.489 | 40.9 | 49.2 | -16.9 |
| 3 | 73.8 | 15.1 | 4.9 | | 37.6 | 46.5 | -19.1 |
| 4 | 57.8 | 14.2 | 4.1 | | 36.2 | 39.8 | -9.1 |
| 5 | 46.5 | 12.6 | 3.7 | | 33.6 | 34.8 | -3.4 |
| 16 | 36.3 | 5.3 | 6.9 | | 21.3 | 30.1 | -29.2 |
| 17 | 37.1 | 3.9 | 9.5 | | 18.8 | 30.5 | -38.3 |
| 8 | 39.5 | 22.3 | 1.8 | | 47.9 | 31.3 | 52.9 |
| 9 | 52.0 | 8.2 | 6.3 | | 26.1 | 37.0 | -29.4 |
| 20 | 62.0 | 12.4 | 5.0 | | 33.4 | 41.6 | -19.8 |
| 12 | 33.8 | 6.1 | 5.5 | | 22.9 | 28.9 | -20.9 |
| 21 | 34.0 | 6.1 | 5.5 | | 22.8 | 29.0 | -21.3 |
| 14 | 49.3 | 8.7 | 5.7 | | 27.0 | 35.8 | -24.7 |
| 22 | 48.9 | 20.0 | 2.4 | | 44.8 | 35.9 | 24.9 |
| SK4 | 22.3 | 7.9 | 2.8 | | 25.3 | 22.7 | 11.4 |
| SK1/SK2/SK3 | 34.6 | 5.8 | 5.9 | | 21.7 | 28.7 | -24.4 |
| H1 | 50.0 | 12.3 | 4.1 | | 31.1 | 34.3 | -9.3 |
| H2 | 32.0 | 8.5 | 3.8 | | 24.7 | 25.9 | -4.6 |
| H4 | 30.2 | 6.9 | 4.4 | | 21.9 | 25.0 | -12.4 |
| 18 | 43.8 | 17.0 | 2.6 | | 40.6 | 33.8 | 20.1 |
| 19 | 30.4 | 9.2 | 3.3 | | 28.3 | 27.5 | 2.8 |
| SH5 | 9.7 | 12.1 | 0.8 | | 29.0 | 12.8 | 126.5 |
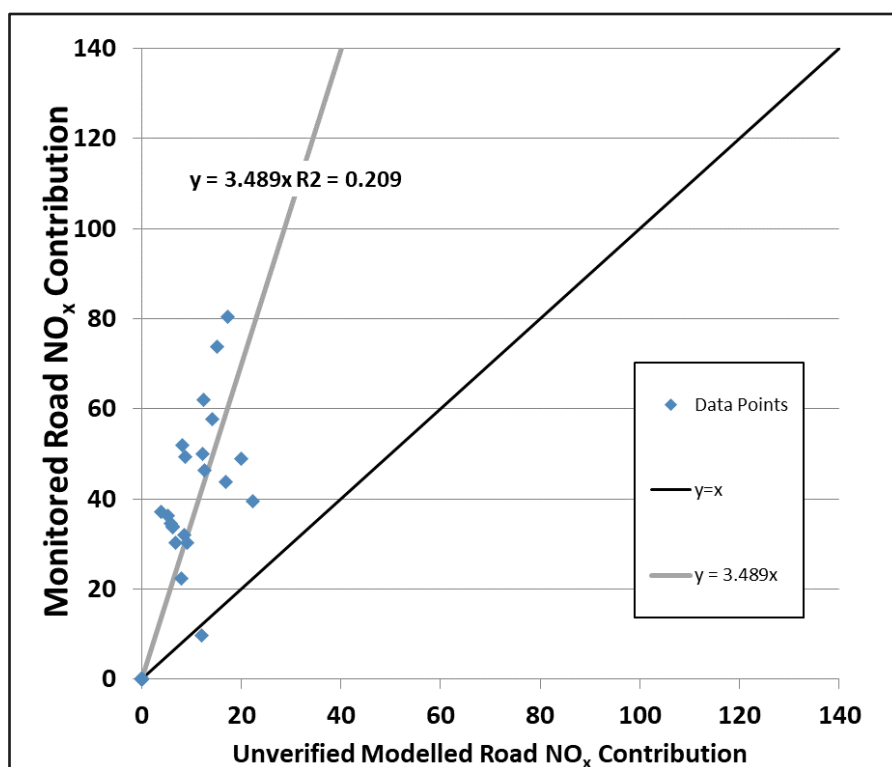
**Plate 19.3: Comparison of Modelled vs. Monitored Road NO$_x$ Contribution – Initial (3.489)**

75. LAQM.TG22 states that:

"*In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%*".

76. The difference between modelled vs. monitored NO$_2$ concentrations was outside the ±25% recommended tolerance at five locations (16, 17, 8, 9 and SH5), however inside ±25% and/or ±10% at the remaining sixteen locations.

77. Although modelled concentrations were within the LAQM.TG22 recommended tolerances at most of the verification locations, there is a clear difference in model performance at others. A review of the monitoring locations (and surrounding modelled environments) was therefore undertaken to further refine the dispersion model.

78. Upon review, monitors 16, 17, 22 and SK1/SK2/SK3 and SH5 were removed from the verification exercise for the following reasons:

- BBC monitors 16 and 17 — these monitors are located adjacent to the Buoy Yard car park, off the A1138 South End in Boston. From review of satellite and street view

imagery, in addition to the car park there is an area of unofficial parking adjacent to the River Witham. The car park and parking areas are not specifically included within the dispersion model; and such locations are likely to give rise to additional emissions which are typical of the associated vehicle movements. A large underprediction at monitors 16 and 17 is therefore likely attributed to the representation of the locations within the dispersion model and how real-world conditions are not exactly mirrored given the lack of inputs (e.g. car park flows);

- BBC monitor 22 – monitor 22 is located adjacent to a roundabout in Boston; where the A16 John Adams Way, A52 Liquorpond Street and the A16 Spalding Road meet. This is a central location within the Haven Bridge Air Quality Management Area (AQMA), and therefore elevated $NO_2$ concentrations may be anticipated. From review of satellite and street view imagery, monitor 22 is located behind a large hedge which is approximately 8m deep between the kerb of the roundabout and the monitor. The hedge height is similar to the monitor; however, this has the potential to fluctuate. It is logical to suspect that the hedge is having a bearing on monitored concentrations at this location. As such a feature is not represented within the dispersion model, this is likely to explain the large overprediction at monitor 22 in the verification exercise as the influence of the hedge is not captured;

- ELDC monitor SK1/SK2/SK3 — the monitor is located outside The Red Lion pub, adjacent to the A52 one-way gyratory in Skegness. The B1451 Lumley Road joins the gyratory approximately 25m south of monitor SK1/SK2/SK3 and is one of the main routes to the beach front. The B1451 has not been included within the dispersion model, due to a lack of available baseline traffic data. The model underprediction is therefore likely attributed to the missing contribution of the B1451 from the model. Furthermore, along the front of the pub there are several benches provided as outdoor seating for customers, directly below monitor SK1/SK2/SK3. This potentially introduces a localised pollutant source (e.g. from smoking), which is interacting with the monitor, and this would not be represented within the dispersion model; and

- SHDC monitor SH5 – based on a review of satellite imagery and street view alongside details within SHDC's 2020 ASR, the location of SH5 could not be verified. Further, the description of the monitoring location and the NGR did not match. On this basis, SH5 was removed from the verification exercise.

79. The verification exercise was repeated with the above monitors removed to refine the dispersion model.

### 19.10.1.2 Remaining Relevant Monitors – Removal of 16, 17, 22, SK1/SK2/SK3 and SH5

80. Comparison of the modelled vs. monitored road $NO_x$ contribution at the remaining relevant verification locations is detailed in Table 19.11. An adjustment factor of 3.708 has been derived, based on a linear regression forced through zero, as shown in Plate 19.4

**Table 19.11: NOₓ/NO₂ Model Verification – Remaining Relevant Monitors (3.708)**

| Site ID | Monitored Road $NO_x$ (µg/m³) | Modelled Road $NO_x$ (µg/m³) | Ratio (Monitored vs. Modelled Road $NO_x$) | Adjustment Factor | Adjusted Modelled Total $NO_2$ (µg/m³) | Monitored Total $NO_2$ (µg/m³) | % Difference (Adjusted Modelled $NO_2$ vs Monitored $NO_2$) |
|---|---|---|---|---|---|---|---|
| 1 | 80.5 | 17.3 | 4.7 | 3.708 | 42.5 | 49.2 | -13.7 |
| 3 | 73.8 | 15.1 | 4.9 | | 39.1 | 46.5 | -16.0 |
| 4 | 57.8 | 14.2 | 4.1 | | 37.5 | 39.8 | -5.7 |
| 5 | 46.5 | 12.6 | 3.7 | | 34.9 | 34.8 | 0.2 |
| 8 | 39.5 | 22.3 | 1.8 | | 49.8 | 31.3 | 59.1 |
| 9 | 52.0 | 8.2 | 6.3 | | 27.0 | 37.0 | -27.0 |
| 20 | 62.0 | 12.4 | 5.0 | | 34.6 | 41.6 | -16.8 |
| 12 | 33.8 | 6.1 | 5.5 | | 23.5 | 28.9 | -18.6 |
| 21 | 34.0 | 6.1 | 5.5 | | 23.5 | 29.0 | -18.9 |
| 14 | 49.3 | 8.7 | 5.7 | | 27.9 | 35.8 | -22.2 |
| SK4 | 22.3 | 7.9 | 2.8 | | 26.1 | 22.7 | 15.1 |
| H1 | 50.0 | 12.3 | 4.1 | | 32.4 | 34.3 | -5.7 |
| H2 | 32.0 | 8.5 | 3.8 | | 25.6 | 25.9 | -1.1 |
| H4 | 30.2 | 6.9 | 4.4 | | 22.7 | 25.0 | -9.3 |
| 18 | 43.8 | 17.0 | 2.6 | | 42.2 | 33.8 | 24.8 |
| 19 | 30.4 | 9.2 | 3.3 | | 29.2 | 27.5 | 6.3 |
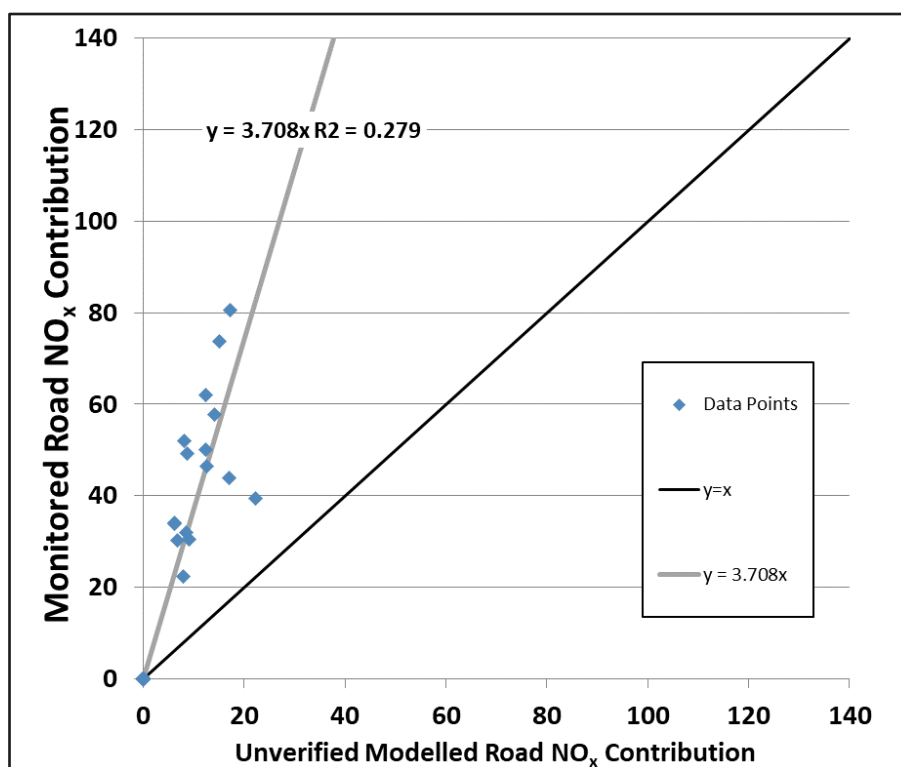
**Plate 19.4: Comparison of Modelled vs. Monitored Road NO$_x$ Contribution – Remaining Relevant Monitors (3.708)**

81. The difference between modelled vs. monitored NO$_2$ concentrations was outside the ±25% recommended tolerance at two location in Boston (8 and 9), although within the LAQM.TG22 recommended tolerances at the remaining verification locations. The difference in model performance across the modelled domain and specifically, the large underpredictions observed in central Boston are assumed to be a function of the differences in surrounding modelled environments and associated characteristics. A further review of this was undertaken to further refine the dispersion model.

82. Based on this review and associated differences in local environments (i.e. within central Boston vs outside Boston) and model performance, a zonal verification approach was investigated to provide more confidence in model predictions. The zonal verification approach is detailed in the following sections.

### 19.10.1.3 Central Boston Initial

83. In relation to a potential zonal verification approach, monitoring locations within central Boston were initially considered given their similar setting and exposure to similar traffic flows/mix, and similar model performance (highlighted in Table 19.11).

84. Comparison of the modelled vs. monitored road $NO_x$ contribution at the verification locations within central Boston is detailed in Table 19.12. An adjustment factor of 3.891 has been derived, based on a linear regression forced through zero, as shown in Plate 19.5.

**Table 19.12: $NO_x$/$NO_2$ Model Verification – Central Boston Initial (3.891)**

| Site ID | Monitored Road $NO_x$ ($\mu g/m^3$) | Modelled Road $NO_x$ ($\mu g/m^3$) | Ratio (Monitored vs. Modelled Road $NO_x$) | Adjustment Factor | Adjusted Modelled Total $NO_2$ ($\mu g/m^3$) | Monitored Total $NO_2$ ($\mu g/m^3$) | % Difference (Adjusted Modelled $NO_2$ vs Monitored $NO_2$) |
|---|---|---|---|---|---|---|---|
| 1 | 80.5 | 17.3 | 4.7 | 3.891 | 43.8 | 49.2 | -11.0 |
| 3 | 73.8 | 15.1 | 4.9 | | 40.3 | 46.5 | -13.4 |
| 4 | 57.8 | 14.2 | 4.1 | | 38.7 | 39.8 | -2.8 |
| 5 | 46.5 | 12.6 | 3.7 | | 35.9 | 34.8 | 3.1 |
| 9 | 52.0 | 8.2 | 6.3 | | 27.8 | 37.0 | -25.0 |
| 20 | 62.0 | 12.4 | 5.0 | | 35.6 | 41.6 | -14.4 |
| 12 | 33.8 | 6.1 | 5.5 | | 24.1 | 28.9 | -16.7 |
| 21 | 34.0 | 6.1 | 5.5 | | 24.1 | 29.0 | -17.0 |
| 14 | 49.3 | 8.7 | 5.7 | | 28.6 | 35.8 | -20.0 |
| 8 | 39.5 | 22.3 | 1.8 | | 51.4 | 31.3 | 64.2 |
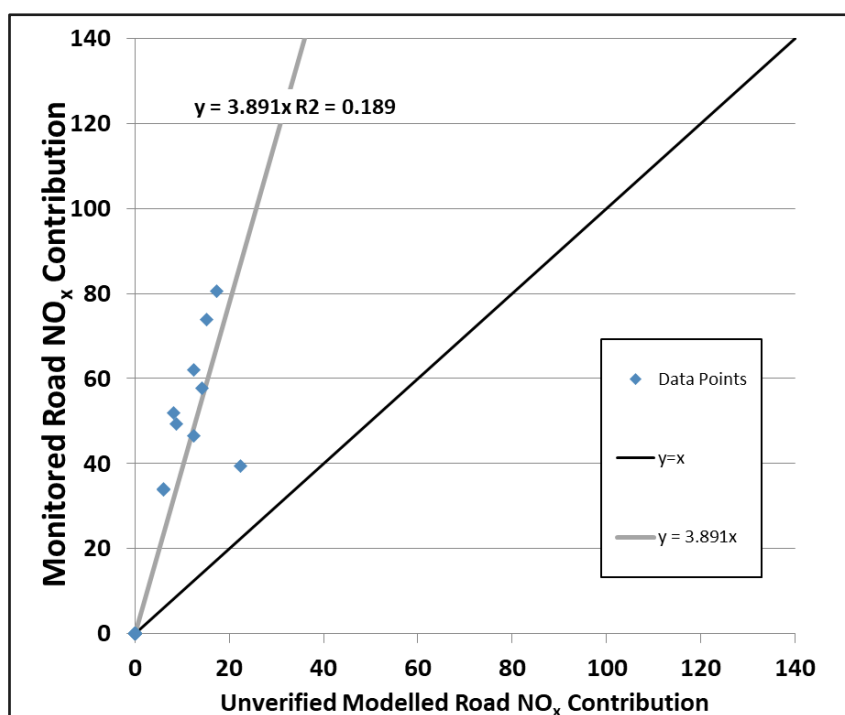
**Plate 19.5: Comparison of Modelled vs. Monitored Road NOx Contribution – Central Boston Initial (3.891)**

85. As noted in Table 19.12, the difference between the adjusted modelled $NO_2$ and monitored $NO_2$ is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations apart from 8.

86. In addition, a verification factor of 3.891 reduces the Root Mean Square Error (RMSE) from a value of 20.2µg/m$^3$ to 8.3µg/m$^3$. As the RMSE is not within the ideal LAQM.TG22 prescribed limit (±10% of the annual mean AQAL), further adjustments were required.

### 19.10.1.4 Central Boston Final – Domain A

87. A review of verification location 8 was undertaken due to the clear difference in model performance, relative to the other locations within central Boston. Monitoring location 8 is located at the roadside of Bargate Roundabout in Boston. Its location was distance validated using satellite imagery and street view, and the model inputs at this location were reviewed to ensure the real-world environment was correctly represented in the model.

88. The difference between the adjusted modelled $NO_2$ and monitored $NO_2$ remained outside of ±25% at monitoring location 8. BBC monitor 8 was therefore removed from the

verification exercise. Given the ratio of monitored vs. modelled road $NO_x$ at monitor 8 was much less than the ratios at the other monitors within central Boston, this approach was considered conservative as removal of monitor 8 increases the overall adjustment factor and therefore increases the final adjusted modelled concentrations.

89. Comparison of the modelled vs. monitored road $NO_x$ contribution at the verification locations within central Boston, following the removal of 8 is detailed in Table 19.13. An adjustment factor of 4.728 has been derived, based on a linear regression forced through zero, as shown in Plate 19.6.

**Table 19.13: $NO_x$/$NO_2$ Model Verification – Central Boston Final – Domain A (4.728)**

| Site ID | Monitored Road $NO_x$ ($\mu g/m^3$) | Modelled Road $NO_x$ ($\mu g/m^3$) | Ratio (Monitored vs. Modelled Road $NO_x$) | Adjustment Factor | Adjusted Modelled Total $NO_2$ ($\mu g/m^3$) | Monitored Total $NO_2$ ($\mu g/m^3$) | % Difference (Adjusted Modelled $NO_2$ vs Monitored $NO_2$) |
|---|---|---|---|---|---|---|---|
| 1 | 80.5 | 17.3 | 4.7 | 4.728 | 49.7 | 49.2 | 1.0 |
| 3 | 73.8 | 15.1 | 4.9 | | 45.6 | 46.5 | -2.0 |
| 4 | 57.8 | 14.2 | 4.1 | | 43.7 | 39.8 | 9.9 |
| 5 | 46.5 | 12.6 | 3.7 | | 40.5 | 34.8 | 16.4 |
| 9 | 52.0 | 8.2 | 6.3 | | 31.0 | 37.0 | -16.2 |
| 20 | 62.0 | 12.4 | 5.0 | | 40.2 | 41.6 | -3.4 |
| 12 | 33.8 | 6.1 | 5.5 | | 26.6 | 28.9 | -7.9 |
| 21 | 34.0 | 6.1 | 5.5 | | 26.6 | 29.0 | -8.3 |
| 14 | 49.3 | 8.7 | 5.7 | | 32.1 | 35.8 | -10.4 |
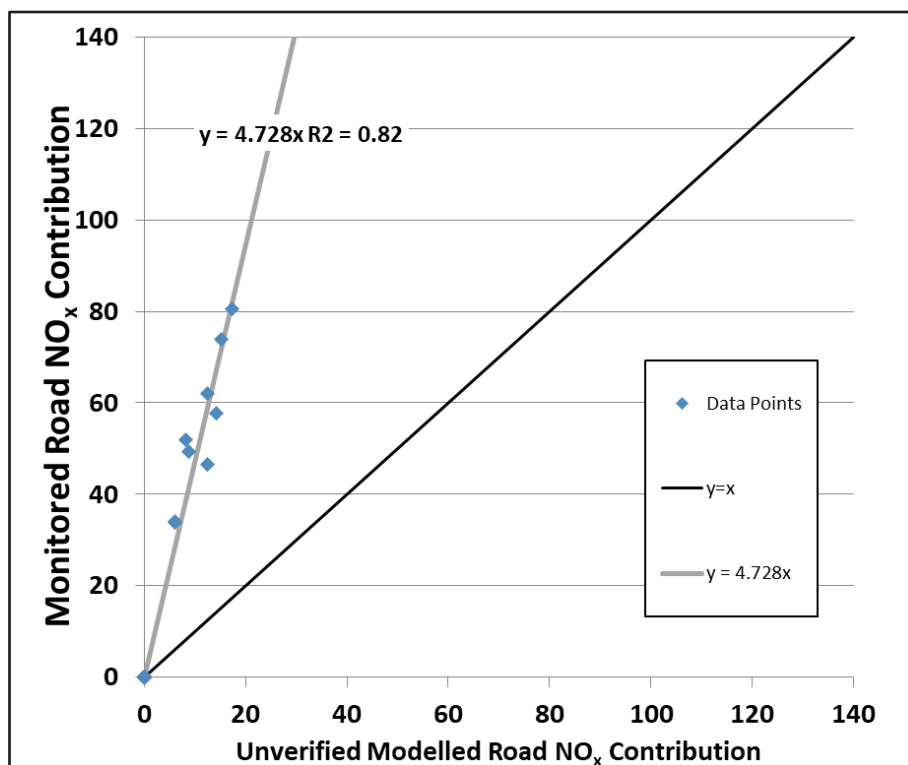
**Plate 19.6: Comparison of Modelled vs. Monitored Road NOx Contribution – Central Boston Final – Domain A (4.728)**

90. As noted in Table 19.13, the difference between the adjusted modelled $NO_2$ and monitored $NO_2$ is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations.

91. In addition, a verification factor of 4.728 reduces the Root Mean Square Error (RMSE) from a value of 21.1µg/m³ to 3.5µg/m³ – within the ideal LAQM.TG22 prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (4.278) was considered acceptable and was subsequently applied to all road-NOx concentrations predicted within central Boston – assigned verification Domain A in Table 19.2.

### 19.10.1.5 Outside Central Boston – Domain B

92. Comparison of the modelled vs. monitored road $NO_x$ contribution at all other verification locations (i.e. outside central Boston) following the removal of verification locations detailed in Section 19.10.1.1 is presented in Table 19.14. An adjustment factor of 3.253 has been derived, based on a linear regression forced through zero, as shown in Plate 19.7.

**Table 19.14: NO$_x$/NO$_2$ Model Verification – Outside Central Boston – Domain B (3.253)**

| Site ID | Monitored Road NO$_x$ (µg/m$^3$) | Modelled Road NO$_x$ (µg/m$^3$) | Ratio (Monitored vs. Modelled Road NO$_x$) | Adjustment Factor | Adjusted Modelled Total NO$_2$ (µg/m$^3$) | Monitored Total NO$_2$ (µg/m$^3$) | % Difference (Adjusted Modelled NO$_2$ vs Monitored NO$_2$) |
|---|---|---|---|---|---|---|---|
| 18 | 43.8 | 17.0 | 2.6 | 3.253 | 38.9 | 33.8 | 15.0 |
| 19 | 30.4 | 9.2 | 3.3 | | 27.2 | 27.5 | -1.0 |
| H1 | 50.0 | 12.3 | 4.1 | | 29.8 | 34.3 | -13.3 |
| H2 | 32.0 | 8.5 | 3.8 | | 23.7 | 25.9 | -8.4 |
| H4 | 30.2 | 6.9 | 4.4 | | 21.1 | 25.0 | -15.6 |
| SK4 | 22.3 | 7.9 | 2.8 | | 24.4 | 22.7 | 7.3 |
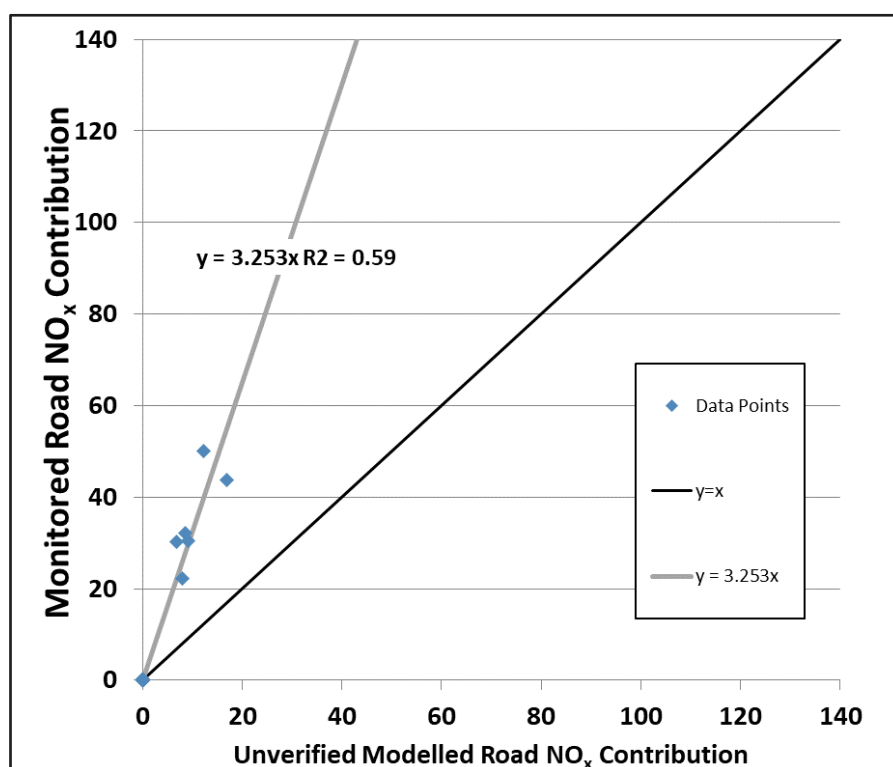


**Plate 19.7: Comparison of Modelled vs. Monitored Road NOx Contribution – Outside Central Boston – Domain B (3.253)**

93. As noted in Table 19.14, the difference between the adjusted modelled NO$_2$ and monitored NO$_2$ is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations.

94. In addition, a verification factor of 3.253 reduces the Root Mean Square Error (RMSE) from a value of 12.7µg/m$^3$ to 3.4µg/m$^3$ – within the ideal LAQM.TG22 prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (3.523)

was considered acceptable and was subsequently applied to all road-NOx concentrations predicted outside of central Boston – assigned verification Domain B in Table 19.2.

### 19.10.2   PM$_{10}$ / PM$_{2.5}$ Verification

95. The adjustment factor of 4.728 for locations within central Boston (Domain A) and 3.253 for all locations outside central Boston (Domain B) has been applied to road-PM$_{10}$ and PM$_{2.5}$ concentrations (as output of the ADMS-Roads dispersion model), following the recommendations of LAQM.TG22, in the absence of local particulate monitoring.

## 19.11   Modelling Results

### 19.11.1   Human Receptors

96. Results have been grouped by Local Authority – ELDC, BBC, NKDC and SHDC.

### 19.11.1.1 NO$_2$ Modelling Results

97. Table 19.15 presents the annual mean NO$_2$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

98. In accordance with Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) guidance '*Land-Use Planning & Development Control: Planning for Air Quality*', the impact of the construction phase of the Project on annual mean NO$_2$ concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean NO$_2$ concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean NO$_2$ AQAL in the 2027 DS scenario, unmitigated effects associated with annual mean NO$_2$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

99. The empirical relationship given in LAQM.TG22 states that exceedances of the 1-hour mean NO$_2$ AQAL are unlikely to occur where annual mean concentrations are <60µg/m$^3$. Annual mean NO$_2$ concentrations predicted at all receptor locations are well below this limit in the 2027 DS scenario. Therefore, it is unlikely that an exceedance of the 1-hour mean AQAL will occur. Effects associated with likely 1-hour mean NO$_2$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

**Table 19.15: Predicted Annual Mean NO₂ Concentrations – 2027 Construction Year**

| Receptor | Predicted Annual Mean NO$_2$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| *ELDC* | | | | | | |
| R1 | 12.8 | 9.6 | 9.7 | 0.1 | 24.3 | Negligible |
| R2 | 13.2 | 9.8 | 9.9 | 0.2 | 24.8 | Negligible |
| R3 | 11.2 | 8.9 | 8.9 | 0.1 | 22.3 | Negligible |
| R4 | 12.5 | 9.5 | 9.5 | 0.1 | 23.8 | Negligible |
| R5 | 15.5 | 10.9 | 11.0 | 0.4 | 27.5 | Negligible |
| R6 | 12.6 | 9.5 | 9.6 | 0.2 | 24.0 | Negligible |
| R7 | 15.7 | 11.0 | 11.1 | 0.4 | 27.8 | Negligible |
| R8 | 16.2 | 11.1 | 11.2 | 0.2 | 28.0 | Negligible |
| R9 | 12.0 | 9.2 | 9.3 | 0.1 | 23.3 | Negligible |
| R10 | 12.9 | 9.7 | 9.8 | 0.2 | 24.5 | Negligible |
| R11 | 16.2 | 11.2 | 11.3 | 0.3 | 28.3 | Negligible |
| R12 | 12.9 | 9.7 | 9.7 | 0.2 | 24.3 | Negligible |
| R13 | 16.4 | 11.3 | 11.4 | 0.3 | 28.5 | Negligible |
| R14 | 16.5 | 11.3 | 11.4 | 0.3 | 28.5 | Negligible |
| R15 | 17.0 | 11.5 | 11.6 | 0.3 | 29.0 | Negligible |
| R16 | 17.7 | 11.8 | 12.0 | 0.3 | 30.0 | Negligible |
| R17 | 15.7 | 10.4 | 10.5 | 0.2 | 26.3 | Negligible |
| R18 | 13.7 | 9.6 | 9.7 | 0.2 | 24.3 | Negligible |
| R19 | 14.0 | 9.8 | 9.8 | 0.2 | 24.5 | Negligible |
| R20 | 15.1 | 10.2 | 10.3 | 0.2 | 25.8 | Negligible |
| R21 | 13.8 | 9.7 | 9.8 | 0.3 | 24.5 | Negligible |
| R22 | 17.5 | 11.1 | 11.3 | 0.5 | 28.3 | Negligible |
| R23 | 13.4 | 9.5 | 9.6 | 0.3 | 24.0 | Negligible |
| R24 | 16.7 | 10.8 | 10.9 | 0.4 | 27.3 | Negligible |
| R25 | 12.8 | 9.3 | 9.3 | 0.2 | 23.3 | Negligible |
| R26 | 16.7 | 10.7 | 10.9 | 0.3 | 27.3 | Negligible |
| R27 | 16.1 | 10.5 | 10.7 | 0.4 | 26.8 | Negligible |
| R28 | 15.2 | 10.2 | 10.4 | 0.4 | 26.0 | Negligible |
| R29 | 16.7 | 10.8 | 11.0 | 0.5 | 27.5 | Negligible |
| R30 | 15.4 | 10.3 | 10.4 | 0.4 | 26.0 | Negligible |
| R31 | 14.2 | 9.8 | 9.9 | 0.2 | 24.8 | Negligible |
| R32 | 13.1 | 9.4 | 9.4 | 0.2 | 23.5 | Negligible |
| R33 | 14.1 | 9.8 | 9.9 | 0.2 | 24.8 | Negligible |

| Receptor | Predicted Annual Mean NO$_2$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R34 | 12.8 | 9.3 | 9.4 | 0.2 | 23.5 | Negligible |
| R35 | 13.3 | 9.5 | 9.6 | 0.2 | 24.0 | Negligible |
| R36 | 15.7 | 10.5 | 10.6 | 0.3 | 26.5 | Negligible |
| R37 | 16.2 | 11.0 | 11.2 | 0.4 | 28.0 | Negligible |
| R38 | 13.8 | 10.1 | 10.2 | 0.2 | 25.5 | Negligible |
| R39 | 14.1 | 10.2 | 10.4 | 0.3 | 26.0 | Negligible |
| R40 | 17.1 | 11.4 | 11.6 | 0.5 | 29.0 | Negligible |
| R41 | 16.0 | 11.0 | 11.1 | 0.4 | 27.8 | Negligible |
| R42 | 15.6 | 10.8 | 10.9 | 0.4 | 27.3 | Negligible |
| R43 | 16.9 | 11.3 | 11.5 | 0.5 | 28.8 | Negligible |
| R44 | 19.1 | 12.2 | 12.5 | 0.7 | 31.3 | Negligible |
| R45 | 22.7 | 13.7 | 14.2 | 1.2 | 35.5 | Negligible |
| R46 | 13.7 | 9.9 | 10.0 | 0.2 | 25.0 | Negligible |
| R47 | 14.2 | 10.1 | 10.2 | 0.3 | 25.5 | Negligible |
| R48 | 11.4 | 8.9 | 9.0 | 0.2 | 22.5 | Negligible |
| R49 | 12.9 | 9.6 | 9.6 | 0.2 | 24.0 | Negligible |
| R50 | 11.6 | 9.0 | 9.1 | 0.2 | 22.8 | Negligible |
| R51 | 13.6 | 9.9 | 10.0 | 0.3 | 25.0 | Negligible |
| R52 | 10.0 | 8.4 | 8.4 | <0.1 | 21.0 | Negligible |
| R118 | 14.4 | 9.9 | 10.0 | 0.2 | 25.0 | Negligible |
| R119 | 13.6 | 9.5 | 9.6 | 0.2 | 24.0 | Negligible |
| R120 | 13.9 | 9.6 | 9.7 | 0.2 | 24.3 | Negligible |
| R121 | 15.6 | 10.2 | 10.3 | 0.3 | 25.8 | Negligible |
| R122 | 17.0 | 10.9 | 11.1 | 0.4 | 27.8 | Negligible |
| R123 | 13.4 | 9.5 | 9.6 | 0.3 | 24.0 | Negligible |
| R124 | 18.1 | 11.2 | 11.4 | 0.5 | 28.5 | Negligible |
| R125 | 12.1 | 9.0 | 9.1 | 0.2 | 22.8 | Negligible |
| R126 | 14.7 | 10.0 | 10.1 | 0.3 | 25.3 | Negligible |
| R127 | 15.7 | 10.3 | 10.4 | 0.4 | 26.0 | Negligible |
| R128 | 14.2 | 9.7 | 9.8 | 0.3 | 24.5 | Negligible |
| R129 | 16.6 | 10.6 | 10.8 | 0.4 | 27.0 | Negligible |
| R130 | 12.7 | 9.2 | 9.2 | 0.2 | 23.0 | Negligible |
| R131 | 12.2 | 8.9 | 9.0 | 0.2 | 22.5 | Negligible |
| R132 | 13.2 | 9.4 | 9.5 | 0.2 | 23.8 | Negligible |
| R133 | 17.0 | 10.8 | 11.0 | 0.4 | 27.5 | Negligible |

| Receptor | Predicted Annual Mean NO$_2$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R134 | 13.8 | 9.6 | 9.7 | 0.3 | 24.3 | Negligible |
| R135 | 17.8 | 11.1 | 11.3 | 0.5 | 28.3 | Negligible |
| R136 | 13.7 | 9.6 | 9.7 | 0.3 | 24.3 | Negligible |
| R137 | 17.6 | 11.0 | 11.2 | 0.5 | 28.0 | Negligible |
| R138 | 13.7 | 9.6 | 9.7 | 0.3 | 24.3 | Negligible |
| R139 | 18.3 | 11.3 | 11.5 | 0.5 | 28.8 | Negligible |
| R140 | 15.8 | 10.9 | 11.0 | 0.3 | 27.5 | Negligible |
| R141 | 16.3 | 11.1 | 11.3 | 0.3 | 28.3 | Negligible |
| R142 | 19.5 | 12.5 | 12.7 | 0.5 | 31.8 | Negligible |
| R143 | 18.2 | 12.0 | 12.1 | 0.5 | 30.3 | Negligible |
| R144 | 15.1 | 10.6 | 10.7 | 0.2 | 26.8 | Negligible |
| R145 | 12.8 | 9.6 | 9.7 | 0.2 | 24.3 | Negligible |
| R146 | 31.7 | 14.9 | 15.3 | 1.1 | 38.3 | Negligible |
| R147 | 16.1 | 11.2 | 11.3 | 0.2 | 28.3 | Negligible |
| R148 | 15.2 | 10.8 | 10.8 | 0.1 | 27.0 | Negligible |
| R149 | 18.9 | 12.5 | 12.6 | 0.2 | 31.5 | Negligible |
| R150 | 19.4 | 12.8 | 12.9 | 0.3 | 32.3 | Negligible |
| R151 | 13.0 | 9.7 | 9.8 | 0.1 | 24.5 | Negligible |
| R152 | 11.9 | 9.2 | 9.3 | 0.2 | 23.3 | Negligible |
| R153 | 13.8 | 10.1 | 10.2 | 0.2 | 25.5 | Negligible |
| R154 | 22.1 | 13.1 | 13.2 | 0.3 | 33.0 | Negligible |
| R155 | 19.4 | 12.5 | 12.7 | 0.5 | 31.8 | Negligible |
| R165 | 17.7 | 11.2 | 11.3 | 0.2 | 28.3 | Negligible |
| R166 | 17.1 | 11.0 | 11.0 | 0.2 | 27.5 | Negligible |
| R167 | 15.4 | 10.7 | 10.8 | 0.4 | 27.0 | Negligible |
| R168 | 20.3 | 12.5 | 12.9 | 0.8 | 32.3 | Negligible |
| R169 | 15.6 | 10.7 | 10.9 | 0.3 | 27.3 | Negligible |
| R170 | 17.7 | 11.1 | 11.3 | 0.5 | 28.3 | Negligible |
| R171 | 18.1 | 11.2 | 11.4 | 0.5 | 28.5 | Negligible |
| R177 | 18.6 | 12.0 | 12.2 | 0.7 | 30.5 | Negligible |
| R178 | 13.8 | 9.6 | 9.7 | 0.3 | 24.3 | Negligible |
| R179 | 13.1 | 9.4 | 9.5 | 0.2 | 23.8 | Negligible |
| R180 | 13.8 | 9.5 | 9.7 | 0.3 | 24.3 | Negligible |
| *BBC* | | | | | | |
| R53 | 16.3 | 10.9 | 10.9 | <0.1 | 27.3 | Negligible |

| Receptor | Predicted Annual Mean NO$_2$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R54 | 16.9 | 11.3 | 11.4 | 0.1 | 28.5 | Negligible |
| R55 | 12.7 | 9.4 | 9.4 | <0.1 | 23.5 | Negligible |
| R56 | 21.0 | 13.3 | 13.4 | 0.2 | 33.5 | Negligible |
| R57 | 15.7 | 10.8 | 10.8 | <0.1 | 27.0 | Negligible |
| R58 | 19.8 | 12.7 | 12.8 | 0.1 | 32.0 | Negligible |
| R59 | 15.9 | 10.8 | 10.9 | <0.1 | 27.3 | Negligible |
| R60 | 12.9 | 9.5 | 9.5 | <0.1 | 23.8 | Negligible |
| R61 | 15.7 | 10.8 | 10.8 | 0.1 | 27.0 | Negligible |
| R62 | 16.5 | 11.1 | 11.2 | 0.1 | 28.0 | Negligible |
| R63 | 12.8 | 9.8 | 9.8 | <0.1 | 24.5 | Negligible |
| R64 | 17.2 | 12.3 | 12.4 | 0.2 | 31.0 | Negligible |
| R65 | 16.7 | 11.8 | 11.9 | 0.2 | 29.8 | Negligible |
| R66 | 14.9 | 10.0 | 10.0 | <0.1 | 25.0 | Negligible |
| R67 | 16.1 | 10.5 | 10.5 | 0.1 | 26.3 | Negligible |
| R68 | 25.7 | 14.4 | 14.5 | 0.2 | 36.3 | Negligible |
| R69 | 23.7 | 13.6 | 13.7 | 0.2 | 34.3 | Negligible |
| R83 | 15.9 | 10.2 | 10.2 | <0.1 | 25.5 | Negligible |
| R84 | 23.8 | 13.4 | 13.4 | 0.1 | 33.5 | Negligible |
| R85 | 21.0 | 12.3 | 12.4 | 0.1 | 31.0 | Negligible |
| R86 | 15.3 | 10.1 | 10.2 | <0.1 | 25.5 | Negligible |
| R87 | 17.8 | 11.3 | 11.3 | <0.1 | 28.3 | Negligible |
| R88 | 20.5 | 12.4 | 12.4 | 0.1 | 31.0 | Negligible |
| R89 | 27.8 | 15.7 | 15.7 | 0.2 | 39.3 | Negligible |
| R90 | 26.5 | 14.9 | 14.9 | <0.1 | 37.3 | Negligible |
| R91 | 22.1 | 13.0 | 13.0 | <0.1 | 32.5 | Negligible |
| R92 | 25.8 | 16.3 | 16.3 | <0.1 | 40.8 | Negligible |
| R93 | 46.0 | 26.8 | 27.0 | 0.5 | 67.5 | Negligible |
| R94 | 41.9 | 24.2 | 24.3 | 0.3 | 60.8 | Negligible |
| R95 | 64.4 | 35.5 | 35.8 | 0.5 | 89.5 | Negligible |
| R96 | 33.6 | 20.7 | 20.8 | 0.4 | 52.0 | Negligible |
| R97 | 43.2 | 24.3 | 24.4 | 0.3 | 61.0 | Negligible |
| R98 | 27.0 | 17.6 | 17.7 | 0.2 | 44.3 | Negligible |
| R99 | 28.4 | 18.3 | 18.4 | 0.3 | 46.0 | Negligible |
| R100 | 15.0 | 10.4 | 10.4 | <0.1 | 26.0 | Negligible |
| R101 | 43.6 | 25.5 | 25.6 | 0.3 | 64.0 | Negligible |

| Receptor | Predicted Annual Mean NO$_2$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R102 | 39.5 | 23.4 | 23.5 | 0.3 | 58.8 | Negligible |
| R103 | 40.9 | 24.1 | 24.2 | 0.3 | 60.5 | Negligible |
| R104 | 35.3 | 21.2 | 21.3 | 0.2 | 53.3 | Negligible |
| R105 | 60.6 | 32.8 | 33.1 | 0.6 | 82.8 | Negligible |
| R106 | 47.5 | 26.5 | 26.7 | 0.5 | 66.8 | Negligible |
| R107 | 34.2 | 20.6 | 20.7 | 0.4 | 51.8 | Negligible |
| R108 | 34.4 | 20.7 | 20.9 | 0.4 | 52.3 | Negligible |
| R109 | 39.5 | 23.4 | 23.6 | 0.5 | 59.0 | Negligible |
| R110 | 19.8 | 13.7 | 13.8 | 0.2 | 34.5 | Negligible |
| R111 | 17.5 | 12.5 | 12.6 | 0.2 | 31.5 | Negligible |
| R112 | 18.2 | 12.7 | 12.8 | 0.2 | 32.0 | Negligible |
| R113 | 12.3 | 9.4 | 9.4 | 0.1 | 23.5 | Negligible |
| R114 | 16.6 | 10.9 | 11.0 | 0.3 | 27.5 | Negligible |
| R115 | 12.8 | 9.3 | 9.4 | 0.2 | 23.5 | Negligible |
| R116 | 13.1 | 9.4 | 9.4 | 0.2 | 23.5 | Negligible |
| R117 | 15.0 | 10.1 | 10.2 | 0.2 | 25.5 | Negligible |
| R156 | 22.1 | 13.6 | 13.7 | 0.4 | 34.3 | Negligible |
| R157 | 20.4 | 12.6 | 12.7 | 0.3 | 31.8 | Negligible |
| R158 | 20.4 | 12.6 | 12.7 | 0.4 | 31.8 | Negligible |
| R159 | 18.8 | 11.8 | 12.0 | 0.3 | 30.0 | Negligible |
| R161 | 15.3 | 9.7 | 9.7 | <0.1 | 24.3 | Negligible |
| R162 | 17.1 | 10.3 | 10.3 | <0.1 | 25.8 | Negligible |
| R172 | 38.4 | 22.6 | 22.7 | 0.2 | 56.8 | Negligible |
| R173 | 44.6 | 25.9 | 26.0 | 0.3 | 65.0 | Negligible |
| R174 | 57.0 | 31.7 | 31.9 | 0.5 | 79.8 | Negligible |
| R175 | 26.3 | 14.8 | 15.1 | 0.6 | 37.8 | Negligible |
| R176 | 16.2 | 9.9 | 9.9 | <0.1 | 24.8 | Negligible |
| R181 | 28.1 | 17.9 | 18.0 | 0.1 | 45.0 | Negligible |
| R182 | 36.3 | 21.5 | 21.6 | 0.3 | 54.0 | Negligible |
| R183 | 27.5 | 17.5 | 17.6 | 0.3 | 44.0 | Negligible |
| R184 | 19.5 | 12.2 | 12.3 | 0.3 | 30.8 | Negligible |
| R185 | 19.6 | 12.2 | 12.3 | 0.3 | 30.8 | Negligible |
| R186 | 36.4 | 21.7 | 21.8 | 0.2 | 54.5 | Negligible |
| R187 | 25.5 | 16.6 | 16.7 | 0.2 | 41.8 | Negligible |

| Receptor | Predicted Annual Mean $NO_2$ Concentration (µg/m³) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| *NKDC* | | | | | | |
| R70 | 25.5 | 14.4 | 14.5 | 0.2 | 36.3 | Negligible |
| R71 | 30.0 | 16.3 | 16.4 | 0.2 | 41.0 | Negligible |
| R72 | 26.6 | 14.9 | 14.9 | 0.2 | 37.3 | Negligible |
| R73 | 23.1 | 13.4 | 13.4 | 0.2 | 33.5 | Negligible |
| R74 | 23.1 | 13.3 | 13.4 | 0.2 | 33.5 | Negligible |
| R75 | 28.8 | 15.8 | 15.9 | 0.2 | 39.8 | Negligible |
| R76 | 25.6 | 14.4 | 14.5 | 0.2 | 36.3 | Negligible |
| R77 | 23.2 | 13.4 | 13.5 | 0.2 | 33.8 | Negligible |
| R78 | 28.7 | 15.8 | 15.9 | 0.2 | 39.8 | Negligible |
| R79 | 19.1 | 11.7 | 11.7 | <0.1 | 29.3 | Negligible |
| R80 | 17.0 | 10.8 | 10.8 | 0.1 | 27.0 | Negligible |
| R81 | 32.8 | 17.9 | 17.9 | 0.2 | 44.8 | Negligible |
| R82 | 17.6 | 11.3 | 11.4 | <0.1 | 28.5 | Negligible |
| *SHDC* | | | | | | |
| R160 | 20.0 | 11.1 | 11.2 | 0.2 | 28.0 | Negligible |
| R163 | 18.4 | 10.8 | 10.8 | <0.1 | 27.0 | Negligible |
| R164 | 32.1 | 15.7 | 15.7 | 0.2 | 39.3 | Negligible |

### 19.11.1.2 PM$_{10}$ Modelling Results

100. Table 19.16 presents the annual mean $PM_{10}$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

101. In accordance with EPUK & IAQM guidance, the impact of the Project on annual mean $PM_{10}$ concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean $PM_{10}$ concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean $PM_{10}$ AQAL, unmitigated effects associated with annual mean $PM_{10}$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

102. Based upon the maximum predicted annual mean $PM_{10}$ concentration of 25.0µg/m³ (predicted at R95 in 2027 DS), this equates to 13-days where 24-hour mean $PM_{10}$ concentrations are predicted to be greater than 50µg/m³. This is well below the 35

permitted exceedances, and therefore the number of maximum exceedances is in compliance with the 24-hour mean AQAL. Effects associated with likely 24-hour mean $PM_{10}$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

**Table 19.16: Predicted Annual Mean $PM_{10}$ Concentrations – 2027 Construction Year**

| Receptor | Predicted Annual Mean $PM_{10}$ Concentration (µg/m³) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| *ELDC* | | | | | | |
| R1 | 16.2 | 15.3 | 15.4 | 0.2 | 38.5 | Negligible |
| R2 | 16.3 | 15.4 | 15.4 | 0.2 | 38.5 | Negligible |
| R3 | 15.9 | 15.0 | 15.0 | 0.1 | 37.5 | Negligible |
| R4 | 15.6 | 14.7 | 14.7 | 0.2 | 36.8 | Negligible |
| R5 | 16.5 | 15.6 | 15.7 | 0.3 | 39.3 | Negligible |
| R6 | 16.0 | 15.1 | 15.2 | 0.2 | 38.0 | Negligible |
| R7 | 16.5 | 15.6 | 15.7 | 0.3 | 39.3 | Negligible |
| R8 | 16.7 | 15.7 | 15.8 | 0.3 | 39.5 | Negligible |
| R9 | 15.8 | 14.9 | 14.9 | 0.1 | 37.3 | Negligible |
| R10 | 15.9 | 15.0 | 15.0 | 0.2 | 37.5 | Negligible |
| R11 | 16.5 | 15.5 | 15.7 | 0.3 | 39.3 | Negligible |
| R12 | 15.9 | 15.0 | 15.0 | 0.2 | 37.5 | Negligible |
| R13 | 16.5 | 15.5 | 15.7 | 0.4 | 39.3 | Negligible |
| R14 | 16.5 | 15.5 | 15.7 | 0.4 | 39.3 | Negligible |
| R15 | 16.8 | 15.8 | 15.9 | 0.3 | 39.8 | Negligible |
| R16 | 16.9 | 15.9 | 16.1 | 0.4 | 40.3 | Negligible |
| R17 | 17.0 | 16.0 | 16.1 | 0.4 | 40.3 | Negligible |
| R18 | 16.6 | 15.6 | 15.7 | 0.3 | 39.3 | Negligible |
| R19 | 16.9 | 15.9 | 16.0 | 0.3 | 40.0 | Negligible |
| R20 | 17.2 | 16.2 | 16.3 | 0.3 | 40.8 | Negligible |
| R21 | 16.9 | 15.9 | 16.0 | 0.3 | 40.0 | Negligible |
| R22 | 17.7 | 16.7 | 16.9 | 0.5 | 42.3 | Negligible |
| R23 | 16.8 | 15.8 | 15.9 | 0.3 | 39.8 | Negligible |
| R24 | 17.5 | 16.5 | 16.7 | 0.4 | 41.8 | Negligible |
| R25 | 16.6 | 15.6 | 15.7 | 0.2 | 39.3 | Negligible |
| R26 | 17.4 | 16.4 | 16.6 | 0.4 | 41.5 | Negligible |
| R27 | 17.5 | 16.5 | 16.6 | 0.4 | 41.5 | Negligible |
| R28 | 17.3 | 16.3 | 16.4 | 0.4 | 41.0 | Negligible |

| Receptor | Predicted Annual Mean PM$_{10}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R29 | 17.6 | 16.6 | 16.8 | 0.4 | 42.0 | Negligible |
| R30 | 17.3 | 16.3 | 16.5 | 0.4 | 41.3 | Negligible |
| R31 | 17.0 | 16.0 | 16.1 | 0.3 | 40.3 | Negligible |
| R32 | 16.7 | 15.7 | 15.8 | 0.2 | 39.5 | Negligible |
| R33 | 17.0 | 16.0 | 16.1 | 0.3 | 40.3 | Negligible |
| R34 | 16.8 | 15.8 | 15.9 | 0.2 | 39.8 | Negligible |
| R35 | 16.9 | 15.9 | 16.0 | 0.3 | 40.0 | Negligible |
| R36 | 17.5 | 16.4 | 16.6 | 0.4 | 41.5 | Negligible |
| R37 | 16.5 | 15.4 | 15.5 | 0.4 | 38.8 | Negligible |
| R38 | 15.9 | 14.9 | 15.0 | 0.2 | 37.5 | Negligible |
| R39 | 16.0 | 14.9 | 15.0 | 0.2 | 37.5 | Negligible |
| R40 | 16.6 | 15.6 | 15.7 | 0.4 | 39.3 | Negligible |
| R41 | 16.4 | 15.3 | 15.4 | 0.3 | 38.5 | Negligible |
| R42 | 16.3 | 15.2 | 15.3 | 0.3 | 38.3 | Negligible |
| R43 | 16.3 | 15.3 | 15.4 | 0.3 | 38.5 | Negligible |
| R44 | 16.8 | 15.7 | 15.9 | 0.4 | 39.8 | Negligible |
| R45 | 16.7 | 15.6 | 15.7 | 0.3 | 39.3 | Negligible |
| R46 | 15.8 | 14.8 | 14.9 | 0.3 | 37.3 | Negligible |
| R47 | 16.3 | 15.3 | 15.4 | 0.4 | 38.5 | Negligible |
| R48 | 15.9 | 14.9 | 14.9 | 0.2 | 37.3 | Negligible |
| R49 | 16.1 | 15.1 | 15.2 | 0.3 | 38.0 | Negligible |
| R50 | 15.9 | 14.9 | 15.0 | 0.2 | 37.5 | Negligible |
| R51 | 16.0 | 15.0 | 15.1 | 0.3 | 37.8 | Negligible |
| R52 | 15.9 | 14.9 | 14.9 | <0.1 | 37.3 | Negligible |
| R118 | 17.5 | 16.5 | 16.6 | 0.2 | 41.5 | Negligible |
| R119 | 17.3 | 16.3 | 16.4 | 0.2 | 41.0 | Negligible |
| R120 | 17.4 | 16.4 | 16.5 | 0.2 | 41.3 | Negligible |
| R121 | 17.8 | 16.8 | 16.9 | 0.3 | 42.3 | Negligible |
| R122 | 16.6 | 15.6 | 15.7 | 0.3 | 39.3 | Negligible |
| R123 | 17.3 | 16.2 | 16.3 | 0.2 | 40.8 | Negligible |
| R124 | 18.1 | 17.1 | 17.2 | 0.3 | 43.0 | Negligible |
| R125 | 17.0 | 16.0 | 16.0 | 0.1 | 40.0 | Negligible |
| R126 | 17.5 | 16.5 | 16.6 | 0.2 | 41.5 | Negligible |
| R127 | 17.5 | 16.4 | 16.5 | 0.2 | 41.3 | Negligible |
| R128 | 17.2 | 16.1 | 16.2 | 0.2 | 40.5 | Negligible |

| Receptor | Predicted Annual Mean PM$_{10}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R129 | 17.6 | 16.6 | 16.7 | 0.3 | 41.8 | Negligible |
| R130 | 16.9 | 15.9 | 15.9 | 0.1 | 39.8 | Negligible |
| R131 | 16.7 | 15.7 | 15.7 | 0.1 | 39.3 | Negligible |
| R132 | 16.7 | 15.7 | 15.7 | 0.2 | 39.3 | Negligible |
| R133 | 17.4 | 16.4 | 16.5 | 0.3 | 41.3 | Negligible |
| R134 | 16.8 | 15.8 | 15.8 | 0.2 | 39.5 | Negligible |
| R135 | 17.6 | 16.5 | 16.6 | 0.3 | 41.5 | Negligible |
| R136 | 16.8 | 15.7 | 15.8 | 0.2 | 39.5 | Negligible |
| R137 | 17.5 | 16.5 | 16.6 | 0.3 | 41.5 | Negligible |
| R138 | 16.8 | 15.7 | 15.8 | 0.2 | 39.5 | Negligible |
| R139 | 17.6 | 16.5 | 16.7 | 0.3 | 41.8 | Negligible |
| R140 | 17.9 | 16.9 | 17.0 | 0.2 | 42.5 | Negligible |
| R141 | 17.9 | 16.9 | 17.0 | 0.2 | 42.5 | Negligible |
| R142 | 18.5 | 17.5 | 17.7 | 0.3 | 44.3 | Negligible |
| R143 | 18.2 | 17.3 | 17.4 | 0.3 | 43.5 | Negligible |
| R144 | 16.9 | 15.9 | 16.0 | 0.2 | 40.0 | Negligible |
| R145 | 16.5 | 15.6 | 15.6 | 0.1 | 39.0 | Negligible |
| R146 | 19.5 | 17.3 | 17.6 | 0.6 | 44.0 | Negligible |
| R147 | 16.2 | 15.2 | 15.2 | 0.2 | 38.0 | Negligible |
| R148 | 15.7 | 14.8 | 14.8 | 0.2 | 37.0 | Negligible |
| R149 | 15.8 | 14.8 | 14.9 | 0.3 | 37.3 | Negligible |
| R150 | 16.4 | 15.4 | 15.5 | 0.3 | 38.8 | Negligible |
| R151 | 15.8 | 14.8 | 14.9 | 0.2 | 37.3 | Negligible |
| R152 | 15.8 | 14.8 | 14.9 | 0.1 | 37.3 | Negligible |
| R153 | 16.4 | 15.4 | 15.5 | 0.2 | 38.8 | Negligible |
| R154 | 17.6 | 16.6 | 16.7 | 0.4 | 41.8 | Negligible |
| R155 | 18.5 | 17.5 | 17.7 | 0.3 | 44.3 | Negligible |
| R165 | 16.7 | 15.7 | 15.8 | 0.3 | 39.5 | Negligible |
| R166 | 16.2 | 15.2 | 15.3 | 0.2 | 38.3 | Negligible |
| R167 | 15.6 | 14.6 | 14.7 | 0.2 | 36.8 | Negligible |
| R168 | 16.5 | 15.4 | 15.6 | 0.5 | 39.0 | Negligible |
| R169 | 15.9 | 14.8 | 15.0 | 0.3 | 37.5 | Negligible |
| R170 | 17.5 | 16.5 | 16.6 | 0.3 | 41.5 | Negligible |
| R171 | 17.6 | 16.6 | 16.7 | 0.3 | 41.8 | Negligible |
| R177 | 15.9 | 14.8 | 14.9 | 0.3 | 37.3 | Negligible |

| Receptor | Predicted Annual Mean PM$_{10}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R178 | 16.8 | 15.8 | 15.8 | 0.2 | 39.5 | Negligible |
| R179 | 16.7 | 15.7 | 15.7 | 0.2 | 39.3 | Negligible |
| R180 | 17.0 | 16.0 | 16.1 | 0.2 | 40.3 | Negligible |
| *BBC* | | | | | | |
| R53 | 18.7 | 18.5 | 18.6 | 0.1 | 46.5 | Negligible |
| R54 | 18.0 | 18.1 | 18.2 | 0.1 | 45.5 | Negligible |
| R55 | 17.2 | 16.8 | 16.9 | <0.1 | 42.3 | Negligible |
| R56 | 19.2 | 19.8 | 19.9 | 0.2 | 49.8 | Negligible |
| R57 | 18.2 | 18.1 | 18.2 | 0.1 | 45.5 | Negligible |
| R58 | 19.0 | 19.4 | 19.5 | 0.2 | 48.8 | Negligible |
| R59 | 18.2 | 18.2 | 18.2 | 0.1 | 45.5 | Negligible |
| R60 | 17.3 | 16.9 | 16.9 | <0.1 | 42.3 | Negligible |
| R61 | 17.7 | 17.6 | 17.6 | 0.1 | 44.0 | Negligible |
| R62 | 17.8 | 17.8 | 17.9 | 0.1 | 44.8 | Negligible |
| R63 | 17.2 | 16.8 | 16.9 | <0.1 | 42.3 | Negligible |
| R64 | 18.2 | 18.4 | 18.5 | 0.2 | 46.3 | Negligible |
| R65 | 18.1 | 18.1 | 18.1 | 0.2 | 45.3 | Negligible |
| R66 | 18.1 | 17.2 | 17.2 | <0.1 | 43.0 | Negligible |
| R67 | 18.3 | 17.4 | 17.5 | 0.1 | 43.8 | Negligible |
| R68 | 20.8 | 19.8 | 19.9 | 0.2 | 49.8 | Negligible |
| R69 | 20.1 | 19.1 | 19.2 | 0.2 | 48.0 | Negligible |
| R83 | 18.4 | 17.4 | 17.5 | <0.1 | 43.8 | Negligible |
| R84 | 19.9 | 18.9 | 18.9 | 0.2 | 47.3 | Negligible |
| R85 | 19.4 | 18.3 | 18.4 | 0.1 | 46.0 | Negligible |
| R86 | 18.1 | 17.0 | 17.1 | <0.1 | 42.8 | Negligible |
| R87 | 17.1 | 16.1 | 16.1 | <0.1 | 40.3 | Negligible |
| R88 | 17.8 | 16.6 | 16.7 | 0.1 | 41.8 | Negligible |
| R89 | 18.7 | 17.6 | 17.7 | <0.1 | 44.3 | Negligible |
| R90 | 19.1 | 18.0 | 18.0 | <0.1 | 45.0 | Negligible |
| R91 | 18.0 | 16.9 | 16.9 | <0.1 | 42.3 | Negligible |
| R92 | 18.0 | 16.8 | 16.8 | <0.1 | 42.0 | Negligible |
| R93 | 21.0 | 19.9 | 20.0 | 0.2 | 50.0 | Negligible |
| R94 | 21.2 | 20.0 | 20.1 | 0.1 | 50.3 | Negligible |
| R95 | 26.1 | 24.9 | 25.1 | 0.3 | 62.8 | Negligible |
| R96 | 18.8 | 17.6 | 17.7 | 0.1 | 44.3 | Negligible |

| Receptor | Predicted Annual Mean PM$_{10}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R97 | 20.9 | 19.6 | 19.7 | 0.1 | 49.3 | Negligible |
| R98 | 17.6 | 16.4 | 16.5 | <0.1 | 41.3 | Negligible |
| R99 | 17.8 | 16.6 | 16.7 | <0.1 | 41.8 | Negligible |
| R100 | 18.1 | 17.3 | 17.4 | <0.1 | 43.5 | Negligible |
| R101 | 22.2 | 21.2 | 21.2 | 0.2 | 53.0 | Negligible |
| R102 | 21.2 | 20.2 | 20.2 | 0.2 | 50.5 | Negligible |
| R103 | 21.6 | 20.5 | 20.6 | 0.2 | 51.5 | Negligible |
| R104 | 20.2 | 19.2 | 19.2 | 0.2 | 48.0 | Negligible |
| R105 | 25.5 | 24.0 | 24.2 | 0.4 | 60.5 | Negligible |
| R106 | 22.2 | 20.9 | 21.0 | 0.3 | 52.5 | Negligible |
| R107 | 19.2 | 18.1 | 18.2 | 0.2 | 45.5 | Negligible |
| R108 | 19.3 | 18.3 | 18.4 | 0.2 | 46.0 | Negligible |
| R109 | 20.5 | 19.5 | 19.6 | 0.3 | 49.0 | Negligible |
| R110 | 16.6 | 15.5 | 15.6 | 0.1 | 39.0 | Negligible |
| R111 | 16.2 | 15.1 | 15.2 | 0.1 | 38.0 | Negligible |
| R112 | 16.5 | 15.3 | 15.4 | 0.2 | 38.5 | Negligible |
| R113 | 17.1 | 16.1 | 16.2 | 0.1 | 40.5 | Negligible |
| R114 | 18.1 | 17.1 | 17.2 | 0.3 | 43.0 | Negligible |
| R115 | 17.2 | 16.1 | 16.2 | 0.2 | 40.5 | Negligible |
| R116 | 17.2 | 16.2 | 16.3 | 0.2 | 40.8 | Negligible |
| R117 | 17.7 | 16.6 | 16.7 | 0.3 | 41.8 | Negligible |
| R156 | 18.6 | 17.6 | 17.7 | 0.3 | 44.3 | Negligible |
| R157 | 19.0 | 18.0 | 18.1 | 0.3 | 45.3 | Negligible |
| R158 | 19.0 | 18.0 | 18.1 | 0.3 | 45.3 | Negligible |
| R159 | 18.9 | 17.9 | 18.0 | 0.3 | 45.0 | Negligible |
| R161 | 18.5 | 17.4 | 17.4 | <0.1 | 43.5 | Negligible |
| R162 | 18.9 | 17.8 | 17.8 | <0.1 | 44.5 | Negligible |
| R172 | 21.0 | 20.0 | 20.1 | 0.2 | 50.3 | Negligible |
| R173 | 22.3 | 21.4 | 21.5 | 0.2 | 53.8 | Negligible |
| R174 | 25.3 | 24.2 | 24.3 | 0.3 | 60.8 | Negligible |
| R175 | 19.9 | 18.9 | 19.0 | 0.4 | 47.5 | Negligible |
| R176 | 18.3 | 17.2 | 17.2 | <0.1 | 43.0 | Negligible |
| R181 | 18.7 | 17.5 | 17.6 | <0.1 | 44.0 | Negligible |
| R182 | 20.1 | 19.1 | 19.1 | 0.2 | 47.8 | Negligible |
| R183 | 18.0 | 17.0 | 17.1 | 0.2 | 42.8 | Negligible |

| Receptor | Predicted Annual Mean PM$_{10}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R184 | 18.9 | 17.9 | 18.0 | 0.3 | 45.0 | Negligible |
| R185 | 18.8 | 17.8 | 17.9 | 0.3 | 44.8 | Negligible |
| R186 | 20.2 | 19.2 | 19.3 | 0.2 | 48.3 | Negligible |
| R187 | 17.9 | 16.9 | 16.9 | 0.2 | 42.3 | Negligible |
| *NKDC* | | | | | | |
| R70 | 20.6 | 19.6 | 19.7 | 0.2 | 49.3 | Negligible |
| R71 | 21.7 | 20.7 | 20.9 | 0.3 | 52.3 | Negligible |
| R72 | 20.9 | 19.9 | 20.0 | 0.2 | 50.0 | Negligible |
| R73 | 20.0 | 19.0 | 19.1 | 0.2 | 47.8 | Negligible |
| R74 | 20.0 | 19.0 | 19.1 | 0.2 | 47.8 | Negligible |
| R75 | 21.4 | 20.5 | 20.6 | 0.3 | 51.5 | Negligible |
| R76 | 20.6 | 19.6 | 19.7 | 0.2 | 49.3 | Negligible |
| R77 | 20.0 | 19.1 | 19.1 | 0.2 | 47.8 | Negligible |
| R78 | 21.4 | 20.5 | 20.6 | 0.3 | 51.5 | Negligible |
| R79 | 19.0 | 18.1 | 18.1 | 0.1 | 45.3 | Negligible |
| R80 | 18.4 | 17.5 | 17.5 | 0.1 | 43.8 | Negligible |
| R81 | 21.2 | 20.1 | 20.2 | 0.2 | 50.5 | Negligible |
| R82 | 18.7 | 17.7 | 17.7 | <0.1 | 44.3 | Negligible |
| *SHDC* | | | | | | |
| R160 | 19.3 | 18.2 | 18.3 | 0.2 | 45.8 | Negligible |
| R163 | 19.1 | 18.1 | 18.1 | <0.1 | 45.3 | Negligible |
| R164 | 22.8 | 21.6 | 21.7 | 0.2 | 54.3 | Negligible |

### 19.11.1.3 PM$_{2.5}$ Modelling Results

103.     Table 19.17 presents the annual mean PM$_{2.5}$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

104.     In accordance with EPUK & IAQM guidance, the impact of the Project on annual mean PM$_{2.5}$ concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean PM$_{2.5}$ concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean PM$_{2.5}$ AQAL, unmitigated effects associated with annual mean PM$_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

**Table 19.17: Predicted Annual Mean PM$_{2.5}$ Concentrations – 2027 Construction Year**

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m³) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| **ELDC** | | | | | | |
| R1 | 9.0 | 8.4 | 8.4 | 0.2 | 42.0 | Negligible |
| R2 | 9.0 | 8.4 | 8.4 | 0.2 | 42.0 | Negligible |
| R3 | 8.7 | 8.1 | 8.2 | 0.1 | 41.0 | Negligible |
| R4 | 8.7 | 8.1 | 8.2 | 0.2 | 41.0 | Negligible |
| R5 | 9.2 | 8.6 | 8.7 | 0.4 | 43.5 | Negligible |
| R6 | 8.9 | 8.3 | 8.4 | 0.2 | 42.0 | Negligible |
| R7 | 9.2 | 8.6 | 8.7 | 0.4 | 43.5 | Negligible |
| R8 | 9.3 | 8.6 | 8.7 | 0.3 | 43.5 | Negligible |
| R9 | 8.8 | 8.2 | 8.2 | 0.2 | 41.0 | Negligible |
| R10 | 8.9 | 8.3 | 8.4 | 0.2 | 42.0 | Negligible |
| R11 | 9.3 | 8.6 | 8.7 | 0.4 | 43.5 | Negligible |
| R12 | 8.9 | 8.3 | 8.4 | 0.2 | 42.0 | Negligible |
| R13 | 9.3 | 8.7 | 8.7 | 0.4 | 43.5 | Negligible |
| R14 | 9.3 | 8.7 | 8.7 | 0.4 | 43.5 | Negligible |
| R15 | 9.3 | 8.7 | 8.7 | 0.4 | 43.5 | Negligible |
| R16 | 9.4 | 8.7 | 8.8 | 0.4 | 44.0 | Negligible |
| R17 | 9.5 | 8.8 | 8.8 | 0.4 | 44.0 | Negligible |
| R18 | 9.2 | 8.5 | 8.6 | 0.3 | 43.0 | Negligible |
| R19 | 9.3 | 8.7 | 8.7 | 0.3 | 43.5 | Negligible |
| R20 | 9.5 | 8.8 | 8.9 | 0.4 | 44.5 | Negligible |
| R21 | 9.3 | 8.7 | 8.7 | 0.3 | 43.5 | Negligible |
| R22 | 9.8 | 9.1 | 9.2 | 0.5 | 46.0 | Negligible |
| R23 | 9.3 | 8.6 | 8.7 | 0.3 | 43.5 | Negligible |
| R24 | 9.7 | 9.0 | 9.1 | 0.5 | 45.5 | Negligible |
| R25 | 9.2 | 8.5 | 8.6 | 0.2 | 43.0 | Negligible |
| R26 | 9.7 | 9.0 | 9.1 | 0.5 | 45.5 | Negligible |
| R27 | 9.7 | 9.0 | 9.1 | 0.4 | 45.5 | Negligible |
| R28 | 9.6 | 8.9 | 9.0 | 0.4 | 45.0 | Negligible |
| R29 | 9.7 | 9.1 | 9.2 | 0.5 | 46.0 | Negligible |
| R30 | 9.6 | 8.9 | 9.0 | 0.4 | 45.0 | Negligible |
| R31 | 9.4 | 8.8 | 8.8 | 0.3 | 44.0 | Negligible |
| R32 | 9.2 | 8.5 | 8.6 | 0.3 | 43.0 | Negligible |
| R33 | 9.4 | 8.7 | 8.8 | 0.3 | 44.0 | Negligible |

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R34 | 9.3 | 8.6 | 8.6 | 0.2 | 43.0 | Negligible |
| R35 | 9.3 | 8.7 | 8.7 | 0.3 | 43.5 | Negligible |
| R36 | 9.7 | 9.0 | 9.1 | 0.4 | 45.5 | Negligible |
| R37 | 9.7 | 9.0 | 9.0 | 0.4 | 45.0 | Negligible |
| R38 | 9.4 | 8.7 | 8.7 | 0.2 | 43.5 | Negligible |
| R39 | 9.4 | 8.7 | 8.8 | 0.3 | 44.0 | Negligible |
| R40 | 9.8 | 9.1 | 9.1 | 0.4 | 45.5 | Negligible |
| R41 | 9.6 | 8.9 | 9.0 | 0.3 | 45.0 | Negligible |
| R42 | 9.6 | 8.9 | 8.9 | 0.3 | 44.5 | Negligible |
| R43 | 9.6 | 8.9 | 9.0 | 0.3 | 45.0 | Negligible |
| R44 | 9.9 | 9.1 | 9.2 | 0.4 | 46.0 | Negligible |
| R45 | 9.9 | 9.1 | 9.2 | 0.4 | 46.0 | Negligible |
| R46 | 8.9 | 8.3 | 8.3 | 0.4 | 41.5 | Negligible |
| R47 | 9.1 | 8.4 | 8.5 | 0.4 | 42.5 | Negligible |
| R48 | 8.8 | 8.2 | 8.2 | 0.2 | 41.0 | Negligible |
| R49 | 8.9 | 8.3 | 8.4 | 0.3 | 42.0 | Negligible |
| R50 | 8.8 | 8.2 | 8.2 | 0.2 | 41.0 | Negligible |
| R51 | 8.9 | 8.3 | 8.4 | 0.4 | 42.0 | Negligible |
| R52 | 8.7 | 8.1 | 8.1 | 0.1 | 40.5 | Negligible |
| R118 | 9.8 | 9.1 | 9.2 | 0.2 | 46.0 | Negligible |
| R119 | 9.6 | 9.0 | 9.0 | 0.2 | 45.0 | Negligible |
| R120 | 9.7 | 9.0 | 9.1 | 0.2 | 45.5 | Negligible |
| R121 | 9.9 | 9.2 | 9.3 | 0.3 | 46.5 | Negligible |
| R122 | 9.6 | 8.9 | 9.0 | 0.3 | 45.0 | Negligible |
| R123 | 9.5 | 8.8 | 8.8 | 0.2 | 44.0 | Negligible |
| R124 | 10.0 | 9.3 | 9.4 | 0.3 | 47.0 | Negligible |
| R125 | 9.3 | 8.7 | 8.7 | 0.1 | 43.5 | Negligible |
| R126 | 9.6 | 8.9 | 9.0 | 0.2 | 45.0 | Negligible |
| R127 | 9.7 | 9.0 | 9.0 | 0.3 | 45.0 | Negligible |
| R128 | 9.5 | 8.8 | 8.9 | 0.2 | 44.5 | Negligible |
| R129 | 9.8 | 9.1 | 9.1 | 0.3 | 45.5 | Negligible |
| R130 | 9.3 | 8.7 | 8.7 | 0.2 | 43.5 | Negligible |
| R131 | 9.2 | 8.6 | 8.6 | 0.1 | 43.0 | Negligible |
| R132 | 9.3 | 8.7 | 8.7 | 0.2 | 43.5 | Negligible |
| R133 | 9.8 | 9.1 | 9.1 | 0.3 | 45.5 | Negligible |

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R134 | 9.4 | 8.7 | 8.8 | 0.2 | 44.0 | Negligible |
| R135 | 9.8 | 9.1 | 9.2 | 0.3 | 46.0 | Negligible |
| R136 | 9.4 | 8.7 | 8.8 | 0.2 | 44.0 | Negligible |
| R137 | 9.8 | 9.1 | 9.2 | 0.3 | 46.0 | Negligible |
| R138 | 9.4 | 8.7 | 8.8 | 0.2 | 44.0 | Negligible |
| R139 | 9.8 | 9.1 | 9.2 | 0.3 | 46.0 | Negligible |
| R140 | 9.7 | 9.0 | 9.1 | 0.3 | 45.5 | Negligible |
| R141 | 9.6 | 9.0 | 9.0 | 0.2 | 45.0 | Negligible |
| R142 | 10.0 | 9.4 | 9.4 | 0.4 | 47.0 | Negligible |
| R143 | 9.9 | 9.2 | 9.3 | 0.3 | 46.5 | Negligible |
| R144 | 9.4 | 8.8 | 8.8 | 0.2 | 44.0 | Negligible |
| R145 | 9.2 | 8.6 | 8.6 | 0.1 | 43.0 | Negligible |
| R146 | 10.9 | 9.5 | 9.6 | 0.6 | 48.0 | Negligible |
| R147 | 9.1 | 8.5 | 8.5 | 0.2 | 42.5 | Negligible |
| R148 | 9.0 | 8.3 | 8.4 | 0.2 | 42.0 | Negligible |
| R149 | 9.2 | 8.5 | 8.6 | 0.3 | 43.0 | Negligible |
| R150 | 9.4 | 8.7 | 8.8 | 0.3 | 44.0 | Negligible |
| R151 | 8.9 | 8.2 | 8.3 | 0.2 | 41.5 | Negligible |
| R152 | 8.8 | 8.1 | 8.2 | 0.2 | 41.0 | Negligible |
| R153 | 9.0 | 8.4 | 8.4 | 0.3 | 42.0 | Negligible |
| R154 | 10.1 | 9.4 | 9.5 | 0.4 | 47.5 | Negligible |
| R155 | 10.0 | 9.3 | 9.4 | 0.4 | 47.0 | Negligible |
| R165 | 9.6 | 8.8 | 8.9 | 0.3 | 44.5 | Negligible |
| R166 | 9.3 | 8.6 | 8.7 | 0.3 | 43.5 | Negligible |
| R167 | 9.2 | 8.5 | 8.6 | 0.3 | 43.0 | Negligible |
| R168 | 9.7 | 9.0 | 9.1 | 0.5 | 45.5 | Negligible |
| R169 | 9.3 | 8.7 | 8.7 | 0.3 | 43.5 | Negligible |
| R170 | 9.6 | 9.0 | 9.0 | 0.3 | 45.0 | Negligible |
| R171 | 9.7 | 9.0 | 9.1 | 0.3 | 45.5 | Negligible |
| R177 | 9.3 | 8.7 | 8.7 | 0.3 | 43.5 | Negligible |
| R178 | 9.2 | 8.6 | 8.6 | 0.2 | 43.0 | Negligible |
| R179 | 9.1 | 8.5 | 8.5 | 0.2 | 42.5 | Negligible |
| R180 | 9.4 | 8.7 | 8.8 | 0.2 | 44.0 | Negligible |
| *BBC* | | | | | | |
| R53 | 10.4 | 10.2 | 10.2 | 0.1 | 51.0 | Negligible |

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R54 | 10.0 | 9.9 | 9.9 | 0.2 | 49.5 | Negligible |
| R55 | 9.6 | 9.2 | 9.2 | <0.1 | 46.0 | Negligible |
| R56 | 10.7 | 10.8 | 10.9 | 0.2 | 54.5 | Negligible |
| R57 | 10.1 | 9.9 | 9.9 | 0.1 | 49.5 | Negligible |
| R58 | 10.6 | 10.6 | 10.7 | 0.2 | 53.5 | Negligible |
| R59 | 10.1 | 9.9 | 10.0 | 0.1 | 50.0 | Negligible |
| R60 | 9.6 | 9.2 | 9.3 | <0.1 | 46.5 | Negligible |
| R61 | 9.8 | 9.6 | 9.6 | 0.1 | 48.0 | Negligible |
| R62 | 9.9 | 9.7 | 9.7 | 0.1 | 48.5 | Negligible |
| R63 | 9.5 | 9.2 | 9.2 | <0.1 | 46.0 | Negligible |
| R64 | 10.0 | 10.0 | 10.1 | 0.2 | 50.5 | Negligible |
| R65 | 10.0 | 9.9 | 9.9 | 0.2 | 49.5 | Negligible |
| R66 | 10.0 | 9.4 | 9.4 | <0.1 | 47.0 | Negligible |
| R67 | 10.1 | 9.5 | 9.5 | 0.1 | 47.5 | Negligible |
| R68 | 11.5 | 10.8 | 10.8 | 0.2 | 54.0 | Negligible |
| R69 | 11.1 | 10.4 | 10.4 | 0.2 | 52.0 | Negligible |
| R83 | 10.3 | 9.6 | 9.6 | <0.1 | 48.0 | Negligible |
| R84 | 11.2 | 10.4 | 10.4 | 0.2 | 52.0 | Negligible |
| R85 | 10.9 | 10.1 | 10.1 | 0.1 | 50.5 | Negligible |
| R86 | 10.1 | 9.4 | 9.4 | <0.1 | 47.0 | Negligible |
| R87 | 10.1 | 9.4 | 9.4 | <0.1 | 47.0 | Negligible |
| R88 | 10.5 | 9.7 | 9.7 | 0.1 | 48.5 | Negligible |
| R89 | 11.1 | 10.3 | 10.3 | 0.1 | 51.5 | Negligible |
| R90 | 11.3 | 10.5 | 10.5 | <0.1 | 52.5 | Negligible |
| R91 | 10.6 | 9.9 | 9.9 | <0.1 | 49.5 | Negligible |
| R92 | 11.2 | 10.4 | 10.4 | <0.1 | 52.0 | Negligible |
| R93 | 13.1 | 12.2 | 12.2 | 0.2 | 61.0 | Negligible |
| R94 | 13.1 | 12.2 | 12.2 | 0.2 | 61.0 | Negligible |
| R95 | 16.0 | 14.9 | 15.0 | 0.3 | 75.0 | Negligible |
| R96 | 11.8 | 10.9 | 10.9 | 0.1 | 54.5 | Negligible |
| R97 | 13.0 | 12.0 | 12.0 | 0.1 | 60.0 | Negligible |
| R98 | 11.1 | 10.2 | 10.2 | <0.1 | 51.0 | Negligible |
| R99 | 11.2 | 10.3 | 10.4 | <0.1 | 52.0 | Negligible |
| R100 | 10.0 | 9.5 | 9.5 | <0.1 | 47.5 | Negligible |
| R101 | 13.7 | 12.8 | 12.9 | 0.2 | 64.5 | Negligible |

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| R102 | 13.1 | 12.3 | 12.3 | 0.2 | 61.5 | Negligible |
| R103 | 13.3 | 12.5 | 12.5 | 0.2 | 62.5 | Negligible |
| R104 | 12.5 | 11.7 | 11.7 | 0.2 | 58.5 | Negligible |
| R105 | 15.6 | 14.5 | 14.5 | 0.4 | 72.5 | Negligible |
| R106 | 13.7 | 12.7 | 12.8 | 0.3 | 64.0 | Negligible |
| R107 | 12.0 | 11.2 | 11.3 | 0.2 | 56.5 | Negligible |
| R108 | 12.0 | 11.3 | 11.3 | 0.2 | 56.5 | Negligible |
| R109 | 12.7 | 12.0 | 12.0 | 0.3 | 60.0 | Negligible |
| R110 | 10.0 | 9.3 | 9.3 | 0.1 | 46.5 | Negligible |
| R111 | 9.8 | 9.0 | 9.1 | 0.1 | 45.5 | Negligible |
| R112 | 9.9 | 9.2 | 9.2 | 0.2 | 46.0 | Negligible |
| R113 | 9.6 | 8.9 | 9.0 | 0.1 | 45.0 | Negligible |
| R114 | 10.2 | 9.5 | 9.5 | 0.3 | 47.5 | Negligible |
| R115 | 9.6 | 8.9 | 8.9 | 0.2 | 44.5 | Negligible |
| R116 | 9.6 | 8.9 | 9.0 | 0.2 | 45.0 | Negligible |
| R117 | 9.9 | 9.2 | 9.2 | 0.3 | 46.0 | Negligible |
| R156 | 10.7 | 10.0 | 10.0 | 0.3 | 50.0 | Negligible |
| R157 | 10.6 | 9.9 | 10.0 | 0.3 | 50.0 | Negligible |
| R158 | 10.6 | 9.9 | 10.0 | 0.3 | 50.0 | Negligible |
| R159 | 10.4 | 9.7 | 9.8 | 0.3 | 49.0 | Negligible |
| R161 | 10.3 | 9.6 | 9.6 | <0.1 | 48.0 | Negligible |
| R162 | 10.5 | 9.8 | 9.8 | <0.1 | 49.0 | Negligible |
| R172 | 13.0 | 12.2 | 12.2 | 0.2 | 61.0 | Negligible |
| R173 | 13.8 | 13.0 | 13.0 | 0.2 | 65.0 | Negligible |
| R174 | 15.5 | 14.5 | 14.6 | 0.4 | 73.0 | Negligible |
| R175 | 11.2 | 10.4 | 10.5 | 0.4 | 52.5 | Negligible |
| R176 | 10.2 | 9.5 | 9.5 | <0.1 | 47.5 | Negligible |
| R181 | 11.6 | 10.8 | 10.8 | 0.1 | 54.0 | Negligible |
| R182 | 12.5 | 11.7 | 11.7 | 0.2 | 58.5 | Negligible |
| R183 | 11.3 | 10.6 | 10.6 | 0.2 | 53.0 | Negligible |
| R184 | 10.7 | 9.9 | 10.0 | 0.3 | 50.0 | Negligible |
| R185 | 10.5 | 9.8 | 9.9 | 0.3 | 49.5 | Negligible |
| R186 | 12.6 | 11.8 | 11.8 | 0.2 | 59.0 | Negligible |
| R187 | 10.8 | 10.0 | 10.1 | 0.2 | 50.5 | Negligible |

| Receptor | Predicted Annual Mean PM$_{2.5}$ Concentration (µg/m$^3$) | | | % Change of AQAL | % of 2027 DS Relative to AQAL | EPUK & IAQM Impact Descriptor |
|---|---|---|---|---|---|---|
| | 2019 BC | 2027 DM | 2027 DS | | | |
| **NKDC** | | | | | | |
| R70 | 11.4 | 10.7 | 10.7 | 0.2 | 53.5 | Negligible |
| R71 | 12.0 | 11.3 | 11.4 | 0.3 | 57.0 | Negligible |
| R72 | 11.6 | 10.8 | 10.9 | 0.2 | 54.5 | Negligible |
| R73 | 11.1 | 10.4 | 10.4 | 0.2 | 52.0 | Negligible |
| R74 | 11.0 | 10.4 | 10.4 | 0.2 | 52.0 | Negligible |
| R75 | 11.9 | 11.2 | 11.2 | 0.3 | 56.0 | Negligible |
| R76 | 11.4 | 10.7 | 10.7 | 0.2 | 53.5 | Negligible |
| R77 | 11.1 | 10.4 | 10.4 | 0.2 | 52.0 | Negligible |
| R78 | 11.9 | 11.2 | 11.2 | 0.3 | 56.0 | Negligible |
| R79 | 10.5 | 9.8 | 9.8 | 0.1 | 49.0 | Negligible |
| R80 | 10.1 | 9.5 | 9.5 | 0.1 | 47.5 | Negligible |
| R81 | 11.8 | 11.0 | 11.0 | 0.3 | 55.0 | Negligible |
| R82 | 10.2 | 9.6 | 9.6 | <0.1 | 48.0 | Negligible |
| **SHDC** | | | | | | |
| R160 | 10.9 | 10.2 | 10.2 | 0.2 | 51.0 | Negligible |
| R163 | 10.7 | 9.9 | 9.9 | <0.1 | 49.5 | Negligible |
| R164 | 12.8 | 11.8 | 11.9 | 0.2 | 59.5 | Negligible |

## 19.11.2  Ecological Receptors

105. Results presented herein relate to the maximum modelled impact at each individual ecological designation requiring detailed assessment and as such, represents a conservative outlook. Multiple habitats have been considered where present, however, the maximum impact across the habitats is presented.

### 19.11.2.1 NO$_x$ Critical Level Modelling Results

106. Table 19.18 presents the maximum modelled 2027 annual mean NO$_x$ Critical Level (30µg/m$^3$) impacts at all applicable ecological receptor locations for initial screening.

107. At the SSSI (ER1), the maximum increases in annual mean NO$_x$ concentrations as a result of the Project (both alone and in-combination) are predicted to be <1% of the Critical Level and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

108. At the local sites ER14, ER15, ER16, ER17, ER18, ER20, ER21, ER26, ER28, ER29, ER32, ER35 and ER36, the maximum increases in annual mean $NO_x$ concentrations as a result of the Project (both alone and in-combination), are predicted to be <1% of the Critical Level and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

109. At the remaining local sites ER5, ER6, ER7, ER8, ER9, ER10, ER11, ER12, ER13, ER22, ER25, ER31, ER33, ER34, ER41, ER43 and ER46, the maximum increases in annual mean $NO_x$ concentrations as a result of the Project (both alone and/or in-combination) are predicted to be >1% of the Critical Level. Further assessment of impacts is therefore required, as presented in Table 19.18.

**Table 19.18: Maximum Predicted Annual Mean $NO_x$ Impacts – 2027 Construction Year**

| ID | Designation | Maximum Modelled Contribution | | | | Further Assessment? |
|---|---|---|---|---|---|---|
| | | Project Alone | | In-Combination | | |
| | | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level | |
| ER1 | SSSI | 0.2 | 0.5 | 0.2 | 0.5 | No |
| ER5 | LNR | 0.2 | 0.7 | 0.4 | 1.3 | Yes |
| ER6 | LWS | 0.4 | 1.3 | 0.7 | 2.4 | Yes |
| ER7 | LWS | 0.4 | 1.4 | 0.4 | 1.4 | Yes |
| ER8 | LWS | 0.3 | 1.0 | 0.6 | 1.9 | Yes |
| ER9 | LWS | 0.4 | 1.4 | 0.8 | 2.6 | Yes |
| ER10 | LWS | 0.4 | 1.4 | 0.6 | 2.1 | Yes |
| ER11 | LWT | 1.1 | 3.7 | 1.1 | 3.7 | Yes |
| ER12 | LWS | 0.3 | 0.8 | 0.5 | 1.6 | Yes |
| ER13 | LWS | 0.2 | 0.6 | 0.4 | 1.2 | Yes |
| ER14 | LWS | <0.1 | 0.1 | <0.1 | 0.1 | No |
| ER15 | LWT | 0.2 | 0.5 | 0.2 | 0.5 | No |
| ER16 | LWS | <0.1 | 0.1 | <0.1 | 0.1 | No |
| ER17 | LWS | 0.1 | 0.2 | 0.1 | 0.4 | No |
| ER18 | LWS | 0.2 | 0.6 | 0.2 | 0.6 | No |
| ER20 | LWS | 0.3 | 0.9 | 0.3 | 0.9 | No |
| ER21 | LWS | 0.1 | 0.2 | 0.1 | 0.2 | No |
| ER22 | LWS | 0.4 | 1.4 | 0.4 | 1.4 | Yes |
| ER25 | LWS | 0.7 | 2.4 | 1.2 | 4.0 | Yes |
| ER26 | LWS | <0.1 | 0.1 | <0.1 | 0.1 | No |

| ID | Designation | Maximum Modelled Contribution | | | | Further Assessment? |
|---|---|---|---|---|---|---|
| | | Project Alone | | In-Combination | | |
| | | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level | |
| ER28 | LWS | <0.1 | 0.1 | <0.1 | 0.1 | No |
| ER29 | LWS | 0.2 | 0.5 | 0.2 | 0.5 | No |
| ER31 | LWS | 0.4 | 1.2 | 0.5 | 1.8 | Yes |
| ER32 | LWS | 0.1 | 0.2 | 0.1 | 0.3 | No |
| ER33 | LWS | 0.4 | 1.3 | 0.6 | 2.0 | Yes |
| ER34 | LWS | 0.4 | 1.3 | 0.6 | 1.9 | Yes |
| ER35 | LWS | <0.1 | 0.1 | <0.1 | 0.1 | No |
| ER36 | LWS | 0.2 | 0.6 | 0.2 | 0.6 | No |
| ER41 | LWS | 0.5 | 1.8 | 0.5 | 1.8 | Yes |
| ER43 | LWS | 0.3 | 1.1 | 0.5 | 1.6 | Yes |
| ER46 | LWS | 0.3 | 1.0 | 0.3 | 1.0 | Yes |

110.    Where required, further assessment and calculation of the total maximum predicted annual mean $NO_x$ concentrations for comparison against the Critical Level ($30µg/m^3$) across the three model scenarios is presented in Table 19.19.

**Table 19.19: Maximum Predicted Annual Mean $NO_x$ Concentrations – 2027 Construction Year**

| ID | Designation | DM-C | | DM | | DS | |
|---|---|---|---|---|---|---|---|
| | | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level |
| ER5 | LNR | 15.6 | 51.9 | 15.7 | 52.5 | 15.9 | 53.1 |
| ER6 | LWS | 21.8 | 72.8 | 22.2 | 74.0 | 22.6 | 75.2 |
| ER7 | LWS | 17.8 | 59.3 | 17.8 | 59.3 | 18.2 | 60.7 |
| ER8 | LWS | 19.1 | 63.7 | 19.4 | 64.6 | 19.7 | 65.6 |
| ER9 | LWS | 23.0 | 76.7 | 23.4 | 78.0 | 23.8 | 79.4 |
| ER10 | LWS | 34.0 | 113.4 | 34.2 | 114.1 | 34.6 | 115.5 |
| ER11 | LWT | 22.7 | 75.5 | 22.7 | 75.5 | 23.8 | 79.2 |
| ER12 | LWS | 17.4 | 58.1 | 17.7 | 58.9 | 17.9 | 59.7 |
| ER13 | LWS | 15.2 | 50.7 | 15.4 | 51.3 | 15.6 | 52.0 |
| ER22 | LWS | 19.4 | 64.6 | 19.4 | 64.6 | 19.8 | 66.0 |
| ER25 | LWS | 31.3 | 104.3 | 31.8 | 106.0 | 32.5 | 108.4 |
| ER31 | LWS | 31.9 | 106.4 | 32.1 | 107.0 | 32.5 | 108.2 |
| ER33 | LWS | 32.4 | 108.1 | 32.6 | 108.8 | 33.0 | 110.1 |
| ER34 | LWS | 31.8 | 106.1 | 32.0 | 106.8 | 32.4 | 108.1 |
| ER41 | LWS | 21.8 | 72.6 | 21.8 | 72.6 | 22.3 | 74.4 |

| ID | Designation | DM-C | | DM | | DS | |
|---|---|---|---|---|---|---|---|
| | | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level | µg/m³ | % of Critical Level |
| ER43 | LWS | 29.0 | 96.5 | 29.1 | 97.0 | 29.4 | 98.1 |
| ER46 | LWS | 19.8 | 66.1 | 19.8 | 66.1 | 20.1 | 67.2 |

111.    At the majority of local sites requiring further assessment, no exceedances of the Critical Level (30µg/m³) are predicted across the three model scenarios (DM-C, DM and DS). Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

112.    Exceedances of the Critical Level are predicted at ER10, ER25, ER31, ER33 and ER34 (where the maximum modelled contributions are also >1% for both Project alone and in-combination). These exceedances occur across all three model scenarios and therefore occur in the future baseline regardless of the Project and/or committed developments and cumulative projects/plans coming forward.

113.    In consultation with the Project Ecologist, the exceedances at each of the designated ecological sites were investigated and each is discussed in turn.

**ER10**

114.    At ER10, A16 Verges North of the River Glen LWS, in all three model scenarios (2027 DM-C, DM and DS), the exceedances of the annual mean $NO_x$ Critical Level occur at receptors on the edge of the designation which borders the roadside of the A16. At these exceedance locations, at approximately 2m into the designation concentrations fall to below the Critical Level and therefore only a peripheral strip is likely to be affected.

115.    Furthermore, the exceedances only occur in the LWS area to the east of the carriageway, likely due to the prevailing wind direction and only for approximately two thirds of its length (exceedances are the red points in **Plate 19.8**). Given the above factors, and that only a small part of the wider site experiences exceedances, effects are considered not significant.

**Plate 19.8: Modelled Exceedances of the NO$_x$ Critical Level at ER10 in 2027 DS**

**ER25**

116.     At ER25, Hobhole Drain, Baker's Bridge South, in all three model scenarios (2027 DM-C, DM and DS), three modelled receptors are predicted to exceed the annual mean NO$_x$ Critical Level of 30µg/m$^3$. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.9**). The concentrations north and south of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.

**Plate 19.9: Modelled Exceedances of the NO$_x$ Critical Level at ER25 in 2027 DS**

**ER31**

117. At ER31, Pinchbeck Marsh LWS, in all three model scenarios (2027 DM-C, DM and DS), the exceedances of the annual mean NO$_x$ Critical Level occur at receptors on the edge of the designation which borders the roadside of the A16. At these exceedance locations, at approximately 2m into the designation concentrations fall to below the Critical Level and therefore only a peripheral strip is likely to be affected.

118. Furthermore, the exceedances only occur in the LWS area to the northeast of the carriageway, likely due to the prevailing wind direction (exceedances are the red points in Plate 19.10). Given the above factors, and that only a small part of the wider site experiences exceedances, effects are considered not significant.

**Plate 19.10: Modelled Exceedances of the NO$_x$ Critical Level at ER31 in 2027 DS**

**ER33**

119.     At ER25, Risegate Eau LWS, in all three model scenarios (2027 DM-C, DM and DS), two modelled receptors are predicted to exceed the annual mean NO$_x$ Critical Level of 30µg/m$^3$. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.11**). The concentrations east and west of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.

**Plate 19.11: Modelled Exceedances of the NO$_x$ Critical Level at ER33 in 2027 DS**

**ER34**

120.    At ER34, River Glen Corridor LWS, in all three model scenarios (2027 DM-C, DM and DS), two modelled receptors are predicted to exceed the annual mean NO$_x$ Critical Level of 30µg/m$^3$. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.12**). The concentrations east and west of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.



**Plate 19.12: Modelled Exceedances of the NO$_x$ Critical Level at ER34 in 2027 DS**

121.    As discussed above, the effects in relation to the annual mean $NO_x$ Critical Level at each of the designated ecological sites are determined as not significant.

### 19.11.2.2 Nutrient Nitrogen Critical Load Modelling Results

122.    Table 19.20 presents the maximum modelled 2027 nutrient nitrogen Critical Load impacts at all applicable ecological receptor locations for initial screening.

123.    At the SSSI (ER1), the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

124.    At the local sites, the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

**Table 19.20: Maximum Predicted Nutrient Nitrogen Impacts – 2027 Construction Year**

| ID | Designation | Critical Load Min (kgN/ha/yr) | Maximum Modelled Contribution | | | |
|---|---|---|---|---|---|---|
| | | | Project Alone | | In-Combination | |
| | | | kgN/ha/yr | % of Min Critical Load | kgN/ha/yr | % of Min Critical Load |
| ER1 | SSSI | 15 | 0.03 | 0.2 | 0.03 | 0.2 |
| ER5 | LNR | 10 | 0.03 | 0.3 | 0.06 | 0.6 |
| ER6 | LWS | 10 | 0.03 | 0.3 | 0.05 | 0.5 |
| ER7 | LWS | 10 | 0.03 | 0.3 | 0.03 | 0.3 |
| ER8 | LWS | 10 | 0.02 | 0.2 | 0.04 | 0.4 |
| ER9 | LWS | 10 | 0.03 | 0.3 | 0.06 | 0.6 |
| ER10 | LWS | 10 | 0.03 | 0.3 | 0.04 | 0.4 |
| ER11 | LWT | 10 | 0.08 | 0.8 | 0.08 | 0.8 |
| ER12 | LWS | 10 | 0.02 | 0.2 | 0.04 | 0.4 |
| ER13 | LWS | 10 | 0.03 | 0.3 | 0.05 | 0.5 |
| ER14 | LWS | 10 | 0.01 | 0.1 | 0.01 | 0.1 |
| ER15 | LWT | 10 | 0.03 | 0.3 | 0.03 | 0.3 |
| ER16 | LWS | 10 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER17 | LWS | 10 | 0.01 | 0.1 | 0.02 | 0.2 |

| ID | Designation | Critical Load Min (kgN/ha/yr) | Maximum Modelled Contribution | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | Project Alone | | In-Combination | |
| | | | kgN/ha/yr | % of Min Critical Load | kgN/ha/yr | % of Min Critical Load |
| ER18 | LWS | 10 | 0.01 | 0.1 | 0.01 | 0.1 |
| ER20 | LWS | 10 | 0.02 | 0.2 | 0.02 | 0.2 |
| ER21 | LWS | 10 | 0.01 | 0.1 | 0.01 | 0.1 |
| ER22 | LWS | 6 | 0.03 | 0.6 | 0.03 | 0.6 |
| ER25 | LWS | 10 | 0.05 | 0.5 | 0.09 | 0.9 |
| ER26 | LWS | 10 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER28 | LWS | 10 | <0.01 | <0.1 | 0.01 | 0.1 |
| ER29 | LWS | 10 | 0.01 | 0.1 | 0.01 | 0.1 |
| ER31 | LWS | 10 | 0.03 | 0.3 | 0.04 | 0.4 |
| ER32 | LWS | 10 | <0.01 | <0.1 | 0.01 | 0.1 |
| ER33 | LWS | 10 | 0.03 | 0.3 | 0.04 | 0.4 |
| ER34 | LWS | 10 | 0.03 | 0.3 | 0.04 | 0.4 |
| ER35 | LWS | 10 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER36 | LWS | 6 | 0.01 | 0.2 | 0.01 | 0.2 |
| ER41 | LWS | 10 | 0.04 | 0.4 | 0.04 | 0.4 |
| ER43 | LWS | 10 | 0.02 | 0.2 | 0.03 | 0.3 |
| ER46 | LWS | 10 | 0.02 | 0.2 | 0.02 | 0.2 |

### 19.11.2.3 Acidification Critical Load Modelling Results

125.      Table 19.21 presents the maximum modelled 2027 acidification Critical Load impacts at all applicable ecological receptor locations for initial screening.

126.      At the SSSI (ER1), the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum MaxN Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

127.      At the local sites, the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum MaxN Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

**Table 19.21: Maximum Predicted Acidification Impacts – 2027 Construction Year**

| ID | Designation | MaxN Critical Load (keq/ha/yr) | Maximum Modelled Contribution | | | |
|---|---|---|---|---|---|---|
| | | | Project Alone | | In-Combination | |
| | | | keq/ha/yr | % of MaxN Critical Load | keq/ha/yr | % of MaxN Critical Load |
| ER1 | SSSI | 1.7 | <0.01 | 0.1 | <0.01 | 0.1 |
| ER5 | LNR | 1.7 | <0.01 | 0.1 | <0.01 | 0.3 |
| ER6 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER7 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER8 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER9 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER10 | LWS | 5.1 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER11 | LWT | 4.9 | 0.01 | 0.1 | 0.01 | 0.1 |
| ER12 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER13 | LWS | 1.7 | <0.01 | 0.1 | <0.01 | 0.2 |
| ER14 | LWS | 10.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER15 | LWT | 1.7 | <0.01 | 0.1 | <0.01 | 0.1 |
| ER16 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER17 | LWS | 10.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER18 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER20 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER21 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER22 | LWS | 0.7 | <0.01 | 0.4 | <0.01 | 0.4 |
| ER25 | LWS | 5.0 | <0.01 | 0.1 | 0.01 | 0.1 |
| ER26 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER28 | LWS | 1.8 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER29 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER31 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER32 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER33 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER34 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | 0.1 |
| ER35 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER36 | LWS | 0.7 | <0.01 | 0.2 | <0.01 | 0.2 |
| ER41 | LWS | 4.9 | <0.01 | 0.1 | <0.01 | 0.1 |
| ER43 | LWS | 5.0 | <0.01 | <0.1 | <0.01 | <0.1 |
| ER46 | LWS | 4.9 | <0.01 | <0.1 | <0.01 | <0.1 |

## 19.12   Conclusion

### 19.12.1   Human Receptors

128.   Road traffic effects associated with the construction phase on concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ at human receptor locations are found to be **not significant** in terms of the EIA regulations.

### 19.12.2   Ecological Receptors

129.   In consideration of the outcomes of the assessment, road traffic impacts on all ecological designations can be considered negligible. Resultant effects are concluded to be **not significant** in terms of the EIA Regulations. No further assessment is therefore required.

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